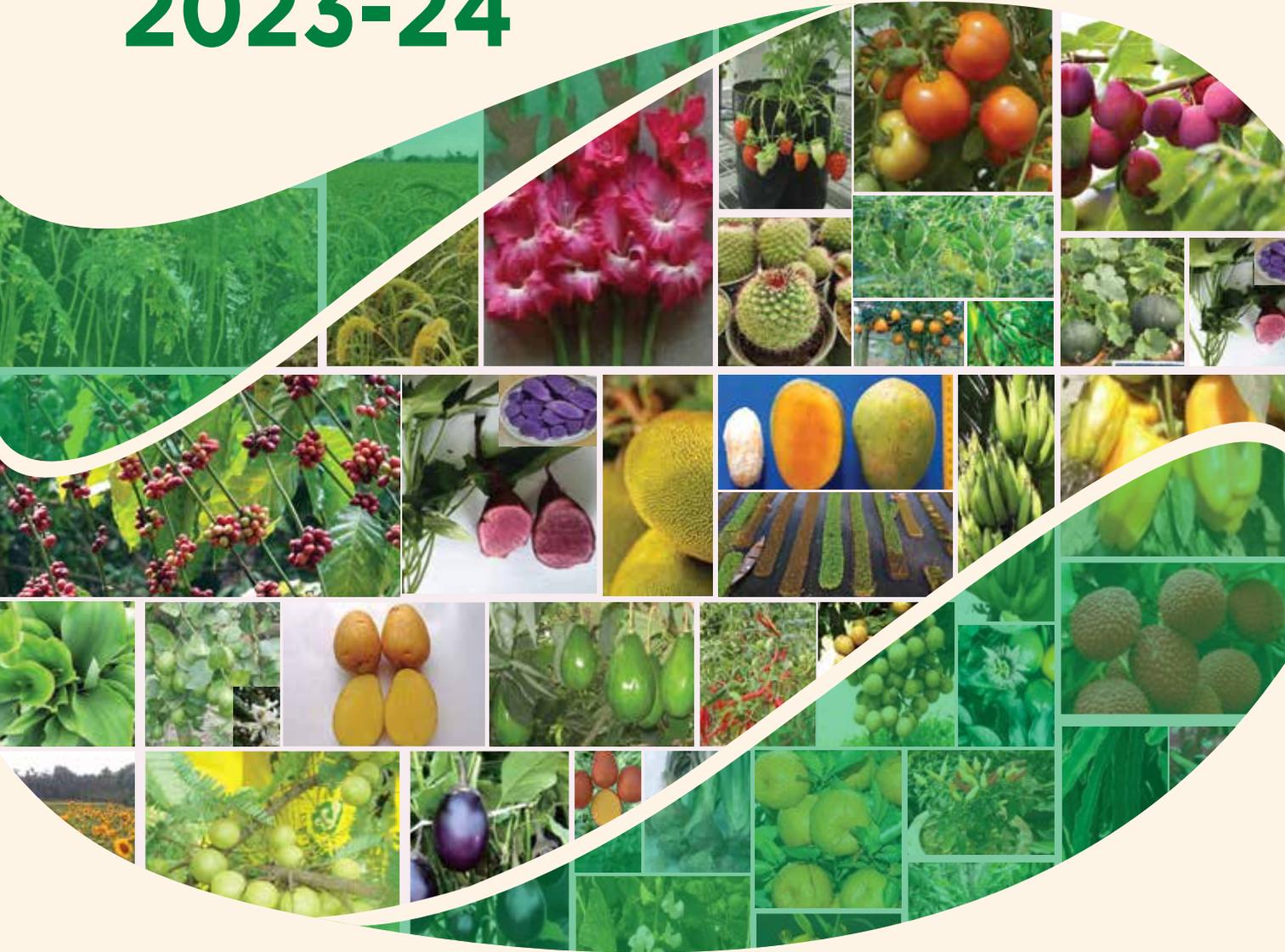


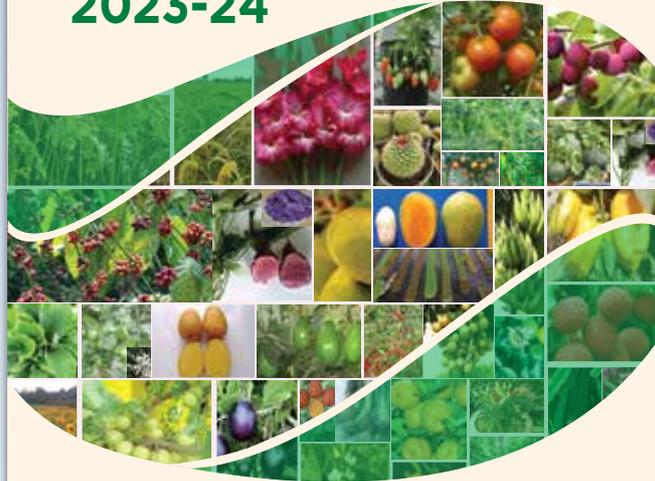
BARI Annual Report 2023-24



Bangladesh Agricultural Research Institute

www.bari.gov.bd

BARI **Annual Report** **2023-24**



Bangladesh Agricultural Research Institute

Compiled and Edited by:

Dr. Md. Abdullah Yousuf Akhond

Dr. Munshi Rashid Ahmad

Dr. Ashraf Uddin Ahmed

Dr. Md. Ataur Rahman

Dr. Abu Hena Sorwar Jahan

Dr. Mohd. Moniruzzaman

Dr. Md. Bazlur Rahman

Dr. Md. Mizanur Rahman

Md. Hasan Hafizur Rahman

Published by

Bangladesh Agricultural Research Institute (BARI)

October, 2024

200 Copies

Printed by

Janani Printers

105 Arambag, Motijheel

Dhaka-1000

The correct citation for this reports:

BARI (Bangladesh Agricultural Research Institute) 2024

Annual Report (2023-2024), BARI, Joydebpur, Gazipur-1701, Bangladesh

Foreword



This annual report is a comprehensive overview of the activities and achievements of BARI from the year 2023-24. As the name suggests, it is produced on yearly basis and includes major findings of the experiments conducted by the scientists of different disciplines working in various Crop Research Centers and Research Divisions of BARI during the preceding year. The major research areas include variety development of different crops, such as tubers (potato, sweet potato, aroids, etc.), oilseeds (mustard, rapeseed, groundnut, sunflower, etc.), horticultural crops (fruits, vegetables and ornamentals), spices (onion, garlic, chili, turmeric, ginger etc.) and cereals (barley, oat, millets, etc.). The areas of research also include improvement of cropping systems, crop, soil, water and irrigation management, plant nutrition, disease and insect management, plant biotechnological research, postharvest processing, production economics, development of low-cost farm machinery, and farm management. Besides, attention has also been given to adaptation and mitigation of climate change related issues, char and hill farming and farming under drought and saline conditions. Our scientists have also engaged in developing technologies which are appropriate as well as sustainable with a view to narrowing the gap between current food demand and its production in the country.

Although this report tried to summarize all the research activities of the previous year, it is really difficult to accommodate complete findings of all the studies in a single volume. So, like previous years, only the major findings of the studies have been incorporated in abstract forms allowing the readers to get an overview of the studies in brief. Detailed information of any particular study may be obtained from the respective Centers' or Divisions' reports.

I express my heartfelt thanks and appreciate the efforts of scientists, editors, and associates who have worked hard to bring this report out on time. I hope this report will be useful to scientists, teachers, students, policymakers and other stakeholders who are engaged in agricultural research and development for food and nutrition security of the country.

A handwritten signature in black ink, appearing to read 'A. Yousuf Akhond'.

Dr. Md. Abdullah Yousuf Akhond
Director General, BARI

BOARD OF MANAGEMENT

CHAIRMAN

Director General (Ex-officio)

Member

- * Two eminent scientists, one in social science and other in the field pertaining to the speciality of the Institute (nominated by the Ministry or the Division dealing with agriculture)
- * A representative of the Council (nominated by the Council)
- * The Directors of the Institute (Ex-officio)
- * Two senior scientists of the Institute (nominated by the Ministry or the Division dealing with agriculture)
- * A representative of the DAE not below the rank of Director (nominated by the Ministry)
- * Two representatives, one from the Ministry or the Division dealing with agriculture and the other from the Finance Division not below the rank of Deputy Secretary (nominated by the respective Ministry or Division)
- * Two representatives, one from among the farmers and the other from among the non-Govt. Organizations (NGOs) performing functions similar to those of the Institute (nominated by the Ministry or Division dealing with agriculture)

The Director-in-charge of administration of the Institute acts as secretary of Board.

CONTENTS

Foreword

Board of Management

Tuber Crops	01
--------------------------	----

Pulse Crops

Blackgram	32
Lentil	33
Grasspea	38
Chickpea	41
Fieldpea	44
Cowpea	46
Mungbean	46
Pigeon pea	49

Oilseed Crops

Rapeseed - Mustard	55
Sesame	67
Groundnut	69
Soybean	76
Sunflower	79
Linseed	84
Niger	85
Safflower	85

Spice Crops

Onion	96
Garlic	96
Chilli	96
Ginger	96
Turmeric	98
Coriander	98
Cumin	99
Black cumin	100
Ajown	101
Dill	101
Black pepper	102
Bay leaf	102

Vanilla	103
Cardamom	103
Betel leaf	103
Golmorich	103
Cinnamon	104
Fengreek	104
Plum (Alu-bukhara)	105
Mint	106

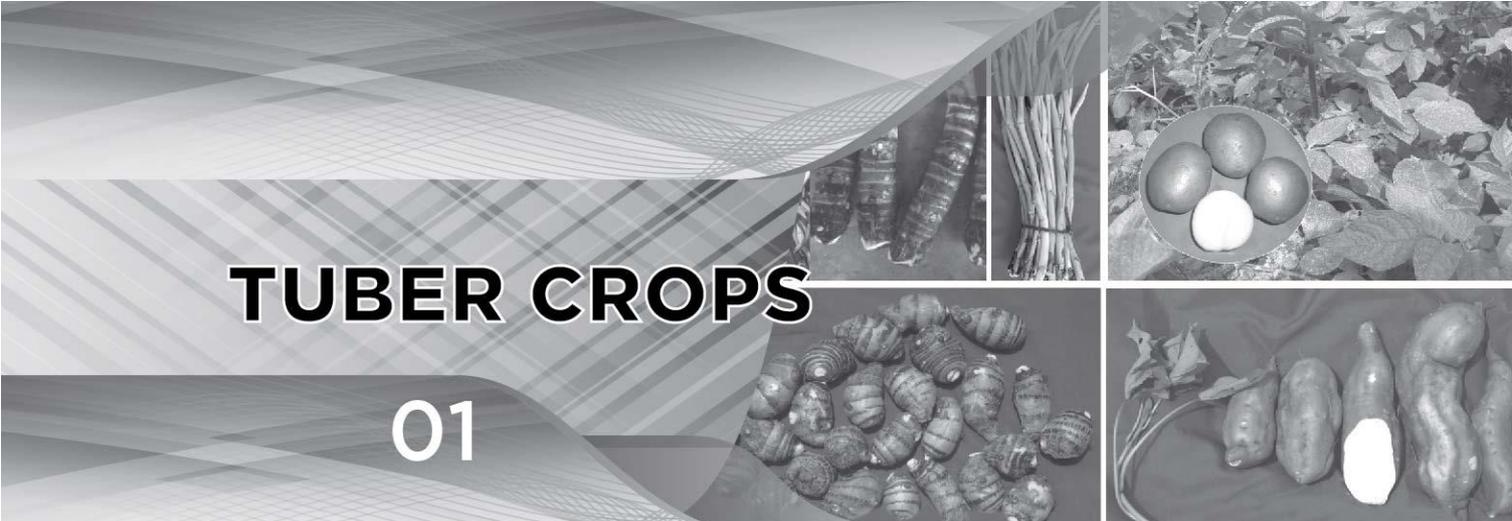
Vegetable Crops

Eggplant	121
Tomato	121
Sweet pepper	122
Bottle gourd	123
Water melon	124
Muskmelon	126
Sponge gourd	126
Pumpkin	126
Ridge gourd	128
Squash	128
Snake gourd	129
Cucumber	129
Teasle gourd	130
Pointed gourd	130
Country bean	131
Yard long bean/ velvet bean/ french bean ...	134
Mushroom	135
Stem amaranth	135
Okra	136
Cauliflower	137
Organic	138

Fruit Crops

Jackfruit	155
Mango	167
Banana	173
Litchi	174

Guava	175	FMF Engineering	239
Shahi Papaya	176	Agricultural Economics	250
Ber	176	Plant Genetic Resources	256
Coconut	178	On-Farm Studies	263
Mandarin	179	Plant Pathology	210
Sweet orange	179	Plant Physiology	333
Pummelo	180	Seed Technology	338
Bael	183	Vertebrate Pest	343
Wood apple	184	Postharvest Technology	245
Golden apple	184	Biotechnology	358
Burmese grape	184	Soil Management	362
Custard apple	185	Entomology	374
Indian dillenia	186	Hill Agriculture	379
Cowa	186	Agricultural Statistics and ICT	382
Water chestnu	189	Training & Communication Wing	388
Dragon fruit	190	Planning & Evaluation Wing	391
Avocado	194	Budget	397
Flower Crops	175	Information Report	
Cereal Crops		(As per Information	
Barley	205	Commission Requirements)	400
Millets	209		
Buckwheat	211		
Agronomy	212		
Irrigation and Water Management	232		



TUBER CROPS

01

Tuber crops viz. potato, sweet potato, aroids, yam and cassava are essential food crops. Tuber Crops Research Centre (TCRC), BARI deals with these crops. The main research thrust of TCRC is on variety development considering high yield, short duration, biotic-abiotic stress tolerant, good keeping and processing quality. Breeding, biotechnology, disease & pest management, soil & nutrient management, organic culture, postharvest processing are the major concern groups to improve tuber crops. Achievements during 2023-2024 on varietal improvement, biotechnology approaches, disease management, insect management, production technology, soil, water and nutrient management, postharvest technology, organic culture and technology transfer have been given below:

Varietal Improvement

Potato

Hybridization for high yielding (early bulking and early maturity, etc.) Potato variety development

S. Naznin, M.A. Kawochar, T. Jahan, A.T.M.T. Islam, M. Rahman, M.S. Hosasin, M. M. Islam, and M.M. Rahman

Hybridization was done at Debiganj and Gazipur using 64 and 52 advanced lines/varieties, respectively under 16 hours extended photoperiod to create variability, and to select superior genotypes in the subsequent generations. For early bulking and early mature variety development targeted parents were BARI Alu-86, BARI Alu-79, BARI Alu-85 (Seven four seven), BARI Alu-75 (Montecarlo) and BARI Alu-52 (Labadia) etc. For improving natural storage capacity targeted parents were BARI Alu-48, BARI Alu-100 (Ottawa) and

BARI Alu-67 (Gorgina) etc. Different high yielding varieties were used for high yielding variety development. We found several successful crosses by using those varieties as male and female parent and collected seeds from crosses for developing early bulking, early mature, longer natural storage capacity and high yielding varieties at both the locations. Those seeds will be sown next year for F₁ seedling production for subsequent variety development process.

Production of potato seedling tubers from F₁ seed (F₁C₀)

M. Rahman, M. A. Halim, A.T.M. T. Islam, M. A. Kawochar, S. Naznin, T. Jahan, A.K. Das and M.M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 76 single plants and 128 single tubers of 263 crosses were selected for high yielding table potato. In total 123kg seedling tubers were stored for next year.

Field evaluation of F₁ potato seedling tubers (F₁C₁)

M. Rahman, A.T.M. T. Islam, M. A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected seedling tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₀) was planted separately. In single plant generations (F₁C₁) 143 potato clones weighing 105 kg were selected and stored at BSPC, Debiganj for further evaluation.

Preliminary observation trial with potato germplasm (F₁C₂)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₁) was planted separately. In single row generations (F₁C₂) 46 potato clones weighing 200 kg were selected and stored at BSPC, Debiganj for further evaluation.

Secondary observation trial with potato germplasm (F₁C₃)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₂) was planted separately. In single plot generations (F₁C₃) 15 potato clones weighing 153 kg were selected and stored at BSPC, Debiganj for further evaluation.

Advanced observation trial with potato germplasm (F₁C₄)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₃) was planted separately. In advanced observational trial (F₁C₄) 30 potato clones weighing 1965 kg were selected and stored at BSPC, Debiganj for further evaluation.

Secondary Yield Trial (SYT) with potato lines (F₁C₆)

A.T.M.T. Islam, S. Naznin, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

Six hybrid clones of potato were evaluated along with four check varieties BARI Alu-13 (Granola), BARI Alu-25 (Asterix), BARI Alu-28 (Lady Rosetta) and BARI Alu-62 at Bogura, Debiganj,

Gazipur, Jamalpur, Jashore and Munshigonj. The highest average yield (36.18 t/ha) was observed in genotype 19.113 followed by genotypes 19.96 (35.90 t/ha) and 19.3 (34.46). Considering the tuber yield, dry matter, organoleptic taste, disease, insect infestation and tuber characteristics (shape, size, colour, scoring) these six hybrid genotypes (19.3, 19.34, 19.87, 19.96, 19.99 and 19.113) can be selected for next year AYT.

Advanced Yield Trial (AYT) With Hybridized Potato Lines (F₁C₇)

S. Naznin, A.T.M.T. Islam, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

Four advanced lines of potato were evaluated along with five check varieties BARI Alu-7 (Diamant), BARI Alu-13 (Granola), BARI Alu-25 (Asterix), BARI Alu-28 (Lady Rosetta) and BARI Alu-62 at six locations during 2023-24 for seventh generation. At final harvest, Advanced line 18.46 gave the statistically highest tuber yield (58.8 t/ha) at Bogura during final harvest. This line also gave average highest marketable yield (38.1 t/ha) followed by 18.8 (30.1 t/ha). The average dry matter percentages of line 18.8 were satisfactory (20.62%) and suitable for processing purpose. Advanced lines 18.8 and 18.46 can be selected for next year RYT Trial due to their performance regarding tuber yield, dry matter, organoleptic taste, disease and insect infestation and tuber characteristics (shape, size, colour, scoring) etc.

Participatory variety selection of AYT lines (F₁C₇)

S. Naznin, A.T.M.T. Islam, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

Four hybridized lines with five check varieties were evaluated at farmer's field under participatory variety selection to understand the performance as well as farmers opinion. The average highest tuber yield was recorded in line 18.8 (32.52 t/ha) followed by 18.46 (31.35 t/ha) and lowest average yield was found in check variety BARI Alu-28 (Lady Rosetta) (19.33 t/ha). Considering tuber yield, tuber size, shape and colour, farmers of all

locations showed their keen interest to most of the advanced lines, but varied from location to location. Therefore, further evaluation is needed for confirmation.

Regional Yield Trial (RYT) with advanced potato lines (F₁C₈)

A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

Four advanced lines of potato namely 16.9, 16.28, 17.18 and 17.19 along with five check varieties BARI Alu-7 (Diamant), BARI Alu-13 (Granola), BARI Alu-25 (Asterix), BARI Alu-28 (Lady Rosetta) and BARI Alu-62 were evaluated at six agro-ecological locations during 2023-24 cropping season). All four advanced lines are good as early bulker. Advanced line 17.19 gave the statistically highest tuber yield (44.5 t/ha) at Jashore during final harvest at 90 DAP. This line also gave average highest yield (33.0 t/ha) which was statistically similar with 16.9 (35.1 t/ha), 16.28 (32.6 t/ha) and 17.18 (32.6 t/ha) and BARI Alu-62 (33.1 t/ha). All the advanced lines are statistically similar and these lines are not better than check BARI Alu-62. This could be happened due to severe attack of late blight at later stage. Therefore, we need further evaluation for more confirmation. Average dry matter percentages of all lines were not suitable for processing purpose. Considering tuber yield, performance, disease, insect infestation and tuber characteristics (shape, size, colour, scoring) these advanced lines need further evaluation for final recommendation.

Participatory variety selection of RYT lines (F₁C₈)

A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

Four hybridized lines with two check varieties were evaluated at farmer's field under participatory variety selection to understand the performance as well as farmers opinion. In case of average yield of all locations the highest yield was recorded in 17.19 (39.53 t/ha) followed by genotype 17.18 (37.48 t/ha) and lowest average yield was found in BARI

Alu 28 (Lady Rosetta) (25.87 t/ha). Considering tuber yield, tuber size, shape and colour, the most of the farmers showed their keen interest to 17.18, but varied from location to location. Therefore, further evaluation is needed for confirmation.

Preliminary yield trial of exotic potato germplasm

T. Jahan, A.T.M.T. Isl, Am M.A. Kawochar, S. Naznin, M.S. Hossain, M.S. Rahman, M.M. Kadir, M.K. Alam, M. Salim, B. Anwar, K.U. Ahammad, M. Rahman, M. Sultana, M.T. Rahman, M. M. Islam and M. M. Rahman

Three exotic germplasm viz. Lady Alicia, Sound and Toronto along with four checks BARI Alu-13, BARI Alu-25, BARI Alu-28 and BARI Alu-62 were evaluated at six locations named as Gazipur, Bogura, Debiganj, Jamalpur, Jashore and Munshiganj of BARI during the last 2023-24. Significant variation was observed due to the both environmental and genotypic factors to the expression of different characters of potato emphasized with the yield and dry matter production. Considering all the locations, the top most producer was the check variety BARI Alu-25 (35.24 t/ha) followed by BARI Alu-28 (34.56 t/ha) at Jashore and BARI Alu-62 (34.37 t/ha) at Jamalpur region But the Exotic material Toronto showed good performance at Jashore delivering the highest yield (33.05 t/ha). The highest dry matter (23.23%) was gained from the Toronto at Munshiganj and Lady Alicia at Jashore region whereas the lowest was observed in the exotic genotype Sound (16%) at Debiganj. Considering the performance, all the tested exotic germplasm can be selected for SYT.

Advanced Yield Trial (AYT) of exotic potato varieties (C₂)

S. Naznin, M.A. Kawochar, A.T.M.T. Islam, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

One exotic variety viz. Alanis along with four check BARI Alu-7 (Diamant), BARI Alu-13 (Granola), BARI Alu-25 (Asterix), BARI Alu-28 (Lady Rosetta) and BARI Alu-62 were evaluated at six different agro ecological locations of Bangladesh named as Bogura, Debiganj, Gazipur, Jamalpur, Jashore and Munshiganj during 2023-24.

Significant variation was observed due to environmental factors in different locations to the expression of different characters of potato. At final harvest, average yield of exotic variety Alanis was lower than checks (25.1 t/ha) therefore we could not select this exotic variety for next year trial. Average dry matter percentage of exotic variety was not satisfactory (18.58) for processing purpose. Although tuber shape, size and colour of exotic variety Alanis was good however yield and uniformity are not up to the mark. Therefore, no material is selected from this study for next year trial.

Participatory Variety Selection (PVS) of ayt exotic potato varieties (C₂)

S. Naznin, M.A. Kawochar, A.T.M.T. Islam, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

One exotic potato variety along with five check varieties were evaluated at farmers' field of four agro ecological environments during 2023-24. Yield varied significantly from location to location. The average highest tuber yield was recorded in check BARI Alu-62 (27.75 t/ha) followed by Alanis (27.42 t/ha) and lowest average yield was found in check variety BARI Alu-28 (Lady Rosetta) (19.33 t/ha). Farmer's interest towards tested genotypes varied location to location. Some farmers liked new exotic variety and other did not due to its lower yield than check. Therefore, no material is selected from this study for next year trial.

Regional yield trial of exotic potato varieties

A.T.M.T. Islam, S. Naznin, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

One exotic potato variety SHC 1010 along with check varieties BARI Alu-13 (Granola), BARI Alu-25 (Asterix), BARI Alu-28 (Lady Rosetta) and BARI Alu-62 were evaluated at six different agro ecological environment/locations during 2023-24 cropping season in RYT. The significant influence was observed of different environmental factors of different locations on the expression of different characters of potato. Mean yield over the locations, Check variety BARI Alu-62 gave average highest

yield (33.12 t/ha) followed by SHC 1010 (28.11 t/ha). Therefore, this exotic variety SHC 1010 can be recommended for the release as commercial varieties due to their higher tuber yield potentialities.

Participatory Variety Selection (PVS) of RYT exotic potato varieties (C₃)

A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Selim, M.K. Alam, M. Sultana, M.T. Rahman, M.B. Anwar, K.U. Ahammad, M.S. Rahman, M.M. Kadir, M.M. Islam and M.M. Rahman

One exotic variety SHC 1010 with two check varieties BARI Alu-62 and BARI Alu-28 (Lady Rosetta) were evaluated at farmer's field under participatory variety selection to understand the performance as well as farmers opinion. In case of average yield of all locations the highest yield was recorded in SHC 1010 (36.02 t/ha) and lowest average yield was found in BARI Alu 28 (Lady Rosetta) (25.87 t/ha). Considering tuber yield, tuber size, shape and colour, the most of the farmers showed their keen interest to SHC 1010 in every location.

Hybridization for heat and salt tolerance potato variety development

M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, A.K. Das and M.M. Matiar

Hybridization was done at both in BSPC, BARI, Debiganj and TCRC, BARI, Gazipur using 37 parents for each locations under 16 hours extended photoperiod to create variability in the subsequent generations. To develop heat and salt tolerance variety, targeted parents were BARI Alu-72, BARI Alu-73 and BARI Alu-78. Different high yielding varieties were also used. One hundred-eleven successful crosses were produced by using those varieties as male and female parent and collected seeds from crosses too. Those seeds will be sown next year for F1 seedling production for subsequent variety development process.

Production of seedling tubers from F1 seed for heat tolerant potato variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder

Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 52 single plants and 115 single tubers of 130 crosses were selected for heat tolerant potato. In total 69 kg seedling tubers were stored for next year.

Evaluation of potato genotypes for early heat tolerance

M. Rahman, A.T.M.T. Islam, M. A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, M.N. Uddin, A. K. Das and S. Akhter

Potato production outside the regular growing season results in farmer's profit. In addition, potato consumers are attracted due to decreased supply in the market. Further, farmers grow an early potato in the northern regions of Bangladesh and gain more profit due to a higher price at that time. However, potato production may be affected by increased pest and disease pressure and higher soil temperature. We hypothesized that potato varieties showed less significant tuber yield reduction when they are not grown in a normal season. This experiment was taken to find suitable genotypes for earlier cultivation in northern regions of Bangladesh prior to mid of November. Performance of eighteen genotypes of potato along with four check varieties BARI Alu-13 (Granola), BARI Alu-29 (Courage), and BARI Alu-44 (Elgar) were evaluated at the breeder seed production center, Debiganj during Rabi season 2023-2024 following a randomized complete block design with three replications. The results revealed significant variations due to genotypes for all characters. Emergence, plant height, stem per hill, tuber yield at 60 days were recorded to identify the early bulker varieties. Finally, BARI Alu-86, BARI Alu-100, clone 18.13, and exotic variety Zorba can be selected for early heat tolerant variety on the basis of field performance.

Hybridization for late blight resistant table potato variety development

S. Naznin, A.T.M.T. Islam, M. A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M.M. Islam and M.M. Rahman

Hybridization was done at Debiganj and Gazipur using a number of late blight resistant genotypes {BARI Alu-46, BARI Alu-53, BARI Alu-77 (Sarpota Mira), BARI Alu-90 (Alouette) and BARI Alu-91 (Carolus) etc.} under 16 hours extended

photoperiod to develop late blight resistant varieties. Those varieties had several R-gene and we targeted those genes to transmit subsequent generations. We found total 37 successful crosses by using those varieties as male and female parent and collected seeds from crosses for developing late blight resistant at both the locations. Those seeds will be sown next year for F₁ seedling production for subsequent variety development process.

Advanced yield trial of CIP heat tolerant potato germplasm

M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. A. Ali, E. H. M. S. Rahaman, D. Chanda, M.M.I. Chowdhury, M.S. Rahman, N. Akter, M.G. Kibria and M.M. Rahman

This study presented results from high temperature screening of 13 genotypes in both the stress and non-stress condition in the field at OFRD, Shampur, Rajshahi and RHRC, Labukhali, Patuakhali, Bangladesh during 2023-24 cropping season. Paired trials were conducted in the field under high temperature (stress) and optimum temperature (non-stress) conditions. Under the heat stress condition, the highest tuber yield (34.76 t/ha and 34.09 t/ha) obtained from CIP-403 at Patuakhali and BARI Alu-72 at Rajshahi while the highest mean tuber yield (32.91 t/ha and 32.30 t/ha) obtained from check BARI Alu-72 and CIP-444. Genotypes CIP-449, CIP-448 and CIP-444 showed relatively higher HTI, lower HSI and lower yield reduction. Moreover, they ranked as second, third and fourth respectively. Heat intensity index (HII) was 0.21. These genotypes need to be selected for father evaluation to get precise information.

Production of seedling tubers from F₁ seed for late blight resistant variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 19 single plants and 42 single tubers of 54 crosses were selected for late blight resistant potato. In total 37 kg seedling tubers were stored for next year.

Production of seedling tubers from F₁ seed for nutrient (Fe and Zn) enriched potato variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 17 single tubers of 45 crosses were selected for late blight resistant potato. In total 10 kg seedling tubers were stored for next year.

Advanced yield trail of nutrient enriched (Fe & Zn) potato lines (CIP source)

T. Jahan, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, M. Rahman, M.S. Hossain, M.S. Rahman, M.M Kadir, M.K. Alam, M. Salim, B. Anwar, K.U. Ahammad, M. Rahman, M. Sultana, M.T. Rahman, M. M. Islam and M.M. Rahman

Sixteen biofortified germplasm provided by CIP along with four check BARI Alu-7, BARI Alu-13, BARI Alu-25 and BARI Alu-28 were evaluated at six different agro ecological locations of Bangladesh named as Bogura, Debiganj, Gazipur, Jamalpur, Jashore and Munshiganj during 2023-24 to search for getting some outstanding variety having Iron (Fe) and Zink (Zn) content. Significant variation was observed due to environmental factors in different locations to the expression of different characters of potato. At the end of the study, regarding some phenotypic characters, some CIP materials can be selected as CIP-444 (52.29 t/ha), CIP-442 (46.98t/ha) and CIP-417 (43.76 t/ha) based on yield performance, CIP-413 (24.87) and CIP-416 (23.72) based on DM%, CIP-415 based on grading, CIP-413, CIP-448 and CIP-449 based on tuber shape and other characters for the next year RYT program.

Hybridization for potato variety development containing processing attributes

M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, A.K. Das and M.M. Matiar

For hybridization, 35 and 22 parents were planted in BSPC, BARI, Debiganj and TCRC, BARI, Gazipur under 16 hours extended photoperiod to

create variability in the subsequent generations. To develop potato variety containing processing qualities, BARI Alu-28(Lady Rosetta), BARI Alu-29(Courage), BARI Alu-43(Atlas), BARI Alu-68(Atlantic), BARI Alu-71(Dolly), BARI Alu-76(Caruso), BADC Alu12(Santana), and BADC Alu14(SHC1010) for chips and flakes while BARI Alu97(Alverstone Russet) and BARI Alu103 for French fry were used as both female and male parents with targeted genes. Several high yielding varieties were also used. Sixty-six successful crosses were found by using those varieties as male and female parent and collected seeds from crosses too. Those seeds will be sown next year for F₁ seedling production for subsequent variety development process.

Production of seedling tubers from F₁ seed for potato variety development containing processing attributes

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 17 single plants and 40 single tubers of 40 crosses were selected for processing attributes potato. In total 34 kg seedling tubers were stored for next year.

Participatory variety selection of Late Blight Resistant (LBR) advanced potato lines

M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. A. Ali, E. H. M. S. Rahaman, M. Rahman, M.A. Halim, A.K. Das, M. Sultana, M.T. Rahman and M.M. Rahman

Ten advanced potato lines along with 4 checks e.g. BARI Alu-7(Diamant) and BARI Alu-25(Asterix) as positive, and BARI Alu-46 and BARI Alu-90 as negative checks were evaluated in the farmer's field in three different locations during the cropping season 2023-24. No late blight disease was observed in both the locations. In case of average yield over two locations, CIP444 produced the highest tuber yield (49.7t/ha). CIP403 and CIP449 performed more yield than 40 t/ha and even more than the checks. Considering size, shape, colour and yield, farmers of all locations showed their

keen interest about the CIP403, CIP444 and CIP449.

Hybridization for potato variety development containing export qualities

M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, A.K. Das and M.M. Matiar

Hybridization was done at BSPC, BARI, Debiganj and TCRC BARI, Gazipur using 20 and 29 parents, respectively under 16 hours extended photoperiod to create variability, and to select superior genotypes in the subsequent generations. For variety development of potato containing export qualities. Major targeted parents were BARI Alu-62, BARI Alu-85, BARI Alu-85, BARI Alu-89, BARI Al-100, etc. For improving natural storage capacity targeted parents were BARI Alu-62, and BARI Alu-100 (Ottawa). Forty-three high yielding and good tuber qualities varieties were also used as female and male parents. We found 46 successful crosses by using those varieties as male and female parent and collected seeds from crosses for developing potato variety containing processing qualities. Those seeds will be sown next year for F1 seedling production for subsequent variety development process.

Hybridization for anthocyanin enriched potato variety development

T. Jahan, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, M. Rahman, M.S. Hossain and M. M. Rahman

A crossing study was done among some selected advanced lines and high yielding varieties to get superior hybrids having anthocyanin content for subsequent generation in Tuber crops Research Centre, BARI, Gazipur, during the last 2023-24. The mission of this effort was to try to mitigate the global focus on food security by nourishing the existing variety with incorporating potential health promoting substances. The parents that were selected in this program were BARI Alu- 53 (P1), advanced line 33.32 (P2), advanced line 33.33 (P3), BARI Alu- 101 (P4), BARI Alu-90 (P5), BARI Alu- 85 (P6), BARI Alu- 63 (P7), BARI Alu- 62 (P8), BARI Alu- 56 (P9). A di-allele design for crossing was applied in this study. All the crosses didn't go to success that means fruit or berry and seed formation due to some obstacles

Production of potato seedling tubers from F₁ seed (F₁C₀) through speed breeding method

S. Naznin, A.T.M.T. Islam, M.A. Kawochar, T. Jahan, M.A. Halim, M. Rahman, M.M.H. Molla, M.M. Islam and S. Akhter

Hybrid true seeds which were produced in TCRC greenhouse during July to October, 2023 and were sown under net house during this season 2023-24. We found seedling tuber for variety development based on different criteria such as heat tolerant, late blight resistant, processing, anthocyanin rich, high yielding table potato, early bulker and longer storage capacity. After harvesting of all plantlets, 27.281 kg seedling tubers were stored for next year.

Evaluation of F₁ potato seedling tubers (F₁C₁) through speed breeding (F₁C₁)

M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, A.K. Das and M.M. Matiar

Through hybridization and selection program under speed breeding methods utilized maximum light, temperature and water. Speed breeding is a method which greatly shortens time without reducing the generation cycle and accelerates breeding and research programs. Single tubers were planted in net house at TCRC, BARI Gazipur during winter of 2023-24. To develop heat and salt tolerance and high yielding variety under speed breeding, 248 single plants were selected from 1193 single tubers under 15 crosses where 10 crosses for heat and salt tolerant variety development and 5 crosses for high yielding potato variety development. Collected tubers were stored for subsequent breeding program.

Maintenance of released potato varieties, germplasm, lines and TPS parents

M. Rahman, A.T.M. T. Islam, M. A. Kawochar, S. Naznin, T. Jahan, M.M. Islam, M. S. Hossain and M.M. Rahman

A total of 24249 kg seeds of potato was preserved in Breeder Seed Production Center cold storage, Debiganj, Panchagarh collected from 3775 potato variety/germplasm/hybrid clone during 2023-2024. The preserved materials will be used in future for variety development program.

Morphological characterization of advanced breeding lines and exotic potato germplasm

T. Jahan, A.T.M.T. Islam, M.A. Kawochar, S. Naznin and M.M. Rahman

A study was conveyed in the experimental field of TCRC, BARI, Gazipur during 2023-24 to know the diversity and to characterize eight advanced clonal hybrids with three exotic potato germplasm at TCRC, Gazipur during 2023-24 following the DUS descriptor. There were lots of variations in morphological as well as to agro-morphic characters.

Sweet Potato

Hybridization of sweet potato by polycross method

Z. Alam, M. A. H. Khan, M. S. Alam, M. A. Ali, M. M. Islam and M.M. Rahman

To harness heterozygosity among sweet potato genotypes, the polycross method was employed to produce half-sib hybrid seeds with significant variability in yield potential, dry flesh, earliness, carotene content, disease resistance, and taste. Ultimately, the primary goal of the breeding program is to develop a superior variety. The experiment took place during the 2023-24 season in Gazipur, resulting in the collection of 580 F1 seeds from twelve parent genotypes. The highest number of F1 seeds was obtained from BARI Mistialu-18 (120 seeds), followed by Moz1.9 (112 seeds), while the fewest came from BARI Mistialu-3 (10 seeds). These F1 seeds will be planted in nursery beds next season for vine and tuber production, as well as for evaluation.

Collection and maintenance of sweet potato germplasm

Z. Alam, M. A. H. Khan, M. S. Alam, M. A. Ali, M. M. Islam and M.M. Rahman

In February 2022, thirteen sweet potato germplasm were acquired from the International Potato Center (CIP) in Peru and Mozambique. These germplasm were first grown in a tissue culture laboratory to ensure their successful propagation and subsequently transferred to the field for long-term conservation and maintenance. In addition to these germplasm, 500 sweet potato seeds imported from Peru were successfully germinated and are currently being maintained in the TCRC field. This

initiative aims to enhance genetic diversity and support ongoing research and development efforts in sweet potato cultivation.

Observational yield trial of sweet potato germplasm

Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, E. H. M. S. Rahaman, D. Chanda, M. M. Islam, M. M. H. Molla and M.M. Rahman

An experiment was conducted to evaluate 70 sweet potato germplasm alongside four check varieties (BARI Mistialu-12, BARI Mistialu-16, BARI Mistialu-17, and BARI Mistialu-18) using an augmented experimental design at BARI, Gazipur, beginning on November 14, 2023. The data were collected on traits such as average foliage fresh weight per plant (FW), average number of storage roots per plant (RN), average storage root weight per plant (RW), marketable storage root number per plant (MRN), and marketable storage root weight per plant (MRW). Analysis revealed significant variations among genotypes for all measured traits ($p < 0.05$), and diversity was assessed using the coefficient of variation, which ranged from 27.83% to 47.57%. The MGIDI index identified eleven high-performing genotypes (BARI Mistialu-12, BARI Mistialu-16, Entry-51, BARI Mistialu-18, Entry-18, Entry-16, Entry-4, Entry-41, Entry-10, Entry-67, and Entry-8). These genotypes were selected based on their predictive performance, broad-sense heritability (h^2), trait uniqueness (TU), selection differential (SD), and selection gain (SG). The findings provide valuable insights into the genetic diversity of sweet potatoes, which can guide future breeding efforts.

Advanced yield trial of sweet potato germplasm

Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, E. H. M. S. Rahaman, D. Chanda, M. Moniruzzaman and M. M. Rahman

This study investigates the impact of location, treatment, and genetic variations on sweet potato yield and traits across diverse agroecological zones in Bangladesh. Utilizing a Randomized Complete Block Design (RCBD), 13 sweet potato genotypes, including four check varieties, were evaluated at four locations: Debiganj, Jamalpur, Bogura, and Gazipur. The trials, conducted from 19 October to 11 November 2023, revealed significant variations in marketable root number and weight across

locations, with some genotypes demonstrating consistently high performance. Key findings underscore the critical role of both genetic and environmental factors in optimizing sweet potato yield. The study recommends the selection of genotypes P1-33, P7-745, G-39, G-253, H.619/18, INDO1.1/19, and CIP-106090.1 for Regional Yield Trials (RYT), emphasizing the need to match genotypes to their optimal environmental conditions to achieve the best performance.

Regional yield trial of sweet potato clones

Z. Alam, M. A. H. Khan, M. S. Alam, M. Sultana, M. Z. H. Prodhan, M. M. Rahman, M. S. Rahman, M. M. Quader, M. B. Anwar, K. U. Ahammad, S. M. K. H. Chowdhury, A. S. M. H. Rashid, M. M. Islam and M.M. Rahman

An experiment was conducted with nine sweet potato clones: Moz.1.9, SPM-103, SPO-104, H9.7.12, H9.10.12, H6.52.11, H9.48.11, H5.ej.10, and H16.ej.10 across five different locations (Bogura, Jamalpur, Debiganj, Jashore, and Gazipur). Of these clones, BARI Mistialu-18, BARI Mistialu-12, and H9.48.11 demonstrated stable and above-average root yields. BARI Mistialu-18 and SPO-104 were selected based on the MTSI index. All genotypes showed good performance across all traits studied. These sweet potato clones will be utilized in the next RYT to verify their yield stability.

Participatory variety selection trial with sweet potato clones

Z. Alam, M. A. H. Khan, M. S. Alam, M. Sultana, M. Z. H. Prodhan, M. M. Rahman, M. S. Rahman, M. M. Quader, M. M. Islam and M.M. Rahman

A participatory variety selection trial at farmer's field of was carried out in Gazipur, Bogura and Jamalpur with clones namely H9.7/12, H9.10/12, H6.52/11, H5.ej/10, H16.ej/10, H9.48/11, Moz1.9, BARI Mistialu-18, SPM103 and SPO104 with three check variety BARI Mistialu-12 and BARI Mistialu-16 during the winter season of 2023-24. Farmers experienced very good mouth feel during testing BARI Mistialu-12, SPO104, BARI Mistialu-18 and BARI Mistialu-17. Overall, they choose H16.ej/10, BARI Mistialu-18 and SPO104 in respect of their marketable yield and organoleptic test.

Screening of suitable sweet potato variety for northern part of Bangladesh

M. Rahman, Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, M. M. Uddin, M. M. Islam, M. M. H. Molla and M.M. Rahman

The study aimed to select high-yielding sweet potato varieties that are suitable to grow in northern part of Bangladesh. The experiment was conducted following randomized complete block design with three replications. BARI released 17 sweet potato varieties were used in this study. The results showed that there were significant differences in the characters of 17 sweet potato genotypes in terms of their length of vines, marketable root weight, non-marketable root weight and tuber yield. The study showed that the highest yield was observed in BARI Misti Alu-12 (35.72 t ha⁻¹) followed by BARI Misti Alu-15 (25.74 t ha⁻¹) and the lowest was documented in BARI Misti Alu-4 (9.19 t ha⁻¹).

Observational trial of white skin and white fleshed CIP sweet potato germplasm

M. Rahman, Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, M. M. Uddin, M. M. Islam, M. M. H. Molla and M.M. Rahman

The study aimed to select high-yielding white fleshed sweet potato varieties that are suitable to grow around Bangladesh. The experiment was conducted following augmented design. Thirty-seven CIP sweet potato germplasm and 5 BARI released variety were used in this study. The results showed that there were significant differences in the characters of 42 sweet potato genotypes in terms of their main vine length and number of marketable root weight and tuber yield. The study showed that CIP-922 germplasm gave the highest marketable root weight (965.52 g/plant) followed by CIP-06 germplasm (867.00 g/plant), and the lowest was recorded in CIP-220 germplasm. The experiment revealed that the CIP-922 germplasm gave highest yield (58.81 t ha⁻¹) whereas CIP-220 germplasm gave lowest yield (0.24 t ha⁻¹).

Screening of salt-tolerant sweet potato genotypes in saline area

Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, E. H. M. S. Rahaman, D. Chanda, M. M. Islam, S. Akhter and M. M. Rahman

A field experiment was conducted in the Satkhira region during the 2023-24 growing season to

identify saline-tolerant sweet potato genotypes suitable for harvesting at 120 days. The study evaluated eight sweet potato germplasms using a randomized complete block design (RCBD) to assess their phenotypic characteristics, yield, and yield-contributing traits. Among the tested genotypes, V6 exhibited the highest performance with a yield of 23.94 tons per hectare. Genotypes V7, V8, and V1 also demonstrated superior performance, yielding 16.81 tons per hectare, 15.38 tons per hectare, and 14.79 tons per hectare, respectively. Based on these results, four genotypes, including V6, V7, V8, and V1, were selected for their saline tolerance and potential for further evaluation. This study provides valuable insights into the development of sweet potato varieties capable of thriving in saline-prone environments, contributing to food security in affected regions.

Aroids

Collection and maintenance of aroids

F. Begum, M.S. Alam, M.Z.H. Prodhon, M.M. Islam and M.M. Rahman

Germplasm collection and documentation are necessary for effective conservation and management of plant genetic resources. Five suckers and corms were collected from different districts. Nineteen of Mukhikachu, fifty of Panikachu and one of each of Panchamukhi kachu, Poidnal kachu, Dudhkachu, Moulolikachu/Sahebikachu and Ghataman kachu germplasms collected from home and abroad in recent past years and conserved at TCRC field, Joydebpur, Gazipur.

Advanced yield trial of mukhikachu lines

M. S. Alam, F. Begum, M. S. Rahman, B. Anwar and M. M. Rahman

Ten lines of Mukhikachu (*Colocasia esculenta* var. *antiquorum*) viz. MK 179, MK 182, MK 184, MK 186, MK189, MK190, MK 191, MK 192, MK 194 and MK 195 with two check varieties viz. Bilasi and BARI Mukhikachu 2 were evaluated under Advanced yield trial during February to November 2023 at TCRC research field, Gazipur, Jamalpur and Jashore. The growth parameters, yield components and yield were statistically significant among the lines. The highest yield (35.94 t/ha) was

recorded in MK 189 closely followed by the check, Bilasi (35.27 t/ha) and MK 194 (34.52 t/ha).

Regional yield trial of mukhikachu lines

M. S. Alam, F. Begum, M.Z.H. Prodhon, M. Sultana, M.R.H. Mondal, M. S. Rahman, M.M. Kadir, B. Anwar, K. U. Ahammed and M.M. Rahman

Four genotypes of Mukhikachu (*Colocasia esculenta*) viz. MK 122, MK 129, MK 131, MK 176 along with a BARI released variety Bilasi and BARI Mukhikachu 2 as check were evaluated under regional yield trial during March to November 2023. The yield components and yield were statistically significant among the lines. The Mukhikachu line MK 131 produced the highest yield (28.80 t/ha) which was statistically similar with MK 176 (26.45 t/ha) at Jamalpur.

Regional yield trial of rhizome producing panikachu lines

M. S. Alam, F. Begum, M. T. Rahman, M. Sultana, M.R.H. Mondal, M. S. Rahman, M.M. Kadir, B. Anwar, K. U. Ahammed and M. M. Rahman

Five lines of rhizome producing Panikachu (*Colocasia esculenta*) viz. PK 180, PK 181, PK 182, PK 186, PK 187 along with two check varieties BARI Panikachu 4 and BARI Panikachu 6 were evaluated under regional yield trial at Gazipur, Jamalpur, Bogura and Jashore. The results showed significant variation among most of the yield attributes and yield of rhizome producing Panikachu genotypes. Significantly higher stolon yield was obtained in BARI Panikachu 6 at all the studied locations and it was the highest of 24.71 t/ha at Jamalpur. The highest marketable rhizome yield (138.65 t/ha) was obtained in BARI Panikachu 6 at Jamalpur. But PK 186 obtained second in two locations at Jamalpur for stolon (23.08 t/ha) and Gazipur for rhizome (119.70 t/ha).

Regional yield trial of stolon producing panikachu lines

M. S. Alam, F. Begum, M.T. Rahman, M. Sultana, M.R.H. Mondal, M. S. Rahman, M.M.Kadir, B. Anwar, K. U. Ahammed, M.M. Islam, M. M. H. Molla and M. M. Rahman

Three lines of stolon producing Panikachu (*Colocasia esculenta*) namely PK 134, PK 178, PK 179 along with two BARI released stolon producing varieties of Latiraj and BARI Panikachu

2 as check were included in this experiment for selecting new variety(s) under regional yield trial at Gazipur, Jamalpur, Jashore and Bogura during January to August 2023. Most of the yield contributing characters and yield were statistically significant between interaction effect of the genotypes and locations. Stolon yield was the highest (43.13 t/ha) in PK 179 at Jashore. The marketable rhizome yield was the highest (118.64 t/ha) in PK 179 at Jamalpur.

Participatory variety selection trial on stolon producing panikachu lines

M. S. Alam, F. Begum, M. T. Rahman, M. S. Rahman, M. M. Islam, M. M. H. Mollah and M.M. Rahman

Experiments were conducted at the farmer's field of Gazipur, Jamalpur and Bogura during the period from January to August, 2023. Three promising lines like PK 134, PK 178 and PK 179 with two check varieties of BARI Panikachu 1 and BARI Panikachu 2 were included in the experiment. Among the lines, PK 179 was the highest producer in both of rhizome (75.76 t/ha) and stolon (20.74 t/ha).

Participatory variety selection trial on rhizome producing panikachu lines

M. S. Alam, F. Begum, M. T. Rahman, M. S. Rahman, M. M. Islam, M. M. H. Mollah and M.M. Rahman

Experiments were conducted at the farmer's field of Gazipur, Jamalpur and Bogura during the period from January to August, 2023. Three promising lines like PK 180, PK 181 and PK 182 with two check varieties of BARI Panikachu 4 and BARI Panikachu 6 were included in the experiment. Among the lines, BARI Panikachu 6 was the highest producer in both of rhizome (98.15 t/ha) and stolon (18.89 t/ha) but PK 182 gave the second highest rhizome as well as stolon yield.

Advanced yield trial of ghataman kachu in relation to spacing

F. Begum, M.S. Alam and M.M. Rahman

Three spacings like 60 cm × 60 cm, 75 cm × 60 cm and 75cm × 75 cm on Ghataman Kachu (*Alocasia* sp.) were evaluated during March to December 2023 at the field of Tuber Crops Research Centre, Gazipur. The vegetative growth parameter, yield contributing characters and yield were influenced significantly. 75 cm × 75 cm spacing was produced

the highest (30.87 t/ha) yield than 75 cm × 60 cm spacing (13.63 t/ha).

Advanced yield trial of panchamukhi kachu in relation to spacing

M.S. Alam, F. Begum, M.S. Rhaman, M.M. Kadir and M.M. Rahman

Three spacings like 60 cm × 60 cm, 75 cm × 60 cm and 75cm × 75 cm on Panchamukhi Kachu (*Colcasia esculenta*) were evaluated during March to December 2023 at the field of Tuber Crops Research Centre, Gazipur and Jamalpur. The yield was statistically significant in two locations. The yield was around 24.47 t/ha at Gazipur for 60 cm × 60 cm and 18.74 t/ha at Jamalpur under the same spacing.

Yam

Preliminary yield trial of yam (*dioscorea* spp.)

M.H. Rashid, K.A.M.M. Rahman, M.M. Molla, M.M. Islam and M.M. Rahman

Twelve yam germplasm namely DAG-1, DAG-2, DAG-3, DAG-4, DAG-5, DAG-6, DAS-1, DAB-1, DABN-1, DABN-2, DBN-1 and DAM-1 were selected and evaluated at research field, TCRC, Gazipur during 2023-2024 cropping season under PYT. Results of the present study clearly indicated among the germplasm, DAG-3 (50.17 t/ha) offered highest yielder followed by DAG-5 (43.67 t/ha). So, those could be advanced to release as variety considering the result.

Secondary yield trial of yam (*dioscorea* spp.)

M.H. Rashid, K.A.M.M. Rahman, B. Anwar, M.M. Molla, M.M. Islam and M.M. Rahman

Five yam germplasm namely DAC-1, DAC-2, DAK-1, DAL-1 and DDB-1 selected and evaluated at research field of TCRC, Gazipur during 2022-2023 cropping season under SYT. Results of the present study clearly indicated among the germplasm, DAL-1 (37.12 kg) offered highest yielder followed by DAC-2 (27.03 t/ha). So, those could be advanced to release as variety considering the result.

Regional yield trial of yam (*dioscorea* spp.)

M.H. Rashid, K.A.M.M. Rahman, M. Sultana, M.T. Rahman, B. Anwar, M.M. Molla, M.M. Islam and M.M. Rahman

Thirteen yam germplasm namely Bog-1, Bog-2, Bog-3, M.Man-2, Jas-1, Jas-2, Jas-3, Jas-4, Jas-5,

Jas-6, Jas-7, Jas-8 and Jas-9 were selected for evaluation as RYT at Joydebpur and Jashore during 2023-2024 cropping season. Combined analysis was done to see the genotype location interaction. The significant influence was observed of different environmental factor of different locations on the expression of different characters of yam. Results of the present study clearly indicated among the germplasm, Results of the present study clearly indicated among the germplasm, Bog-3 offered highest yielder (107.74 t/ha). So, those could be advanced to release as variety considering the result.

Cassava

Collection and evaluation of cassava germplasm

M.S. Rahman, M.M. Kadir, M.H. Rashid and M.M. Rahman

Five cassava germplasm namely ME Jam-001, ME Jam-002, ME Jam-003, ME Jam-004 and ME Jam-005 were evaluated at RARS, Jamalpur during 2023-24 cropping season. Results of the present study clearly indicated among the germplasms, ME Jam-02 produced the highest yield (69.43 t/ha) which was followed by ME Jam-004 (44.00 t/ha). The lowest yield was obtained from ME Jam 005 (22.83 t/ha).

Secondary yield trial of cassava lines

K.A.M.M. Rahman, M.H. Rashid, M.H. Molla, M.M. Islam and M.M. Rahman

Thirteen local cassava germplasm namely MEE-1, MEE-2, MEE-3, MEE-4, MEL-1, MEL-2, MEL-3, MEL-4, MEL-5, MEL-6, MEL-7, MEL-8 and MEL-9 were evaluated at research field, TCRC, Gazipur and RARS, Cumilla during 2023-24 cropping season under PYT. Results of the present study clearly indicated among the germplasms, MEL-5 offered highest yielder (30.65 ton/ha) which was followed by MEE-3 (29.12 ton/ha). So, those could be advanced to release as variety considering the result.

Jicama

Secondary yield trial of jicama (*Pachyrhizus tuberosus*)

M.H. Rashid and M.M. Rahman

Six jicama germplasm namely PTI-1, PTJ-1, PTB-1, PTB-2, PTK-1 and PTJ-2 were selected and evaluated at research field, TCRC, Gazipur and RARS, Jashore during 2023-2024 cropping season in RCB design with three replications. Results of the present study clearly indicated among the germplasm, the highest yield (21.38 t/ha) also recorded by PTI-1 in Gazipur. PTB-2 gave the highest yield (17.11 t/ha) in Jashore location. So, those could be advanced to release as variety considering the result.

Production Technology

Influence of spacing and date of harvest on the tuber yield of baby potato (BARI ALU-102)

S. Parvin, M.K. Alam, M.H. Sarker, R.Akter and M.M. Rahman

The experiment was conducted at Tuber Crops Research Center, Gazipur, during the rabi season of 2023-24 to find out optimum spacing and harvesting time of BARI Alu-102 (Spartan red) for maximum yield of baby potato. Seven spacing S_1 (50cm x 15cm), S_2 (50cm x 20cm), S_3 (50cm x 25cm) and S_4 (60cm x 10cm), S_5 (60cm x 15cm), S_6 (60cm x 20cm), S_7 (60cm x 25cm) and three harvesting dates H_1 (65 Days after planting), H_2 (75 Days after planting), H_3 (85 Days after planting) were used in the trial. The results revealed that closure spacing (60cm x 10cm) with 75 DAP gave the highest tuber yield (37.3 t ha^{-1}). It may be concluded that closure spacing (60cm x 10cm) with harvesting of 75 DAP would be used for baby potato tuber cultivation in the Northern region of Bangladesh. This is the 1st year findings and need to repeat verify the results.

Performance of promising potato varieties under organic cultivation system

S. Parvin, M.K. Alam, M.H. Sarker, R.Akter and M.M. Rahman

An experiment was conducted to identify the performance of some promising potato varieties under organic production system. The experiment was executed at the organic block under TCRC

research field, Gazipur during the rabi of 2023-24. Seven promising potato varieties namely BARI Alu- 53, BARI Alu- 63, BARI Alu -72, BARI Alu-73, BARI Alu -101, BARI Alu -102, BARI Alu -90 were evaluated. These varieties were evaluated under organic production system where soil fertility was managed with different organic fertilizers like Cowdung, Vermicompost, Trichocompost, and Neem Oil Cake @ 5t/ha each and different botanicals were used to reduce the pest attack. The highest organic tuber yield (30.3 t/ha) was obtained from the variety BARI Alu 63 followed by BARI Alu-90 (28.2 t/ha) and was statistically identical.

Effect of planting time and spacing on the yield of BARI Mistialu-17

S. Parvin, M.K. Alam, M.H. Sarker, R.Akter and M.M. Rahman

The experiment was conducted at TCRC, Gazipur during the rabi season of 2023-24 to find out optimum date of planting, and spacing for higher yield of Anthocyanin content BARI Mistialu-17. Five levels of planting dates viz. 15 October, 1st November, 15 November and 1st Dec, 15 December along with three spacing viz. 60cm x30cm, 60cm x40cm, 60cm x50cm were used in the study. The results revealed that 15 October planting with 60cm x40cm spacing combination produced the highest yield (34.1 t ha⁻¹).

Integrating biochar and vermicompost on the yield and quality of potato varieties

R. Akter, M. Salim and M. K. Alam

The experiment was conducted at the Tuber Crops Research Sub-centre, Munshigonj during the Rabi season of 2023-2024 to find out the suitable combination of inorganic and organic fertilizers. The experiment was laid out in a split plot design. Variety (BARI Alu 62, BARI Alu 63, BARI Alu 79) was in main plot and fertilizer combination (T₁=Control, T₂=biochar 8 t/ha + vermicompost 0 t/ha, T₃ = biochar 6 t/ha + vermicompost 2 t/ha, T₄ = biochar 4 t/ha + vermicompost 4 t/ha, T₅= biochar 2 t/ha + vermicompost 6 t/ha, T₆= biochar 0 t/ha + vermicompost 8 t/ha with three replications. The result revealed that BARI Alu-63 with 8 t/ha of biochar and 0 t/ha⁻¹ of vermicompost and BARI Alu-63 gave the highest yield (41.26 t/ha) of potato, the lowest potato yield (31.03 t/ha ha) was

found in BARI Alu-62 with control where no biochar and vermicompost were applied.

Evaluation of BARI ALU-7 (DIAMANT) from different sources on common scab disease development at munshiganj region

M. Salim and M. K. Alam

An experiment was conducted at the Tuber Crops Research Sub-Centre (TCRSC), Bangladesh Agricultural Research Institute (BARI), Munshiganj during 2023-24 with five treatments namely T₁ = Diamant (BARI), T₂ = Diamant (Private company), T₃ = Diamant (BADC), T₄ = Farmers' Diamant (2nd Year) , T₅ = Farmers' Diamant (3rd Year) with a view to find out the safe sources of seed tuber of BARI Alu-7 (Diamant) to produce common scab free potato and to grow awareness about the common scab diseases among the farmers. Results showed that the minimum potato common scab incidence (13.82%) was found from the seed Diamant (private company) (T₂) treatment which was statistically at par with T₁ i.e. seed from Diamant (BARI). In case of scab severity the lowest common scab severity (0.73) was observed in T₁ treatment whereas the highest common scab severity (1.63) was found in T₃ treatment. The maximum potato fresh tuber yield (22.55 t/ha) was found from T₂ treatment which was statistically similar to T₁ treatment whereas the lowest fresh tuber yield was found from T₁ treatment. Therefore, considering the common scab incidence (%), scab severity and fresh marketable yield diamant potato seed (BARI Alu-7) from BARI and private company T₁ and T₂ (treatment) performed better than other sources.

Evaluation of potato varieties in raise bed cultivation for adverse climatic condition at munshiganj region

M. Salim and M. K. Alam

An experiment was conducted at the Tuber Crops Research Sub-Centre (TCRSC), Bangladesh Agricultural Research Institute (BARI), Munshiganj during rabi season of 2023-24 with six treatments namely T₁ = BARI Alu-13, T₂ = BARI Alu-28, T₃ = BARI Alu-29, T₄ = BARI Alu-79, and T₅ = BARI Alu-76 with a view to select suitable potato variety (es) for the adverse climatic condition and make the potato production more profitable. Results showed that the maximum potato yield (31.40 t/ha) was found in T₅ (BARI

Alu-86) treatment which was statistically similar to T₄ (BARI Alu-79) treatment whereas the lowest potato yield was produced by T₃ (BARI Alu-29) treatment. Therefore, considering capability to survive in adverse climatic condition at the same time good yield and yield contributing characters BARI Alu-13, BARI Alu-86 and BARI Alu-79 may be cultivated to get good early profit from potato production in Munshiganj region.

Effect of spacing on seed size potato tuber production under different varieties

M. Salim and M. K. Alam

An experiment was conducted at the Tuber Crops Research Sub-Centre (TCRSC), Bangladesh Agricultural Research Institute (BARI), Munshiganj during 2023-24 with four types of spacing like S₁=75cm x 30cm, S₂=60 cm x 25cm, S₃=50cm x 20cm and S₄=30cm x 15cm and four varieties namely V₁=BARI Alu-25, V₂=BARI Alu-37, V₃=BARI Alu-62 and V₄=BARI Alu-79 with a view to find out suitable spacing for optimum seed size potato tuber (28-40mm) production in Munshiganj region. Results showed that the maximum (49.14% by weight) seed size potato tuber (28-40mm) was produced by treatment combination V₃S₄ which was statistically at par V₁S₃ and statistically similar with V₄S₄. Closer spacing was more suitable for seed size potato tuber production than wider spacing. In case yield, the maximum tuber yield (35.27 t/ha) was obtained from treatment combination V₄S₄. Therefore, considering the seed size potato tuber production, final yield and yield contributing characters sowing of potato BARI Alu-62 and BARI Alu-79 with closer spacing (30cm x 15cm) may be practiced to cultivate seed size potato tuber in our country.

Controlling of potato common scab development by sulphur and irrigation regimes in munshiganj region

M. Salim and M. K. Alam

An experiment was conducted at the Tuber Crops Research Sub-Centre (TCRSC), Bangladesh Agricultural Research Institute (BARI), Munshiganj during the rabi season of 2023-24 with eighteen treatments namely T₁=I₁S₀G₁, T₂=I₁S₀G₂, T₃=I₁S₀G₃, T₄= I₁S₁G₁, T₅=I₁S₁G₂, T₆= I₁S₁G₃, T₇=I₁S₂G₁, T₈=I₁S₂G₂, T₉= I₁S₂G₃, T₁₀=I₂S₀G₁, T₁₁=I₂S₀G₂, T₁₂=I₂S₀G₃, T₁₃=I₂S₁G₁, T₁₄=I₂S₁G₂, T₁₅=I₂S₁G₃, T₁₆=I₂S₂G₁, T₁₇= I₂S₂G₂, T₁₈=I₂S₂G₃

with a view to find out the cultural management of potato common scab using irrigation regimes and application of sulphur-containing fertilizers. Results showed that at 70 DAP, the best performance (16.71%) in terms of mitigating common scab infection was found from the treatment combination T₉=I₁S₂G₃ and the minimum scab severity (0.87) was observed in T₁₅=I₂S₁G₃. At 85 DAP, the treatment combination T₁₈=I₂S₂G₃ (16.83%) showed the best performance to minimize common scab infection and only (0.72) scab severity was produced by treatment combination T₁₅= I₂S₁G₃. At final harvest (95 DAP) only (14.31%) scab incidence was found from T₁₈ = I₂S₂G₃ and also the treatment combination T₁₈ = I₂S₂G₃ showed the promising performance (0.71) to minimize scab severity. The maximum marketable fresh yield (19.28 t/ha, 27.09 t/ha and 32.63 t/ha) at 70, 85 and 95 DAP, respectively was produced by T₁₈=I₂S₂G₃. Therefore, considering the common scab incidence (%), scab severity and fresh marketable yield; sulphur containing fertilizer may be applied at both planting and tuberization stage with longer irrigation interval to get good fresh yield in our country.

Effect of integrated fertilizer management on productivity and profitability of organic potato production

M. Salim, M. K. Alam and S. Parvin

An experiment was conducted to select safe and profitable potato production system through application of bio-fertilizers under organic management practices. The experiment was executed at the organic block under TCRC research field, Joydebpur during the rabi season of 2023-24. Two bio-fertilizers namely Azotobacter and Phosphorus Solubilizing Bacteria (PSB) which dosage were each one 8 ml per kg seed potato in liquid form and three organic fertilizers with different dosages viz. 10 ton/ha and 8 ton/ha were chosen as the treatment. The number of total treatment was 8 viz. T₁: Control, T₂: Vermicompost 10 t/ha, T₃: Trico-compost 10 t/ha, T₄: ACI Organic Fertilizer 10 t/ha, T₅: Bio-fertilizer (Azotobacter + PSB), T₆: Vermicompost 8 t/ha + (Azotobacter + PSB), T₇: Trico-compost 8 t/ha + (Azotobacter + PSB), T₈: ACI Organic Fertilizer 8 t/ha + (Azotobacter + PSB). BARI Alu -25 was used as material produced under organic production system at organic block, TCRC, Gazipur following organic

practices. The result showed that the maximum (25.04 t/ha) tuber yield was obtained from T₈ treatment which was treated with (ACI Organic Fertilizer 8 t/ha) + (Azotobacter + PSB) was at par with T₆ and T₇ treatment whereas the minimum fresh tuber yield (11.13 t/ha) was produced by treatment T₁ (control). Moreover, the highest gross return (Tk. 1252000/ha), net return (Tk. 697000/ha) and Benefit Cost Ratio (BCR: 2.24) were found from T₈ treatment which was followed by T₆ and T₇ treatment. Therefore it may be concluded that organic potato grown with treatment T₈, T₇, T₆ and T₅ was more profitable than the other practices.

Effect of Alternative Inhibitors on Sprout Suppression of Stored Potato in Ambient Condition

M. Salim and M. K. Alam

An experiment was conducted at the Tuber Crops Research Sub-Centre (TCRSC), Bangladesh Agricultural Research Institute (BARI), Munshiganj during the rabi season of 2022-23 with five treatments viz. T₁ = Peppermint oil, T₂ = Eucalyptus oil, T₃ = Mahogany oil, T₄ = Neem oil and T₅ = Distilled water with a view to find out the superior alternative(s) to toxic CIPC for potato sprout control in ambient storage condition; and to assess the efficacy of botanical sprout inhibitors for extending keeping quality of safe organic potato in natural condition. The first sprouting was initiated in 9th week at 56 days after storage (DAS) when distilled water was used as inhibitors on sprout suppression of stored potato in ambient condition. Eucalyptus oil provided the best performance on sprout suppression of stored potato in ambient condition i.e it took 14th week. The highest (2.33) number of sprouts (>3mm) was observed in 9th week at 56 days after storage (DAS) when distilled water was used as inhibitors on sprout suppression of stored potato in ambient condition where there was no sprouts were present in all other treatments. For the last week of data collection the best performance for both number sprouts (>3mm) and length of sprouts (cm), respectively were found (1.52) and (0.78 cm) when eucalyptus oil was used as inhibitors on sprout suppression of stored potato in ambient condition. Mahogany oil, peppermint oil and neem oil also showed promising performance for sprout suppression of stored potato in ambient condition. Therefore, considering the start of sprout, number of sprouts and length of sprouts

eucalyptus oil, mahogany oil, peppermint oil and neem oil may be used as inhibitors on sprout suppression of stored potato in ambient condition in our country.

Effect of NPK on growth and yield of panikachu varieties

MRH Mondol, M A Akhter, M Sultana and MT Rahman

Two varieties viz. V₁ = BARI Panikachu-1 and V₂ = BARI Panikachu-2 along with four levels of fertilizer doses viz. F₀-control, F₁-140-30-125 kg NPK/ha, F₂- 160-50-145 kg NPK/ha, F₃-180-70-165 kg NPK/ha were included in the study. The results revealed that in considering yield, BARI Panikachu-1 with 180-70-165 kg NPK/ha (25.64 t/ha) may be recommended for stolon production and BARI Panikachu-2 with 180-70-165 kg NPK/ha (19.23 t/ha) would be optimum for rhizome production.

Validation trial of newly developed red skin potato varieties in the farmers field

M.A. Akther, M.T. Rahman, R.H. Mondol and M. Sultana

Six BARI developed red skin potato varieties such as BARI Alu-8, BARI Alu-25, BARI Alu-36, BARI Alu-41, BARI Alu-79, BARI Alu-90 along with BARI Alu-7 (check) and BARI Alu-73 (check) were evaluated in the farmer's field of Shibganj, Bogura during the rabi season, 2023-24 to select and disseminate suitable variety (s) in the farmers field BARI Alu-90, followed by BARI Alu-73 produced the maximum tuber yield. This two varieties may be recommended for northern region of Bangladesh.

Performance of newly developed high yielding early potato varieties in the banana potato intercropping system

M.A. Akther, M.T. Rahman, R.H. Mondol and M. Sultana

The experiment was conducted in the farmer's field of Shibganj the during rabi season of 2023-24 to find out the performance of newly developed early potato varieties in the banana-potato intercropping system. Six varieties such as, BARI Alu-25, BARI Alu-54, BARI Alu-56, BARI Alu-84, BARI Alu-86 and BARI Alu-90 were evaluated in the trial. Among the tested varieties BARI Alu-86, BARI Alu-54 and BARI Alu-84 performed better.

Performance of stolon producing panikachu varieties in field condition

M. Sultana, M.A. Akther, M.R.H. Mondol and M.T. Rahman

A field trial was conducted at Joypurhat, during the Rabi season of, 2022-23 to evaluate the performance of BARI developed stolon producing Panikachu varieties under farmer's field. In the study, the highest stolon yield obtained from BARI Panikachu 8 followed by BARI Panikachu 2 and the lowest stolon yield obtained from local variety.

Performance of late blight resistant potato varieties in joypurhat area

M. Sultana, M.A. Akther, M.R.H. Mondol and M.T. Rahman

A validation trial was conducted at Joypurhat, during the rabi season of, 2023-24 to evaluate the performance of BARI developed late blight resistant potato varieties under farmer's field condition. The unit plot size was 4m×5m. Five BARI released varieties viz. BARI Alu-46, BARI Alu-53, BARI Alu-77, BARI Alu-90 and BARI Alu-91 along with check BARI Alu-25 (Asterix) were tested with three dispersed replications. In the study, all the varieties were free from late blight except BARI Alu-25(45%) and BARI Alu-91 (5%). BARI Alu-77 may be recommended for cultivation in the Joypurhat region.

Effect of intercropping potato with onion

M. Sultana, M.A. Akther, M.R.H. Mondol and M.T. Rahman

An intercropping experiment was conducted at the Tuber Crops Research Sub-Center, Seujgari, Bogura during the rabi season of 2023-24. The experiment consisted of five treatments, viz., T₁= Sole Potato, T₂ = 50% potato + 50% Onion, T₃ = 75% potato + 25 % Onion, T₄ = 25% potato + 75 % Onion, T₅ = Sole Onion. The highest potato equivalent yield (29.69 t/ha) was recorded in 25% potato + 75 % Onion intercropped treatment (T₄) treatment. The highest gross return (1187600 tk/ha), highest gross margin (587802 tk/ha) and BCR was also recorded from T₄ treatment.

Effect of plant spacing on yield of rhizome producing panikachu

M.S. Alam, F. Begum, M. S. Rahman, M. M. Quader, M. M. Islam and M.M. Rahman

The experiment was carried out at TCRC, Gazipur during January to August 2023. The treatments

comprised of nine plant spacing ie. 60 cm × 45 cm (control), 60 cm × 60 cm, 90 cm × 90 cm, 90 cm × 75 cm, 90 cm × 60cm, 90 cm × 45 cm, 75 cm × 75 cm, 75 cm × 60 cm and 75 cm × 45 cm with one rhizome producing varieties of BARI Panikachu 6 were evaluated in this experiment for selecting the appropriate spacing for maximization yield Panikachu. The rhizome producing Panikachu variety BARI Panikachu 6 was used in this experiment and planted following randomized complete block design with 3 replications at TCRC research field, Gazipur. The growth parameters, yield components and yield were statistically significant. The highest single marketable rhizome weight (2.78 kg) was obtained in 75 cm × 75 cm spacing as well as marketable rhizome yield (97.18 t/ha) was obtained by 60 cm × 45 cm spacing which was statistically similar with 75 cm × 45 cm (93.25 t/ha).

Effect of planting geometry on the yield of mukhikachu

M.S. Alam, F. Begum, M. S. Rahman, M. M. Quader, M. M. Islam and M.M. Rahman

The field experiment was carried out at TCRC, Bangladesh Agricultural Research Institute, Gazipur during April 2023 to November 2023 to ascertain the proper spacing for Mukhikachu production. The treatment consisted of seven spacings. Yield and yield contributing characters were significantly influenced by spacing. The maximum yield (22.59 t/ha) was obtained at a spacing of 60 cm × 45 cm.

Tuber Crops Disease Management

General survey, monitoring and others

Survey and monitoring of new tuber crops diseases in Bangladesh

M.M. Rahman, M.I. Hossain, M.Z. Masud, M.M.E. Rahman, M.M. Begum, and M.M. Rahman

A survey work was conducted to observe the incidence of Tuber crops diseases mainly potato and sweet potato in some districts of Bangladesh. In case of potato Late blight disease incidence was highest in Panchagarh, Thakurgaon, Nilphamary, Rangpur, Bogura and Gazipur and lower in Kurigram, Dinajpur, Lalmonirhat and Gaibandha districts. Bacterial wilt and Blackleg disease incidence were medium in the early season cultivation whereas lower in season. Common scab,

mosaics, stem rot, early blight, stem canker, and black scurf, PVY were less disease incidences of potato in Bangladesh. Four sweet Potato diseases were observed among them sweet potato feathery mottle virus was medium infestation.

Fungal disease management

Screening of selected potato varieties/germplasm/lines against late blight of potato

M.Z. Masud, M.M. Rahman, A.K. Saha, M.M. Begum, M.I. Hossain, and A.K. Das

Late blight of potato, caused by *Phytophthora infestans* (Mont.) de Bary, is one of the most important diseases of potato (*Solanum tuberosum* L.) in Bangladesh. The experiment was conducted under natural field condition in the isolated field of BSPC, BARI, Debiganj, Panchagarh to evaluate 39 (Thirty-nine) potato varieties/germplasm/lines against late blight disease during 2023-24 crop season. None of the variety/germplasm was found immune. BARI alu-90 were found highly resistant BARI Alu-46 and BARI alu-91 was found resistant. but BARI Alu- 47and BARI Alu-77 were moderately resistant. Yield of BARI Alu-90 produced the significantly highest yield (35.93 t ha^{-1}) and it was almost similar with BARI Alu-46 (33.50 t ha^{-1}), followed by BARI Alu-77 (28.65 t ha^{-1}) and BARI Alu-53 (27.92 t ha^{-1}).

Bacterial disease management

Monitoring of disease status of BARI released potato varieties against common scab

M.M. Begum, M.M. Rahman, M.I. Hossain and M.M. Rahman

Fourteen potato varieties viz. BARI Alu-7, BARI Alu-73, BARI Alu-77, BARI Alu-78, BARI Alu-79, BARI Alu-86, BARI Alu-87, BARI Alu-88, BARI Alu-89, BARI Alu-90, BARI Alu-91, BARI Alu-100, BARI Alu-102, and BARI Alu-104 were evaluated to screen resistant varieties against scab disease at Tuber Crops Research Centre, BARI, Joydebpur, Gazipur during 2023-24 cropping year under the field condition at Rabi season. Considering scab incidence, BARI Alu-86, BARI Alu-87, BARI Alu-89, BARI Alu-90, and BARI Alu-102 performed better and found completely free from common scab of potato.

Virus disease management

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (six progeny)

M. M. Begum

Three potato lines were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24. Based on field observation and according to ELISA test, one line namely 15.35 found free from PLRV, PVY and other combine virus infection compared to other lines.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (fourth progeny)

M. M. Begum

Six potato lines were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. All lines were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The hybrid clones namely 16.16, 16.28, 16.62 and 16.7 performed better and found free from any other viruses under ELISA test in the laboratory.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (third progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum, and M.M. Rahman

Fourteen potato lines along with check Diamant were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. All lines including a check variety Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The hybrid clones 18.102, 18.117 and 18.12 performed better considering all the parameters and found free from any other viruses.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (second progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

Three exotic potato lines along with check Diamant were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. All lines

including a check variety Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The exotic lines Sound and Lady Alica were found free from any other viruses.

Evaluation of potato hybrid clones and exotic lines for PLRV and PVY resistance under the infection pressure (first progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

Ten exotic potato lines and potato variety Diamant as check material were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24 as a first generation. All tested lines were found completely free from any type of virus including the check variety Diamant. This experiment will be repeated in the next year.

Evaluation of potato hybrid clones and exotic lines for PLRV and PVY resistance under the infection pressure (first progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

A total of six exotic lines and variety Diamant (as a control) were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24 as a first generation. All tested lines were found completely free from any type of virus including the check variety Diamant. This experiment will be repeated in the next year.

Detection of potato viruses (PLRV, PVY, PVX, PVM and PVS) in the supplied samples of different companies through DAS-ELISA

M. M. Begum

A total of 760 plantlet samples from different government and non-government organizations were tested for the presence of viruses by using specific DAS-ELISA detection separate kits as PLRV, PVY, PVX, PVS and PVM according to manufacturer's instructions (Bioreba AG, Switzerland). Among the tested samples, virus free found about 71% and 29% found infected with different alone and combine viruses. Mixed virus found the highest about 36% followed by PVX (26%), PVY (17%), PVS (13%), PVM (5%) and PLRV (3%)

Observational trial of sweet potato varieties/germplasm against virus diseases

M.I. Hossain, M.M. Begum, M.M. Rahman, M.A.H. Khan, M.S. Alam and M.M. Rahman

An experiment was conducted to screen the sweetpotato lines against different virus diseases in 2023-24 cropping season at Tuber Crop Research Centre, Bangladesh Agricultural Research Institute, Gazipur. Twelve sweetpotato germplasms were evaluated against virus diseases and only mild mosaic virus was observed in the field. Among 12 tested lines, five lines SPM-103, H9.48/11, BARI SP-12, H 6.52/11, and H 9.7/12 performed as the best lines for showing less than 0.8% virus infection. The experiment will be repeated in the next season.

Insect Pest Management

Incidence of cutworm (*Agrotis ipsilon*) on advanced materials of potato in field condition

Fahriya Yasmin, MZH Prodhan, Md. Mosharraf Hossain Molla, Md. Monirul Islam and Md. Matiar Rahman

Fifteen advanced materials namely 19.34, 19.96, 19.99, 19.113, 19.147, 17.12a, 17.159, 17.167, 16.9, 16.62, 33.32, 33.33, SHC 1010, Chenoa, Zorba along with three released varieties, BARI Alu-25 (Asterix), BARI Alu-62 and BARI Alu-90 (Alouette) were evaluated against cutworm at Tuber Crops Research Centre, BARI, Gazipur. Among all the germplasms 19.34 and 17.159 showed highest performance in case of insect tolerance and productivity respectively.

Incidence of sweet potato weevil (*Cylas formicarius* FAB.) on advanced materials of sweet potato

Fahriya Yasmin, MZH Prodhan, Md. Mosharraf Hossain Molla, Md. Monirul Islam and Md. Matiar Rahman

Ten advanced materials Moz 1.15, Moz 1.9, SPM 103, SPO 104, H 9.7/12, H 9.10/12, H 6.52/11, H 9.48/11, H 5.ej/10, H 16.ej/10 and three varieties (BARI Mistialu-12, BARI Mistialu-16 and BARI Mistialu-17) were evaluated against sweet potato weevil at Tuber Crops Research Centre, BARI, Gazipur. Among the germplasm SPM 103, H 5.ej/10, BARI Mistialu-17 and H 9.7/12 showed better performance against sweet potato weevil.

Studies on succession of insect-mite pests on yam

Fahriya Yasmin, MZH Prodhan, Md. Mosharraf Hossain Molla, Md. Monirul Islam and Md. Matiar Rahman

The trial was conducted at Tuber Crops Research Centre, BARI, Gazipur to identify of insect pests attacking yam at different growth stages. The crop was kept unprotected. Six species of insect-pests i.e., Leaf roller, June beetle, Gypsy moth, Tussock moth, Common cutworm and Mealybug were found to attack the crop. All the pests were appeared at vegetative state except Tussock moth and Mealybug which was appeared at the reproductive stage and caused minor to moderate damage.

Tuber Crops Biotechnology and Seed Production

Tissue Culture and Maintenance

Production, distribution and *in vitro* maintenance of potato varieties/germplasm

M.M.H. Molla, F. Akhter, S. Islam and M.M.Rahman

Plantlets were produced using shoot tip and meristem from virus free tubers of different potato varieties. Simple MS media was used for growth and development of the plantlets under aseptic conditions. A total of 13580 disease free plantlets of BARI released potato varieties were planted at TCRC, Gazipur for G₀ generation seed potato (Minituber) during 2023-2024. Also virus free mother stock (plantlets of promising potato varieties) were sent to BSPC, Debigonj for mass propagation. Mother stocks of the varieties are being maintained by subcultures for future multiplications and short term conservation.

Improvement of indigenous promising potato cultivars through meristem culture and their yield performance study with traditional cultivars

F. Akhter, M.M.H. Molla, S. Islam and M.M.Rahman

Virus free plantlet were produced through meristem culture planted under net house . A total of 750g mini-tubers were produced from eighty meristem

derived virus free plantlets of shilbilati during 2023-24 cropping season at Tuber Crops Research Centre, TCRC, Gazipur.

Purification of *in vitro* propagation protocol of cassava (*Manihot esculenta* Crantz)

F. Akhter, M.M.H. Molla, S. Islam, A.T.M. T.Islam, M. H. Rashid and M.M.Rahman

This study was conducted at the tissue culture lab, TCRC in BARI during 2023-2024 with a view to establish a protocol for *in vitro* multiple shoot production. Nodal explants in liquid MS medium supplemented with TDZ showed better performance for expand explant after 7days of culture. MS media supplemented with BAP and GA₃ showed highest number of shoots/explant (average 7 shoots/explant) after 7 days of culture.

***In vitro* propagation technique development in olkachu**

F. Akhter, M.M.H. Molla , S. Islam and S. Alam

This study was conducted at the tissue culture lab, TCRC, BARI during 2023-2024 with a view to establish a protocol for *in vitro* propagation of BARI Olkachu-1. Minimum 4 days required for shoot initiation. MS media supplemented with 6-Benzyl amino purine (BAP) and Indole butyric acid (IBA) was used for multiple shoot production.

***In vitro* regeneration of sweet potato (*Ipomoea balatas* L) for transgenic protocol development**

F. Akhter, M.M.H. Molla, S. Islam and M.M.Rahman

In vitro plantlets were established from nodal explants. 0.5 mg/l Kn was used in BAP supplemented with MS media according to (0.0,0.5, 1.0, 1.5, 2.0 mg/l). MS+ 2.0mg/l BAP +0.5mg/l Kn showed the best results in case of no of nodes and no. of leaves/plantlet for both varieties, BARI Misti Alu-4 and BARI Misti Alu-8. internodes, petioles, leaf segments of *in vitro* plantlets were used for callus formation. Explants cultured on MS media supplemented with six combinations of 2, 4-D (0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 mg/L) and 6-benzylaminopurine (BAP) 0.5 mg/L. Friable callus was obtained of both varieties from internodes and petioles cultured on MS media supplemented with 3 mg/l 2, 4-D + 0.5 mg/L BAP after 45 days of inoculation.

***In vitro* propagation of late blight resistant and heat tolerant potato varieties and standardization of nutrient film technique protocol for quality seed production round the year**

S. Islam, M. M. H. Molla, F. Akhter, H. Rashid, and M.M. Rahman

The range of tuber production per plant and tuber weight (g) of the varieties were 50.42 to 60.50 and 290.92 to 335.50 (g), respectively. Among the varieties BARI Alu-46 performed better compared to BARI Alu-53 and 73. Total harvested tubers were 2145 which was 14.41 Kg. Tubers were harvested 6 times from the varieties and found them significant variations among the harvest of varieties for tuber number, tuber weight. The highest number of tubers (28.58) harvested on June 12, 2024, from the variety of BARI Alu-53 followed by the same variety (23.50). Similarly, the highest weight of tubers was found on April 6, 2024, from the variety of BARI Alu-46 (88.75 g) followed by BARI Alu-53 (48.93 g).

Molecular Breeding and Genetics

Fingerprinting of BARI released potato varieties using SSR marker

F. Akhter, S. Islam, M.M.H. Molla and M.M.Rahman

The study has been conducted at molecular lab, TCRC, Gazipur using a total of 83 BARI released potato varieties. To determine the genetic diversity of these varieties, 20 SSR markers were selected and DNA fingerprinting has been conducted using these SSR markers.

Molecular characterization of BARI released sweet potato varieties using SSR marker

F. Akhter, S. Islam, M.M.H. Molla and M.M.Rahman

The study has been conducted at Molecular Biology Lab, TCRC, BARI, Gazipur during 2023-24. In this study, we determined the genetic diversity of 15 BARI released sweet potato varieties using microsatellite markers. They were analyzed for diversity using 10 simple sequence repeat (SSR) primers. The presence of bands was scored for each SSR and for each variety and the data were analyzed by principal coordinates analysis. The polymorphic SSR loci revealed a

diverse relationship among the sweet potato varieties, which was grouped into two major clusters by unweight pair group method analysis (UPGMA). Cluster analysis showed a Jacquard coefficient ranging from 0.00- 0, 81 indicating high genetic diversity among those varieties.

Molecular characterization of BARI released varieties and developed advanced panikachu lines

F. Akhter, F. Begum, S. Islam, M. M. H. Molla and M.M.Rahman

The study was conducted at Molecular Biology Lab, TCRC, BARI, Gazipur during 2023-24. In this study, genetic diversity of BARI released six panikachu varieties and seven advanced lines was determined using microsatellite markers. Morphological data were recorded in different stages of growth and DNA extraction from young leaves were completed by using CTAB method. Ten pairs of SSR primers were designed for diversity analysis among the varieties and lines in molecular level.

Advanced Yield Trial (AYT) of marker-assisted selected late blight resistance potato lines

S. Islam, M.M.H. Molla, F. Akhter, M. Rahman, M.M. Rahman, M. Sultana and M.M. Rahman

A total of 25 lines from the population of TB8, 10, 11 and 17 were planted at Debiganj, Rangpur, Bogura and Gazipur. Significant variations were found for the trait of AUDPC and yield. Yield and the rAUDPC and AUDPC had been reported here. Out of 25 lines 14 lines had less than 250 AUDPC of late blight infection where <250 AUDPC is considered as resistant to late blight. Some lines produced more than 40 t/ha tuber yield. 14 lines (TB10-019, TB10-089, TB11-002, TB11-006, TB11-007, TB11-009, TB11-020, TB11-026, TB11-046, TB11-052, TB11-052B, TB11-060, TB11-072, TB11-073, TB11-081, TB11-086, TB11-192, and TB17-029) were selected to evaluate next year 2024-25.

Secondary Yield Trial (SYT) of marker assisted selected heat tolerant potato lines

S. Islam, F. Akhter, M. M. H. Molla., M. Rahman, S. Rahman and M.M. Rahman

TCRC developed heat tolerant varieties BARI Alu-72 and, BARI Alu-73. Three crosses TB15, TB16 and TB19 were made with table potatoes (BARI

Alu-25 and 63) during the year of 2018-19. TPS was planted and tuberlets were produced from those crosses at BSPC in 2019-20. More than 300 genotypes from those crosses were planted at BSPC, Rangpur and TCRC, Gazipur in 2019-20. From that experiment, 110 lines were selected and evaluated again at BSPC and Gazipur in 2020-21, 2021-22, at Rajshahi in 2021-22. A total of 45 selected lines had been selected and planted in BSPC, OFRD Rajshahi, TCRC, Gazipur research field on the first week of December 2022. From the evaluation of 2023, 25 lines planted in the same locations and from that evaluations the selected lines were as follows: TB15B-012, TB19-023, TB19-079, TB19-018, TB19-001, TB19-047, TB19-080, TB15-026, TB16-009, TB15B-005, TB19-075, TB19-095, TB19-009, TB15B-019, TB19-096, TB19-025 and TB15A-118). Those lines were selected from the yield of TCRC, BSPC and Rajshahi.

Marker Assisted Selection (MAS) of disease resistance genes in tetraploid potato for late blight and viruses

S. Islam, M.M.H. Molla, F. Akhter, M. Rahman and M.M. Rahman

TCRC developed late blight resistant varieties BARI Alu-46, 53, 77, 90 and 91. Some crosses were made with virus resistant advanced lines during the year 2018-2021. TPS was planted and tuberlets were produced from those crosses at BSPC in 2019-2022. After a series of evaluation, 17 lines were selected from the yield and resistance to late blight disease. The distribution of yield and AUDPC at TCRC and BSPC had shown left skewed. The selected lines were TB13-01, TB24-02, TB27-05, TB27-07, TB29-14, TB29-17, TB31-02, TB31-09, TB31-13, TB31-19, TB37-02, TB37-26, TB43-01, TB49-10, Tb59-5, TB82-01 and TB83-01. From the crosses of 2022-23, BSPC produced tubers from those crosses. As per crosses some single lines were produced which will be evaluated in the following year.

Marker Assisted Selection (MAS) of late blight resistant bio-fortified potato

S. Islam, M.M.H. Molla, F. Akhter, M. Rahman, and M.M. Rahamn

Flowers from the planted potato varieties did not come at a time. Crosses were made among the selected parents in the crossing. After some

possible crosses, 26 crosses were found successful. The total number of TPS was 13,474 from the weight of 16 family's 965 mg TPS. Some lines had more than 40 t/ha yield from 394 lines of LBR biofortified potato germplasm. Out of 414 biofortified lines, TB256-13, TB272-5, TB262-9, TB258-10, TB261-6, TB260-3, TB254-8, TB261-16, TB254-4, TB257-11, TB257-21, TB261-14, TB267-12, TB267-8 and TB252-4 produced yield more than 40 t/ha. Best lines will be selected based on yield and Fe and Zn analysis.

Genetic variation assesment in cassava genotypes using SSR markers

S Islam, F. Akhter, M. M. H. Molla., H. Rashid and M.M. Rahman

The genetic diversity of 14 cassava (*Manihot esculenta*) varieties (MEL group) and Vietnam (MEE group) was evaluated using 10 SSR marker primer pairs. DNA was extracted from cassava leaves and amplified through PCR, followed by gel electrophoresis. Analysis revealed two distinct clusters: the MEL group demonstrated higher genetic diversity, while the MEE group exhibited a more uniform genetic structure. The MEL group, with varieties MEL-1, MEL-5, and MEL-6 showing high similarity and MEL-2 and MEL-10 being more distant, displayed a broader genetic base. Conversely, the MEE group was more homogeneous, with MEE-3 being the most distinct. These results suggest that the MEL group is a valuable genetic resource for breeding programs. The observed genetic variations between the groups highlight the potential for selection and breeding strategies that could improve cassava resilience and productivity.

Molecular diagnosis of potato viruses in bangladesh and sequencing of potato virus x (PVX)

S Islam, F. Akhter, M. M. H. Molla., M.M. Begum, and M.M. Rahman

Potato virus X (PVX) is a significant pathogen affecting potato crops worldwide. This study aimed to detect and characterize PVX from infected potato leaf samples collected in Gazipur, Bangladesh. An initial screening was conducted using an Enzyme-Linked Immunosorbent Assay (ELISA) to confirm the presence of PVX. Positive samples were then subjected to RNA extraction, followed by cDNA synthesis. PCR amplification

using specific primers targeting the coat protein gene further confirmed PVX presence. One of the positive samples was selected for whole-genome sequencing, revealing the complete nucleotide sequence of the PVX isolate. Phylogenetic analysis showed that the Bangladeshi isolate closely relates to other global PVX strains, suggesting a potential common origin. The findings contribute to understanding PVX genetic diversity and highlight the importance of molecular diagnostics in managing potato viruses in the region.

Molecular diagnosis and field survey of the distribution of the sweet potato infecting viruses in Bangladesh

S. Islam, M.M. Rahman, M.M.H. Molla, F. Akhter, M.A. Ahmed and M.M. Rahman

Sweet potato is vital for food security in Bangladesh, but viral diseases threaten its yield. Despite its importance, research on sweet potato viruses in the region is limited. This study assessed yield loss from viral infections and detected sweet potato viruses in major growing areas using PCR. Seventeen sweet potato varieties from BARI were tested for yield variation, showing virus-free plants produced 15.5–32.75 tuber t/ha, while infected plants yielded 7.33–17.57 t/ha, with losses ranging from 28.27% to 67.1%. Virus detection in samples from Gazipur, Bogura, Gaibandha, Rangpur, and Sherpur identified Sweet Potato Stunt Virus (SPCSV) as most prevalent, followed by Sweet Potato Feathery Mottle Virus (SPFMV). PCR confirmed SPFMV, SPCSV, and Sweet Potato Virus G (SPVG) in multiple samples. These findings highlight the need for effective virus management to protect Bangladesh's sweet potato production.

Production of Quality Tuber Crops Seed

Production of nucleus seed potato (mini tuber, G0) using in vitro plantlet

M. Rahman, M.W. Rahman, M.A. Halim, M.M.H. Molla, A.K. Das and M.M. Rahman

In vitro potato plantlets were used in this study to produce minituber. A total of 2483.33 kg minitubers were produced from 30442 plantlets during 2023-24 at Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh. Mini tubers of all

varieties are stored in Breeder seed production centre (BSPC) cold storage and for the next year multiplication for subsequent generation. Mini tuber of different lines were multiplied for next year trial. The highest amount was harvested from the variety BARI Alu-25 (Asterix) 215 kg.

Production of breeder and foundation potato seed at BSPC, Debiganj, Panchagarh during 2023-2024

M.W. Rahman, M. Rahman, M. Z. Masud, M. A. Halim, B.R. Barman, M. K. Kobra, M.M.H. Molla, A. K. Das and M.M. Mahman

Breeder and Foundation seed Production of different potato varieties is the routine works of Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh. A total of 653.03-ton seed potato (nucleus, breeder, foundation and germplasm seed) were produced from 108.50 acres of land during 2023-24 cropping season. To produce breeder seed, nucleus and G1 seed were used and in case of foundation seed production breeder seed were used. Mini tuber of the varieties were multiplied for next year Breeder seed production.. Mini tubers of different germplasms were multiplied for next year trial . The highest amount of breeder and foundation seed washarvested from the variety BARI Alu-25 (128.420 ton & 46.693 ton).

Seed production and distribution of sweetpotato and aroids

M. S. Alam, Z. Alam, F. Begum, M. A. H. Khan, M.T. Rhaman, M. Sultana, M. S. Rahman. M.M. Kadir, M.M.H. Molla, M. M. Islam and M.M. Rahman

Seed production is a regular programme of TCRC for varietal maintaining and distribution to farmers or different adaptive or demonstration trials. Eight lakhs twenty thousand two hundreds of vine cuttings of the seventeen Sweetpotato varieties, around six lakhs three thousand seven hundreds of Panikachu suckers of the seven Panikachu varieties and around One thousand five hundred ninty kilogram of corms (Seed) of the two Mukhikachu varieties were produced at Gazipur, Jamalpur, Bogura, Jashore and Dediganj. From that around three lakhs thirty nine thousand six hundrad vine cuttings of sweetpotato, around two lakh fifty one thousand eight hundred suckers (seedlings) of Panikachu and around one thousand eleven

kilogram corms (seed) of Mukhikachu varieties were distributed for farmers and used in the different experiments.

Production and maintainance of minor crops seed

M.H. Rashid, A.K.M.M Rahman, M. Rahman, M.A. Halim, M.M.H. Molla, M.M. Islam and M. M. Rahman

Seed production is a regular programme of TCRC for varietal maintaining and distribution to farmers or different adaptive or demonstration trials. Around **4131.28** kg yam seed tuber were produced from mentioned varieties **60,000** stem cuttings were produced from cassava varieties and advanced lines and **11.77** kg jicama seed were produced by advanced lines on research field of TCRC, Gazipur.

Post Harvest Technology

Storage behaviour of hybrid clones of potato under AYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

The experiment was conducted at Tuber Crops Research Center, BARI from March to July 2023. Five clonal hybrids of AYT were evaluated with five check varieties for storage behaviour under natural conditions. At 60 DAS, the minimum weight loss (10.20%) was found in BARI Alu-7 followed by BARI Alu- 28 (10.27%), 17.19 (21.67%) and 17.12a (21.97%). At 90 DAS, the minimum weight loss (19.67 %) was also recorded in BARI Alu-13 followed by BARI Alu- 28 (28.09%). Among the hybrid clones minimum weight loss was recorded in 17.12a from 15 DAS to 105 DAS ranging from 2.91% to 82.43%. At 60 DAS maximum BSR loss was recorded in BARI Alu-90 (41.29%) closely followed by 17.18 (40%) and minimum was in BARI Alu-7 (4.83%). The data shows that the minimum bacterial soft rot (BSR) of 33.76% was found in BARI Alu-7 and maximum in BARI Alu-90 (72.56%) at 90 DAS. Compared to controls all the tested hybrid clones showed moderate loss due to BSR ranging from 51.86% - 68.86% at 105 DAS where 17.12a (54.05%) and 17.167 (51.86%) performed better. In conclusion, hybrid clones 17.12a, 17.19 and 17.167 under AYT performed better storage performance in natural conditions.

Storage behaviour of hybrid clones of potato under RYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

The study was conducted at Tuber Crops Research Center, BARI during 2023-24 with six hybrid clones under RYT to evaluate the storage quality of hybrid clones under natural conditions. All the six tested hybrid clones under RYT ranged from 22% to 94.17% for cumulative weight loss for 90 and 120 DAS. At 90 DAS, the minimum weight loss (19.66%) obtained in BARI Alu- 7 was statistically similar with 16.28 (22%), BARI Alu-28 (28.09%), 16.62 (30.6%), 16.9 (31%) and 16.16 (32.63%) while maximum weight loss was recorded in 33.33 (86.25%). Minimum weight loss at 150 DAS was found in 16.62 (45.24%) followed by 16.28 (57.2%) and 16.16 (64.73%). Among the tested genotypes maximum percentage of bacterial soft rot (BSR) (69.16%) was observed in 33.33 and minimum in 16.28 (14.40%) which was statistically similar to 16.62 (14.57%) and 16.9 (26.60%) at 90 DAS. 16.62 (20.28%) was recorded with the lowest rotting loss followed by 16.28 (36.80%) whereas the maximum was found in BARI Alu-90 (83.64%) at 150 DAS. It can be concluded that hybrid clones 16.62, 16.28 and 16.9 under RYT showed better storage performance in natural conditions.

Storage behaviour of exotic potato varieties under SYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

An experiment was conducted at Tuber Crops Research Center, BARI from March to June 2023. Tubers of four exotic potato varieties with five check varieties of SYT were evaluated for storage behaviour under natural conditions. Maximum cumulative weight loss at 60 DAS was recorded in BARI Alu-13 (29.53%) while the minimum was recorded in Cheona (6.47%) closely followed by BARI Alu-7 (10.20%) and BARI Alu-28 (10.27%). All the tested potato varieties under SYT ranged from 19.67% to 78.28% for cumulative weight loss at 90 DAS. At 90 DAS, the minimum weight loss (19.67%) obtained in BARI Alu-7 was statistically similar to Cheona (25.07%), Zorba (46.52%) and BARI Alu-28 (28.09%) while maximum weight loss was recorded in again in Alanis (78.28%). All the tested exotic varieties performed better compared to controls ranging from 4.85% -24.53% at 60 DAS. A maximum percentage of bacterial

soft rot (BSR) (41.29%) was observed in BARI Alu-90 and a minimum in SCH 1010 at 60 DAS. Cheona (42.61%) was recorded with the minimum rottage loss which was statistically similar to BARI Alu-7 (33.77%) and the maximum was recorded again in BARI Alu-90 (72.56%) at 90 DAS. To conclude among the four exotic potato varieties Cheona and Zorba perform better in terms of cumulative weight loss and cumulative rottage loss due to BSR at 90 DAS.

Storage behaviour of hybrid clones of potato under SYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

An experiment was conducted at Tuber Crops Research Center, BARI from March to July 2023. Tubers of seven hybrid clones of SYT were evaluated for storage behavior under natural conditions. Cumulative weight loss for seven hybrid clones at 60 DAS ranged from 10.20-38.97% where maximum was recorded in 18.13(38.97%) and minimum in BARI Alu-7 (10.20%) and BARI Alu-28 (10.26%) which was statistically significant with 18.8 (17.20%), 18.19 (15.20%), 18.46 (22.22%), 18.102 (16.83%) and 18.117 (22.04%). At 75 DAS 18.102 and 18.117 were recorded with 23.57% and 29.95% cumulative weight loss which was statistically similar to BARI Alu-28 (12.52%) and BARI Alu-7 (18.33%). There was a sharp increase in weight loss % for the hybrid clones after 75 DAS. Among the tested hybrid clones cumulative weight loss % at 105 DAS ranged from 71.66%- 95.82%) while the lowest was in BARI Alu-7 (34.73%). Among the hybrid clones minimum percentage of bacterial soft rot (BSR) was observed in 18.19 (15.60%) followed by 18.8 (17.91%), 18.102 (20.42%) and 18.117(17.37%) which was statistically significant with BARI Alu-7 (4.83%) 60 DAS. Loss due to Bacterial Soft Rot (BSR) was high (48.43%-69.04%) in all the hybrid clones at 90 DAS (Table 2) where the maximum was recorded at 18.8. At 105 DAS maximum rottage loss was recorded in BARI Alu-90 (83.64%) which was statistically similar with all the tested materials except BARI Alu-7 (61.13%). It can be concluded that hybrid clones 18.8, 18.46, 18.102 and 18.117 showed better performance in terms of cumulative weight loss % and rottage loss %.

Studies on the processing quality (chips and French fry) of potato cultivars and hybrid clones

T. Hasan, M.H. Rashid, M.M. Molla, M.H.H. Khan, M.M. Islam and S. Akter

Hybrid clones and nutrient-enriched (Fe and Zn) materials from CIP source under SYT and AYT were studied for their processing quality in the form of chips and French Fries. Among the hybrid materials under SYT and AYT 19.87 produced light whitish colour (scored 10) crispy chips, 19.113 produced light golden colour (scored 8) crispy chips and 19.96 produced golden colour (scored 6) crispy chips like the chips from BARI Alu-28 and BARI Alu-97 (scored 8-9). 18.8 produced light whitish colour chips (scored 10) with excellent appearance (scored 20) which supersedes the performance of the check varieties. 18.19 and 18.37 produced light golden to light whitish colour crispy chips (scored 8-9.33) with very good to excellent appearance (scored 18.67). Among the nutrient-enriched (Fe and Zn) materials from CIP sources CIP-401 and CIP-446 produced light whitish colour crispy chips with an excellent external appearance. CIP-402 and CIP-444 produced golden to light golden colour chips with very good external appearance like BARI Alu-28 and BARI Alu-97. 19.96 produced light golden colour French fries (scored 8) with bright white crystalline internal colour (scored 20), crispy texture (scored 20) and mealy inside texture (score 30). 18.8 produced excellent French fries with a light whitish colour (scored 10), white, crystalline internal colour (scored 20), crispy outside texture (scored 20) and mealy inside texture (scored 30). 18.19 and 18.102 produced very good French fries with golden to light golden colour, opaque inside colour, moderately crispy outside texture and mealy inside texture. Among the 21 CIP materials CIP-401 and CIP-402 produced very good French fries with a light golden colour, opaque internal colour, moderately crispy to crispy outside texture and moderately mealy to mealy inside texture like BARI Alu-28 and BARI Alu-97. Processing quality of hybrid clones 19.87 and 19.113 produced light golden to light whitish colour chips and 19.96 produced both excellent chips and French fries under SYT. Among the hybrid materials under AYT 18.8, 18.19 and 18.37

showed better performance in producing chips whereas 18.8, 18.19 and 18.102 were good at producing French fries too. Among the nutrient-enriched materials from CIP source CIP-401, CIP-402, CIP-444, and CIP-446 performed better for chips. CIP 401 and CIP 402 are good at producing French fries.

Socio-Economics

Adoption and Profitability of BARI Developed Potato varieties in Bangladesh

M.S. Akter, M.A. Rashid, M.M.H. Molla, M.M. Islam and S. Akhter

The study assessed the adoption and profitability of BARI released potato varieties, determined the level of input use and explored the problems regarding marketing of potato varieties in Bangladesh. The study analyzed 100 household's data collected from BARI potato variety adopters and non-adopters spread in the two potato growing districts namely Bogura and Joypurhat. Descriptive statistics and profit equation were used to analyze data. The study reveals that among the BARI potato varieties the most adopted potato variety in the study areas is BARI Alu-25 (Asterix) which is 53%. BARI released varieties of potato covered about 86% of total potato areas in 2022-2023. In 2021-2022 area under BARI potato varieties was 87% and in 2020-2021 it was approximately 86%. Area under local variety cultivation is increasing from 12.73% in 2021-2022 to 13.47% in 2022-2023. The average total cost of cultivation was highest Tk. 377785 in BADC Alu-1 (Sunshine) cultivation. Total cost of BARI Alu-25 and BARI Alu-54 were tk. 362685 and Tk. 361417 respectively. Human labour and seedling cost were the major cost items in potato cultivation. Though BARI Alu-90 has highest total return which was Tk. 755520, it is not much popular in the study area due to non-availability of seed. The benefit-cost ratio of BARI Alu-90 was highest 2.08 followed by BARI Alu- 54 (1.73), BARI Alu- 25 (1.49), BARI Alu- 8 (1.72), BARI Alu- 29 (1.72), Sunshine (1.54) and Pakri (1.51). 94% farmers faced the problem of non-availability of good quality seed and 74% of farmers claimed that unstable potato marketing is a problem.

Technology Validation and Transfer

Adaptive trials with sweet potato varieties

M. I. Nazrul, M. J. Alam, M. S. Rana, A. A. Mahmud, M. M. Rahman, A.K.M.Z.U. Noor, M.A. Rahman and M.M. Rahman

The demonstration trials were conducted during 2023-24 in winter season at Sylhet, Sherpur, Gaibandha and Gazipur to evaluate the performance of color flesh newly developed sweet potato varieties in Sylhet. Five different varieties of sweet potato viz. V₁: BARI Mishti Alu-12, V₂: BARI Mishti Alu-14, V₃: BARI Mishti Alu-15, V₄: BARI Mishti Alu-16, V₅: BARI Mishti Alu-17 were used in this trial. The experiment was setup in randomized complete block design with three replications. The average root yield of five varieties at four locations ranges from 24.49 to 30.39 t ha⁻¹. The highest root yield obtained from BARI Mistialu-12 and the lowest yield was found in BARI Mistialu-17.

BSPC

Production of nucleus seed potato (mini tuber, g₀) using *in vitro* plantlet

M. Rahman, M.W. Rahman, M.A. Halim and A.K. Das

This work was carried out to produce high quality Mini tuber from *in vitro* plantlet. A total of 2483.33 kg mini-tubers were produced from 30442 plantlets during 2023-24 cropping season at Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh. Mini tubers of all varieties are stored in Breeder seed production centre (BSPC) cold storage and used for next year multiplication for subsequent generation as well as to meet up BADC and other organization requirement. Mini tuber of different lines were multiplied for next year trial setup. The highest amount was contributed by the variety BARI Alu-25 (Asterix) 215 kg.

Production of breeder and foundation potato seed at BSPC, Debiganj, Panchagarh during 2023-2024

M.W. Rahman, M. Rahman, M. Z. Masud, M. A. Halim, B.R. Barman, M. K. Kobra, and A. K. Das

Breeder and Foundation seed Production of different potato varieties is the routine works of Breeder Seed Production Centre (BSPC), Debiganj,

Panchagarh. A total of 653.03-ton nucleus, breeder, foundation and germplasm seed were produced from 108.50 acres of land during 2023-24 cropping season. To produce breeder seed, nucleus and G_1 seed were used and in case of foundation seed production breeder seed were used. All varieties Mini tuber were multiplied for next year Breeder seed production to meet up requirement of BADC and other organization. Mini tubers of different germplasms were multiplied for next year trial setup. The highest amount of breeder and foundation seed was recorded by the variety BARI Alu-25 (128.420 ton & 46.693 ton).

Expt.02. Production of potato seedling tubers from F1 seed (F1C0)

M. Rahman, M. A. Halim, S. Naznin, M.M. Islam, M. A. Kawochar, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 76 single plants and 128 single tubers of 263 crosses were selected for high yielding table potato. In total 123kg seedling tubers were stored for next year.

Expt.20. Production of seedling tubers from F1 seed for heat tolerant potato variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 52 single plants and 115 single tubers of 130 crosses were selected for heat tolerant potato. In total 69 kg seedling tubers were stored for next year.

Expt.26. Production of seedling tubers from F1 seed for late blight resistant variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj,

Panchagarh during this season 2023-24. After harvesting of all plantlets, 19 single plants and 42 single tubers of 54 crosses were selected for late blight resistant potato. In total 37 kg seedling tubers were stored for next year.

Expt.31. Production of seedling tubers from F1 seed for nutrient (FE and ZN) enriched potato variety development

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 17 single tubers of 45 crosses were selected for late blight resistant potato. In total 10 kg seedling tubers were stored for next year.

Expt.35. Production of seedling tubers from F1 seed for potato variety development containing processing attributes

M.A. Halim, M. A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, A. K. Das and M. M. Rahman

Hybrid true seeds which were produced in 2022-23 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2023-24. After harvesting of all plantlets, 17 single plants and 40 single tubers of 40 crosses were selected for processing attributes potato. In total 34 kg seedling tubers were stored for next year.

Expt.3. Field evaluation of F1 potato seedling tubers (F1C1)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected seedling tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F_1C_0) was planted separately. In single plant generations (F_1C_1) 143 potato clones weighing 105 kg were selected and stored at BSPC, Debiganj for further evaluation.

Expt.04. Preliminary observation trial with potato germplasm (F1C2)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₁) was planted separately. In single row generations (F₁C₂) 46 potato clones weighing 200 kg were selected and stored at BSPC, Debiganj for further evaluation.

Expt.05. Secondary observation trial with potato germplasm (F1C3)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₂) was planted separately. In single plot generations (F₁C₃) 15 potato clones weighing 153 kg were selected and stored at BSPC, Debiganj for further evaluation.

Expt.06. Advanced observation trial with potato germplasm (F1C4)

M. Rahman, A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahan, M.A. Halim, A.K. Das and M.M. Rahman

Last year's collected tubers were planted individually in the field. During the selection process all potato clones are examined critically. Each material (F₁C₃) was planted separately. In advanced observational trial (F₁C₄) 30 potato clones weighing 1965 kg were selected and stored at BSPC, Debiganj for further evaluation.

Expt.40. Maintenance of released potato varieties, germplasm, lines and TPS parents

M. Rahman, S. Naznin, M.M. Islam, M. S. Hossain, M. A. Kawochar and M.M. Rahman

A total of 24249 kg seeds of potato were preserved in Breeder Seed Production Center cold storage, Debiganj, Panchagarh collected from 3775 potato variety/germplasm/hybrid clone during 2023-2024. The preserved materials will be used in future for variety development program.

Evaluation of potato genotypes for early heat tolerance

M. Rahman, M. A. Halim and A. K. Das

Potato production outside the regular growing season results in farmer's profit. In addition, potato consumers are attracted due to decreased supply in the market. Further, farmers grow an early potato in the northern regions of Bangladesh and gain more profit due to a higher price at that time. However, potato production may be affected by increased pest and disease pressure and higher soil temperature. We hypothesized that potato varieties showed less significant tuber yield reduction when they are not grown in a normal season. This experiment was taken to find suitable genotypes for earlier cultivation in northern regions of Bangladesh prior to mid of November. Performance of eighteen genotypes of potato along with four check varieties BARI Alu-13 (Granola), BARI Alu-29 (Courage), and BARI Alu-44 (Elgar) were evaluated at the breeder seed production center, Debiganj during Rabi season 2023-2024 following a randomized complete block design with three replications. The results revealed significant variations due to genotypes for all characters. Emergence, plant height, stem per hill, tuber yield at 60 days were recorded to identify the early bulker varieties. Finally, BARI Alu-86, BARI Alu-100, clone 18.13, and exotic variety Zorba can be selected for early heat tolerant variety on the basis of field performance.

Expt. 2.61: screening of suitable sweet potato variety for northern part of Bangladesh

M. Rahman, M. A. Halim, Z. Alam, M.A.H. Khan, M.S. Alam, M. M. Uddin, M. M. Islam, M. M. H. Molla and S. Akhter

The study aimed to select high-yielding sweet potato varieties that are suitable to grow in northern part of Bangladesh. The experiment was conducted following randomized complete block design with three replications. BARI released 17 sweet potato varieties were used in this study. The results showed that there were significant differences in the characters of 17 sweet potato genotypes in terms of their length of vines, marketable root weight, non-marketable root weight and tuber yield. The study showed that the highest yield was observed in BARI Misti Alu-12 (35.72 t ha⁻¹) followed by BARI Misti Alu-15 (25.74 t ha⁻¹) and the lowest was documented in BARI Misti Alu-4 (9.19 t ha⁻¹).

Expt. 2.3. Observational trial of white skin and white fleshed CIP sweet potato germplasm

M. Rahman, M. A. Halim, Z. Alam, M. A. Ali, M. A. H. Khan, M. S. Alam, M. M. Uddin, M. M. Islam and S. Akter

The study aimed to select high-yielding white fleshed sweet potato varieties that are suitable to grow around Bangladesh. The experiment was conducted following augmented design. Thirty-seven CIP sweet potato germplasm and 5 BARI released variety were used in this study. The results showed that there were significant differences in the characters of 42 sweet potato genotypes in terms of their main vine length and number of marketable root weight and tuber yield. The study showed that CIP-922 germplasm gave the highest marketable root weight (965.52 g/plant) followed by CIP-06 germplasm (867.00 g/plant), and the lowest was recorded in CIP-220 germplasm. The experiment revealed that the CIP-922 germplasm gave highest yield (58.81 t ha⁻¹) whereas CIP-220 germplasm gave lowest yield (0.24 t ha⁻¹).

Expt. 2.62: observational yield trial of color fleshed CIP sweet potato germplasm

M. A. Halim, M. Rahman, Z. Alam, M. A. Ali, M.A.H. Khan, B. R. Barman

The study aimed to select high-yielding color fleshed sweet potato germplasm. The experiment was conducted following randomized complete block design with three replications. The study showed that the longest main vine was found in CIP-284 (196.5cm) and the shortest vine was found in BARI sweet potato-8 (38.4cm). The highest weight of biomass was recorded in CIP-520 (882.5gm) and the lowest in BARI Sweet potato-8 (17.9gm). The highest number of marketable roots was found in BARI Sweet potato-12 (118) and the lowest in CIP-265 (2). The weight of marketable roots was high in BARI Sweet potato-12 (13437.67 gm) and low in CIP-265 (156.67 gm). CIP-658R gave the longer roots (18.1cm) and the shorter root was found in CIP-265 (9.3cm). The wider root was recorded in CIP-310 (15.2cm) and the narrower roots was found in CIP-566 (6.9cm). The highest yield was observed in BARI Sweet potato-12 (40.7 ton/ha) and lowest one was in CIP-265 (1 ton/ha).

Evaluation of pummelo germplasm

B R Barman, M W Rahman, M Rahman, M A Halim and A K Das

The study was undertaken at Breeder Seed Production Centre, BARI, Debiganj, Panchagarh to find out high yielding and good quality germplasm of pummelo with 30 accessions which were locally collected in the year 2006. All germplasm gave fruits except CG Deb-009, CG Deb-025 and CG Deb-030. The heaviest fruit (1475 g) was found in CG Deb-001 whereas the lightest (780kg) fruit was obtained from germplasm CG Deb-026. Highest edible portion (58.67%) was found in CG Deb-017; lowest (21.24%) in CG Deb-019. The highest TSS (9%) was recorded in CG Deb-003 whereas the lowest TSS (5.2%) was found in CG Deb-024. Maximum number of fruits per plant (150) was collected from CG Deb-015 followed by CG Deb-007 (90). In terms of palatability excellent taste was found in CG Deb-003, and CG Deb-021 with no bitter pulp.

Evaluation of avocado germplasm

B R Barman, M W Rahman, M Rahman, M A Halim and A K Das

The study was conducted at the Breeder Seed Production Centre (BSPC), BARI, Debiganj, Panchagarh during year 2023-24 with a view to identify and select the most desirable avocado germplasm; and to develop a high yielding, good quality avocado variety. Two avocado germplasm viz., PA Deb-001 and PA Deb-002 was considered in this study. Both germplasm provided fruits in this year. In case of germplasm PA Deb-001 number of fruits was counted 37, whereas in PA Deb-002 number of fruits was 2. The average fruit weight was found 689.47 g from germplasm PA Deb-001 and that of germplasm PA Deb-002 was 307.17 g. In PA Deb-001, fruit length and diameter were measured 12.05 cm and 10.70 cm, in germplasm PA Deb-002 were 11.32 cm and 7.61 cm respectively. The fruit yield per plant 25.51 kg was obtained from germplasm PA Deb-001, while in germplasm PA Deb-002 that was 0.61 kg.

Screening of selected potato varieties/germplasm/ lines against late blight of potato

M.Z. Masud, M.M. Rahman, M.W. Rahman, A.K. Saha, M.M. Begum and A.K. Das

Late blight of potato, caused by *Phytophthora infestans* (Mont.) de Bary, is one of the most

important diseases of potato (*Solanum tuberosum* L.) in Bangladesh. The experiment was conducted under natural field condition in the isolated field of BSPC, BARI, Debiganj, Panchagarh to evaluate 39 (Thirty-nine) potato varieties/germplasm/lines against late blight disease during 2023-24 crop season. None of the variety/germplasm was found immune. BARI alu-90 were found highly resistant BARI Alu-46 and BARI alu-91 was found resistant. but BARI Alu- 47and BARI Alu-77 were moderately resistant. Yield of BARI Alu-90 produced the significantly highest yield (35.93 t ha⁻¹) and it was almost similar with BARI Alu-46 (33.50 t ha⁻¹), followed by BARI Alu-77 (28.65 t ha⁻¹) and BARI Alu-53 (27.92 t ha⁻¹).

Response of potato varieties to water stress under field condition

M.W. Rahman, M.K. Kubra, M.M. Islam and A.K. Das

An experiment was conducted at Breeder seed Production Centre (BSPC), Debiganj, Panchagarh during the Rabi season of 2023-2024 to study the response of potato varieties to water stress under field condition. There were five treatments comprising different levels of irrigation such as T₁ = One irrigation (Emergence stage), T₂ = One irrigation (Stolonization stage), T₃ = Alternate furrow irrigation (One at emergence stage, another at stolonization stage), T₄ = Two irrigations (Emergence + Stolonization stage), and T₅ = No irrigation. Eight released potato varieties such as BARI Alu40, BARI Alu41, BARI Alu46, BARI Alu63, BARI Alu62, BARI Alu72, BARI Alu73 and BARI Alu86 were used in this experiment. The experiment was laid out in split plot design with three replications keeping the irrigation levels in main plots and variety in sub-plots. The depth of irrigation was kept 5.5 inch (14 cm) in the furrow. Significant variation was observed on tuber yield and yield contributing characters of potato due to application of irrigation water at different growth stages of potato. On the other hand, there was no significant variation on dry matter content of potato due to application of different level of irrigation water at different growth stage. Here remarkable that tuber yield of potato from T₃, T₂ and T₁ were recorded 33.14ton/ha,32.54 ton/ha and 31.34 ton/ha, which was approximately with T₄. From the result we see that alternate furrow irrigation or one irrigation at stolonization stage or one irrigation at

emergence stage is suitable for those area in which irrigation water was not available. From the interaction effect, maximum tuber yield was recorded in BARI Alu86 (42.15 ton/ha) in which two irrigations was applied which was statistically identical to BARI Alu40 (40.83 ton/ha), BARI Alu41 (40.37 ton/ha) and BARI Alu46 (41.34 ton/ha). Minimum was found in BARI Alu63 (17.38 ton/ha) in which no irrigation was applied. From the interaction effects among eight varieties, we see that BARI Alu46, BARI Alu72, BARI Alu73 and BARI Alu86 gave the yield above 24 ton/ha without no irrigation, which is above National average yield. Therefore, it may be find out that BARI Alu46, BARI Alu72, BARI Alu73 and BARI Alu86 were water stress tolerant potato varieties.

Postharvest Technology Section, TCRC

Storage behaviour of hybrid clones of potato under AYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

The experiment was conducted at Tuber Crops Research Center, BARI from March to July 2023. Five clonal hybrids of AYT were evaluated with five check varieties for storage behaviour under natural conditions. At 60 DAS, the minimum weight loss (10.20%) was found in BARI Alu-7 followed by BARI Alu- 28 (10.27%), 17.19 (21.67%) and 17.12a (21.97%). At 90 DAS, the minimum weight loss (19.67 %) was also recorded in BARI Alu-13 followed by BARI Alu- 28 (28.09%). Among the hybrid clones minimum weight loss was recorded in 17.12a from 15 DAS to 105 DAS ranging from 2.91% to 82.43%. At 60 DAS maximum BSR loss was recorded in BARI Alu-90 (41.29%) closely followed by 17.18 (40%) and minimum was in BARI Alu-7 (4.83%). The data shows that the minimum bacterial soft rot (BSR) of 33.76% was found in BARI Alu-7 and maximum in BARI Alu-90 (72.56%) at 90 DAS. Compared to controls all the tested hybrid clones showed moderate loss due to BSR ranging from 51.86% - 68.86% at 105 DAS where 17.12a (54.05%) and 17.167 (51.86%) performed better. In conclusion, hybrid clones 17.12a, 17.19 and 17.167 under AYT performed better storage performance in natural conditions.

Storage behaviour of hybrid clones of potato under RYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

The study was conducted at Tuber Crops Research Center, BARI during 2023-24 with six hybrid clones under RYT to evaluate the storage quality of hybrid clones under natural conditions. All the six tested hybrid clones under RYT ranged from 22% to 94.17% for cumulative weight loss for 90 and 120 DAS. At 90 DAS, the minimum weight loss (19.66%) obtained in BARI Alu-7 was statistically similar with 16.28 (22%), BARI Alu-28 (28.09%), 16.62 (30.6%), 16.9 (31%) and 16.16 (32.63%) while maximum weight loss was recorded in 33.33 (86.25%). Minimum weight loss at 150 DAS was found in 16.62 (45.24%) followed by 16.28 (57.2%) and 16.16 (64.73%). Among the tested genotypes maximum percentage of bacterial soft rot (BSR) (69.16%) was observed in 33.33 and minimum in 16.28 (14.40%) which was statistically similar to 16.62 (14.57%) and 16.9 (26.60%) at 90 DAS. 16.62 (20.28%) was recorded with the lowest rottage loss followed by 16.28 (36.80%) whereas the maximum was found in BARI Alu-90 (83.64%) at 150 DAS. It can be concluded that hybrid clones 16.62, 16.28 and 16.9 under RYT showed better storage performance in natural conditions.

Storage behaviour of exotic potato varieties under SYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

An experiment was conducted at Tuber Crops Research Center, BARI from March to June 2023. Tubers of four exotic potato varieties with five check varieties of SYT were evaluated for storage behaviour under natural conditions. Maximum cumulative weight loss at 60 DAS was recorded in BARI Alu-13 (29.53%) while the minimum was recorded in Cheona (6.47%) closely followed by BARI Alu-7 (10.20%) and BARI Alu-28 (10.27%). All the tested potato varieties under SYT ranged from 19.67% to 78.28% for cumulative weight loss at 90 DAS. At 90 DAS, the minimum weight loss (19.67%) obtained in BARI Alu-7 was statistically similar to Cheona (25.07%), Zorba (46.52%) and BARI Alu-28 (28.09%) while maximum weight loss was recorded in again in Alanis (78.28%). All the tested exotic varieties performed better compared to controls ranging from 4.85% -24.53% at 60 DAS. A maximum percentage of bacterial soft

rot (BSR) (41.29%) was observed in BARI Alu-90 and a minimum in SCH 1010 at 60 DAS. Cheona (42.61%) was recorded with the minimum rottage loss which was statistically similar to BARI Alu-7 (33.77%) and the maximum was recorded again in BARI Alu-90 (72.56%) at 90 DAS. To conclude among the four exotic potato varieties Cheona and Zorba perform better in terms of cumulative weight loss and cumulative rottage loss due to BSR at 90 DAS.

Storage behaviour of hybrid clones of potato under SYT in natural condition

T. Hasan, M.H. Rashid, M.M. Islam and S. Akter

An experiment was conducted at Tuber Crops Research Center, BARI from March to July 2023. Tubers of seven hybrid clones of SYT were evaluated for storage behavior under natural conditions. Cumulative weight loss for seven hybrid clones at 60 DAS ranged from 10.20-38.97% where maximum was recorded in 18.13(38.97%) and minimum in BARI Alu-7 (10.20%) and BARI Alu-28 (10.26%) which was statistically significant with 18.8 (17.20%), 18.19 (15.20%), 18.46 (22.22%), 18.102 (16.83%) and 18.117 (22.04%). At 75 DAS 18.102 and 18.117 were recorded with 23.57% and 29.95% cumulative weight loss which was statistically similar to BARI Alu-28 (12.52%) and BARI Alu-7 (18.33%). There was a sharp increase in weight loss % for the hybrid clones after 75 DAS. Among the tested hybrid clones cumulative weight loss % at 105 DAS ranged from 71.66%- 95.82%) while the lowest was in BARI Alu-7 (34.73%). Among the hybrid clones minimum percentage of bacterial soft rot (BSR) was observed in 18.19 (15.60%) followed by 18.8 (17.91%), 18.102 (20.42%) and 18.117(17.37%) which was statistically significant with BARI Alu-7 (4.83%) 60 DAS. Loss due to Bacterial Soft Rot (BSR) was high (48.43%-69.04%) in all the hybrid clones at 90 DAS (Table 2) where the maximum was recorded at 18.8. At 105 DAS maximum rottage loss was recorded in BARI Alu-90 (83.64%) which was statistically similar with all the tested materials except BARI Alu-7 (61.13%). It can be concluded that hybrid clones 18.8, 18.46, 18.102 and 18.117 showed better performance in terms of cumulative weight loss % and rottage loss %.

Studies on the processing quality (chips and french fry) of potato cultivars and hybrid clones

T. Hasan, M.H. Rashid, M.M. Molla, M.H.H. Khan, M.M. Islam and S. Akter

Hybrid clones and nutrient-enriched (Fe and Zn) materials from CIP source under SYT and AYT were studied for their processing quality in the form of chips and French Fries. Among the hybrid materials under SYT **and** AYT 19.87 produced light whitish colour (scored 10) crispy chips, 19.113 produced light golden colour (scored 8) crispy chips and 19.96 produced golden colour (scored 6) crispy chips like the chips from BARI Alu-28 and BARI Alu-97 (scored 8-9). 18.8 produced light whitish colour chips (scored 10) with excellent appearance (scored 20) which supersedes the performance of the check varieties. 18.19 and 18.37 produced light golden to light whitish colour crispy chips (scored 8-9.33) with very good to excellent appearance (scored 18.67). Among the nutrient-enriched (Fe and Zn) materials from CIP sources CIP-401 and CIP-446 produced light whitish colour crispy chips with an excellent external appearance. CIP-402 and CIP-444 produced golden to light golden colour chips with very good external appearance like BARI Alu-28 and BARI Alu-97. 19.96 produced light golden colour French fries

(scored 8) with bright white crystalline internal colour (scored 20), crispy texture (scored 20) and mealy inside texture (score 30). 18.8 produced excellent French fries with a light whitish colour (scored 10), white, crystalline internal colour (scored 20), crispy outside texture (scored 20) and mealy inside texture (scored 30). 18.19 and 18.102 produced very good French fries with golden to light golden colour, opaque inside colour, moderately crispy outside texture and mealy inside texture. Among the 21 CIP materials CIP-401 and CIP-402 produced very good French fries with a light golden colour, opaque internal colour, moderately crispy to crispy outside texture and moderately mealy to mealy inside texture like BARI Alu-28 and BARI Alu-97. Processing quality of hybrid clones 19.87 and 19.113 produced light golden to light whitish colour chips and 19.96 produced both excellent chips and French fries under SYT. Among the hybrid materials under AYT 18.8, 18.19 and 18.37 showed better performance in producing chips whereas 18.8, 18.19 and 18.102 were good at producing French fries too. Among the nutrient-enriched materials from CIP source CIP-401, CIP-402, CIP-444, and CIP-446 performed better for chips. CIP 401 and CIP 402 are good at producing French fries.

PULSE CROPS

02



Blackgram

Varietal Improvement

Hybridization of blackgram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Black gram (*Vigna mungo* (L.) Hepper) is a legume commonly used as proteinaceous food and forage. Hybridization is one of the basic and important conventional breeding approaches for creating the genetic variability among the existing genotype with desirable genes combination. The objectives of this breeding were to develop high yielding and Powdery mildew tolerant/resistance variety. We initiated present investigation to select appropriate genome donor from crop wild relatives (CWRs) of Asian *Vigna*. In the present study, about 5 interspecific crosses among black gram were attempted. The maximum crossability (23) was recorded between black gram in BARI Mash-3 x BBLX-08008-2-1. The F₁ hybrids were also produced from crosses involving black gram showed the least crossability with an unfilled pod. We propose that this study will help in the selection of highly compatible *Vigna* species for black gram improvement program.

Confirmation F₁ generation of black gram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

To ensure fertile crosses between the parents, confirmation is very much essential. One hundred forty-seven seeds from Nine F₁s obtained from Kharif II season, 2022 were grown along with their parents at Pulses Research Centre, Ishwardi, Pabna during Kharif II, 2023. On the basis of desired characters nine accessions were selected as confirmed crosses comparing between two parents and were harvested separately for the next year trial.

Growing and evaluation of F₂ generation of black gram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Nine F₂ segregates were grown along with one check BARI Mash-3 to advance the generation at Pulses Research Centre, Ishwardi, Pabna during Kharif II season, 2023. The total population was bulked and harvested for retention of more variability which will be grown as F₃ segregation generation in the next season.

Growing and evaluation F₃ generation of black gram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Fourteen F₃s were grown along with check to advance the generation at Pulses Research Centre, Ishwardi, Pabna during Kharif II season, 2023. The total population was bulked and harvested for retention of more variability which will be grown as F₄ segregation generation in the next season.

Growing and evaluation of black gram F₄ generation

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Fifteen F₄s progenies were evaluated and their seeds were bulked during Kharif-II season, 2023 and each of the individual single plants will be grown in an individual line as F₄s generation in the next season where family selection will be done.

Growing and evaluation of black gram F₅ generation

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Genetic combination turns to more homozygous condition in F₅ and for this reason selection of

family is done in this generation. To select appropriate and desired combinations nine F₅s were grown along with check varieties at Pulses Research Centre, Ishwardi, Pabna. Finally, sixty single plants were selected which will be grown in the next year at F₆ generation.

Growing and evaluation of black gram F₆ generation

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Genetic combination turns to more homozygous condition in F₆ and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F₆s and one interspecific cross material were grown along with check varieties at Pulses Research Centre, Ishwardi, Pabna. Finally, sixty single plants were selected which will be grown in the next year at F₇ generation/OT trial.

Observation trial of black gram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Twenty five blackgram genotypes were assessed for grain yield and its attributing traits at Pulses Research Centre, Bangladesh Agrivultural Research Institute (BARI), Ishurdi, Pabna, in summer season of 2022-2023. The genotypes were sown in randomized complete block design with three replications. Plot size was 2 rows x 4 m long with spacing of 50 X 10 cm. The traits like plant height, early plant stand/m², days to flowering, days to maturity, final plant stand /m², pods/plant, seed/pod, 100 seed weight and grain yield/ha were recorded. This year combined results showed nonsignificant differences among genotypes for all the characters except 100 seed weight. Based on average yield performance and days to maturity the genotypes nine genotypes BBLXK2-0170064-1, BBLXK2-017006-2, BBLXK2-017006-4, BBLXK2-017007-2, BBLXK2-017007-3, BBLXK2-017009-9, BBLXK2-017010-7, BBLXK2-017010-14 and BBLXK2-017011-15 with two checks varieties will be showed good performed better than the others and they were considered as pipeline varieties for further evaluation.

Regional yield trial of black gram

M.M. Hossen, M. J. Alam, M. M. Rahman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Seven blackgram genotypes with two checks BARI Mash-3 and BARI Mash-4 were assessed for grain yield and its attributing traits at Pulses Research Centre, Ishwardi, PRSS, BARI, Gazipur, RARS, Jessore, RPRS, Madaripur and RARS, Jamalpur under this trial in summer season of 2023-2024. The genotypes were sown in randomized complete block design with three replications. The traits like plant height, early plant stand/m², days to flowering, days to maturity, final plant stand /m², pods/plant, seed/pod, 100 seed weight and grain yield/ha were recorded. This year combined results of five locations showed nonsignificant differences among genotypes for all the characters except 100 seed weight. Based on average yield performance and days to maturity the 5 genotypes viz; BBLXK₂-016007-6, BBLXK₂-016004-13, BBLXK₂-016003-3, BBLXK₂-016004-9 and BBLXK₂-08008-2-1 will be evaluated in next year for Participatory Variety Selection (PVS) under different locations of farmers field.

Crop and soil management

Effect of bio-fertilizer and phosphorus levels on growth and yield of black gram

M.S. Alam, J. Hossain, M.M. Kamal and M.S.Uddin

A field experiment was conducted at PRC, BARI, Ishurdi, Pabna during Kharif-2 season of 2023 to find out the response of black gram to different levels of phosphorus, and bio-fertilizer on growth and yield. The experiment was laid out in a Randomized Complete Block Design with assigned 7 different treatments. The treatments were T₁ = Native fertility, T₂ = P₁₈ kg ha⁻¹ (Recommended dose), T₃ = *Rhizobium*, T₄ = *Rhizobium* + P₆ kg ha⁻¹, T₅ = *Rhizobium* + P₁₈ kg ha⁻¹ (RD), T₆ = *Rhizobium* + P₁₂ kg ha⁻¹ and T₇ = *Rhizobium* + P₂₇ kg ha⁻¹, K₂₀S₁₀B₂ kg ha⁻¹ are at blanket dose or flat rate for all treatment. The results revealed that *Rhizobium* + recommended dose of phosphorus (T₆) showed significant effect on nodulation and yield of blackgram. The highest seed yield (1.76 t ha⁻¹) was obtained from (T₆) and the lowest seed yield (1.02 t ha⁻¹) was recorded in the control (T₁). The maximum nodule number plant⁻¹ (29) was found in T₆ while the minimum nodule number plant⁻¹ (16) was in control. Yield increased 27-42% over control. The higher gross margin (Tk

66480 ha⁻¹) was found in Rhizobium + P₁₈ kg ha⁻¹. Rhizobium treated seed + P₁₈ kg ha⁻¹ (N₂₀P₁₈K₂₀S₁₀B₂) recommended dose of fertilizer performed better in blackgram production.

Lentil

Varietal Improvement

Hybridization of lentil

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

Hybridization of lentil was conducted to develop high yielding and stemphylium blight resistant variety at Pulses Research Centre, Ishwardi, Pabna during Rabi 2023-24. Four parents were used in crosses and a total of 378 successful cross seeds were harvested from six cross combinations. The cross seeds will be sown next season for the confirmation of lentil F₁ plants.

Confirmation of F₁ plants in lentil

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

To confirm crosses between the parents is essential to advance the generation for variety development. Five F₁s obtained from Rabi 2022-23 along with their parents were grown at Pulses Research Centre, Ishwardi, Pabna during Rabi 2023-24. On the basis of phenotypic markers such as leaf color, stem pigmentation, flower color, leaf shape, presence/absence of tendrils, time to flowering and maturity five accessions were confirmed by comparing between two parents and harvested separately for the next year F₂ generation.

Growing and evaluation of lentil F₂ generation

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

Six F₂ populations along with check variety BARI Masur-8 were grown at Pulses Research Centre, Ishwardi, Pabna during rabi, 2023-24 to advance the generation. The individual population was harvested and bulked for retention of more variability which will be grown next year as F₃ segregation.

Growing and evaluation of lentil F₃ generation

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

Five F₃ populations were evaluated during rabi 2023-24 at Pulses Research Centre, Ishwardi,

Pabna to advance the generations. At maturity, one to two pods of each plants were collected and bulked crosswise/population wise. The bulked seeds from each population will be sown next year as F₄ generations.

Growing and evaluation of lentil F₄ generation

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

Twelve F₄ populations were evaluated during rabi 2023-24 at Pulses Research Centre, Ishwardi, Pabna to advance the generations. At maturity, one to two seeds of each plants were collected and bulked crosswise/population wise. The bulked seeds from each population will be sown next year as F₅ generations.

Growing and evaluation of lentil F₆ generation

M.S.U. Zaman, M.A. Zaman, A.K.M.M Alam, and M. Saleh Uddin

Eleven F₅ populations were sown on 27 November during 2023-24 at Pulses Research Centre, Ishwardi, Pabna to advance the generation. At maturity, individual lines from each of the crosses were selected and harvested separately based on the homogeneity of the line in respect to traits such as days to maturity, branches/plant, number of pods/plant and disease reaction which will be grown in the next year as observation trial.

Preliminary yield trial of lentil

M.S.U. Zaman, M. A. Zaman, MM Hossain, S. Kobir, AKMM Alam and M. Saleh Uddin

The experiment was conducted with five promising lentil genotypes to assess the performance of yield and yield contributing traits in five different locations- Ishwardi, Gazipur, Madaripur, Jashore and Jamalpur during rabi, 2023-24. Significant variations were observed for days to flower, days to maturity, pods per plant, hundred seed weight and seed yield in most of the locations. Among the genotypes, BLX 16001-1 flowered and matured earlier than the other genotypes. In comparison to pod numbers, the highest pods/plant (83) was obtained in BLX 16009-15 followed by BLX 16009-5. In respect to yield performance, the genotype BLX 16009-5 exhibited the highest average yield (1209 kg ha⁻¹) over the locations, which was 8% out yielded over BARI Masur-8.

Screening of lentil germplasm for resistance to stemphylium blight disease

M.S.U. Shahin Uz Zaman, Debasish Sarker and M. A. Y. Akhond

Stemphylium blight (SB) is one of the major constraints to lentil production in Bangladesh. Four-hundred lentil germplasm were tested for response to stemphylium blight disease under field conditions at Pulses Research Centre (PRC), Ishwardi, Pabna. The analysis of variance revealed significant effects of genotype on disease severity and others yield related traits. The mean disease severity varied across geographical origin of germplasm (Bangladesh versus Canada) and this was reflected in the frequency distributions of disease reaction. The frequency distribution of mean disease severity scores of 228 germplasm revealed a continuous distribution, suggesting the interplay of several genes with minor effects in stemphylium blight resistance. Six accessions/germplasm- 9507-4-1, LR26-138, LR59-121, LR26-78 and Crimson AGL at were found resistant to SB with a percent disease index of 01-20%, while the other 64 germplasm showed moderately resistant with a percent disease index of 21-30%. The moderately resistant variety BARI Masur-8 was identified as moderately resistance. The percent disease index was negatively correlated with yield and its related traits.

Screening of lentil germplasm for tolerance to terminal heat stress

M.S.U. Shahin Uz Zaman and M. A. Y. Akhond

Late-sown lentils are exposed to terminal heat stress at reproductive stage leading to considerable yield losses. Four hundred lentil germplasm were tested in response to high temperature under field conditions. Significant differences were found in the germplasm in response to stress for the traits. The traits- days to flower, days to maturity, branches/plant, plant height, pods/plant, %filled pods, stemphylium blight, 100 seed weight and seed yield in heat stressed plants in late-sown were decreased by 13, 21, 54, 9, 35, 19, 0.0, 25 and 84%, respectively, compared with the control plants in optimum sowing. Multi-trait genotype-ideotype distance index (MGIDI) was used to rank the genotypes based on stress tolerance index (STI) to identify the superior heat-tolerant germplasm. Ten germplasm such as 79400, 79402, 79436, 79448, BLX-12009-6, ILXB-87105-1993, LRIL-21-67, M-

2, R1-T2 and RL-12-179 commonly exhibited tolerance at both Ishwardi and Rajshahi locations.

Confirmation of heat tolerant F₁ generation of lentil

M. A. Zaman, M. Shahinuzzaman, M. J. Alam, M. G. Azam, and AKM alam

A total of 25 individual F₁s of heat tolerant lentil plants were confirmed from seven cross combinations and these individual single plants will be grown as a F₂s generation in the next growing season for advancement of segregating generations of heat tolerant lentil genotypes.

Genetic enrichment of heat and stemphylium blight stress tolerant lentil genotypes through top cross and back cross method

M. A. Zaman, M. Shahinuzzaman, M. J. Alam, M. G. Azam, and AKM alam

A total of 105 crossed seeds were obtained and harvested from the seven top and one back cross combination during rabi 2023-24 at PRC, Ishurdi, Pabna, and these harvested seeds would be grown as F₁s in the next growing season for confirmation as F₁s generations at PRC, Ishurdi, Pabna.

Growing and evaluation of heat tolerant lentil F₂ generation

M. A. Zaman, M. Shahinuzzaman, M. J. Alam, M. G. Azam, and AKM alam

The maximum segregation and genetic variability is accomplished in F₂ generation of any hybridization program. With a close observation, selection of appropriate and desired combinations, Nineteen F₂s were grown along with BARI Masur-7 and BARI Masur-8 as check varieties at Pulses Research Centre, Ishurdi, Pabna. Selected individual plants were bulked and harvested from nineteen accession for advancement of segregating populations as F₃s generation in the next growing season.

Multi-locational yield trial of heat tolerant lentil genotypes under different hotspot regions of Bangladesh

M. A. Zaman, Raziuddin, M. Shahinuzzaman, N. Nahar, M. S. Hossain, M. S. Kabir, B. C. Kundu, AKM. M. Alam, and M. S. Uddin

Before releasing variety of the genotypes, multi-location yield trial is conducted to assess the yield

performance over the locations. However, MET was conducted to evaluate the performance of six heat tolerant lentil genotypes (BLX-09015, BLX-05002-3, LRIL-21-1-1-1-1, LRIL-21-1-1-1-1-6, BLX-05002-6) including BARI Masur-8 along as a check) for yield and yield contributing traits, stability and reaction against disease of root rot and *Stemphylium* blight of lentil at 4 different environment of lentil growing areas of Bangladesh during Rabi 2023-24. All genotypes were severely infested by foot rot disease of lentil except the genotypes BLX-05002-3, and BLX-05002-6. 0-5 disease rating scale was used for scoring the tested lentil genotypes against the *Stemphylium* blight disease of lentil. Considering yield and all yield contributing traits along with the disease severity of root rot and *Stemphylium* blight disease of lentil finally the genotypes BLX-05002-3, and BLX-05002-6, LRIL-21-1-1-1-1-6 were selected as advanced genotypes of lentil over the location for further evaluation in the next season under participatory varietal selection trial at farmer's field of different lentil growing areas with replicated large plot.

Crop and soil management

Enrichment of zinc and iron of lentil through agronomic bio-fortification

M.S. Alam, J. Hossain, M.M. Kamal and M.S.Uddin

Nutritional food security is important question in any nation. To build a health nation is essential for nutritional food. Zinc and iron micronutrient reach food demand increasing day by day for woman and children health. Bio-fortification of lentil through zinc (Zn) and iron (Fe) fulfill nutritional food demand. Therefore, a field experiment was conducted at PRC, BARI, Ishurdi, Pabna during Rabi season of 2023-2024 to evaluate the response of lentil (BARI Masur-8) to zinc and iron bio-fortification and yield. The experiment was laid out in a Randomized Complete Block Design with assigned 6 different treatments. The treatments were as follows T₁= Control (without zinc & Fe), T₂= Soil Zn & Fe (each @ 2 kg ha⁻¹), T₃= Soil Zn & Fe (each @ 5 kg ha⁻¹), T₄= Foliar spray Zn & Fe (each @ 0.1%) at before flower stage, T₅= Foliar spray Zn & Fe (each @ 0.2%) at flower & podding, T₆= Soil Zn & Fe (each @ 2 kg ha⁻¹) and foliar spray Zn & Fe (each @ 0.2%) at flower & podding and other fertilizer (N₂₀P₄₀K₂₀S₁₀, kg ha⁻¹) used as

blanked doses. Lentil was significant effect on number of nodule plant⁻¹, branch plant⁻¹, pod plant⁻¹, seed yield, additional income and gross margin. The results revealed that soil application Zn & Fe (each @ 2 kg ha⁻¹) and foliar spray Zn & Fe (each @ 0.2%) at flower & podding treatment (T₆) showed significant effect on nodulation and yield of lentil. The higher seed yield (2.43 t ha⁻¹) was obtained from (T₆) and the lower seed yield (1.23 t ha⁻¹) was recorded in control (T₁). The maximum nodule number 42 plant⁻¹ was found in T₆ while the minimum nodule number 10 plant⁻¹ was in control. Yield increased over control was 19-49%. The maximum additional income, gross margin and MBCR was recorded from T₆. After one cropping cycle, pH, Zn and Fe of the soil significantly increased among the treatment but OM, total N, K and B nutrient decreased in soil. Zn content (53.69 ppm), Fe content in seed (292.60ppm) and protein content (----%) was observed in same treatment.

Validation of performance of herbicides for controlling weeds in lentil

J. Hossain, M.S. Alam, M.M. Rashid, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2023-24 to find out the performance of herbicide for controlling weed in grass pea. Four treatments were viz. T₁: Panida-33EC (Pendimethaline @ 3.0 L ha⁻¹), T₂: Panida-33EC and Weednil (Quizalofop-ethyl @ 750 ml ha⁻¹), T₃: Hand weeding at 25 DAS and T₄: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Hand weeding gave higher pods plant⁻¹, and consequently gave higher yield and the maximum gross return. On the other hand, Panida-33EC and Weednil gave higher gross margin and MBCR due to lower variable cost. Therefore, Panida-33EC and Weednil was better option to control weeds in lentil.

Growth and yield of lentil as influenced by foliar spray of potassium nitrate

M.M. Rashid, J. Hossain, S. Mahmud, S. Ahmed and M. S. Uddin

A field experiment was carried out during 2023-24 in the research field of Regional Pulse Research Station, Madaripur to find out the effect of foliar spray of potassium nitrate on lentil grown in rainfed lowland rice fallows. The treatments

consisted of foliar spray of potassium nitrate (0.25%, 0.50%, 0.75% and 1.00%), water spray and control during 50% flowering. yield and yield parameters was not significant effect among the treatments. The plant height varied from 27 cm to 29 cm, and the number of pods per plant varied 16 to 22. The seed yield varied 822 kg ha⁻¹ to 926 kg ha⁻¹. So, this experiment should be continued in next year for confirmation.

Lentil and chickpea intercropping performances

M.S. Kobir; M.S. Alam; M.J. Hossain; M. Mohiuddin, M.H. Rahman; S. Paul and K.U. Ahammad

The experiment was conducted at Regional Agricultural Research Station, Jashore during Rabi 2023-24. The experiment was conducted considering different legume-legume intercropping system viz. T₁ =1:1 (Lentil: Chickpea), T₂ =2:1 (Lentil: Chickpea), T₃ =3:1 (Lentil: Chickpea), T₄=4:1 (Lentil: Chickpea), T₅=(80% lentil+20% chickpea) mixed cropping, Sole Lentil, Sole Chickpea in RCB design with 3 replications. Lentil and chickpea crop ratio of 4:1 in the same field was the best combination considering different intercropping performance indices.

Performance of pulse based cropping pattern in the high ganges river floodplain (AEZ-11)

M.S. Alam, J. Hossain, and M.S.Uddin

A field experiment was initiated at Pulses Research Centre, BARI, Ishurdi, Pabna during 2023-24 to find out the more profitable cropping pattern in High Ganges river floodplain (AEZ-11). The experiment was laid out in a Randomized Complete Block Design with three dispersed replications. The four different cropping patterns were as follows i) CP₁ = *T.aman* rice- Fallow -*Boro* rice ii) CP₂ = *T.aman* rice- Lentil -*Boro* rice, iii) CP₃ = *T.aman* rice- Grass pea -*Boro* rice, iv) CP₄ = *T.aman* rice- Field pea -*Boro* rice. Field duration, system productivity (REY), production efficiency (PE) and land use efficiency (LUE) of different cropping pattern in High Ganges river floodplain (AEZ-11) significantly varied among the cropping pattern. The results revealed that *T.aman* rice- Lentil -*Boro* rice cropping pattern (CP₂) showed significant effect on field duration, system productivity, production efficiency and land use efficiency. The maximum REY (14.53 t ha⁻¹), PE (42.73 kg ha⁻¹ day⁻¹) and LUE (97.15%) were obtained from CP₂

and the minimum REY (9.72 t ha⁻¹), PE (38.88 kg ha⁻¹ day⁻¹) and LUE (68.49%) were recorded in existing cropping pattern CP₁. REY increased over existing cropping pattern was 32-35%. The maximum additional income Tk. 130250 ha⁻¹ and gross margin Tk. 115130 ha⁻¹ and MBCR (8.61) recorded from CP₂ due to addition lentil in fallow period.

Effects of tillage and residue retention on the performance of lentil-mungbean -*T.aman* cropping pattern at Madaripur

M.M. Rashid, J. Hossain, M.A. Islam, S. Mahmud, S. Ahmed and M. S. Uddin

The field experiment was conducted at RPRS, Madaripur during 2023-24 to assess the agronomic productivity, soil health and economic profitability of tillage and residue retention in rice-based system. The results of Ishurdi showed that the seed yield was the highest in Strip planting (1536 kg/ha) and the lowest in Conventional tillage (1224 kg/ha). However, this study will be continued for a long-term period to concrete conclusion.

Response of rhizobium and trichoderma on yield of lentil at Madaripur

S. Mahmud, J. Hossain, M.M. Rashid S. Ahmed, M. E. Ali and M. S. Uddin

A field experiment was conducted at RPRS, BARI, Madaripur during Rabi season of 2023-24 to evaluate the performance of Lentil var. BARI Masur-8 treated with Rhizobium and Trichoderma. Six treatments viz. Lycomax (Trichoderma) @ 3g/litre, Bioderma (Trichoderma) @ 75kg/ha, Rhizobium, Rhizobium + Lycomax @ 3g/litre, Rhizobium + Bioderma @ 75kg/ha and control were tested in this experiment. Highest yield was obtained from combined application of rhizobium and bioderma (656kg/ha) and lowest from control (512 kg/ha). The result therefore suggested that combined application of Trichoderma and Rhizobium can increase the growth of lentil which plays an important role in organic agriculture.

Disease Management

Identification and characterization of root rot pathogens of lentil

D. Sarkar, M. Z. Rahman, M.A.A, Momin, M. Akhterruzzaman, M. Hossain, J. Hossain, M. and R. Humauan

Root rot disease is one of the major threats to production of the lentil in Bangladesh. It is very complex to identify which soil-borne pathogens are associated with root rot disease on lentil and to determine their prevalence, a survey was conducted from November 2023 to March 2024 at different pulse-growing regions in Bangladesh. Lentil root rot symptoms were obtained from seven Research plots in various Agri-ecological Zones. Rotted roots were washed, potential pathogens were cultured, and isolates were putatively identified into the major pathogen groups based on morphology and cultural variation. The percentage of *Fusarium* spp during the survey was the most dominant (38%) compared to other pathogens. where *Rhizoctonia*, *Sclerotium*, and *Oomycetes* & unidentified isolates recovered ranged from 18%, 13%, and 31% respectively. From the pathogenicity test, *Rhizoctonia* and unidentified isolates were attacked early compared to the *Fusarium* and *Sclerotium* isolates. This survey provided baseline information on the prevalence of critical soil-borne pathogens. In the future, additional genetic markers will be utilized to further identify organisms, a species characterization will be conducted to assess pathogenicity and virulence, and lentil germplasm will be screened for

Screening of lentil germplasm for root rot and wilt resistance

D. Sarkar, M. Z. Rahman, M. R. Humauan, and B. Akhter

The experiment was conducted at Pulses Research Centre (PRC), Ishurdi, Pabna, during 2023-24. Forty-seven lentils advanced entries were selected from the previous year's trial to search for root rot disease resistance. Breeding resistant cultivars is the major approach to control the disease. This investigation aims to evaluate lentil cultivars against root rot Disease. Fifteen germplasm lines were found Resistant to lentil root rot disease and these genotypes could be used in future breeding

programs to get stable and higher yields of lentil in the country.

Evaluation of biosynthesized agnps against foot and root rot pathogens of lentil

M. Z. Rahman, D. Sarkar, A. K. M. Sahfiqul Islam and AKM Alam

Foot and root rot disease caused by *Sclerotium rolfsii*, *Rhizoctonia solani*, and *Fusarium* sp, which inflicts significant yield losses of about 100 %. To address this, the green synthesis of AgNPs using *Azadirachta indica* (Neem), *Moringa oleifera* (Moringa) leaf extract, and silver nitrate (AgNO₃), examined their efficacy against foot and root rot disease. The biosynthesized AgNPs were characterized through various analytical techniques. The results of UV-visible spectrophotometers revealed an absorption peak ranging from 421 to 434 nm, validating the synthesis of AgNPs in the solution. *In vitro* assays demonstrated the significant inhibitory effects of AgNPs on mycelial growth of *F. oxysporum*, *R. solani*, and *S. rolfsii* particularly at Ag:N (10:3) and Ag:NM (10:1) concentrations. The findings highlight the potential of AgNPs as a sustainable and effective alternative for managing foot and root rot disease in lentil, offering a safer solution amidst environmental concerns associated with conventional fungicides.

Effect of biological agents and chemical fungicides for controlling foot and root rot of lentil

M. Z. Rahman, D. Sarkar, Raziuddin and AKM Mahbulul Alam

The experiment was conducted at Pulses Research Sub-center, BARI, Gazipur and Pulses Research Centre, Ishurdi, Pabna during 2023-24 to find out the effective fungicide as well as biological agents in controlling foot and root rot disease of lentil. Eight fungicides were tested for their efficacy against the disease, and the susceptible variety BARI Masur-1 was used as control treatment. The lowest foot and root rot ((5.59% & 17.16%)) was obtained from seed treatment with Provax 200 wp (Carboxin + Thiram) @ 3 g/kg and the highest incidence (10.30% & 55.79%) was obtained from untreated control. The highest yield (1333 & 1446 Kg/ha) was yielded seed treatment with Provax 200 wp @ 3 g/kg, and the lowest yield was obtained from untreated control plots (1000 & 1146 Kg/ha).

Screening of different groups of fungicides and bio-agents against stemphylium blight of lentil

M. Z. Rahman, D. Sarkar, Raziuddin and AKM Mahbubul Alam

The experiment was conducted at Pulses Research Sub-Center, BARI, Gazipur and Pulses Research Centre, Ishurdi, Pabna during 2023-2024 to find out the effective and economic fungicide in controlling stemphylium blight of lentil. Eight fungicides were tested for their efficacy against the disease. The susceptible variety BARI Masur-1 was used and Stemphylium blight disease severity was measured using 0 to 5 rating scale. According to the study, Fungicides Luna sensation, Navara, and Stromin gave good results to control disease, as well as grain production. Overall, every fungicidal treatment decreased the severity of the disease and enhanced seed output compared to the control except for biological control approach.

Evaluation of selected exotic germplasm of lentil resistant to stemphylium blight in natural conditions.

D. Sarkar, M. Z. Rahman, M.A.A, Momin, M. Akhterruzzaman, M. Hossain, J. Hossain, M. and R. Humauan,

The stability and high yielding of lenti genotype is an important factor for long-term development stemphylium disease resistance. The effects of G × E interaction on disease severity and yield stability in 8 lentil genotypes in four different environments were investigated in this experiment. The experiment used a lattice square design in each environment. A two-dimensional GGE biplot was generated using the first two principal components (axis 1 and axis 2), which accounted for 96.19%, and 97.87% difference in GEI for Disease severity and yield per plant, respectively. The GGE biplot revealed that the two winning genotypes 9528-11-1, and BARI Masur-8, appear across environments. Based on ideal genotype ranking genotype 9528-11-1 was the best performer, with a high mean yield and high stability in the tested environment. According to the stability genotypes 9528-11-1 and BARI Masur-8 were extremely stable, while genotypes 9519-1-1, 9519-2-1, 9532-8-1 and 9527-22-1 were high stable, with a lower average yielding per plant. According to our results, breeding could improve yield production, and the genotypes discovered could be recommended for commercial cultivatio.

Grasspea

Varietal Improvement

Hybridization of grasspea

M. A. Zaman, M. M. Rahman, M. G. Azam and AKMM Alam

Hybridization of grasspea was conducted for creating diverse genetic variability with desired gene combinations within the existing germplasm at Pulses Research Centre, BARI, Ishurdi, Pabna during Rabi 2023-24. Six parents with desired traits were used and a total of 595 successful crossed seeds were collected from fifteen cross combinations that will be sown during the next season for confirmation of grasspea F₁ generations.

Hybridization of grasspea (Set-II)

M. M. Rahman, M. J. Alam, M. A. Zaman, M. S. U. Zaman, AKMM Alam and M. S. Ahmed

Hybridization of grasspea under set-ii were conducted within 7 parents during Rabi 2023-24 at PRSS, BARI, Gazipur and PRC, BARI, Ishurdi, Pabna to develop a number of new segregates of grasspea with high yielding, early maturing and low ODAP content i. A total of 214 successful crossed seeds were collected and preserved in the -20°C refrigerator for growing in the next growing season for confirmation of F₁ s generation at Pulses Research Sub-Station (PRSS), Joydebpur, Gazipur.

Confirmation of grasspea F₁s generation

M. M. Rahman, M. J. Alam, M. A. Zaman, M. S. U. Zaman, AKMM Alam and M. S. Ahmed

Sixteen F₁s generation was grown for confirmation of F₁s generation based on single plant selection procedure comparing the phenotypic behavior of male parents at PRSS, BARI, Joydebpur, Gazipur during rabi 2023-24. A total of 44 single plants were confirmed as F₁s generation of grasspea from sixteen cross combination and these confirmed F₁s were harvested and preserved for growing in the next season as F₂s generation of grasspea at PRSS, BARI, Joydebpur, Gazipur.

Growing of F₃ generation of grasspea

M. G. Azam, M. A. Zaman, M. M. Rahman and AKMM Alam

Nine F₃s segregates were grown along with check variety BARI Khesari-5 to advance the generation at Pulses Research Centre, Ishurdi, Pabna during

rabi, 2023-24. The total population was bulked and harvested for retention of more variability which will be grown in the next Rabi season as F₄S segregation generation in the next season.

Growing of F₄ generation of grasspea

M. G. Azam, M. A. Zaman, M. M. Rahman and AKMM Alam

Twelve F₄S progenies were evaluated and their seeds were bulked during Rabi 2023-24 and these bulked populations will be grown and evaluated as F₅S generation in the next season for advancement of grasspea segregating populations.

Growing of grasspea F₅ generation

M. G. Azam, M. A. Zaman, M. M. Rahman and AKMM Alam

Genetic combination turns to more homozygous condition in F₅ and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F₅S were grown along with check variety BARI Khesari-5 at Pulses Research Centre, Ishurdi, Pabna during rabi 2023-24. Finally, these bulked populations will be grown and evaluated as F₆ generation in the next season for advancement of grasspea segregating populations.

Growing of grasspea F₆ generation

M. A. Zaman, M. M. Rahman, M. G. Azam, and AKMM Alam

Genetic combination turns to more homozygosity in F₆ and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F₆S were grown along with check variety BARI Khesari-5 at Pulses Research Centre, Ishurdi, Pabna during rabi 2023-25. Finally, fourteen lines/families were selected which will be grown in the next year at observation trial (OT).

Preliminary yield trial of grasspea

M.M. Rahman, M. A. Zaman, M. G. Azam, AKMM Alam, M. S. Kabir, J. Hossain, M. M. Hossain, M. S. Hossain, and M. S. Uddin

The experiment was carried out to evaluate the performance of nine grasspea genotypes along with check BARI Khesari-5 for yield and yield related traits in five locations *viz.* Pulses Research Centre, Ishurdi, Pabna; RARS, Jashore; RARS, Barishal; RARS, Jamalpur, and PRSS, Joydesbpur during

Rabi 2023-24. Different genotypes of grasspea showed significant or non-significant variations among all the parameters across all five environments under multi-locational trials. Considering mean data for both days to 50% flower and maturity the genotypes IFLA-2298 and IFLA-2781 were identified earlier compared to other genotypes respectively. The maximum 41.40 pods/plant were produced in the genotype IFLA-2298, and the minimum 30 pods/plant was obtained from the genotype IFLA-159. The genotypes IFLA-2158, and IFLA-2136 were identified as bold and small seeded over the locations mean respectively. The genotype IFLA-2258 produced maximum seed yield (1039.40 kg/ha) and the genotype IFLA-1522 produced the minimum yield (762 kg/ha). Finally, considering the yield and desired yield contributing traits four genotypes IFLA-2258, IFLA-2763, IFLA-2781 and IFLA-159 were selected for RYT trial in the next rabi season.

Regional yield trial of grasspea

M. A. Zaman, M.M. Rahman, M. G. Azam, AKMM Alam, J. Hossain, M. S. Kabir, M. M. Hossain, and M.S. Uddin

The experiment was carried out to evaluate the performance of seven grasspea genotypes with check variety BARI Khesari-3 for yield and yield contributing traits at five different locations of Bangladesh during rabi 2023-24. Based on mean data for both days to 50% flowering and maturity the genotype 114505 and 116755 were identified earlier compared to other genotypes respectively. The genotypes 114585 and 66054 was found as dwarf type with moderate yield performance over locations. The number of pods varied among the genotypes and highest mean pods/plant (41.20) found in the genotype 116755 following by the genotypes IGYT-124, and the genotype 114505. Considering the yield and yield contributing traits the genotypes IGYT-124, 116690, 116755 were selected based on over locations performance and these genotypes will be advanced in the next year as PVS trial at farmers field of the grasspea growing areas of Bangladesh.

Participatory varietal selection of grass pea

M. G. Azam, M. A. Zaman, M.M. Rahman, AKMM Alam, J. Hossain, M. S. Kabir, M. M. Hossain, and M. S. Uddin

Seven advance genotypes including one check varieties BARI Khesari-5 were evaluated at RPRC,

Madaripur; RARS, Jashore; RARS, Jamalpur; and PRSS, Joydebpur in a RCB design with 3 replications. Days to 50% flowering and maturity ranged from 69-88, and 106-130 respectively over the locations. No dwarf genotypes were found compared to the check variety BARI Khesari-5 from the present investigation. The genotypes IGYT-110, and IGYT-123 produced the maximum pods/plant and yield/ha over the location. Considering mean value of yield, yield contributing traits and yield stability over the locations, the genotypes IGYT-110, and IGYT-123 were selected for next year rabi season as adaptive trial at farmer's field of grasspea growing areas of Bangladesh.

Evaluation of grass pea genotypes as a herbage (leafy vegetable) in Bangladesh

M. M. Rahman, M. J. Alam, M. A. Zaman, M. S. Zaman, AKMM Alam and M. S. Ahmed

Grasspea (*Lathyrus sativus* L.) locally known as "Khesari" was extensively cultivated in all over Bangladesh. Five advanced grass pea genotypes were grown along with check variety BARI Khesari-3 during winter season of 2023-24 at Pulses research sub-center, BARI, Gazipur following three rows with three meter and the preference of grasspea consumption in the descending order: highly soft & succulent > medium soft & succulent > hardy & rough. This study focuses on the exploration, collection, and survey of grasspea as a leafy vegetable with the aim of revitalizing traditional knowledge for practical applications. Significant differences were observed in five genotypes along with check BARI Khesari-3 on the basis of herbage yield and organoleptic test. Among the tested entries these genotypes BGP-13010, IGYT-122 and BARI Khesari-3 were highly soft & succulent; two genotypes BGP-13009 and IGYT-125 were medium soft & succulent and one genotype IGYT-123 was hardy and rough. The highest yield (9397.22 kg/ha) was found in our check variety BARI Khesari-3 and BGP-13010 (8238.89 kg/ha) followed by IGYT-122 (7811.11 kg/ha). Based on organoleptic test of leaves of selected genotypes of grasspea was assessed for proximate parameters. This comprehensive study provides valuable insights into use and preferences associated with grasspea consumption in Bangladesh, paving the way for practical applications and the revival of traditional knowledge. This experiment will be further

evaluation in next year for the preference of grasspea consumption in the descending order: leafy vegetable > pulse > fodder > by-products/processed product and the nutritional profiling of leaves.

Evaluation of advanced grasspea genotypes in north and southern region as a relay crop with one check BARI Khesari-5

M. M. Rahman, M. J. Alam, M. A. Zaman, M. S. Zaman, M. A. Islam, AKMM Alam and M. S. Ahmed

The experiment was carried out to evaluate the performance of seven grasspea genotypes with one check BARI Khesari-5 for yield and yield related traits in five locations viz. PRC, Ishwardi, Pabna; PRSS, Gazipur; and RARS, Barisal during Rabi 2023-24 but Barisal location has been failure due to heavy rainfall. There are significant variations were found among the genotypes across the environments in case of days to maturity, plant height, pods per plant, 100 seed weight and yield. All tested genotypes late matured the mean values of five locations comparatively our check variety BARI Khesari-5. The highest mature showed in IGYT-110 (128 days) and lowest in IGYT-125 (123 days). The genotype BGP-13009 showed the highest average plant height (52.12 cm) and lowest in IGYT-124 (48.07 cm) followed by check variety BARI Khesari-5 (47.63 cm). The highest pods per plant (21) found in IGYT-125 followed by IGYT-124 (19), IGYT-122 (18), BGP-13010 (18) and BGP-13009 (17) while the lowest pods per plant in BARI Khesari-5 (15). The highest average 100 seed weight (6.73 gm) recorded in IGYT-125 followed by IGYT-124 (6.25 gm), BGP13010 (6.19 gm) and IGYT-122 (6.00 gm) while lowest 100 seed weight in BARI Khesari-5 (5.14 gm). The genotype BGP-13009 produced the highest average seed yield (1254 kg/ha) followed by BGP-13010 (1205 kg/ha), IGYT-125 (1196 kg/ha) and IGYT-122 (1143 kg/ha) while the lowest yield (1020 kg/ha) performed in IGYT-124.

International grass pea yield trial (ICARDA)-2nd year

M. M. Rahman, M. J. Alam, M. S. Zaman, M. A. Zaman, M. M. Hossen, AKMM Alam, and M. S. Ahmed

Twenty two grass pea genotypes were selected from the ICARDA materials previous year 2022 through International grass pea Trial-1st year and

including five local checks were evaluated at Pulses Research Sub-Center, BARI, Gazipur during rabi 2023-24. The local checks BARI Kheseri-1, BARI Kheseri-2, BARI Kheseri-3, BARI Kheseri-5 and BARI Kheseri-6 were earlier than the all exotic entries considering days to 50% flowering and 80% maturity. Seven advanced lines IF-2175, IF-2191, IF-2194, IF-2261, IF-2286, IF-2298 and IF-2301 were the better performances considering high yield and pods per plant among the 22 exotic lines followed by BARI kheseri-3, BARI Kheseri-5 and BARI Kheseri-6. No exotic lines could exceed our 3 local checks in case of yield. So, this seven advanced lines such as IF-2175, IF-2191, IF-2194, IF-2261, IF-2286, IF-2298 and IF-2301 were the considering as a high yielding for observation trial in next year.

Yield and ODAP content variation of advanced grass pea genotypes in saline and drought prone areas in Bangladesh

M. M. Rahman, M. J. Alam, M. S. Zaman, S Mondal, M.E.A. Pramanik, AKMM Alam and M. S. Ahmed

The experiment was carried out to evaluate the performance of ten advanced grass pea genotypes with one check BARI Khesari-3 to observe the effect of drought and saline on yield related traits in three locations viz. PRSS, Gazipur; ARS, Sathkhira; and OFRD, Borandra, Rajshahi during Rabi 2023-24. Significant variations were found among the genotypes across the environments. The genotype 114585, IGYT-124 and BGP-13009 flowered and matured earlier considering the mean values of three locations followed by BARI Khesari-3. The genotype IGYT-110 showed the highest average plant height (79 cm) followed by IGYT-124 (77 cm), IGYT-122 (76 cm) and IGYT-125(75 cm) while the lowest in 116690 (68 cm). The number of pods varied across locations. Highest pods per plant (41) found in IGYT-122 followed by IGYT-124 (40) BGP-13009 (30) and BARI kheseri-3 (38 cm) while the lowest pods per plant in IGYT-125 (30). The highest average 100 seed weight (6.82 g) recorded in IGYT-110 followed by 116690 (6.56 g) and IGYT-122 (6.05 gm) while lowest 100 seed weight in BGP-13010 (5.26 g). The genotype IGYT-123 produced the highest average seed yield (1230 kg/ha) followed by IGYT-110 (1199 kg/ha), IGYT-122 (1182

kg/ha) and 116690 (1165 kg/ha) while the lowest yield (936 kg/ha) performed in IGYT-124.

Evaluation of previously selected local and exotic grass pea advanced genotypes (2nd year) for genetic perspective in Bangladesh

M. M. Rahman, M. J. Alam, M. A. Zaman. M. S. Zaman, M. M. Hossen, AKMM Alam and M. S. Ahmed

One hundred thirty two local and exotic grass pea germplasms were evaluated from previously selected germplasm with five local checks BARI Kheseri-1 BARI Kheseri-2 BARI Kheseri-3 BARI Kheseri-5 and BARI Kheseri-6 at Pulses Research Sub-Center, BARI, Gazipur during Rabi 2023-24. Among the 132 genotypes with 5 local checks; 33 genotypes were very earlier and comparatively good yield than the all evaluated germplasm considering 80% maturity and yield potentiality in both location. According to clustering on the basis of 80% days to maturity we found extra early 8 genotypes, medium early 25 genotypes and late 104 genotypes; on the basis of yield 25 genotypes high yield, 13 genotypes medium yield and 99 genotypes low yield. So we can consider 8 genotypes and 25 genotypes as a extra early and medium early as well as 25 genotypes and 13 genotypes as a high yield and medium yield for observation trial in next year.

Screening of grasspea germplasm for tolerance to waterlogging at seedling stage

M.S.U. Shahin Uz Zaman and M.M. Rahman

Grass pea is exposed to waterlogging at different growth stages when grown as relay in rice-based cropping. A total of 100 germplasm was exposed to waterlogging stress for 21 days at seedling stage in the pot soil to identify waterlogging tolerance at seedling. Significant variation of %Reduction the value of traits in waterlogged soil was found during WL in compared to drained control. Traits such as chlorophyll, branch/plant, plant height, shoot dry weight, root length, root dry weight, pods/plant, 100 seed weight, and seed yield/plant in stressed plants were decreased by 23, 42, 24, 69, 60, 65, 73, 19 and 79%, respectively, compared with the drained control plants. For selecting the tolerant genotypes, the MGIDI index was used to rank the treatments based on the desired values of traits. The genotypes selected were based on their MGIDI index values, as indicated by the red-colored dots.

The selected genotypes are 114510, SEL-1784, 114505, SEL-554, Norail local, SEL-1327, 114508, 116820, SEL-1959, 116690, 114585, Sirajgong local, CGI-08941789, SEL-390 and 66065.

Crop and soil management

Validation of performance of herbicides for controlling weeds in grasspea

J. Hossain, M.S. Alam, M.M. Rashid, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2023-24 to find out the performance of herbicide for controlling weed in grass pea. Four treatments were viz. T₁: Panida-33EC (Pendimethaline @ 3.0 L ha⁻¹), T₂: Panida-33EC and Weednil (Quizalofop-*p*-ethyle @ 750 ml ha⁻¹), T₃: Hand weeding at 25 DAS and T₄: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Hand weeding gave higher pods plant⁻¹, and consequently gave higher yield and the maximum gross return. On the other hand, Panida-33EC and Weednil gave higher gross margin and MBCR due to lower variable cost. Therefore, Panida-33EC and Weednil was better option to control weeds in grass pea.

Effect of rhizobium bio-fertilizer on productivity and nutritional quality (protein & zinc) of grasspea varieties

S. Aktar, J. Hossain, AKMM. Alam, M.M. Rashid, S. Ahmed and M.S.Uddin

The experiment was conducted at RPRS, Madaripur during *Rabi* season of 2023-24 to observe the effect of rhizobium inoculant on growth and yield of grasspea. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and eight treatments. The higher seed yield (1150 kg ha⁻¹) was obtained from BARI khesari-6+ Rhizobium inoculum followed by BARI khesari-2+ Rhizobium inoculum while the lowest seed yield (756 kg ha⁻¹) was observed in BARI khesari-3.

Chickpea

Varietal Improvement

Hybridization of chickpea

M. J. Alam, N. Naher, AKMM Alam and M. S. Uddin

Hybridization of chickpea was undertaken for creation of genetic variability with desired gene combinations at PRC, Ishurdi, Pabna during *rabi* 2023-24. Six parents were used followed by half-diallel fashion and a total of 303 crossed derived seeds were harvested separately from fifteen cross combinations.

Confirmation of chickpea F₁ generation

M. J. Alam, N. Naher, AKMM Alam and M. S. Uddin

Fifteen cross combinations were grown along with their parents in both sides during *rabi* season 2023-24 at PRC, Ishurdi, Pabna. A total of 26 individual F₁s plants have been confirmed and harvested separately from the cross combinations and those single plants will be grown as F₂ generation in next season.

Growing and evaluation of F₂ generation of chickpea

M. J. Alam, N. Naher, AKMM Alam and M. S. Uddin

Ten F₂ segregates were grown along with two checks BARI Chola-5 and BARI Chola-10 to advance the generation at Pulses Research Centre, Ishurdi, Pabna during *rabi*, 2023-24. The progenies of different accessions were bulked and harvested for retention of more variability which will be grown as F₃ segregation generation in the next season.

Growing and evaluation of chickpea F₃ generation

M. J. Alam, N. Naher, AKMM Alam and M. S. Uddin

Bulked population of nine F₃s accessions were grown along with two checks BARI Chola-5 and BARI Chola-10 to advance the generation at Pulses Research Centre, Ishurdi, Pabna during *rabi*, 2023-24. Again the progenies of different accessions were bulked and harvested for retention of more

variability which will be grown as F₄ segregation generation in the next season.

Growing and evaluation of chickpea F₄ generation

M. J. Alam, N. Naher, M. G. Azam, AKMM Alam and M. S. Uddin

Ten F₄s progenies were evaluated and their seeds were bulked during rabi, 2023-24 and each of the individual single plants will be grown in an individual line as F₅s generation in the next season where family selection will be done.

Growing and evaluation of chickpea F₆ generation

M. J. Alam, N. Naher, M. G. Azam, AKMM Alam and M. S. Uddin

Genetic combination turns to more homozygous in F₆ and for this reason selection of family is done in this generation. To select appropriate and desired combinations seven F₆s were grown along with check varieties at Pulses Research Centre, Ishurdi, Pabna. Finally eleven lines/families were selected which will be grown in the next year under observation trial.

Preliminary yield trial of chickpea

M. J. Alam, M.S. Kobir, E. Pramanik, R. Uddin, S. Mahmud, AKMM Alam and M. S. Uddin

The trial was conducted at five locations to evaluate the performance of ten chickpea genotypes including check varieties, BARI Chola-5 and BARI Chola-10. The trial was laid out in a RCB design with three replications. Significant variation was observed in most of the yield contributing characters and seed yield across the locations. The highest average yield (1567 kg/ha) across the locations was found in genotype BCX-17007-6 followed by BCX-17007-2, BCX-17009-1 and BCX-17009-3. In respect to Botrytis Gray Mold disease, there was no appearance of disease symptom this year. Regarding locations, entries performed relatively better at Ishurdi and Barind and poor at Barishal and Madaripur. Considering yield and yield contributing traits, four entries BCX-17007-6, BCX-17007-2, BCX-17009-1 and BCX-17009-3 were selected to evaluate next year under RYT.

Regional yield trial of chickpea

M. J. Alam, M.S. Kobir, E. Pramanik, R. Uddin, S. Mahmud, AKMM Alam and M. S. Uddin

The trial was conducted at five locations to evaluate the performance of six chickpea genotypes along with check BARI Chola-5 and BARI Chola-10. The experiment was laid out in a RCB design with three replications. Significant variations were observed in most of the yield contributing characters except days to flower and pods per plant. The highest average yield (1527 kg/ha) across the locations was found in genotype BCX-16006-2 followed by BCX-16006-1 and BCX-16006-4 and lowest in BARI Chola-5. In respects to Botrytis Gray Mold disease, there was no appearance of disease symptom this year. Considering yield and yield contributing traits, three entries BCX-16006-2, BCX-16006-1 and BCX-16006-4 were selected to evaluate next year under on-farm trial.

On-farm yield trial of promising chickpea genotypes

M. J. Alam, N. Naher, M.S. Kobir, M. E. Pramanik, M. A. Islam, M. M. Zaman, AKMM Alam and M. S. Uddin

The trial was conducted at four locations to evaluate the performance of five chickpea genotypes including check varieties BARI Chola-5 and BARI Chola-10. The experiment was laid out in a RCB design with three replications. Significant variation was observed plant height, 100 seed wt. and yield at different locations. The highest average yield (1412 kg/ha) across the locations was found in genotype BCX-13002-2. In respect to Botrytis Gray Mold disease, there was no appearance of disease symptom this year. Considering yield and yield contributing traits, the entry BCX-13002-2 is selected to re-evaluate under on-farm trial in the next rabi season.

Evaluation of kabuli chickpea germplasm

M. J. Alam, AKMM Alam and M. S. Uddin

Twenty seven kabuli chickpea genotypes were grown with standard check varieties viz. BARI Chola-5 and BARI Chola-10 during rabi, 2023-24 at Pulses Research Centre, Ishurdi, Pabna to select better performing kabuli genotypes. The entries of the experiment were laid out in a RCB design with two replications with spacing of 50 cm between rows. Significant variations were found in yield and

yield contributing traits. Among the tested entries, G4 flowered earlier and G24 followed by BARI Chola-11 matured earlier than the other entries. The highest plant height was recorded in G21, while the lowest in G27. The entry G26 followed by G21 showed the highest number of pods/plant while the lowest in G27. The highest 100 seed weight was found in the entries of G13 and the lowest in BARI Chola-11. The highest yield was found in G24 followed by G23 and G9. In respect to Botrytis Gray Mold disease, we did not find any symptom of the disease this year. The entries viz. G9, G23 and G24 out yielded both the check varieties which are selected for OT in the next year.

Evaluation of short duration chickpea germplasm

M. J. Alam, AKMM Alam and M. S. Uddin

Seventeen genotypes were grown with standard check variety viz. BARI Chola-11 during rabi, 2023-24 at Pulses Research Centre, Ishurdi, Pabna to find out short duration promising lines following RCB design with two replications. Significant variations were found in all the yield and yield contributing traits. Among the tested entries, G16 flowered earlier followed by BARI Chola-11. G8 followed by G13 matured earlier than the other entries. In case of crop duration, few genotypes required 3 to 7 days less than the check variety. The highest plant height was recorded in G15 followed by G1, while the lowest in G7. The entry G8 followed by G3 showed the highest number of pods/plant while the lowest in G5 and G14. The highest 100 seed weight was found in the entries of G1 and the smallest in G10. The highest yield was found in G14 followed by G8 and G15. The lowest yield was observed in G5. In case of yield, eight entries viz. G8, G9, G10, G11, G13, G14, G15 and G17 out yielded the check variety BARI Chola-11.

Crop and soil management

Bio-fortification of chickpea through water soluble zinc sulphate

M.S. Alam, M.M. Kamal and M.S. Uddin

Zinc fortified chickpea maintains balance nutrition of pregnant women and children and contributes to the growth and reproduction of plants, animals, and humans. Therefore, a field experiment was conducted at PRC, BARI, Ishurdi, Pabna during Rabi season of 2023-2024 to find out the response

of chickpea to zinc bio fortification and yield. The experiment was laid out in a Randomized Complete Block Design with three replications and assigned 6 different treatments. The treatments were T₁= Native fertility, T₂= Soil ZnSO₄ @ 2 kg ha⁻¹, T₃= Soil ZnSO₄ @ 5 kg ha⁻¹, T₄= Foliar spray ZnSO₄ @ 0.1% at before flowering stage, T₅= Foliar spray ZnSO₄ @ 0.2% at flowering stage and T₆= Soil ZnSO₄ @ 2 kg ha⁻¹ and foliar spray ZnSO₄ @ 0.2% at flowering and podding stage. The results revealed that all the treatment except control showed statistically identical effect on plant height, nodule number plant⁻¹, pod plant⁻¹, and seed yield of chickpea. The higher seed yield (2.88 t ha⁻¹) was found in (T₆) and the lower seed yield (1.50 t ha⁻¹) was obtained from the control (T₁). Yield increased over control was 40-48%. The maximum gross margin and MBCR were found in soil application and spray Zn at flower & podding (T₆). After one cropping cycle, OM, total N, K, and B of the soil decreased from initial soil among the treatment but pH, Zn and Fe nutrient has been increased from initial stage. The higher Zn content (38.61 ppm), Fe content in seed (97.62 ppm) and protein content (---%) in seed were observed in same treatment.

Effect of bio-fertilizer and phosphorus on yield of chickpea (BARI Chola-10)

M.S. Alam, J. Hossain, M.M. Kamal and M.S.Uddin

Bio-fertilizer with phosphorus boost-up chickpea growth and production therefore a field experiment was conducted at PRC, BARI, Ishurdi, Pabna during Rabi season of 2023-2024 to evaluate the effect of bio-fertilizer and phosphorus on yield of chickpea. The treatments were as follows- T₁= (Native fertility), T₂= Recommended dose of fertilizer (P₁₈-K₂₀-S₁₀-B₂ kg ha⁻¹) T₃ = *Rhizobium*, T₄= *Rhizobium* + 110% P (19.8 kg ha⁻¹ P), T₅= *Rhizobium* + 120% P (23.4 kg ha⁻¹ P) and T₆= *Rhizobium* + 140% P (25.2 kg ha⁻¹ P) and other fertilizers were used as blanket dose. The experiment was laid out in a Randomized Complete Block Design with three replications. Chickpea was significantly higher value of nodule number plant⁻¹, plant height, branch plant⁻¹, pod plant⁻¹, grain and stover yield (t ha⁻¹), additional income and gross margin. The results revealed that *Rhizobium* + 110% P (T₄) showed significant effect on nodulation and yield of chickpea. The higher seed yield (2.55 t ha⁻¹) was found in (T₄) and the lower

seed yield (1.67 t ha^{-1}) was obtained from T_1 (native fertility). The maximum nodule number (40 plant^{-1}) was recorded from T_4 while the minimum nodule number (14 plant^{-1}) was in T_1 . Yield increased over control was 26-35%. The higher additional income and gross margin was obtained from T_4 . The Maximum MBCR (25.71) was found in T_3 due to low price of *Rhizobium*. On the basis of yield and nodulation *Rhizobium* + 110%P (T_4) performed better than other treatments.

Efficacy of different source of bio and chemical fertilizer on growth and yield of chickpea

M.S. Alam, J. Hossain, M.Y. Ali, M.M. Kamal and M.S. Uddin

Chickpea maintains soil fertility through biological nitrogen fixation and contributes to the sustainability of the cropping system in cereal legume rotation. Therefore, a field experiment was conducted at PRC, BARI, Ishurdi, Pabna during Rabi season of 2023-24 to find out the response of chickpea to different bio and chemical fertilizer on growth and yield. The treatments were T_1 = Native fertility, T_2 =Recommend dose of fertilizer ($P_{18}K_{20}S_{10}B_2 \text{ kg ha}^{-1}$) BARI, T_3 = Easy Rhiz Chickpea + RD, T_4 =*Rhizobium* + RD, T_5 = $N_{22}P_{18}K_{20}S_{10}B_2 \text{ kg ha}^{-1}$ FRG, T_6 = BARI RCA-203 bio-fertilizer +RD. The experiment was laid out in a Randomized Complete Block Design with three replications and assigned 6 different treatments. The results revealed that all the treatment except control showed statistically identical effect on plant height, nodule number plant⁻¹, pod plant⁻¹, and thousand seed weight of chickpea. The higher seed yield (2.25 t ha^{-1}) was found in (T_4) and the lower seed yield (1.37 t ha^{-1}) was obtained from the control (T_1). Yield increased over control was 10-39%. The maximum gross margin and MBCR were found in *Rhizobium* +RD.

Validation of performance of herbicides for controlling weeds in chickpea

J. Hossain, M.S. Alam, M.M. Rashid, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2023-24 to find out the performance of herbicide for controlling weed in chickpea. Four treatments were viz. T_1 : Panida-33EC (Pendimethaline @ 3.0 L ha^{-1}), T_2 : Panida-33EC and Weednil (Quizalofop-p-ethyl @ 750 ml ha^{-1}), T_3 : Hand weeding at 25

DAS and T_4 : Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Hand weeding gave higher pods plant⁻¹, and consequently gave higher yield and the maximum gross return. On the other hand, Panida-33EC and Weednil gave higher gross margin and MBCR due to lower variable cost. Therefore, Panida-33EC and Weednil was better option to control weeds in chickpea.

Response of rhizobium and trichoderma on yield of chickpea at madaripur

S. Mahmud, J. Hossain, M.M. Rashid S. Ahmed, M. E. Ali and M. S. Uddin

A field experiment was conducted at RPRS, BARI, Madaripur during Rabi season of 2023-24 to evaluate the performance of Chickpea var. BARI Chola-10 treated with *Rhizobium* and *Trichoderma*. Six treatments viz. Lycomax (*Trichoderma*) @ 3g/litre , Bioderma (*Trichoderma*) @ 75kg/ha , *Rhizobium*, *Rhizobium* + Lycomax @ 3g/litre , *Rhizobium* + Bioderma @ 75kg/ha and control were tested in this experiment. The highest yield was obtained from combined application of *rhizobium* and lycomax (765kg/ha) and the lowest from control (430kg/ha). The result therefore suggested that combined application of *Trichoderma* and *Rhizobium* can increase the growth of chickpea which play an important role in organic agriculture.

Agronomic biofortification of chickpea with zinc through application of zinc fertilizer

M.S. Kobir; M.S. Alam; M.J. Hossain; M. Mohiuddin, M.H. Rahman; S. Paul and K.U. Ahammad

The experiment was conducted at Regional Agricultural Research Station, Jashore during Rabi 2022-23. The experiment was conducted considering five different treatments. Among the treatments soil application of $25 \text{ kg ha}^{-1} \text{ZnSO}_4$ (21% Zn) at sowing along with Foliar ZnSO_4 21% Zn @ 0.5% at flowering and pod formation stage revealed the best method for agronomic biofortification of chickpea with Zn.

Disease Management

Effect of biological agents and chemical fungicides on fusarium wilt disease in chickpea

M. Z. Rahman, D. Sarkar, and Raziuddin

The experiment was conducted at PRSC, BARI, Gazipur during 2023-24 to find an effective management practice for Fusarium wilt disease of Chickpea. Five management practices and one control were used as treatment. The lowest disease incidence (8.92 %) was obtained from the seed treatment with Provax 200 wp (Carboxin + Thiram) @ 3 g/kg seed and the highest incidence (34.00%) was obtained from untreated control. The highest seed yield (1650 Kg/ha) was recorded in seed treatment with Provax 200 wp @ 3 g/kg, and the lowest yield was obtained from the untreated control plot (1093 Kg/ha).

Fieldpea

Varietal Improvement

Hybridization and advancement of filial generations in fieldpea hybridization of fieldpea

M G Azam, N Naher, M J Alam and AKMM Alam

Hybridization of fieldpea was conducted to obtain genotypes having desired gene combinations during rabi, 2023-24 at Pulses Research Centre, Ishurdi, Pabna. Six parents were used as half diallel fashion and a total of 456 successful crossed seeds were collected from fifteen cross combinations.

Confirmation of fieldpea F₁ generation

M G Azam, N Naher, M J Alam and AKMM Alam

Fifteen cross combinations were grown along with their male and female parents in both sides during rabi season 2023-24 at PRC, Ishurdi, Pabna. A total of 37 individual F₁S plants have been confirmed and harvested separately from 15 combinations and these single plants will be grown as F₂ generation in next season.

Growing and evaluation of F₃ generation of fieldpea

M G Azam, N Naher, M J Alam and AKMM Alam

Three F₃S progenies were evaluated and their seeds were bulked during rabi, 2023-24 and each of the individual single plants will be grown in an individual line as F₄S generation in the next season where family selection will be done.

Growing and evaluation of fieldpea F₅ generation

M G Azam, N Naher, M J Alam and AKMM Alam

Seven F₅S progenies were evaluated and their seeds were bulked during rabi, 2023-24 and each of the individual single plants will be grown in an individual line as F₆S generation in the next season where family selection will be done.

Observation trial of fieldpea

M G Azam, N Naher, M J Alam and AKMM Alam

Nine families selected from last season's F₆ families were grown with check variety BARI Motor-1 and BARI Motor-3 during rabi season of 2023-24 at Pulses research center, Ishurdi, Pabna following RCB design with two replications. Significant variation was found among the genotypes in regards to yield and yield contributing traits. The genotypes BFPX-17007-2 and BFPX-17007-4 flowered (46 days) and matured (98 days) earlier followed by BFPX-17002-16, BFPX-17005-4, BFPX-17005-7, BFPX-17006-7, BFPX-17007-2, BFPX-17008-3, BFPX-17008-5, BFPX-17008-7, BFPX-17008-8, and BFPX-17008-14 mature the earliest at 98 days. The highest plant height (182 cm) was recorded in BFPX-17007-13 while the lowest (118.5 cm) in BARI Motor-1. The genotype BFPX-17007-13 and BFPX-17006-7 exhibited the highest number (23) of pods/plant. The highest yield (1767 kg/ha) was found in BFPX-17002-12 followed by BFPX-17002-13, BFPX-17001-11, BFPX-17005-7, BFPX-17005-4, BFPX-17003-8, BFPX-17001-3, BFPX-17002-7, BFPX-17003-10, BFPX-17005-1, BFPX-17003-5. Based on yield performance, earliness eleven entries were selected for next year PYT.

Regional yield trial of fieldpea

M G Azam, N Naher, M J Alam, AKMM Alam, R Uddin, MM Rashid, M. S. Kobir, M. A. Hossain and M. S. Uddin

The experiment was carried out to evaluate the performance of five fieldpea genotypes along with check BARI Motor-1 and BARI Motor-3 for yield and yield related traits at Pulses Research Centre, Ishurdi, Pabna (Isd), Pulses Research Sub-station, Gazipur (Gaz) and Regional Agricultural Research Station, Jashore (Jas) and Regional Pulses Research Station, Madaripur (Mad) during Rabi 2023-24. Significant variations were observed for days to

flower, days to mature, plant height (cm), pods per plant, 100 seed weight and the performance of seed yield. Among the genotypes, BFPX-16003 flowered and matured earlier than the other genotypes. The highest plant height was recorded in BFPX-16003 followed by BARI Motor-3 and BFPX-16005 in all locations. The genotypes BFPX-16003 exhibited the highest number of pods per plant among the tested genotypes. In the current study, as depicted by the mean grain yield of 5 genotypes ranged 817 kg/ha (BARI Motor-1) to 1068 kg/ha (BFPX-16003). As revealed by GGE biplots and average seed yield across locations, the genotype BFPX-16003 and BFPX-16005 identified as most adapted line and stable performer with negligible $G \times E$ interaction and high yield could be used directly as variety.

Phenotypic diversity in qualitative and quantitative traits for selection of high yield potential field pea genotypes

M.G. Azam, A.K.M.M. Alam & N. Naher

Field pea (*Pisum sativum* L.) needs improvement to increase productivity due to its high price and demand. However, the incidence of powdery mildew (PM) disease limits its production. This study aimed to analyze the diversity of qualitative and quantitative traits against powdery mildew resistance by utilizing cluster and principal component analysis to explore PM resistance high-yield potential field peas. Shannon and Weaver's diversity index (H') displayed high intra-genotype diversity for quantitative and qualitative aspects. Heterogeneity was identified for resistance against powdery mildew infections. 85 genotypes were divided into 5 groups using D^2 statistics. The highest inter-cluster D^2 value was observed between clusters 2 and 4 (11.96) while the lowest value was found between clusters 1 and 2 (3.01). Most of the genotypes had noticeable differences, so they could be employed in a crossing scheme. Eight genotypes were extremely resistant, 30 were resistant, 25 were moderately resistant, 19 were fairly susceptible, and 3 were susceptible to powdery mildew disease. Among 30 resistant genotypes, BFP77, BFP74, BFP63, BFP62, BFP43, and BFP80 were high yielders and, could be used directly and/or transferred through hybridization to high-yielding disease-susceptible genotypes. Among the 25 moderately resistant genotypes, BFP78, BFP72, BFP79, and BFP48 were found to

be high yielders. In principal component analysis (PCA), the first four PCs with Eigen values > 1 accounted for 81.3% variability for quantitative traits. Clustering sorted genotypes into five groups, where groups 1 to 5 assembled 32, 18, 26, 1, and 8 genotypes, respectively. Genotypes of cluster 5 were identified as high yielders with its attributes. Pearson correlation significantly and positively correlated across all traits except for PM. This variation suggested that there is a mechanism to select promising genotypes for field pea breeding. Considering all features, BFP78, BFP77, BFP74, BFP63, BFP62, BFP 45, BFP79, and BFP80 could be preferred as high yielders and PM resistance owing to longer pod lengths seeds per pod and pods per plant.

Evaluation of fieldpea (*Pisum sativum* L.) genotypes in southern belt of Bangladesh

N. Naher, M.G. Azam & A.K.M.M. Alam

An experiment was conducted at Kalapara, Patuakhali and Benarpota, Satkhira during Rabi 2023-24 to find out suitable and high yielding saline tolerant genotypes/variety of field pea. Eight genotypes with two check variety viz. BARI Motor-1 and BARI Motor-3 were evaluated in this trial. Results revealed that all the yield contributing characters under study were significantly different among the genotypes, The maximum number of pods/plant obtained from BARI Motor 1 and lowest in BFP-11015. Mean 100 seed weight ranged from 6.0-14.7 g. Maximum 100 seed weight obtained from Sekim local followed by BFP-15004-8 and BFP-11016. The mean yield of the tested genotypes varied from 722-1025 kg/ha. Comparatively the tested entries performed better yield at Kalapara, Patuakhali than Benarpota, Satkhira.

Screening of fieldpea genotypes at different level of salinity in hydroponic culture

N. Naher, M.G. Azam & A.K.M.M. Alam

The experiments were carried out during 2023-24 at the glass house of Plant Breeding division, Bangladesh Agricultural Research Institute (BARI). Main objective was to screen out the salt tolerant genotypes on the basis of physiological response and growth parameter. The experiments were laid out in the randomized complete block design (RCBD) with three replications. The experiment consisted of 14 genotypes with three checks BARI

Motor 1, BARI Motor 2 and BARI Motor 3 for screening of fieldpea genotypes under different salt concentrations. The genotypes have shown a significant variation with effect of different levels of salinity on different physiological traits, growth behavior and ion accumulation.

Crop and soil management

Validation of performance of herbicides for controlling weeds in field pea

J. Hossain, M.S. Alam, M.M. Rashid, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2023-24 to find out the performance of herbicide for controlling weed in field pea. Four treatments were viz. T₁: Panida-33EC (Pendimethaline @ 3.0 L ha⁻¹), T₂: Panida-33EC and Weednil (Quizalofop-p-ethyle @ 750 ml ha⁻¹), T₃: Hand weeding at 25 DAS and T₄: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Hand weeding gave higher pods plant⁻¹, and consequently gave higher yield and the maximum gross return. On the other hand, Panida-33EC and Weednil gave higher gross margin, and MBCR due to lower variable cost. Therefore, Panida-33EC and Weednil was better option to control weeds in field pea.

Disease Management

Screening of field pea germplasm against powdery mildew and rust diseases

M. Z. Rahman, N. Jahan, N. Naher, D. Sarkar and AKM Mahbul Alam

The screening trial was conducted with 141 germplasm at the Plant Genetic Resources Centre (PGRC), BARI, Gazipur. These accessions were screened in the natural field environment and showed varying levels of resistance. Lentil variety BARI Motor-3 was used as a check throughout the experiment. Among the evaluated lines 121 germplasm were identified as resistance three lines showed moderate resistance.

Effect of fungicides on powdery mildew and rust diseases in field pea

M. Z. Rahman, D. Sarkar, Raziuddin and AKM Mahbul Alam

The experiment was conducted at PRSC, BARI, Gazipur during 2023-24 to find an effective

fungicide for controlling Powdery mildew and rust diseases of Fieldpea. Eleven fungicides and one control were used as treatment. The lowest disease incidence (10.00 %) was obtained from spraying with Nativo 75 WP (Tebuconazole + Trifloxystrobin) and the highest incidence (60.00%) was obtained from untreated control. The highest seed yield (2400 Kg/ha) was recorded in Nativo 75 WP treated plots, and the lowest yield was obtained from the untreated control plots (1633 Kg/ha).

Cowpea

Varietal Improvement

Adaptation of cowpea genotypes for southern region

AKM M. Alam, R. Uddin, and B.C. Kundu

Native cowpea germplasms are adaptable and location-specific. Better germplasms should be discovered from the native cowpea genetic pool. During the Rabi season of 2023–24, an experiment was conducted at RARS, Rahmatpur, Barishal, to assess the performance of seven chosen cowpea germplasms against one control variety under the agroclimatic conditions of the south. The study tested seven carefully chosen cowpea germplasms: CPL-2-17, CPL-3-17, CPL-4-17, CPL-5-17, CPL-6-17, CPL-7-17, and CPL-8-17, together with one check variety, BARI Felon-1. The findings showed that no germplasm had produced more than the check variety in terms of numbers. Yet, CPL-2-17, CPL-3-17, and CPL-8 may be taken into consideration for further assessment.

Evaluation of cowpea exotic lines

AKMM Alam, R. Uddin, and B.C. Kundu

In climate change situation, cowpea cultivation in coastal region is uplifting the economic progress of smallholder farmers in a significant way. The crop faces multifarious challenges through its life span including salinity, submergence, heat stress, etc. The adversities can be ameliorated by replacing the existing landraces and varieties in terms of salinity, submergence, and heat tolerance through varietal improvement. Selected fifteen IITA exotic cowpea germplasm out of 350 core collection were evaluated in the south-central coastal region of Bangladesh. Results indicated that TVU-1886, TVU-1280, TVU-5307, and TVU-473 had

produced the maximum seed yield over the check variety BARI Felon-1.

Crop and soil management

Performance of cowpea with leafy vegetable

J. Hossain, M. M. Rashid, M.S. Alam, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Centre, Madaripur during 2023-24 to find out the performance of cowpea with leafy vegetable. Five treatments were viz. T₁: Cowpea with red amaranth, T₂: Cowpea with spinach, T₃: Cowpea with jute, T₄: Cowpea with coriander, T₅: Cowpea (Sole). , the highest cowpea equivalent yield was calculated from Cowpea with spinach (4.78 t ha⁻¹) and the minimum cowpea equivalent yield was calculated from sole Cowpea. The highest gross return (Tk. 573333 ha⁻¹) and gross margin (Tk. 533333 ha⁻¹) was obtained from Cowpea with spinach which was followed by Cowpea with coriander.

Performance of cowpea as influenced by sowing dates in barishal

R. Uddin, A. K. Zaman and B.C. Kundu

Cowpea sowing at south central coastal region of Bangladesh is varies from region to region depending upon soil moisture condition and T. Aman rice harvesting. Optimum date of sowing for cowpea in different regimes of southern belt still not investigated. A field study was carried out at RARS, Rahmatpur, Barisal during Rabi season of 2023-24 to observe the effect of different sowing dates on cowpea cultivation. *The experiment was carried out five sowing dates under Randomized Complete Block Design with three replications. Cowpea sowing 20 December in cultivation method is suggestible in terms of maximum dry matter accumulation at developmental stages, better time-span to flourish growth and developmental stages and higher seed yield (1247 Kg/ha).*

Effect of plant spacing on advanced lines of cowpea

R. Uddin, A. K. Zaman and B.C. Kundu

Sowing methods of cowpea in south central coastal region is either relay sown or sowing in cultivation method in broadcasting system. Trials from different research programs demonstrated that line

sowing of cowpea at 30-40cm apart had exhibited certain yield increment in respect of proper intercultural operations, light use efficiency etc. An investigation was conducted consisting of BARI Felon-1, TVU-1886 and TVU-473 of different canopy attributes and plant spacing of 40 cm, 50 cm and 60 cm apart to ascertain the optimum plant spacing and therefore plant population for cowpea cultivation. Results revealed that, the short statured TVU-1886 gave the maximum seed yield at 40 cm of spacing, TVU-473 gave the maximum yield at 50 cm of spacing and the check variety BARI Felon-1 gave the maximum seed yield at both 50 cm and 60 cm of spacing.

Mungbean

Varietal Improvement

Hybridization of mungbean

AKMM. Alam, M. G. Azam, and M.J. Alam

Hybridization program was conducted during Kharif-I, 2024 at PRC, Ishurdi, Pabna for creating the genetic variability among the existing germplasm for desired gene pool. Five parents were used having desired genetic combinations and hybridization was conducted which yielded eighteen cross combinations.

Confirmation of mungbean F₁ generation

AKMM. Alam, M. G. Azam, and M.J. Alam

Fifteen F₁s obtained from Kharif-I, 2023 were grown along with their parents on both sides at Pulses Research Centre, Ishurdi, Pabna during Kharif-I, 2024. On the basis of desired characters 76 single plants were confirmed from eleven cross combinations and that were labelled with new accession number. The confirmed F₁s will be grown on the next season as F₂s generations.

Growing and evaluation of mungbean F₂ generation

AKMM. Alam, M. G. Azam, and M.J. Alam

With a view to select appropriate and desired combinations, six F₂s were grown along with BARI Mung-6 as a check at Pulses Research Centre, Ishwardi, Pabna during Kharif I, 2024. 8-15 plants were selected from each progeny and harvested separately for retention of more variability which will be grown in F₃ generation in the next season.

Growing and evaluation of mungbean F₃ generation

AKMM. Alam, M. G. Azam, and M.J. Alam

Eleven F₃s progenies were evaluated and 5-15 plants were selected from each progenies during Kharif- I, 2024 and these plants will be grown and evaluated as F₄s generation in the next season for advancement of mungbean segregating populations.

Growing and evaluation of mungbean F₄ generation

AKMM. Alam, M. G. Azam, and M.J. Alam

For advancement of the segregation generations of mungbean from F₄ to F₅ based on phenotypic view with desired genes combinations six F₄s generations were grown along with check BARI Mung-6 at Pulses Research Centre, Ishwardi, Pabna during Kharif-I, 2024. 10-20 plants were selected from each progeny and harvested separately which will be grown in F₅ generation in the next season.

Growing and evaluation of mungbean F₅ generation

AKMM. Alam and M. G. Azam

Genetic combination turns to more homozygous condition in F₅ and for this reason selection of family is done in this generation. For advancement and attaining more homozygosity in filial generations of mungbean, ten progenies of F₄s seed were grown as F₅S generation along with check BARI Mung-6 at Pulses Research Centre, Ishwardi, Pabna during Kharif-I, 2024. 5-20 plants were selected from each progeny and harvested separately and stored in cool room separately for growing and evaluation in the next season trial as F₆s generations.

Growing and evaluation of mungbean F₆ generation

M.G. Azam, Akmm. Alam and M.J. Alam

Genetic combination turns to more homozygosity in F₅ and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F₅s were grown along with check varieties at Pulses Research Centre, Ishwardi, Pabna. Finally, eighteen lines/families were selected which will be grown in the next year at observation trial.

Observation trial of mungbean

M.G. Azam, AKMM. Alam and M.J. Alam

Forty five lines from eight families selected from last season's F₆ treated as lines. The forty-seven lines with two check varieties BARI Mung-6, BARI Mung-7 kharif I season of 2024 at Pulses Research Centre, Ishwardi, Pabna followed RCB design with two replications. Finally Eleven genotypes viz: BMXK1-17002-26-2, BMXK1-17005-7-2, BMXK1-17004-17-1, BMXK1-17010-11-1, BMXK1-17008-9-9, BMXK1-17008-2-1, BMXK1-17008-9-1, BMXK1-17003-15-11, BMXK1-17008-2-19 and BMXK1-17009-7-5 were preliminary selected for PYT in the next season.

Participatory varietal selection of mungbean

AKMM. Alam, M. G Azam and M. S. Uddin

The experiment was carried out to evaluate the performance of three mungbean genotypes along with check BARI Mung-7 and BARI Mung-8 for yield and yield related traits at Pulses Research Centre, Ishurdi, Pabna (Isd), Pulses Research Sub-station, Gazipur (Gaz), Regional Pulses Research Station, Madaripur (Mad) and Regional Agricultural Research Station, Barishal (Bar) during Kharif 2024. Significant variations were observed for days to flower, days to mature, plant height (cm), pods per plant, 100 seed weight and the performance of seed yield at different locations. Among the genotypes, BMXK1-16006-8 flowered and matured earlier than the other genotypes. The highest plant height was recorded in BMXK1-16010-1 followed by BMXK1-16010-3 and BARI Mung-7 in all locations. The genotypes BARI Mung-7 exhibited the highest number of pods per plant among the tested genotypes. In the current study, as depicted by the mean grain yield of 5 genotypes ranged 861 kg/ha (BARI Mung-8) to 1192 kg/ha (BMXK1-16010-1). As revealed by AMMI and GGE bi plots and average seed yield across locations, the genotype BMXK1-16010-1 and BMXK1-16006-8 identified as most adapted line and stable performer with negligible G × E interaction and high yield could be used directly as variety.

Evaluation of bold seeded mungbean (*Vigna radiata* l. wilczek) germplasm for export quality

M. G Azam, AKMM. Alam and M. S. Uddin

The experiment was carried out to evaluate the performance of three mungbean genotypes along

with check BARI Mung-6 at Pulses Research Centre, Ishurdi, Pabna (Isd), during Kharif 2024 to select high yielding bold seeded mungbean. Significant variations were observed for days to flower, days to mature, plant height (cm), pods per plant, 100 seed weight and the performance of seed yield at different locations. The descriptive analysis of yield and its attributing traits had pointed out some important characters like PH, HSW, PL, SL, SB and YPH as the important characters to identify and classify the diversity from the germplasm. According to the finding of the research the identified diverse genotypes from the clusters like MB-04, BMB2023001, BMB2023002, BMB2018001, BMB2023003, VI000470 AG, AVMU-1696, China, VI001339 AG, BARI Mung-6, BMB2018002, Thailand and Nanjin were superior in seed related traits with yield. Therefore, the information of this result will be very useful with these characters for future mungbean breeding program.

Interspecific hybridization involving *Vigna radiata* with *vigna mungo*

AKMM. Alam, M. G. Azam, and M. J. Alam

Hybridization program between *Vigna radiata* with *Vigna mungo* was conducted during Kharif-I, 2024 at PRC, Ishwardi, Pabna for creating the genetic variability among the existing germplasm for desired gene pool. Four parents were used having desired genetic combinations and hybridization was going on to seven cross combinations. A total of 52 successful crossed seeds were harvested from five cross combinations and preserved these seed for confirmation of F₁S in the next season.

Identification and quantification of volatiles compounds through bio-chemicals analysis in aromatic mungbean

M. G. Azam, AKMM. Alam, AKM Khorsheduzzaman, M. H. Bari, M. S. Uddin, and M. M. Uddin

Mungbean having high food value and easily digestible proteins is one of the socioeconomically important crop of Bangladesh. Among the varied cultivars, aromatic mungbean is having aroma and hence popularly cultivated in the pockets of Ganga river basin at Chapainawbganj, Thakurgaon and Chuadanga districts. In the present study, aroma volatiles with special reference to 2-acetyl-1-pyrroline (2AP) were analyzed using HS-SPME-

GCMS from aromatic mungbean and compared with non-scented mungbean (BARI Mung-6). The highest concentration of 2AP was found in dried seeds 0.38 ppm in E8 followed by E33, E55, E4, E32, E25, E27, E8, E31, E22 and the lowest found in E50 (0.07ppm).

Mungbean international screening nursery (AVRDC)-thrips

AKMM. Alam, M. G Azam and M. S. Uddin

Mungbean is an important pulse crop and gaining popularity in the farming community of Bangladesh. It is a short duration grain legume widely grown in south and Southeast Asia. The experiment was laid out in a randomized block design with three replications during kharif 2024 at the experimental field of Pulses Research Centre, BARI, Ishwardi, Pabna under rainfed condition. Nineteen genotypes of mungbean originating from World Vegetable Centre (WVC) India, along with check variety BARI Mung-6 from Bangladesh were studied in this experiment. Screening was done on the basis of incidence of insect pests from first incidence up to harvest and to search for the most resistant varieties against thrips. Among the 19 mungbean genotypes, variations were observed in damage caused by thrips on flower bud and flower infestations and shedding of flower buds and flowers. The lowest flower bud and flower infestation (23.15 and 2.90 %, respectively) and shedding (15.13 and 12.24%, respectively) were found in AVMU-21010 genotype, which were followed by AVMU-21022, AVMU-21015, and AVMU-21002. Contrarily, the highest flower bud and flower infestation (52.66 and 28.60%, respectively) and shedding (54.03 and 39.18%, respectively) were recorded in AVMU-21014 genotype, which were followed by AVMU-21021 and AVMU-21017. Resistance genotypes will be used next year trail.

Mungbean international screening nursery (AVRDC)-heat tolerance

AKMM. Alam, M. G Azam and M. S. Uddin

According to collaborative programs between BARI and WVC (World Vegetable Centre, India), Mungbean International Screening Nursery (Heat Tolerance) 2024, was conducted at PRC, Ishurdi, Pabna. The entry AVMU-21228 and AVMU-21202 flowered earlier. Entries AVMU-21245, AVMU-21249, AVMU-21206, AVMU-21209, AVMU-

21215 also matured earlier. The highest plant height was observed in AVMU-21215 (58.40cm) and lowest found in AVMU-21203 (38.73cm). Highest pods per plant (22) were found in AVMU-21245 and lowest (17) in AVMU-21204. Highest 100 seed weight (4.75g) was found from AVMU-21202 and lowest (3.81g) in AVMU-21206. Four entries out yielded the check variety BARI Mungbean-6. Those entries were AVMU-21210, AVMU-21241, AVMU-21215 and AVMU-21204. Finally, four entries like AVMU-21210, AVMU-21241, AVMU-21215 and AVMU-21204 were selected on the basis of yield, plant vigor, plant type, seed size and other desirable characters for further evaluation in breeding trials.

Mungbean international screening nursery (AVRDC)

AKMM. Alam, M. G Azam and M. S. Uddin

The experiment was conducted at Pulses Research Centre, Ishurdi during Kharif-I, 2024 to find out stable lines of mungbean. The entries AVMU-2001, AVMU-1609, AVMU-1686, AVMU-2018, AVMU-1611 and AVMU-2019 flowered earlier. Entries AVMU-2009, AVMU-1609, AVMU-1686, AVMU-1611, AVMU-1678, AVMU-1682, AVMU-1683, AVMU-1624, AVMU-1685, AVMU-1655, AVMU-1677, AVMU-2012, AVMU-2023, AVMU-1679, AVMU-1604, AVMU-1705 also matured earlier. The highest plant height was observed in AVMU-1619 followed AVMU-1627, AVMU-1612, AVMU-1635 and AVMU-1605 and lowest found in AVMU-2025 followed by AVMU-1608, AVMU-1685, AVMU-1686, AVMU-1681. Highest pods per plant (20) were found in AVMU-1627 and lowest (9) in AVMU-1602, BARI Mung-7, AVMU-2020, AVMU-1681 and AVMU-1608. Highest 100 seed weight (6.385 g) was found from AVMU-2013 and lowest (2.675) in AVMU-1660. The highest yield per plant was obtained from AVMU-1622, AVMU-2001, AVMU-1682, AVMU-1628, AVMU-1632, AVMU-1651, AVMU-1684, AVMU-1660, AVMU-1604, AVMU-1603, and AVMU-1649 over check BARI Mung-6. Finally, eleven genotypes like AVMU-1622, AVMU-2001, AVMU-1682, AVMU-1628, AVMU-1632, AVMU-1651, AVMU-1684, AVMU-1660, AVMU-1604, AVMU-1603, and AVMU-1649 were selected on the basis of yield, plant vigor, plant type, seed size and other desirable

characters for further evaluation in breeding trials. The selected genotypes will be used for the next year at preliminary yield trail.

Crop and soil management

Effect of *rhizobium* inoculant on nitrogen compensation and yield of mungbean

M.S. Alam, M.M. Kamal and M.S.Uddin

A field experiment was conducted at PRC, BARI, Ishurdi, Pabna during 2023 to evaluate the nitrogen compensation potentiality of *Rhizobium* inoculant through nodulation and yield of mungbean. The experiment was laid out in a Randomized Complete Block Design with three replications and assigned 7 different treatments. The treatments were as follows, T₁= Native fertility, T₂=Recommend dose of fertilizer (N₂₀P₁₈K₂₀S₁₀B_{1.7} kg ha⁻¹), T₃= *Rhizobium* inoculant, T₄= *Rhizobium*+75% RDN (Recommended dose of nitrogen), T₅= *Rhizobium*+50% RDN, T₆= *Rhizobium*+25% RDN, and T₇= *Rhizobium*+ 0% RDN and other fertilizer used as blanket dose. *Rhizobium* inoculant was significantly effect on nodule number, root dry weight, branch plant⁻¹, pod plant⁻¹, thousand seed weight, seed yield and stover yield. The results revealed that *Rhizobium* + 75% recommended dose of nitrogen (T₄) showed significant effect on nodulation and yield of mungbean. The higher seed yield (0.95 t ha⁻¹) was found in (T₄) and the lower seed yield (0.56 t ha⁻¹) was obtained from the native fertility (T₁). The maximum nodule number plant⁻¹ before and after flowering (57 and 82, respectively) was recorded from T₄ while the minimum nodule number plant⁻¹ before and after flowering (11 and 15, respectively) was in native fertility. Yield increased over control was 25-41%. The higher additional income (Tk. 31200 ha⁻¹) and MBCR (5.31) were found in *Rhizobium* + 75% recommended dose of nitrogen and to reduce the use of 25% N fertilizers.

Development of weed management strategy for summer mungbean

J. Hossain, M. M. Rashid, M.S. Alam, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Centre, Madaripur during 2023-24 to find out the suitable weed management strategy for mungbean. Eight treatments were viz. T₁: Panida-33EC (Pendimethaline @ 5ml L⁻¹ water), T₂: Panida-33EC with one hand weeding at 30

DAE (Days after Emergence), T₃: Weednil (Quizalofop-p-ethyle @ 1.5 ml L⁻¹ water), T₄: Panida-33EC + Weednil, T₅: one hand weeding at 20 DAE, T₆: Two hand weeding at 20 DAE and 40 DAE, T₇: Control (No Weeding). Weed control efficiency in Panida with one hand weeding was as similar as 2 HW and Panida+weednil. The highest seed yield was recorded from two hand weeding (787 kg ha⁻¹) followed by Panida with one hand weeding (767 kg ha⁻¹), but the gross margin was the highest in Panida with one hand weeding (Tk. 19673 ha⁻¹). Therefore, Panida-33EC with one hand weeding at 30 DAE was better weed management strategy to control weed in mungbean.

Determination of optimum dose of panida for weed control in mungbean

J. Hossain, M. M. Rashid, M.S. Alam, S. Ahmed and M. S. Uddin

The experiment was conducted at the Regional Pulses Research Centre, Madaripur during 2023-2024 to find out the appropriate dose of Panida for weed control in mung bean. Six treatments viz., T₁: 3 ml Panida-33EC L⁻¹ of water, T₂: 5 ml Panida-33EC L⁻¹ of water, T₃: 7 ml Panida-33EC L⁻¹ of water, T₄: 9 ml Panida-33EC L⁻¹ of water, T₅: Control (No weedicide) were included in this experiment. This was laid out in Randomized Complete Block Design with three replications. Mutha, durba and shama weeds were more controlled in higher dose than no weedicide. The highest seed yield was recorded from 7 ml Panida (669 kg ha⁻¹) followed by 9 ml Panida (658 kg ha⁻¹) and the lowest seed yield (322 kg ha⁻¹) in weedy plot. The gross margin was the highest in 5 ml Panida (Tk. 28755 ha⁻¹). Therefore, 7 ml Panida was better dose to control weeds in mugbean based on weed control, yield and gross margin.

Effect of sowing time on yield of mungbean at Madaripur

S. Mahmud, J. Hossain, M.M. Rashid S. Ahmed and M. S. Uddin

A field experiment was conducted at RPRS, BARI, Madaripur during Kharif-I season of 2023-24 to evaluate the performance of mungbean var. BARI Mung-6 in six different sowing date viz. T₁: 30th January, 2024, T₂: 10th February, 2024, T₃: 20th February, 2024, T₄: 2nd March, 2024, T₅: 12th March, 2024, T₆: 22nd March, 2024. Highest yield was obtained from 12th March, 2024 (608.33kg/ha) and lowest from 30th January (440 kg/ha). The

result therefore suggested that 12th March is the optimum sowing time for mungbean cultivation at Madaripur.

Response of rhizobium and trichoderma on yield of mungbean at Madaripur

S. Mahmud, J. Hossain, M.M. Rashid S. Ahmed, M. E. Ali and M. S. Uddin

A field experiment was conducted at RPRS, BARI, Madaripur during Kharif-I season of 2023-24 to evaluate the performance of mungbean var. BARI Mung-8 treated with Rhizobium and Trichoderma. Six treatments viz. Lycomax (Trichoderma) @ 3g/litre, Bioderma (Trichoderma) @ 75kg/ha, Rhizobium, Rhizobium + Lycomax @ 3g/litre, Rhizobium + Bioderma @ 75kg/ha and control were tested in this experiment. The highest yield was obtained from combined application of rhizobium and bioderma (550kg/ha) and the lowest from control (365kg/ha). The result therefore suggested that combined application of Bioderma and Rhizobium can increase the growth of mungbean which plays an important role in organic agriculture.

Crop and soil management

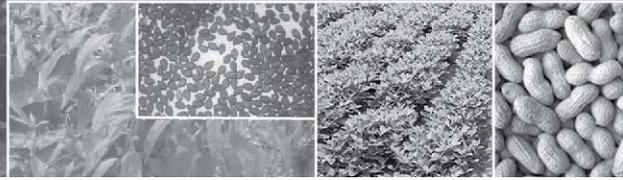
Profitability analysis of pulse based cropping patterns against rice based cropping systems in Madaripur

M.M. Rashid, J. Hossain, S. Mahmud, S. Ahmed and M. S. Uddin

A field experiment was conducted at Regional Pulses Research Station, BARI, Madaripur during rabi season 2022-23 to find out the suitable pulse based cropping pattern in Madaripur. The experiment was conducted in a RCB design with three replications. There were six cropping patterns were applied. The highest rice equivalent yield (REY) was obtained from the cropping pattern CP₄ (45) and the lowest rice equivalent yield was obtained from the cropping pattern CP₆ (17). Based on the above results it can be suggested that, T. Aman (cv. BRRIdhan-75) - Potato (cv. BARI Alu-75) – Mungbean (BARI Mung-8) – Jute (Bongobir) may be a suitable cropping pattern for the farmers of Madaripur region for gaining more profit compared to other studied cropping patterns. Farmers in this region prefer to cultivate jute as fibre, in that case CP₁ [Mustard –Mungbean – Jute (Fibre) -T.aman] could be another profitable cropping pattern due to higher gross margin than CP₂, CP₃, CP₅ and CP₆.

OILSEED CROPS

03



Oilseed Research Centre (ORC) is one of the important Centre of Bangladesh Agricultural Research Institute. It has been conducting research work on nine oilseed crops like rapeseed-mustard, groundnut, sesame, soybean, sunflower, linseed, niger, safflower and perilla of which the first five are considered as major. ORC of BARI has given major thrust to develop high yielding oilseed varieties with special emphasis on short duration to fit in rice based cropping system, dwarf type, waterlogged tolerant, diseases and insects resistant. Also maintenance of germplasm, development of inbred lines, creation of variations and recombination through hybridization and mutation and selection of climate resilient varieties are given more importance in research. ORC has already developed 52 varieties of different oilseed crops having was yielding, short duration, dwarf type and stress tolerance and their production technologies. The research achievements during 2023-2024 on varietal improvement, Crop and soil management, disease and insect management, and technology transfer have been given below:

Crops Improvement

A. Rapeseed-Mustard (*Brassica* spp.)

Rapeseed- mustard is a major oilseed crop in Bangladesh. It contributes a lion share to the total edible oil production in the country. The Oilseed Research Centre of BARI has already developed 21 rapeseed and mustard varieties, which comprises 10 *Brassica rapa*, 7 *B. juncea*, and 4 *B. napus*. Most of the developed varieties take long duration to mature except a few. As a result, they do not fit well in the existing T.aman – mustard - Boro rice cropping pattern. There is a limited scope of horizontal expansion of cultivation of rapeseed-mustard. So, for increasing rapeseed-mustard production, seed

yield must be increased per unit area. Hybrid variety can play an important role in this regard. Now quality of mustard oil has been considered in variety development. Short duration double low varieties have to be developed. Therefore, high yielding and short duration rapeseed and mustard varieties should be developed to fit into the existing cropping pattern. The existing varieties are also susceptible to *Alternaria* leaf blight and white mold diseases, and aphids. Thus, to develop varieties with high yield potential, early maturity, disease and insect resistance, and wider adaptability, the following experiments were conducted.

Sub-Project I: Collection, evaluation and maintenance of oilseed crops germplasm

Collection of rapeseed mustard germplasm

M. S. Uddin, D. R. Datta and M.N. Islam

During the 2023-24 season, three germplasm samples of *Brassica juncea* were collected-two from Vellore, India, and one from Sylhet, Bangladesh. The seeds, characterized by their brown color, varied in size with the Indian samples being bold and small, while the Bangladeshi sample was small-seeded. These collected germplasms will be regenerated for further characterization and preliminary evaluation in the upcoming season.

Maintenance of rapeseed mustard germplasm

M.Q.I. Matin, D. R. Datta, M. S. Uddin and M. N. Islam

During the rabi 2022-23 season, a total of 146 accessions were grown to maintain and utilize germplasm of *Brassica rapa* L., *B. juncea* L., and *B. napus* L. This included 82 accessions of *B. rapa* L., 46 of *B. juncea* L., and 18 of *B. napus* L., all planted in a non-replicated trial at Joydebpur on

November 16, 2023. Each plot measured 3 rows by 3 meters, with row spacing of 30 cm and plant spacing of 5 cm after thinning. Fertilizers were applied at rates of 120 kg/ha N, 80 kg/ha P, 60 kg/ha K, 40 kg/ha S, 4 kg/ha Zn, and 1 kg/ha B using Urea, TSP, MOP, Gypsum, Zinc sulfate, and Boric acid, respectively. Half of the urea and all other fertilizers were applied at final land preparation, with the remaining urea applied at flower initiation. Intercultural operations were carried out as needed to ensure optimal crop growth. Seeds from twenty randomly selected plants per accession were collected and stored for future breeding programs. These seeds will be grown and further evaluated in the next season to continue preserving and enhancing the germplasm.

Sub-Project II: Development of high yielding short duration variety in *Brassica rapa* L. and *Brassica napus* L.

Hybridization in *brassica rapa* L. (Set-II)

M. S. Uddin, D. R. Datta, M.Q. I. Matin and M.N. Islam

In the rabi 2023-24 season, a hybridization program was carried out at Gazipur to develop new *Brassica rapa* varieties with desirable traits such as short duration, yellow seeds, multilocular pods, disease tolerance, and abiotic stress resistance. The program used ten early-maturing *Brassica rapa* lines (Golden Sapphire, BS-9, BS-12, SS-75, SS72, SBC 4093, SBC 6823, Din-2, SBC 8693 (y)) as female parents and three varieties (BS-14, BS-17) as male parents, employing a Line \times Tester method for crossing. The sowing date was November 22, 2023, with each plot consisting of 2 rows, each 3 meters long, spaced 30 cm apart with a 5 cm distance between plants after thinning. Emasculation and crossing were performed in the morning. A total of 4,767 seeds were harvested from the cross combinations and have been preserved for confirmation trials in the next season. Data on pollinated buds, successful buds, and seeds obtained were recorded, with details provided in Table 1. The collected seeds are properly stored for future evaluation.

Hybridization in *brassica rapa*

M.K. Alam, M.I. Riad and M.M. Kadir

In the hybridization program conducted during rabi 2023-24, various cross combinations of *Brassica*

rapa were tested to develop new varieties with improved traits. The program involved ten female lines, including Golden Sapphire, BS-9, BS-12, SS-75, SS-72, SBC 4093, SBC 6823, Din-2, and SBC 8693 (y), crossed with three male varieties: BS-14, BS-17, and BS-14. The crosses were carried out using the Line \times Tester method, with sowing starting on November 22, 2023. Each plot consisted of two rows, 3 meters long, with row spacing of 30 cm and plant spacing of 5 cm after thinning. A total of 4767 seeds were harvested from these cross combinations. Data on pollinated buds, successful buds, maturity duration, and seed yield for each cross combination are detailed in Table 1. For instance, the cross BC-21028 \times BARI Sarisha-20 produced 79 seeds from 24 successful buds, with a maturity duration of 74 days. The collected seeds are stored for evaluation in the upcoming season, and detailed records on cross combinations and pollination outcomes have been maintained for further analysis.

Evaluation of F₁ generation of *brassica rapa*

M K Alam, M I Riad and M M Kadir

During the rabi 2023-24 season, seeds from 21 cross combinations of *Brassica rapa* were harvested and bulked for growing the F₂ generation. The F₁ seeds from these crosses were sown on November 14, 2023, with each entry planted in single-row plots measuring 2 meters in length, spaced 40 cm apart with 10 cm between plants. Five competitive plants were randomly selected from each F₁ plot and their parents for data collection. The harvested F₁ progenies were bulked and preserved for future F₂ generation trials. Table 03 outlines the performance of these F₁ hybrids, including days to maturity, plant height, number of siliquae, and seeds per siliqua. For example, the cross BC-0837-2 (Y) \times BC-15015 (Y) resulted in plants with a maturity period of 79 days, a height of 114.2 cm, 170.2 siliquae, and 30 seeds per siliqua. Similarly, the parent plants' data are provided, showing various traits such as maturity duration, plant height, and seeds per siliqua. This data will be used to evaluate and select the best performing hybrids for the F₂ generation.

Evaluation of segregating generations of *brassica rapa*

M.S. Uddin, D.R. Datta and M.N. Islam

During the 2023-24 season at Gazipur, segregating generations of *Brassica rapa* were evaluated to

develop homogeneous lines. The F1 to F4 seeds were sown using the cross-to-row method, with families from the F5 and F6 generations sown using the family-to-row method, alongside BARI Sarisha-14 as a check. The sowing took place on November 16, 2023, in 4-row plots each 3 meters long, with a spacing of 30 cm between rows and 5 cm between plants. Seedlings were thinned to 5 cm apart shortly after germination. Fertilization followed a regimen of 120:80:60:40:4:1 kg/ha of N:P:K:S and Boron from Urea, TSP, MOP, Gypsum, Zinc Sulphate, and Boric acid, respectively. Half of the urea and all other fertilizers were applied at final land preparation, with the remainder of the urea applied at the flowering stage. Intercultural operations were carried out as needed. Selection focused on short-duration plants (maturing in up to 85 days), erect and compact types with desirable agronomic traits, and tolerance to disease and insects. From the F1 to F4 generations, desirable plants were selected based on earliness, seed yield, and yield attributes, with 27, 16, 14, and 13 plants selected from the F2, F3, F4, and F5 generations, respectively. For the F6 generation, 5 progenies were chosen for seed yield evaluation in the observational trial for the following year. Table 1 summarizes the crosses, progenies, and selections made across the F1 to F6 generations.

Selection in segregating generation (F₂-F₆) of *Brassica* Spp.

M K Alam, M I Riad and M M Kadir

Segregation in genetics, also known as Mendel's first law or the Principle of Segregation, describes the separation of genes and their alleles during meiosis, leading to distinct genetic combinations in daughter cells. This principle also applies to populations exhibiting phenotypic variation, where the objective is to select desirable traits based on phenotypic performance, maturity, disease resistance, and physical grain quality for advancing generations. Seeds from the F2 to F6 generations of *Brassica* species were sown between November 14 and 16, 2023, with space planting in 3-meter-long plots and a 30 cm row spacing. Recommended fertilizers were applied, and uniform crop growth was ensured. The number of families planted, families selected, and single plants selected for *Brassica rapa*, *Brassica napus*, and *Canola* germplasm.

Observation trial of *brassica rapa* l. (Set-I)

M.S. Uddin, D.R. Datta, M.Q.I. Matin and M.N. Islam

Nineteen advanced lines of *Brassica rapa* L. having yellow flower and yellow seed coat colour along with BARI Sarisha-20 as check were evaluated with two replications. Maturity duration ranged from 82 to 90 days. Four lines were matured within 84 days. The highest (71) number of siliquae per plant recorded in BS-14x-BS-15-1 and highest (38) number of seeds per siliqua recorded in BC-2014-Y02-1-2. The seed yield ranged from 1311 to 2907 kg/ha. Considering earliness, seed yield and other yield contributing characters, two lines BC2014-y011 and BC2014-y01 were selected for the next trial and other variety development activities.

Nineteen lines of *Brassica rapa* having yellow flower and yellow seed coat colour were selected last year from F7 generation of different cross combinations. These lines along with one check as BARI Sarisha-20 were evaluated with two replications under observation trial of *Brassica rapa* (Set-I) at Gazipur during 2023-24. The lines were sown on 14 November 2023 in 3 rows of 3m long with spacing of 30 cm and 5cm between rows and plants, respectively. The seedlings were thinned after a few days of germination 5 cm apart. Fertilizers were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn and Boron from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively (FRG, 2018). Half of the urea and all other fertilizers were applied during final land preparation. The rest of the urea was applied at flower initiation stage. All intercultural operations were done timely to raise a good crop. Data were taken on days to 50% flowering (DFF), days to maturity (DM), plant height (cm), no. of siliquae per plant, no. of seeds per siliqua, 1000-seed weight (g) and seed yield per plot. The plot yield was converted into kg per hectare to measure the yield of the line. The mean performance of twelve lines along with check as BARI Sarisha-20 are presented in Table 1. Variations were observed among the lines and significant variations recorded all the parameters except days to flowering and number of branches per plant. Maturity duration ranged from 82 to 90 days in case for the tested lines. Plant height ranged from 69.5 to 107 cm. Number of siliquae per plant ranged from 23 to 54. The highest (48) number of siliquae per plant recorded in BS-

14xSAU-1-4. The number of seeds per siliqua ranged from 11 to 30. The highest (28) number of seeds per siliqua was recorded in BC-2014-Y02-1. The 1000 seeds weight ranged from 3.0 to 4.6g. The highest (4.14g) 1000 seeds weight were found from line BS-15xSAU-1-2. The seed yield of advanced line BC-221309-3 (BS-13xBS-9xBS-14) significantly differ from the other lines including check BARI Sarisha-20. The seed yield ranged from 716 to 1360 kg ha⁻¹. The highest (1310 kg ha⁻¹) seed yield recorded in BC-221309-3 (BS-13xBS-9xBS-14) which was identical with advanced line BC-2014-Y014 and BC-221705-10 (BS17xRai-5). Considering earliness, seed yield and other yield contributing characters, four lines BS-6xSAU-1-2, BC-221705-10 (BS17xRai-5), BC-2014-Y014 and BC221309-3 (BS-13xBS-9xBS-14) were selected for the next trial.

Observation trial of *brassica rapa* l. (Set-II)

M.S. Uddin, D.R. Datta, M.Q.I. Matin and M.N. Islam

Eleven advanced lines of *Brassica rapa* with brown seed coats, alongside the check variety BARI Sarisha-9, were evaluated in an observation trial at Gazipur with two replications. The days to 50% flowering and maturity duration ranged from 32 to 37 days and 78 to 85 days, respectively. Notably, BS-14XSAU-1-4 exhibited the highest number of siliquae per plant (101), while seed yields varied between 1093 and 2456 kg/ha. Based on earliness, seed yield, and other yield-related traits, lines BS-14XBS15-10 and BS-6XBS-14-6 were selected for the next trial. Additionally, thirteen advanced lines of *Brassica rapa* with yellow flowers and brown seed coats, selected from the F7 generation, were evaluated alongside BARI Sarisha-9 in the same trial. Sown on November 14, 2023, the plots were managed with standard fertilization and intercultural practices. Data on various agronomic traits showed significant variation, with maturity duration ranging from 78 to 85 days and plant height from 95.3 to 126.2 cm, with BS-14XBS-15-10 being the tallest. The number of siliquae per plant ranged from 40.8 to 119, with BS-15 X SAU-1-1 recording the highest at 115. Seed counts per siliqua varied from 14 to 39, and the 1000-seed weight ranged from 3.16 to 3.92 g. The highest seed yield was recorded in BS-14XBS15-10 and BS-6XBS-14-6, reaching 2080 kg/ha. These lines, alongside BS-14 X SAU-1-1, BS-15 X SAU-1-1,

and BS-14XBS-15-6, were chosen for further trials based on their overall performance.

Observation yield trial of *brassica rapa* l (set-iii) (yellow seed)

M K Alam, M I Riad and M M Kadir

An observational yield trial of *Brassica rapa*, conducted at the Regional Agricultural Research Station in Jamalpur during the Rabi season of 2023-2024, evaluated 16 yellow-seeded genotypes for yield and yield-contributing traits. The genotype BC-22007 achieved the highest yield of 1772 kg/ha, outperforming the check varieties BARI Sarisha-14 and BARI Sarisha-20 by 37% and 30%, respectively. The second highest yield was recorded by BC-22003 at 1736 kg/ha, which was 34% and 27% higher than the checks. BC-22004 followed with a yield of 1733 kg/ha and showed the tallest plant height (122 cm), the highest number of primary branches (8.6), and the most siliquae per plant (140). This genotype matured in 79 days and yielded 33% and 27% more than the check varieties. Other evaluated traits included plant height, primary and secondary branches per plant, siliquae per plant, siliqua length, seeds per siliqua, days to maturity, and plot yield, which was converted to kg/ha. Significant variations were observed in all traits except days to maturity. The genotypes BC-22007, BC-22003, BC-22004, BC-22008, and BC-18004 demonstrated superior performance in both yield and yield-contributing traits and are recommended for selection in the next year's trial. Based on these results, these five genotypes are proposed for preliminary yield trials in the upcoming season due to their short duration and high seed yield.

Observation yield trial of *brassica rapa* l (set-iv) (brown seed)

M K Alam, M I Riad and M Kadir

An observational yield trial of 16 brown-seeded *Brassica rapa* genotypes was conducted at the Regional Agricultural Research Station, Jamalpur, during the Rabi season of 2023-2024. The trial, laid out in a randomized complete block design with two replications, included check varieties BARI Sarisha-9 and Tori-7. Genotypes were evaluated for yield and yield-contributing traits, with the highest yield recorded in BC-18006 at 1849 kg/ha, surpassing BARI Sarisha-9 and Tori-7 by 30% and 15%, respectively. The second highest yield was

from BC-23001 at 1732 kg/ha, yielding 22% and 7% more than the checks. Other top performers included Tori-7 (1613 kg/ha), BC-18019 (1600 kg/ha), BC-22022 (1536 kg/ha), and BC-22025 (1518 kg/ha). These genotypes also demonstrated superior performance in yield-contributing characters. The trial plots were sown on November 8, 2023, with a plot size of 3m x 2m, and utilized a standard fertilization regimen. Data collected included days to maturity, inflorescence length, plant height, number of primary branches, siliqua length, number of siliquae per plant, seeds per siliqua, and yield per plot, which was converted to kg/ha. Significant differences were observed in days to maturity, inflorescence length, number of siliquae per plant, and yield. BC-18006 matured in 74 days, and BC-23001 and Tori-7 matured in 78 days, with BC-18019 taking 77 days. The highest standard error and coefficient of variation were observed in yield and number of siliquae per plant. Based on these results, the genotypes BC-18006, BC-23001, BC-18019, BC-22022, and BC-22025 are recommended for preliminary yield trials next season, considering their high yield and short duration.

Preliminary yield trial of *brassica rapa* l. (Set-I)

D.R. Datta, M.S. Uddin, M.M.H. Khan, M.R. Humauan, M.I. Riad, M.K. Alam, Ms Kobir and Ku Ahammad, S. Ghosh, T.A. Mujahidi, M.M. Kader, and M.N. Islam

An evaluation of ten yellow-seeded *Brassica rapa* lines, including two checks (BARI Sarisha-14 and BARI Sarisha-20), was conducted across six locations—Gazipur, Ishwardi, Barisal, Jashore, Chattogram, and Rangpur—during the Rabi season of 2023-2024 to identify high-yielding genotypes. The experiment, laid out in a randomized complete block design with three replications and plots of 3m x 0.9m, revealed significant variations in most traits except days to maturity, number of branches per plant, and thousand-seed weight. Seed yield ranged from 1289 to 1666 kg/ha across locations, with BC-100614(4)-9 achieving the highest yield of 1666 kg/ha. Other top performers included BC-100614(7)-3, BC-110714(7)-8, BC-100614(8)-7, and BC-2014-Y08. The trials included sowing dates that varied by location, with seeding performed from November 1 to November 23, 2023. Fertilization was standardized at

120:80:60:40:4:1 kg/ha of N:P:K:S and Boron. Data were collected on days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of siliquae per plant, number of seeds per siliqua, 1000-seed weight, and seed yield per plot, which was converted to yield per hectare. Analysis revealed significant differences in days to 50% flowering, plant height, number of siliquae per plant, number of seeds per siliqua, and seed yield. The lines BC-100614(4)-9, BC-100614(7)-3, BC-110714(7)-8, BC-100614(8)-7, and BC-2014-Y08 were selected for the next year's Regional Yield Trial based on their high seed yield and other favorable traits.

Preliminary yield trial of *brassica rapa* l (Set-II) (yellow seed)

M I Riad, M K Alam, M Kadir and M.S. Uddin

A preliminary yield trial of twelve yellow-seeded *Brassica rapa* genotypes was conducted at the Regional Agricultural Research Station (RARS) Jamalpur during the Rabi season of 2023-2024. The trial, set up in a randomized complete block design with three replications and using BARI Sarisha-14 and Tori-7 as checks, assessed yield and yield-contributing traits. Genotype BC-18008 achieved the highest yield of 1578 kg/ha, surpassing BARI Sarisha-14 and Tori-7 by 16% and 51%, respectively. BC-15044 followed with a yield of 1511 kg/ha, 11% and 45% higher than the checks, and BC-18009 produced 1433 kg/ha, 5% and 37% higher than BARI Sarisha-14 and Tori-7. These genotypes also excelled in other yield-contributing traits. Sowing was done on November 10, 2023, with a plot size of 3m x 2m, and data were collected on various parameters including days to maturity, plant height, number of primary branches, siliqua length, number of siliquae per plant, and seeds per siliqua. The plot yields were converted to hectare units for analysis. Significant variations were found in all measured traits, with BC-18008, BC-15044, and BC-18009 showing superior performance. These three genotypes demonstrated potential for cultivation between T. aman and Boro rice, and they are recommended for selection in the next year's regional yield trial. The highest standard deviation and coefficient of variation were noted for yield (136.70) and seeds per siliqua (26.33), indicating variability in these traits.

Regional yield trial of *brassica rapa* l.

D.R. Datta, M.S. Uddin, M.M.H. Khan, M.R. Humauan, M.K. Alam, M.H. Rahman, Ms Kobir and Ku Ahammad, S. Ghosh, T.A. Mujahidi, M.M. Kader, and M.N. Islam

Ten lines of *Brassica rapa* L., including the checks BARI Sarisha-14 and BARI Sarisha-20, were evaluated across six locations to identify high-yielding lines with favorable agronomic traits and wide adaptability. The experiment, conducted during the Rabi season of 2023-24 at Barishal, Chattogram, Gazipur, Ishwardi, Jamalpur, Jashore, and Rangpur, was laid out in a randomized complete block design with three replications. Plot size was 3 m × 1.8 m, with continuous seeding and rows spaced 30 cm apart. Fertilizers were applied following the FRG 2018 guidelines, and standard crop management practices were followed. Data were collected on days to 50% flowering (DFF), days to 80% maturity (DM), plant height (PH), number of branches per plant (NBPP), number of siliquae per plant (NSPP), seeds per siliqua (NSPS), 1000-seed weight (TSW), and seed yield (kg/ha). Statistical analysis revealed significant variation across most traits. Days to 50% flowering ranged from 31 to 33 days, and days to maturity from 82 to 83 days. Plant height varied between 64.5 and 96.33 cm, with branch numbers ranging from 3.33 to 6.73 per plant. The number of siliquae per plant ranged from 47.8 to 73.23, and seeds per siliqua from 25.67 to 32.27. Thousand-seed weight ranged from 3.39 to 5.58 g, and seed yield varied from 1353 to 1822 kg/ha at Gazipur, and 1265 to 1546 kg/ha across all locations. The highest yield at Gazipur was recorded by BC-100614(8)-1, producing 1822 kg/ha. Across all locations, BC-100614(4)-2 and BC-100614(4)-5 stood out, yielding 1546 kg/ha and 1513 kg/ha, respectively. Based on their performance, these two lines were selected for further adaptive trials in the next year.

Hybridization in *brassica napus* (Set-I)

M. K. Alam, M. I. Riad, M. M. Kadir and Ms Uddin

A hybridization program was conducted at RARS, BARI, Jamalpur during 2023-24 to develop new recombinant *Brassica napus* L. lines with early maturity, disease tolerance, abiotic stress resilience, and high yield potential. The 8×8 half-diallel mating design resulted in 28 successful cross combinations, producing a total of 1203 seeds.

These seeds were harvested for future confirmation trials. The cross combinations involved various parental lines, with days to maturity ranging from 84 to 88 days. The number of pollinated buds and successful buds varied across combinations, with the highest seed production observed in crosses such as Nap-20002 × Nap-18010 (86 seeds), Nap-0717-2 × Nap-15029 (72 seeds), and Nap-20009 × Nap-0717-2 (66 seeds). All the harvested seeds have been preserved for further evaluation in the next season's trials.

Evaluation of Segregating Generations of *Brassica Napus*

M.S. Uddin, D.R. Datta and M.N. Islam

The segregating generations of *Brassica napus* L. were evaluated during 2023-24 at Gazipur to develop homogeneous lines. F5 and F6 seeds were sown using the family-to-row method alongside BARI Sarisha-18 as a check. Based on early maturity, seed yield, and yield-contributing traits, six desirable plants were selected from the F5 generation. Similarly, five promising progenies were chosen from the F6 generation for seed yield evaluation in next year's observational trials. The F5 and F6 families were grown in 4-row plots, each 3 meters long, with spacing of 30 cm between rows and 5 cm between plants. Seeding took place on 21 November 2023, and thinning was done after germination to maintain proper plant spacing. Fertilizers were applied at the recommended rates (120:80:60:40:4:1 kg/ha of N:P:K:S and Boron) during final land preparation, with the remaining urea applied at the flower initiation stage. Agronomic practices and intercultural operations were timely executed to ensure proper crop growth. Selection focused on plants with early maturity, erect and compact growth, desirable agronomic traits, and tolerance to diseases and insects. The selected progenies will be further evaluated for yield in the next season.

Evaluation of F₁ generation of *brassica napus*

M K Alam, M I Riad and M M Kadir

In a hybridization program conducted during Rabi 2023-24 at Jamalpur, 28 cross combinations of *Brassica napus* were evaluated for their performance. The F1 seeds, produced from crosses made during 2021-22, were sown on 14th November 2023. Each entry was grown in a 2-meter-long single row plot with spacing of 40 cm

between rows and 10 cm between plants. The parents were also included as checks. Five competitive plants were randomly selected from each F1 plot and their parents for data collection. Among the 28 cross combinations, hybrids such as Nap-0717-2 X Nap-15027 (plant height: 114 cm, seeds per siliqua: 38.2), Nap-0733-1 X Nap-16064 (plant height: 103 cm, seeds per siliqua: 34.5), and Nap-15037 X Nap-0876 (plant height: 90 cm, seeds per siliqua: 34.2) showed promising performance. Based on the results, all 28 hybrids were selected and their F1 progenies were harvested, bulked, and preserved for growing the F2 population in the next generation. The parents' performance was also recorded, with notable results including Nap-0717-2 (plant height: 106 cm, seeds per siliqua: 28.2) and Nap-15029 (plant height: 100 cm, seeds per siliqua: 29.8). These selections will be further evaluated in the F2 generation to continue the breeding process.

Observation yield trial of *brassica napus*

M K Alam, M I Riad and M Mkadir

An observational yield trial of *Brassica napus* was conducted during Rabi 2023-24 at RARS, Jamalpur, involving 30 genotypes, including the check varieties BARI Sarisha-8 and BARI Sarisha-13. The trial aimed to evaluate yield and yield-contributing characteristics. Genotype Nap-22021 recorded the highest yield of 1979 kg/ha, outperforming the check varieties by 21%. Nap-22016 produced the second-highest yield at 1971 kg/ha, with 20% and 21% higher yields than BARI Sarisha-8 and BARI Sarisha-13, respectively. Nap-22019 followed with a yield of 1897 kg/ha, which was 16% higher than both check varieties. Other notable genotypes were Nap-22037 and Nap-22026, yielding 1853 kg/ha and 1845 kg/ha, respectively. These genotypes matured within 80-82 days, making them suitable for cultivation between T. Aman and Boro rice. The experiment was conducted using an RCBD design with two replications. Each plot measured 3.0m x 2.0m, and seeds were sown on 13th November 2023. Fertilizers were applied according to recommended doses, and urea was split between land preparation and the flowering stage. Data were collected on various traits, including days to flowering, days to maturity, plant height, inflorescence length, siliqua per plant, and seed yield. Significant differences were observed for most traits except primary branches per plant and siliqua per plant. Based on

the results, Nap-22021, Nap-22016, Nap-22019, Nap-22037, and Nap-22026 showed superior performance in terms of yield, early maturity, and other agronomic traits. These genotypes, which matured within 82 days and produced yields close to 2000 kg/ha, are promising candidates for further evaluation in preliminary yield trials next season. The highest standard error and coefficient of variation were observed for yield and the number of primary siliqua per plant. These findings suggest that these genotypes could significantly enhance productivity in *Brassica napus* cultivation.

Preliminary yield trial of *brassica napus*

M I Riad, M K Alam and M Kadir

A preliminary yield trial of *Brassica napus* was conducted with 14 genotypes at RARS Jamalpur during the Rabi season of 2023-24 to assess yield and yield-contributing traits. The highest yield was produced by genotype NAP-44021 (2161 kg/ha), followed by NAP-33021 (2083 kg/ha), NAP-37021 (1994 kg/ha), NAP-20021 (1894 kg/ha), NAP-49021 (1861 kg/ha), and NAP-47021 (1811 kg/ha). These genotypes yielded between 11% and 39% more than the check varieties BARI Sarisha-8 and BINA Sarisha-9. Based on their performance, these six genotypes are promising candidates for further trials. The experiment was laid out in an RCBD design with three replications, using 14 promising genotypes of *Brassica napus* and two checks. Plots measured 3.0 m x 2.0 m, and seeds were sown on 11 November 2023, with 30 cm spacing between rows. After 11 days of germination, seedlings were thinned to 5 cm apart. Fertilizers were applied at 120:80:60:40:4:1 kg/ha of N: P: K: S: Zn: and Boron. Data were collected on days to maturity, plant height, primary branches per plant, siliqua length, number of siliquae per plant, seeds per siliqua, and yield per hectare. All genotypes showed significant differences in yield and yield-contributing traits. NAP-44021, the top performer, yielded 2161 kg/ha, surpassing the check varieties by 32% and 39%, and matured in 81 days. NAP-33021, yielding 2083 kg/ha, took 82 days to mature, producing 28% and 34% more than the checks. NAP-37021, NAP-20021, NAP-49021, and NAP-47021 also demonstrated higher yields, ranging from 1811 to 1994 kg/ha, with maturity periods of 80-82 days, outperforming the checks by 11%-28%. These six genotypes showed superior performance in most yield-contributing traits and

can be considered suitable for cultivation between T. Aman and Boro rice. Based on the results, NAP-44021, NAP-33021, NAP-37021, NAP-20021, NAP-49021, and NAP-47021 are recommended for regional yield trials, given their short duration and high seed yield potential. The highest standard deviation (179.74) and coefficient of variation (22.67%) were observed for yield and primary branches per plant.

Adaptive yield trial of *brassica napus*

M K Alam, M I Riad and M Mkadir

An adaptive yield trial of *Brassica napus* L. was conducted with eight advanced lines at a farmer's field in Jamalpur during the Rabi season of 2023-2024 to evaluate yield and yield-contributing traits. The tested materials showed promising yield performance in the location. Among the genotypes, Nap-49021 produced the highest seed yield of 2038 kg/ha, outperforming the check varieties BARI Sarisha-8 by 8% and BINA Sarisha-9 by 16%. Nap-32021 followed closely with a yield of 2028 kg/ha, showing an 8% and 15% increase over the same checks, respectively. Nap-0733-1 produced the third-highest yield (1910 kg/ha), exceeding BARI Sarisha-8 by 2% and BINA Sarisha-9 by 8%. All three genotypes matured within 80-81 days. The experiment was conducted at Melanda Upazila, Jamalpur District, using a randomized complete block design with three replications. BARI Sarisha-8 and BINA Sarisha-9 were used as check varieties. Seeds were sown on November 9, 2023, in 30 cm rows, and seedlings were thinned to 5 cm apart after germination. Fertilizers were applied at a rate of 120:80:60:40:4:1 kg/ha (N:P:K:S:Zn), with half of the urea and all other fertilizers incorporated during final land preparation and the remainder of the urea applied at the flowering stage. Data were collected on days to flowering, maturity, plant height, branches, siliqua/plant, siliqua length, seeds/siliqua, and yield per hectare. Significant differences were observed for most traits, including days to flowering, maturity, plant height, branches per plant, siliqua/plant, and yield. Nap-49021 yielded the highest at 2038 kg/ha and matured in 81 days, showing superior performance in primary branches and a moderate number of secondary branches and siliquae per plant. Nap-32021 followed with a yield of 2028 kg/ha and also matured in 81 days, demonstrating moderate plant height and inflorescence length. Nap-0733-1, with

a yield of 1910 kg/ha, matured in 87 days and showed good performance across the yield-contributing traits. These three genotypes, which matured within 82 days, are suitable for cultivation between T. Aman and Boro rice, producing higher yields than the check varieties. Considering their early maturity, plant height, siliqua per plant, and seed per siliqua, Nap-49021, Nap-32021, and Nap-0733-1 are recommended for further evaluation in farmers' fields next season. The highest standard error (99.933) and coefficient of variation (14.13%) were observed for yield and the number of primary siliquae per plant. These genotypes hold promise for improved yield performance in future trials.

Sub-Project III: Development of high yielding variety in *Brassica juncea* L. and *Brassica carinata* L.

Observation yield trial of *brassica juncea*

M K Alam, M I Riad and M Kadir

An observation yield trial of *Brassica juncea* L. was conducted with sixteen genotypes at RARS Jamalpur during the Rabi season of 2023-2024 to evaluate yield and yield-contributing traits. Among the genotypes, OTBJ-01 produced the highest seed yield of 1633 kg/ha, followed closely by OTBJ-07 (1628 kg/ha), OTBJ-03 (1622 kg/ha), and OTBJ-11 (1575 kg/ha). These four genotypes outperformed the check varieties BARI Sarisha-11 and BARI Sarisha-19, yielding 12% and 7%; 11% and 5%; 10% and 5%; and 7% and 2% higher yields, respectively. Considering their superior performance, these genotypes—OTBJ-01, OTBJ-07, OTBJ-03, and OTBJ-11—are potential candidates for further trials. The trial was conducted at the Regional Agricultural Research Station in Jamalpur using a randomized complete block design (RCBD) with three replications. BARI Sarisha-11 and BARI Sarisha-19 were used as check varieties. Seeds were sown on November 9, 2023, in rows 30 cm apart, and seedlings were thinned to a spacing of 5 cm. Fertilizers were applied at a rate of 120:80:60:40:4:1 kg/ha (N:P:K:S:Zn), with half of the urea and all other fertilizers incorporated during final land preparation and the remaining urea applied at flowering. All intercultural operations were conducted uniformly. Data were collected on traits such as days to flowering, maturity, inflorescence

length, plant height, branches per plant, siliquae per plant, siliqua length, seeds per siliqua, and yield per hectare. The data were statistically analyzed. Significant differences were observed for all traits except days to maturity and plant height. Genotype OTBJ-01 produced the highest yield (1633 kg/ha), 12% and 7% higher than BARI Sarisha-11 and BARI Sarisha-19, respectively. It also exhibited the longest inflorescence, the longest siliqua length, and moderate values for primary branches, siliquae per plant, and seeds per siliqua. OTBJ-01 matured in 115 days. OTBJ-07 followed with a yield of 1628 kg/ha, maturing in 119 days, and producing 11% and 5% higher yields than the check varieties. OTBJ-03 yielded 1622 kg/ha, with 10% and 5% higher yields than BARI Sarisha-11 and BARI Sarisha-19, maturing in 114 days. This genotype showed the longest siliqua length and a moderate number of siliquae per plant. OTBJ-11 produced a yield of 1575 kg/ha and matured in 118 days, surpassing the check varieties by 7% and 2%. Overall, the four genotypes—OTBJ-01, OTBJ-07, OTBJ-03, and OTBJ-11—showed strong performance in most yield-contributing traits. The highest standard error (144.52) and coefficient of variation (35.41%) were observed for yield and the number of secondary branches per plant, respectively. Based on these results, the genotypes OTBJ-01, OTBJ-07, OTBJ-03, and OTBJ-11 can be selected for further yield trials, focusing on seed yield and related traits.

Preliminary yield trial of *brassica juncea*

M K Alam, M I Riad and M Kadir

A regional yield trial of *Brassica juncea* L. was conducted at RARS Jamalpur during the 2023-2024 Rabi season to evaluate the yield and yield-contributing traits of 16 genotypes. The genotype OTBJ-09 produced the highest yield, achieving 2267 kg/ha, which was 46% and 33% higher than the check varieties BARI Sarisha-11 and BARI Sarisha-19, respectively. OTBJ-10 followed with a yield of 1959 kg/ha, outperforming the check varieties by 26% and 15%. The third highest yield, 1943 kg/ha, was recorded for OTBJ-02, which produced 25% and 14% higher yields than the check varieties. Additionally, genotypes OTBJ-13 and OTBJ-03 ranked fourth and fifth in yield performance. These five genotypes showed superior yield and yield-contributing traits, making them candidates for further trials. The experiment

was conducted in a randomized complete block design (RCBD) with three replications. BARI Sarisha-11 and BARI Sarisha-19 were used as check varieties. Seeds were sown on November 9, 2023, in 3.0 m x 2.0 m plots, with rows spaced 30 cm apart. Seedlings were thinned to 5 cm after germination. Fertilizers were applied at 120:80:60:40:4:1 kg/ha (N:P:K:S:Z), with half of the urea and all other fertilizers incorporated during final land preparation, and the remaining urea applied at the flowering stage. Standard intercultural operations were carried out uniformly. Data were collected on days to flowering, maturity, plant height, branches per plant, siliqua per plant, siliqua length, seeds per siliqua, and yield per hectare, and were analyzed statistically. Significant differences were observed among the genotypes for most traits except inflorescence length and seeds per siliqua. OTBJ-09, the top-performing genotype, not only achieved the highest yield but also showed strong performance in plant height, secondary branches per plant, and siliqua per plant. It matured in 113 days. OTBJ-10, which yielded 1959 kg/ha, demonstrated the greatest plant height and favorable values for branches per plant and siliqua per plant, maturing in 112 days. OTBJ-02, which produced 1943 kg/ha, along with OTBJ-13 and OTBJ-03, also exhibited strong yield-related traits. The highest standard error (141.97) and coefficient of variation (35.65%) were observed for yield and the number of secondary branches per plant. Based on these findings, the genotypes OTBJ-09, OTBJ-10, OTBJ-02, OTBJ-13, and OTBJ-03 are recommended for further regional yield trials.

Sub-Project III: Development of high yielding variety in *Brassica juncea* L. and *Brassica carinata* L.

Regional yield trial of *brassica juncea* l.

D.R. Datta, M.S. Uddin, M.R. Humayan, M.M.H. Khan, Ms Kobir and Ku Ahammad, S. Ghosh, T.A. Mujahidi, M.K.Alam, M.M. Kader, and M.N. Islam

An evaluation of eight advanced lines of *Brassica juncea*, including the check variety BARI Sarisha-19, was conducted across six locations to identify high-yielding and stable lines based on yield and related traits. Days to 50% flowering ranged from 40 to 42 days, and days to maturity varied from 100 to 107 days. Plant height spanned from 131.3 to

148.53 cm, while the number of siliquae per plant ranged between 97.4 and 143.6, and seeds per siliqua ranged from 10.47 to 14.43. Seed yield across locations varied from 978 to 1548 kg/ha, with the highest yield recorded from B-11536(12)-6 at Gazipur and BJDH-05 across all locations. Based on seed yield and other contributing traits, three lines—BJ-1111(7)-7, BJDH-20, and BJDH-05—were selected for further adaptive trials. The experiment took place during the 2023-24 Rabi season at Barisal, Chattogram, Gazipur, Ishwardi, Jamalpur, Jashore, and Rangpur. It included seven advanced lines along with the check BARI Sarisha-19, following a randomized complete block design with three replications. Each plot measured 3 m × 1.8 m, and seeding was done in November 2023 across the locations. Seedlings were thinned to maintain a 5 cm plant spacing, and fertilizers were applied at 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn from recommended sources. Half of the urea and all other fertilizers were applied during final land preparation, with the remaining urea added at flower initiation. Standard intercultural operations were conducted to ensure proper crop development. Data were collected on days to 50% flowering, days to maturity, plant height, primary branches per plant, siliquae per plant, seeds per siliqua, 1000-seed weight, and seed yield. Statistical analysis using STAR and R software revealed significant variation in all traits except for days to 50% flowering and plant height. The line BJDH-05 produced the highest seed yield (1878 kg/ha), followed by BJ-1111(7)-7 (1830 kg/ha). Based on performance, BJ-1111(7)-7, BJDH-20, and BJDH-05 were selected for the next year's breeding program due to their promising seed yield and yield-contributing characteristics.

Interspecific hybridization in *b. Napus* l.; *b. Rapa* l. and *b. Carinata*

M.S. Uddin and D.R. Datta

BARI Sarisha -18 was used as female and 6 testers ((BS-14, BS-16, *Carinata*, *Rorippa indica*, White mustard and Black Mustard) were used as male. Crossing was done followed by Line × Tester method. Twenty-four interspecific cross buds were successful, and 47 seeds were found. The collected seeds were properly stored for evaluation in the next season. One variety of Brassica napus (BARI Sarisha -18) which was used as female parent and 6 testers ((BS-14, BS-16, *Carinata*, *Rorippa indica*,

White mustard and Black Mustard) were used as male. The seeds were sown continuous and row to row distance was 30 cm apart from each. The seedlings were thinned after a few days of germination 5 cm apart. Fertilizers were applied @ 120:80:60:40:4:1 kg ha⁻¹ of N:P:K:S:Zn and Boron from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid respectively (FRG, 2018). Half of the urea and all other fertilizers were applied during final land preparation. The rest of the urea was applied at flower initiation stage. All intercultural operations were done timely to raise a good crop. The sowing date was 15 November 2023. Unit plot size was 2 rows 3 m long and row to row distance 30 cm and plant to plant distance 5 cm after thinning. Crossing was done followed by Line × Tester method. Emasculation and pollination were followed by bagging with thin brown paper bags and labelled with tags. To overcome the interspecific pre-fertilization barrier, 0.1% gibberellic acid was sprayed after emasculation by using a hand sprayer. Achieving the proper maturation of siliqua F1 hybrids were harvested and after proper drying the seeds were stored in the refrigerator for the use of next winter season. At flowering time single crosses were made. Matured siliquae of all the crosses were harvested, dried and after threshing seeds were preserved properly for next use. Twenty-four interspecific cross buds were successful, and forty seven seeds were collected from different interspecific cross combinations were stored to grow in the next season.

Evaluation of segregating generation of interspecific crosses

M.S. Uddin, D.R. Datta and M.N. Islam

During the 2023-24 season at Gazipur, segregating generations of interspecific crosses were evaluated to develop homogeneous lines. F1 to F4 seeds were sown using cross or plant-to-row methods, alongside parents and BARI Sarisha-18 as a check. In the F2 and F3 generations, 8 and 10 desirable plants, respectively, were selected based on earliness, seed yield, and yield attributes. Seeds from these selected plants were stored in a cool room for future evaluation. F1 and F2 seeds were sown using the cross-to-row method, and six F6 generation families were evaluated using the family-to-row method. Seeding occurred on 16 November 2023, with plots measuring 2 rows, each 3 m long, spaced 30 cm apart with 5 cm between

plants. Fertilizers were applied at 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn, with half the urea and all other fertilizers applied during final land preparation, and the remaining urea applied at flowering. Intercultural operations were performed to ensure optimal crop growth. Single plant selection in F6 was based on traits such as short duration, erect growth, desirable agronomic characters, and disease and insect tolerance. From 55 F2 plants, 43 desirable plants were selected (see Table 1). In F6, two progenies were chosen for seed yield evaluation in the next observational trial. The selected seeds are kept in a cool room for further assessment in the next season.

Preliminary yield trial of entries developed from interspecific hybridization between *b. Carinata* and *b. Napus*

U. Kulsum, M.S. Uddin, M.M.H. Khan, T A Mujahidi, M S Kobir, S Ghosh

An interspecific hybridization was undertaken to integrate desirable traits from *B. carinata* into the existing *B. napus* variety, BARI Sarisha-13. The evaluation at multiple locations revealed that the genotypes 13CA32014-2 (2354 kg/ha) and 13CA52014-3 (2382 kg/ha) outperformed both check varieties, BARI Sarisha-18 and BARI Sarisha-13, in seed yield. Notably, 13CA52014-3 exhibited reduced pod shattering compared to other entries. In the multi-location trial, the average yields for 13CA32014-2 and 13CA52014-3 were 7% and 1% higher, respectively, than the mean yield of BARI Sarisha-18, and all entries surpassed BARI Sarisha-13. The experiment, conducted during rabi 2023-24 at Joydebpur, Rangpur, Barishal, Hathazari, and Jashore, included six accessions derived from crosses between BARI Sarisha-13 and *B. carinata*. The experimental design was a randomized complete block design (RCBD) with three replications. Each entry was planted in plots of 3 m × 1.2 m with a 30 cm row spacing. Fertilizers were applied at 260:170:90:160:5:10 kg/ha of urea, TSP, MOP, gypsum, Zn oxide, and boric acid, respectively, with half of the urea and all other fertilizers applied at planting and the remaining urea applied at flowering. Data collected from 10 randomly selected plants included days to 50% flowering, days to maturity, plant height, number of siliqua per plant, seeds per siliqua, thousand-seed weight, seed yield per plot, and disease and insect

resistance. Statistical analysis was performed using R software and Microsoft Excel. In Gazipur, significant differences were observed among the entries for all parameters except plant height. All entries flowered and matured earlier than BARI Sarisha-18. The plant height ranged from 96 to 116 cm, with BARI Sarisha-18 showing the highest number of siliqua per plant and thousand-seed weight, while 13CA92014-4 had the lowest. The number of seeds per siliqua ranged from 22 to 32. The highest seed yield was recorded for 13CA52014-3 (2382 kg/ha), followed by 13CA32014-2 (2354 kg/ha), both of which were statistically similar to BARI Sarisha-18 (2250 kg/ha) but significantly higher than BARI Sarisha-13 (1779 kg/ha). Notably, 13CA32014-2 and 13CA52014-3 produced 32% and 34% higher seed yields than BARI Sarisha-13 and 5% and 6% more than BARI Sarisha-18, respectively. In the multi-location trial, 13CA32014-2 and 13CA52014-3 matured three days earlier than BARI Sarisha-18 and one day earlier than BARI Sarisha-13. These entries achieved the highest average seed yields across locations, with 13CA32014-2 yielding 2042 kg/ha and 13CA52014-3 yielding 1930 kg/ha, surpassing BARI Sarisha-18 (1910 kg/ha) and BARI Sarisha-13. The highest seed yields were recorded in Hathazari, while Jashore had the lowest. Significant genotype-environment interactions were observed for maturity and seed yield. Given their superior performance in yield and related traits, 13CA32014-2 and 13CA52014-3 will advance to the Regional Yield Trial program next year.

Sub-Project IV: Development of hybrid variety in *Brassica rapa* L. and *Brassica napus* L.

Maintenances of cms, maintainer and restorer lines of *b. Napus*

D.R. Datta, M.S. Uddin and M. N. Islam

The experiment conducted at Gazipur during the rabi season of 2023-24 involved two CMS lines, CMSZ1 (248) and CMSZ2 (279), two maintainer lines, Nap-248M and Nap-279M, and one restorer line, Nap-14-01R. The plots, each 3 meters long with four rows, were seeded on November 17, 2023. The seedlings were thinned to 5 cm apart, and fertilization was applied at 120:80:60:40:4:1

kg/ha for N:P:K:S and Boron using urea, TSP, MOP, gypsum, zinc sulfate, and boric acid. Half of the urea and all other fertilizers were applied during land preparation, with the remaining urea applied at flowering. CMS lines were crossed with the maintainer lines, and the maintainer and restorer lines were self-pollinated, with bagging used to prevent cross-pollination. Days to flowering and maturity for CMS lines ranged from 45-50 days and 100 days, respectively. A total of 93 buds from 17 CMS plants were crossed with maintainer lines, yielding 2,477 seeds from 87 siliquae. For self-pollination, days to flowering and maturity for Nap-248M and Nap-279M were 45-46 days and 95-96 days, respectively. A total of 483 buds from 73 plants were selfed, producing 4,383 seeds from 445 siliquae. The final seed inventory included 2,477 seeds from CMS lines, 1,980 seeds from maintainer lines, and 2,403 seeds from the restorer line, all of which were stored for future breeding programs.

Development of short duration parental lines in *brassica napus* I.

D.R. Datta, M.S. Uddin, and M. N. Islam

In the rabi season of 2023-24, an experiment was conducted at Gazipur involving back-crossing long-duration CMS lines with short-duration *Brassica napus* restorer lines to develop shorter-duration parental lines and test cross hybrids. The experimental setup included two CMS lines (CMSZ1 (248) and CMSZ2 (279)), one restorer line (Nap-14-01R), and three short-duration *Brassica napus* lines (Nap-0876, Nap-0869, and Nap-205). Seeds were sown on November 22, 2023, with rows spaced 30 cm apart and seedlings thinned to 5 cm apart after germination. Fertilization was applied at 120:80:60:40:4:1 kg/ha of N:P:K:S and Boron using urea, TSP, MOP, gypsum, zinc sulfate, and boric acid. Half of the urea and all other fertilizers were applied during land preparation, with the remaining urea applied at flowering. Hand pollination was used for crossing CMS lines with the short-duration *Brassica napus* lines, with bagging employed to prevent out-crossing. A total of 326 buds from 48 CMS plants were crossed, resulting in 251 siliquae and 5,639 seeds, which were stored for evaluation in the next season. Days to flowering for CMS lines ranged from 48 to 50 days, and days to maturity ranged

from 98 to 99 days. All collected seeds are being stored for future use.

Evaluation of hybrid rapeseed-mustard

M.S. Uddin, D.R. Datta, S. Ghosh, and M.N. Islam

An experiment was conducted to evaluate the performance of hybrid mustard BHS-01 compared to the check variety Advanta during the rabi season of 2023-24. BHS-01 exhibited superior traits, producing approximately 11% higher seed yield than Advanta and maturing faster. The trial was set up across multiple locations: Gazipur, RARS Burirhat, Rangpur, and OFRD Khulna. The unit plot size was 3 m x 2 m, and seeding occurred on November 9, 2023, with lines spaced 30 cm apart. Fertilizer application followed a rate of 115-33-43-27-2-1 kg/ha of N-P-K-S-Zn-B, with half of the nitrogen and all other fertilizers applied at planting, and the remaining nitrogen top-dressed 22 days after emergence. Salinity levels in the experimental field ranged from 2.3 to 5.31 dS/m, recorded at 15-day intervals. The crop was harvested between January 29 and February 13, 2024. For analysis, data on yield and yield attributes were collected from 10 randomly selected plants per plot, including days to flowering, days to maturity, plant height, number of primary branches per plant, number of siliquae per plant, siliqua length, number of seeds per siliqua, 1000-seed weight, and plot yield, which was converted to kg/ha. Results showed that BHS-01 outperformed Advanta in seed yield, maturity time, number of siliquae per plant, and seeds per siliqua. The mean performance of BHS-01 was notably superior, validating its potential as a high-yielding variety. These findings suggest that BHS-01 should be considered for further trials in the next year to confirm these results.

Sub-Project V: Development of double low (canola) variety in rapeseed

Hybridization in double low *b. Napus* I.

M.S. Uddin, D.R. Datta, and M.N. Islam

In this study, fifteen double low inbred lines of *Brassica napus* were utilized as female parents, with BARI Sarisha-18 serving as the tester in a Line × Tester crossing scheme. The experiment included crossing these inbred lines with the tester, resulting in 697 successful cross buds and a total of

11,623 seeds. These seeds have been properly stored for evaluation in the subsequent season. The parental material consisted of diverse genotypes, including BARI Sarisha-17 (*Brassica rapa*), and several *Brassica napus* lines such as Nap-0876 and Nap-0569, characterized by high erucic acid content (30-45%) and short duration (80-85 days), as well as Nap-14-001, Nap-14-004, Nap-14-007, Nap-14-010, and Nap-14-011, known for low erucic acid (less than 2%), high yield (2.0-2.5 t/ha), and longer duration (100-105 days). These materials were crossed during the rabi season of 2015-16, and the resulting F1 plants were selfed from 2016 to 2021 to develop F6 generation lines. The 15 F6 lines (Nap-RIL-01 to 15) were planted on November 20, 2023, with a row spacing of 30 cm and seedlings thinned to 5 cm apart. Fertilization followed a regimen of 120:80:60:40:4:1 kg/ha of N:P:K:S and Boron from urea, TSP, MOP, gypsum, zinc sulfate, and boric acid. Half of the urea and all other fertilizers were applied at final land preparation, with the remaining urea applied at the flowering stage. Emasculation and pollination were conducted using bagging with thin brown paper bags, and the process was meticulously recorded. The collected seeds, totaling 11,623, were successfully stored for future evaluation.

Regional yield trial of *brassica napus* (canola)

M. K. Alam, M. I. Riad, M. R. Humayun, M. S. Huda, K.C. Saha and M. M. Kadir

The experiment assessed 16 canola-type *Brassica napus* genotypes for yield and yield-related traits during the rabi season of 2023-2024 at RARS Jamalpur, Rajbari, Dinajpur, and Ishurdi, Pabna. The study utilized a randomized complete block design with three replications, and plots were 3.0 m × 2.0 m in size. Sowing occurred on November 12, 2023, with rows spaced 30 cm apart. Post-germination, seedlings were thinned to 5 cm apart. Fertilization followed recommended practices, and all necessary intercultural operations were performed. At the Jamalpur site, maturity durations varied from 84 to 89 days, with seed yields ranging from 1630 to 2337 kg/ha. The genotype BNC-22019 achieved the highest seed yield of 2337 kg/ha, surpassing the check variety BARI Sarisha-18 by 14%. BNC-22023 recorded a seed yield of 2285 kg/ha, 12% higher than the check, and matured in 85 days. BNC-22018 yielded 2240

kg/ha, a 9% increase over BARI Sarisha-18, and took 88 days to mature. Analysis showed significant variations among the genotypes for traits including plant height, primary branches, pods per plant, and seed yield. BNC-22019 not only had the highest yield but also showed increased pods per plant and seeds per pod. BNC-22023 yielded 2285 kg/ha, excelling in seeds per pod and pod length, with moderate plant height and primary branches. BNC-22018 and BNC-22020 had yields of 2240 kg/ha and 2226 kg/ha, respectively, with BNC-22020 maturing in just 84 days. Genotypes BNC-22019, BNC-22023, BNC-22018, and BNC-22020 are recommended for further trials in farmers' fields next season due to their superior yield performance, early maturity, and other beneficial traits.

Confirmation of F1 generation of *brassica napus*

M. K. Alam, M. I. Riad, M. M. Kadir and M.S.Uddin

Seeds from 21 *Brassica napus* cross combinations were harvested and bulked cross-wise for planting the F2 generation. The F1 seeds from these combinations, made during 2020-2021, were sown on November 14, 2023. Each entry was planted in a single row, 2 meters long, with 40 cm spacing between rows and 10 cm between plants, alongside their parent varieties as controls. Five representative plants from each F1 plot and the parents were selected for data collection. The 21 confirmed hybrids will be grown as F2 in the next season. Data collected from the F1 generation at Jamalpur during the rabi season of 2023-2024, including days to maturity, plant height, number of branches, pods per plant, pod length, seeds per siliqua, and seed weight. Among the hybrids, various cross combinations exhibited a range of attributes, such as plant height and seed yield, with all seeds preserved for further evaluation in the next generation.

Confirmation of F1 generation of canola germplasm

M. K. Alam, M. I. Riad and M. M. Kadir

Seeds from 11 *Brassica spp.* cross combinations were individually harvested and bulked cross-wise for planting the F2 generation. The F1 seeds from these combinations, made during 2020-2021, were sown on November 13, 2023. Each entry was planted in a single 2-meter row, with 40 cm spacing

between rows and 10 cm between plants, alongside their parental controls. Five representative plants from each F1 plot and parent were selected for data collection. Eleven hybrids were confirmed and selected for the F2 generation. The harvested F1 progenies were bulked and preserved for future planting. The performance data for the F1 generation, recorded at Jamalpur during the rabi season of 2023-2024, is detailed in Table 1, including metrics such as days to maturity, plant height, number of branches, number of pods, pod length, seeds per siliqua, seed weight, and seed color.

Observation yield trial of *brassica napus* (canola)

M. K. Alam, M. I. Riad, M. M. Kadir and Ms. Uddin

An evaluation of 27 *Brassica napus* canola-type genotypes for yield and yield-contributing traits was conducted at RARS Jamalpur during the rabi season of 2023-2024, using a randomized complete block design with two replications. The released variety BARI Sarisha-18 served as the check. The plot size was 3.0 m x 2.0 m, with seeds sown on November 14, 2023, in continuous rows spaced 30 cm apart. After germination, seedlings were thinned to 5 cm spacing, and recommended fertilization practices were followed. Data on yield and contributing parameters were collected and analyzed statistically. The genotype NAP-02 X NAP-0865 yielded the highest at 2419 kg/ha, which was 21% more than BARI Sarisha-18 and matured in 94 days. This genotype also exhibited the highest plant height (135 cm) and pods per plant (128), with the maximum seeds per pod (32). The second-highest yield of 2363 kg/ha was recorded for NAP-02 X BEN-21, which produced 18% more than the check variety and took 94 days to mature. NAP-02 X NAP-15029 followed with a yield of 2346 kg/ha, 17% higher than BARI Sarisha-18, and matured in 91 days. Given their superior canola quality, seed yield, and yield attributes, NAP-02 X NAP-0865, NAP-02 X BEN-21, and NAP-02 X NAP-15029 are recommended for preliminary yield trials in the upcoming year.

Regional yield trial of *brassica rapa* (canola)

M. K. Alam, M. I. Riad and M. M. Kadir

A regional yield trial for canola-type *Brassica rapa* L. was conducted at RARS Jamalpur during the

rabi season of 2023-2024, evaluating 10 genotypes in a randomized complete block design with three replications. The plot size was 3.0 m x 2.0 m, with seeds sown on November 12, 2023, in rows spaced 30 cm apart, and seedlings thinned to 5 cm spacing after germination. Fertilizers were applied according to recommended practices, and all intercultural operations were performed as needed. BCC-22004 exhibited the highest seed yield at 1932 kg/ha, surpassing check varieties BARI Sarisha-9 and BARI Sarisha-12 by 47% and 45%, respectively. BCC-22002 followed with a yield of 1919 kg/ha, which was 46% and 44% higher than the check varieties, while BCC-22003 yielded 1905 kg/ha, showing 43% and 44% increases over the checks. BCC-22004 also demonstrated superior traits such as the highest number of seeds per pod (22) and a moderate number of pods per plant (153), maturing in 83 days. The other top-performing genotypes, BCC-22002 and BCC-22003, matured in 88-89 days. Based on these results, BCC-22004, BCC-22002, and BCC-22003 are recommended for further evaluation in adaptive yield trials for the upcoming season, with BCC-22001 also considered for its promising performance.

Observation yield trial of *brassica napus* L. (Set-II)

U. Kulsum and M. Shalim Uddin

In an observation yield trial conducted at Joydebpur during the 2023-2024 season, fifteen *Brassica napus* lines, including the check variety BARI Sarisha-18, were evaluated for yield and yield-contributing traits. The trial utilized a randomized complete block design with three replications, each plot measuring 3 meters in length and consisting of three rows with a 30 cm row spacing. Sowing occurred on November 17, 2023, with fertilizers applied at recommended rates and split applications of urea. Data collection focused on days to flowering, days to maturity, plant height, branches per plant, siliques per plant, seeds per siliqua, thousand-seed weight, and seed yield per plot. Statistical analysis was performed using R tools and Microsoft Excel. Among the lines tested, SDNapus-15 achieved the highest seed yield of 2238.7 kg/ha, 20% greater than BARI Sarisha-18, and matured in 92 days with 86 siliques per plant and 30 seeds per siliqua. SDNapus-2 and SDNapus-8 also outperformed the check variety,

yielding 14% and 9% more, respectively, and maturing in 89 to 90 days. Given their superior performance, SDNapus-15, SDNapus-2, and SDNapus-8 are recommended for preliminary yield trials in the upcoming season.

Sub-Project VII: Development of climate smart variety of Rapeseed-mustard through Speed Breeding

Root analysis rapeseed-mustard for identifying superior genotypes through hydroponic

M.S. Uddin, D.R. Datta, and M.I. Islam

In a high-lux speed breeding lab, fifteen rapeseed-mustard varieties (*Brassica sp.*) were grown hydroponically to assess their growth performance and biomass allocation. Utilizing advanced statistical methods—including descriptive statistics, ANOVA, PCA, heatmaps, cluster dendrograms, and the Multi-trait Genotype-Ideotype Distance Index (MGIDI)—the study aimed to identify phenotypic traits contributing to superior growth and yield. The experimental setup included controlled humidity (70%), optimal light intensity ($400 \mu\text{mol m}^{-2} \text{s}^{-1}$), and a 22-hour photoperiod to maximize photosynthesis. Hoagland's nutrient solution was used, with replacements every five days to ensure balanced nutrition. The analysis, conducted with RStudio and STAR software, revealed significant trait variations among the 24 Brassica genotypes provided by the Bangladesh Agricultural Research Institute's Oilseed Research Centre. The top-performing genotypes were V2 (Nap-21070), V10 (BINA Sharisha-3), and V15 (BJ-11536(12)-1), showing remarkable biomass yield and growth performance. Variations in traits like average root width (ARW), number of branches (NB), and node count (NC) were observed. Statistical evaluations, including PCA and heatmaps, highlighted these genotypes' strengths and their proximity to the ideal performance profile. The MGIDI plot identified V15, V10, and V2 as close to the ideal genotype, indicating their high potential for further breeding. The hierarchical clustering of genotypes revealed distinct clusters with varying levels of genetic similarity, aiding in identifying high-performance varieties. The radar plot analysis demonstrated significant contributions of certain variables to growth and yield, with some genotypes impacting

specific factors more than others. Overall, the study underscores the effectiveness of hydroponic systems in enhancing rapeseed-mustard growth and highlights V15, V10, and V2 as promising candidates for commercial production and breeding programs. This research provides a robust framework for selecting high-yielding, resource-efficient rapeseed-mustard varieties, potentially advancing sustainable agriculture practices.

Development of multi-parent advanced generation inter-cross (magic) populations

M.S. Uddin, D.R. Datta and M.N. Islam

The Plant Breeding Division at the Bangladesh Agricultural Research Institute, Joydebpur, conducted an experiment to develop a 16-way MAGIC population aimed at consolidating favorable genes from multiple parents into a single line and enhancing genetic variability. This involved successfully making eight 4-way crosses, five 6-way crosses, and two 8-way crosses. The crosses were grown in the high lux growth (HLG) room at the Oilseed Research Centre (ORC), where customized greenhouse conditions with enhanced lighting accelerated the process. The crosses were also planted in the ORC breeding field with a row spacing of 25 cm, and standard fertilization and intercultural practices were followed. Rouging was performed before flowering, and the mature siliques from the crosses were harvested, dried, and threshed for seed preservation. The seeds from the crosses are set to be evaluated in the next rabi season alongside their parents. Seed production data includes: 24 seeds from the cross BS-15×BS-9×BS-17×Rai-5, 58 seeds from BS-14×BS-9×BS-17×Rai-5, and 86 seeds from BS-17×BS-11×Line 248×BS-18, among others. For the 6-way and 8-way crosses, the seeds harvested include 183 from BS-17×BS-11×BS-18×BS-18×Wild×0876 and 73 from BS-11×BS-18×0876×BS-17×BS-11×0876. These seeds will be used for further breeding efforts, including making additional 8-way and 16-way crosses.

Development of hexaploidy *brassica spp.*

M.S. Uddin, D.R. Datta and M.N. Islam

The experiment at the speed breeding laboratory of the Oilseed Research Centre, Bangladesh Agricultural Research Institute, Gazipur, aimed to enhance genetic diversity and improve agronomic traits in diploid and allotetraploid crop species.

Crosses were made between two of three allotetraploids (e.g., AACC × BBCC) to produce hybrids crossed with the third species (CCAB × AABB → AABBC), resulting in allohexaploids from crosses of *B. napus*, *B. carinata*, and *B. juncea*. These crosses utilized unreduced gametes to restore balanced ploidy levels or colchicine treatment for diploids. The crosses were grown in 1-meter-long plots in a greenhouse. The first generation (2021-22) yielded 25 seeds, the F2 generation produced 35 seeds (2022-23), and the F3 generation generated 230 allohexaploid seeds, which were successfully grown in 2023-24. From these, seven allohexaploid plants were selected for the next season along with their parents for further evaluation. The second generation of *B. napus* × *B. carinata* and *B. juncea* produced 35 allohexaploid seeds, which were also successfully cultivated in 2023-24, with five plants selected for continued growth.

Development of nested association mapping (nam) populations

M.S. Uddin, D.R. Datta and M.N. Islam

The experiment conducted at the greenhouse of the Plant Breeding Division, Bangladesh Agricultural Research Institute, Joydebpur, aimed to develop a NAM (Nested Association Mapping) population to enhance genetic variability and assess the lines under multiple stresses. Utilizing twenty diverse parental lines, ten successful single crosses were made. The parental seeds were sown in pots within a high-lux growth room, where the greenhouse environment was customized with enhanced lighting to expedite crop performance assessments. Fertilizers were applied according to recommendations, with necessary intercultural operations and rouging done before flowering. During flowering, single crosses were made, and the mature siliquae were harvested, dried, and threshed for seed preservation. In total, eighteen single crosses, eight three-way crosses, and two four-way crosses were successfully created and will be grown in the next rabi season for further confirmation and additional crossings. For F2 plant selfing, various combinations produced F4 seeds with differing seed coat colors: BS-15×BS-9 yielded 342 brown seeds, BS-14×BS-9 yielded 164 brown seeds, and BS-9×BS-11 yielded 120 brown seeds, among others. Notable quantities included

BS-18×Wild with 575 brown seeds and BS-7×BS-18 with 1300 brown seeds.

Introgression of heat tolerance gene in rapeseed-mustard from wild relatives

M.S. Uddin, D.R. Datta and M.N. Islam

The experiment conducted at the breeding field of the Oilseed Research Centre, Bangladesh Agricultural Research Institute, Gazipur, focused on introgressing heat and aphid tolerance genes and broadening genetic diversity. The study utilized BARI Sarisha-18 (*B. napus*; 2n=34) and *Rorippa indica* (2n=16, 32), a wild relative of *Brassica spp.* F3 seeds were sown using a cross-to-row method, with each plot consisting of one row 3.0 meters long and spaced 30 cm apart. Sowing occurred on November 21, 2023, with seedlings thinned to 5 cm apart after germination. Fertilizers were applied at recommended rates (120:80:60:40:4:1 kg ha⁻¹ of N:P:K:S and Boron) with half of the urea and all other fertilizers applied during final land preparation, and the remaining urea at the flowering stage. Timely intercultural operations ensured good crop development. Matured siliquae from all crosses were harvested, dried, threshed, and preserved. From 120 F3 plants, 17 desirable plants were selected for advancing to the F4 generation. The selection results for the F3 generation of interspecific Brassica crosses are detailed in Table 1, showing the number of plants selected for each cross.

Sub-Project VIII: Maintenance breeding of rapeseed-mustard

Maintenance of bari released rapeseed-mustard varieties (Set-I)

M.Q.I. Matin, D. R. Datta, M. S. Uddin and M. N. Islam

In the Rabi season starting November 20, 2023, a total of 20 BARI-released rapeseed-mustard varieties were cultivated to maintain genetic purity and for future breeding programs. Each variety was grown in plots consisting of 5 rows, each 3 meters long, with a row-to-row distance of 30 cm and a plant-to-plant distance of 5 cm after thinning. Fertilizers were applied at the recommended rates of 120:80:60:40:4:1 kg/ha for N, P, K, S, Zn, and Boron, using urea, TSP, MOP, gypsum, zinc sulfate, and boric acid, respectively. Netting was

employed across the entire plot to ensure genetic purity. Seed yields varied by variety, with amounts collected as follows: Tori-7 (155 g), SS-75 (150 g), TS-72 (205 g), Daulat (270 g), Rai-5 (390 g), BS-6 (160 g), BS-7 (272 g), BS-8 (333 g), BS-9 (170 g), BS-10 (295 g), BS-11 (352 g), BS-12 (155 g), BS-13 (378 g), BS-14 (138 g), BS-15 (160 g), BS-16 (388 g), BS-17 (185 g), BS-18 (380 g), BS-19 (433 g), and BS-20 (145 g). Varieties BS-7, BS-8, BS-13, and BS-18 belong to the napus group; Rai-5, Daulat, BS-10, BS-11, BS-16, and BS-19 are from the juncea group; while Tori-7, SS-75, TS-72, BS-6, BS-9, BS-12, BS-14, BS-15, BS-17, and BS-20 are from the rapa group. The collected seeds are properly stored for use in the next year's breeding program.

Crop Management

Effects of sowing methods on yield and economic return of mustard under rice based cropping system in barishal region

M. A. Rahman, F. Begum, M. M. Rahman, P. Roy and M. M. Karim

An experiment was conducted at the Regional Agricultural Research Station (RARS), BARI, Rahmatpur, Barishal during the 2023-24 season to improve mustard yield and economic return in a rice-based cropping system. The study employed a two-factor randomized complete block design (RCBD) with three replications. Factor A included five sowing methods (relay sowing, broadcast with conventional tillage, line sowing with conventional tillage, line sowing with PTOS, and furrow planting with zero tillage) and Factor B involved two mustard varieties: BARI Sarisha-14 (V1) and BARI Sarisha-18 (V2). Conducted in the Ganges Tidal Floodplain (AEZ-13), the experiment featured clay loam soil with medium-low land characteristics, neutral pH, and low organic matter. Fertilizers (250-170-85-150-5-10 kg/ha of urea, TSP, MP, gypsum, zinc sulfate, boric acid, and 3 tons/ha cow dung) were applied at land preparation, with 50% of the urea top-dressed after 20-25 days. Results showed that plant height, siliqua per plant, seeds per siliqua, branches per plant, and seed yield were significantly influenced by sowing methods and varieties. The tallest plants (119.93 cm) were found in broadcast with conventional tillage (BARI Sarisha-18), while the highest siliqua per plant (64.10) was observed in line sowing (BARI

Sarisha-18). The highest seed yield (2,041.9 kg/ha) was also achieved with line sowing (BARI Sarisha-18), whereas the lowest (674.1 kg/ha) was recorded in relay sowing (BARI Sarisha-14). BARI Sarisha-18 took longer to mature (88.87 days), but also exhibited superior plant height (103.53 cm) and siliqua per plant (52.41), while BARI Sarisha-14 had more seeds per siliqua (26.84). These preliminary results suggest that BARI Sarisha-18 with line sowing under conventional tillage performed best, but further research is required before a final recommendation can be made.

Performance of mustard and other crops in rice based cropping patterns in Barishal region

M. A. Rahman, F. Begum, M. M. Rahman, P. Roy and M. M. Karim

A field experiment was conducted at the Regional Agricultural Research Station (RARS), BARI, Rahmatpur, Barishal throughout 2023-2024 to assess the performance of mustard and other crops in rice-based cropping patterns in the Barishal region. The experiment tested seven cropping patterns: CP1 (Mustard-Sesame-T. aman), CP2 (Mustard-Mungbean-T. aman), CP3 (Mustard-Jute-T. aman), CP4 (Mustard-Maize-T. aman), CP5 (Mustard-T. aus-T. aman), CP6 (Mustard-Fallow-T. aman), and CP7 (Fallow-Fallow-T. aman, as a control). The trial was laid out in a randomized complete block design (RCBD) with four replications. The site, located in the Ganges Tidal Floodplain (AEZ-13), features medium-high loamy soil. Initial soil samples were collected and analyzed by the Soil Resource Development Institute (SRDI) in Barishal. Only T. aman rice (monsoon) and mustard (winter) were harvested during the initial phase, as sesame and mungbean crops were damaged by cyclone Remal, while other summer crops (jute, maize, and T. aus) are still growing. Mustard equivalent yield (MEY) was calculated to compare the system performance across patterns using the formula $MEY = Y_x (P_x \div Pr)$, where Y_x is the yield of non-mustard crops, P_x is their price, and Pr is the price of mustard. Data were analyzed using Statistix 10 software and evaluated with Duncan's Multiple Range Test (DMRT). The cropping patterns showed significant differences in MEY. The highest MEY (3023 kg/ha) was recorded in CP5 (Mustard-T. aus-T. aman), which was statistically similar to CP1 (Mustard-Sesame-T. aman), CP2 (Mustard-

Mungbean-T. aman), CP3 (Mustard-Jute-T. aman), CP4 (Mustard-Maize-T. aman), and CP6 (Mustard-Fallow-T. aman). The lowest MEY (1321 kg/ha) came from the control, CP7 (Fallow-Fallow-T. aman). The initial results indicate that all improved cropping patterns outperformed the sole T. aman rice system. A final recommendation will be made after completing the full two-year cropping cycle.

Development of mustard - sesame - t. Aman cropping pattern against farmers pattern for increasing cropping intensity and productivity

P. Roy, F. Begum and M. J. Hussain

Field experiments conducted at the Oilseed Research Centre of the Bangladesh Agricultural Research Institute during 2022-23 aimed to enhance cropping intensity and productivity within a rice-based cropping system. The study evaluated the cropping pattern of T. aman (var. BRRI dhan75) – Mustard (var. BARI Sarisha-18) – Sesame (var. BARI Til-5), employing a Randomized Complete Block (RCB) design with four replications and unit plots measuring 6m x 4m. Mustard, the first crop, was sown on 23 November 2022 and harvested on 7 March 2023, yielding 2.00 t/ha of seeds and 3.00 t/ha of straw. Sesame was planted on 9 March 2023 and harvested on 16 June 2023, with a seed yield of 1.20 t/ha and straw yield of 2.00 t/ha. T. aman was transplanted on 26 May 2023 and harvested on 26 November 2023, producing 4.01 t/ha of rice and 5.00 t/ha of stover. The cropping duration was 105 days for mustard, 97 days for sesame, and 108 days for T. aman. The Rice Equivalent Yield (REY) was 11.53 t/ha, with a Benefit-Cost Ratio (BCR) of 2.33. The results demonstrate that this three-crop sequence not only provides a reasonable economic return but also offers increased employment opportunities, enhances food and nutritional security, and improves cropping intensity without depleting soil nutrients.

Effect of relaying time of maize with mustard

M. M. Karim, F. Begum, P. Roy and M. J. Hussain

The field experiment at the Oilseed Research Centre (ORC), BARI, Gazipur during the rabi season of 2023-2024 aimed to identify the optimal timing for relaying maize to improve mustard growth and yield. The study involved eight treatments: T1 (sowing mustard and maize together), T2 (maize sown 10 days after mustard),

T3 (20 days after mustard), T4 (30 days after mustard), T5 (40 days after mustard), T6 (50 days after mustard), T7 (sole mustard), and T8 (sole maize). Mustard (BARI Sarisha-14) was sown on 20 November 2022, and maize (Khoibutta) was sown according to the treatments. Fertilizers were applied at 138-87-60-32-3-2 kg/ha N, P, K, S, Zn, and B, along with 8 t/ha of cow dung. Full doses of TSP, MoP, gypsum, zinc sulfate, and boric acid, along with half of the urea, were applied during land preparation, with the remaining urea top-dressed 40 days after emergence. Intercultural operations and irrigation were carried out as needed. Data on yield and yield-contributing factors were collected from ten selected plants and analyzed using SPSS. The results showed that sowing maize 50 days after mustard yielded the highest mustard yield (1.27 t/ha), followed by sowing maize 40 days after mustard (1.17 t/ha). For maize, the highest yield (2.15 t/ha) was achieved when sown 10 days after mustard. The highest mustard equivalent yield (MEY) of 3.75 t/ha was recorded in the treatment where maize was sown 10 days after mustard, which was statistically similar to sowing maize 50 days after mustard. However, the highest relay cropping MEY of 2.54 t/ha was achieved with maize sown 40 days after mustard. Consequently, sowing maize 50 days after mustard is recommended for optimal yield and economic return. The experiment also found significant differences in plant height, number of pods per plant, and 1000-seed weight among treatments. Maize sowing 40 days after mustard provided the best balance of yield and economic return, with the highest gross margin and benefit-cost ratio found in this treatment.

Disease Management

Screening of rapeseed-mustard varieties/lines against alternaria blight disease of mustard

N. A. Sultana and K. Jahan

The experiment conducted at the Oilseed Research Centre, BARI, Joydebpur during the 2023-2024 rabi season aimed to identify rapeseed-mustard lines resistant to Alternaria blight. Thirty lines of Brassica spp. were tested, including B. rapa, B. napus, and B. juncea, with BARI Sarisha-14 used as a susceptible check. The seeds were sown on November 14, 2023, in a randomized block design with three replications, and cultural practices

followed standard recommendations. Fertilizers were applied at rates of 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn from urea, TSP, MP, gypsum, zinc sulfate, and boric acid, respectively, with half of the urea applied at land preparation and the remainder at flower initiation. Disease severity was recorded at 60-65 days after sowing using a 0-5 scale, where 0 indicated immune and 5 indicated highly susceptible. The results showed no lines were immune or highly resistant to *Alternaria* blight. Five lines-NAP-20002, NAP-16036, BJ-2014-Y-04, BJ-10-10104(Y), and BJ-1110(12)-1-exhibited moderately resistant reactions. These lines also had varying yields, with BJ-10-10104(Y) producing the highest yield of 7.8g per plant, while BC-100614(3)-1 yielded the lowest at 2.6g per plant. These moderately resistant lines are promising candidates for breeding programs aimed at developing varieties resistant to *Alternaria* blight.

Efficacy of different group of chemical fungicides against alternaria blight of mustard

N.A. Sultana and K. Jahan

During the 2023-2024 cropping season at the Oilseed Research Centre (ORC), BARI, Joydebpur, an experiment evaluated seven fungicides for controlling *Alternaria* blight in mustard. The fungicides tested included Rovral 50 WP (Iprodian), Nativo 75 WG (Tebuconazole and Trifloxystrobin), Tilt 250 EC (Propiconazole), Folicur 250 EC (Tebuconazole), Score 250 EC (Difenoconazole), Navara 28 SC (Azoxystrobin and Cyproconazole), and Amister Top 325 SC (Azoxystrobin and Difenoconazole). These were sprayed three times at 10-day intervals starting from the first appearance of the disease. All fungicides significantly reduced disease severity compared to the control. Rovral 50 WP and Amister Top 325 SC were particularly effective, with Rovral providing the highest yield, followed closely by Amister Top. The experiment used a randomized complete block design with three replications, where BARI Sarisha-14 seeds were sown on November 14, 2023. Each plot measured 3m x 2m with 40 cm row spacing, and fertilizers were applied at rates of 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn. The rest of the urea was applied at the flowering stage. Disease data were collected at 60 days after sowing (DAS) for leaves and 70 DAS for pods, using a 0-5 scale to measure disease severity. Percent Disease Index (PDI) was calculated and

transformed using arcsine transformation. Results showed that Rovral 50 WP treated plots had the lowest PDI (24.80), significantly reducing the disease by 79.13% compared to the control. Amister Top 325 SC followed closely with a 78.22% reduction. Among the fungicides, Rovral 50 WP achieved the highest plant height (91.76 cm), number of siliqua per plant (67.63), and seed number per siliqua (36.33), and the highest thousand-seed weight (3.68 g). The highest yield (1565 kg/ha) was also recorded with Rovral 50 WP, statistically similar to Amister Top 325 SC (1 ml/l), while the control yielded the least (1127 kg/ha). In conclusion, all tested fungicides effectively controlled *Alternaria* blight, but Rovral 50 WP, Amister Top 325 SC, and Navara 28 SC were particularly effective, enhancing both disease control and seed yield. These fungicides are recommended for use in managing *Alternaria* blight and maximizing mustard production.

Insect Management

Effect of insecticides on foraging behaviour of honeybee (*apis mellifera* L.) On mustard (*brassica rapa*)

R. Islam , M. A. Islam and A. Samiha

This study assessed the impact of four insecticides-imidacloprid, thiamethoxam, spinosad, and nimbecidine-on the foraging behavior of honey bees (*Apis mellifera* L.) on mustard (*Brassica rapa*) during peak flowering in the rabi 2023-24 season at the Oilseed Research Centre, Gazipur. The insecticides were applied at specified rates using a knapsack sprayer in a randomized complete block design with three replications. Observations on bee visitation were recorded before spraying and at intervals of 1, 2, 3, 24, and 48 hours, and one week post-application. Results indicated no honey bees were present in the imidacloprid and thiamethoxam-treated plots for the first 48 hours, showing a 100% repellent effect. Spinosad exhibited moderate repellency (75.01% to 60.01%), while nimbecidine had the least effect (18.40% to 10.50%). This study highlights the significant repellency of imidacloprid and thiamethoxam on honey bee foraging, raising concerns about their impact on pollinators. Conversely, spinosad showed milder effects, and nimbecidine had minimal impact. The findings emphasize the importance of selecting insecticides carefully to

protect beneficial pollinators in agricultural practices.

Development of a management approach against flea beetle (*phyllostreta striolata*) attacking mustard

M.A. Islam, A. Samiha and R. Islam

The experiment was conducted at the Oilseed Research Centre, BARI, Gazipur, during the Rabi season of 2023-24 to develop effective management packages against flea beetles in mustard. The study included six treatments: T1 (White sticky trap + Spinetoram), T2 (White sticky trap + Bio-chamak), T3 (White sticky trap + Biotrin), T4 (White sticky trap + Spinosad), T5 (Nitro 505 EC), and T6 as the untreated control. Mustard seeds (BARI Sorisha-14 and BARI Sorisha-18) were sown on November 25, 2022, and January 13, 2024, respectively, using a randomized complete block design with three replications. The unit plot size was 5.0 m x 4.0 m for BARI Sorisha-14 and 1.0 m x 1.0 m for BARI Sorisha-18, with a 1.0 m row-to-row spacing and 30 cm between plants. Pest counts for flea beetles were recorded at seven-day intervals from five randomly selected plants and five leaves from each plant, and the number of beetles captured per sticky trap was also counted. The results showed that the maximum number of flea beetles per five leaves (10.33) was found in untreated control plots, while the lowest number (2.11) was recorded in T5 treated plots. The highest percentage of plant infestation was observed in the control (68.39%), while the lowest (35.32%) was in the T5 treatment. In the first experiment, no flea beetles were observed throughout the study period. However, significant beetle activity was noted in the second experiment, with a range of 2.11 to 10.33 beetles per five leaves among treatments. Flea beetle numbers correlated positively and significantly with maximum temperature, while a negative linear correlation was observed with relative humidity. In conclusion, Nitro 505 EC (Chlorpyrifos + Cypermethrin) at a rate of 1 ml/L of water proved effective against flea beetles, resulting in lower infestation rates. The experiment will be repeated next year for further investigation.

B. Sesame

Maintenance of germplasm of sesame

M. H. Rashid, M. S. Kobir and M. R. Humayun

The experiment conducted during the Kharif-1 season of 2024 at the Oilseed Research Centre, Gazipur, RARS Ishwardi, and Jashore aimed to rejuvenate existing germplasm collections. A total of 66 entries, including three check varieties (BARI Til-2, BARI Til-3, and BARI Til-4), were planted across the three locations. The seeds were sown without replication on February 27 in Gazipur, February 29 in Jashore, and March 25 in Ishwardi. Recommended fertilizer doses of 80:65:60:20:4 kg/ha of N, P, K, S, and Zn, respectively, were applied. Intercultural operations were carried out as needed. All seeds were collected and preserved in cold storage for future use in breeding trials. Seed yields varied across the locations, with notable amounts harvested from entries such as Ses JP-47Y (6.02 kg) and Ses-05178 (1.53 kg). The collected seeds will be evaluated further and used for different breeding purposes.

Hybridization of sesame

M. H. Rashid, M. S. Uddin and K. C. Saha

During Kharif-2, 2023, a hybridization program was conducted at Gazipur involving different sesame crossing materials. Out of 620 pollinated buds across 24 cross combinations, 360 capsules were produced, resulting in 11,643 F1 seeds. These seeds will be used for the next year's F1 population. Six released varieties and one advanced line were planted on August 29, 2023, in a net house, with crosses made in the first week of October. The seeds were planted in 2-row plots with specific spacing and fertilization, and successful crosses were achieved in 60% of the cases. The highest seed yield per capsule was noted from the cross BARI Til-3 X BINA Til-1, which produced 73 seeds per capsule, followed by BARI Til-3 X BARI Til-6 with 63 seeds. Average seed production per capsule was 33. The collected F1 seeds have been preserved in cold storage for future use.

Confirmation of F₁ generation of sesame

M. H. Rashid

The F₁ generation of thirty sesame cross combinations (15 direct and 15 reciprocal) was evaluated at ORC, BARI, Gazipur, to advance from

F1 to F2. Seeds were sown on February 27, 2024, at Joydebpur, with 99 plants selected based on their growth, maturity, and agronomic traits. Spacing was 30 cm between rows and 8 cm between plants, and recommended fertilizers were applied. Days to flowering ranged from 30 to 38, and days to maturity from 90 to 97. Four cross combinations were discarded due to low yield and higher disease susceptibility. Of the remaining 26 cross combinations, 99 plants were confirmed as F1 for further advancement. Data on days to flowering, days to maturity, and seed yield per plant were recorded and analyzed.

Evaluation of F₃, F₅ AND F₆ generation of sesame

M. H. Rashid, M. S. Uddin and K. C. Saha

During Kharif-1, 2024, five F₃, eight F₅, and six F₆ generations of sesame were evaluated at Gazipur to advance the generation and select desirable plants. Seeds were sown on March 12, 2024, with a spacing of 30 cm between rows and 8 cm between plants, and fertilizers were applied at 80:65:60:20:4 kg ha⁻¹ of NPKSZn. Data on days to flowering, maturity, and seed yield were recorded. The F₃ generation showed flowering in 35-39 days and maturity in 86-88 days. The F₅ generation had flowering in 29-35 days and maturity in 88-95 days, while the F₆ generation had flowering in 30-35 days and maturity in 90-95 days. Based on plant growth, maturity, branching, seed color, and disease and insect resistance, 26 plants from the F₃ generation, 67 from the F₅ generation, and 38 from the F₆ generation were selected for further evaluation. The seeds of these selected plants were stored separately in a cool house for future breeding activities.

Observation trial of sesame

M. H. Rashid, M. S. Uddin and K. C. Saha

During Kharif-1, 2024, seven sesame entries, including BARI Til-6 as a check, were evaluated at Gazipur for seed yield and other yield-contributing traits. The experiment used a randomized complete block design with three replications, and seeds were sown on February 27, 2024. Each plot measured 3 rows by 4 meters, with rows spaced 40 cm apart and plants 8 cm apart. Fertilizers were applied at 80:65:60:20:4 kg ha⁻¹ of NPKSZn, and intercultural operations were performed as needed. Significant differences were observed in plant

height, number of branches per plant, pods per plant, seeds per pod, and seed yield, though days to flowering showed no significant variation, ranging from 30 to 36 days. Ses-24 was the shortest at 116.67 cm, while BARI Til-6 was the tallest at 128.60 cm. Entries varied in silique chamber number, with both four- and six-chambered siliques found on the same plant. Ses-27 had the highest number of pods per plant (48), and Ses-25 had the most seeds per pod (65). Ses-26 achieved the highest seed yield at 1490 kg ha⁻¹, followed by Ses-24 with 1450 kg ha⁻¹, Ses-27 with 1420 kg ha⁻¹, and Ses-23 with 1400 kg ha⁻¹. Based on these findings, Ses-26, Ses-24, Ses-27, and Ses-23 were selected for the next yield trial.

Screening of sesame genotypes under water logged condition

M. H. Rashid, M. S. Uddin and K. C. Saha

In Kharif-2, 2023, fifty-one sesame genotypes, including T-6, BARI Til-3, BARI Til-4, and BARI Til-5, were evaluated for water logging resistance at Gazipur in a net house. The genotypes were grown in plastic containers filled with soil composed of 50% organic manure, 40% cow dung, and 10% garden soil. Water logging conditions were simulated during the flowering stage by maintaining water depths of 4 cm above the soil level, with standing water kept for either 24 or 48 hours. The initial plant populations ranged from 6 to 9 per plot. Most genotypes failed to survive the water logged conditions, but six genotypes—Ses-FR-20, Ses-0570, Ses-37, Ses-0178, Ses-5, and Ses-9751—were able to withstand the conditions for 48 hours. Seeds from these resilient genotypes will be preserved and further evaluated next year under similar water logged conditions.

Maintenance of released varieties and advanced line of sesame

M. H. Rashid

In Kharif-1, 2024, twenty sesame accessions, including six released varieties and fourteen advanced lines, were cultivated at Gazipur to ensure the genetic purity of existing germplasm for future breeding programs. Seeds were sown on March 12, 2024, with plots arranged in three rows, each 4 meters long, and spaced 40 cm between rows and 5 cm between plants after thinning. Agronomic traits were assessed, and 100 plants from the middle row of each plot were selected.

Fertilizers were applied at recommended rates of 80:65:60:20:4 kg ha⁻¹ of NPKSZn, and necessary intercultural operations were performed. Seeds collected from twenty randomly selected plants per accession were stored for maintaining germplasm. A total of 7.70 kg of seeds from various lines and varieties were preserved in a cool house for use in future breeding programs.

Insect Management

Relative susceptibility of sesame cultivars against green tobacco capsid (*nesidiocoris tenuis reuter*)

M.A. Islam, A. Samiha and R. Islam

The experiment conducted during the rabi season of 2023-24 at the Oilseed Research Centre (ORC), BARI, Gazipur, aimed to assess the susceptibility of four BARI-released sesame varieties (BARI Till-3, BARI Till-4, BARI till-5, and BARI Till-6) to green tobacco capsid. Laid out in a randomized complete block design with three replications, sesame seeds were sown on March 23, 2024, in plots measuring 4.0 m x 3.0 m. Pest assessments focused on whitefly, leafhopper, hairy caterpillar, and green tobacco capsid, with weekly monitoring from April 13 to May 31, 2024. The results showed that all varieties were infested by the pests, with BARI Till-5 being the most susceptible to green tobacco capsid (6.33 per three leaves). The lowest populations of whiteflies were observed in BARI Till-5 (0.78) and BARI Till-6 (1.13), while higher leafhopper populations were found in BARI Till-3 (3.52) and BARI Till-4 (2.89). Green tobacco capsid showed a positive correlation with relative humidity and a negative correlation with temperature. These findings suggest BARI Till-5 is more susceptible, warranting further investigation in the next season.

C. Groundnut (*Arachis hypogaea* L.)

The groundnut, or peanut (*Arachis hypogaea*), is a significant oil legume in the Fabaceae family, likely first cultivated in the valleys of Paraguay. It is an allotetraploid, originating from a combination of *A. duranensis* and *A. ipaensis*, evolving into the domesticated *A. hypogaea*. Groundnut ranks third in area and production among oil crops in Bangladesh and is adaptable to various growing

conditions, including 'Char' areas in winter and as an intercrop or in crop rotations. It improves soil fertility by fixing atmospheric nitrogen and offers high nutritional value, with oil content of 48-52%, protein (22-25%), carbohydrates (20%), and vitamins B and E. Despite its advantages, groundnut yields in Bangladesh are lower than in developed countries due to issues such as long maturity periods, disease susceptibility, and poor seed dormancy. The Oilseed Research Centre of BARI has developed 12 varieties, including Spanish, Valencia, and Virginia types, focusing on improving yield, disease resistance, early maturation, and seed viability.

Maintenance and evaluation of groundnut germplasm

K C Saha and M S Uddin

A total of 258 groundnut genotypes were evaluated at Joydebpur, Gazipur, to rejuvenate and assess the germplasm for future breeding programs. Sown on December 24, 2023, in non-replicated plots, the genotypes were spaced 30 cm apart in rows and 15 cm between plants. Fertilizers were applied at recommended rates of 10:70:50:30:4:2 kg/ha of NPKSZnB. Data collected included days to first flowering, days to maturity, pod yield per plot, and yield-contributing traits like mature pods per plant, 100-kernel weight, and shelling percentage from 5 random plants per plot. The ranges of observed traits were: days to first flowering (49-64), days to maturity (139-154), plant height (29-72 cm), mature pods per plant (11-45), 100-kernel weight (40-67 g), shelling percentage (59-80%), and plot yield (1290-3600 kg/ha). The highest coefficient of variation (CV%) was noted for mature pods per plant (35.00%), indicating significant variation, while days to maturity showed minimal variation. Seeds from these evaluations will be stored and used in the future breeding program, with a focus on traits demonstrating higher variation for further development.

Hybridization in groundnut

K C Saha and M S Uddin

Five parental lines were crossed in ten different combinations, with a total of 517 buds pollinated at Joydebpur. The crosses were made after emasculating the unopened matured buds in the afternoon and pollinating them the following morning. Out of the pollinated buds, 211 pods were

successfully harvested, resulting in an average cross success rate of 40%. The seeds from these crosses will be grown in the next Rabi season to confirm the F1 generation. The detailed results are summarized, which shows the success rates for each cross combination.

Evaluation of segregating generations of groundnut

K C Saha and M S Uddin

A total of 43, 80, 25, 32, and 89 single plants were selected from the F2, F3, F4, F5, and F6 generations, respectively, based on criteria such as mature pods, pod-bearing nature, and resistance to diseases and insects. Seeds from nine cross combinations of F2, 17 entries of F3, five entries of F4, seven entries of F5, and 20 entries of F6 were sown on December 24, 2023, at Joydebpur, with proper fertilization and crop management. The results, detailed in Tables 1 through 5, indicate that selections were made based on pod characteristics and plant traits. Seeds from the selected F2 plants will advance to F3, while F3 seeds will move to F4, F4 seeds to F5, and F5 seeds to F6. F6 seeds will be used for observation trials in the next season. All selected plants' seeds have been collected and stored for advancing their respective generations.

Observation trial of groundnut

K C Saha and M S Uddin

During the rabi season of 2023-2024, 19 entries, including the checks Dhaka-1 and BARI Chinabadam-8, were evaluated at Joydebpur. The seeds were sown on December 24, 2023, in a randomized complete block design with three replications, using a plot size of 2 rows by 4 meters long, with 40 cm spacing between rows and 15 cm between plants. Fertilizers were applied at 10:70:50:30:4:2 kg/ha of NPKSZnB, and proper intercultural practices were implemented. Data on days to first flowering, days to maturity, and pod yield per plot were collected, with additional measurements for mature pods per plant, 100-kernel weight, and shelling percentage taken from 5 randomly selected plants per plot. Pod yield per plot was converted to yield per hectare. ICGV 94365 recorded the highest shelling percentage at 75%. For pod yield, ICGV 983715 achieved the highest yield of 2700 kg/ha, followed by ICGV 88409 (2556 kg/ha), ICGV 93382 (2496 kg/ha), BDGV 7112-4-2-1 (2443 kg/ha), ICGV 94366

(2420 kg/ha), ICGV 94347 (2373 kg/ha), and ICGV 94062 (2266 kg/ha). These genotypes outperformed the check variety BARI Chinabadam-8 by 21%, 14%, 12%, 9%, 8%, 6%, and 1%, respectively. The genotype ICGV 983715 also had the highest number of mature pods per plant (28), while ICGV 87055 had the highest 100-kernel weight (62 g). Based on these results, the genotypes ICGV 983715, ICGV 88409, ICGV 93382, BDGV 7112-4-2-1, ICGV 94366, ICGV 94347, and ICGV 94062 have been selected for the Preliminary Yield Trial.

Preliminary yield trial of groundnut(set-i)

K C Saha and M S Uddin

During the rabi season of 2023-2024, 20 genotypes, including the checks Dhaka-1 and BARI Chinabadam-8, were evaluated at Joydebpur. The seeds were sown on December 23, 2023, in a randomized complete block design with three replications. Each plot consisted of 6 rows, 4 meters long, with row and plant spacings of 40 cm and 15 cm, respectively. Fertilizers were applied at 10:70:50:30:4:2 kg/ha of NPKSZnB, and appropriate intercultural practices were maintained. Data on days to first flowering, days to maturity, pod yield per plot, and other yield-related traits were collected and analyzed statistically. The genotypes ISD 1314, ICGV 92229, and ICGV 01105 showed the highest shelling percentage at 71%. The top pod yields were achieved by BDGN 14 (2793 kg/ha), TG 51 Bom 15 (2630 kg/ha), BDGV 9112-2-1-2 (2546 kg/ha), ICGV 92229 (2530 kg/ha), ICGV 3479 (2436 kg/ha), ICGV 9118 (2390 kg/ha), JL-24 (2380 kg/ha), and TG 37115 (2363 kg/ha), surpassing the check variety BARI Chinabadam-8 by 25%, 17%, 14%, 13%, 9%, 7%, 6%, and 5%, respectively. BDGN 14 also had the highest number of mature pods per plant (31), while ICGV F3-5 had the highest 100-kernel weight (59 g). Based on these results, the genotypes BDGN 14, TG 51 Bom 15, BDGV 9112-2-1-2, ICGV 92229, ICGV 3479, ICGV 9118, JL-24, and TG 37115 have been selected for the Regional Yield Trial.

Preliminary yield trial of groundnut(set-ii)

K C Saha and M S Uddin

During the rabi season of 2023-2024, 19 genotypes, including the checks Dhaka-1 and BARI Chinabadam-8, were evaluated at Joydebpur. Seeds

were sown on December 24, 2023, in a randomized complete block design with three replications. Each plot consisted of 6 rows, 4 meters long, with row and plant spacings of 40 cm and 15 cm, respectively. Fertilizers were applied at 10:70:50:30:4:2 kg/ha of NPKSZnB. Data on days to first flowering, days to maturity, pod yield per plot, and yield-contributing traits such as the number of mature pods per plant, 100-kernel weight, and shelling percentage were collected and analyzed statistically. The highest pod yield was observed in ICGV 88388 (2760 kg/ha), followed by TMV-2 (2706 kg/ha), ICGV 92269 (2673 kg/ha), SM-14 (2616 kg/ha), ICGV 4514 (2590 kg/ha), Mahshwa (2553 kg/ha), Beijing-3 (2440 kg/ha), ICGV 864017 (2406 kg/ha), and BDGV 9112-2-1-1 (2333 kg/ha), all significantly outperforming the check variety BARI Chinabadam-8. The highest 100-kernel weights were recorded for ICGV 93471 (62 g), ICGV 1352 (61 g), SM-14 (61 g), and ICGV 07406 (61 g). Maximum mature pods per plant were observed in ICGV 88388 (29). Based on bold seeds, high pod yield, and duration, the following nine genotypes—ICGV 88388, TMV-2, ICGV 92269, SM-14, ICGV 4514, Mahshwa, Beijing-3, ICGV 864017, and BDGV 9112-2-1-1—have been selected for the Regional Yield Trial.

Regional yield trial of groundnut (Set-I)

K C Saha and M S Uddin

During the Rabi season of 2023-24, seventeen groundnut genotypes, including two checks (Dhaka-1 and BARI Chinabadam-8), were evaluated at Joydebpur to identify promising lines with desirable traits. The experiment was laid out in a randomized complete block design with three replications, and seeds were sown on December 23, 2023. Each plot consisted of 6 rows, 4 meters long, with row and plant spacings of 40 cm and 15 cm, respectively. Fertilizers were applied at a rate of 10:70:50:30:4:2 kg/ha of NPKSZnB. Intercultural operations were performed as needed to ensure optimal plant growth. Data on days to first flowering, days to maturity, and pod yield per plot were recorded. Additional yield-contributing traits such as the number of mature pods per plant, 100-kernel weight, and shelling percentage were assessed from five randomly selected plants per plot. Pod yield per plot was converted to pod yield per hectare, and the data were statistically analyzed. The highest pod yield was achieved by the

genotype 702-6-2-1 (2773 kg/ha), followed closely by Jhaldhaka (2766 kg/ha), PK-1 (2736 kg/ha), 14-403 (2650 kg/ha), ICGV SL-1 (2630 kg/ha), ICGV 38-3 (2493 kg/ha), 6112-6-1 (2336 kg/ha), and 14-103 (2230 kg/ha). These yields were 31%, 30%, 29%, 25%, 24%, 17%, 10%, and 5% higher, respectively, compared to the check variety BARI Chinabadam-8 (2123 kg/ha). Significant variation was observed among genotypes for all traits except shelling percentage. The number of mature pods per plant was highest in genotype 702-6-2-1 (32 pods), while the shelling percentage was highest in Golachipa (73%). The hundred kernel weight varied between 46 and 64 grams. Based on performance, five genotypes—702-6-2-1, Jhaldhaka, PK-1, 14-403, and ICGV SL-1—were selected for the Adaptive Trial.

Regional yield trial of groundnut (Set-II)

K C Saha and M S Uddin

The experiment, conducted at Joydebpur during the Rabi season of 2023-24, included 15 selected groundnut lines alongside three check varieties: Dhaka-1, BINA Chinabadam-4, and BARI Chinabadam-8. The trial was arranged in a Randomized Complete Block Design with three replications. Seeds were sown on December 23, 2023, in plots measuring 4m x 2.4m, with a spacing of 15 cm between seeds and 40 cm between rows. Fertilizers were applied according to the recommended doses of 10:70:50:30:4:2 kg/ha for N, P, K, S, Zn, and B, respectively. Half of the urea and all other fertilizers were applied during final land preparation, with the remaining urea applied at the peg development stage. Timely intercultural operations ensured uniform crop growth. Data collected included days to first flowering, days to maturity, and pod yield per plot, while additional yield-contributing traits such as the number of mature pods per plant, 100-kernel weight, and shelling percentage were recorded from five randomly selected plants per plot. Pod yield per plot was converted to pod yield per hectare, and the data were analyzed statistically. The highest pod yield was achieved by the genotype ISD 3814 (2756 kg/ha), followed by TG-51 (2670 kg/ha), 14-203 (2656 kg/ha), ICGV 02841 (2643 kg/ha), and ICGV 35-1 (2643 kg/ha). These genotypes were selected for the Adaptive Trial. Significant variation was observed among genotypes for all traits except shelling percentage. The maturity

duration ranged from 140 to 147 days, with the highest number of mature pods per plant (35) recorded in ISD 3814. Hundred kernel weight ranged from 45 to 62 grams, and the highest shelling percentage (73%) was noted in both 14-203 and ISD 4114. Compared to the check variety BARI Chinabadam-8, the selected genotypes showed pod yields 9%, 6%, 5%, 4%, 4%, and 1% higher, respectively.

Disease Management

Evaluation of different group of commercial fungicides against tikka (leaf spot) and rust disease of groundnut (*arachis hypogaea*)

K. Jahan, N, Sultana, R. Islam, S. Akhtar, Mme. Rahman

A field trial was conducted at the Oilseed Research Centre (ORC), BARI, Gazipur during the 2023-24 season to assess the effectiveness of various fungicides against Tikka (leaf spot) disease in groundnut, using the variety “Dhaka-1.” Nine fungicides were tested: Score, Nativo, Folicure, Tilt, Autostin, Rovral, Amister Top, Tip Off, and Ridomil. Each fungicide was applied three times at 15-day intervals, starting at the onset of symptoms, in a randomized complete block design with three replications. Plots measured 3m x 1.6m with 40x10 cm spacing. Fungicides were applied at 0.1% concentration for Tilt, Amister Top, Tip Off, Folicure, and Score, and 0.2% for Rovral, Nativo, Autostin, and Ridomil. A control was included for comparison. Disease severity was assessed by recording Percent Disease Severity (PDS) from 25 randomly selected leaves per plot. Additional data were collected on plant height, number of branches per plant, number of mature pods per plant, and pod weight per five plants. Amister Top (T7) showed the lowest PDS at 18.48%, achieving a 74.60% reduction in disease severity compared to the control (T10), which had a PDS of 72.76%. Other effective fungicides included Ridomil (T9), Tilt (T4), and Nativo (T2), with reductions of 67.92%, 68.03%, and 66.75%, respectively. In terms of yield, Amister Top also had the highest pod weight (70 g per five plants), followed by Autostin (T5) and Rovral (T6). The number of mature pods per plant ranged from 14.53 to 27.12, with no significant differences in plant height (41.77 to 46 cm) or number of branches per plant (4.80 to 5.90). Overall, all fungicides significantly reduced Tikka

leaf spot compared to the control. Amister Top, Tilt, Ridomil, and Nativo were particularly effective, with Amister Top demonstrating the best performance in disease control and yield enhancement. These results recommend Amister Top, Tilt, and Ridomil for managing Tikka leaf spot disease in groundnut to maximize yield.

Screening of groundnut varieties/lines against tikka, rust and other soil borne diseases

K. Jahan, N, Sultana, R. Islam, S. Akhtar, Mme. Rahman

An experiment conducted at ORC, BARI, Gazipur during the Rabi 2023-24 season assessed 35 groundnut entries for resistance to fungal leaf spot caused by *Cercospora arachidicola* and *Cercosporidium personatum* and rust disease. The evaluation, performed under natural epiphytotic conditions, used the infector row method with a spacing of 30 cm x 5 cm, and disease severity was recorded using ‘0-5’ and ‘0-9’ scales for leaf spot and rust, respectively. The results indicated that none of the tested entries were immune or resistant to leaf spot disease. Of the 35 varieties/lines, 22 were classified as moderately resistant (MR) and 13 as moderately susceptible (MS) to leaf spot. Specifically, varieties such as ISD-91068, PK-1, and ICGV 09516 were moderately susceptible, while ISD-94323, ICGV-95090, and BARI Chinabadam-6 showed moderately resistant reactions. Rust disease caused by *Puccinia arachidis* was not significant this year. The absence of resistant varieties highlights the need for further research to identify and develop resistant or moderately resistant groundnut lines to better manage leaf spot disease.

Insect Management

Development of a management approach against major insect pests of groundnut

M.A. Islam, A. Samiha and R. Islam

The experiment was conducted at the Oilseed Research Centre, BARI, Gazipur, during the Rabi season of 2023-24 to develop effective management strategies against major insect pests of groundnut. The study included six treatments: T1 (White sticky trap + Spinetoram), T2 (White sticky trap + Bio-chamak), T3 (White sticky trap + Chlorfenapyr + Emamectin benzoate), T4 (White

sticky trap + Spinosad), T5 (Chlorpyrifos + Cypermethrin), and T6 as the untreated control. Groundnut seeds (BARI Chinabadam-9) were sown on January 1, 2024, using a randomized complete block design with three replications. The unit plot size was 5.0 m x 4.0 m, with 1.0 m spacing between plots and 30 cm between rows. Pest counts for whiteflies, jassids, thrips, leaf rollers, and hairy caterpillars were recorded at seven-day intervals. Results indicated the highest populations of whiteflies, jassids, and thrips in untreated control plots, while T5 showed the lowest. Specifically, the number of whiteflies per leaf ranged from 0.92 to 4.88, with the highest in control plots. The number of leaf rollers and hairy caterpillars per 10 plants was statistically similar across treated plots but significantly lower than in the untreated control. The highest yield was observed in T5 at 2.23 t/ha, compared to 1.35 t/ha in the control. The marginal cost-benefit ratio (MBCR) was highest for T5 at 6.30, with a gross return of Tk 133,800. In conclusion, T5 (Nitro 505 EC) and T3 (Chlorfenapyr + Emamectin benzoate) were the most effective treatments, achieving higher yields and MBCRs. The experiment will be repeated next year for further investigation.

D. Soybean (*Glycine max* L.)

Soybean (*Glycine max*), native to East Asia, is a legume primarily cultivated for its edible beans, classified as an oilseed by the UN Food and Agricultural Organization (FAO). It belongs to the genus *Glycine*, which includes the subgenus *Soja* (containing both the cultivated soybean and its wild ancestor, *Glycine soja*) and the subgenus *Glycine*, which comprises wild perennials. Soybean is a key global crop, ranking fourth in production volume and leading among oilseeds. Its seeds are rich in protein (42-45%) and edible oil (20-22%). In Bangladesh, soybean is gaining popularity, particularly for its oil, which is increasingly used for cooking, though traditional methods of oil extraction are still being developed. The crop's seeds are also utilized in the feed industry and for producing various food items such as soy milk, soy cakes, and soy biscuits. The introduction of soybean to Bangladesh's sub-tropical climate presents challenges like seed longevity issues, altered growth rates due to changes in photoperiod, and various biotic and abiotic stresses. To address these, experiments are being conducted to develop

high-yielding varieties that are resistant or tolerant to yellow mosaic virus (YMV) and possess other desirable traits.

Maintenance and evaluation of soybean germplasm

U. Kulsum, M Shalim Uddin, Md. Nazrul Islam

A total of 114 soybean germplasm lines, along with three check varieties (BARI Soybean-5, BARI Soybean-6, and BARI Soybean-7), were evaluated in an augmented design at Gazipur, BARI. The experimental layout comprised five blocks, each with twenty-seven plots. Seeds were sown on January 21, 2024, in three rows per plot, each 4 meters long, with 40 cm spacing between rows. Fertilizers were applied at rates of 55 kg/ha Urea, 165 kg/ha TSP, 110 kg/ha MP, 100 kg/ha Gypsum, and 9 kg/ha Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation, with the remaining Urea top-dressed before flowering. Irrigation and intercultural operations were conducted as needed. Data were analyzed using R and Microsoft Excel. Descriptive statistics for yield-contributing traits were summarized, including means, standard errors, standard deviations, minimums, maximums, and coefficients of variation (CV). The range of traits was as follows: days to flowering (51 to 74 days), days to maturity (95 to 136 days), plant height (21 to 80.6 cm), root length (7.2 to 16.9 cm), pod length (2.2 to 10.4 cm), pods per plant (15 to 88), hundred-seed weight (5 to 18 g), and seed yield (523.8 to 2738.1 kg/ha). The highest CV was observed for seed yield (30%), followed by pods per plant (27%) and hundred-seed weight (21%). The lowest CV was for days to maturity (6%). The highest standard error was recorded for seed yield (44.4), while the lowest were for pod length (0.1) and root length (0.2). Seeds from five healthy, disease-free, vigorous plants of each germplasm were collected to maintain purity for future breeding programs. Germplasm showing higher variability in seed yield and pods per plant are identified as promising for soybean improvement. These selected genotypes will be valuable for enhancing soybean grain yield in future breeding efforts.

Hybridization in soybean and confirmation of F1 generation

U. Kulsum, Antara Samiha and M Shalim Uddin

BARI developed several popular soybean varieties including Shohag, Bangladesh Soybean-4, BARI Soybean-5, BARI Soybean-6, and BARI Soybean-7, along with advanced lines such as Richmond, ST-1, Australia-1, MTD-453, and other varieties BINA Soybean2 and BU Soybean2 for hybridization. During the kharif season of 2023, 501 buds from these varieties were crossed in 27 combinations, resulting in 136 pods and 248 seeds. Hybridization was carried out at the ORC net house, with emasculation of immature flowers performed the afternoon before anther dehiscence and pollination done the following morning to maximize seed setting. The F1 seeds from these crosses were sown on January 21, 2024, with each cross planted in a single 4-meter row alongside their parent varieties. Data on final plant stand and seed yield per plant were recorded. Approximately 30% of the single crosses successfully produced pods, while three combinations—Shohag X BINA Soybean2, Bangladesh Soybean-4 X Australia-1, and BARI Soybean-7 X ST-1—failed to set pods. F1 seeds from 24 successful cross combinations were harvested separately and will be stored for planting as F2 generation next season. Hybridity was confirmed through flower color, with purple indicating dominance. Each plant's seeds were preserved for evaluation of the segregating generation in the following season.

Observation trial of soybean

U. Kulsum and M Shalim Uddin

Twelve soybean entries, including the check variety BARI Soybean-6, were assessed at ORC, BARI, for seed yield and related traits during the rabi season of 2023-2024. The study used a randomized complete block design with three replications, with plots consisting of three rows, each 4 meters long and spaced 40 cm apart. Seeds were sown on January 16, 2024. Fertilizers were applied as follows: Urea (55 kg/ha), TSP (165 kg/ha), MP (110 kg/ha), Gypsum (100 kg/ha), and Boric acid (9 kg/ha). Half of the Urea and all other fertilizers were applied during final land preparation, with the remaining Urea applied before flowering. Irrigation and intercultural operations were carried out as needed. Data on days to 50% flowering, days to maturity, final plant stand, and seed yield per plot were collected. Additional yield-related traits were recorded from 10 randomly selected plants per plot, and seed yield was converted to kg/ha. Data were

analyzed using R and Microsoft Excel. Days to flowering ranged from 60 to 64 days, and days to maturity ranged from 97 to 123 days. The highest number of pods per plant was found in VIETKHAI (57), comparable to BD2340 and B2 (54). The hundred seed weight was highest in UDA-69 and BD-60 (13 g). Seed yields varied from 1010 to 1913 kg/ha, with USDA-69 and BD-60 surpassing BARI Soybean-6 by 10% and 2%, respectively. Statistical analysis revealed significant differences ($p < 0.01$) among the entries for all traits. The lowest days to maturity was observed in BR-33 (97 days), while MTD-16, B2, and BS-32 took 123 days, the longest. Plant numbers per square meter ranged from 28 to 39, and plant height varied from 38.9 cm to 50.9 cm. Considering yield and related traits, USDA-69 and BD-60 outperformed the check variety. These two entries will advance to the preliminary yield trial program for the next year.

Preliminary yield trial of soybean

U. Kulsum, M Shalim Uddin, M.M. Bashir

Eight soybean entries, including the check variety BARI Soybean-6, were evaluated at Gazipur and Noakhali during the 2023-2024 season to identify high-yielding varieties with desirable agronomic traits. The study was conducted in a randomized complete block design with three replications at both locations. Each plot consisted of four rows, each 4 meters long, spaced 40 cm apart with 10 cm between plants. Sowing occurred on January 16, 2024, at Gazipur and January 15, 2024, at Noakhali. Fertilizers were applied at the following rates: Urea (55 kg/ha), TSP (165 kg/ha), MP (110 kg/ha), Gypsum (100 kg/ha), and Boric acid (9 kg/ha). Half of the Urea and all other fertilizers were applied during final land preparation, with the remaining Urea top-dressed before flowering. Irrigation and intercultural operations were carried out as needed. Data on days to flowering, days to maturity, final plant stand, and seed yield per plot were collected, with yield-related traits recorded from 10 randomly selected plants per plot. Seed yields were converted to kg/ha, and data were analyzed using R and Microsoft Excel. At Gazipur, Australia-1 had the highest hundred seed weight (15.3 g), while GMOT-13 had the most pods per plant (45). In Noakhali, GMOT-13 yielded the highest (3669.9 kg/ha), whereas Australia-1 led at Gazipur with a yield of 2570.8 kg/ha. GMOT-13, LG-92p-1825, and Australia-1 outperformed BARI

Soybean-6 by 21%, 2%, and 20%, respectively. As this was the initial year of evaluation, results will be confirmed through repetition in the next season. Data from Gazipur revealed highly significant variation for all parameters except plant density. Days to flowering ranged from 58 to 63 days, and maturity from 97 to 122 days. USDA-40 was the shortest in plant height (41.9 cm) and matured in the least time (97 days). GMOT-13 had the highest pods per plant (45), and Australia-1 had the maximum hundred seed weight (15.3 g). Both GMOT-13 and Australia-1 produced yields (2570.8 kg/ha and 2508.3 kg/ha) that were 11% and 8% higher than BARI Soybean-6, respectively, though they were statistically similar. The multi-location trial revealed that GMOT-13 and USDA-40 had the lowest maturity duration (96 days) at both sites. GMOT-13 achieved the highest yield in Noakhali (3669.9 kg/ha), while Australia-1 led at Gazipur (2570.8 kg/ha). GMOT-13, LG-92p-1825, and Australia-1 had average yields 21%, 2%, and 20% higher than BARI Soybean-6. Significant variations in days to maturity and seed yield were observed. Based on these results, GMOT-13, LG-92p-1825, and Australia-1 will be advanced for further trials next year to confirm their performance.

Regional yield trial of soybean

U. Kulsum, M Shalim Uddin, M M H Bhuiyan, M M Hasan Khan

The experiment was conducted at Gazipur, Barishal, and Cumilla during the 2023-2024 season to identify high-yielding soybean entries. Eleven soybean entries, including check varieties BARI Soybean-6 and BU Soybean2, were evaluated using a randomized complete block design with three replications at each location. Each plot comprised six rows, each 4 meters long, with 40 cm row spacing. Sowing took place on January 16, 2024, at Gazipur. Fertilizers were applied at the rates of 55 kg/ha Urea, 165 kg/ha TSP, 110 kg/ha MP, 100 kg/ha Gypsum, and 9 kg/ha Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation, with the remaining Urea top-dressed before flowering. Irrigation and intercultural practices were carried out as needed. Data on days to flowering, days to maturity, plant population at harvest, and seed yield per plot were collected, with additional yield-related traits recorded from 10 randomly selected plants per plot. Seed yields were converted to kg/ha, and data were

analyzed using R and Microsoft Excel. At Gazipur, the number of pods per plant ranged from 23 to 48, and the hundred-seed weight ranged from 8.3 to 15.3 grams. Notably, ST-1, MTD-453, USDA-3, and KADSING yielded 28%, 8%, 19%, and 13% more, respectively, than the check variety BARI Soybean-6. MTD-453 and KADSING also showed superior tolerance to diseases and insects. In the multi-location trial, USDA-72, USDA-3, USDA-4, MTD-453, and KADSING produced yields exceeding 10% more than both check varieties, while Richmond and USDA-53 did not surpass the checks. Significant differences were observed among entries for yield and related traits. Days to flowering ranged from 56 to 65 days. USDA-3 and USDA-4 had the shortest maturity periods at 96 days, while MTD-453 took the longest at 108 days. Richmond was the shortest in plant height (32.9 cm), and USDA-53 was the tallest (55.5 cm). Seed yield ranged from 1098 kg/ha in ST-1 to 2161 kg/ha in BU Soybean2. ST-1, MTD-453, USDA-3, and KADSING out-yielded BARI Soybean-6 by 28%, 8%, 19%, and 13%, respectively. The average seed yield across the three locations ranged from 1515 to 2351 kg/ha. BU Soybean2 and MTD-453 were among the boldest seeded entries, both with a hundred-seed weight of 15 grams. USDA-72, USDA-3, USDA-4, MTD-453, and KADSING consistently performed better than the check varieties, showing significant yield advantages. The trial will be repeated next year to further validate these results.

Maintenance of released variety and advanced lines of soybean

U Kulsum

During the rabi season of 2024, five BARI-released soybean varieties and four advanced lines were cultivated at ORC, BARI, Gazipur to ensure genetic purity. The seed production yielded 7 kg of Shohag, 11 kg of Bangladesh Soybean-4, 10 kg of BARI Soybean-5, 32 kg of BARI Soybean-6, and 117 kg of BARI Soybean-7. Additionally, 9 kg of ST-1, 14 kg of MTD-453, 5 kg of Richmond, and 5 kg of Australia-1 were produced. To maintain genetic purity, the varieties and lines were grown separately, with off-type plants being removed. Selected plants were evaluated for genetic purity, uniformity, and distinctness. The seeds were then threshed, dried, cleaned, and stored for future use. The breeder seeds from these varieties will be

utilized to preserve varietal purity, while the seeds from the advanced lines will be employed in ongoing breeding programs.

Adaptive trial of advanced line of soybean in bhola

G Nazmul Hasan

The experiment conducted at Bhola Sadar in AEZ-18 during the rabi season of 2023-2024 aimed to identify suitable soybean varieties for the region and enhance production and farmer income. Five soybean varieties, including MTD-459, ST-1, USDA-72, BARI Soybean-6, and BU Soybean-2, were tested at farmer's fields. Seeds were sown on January 16, 2024, with a seeding rate of 60 kg/ha. Fertilizers were applied at 30-30-50-7.5 kg/ha of N-P-K-S as a basal application. Weeding was performed once, 28-30 days after sowing, and the crop was harvested between May 16-23, 2024. Pest issues included leaf-feeding caterpillars and pod borers, which were controlled by two applications of Volume Flexi, spaced 10-12 days apart. No other significant pest or disease problems were reported. Among the tested varieties, ST-1 yielded the highest at 1.90 t/ha, followed by BARI Soybean-6 with 1.78 t/ha, while BU Soybean-2 produced the lowest yield at 1.34 t/ha. The variety USDA-72 had the tallest plants (60.23 cm) and the highest number of branches per plant (6.73), with a significant number of pods per plant (116.8). BARI Soybean-6 achieved the highest 1000-seed weight (96.24 g). Despite the lack of significant differences in some yield-contributing traits, ST-1 and BARI Soybean-6 showed statistically similar seed yields. The study indicates a growing interest in soybean cultivation in Bhola, suggesting a promising opportunity for disseminating BARI-developed soybean varieties. An upscaling program is recommended to further promote these varieties in the region.

Adaptive trial of advanced lines of soybean

M.M. Bashir and M. S. Islam

The experiment, conducted in Noakhali and Lakshmipur during the rabi season of 2023-2024, aimed to identify suitable soybean varieties for saline-affected char lands under rainfed conditions. The study utilized a Randomized Complete Block (RCB) design with six replications across sandy clay loam to silty clay loam soils of the Young Meghna Estuarine Flood Plain (AEZ 18). Five soybean lines/varieties were tested: MTD-453, ST-

1, USDA-72, BU Soybean-2, and BARI Soybean-6 as checks. The unit plot size was 4m × 2.4m, with sowing done at a rate of 50 kg/ha from January 15-18, 2024, and spacing of 40 × 10 cm. Fertilizers were applied at 25-33-55-18 kg/ha of N-P-K-S, with urea split applied during the first and second weeding (24 and 39 days after sowing). The crop was weeded thrice, with Ripcord 10 EC used twice for insect control. Harvesting took place from April 28-30, 2024. Data on yield and contributing factors were analyzed using Statistix10 software. BU Soybean-2 achieved the highest seed yield at 2.68 t/ha, closely followed by ST-1 at 2.57 t/ha, and MTD-453 at 2.46 t/ha. BARI Soybean-6 produced the lowest yield at 1.76 t/ha. BU Soybean-2 also resulted in the highest gross return (TK. 160,800/ha), gross margin (TK. 114,850/ha), and benefit-cost ratio (3.50). Data presents significant variations among the tested varieties for various traits, except plant height and seeds per pod. USDA-72 had the tallest plants (73.18 cm) and the highest number of branches per plant (3.67), while BU Soybean-2 was the shortest (68.10 cm) and had the lowest number of branches per plant (3.03). ST-1 had the highest plant density (25.2 plants/m²), whereas BU Soybean-2 had the lowest (16.5 plants/m²). USDA-72 also had the highest number of pods per plant (77). ST-1 required the most days to mature (106 days), while BU Soybean-2, BARI Soybean-6, and USDA-72 matured in the fewest days (104 days). BU Soybean-2 had the highest hundred-seed weight (14.49 g), while USDA-72 had the lowest (8.07 g). The highest yielding variety, BU Soybean-2, produced the highest gross return and benefit-cost ratio, with a yield of 3.50 t/ha. ST-1 also showed high performance with 3.36 t/ha. The experiment suggests the need for further trials across different soil types and locations, as well as varied sowing times, to better determine the most suitable soybean varieties for char land areas.

Adaptive trial of advanced line/varieties of soybean in chandpur

M. Jamal Uddin, U Kulsum and M. Shalim Uddin

The adaptive trial conducted during the Rabi season of 2023-24 in Dakkin Gobindia, Hanarchar, Chandpur Sadar Upazila, aimed to evaluate soybean varieties and advanced lines for their suitability in the region. The trial featured two established soybean varieties, BARI Soybean-6 and BU Soybean-2, alongside three promising

advanced lines: MTD-453, ST-1, and USDA-72. The experiment was set up in sandy loam soil with rows spaced 40 cm apart and plants 10 cm apart. Seeds were treated with Provax-200 and sown at a rate of 50 kg/ha on January 14, 2024. Fertilizers were applied at 55 kg/ha of urea, 165 kg/ha of triple super phosphate, 110 kg/ha of muriate of potash, 100 kg/ha of gypsum, and 9 kg/ha of boric acid. Half of the urea was applied during land preparation, with the remaining half top-dressed before flowering. The trial did not require irrigation, and weeding was performed twice at 25 and 50 days after sowing. Harvesting occurred between April 24 and May 10, 2024. Data on plant population, field duration, plant height, days to maturity, root length, number of branches per plant, pods per plant, seeds per pod, and seed yield were recorded and converted to tons per hectare. Seed moisture was adjusted to 8-9%, and pesticides (Autostin and Virtako) were used to control leaf roller and root rot. MTD-453 achieved the highest seed yield at 2,770 kg/ha, followed by ST-1 at 2,710 kg/ha. BARI Soybean-6 yielded 2,506 kg/ha, while BU Soybean-2 produced 2,206 kg/ha, and USDA-72 had the lowest yield at 2,310 kg/ha. In terms of plant height, ST-1 reached 79.7 cm, whereas BU Soybean-2 was the shortest at 39.06 cm. ST-1 had the shortest field duration of 100 days, while BU Soybean-2 required 116 days. The number of branches per plant was highest in USDA-72 (5) and lowest in MTD-453 (2) and BU Soybean-2 (3). USDA-72 also produced the most pods per plant (79), compared to 65 pods in BARI Soybean-6. MTD-453 had the fewest pods per plant (36.33), similar to BU Soybean-2 (49.94). MTD-453 had the highest number of seeds per pod (2.74), with BARI Soybean-6 and ST-1 having the lowest at 2.63. The hundred-seed weight was greatest in MTD-453 (15.4 g) and least in BARI Soybean-6 (12.7 g). Overall, MTD-453 and ST-1 demonstrated the highest seed yields, making them promising lines for the region.

Insect Management

Screening of soybean entries against major insect pests under natural field condition

A. Samiha, R. Islam, M. A. Islam

Sixteen soybean entries were evaluated for resistance to major insect pests during the 2023-24 season at the Oilseed Research Centre (ORC),

BARI, Gazipur. The study included 17 entries, with BARI Soybean-7 as the check variety. Seeds were sown on January 15, 2024, in a randomized complete block design (RCB) with three replications, and no insecticides were applied. Visual assessments of foliage damage from leaf roller, pod borer, common cutworm, and hairy caterpillar were conducted on five randomly selected plants from each entry every ten days, from the first week of February to mid-April, across various growth stages. Pest infestations were most severe during the vegetative, flowering, and pod formation stages. The lowest leaf roller infestation was recorded in Kush-2004 (6.8%), similar to Shohag-1 (7.5%) and ST-1 (8.3%). Shohag-1 also exhibited the lowest hairy caterpillar infestation (12.7%), comparable to Kush-2004 (13.3%) and ASSET-93-13 (13.7%). Additionally, the lowest cutworm infestation was in Shohag-1 (9.1%), similar to ASSET-93-13 (10.7%). The highest pod borer infestation was found in entry 86017-66-6 (3%), but all entries demonstrated some resistance. Kush-2004 produced the highest pod yield, statistically similar to Shohag-1, ST-1, BARI Soybean-5, and ASSET-93-13. Overall, the entries Shohag-1, Kush-2004, ASSET-93-13, and ST-1 exhibited lower pest infestations and better performance, making them suitable candidates for further breeding programs aimed at developing insect-resistant soybean varieties.

E. Sunflower (*Helianthus annuus* L.)

Sunflower is a significant minor oilseed crop in Bangladesh, known for its oil's high content of essential fatty acids, such as linoleic and linolenic acids, which surpass those found in rapeseed and mustard oils. Due to its photo-insensitive nature, sunflower can be cultivated throughout the year, but the rabi (winter) season is ideal for its production. This crop is particularly well-suited for cultivation following the harvest of T. aman rice, especially in the southern districts of the country. The Oilseed Research Centre, BARI has developed three composite sunflower varieties: Kironi, BARI Surjomukhi-2, and BARI Surjomukhi-3. While Kironi and BARI Surjomukhi-2 are tall varieties, they are prone to lodging, which limits their adoption among farmers. In response, BARI Surjomukhi-3, a dwarf variety, has been introduced to address this issue. However, there remains a need to develop high-yielding dwarf synthetic and

hybrid sunflower varieties. In light of these needs, the following experiments have been undertaken to advance sunflower cultivation and address existing challenges.

Maintenance & evaluation of sunflower germplasm

S. H. Habib and Md. Nazrul Islam

During the rabi season of 2023-2024, forty-three sunflower genotypes were cultivated at the Oilseed Research Centre, BARI, Gazipur. To preserve heterozygosity, five plants from each genotype were intermated. At maturity, these plants were harvested, bulked, and will be grown in the following season to maintain the germplasm. Additionally, four hybrids were evaluated alongside two check varieties, BARI Surjamukhi-2 and BARI Surjamukhi-3. Bulk seeds from each hybrid were collected and stored for future evaluation. The experiment began on 15 November 2023, with forty-three sunflower accessions, four hybrids, and the check varieties planted in the ORC, BARI Gazipur research field. The plots consisted of two rows, each 4 meters long, with row and plant spacing set at 50 cm and 25 cm, respectively. Fertilization was carried out using a blend of Urea, TSP, MP, Gypsum, Zinc sulfate, and Boric acid, applied at rates of 90:35:75:30:3:2.5 kg/ha. Half of the Urea and other fertilizers were applied during final land preparation, while the remaining Urea was applied as a top dressing during the flower primordial stage. Pollen from each plot was collected and used for intra-genotypic crossing, with proper bagging to prevent outcrossing. Other necessary intercultural operations were performed to ensure optimal plant growth. The maintenance and seed production of sunflower germplasm are summarized in Table 1, detailing the harvest of five healthy, disease-free plants per entry. These seeds will be used to rejuvenate the germplasm for the next season and contribute to future breeding programs. Evaluation of sunflower hybrids from various sources showed that they took longer to mature and yielded less compared to the check varieties BARI Surjamukhi-2 and BARI Surjamukhi-3 (Table 2). Despite this, the sunflower germplasm remains a valuable resource for developing synthetic, composite, or hybrid sunflower varieties, and the newly collected

hybrids will serve as a foundation for hybrid development in Bangladesh.

Preliminary yield trial of sunflower

S. H. Habib, U. Kulsum, Md Nazrul Islam, Md. M. Ali, Md Jamal Uddin. Md Shahriar Kobir & M. R. Humauan

In the Rabi season of 2023-24, ten sunflower genotypes, along with three check varieties—BARI Surjamukhi-2, BARI Surjamukhi-3, and Hysun-33—were evaluated across four locations: Joydebpur, Cumilla, Jessor, and Ishurdi. The evaluation aimed to assess yield and yield-contributing traits. Seeds were sown at Joydebpur on 15 November 2023, and experiments were conducted in a randomized complete block (RCB) design with three replications. Each plot consisted of six rows, each 4 meters long, with 50 cm row spacing and 25 cm plant spacing. Fertilizers were applied at rates of 90:35:80:30:3.6 and 1.8 kg/ha of NPKSZnB, respectively. Half of the Urea and other fertilizers were applied during final land preparation, while the remaining Urea was top-dressed during the flower primordial stage. Intercultural operations were performed as needed for optimal plant growth. Data on days to flowering, days to maturity, and seed yield were recorded, and seed yield was converted to tons per hectare. Among the genotypes, Syn-3 exhibited a yield comparable to BARI Surjamukhi-2 (2.36 t/ha vs. 2.38 t/ha), but Hysun-33 achieved the highest yield of 2.98 t/ha. Significant differences were observed among genotypes for most traits at different locations. The genotype S7GP04017 was noted for its dwarf stature (95 cm) at the Gazipur location. Hysun-33 required the longest maturation period (105-127 days) and reached the tallest height (166-223 cm), whereas many other genotypes were characterized as dwarf to medium dwarf. Despite the performance of some genotypes being comparable to local checks in terms of yield attributes, none surpassed the hybrid variety Hysun-33. To develop a sunflower variety that meets desired traits such as high yield potential, short growth duration, and dwarf stature, consistency across different locations is crucial. The tested genotypes did not consistently exhibit these characteristics or outperform the check varieties. Therefore, repeating the trial next

season is recommended to further evaluate and select suitable genotypes.

Screening and evaluation of m₇ mutant's family created by gamma radiation

S H Habib and U Kulsum

Gamma radiation-treated M₆ seeds of the BARI Surjamukhi-2 sunflower variety were used to develop suitable mutant varieties. In the M₇ generation, 170 sub-families from various groups were selected. Each group of plants was harvested and preserved as distinct families. These family mutants will be cultivated and assessed in the upcoming rabi season. The M₇ seeds were sown at the Oilseed Research Centre, BARI Gazipur, on November 28, 2023, using a head-to-row method in 4 m long plots, maintaining 50 cm × 25 cm row and plant spacing. Fertilizers were applied at 90:35:75:30:3:2.5 kg/ha of NPKSZnB, using Urea, TSP, MP, Gypsum, ZnSO₄, and Boric acid. Half of the Urea and other fertilizers were applied during land preparation, with the remaining Urea top-dressed during the flower primordial stage. Plots were covered with nylon nets to prevent outcrossing, and selfing was performed within treatments. The M₆ populations were categorized into very dwarf (<65 cm), dwarf (65-100 cm), medium dwarf (100-120 cm), and tall (120-150 cm) based on plant height. Key traits, including head diameter (>17 cm) and stem girth (>1.5 cm), were noted. Mature heads from each group were harvested and preserved for growing as M₇ family mutants. In the M₇ generation, mutants were evaluated for quantitative traits, with the best plants selected and maintained as family. Selection also considered seed coat color and unusual morphologies, such as multiple leaves and varying stem and head shapes, which might indicate off-target mutations. Key criteria included stem thickness to prevent lodging, short stature, large leaf area, and head diameter, which are important for high yield and lodging resistance. A total of 170 mutant sub-families from seven groups were harvested for further evaluation. These mutants, showing near-homogeneity, will be bulked and grown as progeny in the next rabi season. The harvested mutants offer valuable resources for functional genomics and sunflower cultivar development.

Screening and evaluation of m₅ mutant's family using ems

S H Habib and U Kulsum

M₅ seeds of the BARI Surjamukhi-2 sunflower variety, treated with 0.5% ethyl methane sulfonate (EMS), were evaluated to develop mutant inbred lines. The M₅ generation included selected mutants based on plant height categories—very dwarf, dwarf, medium dwarf, tall, and very tall—as well as those with thick stems, larger heads, and seed coat variations. All desired mutants were harvested separately for cultivation in the next rabi season. The M₆ generation was established by sowing EMS-treated M₅ seeds at the Oilseed Research Centre, BARI Gazipur, on November 27, 2023. Seeds were sown using the head-to-row method in 4 m long plots, with a spacing of 50 cm × 25 cm for rows and plants, respectively. Fertilizers were applied at 90:35:75:30:3:2.5 kg/ha of NPKSZnB—Urea, TSP, MP, Gypsum, ZnSO₄, and Boric acid—following recommended practices. Intercultural operations were conducted to ensure optimal plant growth. Each plot was covered with nylon netting to prevent outcrossing, and heads were self-pollinated by hand. Mutants were categorized into very dwarf (<65 cm), dwarf (65-100 cm), medium dwarf (105-120 cm), tall (120-150 cm), and very tall (>150 cm) based on height. Selection also focused on mutants with large heads (diameter >17 cm), robust stems (diameter >1.5 cm), and varied seed colors. Mature heads from each group were harvested separately for future M₆ family cultivation. The M₅ generation, using 0.5% EMS-treated seeds, yielded mutants that varied in height and characteristics compared to untreated controls. The primary goal was to identify and develop dwarf to medium-height mutants, though some tall mutants were also selected for their vigorous growth and large head size. Key traits such as stem thickness, short stature, leaf area, and head diameter are crucial for high-yielding, lodging-resistant varieties. A total of 72 mutant sub-families were harvested and will be bulked for evaluation in the next rabi season. These mutants are valuable for developing sunflower cultivars with desired traits.

Maintenance and seed increase of dwarf advance lines of sunflower

S H Habib

To ensure genetic purity and boost seed production, 17 dwarf sunflower inbred lines were cultivated at the ORC, BARI research field. At maturity, heads from these lines were harvested, threshed, dried,

and the seeds were cleaned to remove any diseases. The quantity of seeds varied by inbred line and was stored for future use in varietal development programs. For the seed increase of advanced sunflower lines, 17 different lines, listed in Table 1, were grown separately at the ORC research field, BARI, Gazipur during the Rabi season of 2023-24. Most of the lines, except Comp-5 and Syn-3, were sown on 26 November 2023 in plots measuring 8 x 4 meters. The lines Syn-3 and Comp-5 were sown on 14 and 29 November 2023, respectively, in larger plots of 1700 m² and 260 m². Row spacing was maintained at 50 cm, with 25 cm between plants. Fertilizers were applied at rates of 90:35:80:30:3.6 and 1.8 kg/ha of NPKSZn and B, respectively, using urea, TSP, MP, Gypsum, Zinc sulphate, and Boric acid (FRG, 2018). Half of the urea and all other fertilizers were applied during final land preparation, while the remaining urea was top-dressed during the flowering primordial stage. Other necessary intercultural operations were performed to ensure optimal plant growth. Each plot was covered with a nylon net to prevent outcrossing, and plants were manually self-pollinated by rubbing pollen within the same genotype. Upon maturity, heads were harvested, and the seeds were threshed, dried, and cleaned to ensure they were disease-free. The collected seeds were stored, with quantities varying by inbred line. Nucleus seeds will be used to maintain varietal purity, while seeds from advanced lines will be utilized in ongoing breeding programs.

Crop Management

Performance of sunflower varieties in the southern region of Bangladesh

G N Hasan, R H Anik & M Islam

The trial was conducted in Bhola Sadar and Dawlatkhan upazilas during the Rabi season of 2023-24, evaluating four sunflower varieties: BARI Surjamukhi-2, BARI Surjamukhi-3, SYN-33, and Hysun-33, using an RCB design with three replications. Fertilizers were applied at rates of 90-40-75-24-3.5-2 kg ha⁻¹ (N-P-K-S-Zn-B), with urea split across three stages. Seeds were sown between 28 December 2023 and 10 January 2024, and heads were harvested between 10 and 20 April 2024. Data showed Hysun-33 had the tallest plants (192.2 cm), largest head diameter (60.7 cm), highest seed count per head (561), and maximum seed yield (2.13 t

ha⁻¹), outperforming the BARI varieties in yield. BARI Surjamukhi-2 had the highest gross margin (48,100 Tk ha⁻¹) among the BARI varieties, despite Hysun-33 having a higher market value. The total variable cost was 54,500 Tk ha⁻¹ for BARI varieties and 70,000 Tk ha⁻¹ for Hysun-33 due to higher seed prices. Farmers in Bhola preferred BARI Surjamukhi-2 and Hysun-33 for their uniform head size, early maturity, and higher yield potential. Although Hysun-33 gave the highest yield, BARI Surjamukhi-2 showed strong economic viability and could be promoted in farmers' fields.

Performance of sunflower varieties in the southern region of Bangladesh

P. Roy, F. Begum, S. H. Habib, M. M. Karim and M. J. Hussain

A field experiment was conducted at the Oilseed Research Centre, BARI, Gazipur, during the Rabi season of 2023-24 to evaluate the performance of three sunflower varieties—BARI Surjamukhi-2, BARI Surjamukhi-3, Hysun-33—and one advanced line, SYN-33. The experiment was laid out in an RCB design with three replications. Fertilizers were applied at 90-40-75-24-3.5-2 kg ha⁻¹ of N-P-K-S-Zn-B, with half the urea and all other fertilizers applied during final land preparation, and the remaining urea split across 20-25 and 40-45 DAS. Seeds were sown on 26 November 2023, and heads were harvested on 27 March 2024. The highest seed yield was observed in Hysun-33 (1.88 t ha⁻¹), likely due to its highest number of seeds per head (551), while BARI Surjamukhi-2, BARI Surjamukhi-3, and SYN-33 yielded 1.70, 1.55, and 1.52 t ha⁻¹, respectively. Hysun-33 also recorded the tallest plants (187.80 cm) and largest head diameter (13.93 cm), while BARI Surjamukhi-2 had the highest 1000-seed weight (65.10 g). Economic analysis showed that BARI Surjamukhi-2 achieved the highest gross margin (46,500 Tk ha⁻¹) despite Hysun-33's higher market seed price, with total variable costs of 55,500 Tk ha⁻¹ for BARI varieties and 75,000 Tk ha⁻¹ for Hysun-33. Although Hysun-33 yielded more, BARI Surjamukhi-2 offered better economic returns. As this was a first-year trial, repetition is needed for final recommendations.

Performance of sunflower varieties in southern region of Bangladesh

S. Mondal, F. Begum, P. Roy and M. S. U. Khan

A field experiment was conducted at the Agricultural Research Station, Binerpota, Satkhira, during the Rabi season of 2023-2024 to evaluate the performance of sunflower varieties in coastal saline areas. The study included four sunflower varieties: BARI Surjamukhi-2, BARI Surjamukhi-3, the advanced line SYN-33, and Hysun-33. The experiment was laid out in an RCBD with three replications. Fertilizers were applied at 90-35-80-30-4 kg ha⁻¹ of N-P-K-S-Zn, along with 5 t ha⁻¹ of cow dung. Seeds were sown on 17 December 2023 after being treated with Provax-200 WP, and the crop was harvested between 12 March and 6 April 2024. Data showed significant yield variation among the varieties. BARI Surjamukhi-2 produced the highest yield (1,515.80 kg ha⁻¹), attributed to a higher number of seeds per head, while Hysun-33 had the lowest yield (272 kg ha⁻¹). The average soil salinity during the growing period ranged from 1.71 to 3.91 dS m⁻¹. These results suggest that BARI Surjamukhi-2 performed best under saline conditions, but further trials are required to confirm the findings and make a final recommendation.

Effect of two different plant growth regulators on grain filling of sunflower

P. Roy, S. H. Habib, F. Begum and M. M. Karim

A field experiment was conducted at the Oilseed Research Centre, Bangladesh Agricultural Research Institute, Gazipur, during the rabi season of 2023-2024 to evaluate the impact of foliar application of plant growth regulators (PGR) on sunflower seed setting and yield. The study was designed using a Randomized Complete Block Design (Factorial) with three replications. The experiment included two factors: factor A comprised three crop growth stages (S1: vegetative stage, S2: anthesis stage, S3: flowering and anthesis stage), and factor B involved four hormone concentrations (H0: control with distilled water, H1: BA at 150 mg/L, H2: GA at 150 mg/L, H3: BA+GA at 150 mg/L each). The plot size was 3 m × 4 m, and BARI Shurjomukhi-3 seeds were sown on 23 November 2023. Fertilizers were applied at N140P43K81S29Zn3B2 kg/ha, with full doses of TSP, MOP, gypsum, zinc oxide, and boric acid, plus half of the urea broadcasted at land preparation and the remaining half applied at 30 and 55 days after sowing (DAS). Intercultural operations were performed as needed, and yield data were collected and analyzed using R software with LSD test at 5% significance. The results

indicated that foliar application of PGR significantly influenced sunflower seed setting and yield. The highest yield (1.32 t/ha) was achieved with the application of BA (150 mg/L) at the vegetative stage (S1H1), which also resulted in the highest number of seeds per plant (535) and mature seeds per plant (418). The tallest plants (128.25 cm) were observed in the S3H3 treatment, likely due to GA's role in elongating plant internodes, while the shortest plants (98.00 cm) were in the S2H0 treatment. The percentage of mature seeds was highest (79%) with BA (150 mg/L) applied at the vegetative stage, followed by BA+GA (150 mg/L) at the same stage. The lowest yield (1.02 t/ha) was recorded in S3H2 due to lower seed maturity. These findings suggest that BA at 150 mg/L applied during the vegetative stage is effective in enhancing seed maturity and yield, although these results are preliminary and should be validated in subsequent experiments for final recommendations.

Intercropping red amaranth and spinach with sunflower at different row arrangement

P. Roy, F. Begum, M. M. Karim and M. J. Hussain

A field experiment was conducted at the Oilseed Research Centre, BARI, Gazipur during the rabi season of 2023-2024 to evaluate optimal row arrangements for intercropping red amaranth and spinach with sunflower. The experiment, designed as a Randomized Complete Block Design with nine treatments, aimed to maximize productivity and economic return. Treatments included sole crops (sunflower, red amaranth, and spinach) and various intercropping configurations. The unit plot size was 4 m × 5 m. Sunflower (BARI Sunflower-3), spinach (BARI Palongshak-1), and red amaranth (BARI Lalshak-1) were sown on November 23, 2023. Fertilizers were applied at N88P34K80S28Zn3B2 kg/ha. Intercultural operations were performed as needed, and vegetables were harvested 35 to 40 days after sowing. Data were analyzed using R software with LSD test at 5% significance. Results showed that while intercropping generally reduced sunflower yield, total productivity increased due to additional yields from red amaranth and spinach. The highest sunflower equivalent yield (SEY) was 2.36 t/ha for sole spinach (T9), followed by 2.30 t/ha for one row of spinach between two rows of sunflower (T5). Sole sunflower (T1) had the lowest SEY at 1.64 t/ha. The highest benefit-cost ratio (BCR) of 1.28 was

achieved with T5, yielding a gross margin of Tk. 23,000/ha. For individual crops, red amaranth yield was highest (9.60 t/ha) in sole cropping (T8), while the lowest (6.10 t/ha) was in T4 (broadcast red amaranth). Spinach yield was highest (36.2 t/ha) in sole cropping (T9) and lowest (30.3 t/ha) in T7 (broadcast spinach), likely due to lower plant density. Economically, T5 (one row of spinach between two rows of sunflower) provided the highest gross return (Tk. 115,000/ha) and T9 (sole spinach) had the highest gross margin (Tk. 38,000/ha). T4 (broadcast red amaranth) had the lowest gross margin (Tk. 1,000/ha), and T1 (sole sunflower) had the lowest gross return (Tk. 82,000/ha). Overall, intercropping one row of spinach between two rows of sunflower was found to be both agronomically feasible and economically advantageous.

Study on branching behavior of sunflower variety under different growing conditions

P. Roy, S. H. Habib, F. Begum and M. J. Hussain

The experiment conducted at the Oilseed Research Centre, BARI, Gazipur during the rabi seasons of 2022-23 and 2023-24 evaluated the branching behavior and yield of sunflower variety BARI Surjamukhi-3 under various stress conditions. Utilizing a randomized complete block design with seven treatments, including a control, the study investigated the effects of transplanting 15-day-old seedlings, sowing seeds from branching plants, and different irrigation timings (none, vegetative stage, flowering stage, seed development stage). Results showed that the tallest plants (95.80 cm) were in the no-irrigation treatment, similar to those where seeds from branching plants were sown. The maximum branching (11 branches per plant) occurred with transplanted seedlings, while the highest yield (1.76 t/ha) was achieved from seeds of branching plants. The lowest yield (1.19 t/ha) was observed with 15-day-old seedlings transplanted. These findings indicate that sunflower (BARI Surjamukhi-3) can benefit from stress conditions such as transplanting and intermittent irrigation, which enhance branching and increase yield, suggesting that careful management of stress conditions can optimize sunflower production.

Effect of foliar application of boron on seed setting and yield of sunflower

P. Roy, S. H. Habib, F. Begum, M. M. Karim and M. J. Hussain

A field experiment was conducted at the Oilseed Research Centre, BARI, Gazipur during the rabi season of 2023-2024 to assess the impact of foliar boron application on sunflower seed setting and yield. The experiment, designed as a Randomized Complete Block Design (Factorial) with three replications, involved two factors: growth stages (S1: vegetative, S2: anthesis, S3: flowering and anthesis) and boron concentrations (B0: control, B1: 50 mg/L, B2: 100 mg/L, B3: 150 mg/L). The plot size was 3m x 4m, and BARI Sunflower-3 seeds were sown on November 23, 2023. Fertilization was applied at N140P43K81S29Zn3 kg ha⁻¹, using a combination of urea, TSP, MOP, gypsum, and zinc oxide. Boric acid and other fertilizers were applied at land preparation, with half of the urea applied at 30 and 55 days after sowing. Intercultural operations were performed as needed, and yield data were collected at harvest. Statistical analysis was conducted using R software, with means adjusted by the LSD test at a 5% significance level. Results showed that a 150 mg/L foliar boron application at both the vegetative and anthesis stages significantly increased mature seeds per head, seed weight, and yield. Boron application led to a higher percentage of mature seeds and fewer immature seeds. This suggests that boron deficiency contributes to seed sterility in sunflowers. The study revealed that foliar boron application had significant effects on seed yield and related attributes. Parameters like days to flowering, maturity, plant height, and head diameter did not show significant differences. The longest plants were in the S1B3 treatment, while the shortest were in the S1B2 treatment. The S3B3 treatment yielded the highest 1000-seed weight (79.0 g) and yield (1.83 t ha⁻¹), whereas the lowest yield (1.58 t ha⁻¹) was observed in S1B2, likely due to a higher number of immature seeds and lower 1000-seed weight (62.1 g). The results align with Al-Amery et al. (2011), who noted that boron can enhance seed yield by reducing sterility. This first-year experiment suggests that applying 150 mg/L boron at vegetative and anthesis stages improves sunflower yield. Further experimentation next year with possibly higher boron doses is recommended to confirm and refine these findings.

Effects of irrigation scheduling on growth and yield of sunflower in barishal region

M. A. Rahman, F. Begum, M. M. Rahman, P. Roy, M. M. Karim and M. J. Hussain

A field trial conducted at RARS, BARI, Rahmatpur, Barishal during the 2023-24 season assessed the impact of various irrigation regimes on sunflower growth and yield. The study, performed in the Ganges Tidal Floodplain (AEZ-13) with clayey loam soil and a subtropical monsoon climate, utilized eight irrigation treatments: I0 (no irrigation), I1 (35 DAE), I2 (55 DAE), I3 (75 DAE), I4 (35 + 55 DAE), I5 (35 + 75 DAE), I6 (55 + 75 DAE), and I7 (35 + 55 + 75 DAE). The experiment employed a Randomized Complete Block (RCB) design with plots of 6×5 m² and line sowing with 60 cm row spacing and 25 cm plant spacing. The crop was fertilized with a combination of N-P-K-S-Mg-Zn-Bo, and cow dung. Results showed that treatment I3, with irrigation at 75 DAE, achieved the highest plant population (7.39 plants), closely followed by I4 (7.36), I7 (7.33), I5 (7.13), and I6 (7.03). The control treatment I0 had the lowest plant population (5.57 plants). Treatment I7, which received three irrigations, produced the largest head diameter (17.60 cm), the highest number of seeds per head (733.40), the heaviest thousand seeds (55.06 g), and the highest seed yield per hectare (2894 kg). The control I0 had the smallest head diameter (12.17 cm), lowest seed count (437.13 seeds), lightest seeds (49.38 g), and lowest seed yield (1248 kg). Straw yield was also highest in I7 at 5.21 t ha⁻¹, compared to 3.12 t ha⁻¹ in I0. Plant height and growth characteristics were significantly influenced by irrigation schedules. Treatment I3 showed the tallest plants at 108.78 cm, statistically similar to I6, I4, I5, and I2 at 65 DAE. By harvest, treatment I7 had the tallest plants (118.00 cm), while I0 had the shortest (79.33 cm). Leaf area was also greatest in I7, with 7876 cm² at 65 DAE and 9094 cm² at 75 DAE. Fresh and dry weights per plant were highest in I7, with fresh weight of 190.21 g and dry weight of 47.92 g at 75 DAE. Overall, BARI Surjomukhi-3 showed the best performance in plant height, leaf area, plant population, head diameter, seed yield, and straw yield under the irrigation regime of three applications at 35, 55, and 75 DAE. Additional studies are needed to confirm these findings and refine irrigation recommendations.

Insect Management

Insect pollinators and their role to yield of

sunflower (*Helianthus annuus* L.)

R. Islam, A. Islam and A. Samiha

Pollinators are essential to agricultural ecosystems, significantly impacting crop yields. This study investigated the diversity and abundance of insect visitors to sunflowers and their effects on yield parameters at the Bangladesh Agricultural Research Institute, Gazipur, during the 2023-24 cropping season. Nine plots (4.0 x 5.0 m each) were established in three random blocks. Five sunflower heads in each plot were covered with mosquito net bags to exclude insect visitors, allowing for self-pollination, while another five heads were left open for natural pollination, and an additional five received hand pollination. Following the flowering period, all heads were bagged to prevent seed predation until seed maturation. Oil content was measured using the Soxhlet extraction method in the plant physiology lab of the Oilseed Research Centre. Weekly observations recorded a total of 492 individuals from seven species across four families and three orders, with Hymenoptera being the most abundant order and *Apis dorsata* as the dominant species. Diptera, particularly *Musca domestica* from the Muscidae family, also contributed significantly, while Coleoptera and Lepidoptera were less abundant. Open pollination resulted in significantly higher seed set per plant, 100-seed weight, seed yield per plant (51.54%, 23.99%, and 56.09%, respectively), and oil percentage (2.72%) compared to bagged pollination. The results confirm that sunflowers attract a variety of insect species, particularly honeybees, emphasizing the vital role of insect pollination in enhancing sunflower yield and overall agricultural productivity.

Development of IPM package against the major insect pests of sunflower

M.A. Islam, A. Samiha and R. Islam

The experiment was conducted at the Oilseed Research Centre, BARI, Gazipur, during the Rabi season of 2023-24 to develop effective management strategies against major insect pests of sunflower. The study included six treatments: T1 (IPM Package-1) with Spinosad, T2 (IPM Package-2) with Bioclean, T3 (IPM Package-3) with SNPV, T4 (IPM Package-4) with Bio-chamak, T5 (Farmers practice) with Nitro 505 EC, and T6 as the untreated control. The sunflower seeds (BARI Surjamukhi-3) were sown on January 1, 2024,

using a randomized complete block design with three replications. Insect counts for whiteflies, aphids, jassids, and hairy caterpillars were recorded every seven days from selected plants. Results showed that the highest pest populations were found in the untreated control plots, with the lowest in T5, which recorded a yield of 1.77 t/ha, while the control yielded only 1.17 t/ha. Significant differences in pest populations were observed: whiteflies ranged from 2.33 to 9.15 per leaf, aphids from 1.72 to 7.88, jassids from 2.33 to 12.32, and hairy caterpillars from 1.65 to 7.12, all favoring the treated plots. The marginal cost-benefit ratio (MBCR) was highest for T5 at 3.59, with the highest gross return of Tk 106,200. In conclusion, both T5 (Nitro 505 EC) and T4 (Bio-chamak) were effective in managing insect pests, resulting in higher yields and benefit-cost ratios. The experiment will be repeated next year for further investigation.

F. Linseed

Maintenance and evaluation of linseed (*linum usitatissimum* L.) Germplasm

Hosna Kohinoor

During the Rabi season of 2023-24, forty linseed genotypes, including the check variety Neela, were evaluated at the Oilseed Research Centre, BARI, Gazipur. The experiment was conducted on plots of 4 meters in length, with rows spaced 40 cm apart and plants 10 cm apart. Sowing was carried out on November 28, 2023. Fertilizer application included 120 kg/ha N, 80 kg/ha P, 60 kg/ha K, 40 kg/ha S, 4 kg/ha Zn, and 1 kg/ha B, using Urea, TSP, MP, Gypsum, Zinc sulphate, and Borax. All fertilizers were applied during final land preparation, with urea split into two applications at the vegetative and reproductive stages. The highest coefficient of variation (CV) was observed for plot yield (36.1%), followed by the number of branches per plant (26.5%) and the number of capsules per plant (25.9%). The top performers included BD-10708, BD-10698, Lin-S-19, BD-10710, and JL-2. The evaluated genotypes showed varied results across traits. BD-10708 achieved the highest yield, with BD-10698, Lin-S-19, BD-10710, and JL-2 also performing well. The maximum number of capsules per plant was recorded in BD-10708, followed by JL-3, BD-10698, and Lin-S-19. Lin-T-17 was the shortest, while BD-7141 was the tallest.

BD-10708 also had the highest number of branches per plant. For the next Rabi season (2024-25), BD-10698, Lin-S-19, BD-10710, and JL-3 will be selected for observation trials based on their yield-related traits. The collected seeds have been preserved for further research and future trials.

Regional yield trial of linseed (*linum usitatissimum* L.)

Hosna Kohinoor, Debi Rani Datta and T.A.Mujahidi

The experiment was conducted across multiple locations—Joydebpur, Barishal, Satkhira, Hathazari, and Cox's Bazar—during the Rabi season of 2023-24 to identify high-yielding linseed genotypes. Six linseed genotypes, including the check variety Neela, were evaluated. At ORC, BARI, Joydebpur, seeds were sown on November 28, 2023, in plots measuring 4 meters long with 6 rows, maintaining 40 cm between rows and 10 cm between plants. Fertilizers were applied at the rates of 120 kg/ha N, 80 kg/ha P, 60 kg/ha K, 40 kg/ha S, 4 kg/ha Zn, and 1 kg/ha B, using Urea, TSP, MP, Gypsum, Zinc sulphate, and Borax. All fertilizers were applied at final land preparation, except urea, which was split into two applications at the vegetative and reproductive stages. Among the evaluated genotypes, Neela was the shortest at 72.7 cm, while BD-10698 was the tallest at 83.9 cm. BD-10708 achieved the highest plot yield of 1300 kg/ha, followed by BD-10698 at 1220 kg/ha. BD-10708 also had the highest number of capsules (104.7) and seeds per capsule (9.8), outperforming BD-10698. In the multi-location trial, BD-10708 consistently produced the highest yield, followed by Lin-1403 and BD-10698. Based on yield and yield-contributing characteristics, BD-10708, Lin-1403, and BD-10698 were selected for the Adaptive Yield Trial program. The data recorded included days to 50% flowering, days to maturity, average plant height, number of branches per plant, number of capsules per plant, seeds per capsule, and plot yield. The highest coefficient of variation (CV) was found in the number of branches per plant (6.4%) and the number of capsules per plant (5.77%). BD-10708 exhibited the highest number of branches per plant (9), the most capsules per plant, the most seeds per capsule (9.8), and the highest plot yield (1300 kg/ha). BD-10708 also flowered and matured earlier than other

genotypes. Seeds of BD-10708, Lin-1403, BD-10698, and Neela will be preserved for further evaluation in adaptive trials at different locations next year.

G. Niger

Maintenance and evaluation of niger (*guizotia abyssinica*) germplasm

Hosna Kohinoor

A total of twenty-one Niger genotypes were evaluated and maintained at the Oilseed Research Centre (ORC), BARI during the Rabi season of 2023-24. The experiment, conducted at the ORC research field in Joydebpur, involved sowing seeds on November 28, 2023. Each genotype was planted in plots measuring 4 rows by 4 meters, with 40 cm spacing between rows and 10 cm between plants. Fertilizers were applied at rates of 120 kg/ha N, 80 kg/ha P, 60 kg/ha K, 40 kg/ha S, 4 kg/ha Zn, and 1 kg/ha B using Urea, TSP, MP, Gypsum, Zinc sulphate, and Borax. All fertilizers were applied at final land preparation, while Urea was split into two applications: one at the vegetative stage (20 days after germination) and another at the reproductive stage (40 days after germination). Intercultural practices were managed effectively. The highest coefficient of variation (CV) was observed for the number of seeds per capitulum (38.9%), followed by the number of capitula per plant (31.2%) and the number of branches per plant (20%). Nig-3706 produced the highest yield (514 g/plot), followed by Nig-3006, Shova, and Nig-2506. The most dwarf genotype was Nig-7706 at 110 cm, while the tallest was Nig-7806 at 173.2 cm. Nig-8706 had the maximum number of capitula per plant, and Shova had the highest number of seeds per capitulum. Nig-3006 produced the most branches per plant (13.6), followed by Nig-8106, Nig-2206, and Nig-8706. For the next Rabi season (2024-25), Nig-3706, Nig-3006, Nig-2506, and Shova were selected for observational trials based on their yield and related traits. Seeds from these genotypes were preserved for further research and evaluation.

H. Safflower

Maintenance and evaluation of safflower

Hosna Kohinoor

During the Rabi season of 2023-24, five safflower genotypes, including the check variety BARI SAFF1, were evaluated at the Oilseed Research Centre (ORC), BARI, Gazipur. The trial took place at ORC, Joydebpur, with seeds sown on November 28, 2023. Each genotype was planted in a 4-row by 4-meter plot, maintaining 40 cm spacing between rows and 10 cm between plants. Fertilizers were applied at rates of 120 kg/ha N, 80 kg/ha P, 60 kg/ha K, 40 kg/ha S, 4 kg/ha Zn, and 1 kg/ha B, using Urea, TSP, MP, Gypsum, Zinc sulphate, and Borax. All fertilizers were applied during final land preparation, while Urea was split into two applications: one at the vegetative stage (30 days after germination) and another at the reproductive stage (70 days after germination). Intercultural practices were managed appropriately. The highest coefficient of variation (CV) was observed for plot yield (34.5%), followed by the number of seeds per capitulum (28.1%) and the number of capitula per plant (21.1%). SAF-T-2017 yielded the most (1107 g), followed by BARI SAFF-1 and SAF-503. The highest CV for plot yield was 36.1%, with the number of seeds per capitulum and number of capitula per plant showing CVs of 24.5% and 21.7%, respectively. SAF-T-17 produced the highest yield, while SAF-503 had the most capitula per plant, and SAF-502 had the most seeds per capitulum. BARI SAFF1 was the most dwarf genotype, while SAF-T-17 was the tallest. SAF-T-17 also had the highest number of branches per plant, followed by BARI SAFF1 and SAF-503. For the next Rabi season (2024-25), SAF-T-17, SAF-503, SAF-502, and BARI SAFF1 were selected for observational trials based on their yield and other traits. Seeds from these genotypes were preserved for future research. The most dwarf genotype, SAF-503, achieved the highest yield in kg/ha. This study will be repeated in the next Rabi season.

I. Molecular study of oilseed crops

Screening of diverse genotypes of oilseed crops using *ssr* primers: molecular characterization of brassica genotype(s) for low erucic acid and glucosinolate content using *ssr* markers

S H Habib, Pryanka Roy and U Kulsum

Rapeseed (*Brassica spp.*) is a critical source of edible oil in Bangladesh, significantly contributing to domestic oil production. ORC, BARI has developed varieties with high glucosinolate and erucic acid levels. To enhance oil quality, breeding

efforts focus on reducing erucic acid and glucosinolate contents. In this study, 27 Brassica genotypes were molecularly screened using trait-specific markers to develop low-erucic-acid and low-glucosinolates cultivars. The study included 26 Brassica napus double-low genotypes and the check variety BARI Sarisha-18. Leaf samples from five plants of each genotype were collected for genomic DNA isolation and purification, following the standardized protocol of the ORC Molecular Biology Lab. DNA quality was assessed by the A260/A280 absorbance ratio using a spectrophotometer, and concentration and purity were verified with 0.8% agarose gel electrophoresis. DNA was diluted to 25-50 ng/ μ l in molecular-grade water and stored at -20°C . Gene expression related to low glucosinolates and low erucic acid was analyzed using semi-quantitative RT-PCR with specific primers. The RT-PCR results revealed that 19 out of 27 genotypes exhibited a mix of low and high glucosinolate expressions, indicating a need for further refinement. All genotypes, except BARI Sarisha-18, showed higher expression levels for the Q1 primer. Fatty acid elongase 1 (FAE1), which regulates erucic acid synthesis, was assessed using various primer pairs to differentiate between low and high erucic acid genotypes. Some genotypes exhibited low erucic acid expression. The genotypes demonstrating low erucic acid and low glucosinolate levels are promising candidates for developing double-low Brassica varieties. These genotypes will be instrumental in breeding programs aimed at improving oil quality.

Response of water-logged tolerant wrky gene expression in sesame under water logged treatment

S H Habib, Pryanka Roy, U Kulsum, Iftexhar Ahmed and Md Motiar Rahman

Waterlogging is a major environmental stress that negatively impacts sesame growth and development. WRKY domain transcription factors play essential roles in managing plant responses to stress. This study focused on five sesame genotypes (BD7026, BD10659, BD11637, BD10160, and BD10166) previously identified as tolerant to waterlogging. Leaf samples from these genotypes, along with BARI Till-5 and BARI Till-6, were collected from PGRC, BARI, Gazipur. Genomic DNA was isolated using a modified extraction method, and four pairs of primers specific to the SiWRKY gene family (Li et al., 2017) were

employed to evaluate gene expression under waterlogging stress. Following PCR amplification, sequencing, and BLAST analysis confirmed the presence of SiWRKY genes. For the gene expression analysis, sesame plants were grown in pots (25 cm diameter, 30 cm depth). After 15 days, half the pots were subjected to waterlogging by submerging them in a bucket with water up to 3 cm above the soil surface for 72 hours. The water was then drained, and the plants were allowed to recover for an additional 72 hours, while the remaining pots were kept under normal conditions. Root samples were collected at various stages: 48 hours, 72 hours, and 72 hours of recovery. RNA was extracted using TRIzol reagent, and cDNA was synthesized with the RevertAid cDNA synthesis kit. Gene expression was assessed with the designed primers. Results showed that SiWRKY transcription factors were expressed in the root tissues of BD10659 and BD11637 under waterlogging conditions, with the BFR SiWRKY gene showing particularly strong expression in these genotypes compared to controls. This indicates that BD10659 and BD11637 have significant potential for developing waterlogging-tolerant sesame varieties. The study identifies these genotypes as promising candidates for breeding programs aimed at improving waterlogging resilience in sesame.

Molecular characterization of sunflower dwarf mutants for dwarfism character: the expression analysis of genes regulating gibberalic acid (ga) pathway

S H Habib, Pryanka Roy, Ummy Kulsum and Md Motiar Rahman

In this study, mutant sunflower populations, treated with gamma radiation and EMS, were analyzed to identify genes associated with dwarfism for developing a dwarf variety. A total of 40 mutants treated with gamma radiation and 11 mutants treated with EMS from the BARI Surjamukhi-2 variety were examined. The analysis focused on gibberellic acid (GA) pathway genes, particularly those involved in dwarfism. Genomic DNA was extracted from the 3rd and 4th leaves of these mutants using an optimized protocol. PCR amplification targeted the GA-deactivation gene GA2ox1 and the entkaurenoic acid oxidase gene, using 25 ng of genomic DNA. The mutants varied in height and seed coat color, including dwarf, medium dwarf, and tall types. Semi-quantitative RT-PCR revealed that the GA2ox gene, which is involved in GA deactivation,

was expressed in both gamma radiation and EMS-treated mutants. The expression of GA2oxs and entkaurenoic acid oxidase genes in these mutants indicates their potential use in developing dwarf sunflower varieties. Further analysis of GA pathway gene expression in additional EMS and gamma radiation-treated mutants, as well as control plants, is ongoing to refine the selection of dwarf phenotypes.

Identification and molecular characterization of the gene families controlling fatty acid biosynthesis in mutant sunflower: the expression analysis of *fad*, *sad* and *oleic* gene sequences

S H Habib, Pryanka Roy, Ummi Kulsum and Md Motiar Rahman

High oleic acid content in oilseed crops is a valuable trait due to its health benefits. This study involved the characterization of mutants treated with gamma radiation and EMS for their fatty acid biosynthesis genes: FAD, SAD, and Oleic. Forty mutants treated with gamma radiation and eleven treated with EMS from the BARI Sunflower-2 variety were analyzed. Genomic DNA was extracted from the 3rd and 4th leaves of these mutants using an optimized protocol. PCR amplification targeted the FAD, SAD, and Oleic genes. Semi-quantitative RT-PCR results indicated that most gamma radiation-treated mutants expressed the SAD and FAD genes (Figures 1a & 1b). Some EMS-treated mutants also showed expression of the SAD gene (Figure 2a). The SAD gene introduces a double bond into the hydrocarbon chain, converting stearic acid to oleic acid, while the FAD gene adds an additional double bond, converting oleic acid to linoleic acid. The expression of the Oleic gene in these mutants confirms effective mutagenesis. Mutants expressing the SAD and FAD genes are promising for developing sunflower varieties with high unsaturated fatty acid content. Further screening of the entire mutant population for these gene expressions is underway to identify the best candidates for breeding high oleic sunflower varieties.

Molecular characterization of newly developed sunflower mutant by genome sequencing

S H Habib, Pryanka Roy, & U Kulsum

Genome sequencing involves cataloging sequence variants within mutants to identify specific genetic changes. For this study, genomic DNA was extracted from four distinct mutants derived from gamma radiation-treated BARI Surjamukhi-2 plants: a robust plant with a big head, a very dwarf mutant, a

mutant with an unusual phenotype, and a mutant with a golden seed coat color (Figure 1). DNA was isolated from leaf samples of each mutant using a modified extraction method from ORCMBL. The quality and quantity of the genomic DNA were assessed with spectrophotometric measurements at 230, 260, and 280 nm, and by electrophoresis on a 0.8% TAE agarose gel. The absorbance ratios A260/A280 and A260/A230 ranged from 2.01 to 2.30 and 1.99 to 2.15, respectively, indicating high purity. The gel electrophoresis displayed clear, distinct bands, confirming intact DNA. RNA contamination was initially present but was removed by treating the DNA with RNase A. The purified genomic DNA is now ready for whole genome sequencing to identify the genetic alterations caused by gamma radiation.

J. Fourth industrial revolution (4IR)

Area estimation of rapeseed-mustard crop using satellite-based remote sensing technique: a case study of tangail district

U Kulsum, I Ahmed, P Roy, Ma Islam, Sh Habib, F Begum, Ma Rahaman

Rapeseed-mustard is a major oilseed crop in Bangladesh, particularly prevalent in the Tangail district. This study aimed to assess the spatial distribution of mustard cultivation using Sentinel-2 remote sensing data for the robi season (2023-2024). Multi-date Sentinel-2 imagery was analyzed to observe temporal changes in crop coverage. The Normalized Difference Vegetation Index (NDVI) and Normalized Difference Yellow Index (NDYI) were calculated to track these changes. Images were selected based on a pattern where NDYI increased and NDVI decreased, and then classified using the k-means clustering method. Out of 25 images, 23 were classified as mustard fields, with the estimated mustard crop area being 79,584.78 acres. This estimate will be cross-checked with data from the Department of Agricultural Extension (DAE) next year and refined for accuracy. The study focused on estimating the spatial extent of rapeseed-mustard in Tangail, a district characterized by the T.aman-Mustard-Boro cropping pattern. Mustard is grown during the robi season, with land preparation occurring between mid-October and mid-November, and harvest typically in late February or early March. The area of interest falls within 89° 44' to 90° 18' east longitude and 24° 01' to 24° 47' north latitude (Figure 1). Sentinel-2 Level-2

(atmospherically corrected) images were used, covering the period from November 1, 2023, to March 31, 2024. Data processing and analysis were conducted using the Google Earth Engine API on Python, within the ARSAM lab at ASICT, BARI. Spectral indices NDVI and NDYI were calculated from the images. Ground truth data was collected from 25 sites in three upazilas (Tangail Sadar, Delduar, and Mirapur), with field dimensions greater than 10x10m² to align with Sentinel-2's spatial resolution. A flow chart detailing the methodology from data import to classification is provided (Figure 2). The analysis of NDVI and NDYI over time revealed that NDYI peaked and NDVI dropped during the flowering stage, which was selected for further examination. Multispectral images contain specific spectral signatures for each pixel, which were used to classify the images. K-means clustering was employed to categorize land covers based on similar spectral signatures, resulting in 20 clusters. Ground truth data identified clusters corresponding to mustard fields. Out of 25 observations, 23 were associated with cluster 14, which was identified as mustard fields. This cluster's pixels were counted to estimate the mustard area, and the classified map is shown (Figure 5). The study achieved an accuracy of 92%, validated by comparing satellite-derived estimates with field survey data using statistical accuracy metrics. This validation is crucial for ensuring the reliability of the crop area maps. The area estimate will be compared with DAE statistical data next year and re-evaluated for improved accuracy and reliability.

Development of four crop based cropping pattern for increasing cropping intensity and productivity

M.M. Karim, P. Roy, F. Begum and M. J. Hussain

Field experiments conducted at the Oilseed Research Centre, BARI, during the 2021-22 and 2023-24 seasons evaluated the agronomic performance and economic returns of five cropping patterns: CP1-Mustard (BARI Sarisha-16) followed by Indian Spinach + Okra and T. aman (BRRi dhan75); CP2-Groundnut + Fenugreek followed by T. aus (BRRi dhan82) and T. aman (BRRi dhan75); CP3-Groundnut + Lentil followed by T. aus (BRRi dhan82) and T. aman (BRRi dhan75); CP4-Sunflower + Garden Pea followed by Sesame + Gimakalmi (BARI Till-4) and T. aman (BRRi dhan75); and CP5-a control with Fallow, Boro (BRRi dhan89), and Fallow, followed by T. aman (BRRi dhan75). The experiments, arranged in a

Randomized Complete Block Design with four replications and unit plots of 6m x 4m, involved various planting dates and fertilizer applications for each crop. Results showed that the highest rice equivalent yield (REY) of 31.02 t/ha was achieved with CP4, followed by CP1. In terms of economic returns, CP4 also yielded the highest gross return of Tk. 930,600/ha and the best benefit-cost ratio (BCR) of 4.22, while CP5, the control, had the lowest BCR of 2.35. These findings suggest that integrating diverse crops into cropping patterns can enhance productivity and economic returns while creating more employment opportunities and improving food and nutritional security for farmers.

Survey of oilseed crop diseases and their existing disease management practices

K. Jahan, N. Sultana, R. Islam, S. Akhtar, Mme. Rahman

In the 2023-24 cropping season, a comprehensive survey was conducted to evaluate the occurrence and incidence of diseases in rapeseed-mustard and sunflower crops across Tangail, Patuakhali, Barguna, and Bhola districts. In Tangail, the survey covered 18 locations within Mirzapur, Delduar, Madhupur, and Dhanbari Upazilas, where five mustard varieties—BARI Sharisha-14, BARI Sharisha-17, BARI Sharisha-18, BARI Sharisha-20, and Tori-7—were cultivated. *Alternaria* blight was prevalent, affecting 80-100% of fields, while club root and nematode root knot were less common, with incidences of 80% and 10%, respectively. White mold and dead inflorescence were also recorded, with BARI Sharisha-18 showing 15% nematode root knot and 10% dead inflorescence in Madhupur. For sunflower, the survey included 17 locations in Patuakhali, Barguna, and Bhola, where varieties such as BARI Sunflower-2, BARI Sunflower-3, Hysun-33, Hysun-36, and Unisun were evaluated. *Alternaria* leaf blight was observed with 55-90% incidence, while soft rot ranged from 2-30%. Mosaic virus and dwarf plant symptoms were noted in some fields. BARI Sunflower-2 had 0-60% *Alternaria* blight and 15% virus incidence, whereas BARI Sunflower-3 showed 80% *Alternaria* blight without white mold or virus symptoms. Hysun-33 had no recorded diseases, while Hysun-36 and Unisun had minor incidences of white mold and virus diseases. The variability in disease prevalence and incidence across different locations was attributed to local cropping patterns, environmental conditions, and pathogen inoculum levels.

SPICES CROPS

04

Varietal development

Development of diverse onion germplasm through hybridization (advancing of generation: Set 1-3)

M. A. Alam, M. A. Khan, M. A. A. Khan, A. H. F. Fahim, M. M. Hassan, S. N. Mazumder and M. Z. H. Prodhan

Onion (*Allium cepa* L.) holds paramount importance in Bangladesh, serving as a staple vegetable and a key economic crop due to its high demand both locally and internationally. The Bangladesh Agricultural Research Institute (BARI), particularly through its Spices Research Centre (SRC), plays a crucial role in advancing onion cultivation by developing high-yielding and disease-resistant varieties. This study focused on hybridizing different onion genotypes to enhance genetic diversity and identify superior lines with desirable agronomic traits. Three sets of crosses were conducted, evaluating performance across multiple seasons at SRC, Shibganj, Bogura. The results from the 2023-24 season highlighted significant variability in plant height (51.60 cm to 68.20 cm), number of leaves (8.60 to 11.20), bulb dimensions (length: 44.00 cm to 57.80 cm, diameter: 43.20 cm to 54.20 cm), and yield metrics (individual bulb weight: 21.92 g to 54.43 g, plot yield: 4.38 kg to 10.89 kg, fresh yield: 12.18 kg to 30.24 kg) among evaluated genotypes. Notably, genotypes like Pop-5 (BARI Piaz-6 x BARI Piaz-1)-B18 and Pop-4 (BARI Piaz-4 x BARI Piaz-6)-B35 exhibited superior performance, indicating potential for enhanced productivity and quality. These findings underscore the importance of continued research and breeding efforts to sustainably improve onion cultivation in Bangladesh, ensuring food security and economic stability.

Mass selection for onion population development

M. A. A. Khan, S. N. Mozumder, M. I. Haque, M. N. Yousuf, and M. M. Kamal

An experiment was conducted to develop and evaluate local and exotic open pollinated promising onion genotype for mass selection at Regional Spices Research Centre, BARI, Gazipur during rabi 2023-2024. Previously created 30 mass bulb population were evaluated in this experiment. The experiment was randomized in alpha lattice design with two replications. On the basis of traits association with bulb yield and mean performances of the genotypes G1, G5, G8, G10, G12, G14, G15, G23, G24 and G26 found promising for massing.

Development of s₃ bulb to s₃ seed generation in onion

M. A. A. Khan, S. N. Mozumder, M. I. Haque, M. N. Yousuf, and M. M. Akand

An experiment was conducted to advance S₃ bulbs to S₃ seed generation in onions for inbred line development at the Regional Spices Research Centre, BARI, Gazipur, during 2023-24. Nineteen collected onion lines were grown to advance from bulb to seed generation. A total of 295 grams of onion seeds were collected from the 19 onion lines and preserved for advancing the generation in the next year.

Development of synthetic population in onion for higher yield and storability

M. A. A. Khan, S. N. Mozumder, M. N. Yousuf, N. Nath, M. M. Akand and M. M. Kamal

Five onion genotypes were crossed in full diallel fashion to produce F₁ seed at Regional Spices Research Centre, BARI, Gazipur during rabi 2023-2024 in order to test the combining ability of the parents to develop a synthetic population of onion.

Total 25 successful crosses were obtained with 267 g amount of seeds. These F₁ seeds were stored and will be evaluated in the next growing season to test the combining ability of the parents.

Advance yield trial of winter onion

M.N.A. Chowdhury, S. N. Mozumder, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, Shibganj, Bogura during November 2023 to April 2024 with a view to evaluate the onion advanced lines for winter season and to select promising winter onion line(s). The experiment was laid out in randomized complete block design with three replications. Five advance lines of onion (ON0333-2, ON0353-2, ON0374-1, ON0376 and ON0377) with BARI Piaz-4 and BARI Piaz-6 were used as check in the study. The higher bulb diameter and single bulb weight (4.84 cm & 51.70 g, respectively) was recorded from ON0374-1 and the lowest (3.69 cm & 37.00 g, respectively) was observed from ON0333-2. The highest bulb yield (20.36 t/ha) was found from ON0374-1 and the lowest (15.70 t/ha) was recorded from ON0333-2. The line, ON0374-1 gave the highest TSS (14.20%) and the lowest (10.50%) was found from BARI Piaz-6. The line ON0353-2, ON0374-1, ON0377 BARI Piaz-4 and BARI Piaz-6 showed moderately resistant to purple leaf blotch disease and rest of them resulted moderately susceptible. Considering all the characters, ON0353-2, ON0374-1 and ON0376 were performed promising.

Advanced yield trial of white onion

M.N.A. Chowdhury, S. N. Mozumder, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre Shibganj, Bogura during November 2023 to April 2024 with a view to study the performance of white onion lines and to select promising one for testing regional adaptability especially for dry powder. Two advanced lines of white onion (ON0331 & ON0357) with BARI Piaz-6 were used as check in the study. The experiment was laid out in randomized complete block design with four replications. It was found that the highest percentage of mortality (9.60) was observed from BARI Piaz-6 and the lowest (4.07) was recorded in ON0357. ON0331 showed higher percentage of bolting (8.60) and the lowest (2.80%) was found in ON0357. The higher percentage of splitted bulb

(6.80) was observed from BARI Piaz-6 while the lower (2.10%) was found in ON0331 followed by ON0357 (3.97%). The highest bulb yield (15.75 t/ha) was recorded from ON0357 and the lowest (13.55 t/ha) was recorded from ON0331. Considering all the characters, ON0357 was found promising.

Advance yield trial of onion

M. A. Alam, M. M. Hassan, A. H. F. Fahim, S. Naher and M. Z. H. Prodhan

Onion (*Allium cepa* L.) is a globally significant crop valued for its culinary and medicinal uses. This study, conducted during the 2023-24 growing season at the Spices Research Centre, Bogura, Bangladesh, aimed to evaluate genetic parameters and performance of various onion genotypes, following a Randomized Complete Block design with three replications. Substantial variations ($P < 0.01$) were observed for most traits except Neck Diameter (ND) and Bulbing Index (BI). Heritability ranged from 0.09 to 0.95, with traits such as Plant Height (PH), Number of Leaves (NL), Bulb Length (BL), Fresh Yield (FY), and Plot Yield (PY) showing high heritability and significant genotypic variance, indicating strong genetic control. Promising genotypes such as Ac Bog-429 and Ac Bog-412 exhibited exceptional performance in terms of individual bulb weight and fresh yield. The study underscores the importance of understanding trait relationships for targeted breeding programs aimed at enhancing yield and bulb quality. These findings contribute valuable insights into the development of improved onion varieties, aligning with broader goals of sustainable agriculture and benefiting farmers and consumers.

Regional yield trial of winter onion against thrips

M.N.A. Chowdhury, M. A. Islam, M. A. Amin, M.R. Islam, M.M. Rahman, S.N. Mozumder, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, Regional Spices Research Center, Gazipur and Magura, Spices Research Sub-center Faridpur and Lalmonirhat during November 2023 to April 2024 with a view to study the regional adaptability of the selected winter onion lines against thrips at different onion growing areas and to select promising winter onion line(s) for releasing as a thrips tolerant variety. Two

onion lines ON0326, ON0332 with BARI Piaz-6 were used in this study. The experiment was laid out in randomized complete block design with five replications. It was found that significantly the highest number of thrips and IYSV per plant (10.18 and 11.55, respectively) was recorded at Lalmonirhat location and the lowest (7.42 and 9.45, respectively) was found at Faridpur location. In case of bulb yield, the highest yield (15.50 t/ha) was obtained at Magura location and the lowest (11.68 t/ha) was recorded at Gazipur location. The line ON0332 gave the lowest number of thrips and IYSV per plant (3.87 and 4.26, respectively) and the highest (14.44 and 19.39, respectively) was found from BARI Piaz-6. Significantly the highest bulb yield (15.60 t/ha) was found from ON0332 while the lowest (12.37 t/ha) was found from BARI Piaz-6. Considering the thrips population and bulb yield the line ON0332 performed better in all location. In respect of soil health, environmental issue and other yield contributing traits, ON0332 was found promising for variety release.

Regional yield trial of onion

M. A. Alam, M. A. Islam, M. A. A. Khan, M. A. Uddin, A. H. F. Fahim, S. N. Mazumdar and M. Z. H. Prodhon

The experiment was conducted at Spices Research Centre, Shibganj, Bogura; Regional Spices Research Centre, Gazipur; Spices Research Sub-Centre, Faridpur and Spices Research Sub-Centre, Lalmonirhat during 2023-2024. Four onion genotypes including BARI Piaz-1, BARI Piaz-4 and BARI Piaz-6 as check were used in this study. The experiment was laid out in randomized complete block design with three replications. Considering yield and other attributes the genotype Ac Bog-413 was found promising.

Maintainance of onion germplasm

M. A. Alam, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, S. Naher and M. Z. H. Prodhon

The present experiment was conducted to evaluate the performance of various onion genotypes at Spices Research Centre, Shibganj, Bogura during 2023-2024. Observations were recorded for several traits to capture the variability among genotypes. The study identified promising genotypes exhibiting superior performance, with a total of 80

genotypes being preserved for future breeding programs.

Regional yield trial of negi onion (*Allium fistulosum* L.) genotypes

M. A. Khan, M. M. Rahman, M. I. Haque, S. Brahma, M. M. Alam, M. K. Hasan, S. N. Mozumder, M. N. A. Choudhury, M. A. Islam, M. R. Islam and R. Sarker

Regional Yield Trial was conducted at Spices Research Sub-Centre (SRSC), Bangladesh Agricultural Research Institute (BARI), Faridpur; SRSC, BARI, Lalmonirhat; Spices Research Centre, Bogura; Regional Spices Research Centre (RSRC), BARI, Magura and RSRC, BARI, Gazipur in Bangladesh during 2023-2024 to observe regional performance of Negi onion genotype AF Far 002 and AF Far 003 on growth, yield and quality. The variety BARI Pata Piaz-1 was used as check. The study revealed that the Negi onion genotype AF Far 002 exhibited good performance at all AEZ locations in Bangladesh studied on the growth, yield of pseudostem & seed and quality aspects. The genotype AF Far 002 significantly gave the highest plant height, pseudostem length, weight of single pseudostem, pungency, pseudostem yield. No thrips infestation was occurred in Negi onion field. Some stemphylium blight disease was seen on the tips of Negi onion which was easily controlled by applying fungicides. A variety would be released with the promising Negi Onion line AF Far 002.

Evaluation of garlic germplasm

M. S. Naher, M. M. Hasan, M. A. Islam and Z. H. Prodhon

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during Rabi Season 2023-2024 to select the promising garlic germplasm for releasing a variety. Thirteen different garlic germplasm (GC0055, GC0042, GC0056, GC0048, GC0043, GC0027, GC0040, GC0035, GC001, GC005, GC0030, GC0012, and GC0031) and BARI Rashun-1 check as were collected and evaluated based on their yield and other desirable characters. The experiment was laid out in RCB design with three replications. Among the germplasm, the highest yield (10.15 t/ha) was obtained from GC0055 and the lowest (6.93 t/ha) was found from BARI Rashun-1. Disease severity was also lower in GC0055. Significantly all the

yield contributing characters are also found better from GC0055.

Advance yield trial of garlic line

M. S. Naher, M. M. Hasan, M. A. Islam and Z. H. Prodhan

The study was conducted at the farm of Spices Research Centre, BARI, Shibganj, Bogura during rabi Season 2023-2024 to select the promising garlic germplasm for releasing a variety. The experiment was laid out in RCB design with three replications. Three different garlic germplasm (GC0029, GC0036 and GC0047) including BARI Rashus-1 as check were evaluated based on their yield and other desirable characters. Among the germplasm, the highest yield (9.77 t/ha) was obtained from GC0047 and the lowest (6.7 t/ha) was found from BARI Rashus-1. Disease severity was also lower in GC0047. The significant variation was found in plant height, bulb length, bulb width, clove length, clove width, yield /plant and yield t/ha. Considering all the characters, the germplasm GC0047 and GC0036 were found promising and selected for next year RYT trial.

Regional yield trial of promising garlic line

M. S. Naher, M. M. Hasan, M. A. Islam and Z. H. Prodhan

From November 2023 to March 2024, the experiment was carried out in the Spices Research Center in Bogura, the Regional Spices Research Center in Magura, the Spices Research Sub-center in Lalmonirhat, the Regional Spices Research Center in Gazipur and Spices Research Sub-center Faridpur. Included in the study were ten advanced lines of garlic (GC0050, GC0045, GC0054, GC0017, GC0049, GC0046, GC0035, GC0038, GC0044, and BARI Rashun-1 as check). Regarding location, Spices Research Sub-center Lalmonirhat had the maximum yield (10.96 t/ha), while SRSC, Faridpur recorded the lowest yield (4.12 t/ha). Regarding germplasm/line, GC0054 yielded the maximum yield (10.45 t/ha), whereas GC0038 yielded the lowest (5.14 t/ha). The yield parameter was not significantly affected by the combined effect of location and advance line. The highest values from GC0054 were observed for each site in terms of plant height, number of leaves/plant, bulb breadth, clove width, yield/plant, and yield (t/ha). Out of all the characters and disease reaction,

GC0054 and GC0049 were the two that showed the most promising.

Evaluation of chilli genotypes

M. A. Alam, M. M. Hassan, A. H. F. Fahim, M. A. Rahman and M. Z. H. Prodhan

Chili (*Capsicum* spp.) is a vital crop worldwide, renowned for its culinary and medicinal applications. This study aimed to evaluate the genetic parameters and performance of fifteen chili genotypes during the 2023-24 growing season at the Spices Research Centre, Bogura, Bangladesh. A Randomized Complete Block Design (RCBD) with three replications was utilized. Data were collected on plant height (PH), number of branches (NB), number of fruits per plant (NFP), weight of fruits per plant (WFP), single fruit weight (SFW), fruit length (FL), peduncle length (PL), fruit diameter (FD), and fresh yield (FY). Significant variations ($P < 0.01$) were observed in most traits except NB. High heritability and genotypic variance for PH, FL, FD, NFP, WFP, and FY indicated strong genetic control and potential for effective selection. Genotypes VTNMCH-1 and BGCOMA-6 excelled in WFP and FY, making them promising candidates for breeding programs aimed at improving yield and fruit quality. This research provides critical insights into the genetic and phenotypic diversity of chili genotypes, facilitating the development of superior, high-yielding varieties. The findings contribute to sustainable agriculture and support the agricultural economy of Bangladesh.

Evaluation of hybrid chilli genotypes

M. A. Alam, M. M. Hassan, A. H. F. Fahim, M. A. Rahman and M. Z. H. Prodhan

Chili (*Capsicum* spp.) is an important crop globally, appreciated for its culinary and medicinal uses. This study evaluated the genetic parameters and performance of twelve chili hybrid genotypes during the 2023-24 growing season at the Spices Research Centre, Bogura, Bangladesh. A Randomized Complete Block Design (RCBD) with three replications was utilized. Data were collected on plant height (PH), number of branches (NB), fruit length (FL), peduncle length (PL), fruit diameter (FD), number of fruits per plant (NFP), weight of fruits per plant (WFP), single fruit weight (SFW), and fresh yield (FY). Significant variations ($P < 0.01$) were observed in most traits except NB. High

heritability and genotypic variance for PH, FL, FD, NFP, WFP, and FY indicated strong genetic control and potential for effective selection. Hybrids like BGCMA-4 X OC-22 and OC-18 X OC-22 excelled in WFP and FY, making them promising candidates for breeding programs aimed at improving yield and fruit quality. This research provides critical insights into the genetic and phenotypic diversity of chili hybrids, facilitating the development of superior, high-yielding varieties. The findings contribute to sustainable agriculture and support the agricultural economy of Bangladesh.

Generation advancement of f₃ chilli

M. A. A. Khan, S. N. Mozumder, M. I. Haque, M. N. Yousuf, M. M. Akand and M. M. Kamal

This study was undertaken to evaluate F₃ progenies of chili obtained from a 5×5 half diallel at RSRC, BARI, Gazipur during the rabi season of 2023-2024. Significant variation was observed for most of the traits studied, except for days to 50% flowering, days to 50% fruiting, and plant height. Considering fruit length, fruit diameter, single fruit weight, and fruit weight per plant, it was clear that the progeny P₅×P₃ F₃ (1.97 kg) was the best performer, followed by P₆×P₂ F₃ (1.81 kg), P₄×P₁ F₃ (1.51 kg), P₅×P₂ F₃ (1.39 kg), and P₃×P₂ F₃ (1.33 kg).

Observation yield trial of chilli

M. A. Alam, M. A. A. Khan, M. I. Haque, M. M. Hasan, A. H. F. Fahim, S. N. Mazumdar and M. Z. H. Prodhan

The present experiment was conducted to evaluate all the available germplasm for their performances and to maintain the existing chilli germplasm with the aim to preserve the existing variability for future breeding program at Spices Research Centre, Shibganj, Bogura during 2023-2024. Observations were recorded for limited numbers of traits to capture the variability. Quite a few genotypes from both sets showed promising performance. In parallel a total of 80 genotypes seeds from true to type plants were selfed and preserved.

Advance yield trial of chilli (Set-I)

M. A. Alam, M. M. Hassan, A. H. F. Fahim, M. A. Rahman and M. Z. H. Prodhan

Chilli (*Capsicum* spp.) is a globally significant crop valued for its diverse culinary and medicinal

applications. However, challenges such as yield variability and fruit quality persist, necessitating a deeper understanding of genetic and phenotypic variations among chilli genotypes. This study, conducted during the 2023-24 growing season at the Spices Research Centre, Bogura, Bangladesh, following Randomized Complete Block design with three replications, aimed to evaluate various chilli genotypes and analyze associations among key traits. Significant variations in genotype performance and trait associations were observed. Promising genotypes such as VTNMCH-1 exhibited exceptional performance, with high yields and desirable fruit characteristics. Genetic and phenotypic correlations provided valuable information into trait interactions. Strong positive correlations between NFP, WFP, SFW, and FY suggest that these traits can be jointly selected for improved yield. Longer fruits tend to have smaller diameters. Findings underscored the importance of understanding trait relationships for targeted breeding programs aimed at enhancing yield and fruit quality. Overall, this research contributes valuable understandings to the development of improved chilli varieties, aligning with broader goals of sustainable agriculture and benefiting farmers and consumers.

Advance yield trial of chilli (Set-II)

M Rahman and M A Siddiky

The trial was conducted during rabi season of 2023-2024 at RSRC, BARI, Cumilla to study the performance of different chilli lines for developing variety having higher yield. The experiment was laid out in randomized complete block design with three replications. The highest plant height (73.00 cm) was recorded from CA Cum-018 and the lowest plant height (53.83 cm) was recorded from CA Cum-008 followed by CA Cum-014. The highest No. of fruits/plant was recorded from CA Cum-018 followed by CA Cum-017 and the lowest No. of fruits/plant was recorded from BARI Morich-3 followed by CA Cum-008. The highest fruit length (7.73cm) was recorded from CA Cum-018 followed by CA Cum-017 and the lowest fruit length (1.16 cm) was recorded from CA Cum-008. The highest yield (11.45 t/ha) on green weight was recorded from CA Cum-016 followed by CA Cum-017 and The lowest yield (6.14t/ha) on green weight was recorded from BARI Morich-3.

Advanced yield trial of chilli genotypes against thrips and mite

M. M. Hossain, M. Z. H. Prodhan, M. A. Isla, M. A. Sarkar and M. O. Hoque

The field study was conducted at Spices Research Sub-centre, Shibganj, Lalmonirhat, Bangladesh during Rabi season of 2023-24 to test the performance of different chilli genotypes against thrips and mite. Eleven different chilli genotypes (C0718, C01245, C0145, C0649, C0650, C01111, C0701, C0613, C0614, C01212 and C01236) along with BARI Morich-1, 2 and 3 were evaluated against thrips and mite. Out of eleven chilli genotypes screened against thrips and mites, none was found completely free from the attack of pests. The three genotypes, C0145, C0718 and C01212 recorded lowest number of thrips, mite and leaf curl were found resistant, three genotypes, C0701, C01236 and BARI Morich-2 were found moderately resistant, five genotype, C0649, C0650, C01245, BARI Morich-1 and 3 were found susceptible and three genotypes viz., C01111, C0613 and C0614 were found highly susceptible to both thrips and mite. Thrips and mite populations are negatively correlated with Chlorophyll Concentration Index of leaf. Further resistant and moderately resistant genotypes showed thick and dark green colour leaves, very thin and light green colour leaves was observed in highly susceptible genotypes. The highest total phenol content was recorded from the genotype C01212 (22.60 mg/g) followed by C0718 (21.40 mg/g) and C0145 (18.80 mg/g) and the lowest total phenol content was recorded from the genotype C0614 (12.34 mg/g) followed by C0613 and C01111 with 12.50 and 13.00mg/g of total phenol content. The maximum fruit yield of chilli was also obtained from the genotype C01212 (16.73 t/ha) followed by the genotype C0718 (15.79 t/ha) and C0145 (14.29 t/ha).

Regional yield trial of chilli (Set-I)

M. A. Alam, M. A. Islam, M. A. A. Khan, A. H. F. Fahim, M. M. Hassan, S. N. Mazumdar and M. Z. H. Prodhan

This study evaluated the performance of eight chilli genotypes across three locations during the 2023-2024 growing season. The experiment, conducted at Spices Research Centre, Shibganj, Bogura; Regional Spices Research Centre, Gazipur; and Spices Research Sub-Centre, Lalmonirhat,

employed a randomized complete block design with three replications. Traits such as plant height, number of branches, fruit dimensions, single fruit weight, fruit yield, and others were measured to assess genotype performance. Significant genetic variation was observed among the studied traits, with certain genotypes exhibiting distinct characteristics such as tall plants, high fruiting efficiency, and superior yield. For instance, BGCOMA-4 displayed tall plants (104.70 cm), while INDCH-39 demonstrated the highest number of branches (8.20) and longest fruit length (7.58 cm). INDCH-39 also exhibited the highest fruit yield (10.20 t/ha), indicating its potential as a high-yielding genotype. Comparative analysis across locations revealed variations in yield performance, with Bogura emerging as the most favorable location for onion yield. Genotypes like INDCH-33 and INDCH-39 demonstrated consistent and superior performance across locations, indicating their potential for broader adaptation and higher yield. These findings underscore the importance of genotype selection and environmental considerations in optimizing chilli yield and ensuring food security. Further research into genotype-environment interactions and the development of targeted breeding strategies are essential for enhancing crop productivity and sustainability in chilli cultivation.

Regional yield trial of chilli (Set-II)

M. I. Haque, M. A. A. Khan, S. N. Mozumder, M. N. Yousuf, and M. M. Kamal

The present study was conducted to evaluate the performance of six chilli genotypes. A randomized complete block design with three replications was implemented across two locations, Gazipur and Cumilla, during 2023-24. The combined performance of the genotypes showed significant variation for almost all traits across locations, except for the days to 50% flowering. The highest green fruit yield was recorded from the line CO 631 (10.34 t/ha), which was slightly lower than the check variety BARI Morich-2 (13.64 t/ha).

Maintenance of chilli germplasm

M. I. Haque, M. A. A. Khan, S. N. Mozumder, M. N. Yousuf, and M. M. Kamal

The present study was conducted on 36 Chilli genotypes during 2023-24 to enhance, increase and conserve chilli germplasm to utilize in the crop

improvement of chilli. A total 10 agronomic traits of chilli genotypes were recorded and higher standard deviation was observed in fruit weight per plant and 50% flowering and 50% fruiting. A Total 165 gm seeds of different chilli genotype were harvested and stored as nucleus seeds for future research purpose

Maintenance breeding of chilli

M. N. A. Chowdhury, M. T. Rahman, M. A. Oadud, M. I. Haque and M. Z. H. Prodhan

The experiment was conducted at Tuber Crop Research Sub Centre, Sawasgari, Bogura during 2023-2024 with a view to maintain the varietal purity through maintenance breeding. BARI Morich-4 (winter variety) was used in this study. Desired plants were selected according to the morphological characters of the mother parent. Red ripe fruits were collected from the specific characterized plants for maintaining varietal purity. After ripening seed were collected, processed and stored.

Regional yield trial of ornamental chilli

A. H. F. Fahim, M. A. Islam, M. N. Yousuf, M. R. Islam, M. N. Farid, F. Ahmed, M. A. Alam, M. A. Rahman, M. M. Haasan, and M. Z. H. Prodhan

The experiment was conducted at Spices Research Center, Bogura, Regional Spices Research Center, Jaydebpur, Spices Research Sub Center, Lalmonirhat and Citrus Research Station, Jaintapur during Rabi season of 2022-23 and 2023-24. Two advanced ornamental chilli lines (OC 011 and OC 018) were evaluated for their performance against BARI Ornamental Morich-1 and BARI Ornamental Morich-2 as check. The experiment was laid out in a Randomized Complete Block Design (factorial) with four replications. Significant differences among the chilli lines were observed in each location regarding different parameters. Among the locations, the higher amount of green fruit (0.46 Kg/plant in 2022-23 and 0.64 kg/plant in 2023-24) was harvested in Bogura location and the lower amount of green fruit (0.12 kg/plant in 2022-23 and 0.17 kg/plant in 2023-24) was harvested in Gazipur location. Among the ornamental chilli lines/variety, the highest green fruit yield (0.39 kg/plant in 2022-23 and 0.56 kg/plant in 2023-24) was obtained from OC 018 followed by OC 011 (0.28 Kg/plant in 2022-23 and 0.30 kg/plant in 2023-24) and the lowest amount of fruit (0.16 Kg/plant in 2022-23

and 0.19 kg/plant in 2023-24) was harvested from the check variety BARI Ornamental Morich-1. In case of interaction effect of location and ornamental chilli line/variety the highest amount of fruit (0.56 Kg/plant in 2022-23 and 1.05 kg/plant in 2023-24) was harvested from the ornamental chilli line OC 018 in Bogura location because of its biggest sized fruit which was identical to OC 011 in Bogura location (0.54 Kg/plant in 2022-23 and 0.57 kg/plant in 2023-24). The lowest amount of green fruit (0.08 Kg/plant in 2022-23 and 0.05 kg/plant in 2023-24) was harvested from BARI Ornamental Morich-1 and BARI Ornamental Morich-2 in Gazipur location respectively. All the ornamental chilli lines adopt well in all locations. Both the lines performed better than the check varieties. So that the lines OC 018 and OC 011 may be applied for registration for releasing new ornamental chilli varieties.

Regional yield trail of naga chili lines

F. Ahmed, J. C. Sarker, M. H. M. B. Bhuyan, M. N. A. Chowdhury and S. M. L. Rahman

Regional yield trial was conducted with selected two advance Naga chili lines at five different locations of BARI research stations during winter season of 2023-24 to observe their yield and yield potentiality as well as quality of chili produced. Maximum plant height was recorded at CC Jai-010 (200 cm) in Cumilla, whereas the shortest plant was recorded at CC Jai-018 (34 cm) in Joydebpur. CC Jai-010 produced the highest number of fruits per plant (230) in Cumilla. There was no fruiting in Joydebpur. Fruit length found maximum at CC Jai-018 (6.65 cm) in Akbarpur. But the shortest fruit was found at CC Jai-018 (4.11 cm) in Cumilla. Fruit diameter found maximum at CC Jai-010 (2.42 cm) in Cumilla. Contrary the lowest fruit diameter was found in CC Jai-018 (1.91 cm) in Cumilla. Maximum individual fruit weight (7.5 g) was obtained from the line CC Jai-010 in Akbarpur whereas, the minimum was (3.9 g) in Cumilla. The line CC Jai-010 noted maximum fruit yield (1087.9 g plant⁻¹) in Cumilla. On the other side the line CC Jai-010 noted lowest fruit yield plant⁻¹ (88.4 g plant⁻¹) in Bogura. Highest yield was recorded in CC Jai-018 (18.13 t ha⁻¹) in Cumilla whereas, lowest at CC Jai-018 (1.99 t ha⁻¹) in Bogura. Both the lines (CC Jai-010 and CC Jai-018) were susceptible to disease, mite, thrips. Aphid infestation was also observed.

Evaluation of ginger germplasm

M. A. Islam, M. M. Hasan, M. S. Naher and Z. H. Prodhon

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during April 2023 to February 2024 to select the promising ginger germplasm for releasing a variety. Twenty five different ginger germplasm (G0042, G0023, G0010, G0020, G0047, G0025, G0021, G0045, G0022, G0036, G0032, G001, G0043, G004, G0033, G0040, G0034, G0024, G0050, G0051, G0052, G0053, G0054, G0055 and G0044) with BARI Ada-1 as check were evaluated based on their yield and other characters. The experiment was laid out in randomized complete block design with three replications. Significantly the highest plant height, number of tillers/plant, number of leaves/plant, weight of primary and secondary rhizome was observed in the line G0010. The highest yield (24.75 t/ha) was also obtained from G0010 and the lowest yield (12.27 t/ha) was found from G0042 line.

Advanced yield trial of promising ginger lines

M. A. Islam, M. M. Hasan, M. S. Naher and Z. H. Prodhon

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during April 2023 to February 2024 to select the promising ginger germplasm for releasing a variety. Three promising ginger germplasm (G0046, G0048 and G0021) were included in the study with BARI Ada-1 as check. The experiment was laid out in randomized complete block design with three replications. The highest yield (17.0 t/ha) was recorded from G0046 and the lowest yield (12.71 t/ha) was recorded from G0021. Significantly higher plant height, number of tillers/plant, number of leaves/plant, weight of primary and secondary rhizome and yield along with better yield contributing characters were observed from the line G0046. The highest dry matter (%) of 26.33 was found from G0046. The lowest dry matter 22.6 was obtained from G0021.

Regional yield trial of promising ginger line

M. A. Islam, M. S. Naher, M. M. Hasan, M. M. Ahmed and Z. H. Prodhon

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura and Spices Research Sub Center Lalmonirhat during April

2023 to February 2024. Three promising ginger germplasm (G005, G0028 and G0027) were included in the study with BARI Ada-1 as check. The experiment was laid out in randomized complete block design with three replications. Significant differences among the ginger germplasm were observed in both the location regarding different parameters. In case of location, the height yield (24.71 t/ha) was recorded at SRSC, Lalmonirhat and the lowest yield (14.47 t/ha) was recorded at SRC, Bogura. In case of advance line, the height yield (21.56 t/ha) was found from G005, and the lowest yield (16.00 t/ha) was found from BARI Ada-1. The combined effect of location × advance line gave significant effect on yield and other parameter. The highest yield (27.65 t/ha) was obtained from G005 at SRSC, Lalmonirhat location. While the lowest yield (12.87 t/ha) was obtained from BARI Ada-1 at SRC, Bogura location. Significantly higher plant height, number of tillers/plant, number of leaves/plant, weight of primary and secondary rhizome, dry matter (%) and yield along with better yield contributing characters were observed from the line G005. The highest dry matter (%) of 27.42 and 27.73 was found from G005 in Bogura and Lalmonirhat location, respectively. The lowest dry matter 20.69 % was obtained from G0027 at Bogura location.

Advance yield trial of turmeric (*Curcuma longa* L.)

M. M. Rahman, M. A. Khan and R. Sarker

After germplasm evaluation and preliminary yield trial, the advance yield trial was conducted at the farm of SRSC, Faridpur during 2023-24 to assess the performance of selected turmeric genotypes. The experiment was laid out in RCB design with three replications. Six different turmeric genotypes (CL Far 001, CL Far 002, CL Far 003, CL Far 004, CL Far 005 and CL Far 006) and BARI Holud -4 and BARI Holud-5 as check varieties were used as treatments. They were evaluated based on their yield and other desirable characters. All the evaluated germplasms and check variety showed statistically different results in all parameters except leaves no per plant and leaf breath. The plant/plot Showed significantly different results for some climatic and germination issues. Despite of low no of plants/plot (71.33), CL Far 006 yielded the highest (22.19 t/ha) followed by CL Far 001 and CL Far 002 (19.91 & 19.14 t/ha). The check

varieties BARI Holud-4 and BARI Holud-5 yielded 13.37 and 17.96 t/ha, respectively.

Advance yield trial of turmeric

M. A. Alam, M. A. Mottalib, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, S. Naher and M. Z. H. Prodhhan

The present experiment was conducted to select superior turmeric lines for higher yield at Spices Research Centre, Shibganj, Bogura during 2023-2024. Ten turmeric genotypes, including BARI Holud-4 and BARI Holud-5 as checks, were used in this study. The experiment was laid out in alpha lattice design with three replications. Genotypes T0095, Kukurmoni, and K-5 out-yielded both the check entries, followed by BARI Holud-5. The trial needs to be continued, including a new set of promising genotypes in the next season.

Regional yield trial of turmeric (Set-I)

M. A. Alam, M. R. Islam, M. A. A. Khan, M. M. Rahman, M. M. Hassan and M. Z. H. Prodhhan

The present experiment was conducted to select superior turmeric lines for higher yield at Spices Research Centre, Shibganj, Bogura; Regional Spices Research Centre, Gazipur; Regional Spices Research Centre, Magura and Spices Research Sub-Centre, Faridpur during 2023-2024. Five turmeric genotypes including BARI Holud-4 and BARI Holud-5 as check were used in this study. The experiment was laid out in RCB design with three replications. Genotype T0098 out yielded both the check entries, which was followed by BARI Holud-5. Genotype TO0137 was yielded similar to BARI Holud-5 but was earlier maturing.

Regional yield trial of turmeric (Set-II)

M. R. Islam, R. Ara, M. A. Alam, A. J. M. Obaidullah, M. A. Alam and M. M. Rahman

The experiment was conducted during 2022-2023 and 2023-2024 at different agro-ecological zones to evaluate different turmeric lines and to select the promising one for releasing a variety. The experiment was laid out in randomized complete block design with three replications. Three different turmeric lines (T073-1, T0098 and T0137) including BARI Holud-4 and BARI Holud-5 as check were evaluated based on their yield and other desirable characters. Significant differences were observed among different lines. The highest fresh yield (51.12 t/ha in 2022-23 and 27.90 t/ha in 2023-

24) was found from BARI Holud-4 whereas the lowest fresh yield (34.85 t/ha in 2022-23 and 20.49 t/ha in 2023-24) was found from BARI Holud-5. Significantly the highest dry yield (12.44 t/ha in 2022-23 and 8.41 t/ha in 2023-24) was observed from T0137 turmeric line followed by T073-1. Whereas lowest dry yield (8.92 t/ha in 2022-23 and 5.17 t/ha in 2023-24) was observed in BARI Holud-4.

Maintainance of turmeric germplasm

M. A. Alam, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, S. Naher and M. Z. H. Prodhhan

The present experiment was conducted to evaluate the performance of various turmeric genotypes and to maintain the existing turmeric germplasm for future breeding programs at Spices Research Centre, Shibganj, Bogura during 2023-2024. Observations were recorded for several traits to capture the variability. A number of genotypes exhibited promising performance. In parallel, a total of 80 genotypes from true-to-type plants were preserved.

Evaluation of cumin germplasm

M. M. Hasan, M. A. Alam and Z H Prodhhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during rabi season of 2023-2024 to evaluate the germplasm which collected from different sources and to identify the best germplasm with higher yield and other desirable characters. The experiment was laid out in RCB design with three replications. seventeen different cumin genotypes with a check BARI Cumin 1 were evaluated for yield and yield contributing characters. Seed yield and yield contributing characters were significantly different among the germplasm. The highest seed yield was obtained from CN45 (621.60 kg/ha) and the lowest seed yield was recorded from CN48 (364.39 kg/ha).

Evaluation of coriander germplasm

M. M. Hasan, M. A. Alam and Z H Prodhhan

The experiment was conducted to evaluate the germplasm collected from different sources and to identify the best genotype with higher yield and desirable characters at Spices Research Centre, BARI, Shibganj, Bogura during rabi 2023-2024. Thirty-two different coriander genotypes with BARI Dhonia 1 as a check were evaluated based on

their yield attributes and yield. The experiment was laid out in RCB design with three replications. All the traits varied significantly among the genotypes without Seed/Umbellets. The highest plant height (154.50cm) and number of seed/umbellets (6.74) was found in COR34. The highest seed yield was found in COR34 (1.65 t/ha) and the lowest (0.57 t/ha) was COR12.

Evaluation of fenugreek germplasm

A. H. F. Fahim, M. M. Hasan, M. A. Rahman, M. A. Alam, M. A. Mottalib and M. Z. H. Proadhan

The trial was conducted at Spices Research Centre, BARI Shibganj, Bogura during the *Rabi* season of 2023-24 to evaluate the germplasm collected from different sources in terms of their yield potentiality and to identify the superior one(s). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Thirteen different fenugreek germplasm (FK25, FK27, FK30, FK31, FK32-1, FK32-2, FK33, FK34, FK36, FK39, FK40, FK41 and FK42) were evaluated against recommended variety BARI Methi-4 (Proposed). Seed yield and other yield contributing characters were significantly varied among the germplasm. The higher amount of seeds (2.22 t/ha) was harvested from the check variety BARI Methi-4 which was identical to FK42 (2.09 t/ha) followed by FK36 (1.96 t/ha). The lower amount of seeds (0.34 t/ha) was harvested from FK27. Among the germplasm FK42 performed better in terms of yield potentiality but not out yielded than the check variety BARI Methi-4. The experiment will be repeated in the next year for confirmation of the results.

Evaluation of sickle fruit fenugreek germplasm

M. M. Hasan, M. A. Alam and Z H Proadhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during rabi season of 2023-2024 to evaluate the germplasm collected from different sources and to identify the best genotype with higher yield and desirable characters. The experiment was laid out in RCB design with three replications. Six different sickle fruit fenugreek (Firingi) genotypes with BARI firingi1 as check were evaluated for yield and yield contributing characters. Seed yield and other yield contributing characters were significantly different except number of seeds/pod and 1000 seed weight (g) among the studied genotypes. The highest plant

height was recorded from FRG 01 (71.20 cm). The lowest plant height was found in FRG 02 (66.40 cm). FRG05 performed best, the highest seeds yield (797.87 kg/ha).

Evaluation of fennel germplasm

M. M. Hasan, M. A. Alam and Z H Proadhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during rabi season of 2023-2024 to evaluate the fennel germplasm collected from different sources and to identify the best genotype with higher yield and desirable characters. The experiment was laid out in RCB design with three replications. Sixteen different fennel genotypes with a check BARI Mouri 2 were evaluated for yield and yield contributing characters. Seed yield and other yield contributing characters were significantly different among the genotypes. The highest plant height was recorded from FN10 (180.24cm). The higher seed yield was obtained from FN16 and FN24 (1.05 t/ha). The lowest seed yield was recorded from FN23 (0.83 t/ha).

Evaluation of dill germplasm

M. M. Hasan, M. A. Alam and Z H Proadhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during rabi season of 2023-2024 to evaluate the germplasm collected from different sources and to identify the best genotype with higher yield and desirable characters. The experiment was laid out in RCB design with three replications. Ten different dill genotypes with BARI Soluk1 as check were evaluated for yield and yield contributing characters. Seed yield and other yield contributing characters varied significantly due to different genotypes except number of primary branches/plant. The highest plant height was recorded from AG10 (135.31cm) and the lowest plant height was found in AG01(126.88cm). In case of seed yield, AG01 performed best (482 kg).

Evaluation of ajowan germplasm

M. M. Hasan, M. A. Alam and Z H Proadhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during rabi season of 2023-2024 to evaluate the germplasm collected from different sources and to identify the best genotype with higher yield and desirable characters. The experiment was laid out in RCB

design with three replications. Eight different ajowan genotypes with BARI Ajowan1 as check were evaluated for yield and yield contributing characters. Seed yield and other yield contributing characters were significantly different among the studied genotypes. The highest plant height was recorded from TA08 (128.63cm) and the lowest plant height was found in TA02 (102.49 cm). TA06 performed best, the highest seeds yield (1.35t/ha).

Maintainance of betel vine germplasm

M. A. Alam, M. A. Mottalib, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, S. Naher and M. Z. H. Prodhhan

The present experiment was conducted to evaluate betel vine genotypes for higher leaf production at the Spices Research Centre, Shibganj, Bogura during 2023-2024. Thirty-seven genotypes were evaluated, with BARI Pan-1 and BARI Pan-2 used as checks. Among the evaluated genotypes, BL 001 and Rajshahi pan-3 were found promising. The promising genotypes need to be evaluated further in the next season.

Preliminary yield trial of fennel (*Foeniculum vulgare*)

M.M. Rahman, M.A. Khan and R. Sarker

A preliminary yield trial of fennel germplasm was conducted during 2023-24 at Spices Research Sub-Centre, Faridpur to evaluate that germplasm. The experiment was laid out in RCB design and one selected line (FV Far 001) and two variety (BARI Mouri-1 and BARI Mouri-2) were used as treatments. Highest seed yield (891.87 kg/ha) and 1000 seed weight (4.09 g) was found by FV Far 001.

Advance yield trial of betel vine

M. A. Alam, M. A. Mottalib, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, S. Naher and M. Z. H. Prodhhan

The present experiment was conducted to evaluate betel vine genotypes for higher leaf production at Spices Research Centre, Shibganj, Bogura during 2023-2024. Lines BL0025, BL0027, BL0028, BL0030, and BL0040 were evaluated, with BARI Pan-3 used as a check. Among the evaluated genotypes, BL0027 was found promising. The promising genotypes need to be evaluated further in the next season.

Preliminary yield trial of garden cress

R. Islam, M. A. Alam and A. J. M. Obaidullah

Garden cress (*Lepidium sativum*) is an annual, fast growing edible herbaceous plant that belongs to Brassicaceae family. Plant had leaves were lobed shape with linear segments. Flowers were small in size, white to pinkish in colour and formed a highly clustered inflorescence have many branches on the upper part. Fruits are obovate pods with two seeds per pods, elliptic, flat, tip broadly winged with notched tip, grey, approximately 5 mm long. A field experiment was conducted at Regional Spices Research Centre, Bangladesh Agricultural Research Institute, Magura during 2023-2024 to characterized and evaluated garden cress genotypes.

Regional yield trial of mint

M. N. A Chowdhury, M. M. Hasan, M. M. Rahman, M. R. Islam, M. A. Oadud, M. S. Naher and M. Z. H. Prodhhan

The experiment was conducted at Spices Research Centre, Shibganj, Bogura, Regional Spices research Centre, Magura and Spices Research Sub-centre, Faridpur during November 2023 to June 2024 with a view to study the regional adaptability of the selected mint lines on different areas and to select promising mint line (s) for releasing variety. One advance line (M003) with BARI Pudina-1 and BARI Pudina-2 were used in the study. The experiment was laid out in a randomized complete block design with five replications. Among the locations, it was found that the highest number of twigs per plant (21.93) was found in Faridpur location and the lowest number (19.04) was found at Magura location. Faridpur location gave the highest number of leaves per twig (20.98) and the lowest (19.69) was found in Bogura location. The highest leaves with twig yield (13.75t/ha) was found at Bogura location and the lowest (11.35 t/ha) was found at Faridpur location. Significantly the highest leaves with twig yield (13.58 t/ha) was recorded from M003 and the lowest (10.60 t/ha) was found from BARI Pudina-1. In respect of combined effect, it was observed that M001 gave the highest leaves with twig yield (15.53 t/ha) at Bogura location and the lowest (10.06 t/h) was recorded from BARI Pudina-1 at Magura location.

Collection and evaluation of annatto (*Bixa orellana* L.) For seed multifaction as a source of natural edible dye

S. Brahma, M.N. Yousuf, M.A.A. Khan, R. Ara and S.N. Mozumder

The experiment was conducted at the research field of Regional Spices Research Centre, BARI, Gazipur during 2023-2024 to study the morphological and ecological features and uses of annatto germplasm and to select the promising one(s) for releasing as a variety. Seven germplasm namely BO Gaz 001, BO Gaz 002, BO Gaz 003, BO Gaz 004, BO Gaz 005, BO Gaz 006 and BO Gaz 007 were collected from different region of Bangladesh. Among the seven germplasms BO Gaz 003 perform the best regarding morpho-phenological charters of annatto.

Stress breeding

Screening of chilli genotypes for their tolerance to drought stress

M.N. Yousuf, S. Brahma, M.A.A. Khan, M.I. Haque and S.N. Mozumder

A field experiment was conducted during *rabi* seasons of 2023-2024 in the research field of BARI, Gazipur, to evaluate the chilli genotypes for their tolerance to drought stress. The experiment was set up in split plot design with Factor A (main plot) Tree irrigations levels: $I_1 = 100\%$ Field Capacity (FC), $I_2 = 30\%$ depletion of Field capacity (FC), $I_3 = 50\%$ depletion of Field capacity (FC) and Factor B: 8 Chilli genotypes (CO620, Akashi, China Morich, CO630-1, CO613-1, BARIMorich-4, BARI Morich-2, BARI Morich-1) having three replications. Almost all the yield and yield contributing characters of chilli were significantly influenced due to application of irrigation. Hence, the application of irrigation at 100% Field Capacity in China Morich gave the highest fruit yield per plant (95.74g).

Selection of chilli genotypes in drought and saline stress by multi-trait stability index at seedling emergence stage

Mohammad Matin Akand, Nure Yousuf, M. M. Kamal, S. Brahma, M.I. Haque and M.A.A. Khan

Drought and salinity are the main limiting environmental factors that restrict the yield of chilli. To recommend genotypes for cultivation

under adverse drought and saline stress conditions, multi-environment trials (MET) are needed. However, MET analysis is usually performed considering a single trait, which provides lower reliability in recommending genotypes when compared to multi-trait analysis. Thus, this study was carried out to investigate the stability of the multi-trait stability index (MTSI) in 20 chilli cultivars under the effects of drought and saline stress on seed germination and initial seedling growth. Drought and saline stresses were imposed by seed exposure to -0.20 MPa iso-osmotic solutions with polyethylene glycol-PEG 6000 (119.6 g/L) or NaCl (2.36 g/L) for 12 days at 25°C . The germination rate, seedling length and seedling fresh matter were measured. When considering the index for multiple environments, we can select the most stable genotypes CO631, CO632 and Co641 among the 20 tested genotypes.

Effect of water stress on root architecture in chilli pepper genotypes

Mohammad Matin Akand, Nure Yousuf, M. M. Kamal, S. Brahma, M.I. Haque and M.A.A. Khan

A pot culture experiment was conducted to study the root growth and modifications of chilli and their anatomy in a completely randomized design with three replications, three treatments and four chilli genotypes at Regional Spices Research Centre (RSRC), BARI, Gazipur. Thirty-six pots and five seeds per pot were used to grow the seeds. After five weeks, the genotypes were exposed to different drought stress conditions by keeping the soil moisture content at 100% (control), 60% (moderate), and 40% (severe). Genotypic differences were marked in root system architecture and anatomy. Under severe drought, Co446, Co525, and Co632 showed varied shoot and root lengths. Co525 had the highest shoot and root fresh weight while Co631 and Co446 exhibited superior lateral root development. Specific root lengths varied with Co631 having the highest and Co525 the lowest.

Cultural management

Effect of intercropping onion with brinjal

M.M. Rahman and M.A. Khan

A field study was carried out at Spices Research Sub-Centre (SRSC), Bangladesh Agricultural

Research Institute (BARI), Faridpur during the season of 2022-2023 and 2023-24 to find out the combinations of brinjal and onion which can be profitable than monocropping. Seven treatments combination viz., brinjal 100% + onion 70%, brinjal 100% + onion 60%, brinjal 100% + onion 50%, brinjal 100% + onion 40%, brinjal 100% + onion 30% and sole crop of brinjal and sole crop of onion were evaluated in RCBD design with three replications. BARI Begun-12 and BARI Piaz-4 were used as planting material. Onion was planted in two times, first set to bulb method and after harvesting onion seedlings were transplanted in same field with same design. Both brinjal and onion gave highest yield in sole planting but by the economic performance highest gross return (Tk. 2204300 tk ha⁻¹), gross margin (Tk. 1844199 tk ha⁻¹), net return (1818699 tk ha⁻¹) and BCR (5.72), LER (1.55) and MAI (Tk. 552650 ha⁻¹) were found in brinjal 100% + onion 50% intercropping system in 2022-23. But in 2023-24, highest BCR (9.50) found in T₇ treatment. Among the intercropping treatment highest RVI (1.77) was showed by 70% onion intercropped in between two brinjal rows (100%) in 2022-23 and in 2023-24 it was 1.28, showed by 100% brinjal and 50% onion.. From two year observation with economic basis, the brinjal 100% + onion 50% intercropping system was found as the best intercrop combination among other treatments.

Study of pollination approach on the true seed production of onion

Mst. Sadia Naznin, M.N.A. Chowdhury and M. Z.H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura, during November 2023 to April 2024. Pollination plays a crucial role in the reproductive success of onions (*Allium cepa* L.) and directly affects true seed production. This study investigated the effect of different pollination approaches on the true seed yield of BARI Piaz-4 onion variety. The experiment was laid out in Randomized Complete Block (RCB) design. Five treatments were implemented: T₁ involved natural pollination combined with regular hand pollination; T₂, T₃, and T₄ incorporated natural pollination with hand pollination at intervals of 1, 2, and 3 days respectively; and T₅ served as the control with only natural pollination. The results revealed that T₂ exhibited the highest seed production compared to

T₁, T₃, T₄, and T₅ (Table 1). Additionally, there was a progressive reduction in seed production in treatments T₃, T₄, and T₅, attributed to the increased interval between hand pollination sessions. The seed yield of T₂ (302.02 kg/ha) surpassed that of T₁ (281.96 kg/ha), indicating the effectiveness of hand pollination at 1-day intervals in enhancing true seed production in onion (BARI Piaz-4). Here, T₁ and T₂ statistically are statistically similar. These findings underscore the importance of pollination management strategies in optimizing seed yield in onion cultivation. The results indicate that T₂, involving hand pollination with a 1-day interval after natural pollination, yields the highest true seed production compared to T₁ and T₃-T₅, which progressively decrease due to longer intervals between natural and hand pollination. However, in respect of pollination approach, all parameters i.e., No. of active flower per umbel (117.39), No. of seed per umbel (231.30), 1000 seed weight (4 g) showed in highest with T₂ (Natural pollination with 1 days interval hand pollination). The higher yield in T₂ compared to T₁ can be attributed to the timing of hand pollination. With a 1-day interval, hand pollination occurs closer to the natural pollination event, maximizing the chances of successful fertilization and seed set. In contrast, T₅ served as control with only natural pollination which results in a comparatively lower seed production.

Effect of mulching and different weed management practices on weed control and yield of garlic

M. N. Farid, M.A. Islam, M. A. Hossain, M. A. Sarkar and M. E. Haque

A field experiment was carried out at Spices Research Sub-Centre, Bangladesh Agricultural Research Institute, Lalmonirhat during November 2023 to April 2024 to assess the effect of mulching and different weed management of garlic. The treatments comprised of T₁: Rice straw 1 t/ha + Pendimethalin (30% EC) @ 5ml/L, T₂: Rice straw 2 t/ha + Pendimethalin (30% EC) @ 5 ml/L, T₃: Rice straw 3 t/ha + Pendimethalin (30% EC) @ 5 ml/L, T₄: Rice straw 4 t/ha + Pendimethalin (30% EC) @ 5 ml/L, T₅: Manual weeding (25, 50 and 75 DAP) and T₆: (Control). The experiment was laid out in RCB design with three replications using BARI Rashun-3 as test material. Mulching and spraying of herbicide were affected all the

parameters studied. The lowest dry weed biomass (g/m^2) 6.63g was found at T_1 and the highest (32.87 g) was found at T_6 after 60 DAP. At 60 DAP the highest WCE (%) 79.85 was found at T_3 followed by T_1 . The lowest WCE (%) 75.96 was found at T_2 . Among the treatments, the highest yield of 9.14 t/ha^{-1} was obtained from treatment T_3 : Rice straw 4 t/ha + Pendimethalin (30% EC) @ 5 ml/L and the lowest yield was 2.08 t/ha^{-1} from treatment T_6 (Control).

Effect of different cocodust combination on ginger production using bagging culture method

M. A. Islam, M. S. Naher and M. M. Hasan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during April 2023 to February 2024 to identify suitable cocodust combinations for ginger cultivation in bag culture method. Five types of cocodust combinations T_1 : 25% cocodust + 75% soil, T_2 : 50% cocodust + 50% soil, T_3 : 75% cocodust + 25% soil, and T_4 : 100% cocodust T_5 : 100% soil were evaluated based on their yield and other characters. The experiment was laid out in randomized complete block design with three replications. Significantly the highest plant height, number of tillers/plant, number of leaves/plant, weight of primary and secondary rhizome was observed in the T_2 : 50% coco dust + 50% soil combinations. The highest yield (990.27 g/bag) was also obtained from T_2 (50% coco dust + 50% soil) treatment combinations and the lowest yield (473.70 g/bag) was found from T_5 treatment (100% soil).

Effect of sowing time on the yield and yield components of black cumin in Cumilla region

M Rahman and M A Siddiky

The experiment was conducted at the Regional Agricultural Research Station, BARI, Cumilla during Rabi season of 2023-24 to find out the optimum sowing time for black cumin in Cumilla region. The experimental treatments include (i) 4 dates of sowing viz., $S_1=16$ October, $S_2=1$ November, $S_3=16$ November, $S_4=1$ December. Results revealed that sowing time had significant influences on various crop characters and seed yield. The experiment was laid out in randomized complete block design with three replications. Among the planting time treatments, S_3 , (Sowing on 16 November) was superior in relation to plant height, number of primary branches plant^{-1} , number

of capsules plant^{-1} , number of seeds capsules $^{-1}$, capsules length and 1000-seed weight which resulting the highest seed yield (1.57 t/ha^{-1}). whereas The lowest seed yield (0.86 t/ha^{-1}) was recorded in S_4 , treatment So, the results revealed that sowing time ($S_3=16$ November) had significant influences for getting higher seed yield in Black cumin.

Integrated weed management in turmeric

M. R. Islam, M. A. Alam. and A. J. M. Obaidullah

The experiment was conducted at Regional Spices Research Centre, BARI, Magura during 2023-24 to find out the best management practices for controlling weed of Turmeric. The experiment was laid out in randomized complete block design with three replications. Four different treatments and a control plot were studied. Significant differences regarding yield and yield attributes were observed among different treatments. Significantly the highest plant height, number of tillers per clump, number of mother rhizomes, weight of mother rhizome per clump, number of primary fingers, weight of primary fingers, number of secondary fingers per clump, weight of secondary fingers, weight of rhizome per clump was observed from the treatment T_1 (Glyphosate @ 10 ml/L+ Straw mulch 5t/ha + 1 HW at 70 DAP). The highest fresh yield (43.83 t/ha) was found from treatment T_1 (Glyphosate @ 10 ml/L+ 1 HW at 70 DAP + Straw mulch @ 5 t/ha) and the lowest yield (20.63 t/ha) was found from control plot T_5 . Maximum weed control efficiency (93.17%) was found from treatment T_1 (Glyphosate @ 10 ml/L+ 1 HW at 70 DAP + Straw mulch @ 5 t/ha).

Effect of planting time, branch diameter and IBA concentration on plum cutting

A. H. F. Fahim, M. A. Alam and M. Z. H. Prophan

The trial was conducted at Spices Research Centre, BARI Shibganj, Bogura in 2024 to identify optimum time, suitable branch diameter and effective IBA concentration for plum cutting. The experiment was laid out in a Randomized Complete Block Design (Factorial) with four replications. Twenty-four different planting times at 15 days interval (from 1st October 2023 to 15 September 2024), 3 different branch diameters (viz. Thin=<6mm, Medium=6-<8mm & Thick= \geq 8mm) and 4 different IBA concentrations (0 ppm, 3000ppm, 4000ppm, & 5000ppm) were considered as the

treatments for the study. BARI Alubokhara-1 was used as the test crop. The higher percentage (98%) of cutting success rate was found when cuttings were planted on 1st November which was identical to the 15 November planting (97%). No cuttings survived after planting them from 1st February to 15 October. Also, the highest cutting success rate (99%) was recorded when 3000 ppm IBA and medium-sized branch diameter were used for plum cuttings. Which was identical to 3000 ppm IBA x thick branch (97%) and 3000 ppm IBA x thin branch (96%). The lowest cutting success rate 50% was observed from 5000ppm IBA x thin branch diameter. On the other hand, the higher percentage (100%) of plum saplings survived after transplanting in polybags from nursery beds when cuttings were planted in the date of 1st November which was identical to 15 November (100%), 1st December (100%) and 15 December (100%). The lowest survival percentage (95%) of cuttings was observed when planted on 15 January. The highest sapling survival percentage (100%) was recorded when 3000 ppm IBA and medium-sized branch diameter were used for plum cuttings. Which was identical to 3000 ppm IBA x thick branch (100%) and 3000 ppm IBA x thin branch (100%). The lowest sapling survival percentage (79%) was observed when 5000ppm IBA x thin branch diameter was used for plum cuttings. it was concluded that 1st November to 15 November was the optimum time for plum cutting. Moreover, 3000 ppm IBA concentration and 6-8mm branches were the best for successful plum cuttings.

Effect of soaking duration on the germination, growth and development of almond seedling

A. H. F. Fahim, M. A. Alam, and M. Z. H. Prodhon

The trial was conducted at Spices Research Centre, BARI Shibganj, Bogura during the *Rabi* season of 2023-24 to identify the most effective soaking duration for almond seed germination and to develop new almond lines for further research. The experiment was laid out in a Completely Randomized Design (CRD) with three replications. Five different soaking durations viz. 12 hours, 24 hours, 36 hours, 48 hours, and control (without soaking) were evaluated for the study. The almond seeds used for the study were collected from the market of Hili Land Port, Hakimpur, Dinajpur. It was found that the seed soaking duration had a significant effect on the germination and

establishment of seedlings from almond seeds. The higher percentage (39%) of almond seeds germinated when seeds were soaked in water for 48 hours followed by 36 hours (30%). The lowest percentage of seeds (1%) were found from the control treatment where seeds were not soaked in water and directly placed in the refrigerator for germination. On the other hand, the higher percentage (38%) of almond seedlings was established when seeds were soaked in water for 48 hours. No seedlings were established from the control treatment and 12 hours of water soaking. So, water soaking of almond seeds for 48 hours followed by keeping them in the refrigerator (at 8-9°C) for 60 days was the most effective for the establishment of almond seedlings from seeds.

Soil and water management

Using nano fertilization to improve yield and quality of onion

M. N. Yousuf, S. Brahma, M. A. A. Khan, M. I. Haque and S.N. Mozumder

A Field experiment was conducted at Regional Spices Research Centre, BARI, Gazipur to find out the efficacy nano fertilizer on yield and yield contributing characters of onion during *rabi* season of 2023-2024. The experiment was designed in Factorial Randomized Complete Block Design having four replications. The treatment composed T₁ = 100% Conventional fertilizers (N, P, K, S, Zn and B @ 100, 50, 100, 30, 3.5 and 1.5 kg ha⁻¹), T₂ = 100% Nano fertilizers (N, P, K, S, Zn and B @ 100, 50, 100, 30, 3.5 and 1.5 kg ha⁻¹), T₃ = 50% Conventional +50% nano fertilizer. The conventional and nano fertilizer had significant effect on yield, yield contributing parameters of onion. The highest bulb yield (33.35 t ha⁻¹) and marketable bulb yield (32.68 t ha⁻¹) were recorded when onion variety BARI Piaz-4 cultivated under 50% Conventional +50% nano fertilizer in the study area.

Effect of nitrogen regimes on the yield and quality of onion (*allium cepa* L.) Through set to bulb method

M. A. Khan, M. M. Rahman and R. Sarker

The present research work was laid out at Spices Research Sub-Centre (SRSC), Bangladesh Agricultural Research Institute (BARI), Faridpur

during winter season of 2023-2024 to find out the optimum dose of nitrogen for obtaining higher yield and quality of onion through set to bulb method with the variety BARI Piaz-4. The seven levels of nitrogen doses were: T₂: 0 kg N/ha, T₂: 30 kg N/ha, T₃: 60 kg N/ha, T₄: 90 kg N/ha, T₅: 120 kg N/ha, T₆: 150 kg N/ha and T₇: 180 kg N/ha in the study. The experiment was carried out in the Randomized Complete Block Design with three replications. The results revealed that characteristics studied were influenced by N regimes. Growing onion without N exhibited yellowing in colour on the plants under the score 5 significantly followed by 30kg N/ha (score 3). While, onion plants at N @60-180kg/ha had no sign of yellowing on the plant. Instead of yellowing, plants with higher doses of N showed dark green in colour. Days to maturity were increased with increasing N up to 150kg N/ha ranged from 75.33 to 82.33 days. and then it was decreased at 81.07 days with 180kg N/ha. The maximum individual bulb weight was recorded at 150kg N/ha (34.22g). However, onion plant with zero (0) kg N gave the minimum individual bulb weight (17.32g). Incorporation of 150kg N/ha produced the highest bulb yield (22.15t/ha) which was mutually equal to 180kg N/ha (21.08t/ha) and 120kg N/ha (20.74t/ha) but statistically different with 90kg N/ha (17.32t/ha). The lowest bulb yield (10.05t/ha) was obtained from zero (0) kg N/ha. Plants with 120kg N/ha gave 16.43% split bulb which was statistically at par with the 90kg N/ha (14.96%) and 150kg N/ha (18.22%). Incidence of bolting gradually decreased with the increase in N rates. Finally considering yield and quality, 120kg N/ha was optimum for the production of onion through set to bulb method with the variety BARI Piaz-4. Insufficient and excessive addition of N both reduced yield and quality of onion.

Effect of different levels of nutrients on growth, yield and storage capacity of winter onion

M. A. Rahman, M. N. A. Chaudury, M. A. Alam, A. H. F. Fahim and Z. H. Prodhan

A field experiment was conducted at the Spices Research Center (SRC), BARI, Shibganj, Bogura during the rabi season of 2023 - 2024 to know the effect of different fertilizer management practices on growth, yield and storage capacity of winter onion. There were five treatment combinations viz. T₁: N₀ K₀ S₀ + other nutrients as per FRG recommendation (Control), T₂: N₁₁₀ K₇₅ S₅₀ + other

nutrients as per FRG recommendation, T₃: N₁₄₀ K₁₂₀ S₇₀ + other nutrients as per FRG recommendation, T₄: N₁₆₀ K₁₆₀ S₈₀ + other nutrients as per FRG recommendation and T₅: N₂₀₀ K₂₀₀ S₁₀₀ + other nutrients as per FRG recommendation were studied in a randomized complete block design with four replications. Positive effects of different treatments were recorded on yield, yield contributing characters and storage capacity of onion. The highest yield (20.45 t/ha) was found in T₅. Percent non-marketable bulb number was found highest in T₅ (23.72) and % non-marketable bulb weight was lowest in T₄ (3.88) after two months of storage. The highest level of gross margin (tk. 397593), BCR (1.50) and MBCR (1.57) were obtained from T₄ and also maximum level of gross margin (tk. 563731), BCR (1.83) and MBCR (6.72) were obtained from T₅.

Nutrient management on growth and rhizome yield of turmeric

M. N. Yousuf, S. Brahma, M. A. A. Khan, M. I. Haque and S.N. Mozumder

A Field experiment was conducted at Regional Spices Research Centre, BARI, Gazipur to find out the varietal efficacy under different nutrient management package of turmeric during 2023-2024. The experiment was designed in Factorial Randomized Complete Block Design having three replications. The treatment composed of three turmeric varieties: BARI Holud-3, BARI Holud-4 and BARI Holud-5 with three nutrient management packages: 100% RDF (180-60-160-30-4-2 kg NPKSZnB ha⁻¹) + Cowdung 5 tha⁻¹, 100% RDF + Vermicompost 3tha⁻¹ and 100% RDF + Mustard cake 2tha⁻¹. The individual as well as interaction effect of turmeric varieties and nutrient management packages showed significant effect on yield, yield contributing parameters of turmeric. The highest rhizome yield (31.25 t ha⁻¹) was recorded when turmeric variety BARI Holud-4 cultivated under 100% RDF + Vermicompost 3 t ha⁻¹ in Grey Terrace Soil of Madhupur Tract (AEZ-28).

Effect of integrated nutrient management on seed yield of coriander

M.N. Yousuf, S. Brahma, M.A.A. Khan, S.N. Mozumder and R. Ara

A field experiment was conducted during *rabi* seasons of 2023-2024 in the research field of BARI, Gazipur, to study the effect of integrated

nutrient management on seed yield and yield contributing characters of coriander cv. BARI Dhania-2. The experiment was set up in Randomized Complete Block Design (RCBD) with five treatment combinations: 100% RDCF (80-35-60-15-2.5-1.5 kgNPKSZnBha⁻¹), 75% RDCF + 25% N from Cowdung, 75% RDCF + 25% N from Vermicompost, 75% RDCF + 25% N from Poultry manure and Control (native fertility), having three replications. Almost all the yield and yield contributing characters were significantly influenced due to application of organic manures with combinations chemical fertilizers on the IPNS basis to produce coriander seed production. Significantly higher seed yield (2.14 tha⁻¹) was obtained from treatment 75% RDCF + 25% N from vermicompost and the minimum seed yield (0.66 t ha⁻¹) in control (native fertility) treatment. Hence, the application of 60-35-60-15-2.5-1.5 kgNPKSZnBha⁻¹ with combination of vermicompost @1850 kg ha⁻¹ could be regarded as the best nutrient management package for achieving higher coriander seed production in the study area.

Growth and yield of black cumin influenced by integrated nutrient management

M. A. Rahman, M. R. Ali, J. Rahman, A. H. F. Fahim, M. A. Alam, M. M. Hasan and Z. H. Prodhon

A field experiment was conducted at the Spices Research Center (SRC), BARI, Shibganj, Bogura during the rabi season of 2023-2024 to know the effect of different nutrient management practices on growth and yield of black cumin. Five treatments viz. T₁=recommended fertilizer dose (RFD) (N₆₀P₂₄K₄₅S₁₅Zn₂B_{1.4} kg/ha) (FRG, 2018), T₂=125% of RFD, T₃= Integrated Plant Nutrient System (IPNS) with 3 t/ha PM, T₄= Integrated Plant Nutrient System (IPNS) with 3 t/ha FYM and T₅= farmers' practice (N₅₈P₁₉K₃₈S₁₄Zn₂B_{1.4} kg/ha) were studied in a randomized complete block design having four replications. The highest black cumin seed yielder (1.56 t/ha) treatment was T₄ with higher level of BCR (1.41). For each Tk. 3.99 added cost of cultivation would return Tk. 3.99 added benefit to the black cumin farmers (MBCR = 3.99) for adopting IPNS fertilizer management practice with 3 t/ha FYM.

Insect and disease management

Survey and monitoring of new pest arthropods infesting spice crops in Bangladesh

MZH Prodhon

Survey and monitoring were conducted at different growing areas during 2023-24 to document new pest arthropods infesting spice crops. Twenty-five new pest arthropods were found to attack on 19 different Spice crops. Most of the pests caused damage on different crops in Bangladesh but they are new in spice crops. Among them, Lateral-lined armyworm on onion, Webber on cumin and fennel, Black looper on celery and Cinnamon butterfly on Cinnamon are new in Bangladesh. The document helps to update the check list of pest arthropods on spices crops in Bangladesh.

Incidence of fall armyworm, *spodoptera frugiperda* on ginger in ginger growing areas of bangladesh

MZH Prodhon

Fall Armyworm (FAW), *Spodoptera frugiperda*, (J.E. Smith) has been recorded in Bangladesh on maize during November 2018. It is a destructive and invasive pest, about 79% maize plants and 26% cob were damaged by the pest in Bangladesh during 2019-20. Subsequently the pest was reported to attack on cabbage and tobacco from Rangpur, Bangladesh. Recently, the pest was found to attack on ginger (*Zingiber officinale*) fields, about 21.94% infestation observed during 2023-24. It is suspected that the infestation spread gradually to the ginger growing areas in Bangladesh.

Advanced yield trial of chilli genotypes against thrips and mite

M. M. Hossain, M. Z. H. Prodhon, M. A. Isla, M. A. Sarkar and M. O. Hoque

The field study was conducted at Spices Research Sub-centre, Shibganj, Lalmonirhat, Bangladesh during Rabi season of 2023-24 to test the performance of different chilli genotypes against thrips and mite. Eleven different chilli genotypes (C0718, C01245, C0145, C0649, C0650, C01111, C0701, C0613, C0614, C01212 and C01236) along with BARI Morich-1, 2 and 3 were evaluated against thrips and mite. Out of eleven chilli genotypes screened against thrips and mites, none was found completely free from the attack of pests.

The three genotypes, CO145, CO718 and CO1212 recorded lowest number of thrips, mite and leaf curl were found resistant, three genotypes, C0701, C01236 and BARI Morich-2 were found moderately resistant, five genotype, C0649, C0650, C01245, BARI Morich-1 and 3 were found susceptible and three genotypes viz., C01111, C0613 and C0614 were found highly susceptible to both thrips and mite. Thrips and mite populations are negatively correlated with Chlorophyll Concentration Index of leaf. Further resistant and moderately resistant genotypes showed thick and dark green colour leaves, very thin and light green colour leaves was observed in highly susceptible genotypes. The highest total phenol content was recorded from the genotype CO1212 (22.60 mg/g) followed by CO718 (21.40 mg/g) and CO145 (18.80 mg/g) and the lowest total phenol content was recorded from the genotype CO614 (12.34 mg/g) followed by CO613 and CO1111 with 12.50 and 13.00mg/g of total phenol content. The maximum fruit yield of chilli was also obtained from the genotype CO1212 (16.73 t/ha) followed by the genotype CO718 (15.79 t/ha) and CO145 (14.29 t/ha).

Field validation of newly developed bio rational pest management of major insect pest of chili in charland

M. A. Hossain, M.A. Islam, and M. A. Sarker

A field experiment was conducted at the farmers field of char Gonai, Kaunia, Rangpur during the year of 2023-24 for evaluating bio-rational based management packages against insect pests in chilli. Results revealed that the percent of leaf infestation by chilli mite and fruit infestation by pod borer were significantly less in bio-rational based management package than the farmer's practice in chilli. Bio-rational based management package Blue sticky trap + Spraying of Biotrin Matrine 0.5%) AS @ 1.5ml/L + Pheromone trap + Spraying of Spinosad (Success 2.5 SC @ 1.2ml/L) was more effective against trips and pod borer of chilli.

Effect of different chemical in controlling pod borer complex of black cumin

M. R. Islam, M. Z. H. Pradhan, M. A. Alam and A. J. M. Obaidullah

The experiment was conducted at Regional Spices Research Centre, BARI, Magura during 2023-2024 to find out the effect of different chemical in

controlling pod borer complex of black cumin. BARI Kalojira-1 was used as the test variety. The experiment was laid out in randomized complete block design with three replications and six different treatments viz T₁: Tracer (Spinosad 0.4 ml/l), T₂: Proclaim (Emamectine benzoate @ 1g/l), T₃: Coragen (Chlorantraniliprole @ 0.5 ml/l), T₄: Collection and destruction of larvae from the pod and T₅: Siana (abamectin benzoate @ 1g/l), T₆: Untreated plot (control). Significant differences regarding yield and yield attributes were observed among different treatments. The highest yield (1375 kg/ha in 2022-23 and 1170 kg/ha in 2023-24) was found from T₂: Proclaim (Emamectine benzoate @ 1g/l) which was significantly higher than those of other treatments. The lowest yield (718 kg/ha in 2022-23 and 670 kg/ha in 2023-24) was found from control plot T₆. Significantly higher plant height, number of capsules/plant, number of seeds/capsule, less disease incidence with better yield contributing characters were observed from treatment T₂: Proclaim (Emamectine benzoate @ 1g/l). The highest number of damage capsule (24.02 % in 2022-23 and 23.99% in 2023-24) was observe in control plot and the lowest damage capsule (4.11 % in 2022-23 and 3.41% in 2023-24) was observed in T₂: Proclaim (Emamectine benzoate @ 1g/l) treated plot.

Survey and identification of new diseases of spice crops in Bangladesh

M. A. Wadud, M. Z. H. Proadhan, M. N. A. Chowdhury and N. Nath

Survey was conducted at different growing areas during 2023-24 to identify the new disease of spice crops with their causal organisms. Eleven new diseases were their causal organisms found to infect on 8 different Spice crops. Most of the pathogens caused damage on different crops in Bangladesh but they are new in spice crops. Among them, seedling rot and leaf spot of onion (*Curvularia* spp.), inflorescence blight of onion (*Botrytis* spp.), seedling rot (*Curvularia* spp.) of chilli, leaf and stem rot (*Fusarium* spp.) of chilli, wilt (*Fusarium* spp.), leaf spot of celery (*Alternaria* spp.), root rot of celery (*Fusarium* spp.), leaf spot of ginger (*Colletotrichum* spp.), leaf spot of plum (*Colletotrichum* spp.), leaf spot of chaba (*Colletotrichum* spp.), leaf rot of vanilla (*Colletotrichum* spp.), root knot nematode on onion and ginger are new. The identification of these new

diseases of different spice crops with their causal organisms helps to manage these diseases on spices crops in Bangladesh.

Cultural and morphological characteristics of fusarium wilt causing organisms of black cumin

M. A. Wadud, M. Z. H. Prodhan, M. M. Kamal and N. Nath

Black cumin (*Nigella sativa*) belongs to the family Ranunculaceae is an important seed spices crop. Black cumin is well known for its medicinal properties throughout the world. The climate of Bangladesh very conducive for wilt disease development in black cumin. This research is focused to identify *Fusarium* spp., wilt causing pathogens of black cumin at molecular level of all isolates of *Fusarium* spp. in BARI Black cumin-1. Spices Research Centre, Bogura, Regional spices Research Centre Gazipur and Magura and Spices Research Sub-Centre, Faridpur to identify the causal organisms with their morphological characteristics as well as their molecular characters. In an attempt to identify the causal organism of the wilt of black cumin by using molecular tools, a total of thirty plant samples were collected from the plants showing wilt symptoms of four AEZ (Spices Research Centre, Bogura, Regional spices Research Centre Gazipur and Magura and Spices Research Sub-Centre, Faridpur) in Bangladesh. According to cultural and morphological variation all the isolates were *Fusarium* spp. The findings of this experiment will help to for designing proper management strategies against wilt of Black cumin in Bangladesh.

Survey and identification of bacterial wilt causing organism of turmeric

M. A. Wadud, M. Z. H. Prodhan, M. N. Farid, N. Nath and M. N. A. Chowdhury

A survey program was conducted in five districts namely Bogura, Rangpur, Lalmonirhat, Magura and Meherpur to find out the incidence and causal organism of rhizome rot of turmeric. Turmeric (*Curcuma longa* L.) is a valuable medicinal plant as well as spice crop in Bangladesh. Turmeric is much more used in Bangladesh as a spice and is cultivated more or less all over the country. But average yield is low as compared to other turmeric growing countries of the world. The production is not enough to fulfill the annual requirement of the country. Like many countries diseases are the

major limiting factors for turmeric cultivation in Bangladesh. Among the diseases, rhizome rot disease is a severe danger to turmeric cultivation due to infection of *Ralstonia solanacearum*. The bacterial disease was observed on turmeric in surveyed areas at maturity stage. The leaves suddenly wilted, curled and yellowed, and the whole plant finally died. The highest incidence was recorded in Lalmonirhat and the lowest in Meherpur district. Creamy-whitish bacteria were isolated from the rhizomes of the infected turmeric. These bacteria were identified as *Ralstonia solanacearum* were isolated from diseased plants using TZC medium as a selective medium for identification of *Ralstonia solanacearum*.

Effect of fungicides, bio-agent in controlling alternaria disease of black cumin

M. R. Islam, M. A. Alam and A. J. M. Obaidullah

The experiment was conducted at Regional Spices Research Centre, BARI, Magura during 2022-2023 and 2023-2024 to find out the effect of fungicides, bio-agent in controlling alternaria disease of black cumin. BARI Kalojira-1 was used as the test variety. The experiment was laid out in randomized complete block design with three replications and six different treatments viz T₁: Agrizeb (Mancozeb) @ 3 g/l, T₂: Novofix (Mancozeb + Metalaxyl) @ 2 g/l, T₃: Companion (Mancozeb + carbendazim) 3 g/l T₄: Amistar top (Azoxystrobin + Difenconazole) @ 1.5ml/l, T₅: Trichoderma powder @ 10 kg/ha and T₆: Control. Significant differences regarding yield and yield attributes were observed among different treatments. The highest yield (1517.70 kg/ha in 2022-23 and 1340.00 kg/ha in 2023-24) was found from T₄ Amistar top (Azoxystrobin + Difenconazole @ 1.5 ml/l) which was significantly higher than those of other treatments. The lowest yield (718.70 kg/ha in 2022-23 and 625.00 kg/ha in 2023-24) was found from control plot T₆. Significantly higher plant height, number of capsules/plants, number of seeds/capsules, less disease incidence with better yield contributing characters were observed from treatment T₄ Amistar top (Azoxystrobin + Difenconazole @ 1.5 ml/l) in both studied years. The highest incidence of alternaria disease (12.16 % in 2022-23 and 8.53% in 2023-24) was from in T₆ (control) and the lowest disease incidence (1.18 % in 2022-23 and 0.76% in 2023-24) was observed in T₄: Amistar top (Azoxystrobin + Difenconazole) @ 1.5 ml/l).

Information and communication technology

Acreege estimation and yield prediction of onion using remote sensing technique

MA Alam, MA Mottalib, G Mahboob, AFM Tariqul Islam, K Hassan, SN Mojumdar and MZH Prodhan

This present research work mainly focused on the integrated application of satellite Remote Sensing (RS) and Geographic Information System (GIS) for identifying and estimating of onion cultivated area of Bangladesh. The advances in remote sensing have enhanced the process of monitoring the development of agricultural crops and estimating their yields. Therefore, remote sensing and GIS techniques were employed, in this study, to estimate onion acreage and predict onion yield in Pabna district. Cloud free single date Sentinel-2 satellite images were acquired during the onion growth stages. Seven vegetation indices (VIs) (NDVI, SAVI, GSAVI, OSAVI, MSAVI, TSAVI, and SARVI) were generated from the images. For the calculation of onion acreage, hybrid classification technique viz. combination of unsupervised and supervised based image classification techniques was applied to illustrate the spatial distribution of onion and compare their classification accuracy based on ground-truthing. Overall classification accuracies were accounted of 76.21% and Kappa values of 0.72. Then, the satellite data based estimated area was compiled and compared later with government official statistics which accounted for 1.92% estimation error to government field measured statistics. For yield computation, linear regression analysis was then applied to predict the onion yield in the study area for the 2023–2024 growth season using the RS based onion acreage product. Onion yield data were collected from farmers and BBS (Bangladesh Bureau of Statistics) and were correlated to the adjacent VIs, where yield prediction algorithms were developed and used to generate prediction yield maps. SAVI line VIs was the most stable VI and selected as the VI in terms of R^2 value ($R^2=0.521$ to 0.573) to predict onion production estimation. These regression model showed that a fairly acceptable association based on r ; %RMSE; and %MBE= -0.69 with reported yield data as compared to other vegetation indices. The expected yield prediction errors of approximately 2.92 percent compared with BBS statistics which signify

the potential of remote sensing data for yield prediction estimation. Results of the study revealed that RS based acreage yield estimation has shown more accurate results and can meet the requirements of regional-scale onion yield estimation and, thus, can prove highly beneficial in policy and decision making.

Assessment of in-season tillage machinery determination for garlic cultivation using geo-spatial technique

MA Mottalib, MA Alam, AHF Fahim, MA Rahman, MA Islam, MM Hasan, Mmalam, G Mahboob, AFM Tariqul Islam, SSA Kamar, MA Hoque, MA Hossain, K Hassan, SN Mozumder and MZH Prodhan

Timely and accurate mapping of garlic distribution is an important way to obtain the dynamics of garlic planting and is of great significance for the planning and management of the garlic market management. Crop extraction methods based on remote sensing usually use spectral-temporal features. The purpose of this study was to delineate for predicting tillage machinery required to cultivate them using high-resolution Sentinel-2 satellite imagery in the study area of Bangladesh. In this study Sentinel-2 images was used to for garlic area extraction. The preprocessed multiple-band images were classified which derived from different vegetation indices calculation resulting satisfactory overall accuracy. Subsequently the required number of tillage machines was work out on the basis of estimated annual use of machine average crop hectarage that to be needed for crop cultivation during a cropping season in the study areas. This study gives inspiration in selecting the remotely sensed data source, the band, and phenology for accurately extracting garlic planting area, which could be transferred to other sites with larger areas and similar agriculture structures. Besides, this research provides valuable insights for policymakers by providing near-real-time, tillage machinery estimates at the local level, facilitating informed decision making in attaining sustainable agricultural mechanization.

Agricultural engineering technology

Field performance evaluation of BARI power tiller operated multi-crop seeder in spices crop production

Ma Mottalib, Ma Alam, Ahf Fahim, Mm Hasan, Mm Alam, Ma Hoque, Ma Hossain, K Hassan, and Mzh Prodhan

This research demonstrates for enhancing different spices crops like onion, black cumin and coriander crop productivity through BARI power tiller operated multi-crop seeder machine. An evaluation of the performance of the seeder machine was done to find out for its performance and techno-economic feasibility in field condition. Field tests were conducted for three consecutive years of 2022, 2023, and 2024 at the SRC research field. The metering device performance was found acceptable for sowing of onion, fenugreek, coriander and black cumin. The BARI power tiller operated multi-crop seeder machine was found suitable in terms of technical and financial performance over traditional system. The benefit-cost ratio of machine was found higher than that of conventional system which was profitable venture for a machine owner. To extend the benefits of BARI power tiller operated multi-crop seeder machine among the farmers and custom hire service providers, appropriate adoption and dissemination programs must be launched all over Bangladesh

Post-harvest technology

Effect of different preservatives, packaging material and temperature on onion paste

Md. Masud Alam, Mgf Chowdhury and Mzh Prodhan

This experiment was undertaken to study the paste behavior of BARI piaz-5 under room temperature and refrigerated temperature, storing glass bottle (GB) and food grade plastic pot (PP). The fresh, peel and sliced onion were crushed in blender. The onion paste was prepared using 100 ml water per kg sliced onion. The onion paste treated with sodium chloride (NaCl) +CA+ $\text{Na}_2\text{S}_2\text{O}_5$, NaCl +CA+ KMS and CA alone and another onion paste (control) was collected from market. All the samples of prepared onion paste were stored in glass bottle (GB) and food grade plastic pot (PP)

and kept in room and refrigerated temperature. The colour, flavor, texture and overall acceptability of all the samples (treated and untreated) of onion paste were observed at 15 days interval up to 270 days storage. The colour, flavour, texture and overall acceptability of the onion pastes, treated with NaCl +CA+ KMS was more acceptable at room and refrigerated temperature compared to other treatments. The onion paste of glass bottle showed better results compared to plastic pot. It was also observed that onion paste, stored in glass container and plastic pot at refrigerated temperature (RFT) were acceptable up to 270 days of storage.

Nutritional and microbiological study of SRC developed spices powder compared to fresh sample

Md. Masud Alam, Ma Mottalib and Mzh Prodhan

Processing and preservation of garlic by suitable means is a major thrust area since a long time. These techniques are mainly used for preservation and value addition of garlic. It is used in number of food items like soup, fast food, pizza, vegetables, dry sauces etc. This study was concerned with the development of export-oriented quality garlic powder using dehydration technology with attractive organoleptic and nutritional properties. The garlic powder obtained from fresh garlic through processing process in which remains all active ingredients of the garlic can be added into other food for improving the mouth feeling of the food as the spice during eating. Now a day people do not have enough time to prepare garlic paste at home, so they depend on the ready to eat spice for curry making. The chemical compositions of the fresh and dehydrated garlic products were determined and it was observed that the qualities of the products were satisfactory. Organoleptic taste testing showed that the developed product was accepted by the panelists. The study thus shows that high quality shelf-stable garlic powder can be developed utilizing available low-cost dehydration processes and thereby, post-harvest losses of garlic can be reduced to an acceptable level.

Suitability study of SRC developed plum in fried rice

Md. Masud Alam, Ma Mottalib and Mzh Prodhan

The plum is the costly spice crop in Bangladesh. In our country normally it is used as spice item for process of preparing and providing food for

different types of events, such as weddings, concessions and corporate and social gatherings. But after independency of Bangladesh it was always imported from abroad. Till now the imported variety normally used in Biryani and as spice item for food processing. The Spices Research Center (SRC), Bangladesh Agricultural Research Institute (BARI) developed “BARI Plum-1” variety in 2018. The developed variety is good to look but it is not tasty in fresh condition. But after mini processing it can use for Biryani and for other food processing. The present study was concerned with the acceptability of SRC developed plum variety in Biryani/fried rice and was organoleptically evaluated by the panelists using 1-9 hedonic scale. The panelists were selected at random from different class of people. The panelists tasted the products and assigned marks for color, flavor, texture, pungency, taste and overall acceptability. The mean score for color, flavor, texture, pungency, taste and overall acceptability showed that all samples secured score within the acceptable limit ranging from 6.30 to 8.70, ranking ‘like slightly to ‘like very much’. The test score indicated that among three samples, the Biryani; processed by SRC developed plum variety was most acceptable as well as imported plum. The study thus shows that SRC developed plum variety can be used as spice item as like as imported plum variety in Biryani and other for food processing.

Socio economic study

Studies on post-harvest losses of garlic and factors affecting for such losses in selected areas in Bangladesh

Md. Kamrul Hasan, Shailendra Nath Mozumder and Md. Zulfikar Haider Prodhan

Garlic is one of the most economically important crops cultivated and consumed worldwide. Post-harvest losses have been accounted a major problem of garlic in Bangladesh. This study was conducted to quantify the post-harvest losses of Rajshahi, Natore and Rajbari districts at various stages of supply chain viz. farm, wholesale market and retail market levels. Descriptive statistics and multiple regression models were used for data analysis. Maximum aggregate post-harvest losses (10.95 kg/q) have been found at producer level due to faulty storage, lack of adequate transportation, drying, improper handling of the produce at the

time of marketing, rotted bulbs, splitted clove, poor packing facilities, injury at the time of harvesting and de-topping. Total losses in the supply chain were estimated to be 13.12 kg/q in which 83.43 percent losses were observed at farm level and rest were contributed at wholesale and retail level. The total financial losses were estimated to be 1447.53 Tk/q from farm to retailer level of which 84.07 percent occupied by the farmers. The econometric estimation revealed that total production, garlic price, more farming experience, harvesting at matured stage, proper post-harvest activities, proper drying and proper storage condition had significant effect on losses at farm level whereas garlic price, more business experience, proper storage, structured selling place, proper loading and unloading method, and favourable weather reduced post-harvest losses significantly and market distance showed significant effect on losses at wholesale market level. Factors such as as garlic price, more business experience, proper storage, retailer as a shopkeeper and favourable weather reduced post-harvest losses, significantly at retail level. The study suggests there is an urgent need of training on all the activities of production, harvesting and marketing to minimize post-harvest losses and to fetch maximum gains, if the garlic production is to be sustained on a profitable basis in the study areas.

Technology validation and transfer

Effect of technological interventions on yield gap analysis and profitability of winter onion (*Allium cepa* L.) varieties

M. A. Khan, M. M. Rahman and R. Sarker

A study was conducted in growing onion through front line demonstrations (FLDs) by Spices Research Sub-Centre, Bangladesh Agricultural Research Institute, Faridpur, Bangladesh at the fields of five farmers under five villages (Ramchandrapur, Bajarkandi, Bisnudia, Chilarkandi and Narasinghdia) of Faridpur Sadar, Faridpur district, Bangladesh during winter season of 2023-2024. Under the present investigation, an improved package of technologies along with two high yielding varieties (BARI Piaz-4 and BARI Piaz-6) was intervened to exhibit its performance, to find out yield gap and to compare profitability between improved technologies and farmers’

traditional practices (including local variety). The study revealed that the package of scientific technologies improved average productivity (20.01t/ha) as compared to the farmers' traditional practices (17.68t/ha). The average demonstration yield was 13.18% higher than that of control. The technology gap and extension gap had higher in BARI Piaz-4 (4.22 & 2.66t/ha) as compared to those of BARI Piaz-6 (3.76 & 2.01t/ha), respectively. The technology index of BARI Piaz-4 and BARI Piaz-6 were 16.88 and 16.34%, respectively. The lower the value of technology index, higher the level of adoption of technology. Average adoption index was maximum in demonstration plot (72.22%) as compared to control plot (22.22%). However, adoption index value of BARI Piaz-6 was higher (77.78%) than that of BARI Piaz-4 (66.66%). The FLD plot gave higher gross return, net return and benefit cost ratio over farmers traditional practices. Considering the yield and profitability farmers expressed their satisfaction with performance of improved technologies along with varieties under the study. Considering yield, quality and profitability; farmers expressed their satisfaction with performance of improved technologies along with varieties under the study. But farmers preferred BARI Piaz-6 over BARI Piaz-4.

Adaptive trial of onion varieties in charland condition

M. A. Hossain, M. A. Islam, M. N. Farid, and, M. A. Sarker

A field experiment was conducted during Rabi 2023-24 in the char land area of Modhupur, Kaunia, Rangpur at the Spices Research Sub-Centre, BARI, Lalmonirhat to assess the performance of different onion varieties for bulb production. The experiment used four onion varieties (BARI Piaz-1, BARI Piaz-4, BARI Piaz-6, and BARI Piaz-7) with a randomized complete block design and three replications. The results showed that the variety had a positive impact on bulb breadth (cm), bulb length (cm), and onion yield (t/ha) in char land. Among the varieties, BARI Piaz-4 recorded the highest bulb breadth (3.52cm), bulb length (4.38 cm), and yield (23.47 t/ha). Regarding sowing methods, line sowing showed the highest performance in terms of bulb breadth (3.45cm), bulb length (4.10 cm), and yield

(24.38 t/ha), with a similar trend observed in the broadcast method. However, the treatment combination of BARI Piaz-4 with the broadcast method resulted in the highest bulb breadth (3.38cm), bulb length (5.03 cm), and yield (27.83 t/ha), with a similar trend found in BARI Piaz-4 with the line sowing method.

Effect of sowing methods and varieties on bulb yield of onion in charland

M. A. Hossain, M. A. Islam, M. N. Farid and M. A. Sarker

A field trial was conducted during the Rabi 2023-24 season in the char land of Modhupur, Kaunia, Rangpur at Spices Research Sub-Centre, BARI, Lalmonirhat, to investigate the impact of different sowing methods on bulb production of different onion varieties. The trial included four onion varieties (BARI Piaz-1, BARI Piaz-4, BARI Piaz-6, and BARI Piaz-7) and three sowing methods (S1=Broadcast method, S2=Line sowing method, S3=Transplanting method) in a randomized complete block design with three replications. Among the varieties, BARI Piaz-4 showed the highest bulb breadth (3.52cm), bulb length (4.38 cm), and yield (23.47 t/ha). In terms of sowing methods, the line sowing method demonstrated the best performance in bulb breadth (3.45cm), bulb length (4.10 cm), and yield (24.38 t/ha), although the broadcast method showed a similar trend. The combination of BARI Piaz-4 with the broadcast method produced the highest results for bulb breadth (3.38cm), bulb length (5.03 cm), and yield (27.83 ton/ha), with a similar trend observed for BARI Piaz-4 with the line sowing method.

Adaptive yield trial of black cumin in Khulna region

A. J. M. Obaidullah, M. A. Alam, M. R. Islam, S. Mondol and M. S. U. Khan

An experiment was conducted in the farmer's field at ARS, BARI, Satkhira during rabi season 2023-2024. The aim of the experiment was to evaluate the performance and popularize black cumin variety in Khulna region. Three black cumin varieties/germplasm viz. BARI Kalozira-1, BC014 germplasm and local variety were included in this study. Among three varieties BC014 germplasm gave the highest yield (0.64 t/ha) while local variety yield was found the lowest (0.53 t/ha).

Adaptive yield trial of fenugreek in Khulna region

M. R. Islam, M. A. Alam, A. J. M. Obaidullah, S. Mondol and M. S. U. Khan

An experiment was conducted in the farmer's field at ARS, BARI, Satkhira during rabi season 2023-2024. The aim of the experiment was to evaluate the performance and popularize fenugreek variety in Khulna region. Three fenugreek varieties/germplasm viz. BARI Methi-3, advanced fenugreek germplasm FK029 and local variety were included in this study. Among three varieties FK029 gave the highest yield (0.89 t/ha) while local variety yield was found the lowest (0.68 t/ha).

Performance of different fenugreek varieties in charland area of Cumilla

M Rahman and M A Siddiky

The experiment was conducted at farmer's field of charland area under Roghunathpur village of Meghna upazila in Cumilla district during rabi season of 2023-24 to compare the yield performance of BARI released fenugreek varieties against local variety with the aim to replace it by the best one. The fenugreek varieties viz. BARI Methi-2 and BARI Methi-3 were compared with local variety. The experiment was laid out in randomized complete block design with three replications. The highest number of primary branches/plant (12.33), number of pods/plant (83.68), pod length (11.90cm), 1000-seed weight (10.03g) were recorded in BARI Methi-3. The highest seed yield (4.04t/ha) was found in BARI Methi-3. BARI Methi-3 was higher yielder than the check local variety. So, the local variety might be replaced by high yielding BARI Methi-3 variety.

Postharvest Technology Section, SRC

Suitability study of SRC developed plum in fried rice

M.M. Alam, M.G.F. Chowdhury and M.Z.H. Prodhan

The present study was concerned with the acceptability of SRC developed plum variety in Biryani/fried rice and was organoleptically evaluated by the panelists using 1-9 hedonic scale. Fresh plum was collected from the SRC of BARI and were cleaned and washed with tap water and

spread on a perforated tray to drain out excess water and subsequently used for preparation. The samples were treated in three ways; T₁- Processed Plum (salt+ sweetener's+ vinegar+ oil), T₂- Processed Plum (salt + vinegar + sugar + sweetener's + oil), T₃- Processed Plum (salt + vinegar+ oil). Among three two treated products were selected as ingredient for biryani compared to imported variety of plum. A panel of 20 judges evaluated the color, smell/flower, pungency, texture, taste and overall acceptability of the Biryani with plum. The evaluation was conducted after 12 months of storage.

For color the highest score (8.10) was given by sample T₁ and T₂ which was followed by T₃ with score 6.5, and sample T₁ was equally acceptable as sample T₂. In case of flavor preference sample T₁ secured the highest score, 8.0 and was closely followed by sample T₂ and T₃ securing 7.60 and 6.7 and samples T₁ and T₂ are equally acceptable at 1% level and statistical insignificance. It was found that the highest score (8.20) for texture was given by sample T₂ and is closely followed by sample T₁ securing 7.80 and these samples are equally acceptable. In case of pungency preference sample T₂ secured the highest score, 8.10 and was closely followed by sample T₁ securing 8.0 and the lowest score (6.50) was given by sample T₃ and statistically different from sample T₁ and T₂. For taste the highest score (8.70) was given by sample T₂ which was closely followed by T₂ and T₃ with score 8.3 and 6.70 and among the samples T₁ and T₂ were equally acceptable though there is little bit difference in scoring but T₃ statistically different from them. For overall acceptability preference the highest score (8.5) was given by sample T₂. The Biryani; processed by SRC developed plum variety was most acceptable as well as imported plum. The study thus shows that SRC developed plum variety can be used as spice item as like as imported plum variety in Biryani and other for food processing.

Nutritional and microbiological study of SRC developed spices powder compared to fresh sample

M.M. Alam, M.G.F. Chowdhury and M.Z.H. Prodhan

This study was concerned with the development of export-oriented quality garlic powder using dehydration technology with attractive organoleptic and nutritional properties. Uniform size garlics

were sorted then were peeled manually with stainless steel knife. The garlic cloves were treated for few minutes. Dehydration of samples was done in 45-50°C in mechanical dryer up to 6-8% moisture content. After dehydration, the dehydrated garlic cloves were crushed and finely grounded to form garlic powder. Then garlic powder were packed and stored in room and refrigerated temperature.

The energy content of fresh and dehydrated garlic powder were found 44.02 and 362.35 kcal/100g. The protein content of fresh and dehydrated garlic was 5.23 and 11.55%. The fat content of fresh and dehydrated garlic powder were found 0.15 and 1.01 %. The ash content of fresh and dehydrated garlic powder were found 0.95 and 2.40%. Ash is composed of all mineral salts. The P and Ca in fresh garlic were found 0.35 and 0.05mg/100g and K, P, Na, Zn and Ca in dehydrated garlic powder were observed and 651.92, 20.8, 51.71, 35.64, 69.87 mg/100g, respectively. Total carbohydrate content of fresh and dehydrated garlic was found 11.63 and 72.39%, respectively. The vitamin C is moderately available in fresh and dried garlic (11.20 mg and 19.6 mg/100g). It was exhibited that a bit bacteria was in garlic powder after long time storage which can be destroy in cooking time but *Salmonella spp.* and *E coli* were near about absent. The study thus shows that high quality shelf-stable garlic powder can be developed utilizing available low-cost dehydration processes. When market rates of garlic are fluctuating, garlic powder can be prepared as alternative source of many culinary preparations in the off season which may save precious time, money and energy.

Effect of different preservatives, packaging material and temperature on onion paste

M.M. Alam, M.G.F. Chowdhury and M.Z.H. Proshan

This experiment was undertaken to study the paste behavior of BARI Piaz-2. The fresh, peel and sliced

onion were crushed in blender and onion paste was prepared using 100 ml water per kg sliced onion. The onion paste treated with 10% NaCl +1% Citric acid (CA)+ 1000 ppm Sodium benzoate (SB) (T₁), 10% NaCl +1% CA+ 1000 ppm KMS (T₂) and 1% CA alone (T₃) and another onion paste (control-T₄) was collected from Dhaka super shop. All the samples were stored in glass bottle (GB) and food grade plastic pot (PP) and kept in room (RT; 25-30°C) and refrigerated temperature (RFT;10°C). The effects of packaging material (GB and PP) and storage conditions (room and refrigerated condition) on the composition and keeping quality of the treated pastes were evaluated.

It was observed that the fresh onion contained moisture, 82.20 %; food energy 45.86 %; protein 1.3%; fat 0.13 %; ash 0.50 %; carbohydrate 11.25%; fibre 0.70%; vitamin C 12.0 %; acidity 1.44 % and pH 4.19. The effects of temperature and storage time on the composition of onion paste produced from fresh onion treated with three types of preservatives; were packed in GB and food grade PP and stored in room (RT; 25-30°C) and refrigerated (RFT;10°C) temperature. There was little bit difference in moisture content, ash, acidity, pH and TSS with respect to increase storage period. A little bit bacteria was found in the sample of T₁ and T₂ onion paste after 270 days storage which can be destroy in cooking time but *Salmonella spp.* and *E coli* were almost absent. The color, flavor, texture and overall acceptability of the onion pastes, treated with 10% NaCl+1% CA+1000ppm KMS was more acceptable at room up to 180 days and refrigerated temperature up to 270 days for both packaging. The onion paste of GB shown little bit better results compared to PP.

VEGETABLE CROPS

05

Observational yield trial of eggplant

Akm Quamruzzaman, Md. Nazim Uddin, L Akter and S Akter

An observational trial with eighteen eggplant lines/ varieties was conducted at the experimental farm of the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24 to observe the performance of yield potential and horticultural traits. There was diverged variability observed among the 18 eggplant lines/ varieties. The earliest harvested eggplant line was SM 555 (100 days), while the range of the number of marketable fruit/ plant was 17.0 to 36.0, and the single fruit weight was 82–233g. The range of eggplant fruit and shoot borer (ESFB) infestation was 10.3% (SM 553) to 17.5% (BD 2665 and BD 2809), while 13 lines performed zero per cent mortality by bacterial wilt, while the other five lines showed only 10% mortality. The range of fruit yield was 26.57 to 54.52 t/ha, while the maximum was in BD 95465 (4.54 kg). Considering earliness, high yield, EFSB infestation, bacterial wilt infection tolerance, fruit shape and colour, the lines BD 95465, BD 2652, SM 512, and SM 553 were selected for future use as breeding lines.

Evaluation of eggplant hybrids

Akm Quamruzzaman, Md. Nazim Uddin, L. Akter and S. Akter

An evaluation trial with twenty-two eggplant hybrids was conducted at the experimental farm of the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24 to observe the performance on yield potential and horticultural traits. There was diverged variability observed among the 22

eggplant lines/ varieties. There was significant variability observed among the 22 eggplant hybrids. The range for days to the first harvest and harvest duration were 90-110 days and 49 -71 days, respectively, while the range of the number of marketable fruit/plants was 13-44, and the single fruit weight was 99-378 g. Significant variation was observed in fruit length and fruit diameter among the lines/variety. The range of fruit length and fruit diameter was 3.7-9.9 cm and 10.4-29.0 cm, respectively, while the range of eggplant fruit and shoot borer (ESFB) infestation and bacterial wilt infection was 10.0-27.0% and 0.0-10.0%, respectively. In this study, the range of fruit yield was 32.65 to 65.19 t/ha. Considering higher yield, pest and diseases reaction the hybrids viz., F₁ 1x5 (54.67 t/ha), F₁ 216x14 (57.83 t/ha), F₁ 216x203 (52.03 t/ha), F₁ 253B x21 (56.70 t/ha), F₁ 262x21 (55.84 t/ha), F₁ 318x23A (56.51 t/ha), F₁ 353Ax21 (65.19 t/ha), F₁ 407x21 (63.44 t/ha) were selected for further confirmation.

Advanced yield trial of eggplant for winter

H E M K Mazed, M A Hossain, H Rahman, A Akter and R Sultana

The study was conducted at the research field of Horticulture Research Centre, Regional Agricultural Research Station, BARI, Jamalpur during the winter season of 2023-2024 to develop new high yielding OP variety. Six eggplant lines viz. SM Jam-003, SM Jam-008, SM Jam-011, SM Jam-015, SM Jam-017, SM Jam-020 and BARI Begun-12 as check were evaluated. The highest (16.3) number of fruits per plant was counted from the line SM Jam-008 and the lowest (11.0) number of fruits from SM Jam-015. The heaviest fruit was found in SM Jam-015 (244.00 gm) and the smallest fruit was observed in SM Jam-008 (80.33 gm). The maximum yield (5.82 kg/plant and 44.56 t/ha) was produced by the Check variety BARI Begun -12 and among the lines the maximum

yield (2.71 kg/plant and 37.23 t/ha) was produced by SM Jam-015 and the minimum yield (1.33 kg/plant and 18.09 t/ha) was produced by SM Jam-008. Considering yield and yield contributing characters the lines SM Jam-003, SM Jam-011, SM Jam-015, SM Jam-017 and SM Jam-020 were found promising and might be recommended for regional yield trial.

Regional yield trial of eggplant

Akm Quamruzzaman, M. Nazim Uddin, L Akter, S Akter, H E M K Mazed, M A Habib and M R Islam

The study was conducted with five purple colored lines/varieties viz., SM 405, SM18, SM236B, SM217A and BARI Begun-5 and seven green colored lines/ varieties viz., SM262, SM276, SM275, SM470, SM332, BARI Begun-6 and BARI Begun-9 at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur along with different RARS (Jamalpur, Akbarpur and Rahmatpur) of BARI during the winter season of 2023-24 to develop new high yielding variety and to study the adaptability at different agro ecological zones. In the Gazipur location, the range of fruit yield per plant was 3.86-4.88 kg, while the range of ESFB and BW infestation was 8.8-19.8 and 0-10%. All the lines showed 0.0% BW infection except two lines (SM18, BARI Begun-5). The range of fruit yield per hectare was 46.37-58.50t/ha, while the higher yield was obtained from purple colored lines. SMP 405 (58.50t/ha), SM236B (49.50 t/ha) and green colored lines were SM276 (57.48 t/ha), SM275 (52.80 t/ha). So, considering earliness, yield, and tolerance to fruit infection by ESFB, bacterial wilt infection two lines viz., SMP 405 (purple colored), SM276 (green colored) might be selected for releasing as new OP eggplant varieties. Considering earliness, yield, and tolerance to fruit infestation by ESFB, bacterial wilt infection two lines viz., SMP 405 (purple colored), and SM276 (green colored) might be selected for releasing as new OP colored eggplant varieties.

Inbred development of eggplant [S₁-S₂]

Akm Quamruzzaman, Mn Uddin, L Akter and S Akter

Twenty seven eggplant lines were selected from the S₁ generation of eggplant lines based on the number of fruits per plant, individual fruit weight,

fruit shape, and colour which was evaluated in the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24. The lines varied for the response of some characters studied. This experiment was designed to identify the good quality eggplant lines having more fruit numbers and higher yield as well as attractive fruit shapes, sizes, and colours. Eighteen lines were selected considering the yield and yield contributing characters as well as their attaining homozygosity and yield of these lines varied from 51.22 to 69.9 tons. Considering, EFSB infestation and bacterial wilt (BW) infection, twelve lines viz., BD 603, BD 607, BD 608, BD 610, BD 612, BD 613, BD 615, BD 616, BD 619, BD 620, BD 625, BD 627 may be selected to be used for breeding purposes for developing quality eggplant varieties.

Regional yield trial of eggplant hybrids

M. Nazim Uddin, Akm Quamruzzaman, L. Akter and S. Akter

The study was conducted with five purple colored eggplant hybrids (F₁ 5x216, F₁ 5x405, F₁ 18x405, F₁ 18x233, F₁ 20x5) and eight green colored eggplant hybrids (F₁ 12x11, F₁ 13X353A, F₁ 21X11, F₁ 21X220, F₁ 253BX220, F₁ 275X11, F₁ 357X221B, F₁ 407x332) along with three check varieties (BARI Hybrid Begun-4, BARI Hybrid Begun-6, Purple king F₁ (commercial)] at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur along with different RARS (Jamalpur, Akbarpur and Rahmatpur) of BARI during the winter season of 2023-24 to develop new high yielding hybrid eggplant variety. In the Gazipur location, the range of fruit yield per plant and hectare was 3.75-4.77 kg and 45.00-57.33 ton, respectively, while the higher yielded purple colored hybrids were viz., F₁ 18x405 (57.33 t/ha), F₁ 20x5 (54.12 t/ha), F₁ 5x405 (53.92 t/ha) and green colored hybrids were viz., F₁ 253BX220 (55.20 t/ha), F₁ 13X353A (53.54 t/ha), F₁ 407X332 (53.02 t/ha). The range of ESFB infestation and bacterial wilt was 13.4-21.0% and 0.0-10.0%, respectively. The higher per hectare fruit yield for green color was recorded in F₁ 253BX220, F₁ 13X353A, F₁ 407X332, F₁ 357X221B, and F₁ 21X220, while for purple colored eggplant hybrids were recorded in F₁ 18x405, F₁ 20x5, F₁ 5x405. So, considering

earliness, yield, and tolerance to fruit infestation by EFSSB, bacterial wilt infection two lines viz., F1 5x405 and F1 357x220 might be selected for release as new hybrid eggplant varieties.

Development of bacterial wilt resistant eggplant variety through backcross method

Mh Islam, Akm Quamruzzaman, Mn Uddin, M Afroz, Mza Talukder, L Akter, S Akter

A cross between hybrid and one of its parents is known as backcross which progenies genotype become increasingly similar to that of the parent. Through this method the bacterial wilt tolerant gene transfer into desire plant. The objective of the experiment to improve high yielding BARI eggplant variety against bacterial wilt. The study was done with two bacterial wilt susceptible eggplant variety (BARI Begun -6 & BARI Begun -12) along with one resistant variety (BARI Begun -8) at the research farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023 to develop new improve variety of eggplant. The seeds of susceptible & resistant were sown on the seedbed on 13 September, 2023. Fifty-five days old seedlings were transplanted in the seed bed on 7 November, 2023. Three seed bed were used for three different varieties including one sick bed used for grow resistant variety (BARI Begun -8). There used three different type of inoculum pressure to survive only resistant variety in sick bed but no artificial inoculation pressure was applied on other seed bed for growing susceptible variety. BARI Begun- 8 used as a doner parent and used pollen of this variety for crossing with BARI Begun - 6 and BARI Begun-12. BARI Begun-8 X BARI Begun -12 and BARI Begun-8 X BARI Begun-6 crossed seeds were collected from mature fruit for growing F₁ population which will be used in backcross to grow BC₁F₁ population.

Effect of planting time on yield and quality of bari begun-12

M. Mostaque Ahmed, M. Nasirul Farid and M. Kamrul Islam

In this study, the effects of different planting time on the yield and quality of BARI Begun-12 were observed in a field experiment. This experiment was laid out in Randomized Complete Block Design with three replications during 2023-2024 at

the Regional research Station, BARI, Rangpur. Five planting time (T₁=1st August, T₂=16th August, T₃=1st September, T₄= 16th September and T₅= 1st October) were used as treatment. Results showed that yield component, yield and quality of BARI Begun-12 were performed by different planting time except days to 50% flowering, fruit length (cm) and plant height (cm) at last harvest. In the study number of fruits/plant, individual fruit weight (g), fruit diameter (cm), fruit yield (kg/plant) and fruit yield (t/ha) responded in higher regarding with T₁= 1st August and 16th September among the treatment. However, the highest number of fruit/plant (5.51), individual fruit weight (717 g), fruit diameter (35.07 cm), fruit yield /plant (2.74 kg) and fruit yield (72.25 t/ha) were recorded from T₁= 1st August planting time followed by other treatments. The lowest number of fruit/plant (3.93), individual fruit weight (499.67 g), fruit diameter (30.08 cm), fruit yield /plant (1.97 kg) and fruit yield (48.46 t/ha) were recorded from T₅= 1st October planting time.

Screening of eggplant germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

Nineteen and twenty five eggplant varieties/accessions for Kharif and Rabi seasons were evaluated for resistance to *Ralstonia solanacearum* grown under artificial epiphytotic conditions during 2023-2024 cropping seasons. Among them, six germplasm, 215X83-B3, Paler Hazarijhuri Begun, 18X223, SM-233, 253BX83B3 and BARI Begun-8 were graded as resistant in Kharif season. Only 357X220 showed moderately resistant reaction. In Rabi season, one variety and seven lines such as BARI Begun-8, 21X11, 20X5, 12X11, 18X405, SM-332, 407 X 332 and SM-405 showed resistant reaction. Seven lines such as SM-18, 275X11, 21x220, SM-105, 5X405, 5X216 and SM-275 showed moderately resistant reaction. The rest of the germplasm showed moderately susceptible to highly susceptible reaction to *R. solanacearum* in both seasons.

Screening of eggplant germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali

Ten eggplant varieties/accessions viz. SM-405, 217 (A), 20 x 5, 5 x 405, BARI Begun- 4, BARI Begun- 8, 5 x 216, 216-A, 12 x 11 and 18 x 405

were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-2024 cropping season. Among them 5 x 405 showed resistant, eight accessions such as SM-405, 217 (A), 20 x 5, BARI Begun-4, BARI Begun-8, 5 x 216, 216-A and 18 x 405 showed moderately resistant and 12 x 11 showed moderately susceptible to root knot nematode.

Integrated disease management of bacterial wilt in eggplant

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during December, 2023 to May, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of eggplant. There were six treatments were used, such as T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 2.13 t/ha (in pit) (ii), T₂=Stable Bleaching Powder @ 25 kg/ha + *Bacillus cereus* (Seed and root soaking), T₃= Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T₅=Farmer's practice and T₆= Susceptible check (BARI Begun-4). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided highest yield.

Nano-packaging of eggplant to extend the shelf life maintaining quality and food safety

M.A. Rahman, M.S. Arfin and Z.H. Fahad

The effect of polymeric packaging film in extending the shelf life and postharvest quality of 'BARI Eggplant-8' was investigated. Eggplant fruits were harvested at commercial maturity stage, washed, surface air-dried and packed into different polymeric films including TiO₂ incorporated nano-polyethylene film, and stored at ambient room condition (25±1°C and 65±5% RH) for 12 days. The rate of decrease in weight loss, tissue softening and ascorbic acid content delayed in fruit packed into different packaging film. The higher accumulation of CO₂ in non-perforated packaging films (1.06-1.2 ml kg⁻¹h⁻¹) reduced the respiration rate compared to unpackaged control fruits and consequently extended at least six days extra storage life. Results of this study demonstrate the efficacy of both perforated and non-perforated

packaging films on eggplant quality and postharvest life. Therefore, these packaging films may be used as MAP in retail shop to extend the shelf life of eggplant up to 10-11 days at ambient conditions.

Evaluation and characterization of tomato lines

AKM Quamruzzaman, L. Akter and M.H. Islam

An trial was conducted on new tomato lines to study the yield, pest and diseases resistance and quality attributes at the experimental field of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur Bangladesh during the winter season of the year 2023-24. Fruit yield per hectare was also varied significantly from 15.7-150.4 t/ha. The higher fruit yield per hectare was obtained from the lines SLA 035 (150.40 t/ha), SLA 031 (126.54 t/ha), SLA 039 (107.23 t/ha), SLA 040 (111.33 t/ha), SLA 044 (98.91 t/ha), SLA 041 (87.40 t/ha), SLA 045 (86.16 t/ha), SLA 030 (84.70 t/ha), SLA 043 (80.79 t/ha). Considering earliness, quantitative and qualitative characters, late blight, TYLCV, bacterial wilt infection and leaf miner, fruit borer infestation, nine tomato lines SLA 035, SLA 031, SLA 039, SLA 040, SLA 044, SLA 041, SLA 045, SLA 030, SLA 043 were found promising. So, these nine lines can be selected for further confirmation. Considering earliness, quantitative and qualitative characters, late blight, TYLCV, bacterial wilt infection and leaf miner, fruit borer infestation, nine tomato lines SLA 035, SLA 031, SLA 039, SLA 040, SLA 044, SLA 041, SLA 045, SLA 030, SLA 043 were found promising. So, these nine lines can be selected for further confirmation.

Evaluation of tomato lines

M. A. Goffar, M.R. Karim and M.S. Alam

A study was conducted with 14 tomato germplasm with two checks at research field of Olericulture Division of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24 to identify promising tomato lines in respect of high yielding, tolerance to insect-pest and diseased and resistant breeding sources too. All the lines showed differences in most of the parameters studied. There were six lines- SI0429, SL0432, SL0433, SL0439, SL0805 and SL0806 found to be promising with yield more than 2.5-3.19 kg fruit

per plant having average fruit weight 92.0-250.0g. No virus infection found to infect in the field condition. Considering the plant growth habit, flowering trends, and other horticultural traits, six lines may be selected for preliminary yield trial in the next year, while these lines may also be used as breeding materials for further tomato improvement program.

Evaluation of exotic tomato lines

S.P. Chakma, M.M. Hasan and N.U. Ahmed

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2023-24 with 11 tomato germplasms including cooking and cherry tomato to find out the suitable tomato lines to develop as a new variety. The maximum individual fruit weight (48.82), average 5 fruit weight (235.14 g) with flattened red in color was observed in SL Rai-016 followed by SL Rai-051 with rounded purplish-black in color. TSS (%) varied from 5 to 10. The maximum fruit size (40.19 mm ×40.92 mm) and thickness of pericarp (7.08 mm) were observed in by SL Rai-051 followed by SL Rai-016. SL Rai-016 and SL Rai-051 were found superior among the others line.

Adaptive trial of bari tomato at chattogram

M. M. Rahman, M. Moniruzzaman, A. Tbasum and M. R. Sarkar

The trial was conducted at the research field of Horticulture Research Centre, RARS, Hathazari, Chattogram during the winter season of 2023-24 to find out best varieties for this region. Significant differences were observed in all the parameters during studied period. The earliest 50% flowering was observed in the BARI Tomato 11(51 days) followed by BARI Tomato-15(51.50 days) and maximum days to required 57 days was observed in BARI Tomao 14. The highest number of fruits was observed in the BARI Tomato 11 (195.97) followed by BARI Tomato-20 (51). The highest yield per plant and per hectare were the highest in BARI Tomato 11 (2.94kg/plant and 141.4 t/ha) followed BARI Tomato 3 (2.76 kg/plant and 133.09 t/ha) but it was the lowest in BARI Hybrid Tomato-8 (153 kg/plant and 73.66 t/ha).

Regional yield trial of afaci tomato

AKM Quamruzzaman, L. Akter, M.H. Islam and M A Sumi

A regional yield trial was conducted on WVC (The World Vegetable Centre-former AVRDC) supplied tomato lines to study the yield, pest and disease resistance and quality attributes at the experimental field of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur Bangladesh during the winter season of the year 2023-24. There were five selected tomato lines viz., AVTO 1008, AVTO 1306, AVTO 1409, AVTO 1705, and AVTO 1717 along with two local checks BARI Tomato-11, BARI Tomato-15 were included in this study. A wide range was observed for fruit yield traits, while the range was 77.8-108.8 t/ha. A significantly higher yield was observed in AVTO 1306 (108.77 t/ha), followed by AVTO 1409 (103.36 t/ha), and AVTO 1008 (102.80 t/ha) and AVTO 1717 (102.47t/ha) in the Gazipur condition. A minor infestation was observed for TYLCV infection and leaf-sucking pests, while the range was 0-3.3 and 0-8.3%, respectively. Considering yield and pest and disease reaction two lines viz., AVTO 1306 and AVTO 1409 were selected for release as new tomato varieties.

Inbred development of tomato [S₄-S₅]

AKM Quamruzzaman, L. Akter and M.H. Islam

Ten tomato inbreds were selected from the S₄ generation of tomato lines based on the number of fruits per plant, individual fruit weight, fruit shape, and colour which was evaluated in the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24. The inbreds varied for the response of some characters studied. This experiment was designed to identify the good quality tomato inbreds having more fruit number and higher yields as well as attractive fruit shapes, sizes, and colours. TYLCV, late blight infection and leaf sucking pest infestation were important characters, which play important roles in the selection of a tomato variety, while the range was 0.0-0.0%, 0% and 0-10%, respectively. The fruit yield per plant and fruit yield per hectare varied from 3.01-3.58kg and 90.21-107.25 tons, respectively, while the higher yield inbreds were SLA 15-6 (107.25t/ha), AVTO 1907 (105.84 t/ha),

SLA 15-1A (104.94 t/ha), AVTO 1717 (101.46 t/ha). Four inbreds were selected considering the yield and yield contributing characteristics, tolerance to pests, and diseases as well as their attaining homozygosity. So, these 4 inbreds viz., AVTO 1907, AVTO 1717, SLA 15-1A, and SLA 15-6 which produced more than 100.0 ton/ha and nearly zero per cent pest-disease infestation may be selected for breeding purposes for developing quality tomato variety.

Study of heterosis in summer tomato

AKM Quamruzzaman, L. Akter and M. Hasinul Islam

The study was conducted with twelve tomato cross combination along with standard hybrids (Mintoo Super) at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the summer season of 2023. A significant difference among crosses was observed for all the characters studied. Significant negative standard heterosis was expressed for days to first flowering (4 combinations), days to 50% flowing (6 combinations), days to first harvest (7 combinations), and days to fruit maturity (8 combinations). The number of fruits per plant is the most important component trait which is directly related to increased fruit yield per plant. Significant positive standard heterosis was noticed in 7 cross combinations. The crosses F_1 2101 (25.93%), F_1 2501 (22.22%), and F_1 1501 (18.52%) outperformed the other combinations. Positive standard heterosis was noticed in three cross combinations for single fruit weight, while highest heterosis was obtained in F_1 2301 (28.02%). The ultimate goal of any breeding program is to achieve a higher marketable yield per unit of area. Five cross combinations, viz., F_1 203 (25.65%), F_1 1501 (14.34%), F_1 2101 (14.32%), F_1 2301 (15.62%) and F_1 2501 (16.22%) showed significantly standard positive heterosis. The significant negative standard heterosis varied from -100% to 0.00% for TYLCV infection and leaf sucking pest infestation. Considering yield and yield contributing and pest and diseases the cross combination viz., F_1 203, F_1 1501, F_1 2101, F_1 2301 and F_1 2501 were selected for further confirmation.

Study of heterosis in winter tomato hybrids

AKM Quamruzzaman, Limu Akter and M.H. Islam

The study was conducted with fifteen winter tomato hybrids along with standard hybrid (commercial variety Mintoo Super) at the research farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24 to develop new high yielding winter tomato hybrids. The standard heterosis for 15 winter tomato hybrids over standard hybrid (Mintoo super) was calculated for yield and yield contributing parameters. The significant negative standard heterosis was observed in days to 1st harvest was -4.0 to -1.0%, while for number of fruit/ plant and single fruit weight was 10.6 to 93.1% and 6.5 to 10.9%, respectively. The positive standard heterosis range for fruit yield trait was 2.2 to 28.2%. The standard heterosis range for TYLCV infection and leaf sucking pests infestation was -100% to 300% and -500% to 0.0%, respectively. Considering significant standard heterosis against yield and yield contributing traits and pest disease infestation, five hybrids viz., F_1 3203, F_1 3303, F_1 1603, F_1 1903 and F_1 1403 might be selected for RYT evaluation.

Study of heterosis and combining ability in tomato (summer and winter)

M. A. Goffar, M.M. Rahman, M.M Rohman and P. Hanson

A study on combining ability and heterosis of eight parents and their 28 crosses was conducted at the experimented field of Olericulture Division of HRC, BARI during winter season of 2023-24. The GCA and SCA effects of parents and their crosses and percent heterosis over better and mid parent were recorded. Considering breeding and horticultural traits, 10 hybrids were selected covering two categories (six combinations for winter type and four cross combinations for summer type) for further study in the following year.

Regional yield trial of winter tomato hybrids

AKM Quamruzzaman, L. Akter, M.H. Islam and M A Sumi

A regional yield trial was conducted on eight tomato hybrids to study the yield, pest and disease resistance and quality attributes at the experimental field of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural

Research Institute (BARI), Gazipur Bangladesh during the winter season of the year 2023-24. Significant variation was observed in the number of fruit/ plant, single fruit weight, fruit yield, fruit length, fruit diameter, TSS, TYLCV and leaf-sucking pests. The range for days to 1st harvest was 99-104 days, while the range for number of fruit/ plant and single fruit weight was 36.0-155.0 and 14.5-90.0g, respectively. A significantly higher yield was observed in F₁ 4601 (111.38 t/ha), F₁ 1501 (103.85 t/ha), and F₁ 1903 (100.22 t/ha) in the Gazipur condition. Considering yield-related attributes and pest, and disease resistances, the hybrids viz., F₁ 4601 and F₁ 1501 performed well, so these two hybrids can be selected for the release of the new hybrid tomato variety.

Regional yield trial of saline tolerant tomato hybrids

M. A. Goffar, Afms Ahsan, S. Mondal, M.S.U. Khan and M.R. Karim

A regional yield trial with four saline tolerant hybrids was conducted at the experimental field of Olericulture Division of HRC, BARI, Gazipur and at two Regional Agricultural Research Station (RARS/ARS) Shatkhira and Rahmatpur during the winter season of 2023-24 to assess the regional adaptability and yield performance. The lines (P₁xP₂, P₁xP₃, P₁xP₆, P₅xP₆) were relatively saline tolerant (tasted at physiology Division, BARI in 2019-20). Most of the parameters significantly differed among the tomato entries. Under Gazipur condition, the control treatment produced the largest average fruit weight (56.12 g). The same entry exhibited maximum yield per plant (2.31kg) followed by 2.29 kg fruit harvested from the treatment P₁xP₃. The maximum marketable yield per ha was obtained from P₅xP₆ (67.33 t) followed 66.43 t contributed from the hybrid line P₁xP₃. The mean value of virus infection under field condition at 75 DAS was counted 0.0 to 4.0%. The magnitude of virus infection at this stage was not so harmful for commercial harvest. Considering the yield performance (during harvesting, soil salinity was 9.56 ds/m), uniformity and other attributes, P₅xP₆ was found to be promising. The average yield over location revealed that the hybrid line P₅xP₆ was found to be promising with the highest yield (51.07t/ha).

Regional yield trial of summer tomato hybrids

M. A. Goffar and M. R. Karim

A trial was conducted with eight summer hybrid tomato entries to evaluate yield potentials and tolerance level against bacterial wilt (BW) and virus under field condition at the experimental field of Olericulture Division of HRC, BARI, Gazipur during summer season of the year 2023. There were eight selected hybrids viz.: P₁xP₃ (S-I); P₁xP₄ (S-I); P₄xP₆ (S-I); P₅xP₆ (S-I); P₁xP₈ (S-II); P₂xP₈ (S-II), P₅xP₈ (S-II), P₇xP₈ (S-II) and one local check (BARI Hybrid Tomato-8) was included in this study. All the parameters were found to be significantly differed. There were four hybrid combinations (P₁xP₃, (S-I), P₄xP₆ (S-I), P₁xP₈ (S-II), P₅xP₈ (S-II), and P₇xP₈ (S-II)) showed good yield which was confined to 28.0-38.0 tones. The incidence of wilt infection was the highest in P₁xP₄ (S-I) (10.0%). The other entries were wilt infected between 6.0-8.0% only. The highest virus infection was recorded in the treatment P₅xP₆ (S-I) (12.0%), while other treatments comprise between 8.0-10.0% virus infection. Among the hybrid tomato entries, above mentioned combinations (P₄xP₆ (S-I), P₁xP₈ (S-II), P₅xP₈ (S-II), and P₇xP₈ (S-II)) were suitable in terms of yield, pest and diseases tolerance. It will be worthwhile to verify the performance of these promising entries as regional yield trial in the next year to confirm the results and for confirming the results and for studying adaptability in the different agro-ecological zones of Bangladesh adaptability capability in the different parts of the country.

Holobiont breeding in tomato

M Nazim Uddin and Akm Quamruzzaman

Tomato breeding programs traditionally emphasize commercial traits like yield and fruit quality, often at the expense of environmental stress resistance. Recent studies suggest integrating beneficial microbiomes into breeding programs can enhance plant health and stress tolerance. This study evaluates 14 tomato genotypes using a Multi-parent Advanced Generation Inter Cross (MAGIC) population approach to assess their performance under organic management conditions. Key agronomic traits, including yield, flowering time, and disease resistance, were measured, with a focus on recruitment of beneficial microbiomes. Conducted from November 2023 to March 2024, the experiment used a Randomized Complete Block Design (RCBD) with three replications. Tomato

seedlings were grown using a double transplanting method and planted in raised beds with organic nutrient management. The study measured days to first flowering (DFPPF), number of fruits per plant, single fruit weight, fruit size, total soluble solids (TSS), locule number, pericarp thickness, plant height, yield per plant, and late blight infestation. Results revealed significant variability among the genotypes. 3241AA x 3150-A-5 exhibited the highest fruit yield, while Cheri-11 produced the most fruits per plant but with smaller fruit size and higher disease susceptibility. 3324A and 3241AA showed strong resistance to late blight. 8 x 33 (self) demonstrated high TSS, indicating superior fruit sweetness but with notable disease presence. These findings highlight the potential of integrating microbiome recruitment and stress resistance into breeding programs. Varieties like 3241AA x 3150-A-5 and Cheri-11 offer valuable traits for enhancing productivity and fruit quality, while 3324A and 3241AA provide strong disease resistance. The study underscores the importance of considering a range of traits in breeding programs to develop resilient tomato varieties suitable for sustainable cultivation in Bangladesh.

Maintenance of BARI released op and parent's of hybrid tomato varieties

M.A. Goffar and M.R. Karim

A study was carried out at the experimented field of Olericulture Division of HRC, BARI, Gazipur during winter season of 2023-24. In this study, parents/inbred of four tomato hybrid varieties (BARI Hybrid Tomato-4, Hybrid Tomato-5, Hybrid Tomato-8, & Hybrid Tomato-9) and three OP tomato varieties (BARI Tomato-2, BARI Tomato-14 and BARI Tomato-15) were included. Seeds of self-pollinated fruits have been preserved in the cold storage at 8°C temperature. This procedure will be done in the next year with the preserved seed.

Development of year-round production packages of cherry tomato under protected and open field

M.A. Goffar, M.S. Alam and M. R. Karim

A yield trial of one selected cherry tomato line (selected for releasing) of WVC with check BARI Tomato-11 was conducted at the experimental field of Olericulture Division, Horticulture Research Centre (HRC) during the winter season of the year of 2023-24 under net house and open field to assess

the yield potentiality, pest and disease reaction and adaptability. The fruit number per plant varied from 173.0 to 147.0. The highest fruit yield per hector obtained from SL0068 (63.75 tons), while BARI Tomato-11 gave 48.23 tons per hectare. No virus and bacterial wilt found to be infected in the field.

Effect of different shading material on yield and quality of summer tomato

M.A. Sumi, M. S. Alam and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar during the Kharif season 2023-24 with a view to assess the effect of different shading nets (shading intensity and color) (T₁: White polythene, T₂: Green shade net, T₃: Black shading net, T₄: Jute net) on the growth of tomato plants growing in the summer season to assess the benefits of shade in terms of improved crop yield. Maximum Fruit yield was obtained from T₁ (9.08t ha⁻¹) and minimum was T₃ (1.62 t ha⁻¹).

Effect of rootstock on tomato grafting against bacterial wilt

S Sultana, T H Tabassum, M O Kaisar and M A Siddiky

Two BW resistant BARI released brinjal varieties-BARI Begun-8 & BARI Begun-10 and one wild species were evaluated as rootstocks for grafting with three BARI released popular tomato varieties as scion under open field conditions at RARS, BARI, Cumilla during Kharif season of 2023. This year, the survival of grafted plants were comparatively low due to extreme hot weather. BARI Begun-8 were found the best compatible with BARI Hybrid Tomato-8 (42.90%) and BARI Hybrid Tomato-11 (54.00%) as rootstock whereas BARI Hybrid Tomato-10 were found more compatible with BARI Begun-10 (64.90%) and kantabegun (61.10%). The lowest wilting was observed when grafted with BARI Begun-8 in all varieties - BARI Hybrid Tomato-8(34.17%), BARI Hybrid Tomato-10 (40.00%) and BARI Hybrid Tomato-11 (34.17%). Accordingly, BARI Begun-8 also performed better regarding yield as a rootstock in all cases, in BARI Hybrid Tomato-8 (42.00 t/ha), BARI Hybrid Tomato-10 (30.88 t/ha) and BARI Hybrid Tomato-11 (52.62 t/ha).

Screening of tomato germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali
Nineteen tomato varieties/accessions were screened to find out bacterial wilt resistant source grown under artificial epiphytotic field conditions during 2023-2024 cropping seasons. Among the accessions, Among the varieties/accessions, only one variety and seven lines of tomato such as BARI Tomato-11, AV-135, AV-1616, 1008, AVTO-1315, AV-1306, AVTO-1921 and 1903 showed resistant reaction against bacterial wilt. Eight lines such as 1711, AV-1712, AVTO-1010, AV-1907, AVTO-1911, AVTO-1713, 1719 and AVTO-1718 were grades as moderately resistant. Rest of the accessions of tomato showed moderately susceptible reaction to *R. solanacearum*.

Screening of tomato germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali
Nineteen tomato varieties/accessions were screened to find out bacterial wilt resistant source grown under artificial epiphytotic field conditions during 2023-2024 cropping seasons. Among the accessions, Among the varieties/accessions, only one variety and seven lines of tomato such as BARI Tomato-11, AV-135, AV-1616, 1008, AVTO-1315, AV-1306, AVTO-1921 and 1903 showed resistant reaction against bacterial wilt. Eight lines such as 1711, AV-1712, AVTO-1010, AV-1907, AVTO-1911, AVTO-1713, 1719 and AVTO-1718 were grades as moderately resistant. Rest of the accessions of tomato showed moderately susceptible reaction to *R. solanacearum*.

Screening of tomato germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali
Twenty tomato varieties/accessions were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-2024 cropping season. Among them, six accessions (AVTO-1315, BARI Tomato-11, AVTO-1010, AV-1907, AVTO-1921 and AV-195) showed resistant, nine accessions (AVTO-1911, 1719, AV-1306, 1711, AV-1712, AV-1616, AV-1306, AVTO-1911 and AVTO-1314) showed moderately resistant, four accessions (1409, 1717, AV-1711 and AVTO-1718) showed susceptible and one accession (AVTO-1713) showed highly susceptible reaction to root knot nematode.

Screening of tomato germplasm for resistance to tomato leaf curl virus under field condition

M. Mahfuzur Rahman, L. Yasmin, M. Afroz, Siddique Alam and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-2024 cropping season with promising germplasm and variety of tomato to find out resistant sources against Tomato Leaf Curl Virus (TLCV) disease. A total of 16 tomato variety/ accessions were evaluated including susceptible check. Nine germplasm were showed resistant and twelve germplasm were found moderately resistant to disease and rest of the moderately susceptible. The highest yield was recorded in BARI Hybrid tomato 8 (22.73 ton/ha) and lowest yield was obtained in GP-0093 (6.49 ton/ha) respectively.

Integarted disease management of bacterial wilt in tomato

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during November, 2023 to April, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of tomato. There were seven treatments were used, such as T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 4.8 t/ha (in pit) (ii), T₂= Stable Bleaching Powder @ 25 kg/ha + *Bacillus subtilis* 38 (Seed and root soaking), T₃= Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), T₅= Farmer's practice and T₆= Susceptible check (BARI Tomato-15). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided the highest yield.

Influence of humic acid on the growth, yield and physiological attributes of tomato under drought

M. Moniruzzaman and R. Khatoon

The pot experiment was conducted using three drought stress [DS₀ = Irrigation upto 100% FC (Field capacity)], DS₁ = Irrigation upto 50% FC, DS₂ = Irrigation upto 25% FC) and four humic acid (HA) concentrations [T₀ = Control (No spray of HA), T₁ = Spray of HA @ 500 ppm, T₂ = Spray of

HA @ 1000 ppm, T₃ = Spray of HA @ 1500 ppm] having 12 treatment combinations during October 2023 to April 2024. Drought stress was imposed 23 days after 26 day-old seedling transplantation and SA were sprayed four times after 23 days of transplantation (DAT) at 15 days interval. Different growth characters viz., plant height, leaf number/plant, leaf area index (LAI), SPAD value, dry weight/plant and yield attributes viz., number of fruits/plant, fruit length and breadth, individual fruit weight and fruit yield/plant were significantly influenced by drought stress and SA applications. The combination DS₁ x T₃ recorded maximum plant height, leaf number, SPAD value, dry weight/plant. This combination gave the highest fruit yield (2.42 kg/plant) closely followed by DS₁ x T₂ (2.40 kg/plant). It is concluded that four times 1000-1500 ppm HA sprays at 15 days interval after 50 days after sowing (3 weeks after transplanting) could be successfully used to obtain better growth and yield in tomato under moderate drought stress (50% FC).

Effect of seed priming with salicylic acid on germination and seedling growth of tomato under induced drought stress

M. Moniruzzaman and R. Khatoon

A lab study was conducted to explore the effects of salicylic acid (SA) amendment on germination of tomato under induced drought stress and screen the optimal concentrations of SA to tomato germination under induced drought conditions. Seeds were presoaked in different levels of SA solutions 0.5, 0.75 and 1.0 mM) and then applied in PEG 6000 solutions (8.0, 10.0, 12 and 16.0 % PEG). The effects of PEG induced drought and external SA application on germination percentage, germination characteristics such as mean germination time, T₅₀ value, germination value, speed of germination and coefficient of velocity of germination, seedling growth characters viz. shoot length, root length, seedling length, seedling fresh and dry weight and seedling vigour index were investigated. The appropriate concentration of SA (0.75 mM) prominently relieved PEG induced stress drought and improved seed germination, germination properties and seedling growth of tomato seeds under PEG induced drought stress of 10, 12 and 16% PEG.

Effect of seed priming with salicylic acid on germination and seedling growth of tomato

under induced salinity stress

M. Moniruzzaman and R. Khatoon

A lab study was conducted to explore the interactive amendment effects of exogenous salicylic acid (SA) and salinity on seed germination process of tomato. Seeds were presoaked in different levels of SA water solutions (0.5, 0.75 and 1.0 mM) and then applied in NaCl solutions (8.0 and 10.0 dS/m) and distilled water as control. The effects of salinity and external SA on germination percentage, germination characteristics such as mean germination time, speed of germination, T₅₀ value, coefficient of velocity of germination and germination value, seedling growth characters viz. shoot length, root length, seedling length, seedling dry weight and seedling vigour index were investigated. The appropriate concentration of SA (0.5 mM) prominently relieved salt stress and improved seed germination, germination properties and seedling growth of tomato seeds under salinity stress of 8 and 10 dS/m.

Influence of biochar on the growth and yield of tomato under salinity stress

M. Moniruzzaman, R. Khatoon, M. Moniruzzaman, M.A.Quddus and M.A.Goffar

A pot culture experiment was conducted at the Plant Physiology Section of HRC, BARI, Gazipur, from November 2023 to April 2024 to determine the optimal biochar doses to mitigate the effects of salinity stress and enhance tomato adaptation in saline conditions. The variety BARI Tomato-16 was exposed to three different levels of rice husk biochar: 0%, 5%, and 10% (w/w) of 12 kg soil per pot, designated as Bc₁, Bc₂, and Bc₃, respectively, and four levels of NaCl salinity: 0.0, 4.0, 8.0, and 12.0 dSm⁻¹, designated as S₁, S₂, S₃, and S₄, respectively. The results showed that increasing salinity levels significantly decreased the growth, physiological health, yields, and related characteristics of tomato plants compared to the non-saline in the absence of biochar application. However, applying biochar in combination with varying levels of salt stress significantly improved growth, physiology, fruit yields, and related characteristics. Notably, BARI Tomato-16 exhibited the least impact from the stress. When biochar was applied at rates of 5% and 10% (w/w), tomato yields increased by 12.70% and 14.05%, respectively, at salinity levels of 8 and 12 dS/m, compared to the control (0%). The application of

10% (w/w) biochar also resulted in the highest tomato plant growth and yield, indicating that biochar effectively mitigates the effects of salt stress. Therefore, biochar amendment had the potential to alleviate salt stress in tomato plants.

Response of seed priming by salicylic acid to germination and seedling growth of tomato under salinity

M.S.U. Khan and S. Mondal

Seed priming is known to improve germination and seedling emergence under different environmental stresses. Salicylic acid (SA) also plays a major role in regulation of many physiological processes e.g. growth, development, ion absorption and germination of plants. An experiment was carried out in completely randomized design with three replications in the Plant Physiology laboratory of Agricultural Research Station (ARS), BARI, Binerpota, Satkhira the rabi season of 2023-2024 in order to alleviate salinity-induced growth inhibition at the early stage of tomato (BARI Tomato-21) seedlings. Experimental treatments included 4 levels of seed priming ($SA_0 = 0\text{mM}$, $SA_{0.1} = 0.1\text{mM}$, $SA_{0.3} = 0.3\text{mM}$ and $SA_{0.5} = 0.5\text{mM}$) and 2 levels of salinity stress ($S_0 = 0\text{dS/m}$, $S_5 = 5\text{dS/m}$ and $S_{10} = 10\text{dS/m}$). The results showed severe reduction in germination and seedling growth with increasing stress levels. Seed-priming with $SA_{0.1} = 0.1\text{mM}$ not only enhance Na^+/K^+ uptake but also reduced mean germination time compared to the untreated seeds. Seedling growth of SA-primed seeds had significantly higher root and shoot length than non-primed seeds. Such results indicated reduction in severity of the effect of salinity stress on germination and seedling growth parameters of tomato by priming with $SA_{0.1} = 0.1\text{mM}$ which ultimately could tolerate saline conditions to some extent.

Development of management approach against tomato leaf miner, *liriomyza sativae*

A. Mohammad, M. S. Hossain and M. I. Islam

The experiment was conducted at research field of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during 2023-2024. The experiment was laid out in RCB design with three replications. There were five treatments viz T_1 : Hand picking of seriously infested leaf+ D-lemonene (bioclean) @ 1ml/litre of water, T_2 : Hand picking of seriously infested leaf + Spinosad Tracer 45 SC) @ 0.4 ml/l of wate, T_3 :

Hand picking of seriously infested leaf + Abamectin (Matrixine plus 5 EC) 1 ml/l of water, T_4 : Hand picking of seriously infested leaf + Matrine (Biotrin 0.5%) @ 1.5 ml/L of water and T_5 : Untreated control. Result indicated that Hand picking of seriously infested leaf + Abamectin (Matrixine plus 5 EC) 1 ml/l of water showed the best performance considering reduction of leaf miner infestation (62.92%), increase of marketable yield (77.82%) and marginal benefit cost ratio (11.42).

Survey and documentation of insecticide use pattern on summer tomato production at jashore and satkhira districts

M. I. Islam, M. S. Hossain and A. Mohammad

The study was a descriptive survey, which was undertaken to describe the insecticide use pattern on summer tomato production at Jashore and Satkhira districts. The study was conducted at summer tomato growing area of Jashore and Satkhiradistrict. Ninety farmers were selected randomly from selected area and considered as sample of the study. The interview schedule was developed according to the objective of the study. Farmer of the study area used 16 different pesticide and most of them were toxic. 73.34% of the farmer practice frequent spraying at study area. 27.78% farmer harvest crop after 6 or more days of spraying but rest of 72.22% farmer harvest crop at before 6 days after spraying. 53.33% farmer measure pesticide approximately and 44.44% farmer did not use any safety method during pesticide spraying. Farmer's education, farm size annual income and training experience has negative relationship with schedule of insecticide spray and positive relationship with harvesting time after insecticide spray, use of tools for measuring pesticide, safety method followed by the farmer where many of the relationships were significant.

Nano-packaging of tomato to extend the shelf life maintaining quality and food safety

M.A. Rahman, M.S. Arfin and Z.H. Fahad

The effect of polymeric packaging films in extending shelf life and postharvest quality of 'BARI tomato-15' was investigated. Tomato fruits were harvested at the breaker-turning stage, washed with 0.05% aqueous scallop powder solution, air-dried and packed into different polymeric films including TiO_2 incorporated nano-polyethylene

film, and stored at ambient room condition ($25\pm 1^\circ\text{C}$ and $65\pm 5\%$ RH) for 12 days. The rate of decrease in weight loss, tissue softening, surface colour development and ascorbic acid content delayed in fruit packed into different packaging film. The higher rate of CO_2 accumulation in non-perforated packaging films reduced the respiration rate compared to perforated films or unpackaged control fruits and consequently extended at least six days extra storage life

Evaluation of yield potential of tomato genotypes under elevated fertilizer level

M. A. Aatur Rahman, M. A. Quddus, M. A. Hossain and M. R. Ahmed

The experiment was initiated at the research field of Horticulture Research Centre (HRC), BARI during winter season of 2023-24. Four levels of fertilizers control, recommended dose of fertilizers ($\text{N}_{120}\text{P}_{30}\text{K}_{50}\text{S}_{20}$), 150% of recommended fertilizer, 150% of recommended fertilizer plus 10.0 t/ha cow-dung were applied in main plots and seedlings five tomato genotypes ($V_1 = \text{BARI Tomato -14}$, $V_2 = \text{BARI Hybrid Tomato -8}$, $V_3 = \text{BARI Hybrid Tomato -10}$, $V_4 = \text{AvTo -1314}$ and $V_5 = \text{AvTo -1409}$) were planted in the subplots. The results indicated that yield response to applied fertilizer was varied among the genotypes. The genotype AvTo-1409 was more responsive to fertilizer that gave maximum yield (80.4 t/ha) under 150% recommended fertilizer with 10 t/ha cow-dung followed by BARI hybrid tomato 10. Also under the control condition that advanced line gave significantly higher yield compare to other genotypes. The advance line AvTo-1409 had profuse bearing of moderate size of fruits resulting maximum yield both under control and higher level of fertilizer. The advanced line AvTo - 1314 had better canopy coverage with larger size of fruits but the number of fruits was less than other genotypes resulting less yield than other genotype. Also infestation of blight disease was more severe in AvTo - 1314 Av causing fewer yields compare to other genotypes. BARI Hybrid Tomato -8 and advanced line AvTo - 1409 are equally responsive to higher dose of fertilizer with higher yield potentials.

Foliar application of micronutrient nanoparticles in improving productivity, quality

and nutrient uptake of summer tomato

M. A. Quddus, M. Aatur Rahman, M.A. Hossain, R. Ahmed and M. S. Arfin

A field investigation was conducted in summer season of 2023 to evaluate the effect of zinc, boron and micronutrient nanoparticles on growth, yield traits, yields and quality of tomato. The investigation was scheduled with 5 treatment involving four levels of nano complete micronutrient (0, 1, 2 and 3 gL^{-1}) and zinc sulphate at 2 gL^{-1} + boric acid at 1 gL^{-1} following randomized complete block design with three replications. The result indicated that foliar application of 1 gL^{-1} nano complete microfertilizer produced the highest marketable fruit yield (52.4 t ha^{-1}) which was 61.7% higher over control treatment with higher individual fruit weight (66.2 g), maximum number of fruits per plant (28.3) and highest plant height (107 cm). The same treatment showed greater amount of TSS (5.00 °Brix), maximum vitamin C (34.7 mg/100g) and beta carotene (213 mcg/100g) of tomato. The result suggests that foliar application of 1 gL^{-1} nano complete microfertilizer can increase the fruit yield and quality improvement of summer tomato.

Regional yield trial of sweet pepper

L. Akter, A.K.M. Quamruzzaman, M R Karim, H Barua and A Akter

An experiment was conducted with four sweet pepper line with a check (BARI Mistimorich- 2) at the central Experimental farm of Olericulture Division, Horticulture Research Centre (HRC), Gazipur; ARS, Pahartoli, Chattogram and RARS, Jamalpur, Bangladesh Agricultural Research Institute (BARI), from October 2023 to April 2024. The shortest day (64.05) required for harvesting by the line CA 0043A. The highest number of fruits/plant obtained from CA 0046 (9.43) followed by CA 0042A (8.76) and the lowest in BARI Mistimorich-2 (7.52). Highest average fruit weight was obtained from the line CA 0046 (106.32g). The average per plant yield varied from 0.48 to 0.59 kg. The highest yield/plant was obtained from the line CA 0043A, whereas the lowest was from the line CA 0031. The yield (t/ha) was varied from 24.21 to 29.07 t/ha. The highest average yield per hectare was produced by CA 0043A (29.07 ton). The lowest yield per hectare was obtained from CA

0031 (24.21 ton). The fruit colour of CA 0042A was orange red which turned into yellowish at mature stage whereas CA 0043A had the red color fruits turned at the mature stage. Only two categories of fruit shape were found among the lines studied. CA 0042A produced fruits with conical shape while rest of the varieties had the bell shape fruits. Very minimum infestation of fruit borer, white fly and mite were observed in tested lines/varieties as the plots were covered by nylon net. The variety evaluation team selected the line CA 0043A for releasing as a variety namely BARI Mistimorich-3.

Inbred development in sweet pepper

L. Akter, Akm Quamruzzaman and S. Akter

The experiment was conducted at the experimental farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agriculture Research Institute (BARI) during, the winter season of 2023-24 with fourteen sweet pepper lines namely CA0008, CA0009, CA0010, CA0011, CA0012, CA0013, CA0014, CA0015, CA0016, CA0017, CA0018, CA0019 and CA0020 with BARI Mistimorich- 1 as check variety to develop inbred lines for hybridization. All the parameters varied significantly among the different lines. Among them, those are lead to yield and yield related traits, exhibit very significant differences. If earliness is considered, the line CA0014 took the minimum days (39.11 days) to 50% flowering; whereas, CA0020 was earliest to produce marketable fruits (57.70 days). There was significant difference in case of fruit number, whereas the maximum number of fruits were harvested from the line CA0012 (17.44). The highest fruit yield per plot was recorded from CA0014 (11.90 kg) which was also similar to the calculated per hectare yield (42.50 t/ha Considering earliness, fruit size, fruit yield the lines viz., CA0011, CA0012, CA0014, CA0015, Ca0016 and CA0018 exhibited their best responsible to various traits. So the lines were selected as suitable inbred for next year hybridization programme as well as variety development.

Evaluation of hybrid sweet pepper

L. Akter, Akm Quamruzzaman and S. Akter

Five selected F₁'s of sweet pepper (P₁ xP₂, P₁ xP₃, P₂ xP₃, P₁ xP₇ and P₃ xP₄) with a check (F₁ Syam) were evaluated at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24. The P₂ xP₃ took the minimum days to 1st harvest (68.00 days). The highest number of fruits per plant (7.95) was recorded from P₂ xP₃. The heaviest fruits (176.67g) were obtained from P₁ xP₂. Fruit weight per plant was found maximum (1.30kg) in P₂ xP₃ followed by the P₁ xP₂ (1.06kg) and P₁ xP₃ (1.02kg) . The highest yield was produced by P₂ xP₃ (36.24 t/ha). The hybrids P₂ xP₃, P₁ xP₃ and P₁ xP₇ were found promising for earliness, high yield and other characters. So, these lines were recommended for further evaluation as advanced yield trial.

Regional yield trial of sweet pepper hybrids

L. Akter, Akm Quamruzzaman and S. Akter

This study was conducted at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur, RHRS, Lebukhali, Patuakhali and ARS Pahartoli, Chattogram during the winter season of 2023-24. Six sweet pepper hybrid/ varieties viz., P₆xP₈, P₂xP₃, P₂xP₆, P₈xP₁₀, P₉xP₁₀ and F₁ Sweet beauty were included in the study. All the parameters which were studied in this experiment varied significantly among the hybrids. In case of days to harvest, the P₆ xP₈ was the earliest and it took 67 days to harvest. The very important character is number of fruits, the highest number of fruits were counted in the F₁ Super beauty (6) and which is followed by P₂xP₆, P₈xP₁₀ and P₉xP₁₀ while the minimum was 4 in P₆xP₈ and P₂xP₃. The heaviest fruits were recorded in the line P₆xP₈ (187 g), while the F₁ Super beauty produced the least weight fruits (167 g). The little leaf infestation was demonstrated in all the hybrids except Hybrids 5 (0%) and the variety F₁ Super beauty (0%). The maximum yield per hectare were calculated in F₁ Super beauty (35.93 t/ha) which was at per with P₂xP₆ and followed by P₆xP₈, P₈xP₁₀ and P₉xP₁₀ while the minimum was recorded in P₂xP₃ (29.29 t/ha). After completion of the third year trial also by the recommendation of the evaluation committee the line P₂xP₆ can be released as a hybrid sweet pepper variety.

Response of seed priming by ga₃ and kno₃ to germination and seedling growth of sweet

pepper in seed bed

R. Khatoon, M. Moniruzzaman and L. Akter

The priming agents- GA₃ (250 ppm, 500 ppm and 750 ppm) and KNO₃ (0.25%, 0.50%, 0.75% and 1%), distilled water as control were used for higher seedling emergence performance and seedling growth of sweet pepper seeds. Higher percentage of seedling emergence, shoot length and seedling dry weight of sweet pepper seeds recorded from BARI Mistimorich-1 and BARI Mistimorich-2 seeds treated with 0.50% KNO₃ and 250 ppm GA₃ compared to control treatment. From two years average results, 0.50% KNO₃ and 250 ppm GA₃ gave better result for maximum seedling emergence and healthy seedling growth of BARI Mastimorich-1 (V₁) and BARI Mastimorich-2 (V₂).

Integrated nutrient management to improve productivity of sweet pepper

Quddus M.A., M. Aatur Rahman. M.A. Hossain and R. Ahmed

The experiment was conducted following RCB factorial design with 3 replications. Two levels of cow-dung as factor A: CD₁: 5 ton CD/ha and CD₂: 10 ton CD/ha and 4 levels of inorganic fertilizer as factor B: F₁: Control, F₂: N₁₂₀P₄₅K₇₅S₁₀Zn₃B₂ kg ha⁻¹, F₃: 125% of F₂, F₄: 150% of F₂ were tested. Results indicated that combination of 10 ton CD/ha with 125% RDF contributed significant effect to attain more number of fruit per plant (11.5), heavy fruit (115 g), higher fruit yield (17.9 t ha⁻¹) and higher vitamin C content (75.4 mg/100g) in fruits.

Survey on bacterial wilt of solanaceous vegetable crops

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

A comprehensive survey was conducted during July-June, 2023-2024 cropping season in Thakurgaon district to record the incidence of bacterial wilt of eggplant. Data on area surveyed, wilt incidence (%), etc. were recorded at the time of survey. A total of 180 wilt infected plant samples of eggplant and tomato were collected from Bogura, Thakurgaon, Sylhet, Gazipur and Rangpur districts during January-December-June 2023-2024. A total 150 isolates *R. solanacearum* were isolated from eggplant, tomato, chili and potato. Biochemical tests such as Gram reaction/Potassium hydroxide test, Kovac's oxidase test, Catalase test, urease test and biovar test were performed for

biochemical characterization of the isolates. All biochemical tests were found positive, which confirm identification of those isolates. Molecular Characterization of *R. solanacearum* were also performed.

Regional yield trial of bottle gourd

L. Akter, Akm Quamruzzaman, H. Islam, H Rahman, R Alam and M R Islam

A study on the performance of four bottle gourd lines with BARI Lau-4 was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur along with different RARS (Akbarpur, Jashore and Rahmatpur) of Bangladesh during the winter season of 2023-24 to develop new high yielding OP bottle gourd varieties. Significant variation was observed in average fruit weight, yield /plant, fruit length, fruit yield. The highest number of fruits/ plant was produced in LS 154 (9.7), followed by BARI Lau-4 (9.3), LS 171 (9.2), LS 231 (9.0), while the maximum average fruit weight was produced by LS 154 (2.3 kg), followed by LS 171 (2.2 kg), BARI Lau-4 (2.2 kg). The range of fruit length and fruit diameter were 30.0-37.5cm and 10.0-11.5 cm, respectively. The Highest yield/ plant was produced by LS 154 (50.20 t/ha), followed by BARI Lau-4 (46.04 t/ha), LS 171 (45.54 t/ha), while lowest yield was produced by LS 232 (37.62 t/ha) in Gazipur condition. In case of mean fruit yield over 6 locations, the lines viz., LS 154, LS 231 and LS 232 performed well, so these three lines can be selected for release of new bottle gourd OP variety.

Inbred development of bottle gourd

L. Akter, AKM Quamruzzaman and H. Islam

The study was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur during 2023-24 to develop better inbred for hybridization. There was diverged variability observed among the six bottle gourd germplasm. The range of number of fruit/ plant and average fruit weight was 7-10 fruits and 1.81-2.30 kg, respectively. The range of fruit length and diameter was 18.50- 35.00 cm and 15.00 - 10.50 cm, respectively. The highest fruit yield was produced by LS231 (38.67 t/ha), followed by LS232 (36.80 t/ha), BARI Lau-4 (34.93 t/ha). Among the germplasm 2 types of fruit shape and 2 types of fruit color were observed. Considering yield contributing characters, fruit shape and color the

germplasm LS231 and LS232 were found promising and considered to be suitable for the inbred for further breeding program.

Development of inbred lines for yield and quality traits in bottle gourd from commercial hybrids

H Rahman, M A Hossain, A Akter, R Sultana and H E M K Mazed

A study was conducted to evaluate some Bottle gourd (*Lagenaria siceraria*) F₁ lines in respect of yield and quality and selfing of respected lines in order to develop inbred lines at HRC field, RARS, Jamalpur during season of 2023-24. Ten Bottle gourd F₁ lines viz. Chiang Mai, White Man, Jamuna, Hi Green, Moyna, Nandini, Arafa, Mina, Super Chamok and Diana were evaluated to investigate the yield and yield contributing characters. The highest number of fruits per plant (14) was produced by Diana whereas the lowest number of fruits (6) was noted from Super Chamak. The higher individual fruit weight (2.24 kg) was noted in Hi Green and lower (1.20 kg) in Chiang Mai. The more fruit yield per plant (26.89 kg) & per hectare (53.78 t) was produced by Hi Green as against the less (8.40 kg per plant & 16.80 t per hectare) in Chiang Mai.

Regional yield trial of bottle gourd hybrids

L. Akter, Akm Quamruzzaman and H. Islam

The performance study of four Bottle gourd hybrids with a commercial check Moyna was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur along with different RARS/RHRS (Akbarpur, Jessore and Jamalpur) of Bangladesh during the winter season of 2023-24 to develop new high yielding bottle gourd hybrid varieties. In case of days to 1st harvest, the earliest hybrid was F₁ 2x232 (82.33 days), while the maximum number of fruit/plant (9.56) was produced in F₁ 3x4. The heaviest fruit was produced in F₁ 4x3 (2.47 kg), followed by F₁ 3x4 (2.30 kg). Considering earliness, yield potentiality, fruit color, acceptable fruit shape two advanced lines viz., F₁ 3x4 and F₁ 4x3 were found promising and may be released as new hybrid bottle gourd variety.

Inbred development of pumpkin (S₅- S₆)

Bahauddin Ahmed and Akm Qumruzzaman

Five pumpkin lines (CM01-1-2-3-5, CM01-1-2-(A)-3, BD10063-1-1-7-8, BD02-2-3-3-5 and BD02-2-7-4-1) were selected from different lines on the basis of individual fruit weight, flesh thickness and flesh color which were evaluated in Olericulture Division, HRC, BARI, Gazipur during the winter season of 2023-24 to develop superior pumpkin inbred lines. The lines varied for their response of some characters studied. The flesh thickness, average fruit weight, fruits per plant, yield per plant and yield (t/ha) was ranged from 3.85 to 4.50 cm, 4.05 to 10.50 kg, 2.3 to 3.5, 14.18 to 24.50 kg and 28 to 49.00 ton, respectively. The TSS ranged from 9 to 10.6%. The lines were in different shapes such as round, high round and elliptical. The deep orange type flesh color was dominant among the genotypes. Fruit fly infestation and virus incidence was also observed in these lines. Best individuals from every line were selected and selfed. Seeds of S₅ progenies of pumpkin lines were stored for advancing S₆ progenies in the next year.

Development of inbred in pumpkin (S₂ TO S₃)

S Sultana, T H Tabassum and M A Siddiky

The trial was conducted at RARS, BARI, Cumilla in winter 2023. Ten locally collected and eight PGRC sourced pumpkin lines were advanced from S₂ generation to S₃ generation to develop variable inbred lines for hybrid production. Variations were found among the lines for the characters studied. In case of female flower opening, the genotype CM Cum-3.2.2.6 required the minimum days (64 DAS) in opposite to the check BARI Mistikumra -2 which took the maximum days (99 DAS). There was a huge variation regarding fruit weight which varied from 2.3 kg to 8.0 kg. In case of fruit number, CM Cum-4.2.3.9 produced the maximum (7) with average yield 52.32 t/ha followed by BD-2153.7 (49.55 t/ha), CM Cum-3.2.2.6 (44.70 t/ha). In addition, all the lines gave the satisfactory yield/plant with good numbers of fruits compared to check (21.59 kg). Furthermore, the TSS% ranged from 3.5%-7.5%. CM Cum-4.1.1.1 possessed the highest TSS content (7.5%) followed by CM Cum-20.1.4 (7%) and CM Cum-4.2.3.9 (7%). Some genotypes were found apparently virus free viz. BD- 309.7 (00%) & CM Cum-4.2.3.9 (1.11%). Best individuals from every line were selected and selfed.

Maintanance of hybrid pumpkin parent's

Bahauddin Ahmed

A study was carried out at the experimental field of Olericulture Division, HRC, BAR Iduring the winter season of 2023-24 to maintain the genetic purity of BARI developed two pumpkin hybrids (BARI Hybrid Mistikumra -1 and BARI Hybrid Mistikumra-2). Standard crop management practices were followed for crop production and standard selfing and crossing methods were also followed for seed production. Seeds of selfed and crossed fruits have been preserved in cool room at 8°C temperature. These seeds will be used for multiplying the next year and commercial use.

Regional yield trial (RYT) of year round pumpkin hybrids

N. Akter, M. Ratna, E. Mahmud, M. Islam, S. Yesmin, M. I. A. Howlader and M. G. Kibria

The experiment was set up in the experimental field of RHRS, Lebukhali, Dumki, Patuakhali to identify the high yielding year round pumpkin hybrids. Two selected hybrids B X D, B X E with Sweety as a check used in this experiment. Highest hollowness was found in check variety sweety (19.83 cm) and lowest in the genotype B X E (15.40 cm). The highest TSS (10.33%) was recorded in B X E. Besides, the lowest TSS was obtained in B X D (8.33%). Fruit fly infestation was highest in Sweety (3.20%) and lowest in B x E (0.90%). Shortest vine length (496cm) was produced in the line B X E. whereas check variety Sweety gave the longest vine length (695 cm). Number of fruit varied from 2.63 fruit plant-1 to 5.07fruit plant-1. The lowest number of fruit was obtained from sweety and the highest number of fruit was found in B XE. There were highly significant variation among the treatments for fruit yield. The highest yield plant-1 was recorded in B X E (16.45kg/plant) and the lowest yield plant-1 was found in Sweety (11.34kg/plant).

Development of pollen preservation method of pumpkin

Shakila Akter, Bahauddin Ahmed, A.R. Gazi, Akm Quamruzzaman and M K Jamil

A study was conducted in the research farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the winter season of 2023-24 to develop a simple, inexpensive, and easily reproducible protocol for pollen storage in

pumpkin. Pollen grains are collected at anthesis period and stored at three different temperature condition. Pollen viability were assessed with staining and then viable pollens were used to pollinate female flowers. Pollen remains viable for maximum period of time (up to 30 days) with -20°C storage temperature, followed by 4°C temperature (up to 15 days) and room temperature (up to 5 days). Pollen viability and percent fruit set decreases with time and storage conditions.

Evaluation of pumpkin genotypes to mosaic viral disease under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during 2023-24 cropping season with promising germplasm of pumpkin to find out resistant sources against mosaic viral diseases. A total of 20 pumpkin germplasm were evaluated including susceptible check (sweety). Among the germplasms, ten germplasm were showed resistant and five germplasm were found moderately resistant and rest of the germplasm were showed moderate susceptible to the disease. The highest yield was recorded in BD-232 (13.00 t/ha) followed by BD-269 (11.00 ton/ha) with 0.00% disease incidence and the lowest yield was obtained in BD-2214 (6.78 ton/ha) respectively with 0.00% disease incidence.

Performance of bitter melon under different training systems

M.R. Islam, S. Hasna, S.D. Setu, M.G. Rahman, A.K.Das and B. C. Kundu

The experiment was conducted at the horticultural research field at Regional Agricultural Research Station, Rahmatpur, Barishal during 2022-23. The experimental material consists of bitter melon variety BARI Korola-2 which was raised in Randomized Block Design with four treatments and three replications for each treatment. The treatments included four different training systems viz., T₁ (Ground: Control), T₂ (Bush: dry bamboo sticks along with thorny branches), T₃ (Kniffin system), T₄ (bower system). Growth characters like plant height, number of branches/plants were found significantly maximum. In respect of number of fruits per plant highest was recorded from treatment T₄ (26.62) and lowest fruit was from treatment T₁

(14.12). The highest weight of fruits/plant was from the treatment T₄ (2.31 kg) and minimum weight of fruits/plant from treatment T₁ (1.23 kg). In case of average single fruit weight, the highest individual fruit weight was the treatment T₄ (86.56g) and the lowest one was the treatment T₁ (64.46g). The highest yield per hectare was found in the treatment T₄ (16.17 t/ha). The lowest yield per hectare was observed in the treatment T₁ (8.61 t/ha). It can be concluded that for higher yield of bitter gourd during rainy season, it is better if the crop is raised using one of the training system preferably bower system.

Effect of spacing and number of plant per pit on growth and yield of bitter gourd

M. A. Habib, M. Rasheduzzaman, M. A. Sumi, M. S. Alam and M. H. Hossain

A field experiment on Bitter gourd was conducted at the experimental field of RARS, BARI, Akbarpur, Moulvibazar, during the kharif season of 2023. The study comprises two spacing i.e., S₁= (1.5m × 1.5m), S₂= (2.0m × 1.5m); and no. of plant/pit P₁= 1 Plant/pit, P₂=2 Plant/pit, P₃=3 Plant/pit to evaluate the effect on growth and yield of Bitter gourd. Combined effect of spacing and no. of plant/pit was not significantly different except avg. fruit wt. and yield. Maximum individual fruit weight (116.67 g) was obtained from S₂P₁ combination and followed by (108.80 g) was in S₁P₁ combination. Maximum yield (20.08 tha⁻¹) was obtained from S₁P₂ combination and minimum yield (11.16 tha⁻¹) was obtained from S₂P₃ combination. Maximum MBCR (2.51) was obtained from S₁P₂ treatment and minimum MBCR (1.28) was obtained from S₂P₃ treatment.

Optimization of recipe on the production of strawberry-flavoured ash gourd jam

Z.H. Fahad, M.N. Islam, M.A. Rahman and M.S. Arfin

The study aimed to optimize the formulation of vegetable jam with strawberry pulp and flavourings to maximize the overall acceptance and sustained quality during storage. The ash gourd jam with the strawberry pulp and fruit flavour (T₂) scored highest for both the sensory evaluation and quality during storage. Though the physicochemical properties for all the treatments were non significantly different, during storage, the colour degradation was lowest for T₂, followed by T₅,

which was prepared with only ash gourd and artificial flavourings and colours. During storage, the physicochemical properties changed but was not significantly different within the group at any stages.

Heterosis study in snake gourd

Bahauddin Ahmed, M.S. Alam and Akm Quamruzzaman

A study was conducted in snake gourd hybrids to estimate the magnitude of standard heterosis for yield and its related components. Fifteen hybrids were generated from six diverged parents which were evaluated in Randomized Complete Block Design with three replications at the Olericulture Division, Horticulture Research Centre (HRC) BARI Gazipur during kharif season of 2023. Appreciable standard heterosis was found over fourteen hybrids (seeds were not germinated in one hybrid) for all the traits studied. The range of significant standard heterosis for number of marketable fruits per plant and average fruit weight was -0.56 to 35.21% and -1.80 to 12.70%, respectively, while for fruit length and fruit breadth it was 0.91 to 25.50% and 0.60 to 6.45%, respectively. Among the tested hybrids the hybrid 7, hybrid 9 and hybrid 14 showed the negative standard heterosis for fruit yield and the range of standard heterosis was -1.00 to 30.40%. Considering the standard heterosis of yield and yield contributing characters, the snake gourd hybrid 1, hybrid 2, hybrid 3, hybrid 4 and hybrid 5 were found promising and may be recommended for regional yield trial.

Development and screening of ymvv resistant okra

S Sultana, T H Tabassum, and M A Siddiky

This experiment was conducted during Kharif season of 2024 in the experimental field of RARS, Cumilla. Three okra lines developed from the segregating population of commercial varieties (Hybrid) and BARI Dherosh-2 were included in this study to exploit in resistance breeding program. Two lines were identified as highly resistant to YVMV. Individual plant with desired combination of characters specially resistance to YVMV has been selected in the F₂ and F₃ generations of different commercial hybrids and will be continued to F₅ or F₆. Inter-crosses among hybrids also have

been done and selection will be proceeded in the subsequent generations.

Effects of plastic mulches and poly tunnel on growth and yield of okra during winter season

M.M R. Salim, A. K. M. Khorsheduzzaman, A. J. M. Obaidullah

A study was carried out, at Olericulture Division, PRC & RARS, Bangladesh Agricultural Research Institute (BARI), Ishurdi, Pabna, to evaluate the effects plastic mulch and poly tunnel on growth and yield of okra (*Abelmoschus esculentus* L.) during winter. Ploy tunnel shed and plastic mulches was used for the heat treatment. Plastic mulches significantly increased soil temperature and conserved soil moisture. They increased seedling emergence, improved plant growth and resulted in early flowering and increased total yield of okra. Most of the cases no significant differences between the treatments were obtained, but plant height(cm), pod diameter (cm) and number of pod/plant were significantly superior to ploy tunnel shed and plastic mulches treatments. Tunnel and plastic mulches increased total yield by 15.66% compared to the control.

Effect of boron and magnesium on growth, yield and quality of okra

M. A. Quddus, M. Aatur Rahman, M.A. Hossain, R. Ahmed and M. S. Arfin

An experiment was conducted in summer season of two consecutives year 2023 and 2024 to evaluate the effect of boron and magnesium on growth, yield traits and yields of okra. The experiment was planned with 16 treatment combinations involving four levels each of boron (0, 1, 2 and 3 kg ha⁻¹) and magnesium (0, 4, 8 and 12 kg ha⁻¹) following factorial design with three replications. The result indicated that application of B 2 kg ha⁻¹ and Mg 12 kg ha⁻¹ produced higher number of fruits per plant (27.0) and higher fresh fruit yield (16.0 t ha⁻¹) that was 61.3% higher over control (B₀Mg₀) treatment and greater vitamin C (37.9 mg/100g) of okra. The interaction effect of boron and magnesium was more positive their single effect. Hence, the result suggests that combined application of B 2 kg ha⁻¹ and Mg 12 kg ha⁻¹ can increase the fruit yield and quality of okra. The present findings may have potential to improve the yield and quality of okra in the areas where soils are deficit in boron and magnesium.

Regional yield trial of yvmv tolerant okra

S. Yesmin, M. Ratna, E. Mahmud, M. Islam, N. Akter, M. I. A. Howlader and M. G. Kibria

The experiment was conducted at Regional Horticulture Research Station, BARI, Lebukhali, Dumki, Patuakhali during March to June 2024 to select high yielding okra lines with virus tolerance. Three selected lines AE(Pat)1-1, AE(Pat)1-23 and AE(Pat)1-31 with BARI Dherosh-2 as a check were used in this experiment. Highest plant height was obtained from the genotype AE (Pat)1-31 (156.47 cm) whereas the lowest from the genotype AE(Pat) 1-23 (118.00 cm). Yield per plant and yield (t/ha) was also highest in AE(Pat)1-31 (0.78 kg & 32.33 t/ha-1) whereas lowest was in AE (Pat) 1-23 line (0.60 kg & 24.87 t/ha-1). No visual virus symptom was observed. In respect of, yield AE(Pat)1-31 performed better in Patuakhali region.

Screening of okra germplasm resistance to okra yellow vein mosaic virus

L. Yasmin, M. Afroz, M. A. Rahman and M.S. Ali

Twenty okra germplasm were evaluated for resistance to Okra yellow vein mosaic virus (OYVMV) grown under natural conditions during 2024 cropping seasons. Among them, three accessions of okra such as BD-12109, BD-12110 and BD-12116 showed tolerant reaction, nine accessions such as Sabuzshathi (shek agro seed), Sabuzshathi, Duranta (Munir seed), Agam plus, OK-285, BD-12108, BD-12123, BD-12122, BD-12117 showed moderately susceptible reaction. Four accessions showed (BD-12119, BD-12112, Krishan seed and BD-12128) susceptible reaction. Four accessions showed (BD-12107, BD-12121, BD-12125 and BARI Derosh -1) highly susceptible to Okra yellow vein mosaic virus (OYVMV).

Efficacy of chemicals, botanicals and plant defense activators in managing okra yellow vein mosaic virus

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and M.S. Ali

The experiment was conducted to manage okra yellow vein mosaic disease through the chemical, botanical and plant defense activators. The experiment was conducted in Plant Pathology Section, HRC, BARI, and Gazipur during 2024-2025 summer seasons. There were six treatments such as: i) Imidacloprid ii). Neem oil iii). Moringa

oleifera leaf extract iv), *Allium sativum* v). Salicylic acid vi) Untreated control were carried out with three replications. Among the treatments, treatment, imidacloprid at 15 days interval were showed lowest disease incidence and increase the yield of okra.

Seed germination and seedling growth in okra as influenced by different priming agents

M. Moniruzzaman and R. Khatoon

An experiment was conducted at the laboratory of Plant Physiology Section of Horticulture Research centre, BARI during the period from 6 May 2024 to 14 May 2024 to investigate the effect of different priming agents on seed germination and seedling growth of okra. The experiment consisted of two okra varieties, namely BARI Dheros-2 and OK1820 and seven priming agents viz., T₀ = no priming (control), T₁ = Hydropriming, T₂ = 150 ppm GA₃, T₃ = 200 ppm GA₃, T₄ = 40 ppm SA (salicylic acid), T₅ = 50 ppm SA, T₆ = 0.25% KNO₃, T₇ = 0.50% KNO₃, T₈ = 40 mM H₂O₂, T₉ = 100 ppm HA (humic acid), T₁₀ = 200 ppm HA. Seeds were soaked in different solutions for 18 hours. Seed germination, T₅₀ value, speed of germination and germination value were enhanced significantly in both the varieties at 40 mM H₂O₂, 200 ppm humic acid and distilled water. Seedling growth (seedling length, seedling dry weight and seedling vigour index) were also increased at 40 mM H₂O₂, 200 ppm humic acid and distilled water.

Evaluation of local pointed gourd germplasm

M. Mostaque Ahmed, M. Nasirul Farid and M. Kamrul Islam

The experiment was conducted at Regional Agricultural Research Station, BARI, Burirhat, Rangpur during *Rabi* season of 2023-24 with a view to select the superior pointed gourd lines for developing variety at northern regions of Bangladesh. The experiment was laid in randomized complete block design with three replications. Four pointed gourd germplasm viz. TD(R)-Bur-01, TD(R)-Bur-02, TD(M)-Bur-03 and TD(M)-Bur-04 were used as treatment. Among these four germplasm TD(R)-Bur-01, TD(R)-Bur-02 and TD(M)-Bur-03 beard fruits except TD(M)-Bur-04. The result revealed that TD(R)-Bur-01 responded in better performance in respect of number of fruits/plant (46.3), weight of fruit (60 gm), fruit length (20.7 cm), breadth (14.7 cm) and

fruit yield (6.5 kg/plot) followed by TD(R)-Bur-02 with number of fruits/plant (40), weight of fruit (56.2 gm), fruit length (19.6 cm), fruit breadth (14.3 cm) and fruit yield (5.1kg/plot). The lowest data were collected from TD(M)-Bur-03 in respect of number of fruits/plant (29), weight of fruit (36 gm), fruit length (15.2 cm), breadth (14.2 cm) and fruit yield (1.7 kg/plot).

Regional yield trial of hybrid pointed gourd

R. Akter, A. K. M. M. Rahman, A. Sattar, and S. M. M. Rahman

An experiment was conducted at the research field of Regional Horticulture Research Station, BARI, Shibpur, Narsingdi during October to May, 2024 in to find out best pointed gourd hybrids. Five lines of hybrid pointed gourd viz PG 014 X M₁, PG 018 X M₂, PG 009 X M₂, PG 008 X M₂ and BARI Hybrid Potol - 1 (as check) were include in this experiment. Individual fruit weight was maximum in BARI Hybrid Potol - 1 (51.17g) whereas minimum was found in PG 009 X M₂ (40.24g). The highest number of fruits per plant was obtained from PG 009 X M₂ (192.00) whereas the lowest was found PG 018 X M₂ (114.33). In respect of no. of fruits per plant PG 009 X M₂ better performance at Narsingdi region.

Regional yield trial of ridge gourd hybrids

Bahauddin Ahmed and Akm Quamruzzaman

A study on the performance of three ridge gourd hybrids along with check (Hero) was conducted at the experimental field of Olericulture Division, HRC, BARI Gazipur along with different RARS of Bangladesh during the kharif season of 2023 to develop high yielding hybrid ridge gourd varieties. The hybrid 1 required minimum days for 1st female flower open (45.40 days) and the hybrid 1 showed the maximum fruit length (30.60cm) and the hybrid 2 showed the maximum fruit breadth (4.50cm). The hybrid 2 showed the highest average fruit weight (125.70 gm). The number of total fruits per plant was highest in hybrid 2 (46.00) and the lowest was in check variety (41.00). The highest yield per plant was also observed from the hybrid 2 (5.80kg) and lowest yield per plant was observed from the check variety (3.64 kg). The virus infection was less (10%) in hybrid 1 but it is more in other tested hybrids (20-30%). Fruit fly infestation was low due to the use of pheromone trap and bit trap jointly. Considering the yield and

yield contributing characters, the ridge gourd hybrid 2 were found promising and may be released as a new ridge gourd hybrid variety.

Inbred development of sponge gourd (S₁-S₂)

Bahauddin Ahmed and A.R. Gazi

Seven sponge gourd lines (such as: LC003-6, LC005-2, LC006-1, LC007-2, LC008-3, LC009-7, LC10-5) were selected from different lines on the basis of individual fruit weight, yield per plant, total number of fruits per plant and yield (t/ha) which were evaluated in Olericulture Division, HRC, Bangladesh Agricultural Research Institute, Gazipur during the kharif season of 2023 to develop superior sponge gourd lines. The lines varied for their response of some characters studied. The days to 1st female flower, fruit length, fruit breadth, Individual fruit weight, total fruits per plant, yield per plant and yield (t/ha) was ranged from 54.00 to 64.00 days, 25.13 to 38.00 cm, 3.5 to 4.2 cm, 210.72 to 262.10 gm, 57.20 to 65.25, 13.65 to 17.76 kg and 20.07 to 27.85 ton, respectively. Fruit fly infestation and downy mildew incidence was also observed in these lines. Best individuals from every line were stored for advancing S₂ progenies in the next year.

Regional yield trial of cucumber

M Nazim Uddin and A K M Quamruzzaman

This study, conducted from January to April 2024 across seven locations including Gazipur, evaluated the performance of three advanced cucumber lines (CS0079, CS0115, and CS007M) alongside a check variety using a randomized complete block design (RCBD) factorial design. Significant differences were observed among the genotypes. CS0079 had the longest duration (22.5 days) to 50% female flowering and the highest yield (26.5 t/ha). CS0115 produced the highest number (9.9) of fruits per plant and had the heaviest single fruit weight (176.7 g), while CS007M reached the first harvest earliest (35.5 days) but had the smallest fruits in terms of both length (9.2 cm) and breadth (3.0 cm). These findings highlighted the genetic variability among the cucumber lines, with CS0079 and CS0115 showing the most promising for high yield and fruit quality. The study underscores the importance of selecting genotypes with superior yield-contributing traits for enhancing cucumber production.

Development of cucumber population

S Sultana and M A Siddiky

The experiment was conducted at RARS, BARI, Cumilla during Kharif II season of 2023 to develop high yielding and high-quality cucumber varieties using phenotypic recurrent selection method. The materials used in this study comprised up crosses among eight (8) popular hybrids, three (3) local lines and two (2) lines collected from PGRC, BARI using half diallel fashion. The variation regarding average fruit weight was huge (135 g-1094 g). The lowest weighed fruits were found in HC-15.2 giving the yield per plant only 1.07 kg. Yield per plant varied from 1.07 kg to 8.09 kg. The maximum yield came from HC-10.1 (8.09 kg/plant) along with the highest fruit bearing intensity (>60 fruits/plant) of around 200 gm fruit. Fruit number ranged from 7 to 61. There were some other lines which performed potentially eg. HC-16.2, LC-7.1, HC-1.3, HC-6.3, HC-7.2, HC-9.1, HC-12.2 and HC-21.1. The selfed progenies of the selected plants will be subjected to further evaluation and subsequent intercrossing in all possible combination to be used in the continuation of the phenotypic recurrent selection.

Development of inbred in cucumber (S₂ TO S₄)

S Sultana and M A Siddiky

The study consisted of five lines of cucumber which were advanced from S₂ to S₃ generation in kharif II and from S₃ to S₄ generation in winter, 2023-24 at RARS, BARI, Cumilla. The present study is designed to develop promising inbred lines of cucumber. Overall, CS Cum-7.1.3.5 was found to be promising for kharif (21.47 t/ha), CS Cum-15.2.1.6 (18.80 t/ha) for rabi and CS Cum-22.3.2 was found suitable for both season. Best individuals from every line were selected and selfed. Seeds of S₄ progenies of cucumber lines were stored for advancing further in the next year.

Performance of cucumber hybrids

M Nazim Uddin, M Hasinul Islam and Akm Quamruzzaman

This study was conducted at the Olericulture Division, HRC, BARI, Gazipur, from January to May 2024, evaluated seven cucumber hybrids 4S × 1C, 2SH × 7A, 7A × 1C, 1C × 4S, 102 × 4S, 79 × 4S, and 2SH × 4S using a randomized complete block design (RCBD) with four replications.

Seedlings were transplanted onto trellises with a spacing of 100 cm × 100 cm, and a comprehensive fertilizer regimen was applied. Data collected included days to 50% flowering, days to first and last harvest, number of fruits per plant, single fruit weight, fruit size, and yield per hectare. The results demonstrated significant variations in yield and fruit characteristics among the hybrids. The earliest flowering occurred in 7A × 1C, while 102 × 4S had the latest harvest. The highest number of fruits per plant was in 102 × 4S, and the largest fruits were observed in 102 × 4S. Yield per hectare was highest in 2SH × 4S (29.4 t/ha) and lowest in 79 × 4S (19.7 t/ha). Hybrids 102 × 4S and 2SH × 4S showed exceptional performance, making them suitable for high-yield production and commercial cultivation. Five crosses recommended for AYT in the next year.

Screening of cucumber germplasm for resistance to cucumber mosaic virus under field condition

M. Mahfuzur Rahman, L. Yasmin, M. Afroz, Bahauddin Ahmed and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during summer 2023-24 cropping season with promising germplasm of cucumber to find out resistant sources against cucumber mosaic virus (CMV) disease. A total of 20 cucumber germplasm were evaluated including susceptible check (MynamatiF1 & AlviF1). Seven germplasm were shown highly resistant and four germplasm were found moderately susceptible to disease and rest of the susceptible to the disease. The highest yield was recorded in 5G (12.71 t/ha) followed by CS-79 (7.82 ton/ha), CS-25-20-42 (7.09 ton/ha) with 0.00%, 0.00% and 75% disease incidence and the lowest yield was obtained in CS-34-2 (3.67 t/ha) respectively with 41.67% disease incidence.

Inbred development of watermelon [S₄-S₅]

AKM Quamruzzaman, L. Akter and M.R. Karim

Five watermelon lines were selected from different watermelon lines based on the number of fruits per plant, individual fruit weight, fruit shape, color, flesh color and homozygosity which was evaluated in the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the summer season of 2023. The lines varied for the response of

some characters studied. This experiment was designed to identify the good quality watermelon lines having more fruit number and higher yield and with attractive fruit shape, size, color, flesh color and higher TSS. Flesh thickness and rind thickness were important characters, whose range was 13.5-25.0 cm and 1.0-1.3 cm, respectively, while the total soluble solid (TSS) varied 10.3-11.5 %. The fruit yield per plant and fruit yield per hectare varied from 15.6-19.5 kg and 43.62-54.66 tons, respectively. This experiment was designed to identify the good quality watermelon inbreds having more fruit number and higher yield as well as with attractive fruit shape, size, color and also flesh color and higher TSS. There were other points to be considered for the farmers which are pest and disease infestation. Three inbreds viz., CL04A, CL05, and CL21 were selected considering the yield and yield contributing characters and the less pest and disease infestation as well their attaining homozygosity. So these three inbreds viz., CL04A, CL05, CL21 may be used for breeding purposes for developing quality watermelon variety.

Evaluation of watermelon hybrids

AKM Quamruzzaman, L. Akter and M.R. Karim

Seven watermelon hybrids were made last year and selected for evaluation trial with a check variety 'Sweet Baby' in the Olericulture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the summer season of 2023. The lines varied for the response of some characters studied. The total soluble solid (TSS) is one of the important characteristics to choose a good quality variety, which varied from 10.6-11.5 %. The fruit yield per plant and fruit yield per hectare varied from 16.4-21.0 kg and 45.92-58.80 tons, respectively. Four hybrids viz., F1 8×21, F1 2×5, 1 1×21, F1 4×21, and F1 B2×CL2 were selected considering the yield and yield contributing characters and the less pest and disease infestation. So, these four hybrids viz F1 8×21, F1 2×5, 1 1×21, F1 4×21, F1 B2×CL2 may be selected for releasing hybrids watermelon variety.

Regional yield trial of hybrid watermelon

Akm Quamruzzaman, L. Akter, Mr. Karim, M R Islam and M Ratna

The study was conducted with three watermelon hybrids along with the commercial check variety 'Sweet Baby' at the farm of Olericulture Division, Horticulture Research Centre (HRC), Bangladesh

Agricultural Research Institute (BARI), Gazipur along with different RARS, RHRS (Rahmatpur and Patuakhali) of BARI during the summer season of 2023 to develop new high yielding watermelon variety. The hybrids varied for the response of some characters studied. The number of fruit per plant and single fruit weight varied from 3.2-3.8 and 4.7-6.1 kg, respectively, while the total soluble solid (TSS) varied from 10.4-11.7 %. The significant variation was observed with the range for fruit fly infestation, thrips infestation, mite infestation and stem blight infection were 5-7.5%, 2.5-10%, 0-5%, and 05%, respectively. The higher yielder hybrids F_1 1×4 (53.80 t/ha) and F_1 3×5 (50.01 t/ha) were selected considering the yield and yield contributing characters and the less pest and disease infestation. So, these two hybrids viz., F_1 1×4, F_1 3×5 may be selected for releasing quality watermelon variety.

Influence of rootstock on the growth, yield and quality of watermelon

M.G. Rahman, S.D. Setu, S. Hasna, M.R. Islam, A.K. Das and B. C. Kundu

The study was conducted during 2023-2024 at Regional Agricultural Research Station, BARI, Rahmatpur, Barishal. to study the effect of grafting on plant growth and yield of watermelon cultivar under open field conditions. The experiments treatments consisted of two factorial combination of two scion (S_1 = BARI Tormuj-2 and S_2 = Commercial Hybrid i.e. Dragon Super) and five rootstocks (T_1 = BARI Lau-4, T_2 = Local bottle gourd, T_3 =BARI Mistikumra-2, T_4 =Local Sweet gourd, T_5 = Non-grafted), laid out in RCBD with three replications. The results of the experiments revealed that, commercial hybrids grafting with Local sweet gourd showed superior performance in terms of disease & insects attack, early female flowering, plant height, no. of branch/plant, fruit quality, fruit size, average fruit weight, rind thickness and yield contributing characteristics over other treatment. The highest fruit yield (12.01 kg/plant & 44.13 t/ha) was found when Commercial hybrid namely Dragon super grafted with Local sweet gourd which is statistically similar to S_1T_4 (10.66 kg/plant & 39.21 t/ha), S_1T_1 (10.01 kg/plant & 36.79 t/ha) and S_2T_1 (9.80 kg/plant & 36.79 t/ha) treatment. On the other hand, the lowest yield (3.55 kg/ plant & 13.06 t/ha) was found from the interaction effect between variety (BARI Tormuj-2)

and non-grafting plants. This is the first year observation trial, the experiments should continue for more confined data regarding biotic and abiotic stress.

Effect of mulching on growth and yield of watermelon

S.D. Setu, M.G. Rahman, M.R. Islam, S. Hasna, A. K. Das, and B.C. Kundu

The study was conducted during 2023-2024 at Regional Agricultural Research Station, BARI, Rahmatpur, Barishal to study the effect of mulching on plant growth and yield of watermelon cultivar under open field conditions. The experiments treatments consisted of two factorial combination of two variety (V_1 = BARI Tormuj-1 and V_2 = Commercial Hybrid i.e. Dragon Super) and five mulching material (M_1 = Black polythene mulch, M_2 = White polythene mulch, M_3 = Water hyacinth mulch, M_4 = Straw mulch and M_5 = Control (no mulch) laid out in RCBD with three replications. The results of the experiments revealed that, commercial hybrids with black mulching showed better performance in terms of plant height, no. of branch/plant, fruit quality, fruit size, average fruit weight, edible portion and yield contributing characteristics over other treatment. We can observe that highest yield (9.84 kg/ plant & 36.18 t/ha) was found from the interaction effect between commercial hybrid with black polythene mulch V_2M_1 which is statistically similar to V_1M_2 (8.36 kg/plant & 30.72 t/ha). On the other hand, the lowest yield (3.3 kg/ plant & 12.35 t/ha) was found from the interaction effect between variety (BARI Tormuj-1) with no mulching effect. This was the first year observation trial, the experiments should continue for more confined data regarding biotic and abiotic stress.

Development of ipm package against major insect pest of watermelon

M. S. Hossain, A. Mohammad and M. I. Islam

A field study was conducted at Horticulture Research Center, BARI, Gazipur to evaluate five different treatments against major insect pests of watermelon to findout the most effective and suitable control measures. Among five treatments, treatment 3, Sanitation+ Soil drenching with microbial pesticide (Metarhizium anisopliae)+ Bioclean (D-lemonene) @ 1ml/L of water + Sodium Lauryl ether sulphate (Fizimite 10%) @

1ml/L of water + yellow and blue sticky trap + Bagging with butter paper showed the best performance considering reduction of major insect pests infestation, increase of marketable yield and higher marginal benefit cost ratio.

Advanced yield trial of year-round musk melon (Ialmui)

N.U. Ahmed, M.M. Hasan and S.P. Chakma,

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2023-24 to find out the suitable muskmelon lines. It is year-round in character to release as a variety and to utilize in future breeding program of muskmelon. According to yield performance and fruit qualities among the three lines (CM Rai-009, CM Rai-013 and CM Rai-019), the CM Rai-019 was found superior in terms of number of fruits per plant (11.0), yield (69.05 kg/ha) and TSS (6%) followed by CM Rai-009 with no crack on the fruit.

Regional yield trial of squash

M. R. Islam, S. D. Setu, S. Hasna, M.G. Rahman, A. K. Das and B. C. Kundu

Three hybrid squash lines with two check varieties (BARI Squash-1 and commercial hybrid) were evaluated at the experimental field of RARS, Rahmatpur, Barishal during the winter season of 2023-24 to select the high yield potential and lucrative shape lines/genotypes. The hybrid lines hybrid-1, hybrid-2 and hybrid -3 were used in this study. Significant variation was observed among the squash lines for different characters. The highest average fruit weight was observed the Commercial hybrid (1.95 kg) and two hybrid line Hybrid-1 (1.83 kg) and Hybrid-2 (1.64 kg) was also very good in individual fruit wt. From the evaluated lines the Hybrid-1 was the superior for its fruit width, no. of fruit/plant, no. of fruit/plot, yield/plant and yield t/ha.

Regional yield trial of hybrid squash

Bahauddin Ahmed, M. S. Alam and Akm Qumruzzaman, M A Habib and M. R. Islam

A study was conducted in squash to observe the performance of newly developed squash hybrids at different regions of Bangladesh. Three squash hybrids (Hybrid 1, Hybrid 2 & Hybrid 3) were generated from three diverged parents and one commercial check were evaluated in Randomized Complete Block Design with three replications at

the Olericulture Division, Horticulture Research Centre(HRC), BARI Gazipur and other three regional station of BARI (Burirhat, Akbarpur & Rahmatpur) during winter season of 2023-24. The plant growth was excellent before unexpected rain in winter season but after rain the plant was affected by viruses and fruit and root rot diseases. Considering the yield and yield contributing characters of the tested squash hybrids, the hybrid 2 showed the better performance rather than two and it was 31.80 t/ha. The diseases infection was also comparatively low in squash hybrid 2. So, the squash hybrid 2 may be release as a hybrid squash variety.

Preliminary yield trial of bold seeded hyacinth bean

M R Islam, M S Alam, M A Goffar and A K M Qumruzzaman

The experiment was conducted at the research farm of Olericulture Division, HRC, BARI, Gazipur during the Rabi season of 2023-2024 to find out suitable bold seeded hyacinth lines and adaptability of different agro-ecological areas of Bangladesh. Three hyacinth lines viz. LP Pah-013, LP Pah-015, LP Pah-019 and BARI Sheem-10 as check were used in the study. The highest number of pods (358) were obtained from the line LP Pah-19 and the lowest individual fruit weight was observed in LP Pah-013 (11.19g) than other statistically similar genotypes. The pod yield was the highest in the genotype LP Pah-019 (5.16 kg/plant and 22.95 t/ha) and the lowest yield obtained in LP Pah-013 (2.07 kg/plant and 9.22 t/ha). The line LP Pah-019 found promising.

Feasibility study of BARI released hyacinth bean

M.M R. Salim, A. K. M. Khorsheduzzaman, A. J. M. Obaidullah

The study was conducted at Regional Agricultural Research Station, Ishwardi, Pabna during Rabi season of 2023-24 to evaluate the performance of BARI Sheem-1 and BARI Sheem-7 with two local cultivar namely, Auto sheem and Motor sheem in early winter yield and other desirable characters. The experiment was laid out in RCB design with three replications. The maximum number of pods per plant (334) was harvested from Motor sheem whereas, minimum (259) was in Auto sheem. Individual pod weight was maximum (10.94 g) in

Auto sheem and minimum (6.14 g) in BARI Sheem-1. However, the highest weight of pods per plant (2.88 kg) as well as yield (20.13 t/ha) was obtained from Motor sheem whereas; the lowest pod weight per plant (1.74 kg) and yield (13.16 t/ha) was obtained from BARI Sheem-1.

Regional yield trial of hyacinth bean

M R Islam, M S Alam, M A Goffar and A K M Qumruzzaman, A Akter, M M R Salim and M Ratna

Regional yield trial of twelve hyacinth lines was conducted at the Olericulture Division, Horticulture Research Center (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during winter season of 2023-24 to select superior lines. The selected superior lines varied significantly for their response to all the characters studied. The line LP Jam-008 showed earliest for flowering (27 days) and first harvesting (44 days). The BARI Sheem-1 followed by LP Isd-018 produced maximum number of pods, these were 340 and 320 respectively. The highest individual pod weight (23.33g and 19.99g), yield per plant (5.88kg and 4.91kg) and yield per hectare (26.17t and 21.82t) were recorded from DL Gaz-032 and LP Pk-13. The genotypes DL Gaz-032, LP Pk-13 and LP Jam-008 were found promising.

Evaluation of F₃ generation of hyacinth bean

A Akter, M A Hossain, H Rahman, R Sultana and H E M K Mazed

Crop production can be improved by breeding, new varieties of crops having higher yield. The main aim of plant breeding is to produce new crop superior to the existing ones. The most frequently employed plant breeding technique is hybridization. The aim of hybridization is to bring together desired traits found in different plant lines into one plant line via crossing. Evaluation of F₃ generation was conducted at the HRC field, Regional Agricultural Research Station, Jamalpur during 2023-2024 to observe the performance of yield and yield contributing characters of F₃ from some cross combination of hyacinth bean viz. BARI sheem-6 x BARI sheem-1, BARI sheem-6 x BARI sheem-7, BARI sheem-7 x BARI sheem-1, BARI sheem-7 x BARI sheem-6, BARI sheem-1x BARI sheem-5. Maximum number of pods per plant (449) was observed from BARI sheem-7 x BARI sheem-6 (3) and minimum (302) from BARI

sheem-6 x BARI sheem-1(1). BARI sheem-7 x BARI sheem-6(3) gained maximum individual pod weight (18 g), whereas; minimum (10 g) observed in BARI sheem-6 x BARI sheem-1(2). Maximum pod yield (8 Kg/plant, 32.33 kg/plot and 34.04 t/ha) gained from BARI sheem-7 x BARI sheem-6(3) and minimum pod yield (3 Kg/plant, 13.29 kg/plot and 13.99 t/ha) obtained from BARI sheem-6 x BARI sheem-1 (1).

Hybridization of hyacinth bean

H. Barua, S.M.K.H. Chowdhury and A.S.M.H. Rashid

The hybridization program was conducted at the experimental field of Agricultural Research Station, Khulshi, Chattogram during 2023-2024 to develop country bean variety with off season production. A non-reciprocal cross was made between eight parental line of country bean (BARI Sheem-8, BARI Sheem-10, LP Pah-15, LP Pah-25, BARI Sheem-7, IPSA Sheem-1, IPSA Sheem-2 and Rupbaan). Out of 583 emasculated flowers, highest two pods were developed BARI Sheem-8 x IPSA Sheem-1, BARI Sheem-8 x IPSA Sheem-2 and LP Pah-15 x IPSA Sheem-2. Another non-reciprocal cross between BARI Sheem-8 x BARI Sheem-7 and LP Pah-15 x Rupbaan, only one pod were developed.

Screening of hyacinth bean germplasm for resistance to multiplex virus complex under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz, Siddique Alam and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-24 cropping season with germplasm and variety of hyacinth bean to find out resistant sources against country bean common mosaic virus (BCMV) disease. A total of 20 country bean variety/germplasm were evaluated including susceptible check. Among the germplasm, four germplasm have been performed resistance to the mosaic virus disease, three germplasm were showed moderately and rests of the germplasm were found susceptible to the disease. LP Pah -025 germplasm produced the highest yield (29.72 ton/ha) with 33.337% disease incidence followed by LP Jam-004 (26.22 ton/ha), LP Pah-006 (24.48 ton/ha) with disease incidence 50% and 33.33% disease incidence whereas the lowest yield was obtained from

BD10516 (8.74 ton/ha) respectively. Yield of BARI Sheem-1 was 21.85 t/ha with disease incidence 33.33%.

Feasibility study of BARI released two hyacinth bean lines with local cultivar

M.M R. Salim, A. K. M. Khorsheduzzaman, A. J. M. Obaidullah

The study was conducted at Regional Agricultural Research Station, Ishwardi, Pabna during Rabi season of 2023-24 to evaluate the performance of BARI Sheem-1 and BARI Sheem-7 with two local cultivar namely, Auto sheem and Motor sheem in early winter yield and other desirable characters. The experiment was laid out in RCB design with three replications. The maximum number of pods per plant (334) was harvested from Motor sheem whereas, minimum (259) was in Auto sheem. Individual pod weight was maximum (10.94 g) in Auto sheem and minimum (6.14 g) in BARI Sheem-1. However, the highest weight of pods per plant (2.88 kg) as well as yield (20.13 t/ha) was obtained from Motor sheem whereas; the lowest pod weight per plant (1.74 kg) and yield (13.16 t/ha) was obtained from BARI Sheem-1.

Advanced yield trial of french bean

N. U. Ahmed, M. M. Hasan and S. P. Chakma

An experiment for evaluation yield trial on French bean lines was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2023-24 to find out the suitable flat French bean lines in order to release as a variety. BARI Jhar sheem-2 was used as check variety. Among the two lines and control BARI Jhar sheem-2, PV Rai-097 was found superior in terms of pod number (18.30), pod size (20.98 × 1.80 × 0.78 cm), pod weight (22.25 g) and pod yield (40.41 t/ha) compared to control.

Regional yield trial of french bean

M R Islam, M A Goffar, A K M Qumruzzaman, M H Rahman, M A Habib and M M R Salim

The experiment was conducted at the research field Olericulture division, Horticulture Research Centre, BARI Gazipur, during Rabi season of 2023-24 to find out the suitable line of French bean and to study the adaptability of different agro-ecological zones. Two advanced French bean lines viz. JSRVU-002 (green colored), JSRVU-003 (purple colored) were evaluated. The early harvest was

recorded 79 days for JSRVU-002 and the plant height was recorded 2.99 meter for JSRVU-002 and 2.97 meter for JSRVU-003. The number of pods per plant was counted 50 from JSRVU-002 and 48 from JSRVU-003. The highest yield was obtained 20.9 t/ha from JSRVU-002 whereas, JSRVU-003 produced 13.9 t/ha. The bean mosaic virus was minimum in JSRVU-002 (9.5%) while JSRVU-003 (13.3%).

Evaluation of teasle gourd germplasm

R. Akter, A. K. M. M. Rahman, S. M. M. Rahman and R. A. Rimu

The experiment was conducted at the Regional Horticulture Research Station, BARI, Shibpur, Narsingdi during February to May, 2024 to select a high yielding teasle gourd line with desirable traits. Four germplasms were evaluated in this experiment. Longest (10.48 cm) fruit was found from MD Nar-002 genotypes and smallest (6.30 cm) from MD Nar-003. Fruit breadth was maximum (4.50 cm) in MD Nar-003 and minimum (4.0 cm) in MD Nar-002 genotypes. Heaviest fruit (77.20 g) was recorded in MD Nar-002 genotypes and lowest (48.00 g) from MD Nar-001. Maximum no. of seeds (50.00) was recorded from MD Nar-001 and minimum (28.00) was in MD Nar-001.

Advance yield trial of less seeded teasle gourd

M Nazim Uddin and Akm Quamruzzaman

This study was conducted at the Olericulture Division, HRC, BARI, Gazipur from May to September 2023 to evaluate the performance of less-seeded teasle gourd lines. The selected accessions—MD 22-1, MD 9-3-1, MD 21-10, MD 13-3-8, M-1, and MD 9-3-5—were planted on 20 February 2023. Fertilizers were applied at rates of 70 kg N, 50 kg P, 75 kg K, 18 kg S, 4.2 kg Zn, and 2 kg B per hectare, with 10 tons per hectare of cowdung. Data were collected on days to 50% flowering, individual fruit weight, number of seeds per fruit, fruit yield per hectare, number of fruits per plant, fruit length and diameter, fruit yield per plant, and disease and insect infestation. Significant differences were observed in the number of fruits per plant (NOFPP), single fruit weight (SFW), fruit length (FL), and yield per plant (YPP) among the accessions. MD 9-3-5 exhibited the highest NOFPP (83), SFW (83g), FL (9.2 cm), and YPP (8.2 kg), highlighting its superior genetic potential for high yield and

quality. MD 13-3-8 also showed promising results with high NOFPP (80) and YPP (7.2 kg). The findings indicate substantial variability among the teale gourd lines, with MD 9-3-5 and MD 13-3-8 identified as prime candidates for breeding programs aimed at enhancing productivity. The study underscores the importance of selecting accessions with superior yield-contributing traits for maximizing yield.

Regional yield trial of teale gourd

M Nazim Uddin and Akm Quamruzzaman

The study was conducted at the Olericulture Division, Horticulture Research Center, BARI, Gazipur, from May to September 2023. Three selected lines MD-020, MD-021, and MD-23 were assessed for agronomic performance, including flowering time, fruit characteristics, and yield at sellent AE25 of Bangladesh. The results indicated that MD-020 outperformed the other lines, with the highest yield per plant (5.86 kg) and per hectare (14.48 t/ha). MD-020 also exhibited superior fruit size and individual fruit weight, making it a promising candidate for varietal release. MD-021 and MD-23 demonstrated lower yields and smaller fruit sizes. The study concludes that MD-020 is the most suitable line for cultivation under the given conditions, offering potential for enhanced agricultural productivity.

Maintenance breeding for cauliflower varieties (BARI Fulkopi-1 and 2)

M Nazim Uddin and A K M Quamruzzaman

The study has been carried out at Olericulture division, Horticulture Research Center, BARI Gazipur during August 2023 to April 2024 to res. seeds of 2 cauliflower varieties viz., BARI fulkopi 1 and BARI fulkopi 2 produced in different years including three advanced lines namely CL171, CL 172, & CL 180. The evaluation was carried out also in 4 planting time starting from August 2023, September 2023, October, 2023 and November 2023. Seedling were raised at seed bed following double transplanting method and at 4 leaf stage were transferred to main field in the trellis 50 cm × 50 cm of spacing. A total 52 seedlings were planted in each replications. Different planting times significantly affected the performance of cauliflower genotypes. Genotypes like CL-180 and BARI FK-2 (2021) exhibited favorable traits such as high varietal uniformity, large curds, and

good adaptability to planting times. Genotypes like CL-171 and BARI FK-1 also performed well in terms of curd weight and dimensions but varied based on planting time. These findings suggest that selecting appropriate planting times and genotypes can optimize cauliflower production, influencing yield and quality. The performance of cauliflower genotypes and their varietal integrity were presented in the table 1 and observed significance difference across the seed stock and time of planting. As the main objective was to restore the 2 release varieties, however, it was observed the highest integrity observed in BARI fulkopi 1 range from 44- 65 percent on the other hand BARI fulkopi 2 were 19-44 percent. The advanced lines of summer cauliflowers, CL 171 and CL 172 observed 45 to 65 percent uniformity. September harvest took 34-38 days while October to December harvest took 22 to 24 days after curd initiation time. The highest marketable curd weight given by BARI fulkopi 1 & 2 (0.7-0.8 kg) during November planting. However, selected plants were kept under nylon net and pollinated by bees to attain the varietal uniformity.

Foliar application of boron and boron nanoparticles on growth, yield, quality and nutrient use efficiency of cauliflower

M. A. Quddus, M. Aatur Rahman, M.A. Hossain, R. Ahmed and M. S. Arfin

An experiment was conducted in winter season of 2023-24 to evaluate the effect of boron and boron nanoparticles on growth, yield traits, yield and quality of cauliflower. The experiment was planned with 5 treatment involving four levels of boron nanoparticles (0, 100, 200 and 300 ppm) and conventional boric acid @ 1 gL⁻¹ following randomized complete block design with three replications. The result indicated that foliar application of 200 ppm boron nanoparticles produced the highest fresh curd yield (48.9 t ha⁻¹) which was 93.3% higher over control. The treatment also responsible for higher individual curd weight (1723 g), higher content of vitamin C (46.9 mg/100g) protein content (20.3%). The same treatment achieved higher total B uptake (0.528 kg ha⁻¹) by cauliflower. The benefit cost ratio was most (6.47) in foliar application of 200 ppm boron nanoparticles. In contrast, the boron use efficiency in cauliflower exhibited higher in foliar application

of 100 ppm boron nanoparticles. The result suggests that foliar application of 200 ppm B nanoparticles can increase the curd yield and quality of cauliflower.

Management of flea beetle, *phyllostreta striolata* attacking cabbage

M. S. Hossain, A. Mohammad and M. I. Islam

A field study was conducted at Horticulture Research Center, BARI, Gazipur to evaluate six different treatments against flea beetle of cabbage to find out the most effective and suitable control measure. Among treatments, treatment 3, Mechanical control with sweeping net + Spraying of Bio-Chamak (*Celastrus angulatus* 1% EW) @ 2.5ml/L of water) showed the best performance considering reduction of flea beetle infestation, increase of marketable yield and higher marginal benefit cost ratio.

Effect of DHAP residue on growth and yield of broccoli

M.R. Islam, S. Hasna, S.D. Setu, M.G. Rahman, A.K.Das, M.A. Rahman, M.M.R. Talukder & B.C. Kundu

The experiment was carried out during the Rabi season 2023-24 at the main experiment station is Regional Agricultural Research Station, BARI, Rahmatpur, Barishal. The experiments were laid out in Randomized Block Design with three replications. There were six treatments and each treatment. The maximum canopy spread (8320.22 cm²) was observed in the treatment T₆ (100% Dhap Residue + 100% RDF) whereas, the minimum canopy (6179.78 cm²) recorded with the T₁ (control). The minimum time of flowering (62.43 days) were observed in the treatment T₆ (100% Dhap Residue + 100% RDF). Whereas, the maximum time of flowering (78.90 days) recorded with the T₁ (control). The minimum days of time of harvesting (74.25 days) were observed in the treatment T₆ (100% Dhap Residue + 100% RDF). Whereas, the maximum days of time of harvesting (89.76 days) recorded with the T₁ (control). The maximum curd yield (t/ha) was observed in the treatment T₆ (100% Dhap Residue + 100% RDF) whereas, the minimum (16.51 t/ha) curd yield (t/ha) recorded with the T₁ (control). From this study it can be recommend that the application

of dhap residue (5t/ha) and recommended dose of fertilizer can be applied to obtain maximum growth and yield of Broccoli.

Maturity determination of broccoli

M. S. Arfin, M.A. Rahman, M. F. B. Hossain and Z.H. Fahad

The experiment was conducted at the field and laboratory of Postharvest Technology Section, HRC, BARI to determine the optimum maturity stage and shelf life of broccoli (*Brassica oleracea* L. var. *italica*). BARI Broccoli-1 was grown in the field following recommended production practices. The heads were harvested at different time started on 53, 56, 59, 62 and 65 days after transplanting and kept for three days at ambient condition (23±2 °C). Broccoli harvested at 65 days after transplanting showed the slower changes in surface colour (a* -2.96 to -4.84, b* 6.92 to 15.58), 6.18 mg/100g and Vitamin C content 50.41 mg/100g. Considering all physicochemical parameters, broccoli harvested at 65 days after transplanting prolonged the shelf-life by up to three days at ambient condition.

Fresh cut processing techniques of broccoli using different acidulants

M. S. Arfin, M.A. Rahman, M. F. B. Hossain and Z.H. Fahad

The experiment was conducted at the laboratory of Postharvest Technology Section, Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur. In the experiment, the influence of ascorbic acid and citric acid on the quality loss of fresh cut broccoli florets at refrigerator (4±1°C) was addressed. The results highlighted that fresh cut broccoli treated with 1% citric acid had the highest score in sensory evaluation, like 6.84 in appearance, 2.7 in flavor, 6.3 in texture and 6.8 in overall acceptability with biochemical properties of phenol 62.7 mg GAE/g, β-carotene 1.98 μg/gm, total chlorophyll 0.046 mg/g, carotenoids 0.024 mg/g and vitamin C 20.7mg/100g. Considering all biochemical and sensory quality parameters, fresh cut broccoli treated with 1% citric acid and packed in polypropylene box prolonged the shelf life by up to six days at refrigerator (4±1°C).

Influence of nitrogen and potassium application

on productivity, quality and nutrient use efficiency of broccoli

M. A. Quddus, M. Aatur Rahman, M.A. Hossain, R. Ahmed and M. S. Arfin

A field experiment was conducted in Rabi season of 2023-24 to evaluate the effect of nitrogen and potassium on productivity, quality and nutrient use efficiency to determine the N and K fertilizer requirement of broccoli. The experiment was scheduled with 16 treatment combinations involving four levels each of nitrogen (0, 100, 140 and 180 kg ha⁻¹) and potassium (0, 40, 70 and 100 kg ha⁻¹) following factorial design with three replications. The result indicated that application of N 180 kg ha⁻¹ and K 70 kg ha⁻¹ produced higher individual head weight (800g) and higher head yield (21.4 t ha⁻¹) that was 257% higher over control (N₀K₀) treatment and also get greater vitamin C (80.0 mg/100g) of broccoli. The interaction effect of nitrogen and potassium was more positive than their single effect. Hence, the result suggests that combined application of N 180 kg ha⁻¹ and K 70 kg ha⁻¹ can increase the head yield and quality of broccoli. Regression analysis indicated that further investigation in next year is necessary rescheduling the nitrogen levels.

Regional yield trial of year round stem amaranth

M Nazim Uddin, M R Karim, Akm Quamruzzaman, A Akter and M Ratna

The study aimed to evaluate the performance of four stem amaranth lines, including two BARI-developed varieties, in a regional yield trial conducted at the Olericulture Division, HRC, BARI, Gazipur from January to May 2023. The lines AT-Jam 011, AM-024, BARI DATA-1, and BARI DATA-2 were assessed for agronomic traits such as days to first harvest, plant height, yield, and tenderness. Among the tested lines, BARI DATA-2 exhibited the highest yield (9.06 kg/m²) and superior plant growth, making it a promising candidate for further development as a year-round variety. The results highlight the potential for developing high-yielding stem amaranth varieties suitable for diverse growing conditions in Bangladesh.

Effect of spacing and sowing time on the yield and quality of BARI Borboti-2

Mr Alam, Ma Alam and Ku Ahammad

An experiment on spacing and sowing time of BARI Borboti-2 was conducted to identify the best suitable spacing and sowing time at the Regional Agricultural Research Station, Jashore during rabi and kharif season of 2023-2024. The experiment was carried out in two factors. First factor is sowing time viz, October, January, April and July. The second factor is spacing. There were five treatments of spacing viz. 40×30cm, 40×40cm, 50×40cm, 50×50cm and 60×40cm. The earliest flowering as well as harvesting date was found from April sowing of 50×40 cm spacing (49.67 and 62.67 days respectively) while the latest from January sowing of 50×50 cm spacing (55 and 68.33 days respectively). The highest yield was recorded from the October sowing of 40×30 cm spacing (11.85 t/ha) closely followed by 50×50 cm spacing (11.85 t/ha). In case of January sowing of 40×30 cm spacing also gave higher yield (10.98 t/ha), while the lowest yield was recorded from April sowing of 50×50 cm spacing (5.72 t/ha).

Evaluation of drumstick germplasm in Chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Two four-year old drumstick germplasms were evaluated during 2023-2024 at Agricultural Research Station, Khulshi, Chattogram to develop the promising drumstick germplasm for higher yield and qualities. This study compared two drumstick (*Moringa oleifera*) germplasms, designated as MO Pah 001 and MO Pah 002, focusing on their growth, morphology, and pod characteristics. Both accessions were 4 years old. MO Pah 001 exhibited superior growth parameters, including greater height, girth, spread, and number of branches per plant compared to MO Pah 002. Furthermore, MO Pah 001 flowered in February, whereas MO Pah 002 flowered in January. In terms of pod characteristics, MO Pah 001 demonstrated higher pod production per plant (712) and greater pod yield per plant (25.63 kg) compared to MO Pah 002, which produced 335 pods with a yield of 12.36 kg. While individual pod weight and length were slightly higher in MO Pah 001, pod breadth was similar between the two accessions.

Advanced yield trial of drumstick

M.A. Goffar, M.S. Alam and M. H. Islam

A study on evaluation of selected seven drumstick entries was conducted at the experimental field of Olericulture Division of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during 2022-23. The drumstick entry MO 0025 found to be as seasonal natured having good quality pod with average weight (61.53g) and obtained 16.25kg yield per plant, while three lines viz MO 0001, MO-0011 and MO-0012 are considered as off-seasonal promising lines having 40-50g average pod weight. Yearly average per plant yield indicated that the lines MO 0001(1) exhibited maximum yield (13.75 kg) followed by line MO 0012 (15.23 kg). These off-season lines are capable to produce flower two to three times in a year. No major pest and diseases found to attack in the Moringa lines. For further use, five plants of entry have been multiplied.

Improving productivity and adoption of BARI developed selected vegetable crops through integrated management approaches at char-areas of Bogura and rangpur districts (IPVC)

M.A. Goffar and Ms Alam

A program on improving productivity and adoption of BARI developed selected vegetable crops through integrated management approaches (IMA) and non-IMA practices was conducted under coordinated approach evolving an experienced national NGO. In total, selected 16 HYVs and hybrid vegetables were included for three locations covering two upazilas (Char-areas of two upazilas) of two districts (Shariakandi of Bogura and Kaunia of Rangpur district) and at head quarter of BARI, Gazipur during October 2021 - September 2024. Field trials were conducted by NGO at char areas and On-station trial was conducted by lead organization at Gazipur (HQ of BARI) for popularizing and adoption of BARI developed vegetables varieties. This year (Year-II) field trials were conducted to prove the first-year results. All selected vegetables were included as materials and the crops were sown and transplanted timely during the period of July 2022 - August 2023 following optimum crop production protocol. The experimental results of three locations showed that the yield performance of selected crops under IMA gave the highest yield compared to non-IMA practices. The BCR was also higher in IMA than

that of non-IMA practices three patterns. The average MBCR over locations under IMA and non-IMA practices revealed that the highest MBCR under IMA practices, while the higher MBCRs were also recorded from the same cropping patterns. In the early rabi season, radish (15.0t/ha) and red amaranth (10.37t/ha) showed better yield with BCR 1.96 and 1.78 respectively at Shariakandi. In rabi season, tomato contributed 67.93 t/ha with BCR 3.90 at on-station and 62.52 t/ha obtained from farmers field, while garden pea possessed 8.89 to 10.13 t/ha with higher BCR 2.79 to 3.36. In kharif season, bottle gourd yielded 44.46t/ha at Kaunia and the highest yield of okra (20.25 t/ha) was recorded at Shariakandi plot. Garden pea and summer bottle gourd were unfamiliar to char people, now these are being popularized among them. The project activities are focusing and enhancing char dwellers to grow more vegetables and helping to transform their food habit for consuming more vegetables throughout the year by growing different types of vegetables in the project areas. But the fact is that any single pattern isn't suitable for the char areas. However, considering productivity, local consumer's preference, and profitability some selective crops of different crop patterns are more suitable for the char lands. Hence, i) radish-tomato-bottle gourd; and ii) red amaranth-garden pea-okra based patterns may be suggested for piloting in the last year and for recommending future cultivation under IMA practices.

Performance of different varieties/genotypes of garden pea as affected by shoot picking for vegetable and grain production

A. K. M. M. Rahman, R. Akter, R. A. Rimu and S. M. M Rahman

A field experiment was conducted at the research field of Regional Horticulture Research Station, Bangladesh Agriculture Research Institute, Shibpur, Narsingdi during the rabi season of 2023-24 to find out the suitable adapt variety for the higher production of vegetable, grain and economic net return. The experiment was conducted in randomized complete block design with three replications. Three varieties such as BARI Motorsutisuti – 1, BARI Motorsutisuti – 2, BARI Motorsutisuti – 3 and two promising line such as promising line –1 and promising line –2 were compared to identify the suitable adapt variety for

the higher production of vegetable, grain and economic net return. The tallest plant was found in BARI Motorsuti-2 while the dwarf plant was found in BARI Motorsuti-3 and promising line -2. The highest grain yield was found from BARI Motorsuti-2 while the lowest grain yield was found from BARI Motorsuti-3. In case of vegetable yield, the highest vegetable yield was obtained from BARI Motorsuti-2. However, based on economic analysis, BARI-Motor-2 is a suitable cultivar in establishing, increasing both grain and vegetable yield at Narsingdi region.

Yield response of promising velvet bean lines in response to different sowing date

S. M. Faisal and R. H. Nitol

An investigation was carried out at HTARS, Ramgarh during the winter of last year to see the effect of sowing date on growth and yield of velvet bean in hilly area. There were three velvet bean germplasm collected from aboriginals under different locations of Ramgarh area. Those germplasms were named as G₁=MPRAM001, G₂=MPRAM002, G₃=MPRAM003 and G₄=BARI Sheem-8 was used as check. BARI sheem-8 took the shortest time (49 days) for harvest whereas MPRAM002 took the longest (80 days) time to harvest from flowering. The highest (117.67) no. of pods were obtained from BARI sheem-8 and the lowest (2.66) no. of pods were obtained from MPRAM002 when it was planted on October 30. The highest pod yield was observed in MPRAM001 (13.26 t/ha) when it was planted on October 15 followed by BARI sheem-8 (9.08 t/ha) when it was planted on same date.

Application of iron nanoparticles on the growth, yield and physiological traits of tomato in hydroponics

Md Asaduzzaman, Mh Islam, Mar Gazi, S. Akter

There were five concentrations of Fe₃O₄ used in this study to investigate the effect of Fe nanomaterial on growth, yield and fruit quality of tomato in hydroponics. Fe₃O₄ NP at doses of 0, 50, 100, 150 and 200 mg/L were sprayed to the tomato shoots five times during the entire growth period at biweekly interval started from anthesis. BARI Tomato-19 were used as planting materials and grown in coco-dust based soilless culture nourishing with BARI Hydroponic solution-1 (1.5-2.5 dS/m) throughout the period. It is evident that,

that application of iron NP showed positive influence on the growth and yield attributes over control plant sprayed with distilled water only. It was found that about 0.5-1 kg/plant higher fruit yield can be obtained through the application of Fe NP in tomato. Further trials are recommended for considering the higher doses, types and time of application in high value fruity vegetables grown in hydroponics.

Effect of supplemental led on the yield and quality of sweet pepper grown in soilless culture during winter in the greenhouse

Md Asaduzzaman, Mh Islam, Mar Gazi

Three sweet peppers were evaluated under with or without light emitting diodes (LED) supplementation during the winter season in the greenhouse condition. The varieties of sweet pepper are BARI Mistimorich-1, BARI Mistimorich-2 and JP-1. In this study, LED (R:B::3:1) were used at the start of day for 2-3 hours, manually. Sweet peppers were grown in coco-dust based soilless culture nourishing with BARI Hydroponic solution-1 (1.5-2.5 dS/m) throughout the period. It was found that LED supplementation favors growth and fruit yields in sweet pepper compared to without light condition. BARI Mistimorich-1 produced greater yield performances in LED conditions (232.53 g and 216.64 g higher fruit fresh weight than BARI Mistimorich-1 and BARI Mistimorich-2, respectively) and however, quality parameters were not enhanced due to LED supplementation. In this study, LED supplementation was determined by manual application therefore, real time adjustment and supplementation of LED would result in higher yield and quality of sweet under cloudy weather during winter in Bangladesh.

Effect of modified hydroponic nutrient solution based on commercially available fertilizer for production of high value vegetables

M Asaduzzaman, Mar Gazi and Mh Islam

Three levels of hydroponic solution based on commercial grade fertilizer available in Bangladesh were evaluated against standard nutrient solutions in sweet pepper and tomato grown through soilless culture. These include full, $\frac{3}{4}$ and $\frac{1}{2}$ strength of commercial grade solution along with BARI Hydroponic solution-1 as standard formulation. It was found that $\frac{3}{4}$ and $\frac{1}{2}$ strength of commercial

grade solution produced greater performance compared to standard nutrient solutions (BARI Hydroponic solution-1). Among the three concentrations of commercial grade solution, $\frac{3}{4}$ and $\frac{1}{2}$ strength solution produces greater yield in terms of SPAD, anthesis, total number of fruit and fresh fruit weight of sweet pepper and tomato. Although, $\frac{3}{4}$ and $\frac{1}{2}$ strength commercial grade solution produced significantly similar growth and yield of studied vegetables.

Development of micro-garden model for medium-sized urban-family through soilless culture

M A R Gazi and M Asaduzzaman

A trial was conducted in the net house of Hydroponics and Controlled Environment Agriculture (CEA) research facility of Olericulture Division, Horticulture Research Center (HRC), Bangladesh Agricultural Research Institution (BARI), Gazipur, Bangladesh to produce fresh and high quality nutrient rich high value vegetables throughout the year at 3-4 member's family level consumption. Sweet pepper and tomato were grown in small plastic buckets, styrofoam box, and wooden box using coco-coir substrate following soilless culture. Modified Coopers solution-1 (1.5 dS/m) was supplied to nourish the plant. Results indicate that sweet pepper and tomato can be grown successfully having optimum yield for several cycles. Sweet pepper (832-1516g/ plant), table types tomato (385.7 – 1583.3g/ plant) can be obtained from this micro-garden model. Therefore, results of this trial indicate that micro-model has great potential of supplying fresh, nutrient and antioxidant rich vegetables for individual family level consumption toward nutritional security round the year.

Effect of biostimulants on the growth, yield and quality of sweet pepper in coco-coir substrate

M Asaduzzaman, S. Akter, Mar Gazi, Mh Islam

Five biostimulants were applied to sweet pepper to investigate its influence on the performance of sweet pepper under soilless culture. These includes control (distilled water as spray), Radison, Humi Star, Compelasol and Azumin. Two independent experiments were conducted considering seedling growth studies and in culture experiment. Biostimulants were sprayed in seedlings stage after transferring to nursery (Bioassay) and at

transplanting, anthesis, and bi-weekly interval (culture experiment). BARI Mistimorich-1 was used as planting material and grown in coco-dust based soilless culture nourishing with BARI Hydroponic solution-1 (1.5-2.0 dS/m) throughout the period. In bioassay, Humistar and Azumin had positive influence than other biostimulants. While in culture experiment, in general growth and yield attributes were significantly influence by the biostimulants application and especially Humistar and Azumin yield higher fruit yield in sweet pepper. Therefore, for higher yield of sweet pepper, farmers are recommended to apply either Humistar or Azumin during active vegetative growth and also during fruit development stage.

Effect of biostimulants on the growth, yield and quality of tomato in coco-coir substrate

M Asaduzzaman, S. Akter, Mar Gazi, Mh Islam

Five biostimulants were applied to tomato to investigate its influence on the performance of tomato under soilless culture. These includes control (distilled water as spray), Radison, Humi Star, Compelasol and Azumin. Two independent experiments were conducted considering seedling growth studies and in culture experiment. Biostimulants were sprayed in seedlings stage after transferring to nursery (Bioassay) and at transplanting, anthesis, and bi-weekly interval (culture experiment). BARI Tomato – 19 was used as planting material and grown in coco-dust based soilless culture nourishing with BARI Hydroponic solution-1 (1.5-2.0 dS/m) throughout the period. In bioassay, Humistar and Azumin had positive influence than other biostimulants. While in culture experiment, in general growth and yield attributes were significantly influence by the biostimulants application and especially Humistar and Azumin yield higher fruit yield in tomato. Therefore, for higher yield of tomato, farmers are recommended to apply either Humistar or Azumin during active vegetative growth and also during fruit development stage.

Development of low-cost hydroponic solution for vegetable production

H E M K Mazed, M A Hossain, H Rahman, A Akter and R Sultana

The experiment was conducted at the Hydroponic net house at Horticulture Research Centre, Regional Agricultural Research Station, Jamalpur

during the September 2023-May 2024 with a view to evaluate the performance of differently formulated nutrient stock solution of BARI. The experiment test was conducted with two crops and those are BARI Hybrid Tomato-11, BARI Lettuce-1 and BARI China copi-1. Two solutions were: “LC solution-1 (A, B, C)” and “LC solution-2 (A, B, C)”. The production cost of these solutions approximately 120-141 Tk., and 90-104 tk., respectively. Most of the cases similar production for each crop has been gotten. By using “LC solution-2” farmers would get higher BCR for some crops. In tomato production the highest yield per plant and yield per m² (media area) was found 2.85 kg and 21.82 kg respectively, from “LC solution-1” treatment it was 2.59 kg and 21.05 kg respectively, from “LC solution-2” treatment. In Lettuce production the highest edible leaf per plant and yield per m² (media area) was recorded 289 g and 6.98 kg, respectively, from “LC solution-1” treatment it was 281 g and 6.62 kg from “LC solution-1” treatment. In Chaina cabbage production the highest edible leaf per plant and yield per m² (media area) was recorded 360 g and 8.05 kg from “LC solution-2” treatment while 340 g and 7.60 kg from “LC solution-1” treatment.

Production of selected vegetables through IOT based hydroponic system

H E M K Mazed, M A Hossain, H Rahman, A Akter and R Sultana

The experiment was conducted at the Hydroponic Net House at Horticulture Research Centre nursery, Regional Agricultural Research Station, BARI, Jamalpur on October 2023-May 2024 with a view to evaluate the performance of commercial tomato variety in automatically programmed hydroponic system using LC hydroponic stock solutions A, B, C. BARI released one tomato variety viz., “Beautiful” was used were for the experimental crop. Total 96 tomato plants were planted in cocodust substrate base media. Three treatments with three replications were applied for the experiment. The treatments were T₁= cocodust in grow bag on elevated bench, T₂= cocodust in plastic pot on floor mat, T₃= cocodust in plastic pot submerged in 2-inch residual nutrient. The maximum single fruit weight was recorded from T₁ (98.66 g) treatment on the other hand the minimum single fruit weight was recorded from T₂ (89.33 g) treatment. The highest yield plant⁻¹ was obtained

from T₁ (2.92 kg) treatment while the minimum was found from T₂ (2.34 kg) treatment.

Production of vegetables under different led light in indoor condition through IOT based hydroponic culture

H E M K Mazed, M A Hossain, H Rahman, A Akter and R Sultana

The experiment was conducted at the Hydroponic laboratory at Horticulture Research Centre, Regional Agricultural Research Station, Jamalpur during the winter season of 2023-2024 with a view to evaluate the performance of different leafy vegetables under LED light in indoor condition. “LC Hydroponic solution-A, B and C” were used to culture the plants and the circulating system was maintained. The lab environment is not controlled but protected. LED grow light, LED tube light 40 and 20 watt were used for the plant production. Two vegetables were selected for the experiment viz., Indian Spinach (BARI Puishak-1) and Kangkong (BARI Gima Kolmi-1). The highest number of edible leaves was found from Indian Spinach (19.2) while the number of edible leaves of kangkong was recorded (15.3). The maximum leaf length was observed in kangkong (13.7 cm) which is desirable but the minimum was found in indian spinach (11.4 cm). Significant variation was found in leaf breadth also and followed the oposite trend. The maximum root length was observed in kangkong (47.3 cm) while but the minimum was found in Indian spinach (45.6 cm). Since kangkong is treated as aquatic plant that’s why root length showed the maximum result. The highest entire single plant weight recorded from Indian spinach (68.0 g) while the lowest was observed in kangkong (39.0 g). The maximum edible part weight recorded from Indian spinach (73.0 g) while but the minimum was observed in kangkong (34.0 g).

Demonstration of simplified hydroponic system for growing high value vegetables

Mr Alam, Smm Rahman and Ku Ahammad

The program was carried out at HRC, Regional Agricultural Research Station, BARI, Jashore in a semi-controlled net house during 2023-24. It was conducted on three types of culture namely soilless culture system (SCS), nutrient film technique (NFT) and deep water culture system (DWC). Fruit

bearing vegetables tomato and capsicum were cultivated at SCS in rabi season. Leafy vegetables, lettuce, spinach and kangkong (gima kalmi) were cultivated at NFT and DWC system during *rabi* season.

Performance of lettuce spinach in recirculating hydroponics system

S. M. K.H. Chowdhury, M. G. Azam, H. Barua and A. S. M. Harunor Rashid

The experiment was conducted in Agricultural Research Station (ARS), Khulshi, Chattogram during 2023-2024 to find out the feasibility of vegetable production in hydroponics system in Chattogram region. The weight of each plant of BARI Lettuce-1 and BARI Palongshak-2 were found 131.7 g and 114.3 g respectively. The number of leaves from a single plant was 16.3 in BARI Lettuce-1 and 11.83 in BARI Palongshak-1. The length and breadth of leaves in BARI Lettuce-1 were 24.16 cm and 11.51 cm respectively and whereas, the length and breadth of leaves in BARI Palongshak-2 were 39.75 cm and 12.76 cm respectively. The yield was found 15.95kg from 4.00 m² area and 39.86 ton/ ha in BARI Lettuce-1 and in case of BARI Palongshak-2, the yield was 17.45 kg from 4.00 m² area and 43.63 ton/ ha.

Breeding brinjal through holobiont approaches under organic management

M Nazim Uddin, Limu Akter and Akm Quamruzzaman

Brinjal (eggplant) is a key crop in many regions, offering nutritional benefits and culinary versatility. Traditional breeding programs have largely focused on improving yield, fruit size, and quality, but the integration of organic management practices and plant disease resistance is gaining importance for sustainable cultivation. Furthermore, the plant microbiome's role in promoting plant health and resilience necessitates its consideration in breeding programs. This study evaluates 30 brinjal genotypes under organic management conditions, focusing on agronomic traits, disease resistance, and microbiome populations. A Randomized Complete Block Design (RCBD) with three replications was used to assess flowering time, yield, fruit weight, and viral and wilt infestations. Significant variation was observed among the genotypes in traits such as plant height, leaf

dimensions, fruit size, and weight. The study identified promising genotypes, like SM-21 and BD-604, with high yield potential and resilience, despite challenges like susceptibility to *Rastonia*. These findings contribute to developing robust, sustainable brinjal varieties by integrating conventional traits, organic management, and microbiome considerations.

Evaluation of microbiome on the growth, quality and yield of vegetables under organic conditions

M Nazim Uddin, and Akm Quamruzzaman

This study evaluated the effects of different microbiome treatments on the yield and quality parameters of three cool-season crops: cauliflower, cabbage, and kohlrabi. Conducted at the Olericulture Division, HRC, BARI, from October 2023 to April 2024, the experiment involved four treatments (T1, T2, T3, T4) with microbiomes derived from kitchen waste, vegetable waste, cattle manure, and root biospheres. The results showed significant improvements in yield and quality across all crops with microbiome treatments, particularly T2 and T3. T2 consistently outperformed other treatments, resulting in the highest yields for cauliflower (69 t/ha), cabbage (80.3 t/ha), and kohlrabi (30.1 t/ha). T4, the control, showed the lowest performance in all crops. The study demonstrates the potential of microbiome treatments to enhance crop productivity and quality, particularly in cool-season crops, making them a viable option for sustainable agricultural practices.

Fruits and vegetables based agroforestry system and agroecological practices

M Nazim Uddin, and A K M Quamruzzaman

This study evaluates the yield performance and economic returns of various crops in a fruits and vegetables-based agroforestry system in Bangladesh. The crops assessed include BARI Seem-6 (Hyacinth Bean), guava, mango, small and Jara lemon, turmeric, and onion. The results indicate significant variability in yield and gross return among the crops across different replications. BARI Seem-6 and guava were the most profitable crops, with stable yields and high economic returns. Mango and Jara lemon exhibited more variability, indicating a need for improved

management practices. Turmeric and onion, as intercrops, contributed significantly to the overall profitability of the system. The study underscores the potential of integrating diverse crops within agroforestry systems to enhance agricultural productivity, economic returns, and environmental sustainability.

Identification of post harvest diseases of vegetable

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali

Disease samples of capsicum, brinjal, and tomato were collected from vegetable and fruit research field of Horticulture research centre, BARI, Gazipur during October 2023 to May 2024. Disease symptoms appeared on fruits. *Fusarium* sp. & *Alternaria* sp. were identified from capsicum; *Fusarium* sp., *Alternaria* sp. & *Diplodia* sp were identified from brinjal; *Chladosporium* sp., *Odiodendron* sp, *Candida* sp. & *Alternaria* sp were identified from cauliflower.

Integrated nutrient management for gardenpea-bitter gourd-indian spinach-red amaranth cropping system to increase system productivity and quality

M. A. Quddus, M. Ataur Rahman, R. Ahmed, M.A. Hossain and S. Arfin

An experiment was conducted during 2022-23 and 2023-24 to evaluate the effect of integrated nutrient management on Garden pea-Bitter gourd-Indian spinach-Red amaranth cropping system and to determine the suitable combination of organic and inorganic fertilizers for sustaining crop productivity and soil fertility. Results indicated that application of 25% vermicompost + 75% RDF on IPNS basis (T₃) produced the highest seed yield of garden pea (green pod 8026 kg ha⁻¹ and seed yield 1780 kg ha⁻¹), fruit yield of bitter gourd (11.1 t ha⁻¹), fresh twig yield (20.5 t ha⁻¹) of Indian spinach and fresh yield (7.25 t ha⁻¹ in first frequency and 10.9 t ha⁻¹ in second frequency) of red amaranth. However, the highest system garden pea equivalent yield (15.6 t ha⁻¹) was also produced in T₃ treatment. The results of system four crops (Gardenpea-Bitter gourd-Indian spinach-Red amaranth) specified that combination of 25% vermicompost + 75% of recommended inorganic fertilizer based on IPNS can practice in the experimental soil condition.

Nutrient requirements for brinjal-indian spinach-kangkong-red amaranth cropping system to increase system productivity and maintain soil fertility

M. A. Quddus, M. Ataur Rahman, R. Ahmed, M.A. Hossain and S. Arfin

A field investigation was conducted during 2023-24 to evaluate the effect of combined application of organic and inorganic fertilizer on Brinjal-Indian spinach-Kangkong-Red amaranth cropping system and to determine the suitable combination of organic and inorganic fertilizers for sustaining crop productivity, quality and soil fertility. Results indicated that application of 3 t vermicompost ha⁻¹ + 100% RDF (T₃) produced the highest fruit yield (15.6 t ha⁻¹) of brinjal and the maximum fresh twig yield (22.5 t ha⁻¹) of Indian spinach. The same (T₃) treatment exhibited the higher amount of vitamin C (12.0 mg/100g for brinjal and 41.9 mg/100g for Indian spinach). However, the highest system brinjal equivalent yield (32.5 t ha⁻¹) was also recorded in T₃ treatment. The results of system two crops (brinjal and Indian spinach) specified that combination of 3 t vermicompost ha⁻¹ with 100% of recommended dose of inorganic fertilizer is suitable.

Cost and return analysis of different vegetable cultivation

Rafiqul Islam^{and} Esrat Jahan

The study was conducted in major vegetable-growing areas of Bangladesh. The aim of the study was to find out the costs and returns of 8 vegetables namely BARI *Lalshak 1* (Red Amaranth), BARI *Palongshak 1* (Spinach), BARI *Puishak 1* (Indian Spinach), BARI *Mula 1* (Radish), BARI Hybrid *Mistykumra 1* (Pumpkin), BARI *Dheros 2* (Lady's finger), BARI *Jharshim 1*, and BARI *Data 1*. Data were collected on the basis of focus group discussion. It revealed that the production of all the vegetables was profitable. Among the vegetables, BARI *Jharshim 1* and BARI *Data 1* was more profitable than others. and BARI *Dheros 2* was the least profitable vegetable in the study areas. Human labor costs incurred the major share of the total cost of production for all vegetables. and the cost of fertilizer was the second highest cost item in the production line. The cost of irrigation and pesticide incurred a minimum amount to produce the vegetables. Shortage of labor and high wage rate, disease, and pest infestation hampered vegetable cultivation in the study areas.

FRUIT CROPS

06



Project I: Varietal Development

Evaluation of jackfruit germplasm at fruit research farm, gazipur

M. J. Rahman, M. Z. Rahman and M. A. Islam

Twelve jackfruit germplasm were evaluated to select the superior ones at the Fruit Research Farm of HRC, BARI, Gazipur. Wide range of diversity was manifested in the tree characters, number of fruits per plant and fruit characters of jackfruit. Number of fruits ranged from 12 to 31. The fruit weight ranged from 4.40 to 9.24 kg. Number of bulb per fruit varied from 38 in AH Joy-204 to 154 in AH Joy-099. Maximum and minimum edible portions were recorded to be 57.8% in AH Joy-217 and 43.2 % in AH Joy-209, respectively. TSS content was noticed to vary from 18.0 to 22.0°Brix. With respect to the number of fruits per plant, fruit weight, edible portion and TSS content AH Joy-078, AH Joy-099, AH Joy-115, AH Joy-215 and AH Joy-218 were found auspicious.

In-situ evaluation of jackfruit germplasm at gazipur

M. J. Rahman and M. A. Islam

Three jackfruit germplasm viz., AH Joy-261, AH Joy-266, AH Joy-272 and AH Joy-273 were evaluated to identify the superior, profuse bearer and large sized jackfruit from different locations of Bangladesh. Number of fruits per plant varied from 12 to 320. Age of tree ranged from 31 to 34 years. Fruit weight ranged from 4.10 to 69.0 kg. Fruit length varied from 24.0 to 76 cm while diameter varied from 19.0 to 38.6 cm. Maximum and minimum bulb weight per fruit were recorded to be 2.82 kg in AH Joy-261 and 42.4 kg in AH Joy-273, respectively. Number of bulb per fruit varied from 84 in AH Joy-266 to 681 in AH Joy-273. Maximum and minimum edible portion were

manifested to 59.7% in AH Joy-272 and 54.2 % in AH Joy-261, respectively. TSS was noticed to vary from 22.0 to 29.0 ° Brix.

Hybridization in jackfruit

M. A. Islam, M. J. Rahman and M. M. Khatun

Hybridization in jackfruit was carried out at the Fruit Research Farm of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during the flowering season of 2024 to incorporate some important characters like colour, off-season, year round with regular heavy bearing habit in the desired variety or cultivar. Cross combinations for hybridization were: BARI Kanthal-6 × BARI Kanthal-3 and AH Joy-115 × Hazari Kanthal. Initial fruit set was found 1and 1 in BARI Kanthal-6 × BARI Kanthal-3 and AH Joy-115 × Hazari Kanthal cross combinations and finally number of fruits was harvested 1and 1, respectively. From the cross combinations BARI Kanthal-6 × BARI Kanthal-3 and AH Joy-115 × Hazari Kanthal, 2 fruits were harvested and seedlings were raised, would be planted in the main field.

Characterization and performance of thirteen jackfruit germplasm in hathazari, chattogram

A. Tabassum, M. Moshir Rahman, M. Moniruzzaman and M. Rashed Sarker

The experiment was carried out at the Regional Agricultural Research Station, Hathazari, Chattogram. Thirteen jackfruit germplasms were selected for the experiment to identify the superior ones. A wide variability was observed in different parameters such as yield, fruit weight, number of fruits per plant, length, breadth and size of fruit, fruit rind color, number of bulbs or flake in a fruit, total weight of bulbs, bulb length and breadth, bulb color, bulb shape, total weight of seeds, no of seeds

per fruit, seed length and breadth, seed shape, stalk attachment, percent edible portion and percent TSS.

Evaluation of colour fleshed small sized jackfruit germplasm in the southern region

M.G. Rahman, S. Hasna, M.R. Islam, S.D. Setu, A.K.Das, H.B. Harun and B.C. Kundu

Eleven jackfruit germplasm viz., AH Rah 01 AH Rah 01, AH Rah 02, AH Rah 03, AH Rah 04, AH Rah 05, AH Rah 06, AH Rah 07, AH Rah 08, AH Rah 09, AH Rah 10, AH Rah 11, AH Rah 12, AH Rah 13 and AH Rah 14 were evaluated to identify the color fleshed and small sized ones at the periphery of Regional Agricultural Research Station, BARI, Rahmatpur. Maximum plant height was recorded (13.40 m) in AH Rah 13 and minimum (6.25 m) in AH Rah 07. Maximum base girth was recorded to be (378.0 cm) in AH Rah 13 and minimum (53.0 cm) in AH Rah 08. Number of fruits per plant varied from 88 to 12 and the average number of fruits was 41.36. Maximum fruit weight (10.97 kg) was recorded in AH Rah 14 and minimum fruit weight was recorded in AH Rah 13 (3.44 kg). Edible portion of fruit ranged from 84.68 to 33.33%. Number of bulb varied from 188 to 46. Maximum TSS (23°Brix) was found in AH Rah 03 and minimum TSS were noticed in AH Rah 06, AH Rah 07 and AH Rah 08 (16 °Brix).

Hybridization in mango

M. S. Uddin and M.O. Kaiser

Good quality mangoes have huge demand in local and international market. To mitigate the growing demand of quality mangoes as well as export potential variety, a hybridization programme was conducted following half-diallel fashion at the Fruit Research Farm, Horticulture Research Centre, BARI, Gazipur to develop superior hybrids with desirable characters of mango. BARI Aam-4 X BARI Aam-7, BARI Aam-4 x BARI Aam-3, BARI Aam-3 x Ruby, BARI Aam-3 x BARI Aam-7 and BARI Aam-3 x Harivanga. A total of 765 flowers from 190 panicles were emasculated and 720 flowers pollinated. Six hybrid fruits were obtained from four cross combinations. These six hybrid fruits were harvested at mature stage and stones of the ripen fruits were sown in soil for germination in polybag in the net house. Then the seedlings will transfer to main field for evaluation.

Performance of mango hybrid at joydebpur

M. S. Uddin and B.C. Sarker

An experiment was carried out at the fruit research farm, HRC, BARI, Gazipur to evaluate the performance of a promising mango hybrids to release as a variety. It was planted in the year 2018 and the tree volume 33.63 m³ was recorded in the hybrid MI JoyHy-001. The average fruit weight (265.0 g), fruit yield (8.48 kg), edible portion (79.24%) and TSS (26.0 %) were recorded. The shelf life was recorded 8-10 days at ambient condition.

Hybridization in mango

M. A. Shahed, M. S. Islam, M. H. Waliullah and K. H. Alam

A total of 1195 flowers from 211 selected panicles from different cross combinations were emasculated where 1121 flowers were pollinated. Total 20 hybrid fruits were obtained from different cross combinations (thirteen fruits BARI Aam-4×Cartimon, one fruit from Cartimon×BARI Aam-14 and two fruits from MI Raj-002× BARI Aam-4 and four fruits BARI Aam-3× Fazlee) and stones of the hybrids were planted in pot. After germination, the hybrid lines will be transplanted in the field for characterization and evaluation.

Evaluation of mango germplasm

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

An experiment was conducted at the Fruit Research Station, Binodpur, Rajshahi to identify the promising mango germplasm for higher yield and qualities. Twelve mango germplasms namely MI Raj-003, MI Raj-004, MI Raj-005, MI Raj-008, MI Raj-010, MI Raj-011, MI Raj-012, MI Raj-013, MI Raj-017, MI Raj-018, MI Raj-020 and MI Raj-021 were identified before and were evaluated. Among them, earliest flowering and harvesting were observed in MI Raj-010 germplasm. The highest edible portion (72.2%) was achieved from MI Raj-017 while the lowest edible portion (43.7%) was achieved from MI Raj-012. Maximum total Soluble Solids (TSS) (24.7%) was observed in MI Raj-005 where minimum (12.7%) TSS was observed in MI Raj-021. The highest yield per tree (48 kg) was produced by MI Raj-004 but the lowest yield per tree (3 kg) was produced by MI Raj-021. MI Raj-

017 might be considered as a promising line on the basis of fruit size, yield quality and harvesting time.

In-situ evaluation of late mango germplasm

A.S.M. Yousuf Ali, M.M.Rahman, M. M. Hossain and M. M. Rahman

An experiment on In-situ evaluation of late mango germplasm was carried out at RHRS, Chapai Nawabganj to know the detailed information on plant growth, fruit characteristics and yield. The maximum tree volume was recorded in MI ChaL-02 (67.47 m³) and the minimum was recorded in BARI Aam-12(21.2 m³). The highest (102) number of fruits per plant were recorded from MI ChaL-02 and the minimum (67) from BARI Aam-12. The fruit yield varied from 22.78 to 47.43 kg/tree. The maximum fruit yield per tree (47.43kg/tree) was recorded from MI ChaL-02 & the minimum (22.78kg/tree) from BARI Aam-12. Harvesting time was 1st week of Septemer in both MI ChaL-01 & MI ChaL-02 where last week of July was found in BARI Aam-12. MI ChaL-02 gave the maximum (10days) shelf life and the minimum(7days) was recorded from BARI Aam-12. The maximum edible portion (81.29%) was found in MI ChaL-02 whereas minimum (76.45%) was obtained from MI ChaL-01. MI ChaL-01 showed maximum (24%)TSS percentage while BARI Aam-12 showed the lowest (22%)TSS percentage.

Collection and evaluation of early mango germplasm

A.S.M. Yousuf Ali, M.M.Rahman, M. M. Hossain and M. M. Rahman

An experiment on collection and evaluation of early mango germplasm was conducted at the Regional Horticulture Research Station, Chapainawabganj. Five genotypes were collected from five Upazilas of Chapainawabganj district. BARI Aam-1 was used as check variety. Individual fruit weight (228g) was maximum in BARI Aam-1 while the the minimum (115) was found in MI ChaE-03. Harvesting time varied from 1st week of May to last week of May. Harvesting time was 1st week of May in MI ChaE-05 while last week of May was recorded from both BARI Aam-1 & MI ChaE-04. MI ChaE-05 produced maximum edible portion (70%) which was closely followed by BARI Aam-1 (69.2%) whereas the minimum (55.3%) was obtained from MI ChaE-03.

Inter-varietal hybridization of mango

A.S.M. Yousuf Ali, M. M. Rahman and M. M. Rahman

A hybridization programme was conducted in the flowering seasons of 2024 at RHRS, Chapai Nawabganj. A total of 4500 flowers from 905 panicles were emasculated and pollinated. A total of Twenty hybrid fruits were collected this year. Among these, Two hybrid fruits were obtained from the cross Kartimon x BAU Mango-14 and Fifteen from the cross BARI Aam-3 x Palmer. These mango hybrid fruits were harvested at mature stage and stones of the fruits sowed in soil for germination in the hybrid seedling plot. After germination, these one year hybrid seedlings will be transplanted in the main field after khasi and will be evaluated in the following seasons.

Collection and evaluation of exotic mango germplasm

M. Islam, M. Ratna, E. Mahmud, N. Akter, S. Yesmin, M. I. A. Howlader and M. G. Kibria

An experiment with thirty one germplasm of mango was conducted at the experimental field of Regional Horticultural Research Station (RHRS), Lebukhali, Patuakhali for the evaluation of superior mango lines in southern region of Bangladesh. The germplasm MI Lebu-018, MI Lebu-021, MI Lebu-026, MI Lebu-032, MI Lebu-034 and MI Lebu-039 were red skinned and rests were yellow. Fiber was present in the fruit pulp of four germplasm MI Lebu-013, MI Lebu-017, MI Lebu-025 and MI Lebu-033 among the nineteen. The heaviest individual fruit (2219g) was recorded in MI Lebu-042 whereas the lightest individual fruit (160 g) in MI Lebu-035. The maximum edible portion (81.0%) was found in MI Lebu-026 followed by MI Lebu-042 (80.4%) and the minimum (65.6%) in MI Lebu-035. The TSS varied from 10% to 26%. The highest TSS (26%) was recorded in MI Lebu-022 followed by MI Lebu-029 (23%) whereas the lowest (10%) in MI Lebu-013.

Hybridization of mango

S. Yesmin, M. Islam, M. Ratna, E. Mahmud, N. Akter, M. I. A. Howlader and M. G. Kibria

A hybridization programme was conducted in the flowering season of 2024 at RHRS, Lebukhali, Patuakhali. A total of 927 flowers from 177

panicles were emasculated and pollinated. A total of 63 hybrid fruits were set initially but all fruits dropped before getting matured. However, this was the first time attempt of mango hybridization program in RHRS, Lebukhali, Patuakhali. The study will be continued.

Hybridization of mango at chattogram region

S.M.K.H. Chowdhury, H. Barua, M.G. Azam and A.S.M.H. Rashid

The hybridization program was conducted in mango orchard of Agricultural Research Station, Khulshi, Chattogram to develop premium quality mango variety with year-round production. Hybridization was made between BARI Aam-3 and BARI Aam-11. Out of 83 emasculated flowers, 53 fruits were set but all dropped off in 17 inflorescences of crossing between BARI Aam-3 and BARI Aam-11. One seedling during 2021-2022 and two seedlings during 2022-2023 from crossing between BARI Aam-3 and BARI Aam-11, were planted in experimental orchard of ARS, Khulshi, Chattogram.

Evaluation of local and exotic mango germplasm in chattogram region

S. M. K.H. Chowdhury, H. Barua, M. G. Azam and A. S. M. H. Rashid

Eighteen genotypes of mango were evaluated at Agricultural Research Station, Khulshi, Chattogram. Earliest flowering (01 January 2024) in MI Pah 057 and the latest flowering (13 February 2024) in MI Pah 019 was observed. The early Maturity (24 May 2024) recorded from MI Pah002 and the late maturity was observed from MI Pah005 (02 August 2024).Maximum edible portion (84.75 %) was recorded from MI Pah 005 followed by MI Pah 029 (82.78%) and the lowest edible portion (57.95 %) was recorded from MI Pah 021 followed by MI Pah 026 (67.18%). Total Soluble Solids from MI Pah 029 noted maximum (24.55oBrix) followed by MI Pah 056 (23.69oBrix) and Total Soluble Solids from MI Pah 020 noted minimum (13.82oBrix) followed by MI Pah 003 (15.25 oBrix). The highest yield (21.10 t/ha) was harvested from MI Pah 011 followed by MI Pah 056 (11.92 t/ha) and the lowest yield (0.29 t/ha) was harvested from MI Pah 022 followed by MI Pah 019 (0.32 t/ha).

Evaluation of kancha-mitha mango germplasm in chattogram region

H. Barua, S.M.K.H. Chowdhury and A.S.M.H. Rashid

The experiment was conducted at Mango orchard of Agricultural Research Station (ARS), Khulshi, Chattogram to asses mango genotype to release as a kancha-mitha mango variety. This study comprised three genotypes of mango, namely MI Pah 007, MI Pah 010, and MI Pah 020, as well as BARI Aam-9 as a check. Except for MI Pah 007, which bloomed in January, all genotypes produced flowers in February. The highest fruit weight (143.80 g) was MI Pah 020. On the other hand, MI Pah 007 produced the lowest fruit weight (82.80 g). MI Pah 010 produced the longest fruit (9.37 cm) and MI Pah 007 produced the shortest fruit (7.12 cm), on the other hand, the widest fruit (5.93 cm) were produced by MI Pah 020 and the narrowest fruit (4.77 cm) were produced by BARI Aam-9. The highest TSS (10.40 %) was obtained from BARI Aam-9 followed by MI Pah 020 (8.80 %) which was very good to taste. MI Pah 020 produced the highest yield per plant (21.28 kg), while the MI Pah 007 genotype produced the lowest yield per plant (3.73 kg).

Collection and evaluation of local mango germplasm in chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Sixty germplasm of local mango were evaluated at Agricultural Research Station, Khulshi, Chattogram. Among of them twenty-eight germplasm produce flowering this year. Earliest flowering (last week of January 2024) in MI Pah 024, MI Pah 029, MI Pah 030, MI Pah 040 and MI Pah 063 and the latest flowering (Ist week of March 2024) in MI Pah 032 and MI Pah 075 was observed. The heaviest fruit (325.02 g) was recorded from MI Pah 055 and the lightest fruit (134.20 g) was recorded from MI Pah 023). The longest fruit (15.70 cm) was obtained from MI Pah 044 whereas the shortest fruit (6.51 cm) was obtained from MI Pah 023. Maximum number of fruits per plant at mature stage (71) was produced by in MI Pah 025 and minimum (08) was produced by MI Pah 030. The highest edible portion (79.35 %) was recorded from MI Pah 055 and the lowest edible portion (68.46 %) was recorded from MI Pah 023. Total Soluble Solids from MI Pah 032 noted

maximum (24.02 %) and MI Pah 064 noted minimum (15.82 %). The highest yield (18.16 kg) was harvested from MI Pah 064 and the lowest yield (1.85 kg) was harvested from MI Pah 030. There was a variation in both skin color and flesh color. There was medium fibre in MI Pah 010 and MI Pah 021. The less fibre was obtained from MI Pah 030. The remaining germplasm had no fibre in the flesh.

Evaluation of mango germplasm for green consumption at hill valley in chattogram hill tracts

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment was conducted at hill valley of Hill Agricultural Research Station of Raikhali, Rangamati Hill District to find out the best green mango germplasm. The highest number of fruits per plant (570) was found in MI Rai-008 and the lowest number of fruits per plant (41) was in MI Rai-009. The heaviest individual fruit weight (246 g) with edible portion (77.84%) were recorded in MI Rai-008 on the other hand lowest individual fruit weight (145 g) was found in MI Rai-007. The maximum TSS (11%) was found in germplasm MI Rai-008 and BARI Aam-9. Germplasm MIR008 and BARI Aam-9 were found excellent in organoleptic test. Based on the number of fruits per plant and fruit yield with higher individual fruit weight, fruit volume, edible portion and organoleptic test MI Rai-008 were superior among all other germplasms under study in Chattogram Hill Tracts.

Evaluation of newly collected mango germplasm

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of mango germplasm in hill valley was conducted at the fruit orchard of Hill Agricultural Research Station, Raikhali, Rangamati Hill District. The highest no. of fruits per plant (1550) in MI Rai-040 and lowest number of fruits per plant (4) in MI Rai-045. MI Rai-037 performed better in terms of overall performance like individual fruit weight (764 g), TSS (20%), edible portion (73.82%), and size and shape compared to other lines. Based on earliness of harvest MI Rai-040 was superior with better taste, TSS, shape and size. Year-round production MI Rai-029 was superior containing higher TSS and taste. Overall, MI Rai-037, MI Rai-020, MI

Rai-026-2, MI Rai-039 were performed best based on size, shape, color, fruit weight and TSS.

Evaluation of exotic mango germplasm

M. M. Ahmed, M. N. Farid and M. Kamrul Islam

The experiment was conducted at the Regional Agricultural Research Station, Burirhut, Rangpur with a view to find out a suitable mango germplasm for releasing as variety. The germplasm (MI Exo-Bur-001, MI Exo-Bur-003, MI Exo-004, MI Exo-005 and MI Exo-006) were collected from local fruit fair and the saplings were planted in June 2018. The age of the tree was around 6 years and 3rd fruit bearing occurred in 2023. Among the germplasm fruits set were occurred in MI Exo-Bur-003, MI Exo-Bur-004 and MI Exo-Bur-006 under 2023. The maximum number of fruits per plant (48) was recorded from MI Exo-Bur-006, which was followed by MI Exo-Bur-004 (34), whereas minimum number of fruits (8) was found in MI Exo-Bur-003. The average fruit weight was found higher (459.00 g) from MI Exo-Bur-006, followed (268.74g) by MI Exo-Bur-004. The highest fruit yield was found (22.00 kg) in MI Exo-Bur-006, followed (9.13 kg) by MI Exo-Bur-004, while the lowest (2.14 kg) fruit yield was found in MI Exo-Bur-003. But the highest TSS (20%) and edible part (78%) were found in MI Exo-Bur-003 followed by MI Exo-Bur-004 and MI Exo-Bur-006. The lowest TSS (14%) was found in MI Exo-Bur-006.

Hybridization in mango

S. Sultana and M. A. Siddiky

A hybridization program was conducted at Regional Agricultural Research Station, BARI, Cumilla. There were eight cross combinations with the target to develop early variety with heavy bearing nature and off-season variety with low fibre content. A total of 1123 flowers from 134 panicles were emasculated and pollinated. One thirty five (135) fruits from the crosses were set initially but all fruits dropped except twelve (12) before getting matured. Nine crosses from Himsagar × MI Cum-8 and three (3) crosses from BARI Aam-4 × Katimon were successful. Rest of the crosses are being carried out.

Inter-varietal hybridization of mango

M.A. Alam, M.R. Alam and Ku. Ahammad

A hybridization programme on mango was undertaken in the flowering season of 2023 at

HRC, RARS, Jashore. A total of 384 flowers from 72 panicles were emasculated whereas 374 flowers were pollinated comprising two sets- set-I is for ripe mangoes and set-II is for kanchamitha mangoes. Four fruits from different crosses were harvested. Among them, three fruits are derived from BARI Aam-3 × BARI Aam-7 and one fruit is derived from BARI Aam-9 × Banana. The stones of the fruits were sown in soil where 3 were germinated. The plants are now growing up.

Improvement of local mango cultivars

M.A. Alam, M.R. Alam and Ku. Ahammad

Germplasm were collected from different places of Jashore region. Fruit weight was maximum in MI Jas-015 (756 g) followed by MI Jas-014 (511 g). The highest edible portion was got in MI Jas010 (81%). Maximum TSS was recorded in MI Jas-014 (23.0%). Total number of fruits per tree was found maximum in MIJas-010 (12 nos.) followed by MI Jas-017 (9) and (8). The highest yield (3.08 kg) was noted in MIJas-011 followed by MI Jas-010 and MI Jas-015 (3.024 and 2.268 kg, respectively). The biggest sized fruit was found in MI Jas-015. The highest shelf life (5.67 days) was shown by MI Jas-010, MI Jas-012, MI Jas-017 and MI Jas-018.

Evaluation of banana (sabri) germplasm

M. Islam, M. Ratna, E. Mahmud, N. Akter, S. Yesmin, M. I. A. Howlader and M. G. Kibria

An experiment on the evaluation of banana (Sabri) germplasm in southern region of Bangladesh was conducted at the experimental field of Regional Horticultural Research Station (RHRS), Lebukhali, Patuakhali. Six banana germplasm were collected from farmer's orchard or household. The heaviest (16.7 kg) fruit bunch was found in MS Lebu-008 and the lightest (8.8 kg) was in MS Lebu-007. The highest edible portion (85%) was found in MS Lebu-006 and the lowest (76%) was in MS Lebu-009. The highest TSS (40%) was found in MS Lebu-006 and the lowest (18%) was in MS Lebu-007.

Clonal selection of banana cv. Amritsagar

S. M. M. Rahman, M. M. Rahman, A.K.M.M. Rahman, M. H. Rahman and R. Akter

More than five hundred Amrit Sagar germplasm was collected from ten different locations and planted at the research field of Regional Horticulture Research Station of Bangladesh Agricultural Research Institute, Shibpur, Narsingdi

to evaluate and identify the suitable lines/variety and to know regional adaptability of banana. This is fifth year evaluation of fruits of only 5 germplasm were considered. Selected germplasm will be evaluated more precisely. Maximum number of leaves was obtained from MS Nar-005 (12.92) whereas MS Nar-030 produced the minimum leaves (10.97). MS Nar-005 got the highest bunch weight (18.33 kg), number of hands/bunch (7.61) and the heaviest hands (3.19 kg). MS Nar-005 got the highest number of fingers per hand (17.50) followed by MS Nar-022 (16.87) whereas MS Nar-010 got the lowest (14.46). MS Nar-005 produced the highest fruit yield (46.15 t/ha) and MS Nar-030 produced the lowest yield (39.29 t/ha). MS Nar-005 exhibited the highest edible portion (76.65%). TSS was maximum in MS Nar-005 (20.50%) and the lowest was recorded from MS Nar-022 (18.45%). MS Nar-005 exhibited the highest shelf life (7.84 days) as compared to the lowest shelf life in MS Nar-022 (6.82 days).

Evaluation of sobri kola germplasm at jamalpur region

H. Rahman, M. A. Hossain, A. Akter, R. Sultana and H. E. M. K. Mazed

An experiment was carried out for fruit characteristics of Sobri kola at the Horticulture Research Centre, RARS, BARI, Jamalpur. Seven local germplasm viz. MS Jam-001, MS Jam-002, MS Jam-003, MS Jam-004, MS Jam-005, MS Jam-006 and MS Jam-007 were included in the study. The highest yield per plant or bunch weight (21.10 kg) was found from the line MS Jam-007 and the lowest (15.50 kg) from MS Jam-001. The number of fingers per hand ranged from 12 to 14. MS Jam-004 exhibited the heaviest finger (132.29 g) as against the smallest finger in MS Jam-001 (95.35 g). MS Jam-006 exhibited the highest edible portion (86.17%). Highest TSS was observed in MS Jam-001, MS Jam-006 & MS Jam-007 (23 %) and lowest TSS in MS Jam-004 (20%). The fruit yield was recorded highest in MS Jam-007 (52.75 t/ha) followed by MS Jam-003 (50.82 t/ha) and minimum (37.19 t/ha) was found from MS Jam-001.

Hybridization in litchi

M. J. Rahman, M. A. Islam, M. M. Khatun and M. Z. Rahman

Hybridization in litchi was carried out at the Fruit Research Farm of Horticulture Research Centre

(HRC), Bangladesh Agricultural Research Institute, Joydebpur, Gazipur to incorporate some important characters like earliness, lateness, fruit colour, bearing habit in the desired variety or cultivar. Cross combinations for hybridization were: Kanthali x BARI Lichu-4 and BARI Lichu-4 x Kadmi. One fruit was harvested from Kanthali x BARI Lichu-4 cross combinations. One seedling was raised from seed. Fruits were harvested from the F₁ plant of Kanthali x BARI Lichu-4 crossing was done in 2014. Shape and colour of hybrids fruits were found like BARI Lichu-4, harvested one week later than original BARI Lichu-4 in Gazipur condition.

Evaluation of local and exotic litchi germplasm

M. J. Rahman, M. M. Khatun and M. A. Islam

BARI Lichu-1, BARI Lichu-2, BARI Lichu-3, BARI Lichu-4 along with Bombai, Kadmi, Bedana, Madraji and Kanthali and three exotic grafted litchi germplasm were evaluated in the Fruit Research Farm, BARI, Gazipur. Local litchi germplasm were planted during 2007 (Set-1) and 2022 (Set-2). Exotic litchi germplasm were collected from China in 2018. Harvesting time of litchi germplasm was recorded from 2nd week of May to 2nd week of June, 2024. The average fruit weight was observed 20.09 g. Maximum fruit weight was recorded in LC Exo-07 (31.23 g) followed by LC Joy-17 (21.33 g) and LC Joy-23 (20.23 g). Minimum fruit weight was recorded in BARI Lichu-2 (17.0 g).

Intergeneric hybridization of litchi and longan

M. J. Rahman, M. A. Islam and M. M. Khatun

Intergeneric hybridization between litchi and longan was carried out at premises of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute, Joydebpur, Gazipur to incorporate some important characters of BARI Litchi-4 into BARI Longan-2. Ten fruits were harvested from BARI Longan-2 X BARI Lichu-4 cross combinations and three seedlings were raised from seeds. Seedlings were planted in November, 2019 in Fruit Research Farm, Joydebpur, Gazipur. Last year one F₁ plant produced fruits. This year F₁ plant produced 126 fruits. Weight of fruit of Hy EL Joy-01 was 10.83 g and weight of BARI Longan-2 was 10.26 g. The size of fruit was found satisfactory.

Hybridization of local guava with bari guava-2

A. Alam, M. R. Karim, M. T. Islam and M. A. Islam

In order to achieve superior guava variety with superior quality the current investigation was carried out at out at the Fruit Research Farm of Pomology Division under HRC, BARI, Gazipur. The results revealed that the highest yield (9.2 kg/plant) and yield contributing characters viz. fruit weight-272 g, fruit length (8.2 cm) and pulp thickness (2.1 cm) were recorded in the F₁ hybrid of plant number 01 of line number 09. Finally, the fruit of the F₁ hybrid of plant number 01 of line number 09 had flavour like the parent Sowrupkathi.

Evaluation of colour-fleshed guava germplasm

A. Alam, M.A. Haque and A. S. M. M. Uddin

Guava (*Psidium guajava L.*) is one of the important fruit grown in Bangladesh. A lot of colour fleshed guava germplasm exist and it is very popular to younger and old people for their excellent colour and flavour. Ten colour fleshed guava germplasm viz. PG Joy-001, PG Joy-002, PG Joy-003, PG Joy-004, PG Joy-005, PG 006 PG Joy-007 PG Joy-008 PG Joy-009 and PG Joy-010 were collected and planted at the Fruit Research Farm of HRC, BARI Joydebpur, Gazipur in July 2019. The tallest plant was found in PG Joy-001 (2.85 m) and the shortest plant was recorded in PG Joy-010 (2.34m). Maximum base girth was found in PG Joy-008 (20.67 cm) and minimum base girth was noted in PG Joy-009 (15.33 cm). Fruit characteristics of 10 colour fleshed guava lines were significantly. The heaviest fruit was produced by PG Joy-002 (452.52 g) while PG Joy-010 produced the smallest fruit (115.20 g). Maximum number of fruits per plant was recorded in PG Joy-002 (43.45). The highest mesocarp and endocarp TSS was found in PG Joy-002 (9.84% & 11.50%). The highest yield was recorded in PG Joy-002 (18.81 kg/plant) and lowest was recorded in PG Joy-010 (2.73 kg/plant).

Hybridization of guava for wilt resistance

S. Sultana, M. M. Rahman, T. H. Tabassum and M. A. Siddiky

The experiment has been being conducted in Regional Agricultural Research Station, BARI, Cumilla. For hybridization, BARI Guava-2 was used as a recurrent parent, and a wild-type germplasm resistant to wilt was used as a donor

parent to get the F₁ hybrid to be backcrossed with the recurrent one up to 4th generations with the target to transfer resistant gene into the popular variety BARI Guava-2. In F₁, total ten (10) fruits finally harvested and seedlings are being grown in the nursery bed to evaluate against *Fusarium oxysporum*. Data will be recorded on the wilt incidence (%) amongst *Psidium* species, and interspecific hybrid progenies inoculated with *F. oxysporum* f. sp. *Psidii* up to 5 months at monthly interval before further crossing.

Clonal selection of guava CV. Kanchannagar

M.M. Rahman, A. Tabassum, M.R. Sarkar and M. Moniruzzaman

An experiment was conducted to identify suitable Kanchannagar guava germplasm at Regional Agricultural Research Station (RARS), Hathazari, Chattogram. Almost 11 lines were selected for the study to observe their qualitative and quantitative parameters and yield performance. Different parameters such as weight of individual fruit, fruit length, breadth, size of fruit, shape of fruit, flesh thickness, fruit surface and TSS (%) among the germplasm studied. Maximum fruit weight was observed in PG Hat 013(143.37g) followed by PG Hat 010 (141.57 g). Highest fruit length was observed in PG Hat 0 11 (7.16 cm) while the highest fruit breadth was observed in PG Hat 013(6.16 cm). Maximum TSS was recorded in PG Hat 014 and PG Hat 019 (13.43). Comparing all the characteristics, 5 lines showed better performance in terms of individual fruit weight, %TSS, sweetness and taste.

Development of population for gynodioecious papaya variety

A. Alam and M.R. Karim

Hundred percent productive papaya variety is great concern for papaya growers. In order to achieve 100 % productive papaya variety the current investigation was carried out at the Fruit Research Farm of Pomology Division under HRC, BARI, Gazipur. Among the four sets; S₉ progeny of CP Joy-005 produced 80, 17.5 and 2.5 percent andromonoecious, female and male plants, respectively; S₉ progeny of CP Joy-009 produced 62.5, 32.5 and 5 percent andromonoecious, female and male plants; the BC₇ progeny produced 65, 35 and 0 percent andromonoecious, female and male plants, respectively and S₄ progeny of CP Joy-022

produced 60, 40 and 0 percent andromonoecious, female and male plants, respectively. Considering the number of fruits per plants, 28, 22, 26 and 30 fruits were recorded in S₉ progenies of CP Joy-005 and CP Joy-009; BC₇ and finally S₄ progeny of CP Joy-022, respectively. The highest average weight of fruits was 1150 g in S₉ (CP Joy-005) and S₄ progeny of CP Joy-022 produced second highest fruit weight 1060 g (Table 2). Flesh colour was bright yellow in S₉ (CP Joy-005) and S₄ (CP Joy-022) while BC₇ (Shahi × CP Joy-005) produced Light red to red colour flesh (Table 3). The highest flesh thickness was recorded in S₉ (CP Joy-005) followed by S₄ (CP Joy-022). The highest TSS (12.00 %) was recorded in BC₇ (Shahi × CP Joy-005) germplasm followed by that of S₉ (CP Joy-005) (11.50%). Moreover, plants derived from S₉ (CP Joy-005) produced maximum yield (32.20 kg/plant) followed by that of S₄ (CP Joy-022) (31.80 kg/plant). None of the progeny showed bitterness in their flesh.

Maintenance of dioecious inbred lines of papaya

A. Alam and M.R. Karim

Shahi papaya is the first dioecious papaya variety in Bangladesh developed by BARI in the year 1992. The study was done every year to purify and maintain the dioecious inbred lines through sib-mating process at the Fruit Research Farm of Horticulture Research Centre, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur to maintain the dioecious inbred lines of papaya. Seedlings of purified Sib-mated seeds of dioecious inbred lines (Shahi, CP Joy-017, CP Joy-018 & CP Joy-023) were transplanted in the main field on the second week of January 2023 and the Sib-mating process was done from the period of April to June 2023. Total 200 flowers of four dioecious inbred lines were sib-mated and finally 178 fruits have been set. Results indicated that most of the fruit traits were similar to original traits of all inbred lines.

Purification of shahi papaya

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

An experiment was carried out at fruit research station, BARI, Binodpur, Rajshahi to purify the Shahi Papaya variety. Seedling of purified selfed seeds were transplanted in the main field on 28

February 2023 and 10 flowers in each plant were selfed (Sib mating) from June to August 2023. The results showed that the plant and fruit characteristics of Shahi papaya (BARI Pepe-1) under this experiment were almost similar to that of the original Shahi Papaya in the characters under consideration.

Evaluation of exotic ber germplasm

A. Alam, A. Haque, M. O. Kaisar and A.S. M M Uddin

Two sets of exotic ber germplasm (oblong fruit shape-set A and round fruit shape-set B) were evaluated at the Fruit Research Farm of Horticulture Research Centre, BARI Gazipur. Each set contained four different types of germplasm. In set-A, the maximum number of fruits was harvested from ZM Joy (KS)-003 (1387.40/plant), and the minimum number of fruits was counted in ZM Joy (KS)-002 (1144.30/plant). ZM Joy (KS)-003 had the highest individual fruit weight (27.35 g) and yield (37.55 kg/plant), while the lowest individual fruit weight and yield were manifested from ZM Joy (KS)-002 (20.50 g and 23.79 kg/plant, respectively). In set-B, the maximum number of fruits was harvested from ZM Joy (BS)-003 (1002.53/plant), and the minimum number of fruits was counted in ZM Joy (BS)-002 (904.80/plant). The highest individual fruit weight and yield were recorded from ZM Joy (BS)-003 (33.45 g and 33.15 kg/plant, respectively), while the lowest individual fruit weight (28.61 g) and yield (26.25 kg/plant) were recorded from ZM Joy (BS)-001. Fruit quality attributes such as flesh thickness, seed weight, edible portion, and TSS content were statistically comparable among the germplasm.

Study on floral biology of different ber germplasms

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

A field experiment was carried out at experimental orchard, Fruit research station, Bangladesh agricultural research institute, Binodpur, Rajshahi to study the floral biology of ber. Five cultivars of ber planted during 2005 (17 years old plants) at 7 m × 7 m were selected for evaluation. The plants were tagged in the month of April. These cultivars were observed to study the variability in floral biological parameters. The floral parameter such as flowering

habit in the selected cultivars was recorded on the leaf axis of secondary branches. Anthesis occurred in forenoon in some cultivars whereas, in afternoon in others. Dehiscence time was observed from 1 to 2.30 hours in different cultivars. Date of initiation of flowering to end of flowering, flowering duration varied as 7 August to mid November, 53-93 days respectively.

Evaluation of indigenous ber germplasm at khagrachari

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

A study was conducted at Hill Agricultural Research Station in Khagrachari hill district with thirtyone local Ber genotypes. Average individual fruit weight ranged from 5.25g to 13.08 g. The genotype ZM Kha 013 produced the highest individual fruit weight (13.08g) and lowest in ZM Kha 005(5.25g). Fruit weight (12 fruits) of different ber genotypes ranged from 63-157g. The genotype ZM Kha 013 produced the highest fruit weight (157g) and lowest (63g). Edible portion (%) ranged 65.08g (ZM Kha 008) to 72.29% (ZM Kha 023). % TSS of ber genotypes varied from 10.2% (ZM Kha 021%) to 25.0% (ZM Kha 024).

Collection and evaluation pineapple germplasm

M. A. Haque and A. Alam

Four pineapple germplasm were collected and evaluated to assess their performance at the Pomology Division of HRC, BARI, Gazipur. The tallest plant, measuring 90.80 cm, higher number of leaves, totaling 38, as well as the longest leaves at 71.80 cm and the widest leaves at 7.70 cm, were recorded from AC Joy-004.

Preliminary yield trial of exotic pineapple germplasm

M. A. Haque and A. Alam

One exotic pineapple germplasm was evaluated to observe its performance at the Pomology Division of HRC, BARI, Gazipur. The average plant height was observed to be 55 cm and the counted number of leaves was 28. The length and width of the D leaf were measured 47 and 4.52 cm, respectively. The individual fruit weight with the crown was recorded 0.96 kg with a fruit length and width of 11.9 and 10.7 cm, respectively. The edible portion of fruit was observed to be 72%. The TSS content of fruit was noted to be 17%.

Evaluation of dwarf coconut in hilly area of rangamati

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of dwarf coconut in hill valley was conducted at the fruit orchard of Hill Agricultural Research Station, Raikhali, Rangamati Hill District. There were six lines from two different varieties, such as Xiem blue and Kerala hybrid under study. Among those lines, the highest number of fruits per plant (50) and number of inflorescence (16) were observed in CN Rai-010. The biggest fruit (18.7 cm × 13.9 cm), heaviest fruit (1550 g) and water volume (184 ml) were recorded in CN Rai-008.

Evaluation of exotic jamun germplasm

M. M. Khatun and M. A. Islam

Two exotic jamun germplasm were evaluated at the Horticulture Research Center, BARI, Gazipur. Plant height, base girth and number of primary branches were 5.11 m, 58.21 cm and 4 respectively in SC Ex-001; while those were 5.07 m, 77.19 cm and 4 in SC Ex-002 respectively. Individual fruit weight was 7.50 g having edible portion 86.40% and TSS 12.50% with less astringency in SC Ex-001. The germplasm SC Ex-002 was less sweet having TSS 10.80%. The evaluated germplasm SC Ex-001 produced 12.40 kg and SC Ex-002 produced 11.20 kg of fruits in this year. The fruits were black in colour in both germplasm.

Evaluation of jamun germplasm

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

An experiment was conducted at Fruit Research Station, BARI, Binodpur, Rajshahi to evaluate six Jamun germplasm for superior traits (survey on different areas in Rajshahi, Natore and Pabna). Wide variations were observed among the germplasm. The highest fruit weight (15 g) was obtained from SC Raj-014 followed by SC Raj-013 (13 g). Maximum edible portion (86.67 %) was obtained from SC Raj-014 and SC Raj-016 followed by SC Raj-005 and SC Raj-015 (85 %), whereas minimum edible portion (72.50%) was found in SC Raj-004. The highest TSS 18 % was obtained from SC Raj-013. Maximum yield per plant was recorded from SC Raj-005 (50 kg) followed by SC Raj-001 (47 kg). Minimum yield per plant was recorded in SC Raj-006 and SC Raj-014 (20 kg).

Evaluation of jamun germplasm

M.R. Sarkar, A. Tabassum, M.M. Rahman, and M. Moniruzzaman

An experiment was carried out at the Horticultural Research Center, RARS, BARI, Hathazari chattogram to evaluate different parameter of 19 Jamun germplasm. Some cases huge variation was observed among the germplasm. The highest fruit weight(9.97g) was obtained from SC Hat-002 followed by SC Hat-006(8.41g). The maximum edible portion (84%) was recorded from SC Hat-002 where minimum edible portion (76%) was recorded from SC Hat-014. The highest TSS 15% was obtained from SC Hat-025. Maximum Yield per plant was found in SC Hat-002(47kg) followed by SC Hat-006 (42kg). Minimum yield per plant was found in SC Hat-010 (25kg).

Evaluation of lemon germplasm

J.C. Sarker, M.H.M.B. Bhuyan, F Ahmed and S.M.L. Rahman

A study was conducted with seven lemon germplasm along with BARI Lebu-1 as check to evaluate their performance at Citrus Research Station, Jaintapur, Sylhet. In respect of growth and yield characteristics a significant variation was found among the germplasm. The maximum plant height was recorded in CL Jai-001 (260 cm); whereas, the minimum was recorded in BARI Lebu-1 (157 cm). The heaviest fruit (192.33 g) was harvested from CL Jai-006, while the lightest (95.3 g) in CL Jai-002. The highest number of fruits per plant (178.45) was found in CL Jai-001, while the lowest (65.85) in CS Jai-006. Maximum (8.97×5.87 cm) fruit size was recorded in CS Jai-006 whereas minimum (7.13×3.63 cm) in CL Jai-003. CL Jai-001 produces highest yield per plant (21.66 kg) whereas lowest (12.66kg) in CL Jai-006. Maximum TSS content (7.2%) was recorded in BARI Lebu-1, while minimum TSS (5.6%) in CL Jai-006.

Evaluation of lime germplasm

J.C. Sarker, M.H.M.B. Bhuyan, F. Ahmed and S.M.L. Rahman

A study was conducted with three lime germplasm to evaluate their performance at Citrus Research Station, Jaintapur, Sylhet. BARI Kagzilebu-1 was used as check. Significant differences were recorded among the studied germplasm in terms of growth and yield. The maximum plant height was

recorded in CA Jai-001 (2.8 m); whereas, the minimum was recorded in CA Jai-002 (1.6 m). The heaviest fruit (35.3 g) was harvested from CA Jai-001, while the lightest (21.8 g) in CA Jai-003. The highest number of fruits per plant (108) was found in CA Jai-003, while the lowest (54) in BARI Kagzilebu-1. Fruit size recorded maximum (5.9×3.2 cm) in CA Jai-001 whereas minimum (4.1×2.8 cm) in CA Jai-003. CA Jai-001 produces highest yield per plant (2.7 kg), whereas lowest (1.65 kg) in BARI Kagzilebu-1. Maximum TSS content (7.1%) was recorded in CA Jai-001 while CA Jai-003 attained minimum TSS (6.3%).

Collection and evaluation of lime germplasm in chattogram region

M. Moniruzzaman, M. R. Sarkar, A. Tbasum and M. M. Rahman

Five Lime lines viz. CL Hat-001, CL Hat-002, CL Hat-003, CL Hat-005 and CL Hat-006 were evaluated at the Regional Horticulture Research Station, Hathazari, Chattogram. The lines were collected and planted in August 2018. Significant differences were observed in all the parameters except tree shape (ellipsoid) during the studied period. The highest canopy size and plant height was observed in CL Hat-002 (9.1m²) and (4.2m) respectively followed by CL Hat-003 (7.89 m²) and (3.9 m). The highest number of fruits was observed in CL Hat-001 (450) closely followed by CL Hat-003 (315) and minimum fruit per plant recorded in CL Hat-006(157). The highest individual fruit weight recorded in CL Hat-005(93 g) followed by CL Hat-006 (90).The highest juice content observed in CL Hat-005(42 ml) closely followed by CL Hat-006(40 ml).Minimum seed per fruit observed in CL Hat-005 (02) and CL Hat-006 (02). The highest brix% was found in CL Hat-001(6) and CL Hat-005 (6).

Evaluation of collected kaghzi lime

M.R. Islam, S.D. Setu, S. Hasna, M.G. Rahman and B.C. Kundu

The experiment was conducted at the RARS, Rahmatpur, Barishal. Six germplasm of lime were collected from different areas of the southern part of country and planted on July 2013. Wide variations in growth characteristics among the germplasm were found. Among the germplasm, the highest plant highest was attained in CA Rah 01 (6.4 m) and the lowest one was in CA Rah 06 (2.89

m). The highest number of fruits per plant, the heaviest fruit and the total yield per plant was found in CA Rah 02. Among the six germplasm CA Rah 02 was found promising.

In-situ evaluation of local pummelo germplasm

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

The study was conducted at the Fruit Research Station, BARI, Binodpur, Rajshahi. One pummelo germplasm (CG Raj-004) was selected for the evaluation along with BARI Batabilebu-3 control. Mainly colour flesh occurred in the germplasm. Average fruit weight was 1367g. The maximum edible portion was obtained (42.53%) and the TSS (11%). Consideration of fruit characteristics, edible quality, TSS, percent edible portion and yield potentialities, the germplasm CG Raj 004 was found promising.

Evaluation of pummelo germplasm

B R Barman, M W Rahman, M Rahman, M A Halim and A K Das

The study was undertaken at Breeder Seed Production Centre, BARI, Debiganj, Panchagarh to find out high yielding and good quality germplasm of pummelo with 30 accessions which were locally collected in the year 2006. All germplasm gave fruits except CG Deb-009, CG Deb-025 and CG Deb-030. The heaviest fruit (1475 g) was found in CG Deb-001 whereas the lightest (780kg) fruit was obtained from germplasm CG Deb-026. Highest edible portion (58.67%) was found in CG Deb-017; lowest (21.24%) in CG Deb-019. The highest TSS (9%) was recorded in CG Deb-003 whereas the lowest TSS (5.2%) was found in CG Deb-024. Maximum number of fruits per plant (150) was collected from CG Deb-015 followed by CG Deb-007 (90). In terms of palatability excellent taste was found in CG Deb-003, and CG Deb-021 with no bitter pulp.

Evaluation of local pummelo germplasm

M.H.M.B. Bhuyan, J.C. Sarker, F. Ahmed, and S.M.L. Rahman

Evaluation of local pummelo germplasm was conducted at Citrus Research Station, Jaintapur, Sylhet to study their performance. All the germplasm showed significant variation in respect of tree height, base girth, and canopy spreading, leaf characters, flower and fruit characters. Fruits

from 21 germplasm were harvested. Among the germplasm tested CG Jai-004-2 was found superior with tree height (5.1 m), while maximum number of fruits plant⁻¹ (80) was recorded from CG Jai-070. Among the fruit quality attributes maximum fruit weight was found from CG Jai-051 (1268.4 g), but the most attractive pink yellow colored fruit was found from CG Jai-005-3. Unlike, the maximum juice content was found from BARI Batabi-5 (41%). Highest TSS% was found from the juice of CG Jai-070 (12.2%); whereas, % acidity was highest in CG Jai-053 (1.75%). Sugar acid ratio was highest in BARI Batabilebu-2 (1.22), whereas the lowest in CG Jai-004-2 (0.11).

Evaluation of pummelo germplasm in chattogram region

S.M.K.H. Chowdhury, H. Barua, M.G. Azam, A.S.M.H. Rashid

An experiment was conducted at Agricultural Research Station, Khulshi, Chattogram for the evaluation of twenty-five pummelo genotypes. Among these genotypes, fourteen genotypes produced fruits. CG Pah002 gave maximum number of fruits that was 48 followed by CG Pah022 (45). CG Pah 014 gave minimum number of fruit (11) followed by CG Pah 020 that was 12. The heaviest fruit (1860.40 g) was recorded from CG Pah003 followed by CG Pah001 that weighted 1456.33 g. The lightest fruit (673.8 g) was observed in CG Pah020 followed by CG Pah015 that weighted 699.5 g. The highest total soluble solid (10.76%) was counted from CG Pah002 followed by CG Pah006 that was 9.31%. The lowest total soluble solid (7.3%) was counted from CG Pah015 followed by CG Pah005 that were 7.5 %. Maximum edible portion (60.71 %) was calculated from CG Pah002 followed by CG Pah005 that was 60.3 %. Minimum edible portion (42.22 %) was calculated from CG Pah008 followed by CG Pah020 that were 42.71 %. CG Pah022 produced maximum amount of fruit (46.35 kg/plant) followed by CG Pah003 (39.07 kg). CG Pah020 produced minimum amount of fruit (8.09 kg/plant) followed by CG Pah014 (9.63 kg).

Evaluation of pummelo in hilly region of rangamati

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment with thirteen germplasms of pummelo was conducted at the existing fourteen

years old orchard of pummelo plants collected from different parts of Chittagong Hill Tracts at hill valley of Hill Agricultural Research Station of Raikhali in Rangamati Hill District for the evaluation of superior pummelo genotypes in hilly region. CG Rai-047 exhibited the highest fruit weights of 1100 g followed by CG Rai-009 (1050 g). The maximum edible portion 69 % present in CG Rai-009. The maximum yield was found 24.37 t/ha in CG Rai-047 followed by CG Rai-009 (18.90 t/ha), CG Rai-030 (9.45 t/ha). In case of CG Rai-009, CG Rai-030, CG Rai-047 bitterness absent among the others line.

Evaluation of pummelo germplasm

M.A. Alam, M.R. Alam and Ku. Ahammad

The study was undertaken to identify suitable germplasm of pummelo with 19 accessions of 14-18 years old plants along with a locally collected germplasm at Regional Agricultural Research Station, Jashore. The heaviest fruit (2850 g) was found in CG Jas-025 whereas the highest edible portion (63.8%) was got in CG Jas-004. The highest TSS (9.5%) was recorded in CG Jas-015 whereas the lowest TSS (6.0%) was found in CG Jas-025. Maximum number of fruits per plant (122) was observed in CG Jas-023 followed by CG Jas-017 (92). Excellent eating quality was found in CG Jas-007, CG Jas-013, CG Jas-018, CG Jas-023 and CG Jas-029 with bitter less pulp.

Hybridization in satkara

S. M. L. Rahman, F. Ahmed, J. C. Sarker and M. H. M. B. Bhuyan

A hybridization program of satkara was conducted at Citrus Research Station (CRS), Jaintapur, Sylhet. A total of 250 flowers were emasculated and pollinated. Twenty four hybrid fruits were obtained from different crosses. These citrus fruits will be harvested at mature stage and seeds of the fruits were sowed in the soil for germination. After germination, seedlings of hybrid fruits will be transplanted in the main field and will be evaluated.

Hybridization in mandarin

S. M. L. Rahman, F. Ahmed, J. C. Sarker and M. H. M. B. Bhuyan

A hybridization program of mandarin was conducted at the Citrus Research Station (CRS), BARI, Jaintapur, Sylhet. A total of 100 flowers were emasculated and pollinated. Finally no hybrid

fruits were obtained from different crosses. Because of hail storm, other natural calamities and extreme heat, all hybrid fruits were dropped.

Evaluation of mandarin germplasm under north-eastern hilly area of Bangladesh

F. Ahmed, J. C. Sarker, M. H. M. B. Bhuyan and S. M. L. Rahman

Six mandarin germplasm and two varieties viz. BARI Komola-1 and BARI Komola-3 were evaluated. The tallest plant (167.33 cm) was recorded at CR Jai-303 the shortest plant (82.00 cm) in CR Jai-302. The plant CR Jai-303 spreads maximum (155.33 cm×153.33 cm). On the other side CR Jai-306 had the minimum canopy (40.00 cm × 50.00 cm). Maximum stem diameter (3.67 cm) is recorded in CR Jai-303. On the other side, minimum stem diameter (1.90 cm) was recorded at CR Jai-302. All the plants were in satisfactory growth stage except CR Jai-303, which bore fruits.

Hybridization in sweet orange

F. Ahmed, M. H. M. B. Bhuyan, J. C. Sarker and S. M. L. Rahman

A hybridization program of sweet orange was conducted at the Citrus Research Station (CRS), Jaintapur, Sylhet. A total of 320 flowers were emasculated and pollinated. Finally 19 hybrid fruits were obtained from different crosses. These hybrid fruits will be harvested at mature stage and seeds of the fruits were sown in soil for germination. After germination, hybrid seedlings will be transplanted in the main field and will be evaluated.

Performance of exotic sweet orange germplasm

J.C. Sarker, M.H.M.B. Bhuyan, F Ahmed and S.M.L. Rahman

A study was conducted with four exotic sweet orange germplasm to evaluate their performance at Citrus Research Station, Jaintapur, Sylhet. BARI Malta-1 was used as check. Significant differences were recorded among the studied germplasm in terms of quantitative and qualitative characteristics. Maximum fruit weight (241.6g) and size (7.6×7.3 cm) were recorded in CS Jai-051, while minimum (135.3g) in CS Jai-209. High juice content and TSS (12.3%) were recorded in CS Jai-003, while CS Jai-209 recorded the lowest TSS (9.3%). The edible portion was recorded maximum (71.39%) in CS Jai-003, while minimum (53.21%) in CS Jai-209. Pulp colors of studied germplasm were found off

white to orange; whereas, BARI Malta-1 was light yellow.

Evaluation of sweet orange germplasm in the hilly region

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

The experiment was conducted to study the performance of sweet orange germplasm collected from different locations of CHT and planted at HARS, Khagrachari. Two germplasm viz. CS Kha-001, CS Kha-002 and a check variety BARI Malta-1 were evaluated to identify promising sweet orange germplasm in respect of fruit bearing, fruit quality and yield potentiality. Flowering time ranges from February to March. Harvesting time was late November-December in case of CS Kha-001. All the germplasm produced profuse fruits. No. of fruits per plants was the highest (227) in BARI Malta-1 while the lowest (142) was in CS Kha-002. Individual fruit weight was also varying from 131.67-168.33g. The biggest (168.33g) fruit were recorded in CS Kha 002 and the smallest (131.67) was observed in BARI Malta-1. Weight of fruits per plant was (29.82 kg) in BARI Malta-1 while in case of CS Kha-001 it produces yield of 30.04 kg/plant and the lowest (23.87 kg) was in CS Kha-002. TSS 8.5 and 8.6 were found in CS Kha-001 and BARI Malta-1 in respectively. Fruit aroma was strong in all the germplasm.

Evaluation of sweet orange line

M. M. Rahman, A. Tabassum, M. R. Sarkar and M. Moniruzzaman

An experiment was conducted at the citrus orchard of RARS, Hathazari, Chattogram in order to assess the yield potentialities of Katamalta. The plants were seven years old and same tree shape was obloid. Differences were observed in all the quantitative parameters studied. The plant height and canopy size were higher in Katamalta (2.88m and 1.58x3.47 m²) than BARI Malta-1 (2.7m and 1.34x2.28 m²) accordingly. Number of fruits/plant and individual fruit weight were higher in Katamalta (234 & 191g) than that of BARI Malta-1 (150 & 117g respectively). The fruit length and fruit diameter were higher in Katamalta (6.96 cm & 7.1 cm) than BARI Malta-1 (5.51 cm and 4.52 cm). The yield of fruits was higher in Katamalta (27.9 t/ha) which was higher than BARI Malta-1 (11.0 t/ha). The Juice content was higher in Katamalta

(60 ml) than that of BARI Malta-1 (46.2 ml). The TSS was higher in Katamalta (8.5) than BARI Malta-1 (7.1).

Effect of different rootstock on the growth and yield of Navel orange (cs jai-003)

F. Ahmed, M.H.M.B. Bhuyan, J.C. Sarker and S.M.L. Rahman

The study was conducted at Citrus Research Station (CRS), Jaintapur, Sylhet to evaluate the performance of navel orange (CS Jai-003) using different citrus rootstocks viz., Askar Jamir, Decibre, Citromelo, Citrange, Rangpur Lime, Karun Jamir, Rough Lemon, local mandarin, Calamansi, BARI Malta-1 and CS Jai-010. Significant variation was observed in success and survivality percentage. Among the grafted plants maximum success (100%) was recorded in Citromelo, Rough Lemon, Calamansi, and CS Jai-010. The lowest success (57.14%) was recorded in Decibre followed by Askar Jamir (60%), Karun Jamir (60%) and Mandarin orange (60%). The survivality was maximum in Calamansi (100%) followed by Rough Lemon (80%) and CS Jai-010 (80%). Although grafting was successful, but no sapling survived on Askar Jamir, Decibre, Citromelo and local mandarin rootstock seedlings.

Propagation of BARI komola-1 and BARI malta-1 by shoot tip grafting

M.H.M.B. Bhuyan, J.C. Sarker, F Ahmed and S.M.L. Rahman

The experiment was conducted at Citrus Research Station, BARI, Jaintapur, Sylhet. Shoot tip grafting of BARI Komola-1 and BARI Malta-1 was done on local pummelo rootstocks. Seedlings of local pummelo were raised in soil less culture fortified with basal MS medium in standard conditions of temperature, light duration and plant age. Scions collected from BARI Komola-1 and BARI Malta-1 mother plants were in vitro grown in solidified MS media in standard conditions of temperature, light duration and microbud age. Results suggested that rootstock seedlings showed optimum growth at 30°C with complete darkness, whereas optimum growth of the microbud was found in 25°C with 16/8h light/dark cycle. Shoot tips (0.2 mm long), were aseptically excised from the microbuds and were grafted onto the decapitated rootstock seedlings. The micrografts were grown in culture medium under standard condition. But none of the

grafts were successful. The experiment will be continued in the following year to get disease free saplings.

Collection and evaluation of custard apple germplasm

M. H. Waliullah, M. S. Islam, M. A. Shahed and K. H. Alam

An evaluation of Seven custard apple germplasm were carried out in at Fruit Research Station, BARI, Binodpur, Rajshahi. The result indicated that wide range of diversity existed in fruit weight, seed weight, TSS content, pulp content and skin weight etc. The weight of a matured fruit varied from 122 g to 180 g. The highest fruit weight (180 g) was observed in AS Raj-005 followed by AS Raj-007 (171.3 g) and the lowest fruit weight was noted in AS Raj-003 and AS Raj-004 (122 g). Maximum (56.96%) edible portion was measured in AS Raj-007 followed by AS Raj-005 (48.17%). TSS varied from 23.3 to 25 but there was no significant difference in TSS among the germplasm.

Evaluation of bullock's heart (*Annona reticulata* L) germplasm

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of Bullock's heart in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. There were thirteen promising bullock's heart lines under study. Among those lines, the highest individual fruit weight (370 g), fruit size (118.7 mm ×90.76 mm), yield (15.17 kg/tree) and TSS % 29 were observed in AR Rai-010.

Collection and evaluation of bullock's heart genotypes

M.A. Alam, M.R. Alam and K.U. Ahammad

A study was carried out at RARS, Jashore to find out the superior genotypes of bullock's heart (*Annona reticulata* L). The heaviest fruit (555.0 g) was recorded in ARJas-013 followed by ARJas-12 (542.3 g). The highest pulp weight (436.0 g as well as the highest edible portion (78.6%) was observed in AR Jas-013. The longest (10.3 cm) fruit was obtained from ARJas-013 whereas the broadest (10.6 cm) fruit was obtained from ARJas-012. The highest TSS (27.5%) was recorded in ARJas-013. The highest number of fruits per plant (122.0) as

well as the highest yield per plant (50.26 kg) was found in ARJas-007. ARJas-016 was harvested in first week of July. All the genotypes have excellent eating quality.

In-situ evaluation of bael germplasm

A.S.M. Yousuf Ali, M.M.Rahman, M. M. Hossain and M. M.Rahman

An experiment was evaluated at Chapainawabganj Sadar and Shibganj Upazila. The study comprised of one bael germplasm. BARI Bael-1 was used as check. Age of the germplasm, AM Cha-001 was 36 years while BARI Bael-1 was 19 years. The maximum individual fruit weight (1050 g) was found in AM Cha-001, while the minimum (900 g) in BARI Bael-1. Considering TSS (38%), pulp percentage (72.10%) and yield /plant (110.25 kg), the germplasm AM Cha-001 was found better.

Evaluation of bael in hilly area

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment to evaluate Bael (*Aegle marmelos*) was conducted at the Hill Agricultural Research Station, Raikhali, Rangamati Hill District. Eleven promising Bael lines were studied to identify superior genotypes for the hilly region. The heaviest individual fruit weight (1820 g) was recorded in AM Rai-062, followed by AM Rai-060 (1470 g). The maximum number of fruits per plant (71), fruit size (145.8 mm × 134.6 mm), pulp thickness (131.23 mm), edible portion (79.52%), TSS (38%), and yield (104.37 kg/plant) were observed in AM Rai-060, which outperformed the other genotypes.

Evaluation of soursop in hilly area

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment to evaluate Soursop (*Annona muricata*) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District. Fifteen promising exotic and local Soursop lines were studied to identify superior genotypes for the hilly region. Among the fifteen germplasm, three germplasm have flowered and fruited this year. The maximum number of fruits (9), yield (3.10 kg/ha), % TSS (16) observed in AM Rai-001 followed by AM Rai-011 and the highest individual fruit weight (410 g), fruit size (115.37 mm×105.21 mm×98.35 mm) were observed in AM Rai-007 compared to other line.

Evaluation of existing wax apple (jamrul) germplasm

S. Hasna, M.R. Islam, S.D. Setu, M.G. Rahman, A.K.Das, H.B.Harun and B.C. Kundu

The experiment was conducted at the RARS, Rahmatpur. Existing Four germplasm of Wax apple SS Rah 001, SS Rah 002, SS Rah 003 and SS Rah 004 were included in this study. According to yield contributing characteristics number of fruits per plant, individual fruit weight, fruit length, fruit diameter and TSS (%) SS Rah 02 was a promising germplasm.

Evaluation of eggfruit (*Pouteria campechiana*) in hilly area

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment to evaluate Eggfruit (*Tiesa*) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District. Four different tiesa genotypes (PC Rai-001, PC Rai-002, PC Rai-003, and PC Rai-004) were studied. Among these, PC Rai-001 exhibited the highest performance with the maximum number of fruits per plant (360), individual fruit weight (195 g), fruit size (86.69 mm × 69.58 mm), pulp thickness (1.6 cm), edible portion (80.3%), and yield (70.2 kg/plant), outperforming the other genotypes.

Evaluation of jaboticaba (*Plinia cauliflora*) in hilly area

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of jaboticaba in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. There were three genotypes, such as PC Rai-001, PC Rai-002 and PC Rai-003, under study. Among those three lines, the maximum number of fruits per plant (4300), individual fruit weight (7.6 g), fruit size (25.3 mm × 24.8 mm), yield (32.68 kg/tree) and edible portion (79.5%) was observed in PC Rai-001. It also had TSS 17% and was good in taste.

Evaluation of star gooseberry (*Phyllanthus acidus* L.) Germplasms

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of star apple in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. There were four genotypes under study. Among

those four lines, PA Rai-002 had maximum 10-fruit weight (41 gm), flesh thickness (6.25 mm), TSS (10%) and sweet in taste compared to other lines.

Evaluation of star apple (*Chrysophyllum caimito* L.) Germplasms

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of star apple in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. There were three genotypes under study. Among those three lines, CC Rai-002 had maximum number of fruits per plant (189), individual fruit weight (193 g), fruit size (68.01 mm × 68.96 mm), pulp TSS (19%) and yield (36.47 kg/plant) compared to other two lines.

Evaluation of collected cowa germplasm

M.R. Islam, S.D. Setu, S. Hasna, M.G. Rahman, A.K.Das and B.C. Kundu

An experiment was conducted at RARS, BARI, Rahmatpur, Barishal. Ten germplasm of cowa were included in this study. These were GC Rah 01, GC Rah 02, GC Rah 03, GC Rah 04, GC Rah 06, GC Rah 09, GC Rah 14, GC Rah 17, GC Rah 18 and GC Rah 19. Wide variations in growth characteristics among the germplasm were found. Among the germplasm, the highest plant height was attained in GC Rah-04 (7.66m) and the lowest one was in GC Rah-18 (1.8m). The highest number of fruits per plant was found in GC Rah-14 (2965) and the lowest was in GC Rah-18 (30). The highest individual fruit weight was found in GC Rah-14 (58.55 g) and the lowest was in GC Rah- 02 (36.76 g). The highest number of bulb per fruit was found in GC Rah- 02 (7.40) and the lowest was in GC Rah-06 (5.60). The highest yield was found in the germplasm GC Rah-014 (173.60 kg/plant) followed by GC Rah-09 (108.59 kg/plant) and the lowest was in GC Rah-18 (1.43 kg/plant) (Table 2). The highest edible portion was in GC Rah-03 (70%) followed by GC Rah-02 and GC Rah-09 (69%).

Evaluation of collected monkey jack germplasm

S. D. Setu, M. R. Islam, S. Hasna, M. G. Rahman, A.K.Das and B.C. Kundu

The experiment was conducted at the RARS, Rahmatpur, Barishal. Five germplasm of monkey jack were collected from different areas of the southern part of Bangladesh. Wide variations in growth characteristics among the germplasm were

found. The highest percentage of edible portion (58%) was recorded in AL Rah 05. The maximum number of fruits per plant was recorded in AL Rah 04 (576) followed by AL Rah 02 (552) and the lowest (475) in AL Rah 01. The single fruit weight in different plants varied considerably ranging from 150.67 to 187.9g. The highest fruit weight (187.9 g) was recorded in the line AL Rah 01 and lowest in AL Rah 02 (150.67g). The highest fruit yield (104.56 kg) was recorded in the line AL Rah 04 and the lowest in (82.31kg) in AL Rah 05.

Evaluation of collected velvet apple germplasm

S.D. Setu, M.R. Islam, S. Hasna, M.G. Rahman, A.K.Das and B.C. Kundu

The experiment was conducted at the RARS, Rahmatpur. Five germplasm of velvet apple were collected from different areas of the southern part of country. Wide variations in growth characteristics among the germplasm were found. The age of plant of different lines varied considerably ranging from 21 to 13 years (Table 1). The maximum age of plant was recorded in the line DD Rah - 001 having 21 years of age, while DD Rah-005 was found to be the youngest plant (13 years). The maximum plant height (13.5 m) was recorded in DD Rah-001 followed by DD Rah-003 (12 m) and the lowest (7.0m) in DD Rah-005. The highest percentage of edible portion (56.84%) was recorded in DD Rah-002, which was closely followed by DD Rah-001 (52.33%) and DD Rah-003 (51.54%). The lowest edible portion (48%) was obtained from DD Rah-004. TSS is an important criterion for selection of good quality fruit. The highest TSS (21%) was found in DD Rah- 005, which was followed by that of DD Rah- 003 (16%), DD Rah-002(15%), DD Rah-004 (15%), and the lowest in DD Rah- 001(14%). The highest fruit yield (134.31 kg) was recorded in the line DD Rah-002 and the lowest in (70.4 kg) in DD Rah- 004.

Evaluation of para jam (*Antidesma acidum*) germplasm

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment on the evaluation of para jam in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. The fruit size, 100-fruit weight, TSS and yield of the AA Rai-001 were 4.83 mm × 4.52 mm, 3.73 g, 20% and 8.1 kg/tree, respectively.

Collection and evaluation of indian dillenia germplasm

M. R. Alam, M. A. Alam and Ku. Ahammad

A study was carried out at Horticulture Research Center, Regional Agricultural Research Station to evaluate the Indian dillenia (*Chalta*) germplasm available in Jashore region. Two promising germplasm viz. DI Jas-001 and DI Jas-002 were evaluated at Horticulture Research Center, RARS, Jashore for developing as a variety. The germplasm were collected from Jashore region and planted in 2009. The recorded plant heights of the genotypes were 9.1 m and 8.7m. Flowering was started from 28 May 2023. DI Jas-001 produced total 690 fruits in the fifth year of reporting. DI Jas-002 produced total 355 fruits in the second year of reporting. The length and breadth of the fruit were recorded as 8.2 cm and 9.35 cm respectively. Individual fruit weights were 575.5g and 532.3g respectively. Total yield of the plants were 397.9 kg and 188.6 kg respectively.

Effect of different growing media for dragon fruit production on the roof

M. Islam, A. Anwari, T. Islam and M. A. Islam

The experiment was carried out on the rooftop of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. There were seven treatments in the experiment. Maximum number of branches/pillar (29) was noticed in treatment T₂ closely followed by T₇ (27). In the case of number of fruits/pillar, Fruit size and yield, treatment T₂ exhibited the highest result by 39.00, fruit length-10.83 cm, fruit breadth-10.22 cm and 14.76 kg/pillar, respectively. However, treatment T₂ also attained the highest percentage of TSS (19.90 %). So, the treatment T₂ (80% Cocodust + 20% Vermicompost) could be the best option as a growing media for dragon fruit production on the rooftop.

Hybridization in dragon fruit

J.C. Sarker, S.M.L. Rahman, F. Ahmed and M.H.M.B. Bhuyan

A hybridization program of dragon fruit was conducted at Citrus Research Station (CRS), Jaintapur, Sylhet. A total of 15 flowers were

emasculated and pollinated. Four hybrid fruits were obtained from different crosses. These fruits were harvested at mature stage and the seeds of the fruits were sown in the soil for germination. After germination, seedlings of hybrid fruits will be transplanted into the main field and will be evaluated.

Collection and evaluation of dragon fruit germplasm

M. Islam, M. Ratna, E. Mahmud, N. Akter, S. Yesmin, M. I. A. Howlader and M. G. Kibria

An experiment with sixteen germplasm of dragon fruits was conducted at the experimental field of Regional Horticultural Research Station (RHRS), Lebukhali, Patuakhali for the evaluation of superior dragon fruit lines in southern region of Bangladesh. The maximum individual fruit weight (355 g) was recorded from HC Lebu-006 followed by HC Lebu-005 (344 g) but the minimum (171 g) in the HC Lebu-001. The germplasm HU Lebu-001, HU Lebu-001 and HM Lebu-001 white fleshed fruit but others were red fleshed. All the germplasm were red skinned but only HM Lebu-001 yellow skinned fruit.

Evaluation of promising dragon fruit germplasm in rangamati hilly area

N.U. Ahmed, M.M. Hasan and S.P. Chakma

An experiment with three germplasms of dragon fruits collected from different parts of the country were conducted at nine years old dragon fruit orchard of Hill Agricultural Research Station, Raikhali, Rangamati for the evaluation of superior dragon fruit germplasm in hilly region. The maximum individual fruit weight (415 g) was found in HU Rai-002 an oblong shaped red fleshed red skin fruit line followed by HU Rai-003-2 (395 g) with a round shaped white flesh red skin dragon fruit line. The maximum fruit yield (29.88 t/ha) was observed in HU Rai-002 followed by BARI Dragon fruit-1 (22.51 t/ha).

Collection and evaluation of yellow dragon fruit germplasm

M. Moniruzzaman, M. R. Sarkar, A. Tbassum and M. M. Rahman

Three yellow dragon fruit lines viz. HM Hat-001, HM Hat-002 and HM Hat-003 were evaluated at the Regional Horticulture Research Station, Hathazari, Chattogram. The lines were collected

and planted in August 2021. Significant differences were observed in all the parameters during the studied period. The highest plant height was observed in (3.7 m) and 3.5m respectively followed by HM Hat-002 HM Hat-001. The highest number of primary branch was observed in HM Hat-002(124) closely followed by CL Hat-001 (110) and minimum primary branch recorded in HM Hat-003(104). First initial bud was recorded 13 May 2024 from HM Hat-002 followed by HM Hat-001 (15 May 2024). The highest number of flower was recorded in HM Hat-002(115) followed by HM Hat-001(60). There were 44-45 days taken from bud to fruit harvest. The highest number of fruit was recorded in HM Hat-002(56) followed by HM Hat-001(36). The highest individual fruit weight was recorded in HM Hat-002 (485 g) followed by HM Hat-001(375g) and the largest fruit size was 13.5x8.2cm² found in HM Hat-002. The highest yield kg per plant (27.16) and ton per hectare (30.16) found in HM Hat-002 followed by HM Hat-001(15) respectively. Maximum edible portion (75%) and the brix (15%) was found in HM Hat-002 . This experiment is 2nd year on going. After 3rd year completion it can be concluded.

Study on pollen preservation techniques of avocado

A. Anwari and M. A. Islam

The experiment was carried out at the Fruit Research Farm of Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute, Joydebpur, Gazipur to preserve pollen of Avocado. Pollen viability of PA Joy-006 and BARI Avocado-1 was found good both in desiccator and low temperature storage. In comparison, desiccator is better than freezing (4° C). In case of PA Joy-003 and PA Joy-004, fully viable pollen was manifested at 3 DAS.

Evaluation of coffee germplasm

M. T. Islam, M. J. Rahman and M. Islam

An experiment on the evaluation of coffee in plain land was conducted at the Fruit Research Farm of Horticulture Research Centre, BARI, Gazipur district. Maximum plant height (2.10 m) and base girth (21 cm) were observed in CA Joy-004 where canopy size (190 cm x 172 cm) was maximum in CA Joy-003. Minimum plant height (1.60 m) and base girth (12 cm) were observed in CA Joy-005 where canopy size (130 cm x 100 cm) was minimum

in CA Joy-015. Maximum number of fruits/plant (1870) and fruit weight per tree (3.37 kg plant⁻¹) were obtained from the genotype CA Joy-004.

Collection and evaluation of coffee germplasm in chattogram region

S. M. K.H. Chowdhury, H. Barua, M.G. Azam and A. S. M. H. Rashid

An experiment was conducted at Agricultural Research Station, Khulshi, Chattogram to evaluate twenty coffee genotypes to identify the best genotype for releasing as variety. The highest number of bean (3145) per plant was obtained from CA Pah 004 followed by CA Pah 003 that was 2613 and the lowest number of bean (80) per tree was found from CA Pah 013. CA Pah 004 gave the maximum individual bean weight (1.35 g) that was followed by CA Pah 003 weighing 1.33 g and, the genotype CA Pah 018 provided minimum weight (0.93 g) that was followed by CA Pah 001, CA Pah 011 and CA Pah 013, weighing 1.12 g. In case of dry bean, the individual weightiest bean (0.63 g) was obtained from CA Pah 006 followed by CA Pah 003 weighing 0.61 g and the lightest (0.27 g) was attained from CA Pah 016 followed by CA Pah 011 weighing 0.32 g. The highest fresh bean yield per plant (4245.75 g) was obtained from CA Pah 004 followed by CA Pah 003 which was recorded as 2475.29 g and the lowest bean yield per tree was found from CA Pah 013 which was recorded as 89.06 g followed by CA pah 001 (362.88 g). The highest dry bean yield per plant (1593.93 g) was obtained from CA Pah 003 followed by CA Pah 004 which was recorded as 1509.60 g and the lowest bean yield per tree was found from CA Pah 013 which is recorded as 33.60 g followed by CA Pah 014 (154.44 g).

Collection and evaluation of coffee germplasm

M.M. Hasan, S.P. Chakma, N.U. Ahmed and M. A. Hossain

An experiment on the evaluation of coffee in hill valley was conducted at the Hill Agricultural Research Station, Raikhali, Rangamati Hill District. The maximum 100-fresh berry weight (137.01 g), 100-dried filled seed weight (11.61 g), fresh berry yield (8.89 t/ha), and dried seed yield (1.25 t/ha) of *C. arabica* were obtained in CA Rai-012. The highest 100-fresh berry weight (150.66 g), 100-dried filled seed weight (18.18 g), fresh berry yield (5.83 t/ha), and dried seed yield (0.79 t/ha) of *C. canephora* were found in CC Rai-063.

Evaluation of coffee (robusta) germplasm in the north-eastern hilly region of bangladesh

J.C. Sarker, F. Ahmed, M.H.M.B. Bhuyan, and S.M.L. Rahman

The experiment was conducted at Citrus Research Station, Jaintapur, Sylhet to study the performance of collected coffee (robusta) germplasm. Among the three collected germplasm, maximum tree height was recorded in CR Jai-001 (2.34 m); whereas, the minimum was recorded in CR Jai-002 (2.12 m). Similarly maximum stem girth was recorded in CR Jai-001 (18.67 cm) while the minimum was recorded in CR Jai-003 (15.67 cm). The maximum canopy spread in the east-west as well as north-south direction was furthermore recorded in CR Jai-001 (156×126 cm) and minimum (113×133 cm) in CR Jai-003.

Evaluation of promising coffee germplasm in the hilly region of bangladesh

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

The experiment was carried out at the existing plantation of Hill Agricultural Research Station at Khagrachari to present to identify high yield potentiality and better quality coffee beans. 04 (four) genotype of *Coffea Arabica* commonly known as arabica coffee from the existing coffee orchard of HARS, Khagrachari was selected for the study. The maximum plant height of evaluated line was (228.6cm) and minimum was (176.78cm) in CA Kha- 022 & CA Kha- 011 respectively. The maximum length and width of leaf was 12.64 cm & 5.92 cm in CA Kha- 022. In last year the average length and width of individual fruit was 13.49mm & 12.09mm respectively. Harvesting duration of fruit was mid-October to mid-November. The average length and width of individual seed was 12.91 to 12.95 mm & 10.1 to 10.43mm respectively in last three years. Average weight of 100 beans was 120.32gm & total fruit weight (kg) per plant was 3.69 in accession CA Kha- 022.

Studies on different methods and time of vegetative propagation of robusta coffee (COFFEA CANEPHORA)

M. R. Hossain, M. A. A. Malek and M. A. Hossain

The purpose of this study was to assess the success of vegetative propagation of coffee Robusta (*Coffea canephora*) by grafting and cutting. The experiment was conducted at nursery site of Hill

Agricultural Research Station, Khagrachari. Scions and cuttings were collected from the existing coffee germplasm orchard at HARS. In case of grafting maximum success rate (84.40%) was found in M₁T₂ treatment combination and minimum success rate (62.22%) was found in M₁T₄ treatment combination. In case of cutting maximum success rate (53.33%) was found in M₂T₂ treatment combination and minimum success rate (33.33%) was found in M₂T₄ treatment combination. In a nutshell the present findings shows that appropriate time for grafting and cutting of Robusta coffee was mid june (T₂) and success rate of graftings were higher than cuttings.

Evaluation and adaptability of promising coffee germplasm at ramgarh

S. M. Faisal and R. H. Nitol

Ninety-nine germplasms of Coffee (*Coffea robusta*) exist at HTARS, Rammagr, khagrachari which were planted in July 2019. Screening of available coffee germplasm is an important task in order to develop a variety suitable for our local environment. The overall appearance of the plants is elongated conical in addition sympodial vegetative development was observed. The average plant height was 2.25 m whereas the maximum plant height was 2.95 m recorded in CCRAM023. Maximum plant leaf length was 20 cm found line in CCRAM003 and CCRAM075. Berries were produced in CCRAM001 and CCRAM098.

Evaluation of cashew nut germplasm in north-eastern hilly region of bangladesh

J.C. Sarker, F. Ahmed, M.H.M.B. Bhuyan, and S.M.L. Rahman

An experiment was conducted to find out the promising germplasm for commercial cultivation in the region. All the germplasm differed in their growth characters. Among the five germplasm, the maximum tree height was recorded in AO Jai-003 (3.83 m); whereas, the minimum tree height was recorded in AO Jai-002 (2.45 m). Similarly maximum stem girth was recorded in AO Jai-003 (23.57 cm) followed by AO Jai-004 (22.25 cm), while the minimum was recorded in AO Jai-005 (19.87 cm). The maximum canopy spread in the east-west, and north-south direction, was recorded in AO Jai-004 (273.84×265 cm) and minimum (223.34×230 cm) in AO Jai-002.

Evaluation of promising cashew nut germplasm in hill tract

R. H. Nitol and S. M. Faisal

Twenty promising cashew nut germplasm out of 121 were selected in different locations at HTARS, Ramgarh, Khagrachari Hill District to see their yield potentiality and quality nut in order to develop a variety. There were lot of variabilities among the parameters studied. Average plant spread in E-W was 2.63 m. Average plant spread in N-S was 2.68 m. Average tree volume was 7.81 m³. Flower from most of the cashew nut germplasm were cream in color. Some of them viz. AORAM003, AORAM047 and AORAM049 were pink. Flower was first was initiated at mid-February and fruit formation was started from mid-march. It was very unfortunate that most of the flowers were desiccated due to severe heat wave and scarcity of water.

Collection and evaluation of cashew germplasm

M.M. Hasan, S.P. Chakma, N.U. Ahmed and M. A. Hossain

An experiment on the evaluation of cashew nut in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District. The higher cashew nut weight (9.81 g) and size (36.25 mm × 28.19 mm × 21.82 mm) were observed in AO Rai-024. The higher cashew kernel weight was observed in AO Rai-030, AO Rai-032, AO Rai-024 and AO Rai-037, which were 2.81 g, 2.75 g, 2.71 g and 2.68 g, respectively. Based on

nut weight and size, and kernel weight and size AO Rai-024, AO Rai-030, AO Rai-032, AO Rai-037 were found as superior lines among all the lines.

Evaluation of mangosteen germplasm in chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Five years old two mangosteen seedlings i.e, GM Pah 001 and GM Pah 002 were collected from Chattogram region and were evaluated at Agricultural Research Station, Khulshi, Chattogram to develop the promising mangosteen germplasm for higher yield and qualities. Both plants flower bloom in February and are harvested in July. GM Pah 001 produces 35 fruits per plant, with each fruit weighing 68.75 g. The fruits have a length of 5.2 cm and a breadth of 0.9 cm, and each fruit contains 6 arils. The total fruit yield per plant for GM Pah 001 is 2.41 kg. In contrast, GM Pah 002 yields 33 fruits per plant, each fruit weighing 11.75 g. These fruits have a length of 4.1 cm and a breadth of 1.1 cm, and each fruit contains 7 arils. The total fruit yield per plant for GM Pah 002 is 0.39 kg. The total soluble solids (TSS %) percentage is 18.10 %, and the edible portion of the fruit is 27.75% in GM Pah 001. The organoleptic test rates GM Pah 001 as excellent. In comparison, GM Pah 002 has an aril weight of 6.34 g and an exocarp weight of 7.23 g, but it does not produce any seeds. This variety is rated as better in the organoleptic test.

FLOWER CROPS

07

Evaluation, characterization and maintenance of tuberose (*polianthes tuberosa* L.) Germplasm

N. Pervin, F. N. Khan, K. Ambia, M. T. Rashid and N.T. Hasan

Fourteen collected tuberose germplasm were evaluated at the Floriculture Research Field of HRC, BARI, Gazipur during 2023- 2024 to identify the suitable germplasm for commercial tuberose cultivation in Bangladesh. A wide variation was exhibited in the qualitative parameters like flower type, bud colour, petal color, floret arrangement on spike and fragrance. Three categories of flower type viz. single (57.14%), double (35.71%) and semi-double (7.14%) was observed. All the germplasm showed white petal colour except TR-012 and TR-021 which showed creamy white colour. The germplasm TR-013, TR-020 and TR-022 produced heavy scented flowers. The quantitative data revealed that, TR-010 produced the longest spike (101.5 cm) followed by TR-022 (99 cm). TR-020 and TR-022 showed the highest spike diameter (1 cm). The longest rachis (40 cm) and the maximum number of florets/ spike (50) was recorded by TR-020. The germplasm TR-020 also showed the maximum spike weight (99.5 g) and longest vase life (8.52 days). Considering fragrance, longest rachis, weight and vase life, TR-020 found suitable as double cut flower and considering the longest spike and the floret diameter the germplasm TR-010 and TR-17 found suitable as single cut flower respectively for commercial cultivation in Bangladesh.

Evaluation, characterization and maintenance of liliium

K. Ambia, F.N. Khan, N. Pervin and N. T. Hasan

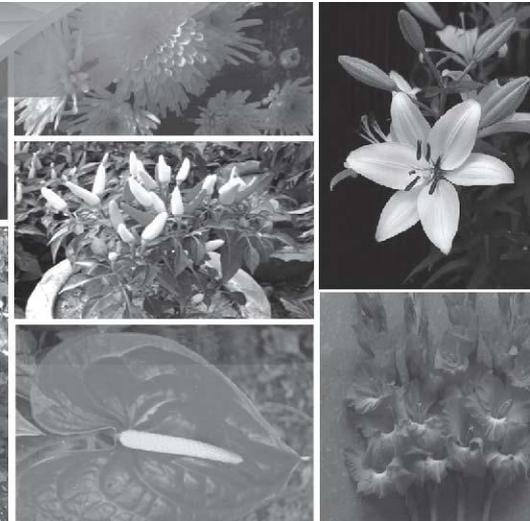
Twenty four germplasms of *Lilium* including BARI Liliium-1, BARI Liliium-2 and BARI Liliium-3 were evaluated to characterize the different species of *Lilium* available in Bangladesh and abroad and to

conserve the collected germplasms for future research under *Lilium* shade at Floriculture Division, HRC, BARI during the Rabi season of 2023-24. The longest plant (89.4cm) was produced by the germplasm Lil-029, longest stalk was recorded in Lil-034 (92.5cm), and maximum number of florets per stalk (11.0) was produced by BARI Liliium-1.

Evaluation, characterization and maintenance of gladiolus

M. T. Rashid, F. N. Khan, N. Pervin, K. Ambia and N. T. Hasan

A study was conducted at Floriculture Farm, Horticulture Research Centre, BARI, Joydebpur, Gazipur during the period from November 2023 to May 2024 to evaluate the performance of different germplasms of gladiolus for selecting promising germplasms in respect of flower production. The germplasm differed significantly among themselves. The maximum height (68.0 cm) was observed in V₈ (GL-040) followed by V₆ (66cm) and V₄ (60 cm). The maximum number of florets per spike (15) was recorded from V₂ (GL-02) and V₆ (GL-025) closely followed by V₇ (GL-037) (14.5). The longest spikes were produced by V₆ (GL-025) (95 cm) closely followed by V₇ (GL-037) (90.0 cm) and V₂ (GL-002) (90.0 cm). Similar trend was also found in case of rachis length and spike weight. Flower yield was also recorded higher in V₇ (GL-037) (230000/ha) followed by V₆ (GL-025) (225000/ha). V₃ (GL-003) was earliest in days to 50% spike initiation (47 days) followed by V₂ (GL-002) (49 days) and V₄ (GL-012) (50 days). It was revealed from the study that GL-002, GL-012, GL-025 and GL-037 found as promising germplasm for selection on the basis of its flower characters such as attractive color, early flowering, maximum number of florets, longest spikes and rachis, highest weight of spike, longest shelf life, etc.



Evaluation, characterization and maintenance of chrysanthemum germplasm

K. Ambia, F.N. Khan, N. Pervin, N. T. Hasan

Eleven Chrysanthemum germplasms with BARI Chrysanthemum-1 and BARI Chrysanthemum-3 as check were evaluated to characterize the different germplasms and to find out the superior germplasms of Chrysanthemum at the Floriculture field of HRC, BARI, Gazipur during Rabi season of 2023-24. The tallest plants were recorded in CM-005 (66.5cm), maximum number of flowers per plant was counted in CM-001 (160.0) and CM-001 also produced longest flower stalk (42.1cm). The vase life varied from 7-12 days among the germplasms.

Evaluation, characterization and maintenance of cactus and succulents

K. Ambia, N. T. Hasan, M. T. Rashid and F.N. Khan

Thirty cactus germplasms and twenty-three germplasms of succulents were evaluated to characterize and maintain at Floriculture Field of HRC, BARI, Gazipur during the year 2023-24. Wide variation in respect of vegetative and floral traits was observed. Among the germplasms, Cac-011 exhibited distinctly large flower than the others. Flower durability varied from 2.0 to 7.0 days. The germplasms Cac-015 and Cac-016 produced higher number (15.0 and 13.0 respectively) of flower whereas Cac-008 produced lowest number of flower (2.0). A large variation was found in shape, size and colour of the observed germplasms. Succulent germplasms showed wide variation in different growth characters.

Collection, evaluation and maintenance of gerbera

N. Pervin, F.N. Khan, N. T. Hasan, K. Ambia and M.T. Rashid

Four germplasm of gerbera were collected and evaluated at the Floriculture Research Field of HRC, BARI, Gazipur during 2023- 2024 to find out the suitable line (s) for cut flower as well as for future breeding program. The germplasm showed wide range of variation for all quantitative and qualitative characters under the study. The tallest plant was produced by GJ-001 (40.00 cm). The maximum number of leaves/plants was produced by GJ-003 (27.00). The maximum plant spread

(24.5 cm) was recorded in GJ-001 closely followed by GJ-002 (23.3 cm). The maximum number of suckers per plant was produced by GJ-001 (3.33) closely followed by GJ-002 and GJ-003 (3.00). The germplasm GJ-004 showed the longest flower stick (54.33 cm). The maximum flower stick diameter (0.93 cm), flower size (10.97cm) and fresh single flower weight (20 g) was observed in GJ-001. The maximum number of flowers (15.33) was produced by GJ-002. Among the germplasm, GJ-003 (13 days) showed the maximum vase life in room temperature followed by GJ-002 (10.33 days). Based on colour, flower number, flower size and vase life, the germplasm GJ-001, GJ-002 and GJ-003 were identified as promising.

Collection, evaluation and maintenance of amaryllis

N. Pervin, F. N. Khan, K. Ambia, M. T. Rashid and N. T. Hasan

Fifty-nine amaryllis germplasm were evaluated to characterize, maintain and conserve the collected germplasm for varietal development at the Floriculture Research Field of HRC, BARI, Gazipur during 2023- 2024. A wide variation was exhibited in the growth and flowering parameters like leaf number, leaf length, leaf diameter, days to bud initiation, days to bud burst, days to bud bloom, floret length, floret diameter, no. of flower/plant, stalk length, stalk diameter and no. of stick/pot. The maximum no. of leaves was produced by H-041 (7.50) followed by H-025 (7.00). The longest leaf (71.75 cm) was recorded by H-040. The germplasm H-010 required the minimum days for bud initiation (25.50 days), bud burst (28.50 days) and bud bloom (29.50 days). The largest flower (19.20 cm) was obtained from H-058. The germplasm H-034 produced the maximum no. of flower /plant (10). The maximum no. of sticks/pot (6.50) produced by H-025. Considering flower colour, attractiveness, early bud initiation, bud burst and bud bloom, long duration blooming, flower size, number of flowers, number of stick/pot the germplasm H-001, H-003, H-004, H-008, H-010, H-011, H-013, H-014, H-018, H-020, H-021, H-024, H-025, H-028, H-033, H-034, H-037, H-040, H-044, H-045, H-049, H-051, H-054, H-055, H-058 and H-059 were considered as promising.

Advanced yield trial of heliconia

F. N. Khan, N. Pervin, K. Ambia, N. Tabassum and M. T. Rashid

A study on the performance of seven heliconia germplasm was conducted at Floriculture Field of HRC, BARI, Gazipur during 2023-2024 to confirm the results of the preliminary yield trial to select suitable lines for variety development. Wide ranges of variations for all qualitative and quantitative characters were observed. Based on flower colour, erect habit, shoot number and vase life, H-004, H-007 and H-008 were identified as promising germplasms.

Collection and evaluation of foliage and ornamental plants

F. N. Khan, N. Pervin, K. Ambia and M. T. Rashid

A study on the performance of foliage and ornamental plants was conducted at Floriculture Field of HRC, BARI, Gazipur during 2023-24 for collection and conservation of house plants by Floriculture Division of Horticulture Research Centre, BARI. Some germplasms of foliage and ornamental plants were collected and evaluated that showed wide range of variation for the traits under studied.

Collection, evaluation and maintenance of water lily

N. T. Hasan , F.N. Khan, M.R. Islam, K. Ambia and M.T. Rashid

A study on the performance of twenty water lily germplasm was conducted at Floriculture Field of HRC, BARI, Gazipur during 2023-24 to evaluate, characterize and conserve the germplasm for future research. Wide range of variations for all qualitative and quantitative characters were observed. All native water lilies are normally tropical type. In case of hybrid water lily, maximum was hardy type except Purple and Pink Capenses, Tropic Sunset, Dauben and Chompu Mameu. Regarding flower size, two native water lily N-001 and N-002 and five hybrid water lily e.g. N-010, N-014, N-019, N-022 and N-023 produced larger flowers (> 10.0cm). Maximum water lily both native and hybrid remain in good condition for 3.0 days whereas N-16 showed comparatively good durability in tub/chari (4.0 days). Regarding number of flowers/plant for 4 months, the native water lily like N-002 and N-005 and the hybrid N-

010, N-011, N-012, N-013, N-014, N-015, N-021 and N-24 produced more flowers (=6.0 to 13flowers/plant).

Collection and evaluation of tulip (*Tulipa sp*) germplasm

F.N. Khan, M.R. Islam, K. Ambia, Mt. Rashid and N. T. Hasan

An observational study on the performance of six Tulip germplasm was conducted at Floriculture Field of HRC, BARI, Gazipur during 2023-24 to characterize and conserve the collected germplasm for future research. Wide range of variations for all qualitative and quantitative characters were observed. T-001 (Laibela) is little early bloomer and produced large and attractive red colour flower. Other germplasm are also attractive considering colour and petal arrangements. T-012 took the maximum days (12) for bud burst. The maximum vase life (10 days) was recorded in T-001. The maximum field life was occurred in T-011. It is second year observation of Tulip in the field. More number of germplasms should be collected for continuing the experiment in order to improve this flower under Bangladesh context.

Hybridization in gladiolus flower

F.N. Khan, N. Pervin, K. Ambia, Mt. Rashid and N. Tabassum

A hybridization program on gladiolus was conducted in the flowering season November, 2016 to June, 2024 at Floriculture Farm, Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur to develop new hybrid varieties. Fifteen crossing were done among some attractive gladiolus germplasms and pods were successfully produced. A large number of cormels were produced from a single cross from first generation. After a successive year of maintenance 15 new gladiolus hybrids have been found.

Effect of potting media on growth and yield of spider lily

M. T. Rashid, F. N. Khan, N. Pervin, K. Ambia, and N. T. Hasan

An investigation was conducted on the effect of potting media on growth and yield of spider lily (*Hymenocallis speciosa* L.) in the Floriculture field of Horticulture Research Centre, Bangladesh Agricultural Research Institute during 2023-24 to develop standard media for its successful

cultivation. The experiment was laid out in a completely randomized design with 6 treatments and each treatment replicated thrice. The maximum plant height (70.0 cm), leaf number (28.3), leaf length (58.0 cm) and width (5.8 cm), days to spike emergence (94.5), spike no. (6), flowering duration (20.6) were found with T₄-Cocodust + Vermicompost (1:1) treatment. Poor performance of all characteristics of spider lily was exhibited in only soil (T₁).

Morphological study of *bougainvillea* lines based on dus test

M. T. Rashid, F. N. Khan, N. P. Mukta, K. Ambia and N. T. Hasan

The experiment was carried out during 2023-24 to estimate the morphological variability of 14 Bougainvillea lines at experiment field of floriculture division, HRC, BARI, Gazipur. Out of the 14 lines, four had lanceolate leaf blade shape while seven lines had medium ovate. Two lines had non-persistent leaves and rest were persistent. The results suggested that the characterization data of these lines can be used as a reference for registration of new varieties under PPV&FR Act, 2001. This investigation may also be helpful to the researchers with respect to breeding of Bougainvillea varieties for particular traits. Moreover, ornamental plant growers can also get benefited with regards to selection of suitable varieties of their interest.

Performance of commercial cultivars of gerbera collected from various sources under protected condition

N. Pervin, F. N. Khan, N. T. Hasan, K. Ambia and M. T. Rashid

An experiment was conducted at Floriculture division, HRC during 2023-24 to observe the performance of Gerbera from various collected sources. Two different sources such as S₁= KF Bio plants, S₂= Apex Agri-science were considered as factor A and four Gerbera germplasm viz., V₁=Red, V₂= White, V₃=Pink, V₄= Yellow were considered as factor B. Analysis of data revealed that different source had a significant effect on most of the attributes of Gerbera. The highest number of suckers/ plant (3.33) was produced by KF Bio plants with red Gerbera (S₁V₁) followed by KF Bio plants with white Gerbera (3.00) (S₁V₂). The

maximum flower stalk diameter (0.93 cm), flower size (10.96 cm) and fresh single flower weight (19.66 g) was obtained by KF Bio plants with red Gerbera (S₁V₁). The highest number of flowers/ plant (15.33) was found by KF Bio plants with white Gerbera (S₁V₂). The KF Bio plants with pink Gerbera (S₁V₃) showed the maximum vase life (13.00 days). Red, white and pink gerbera with the source KF Bio plants (S₁V₁, S₁V₂ and S₁V₃) were suitable combinations for the maximum growth and flowering of gerbera flower.

Performance of succulents in different potting media at shade condition

N. T. Hasan, F.N. Khan, N. Pervin, K. Ambia and M.T. Rashid

An experiment was conducted at the Floriculture Shade Net House under Horticulture Research Centre of Bangladesh Agricultural Research Institute, Gazipur during 2023-24 to evaluate the performance of succulents in different potting media at shade condition. Seven treatments were used in the experiment viz. T₁= Sand 30%+Small Stone 20%+Brick piece 20%+ Cocodust 15%+ Compost 10% +Rice Husk 5%, T₂= Sand 30%+Small Stone 20%+Brick piece 20%+ Cocodust 15%+ Compost 10%+ Perlite 5%, T₃=Sand 40%+Small Stone 15%+Brick piece 15%+ Cocodust 10%+ Compost 10% + Rice Husk 10%, T₄= Sand 40%+Small Stone 15%+Brick piece 15%+ Cocodust 10%+ Compost 10%+ Perlite 10%, T₅= Sand 20%+Small Stone 25%+Brick piece 25%+ Cocodust 10 %+ Compost 10%+ Rice Husk 10%, T₆= Sand 20%+Small Stone 25%+Brick piece 25% + Cocodust 10 %+ Compost 10%+ Perlite10%, T₇ = Cocodust 40% + Sand 25% + Cowdung 25% + Perlite 10%. The experiment was laid out in Completely Randomized Design with five replications. Among the treatments T₆= Sand 20%+Small Stone 25%+Brick piece 25% + Cocodust 10 %+ Compost 10%+ Perlite10% performed the best in respect of plant height, no. of leaves, plant spread.

Standardization of potting media for better growth and yield of *dendrobium* orchid

N. T. Hasan, F.N. Khan, M.R. Islam, K. Ambia and M.T. Rashid

The present investigation was carried out at Floriculture field of Horticulture Research Centre, Bangladesh Agricultural Research Institute during

2023-24 to improve for higher survival percentage and faster growth. The experiment was laid out in a completely randomized design with 6 treatments and each treatment replicated thrice. The data recorded on various parameters viz., plant height, leave number, leaf area, spike length, Number of flowers and number of inflorescence and were statistically analyzed. Significant differences were observed among different potting media on various parameters in Dendrobium orchids. Among all the treatments, T₁ = Charcoal:Coconut Husk (50:50) showed significantly the best results with respect to plant height (15.8 cm), number of leaves (9.5), leaf area (40.0 cm), length of spike (20.1cm), number of flowers (14.0), No. of inflorescence (2).

Root initiation and flower production of chrysanthemum influenced by rooting hormone and cutting time of seedlings

F.N. Khan, N. Parvin, K. Ambia, Mt. Rashid and N. Tabassum

An experiment was conducted at Floriculture Research Field, HRC, BARI during August 2023 to May 2024 to see the effect of rooting hormone and its method of application on root initiation of chrysanthemum and to find out the optimum time for cutting of chrysanthemum seedlings. Rooting hormone as powder form showed better performance regarding seedling height (16.61cm), leaf number (11.74), root number and length (44.27 & 15.61cm, respectively), the highest plant (31.48cm), maximum number of primary and secondary branch/plant (12.42), marketable branch/plant (7.71) and also maximum flowers (31.88) at blooming stage. Cutting for seedling preparation at 1st August showed the highest seedling (18.14cm), maximum number of leaves and roots (11.58 & 62.76, respectively) and the longest root (17.24cm), the highest plant (30.57cm), maximum number of primary and secondary branch/plant (12.66), marketable branch/plant (7.36) and also maximum and largest flowers (33.64 & 4.99cm, respectively) at blooming stage. The Seedlings cutting at 1st August with the application of powder form of rooting hormone produced the maximum number of roots (75.43), the longest root (20.17cm) and the maximum number of flowers/plant (44.67) with highest benefit cost ratio (6.51) at blooming stage. On the other hand, Control i.e. without hormone and 4th

cutting time i.e. cutting done at 21st August showed poor performances regarding all the parameters.

Production and quality of *Cordyline* spp. Influenced by different substrates

Mt. Rashid, F.N. Khan, N. Pervin, K. Ambia and Nt. Hasan

Production and quality of *Cordyline* spp. Influenced by different substrates was evaluated during 2023-2024 at Floriculture field of Horticulture Research Centre to study the impact of different media compositions and to find out the most suitable media for quality production of *Cordyline* spp. The Maximum plant height (70.0 cm), number of leaves (11.6), leaf length (35.0 cm), leaf width (9.5 cm) and visual plant grade (4.50) were recorded with the medium containing cocodust + perlite + vermicompost in 1:1:1, (v/v) combination.

***In vitro* propagation of liliium**

S.R. Haque, A. Naznin, F. N. Khan and M. K. Jamil

The experiment was commenced with a view to develop a suitable protocol for in-vitro propagation of BARI germplasm Liliium-028. Treatment T₂ (4 mg/l BAP) and T₃ (1 mg/l BAP+1 mg/l NAA) both caused shoot proliferation of Liliium-028 where survival percentage were 90% for all. Treatment T₂ (4 mg/l BAP) caused early days to shoot initiation for Liliium-028 (9 days). Treatment T₂ also the highest no. of shoots per explant and the highest shoot height for Liliium-028 (4.3 and 5.2 cm). Both the treatments, T₂, T₃ showed success on rooting of Liliium-028 but the highest 100% root initiation was observed in treatment T₃. After two months in the media treatment T₃ showed better result in case of the maximum no. of root (10) and length of root (2.9) for Liliium-028.

***In vitro* propagation of gerbera**

K. Ambia, N. T. Hasan, N. Pervin and F. N. Khan

A study was conducted during 2023-24 at the tissue culture lab, HRC, BARI to develop a suitable in vitro protocol for Gerbera multiplication. Capitulum from BARI Gerbera-1 and BARI Gerbera-2 were used as explants. Explants were inoculated in the MS media with hormones (2.0mg/L BAP+0.5mg/L IAA) at 25±7 °C with a 16 h photoperiod (2000 lux) provided by cool white

fluorescent tubes for shoot development. Both the varieties responded well.

***In vitro* propagation of gladiolus hybrids**

S.R. HAQUE, A. NAZNIN, F. N. KHAN and M. K. JAMIL

Hybrid Gladiolus -8 which were collected from flower field of Floriculture Division of HRC, BARI during 2023-24 to develop *In-vitro* propagation protocol of gladiolus hybrid. All the node explants were inoculated in the different treatments containing culture media (T_1 =control, T_2 = 3 mg/l BAP, T_3 = 4 mg/l BAP). Among the treatment T_2 , T_3 both showed success on shoot proliferation of Hybrid Gladiolus-8, where treatment T_2 showed the highest survival percentage (70%) and highest no. of shoot (2.3 no.).

Survey on botrytis blight disease in liliium

L. Yasmin, M. Afroz and M. M. Rahman, F. N. Khan and M.S. Ali

Survey was conducted in Floriculture research field of Horticulture Research Centre, BARI, Gazipur during December 2023 to March 2024 to record the incidence and severity of botrytis blight disease of liliium. The surveyed germplasm were Lil-001, Lil-002, Lil- 018, Lil -021, Lil -022, Lil- 023, Lil -024, Lil- 025, Lil- 027, Lil -028, Lil -029, Lil -036, Lil- 041 and Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence of botrytis blight of liliium was 0-35% in Lil-001, Lil-002, Lil- 018, Lil -021, Lil- 025, Lil -028, Lil -029, Lil -036, Lil- 041, Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence was 60-70% in Lil- 023, Lil -024, Lil- 027 and Lil -022. The highest PDI was 67% in Lil- 028 and lowest was 0% in Lil-002. The PDI was 10-56% in Oriental (white), Oriental (Pink), Lil - 036, Lil- 018, Lil -021, Lil -027, Lil-001, Lil -042, Lil -023, Lil -024, Lil -022, Lil -041, Lil -025 and Lil -028.

Effect of zinc and boron on growth, seed yield and quality of gypsophila

M. A. Quddus, M. Aatur Rahman, R. Ahmed and F. N. Khan

An experiment was conducted in winter season of two consecutive years of 2022-23 and 2023-24 to evaluate the effect of zinc and boron on growth, yield traits and yields of gypsophila. The experiment was planned with 16 treatment combinations involving four levels each of zinc (0,

2, 3 and 4 kg ha⁻¹) and boron (0, 1, 2 and 3 kg ha⁻¹) following RCBD factorial design with three replications. The result indicated that joint application of Zn 3 kg and B 2 kg ha⁻¹ produced highest number of fruits (90.4) and highest seed yield (886 kg ha⁻¹) with higher percent yield increment (47.9%) over control. The interaction effect of zinc and boron was superior to their single effect. The result suggests that combined application of Zn 3 kg and B 2 kg ha⁻¹ can increase the seed yield of gypsophila. The present findings may have potential in improving the seed yield and production of gypsophila in the areas where soils are deficit in zinc and boron.

Optimization of drying temperature for retaining colour and bio-active properties of butterfly pea as functional drink source

Z. H. Fahad, M. A. Rahman, M. S. Arfin and N.T. Hasan

The sole purpose of the study was to observe the bioactive response and qualitative sustainability of butterfly peas dried at different temperatures. The experiment was conducted at the Laboratory of Postharvest Technology HRC, BARI, Gazipur, during 2023-24. Butterfly pea flowers were collected from the Floriculture division, HRC, BARI. Flowers were washed and dried at 40, 50, 60, and 70°C in a cabinet dryer for 6 hours as treatments T_1 , T_2 , T_3 , T_4 , and T_5 , respectively. The bioactive and storage properties were observed, and the color was measured. Regarding color and storage properties, the best-suited temperature is 60°C for cabinet drying. The blueness (b^*) remained highest in T_3 and scored -22.4, as well as in the cold-water extraction; it scored -2.00; the total phenolic content was the highest at 16.15±0.19 mg GAE/g sample for T_3 ; the lowest value was 14.10mg GAE/g sample in T_1 . The total flavonoid content was 10.76±0.40, 10.46±0.12, 13.61±0.08, 13.06±0.18mg QE/g sample for T_1 , T_2 , T_3 , and T_4 , respectively. the total anthocyanin content was non-significant; the higher value was 9.00±0.08 mg QE/g sample for T_3 , and the lowest was 8.25±0.12 mg QE/g sample for T_4 . The storage is affected by its packaging material. The extraction properties were highest browns quickly in T_1 and T_2 . The study concludes with thermally stable insights into butterfly pea flowers for further functional food-based processing.

Research Carried out by different section of HRC

ARS Khulshi, Chattogram

Evaluation of pummello germplasm in Chattogram region

S.M.K.H. Chowdhury, H. Barua, M.G. Azam, A.S.M.H. Rashid

An experiment was conducted at Agricultural Research Station, Khulshi, Chattogram during 2023-2024 for the evaluation of twenty-five pummello genotypes. Among these genotypes, fourteen genotypes produced fruits. CG Pah002 gave maximum number of fruits that was 48 followed by CG Pah022 (45). CG Pah 014 gave minimum number of fruit (11) followed by CG Pah 020 that was 12. The heaviest fruit (1860.40 g) was recorded from CG Pah003 followed by CG Pah001 that weighted 1456.33 g. The lightest fruit (673.8 g) was observed in CG Pah020 followed by CG Pah015 that weighted 699.5 g. The highest total soluble solid (10.76%) was counted from CG Pah002 followed by CG Pah006 that was 9.31%. The lowest total soluble solid (7.3%) was counted from CG Pah015 followed by CG Pah005 that were 7.5 %. Maximum edible portion (60.71 %) was calculated from CG Pah002 followed by CG Pah005 that was 60.3 %. Minimum edible portion (42.22 %) was calculated from CG Pah008 followed by CG Pah020 that were 42.71 %. CG Pah022 produced maximum amount of fruit (46.35 kg/plant) followed by CG Pah003 (39.07 kg). CG Pah020 produced minimum amount of fruit (8.09 kg/plant) followed by CG Pah014 (9.63 kg).

Hybridization of mango at Chattogram region

S.M.K.H. Chowdhury, H. Barua, M.G. Azam, A.S.M.H. Rashid

The hybridization program was conducted in mango orchard of Agricultural Research Station, Khulshi, Chattogram during 2023-2024 to develop premium quality mango variety with year-round production. Hybridization was made between BARI Aam-3 and BARI Aam-11. Out of 83 emasculated flowers, 53 fruits were set but all dropped off in 17 inflorescences of crossing between BARI Aam-3 and BARI Aam-11. One seedling during 2021-2022 and two seedlings during 2022-2023 from crossing between BARI

Aam-3 and BARI Aam-11, were planted in experimental orchard of ARS, Khulshi, Chattogram.

Evaluation of local and exotic mango germplasm in Chattogram region

S. M. K.H. Chowdhury, H. Barua, M. G. Azam, and A. S. M. H. Rashid

Eighteen genotypes of mango were evaluated at Agricultural Research Station, Khulshi, Chattogram during 2023-2024. Earliest flowering (01 January 2024) in MI Pah 057 and the latest flowering (13 February 2024) in MI Pah 019 was observed. The early Maturity (24 May 2024) recorded from MI Pah002 and the late maturity was observed from MI Pah005 (02 August 2024). Maximum edible portion (84.75 %) was recorded from MI Pah 005 followed by MI Pah 029 (82.78%) and the lowest edible portion (57.95 %) was recorded from MI Pah 021 followed by MI Pah 026 (67.18%). Total Soluble Solids from MI Pah 029 noted maximum (24.55oBrix) followed by MI Pah 056 (23.69oBrix) and Total Soluble Solids from MI Pah 020 noted minimum (13.82oBrix) followed by MI Pah 003 (15.25 oBrix). The highest yield (21.10 t/ha) was harvested from MI Pah 011 followed by MI Pah 056 (11.92 t/ha) and the lowest yield (0.29 t/ha) was harvested from MI Pah 022 followed by MI Pah 019 (0.32 t/ha).

Evaluation of kancha-mitha mango germplasm in Chattogram region

H. Barua, S.M.K.H. Chowdhury and A.S.M.H. Rashid

The experiment was conducted at Mango orchard of Agricultural Research Station (ARS), Khulshi, Chattogram during 2023-2024 to asses mango genotype to release as a kancha-mitha mango variety. This study comprised three genotypes of mango, namely MI Pah 007, MI Pah 010, and MI Pah 020, as well as BARI Aam-9 as a check. Except for MI Pah 007, which bloomed in January, all genotypes produced flowers in February. The highest fruit weight (143.80 g) was MI Pah 020. On the other hand, MI Pah 007 produced the lowest fruit weight (82.80 g). MI Pah 010 produced the longest fruit (9.37 cm) and MI Pah 007 produced the shortest fruit (7.12 cm), on the other hand, the widest fruit (5.93 cm) were produced by MI Pah 020 and the narrowest fruit (4.77 cm) were produced by BARI Aam-9. The highest TSS (10.40

%) was obtained from BARI Aam-9 followed by MI Pah 020 (8.80 %) which was very good to taste. MI Pah 020 produced the highest yield per plant (21.28 kg), while the MI Pah 007 genotype produced the lowest yield per plant (3.73 kg).

Collection and evaluation of local mango germplasm in Chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Sixty germplasm of local mango were evaluated at Agricultural Research Station, Khulshi, Chattogram during 2023-2024. Among of them twenty-eight germplasm produce flowering this year. Earliest flowering (last week of January 2024) in MI Pah 024, MI Pah 029, MI Pah 030, MI Pah 040 and MI Pah 063 and the latest flowering (1st week of March 2024) in MI Pah 032 and MI Pah 075 was observed. The heaviest fruit (325.02 g) was recorded from MI Pah 055 and the lightest fruit (134.20 g) was recorded from MI Pah 023). The longest fruit (15.70 cm) was obtained from MI Pah 044 whereas the shortest fruit (6.51 cm) was obtained from MI Pah 023. Maximum number of fruits per plant at mature stage (71) was produced by in MI Pah 025 and minimum (08) was produced by MI Pah 030. The highest edible portion (79.35 %) was recorded from MI Pah 055 and the lowest edible portion (68.46 %) was recorded from MI Pah 023. Total Soluble Solids from MI Pah 032 noted maximum (24.02 %) and MI Pah 064 noted minimum (15.82 %). The highest yield (18.16 kg) was harvested from MI Pah 064 and the lowest yield (1.85 kg) was harvested from MI Pah 030. There was a variation in both skin color and flesh color. There was medium fibre in MI Pah 010 and MI Pah 021. The less fibre was obtained from MI Pah 030. The remaining germplasm had no fibre in the flesh.

Collection and evaluation of coffee germplasm in Chattogram region

S. M. K.H. Chowdhury, H. Barua, M.G. Azam and A. S. M. H. Rashid

An experiment was conducted at Agricultural Research Station, Khulshi, Chattogram during 2023-2024 to evaluate twenty coffee genotypes to identify the best genotype for releasing as variety. The highest number of bean (3145) per plant was obtained from CA Pah 004 followed by CA Pah 003 that was 2613 and the lowest number of bean

(80) per tree was found from CA Pah 013. CA Pah 004 gave the maximum individual bean weight (1.35 g) that was followed by CA Pah 003 weighing 1.33 g and, the genotype CA Pah 018 provided minimum weight (0.93 g) that was followed by CA Pah 001, CA Pah 011 and CA Pah 013, weighing 1.12 g. In case of dry bean, the individual weightiest bean (0.63 g) was obtained from CA Pah 006 followed by CA Pah 003 weighing 0.61 g and the lightest (0.27 g) was attained from CA Pah 016 followed by CA Pah 011 weighing 0.32 g. The highest fresh bean yield per plant (4245.75 g) was obtained from CA Pah 004 followed by CA Pah 003 which was recorded as 2475.29 g and the lowest bean yield per tree was found from CA Pah 013 which was recorded as 89.06 g followed by CA pah 001 (362.88 g). The highest dry bean yield per plant (1593.93 g) was obtained from CA Pah 003 followed by CA Pah 004 which was recorded as 1509.60 g and the lowest bean yield per tree was found from CA Pah 013 which is recorded as 33.60 g followed by CA Pah 014 (154.44 g).

Evaluation of mangosteen germplasm in Chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Five years old two mangosteen seedlings i.e., GM Pah 001 and GM Pah 002 were collected from Chattogram region in 2018 and were evaluated during 2023-2024 at Agricultural Research Station, Khulshi, Chattogram to develop the promising mangosteen germplasm for higher yield and qualities. Both plants flower bloom in February and are harvested in July. GM Pah 001 produces 35 fruits per plant, with each fruit weighing 68.75 g. The fruits have a length of 5.2 cm and a breadth of 0.9 cm, and each fruit contains 6 arils. The total fruit yield per plant for GM Pah 001 is 2.41 kg. In contrast, GM Pah 002 yields 33 fruits per plant, each fruit weighing 11.75 g. These fruits have a length of 4.1 cm and a breadth of 1.1 cm, and each fruit contains 7 arils. The total fruit yield per plant for GM Pah 002 is 0.39 kg. The total soluble solids (TSS %) percentage is 18.10 %, and the edible portion of the fruit is 27.75% in GM Pah 001. The organoleptic test rates GM Pah 001 as excellent. In comparison, GM Pah 002 has an aril weight of 6.34 g and an exocarp weight of 7.23 g, but it does not produce any seeds. This variety is rated as better in the organoleptic test.

Regional yield trial of pod potential country bean lines in Chattogram region

S.M.K.H. Chowdhury, H.Barua, M.G. Azam and A.S.M.H. Rashid

The experiment was conducted at Agricultural Research Station (ARS), Khulshi, Chattogram during Rabi season 2023-2024 to find out the best genotypes to release as a variety. The treatment consists of 11 promising lines and BARI Sheem-1 as a check variety. LP Jam008 required the fewest days (37.67 DAS) to flower whereas LP Pah 006 needed the most days (64.00 DAS) to flower. The BARI Sheem-1 produced the most number of pod panicle-1 (10.93) and DL032 produced lowest pod panicle-1 (4.57). the highest yield (21.38 ton ha⁻¹) was obtained from LP Pah006 followed by LP KK013 that was 20.43 ton ha-1 and the lowest yield (8.38 ton ha-1) recorded from DL Isd 021 followed by LP Jam008 that was (11.78 ton ha⁻¹).

Preliminary yield trial of bold seeded country bean lines in Chattogram region

H. Barua, S.M.K.H. Chowdhury and A.S.M.H. Rashid

The experiment was conducted at Agricultural Research Station (ARS), Khulshi, Chattogram during Rabi season 2023-2024 to find out the best genotypes to release as a bold seeded variety. The treatment consists of three promising lines selected based on the performance of the last four years and BARI Sheem-10 as a check variety. Earliest flowering was observed in LP pah 019 (53.67 days) whereas the latest flowering was observed in LP Pah 015 (87.00 days). LP Pah 019 produced the longest pods at 11.41 cm, LP Pah 015 produced the shortest pods at 8.24 cm. BARI Sheem-10 produced the largest diameter at 2.29 cm. LP Pah 019 has produced the most seeds per pod with 5.20. LP Pah 019 has produced the highest 100 seed weight at 141.27 g. BARI Sheem-10 produced the longest seeds at 1.95 cm. Highest seed diameters was found in LP Pah 013 and BARI Sheem-10 measuring 1.32 cm. Seeds of LP Pah 013 are the thickest at 1.02 cm. LP Pah 019 was produced the highest seed yield at 7.34 tonnes per hectare. LP Pah 015 follows with a yield of 6.48 tonnes per hectare. In terms of yield and yield contributing characters, LP Pah 015 and LP Pah 019 were considered to be promising.

Hybridization of country bean

H. Barua, S.M.K.H. Chowdhury and A.S.M.H. Rashid

The hybridization program was conducted at the experimental field of Agricultural Research Station, Khulshi, Chattogram during 2023-2024 to develop country bean variety with off season production. A non-reciprocal cross was made between eight parental line of country bean (BARI Sheem-8, BARI Sheem-10, LP Pah-15, LP Pah-25, BARI Sheem-7, IPSA Sheem-1, IPSA Sheem-2 and Rupbaan). Out of 583 emasculated flowers, highest two pods were developed BARI Sheem-8 x IPSA Sheem-1, BARI Sheem-8 x IPSA Sheem-2 and LP Pah-15 x IPSA Sheem-2. Another non-reciprocal cross between BARI Sheem-8 x BARI Sheem-7 and LP Pah-15 x Rupbaan, only one pod were developed.

Collection and evaluation of drumstick germplasm in Chattogram region

H. Barua, S. M. K.H. Chowdhury and A. S. M. H. Rashid

Two four-year old drumstick germplasms were evaluated during 2023-2024 at Agricultural Research Station, Khulshi, Chattogram to develop the promising drumstick germplasm for higher yield and qualities. This study compared two drumstick (*Moringa oleifera*) germplasms, designated as MO Pah 001 and MO Pah 002, focusing on their growth, morphology, and pod characteristics. Both accessions were 4 years old. MO Pah 001 exhibited superior growth parameters, including greater height, girth, spread, and number of branches per plant compared to MO Pah 002. Furthermore, MO Pah 001 flowered in February, whereas MO Pah 002 flowered in January. In terms of pod characteristics, MO Pah 001 demonstrated higher pod production per plant (712) and greater pod yield per plant (25.63 kg) compared to MO Pah 002, which produced 335 pods with a yield of 12.36 kg. While individual pod weight and length were slightly higher in MO Pah 001, pod breadth was similar between the two accessions.

Performance of lettuce spinach in recirculating hydroponics system

S. M. K.H. Chowdhury, M. G. Azam, H. Barua and A. S. M. Harunor Rashid

The experiment was conducted in Agricultural Research Station (ARS), Khulshi, Chattogram

during 2023-2024 to find out the feasibility of vegetable production in hydroponics system in Chattogram region. The weight of each plant of BARI Lettuce-1 and BARI Palongshak-2 were found 131.7 g and 114.3 g respectively. The number of leaves from a single plant was 16.3 in BARI Lettuce-1 and 11.83 in BARI Palongshak-1. The length and breadth of leaves in BARI Lettuce-1 were 24.16 cm and 11.51 cm respectively and whereas, the length and breadth of leaves in BARI Palongshak-2 were 39.75 cm and 12.76 cm respectively. The yield was found 15.95kg from 4.00 m² area and 39.86 ton/ ha in BARI Lettuce-1 and in case of BARI Palongshak-2, the yield was 17.45 kg from 4.00 m² area and 43.63 ton/ ha.

Postharvest Technology Section, HRC

Determination of maturity indices and proper harvesting time of sweet orange var. BARI malta-1

M.A. Rahman, S. Arfin and Z.H. Fahad

An experiment was conducted to determine the optimum maturity stage and proper harvesting time of sweet orange (*Citrus sinensis*) var. BARI Malta-1 at the Horticulture Research Centre of Bangladesh Agricultural Research Institute (BARI), Gazipur during March to December 2023. Fruits were harvested from the research orchard of BARI at 15 days intervals starting from 15 August and ended on 01 December. Results of this study showed that different harvesting dates had significant effect on the physico-chemical traits and storability of malta fruits. An increasing trend was found in fruit weight and diameter, juice content, total soluble solids and juice content and pH with the advancement of fruit maturity and delaying the harvesting time. On the other hand, fruit tissue firmness, total acidity and vitamin C contents had a gradual decreasing trend with delaying the harvesting time. The colour of fruit skin changed from deep green to yellowish during the maturation time. At 6±1°C and 65±5% RH, the maximum storage life 98-96 days was found in fruits harvested from 15 September to 01 October. Based on the comprehensive consideration, fruits of BARI malta-1 attained the maximum quality traits, taste and flavour during 01 October to 15 November, and hence should be harvested within this period to get best quality fruits and higher market price.

Keywords: BARI malta-1; fruit quality; maturity indices; harvest time; physico-chemical properties, storage life.

Development of low-cost ripening chamber and novel ethylene generator for uniform and safe ripening of jackfruit

M.A. Rahman, M.S. Arfin and Z.H. Fahad

An experiment was conducted in the laboratory of Postharvest Technology Section, Horticulture Research Centre, BARI, Gazipur, Bangladesh to develop a low-cost ripening chamber along with a novel ethylene gas generator (EG) for uniform and safe ripening of jackfruit. Four simple ripening chambers were made with locally available bamboo sticks, jute rope and high-density polyethylene (50 µm) film. The volume of each chamber was about one cubic meter (1m³). To get ethylene gas, novel EG was prepared with small plastic jar, a piece of cotton, 2ml ethephon and 3ml aqueous solution of NaOH. Ten well-matured but unripe jackfruits were placed into each chamber. To standardize the required number of EG; one, two or three EGs were placed around the fruits inside the ripening chamber. Chamber without EG was considered as control treatment. After 24h of treatment application jackfruits were taken out from chambers and allowed for ripening. The developed low-cost ripening chamber and novel EG found highly effective in triggering the ripening process of jackfruit within short time. Almost 100% jackfruits were uniformly ripened after 36h of treatment application even with single EG. In contrast, ripening of jackfruits under control treatment started after 60h of treatment application, increased the number gradually reaching 100% after 120h. The quality of ripe jackfruit was better, and marketable to the local as well distant markets. This is a very simple, economic and effective technology for uniform and safe ripening of jackfruits, and thus jackfruit growers and traders may be used it for proper marketing of fruits.

Keywords: Jackfruit, artificial ripening, ripening chamber, ethylene generator, quality

Nano-packaging of eggplant to extend the shelf life maintaining quality and food safety

M.A. Rahman, M.S. Arfin and Z.H. Fahad

The effect of polymeric packaging film in extending the shelf life and postharvest quality of 'BARI Eggplant-8' was investigated. Eggplant fruits were

harvested at commercial maturity stage and immersed in 0.05% aqueous scallop powder solution, fan-forced air-dried and packed into 0.5% perforated and non-perforated polyethylene, polypropylene, TiO₂ incorporated nano-polyethylene film and open basket (control). The fruits were then stored at ambient room condition (25±1°C and 65±5% RH) for 12 days. The rate of decrease in weight loss, tissue softening and ascorbic acid content delayed in fruit packed into different packaging film. The higher accumulation of CO₂ in non-perforated packaging films (1.06-1.2 ml kg⁻¹h⁻¹) reduced the respiration rate compared to unpackaged control fruits and consequently extended at least six days extra storage life. In contrast, tissue firmness and ascorbic acid contents of eggplants kept in unpackaged condition quickly decreased during the stipulated storage period along with higher transpiration loss was observed in unpackaged eggplant exhibiting values 14.8% on day 5 of storage resulting completely senescence of fruit. Results of this study demonstrated the efficacy of both perforated and non-perforated packaging films on eggplant quality and postharvest life. Therefore, these packaging films may be used as MA packaging in retail shop to extend the shelf life of eggplant up to 10-11 days at ambient conditions.

Keywords: Eggplant, Postharvest shelf life, Nano-packaging film, Delay senescence, Ambient storage

Nano-packaging of tomato to extend the shelf life maintaining quality and food safety

M.A. Rahman, M.S. Arfin and Z.H. Fahad

The effect of polymeric packaging films in extending the shelf life maintaining the postharvest quality of tomato var. 'BARI tomato-15' was investigated. Tomato fruits were harvested at the breaker-turning stage and immersed in 0.05% aqueous scallop powder solution, fan-forced air-dried, and packed into 0.5% perforated and non-perforated polyethylene, polypropylene, TiO₂ incorporated nano-polyethylene film and open basket (control). After packaging, the fruits were stored at ambient room condition (25±1°C and 65±5% RH) for ripening over 12 days. The rate of decrease in weight loss, tissue softening, surface colour development and ascorbic acid content delayed in fruit packed into different packaging films. The maximum delay occurred in fruits packed in non-

perforated polymeric films. The higher accumulation of CO₂ in non-perforated packaging films reduced the respiration rate compared to unpackaged control fruits. In contrast, the hue angle of fruit surface colour, tissue firmness and ascorbic acid contents of tomatoes kept in unpackaged condition quickly decreased during storage exhibiting values 39.3°, 0.49 kgf and 10.9 mg 100g⁻¹, respectively resulting completely ripened of fruit on day 6 of storage. Results of this study demonstrate the efficacy of both perforated and non-perforated film on tomato fruit ripening and imply prospects for using as MA packaging in retail shop for to extend the shelf life up to 10-12 days at ambient conditions.

Keywords: Tomato, Postharvest shelf life, Nano-polymeric film, Delay Ripening, Ambient storage

Maturity determination of broccoli

M. S. Arfin, M.A. Rahman, M. F. B. Hossain and Z.H. Fahad

The designed experiment aimed to determine broccoli's optimum maturity stage and shelf life (*Brassica oleracea* L. var. *italic*). The experiment was initiated at the field and laboratory of the Postharvest Technology Section, Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur, in November 2023. BARI Broccoli -1 was selected for the study. The heads were collected as per treatments and brought to the Postharvest Technology Laboratory, stored at ambient conditions (23±2 °C) for physicochemical parameters measure. Quality parameters like color, chlorophyll a, and ascorbic acid content were considered here. The heads were harvested at different harvesting dates 53, 56, 59, 62, and 65 days after transplanting was selected as experimental treatments. After transplanting it was kept for three days at ambient conditions (23±2 °C) for shelf-life study. The experiment design was RCRD at field and CRD at laboratory with three replications. Broccoli harvested at 65 days after transplanting showed slower changes in surface colour (a* -2.96 to -4.84, b* 6.92 to 15.58), 6.18 mg/100g, and Vitamin C content 50.41 mg/100g. Considering all physicochemical parameters, broccoli harvested 65 days after transplanting prolonged the shelf-life by up to three days at ambient conditions.

Survey on postharvest practices and losses in the guava value chain

Z.H. Fahad, M.N. Islam, M.A. Rahman and M.S. Arfin

A study was conducted to accumulate the scenario of existing postharvest practices and assess postharvest losses in the value chain of guava. The study was conducted by upstream survey in three intensive guava growing areas viz. Pirojpur, Jhalokati, and Chapainawabganj and three city areas, namely, BARIsal, Dhaka, and Gazipur. From each site, ten of each value chain actors (grower, fariar, bepari, arathdar and retailers) were interviewed to get answers using pre-tested questionnaires. Data on postharvest practices, losses, and other socio-economic features were gathered from January to July 2024 during the harvesting season. The collected data were compiled, analyzed, and presented on a category scale. Postharvest practices included stacking the fruits individually, sorting, grading, storing in shades, using lining or cushioning material, and optimal loading into crates. A substantial part of harvested guava was observed to be overripened in the Jhalokati and Pirojpur areas. As a result, growers harvest guava in bulk with a mixed maturity, which triggers the post-harvest loss. Stacking guava one by one in a crate or an open place is practiced mostly in the retailer and araths while at the grower level, the percentage is lower (30-40%). Sorting was lowest at grower and bepari level (20-30%) and highest at retailer (70-80%). However, Grading was reportedly practiced in retail and arath (40-60%) for price variabilities. The use of banana leaves as lining material was seen at bepari level (50-80%) in Pirojpur and Jhalokati, but in Chapainawabganj, newspapers were used primarily. Loading of guava in crates and baskets (30-60%) was hardly optimum in retailers as they Postharvest losses were reported as 1.81%, 1.68%, 5.51%, 4.99%, and 6.68% at the grower, Fariar, Bepari, Arathdar, and Retailer levels; calculated total postharvest loss of guava was 20.67%.

Optimizing vapor heat treatment temperature and time to retain colour and quality of litchi

M.S. Arfin, M.N. Islam, M. F. B. Hossain and M. M. Rahman

The experiment was conducted at the laboratory of Postharvest Technology Section, HRC, BARI Gazipur, to investigate the effectiveness of

temperature and time of vapor heat treatment. The experiment was designed with a fixed temperature and variable holding time, such as 47°C for 10, 20, 30, and 40 minutes. The effect was observed with the control by the retention of color and quality of litchi at refrigerated ($4\pm 1^\circ\text{C}$) conditions. The findings of the present study revealed that moist vapor heat treatment had a positive effect on colour and quality retention and shelf life of litchi. 47°C for 30 minutes treatment showed the minimum colour change (chroma 38.17 and hue angle 18.47). The control showed the maximum colour change (chroma 30.54 and hue angle 12.71) in 30 days of storage. The TSS increased with the storage period. Overall, the highest TSS was 20.20%, and the lowest was 18.47% in control after the 30th day of storage. The pH showed a decreasing trend during storage. The pH of 2.7 was observed at 47°C for 30 min treatment in that period, while the control showed the highest pH of 2.9 on the 30th day of storage. Considering all physicochemical parameters, 47°C for 30 min vapour heat treatment was effective for retaining skin colour and quality of litchi with 30 days of storage period.

Physicochemical characteristics and acceptability of dragon fruit jam prepared from peel and pulp

Z.H. Fahad, M.N. Islam, M.A. Rahman and M.S. Arfin

The sole purpose of the study was to identify suitable formulations in terms of physicochemical and organoleptic properties utilizing the dragon fruit peel in processed jam. The experiment was conducted in the laboratory of the Postharvest Technology Section of HRC, BARI, Gazipur. The raw materials (BARI Dragon Fruit-1) were collected from the farmers' field at the early ripe stage. The designed experiment had five treatments varying pre-selected peel pulp ratios with a fixed sugar percentage of 50% used in the prepared jam. The treatments consisted of T₁ (only pulp), T₂ (25% pulp and 25% peel), T₃ (25% pulp and 25% peel with lemon juice equivalent of the replaced citric acid), T₄ (37.5% pulp and 12.5% peel) and T₅ (12.5% pulp:37.5% peel). The design of the experiment was CRD with three replications. The usable portion of whole dragon fruit was increased from 63.34 \pm 5.08 % (Only Pulp) to 90.74 \pm 1.70% (Pulp and peel) while using peel in a processed jam. Observation of the samples for six months

showed that TSS and total sugar increased slightly during storage for all the treatments, and the ascorbic acid content decreased due to thermal and oxidative degradation during storage in ambient conditions. The color stability was stable in T₄. During storage, it scored 11.84 in redness(a*), 3.31 in lightness(L*), and 3.89 in yellowness(b*). T₅ was not stable in color properties as it initially showed the least redness with high lightness and yellowness. The organoleptic result showed the T₄ (37.5% pulp and 12.5% peel) formulation to be the best in overall acceptability and marketability. The color parameters also showed stability in the storage in T₄ compared to others. T₅(12.5% pulp:37.5% peel) formulation has the lowest overall acceptability and marketability score. The study provides valuable insight into the alternate use of fruit wastage in commercial dragon fruit jam, such as peel. Jams formulated using such fruit parts may be commercially viable and nutritionally beneficial.

Optimization of recipe on the production of strawberry-flavoured ash gourd jam

Z.H. Fahad, M.N. Islam, M.S. Arfin and M.A. Rahman

The primary objective of this study was to optimize the formulation of vegetable jam with strawberry pulp and flavourings to enhance overall acceptance and sustained quality during storage. The experiment was conducted in the laboratory of the Postharvest Technology Section of HRC, BARI, Gazipur. The jam was prepared with a standard procedure, and five treatments were tested for effectiveness. Treatments were T₁(only ash gourd pulp no additional strawberry pulp), T₂(10% strawberry pulp, 0.05% flavour, and 0.025% food color), T₃(10% Strawberry pulp with no food color or flavour), T₄(10% Strawberry pulp with no food color or flavour but citric acid is replaced with equivalent lemon juice) and T₅(Only ash gourd pulp with 0.05% flavour and 0.025% food color). The design of the experiment was CRD with three replications. The physicochemical properties of the strawberry-flavoured jam were observed for 6 months. The TSS, acidity, total sugar, and reducing sugar of all the treatments increased with the storage period, whereas the pH and ascorbic acid content decreased. The maximum ascorbic acid content was 5.85±0.13mg/100g in T₄, whereas the lowest was 2.96±0.13 mg/100g in T₁. At the initial stage, T₁ showed the highest lightness(L*),

24.98±0.13, which changed to 27.34±0.22 during storage. The lowest lightness(L*) was 4.08±0.07 in T₂, which changed to 13.46±0.05 in the 6th month. Although the redness(a*) of all the treatments except T₁ showed closer values, all significantly differ with T₁. T₁ showed a negative value of -1.71±0.03 and -0.68±0.04 for redness(a*) in the initial and 6th months, respectively. the yellowness(b*) was higher at 17.00±0.07 in T₄ at the initial stage, with no significant difference between the groups. The organoleptic analysis showed an overall acceptability of T₂ with a score of 7.9±0.57 was the highest, while T₁ performed lowest with a score of 5.2±0.92. On the other hand, marketability was also highest for T₂, followed by T₅, which ranked second in scoring on overall acceptability and marketability. The study gave insight into the potential use of vegetables in process industries incorporated with fruits.

Optimization of drying temperature for retaining colour and bio-active properties of butterfly pea as functional drink source

Z. H. Fahad, M. A. Rahman, M. S. Arfin and N. T. Hasan

The sole purpose of the study was to observe the bioactive response and qualitative sustainability of butterfly peas dried at different temperatures. The experiment was conducted at the Laboratory of Postharvest Technology HRC, BARI, Gazipur, during 2023-24. Butterfly pea flowers were collected from the Floriculture division, HRC, BARI. Flowers were washed and dried at 40, 50, 60, and 70°C in a cabinet dryer for 6 hours as treatments T₁, T₂, T₃, T₄, and T₅, respectively. The bioactive and storage properties were observed, and the color was measured. Regarding color and storage properties, the best-suited temperature is 60°C for cabinet drying. The blueness (b*) remained highest in T₃ and scored -22.4, as well as in the cold-water extraction; it scored -2.00; the total phenolic content was the highest at 16.15±0.19 mg GAE/g sample for T₃; the lowest value was 14.10mg GAE/g sample in T₁. The total flavonoid content was 10.76±0.40, 10.46±0.12, 13.61±0.08, 13.06±0.18mg QE/g sample for T₁, T₂, T₃, and T₄, respectively. the total anthocyanin content was non-significant; the higher value was 9.00±0.08 mg QE/g sample for T₃, and the lowest was 8.25±0.12 mg QE/g sample for T₄. The storage is affected by its packaging material. The extraction

properties were highest in T₃. The shrinkage was not observed at high-temperature drying initially so for the browning of the sample. However, slow drying also affected the storage quality as it shrinks and browns quickly in T₁ and T₂. The study concludes with thermally stable insights into butterfly pea flowers for further functional food-based processing.

Study on preparation and preservation of fruit drink from jamun

M.S. Arfin, M.N. Islam, M. F. B. Hossain and M.A. Rahman

The experiment was conducted at the laboratory of Postharvest Technology Section, HRC, BARI, Gazipur, to investigate the effectiveness of different preservatives such as citric acid, Potassium metabisulphite (KMS), and sodium benzoate in the quality retention of jamun juice in refrigerator (4±1°C). The design of the experiment was CRD with three replications. 10% for fruit juice was used for preparing drink with preservatives (KMS, sodium benzoate, citric acid), packed in glass bottle and preserved in refrigerator (4±1°C). The present study's findings revealed that preservatives had a positive effect on jamun juice. Positive changes occurred in colour and quality of juice during storage period. The lowest colour changes in respect of a* value decreased (a* 2.92), and b* value increased (b* -2.72), the highest total anthocyanin content 155.4 mg/100g, total flavonoids content 35.4 mg QE/100g, total phenolic content 4.6 mg GAE/100g, vitamin C content 16.7 mg/100g and total viable content at satisfactory level (1.4X10⁴) was found in KMS treated jamun drink at three month of storage in refrigerator (4±1°C). Considering all these physicochemical parameters, KMS was found effective for retaining the food quality of jamun juice for three months of storage at the refrigerator (4±1°C).

Effect of preservatives and drying condition in retaining food quality of mango slice

M.S. Arfin, M.N. Islam, M. F. B. Hossain and Z.H. Fahad

The experiment was conducted at the laboratory of Postharvest Technology Section, HRC, BARI, Gazipur, to investigate the effectiveness of different preservatives such as citric acid, potassium meta bi sulfate (KMS), and ascorbic acid in the retention of

semi-solid 'harivanga' mango slice quality prepared through 70% drying. Findings of the present study revealed that preservatives had positive effect on drying of mango slice and positive changes occurred in colour and shelf life of mango slices. In 70% drying, colour saturation increased and hue angle decreased. The changing rate was higher in control slices and lower in KMS-treated slices after 12 months of storage. The maximum colour change was observed in control treatment (chroma 53.70 and hue angle 35.66) and minimum in KMS treated slices (chroma 80.30 and hue angle 59.49). Beta carotene content decreased with the drying condition and storage time. Control treatment showed the lowest value of beta carotene content 64.71 mg/100g and the highest beta carotene content 96.96 mg/100g was observed in KMS treated slices at 70% drying after 12 months of storage. Furthermore, KMS retained the change of colour and beta carotene content of mango slices in 70% drying condition and KMS was found effective for retaining food quality of mango slice at drying condition.

Selection of suitable cutting size for semi solid dry mango slice

M.S. Arfin, M.N. Islam and M. F. B. Hossain

The experiment was carried out at the laboratory of Postharvest Technology Section, HRC, BARI, Gazipur, to find out the effectiveness of three cutting sizes, 2 slices per mango, 4 slices per mango, and cubes from mango for mango slice drying at 70%. Colour saturation increased and hue angle decreased while the changing rate was higher in cubed mango and lower in 4 slices per mango after 12 months of storage. The maximum colour change was observed in cubed mango (chroma 65.21 and hue angle 50.13) and minimum in 4 slices per mango (chroma 80.60 and hue angle 60.49). The total sugar decreased and reducing sugar increased with the storage time. The highest total sugar content was observed in 4 slices per mango (12.71 mg/100g) and the lowest in cubed mango (9.87 mg/100g). On the other hand, lowest reducing sugar content (3.63 mg/100g) was observed in 4 slices per mango and the highest (3.83 mg/100g) in cubed mango. Considering all these, 4 slices per mango were found to be an adequate cutting size for retaining the food quality of mango slice at drying conditions.

Fresh-cut processing techniques of broccoli using different acidulants

M. S. Arfin, M.A. Rahman, M. F. B. Hossain and Z.H. Fahad

The experiment was conducted at the laboratory of Postharvest Technology Section, Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur. The experiment addressed the influence of ascorbic acid and citric acid on the quality loss of fresh-cut broccoli florets in a refrigerator ($4\pm 1^{\circ}\text{C}$). The florets of broccoli were separated to treat the samples as pre-designed treatments of 1% ascorbic acid, 1% citric acid, only water, and no wash (control), and all samples were packed in a polypropylene (PP) box and kept in a refrigerator ($4\pm 1^{\circ}\text{C}$) for shelf life and quality assessment. The shelf-life varied depending on different acidulants, and biochemical and sensory parameter like phenol, flavonoid, β -carotene, total chlorophyll, carotenoids, vitamin C, appearance, flavor, texture, and overall acceptability were considered here. The results highlighted that fresh-cut broccoli treated with 1% citric acid had the highest score in sensory evaluation, with 6.84 in appearance, 2.7 in flavor, 6.3 in texture, and 6.8 in overall acceptability score along with the biochemical properties of phenol 62.7 mg GAE/g, β -carotene 1.98 $\mu\text{g}/\text{gm}$, total chlorophyll 0.046 mg/g, carotenoids 0.024 mg/g and vitamin C 20.7mg/100g. Considering all biochemical and sensory quality parameters, fresh-cut broccoli treated with 1% citric acid and packed in a polypropylene box prolonged the shelf life by up to six days in the refrigerator ($4\pm 1^{\circ}\text{C}$). The study gives valuable insights into the fresh-cut genre for the prolonging shelf life with quality assurance in refrigerated conditions.

Plant Physiology Section, HRC

Influence of humic acid on the growth, yield and physiological attributes of tomato under drought

M. Moniruzzaman and R. Khatoon

The experiment was conducted at the field of Plant Physiology Section, Horticulture Research Center, Bangladesh Agricultural Research Institute (BARI) during October 2023 to April 2023. The variety 'BARI Tomato-21' was used for this experiment. The factorial experiment consisted of three drought

stresses (DS_0 = Irrigation upto 100% FC (field capacity), DS_1 = Irrigation upto 50% FC, DS_2 = Irrigation upto 25% FC) and humic acid concentrations (T_0 = Control (No spray of HA), T_1 = Spray of HA @ 500 ppm, T_2 = Spray of HA @ 1000 ppm, T_3 = Spray of HA @ 1500 ppm). Every treatment consisted of 4 buckets. Two seedlings (26 day-old) were planted in each pot on 22 November 2023 and after 15 days one seedling was removed keeping the better one. Drought stress was imposed on 14 December 2023 (21 days after transplanting). The study was evaluated under Randomized Complete Block Design (RCBD) with three replications. The application of humic acid (HA) solution started from 14 December 2023 at 15 days interval. The irrigation was applied according to drought treatments. HA was sprayed four times at 15 days interval starting from 19 DAT.

Maximum plant height (99.38 cm) was recorded from $\text{DS}_0 \times \text{T}_3$ closely followed $\text{DS}_1 \times \text{T}_3$ (99.12 cm), $\text{DS}_0 \times \text{T}_2$ (98.38 cm). Maximum leaf number (51.25/plant) was recorded from $\text{DS}_1 \times \text{T}_3$ closely followed by remaining treatment combinations except $\text{DS}_1 \times \text{T}_0$ and $\text{DS}_2 \times \text{T}_0$. Maximum LAI was found from $\text{DS}_0 \times \text{T}_3$ (8.84) closely followed by $\text{DS}_0 \times \text{T}_1$, $\text{DS}_0 \times \text{T}_2$, $\text{DS}_1 \times \text{T}_2$ and $\text{DS}_1 \times \text{T}_3$ and the highest SPAD value (53.90 cm) was recorded from $\text{DS}_1 \times \text{T}_3$ closely followed by the remaining treatment combinations except $\text{DS}_1 \times \text{T}_0$ and $\text{DS}_2 \times \text{T}_0$. The highest dry weight/plant was recorded from $\text{DS}_1 \times \text{T}_3$ (127.79 g) which was statistically similar to $\text{DS}_0 \times \text{T}_3$ (127.59 g).

The combination $\text{DS}_1 \times \text{T}_1$ gave the maximum number of fruits (46.94/plant) which was statistically similar to $\text{DS}_0 \times \text{T}_3$, $\text{DS}_0 \times \text{T}_2$, $\text{DS}_0 \times \text{T}_1$, $\text{DS}_1 \times \text{T}_2$ and $\text{DS}_1 \times \text{T}_3$ and the combination $\text{DS}_2 \times \text{T}_0$ gave the lowest number of fruits/plant. The highest fruit length was observed from $\text{DS}_0 \times \text{T}_3$ (56.58 cm) which was identical with $\text{DS}_0 \times \text{T}_2$ (54.44 cm). Maximum fruit breadth was recorded from $\text{DS}_0 \times \text{T}_3$ (45.98 cm) which was identical with $\text{DS}_0 \times \text{T}_2$ (45.34 cm), $\text{DS}_1 \times \text{T}_2$ (45.54 cm), $\text{DS}_1 \times \text{T}_3$ (44.61 cm) and $\text{DS}_2 \times \text{T}_3$ (42.59 cm). The combination $\text{DS}_0 \times \text{T}_3$ produced maximum individual fruit weight (66.13 g) followed by $\text{DS}_0 \times \text{T}_2$ (62.33 g) and $\text{DS}_1 \times \text{T}_3$ (62.00 g). The highest fruit yield/plant was recorded from $\text{DS}_1 \times \text{T}_3$ (2.42 kg/plant) closely followed by $\text{DS}_2 \times \text{T}_2$ (2.40 kg/plant) and $\text{DS}_1 \times \text{T}_1$ (2.35 kg/plant) followed by $\text{DS}_0 \times \text{T}_3$ (2.27 kg/plant).

Based on the above results it revealed that growth characters and yield attributes were decreased due to the harmful effect of drought stress. Spray of humic acid (HA) @ 1000 and 1500 ppm improved growth characters, yield attributes and fruit yield under drought stress. The yield of tomato was significantly influenced by four times foliar HA applications at 15 days interval starting from 3 weeks of transplanting under drought condition. The study shows that 1000-1500 ppm (1000-1500 mg/L concentration) HA spray could be successfully used to obtain better growth and yield in tomato under moderate drought stress.

Seed germination and seedling growth in okra as influenced by different priming agents

M. Moniruzzaman and R. Khatoon

The study was carried out to assess the effects of priming agents on germination and germination properties of two varieties of okra seeds under natural conditions of the laboratory of Plant Physiology Section, HRC, BARI during 2024. The study consisted of two Okra varieties viz., V₁ = BARI Dheros-2 and V₂ = OK-1820 and eleven priming treatments: T₀ = no priming T₁ = Hydropriming, T₂ = 150 ppm GA₃, T₃ = 200 ppm GA₃, T₄ = 40 ppm SA (salicylic acid), T₅ = 50 ppm SA, T₆ = 0.25% KNO₃, T₇ = 0.50% KNO₃, T₈ = 40 mM H₂O₂, T₉ = 100 ppm HA (humic acid), T₁₀ = 200 ppm HA. The priming of seed was done in the lab at 35±2°C for 24 hours. The experiment was arranged in a completely randomized design (CRD) with three replications. Twenty equal sized seeds of each variety were selected and placed on sterilized petri dish lined with filter paper on 6 May 2024. Those seeds were considered germinated whose root length was more than 3 mm. From these germination counts, several germination attributes were calculated to characterize the salt tolerance, including germination percentage (GP), days required to 50% germination (T₅₀), speed of germination (SoG), germination value (GV) by different formulae proposed by different authors and scientists.

Maximum germination percentage was recorded when seeds were primed with 40 mM H₂O₂ (98.33% in BARI Dhereos-2 and 94.67% in OK1820) closely followed by 100 ppm HA (93.33% in BARI Dhereos-2 and 91.33% in OK1820) and 200 ppm HA (93.33% in BARI Dheros-2 and 93.67% in OK1820) and the lowest

germination percentage was obtained from control (no priming) (77.33% in BARI Dheros-2 and 78.12% in OK1820). In both the varieties, hydro-priming gave higher germination% than no priming. The lowest T₅₀ value was obtained from 200 ppm GA₃ (2.54 days) which was statistically similar to 40 mM H₂O₂ (2.54 days) in case of BARI Dheros-2, whereas in case of OK1820, the lowest T₅₀ value obtained from 50 ppm SA (3.53 days) closely followed by all treatments except control and 0.50% KNO₃. In case of BARI Dheros-2, all priming agents performed better except control and 50 ppm SA with regard to T₅₀ value. Speed of germination (SoG) indicates the speed of germination whereas Germination value (GV) indicates both speed and germination percentage. Higher the SoG and GV values, faster the germination of seeds. Priming with 40 mM H₂O₂ gave maximum values of SoG (6.42 in BARI Dheros-2 and 4.70 in OK1820) and GV (210.71 in BARI Dheros-2 and 1.47.54 in OK1820) which were followed by 200 and 100 ppm HA.

In BARI Dheros-2, the highest seedling length was recorded from hydro-priming (12.16 cm) identical with 40 mM H₂O₂ (11.48 cm) and 200 ppm HA (11.56 cm) and without priming gave the lowest seedling length (1.48 cm). In OK1820, priming with 40 mM H₂O₂ gave the maximum seedling length (10.47 cm) which was statistically similar to hydro-priming (9.97 cm) and 200 ppm HA (9.24 cm) and the lowest recorded from 0.50% KNO₃ (1.17 cm). In BARI Dheros-2, maximum seedling dry weight was observed in 40 mM H₂O₂ (35.40 mg) closely followed by hydro-priming, 150 ppm GA₃, 40 ppm SA, 50 pp SA, 0.25% KNO₃, 100 ppm HA and minimum was obtained when seeds were primed with 200 ppm GA₃. In OK1820 maximum seedling dry weight was observed in 40 mM H₂O₂ (35.59 mg) although there was no significant difference among the treatments except 0.50% KNO₃. Maximum seedling vigour index (SVI) was recorded from 40 mM H₂O₂ (1128.3 in BARI Dheros-2 and 956.83 in OK1820) closely followed by 200 ppm HA and hydropriming in both varieties.

The results revealed that H₂O₂, humic acid and distilled water were found to be the most important priming agents to increase seed germination, germination speed, shoot length and seedling dry weight and seedling vigour index. It is suggested before sowing seeds of okra/or going to breeding

work okra seeds should be soaked in 40 mM H₂O₂ or 200 ppm HA or distilled water for 18 hours.

Effect of seed priming with salicylic acid on germination and seedling growth of tomato (*Solanum lycopersicum* L.) under induced drought stress

M. Moniruzzaman and R. Khatoon

The experiment was conducted at the laboratory of Plant Physiology Section, HRC, BARI during 02 February -15 February 2024. The experiment consisted of 21 treatments viz., T₀ = No priming (control), T₁ = Priming with distilled water, T₂ = Priming with 0.5 mM SA (Salicylic Acid), T₃ = Priming with 0.75 mM SA, T₄ = Priming with 1.0 mM SA, T₅ = Priming with 8% PEG, T₆ = Priming with 10% PEG, T₇ = Priming with 12% PEG, T₈ = Priming with 16% PEG, T₉ = Priming with 8% PEG + 0.5 mM SA, T₁₀ = Priming with 8% PEG + 0.75 mM SA, T₁₁ = Priming with 8% PEG + 1.0 mM SA, T₁₂ = Priming with 10.0 % PEG + 0.5 mM SA, T₁₃ = Priming with 10% PEG + 0.75 mM SA, T₁₄ = Priming with 10% PEG + 1.0 mM SA, T₁₅ = Priming with 12 % PEG + 0.5 mM SA, T₁₆ = Priming with 12% PEG + 0.75 mM SA, T₁₇ = Priming with 12% PEG + 1.0 mM SA, T₁₈ = Priming with 16 % PEG + 0.5 mM SA, T₁₉ = Priming with 16% PEG + 0.75 mM SA, T₂₀ = Priming with 16% PEG + 1.0 mM SA. The tomato variety used in this study was BARI Tomato-21.

The maximum Final germination percentage (FGP) was recorded from T₁ treatment (100%) closely followed by remaining treatments except T₀, T₄, T₈, T₁₇, T₁₈, T₁₉ and T₂₀. T₁₀ treatment gave 93.33% FGP closely followed by T₁₃ (91.67%), T₁₅ (85.0%) and T₁₆ (85.0%). The lowest MGT was found from T₁₃ (5.30 days) closely followed by remaining treatments except T₄, T₇, T₈, T₁₈ and T₁₉ and maximum MGT was observed in T₁₈ treatment (9.14 days). SA @ 0.75 mM performed better in presence of 8, 10, 12 and 16% PEG with regard to T₅₀ value and MGT. Maximum GV was recorded from T₁ (115.36) closely followed by T₅ (86.63), T₆ (84.42), T₉ (99.57), T₁₀ (101.51), T₁₃ (104.38), T₁₂ (96.32), T₁₄ (90.17) and the lowest from T₂₀ treatment (4.64). The maximum speed of germination (SoG) was found from T₁ treatment (3.67) which was identical with the remaining treatments except T₄, T₇, T₈, T₁₅, T₁₆, T₁₇, T₁₈, T₁₉ and T₂₀. The highest coefficient of velocity of germination (CVG) was found from T₁₃ (18.86) closely followed by T₁₀ (18.69), T₁₁ (18.08), T₉

(18.24), T₁ (18.08), T₀ (17.20), T₂ (17.04), T₃ (17.34), T₁₂ (17.73), T₅ (16.38). Among T₁₅, T₁₆ and T₁₇ treatments, T₁₆ treatments gave the highest CVG and among T₁₇, T₁₈ and T₁₉ treatments, T₁₉ produced the highest CVG. It is seen that among the treatments 0.75 mM SA performed better in presence of 10, 12 and 16% PEG with regard to germination and germination properties. Maximum shoot length was obtained from T₂ (5.64 cm) closely followed by T₀, T₁, T₅, T₄, T₉, T₁₀ and T₁₁ treatments. Priming seeds with 8% PEG (T₅) gave the highest root length (6.00 cm), which was statistically similar to T₀ (5.09 cm), T₁ (5.83 cm), T₂ (5.39 cm), T₆ (5.09 cm), T₇ (5.20 cm), T₁₃ (5.10 cm). Maximum seedling length was obtained from T₁ treatment (11.43 cm) being identical with T₀, T₂, T₅, T₆, and T₁₀ treatments. Maximum seedling fresh weight (27.60 mg) was obtained from T₁₉ treatment closely followed by T₁₆ treatment (27.47 mg), T₁ (26.93 mg), T₂ (26.73 mg), T₁₀ (25.80 mg), T₁₂ (25.63 mg) and the lowest seedling fresh weight from T₁₈ treatment (11.03 mg). Maximum seedling dry weight (2.57 mg) was obtained from T₁₉ treatment closely followed by T₁₆ treatment (2.53 mg), T₁₀ (2.23 mg), T₁₃ (2.40 mg), T₁₄ (2.37 mg), T₁₅ (2.32 mg). Maximum Seedling Vigour Index-I was recorded from T₁ (1143.3) which was identical with T₅, T₂, T₀ and T₁₀ treatments. The highest Seedling Vigour Index-II was obtained from T₁₆ (215.33) which was statistically similar to T₁₃ (213.00), T₁₄ (212.00), T₁₀ (189.67), T₁₂ (189.67), T₉ (173.50) and T₁₁ (173.33) and the lowest from T₄ treatment (40.33). It is seen from the results of seedling growth parameters, in presence of PEG induced drought stress (8, 10, 12 and 16 % PEG) 0.75 mM SA performed better.

At the germination stage, the results showed that SA @ 0.75 mM significantly improved the tomato seed germination, germination properties and seedling growth attributes under PEG induced drought stress (10, 12 and 16% PEG) and could be used to mitigate the adverse effect of drought stress at germination and seedling growth stage.

Effect of seed priming with salicylic acid on germination and seedling growth of tomato (*Solanum lycopersicum* L.) under induced salinity stress

M. Moniruzzaman and R. Khatoon

The experiment was conducted at the laboratory of Plant Physiology Section, HRC, BARI during 06 December -21 December 2023. The experiment

consisted of 13 treatments viz., T₀ = No priming (control), T₁ = Priming with distilled water, T₂ = Priming with 0.5 mM salicylic acid (SA), T₃ = Priming with 0.75 mM SA, T₄ = Priming with 1.0 mM SA, T₅ = Priming with 8.0 dS/m NaCl, T₆ = Priming with 10.0 dS/m NaCl, T₇ = Priming with 8.0 dS/m NaCl + 0.5 mM SA, T₈ = Priming with 8.0 dS/m NaCl + 0.75 mM SA, T₉ = Priming with 8.0 dS/m NaCl + 1.0 mM SA, T₁₀ = Priming with 10.0 dS/m NaCl + 0.5 mM SA, T₁₁ = Priming with 10.0 dS/m NaCl + 0.75 mM SA, T₁₂ = Priming with 10.0 dS/m NaCl + 1.0 mM SA. The tomato variety used in this study was BARI Tomato-21. Required number of petri dishes each with a diameter of 9 cm were used in the experiment and arranged in a completely randomized design (CRD) in three replications. Twenty healthy and equal sized seeds of BARI Tomato-21 were selected and placed on sterilized petri dish lined with tissue paper. Number of seeds germinated was counted daily and data recording were continued up to 16 days.

The maximum Final germination percentage (FGP) was recorded from T₇ treatment (100%) closely followed by T₃ (96.67%), T₂ (93.33%) and T₁₀ (93.33%) and the lowest from T₈ (60%) treatment. The lowest MGT was found from T₁ (5.33 days) closely followed by T₂ treatment (5.38 days), T₀ treatment (5.49 days) followed by T₇ (7.52 days) and T₁₀ (7.54 days) and maximum MGT was observed in T₁₂ treatment (11.63 days). The maximum speed of germination (SoG) was found from T₂ treatment (3.54) which was identical with T₁ treatment (3.43), T₀ treatment (3.49), T₇ treatment (2.77) followed by T₁₀ treatment (2.70). The lowest T₅₀ value was found from T₁ (4.63 days) closely followed by T₂ treatment (4.64 days), T₀ treatment (4.66 days), T₇ treatment (6.87 days) and T₁₀ treatment (6.75 days) and maximum T₅₀ value was observed in T₁₂ treatment (11.70 days). The highest coefficient of velocity of germination (CVG) was found from T₁ (18.75) closely followed by T₂ (18.61), T₀ (18.24). The second highest CVG was observed in T₅ treatment (14.26) which was statistically similar to T₆ (12.32), T₇ (14.22) and T₁₀ (13.35) and the lowest from T₁₂ treatment (8.60). Maximum GV was recorded from T₂ (88.21) closely followed by T₁ (82.86), T₁₀ (62.50), T₇ (62.46), and the lowest from T₁₂ treatment (3.10). It is seen that among the treatments 0.5 mM SA performed better in presence of 8 and 10 dS/m

salinity stress with regard to germination and germination properties.

Maximum shoot length was obtained from T₀ (6.67 cm) closely followed by T₁, T₂, T₃, T₄, T₇ and T₁₀ treatments and the lowest from T₁₂ treatment (2.63 cm). Priming seeds with 1.0 mM salicylic acid (SA) (T₄) gave the highest root length (7.43 cm), which was statistically similar to T₃ (6.40 cm), T₂ (6.07 cm) and followed by T₁ (5.97 cm) which was identical to T₅ and T₇ and the lowest from T₁₂ treatment (2.63 cm). Maximum seedling length was obtained from T₄ treatment (13.40 cm) being identical with T₁, T₂, T₃ and T₇ treatments, followed by T₅ and T₁₀ and the lowest seedling length from T₈ treatment (7.70 cm). Maximum seedling dry weight (1.60 mg) was obtained from T₁₀ followed by T₇ treatment (1.47 mg) and the lowest seedling dry weight from T₀ treatment (1.00 mg). Maximum Seedling Vigour Index-I was recorded from T₃ (1208.0) which was identical with T₀, T₁, T₂, T₄, T₅, T₇ and T₁₀ treatments and the lowest from T₁₂ treatment (191.83). The highest Seedling Vigour Index-II was obtained from T₁₀ (149.33) which was statistically similar to T₇ (146.67). It is seen from the results of seedling growth parameters, in presence of salinity levels (8 and 10 dS/m) 0.5 mM SA performed better.

At the germination stage, the results showed that SA @ 0.5 mM significantly improved the tomato germination performance under salt stress (8 and 10 dS/m NaCl) and could be used to mitigate the adverse effect of salt stress.

Influence of biochar on the growth and yield of tomato under salinity stress

M. Moniruzzaman, R. Khatoon, M. Moniruzzaman, M.A.Quddus and M.A.Goffar

The experiment was conducted at the Plant Physiology Section, BARI, BARI from November 2023 to April 2024. Seeds of the tomato variety BARI Tomato-16 were used for the experiment. The study employed a two-factor experimental design. Factor A comprised three levels of biochar (0%, 5%, and 10% by weight of 12 kg soil per pot), designated as Bc₁, Bc₂, and Bc₃, respectively. Factor B included four levels of NaCl salinity (1.5, 4.0, 8.0, and 12.0 dS m⁻¹), designated as S₁, S₂, S₃, and S₄, respectively. After 7 days of seedling transplantation, NaCl treatments were applied to each pot to achieve the specified salinity levels. A salt solution with an electrical conductivity of 2.5

dS/m was added to each pot, except for the control, every alternate day to reach the desired salinity levels. The experiment was designed using a Completely Randomized Design (CRD) with three replications. Twenty-one-day-old seedlings were transplanted into 14-L plastic pots (29 cm high, 32 cm in diameter at the top, and 21 cm at the bottom), which were filled with 12 kg of growth medium composed of 40% well-decomposed cow dung and 60% topsoil. The rice husk biochar was used.

At a salinity level of 12 dS/m with 12 kg of soil, significant reductions were observed in SPAD value (26.05%) and Fv/Fm (26.67%) compared to the non-saline control without biochar. Growth parameters such as leaf area (35.52%), shoot length (24.49%), root length (25.51%), shoot fresh weight (25.51%), root fresh weight (23.93%), shoot dry mass (25.36%), root dry mass (24.30%), and stem diameter (25.86%) were significantly reduced at the 12 dS/m salinity level compared to the non-saline control without biochar. Single fruit weight (26.07%) and yield (22.67%) also decreased at the 12 dS/m salinity level compared to the non-saline control without biochar. A less pronounced decrease in these parameters was observed at moderate salinity levels (8 dS/m) compared to the non-saline control when biochar was not applied. Moreover, the combined application of biochar and different salinity levels further improved the growth parameters of tomatoes. The SPAD value increased by 12.05 %, and the FV/Fm ratio improved by 11.11% with the application of 10% biochar by weight of 12 kg soil. Growth parameters such as leaf area, shoot length, root length, shoot fresh weight, root fresh weight, shoot dry mass, root dry mass, stem diameter were enhanced by 11.21%, 12.07%, 38.81%, 12.53%, 39.53%, 37.47%, 38.86%, and 15.32%, respectively, at a salinity level of (12dS/m) compared to non-saline conditions with the presence of 10% biochar by weight of 12 kg soil. Additionally, single fruit weight and yield per plant increased by 13.34% and 15.38%, respectively, at the 12 dS/m salinity level compared to non-salinity conditions with the same biochar application rate. A similar trend was observed at moderate salinity levels (8 dS/m), with a less pronounced decrease in the same parameters compared to the control, in the presence of biochar. In terms of growth attributes, salt-added treatments led to a decrease of 25.86–35.52%. The combined application led to a 11.21-39.53 % enhancement in

growth characteristics over the respective control. Overall, regardless of salinity, combined application of biochar significantly improved the physiological performance of tomatoes, both in saline and non-saline soils, indicating that biochar effectively reduces the toxic effects of salinity on tomato plants.

The application of a higher concentration of biochar (10% w/w) could be beneficial in mitigating the harmful effects of salinity on tomato plants and enhancing productivity in salt-affected soils.

Response of seed priming by GA₃ and KNO₃ to germination and seedling growth of sweet pepper (*Capsicum annum* L.) in seed bed

R. Khatoon, M. Moniruzzaman, & L. Akter

The experiment was conducted at the seed bed of Plant Physiology Section, HRC, BARI during 25 October 2023 to 20 December 2023. Seeds of BARI Mistimorich-1 and BARI Mistimorich-2 are soaked with GA₃ viz., 250 ppm, 500 ppm, 750 ppm and four levels of KNO₃ viz. 0.25, 0.50, 0.75 and 1% and distilled water as control over night (16 hr). Next day seeds were ringed with distilled water and then air dried for few minutes under shade and then sown in seed bed. The experiment was laid out in RCBD with three replications.

KNO₃ and GA₃ influenced seedling emergence and seedling growth in both two varieties. The highest emergence percentage (95.55%) was obtained from 0.50% KNO₃ closely followed by 0.25% KNO₃ (86.67%) and 250 ppm GA₃ (91.11%) respectively and control treatment gave the minimum result in BARI Mistimorich-1 (V₁). Number of leaves/plant and shoot length of sweet pepper of both varieties were also influenced by KNO₃ and GA₃. In V₁, the maximum number of leaves/seedling (7.89) was recorded from 0.50% KNO₃ closely followed by 0.25% KNO₃ and 250 ppm GA₃, respectively. In V₁, the maximum shoot length was recorded from 250 ppm GA₃ (12.51 cm) which was statistically similar to 0.25% KNO₃ and 500 ppm GA₃ and the lowest from 1% KNO₃. In V₁, KNO₃ and GA₃ had no significant effect on root length. The maximum shoot dry weight was recorded from 0.50% KNO₃ (0.737 g) and minimum (0.483 g) was recorded from 1% KNO₃ in BARI Mistimorich-1 (V₁). The highest root dry weight (0.180 g) was found from 0.50% KNO₃ and 250 ppm GA₃ in V₁ and the minimum (0.097 g) was found from 1% KNO₃

treatment. On the contrary, in V₂, seed treatment with 0.50% gave the highest emergence percentage (93.33%) closely followed by 250 ppm GA₃, 0.25% KNO₃. In V₂, the maximum number of leaves/seedling (7.45) was recorded from 250 ppm GA₃ closely followed by 0.50% KNO₃ and 0.75% KNO₃. 0.25%, 0.75% KNO₃ and 250 ppm, 500 ppm GA₃ respectively. In respect of shoot length GA₃ 250 ppm gave the maximum shoot length (12.09 cm) and minimum (8.82 cm) was obtained from 1% KNO₃ and control treatment. In V₂, KNO₃ and GA₃ had no significant effect on root length. The maximum shoot dry weight (0.557g) was obtained from 250 ppm GA₃ and minimum (0.330g) was found from control treatment. In V₂, 0.50% KNO₃ gave maximum root dry weight (0.243g) and minimum was obtained from 1% KNO₃ (0.097g). From two years' average results, the highest seedling emergence percentage was found from the treatment 0.50% KNO₃ in and 50 ppm GA₃ V₁ (BARI Mistimorich-1) and V₂ (BARI Mistimorich-2). It is observed that application of KNO₃ and 250 ppm GA₃ performed better for increasing sweet pepper emergence percentage and seedling growth than control treatment.

The experimental results revealed that application of 0.50% KNO₃ and 250 ppm GA₃ positively increased seedling emergence percent, seedling length and seedling dry weight. From two years results, it might be inferred that 0.50% KNO₃ and 250 ppm GA₃ might be optimum for maximum seedling emergence.

Effect of calcium chloride and time of harvest on control of spongy tissue in BARI Aam- 3

R. Khatoon, M. Moniruzzaman and M. S. Uddin

The experiment was conducted at the field and laboratory of pomology Division, HRC, BARI. Already established, uniform size in height and spread 'BARI Aam- 3' cultivar trees of approximately 15 years old were used in this experiment. The calcium sources were sprayed at the rates of 1000 ppm, 1500 ppm, 2000 ppm and 0% (control) during three different stages of fruit development i.e. fruit set, 30 days after fruit set and 60 days after fruit set. The experiment was laid out in a randomized complete block design with three replications. The mangoes were kept in normal room temperature (30 °C ± 2 °C and RH 76%). Fruits were harvested at maturity and ripened at an ambient temperature.

Significant effect was observed, when BARI Aam-3 was treated with calcium chloride and different time of harvest. Pre-harvest treatment of developing fruits with calcium chloride solution of 1000 ppm with 1st and 2nd harvest significantly reduced spongy tissue incidence respectively compared to control. The affected tissue was visible only when the ripe fruit was cut into two halves. It was interesting to note that there was no spongy tissue incidence in CaCl₂ 1000 and 1500 ppm treatments in all harvesting time compared to control treatment. At 1st harvest, no spongy tissue incidence was found from all treatment but at 2nd harvest, 14.28% spongy tissue incidence was found from control treatment. At 3rd harvest, maximum spongy tissue percentage (28.57% from both side, 14.63% from one side) was found from control treatment and minimum was obtained from 500 ppm CaCl₂ concentration. There was no spongy tissue incidence found from the treatment with CaCl₂ 1000 and 1500 ppm and better fruit quality characteristics in terms of TSS (%) was found. TSS (%) was from spongy fruit harvested at 2 July to 5 July (13.56-15.25%) in control treatment, whereas in affected tissue TSS (%) was found lower than spongy fruit (11.53-13.50%). In respect of TSS (%) obtained from good fruits, preharvest treatment of fruits with 1000 and 1500 ppm CaCl₂ increased fruits quality. It was also apparent from the results that pre-harvest treatment of fruits during 2 July to 5 July with 1000-1500 ppm CaCl₂ was most effective in reducing the spongy tissue incidence. Sponginess can be minimized by harvesting fruits slightly before maturity.

From this experiment it may be concluded that, treatment of developing fruits of BARI Aam- 3 with 1000 ppm and 1500 ppm CaCl₂ at harvesting time (2 July to 5 July) prevent spongy tissue formation in mature ripe fruits. Pre-harvest spray 1000 ppm and 1500 ppm CaCl₂ before maturity of fruits for 2-3 times was essential to obtain effective control of the spongy tissue disorder.

Effect of plant growth regulators on the incidence of mango malformation cv. BARI Aam- 8

R. Khatoon, M. Moniruzzaman and M. S. Uddin

The experiment was conducted at the field of pomology Division, Horticulture Research Centre. Already established, uniform size in height and spread 'BARI Aam- 8' trees of approximately 10

years old were used in this experiment. The plant growth regulators (PGRs) were different concentration of GA₃ (50 and 75 ppm) and NAA (100 and 200 ppm) with spray time 1st week of October and 1st week of November. Plants, which were severely affected by floral malformation in previous season, were selected for the treatment. Fertilizers were applied after harvest of the previous year's fruit. The stock solution of GA₃ and NAA along with adhesive agent (Trix) was sprayed individually by sprayer. Three plants were sprayed with GA₃ and each NAA solution. Spray was done in the 1st week of October and 1st week of November. All exposed surfaces of the plants including leaves, twigs, and branches were sprayed. Data were recorded on total number of secondary branch/plant; percentage of malformed inflorescences/plant, total number of fruits/plant, single fruit weight, sugar, acidity and total soluble solids (TSS).

Significant effect was found when BARI Aam-8 plants were treated with GA₃ and NAA solutions. It was observed that the number of secondary branches were identical in respect of all treatments. In 2022-23, there was no significant effects on percent malformed inflorescences per plant. But in 2023-24, there was significant effect on percent malformed inflorescences per plant. The highest percent malformed inflorescences (65.83%) was found from control treatment and the lowest (8.96%) was found from 200 ppm NAA treatment. Number of fruits/plant was found highest (221.00) from 200 ppm NAA treatment and the lowest number of fruits/plant (33.25) was obtained from control treatment. The highest single fruit weight (250.5g) was found from 100 ppm NAA treatment followed by 200 ppm NAA and 75 ppm GA₃ treatment and lowest single fruit weight was obtained from control and 50 ppm GA₃ treatment. All are identical value obtained from all treatments with regard to %total sugar content, % reducing sugar in BARI Aam-8. Titratable acidity% (0.166) was found highest in control treatment and all GA₃ and NAA treatment gave the identical value regard to % titratable acidity. GA₃ and NAA had no significant effect on TSS (%).

From this experiment it may be concluded that, treatment of 200 ppm NAA was able to reduce malformed inflorescences percentage per plant.

Plant Pathology Section, HRC

Screening of eggplant germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

Nineteen and twenty five eggplant varieties/accessions for Kharif and Rabi seasons were evaluated for resistance to *Ralstonia solanacearum* grown under artificial epiphytotic conditions during 2023-2024 cropping seasons. Among them, six germplasm, 215X83-B3, Paler Hazarijhuri Begun, 18X223, SM-233, 253BX83B3 and BARI Begun-8 were graded as resistant in Kharif season. Only 357X220 showed moderately resistant reaction. In Rabi season, one variety and seven lines such as BARI Begun-8, 21X11, 20X5, 12X11, 18X405, SM-332, 407 X 332 and SM-405 showed resistant reaction. Seven lines such as SM-18, 275X11, 21x220, SM-105, 5X405, 5X216 and SM-275 showed moderately resistant reaction. The rest of the germplasm showed moderately susceptible to highly susceptible reaction to *R. solanacearum* in both seasons.

Screening of tomato germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

Nineteen tomato varieties/accessions were screened to find out bacterial wilt resistant source grown under artificial epiphytotic field conditions during 2023-2024 cropping seasons. Among the accessions, Among the varieties/accessions, only one variety and seven lines of tomato such as BARI Tomato-11, AV-135, AV-1616, 1008, AVTO-1315, AV-1306, AVTO-1921 and 1903 showed resistant reaction against bacterial wilt. Eight lines such as 1711, AV-1712, AVTO-1010, AV-1907, AVTO-1911, AVTO-1713, 1719 and AVTO-1718 were grades as moderately resistant. Rest of the accessions of tomato showed moderately susceptible reaction to *R. solanacearum*.

Screening of eggplant germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali

Ten eggplant varieties/accessions viz. SM-405, 217 (A), 20 x 5, 5 x 405, BARI Begun- 4, BARI Begun- 8, 5 x 216, 216-A, 12 x 11 and 18 x 405 were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-

2024 cropping season. Among them 5 x 405 showed resistant, eight accessions such as SM-405, 217 (A), 20 x 5, BARI Begun-4, BARI Begun-8, 5 x 216, 216-A and 18 x 405 showed moderately resistant and 12 x 11 showed moderately susceptible to root knot nematode.

Screening of tomato germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali

Twenty tomato varieties/accessions were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-2024 cropping season. Among them, six accessions (AVTO-1315, BARI Tomato-11, AVTO-1010, AV-1907, AVTO-1921 and AV-195) showed resistant, nine accessions (AVTO-1911, 1719, AV-1306, 1711, AV-1712, AV-1616, AV-1306, AVTO-1911 and AVTO-1314) showed moderately resistant, four accessions (1409, 1717, AV-1711 and AVTO-1718) showed susceptible and one accession (AVTO-1713) showed highly susceptible reaction to root knot nematode.

Screening of okra germplasm resistance to okra yellow vein mosaic virus

L. Yasmin, M. Afroz, M. A. Rahman and M.S. Ali

Twenty okra germplasm were evaluated for resistance to Okra yellow vein mosaic virus (OYVMV) grown under natural conditions during 2024 cropping seasons. Among them, three accessions of okra such as BD-12109, BD-12110 and BD-12116 showed tolerant reaction, nine accessions such as Sabuzshathi (shek agro seed), Sabuzshathi, Duranta (Munir seed), Agam plus, OK-285, BD-12108, BD-12123, BD-12122, BD-12117 showed moderately susceptible reaction. Four accessions showed (BD-12119, BD-12112, Krishan seed and BD-12128) susceptible reaction. Four accessions showed (BD-12107, BD-12121, BD-12125 and BARI Derosh -1) highly susceptible to Okra yellow vein mosaic virus (OYVMV).

Screening of tomato germplasm for resistance to tomato leaf curl virus under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz, Siddique Alam and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-2024 cropping season with promising germplasm and variety of tomato to find out resistant sources

against Tomato Leaf Curl Virus (TLCV) disease. A total of 16 tomato variety/ accessions were evaluated including susceptible check. Nine germplasm were showed resistant and twelve germplasm were found moderately resistant to disease and rest of the moderately susceptible. The highest yield was recorded in BARI Hybrid tomato 8 (22.73 ton/ha) and lowest yield was obtained in GP-0093 (6.49 ton/ha) respectively.

Screening of country bean germplasm for resistance to multiplex virus complex under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz, Siddique Alam and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-24 cropping season with germplasm and variety of country bean to find out resistant sources against country bean common mosaic virus (BCMV) disease. A total of 20 country bean variety/germplasm were evaluated including susceptible check. Among the germplasm, four germplasm have been performed resistance to the mosaic virus disease, three germplasm were showed moderately and rests of the germplasm were found susceptible to the disease. . LP Pah -025 germplasm produced the highest yield (29.72 ton/ha) with 33.33% disease incidence followed by LP Jam-004 (26.22 ton/ha), LP Pah-006 (24.48 ton/ha) with disease incidence 50% and 33.33% disease incidence whereas the lowest yield was obtained from BD10516 (8.74 ton/ha) respectively. Yield of BARI Sheem-1 was 21.85 t/ha with disease incidence 33.33%.

Screening of cucumber germplasm for resistance to cucumber mosaic virus under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz, Bahauddin Ahmed and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during summer 2023-24 cropping season with promising germplasm of cucumber to find out resistant sources against cucumber mosaic virus (CMV) disease. A total of 20 cucumber germplasm were evaluated including susceptible check (MynamatiF1 & AlviF1). Seven germplasm were showed highly resistant and four germplasm were found moderately susceptible to disease and rest of

the susceptible to the disease. The highest yield was recorded in 5G (12.71 t/ha) followed by CS-79 (7.82 ton/ha), CS-25-20-42 (7.09 ton/ha) with 0.00%, 0.00% and 75% disease incidence and the lowest yield was obtained in CS-34-2 (3.67 t/ha) respectively with 41.67% disease incidence.

Evaluation of pumpkin genotypes to mosaic viral disease under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and M.S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during 2023-24 cropping season with promising germplasm of pumpkin to find out resistant sources against mosaic viral diseases. A total of 20 pumpkin germplasm were evaluated including susceptible check (sweet). Among the germplasms, ten germplasm were showed resistant and five germplasm were found moderately resistant and rest of the germplasm were showed moderate susceptible to the disease. The highest yield was recorded in BD-232 (13.00 t/ha) followed by BD-269 (11.00 ton/ha) with 0.00% disease incidence and the lowest yield was obtained in BD-2214 (6.78 ton/ha) respectively with 0.00% disease incidence.

Survey on bacterial wilt of solanaceous vegetable crops

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

A comprehensive survey was conducted during July-June, 2023-2024 cropping season in Thakurgaon district to record the incidence of bacterial wilt of eggplant. Data on area surveyed, wilt incidence (%), etc. were recorded at the time of survey. A total of 180 wilt infected plant samples of eggplant and tomato were collected from Bogura, Thakurgaon, Sylhet, Gazipur and Rangpur districts during January-December-June 2023-2024. A total 150 isolates *R. solanacearum* were isolated from eggplant, tomato, chili and potato. Biochemical tests such as Gram reaction/Potassium hydroxide test, Kovac's oxidase test, Catalase test, urease test and biovar test were performed for biochemical characterization of the isolates. All biochemical tests were found positive, which confirm identification of those isolates. Molecular Characterization of *R. solanacearum* were also performed.

Integrated disease management of bacterial wilt in eggplant

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during December, 2023 to May, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of eggplant. There were six treatments were used, such as T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 2.13 t/ha (in pit) (ii), T₂= Stable Bleaching Powder @ 25 kg/ha + *Bacillus cereus* (Seed and root soaking), T₃= Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T₅=Farmer's practice and T₆= Susceptible check (BARI Begun-4). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided highest yield.

Integrated disease management of bacterial wilt in tomato

M. Afroz, L. Yasmin, M. M. Rahman and M.S. Ali

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during November, 2023 to April, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of tomato. There were seven treatments were used, such as T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 4.8 t/ha (in pit) (ii), T₂= Stable Bleaching Powder @ 25 kg/ha + *Bacillus subtilis* 38 (Seed and root soaking), T₃= Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), T₅= Farmer's practice and T₆= Susceptible check (BARI Tomato-15). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided the highest yield.

Efficacy of chemicals, botanicals and plant defense activators in managing okra yellow vein mosaic virus

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and M.S. Ali

The experiment was conducted to manage okra yellow vein mosaic disease through the chemical,

botanical and plant defense activators. The experiment was conducted in Plant Pathology Section, HRC, BARI, and Gazipur during 2024-2025 summer seasons. There were six treatments such as: i) Imidacloprid ii). Neem oil iii). Moringa oleifera leaf extract iv), Allium sativum v). Salicylic acid vi) Untreated control were carried out with three replications. Among the treatments, treatment, imidacloprid at 15 days interval were showed lowest disease incidence and increase the yield of tomato.

Identification of post harvest diseases of fruits and vegetable

L. Yasmin, M. Afroz, M. M. Rahman and M.S. Ali
Disease samples of capsicum, brinjal, tomato, banana, strawberry and beal were collected from vegetable and fruit research field of Horticulture research centre, BARI, Gazipur during October 2023 to May 2024. Disease symptoms appeared on fruits. *Fusarium* sp. & *Alternaria* sp. were identified from capsicum; *Fusarium* sp., *Alternaria* sp. & *Diplodia* sp were identified from brinjal; *Chladosporium* sp., *Odiiodendron* sp, *Candida* sp. & *Alternaria* sp were identified from cauliflower; *Fusarium* sp., *Chladosporium* sp & *Colletotrichum* sp. were identified from banana; *Fusarium* sp. , *Chladosporium* sp, *Pestalotia* sp. & *Aspergillus* sp. & *Penicillium* sp. *Rhizopus* sp. were identified from straw berry and *Fusarium* sp. , *Chladosporium* sp. & *Diplodia* sp.

Survey on botrytis blight disease in liliium

L. Yasmin, M. Afroz and M. M. Rahman, F. N. Khan and M.S. Ali

Survey was conducted in Floriculture research field of Horticulture Research Centre, BARI, Gazipur during December 2023 to March 2024 to record the incidence and severity of botrytis blight disease of liliium. The surveyed germplasm were Lil-001, Lil-002, Lil- 018, Lil -021, Lil -022, Lil- 023, Lil -024, Lil- 025, Lil- 027, Lil -028, Lil -029, Lil -036, Lil- 041 and Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence of botrytis blight of liliium was 0-35% in Lil-001, Lil-002, Lil- 018, Lil -021, Lil- 025, Lil -028, Lil -029, Lil -036, Lil-041, Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence was 60-70% in Lil- 023, Lil -024, Lil- 027 and Lil -022. The highest PDI was 67% in Lil-028 and lowest was 0% in Lil-002. The PDI was 10-56% in Oriental (white), Oriental

(Pink), Lil -036, Lil- 018, Lil -021, Lil -027, Lil-001, Lil -042, Lil -023, Lil -024, Lil -022, Lil -041, Lil -025 and Lil -028.

HRC Akbarpur

Regional yield trial of tomato hybrids

M. A. Habib, M.A. Sumi, M. S. Alam and M. H. Hossain

A regional yield trial was conducted at the Regional Agricultural Research Station, Akbarpur, Moulvibazar during the Rabi season of 2023-2024. Five tomato entries, such as Hybrid 1314, Hybrid 1719, Hybrid 3203, Hybrid 3401, Hybrid 6503 and Hybrid Raja were included in this study to evaluate the yield potentiality and adaptability of different Hybrids at different locations to release as a new variety of tomato Maximum no. of fruit per plant (36.73) was obtained from Hybrid 1314 followed by (33.27) was in Hybrid 3203 and minimum (21.20) fruits per plant was obtained from Hybrid 3401. The highest fruit yield (55.64 t ha⁻¹) was recorded in Hybrid 3203 followed by (54.85t ha⁻¹) and (54.81t ha⁻¹) was recorded in Hybrid 6503 and Hybrid 1314, respectively. The lowest fruit yield (36.63 t ha⁻¹) was recorded in Hybrid 3403.

Regional yield trial of afaci winter tomato lines

M.A. Habib, M.A. Sumi and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar, during the Rabi season of 2023-24 with a view to assessing the yield potentiality of some selected lines to select suitable resistant lines for releasing as new resistant and high yielding tomato varieties. Five tomato lines viz. 1008, 1409, 1705, 1717, SLA 15-6 and BARI Tomato-14 as check were included in the study. The highest marketable fruit yield 58.67 t ha⁻¹ was found in 1409 which was identical in 1717 (55 .50 t ha⁻¹ while the lowest yield 42.80 t ha⁻¹ was found in line1008.

Regional yield trial of eggplant lines (winter)

M. A. Sumi, M. A. Habib and M. H. Hossain

An experiment was conducted to study the performance of nine inbred Brinjal lines viz. 5x405, 20X5, 275x405, 21x11, 5x216, 12x11, 13x353-A, 21x221-B and 275X11 at vegetable field, RARS,

BARI, Akbarpur, Moulvibazar during the Rabi season of 2023-24. The line 12x11 produced the highest number of fruits per plant (35.40), whereas, the lowest number of fruits (7.52) was noted from line 275x405. Maximum single fruit weight (234.00gm) was obtained from the line 275x405 and minimum (78.00 gm) from the line 275X11. The line 275x405 exhibited the lowest fruit yield (4.61tonha-1) and the line 12x11 produced the highest fruit yield (35.58 t ha-1).

Regional yield trial of eggplant lines (summer)

M. A. Sumi, M. A. Habib and M. H. Hossain

The experiment was conducted to study the performance of nine inbred Brinjal lines viz. SM 275, SM 332, SM(I)35 and BARI Hybrid Begun-6 at vegetable field, RARS, BARI, Akbarpur, Moulvibazar during the Kharif season of 2023-24. The line BARI Hybrid Begun-6 produced the highest number of fruits per plant (19.33), whereas, the lowest number of fruits (12.00) was noted from line SM332. Maximum single fruit weight (137.67gm) was obtained from the line SM332 and minimum (62.07 gm) from the line BARI Hybrid Begun-6. The line SM275 exhibited the lowest fruit yield (4.61tonha-1) and the line SM332 produced the highest fruit yield (13.50tha-1).

Regional yield trial of bottle gourd hybrids

M. A. Habib, M. A. Sumi, and M. H. Hossain

Five advanced lines of bottle gourd viz. B-4 × B-3, B-3 × B-4, B-1 × B-2, B-2 × LS-232, LS 171 × B-2 and Diana were included in the study to select superior hybrids with higher yield and better quality. The hybrids varied significantly ($P < 0.05$) for their response to fruit yield (kg plant⁻¹), fruit length (cm), fruit diameter (cm) and fruit yield (t ha⁻¹). The earliest flowering (43) days was occurred in hybrids B-1 × B-2. The highest number of fruits per plant (14.56) was found in LS 171 × B-2 followed by B-1 × B-2 (13.16). The lowest number of fruits per plant (9.41) was in B-3 × B-4. The highest fruit yield (61.00 t ha⁻¹) was recorded in B-1 × B-2 followed by B-4 × B-3 (59.43 t ha⁻¹).

Regional yield trial of squash hybrids

M. A. Habib, M. A. Sumi, and M. H. Hossain

An experiment was conducted at the experimental field of RARS, BARI, Akbarpur, Moulvibazar, during the Rabi season of 2023-24. Three Hybrids of Squash viz. hybrid-1, hybrid-2, hybrid-3 and

Ispahani hybrid squash as check were included in the study to select superior hybrids with higher yield and better quality. The highest number of fruits per plant (4.91) was found in hybrid-2 followed by hybrid-1 (4.87). The highest yield was obtained from hybrid -1 (85.76 t/ha) followed by hybrid -2 (85.16 t/ha) and the lowest yield was obtained from Ispahani hybrid squash (67.53 t/ha).

Evaluation of yard long bean lines with BARI borboti-1

M.A. Sumi, M.A. Habib and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar, during the Rabi season 2023-24 with a view to assess the yield potentiality of two selected yard long bean lines JSR VU 002, JSR VU 003(colored)with check BARI Borboti-1. The marketable fruit yield 23.42 t ha⁻¹ in JSR VU 002 & 16.92 t ha⁻¹ in JSR VU 003 (colored) was found. The marketable fruit yield 14.25 t ha⁻¹ was found in BARI Borboti-1.

Effect of different shading material on yield and quality of summer tomato

M.A. Sumi, M. S. Alam and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar during the Kharif season 2023-24 with a view to assess the effect of different shading nets (shading intensity and color) (T₁: White polythene, T₂: Green shade net, T₃: Black shading net, T₄: Jute net) on the growth of tomato plants growing in the summer season to assess the benefits of shade in terms of improved crop yield. Maximum Fruit yield was obtained from T₁ (9.08t ha-1) and minimum was T₃ (1.62 t ha-1).

Effect of spacing and no. Of plant/ pit on growth and yield of bitter gourd

M. A. Habib, M. Rasheduzzaman, M. A. Sumi, M. S. Alam and M. H. Hossain

A field experiment on Bitter gourd was conducted at the experimental field of RARS, BARI, Akbarpur, Moulvibazar, during the kharif season of 2023. The study comprises two spacing i.e., S1= (1.5m × 1.5m), S2(2.0m × 1.5m); and no. of plant/pit P1= 1 Plant/pit, P2=2 Plant/pit, P3=3 Plant/pit to evaluate the effect on growth and yield of Bitter gourd. Combined effect of spacing and no. of plant/pit was not significantly different except avg.

fruit wt. and yield. Maximum avg. fruit wt. (116.67 g) was obtained from S2P1 combination and followed by (108.80 g) was in S1P1 combination. Maximum yield (20.08 tha⁻¹) was obtained from S1P2 combination and minimum yield (11.16 tha⁻¹) was obtained from S2P3 combination. Maximum MBCR (2.51) was obtained from S1P2 treatment and minimum MBCR (1.28) was obtained from S2P3 treatment.

Effect of liming on growth and yield of bush bean at Moulvibazar

M. J. Hussain, M. Samsuzzaman, M.S. Alam, and M. H. Hossain

The experiment was conducted at the research field of RARS, BARI, Akbarpur, Moulvibazar during winter season of 2022-23 and 2023-24 to find out the effect of Dolochun on BARI Jharsheem-2 and to optimize the amount of liming material for BARI Jharsheem-2 at the acidic soil of Moulvibazar region. The experiment was designed followed RCBD with three replications. Five treatment of different levels of Dolochun were considered as- T₁: 0 ton Dolochun ha⁻¹ (control); T₂: 0.5 ton Dolochun ha⁻¹; T₃: 1 ton Dolochun ha⁻¹; T₄: 1.5 ton Dolochun ha⁻¹ and T₅: 2 ton Dolochun ha⁻¹. From two years' study, it was observed that application of Dolochun has significant effects on bush bean production. Maximum pod yield as well as seed yield of BARI Jharsheem-2 (13.09 and 19.46 ton pod ha⁻¹ and 3.13 and 2.50 ton seed ha⁻¹) was recorded with 1.5 ton Dolochun followed by 1.0 ton ha⁻¹. Similar results were also observed in other parameters of bush bean.

Effect of potassium on the growth, yield and quality of sweet orange

M. J. Hussain, M. F. I. Siraj, M.S. Alam, and M. H. Hossain

The experiment was conducted at the research field of RARS, BARI, Akbarpur, Moulvibazar during 2023-24 to find out the effect of different level of potassium on the growth, yield and quality of sweet orange. The experiment was laid out followed RCBD with three replications. BARI Malta-1 was used for the experiment. Five treatments of different levels of potassium were considered. From one year study, it was observed that that different level of potassium had an impact on yield and fruit quality of sweet orange. Maximum no. of fruits/plant (39.67 nos.) and TSS (9.33%) were

found in T₂ treatment. Individual fruit weight (141.0 g), fruit length (6.3 cm) and fruit diameter (6.4 cm) were found to be the highest in T₄ treatment which was significant compared to others.

Effect of different fertilizer management levels on growth, yield and fruit quality of pummelo (*Citrus grandis*)

M. J. Hussain, M. F. I. Siraj and M. H. Hossain

The experiment was conducted at the research field of RARS, BARI, Akbarpur, Moulvibazar during 2022-23 to find out the effect different fertilizer management levels on vegetative and reproductive growth, yield and fruit quality of BARI Jambura-1. The experiment was laid out followed RCBD with three replications. Six treatments of different levels of fertilizer were considered. From one year study, it was observed that that different fertilizer management levels had impact on yield and fruit quality of pummelo. Maximum no. of fruits/plant (25 nos.), individual fruit weight (728.00 g) were found in T₄ treatment which was significant compared to others. There was no significant variation in fruit length and width among the treatments.

Yield and quality of rock melon influenced by liming material and boron under acidic soil of Sylhet region

M. J. Hussain, M. Samsuzzaman, M.S. Alam, and M. H. Hossain

The experiment was conducted at the research field of RARS, BARI, Akbarpur, Moulvibazar during two consecutive years of 2022 to 2023. The experiment was laid out in RCB design with three replications. Six treatments were considered as T₁= 0.5 ton Dolochun +1.5 kg B ha⁻¹; T₂= 1.0 ton Dolochun +1.5 kg B ha⁻¹; T₃= 1.5 ton Dolochun +1.5 kg B ha⁻¹; T₄= 0 ton Dolochun ha⁻¹; T₅= 0 kg B ha⁻¹ and T₆= Absolute control. A blanket dose of recommended NPKS and Zn fertilizer @ 245: 115: 105: 30: 4 kg and organic manure @ 5 ,ton ha⁻¹ were applied for all the treatment except absolute control. Both yield and yield contributing characters were significantly influenced by applying Dolochun and boron. Maximum fruit yield (41.45 and 49.81 t ha⁻¹) was recorded with 1.5 ton Dolochun + 1.5 kg B ha⁻¹ under recommended NPKS and Zn fertilizer and organic manure followed by 1.0 ton Dolochun ha⁻¹. Higher plant

height, fruit size, flesh thickness and TSS were also found in the same treatment. Fruit cracking was controlled under B treated plants where as it was much higher in the plants without boron. Therefore, 1.5 ton Dolochun + 1.5 kg B ha⁻¹ with recommended N-P-K-S-Zn fertilizer @ 245: 115: 105: 30: 4 kg ha⁻¹ and organic manure @ 5.0 ton ha⁻¹ could be the best dose for rock melon production under the prevailing acidic soil condition of Sylhet region.

Survey, monitoring and documentation of major insect pests attacking citrus in north eastern region of Bangladesh

M. S. J. Shaun, M. H. Hossain, A. K. M. Z. Rahman

A field survey was conducted at RARS, BARI, Akbarpur, Moulvibazar during December 2023-April 2024 to document the insect pests of BARI Jaralebu-1 and their natural enemies. The result revealed that three major citrus insect pests such as citrus leaf miner (65%), Asian psyllid (50%), lemon butterfly (18.52%), beetles and some other insects were found during this period. The peak incidence of citrus mealy bug (5.6%), leaf roller (4.2%), black ant (13.8%), and newly found rice skipper (4.4%) were noticed in BARI Jaralebu-1. Little number of lady bird beetle (2.2%) and spider (2.0%) was found.

Integrated management of tea mosquito bug, *helopeltis antonii* attacking cashew nut

M. S. Hossain, A. Mohammad, S. Hossain, A. Hossain, and M. S. J. Shaun

A field experiment was conducted at research field at RARS, BARI, Akbarpur, Moulvibazar during February to May 2024 to find out effective integrated management package against tea mosquito bug (TMB) following randomized completely block design (RCBD) with three replications. Among five IPM packages, package 3 (Hand picking + Alternate spraying of Cellastrus angulatus 1% EW (Bio-Chamak) @ 2.5ml/L of water and spraying of Dinotefuran + Pymetrozine (Warrior @ 1g/L of water) performed best in reducing infestation.

Population dynamics and bio-rational management of whitefly complex infesting guava

M. S. J. Shaun, M.H. Hossain, A. K. M. Z. Rahman, N. K. Dutta

Seasonal fluctuation of Rugose Spirling Whitefly (RSW) population (adults) on guava was varied in

six months study period during 2023-24 at RARS, BARI, Akbarpur, Moulvibazar. The result revealed that the peak period of RSW infestation was found in January 2024 (67.38%) leaf infestation, no. of nymph/leaf (13.674) and no. of adult RSW/leaf (10.8). Several bio-pesticides and one chemical insecticide as check were evaluated against RSW *Aleurodicus rugioperculatus* infesting guava. Among the tested materials, the highest percent reduction over control of whitefly adult and nymph population were 54.82 and 59.41 day after 1st spray in Imitaf and at 3 days after 2nd spray (DAS), the highest percent reduction over control whitefly adult and nymph population were 87.54 and 81.36 were noticed in Biochamak treated plants.

Present status and farmers perception of cultivating BARI malta-1 in Sylhet region

M. Rasheduzzaman, M. A. Rashid, M. H. Hossain

The study aims to identify the present status and farmer's perception of cultivating BARI Malta-1 in Sylhet region of Bangladesh. Problem Confrontation Index along with Problem and Solution Ranking technique was adopted. The results found that the variety is adopted by 95% Malta farmers of the study areas. A well-defined marketing channel prevails in the market. However, the results from problem confrontation index highlighted that lack of availability of quality sapling, un-attractive color, lack of technical knowledge, management practices, insect-pest infestation, lack of marketing facility and less juicy are the main problems. Furthermore, the top ranked solutions are availing quality sapling through BARI and DAE, providing training facility, developing marketing facility and promoting BARI Malta-1.

Adaptive trial with newly BARI released high yielding potato varieties at haor area

M.A.M Miah, M. S. Alam and M. H. Hossain

A total of three adaptive trials were conducted at RARS, BARI, Akbarpur and farmer's field of Mission area, Giasnagar; Nitechor, Office bazar area of Moulvibazar district. During the Rabi season of 2023-24 to evaluate the performance of newly BARI released eighteen improved potato varieties were tested in this experiment. The highest tuber yield (37.75 t ha⁻¹) was obtained from BARI Alu-78 followed by BARI Alu-79 (36.5 t ha⁻¹) and BARI Alu-87 (35.21 t ha⁻¹). The lowest tuber yield was obtained from BARI Alu-40 (18.89 t ha⁻¹).

¹). Common scab infection was the lowest in BARI Alu-50 (1.32%) and the highest in BARI Alu-25 (2.79%) followed by BARI Alu-90 (2.36%) and BARI Alu-77 (1.98%). Maximum cut worm infestation was recorded from BARI Alu-37 (4.39%) and minimum in the potato variety BARI Alu-90 (1.14%).

Performance of BARI panikachu varieties in Sylhet region

M. A. M. Miah, M. S. Alam and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar, during the Rabi season 2023-24 with a view to assess the adaptation potentiality BARI released six stolon and rhizome producing Panikachu viz. BARI Panikachu-1 (Latiraj), BARI Panikachu-2, BARI Panikachu-3, BARI Panikachu-6, BARI Panikachu-8, BARI Panikachu-9 and Local Panikach-Baniachong & Local Panikachu-Sreemongal were evaluated at RARS, BARI, Akbarpur, Moulvibazar. The results showed variation among most of the growth parameters, yield attributes and yield of stolon and rhizome producing Panikachu genotypes. Higher stolon yield (24.64 t ha⁻¹) was obtained in BARI Panikachu-1 and BARI Panikachu-2 (18.19 t ha⁻¹) followed by BARI Panikachu-3 (16.51 t ha⁻¹) and BARI Panikachu-8 (16.14 t ha⁻¹) at all the studied varieties. Higher marketable rhizome yielding variety was BARI Panikachu-3 (54.32 t ha⁻¹) and the lowest one is local Panikachu-Sreemongal (19.10 t ha⁻¹).

Evaluation of quinoa germplasm at Moulvibazar

M. S. Alam, M. S. J. Shaun, F. I. Siraj and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar, during the Rabi season 2023-24 with a view to assessing the yield potentiality of the selected quinoa lines to select suitable variety. Higher days required for the heading and maturity for the CQ Akb-005 followed by CQ Akb-004 and the lowest value for this trait was found in CQ Akb-003. The highest plant height was observed in CQ Akb-002 (80.37 cm) followed by CQ Akb-004 (72.97 cm) and shortest plant height (60.49 cm) was found in CQ Akb-003. Thousand seeds weight was highest (3.37 g) in CQ Akb-003

and lowest in CQ Akb-004 (2.7 g). The highest yield per plot and per hectare was found in CQ Akb-004 followed by CQ Akb-005 and lowest yield was for CQ Akb-002. Lodging percent was highest in CQ Akb-001 and lowest in CQ Akb-004. In case of diseases and insect infestation percentage, highest foot and root rot and neck rot was in SAU Quinoa-1 followed by CQ Akb-003 and the lowest in CQ Akb-004.

Regional yield trial of quinoa

M. S. Alam, M. S. J. Shaun, and M. H. Hossain

The experiment was conducted at Regional Agricultural Research Station, Akbarpur, Moulvibazar, during the Rabi season 2023-24 for the evaluation of three quinoa lines with a check. Higher days required for the 50% flowering and maturity for the BARI Quinoa Line-1 and the lowest value for this trait was found in CQ Akb-003. Maximum plant height was also observed in BARI Quinoa Line-1 followed by BARI Quinoa Line-3 and minimum plant height was found in SAU Quinoa-1. Thousand seeds weight was higher in CQ Akb-003. The highest yield per hectare was also recorded for BARI Quinoa Line -1 (1.86 tha⁻¹) followed by BARI Quinoa Line-3 (1.80 tha⁻¹) and the lowest yield was recorded for the BARI Quinoa Line -2 (1.44 tha⁻¹).

Preliminary yield trial of proso millet

M. S. Alam, F. I. Siraj, and M. H. Hossain

Preliminary yield trial of five proso millets lines with two check varieties were executed at RARS, BARI, Akbarpur, Moulvibazar during rabi season 2023-2024 to find out the suitable lines. Plant height was maximum (82.11 cm) in BD 1370 followed by BARI Cheena-1 (81.11 cm) and the minimum (69.22 cm) plant height was for BARI Cheena-2. Number of tillers per plant was highest (19.42) in BARI Cheena-1 and the lowest (14.05) in BD 770. Highest (15.73 cm) panicle length was recorded in BD 770 and the lowest (12.02 cm) panicle length was for BD 758. Thousand grain weight was maximum (4.88 g) for BARI Cheena-2 and the minimum (3.57 g) in BD 1405. In case of yield, highest (2.21 tha⁻¹) yield was recorded for BD-758 followed by BD 1402 (1.97 tha⁻¹) and lowest (1.51 tha⁻¹) yield was found in BD770. Considering yield and yield contributing characters three lines i.e., BD-758 and BD-1402 may be selected for the next year trial.

Effect of soil amendments on tomato yield and soil characteristic in acidic soil at Moulvibazar

M. Shaheenuzamn, M.S. Alam, M.A.M. Miah, M. Rasheduzzaman and M.H. Hossain

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Results showed that all amendments increased the growth and yield of tomato significantly ($P < 0.05$) compared to the control (without soil amendments). The results showed that the effect on days to first flowering (DFF), fruit length (cm) (FL) and fruit diameter (cm) (FD), average fruit weight (AFW) (gm), fresh weight/plant (FWPP) (gm) and dry matter/plant (DMPP) (gm) of tomato were not significantly ($P < 0.05$) influenced by soil amendments applied at acidic soil. But days after 50% flowering (D50%F), plant height (PH), branches/Plant (nos.) (BRPP) and no. of fruits/Plant (nos) (NFPP), number of fruits/Plot (NFPP) and yield per hectare (YPH) (ton/ha) of tomato were significantly ($P < 0.05$) influenced by soil amendments and also shelf life of tomato was significantly ($P > 0.001$) influenced by soil amendments at acidic soil in Moulvibazar. In terms of soil properties, lime, phosphorus, and trichoderma improved the soil's physical and chemical properties. The findings confirmed that soil amendments application increased tomato growth, yield and quality.

Influence of foliar application of boron and humic acid on yield of blackgram at acid soil of Moulvibazar

M. A. M. Miah, M.S. Alam, M. Shaheenuzamn and M.H. Hossain

The experiment was conducted at RARS, BARI, Akbarpur, Moulvibazar during the kharif-II season of 2023-2024 to observe the influence of boron (B) and humic acid (H) on the seed yield and yield contributing characters of black gram. There were 16 treatment combinations comprising four levels each of Boron (0, 0.5, 1, 2 g/L) and Humic acid (0, 0.5, 1, 2 g/L) along with a recommended fertilizer dose. In case of boron application, highest seed yield (1.38tha^{-1}) was obtained from 1.0g/L dose of boron and the lowest one was control (1.24tha^{-1}). In case of humic acid application highest seed yield (1.38tha^{-1}) was obtained from 1.0 g/L dose of humic acid and the lowest one was control (1.31tha^{-1}).

¹). The combination of $B_{1.0} \times H_{1.0}$ produced significantly higher yield (1.71tha^{-1}) than the combination ($B_{0.5} \times H_0$) produced (1.12tha^{-1}).

Demonstration of BARI released panikachu variety at Moulvibazar area

M. A. M. Miah, M. S. Alam and M. H. Hossain

A varietal demonstration of panikachu variety was evaluated at farmers field of Mohammadpur bazar, Giasnagar union, Sadar upazila, Moulvibazar district during the Rabi season of 2023-24 with a view to assess the adaptation potentiality BARI released stolon and rhizome producing Panikachu viz. BARI Panikachu-2. The total area under this program was 12 decimal. From the varietal demonstration, it was observed stolon yield (30.74 t ha^{-1}) & rhizome yield (24.64tha^{-1}) of BARI Panikachu-2 performs better all considerable aspect.

Demonstration with BARI released potato varieties in Moulvibazar region

M. Am Miah and M. H. Hossain

The varietal demonstration of potato varieties were evaluated at Akbarpur; Kadupur; Nitessor, Office bazar; Giasnagar union, Sadar upazila, Moulvibazar district during the Rabi season of 2023-24. Three high yielding improved potato varieties BARI Alu-47, 62, 73 were evaluated in 6 farmer's field under this demonstration program. The total area under this program was 60 decimal. From the varietal demonstration, it was observed that yield of BARI Alu-47 (34.84 t ha^{-1}). The common scab infection (1.81%) was observed in BARI Alu-47. Cut worm infestation was (1.42%) BARI Alu - 47.

Demonstration of BARI developed mustard variety

M.A.M Miah and M. H. Hossain

A demonstration program was carried out with a mustard varieties of BARI Sarisha-14, BARI Sarisha-17 & BARI Sarisha-18 during the Rabi season of 2023-24 with a view to find out the yield performance of short duration mustard varieties in farmers field in existing cropping pattern at different locations of Moulvibazar district. Six farmers were included in the demonstration program. Total area was 600 decimals. Out of them four farmer were included in BARI Sarisha-18, one farmer for BARI Sarisha-17 & one farmers for BARI Sarisha-14. In one location yield of BARI

Sarisha -14 was 1.64 tha^{-1} and the production of BARI Sarisha-17 was 1.78 tha^{-1} . The variety of BARI Sarisha-18 was 2.10 t ha^{-1} at 9% moisture holding condition.

Demonstration of BARI released hybrid tomato varieties at Moulvibazar

M.S. Alam, M.A.M Miah, and M. H. Hossain

The varietal demonstration of hybrid tomato varieties was evaluated at Adampur of Kamalganj upazila, Moulvibazar district, during the Kharif season of 2023-24. Two BARI developed hybrid tomato varieties BARI Hybrid tomato-8 and BARI Hybrid tomato-11, were evaluated in three farmer's field under this demonstration program. The area

under this program was 65 decimals. From the varietal demonstration, it was observed that higher yield was recorded in BARI Hybrid tomato-11 (60.03t ha^{-1}).

Demonstration of BARI released vegetable varieties at farmer's field

M. A. Habib and M. H. Hossain

Demonstration of BARI Lau-4 and BARI Mula-1 was carried out in farmer's field during the Rabi season of 2023-24 at Sadar and Sreemangal Upazilla of Moulvibazar district. The yield of BARI Lau-4 was 50 th^{-1} and yield of BARI Mula-1 was 43 th^{-1} .

CEREAL CROPS

08

Introgression of recessive *nud* gene by combination of marker assisted breeding and speed breeding approaches for hulless barley

Z. A. Talukder, M.M. Billah, M.M. Rohman and R. Sultana

Hulless barley has been traditionally used for food and nowadays is considered as a dietary component for functional nutrition. The hulless trait was controlled by a 17-kb deletion harboring the entire ethylene response factor (ERF) gene on the *nud* locus that resides on the barley chromosome 7HL. In the present study, two hulled barley genotypes (BARI Barley-5 and IBON19) were targeted for the marker-assisted introgression of *nud* allele and convert to hulless. Two hulled barley viz., BARI Barley-5 and IBON19 were used as recurrent parents and two hulless barley viz., BARI Barley-7 and BARI Barley-9 were used as donor parents. Two recurrent parents were crossed with two donor parents and produced F₁ seed. *Nud* allele specific marker will be used for hybridity test and true F₁ will be used for producing BC₁F₁ population in the next year.

Hybridization of barley

S. Begum, M.M. Rohman and R. Sultana

Ten selected parental genotypes of barley including advance lines, BHL-27 (P₁), IBON L-53/17 (P₂), X-156 (P₃) (black seed), Atalpha/12 (P₄), Esmardala (P₅), and BARI Barley-7 (BB-7) (P₆) were crossed in half diallel fashion to obtain new recombinant for developing early, dwarf, high nutrient content and high yielding hull-less barley variety. All the crosses were made 15 combinations in a half diallel fashion. All crosses successfully produced seeds which have been preserved and will be grown for confirmation trial in the next year.

Growing of f₁ of barley

M.M. Rohman, S. Begum and R. Sultana

Forty F₁s produced from ten selected parental genotypes of barley and ten selected advance lines namely BB-10 (P₁), BHL-27 (P₂), IBON/L-40/15 (P₃), IBON/L-53/17 (P₄), X-38 (P₅), X-80 (P₆), X-127 (P₇), X-156 (P₈), BARI Barley-7 (BB-7) (P₉) and BARI Barley-9 (BB9) (P₁₀) were evaluated along with their parents in family block to obtain new recombinant for developing high nutrient contained early, dwarf, and high yielding hull-less barley variety. Based on yield and earliness, 19 crosses i.e. P₁ × P₂, P₁ × P₁₀, P₂ × P₇, P₂ × P₉, P₁ × P₁₀, P₃ × P₅, P₃ × P₇, P₃ × P₉, P₃ × P₁₀, P₄ × P₅, P₄ × P₆, P₅ × P₆, P₅ × P₈, P₆ × P₇, P₆ × P₈, P₆ × P₉, P₇ × P₉, P₇ × P₁₀ and P₉ × P₁₀ were selected for next year.

Growing of F₂ generation of barley

M. M. ROHMAN

Thirty-two F₂ populations and two back crosses were evaluated for selecting desirable segregates. Based on earliness, tillering and yield (16-60 g), 39 individual plants were selected. The seeds of the plants were harvested, and threshing was done manually. The seeds were preserved for next year advancing.

Growing of f₃ generation of barley

M. M. Rohman

Fifty-six F₃ population were evaluated for selecting individual plants with desirable traits. Based on earliness, tillering and yield (15-62 g), 56 individual plants were selected. The seeds of the plants were harvested, and threshing was done manually. The seeds were preserved for next year advancing.

Growing of f₄ generation of barley

M. M. Rohman

Seeds of 68F₄ genotypes were grown for selecting desirable plants. Based on earliness, tillering and yield, 48 families were selected. The seeds of the plants were harvested, and threshing was done manually. The seeds were preserved for next year advancing.

Growing of f₅ generation of barley

M. M. Rohman

Seeds of one hundred and fifty four F₅ genotypes were grown for selecting desirable plants. Based on earliness, tillering and yield (19.5-51.5), 123 families were selected. The seeds of the plants were harvested, and threshing was done manually. The seeds were preserved for next year advancing.

Growing of F₆ generation of barley

M.M. Billah, M.M. Rohman and R. Sultana

Seeds of one thirty two F₆ genotypes were grown for selecting desirable plants based on earliness, short stature, hull-less and high yield. In F₆ generation 8 lines were selected for preliminary yield trial in next year.

Advancing of F₃, F₄ and F₅ generations for developing saline tolerant barley line

M.M. Rohman and M. M. Billah

One hundred and two F₃, 29 F₄ and 37 F₅ population were evaluated in Benarpota, Satkhira and Koira Khulna to select saline tolerant barley genotypes to develop saline tolerant line. Based on phenotypic performance, 78 individual plants, yield ranging 10.5-48.5 g/plant, were selected in F₃ generation; 26 families (yield range 15.5-27.5 g/plant) were selected in F₄ generation and 18 families having average single plant yield with 14.2-29.5 g were selected F₄ generation. These generations will be advanced to subsequent generation in the next year.

Observation trial of barley

M.M. Rohman

Thirty-five barley lines were evaluated at Benarpota, Satkhira to select saline tolerant lines. Selection was done based on saline tolerant as well as earliness, plant vigor, number of tillers per plant, panicle length and other desirable yield contributing characters, particularly Na⁺ and K⁺

and their ionic balance. Significant variation was observed among the lines for all the traits. Based on phenotype, yield and ionic balance, 12 lines, G4-1, G4-2, G4-3, G4-4, G4-5, G4-6, G4-7, G4-13, G4-18, G4-32, G4-33 and G4-34 were selected for next year trial.

Preliminary yield trial of barley (Set-I)

S. Begum, M.M. Rhoman, D. Haldar, A. Tabassum and R. Sultana

The experiment was conducted using eleven barley advanced lines including two check varieties, BARI Barley 8 and BARI Barley 9 across three locations namely Gazipur, Ishurdi and Hathazari. The objective of this study was to find out early matured, high yielding stable barley lines and to verify the influence of the environments on the yield at different locations of Bangladesh. Environments mean sum of squares were highly significant for all the trait studied. The highly significant effects of environment indicate high differential genotypic response across the different environments. Interaction of G×E was found non-significant for all the trait studied except yield (t/ha). Based on the AMMI stability parameter, earliness and yield potentiality F6/23E-4 and F6/23E-7 were the most stable high yielding genotypes across the environments.

Preliminary yield trial of barley (SET-II)

M. M. Rohman

Ten barley lines BHL-15, BHL-26, BHL-27, BHL-28, BHL-29, BHL-31, BHL-32, BHL-33, BHL-34, BHL-35 along with two checks (BARI Barley-7 and BARI Barley-9) were evaluated at Benarpota, Satkhira; Koira, Khulna and Gazipur to select saline tolerant and early barley lines. Significant variation was observed among the lines and locations for all the traits. Considering earliness and yield, BHL-33, BHL-15, BHL-32, BHL-27 and BHL-31 were selected for next year trial.

Advanced yield trial of barley

M.S. Akter, M.M. Billah, M.M. Rohman and R. Sultana

Seven genotypes along with two check varieties (BB-8 and BB-9) of barley were assessed for genotype environment interaction (GEI) and stability to select the best barley lines in three different locations namely Gazipur, Jashore and Hathazari. The analysis of variance revealed that

genotypes-environment was greatly responsible for the variations of the traits especially yield under study while both genotype and environment was non-significant for all of the characters. Considering days to maturity, plant height and mean yield potentiality, genotypes E-28 (1.53 t/ha) and E-155 (2.08 t/ha) could be selected as early maturing, dwarf and high yielding genotypes for further evaluation.

Regional yield trial of barley

M.S. Akter, M.M. Billah, M.M. Rohman and R. Sultana

Seven genotypes along with two check varieties (BARI Barley 5 and BARI Barley 9) of barley were assessed for genotype environment interaction (GEI) and stability to select the best barley lines in three different locations i.e. Gazipur, Jashore and Barisal. The analysis of variance revealed that genotypes-environment was not responsible for the variations of all the traits under study. Similarly, both genotype and environment was non-significant for all of the characters. Considering days to maturity, plant height and mean yield potentiality, genotype E 111 (1.87 t/ha) could be selected as early maturing, dwarf and high yielding genotypes for further evaluation.

International barley yield trial for arid and semi-arid regions (ibyt-asa-24)

S. Begum, M. M. Rohman and R. Sultana

Twenty-three barley entries received from ICARDA and two standard check BARI Barley-8 and BARI Barley-9 were evaluated at Gazipur following RCB design with 2 replications to select better performing early, dwarf and high yielding barley lines. Significant variation was observed for all the traits among the tested entries. Considering short stature, yield and yield contributing characters two lines were selected from the 23 barley genotypes for next year trial.

International barley observation nursery (ibon-24)

M.S. Akter, M. M. Rohman, M. M. Billah and R. Sultana

One hundred and forty-seven barley entries received from ICARDA along with three standard checks BARI Barley-7, BARI Barley-8 and BARI Barley-9 were evaluated at BARI, Gazipur, to select better performing hull-less, early, dwarf and high yielding

barley lines. Considering hull-less, short stature, yield and yield contributing characters ten lines were selected from the 147 barley entries for future breeding program.

Nuclear seed maintenance of BARI released variety and some selected advanced lines of barley

A.H Akhi, M. M. Rohman and R. Sultana

Nucleus seeds are genetically pure and represent the true-to-type characteristics of a particular crop variety. It is produced and maintained with great care to prevent genetic contamination. This experiment was conducted to purify of BARI released barley variety. BARI Barley-6, BARI Barley-7, BARI Barley-8, BARI Barley-9, and BARI Barley-10 was maintained and increased by open pollination. Rouging was done at different growth stages. A total of 885 gm, 596 gm, 588 gm, 640 gm and 680 gm seeds were produced from BARI Barley-6, BARI Barley-7, BARI Barley-8, BARI Barley-9, and BARI Barley-10, respectively and preserved for future breeding program.

Growing of m₁ and m₂ generation of foxtail millet

M.M. Billah, Z.A. Talukder and R. Sultana

Ethyl methane sulphonate (EMS) in chemical mutagens and Gamma radiation in physical mutagens are most effective and frequently used for induction of economically desirable mutants in several crops. In the present investigation, two foxtail millet varieties (BARI Kaon-2 and BARI Kaon-4) were chemically treated by EMS to create or encourage variability in two varieties. There were very little mutagenic effects showed in some of the treatment i.e. short plant height, early to late flowering, and number of seed per plant. M₁ generation has sown and M₂ seeds of different treatments were harvested and kept separately for future breeding program.

Preliminary yield trial of foxtail millet

M. M. Billah, M. Z. A. Talukder and M. K. Alam

Twenty foxtail millets lines (BD-1267, BD-1268, BD-1359, BD-1334, BD-1284, BD-11646, BD-021, BD-157, BD-1361, BD-1281, BD-170, BD-162, BD-1270, BD-1360, BD-1283, BD-1268, BD-10832, BD-1361, BD-1276 and BD-1286) including two check variety BARI Kaon-2 & BARI Kaon-4 were evaluated at Gazipur following RCB

design with three replications to find out the suitable lines for next year trial at different locations. Analysis of variance for all characters showed significant genetic variability among lines except days to maturity and panicle length. Considering yield and yield contributing characters eight lines i.e., BD-1359, BD-1284, BD-157, BD-1361, BD-1360, BD-1268, BD-1276 and BD-1286 were selected for the next year trial.

Preliminary yield trial of proso millet lines

M. M. Billah, S.H. Omy and R. Sultana

The experiment was conducted with 16 exotic and locally collected proso millet lines at Gazipur following RCB design with three replications along with one check variety BARI Cheena-1. Each line was grown, characterized and monitored carefully under normal condition. Among the lines BD-789 can be selected for earliness, BD-790 for short stature and BD-1378, BD-1394, BD-1402, and BD-770 for high yield. These 6 lines will be evaluated for advance yield trial to observe their performance in different locations in Bangladesh.

Regional yield trial of proso millet

S.H. Omy, M. M. Billah, B. Sarker, M.I. Riad, S. Kobir and R. Sultana

Advanced yield trial of eight proso millets lines with one check variety were executed at four locations namely Gazipur, Jamalpur, Jashore and Burirhat following RCB design with three replications to find out the suitable lines for variety development. Significant genetic variability were observed among the lines for all characters except days to maturity and panicle length. Considering overall performance over the locations genotypes BD1446 and BD1402 may be selected for the large plot yield trial as candidate variety for next breeding cycles.

Regional yield trial of finger millet

M.M. Rohman

Four finger millet lines namely IE-2619, IE-3392, IE-3077, IE-2043 and BARI Raghi-1 (Check) were evaluated at Gazipur, Jashore and Burirhat following RCB design with three replications. Significant variation was found for genotypes. Considering overall performance, IE-3392 was selected as candidate variety.

Development of base population in sorghum

Z.A. Talukder, M.M. Billah, A.H. Akhi, M. K. Alam and R. Sultana

The experiment was conducted with balanced bulk 4th cycle sorghum seeds of two groups, each group contained 50 selected panicles based on (i) medium height and high yield and (ii) dwarf and earliness were planted and random mated in isolation at BARI Gazipur during rabi 2023-24 for the development of source populations in sorghum. For the purpose of advancing, finally 300 panicles were selected separately from the two groups and preserved carefully. The balanced bulked seeds of these two populations would be grown separately in isolation for final selection of the two desirable source populations in the coming rabi season.

Observation trial of selected colored grain sorghum genotypes

Z. A. Talukder, M.M. Billah, M.K. Alam and R. Sultana

The experiment was conducted to observe the performance of the selected colored grain sorghum genotypes and identify high yielding dwarf colored grain sorghum genotypes. The experiment was laid out in randomized block with twenty-one sorghum genotypes including one check variety (BARI Sorghum-1) at BARI, Gazipur during the rabi season 2023-24. Among the colored grain sorghum genotypes, Entry-1(125cm), Entry-2(122cm), Entry-3(132cm), Entry-4(128cm), Entry-5(123cm), Entry-8(134cm), Entry-14(128cm), Entry-19(124cm) and Entry-20(125cm) found shorter plant height compared to BARI Sorghum-1 (136cm). In case of yield, Entry-1(6.10 t/ha), Entry-2(5.80 t/ha), Entry-7(5.80 t/ha) and Entry-19(6.00t/ha) produced higher yield than BARI Sorghum-1(5.75 t/ha). Considering yield potentiality and dwarfness, entry-1, entry-2, entry-4, entry-7, entry-9, entry-18, entry-19 and entry-20 were found promising and selected for preliminary yield trial (PYT) in the next year.

Evaluation of m₄ mutants for yield and quality traits for creating genetic variation in oats induced by mutation

A.H. Akhi, M.M. Rohman and R. Sultana

Gamma, EMS and combine of gamma and EMS treated seeds of M₄ generation were evaluated to select desired mutant genotypes for oat variety development. A total of 16 mutant line for short

height, 14 for early flowering, 20 for excellent grain performance, 5 for broad leaf and 9 mutant lines for moderately lodging tolerance were selected from gamma and EMS treatment. All the selected mutant seeds were harvested separately and rest of the plant seeds were harvested as bulk and kept separately for future breeding program.

Advanced trial of oat genotypes for early and high yield

A.H. Akhi, M.M. Rohman, R. Sultana, M.I. Riad, M.H. Khan and B.Sarkar

Four genotypes of oat and one check variety (BARI Oat 1) were evaluated Randomized Complete Block Design with 3 replications following RCB design for genotype environment interaction (GEI) and stability for the selection of promising one(s) in four agro-ecological zones namely Gazipur, Jamalpur, Barishal and Rangpur of Bangladesh. The AMMI (additive main effects and multiplicative interaction) model was used to analyze the genotype-environment interaction over four locations to select desired genotypes having higher yield and other potential traits. Regarding genotypes (G), significant variation was found for days to 50% flowering and thousand grain weight. Considering maturity and yield BOL 5 and BOL 1, BOL3 respectively were selected for next year trial.

Regional yield trial of quinoa

M.M. rohman

Four quinoa lines, BQL-1, BQL-2, BQL-3 and SAU Quinoa-1 (as check) were evaluated at Gazipur, Jashore, Akbarpur and Koira in 2023-24 in RCBD design with three replications. Significant difference was observed among the lines and locations for all the traits. Considering yield and other performance, BQL-1 was selected for varietal candidate.

Varietal identification and fingerprinting of BARI released barley (*Hordeum Vulgare* L.) Varieties using morphological descriptors and SSR markers

Z. A. Talukder, M.M. Billah, M.M. Rohman, S. Begum and R. Sultana

Ten BARI released barley varieties have been selected for identification DNA finger printing using morphological descriptors and SSR marker. Morphological characters of BARI released barley varieties have been taken during 2023-24 at BARI,

Gazipur. Among the barley varieties, four are hulled (BARI Barley-1, BARI Barley-2, BARI Barley-4 and BARI Barley-5) and six are hullless (BARI Barley-3, BARI Barley-6, BARI Barley-7, BARI Barley-8, BARI Barley-9 and BARI Barley-10). Among the varieties, BARI Barley-9 was produced the highest yield (2.70t/ha) and BARI Barley-5 was early mature (95 days) variety. For molecular characterization, DNA isolation of ten BARI released barley varieties have been completed using CTAB method. The concentration of DNA of the genotypes have been varied from 1838.2 to 3310.6 ng/μl. The absorbance at 260nm/280nm of DNA samples ranged from 1.80 to 1.86 indicated its good quality of DNA. Approximately 30 SSR markers will be used for DNA finger printing in the next year.

Screening of linked dna marker resistance to bacterial wilt in tomato

Z.A. Talukder and H. Islam (Horticulture)

Bacterial wilt (BW), caused by *Ralstonia solanacearum* species complex, is one of the major biotic factors limiting tomato production in Bangladesh. DNA isolation of ten tomato genotypes were done using CTAB method. The concentration of DNA of the genotypes varied from 618.8 to 3880.4ng/μl. The absorbance at 260nm/280nm of DNA samples ranged from 1.74 to 1.89 indicated its good quality of DNA.

Nutritional analysis of cereals and pseudocereals

M. M. Rohman, S. Sultana and M.H.K. Siraji

Minerals like, Zn, Mn, Cu, Ca, Fe, Mg, P and K were analyzed in Kaon, China, Sorghum, Oat and Raghi. BARI oat-1 (BO-1) had higher Zn followed by BARI Kaon-2 (BK-2). Cu content was higher in BARI China-1 (BC-1). BARI oat-1 (BO-1) had also higher Fe followed by BARI China-2 (BC-2). It had also higher Mn followed by BARI Kaon-4 (BK-4). BARI Raghi-1 contained the highest Ca whereas BARI oat-1 (BO-1) contained the highest values for Mg, P and K.

Nutritional composition of multigrain flour prepared from high value minor cereals

A.H. Akhi, M.M. Rohman, Z.H. Talukder, M. M. Billah, S. Begum, M.K. Alom and R. Sultana

Six different minor cereal varieties namely BARI Barley-9, BARI Oat-1, BARI Raghi-1 BARI Kaon-2, BARI Cheena-1, BARI Sorghum-1 and one

wheat variety of BARI Gom 32 were used for conducting this experiment. Each type of grain were grinded separately to produce fine flour using a grinder and sieved the ground flour to remove any coarse particles, ensuring a fine, uniform texture. In a large mixing bowl, combine the flours in desired proportions to prepare multigrain flour. Among the single grain oat showed highest protein and fibre followed by barley. and in treatment highest protein, fibre and energy were observed in treatment T2. In time of flatbread preparation, T2 treatment showed highest time to cook first side but swelling appearance is near to control. So, treatment T2 were selected for further analysis.

Collection and evaluation of cucumber germplasm for agronomic traits and sex types

Z. A. Talukder, R. Sultana, M.M. Billah, M.K.Alam, I. Ahmed (Pgrc) and A.N.S.Karim (Pgrc)

Twenty-five cucumber genotypes were collected from different seed company in Bangladesh and PGRC, BARI and evaluated the performance of the genotypes based on agronomic traits and sex types. The experiment was laid out in randomized block design with three replications. From the collected genotypes, only two were gynocious, whereas the remaining were monocious. Among the genotypes, maximum fruit number per plant (10) were found in the genotype-4 while minimum (3) was found in the genotype-10. The highest vine length (390cm) was observed in genotype-17 whereas lowest (250cm) was observed in genotype-4. Genotype-8 produced the maximum individual fruit weight (340g) while genotype-9 produced minimum individual fruit weight (180g). The highest fruit yield per plant (2900g) was found in genotype-4 whereas lowest (760g) were found in genotype-14. Considering yield potentiality and sex types, genotype-1, genotype-2, genotype-4, genotype-7, genotype-8, genotype-9, genotype-15 and genotype-18 were selected for hybridization program, and genotype-3 and genotype-4 were selected for development of gynocious cucumber line.

Collection and evaluation of papaya germplasm for Yield and sex types

R. Sultana, Z. A. Talukder, M.M. Billah, M.K. Alam, I. Ahmed (Pgrc) and A.N.M.S.Karim (Pgrc)

Fifteen papaya genotypes have been collected from local market in Bangladesh and evaluated for yield

and sex types. Three sex type viz., male, female and hermaphrodite plant has been observed in the experimental plant materials. The experiment is still in the field. Data recording of yield and yield contributing characters are going on. Besides, crossing among the genotypes and selfing within the genotype is also going on.

Breeder seed production of barley

M.K.Alam, M.M. Billah, M. Rahman, M.M.H. Khan, M.R Islam, M.S Huda, M.B Sarkar

Breeder seeds serve as the foundation for developing new crop varieties with enhanced traits such as higher yield, disease resistance, and improved nutritional quality. To disseminate and popularize as well as to increase pure seed stock of released barley varieties breeder seed were produced at different locations in Bangladesh namely Gazipur, Jamalpur, Burirhut, Rahmatpur, Ishurdi, Dinazpur and Debigonj. A total of 2675kg of barley seed viz. BARI Barley 6, BARI Barley 7, BARI Barley 8, BARI Barley 9 and BARI Barley 10 were produced at seven different locations.

Breeder seed production of foxtail millet, proso millet, sorghum, oat and chia variety

M.K. Alam, M.M. Billah, M. Rahman, M.M. H. Khan, M.S Huda, M.B Sarkar, M.I Riad, M.S Kabir, D Halder, A. Tabassum

Breeder seeds play a vital role in agriculture by serving as the genetic foundation for crop improvement, ensuring high quality and performance, and supporting food security and sustainable practices. Breeder seeds are produced under controlled conditions to maintain high levels of genetic purity and quality. They are carefully managed to ensure that they retain the specific traits intended for production. A total of 3506 kg breeder seed of Foxtail Millet (Kaon), Proso millet (Cheena), Sorghum (Joar), Chia, Raghi and Oat (Joi) were produced at Gazipur, Jashore, Rahmatpur, Debigonj, Dinajpur, Hathazari, Jamalpur and Burirhut during rabi season 2023-2024.

Maintenance and seed increase of barley lines

M.K. Alam and M. M. Rohman

The maintenance of seed production is essential for ensuring high-quality seeds, enhancing agricultural productivity. Proper maintenance ensures that seeds remain genetically pure and free from contamination, which is vital for the reliability of crop varieties. Thirty

barley lines were grown at Gazipur for maintenance and seed increase during rabi 2023-24. A total of 15.5 kg seeds were obtained from 30 lines and stored to use in the breeding program for next year.

Seed production of bari developed hull-less barley lines

M. K. Alam, M.M. Rohman, M. M. Billah and M.Z.A. Talukder

The experiment was conducted at Gazipur to increase pure seed stock of BARI developed hull-less barley lines. A total of 9.24 kg barley seeds were produced from 15 barley lines.

Maintenance and seed increase of foxtail millet germplasm

M.M. Billah, M. K. Alam and S.H.Omy

Germplasm are the main building blocks of variety development. Maintaining seed purity by rouging off type, diseased and weak plants is most important in plant breeding. Again, availability of enough seed is prerequisite to conduct various breeding program to develop better variety. Hence, the experiment was conducted with 15 exotic foxtail millet lines. Each line was investigated carefully and off type, diseased and weak plants were rouged out and a total of 35.7 kg seeds were preserved for future breeding program.

Maintenance and seed increase of BARI released oat variety and germplasm

A.H. Akhi, M.K. Alam and R. Sultana

Oats are a nutritious, versatile, and sustainable food source that offers numerous health benefits, making them an important part of a balanced diet and a valuable crop for agriculture. One BARI released oat variety (BARI Oat-1) and twelve germplasm were maintained in research field of PBD, BARI. As a self-pollinated crop this variety and line was maintained by natural selfing and total of 4.71kg seeds were produced and preserved for future breeding program.

Maintenance of chia germplasm

S. Begum, M.M. Rohman, and R. Sultana

Chia (*Salvia hispanica*) has gained popularity for several important reasons, particularly in health and nutrition. Chia seeds are high in essential nutrients, including omega-3 fatty acids, fiber, protein, antioxidants, and various vitamins and minerals. Eleven chia germplasm were maintained and seed

increased at Gazipur and 3.28 kg seeds were produced and stored for use in next year program.

Maintenance and seed increase of quinoa variety and germplasm

A.H Akhi, M. M. Rohman and R. Sultana

Quinoa is a highly nutritious and versatile grain with significant health benefits. It contains all nine essential amino acids, making it one of the few plant-based complete proteins and is a good source of fiber, vitamins (such as B vitamins), and minerals (including iron, magnesium, and potassium). Seeds of three lines and one quinoa variety namely BARI Quinoa Line-1, BARI Quinoa Line-2 and SAU Quinoa 1 and BARI - Quinoa 1 was maintained and increased by open pollination. A total of 1.00 kg, 1.28 kg, 1.44 kg and 1.87 kg seeds were produced from BARI Quinoa Line-1, BARI Quinoa Line-2, BARI Quinoa -1 and SAU Quinoa 1 respectively and preserved for future breeding program.

Technology transfer activities

M. M. Billah, Z. A. Talukder, M. K. Alam and R. Sultana

Plant breeding division, BARI has been working with five crops like barley, foxtail millet, proso millet, sorghum and oat. This division has also given more emphasis to develop high yielding varieties. Area and production of high value minor cereals can be increased through adopting new varieties and modern technologies. For quick dissemination of new varieties and improved production technologies, a number of technology transfer programs have been initiated during 2023-24 by the plant breeding division. One Officers training on plant breeding and biometry and one SA/SSA training with 25 participants on barley, millet, sorghum and other minor cereal production technology was conducted at BARI, Gazipur. Two farmers training on Crop Production and dissemination of minor cereals were conducted with total 60 farmers at Faridpur and Jamalpur. Demonstration trials were set at Khulna and Rangpur. Besides, one seminar workshop was held at BARI, Gazipur and 2 field days were arranged at Khulna and Rangpur. Thirteen varieties were transferred throughout the countries. Two new varieties (BARI Dhemshi-1 and BARI Quinoa-1) were released, one annual report were published from the division.

AGRONOMY

09



Crop Management

Effect of boron fertilization on yield and quality of bari sarisha-18

J.A. Chowdhury, S.S. Kakon, M.A.H. Khan, M.R. Karim and M.A.K. Mian

A field experiment was conducted at Agronomy research field of Bangladesh Agricultural Research Institute, Joydebpur, Gazipur, during Rabi season of 2023-2024 to find out the appropriate amount of boron fertilizer for optimum yield of BARI Sarisha-18. The experiment was comprised of 6 treatments viz. T₁= Control (no boron applied); T₂=1.5 kg/ha boron; T₃=1.75 kg/ha boron; T₄=2.0 kg/ha boron; T₅=2.25 kg/ha boron and T₆= 2.5 kg/ha boron. Results indicated that yield and yield attributes of mustard were significantly influenced by boron application. The effects of boron were significant on number of siliqua/plant, number of seed/siliqua, seed yield, 1000-seed weight and harvest index (%).The seed yield (2181.33 kg/ha) was found in the treatment T₆ (2.5 kg/ha boron) The seed yield was positively and significantly correlated with the yield contributing characters viz siliqua/plant, seed/siliqua, and 1000-seed weight, but not with plant height and pod length. This result showed that boron had positive influence on reproductive development. Therefore, application of B @ 2.25 kg/ha is a good option to increase yield and yield contributing characters of BARI Sarisha-18.

Yield performance of garlic under different integrated nutrient management at AEZ-9

M.R. Ali, J. Rahman and M.M. Kadir

An experiment was carried out at Regional Agricultural Research Station (RARS), Jamalpur during November 2023 to April 2024 to find out the yield performance of garlic under different integrated nutrient management at AEZ-9. The

treatments were; T₁= Recommended fertilizer dose (95-35-75-25-3-3 kg/ha NPKSZnB), T₂= IPNS+ poultry manure (1.5 t/ha), T₃= IPNS+ poultry manure (3.0 t/ha), T₄= IPNS+ vermicompost (1.5 t/ha), T₅= IPNS+ vermicompost (3.0 t/ha), T₆= IPNS+ FYM (1.5 t/ha), T₇= IPNS+ FYM (3.0 t/ha). BARI Rosun -2 was used in the study. The result indicated that garlic yield was increased due to integrated nutrient management. The highest garlic yield (9.20 t/ha) was found from IPNS+ poultry manure (3.0 t/ha) and the lowest yield (5.89 t/ha) was found from recommended fertilizer dose (95-35-75-25-3-3 kg/ha NPKSZnB) treatment.

Improvement of lentil productivity through increasing potassium (k) fertilizer

M. R Islam

An experiment was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna during Rabi season of 2023-2024 to know the effect of K on productivity of lentil under late and optimum sown condition. BARI Masur-8 were grown with five potassium fertilization levels viz., 1) recommended K fertilization (RKF i.e. 20 kg K/ha), 2) RKF + 25% additional K, 3) RKF + 50% additional K, 4) RKF + 75% additional K and 5) RKF + 100% additional K. The design was split-plot with three replications, where two sowing time viz. i) Nov 15, ii) Dec 15 were allotted in the main plots, and potassium fertilization levels were assigned randomly in the sub-plots. As increase the level of K fertilizer with recommended dose had significantly influenced the relative water content, chlorophyll content, and alleviates the terminal heat stress through accumulation of proline content. However, increase of K at 25, 50, 75 and 100% more with RKF treatment positively influenced the seed yield of lentil, and is also noted that the seed yield increased to 5, 7, 10, 13% in optimum sown condition and 4, 8, 10, 13% in late sown condition,

respectively. Results exhibited K fertilizer improves the productivity of lentil both under late and optimum sown condition.

Effect of planting time on yield of onion at dinajpur

M.M. Khanum, M.S. Huda, M.Z. Ali and S.S. Kakon

The experiment was carried out at the research field of Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Rajbari, Dinajpur during rabi season of 2022-23 and 2023-24 to find out suitable transplanting time for getting higher yield of onion varieties. The experiment consisted of two varieties viz., V₁=BARI Piaz-4 and V₂=BARI Piaz-6 and four planting time viz, P₁=10 December P₂=30 December P₃=10 January and P₄= 30 January. The experiment was laid out in randomized completely block design with three replications. The highest bulb yield (19.41 t/ha) was obtained from V₁P₁ (10 December planting with BARI Piaz-4) treatment. The maximum gross return (Tk. 679350/ ha) and gross margin (Tk. 519100/ ha) and benefit cost ratio (4.23) were recorded from 10December planting with BARI Piaz-4 (V₁P₁). From the result it might be concluded that BARI Piaz-4 and BARI Piaz-6 with December 10 planting might be suitable combination for maximum yield of onion.

Effect of fertilizer dose and variety on the yield and yield attributes of sunflower in rangpur region

S. Hasan, M.A.I. Sarker, M.M. Sheikh and M.N. Sarker

A field experiment was carried out at RARS, BARI, Burirhat, Rangpur during the Rabi season of 2022-23 & 2023-24 to find out the best fertilizer dose and variety for optimum yield of sunflower and better economic return in Rangpur region. The experiment was laid out in split plot design with four fertilizer doses in the sub plot and varieties in the main plot. Fertilizer doses viz T₁: Recommended dose (RD), T₂: 30% more than RD, T₃: 40 % more than RD and T₄: Farmer dose and varieties of sunflower. BARI Shurjomukhi-2 and BARI Shurjomukhi-3 were used in the experiment. The interaction effect of fertilizer dose and variety had varied significantly. The maximum seed yield was obtained from BARI Shurjomukhi-2 (2.28 t/ha) in 2022-23 and (2.15 t/ha) in 2023-24 with 40 %

more than RD. The maximum gross return (182400 Tk./ha) in 2022-23 and (172000 Tk./ha) in 2023-24 were obtained from BARI Shurjomukhi-2 with 40 % more than RD. The highest benefit cost ratio was recorded from V₁T₁ in both the years irrespective of varieties.

Integrated nutrient management in sunflower for rangpur region

M.A.I. Sarker, S. Hasan, M.M. Sheikh and M.N. Sarker

The experiment was carried out at RARS, Burirhat, Rangpur during the Rabi season of 2022-23 and 2023-24 with the objective to determine the nutrient management practices on the productivity and economic of sunflower. The experiment consisted of 6 treatments viz. T₁: Fertilizer dose on STB, T₂: IPNS based on STB with 1.5 t/ha Poultry manures (PM), T₃: IPNS based on STB with 3.0 t/ha PM, T₄: IPNS based on STB with 1.0 t/ha vermicompost, T₅: IPNS based on STB with 3.0 t/ha vermicompost and T₆: RFD (120-42-80-28-3-2 NPKSZnB kg/ha and 5 t/ha CD) + 20% extra. The different nutrient management was evaluated in RCB design with 3 replications and var. BARI Surjomukhi-3 was used. Among the different treatments, the results showed that the highest average of two years' sunflower yield (1.87 t/ha in T₆ and 1.86 t/ha in T₅) was obtained from T₆ and T₅ treatments. Though, the maximum average gross return (Tk. 158343/ha) was recorded from T₆ treatment but the maximum average net return (Tk. 83039/ha) as well as MBCR (2.37) were obtained from T₄ treatment (IPNS with 1.0 t/ha vermicompost).

Performance of different mungbean varieties at moulvibazar

M.A.M. Miah, M.S. Alam, M. Shaheenuzzamn and M.H. Hossain

The experiment was conducted at Regional Agricultural Research Station (RARS), Bangladesh Agricultural Research Institute (BARI) at Moulvibazar during the Kharif-1 season of 2023-2024 to select mungbean varieties for the Moulvibazar area. Five mungbean varieties viz. BARI Mung-6, BARI Mung-7, BARI Mung-8, BINA Mung-8, BINA Mung-9. Among the varieties, the highest number of pods per plant was recorded in BARI Mung-6 (25.54) while the lowest (13.87) was in BARI Mung-8. The highest (10.45) no of seed/pod at BARI Mung-6 was observed and

the lowest one was (9.18) at BARI Mung-8. The highest yield was recorded in BARI Mung-6 (1.78 t/ha) while the lowest (1.30 t/ha) was recorded in BINA mung-8.

Performance of summer tomato varieties at early summer season in Dinajpur

M. S. Huda, M. M. Khanum and M.R Islam

An experiment was conducted at ARS, Rajbari, Dinajpur during Kharif season of 2024 to find out the appropriate transplanting time and variety to get maximum yield of tomato. The experiment was consisted of two planting dates viz. 22 February and 22 March and five varieties viz. BARI hybrid Tomato-8, BARI hybrid Tomato-11, BARI Hybrid Tomato line -75, BARI Hybrid Tomato line -76 and one Local (Bipul plus) as treatments. The experiment was laid out in a RCBD design with 3 replications. The results showed that dates of planting and variety greatly influenced on yield of tomato. The interaction results indicated that the maximum fruit yield (48.46 t/ha) was obtained from BARI Hybrid Tomato-11 with planted on 22 February followed by BARI hybrid Tomato-8 with planted at 22 February (46.86 t/ha). The lowest yield was recorded from local (Bipul plus) cultivar planted at 22 March (25.91 t/ha). Results of economic analysis showed that maximum gross return (Tk. 1115250/ ha) and gross margin (Tk. 809360/ha) and benefit cost ratio (3.65) were obtained from BARI Hybrid Tomato-11 with planted on 22 March. The result indicated that variety BARI Hybrid Tomato-11 and BARI Hybrid Tomato-8 with planted on 22 March might be suitable combination for getting maximum yield and economic return.

Effect of nutrient management on growth, yield and nutrient uptake in sorghum

S.S. Nasreen, A.A. Begum, M. Z. Ali and M.A.K. Mian

The research was conducted at Agronomy Research Field, BARI, Gazipur, during Rabi season of 2023-24 to study the effect of nutrient management on yield and nutrient uptake in sorghum. The experiment was conducted in RCBD with 3 replications consisting five treatments viz., T₁: 150-75-62.5-33.75-2.8-1.4 kg/ha of NPKSZnB; T₂: 120-60-50-27-2.8-1.4 kg/ha of NPKSZnB; T₃: 90-45-37.5-20.25-2.8-1.4 kg/ha of NPKSZnB; T₄: 60-30-25-13.5-2.8-1.4 kg/ha of NPKSZnB; T₅: Control

(Native fertility). The highest yield was found in T₁: 150-75-62.5-33.75-2.8-1.4 kg/ha of NPKSZnB but the highest thousand seed weight were found in T₂: 120-60-50-27-2.8-1.4 kg/ha of NPKSZnB which were statistically similar. T₂: 120-60-50-27-2.8-1.4 kg/ha of NPKSZnB treatment may be recommended for sorghum cultivation in Gazipur region.

Growth and yield of sorghum as affected by planting geometry

S. Akther, J.A. Chowdhury, M.A.H. Khan and M.A.K. Mian

An experiment was conducted in Agronomy Research Field of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur during Rabi season of 2023-2024 to find out suitable planting geometry for getting higher yield of sorghum. Six planting geometry T₁= 50 cm × 10 cm (20 plants/m²), T₂= 50 cm × 15 cm (13 plants/m²), T₃= 60 cm × 10 cm (16 plants/m²), T₄= 60 cm × 15 cm (11 plants/m²), T₅= 70 cm × 10 cm (14 plants /m²) and T₆= 70 cm × 15 cm (9 plants/m²) were used in the study. Results revealed that, planting geometry has great influence on leaf area index (LAI), dry matter production and yield of sorghum. Results revealed that, planting geometry has great influence on leaf area index (LAI), dry matter production and yield of sorghum. Plant spacing 70 cm × 15 cm produced higher LAI, which intercepted higher light energy. Narrow plant spacing, T₁ (50 cm × 10 cm) gave the highest TDM. Highest number of grain/panicle (1280) and 1000 grain yield (33.73g) was found in T₆ treatment but maximum grain yield (4.56 t/ha) was recorded from T₃ treatment due to higher plant population. So 60 cm × 10 cm (16 plants/m²) is suitable for sorghum cultivation.

Growth and yield of barley (*hordeum vulgare*) as influenced by weed and fertilizer management

M. Z. Ali, J. A. Chowdhury, A. A. Begum, S. S. Kakon and M. A. K. Mian

The experiment was conducted at Agronomy research field of Bangladesh Agricultural Research Institute, Gazipur during 2023-2024 to find out the optimum fertilizer dose and appropriate weed management method for getting higher yield and economic return of barley. The treatments were T₁ = 85-25-43-10-3-1.5 kg/ha N-P-K-S-Zn-B (100% use by Breeding Davison) + herbicide Spray

(Pendimethalin 33% EC @ 3 L/ha) at 5 days after sowing (DAS) of barley seed + spading at 25 DAS. T₂ = 68-20-34-8-2.4-1.2 kg/ha N-P-K-S-Zn-B (80% of T₁) + herbicide Spray (Pendimethalin 33% EC @ 3 L/ha) at 5 DAS of barley seed + spading at 25 DAS. T₃ = 51-15-26-6-1.8-0.9 kg/ha N-P-K-S-Zn-B (60% of T₁) + herbicide Spray (Pendimethalin 33% EC @ 3 L/ha) at 5 DAS sowing of barley seed + spading at 25 DAS. T₄ = 34-10-17-4-1.2-0.6 kg/ha N-P-K-S-Zn-B (40% of T₁) + herbicide Spray (Pendimethalin 33% EC @ 3 L/ha) at 5 DAS sowing of barley seed + spading at 25 DAS. T₅ = 43-13 kg/ha N-P (Farmer practice + No weeding). Anguli (*Digitaria* spp), Bothua (*Chenopodium album*), Chapra (*Elusine indica*), Durba (*Cynodon dactylon*), Helencha (*Enhydra fluctuans*), Mutha (*Cyperus rotundus*), Shaknote (*Amaranthus viridis*) and Shama (*Echinochola crusgali*) were the common and dominant weeds in the Barley field. Results showed that the highest number of weeds 178/m² at 25 DAE and 276/m² at 50 DAE was recorded in T₅ Treatment (Farmer practice) respectively. The minimum weed dry weight 6.83 g/m² and 5.25 g/m² and the highest weed control efficiency (WCE) 85.23 and 91.17 % was found in treatment T₂ (68-20-34-8-2.4-1.2 kg/ha N-P-K-S-Zn-B (80% of T₁) + herbicide Spray (Pendimethalin 33% EC @ 3 L/ha) at 5 DAS of barley seed + spading at 25 DAS). The highest grain yield 2.77 t/ha, highest gross return Tk. 1,38,333/ha and higher benefit cost ratio 1.86 were obtained from 85-25-43-10-3-1.5 kg/ha N-P-K-S-Zn-B + herbicide Pendimethalin 33% EC @ 3 L/ha spraying at 5 days after sowing of barley seed + spading at 25 DAS and it was statistically identical with T₂ treatment (grain yield: 2.57 t/ha). So, the result revealed that Fertilizer dose @ 68-20-34-8-2.4-1.2 kg/ha N-P-K-S-Zn-B (80% of T₁) + herbicide Pendimethalin 33% EC spray @ 3 L/ha at 5 days after sowing (DAS) and spading at 25 DAS of barley would be effective for higher grain yield and weed control method for barley cultivation.

Growth and yield of foxtail millet as affected by planting geometry

S.T. Zannat, S.S. Kakon, J.A. Chowdhury, M.R. Karim and M.A.K. Mian

A field experiment was conducted at the Agronomy Research Field of BARI, Gazipur, during Rabi season of 2023-24 to find out suitable planting geometry of foxtail millet. Six planting geometry

viz; T₁ = 100 plants/m² (20cm × 5cm), T₂ = 80 plants/m² (25cm × 5cm), T₃ = 66 plants/m² (30 cm × 5cm), T₄ = 50 plants/m² (20cm × 10cm), T₅ = 40 plants/m² (25cm × 10cm) and T₆ = 33 plants/m² (30 cm × 10cm) were used in the study. Planting geometry showed great influence on Leaf Area Index (LAI), dry matter production and grain yield of foxtail millet. Results revealed that, higher plant population i. e., 80 plants/m² with 25cm × 5cm planting system produced higher LAI and dry matter which ultimately gave the higher grain yield. The highest grain yield was recorded in 80 plants/m² with 25cm × 5cm planting geometry. Significantly the highest grain yield (2.47 t/ha) was observed in 80 plants/m² with 25cm × 5cm spacing. The result also revealed that 80 plants/m² with 25cm × 5cm spacing gave the highest gross return (197600.00) and benefit cost ratio (3.48). The overall results indicated that 80 plants/m² (25cm × 5cm) might be economically profitable for foxtail millet production.

Productivity and quality of fodder oat as influenced by seed rate

S.S. Kakon, J.A. Chowdhury, M.Z. Ali, S.T.Zannat and M.A H. Khan

The experiment was conducted at research farm of Agronomy Division, Bangladesh Agricultural Research Institute, Gazipur during November 2023 to March 2024. The objective of the study was to determine the optimum seed rate on productivity and quality of fodder oats. There were six seed rate viz. T₁= 60 kg/ha, T₂= 70 kg/ha, T₃=80 kg/ha, T₄=90 kg/ha, T₅= 100 kg/ha and T₆= 120 kg/ha included the experiment. Total green fodder yields were differed in different seed rate. The highest fodder yield (41.03t/ha) with highest gross return (Tk. 164133t/ha) was obtained from T₆ (120 kg seed rate /ha) treatment but the highest benefit cost ratio (3.25) was found in T₅(100 kg seed rate /ha) treatment. The results revealed that 100 kg seed/ha and 80 kg seed /ha are profitable for fodder purpose with better adaptability at Gazipur review region (AEZ 28).

Growth and yield of quinoa as affected by sowing time

S.S. Kakon, J.A. Chowdhury, A.A. Begum, M.R. Karim and M.A.K. Mian

The experiment was conducted at Agronomy research field of Bangladesh Agricultural Research

Institute (BARI), Joydebpur, Gazipur, during Rabi (winter) season of 2023-24 to study the effect of yield of quinoa seeds as affected by sowing date. The experiment consisted of six sowing date viz. (10 November, 20 November, 30 November, 10 December, 20 December and 30 December. Sowing date showed great influence on total dry matter (TDM), leaf area index (LAI) and yield of quinoa. The November (20-30) sowing produced the maximum TDM and LAI. These better parameters finally contributed to higher seed yield than earlier and later sowing date. Early planting took longer time for flowering (52 days) and fruiting while late planting gave early flowering, decreased inflorescences number and increased sterile inflorescences. It was also found that 30 November sowing produced higher seed yield (1.17 t/ha and). 20-30 November sowing produced higher seed yield might be due to favourable air temperature (Max.Temp. 25.99°C and Min Temp.15.03°C in 20 November sowing and Max. Temp. 25.82°C and Min Temp.14.77°C in 30 Nov. sowing) for growth and development of quinoa. Late sowing after November 30 produced lower seed yield due to high temperature (26.36 °C) prevailed at the later growth stage of quinoa. Results revealed that November sowing showed better performance while the advancement of sowing dates the temperature was increased, reducing the grain growth duration and decreased seed yield.

Optimization of seed rate for potential yield of quinoa

J.A. Chowdhury, S.S. Kakon, A.A. Begum, M.A.H. Khan, M.R. Karim and M.A.K. Mian

The experiment was conducted at the research field of Agronomy Division Bangladesh Agricultural Research Institute, Gazipur during Rabi season of 2023-24 to determine the optimum seed rate of quinoa. Experimental factor was seed rate at 5 levels (6, 7, 8, 9, and 10 kg/ha) and consisted of five treatments viz. T₁= 6 kg seed/ha; T₂= 7 kg seed/ha; T₃= 8 kg seed/ha; T₄= 9 kg seed/ha and T₅= 10 kg seed/ha. Seed rate showed great influence on yield components and yield of quinoa. It was found that 8, 9 and 10 kg/ha seed rate produced the statistically significant highest seed yield. The results revealed that 8, 9 and 10 kg seed/ha produced higher seed yield might be due to higher plant population. Lower plant population gave higher number of panicle but higher

population gave higher seed yield. Significantly the lowest seed yield was recorded in 6 kg/ha seed rate. Results revealed that seed sown at 8 kg/ha seed performed better.

Effects of different types and rates of compost on winter vegetables in Barishal region

M.A. Rahman and M.M. Rahman

An experiment was carried out at RARS, BARI, Rahmatpur, Barishal during 2023-24 to determine the effect of different types and rates of compost on growth, yield and economic return of winter vegetables. The location represents the Ganges Tidal Floodplain (AEZ-13), characterized with a subtropical monsoon climate and a humid environment. The experiment consisted of two factor with nine treatments viz., Factor A. Compost type: 3 (three), C₁ = Decomposed floating bed, C₂ = Cowdung and C₃ = Vermi-compost; Factor B. Compost rate: 3 (three) includes T₁ = RDF+ 1 t/ha, T₂ = RDF + 3 t/ha and T₃ = RDF + 5 t/ha and they produce nine treatment combinations. The number of days required for curd initiation ranged from 40 to 46 days, with the longest duration observed in plants treated with 5 tons per hectare of decomposed floating bed residue and the shortest in plants treated with 1 ton per hectare of vermi-compost. The time taken for curd maturity was highest in treatment C₁T₃ (70 days) and lowest in treatment C₃T₁ (67 days). The heaviest individual curd was produced by plants treated with C₁T₃ (1.72 kg), while the lightest curd was obtained from plants treated with C₂T₁ (0.98 kg). The highest curd yield (47.69 t/ha) was achieved with 5 tons per hectare of decomposed floating bed residue, whereas the lowest yield was recorded in plots treated with 1 ton per hectare of cow dung (27.29 t/ha). The highest gross return (953800 Tk./ha), net return (625650 Tk./ha) and BCR (2.91) were obtained from the treatment C₁T₃ which denotes as application of decomposed floating bed residue at the rate of 5 ton per hectare.

Weed Management

Determination of crop weed competition of lentil

S. Paul, M.H. Rahman, M.S. Kobir and K.U. Ahmmad

The critical period of weed control (CPWC) for the lentil variety BARI Masur-9 was studied in an

experiment at the Regional Agricultural Research Station, BARI, Jashore, in Rabi Season, 2023-2024. The experiment was set up as a Randomized Complete Block Design with three replications. Two sets of treatments were used: one set of treatments was weed free for periods of 15, 30, 45, 60, and 75 days after sowing (DAS) and then weeds were allowed to grow, while the other set was weedy, where weeds were permitted to grow for periods of 15, 30, 45, 60, and 75 days after sowing (DAS) and then weed was removed up to harvest, with a weedy check and a season-long weed-free plot. Among the weed species presented in the experimental area, yellow nutsedge (*Cyperus esculenta*), bermuda grass (*Cynodon dactylon*) and celosia (*Amaranthus viridis*) were prominent weed species. The critical period of weed control (CPWC) of BARI Masur-9 was estimated based on a 5% yield loss threshold and this period was 22 to 45 days after sowing (DAS) which indicated that weed must be controlled within this period.

Evaluation of new herbicide for controlling weed in garlic field

S. Akther, J.A. Chowdhury, S.S. Kakon, M.Z. Ali, M.A.H. Khan and M.A.K. Mian

A field experiment was conducted at Agronomy Research Field of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur and farmer's field of Chalanbeel area during Rabi season of 2023-2024 to find out the efficacy of herbicide for controlling weeds in garlic field for yield. Treatments included in the experiment were as T₁ = Fair-fluorfen 23.5 % EC (Oxyfluorfen 23.5 % EC) @ 600 ml/ha spraying at pre-emergence (before transplanting) of weed, T₂ = Fair-fluorfen 23.5 % EC (Oxyfluorfen 23.5 % EC) @ 750 ml/ha spraying at pre-emergence (before transplanting) of weed, T₃ = Fair-fluorfen 23.5 % EC (Oxyfluorfen 23.5 % EC) @ 600 ml/ha spraying at post-emergence (3-5 leaves) of weed, T₄ = Fair-fluorfen 23.5 % EC (Oxyfluorfen 23.5 % EC) @ 750 ml/ha spraying at post-emergence (3-5 leaves) of weed, T₅ = Two hand weeding at 25 and 45 DAT and T₆ = Control (No weeding). Results showed that the highest weed population (107/m² at Gazipur and 98/m² at Chalanbeel) at 25 DAT and (147/m² at Gazipur and 139/m² at Chalanbeel) at 45 DAT were recorded in control plot. The highest WCE (84% at Gazipur, 85% at Chalanbeel and 83% at Gazipur, 82% at Chalanbeel was found in T₂ (Fair-

fluorfen 23.5 % EC @ 750 ml/ha spraying at pre-emergence of weed) treatment at 25 DAT and 45 DAT respectively. The highest yield (10.23 t/ha at Gazipur and 10.87 t/ha at Chalanbeel) was obtained from T₂ treatment. The results revealed that herbicide Fair-fluorfen 23.5 % EC @ 750 ml/ha spraying at pre-emergence of weed would be effective for weed control and economically profitable for garlic cultivation at Gazipur and Chalanbeel area.

Effect of integrated weed management on yield of mungbean

A.A. Begum, S. Kundu, S.S. Kakon, J.A. Chowdhury, M.R. Karim and M.A.K. Mian

A field experiment was conducted at Agronomy Research Field of BARI, Gazipur during Kharif-1, 2024 to find out suitable weed management practice for controlling weeds in mungbean for getting higher seed yield and economic return. The treatments were as follows: T₁ = Two hand weeding (HW) at 15 and 30 days after sowing (DAS), T₂ = Atrazine 50% SC @ 2 L/ha at 3 days before sowing (DBS), T₃ = Pendimethalin 33% EC @ 2 L/ha at 3 DBS, T₄ = Pendimethalin 33% EC @ 2 L/ha at 3 DBS + 1 HW at 30 DAS, T₅ = Pendimethalin 33% EC @ 1.5 L/ha at 3 DAS + Quizalofop-p-ethyle 10% EC @ 0.8 L/ha at 30 DAS, T₆ = Quizalofop-p-ethyle 10% EC @ 0.8 L/ha at 15 DAS, T₇ = Quizalofop-p-ethyle 10% EC @ 0.8 L/ha at 15 DAS + 1 HW at 30 DAS, T₈ = BARI weeder at 15 and 30 DAS, T₉ = Spading at 15 and 30 DAS, T₁₀ = No weeding. Weed management practice showed influence on weed population, weed dry matter, weed control efficiency (WCE), intensity of weed infestation, yield components and yield of mungbean. The highest weed population 228 and 377/m² were recorded in control plot at 25 and 45 DAS, respectively. The lowest weed population 42 and 45/m² were recorded in T₁ treatment at 25 and 45 DAS, respectively. Similar trend was observed in weed dry weight. The highest WCE (85% at 25 DAS and 86% at 45 DAS) and the lowest intensity of weed infestation (1.24 at 25 DAS and 1.45 at 45 DAS) were found in T₁ treatment. The highest seed yield (1225 kg/ha), gross return (Tk.98000/ha) and cost of cultivation (Tk.45560/ha) was observed in T₁ followed by T₅ and T₇. But the highest BCR (2.63) was observed in T₅ treatment followed by T₇ (2.38). The result revealed that Pendimethalin 33%

EC @ 1.5 L/ha at 3 days after sowing + Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 30 days after sowing and Quizalofop -p-ethyl 10% EC @ 0.8 L/ha at 15 days after sowing + 1 HW at 30 days after sowing would be most economic and effective weed control method with higher seed yield of mungbean during Kharif -1 season at Gazipur region (AEZ 28).

Effect of integrated weed management on sorghum in winter

S.S. Kakon, S.S. Nasreen, A.A. Begum, M.Z. Ali, S.T. Zannat and M.A. Mian

The field experiment was conducted at Agronomy Research Field, Bangladesh Agricultural Research Institute, Gazipur, during Rabi season of 2023-2024 to find out suitable weed management practice in sorghum. There were seven treatments viz. T₁ = Two hand weeding at 25 and 40 DAS, T₂ = Herbicide Atrazine @ 2 L/ha spraying as pre-emergence + one hand weeding at 25 DAS, T₃ = Herbicide Atrazine @ 2 L/ha spraying as pre-emergence + weeding by BARI weeder at 25 DAS, T₄ = Herbicide Atrazine @ 2 L/ha spraying as post-emergence at 15 DAS + one hand weeding at 35 DAS, T₅ = Herbicide Pendimethalene @ 3 L/ha spraying as pre-emergence + one hand weeding at 25 DAS, T₆ = Herbicide Pendimethalene @ 3 L/ha spraying as pre-emergence and T₇ = No weeding were included in the experiment. *Shyma* (*Echinochloa crusgali*), *Helencha* (*Enhydra fluctuans*), *Mutha* (*Cyperus rotundus*) and *Shetlomi* (*Gnaphalium affine*) were the common and dominant weeds in the sorghum field. Results showed that the highest weed population 106/m² and 186/m² were recorded in control plot at 25 and 45 DAE, respectively. The highest weed control efficiency (85.28% at 25 DAE and 81.58% at 45 DAE) was found in herbicide Atrazine @ 2 L/ha spraying as pre-emergence + one hand weeding at 25 DAS. Significantly the highest yield (3.89 t/ha) was obtained from T₂ treatment. The highest gross return of (Tk. 116550/ha) and BCR (2.22) were obtained from T₂ (herbicide Atrazine @ 2 L/ha spraying as pre-emergence + one hand weeding at 25 DAS) treatment. The result revealed that two herbicides (Herbicide Atrazine @ 2 L/ha and Pendimethalene @ 3 L/ha spraying as pre-emergence + one hand weeding at 25 DAS) would be effective and economic for weed control method of sorghum cultivation.

Effect of integrated weed management on chia

M.A.H. Khan, J.A. Chowdhury, S.S. Kakon, M.Z. Ali, S. Akhter and M. Rahman

The field experiment was conducted at the agronomy research field of Bangladesh Agricultural Research Institute, (BARI), Gazipur and Regional Agricultural Research Station (RARS), BARI, Cumilla, during Rabi season of 2023-2024 to determine appropriate and economic weed management practices for chia cultivation. Treatments included in the experiment were: T₁ = One hand weeding at 30 DAS, T₂ = One hand weeding at 45 DAS, T₃ = Two hand weeding at 30 and 45 DAS, T₄ = Two weeding by BARI dry land weeder at 30 and 45 DAS, T₅ = Herbicide Atrazine @ 2 L/ha spraying as pre-sowing, T₆ = Herbicide Pendimethalin @ 3 L/ha spraying as pre-emergence, T₇ = Herbicide Quizalofop-p-ethyl @ 2 L/ha spraying as post-emergence, T₈ = Oxyfluorfen 24% @ 700 g/ha as pre-emergence and T₉ = No weeding. The highest weed population (51 and 116) was observed in T₉ (control) and the lowest population (20 and 6) was observed in T₆ (Pendimethalin) at 45 DAS in Gazipur and Cumilla respectively. The highest seed yield and yield components were observed in T₇ (Herbicide Quizalofop-p-ethyl @ 2 L/ha spraying as post-emergence) both in Gazipur and Cumilla. The highest benefit cost ratio (3.53 and 3.66) was obtained from T₇ (Herbicide Quizalofop-p-ethyl @ 2 L/ha spraying) at Gazipur and Cumilla respectively. Among the treatments T₇ (Herbicide Quizalofop-p-ethyl @ 2 L/ha spraying as post-emergence) was found as the most suitable weed management practice for obtaining higher yield and economic benefit in chia cultivation.

Efficacy of different herbicides for controlling weeds in onion field

M.Z. Ali, S.T. Zannat, M.S. Huda, M.M. Khanum and M.A.K. Mian

A field experiment was conducted at Agronomy Research Field of Bangladesh Agricultural Research Institute, Gazipur and Agricultural Research Station (ARS), Dinajpur during Rabi season of 2023-2024 to find out the suitable herbicide for controlling weed in onion field. The thirteen treatments were as follows: T₁ = Ensure 88.8 WDG (Mesotrione 8% + Atrazine 80.8%) @ 800 – 1000 g/ha spraying at 2-4 leaf stage of weeds, T₂ = Lopat 50 EC (Quizalofop-p-Ethyl 5%

EC) @ 1150 ml/ha spraying at 2-4 leaf stage of weeds, T₃= Rasen Star 25 EC (Oxadiazon 25%) @ 1 L/ha spraying at 2-4 leaf stage of weeds, T₄ = Meso 10 SC (Mesotrione 10%) @ 1L/ha spraying at 2-4 leaf stage of weeds, T₅ = Petra 18 WP (Acetochlor 14% + Bensulfuron-methyl 4% WP) @ 2 kg/ha spraying at 2-4 leaf stage of weeds, T₆ = Medi Care 10 EC (Fenoxa-P- Ethyl) @ 650 ml/ha spraying at 3-4 DAT, T₇ = Urumi 55 EC (Atrazine 50%+Mesotrione 5%) @ 1 L/ha spraying at 2-4 leaf stage of weeds, T₈ = Maxon 25 EC (Oxadiazon 25% w/w) @ 1 L/ha spraying at 2-4 leaf stage of weeds. T₈ = Pendulum 33 EC (Pendimethalin 33%) @ 2.5 L/ha spraying at 3-4 DAT, T₁₀ = Grande 38.7 CS (Pendimethalin) @ 1.75 L/ha spraying at 3-4 DAT, T₁₁ = Ridhom 30 WP (Bensulfuron Methyl + Bispyribac Sodium) @ 75 g/ha at 3-4 leaf stage, T₁₂ = Two hand weeding at 25 & 50 DAT, T₁₃ = Control (No weeding and herbicide) were use in the experiment. Result showed that number of weeds/m², weed dry weight (g/m²) and weed control efficiency (WCE) and yield of onion were significantly influenced by all the herbicides. The highest weed population (68/m² and 165/ m² at 25 DAT) and (88/m² and 198/ m² at 50 DAT), weed dry weight (27.36 g/m² and 21.23 g/m² at 25 DAT) and (32.15 g/m² and 32.98 g/m² at 50 DAT) was recorded in T₁₃ treatment (Control, no weeding) in both locations. Among the herbicides treated plot lowest weed population (10/m² and 14/ m² at 25 DAT) and (11/m² and 25/m² at 50 DAT), weed dry weight (2.78g/m² and 2.97 g/m² at 25 DAT) and (3.68 g/m² and 3.69 g/m² at 50 DAT) was recorded in T₉ treatment in both locations. The highest weed control efficiency (WCE) at 25 DAT (87.77% and 86.01%) was found in T₉ treatment and at 50 DAT the highest WCE (88.55% and 88.81%) was also found in same treatment. Among the herbicides treated plots highest onion bulb yield (18.36 t/ha at Gazipur and 18.47 t/ha at Dinajpur) was obtained from T₉ treatment. Among the herbicide treated the highest gross return Tk. 6,42,717/ha and Tk. 6,46,450/ha, gross margin Tk. 4,44,870/ha and Tk. 4,48,603/ha, highest BCR 3.25 and 3.27 was obtained from T₉ treatment at Gazipur and Dinajpur respectively. So the result revealed that alleleven herbicides would be effective for weed control and economically profitable for onion cultivation at Gazipue (AE 28) and Dinajpur (AEZ 1).

Evaluation of new herbicides for weed management in soybean

A. A. Begum, S. T. Zannat, M.A. Rahman, J. A Chowdhury and M.A.K Mian

A field experiment was conducted at Agronomy Research Field of Bangladesh Agricultural Research Institute, Joydebpur, Gazipur and RARS, Brishal in 2023-24 to find out the performance of herbicidal weed management in soybean field. The treatments were: ; T₁ = Mentor 70 WP (Metribuzin 70%) @ 750 g/ha at 2-4 leaf stage of weeds , T₂ = Vico 28 SL (Glufosinate Ammonium) @ 1.5 L/ha as pre emergence, T₃ = Vico 28 SL (Glufosinate Ammonium) @ 2.0 L/ha as pre emergence, T₄ = Iris 24.5 EC (Sodium Aciflurofen 16.5% + Clodinafop Propagyl 8%) @ 0.7 L/ha at 2-4 leaf stage of weeds, T₅ = Iris 24.5 EC (Sodium Aciflurofen 16.5% + Clodinafop Propagyl 8%) @ 1.0 L/ha at 2-4 leaf stage of weeds, T₆ = Two Hand weeding at 25 and 45 DAT and T₇ = Control (No weeding). Results showed that number of weed/m², weed control efficiency (WCE) and yield of soybean were significantly influenced by all the weed control methods. The highest weeds/m² at 25 DAP (81/m² at Gazipur and 74/m² at Barishal) was recorded in T₇ (No Weeding) treatment in. At 45 DAP (143/m² at Gazipur and 131/m² at Barishal) highest number of weeds were also found in T₇ treatment. The lowest weed number (37/m² at Gazipur and 18/m² at Barishal) at 25 DAP was found in T₁ treatment and at 45 DAP lowest weeds/m² was found in T₂ (82/m²) treatment at Gazipur and in T₄ (64/m²) treatment at Brishal. At 25 DAP the highest WCE was found in T₂ (91.02%) treatment at Gazipur and in T₁ (83.50%) treatment at Brishal. At 45 DAP the highest WCE (82.27% at Gazipur and 82.63% at Brishal) were also found in T₂ and T₁ treatment respectively. Significantly, the highest yield (2.79 at Gazipur and 1.89 t/ha at Brishal) was observed in T₁ and T₆ treatment. The highest gross margin (35511 Tk/ha at Gazipur and 25825 Tk/ha at Barishal) and BCR (1.74 at Gazipur and 1.56 at Barishal) was found in T₁ treatment. The result showed that, herbicide Metribuzin 70% should be sprayed @ 750 g/ha at 2-4 leaf stage of weeds. Glufosinate Ammonium should sprayed @1.5 L/ha as pre emergence and herbicide Sodium Aciflurofen 16.5% + Clodinafop Propagyl 8% should be applied @ 0.7 L/ha at 2-4 leaf stage of weeds which would be effective for controlling weed in soybean field.

Multiple Cropping

Sunflower- legume strip cropping for resource conservation

A.A. Begum, M.Z. Ali, J.A. Chowdhury, S.S. Kakon, M.R. Karim and M.A.K. Mian

The field experiment was conducted at the research field of Agronomy Division BARI, Gazipur during rabi season of 2023-24 to find out the effect of strip cropping on maintaining soil health and sustainable productivity. Four treatment viz., T₁= Sunflower 4 rows alternate with 8 rows lentil, T₂= Sunflower 4 rows alternate with 8 rows garden pea, T₃= Sunflower 4 rows alternate with 5 rows grass pea, T₄= Sole sunflower 16 rows were tested. All sunflower legume strip cropping showed higher productivity than sole sunflower. But the highest sunflower equivalent yield (SEY) of 3.61 t/ha, gross return (Tk. 144400/ha), gross margin (Tk. 78900/ha) and benefit cost ratio (BCR) of 2.20 was obtained from T₂ (Sunflower 4 rows alternate with 8 rows garden pea strip cropping) treatment. The result revealed that the farmers can be benefited by cultivating any sunflower legume strip cropping with higher productivity than sole sunflower. But among the three strip cropping 'sunflower alternate with garden pea strip cropping' was economically more profitable.

Barley- legume strip cropping for higher productivity and soil health

J.A. Chowdhury, M.Z. Ali, S.S. Kakon, M.R. Karim and M.A.K. Mian

A field experiment was conducted during Rabi season, 2023-2024 at the Agronomy Research Field of Bangladesh Agricultural Research Institute, Gazipur to maintain sustainable productivity and to conserve soil health. The experiment consisted of four treatments viz., T₁= Barley (12 row) alternate with garden pea (8 row), T₂= Barley (12 row) alternate with lentil (8 row), T₃= Barley (12 row) alternate with grass pea (6 row) and T₄= Sole Barley (48 row). Strip cropping increased the accumulation of all investigated macronutrient in soil. The inclusion of pea as strip crop (T₁ treatment) resulted in higher content of all investigated nutrients among the legume crops. The grain yield of barley (2.18 t/ha) was higher in sole barley plot than all strip cropping plot. But barley equivalent yield (BEY), gross return, gross margin and benefit cost ratio (BCR) were higher in all strip

plot than sole barley plot. The highest barley equivalent yield (4.21 t/ha), gross return (Tk. 210500/ha), gross margin (Tk. 153500/ha) and BCR (3.69) were observed in T₁ treatment. The result revealed that the farmers can be benefited by cultivating any one barley legume strip cropping with higher productivity. But among the three strip-cropping, barley + pea strip cropping was more profitable.

Sorghum- legume strip cropping for higher productivity and increase soil health

M.Z. Ali, A.A. Begum, S.S. Kakon, J.A. Chowdhury and M.A.K. Mian

A field experiment was conducted at the research field of Agronomy Division BARI, Gazipur during rabi season of 2023-24. The soil of the research area belongs to AEZ-28. The soil was clay loam with pH 6.3. The experiment consisted of four different treatments viz., T₁= Sorghum 4 rows alternate with 8 rows garden pea, T₂= Sorghum 4 rows alternate with 8 rows lentil, T₃= Sorghum 4 rows alternate with 6 rows chickpea, T₄= Sole Sorghum 8 rows. The maximum grain yield of sorghum was observed in sole sorghum (3.68 t/ha) but the maximum sorghum equivalent yield (6.63 t/ha) and gross return (Tk. 1,65,783/ha), gross margin (Tk. 94,283/ha) and benefit cost ratio (BCR) 2.32 were obtained from T₁ treatment (Sorghum 4 rows alternate with 8 rows garden pea strip cropping) due to lower cost of production. Maximum gross return, gross margin and benefit cost ratio (BCR) were higher in all strip plots than sole sorghum plot. The result revealed that the farmers can be benefited by cultivating any one sorghum legume strip cropping with higher productivity. But among the three strips cropping's sorghum + garden pea strip cropping was economically profitable and agronomically feasible and increased the soil health.

Intercropping okra with mukhikachu at different planting densities

M. R. Islam

The study was conducted during the crop season of 2023 at the Regional Agricultural Research Station, BARI, Ishurdi, Pabna to find out suitable planting geometry and intercrop combination for higher productivity and economic returns. Five intercropping combination, viz T₁= Mukhikachu 100% + okra 100%; T₂= Mukhikachu 100% + okra

90%; T₃= Mukhikachu 50% + okra 50%; T₄= Sole Mukhikachu (100%); T₅= Sole okra (100%) were studied. Intercropping indices recommended a positive association of mukhikachu and okra crops. Depending on the intercropping okra population, mukhikachu yield reduced by 22%, 9% and 49%, respectively but total productivity was increased due to addition of okra yield. Total productivity in terms of mukhikachu equivalent yield (MEY) was increased due to intercropping. The result revealed that the highest mukhikachu equivalent yield (35.85 t/ha), gross return (Tk1075500/ha), LER (1.83), gross margin (Tk. 825690/ha) and benefit cost ratio (4.31) were obtained from T₂ (Mukhikachu 100% + okra 90%) treatment. The lowest gross return (Tk. 422100/ ha), gross margin (Tk. 288610 /ha) and BCR (3.16) were found in sole okra. The result revealed that okra could be introduced as an intercrop with mukhikachu to increase cropping area and enhance profitability of marginal growers.

Feasibility study of different component crops intercropping with chickpea

M. R. Islam and M. A. Hossain

A field trail was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna during 2023-2024 to find out the suitable intercrop combination with chickpea for higher productivity and economic return. Eight treatments combination viz; T₁= One row of chia in between two rows of chickpea , T₂= One row of coriander in between two rows of chickpea, T₃= One row of black cumin in between two rows of chickpea, T₄= One row of linseed in between two rows of chickpea; T₅= One row of barley in between two rows of chickpea , T₆= One row of wheat in between two rows of chickpea, T₇= One row of foxtail millet in between two rows of chickpea and T₈= Sole chickpea were evaluated in this study. The result revealed that the highest chickpea equivalent yield (2.57 t/ha) was obtained from T₁ (One row of chia in between two rows of chickpea) treatment. The highest gross return (Tk. 244875/ha), gross margin (Tk. 185926 /ha) and benefit cost ratio (4.15) were obtained from T₁ (One row of chia in between two rows of chickpea) treatment and the lowest (1.03 t/ha) chickpea equivalent yield (CEY), gross margin (Tk.37828.45 /ha) and BCR (1.63) were recorded in T₇ (One row of foxtail millet in between two rows of chickpea) treatment. The result revealed

that one row of chia, barley and wheat were grown with two rows of chickpea showed suitable intercrop combination for getting maximum yield and economic return.

Intercropping short duration leafy vegetables with sweet gourd

S. Kundu, S.S. Kakon, J.A. Chowdhury, A.A. Begum, M.Z. Ali and M.A.K. Mian

The field experiment was conducted at Agronomy Research Field, Joydebpur, Gazipur of Bangladesh Agricultural Research Institute during rabi season of 2023- 2024 to find out suitable leafy vegetables intercropping with sweet gourd for higher productivity and maximum economic return. The treatments were T₁=100% sweet gourd (2m × 2m) + 100% coriander green (Broadcast), T₂= 100% sweet gourd (2m × 2m) + 75% coriander green (Broadcast), T₃= 100% sweet gourd (2m × 2m) + 100% radish green (Broadcast), T₄= 100% sweet gourd (2m × 2m) + 75% radish green (Broadcast) , T₅= Sole sweet gourd. Intercropping leafy vegetables with sweet gourd did not reduce sweet gourd yield but increased system productivity. The result revealed that the highest gross return (Tk. 246700 /ha), gross margin (Tk. 123140 /ha) and BCR (2.90) were found in T₃ (100% sweet gourd + 100% radish green) treatment. From the result it might be concluded that 100% sweet gourd + 75-100% radish might be suitable intercrop combination for getting maximum yield and economic return.

Development of alternate cropping pattern against potato maize – fallow – t. Aman for Dinajpur region

M. S. Huda, M. M. Khanum, A. A. Begum and S. S. Kakon

A field experiment was carried out at Agricultural Research Station, Rajbari, Dinajpur during 2022-23. The experiment was carried out with three different cropping patterns viz. CP₁=Maize-Fallow-T. Amanrice (Existing Cropping Pattern), CP₂= Potato + relay maize -T. Aus- Summer Onion and CP₃=Potato + relay maize -T. Aus- T. Aman rice. This was laid out in Randomized Complete Block Design with three replications. The higher rice equivalent yield (50.57 and 30.93 t/ha), production efficiency (120 and 73 kg/ ha/ day) and land

utilization index (115 and 116 %) were obtained from the improved cropping patterns Potato + Maize -T. Aus- Summer Onion (CP₂) and Potato + Relay -T. Aus- T. Aman rice(CP₃) than the farmer's one. CP₂ (Potato + Relay Maize-T. Aus-Summer Onion) gave the highest gross return (Tk.1618240/ ha), gross margin (Tk.1251181/ ha) and marginal benefit cost ratio (MBCR) 5.28. CP₃ (Potato + Maize-T. Aus- T Aman) gave the higher gross return (Tk.989760/ ha), gross margin (Tk.697815 / ha) and marginal benefit cost ratio (MBCR) 3.54. Therefore, Potato + Relay Maize – T. Aus- Summer Onion/T. Aman might be suitable and replaceable cropping pattern Potato + relay Maize –T. Aus- Summer Onion for high land to high land area for Dinajpur region.

Development of alternate cropping pattern against mustard-fallow-t.aman at dinajpur region

M.M. Khanum, M.S. Huda, M.Z. Ali, S.S. Kakon and D.A. Choudhury

The experiment was carried out at the research field of Agricultural Research Station, Rajbari, Dinajpur during rabi season of 2022-23 to develop a profitable cropping pattern over existing cropping pattern. Five cropping patterns viz. CP₁= Mustard-T. aus- T. aman rice, CP₂= Mustard- Mungbean-T. aman rice, CP₃= Potato- T. aus- T. aman rice, CP₄= Potato- Mungbean - T. aman rice and CP₅= Mustard- Fallow- T. aman rice were used in the study. The experiment was laid out in randomized completely block design with three replications. The highest REY (40.26 t/ha) was recorded from the cropping pattern Potato- T. aus- T. aman rice (CP₃). The gross return and gross margin were higher in the alternate cropping patterns as compared to existing cropping pattern due to additional yield of T. Aus rice and mungbean. From the result it may be concluded that Potato-T. aus- T. aman rice, Potato-Mungbean- T. aman rice and Mustard- Mungbean- T. aman rice cropping patterns could be recommended for higher productivity of Dinajpur. Therefore, farmers in Dinajpur region of Bangladesh could follow alternate cropping pattern in their medium high land where lands remain fallow after harvesting of mustard/potato for higher crop productivity and profitability.

Comparison of different cropping patterns with potato-maize-t.aman rice cropping pattern in rangpur region

M.N. Sarker, M.A.I. Sarker, M.S. Hasan and M.M. Sheikh

To achieve self-sufficiency in food for increasing population and to increase farmers' income, cropping intensity and productivity of rice based cropping system in the country needs to be increased. With this view; to increase cropping intensity as well as crop productivity the study was undertaken through a field evaluation of different cropping patterns during 2022-23 at Regional Agricultural Research Institute, Burirhat, Rangpur, Bangladesh Agricultural Research Institute (BARI). The study was laid out in RCB design with three replications comprising four cropping patterns viz. set onion-potato-T. aus rice-T. aman rice (CP₁), early potato- onion – T. aus rice-T. aman rice (CP₂), early potato- onion-mungbean- T. aman rice (CP₃) and one farmers' improved pattern potato-maize-T. aman rice (CP₄). In terms of productivity and profitability the CP₃ performed better as compared to the other cropping patterns. The results showed that the highest rice equivalent yield (REY), production efficiency and gross return were recorded in CP₃ and the lowest in CP₄. The REY of CP₁, CP₂ and CP₃ patterns were 35.34, 35.47 and 36.69 t/ha which were 52%, 50% and 12% higher, respectively than that of the CP₄ (24.57 t/ha). The highest net return (527445 TK./ha) and highest marginal benefit cost ratio (2.38) obtained from CP₃ cropping pattern. Results revealed that the highest land use efficiency (89.86%) was recorded in CP₂ and the highest production efficiency (114.39) was from CP₃. Early potato - onion – mungbean-T. aman rice (CP₃) and early potato - onion –T. aus-T. aman rice (CP₂) cropping patterns were more productive and remunerative cropping patterns of Rangpur region of Bangladesh.

Performance of different agro-forestry crops as intercrop with arecanut

M.M. Sheikh, M.A.I. Sarker, S. Hasan and M.N. Sarker

The experiment was conducted at Farmer's field in Bhurungamari, Kurigram during two consecutive cropping seasons, 2022-23 and 2023-2024, respectively with the objectives to introduce and economic performance of different crops as intercrop along with Arecanut and to motivate

farmers to cultivate inter crops in Arecanut orchards. There were three intercrop combinations with sole Arecanut (T₁), T₂: Arecanut-Banana, T₃: Arecanut-Pumpkin-Ladies finger and T₄: Arecanut-Spices (Turmeric). The maximum net return (Tk. 1002000/ha in 2022-23 and Tk.1196000/ha in 2023-24) was observed in T₂ (Arecanut-Banana) treatment. The highest BCR (3.60 in 2022-23 and 3.64 in 2023-24) were recorded in T₃ (Arecanut-Pumpkin-Ladies finger) treatment where, pumpkin and ladies finger were grown as intercrops with arecanut. While minimum BCR found in case of T₄ treatment where turmeric grown along with arecanutas main crop. The result indicated that Arecanut-Pumpkin-Ladies finger combination was found most suitable intercropped combination for higher productivity and economic return.

Productivity of chilli-onion intercropping system as influenced by fertilizer dose

M. Rahman and M.A. Siddiky

An experiment was conducted at the research field of Regional Agricultural Research Station, Cumilla, BARI, during rabi season of 2023-24 to find out optimum fertilizer dose for chilli-onion intercropping system for getting maximum yield and economic return. There were four treatments T₁ = RFD (N₈₀-P₃₈- K₆₃- S₁₃- Zn_{1.5}- B_{1.4} kg/ ha)for chilli + No additional fertilizer for onion, T₂ = RFD (N₈₀-P₃₈- K₆₃- S₁₃- Zn_{1.5}- B_{1.4} kg/ ha) for chilli + 25% RFD (N₂₂-P_{9.5}- K_{18.75}- S₆- Zn_{0.75}- B_{0.35} kg/ ha)for onion T₃ = RFD (N₈₀-P₃₈- K₆₃- S₁₃- Zn_{1.5}- B_{1.4} kg/ ha) for chilli + 50% RFD (N₄₄-P₁₉- K_{37.5}- S_{12.75}- Zn_{1.5}- B_{0.75} kg/ ha)for onion, T₄ = Farmers practice. The experiment was set up in a randomized complete block design with three replications Among the treatments, T₂(RFD (N₈₀-P₃₈- K₆₃- S₁₃- Zn_{1.5}- B_{1.4} kg/ ha)for chilli + 25% RFD (N₂₂-P_{9.5}- K_{18.75}- S₆- Zn_{0.75}- B_{0.35} kg/ ha)for onion)was the best fertilizer dose in respect of chilli equivalent yield (19.11 t/ha), gross return (Tk. 859950/ha), gross margin (Tk. 608950/ha) and benefit cost ratio (3.43).

Performance of intercropping coriander with sunflower

M. Rahman and M.A. Siddiky

An experiment was conducted at the research field of Regional Agricultural Research Station, Cumilla ,BARI, during rabi season of 2023-24 to find out the suitable intercrop combination of coriander with

sunflower for increasing cropping intensity and productivity. There were four treatments viz. T₁ = 100% Sunflower (50 cm × 20 cm) + 3 rows of coriander(60%) in between two rows of sunflower, T₂ = 100%Sunflower (50 cm × 20 cm) + 2 rows of coriander (40%) in between two rows of sunflower, T₃ = 100%Sunflower (50 cm × 20 cm) + coriander broadcast (100%) and T₄ = Sole Sunflower (50 cm × 20 cm).The experiment was set up in a randomized complete block design with three replications Among the treatments T₂ {(100%Sunflower (50 cm × 20 cm) + 2 rows of coriander (40%)} in between two rows of sunflower) treatment was the suitable intercrop combination in respect of sunflower equivalent yield (3.21 t/ha), gross return (Tk. 481500/ha), gross margin (Tk. 352500/ha) and benefit cost ratio (3.73).

Performance of relay bitter gourd in tomato +onion intercroppingat medium high land under AEZ-9 without trellis

M.R. Ali, J. Rahman and M.M. Kadir

An experiment was carried out at Regional Agricultural Research Station (RARS), Jamalpur during November, 2022 to August, 2023 to perform the relay bitter gourd in tomato +onion intercropping at medium high land under AEZ-9 without trellis. The treatments were; T₁= Sole Tomato (60cm×50cm), T₂= Tomato (100%)+ 4 row onion (15 cm×10 cm), T₃= Tomato (100%)+ relay bitter gourd (1m×1.5m), T₄= Tomato (100%)+4 row onion (15cm×10cm) + relay bitter gourd (60cm×1.5m), T₅= Tomato (100%)+ 4 row onion (15cm×10cm) + relay bitter gourd (120 cm×1.5m), T₆= Tomato (100%)+ 4 row onion (15cm×10cm) + relay bitter gourd (180cm×1.5m), T₇= Tomato paired row+8 row onion + relay bitter gourd (105cm×1.5m). BARI Tomato-14 was used in the study. The result indicated that onion yield was reduced due to relay cropping systems. The highest tomato equivalent yield (89.72 t/ha) was found from tomato paired row+8 row onion + relay bitter gourd (1.05m×1.5m) and the lowest yield (73.14 t/ha) was found from sole tomato treatment (60 cm×50cm) treatment.

Enhancement productivity and economic return of pigeonpea through inclusion of turmeric

M. R. Islam and J. Hossain

The trail was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna,

BARI, during 2023-2024 to find out the suitable planting geometry of turmeric with pigeonpea in relation to higher system productivity and economic returns. Six treatments combination viz; T₁= Four rows of turmeric in between two rows of pigeon pea; T₂=Three rows of turmeric in between two rows of pigeon pea; T₃=Two rows of turmeric in between two rows of pigeon pea; T₄= One row of turmeric in between two rows of pigeon pea; T₅=Sole turmeric; T₆=Sole pigeon pea were evaluated in the experiment. The design of the experiment was RCB and replicated thrice. Significantly the highest pigeonpea (3.94 t/ha) and turmeric yield (19.90 t/ha) were obtained from their respective sole crops. Pigeonpea yield was reduced (3-35%) due to intercropping which was compensated by the turmeric yield. Results revealed that T₁ (Four rows of turmeric in between two rows of pigeon pea) and T₂ (Three rows of turmeric in between two rows of pigeon pea) intercropping system gave higher economic return as compared to sole crop. Four rows of turmeric in between two rows of pigeon pea (T₁) was found as the best intercrop combination in terms of higher gross margin (Tk. 507150/ha) along with pigeon pea equivalent yield (16.51 t/ ha) followed by three rows of turmeric in between two rows of pigeon pea (T₂). However, the highest benefit cost ratio (2.59 and 2.69, respectively) was observed when four rows/three rows of turmeric in between two rows of pigeon pea. The result revealed that four rows and three rows of turmeric were grown with two rows of pigeonpea showed suitable intercrop combination for getting maximum yield and economic return. Farmers could be benefited by adoption this technology.

Performances of mustard varieties under existing mango orchard in southern region of Bangladesh

M.M. Rahman and M.A. Rahman

An experiment was carried out at RARS, BARI, Rahmatpur, Barishal during rabi season of 2022-23 to determine the yield and economic return under existing mango orchard. The experiment consisted of four treatments viz., T₁ = BARI Sarisha-11, T₂ = BARI Sarisha-14, T₃ = BARI Sarisha-18 and T₄ = BARI Sarisha-19. The treatment T₃ (BARI Sarisha-18) had the highest plant population per square meter (90). The result revealed that Treatment T₃ (BARI Sarisha-18) produced the highest seed yield (1564.8 kg/ha) than other variety

Performance of intercropping garden pea with sweet gourd

S.T. Zannat, S.S. Kakon, A.A. Begum, M.Z. Ali, M.A.H. Khan and M.A.K. Mian

The experiment was conducted at Agronomy research field of Bangladesh Agricultural Research Institute, Gazipur during rabi season 2023-24 to find out the suitable combination of sweet gourd with garden pea for higher productivity and economic return. Four intercrop combinations of sweet gourd and garden pea viz., T₁= Sole sweet gourd (2m × 2m), T₂ = Four row garden pea (50 cm × continuous sowing) in between two rows of sweet gourd (29%), T₃ = Five row garden pea (40 cm × continuous sowing) in between two rows of sweet gourd (36 %) and T₄ = Six row garden pea (30 cm × continuous sowing) in between two rows of sweet gourd (43%), were tested. The highest mean sweet gourd yield (40.16 t/ha) was recorded in sole sweet gourd (T₁) and the lowest (32.35 t/ha) was found in T₄ (Six row garden pea with 50 cm apart lines in between two rows of sweet gourd) treatment. The highest mean garden pea yield (3.84 t/ha) was also recorded in 100% sweet gourd + Five rows garden pea (36%) with 50 cm apart lines. Maximum Sweet gourd Equivalent Yield (49.85 t/ha), highest gross return (Tk.249250/ha and BCR 1.76) were recorded in 100% sweet gourd + Five rows garden pea (36%) with 50 cm apart lines and the. Result revealed that, garden pea planted in between two rows of with 40 cm apart lines at 36% seed rate might be agronomically feasible and economically profitable.

Performance of winter leafy vegetables intercropped with sorghum

S.T. Zannat, S.S. Kakon, A.A. Begum, J.A. Chowdhury, M.Z. Ali, M.A.H. Khan and M.A.K. Mian

The field experiment was conducted at Agronomy research field, Bangladesh Agricultural Research Institute, Gazipur during rabi season of 2023-2024 to find out suitable intercrop combination for higher productivity and monetary advantage. Treatments included in the experiment were: T₁ = Sole sorghum (60 cm × 20 cm), T₂ = Red amaranth broadcast (75%) in between 2 rows of sorghum GP, T₃ = Red amaranth broadcast (100%) in between 2 rows of sorghum T₄ = Radish broadcast (75%) in between 2 rows of sorghum GP, T₅ = Radish broadcast (100%) in between 2 rows of sorghum,

T₆ = Spinach broadcast (75%) in between 2 rows of sorghum and T₇ = Spinach broadcast (100%) in between 2 rows of sorghum. The maximum grain yield (3.09 t/ha) of sorghum was observed in sole crop and sorghum yield was decreased by around 45%, in other intercrop treatments. The result revealed that the highest SEY (10.34 t/ha), gross margin (Tk. 182810/ha) and benefit cost ratio (3.42) were observed in T₇ {Spinach broadcast (100%) in between 2 rows of sorghum} treatment. From the result it might be concluded that all leafy vegetables intercropped with sorghum could be agronomically feasible and economically profitable.

Development of improved cropping pattern through minor cereal for nutritional security

S.S.Kakon, J.A. Chowdhury, A.A. Begum, M.Z. Ali, S.Akther and M.A.K. Mian

The experiment was conducted at the Research Field of Agronomy Division BARI, Joydebpur, Gazipur (AEZ 28), during rabi season of 2023-24 to find out suitable minor crop based cropping pattern for higher productivity. Four treatments of cropping sequence were: CP₁= Foxtail millet - maize +red amaranth- T.aman; CP₂= Proso millet-maize +red amaranth- T.aman; CP₃=Chia- maize +red amaranth- T.aman and CP₄=Boro-Fallow-T.aman (Farmer's practice).The higher rice equivalent yield (21.75 t/ ha), highest gross return (Tk. 652516/ha) and highest benefit cost ratio (3.12)were found in CP₃cropping pattern. Productivity and economic returns were lower in farmers' existing pattern. In terms of rice equivalent yield was increased by 57.10% in CP₃ followed by 54.25 % in CP₂ and 54.15 % in CP₁ cropping pattern compared to farmers' practice (FP). In case of gross margin, the income was increased by 74.88 % in CP₃ followed by 71.55 % in CP₁ and 71.47 % in CP₂ cropping pattern compared to Farmers' practice (FP). Considering crop productivity, CP₃ (Chia- maize +red amaranth-T.aman) was found the most suitable pattern for sustainable crop production.

A baseline survey of integrated farming systems (ifs) in rangpur region

M.M, Sheikh, M.A.I. Sarker, S Hasan and M.N. Sarker

The present study was conducted in Ganghachara Upazila of Rangpur district during November to

April, 2022-2023 and 2023-2024. Purposive sample technique was followed to select the locale of the study. A total 60 farmers was the sample size of the study in both the year. Four types of land holding systems were observed, the own cultivated land for landless, marginal, small, medium and large were 0.02 ha, 0.08 ha, 0.50 ha, 1.50 ha and 3.63 ha and total cultivated land for marginal, small, medium and large were 0.24 ha, 0.65 ha, 1.72 ha and 4.18 ha. There were five land and four soil types, five types of major farming system models exist in the study area. Six major cropping patterns observed in the study location. There were average 2.32 Cows and 2.67 bullocks per farms having 24.60 per cent and 28.32 per cent share. The farmers had an average of 4.44 goats per sample farm having 47.08 percent share. The average number of poultry birds was 11.12 per sample farm. Fisheries enterprise comprised an average of 0.34 acre of land per sample farm.

Unfavourable -eco system

Salinity

Effect of sowing date on yield of sorghum in saline soil

M.A. H. Khan, J. A. Chowdhury, M R Karim, M. A. K. Mian and S. Mondal

An experiment was conducted at the Agricultural Research Station, Benerpota, Satkhira during rabi season of 2023–2024 to find out the optimum sowing time for sorghum in saline area. BARI Sorghum-1 was grown with five sowing date viz., T₁ =15 December, T₂ =25 December, T₃ =5 January, T₄=15 January and T₅=25 January. The result indicated that, the highest panicle/hill (2.50), grains/panicle (1620), 1000 grain weight (22.82) and grain yield (979.33) was found in 15 December sowing. Result showed that 15 December to 25 December may be the optimum time of sowing for sorghum cultivation in saline area.

Effect of folic acid and potassium on sunflower at varying sowing date under salinity stress

M. R. Karim, J.A. Chowdhury, A.A. Begum, S.S. Kakon, M.A.H Khan and S. Mondol

The experiment was conducted at ARS, Benerpota, Satkhira during 2023-24 with three factors, i.e., Factor A: Sowing date (D₁-14

December, D₂-30 December, D₃-15 January, D₄-30 January), Factor B: Folic acid level (F₀- No folic acid, F₁- 50 µM folic acid) and Factor C: Potassium level (K₀- No potassium, K₁- 1.5% K₂SO₄, K₂- 2.5% K₂SO₄) to find out the effect of seed treatment with folic acid and potassium foliar spray on phenotype and yield of sunflower under saline condition. Non-significant effect was found for seed treatment with folic acid and potassium foliar spray. Higher germination percent (95.14%), head diameter (13.24 cm), head circumference (39.36 cm), seed per head (330.13 nos), seed weight per plant (18.51 g), thousand seed weight (55.91 g) as well as seed yield (1.48 t/ha) was found in D₁ (14 December). Early sowing might be effective for obtaining higher yield of sunflower at saline region.

Char-land

Performance of sweet potato varieties at char land area in Rangpur

M.A.I. Sarker, S Hasan, M. M. Sheikh and M.N Sarker

A field trial was conducted at Mohipur char, Gangachara, Rangpur with different varieties of sweet potato to find out the yield performance of different sweet potato varieties in char land during Rabi season 2022-23 and 2023-24. The experiment was laid out in RCB design with three replications. The five varieties were used in this experiment such as BARI Misti alu-8, BARI Misti alu -12, BARI Misti alu-16 and BARI Misti alu-17 and local. The result revealed that all the developed BARI Sweet potato varieties showed better performance and gave 19-39% in 1st year and 18-32% in 2nd year higher yield than local in char land area. Among the varieties, the highest yield (29.65 t/ha in 2022-23 and 30.11 t/ha in 2023-24) was observed in BARI Misti alu-17.

Performance of potato varieties in char land of Dinajpur

J.A. Chowdhury, M. S. Huda and M. M. Khanum

An experiment was conducted at farmers' fields of Kantanjir char, Kaharol, Dinajpur under ARS, BARI, Dinajpur during the rabi season of 2023-24 for adaption of BARI released potato varieties. Five potato varieties viz. BARI Alu-7, BARI Alu-25, BARI Alu-35, BARI Alu-41, BARI Alu-90

were used. Higher tuber yield (22.48-40.89 t/ ha) was found in BARI released potato varieties. Farmers were interested to grow BARI released potato varieties for getting higher tuber yield in Kantanjir char, Kaharol, Dinajpur if the seed is available.

Performance of sesame varieties in charland area of Cumilla

M. Rahman and M. A. Siddiky

The experiment was conducted at farmer's field of charland area of Roghunathpur village under Meghna upazila in Cumilla district during kharif season of 2023-24 to compare the yield performance of BARI released sesame varieties with the aim to replace it by the best one. The sesame varieties viz. i) BARI Til-4 ii) BARI Til-5 and iii) BARI Til-6 were used in the experiment. The experiment was laid out in randomized complete block design with three replications. The highest yield (1440 kg ha⁻¹) was recorded in BARI til -6. Therefore, BARI til -6 performed better than two varieties in charland area.

Haor

Performance of mustard varieties in haor of Brammanbaria

M. Rahman and M. A. Siddiky

The experiment was conducted at farmer's field of haor area under Kollanpur village of Bancharampur upazilla in Brammanbaria district during rabi season of 2023-24 to compare the yield performance of BARI released mustard varieties against local variety with the aim to replace it by the best one. The mustard varieties viz. BARI Sarisha-14, BARI Sarisha-17 and BARI Sarisha-18 were compared with local variety. The experiment was laid out in randomized complete block design with three replications. The highest number of Siliqua/plant (92.33), number of Seeds/siliqua (27.37), 1000-seed weight (3.67g) were recorded in BARI Sarisha-18. The highest seed yield (1900kg/ha) was found in BARI Sarisha-18 was higher yielder than the check local variety. But farmers preferred BARI Sarisha 17 because of higher yield than local variety and short duration nature than BARI Sarisha-18.

Chalan beel

Performance of mustard - jute cropping pattern in chalanbeel area

S.S. Kakon, J.A. Chowdhury, M.Z. Ali, S.T. Zannat and M.A.K. Mian

A field experiment was conducted at the farmers' field of Chalan beel area under Dabila village of Tarash upazila in Sirajganj district during rabi season of 2022-23 to compare the yield performance of BARI released mustard varieties against local variety with the aim to improve the rice-based cropping system through non-rice crops in the beel area of Bangladesh. The treatments were: T₁=BARI Sarisha-16-Jute cropping pattern, T₂=BARI Sarisha-18-Jute cropping pattern, T₃=BARI Sarisha-19-Jute cropping pattern and T₄=Tori-7-boro-fallow cropping pattern (Control i.e. existing cropping pattern). BARI Sarisha-16 produced maximum yield (2.23 t/ha) and it was 61.34% higher than local variety Tori-7. Local mustard variety Tori -7 might be replaced by high yielding BARI Sarisha-16 variety in mustard-jute cropping pattern to improve the productivity and farmers' income in chalanbeel area of Sirajganj. Use of BARI mustard variety rather than local variety produced higher rice equivalent yield (8.81-8.27t/ha) which were 14.80-24.51% higher than existing pattern. Gross return (Tk. 352267-330933/ha), gross margin (Tk. 214037-192703/ha) and benefit cost ratio (2.55-2.39) were also higher by using BARI varieties instead of local variety. The results of the experiment revealed that Mustard-Jute cropping pattern was found to be superior in respect of productivity and economic returns as compared to existing cropping patterns (i.e. Fallow-Boro rice cropping pattern). Farmers are interested to adopt in these improved cropping patterns in the beel area. They will get more economic returns. The total food production of the country will be enhanced through the adoption of these improved cropping patterns.

Performance of water melon as relay with garlic in chalanbeel area

S.S. Kakon, J.A. Chowdhury, A.A. Begum and M.A.K. Mian

A field experiment was conducted to evaluate the economic benefits of water melon relay with garlic under farmers field condition at Gurudaspur of Sirajganj chalanbeel area during rabi seasons of

2023-2024. The treatments were T₁= garlic/water melon (local), T₂= garlic/water melon (BARI Tarmuj-1), T₃= Water melon (local), T₄= water melon (BARI Tarmuj-1) and T₅= garlic (BARI Rasun-3). Relaying of water melon with garlic at 45 days after garlic planting (DAGP). The result revealed that between the two tested water melon varieties, local variety produced higher fruit yield in both sole and relay cultivation with garlic on the other hand, the higher yield of garlic (11.32t/ha) was found from the treatment sole garlic. The highest garlic equivalent yield (GEY) (23.22t/ha), Gross return (Tk. 1160750.00/ha) and BCR (4.69) were recorded in sole garlic/water melon (local). So water melon relayed with garlic could be an economically viable technology, instead of sole garlic for best utilization of fallow land.

Effect of soil amendments on tomato yield and soil characteristic in acidic soil at Moulvibazar

M. Shaheenuzzaman, M.S. Alam, M.A.M. Miah, M. Rasheduzzaman and M.H. Hossain

The experiment was conducted at RARS farm, Akborpur during rabi season of 2023-24 to evaluate the effect of lime, phosphorus, and trichoderma on tomato yield and post-cropping soil properties. The treatments were as follows: T₁= 90-36-45-15-2-1NPKSZnB kg/ha, T₂= 90-36-45-15-2-1NPKSZnB kg/ha with phosphorus along with (60 kg/ha), T₃= 90-36-45-15-2-1NPKSZnB kg/ha with Lime (2 ton/ha), T₄= 90-36-45-15-2-1NPKSZnB kg/ha with phosphorus (30 kg/ha +Lime (2 ton/ha), T₅= 90-36-45-15-2-1NPKSZnB kg/ha with Lime (2 ton/ha) +Trichoderma (2 ton/ha). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Different soil amendments have varying effects on crop growth, yield and soil properties. The study Data on tomato growth and yield were collected and soils were tested before and after the cropping seasons. Results showed that all amendments increased on yield of tomato compared to the control (without soil amendments). The results showed that the effect on days to 50% flowering, plant height, number of fruits/plant and yield of tomato were significantly influenced by soil amendments and also shelf life of tomato was significantly influenced by soil amendments at acidic soil in Moulvibazar. In terms of soil properties, lime, phosphorus, and trichoderma improved the soil's physical and chemical

properties. The findings confirmed that soil amendments application increased tomato growth, yield and quality.

Sorjan

Improvement of sorjan based cropping system for increasing crop productivity in southern Bangladesh

M.A. Rahman and M.M. Rahman

The sorjan based cropping system research were conducted at farmers' field of Atghar, Nesarabad, Pirojpur year round (2022-23) under sorjan system to develop location specific sorjan based cropping system for increasing crop productivity and profitability in southern region of Bangladesh. As treatment, cropping patterns on different types of non-creeper vegetables (five patterns viz., Brinjal + Chili – Fallow – Chili, Chili + Knolkhol – Fallow – Brinjal, Chili + Coriander leaf + Cauliflower-Fallow – Chili, Brinjal – Chili – Chili, and Knolkhol - Stem amaranth – Chili) and creeper vegetables (five patterns viz., Sweet gourd - Bottle gourd - Bottle gourd, Sweet gourd - Bottle gourd - Ash gourd, Sweet gourd - Bitter gourd - Sponge gourd, Sweet gourd - Ridge gourd - Bottle gourd, and Bottle gourd - Ridge gourd - Ash gourd) were cultivated on sorjan bed and trellis, respectively. Statistically significant variation was observed among the studied cropping patterns on sorjan bed (CPSB) in terms of Chili Equivalent Yield (CEY). Treatment CPSB-1 (Brinjal + Chili – Fallow – Chili) gave the highest CEY (47.51 t/ha) Again, treatment CPST-5 (Bottle gourd - Ridge gourd - Ash gourd) produced the highest BEY (131.10 t/ha), Yield and local market price of bottle gourd, ridge gourd and ash gourd were comparatively high than that of other creeper vegetable crops. Therefore CPST-5 showed the highest BEY. However, the final recommendation will be made after completing the three years tenure cropping patterns.

Intercropping of vegetables with newly established guava orchard under sorjan system in Barishal region

M.A. Rahman and M.M. Rahman

The experiment was conducted at Gava village under Banaripara upazila of Barishal district for year round to develop suitable intercropping

system(s) of vegetables with newly established guava orchard (var. BARI Peyara-2) under sorjan system. The guava seedlings were produced through grafting method where BARI developed guava variety (BARI Peyara-2) and was used as scion was local Swarupkati variety was taken as root stock. Guava seedlings were planted on 22 February 2022 through zigzag method on sorjan bed maintaining row to row distance 3m and plant to plant distance 2m. Different types of non-creeper (4 cropping patterns) and creeper vegetable (5 cropping patterns) crops were cultivated in various seasons as intercrop treatment with guava on sorjan bed and trellis, respectively. The highest GEY (35.30 t/ha) was obtained from GICSB-2 (Guava+Knolkhol+Indian spinach) Among the Guava based intercropping on sorjan trellis (GICST), treatment GICST-2 (Guava + Bottle gourd-Ridge gourd) gave the highest Guava Equivalent Yield (GEY: 48.62 t/ha). Besides, GICST-1 (Guava + Bottle gourd-Ash gourd), GICST-4 (Guava + Sweet gourd-Ridge gourd) and GICST-3 (Guava + Bottle gourd-Bitter gourd) showed the GEY of 41.23, 40.44 and 40.34 t/ha, respectively. The orchard of the grafted BARI Peyara-2 variety is dwarf type and the canopy structure is comparatively lower than that of Swarupkati guava variety. Intercropping of creeper vegetable crops (like bottle gourd, sweet gourd, ridge gourd, bitter gourd etc.) can be grown on sorjan trellis with newly established dwarf type of guava orchard (like BARI Peyara-2 variety) for increasing productivity and economic return. However, non-creeper vegetable crops (cabbage, cauliflower, red amaranth, Indian spinach etc.) can be cultivated on sorjan bed only in the first year orchard establishment. Thereafter it cannot be done due to shading effect of plant leaf canopy. Therefore, the final recommendation will be made after completing three years tenure intercropping of vegetables with new guava orchard.

Influences of management practice on yield and quality of local Swarupkati guava on sorjan bed

M. M. Rahman and M. A. Rahman

An experiment was conducted during 2022-23 at Gava village (farmer's field) in Barishal district of Bangladesh to determine the appropriate management package for guava cultivation on sorjan bed and to reduce cultivation cost as well as increase farmers' income. The experimental

treatments were six viz., T₁ = Earthing up (farmers' practice), T₂ = Earthing up + Recommended dose of fertilizer (RDF), T₃ = RDF + Spraying of pesticides against insect and diseases, T₄ = Earthing up + RDF + Spraying, T₅ = Earthing up + Pruning + Spraying, T₆ = Earthing up + RDF + Pruning + Spraying. The experiment was set up in an established eight years old local guava orchard (var. Swarupkati). Management practices had statistically significant effects on the number of fruit/tree, single fruit weight, fruit weight/tree and fruit yield. Treatment T₆ produced the highest weight of fruit/tree (21.12 kg). The lowest weight of fruit/tree was recorded from treatment T₁ (11.30 kg). Fruit yield became the highest (35.22 t/ha) in treatment T₆. Management practices of T₅, T₄, T₃ and T₂ contributed reduced amount of fruit yields (28.46, 28.22, 25.43 and 23.68 t/ha, respectively). Percentage of Total soluble solid (TSS) exhibited the highest value (14.90%) in T₆ treatment. The longest shelf life (8.33 days) was observed in treatment T₆, which was statistically identical to that of T₅ (8.00 days) and the shortest shelf life (5.67 days) was observed in farmers' practice. Application of improved management practices (Earthing up + RDF: 12 kg cow dung, 500 g urea, 416 g TSP, 416 g MoP, 14 g zinc sulphate, 10 g Sulphur + Pruning of non-productive and dead branches + Spraying of pesticides against insect-pest and diseases) in local Swarupkati guava variety increased the marketable yield and quality under sorjan system in Barishal region.

Yield and quality of golden apple as influenced by agronomic practice on sorjan bed

M. M. Rahman and M. A. Rahman

The field experiment was conducted at Gava village in Banaripara, Barishal during 2022-23 for year round to find out the optimum agronomic practice for getting higher yield and quality of golden apple on sorjan bed in Barishal region. The experiment consisted of five agronomic practice viz., T₁ = Control (Earthing up), T₂ = Earthing up + Spraying pesticides against insect-pest, T₃ = Earthing up + RDF (Recommended dose of fertilizer), T₄ = Spraying + RDF, and T₅ = Earthing up + Spraying + RDF. The treatments were imposed on existing golden apple orchard (variety: local) of 11 years old. The results showed that treatment T₅ resulted the highest yield

of fruit (23.61 t/ha). Treatments T₂, T₃ and T₄ gave the fruit yields of 19.24, 19.08 and 18.48 t/ha, respectively. Treatment T₅ increased the yield of 46.68% over the control. The same treatment (T₅) also contributed the highest amount of marketable yield (22.58 t/ha) and exhibited the highest shelf life (9.17 days). Therefore, golden apple cultivated on sorjan bed with improved agronomic practices (Earthing up + Spraying of pesticides against insect-pest and diseases + Recommended dose of fertilizer: 15 kg cowdung, 190 g urea, 350 g TSP, 300 g MoP, 190 g gypsum, and 15 g boric acid/tree/year) enhanced the fruit yield.

Performance of turmeric varieties under existing golden apple orchard on sorjan bed in Barishal region

M. A. Rahman and M. M. Rahman

The experiment was conducted at Bermahal village under Jhalakati Sadar upazila of Jhalakati district for year round (2023-24) to evaluate the performance of turmeric varieties under existing golden apple orchard on sorjan bed in Barishal region. Five modern varieties of turmeric viz., V₁ = BARI Halud-1, V₂ = BARI Halud-2, V₃ = BARI Halud-3, V₄ = BARI Halud-4 and V₅ = BARI Halud-5 were tested under this experiment. The experiment was laid out in randomized complete block design with three replications. Experimental results revealed that Photosynthetically Active Radiation at open space was 721 $\mu\text{mol m}^{-2}\text{s}^{-1}$ and the value under golden apple orchard was 315 $\mu\text{mol m}^{-2}\text{s}^{-1}$ at experiment plot (43.68% of open place). Among the turmeric varieties, BARI Halud-4 exhibited the highest yield of rhizome (30.19 t/ha), which was statistically identical to that of BARI Halud-5 (26.13 t/ha). BARI Halud-4 gave the highest gross return (Tk. 1509500/ha) followed by BARI Halud-5 (Tk. 1306500/ha). Gross margin was also the highest (Tk. 1025150/ha) in BARI Halud-4, while BARI Halud-5 showed the net return of Tk. 822150/ha. The highest benefit cost ratio (3.12) was obtained from BARI Halud-4 followed by BARI Halud-5 (2.70). Therefore, cultivation of BARI Halud-4 and BARI Halud-5 under existing golden apple orchard on sorjan bed could be more suitable for getting higher yield (30.19 and 26.13 t/ha, respectively) and economic return (Tk. 1025150 and 822150/ha, respectively).

Pilot production programme of grafted BARI peyara-2 replacing local swarupkati guava variety on sorjan bed

M.A. Rahman and M.M. Rahman

The pilot production programme has been conducting since February 2022 at Gava village, Banaripara, Barishal (Farmer's name: Md. Rashedul Islam) for year round to observe the performance of grafted BARI Peyara-2 over the existing local Swarupkati variety under sorjan system in Barishal region. Number of fruit/plant were 53 and 238 in BARI Peyara-2 and Swarupkati variety, respectively. Single fruit weight of BARI Peyara-2 was 263.75 g, while it was 86.50 g in Swarupkati variety. Fruit weight of a single tree was 13.98 kg in BARI Peyara-2 and 14.32 kg in Swarupkati variety. Fruit yields obtained from BARI Peyara-2 and Swarupkati variety were 16.40 and 18.86 kg/ha, respectively. It can be noted that age of BARI Peyara-2 was lower as compared to that of existing local Swarupkati variety (2 and 8 years, respectively). Fruit yield of BARI Peyara-2 might be increased with the increasing of age of the tree. The shelf life of BARI Peyara-2 fruit was range from 10 to 12 days and shelf life for Swarupkati variety was range from 5 to 7 days. Brix value BARI Peyara-2 and Swarupkati guava were 8.25% and 10.12%, respectively. Market prices of BARI Peyara-2 and Swarupkati guava were Tk. 40.00 and 8.00/kg. It can be mentioned that farmers sold the guava fruits at the local market. The consumers' demand for BARI Peyara-2 was high but the demand for Swarupkati variety was medium. The results of Pilot production indicated that grafted BARI Peyara-2 might be suitable for cultivation on sorjan bed in tidal flooding areas of Barishal region. However, it will be needed at least three years to evaluate the yield performance and economic return of BARI Peyara-2 over the existing Swarupkati variety.

Effect of different types and rates of compost on growth, yield and economic return of winter vegetables in Barishal region

M. A. Rahman and M. M. Rahman

An experiment was carried out at RARS, BARI, Rahmatpur, Barishal during 2022-23 to determine the effect of different types and rates of compost on growth, yield and economic return of winter vegetables. The experiment consisted of two factors with nine treatments viz., Factor A. Compost type:

3 (three), C₁ = Decomposed floating bed, C₃ = Cowdung and C₃ = Vermi-compost; Factor B. Compost rate: 3 (three) includes T₁ = RDF + 1 t/ha, T₂ = RDF + 3 t/ha and T₃ = RDF + 5 t/ha. They produce total nine treatment combinations. The experiment was laid out in randomized complete block factorial design (RCBD) having three replications. The number of days required for curd initiation ranged from 40 to 46 days, with the longest duration observed in plants treated with 5 tons per hectare of decomposed floating bed residue and the shortest in plants treated with 1 ton per hectare of vermi-compost. The time taken for curd maturity was highest in treatment C₁T₃ (70 days) the heaviest individual curd was produced by plants treated with C₁T₃ (1.72 kg). The highest curd yield (47.69 t/ha) was obtained with 5 tons per hectare of decomposed floating bed residue. The highest gross return (953800 tk), gross margin (625650 tk) and BCR (2.91) were obtained from the treatment C₁T₃ which was resulted as application of decomposed floating bed residue at the rate of 5 ton per hectare.

Production Program

Production of maize and potato intercropping at char land of Dinajpur

M S Huda and M M Khanum

A production program was conducted at farmer's field of Kantanjir char land of Rajbari, Dinajpur during rabi season of 2023-24 to evaluate the performance of hybrid maize+ potato intercropping technology. Three treatments viz. T₁: Maize + potato, T₂: Sole potato and T₃= Maize + potato were used for production programme. The results revealed that the highest maize yield (17.85 t/ha) was recorded in sole maize than maize + potato intercropping system. Maize + potato intercropping showed better performance (maize equivalent yield: 30.94 t/ha) and gave higher economic return (gross margin: Tk. 310070/ha and BCR:3.01). Farmers showed interest to cultivate maize + potato intercrop for higher productivity and return.

Production programme of chilli- garden pea intercropping at Cumilla region

J.A. Chowdhury

A field experiment was conducted on chilli legume vegetables (garden pea) intercropping system using

three treatments at the farmer's field of Indraboti, Burichang, Cumilla during rabi season, 2023-24. The study was conducted to find out the suitable intercrop combination for higher productivity and economic return. The treatments were viz., T₁= Sole chilli (60 cm × 50 cm), T₂= Chilli (100%) + one row garden pea (50%) and T₃= Chilli (100%) + two row garden pea (100%). Significantly the highest fruit yield of chilli (8.08 t/ha) was obtained in sole chilli. But chilli + one inter row garden pea intercropping system gave the highest chilli equivalent yield (10.30 t/ha). The highest gross margin (Tk. 400000/ha) and BCR (3.68) were obtained from the same treatment. The results revealed that one row garden pea (50%) intercropped in between two rows of chilli (100%) might be suitable intercrop combination for higher productivity and economic return.

Production programme of chilli + bushbean intercropping at char land of Jamalpur

J.A. Chowdhury, M.R. Ali, S.S. Kakon and A.A. Begum

The research work was carried out at Nawvanger char, sadar, Jamalpur 2023-2024 to evaluate the performance of chilli+ bushbean intercropping instead of sole chilli at char land. Treatments included T₁=sole Chilli (60 cm × 50 cm), T₂= Chilli (100%) + one row bushbean (50%) in between chilli and T₃=chilli (100%) + two row bushbean (100%) in between chilli. Garden pea intercrop with chilli could be more profitable than chilli alone. From chilli+ bushbean intercrop, gross return per hectare was found higher than from sole crop system. Chilli Equivalent Yield (CEY) was highest from both combinations of Chilli (100%) + bushbean intercropping system than sole chilli. Among two intercrop combinations, highest CEY (15.57), gross margin (Tk. 312100/ha) and BCR (3.01) was obtained from

Improvement of existing cropping pattern (ITALI-jute) through BARI rasun-jute cropping pattern in the chalan beel area

J.A. Chowdhury, S.S. Kakon, M.A.H.Khan, M.R. Karim and A.A. Begum

The experiment was conducted at the farmers' field of Chalan beel area under Dobila village of

Tarash upazila in Sirajganj district during rabi season of 2023-24 to compare the yield performance of BARI released garlic varieties against local variety with the aim to replace it by the best one for improving the garlic-jute cropping pattern. The garlic varieties, viz. BARI Rasun-3 and BARI Rasun-4 were compared with local variety Itali. BARI Rasun-3 produced maximum yield (8.29 t/ha) and it was 36.12% higher than local variety Itali. Local garlic variety "Itali" might be replaced by high yielding BARI Rasun-3 variety in garlic-jute cropping pattern to improve the productivity and farmers' income in chalanbeel area of Sirajganj. Use of BARI garlic variety rather than local variety produced higher jute equivalent yield (15.46-17.39 t/ha) which were 13.93-28.15% higher. Gross return (Tk. 1267720-1425980/ha), gross margin (Tk. 1060395-1218655/ ha) and benefit cost ratio (6.11-6.88) were also higher by using BARI varieties instead of local variety.

Performance of hybrid maize+indian spinach intercropping in Rangpur region

A.A. Begum, M.A.I. Sarker and S. Hasan

The production programme was conducted at farmers' field in Gangachara upazila of Rangpur district during *kharif* season of 2024 for adaption of hybrid maize and Indian spinach intercropping instead of sole maize. Two intercrop combination viz., maize normal row (MNR) + 1 row Indian spinach and maize paired row (MPR) + 3 rows Indian spinach were evaluated against maize sole crop. Grain yield of maize was the maximum in sole crop but it was decreased 11 to 16% due to inter specific competition for growth resources among maize and indian spinach due to intercropping. The results revealed that all the intercrop combinations might be suitable for higher productivity. The highest maize equivalent yield (17.92 t/ha), gross return (Tk. 448000/ha), gross margin (Tk. 316000/ha) and benefit cost ratio (3.39) was obtained from maize paired row + 3 rows Indian spinach intercrop combination.

IRRIGATION AND WATER MANAGEMENT

10

Background

Irrigation and Water Management Division (IWM) is one of the 16 research divisions of Bangladesh Agricultural Research Institute (BARI) that conducts research on advanced irrigation methods, irrigation scheduling, and on-farm water management of BARI mandated crops. It also conducts research on water quality, agricultural meteorology, drainage, salinity management, groundwater and surface water management through field observations, and applying simulation models and machine learning tools. Till date, IWM Division already developed 53 irrigation and water management technologies and most of them are being used at the farm level. The titles and abstracts of the research conducted during 2023-24 are provided below.

Response of proso millet to different levels of irrigation

C.R. Paul, T.H. Munmun, K.K. Sarker, S.K. Biswas

Proso millet is recognized for its short-season growth, low water requirements, and high tolerance to heat and drought. These qualities make it a promising crop in regions with water scarcity, particularly in drought-prone areas and char lands of Bangladesh. This study aimed to observe the effect of irrigation at different growth stages and to evaluate the performance of irrigation on yield and water productivity of proso millet. Six irrigation treatments at various growth stages were considered with three replications. From this study, treatment T₁, involving one irrigation at the vegetative stage, emerged with the highest grain yield and water productivity, resulting in the importance of optimal irrigation management for maximizing proso millet productivity under varying water availability conditions. This study will continue next year to validate these results.

Multi-step ahead temperature forecast using a bayesian optimization tuned long short-term memory network

C.R. Paul, T.H. Munmun, D.K. Roy

Accurate temperature predictions are crucial for agricultural planning and weather forecasting. This study explored soft computing techniques for predicting average daily temperatures using a dataset over 44 years (1980-2023) across three meteorological stations (Barishal, Gazipur, and Ishurdi). The study developed and compared Long Short-Term Memory (LSTM) networks, Artificial Neural Network (ANN), Extreme Learning Machine (ELM), Gaussian Process Regression (GPR), and Support Vector Regression (SVR) models. The optimal hyperparameters of these models were selected using Bayesian optimization to ensure their best performance. Results indicated the superior predictive accuracy of ANN, ELM, GPR, and SVR models over LSTM for one-day ahead forecasts in Barishal. In addition, tuning of LSTM hyperparameters required extensive computation time compared to its counterparts. The SVR demonstrated superior performance for one, two, and three-days-ahead average temperature predictions compared to ANN, ELM, and GPR, as indicated by Shannon's Entropy-based decision theory. Due to LSTM's poor performance, the study will be continued next year employing the four alternative models for forecasting at the other two stations and across all time horizons.

Effect of irrigation on yield and water productivity of foxtail millet

T.H. Munmun, C.R. Paul, K.K. Sarker, S.K. Biswas

This study aimed to observe the effect of irrigation at different growth stages and to evaluate the

performance of irrigation on yield and water productivity of foxtail millet. Six irrigation treatments at various growth stages were considered with three replications. From this study, one irrigation at the vegetative stage (T_1) resulted in the best figures for both growth, yield, and water productivity while no irrigation decreased these yields and higher irrigation showed the lowest water productivity. Though maximum irrigation improves both growth and yield attributes when water saving is the highest priority, one irrigation at the vegetative stage is suggested for foxtail millet cultivation as it produces the highest water productivity.

Estimation of crop water requirement using an optimization algorithm-tuned fuzzy tree approach

T.H. Munmun, C.R. Paul, M.P. Haque, D.K. Roy

Crop evapotranspiration (ET_c) is a crucial element for making informed decisions on real-time and future irrigation scheduling of major crops. Therefore, accurate prediction of ET_c is crucial in the water resources management discipline. This study evaluates the potential of an optimization algorithm-tuned fuzzy tree (FT) approach for the prediction of ET_c during the initial, development, mid-season, and late-season stages of the sunflower crop in Gazipur. A total of 16 FT models were developed, and model ranking was performed utilizing Shannon's Entropy (SE). Evaluation outcomes for predicting ET_c revealed the superiority of the hybrid PSO-PSO, GA-PSO, GA-PSO, and PSO-GA tuned FT models during the initial, development, mid-season, and late-season stages. The study concluded that the hybrid FT models, composed of several standalone FIS objects, are suitable for predicting seasonal ET_c values.

Growth and yield responses of chia to different levels of irrigation

F. Akter, S.K. Biswas, M.A. Hossain, K.K. Sarker

This study investigated the impact of different irrigation treatments on BARI Chia-1. Treatments included irrigation at the vegetative stage, irrigation at vegetative and flowering stages, and irrigation at vegetative and grain filling stages, irrigation at the flowering and grain filling stages, and irrigation at the vegetative, flowering and grain filling stages. It was observed that irrigation at the flowering stage

and grain-filling stage led to the highest plant height (110.17 cm), spike number/branch (11.33) and seed yield (889.56 kg/ha) followed by irrigation at vegetative and grain filling stages. It indicated that the flowering and grain filling stages are the critical stages to irrigation.

Effect of irrigation interval and mulching on growth, flowering and corm production of gladiolus in winter season

F. Akter, S.K. Biswas, M.A. Hossain, K.K. Sarker, K.F.I. Murad, F.N. Khan

This research aimed to evaluate the influence of different irrigation intervals and mulching on the growth and yield of gladiolus (BARI Gladiolus-4). The treatments comprised different combinations of irrigation intervals (5, 10, 15, and 20 days, along with farmers' practice) with and without mulching practices. The study found that the 10-day irrigation interval with mulching resulted in the highest plant height, spike length, and floret count. However, for corm production, the best results were obtained with a 15-day irrigation interval and no mulching. More frequent irrigation (every five days) led to excessive water use and reduced yield, while longer intervals (15 and 20 days) resulted in lower yields. Farmers' practice showed comparable results to the 15-day irrigation interval with mulching treatment in terms of spike yield, but its water usage resembled the more frequent irrigation approach.

Design and development of a low-cost sprinkler system

M.P. Haque, K.K. Sarker, S.K. Biswas

Efficient water management is crucial for agricultural productivity, especially in regions facing water scarcity and climate variability. This study developed a low-cost sprinkler system using locally available materials in Bangladesh to provide small-scale farmers with an economical irrigation alternative. The system was constructed with UPVC-thread pipes (3/4 inch diameter), G.I. screws (1-1/2 inch), end plugs (3/4 inch), G.I. sockets (3/4 inch), and Teflon tape (1/2 inch). Tested on a 28 ft by 16 ft area (448 ft²) with a domestic water supply (5-6 psi), the system achieved a Coefficient of Uniformity (CU) of 88% (above the acceptable limit of 80%). The discharge rates varied from a maximum of 0.15 cm/min to a minimum of 0.09 cm/min, with the peak at 360 cm from the

sprinkler. This high uniformity and efficient water distribution underscore the system's potential to optimize water use, conserve water, and enhance crop yields by maintaining optimal soil moisture. The system's low cost and ease of construction may make it accessible for smallholder farmers, promoting sustainable agricultural practices and improved livelihoods. For further confirmation, the study should be conducted for the next year.

Identification of surface irrigation potential zone in bangladesh using gis technique

M.P. Haque, D.K. Roy, S.K. Biswas

Bangladesh's agrarian economy faces significant water management challenges, necessitating efficient irrigation methods like surface irrigation to boost agricultural productivity and food security. This research employs Geographic Information Systems (GIS) to identify potential zones for surface irrigation in the Halda River basin, in southeastern Bangladesh. The study utilizes DEM data from the Shuttle Radar Topography Mission, soil information from the Soil Research and Development Institute, land use data from Landsat 8, and hydrological data from the Bangladesh Water Development Board and Meteorological Department, integrating multiple spatial data layers in QGIS. The Soil and Water Assessment Tool (SWAT) Plus model was calibrated and validated using historical streamflow data, achieving Nash-Sutcliffe Efficiency (NSE) of 0.72 and 0.71, and R² values of 0.73 and 0.83 for calibration and validation periods, respectively. The results highlight the model's efficacy in simulating monthly runoff, despite some underestimation during peak flows, attributed to limited rainfall data from a single gauge. The study should be carried out in the next year to detect the surface water potential areas.

Feasibility study of the IOT based precision agriculture for sustainable crop production in Bangladesh

K.K. Sarker, S.K. Biswas, M.N. Uddin, I. Ahmed, A.F.M. Tareq, N.N. Karim, M.R. Islam, M.S. Hasan, M.T. Ali

Sensor-based precision agriculture (PA) is not in general practice and its potential is yet to be adequately investigated. Therefore, this study has been taken to test the feasibility of the Internet of Things (IoT) based PA for predicting water and

fertilizer. The field experiment was set up at BARI, Gazipur. Initial machine learning models-irrigation and fertilizer requirement and pest attack have been developed. A Mobile app has been developed for the end user. IoT-based PA practice (T₁) was evaluated by comparing it with BARI-recommended practices (T₂), drip fertigation (T₃), and traditional practice (T₄). The results indicated that the nutrient and water use efficiency was greater by T₁ than by T₄. BCR of T₁ was lower than T₄ which indicates that the T₁ system is not profitable in the first crop cycle.

Development and evaluation of IOT based automatic smart shed for summer tomato production

K.K. Sarker, S.K. Biswas, M.S. Kabir, K.M. Niloy, D.K. Roy, A.J. Mila, T.H. Munmun, C.R. Paul

The Internet of Things (IoT) enabled sensors-based summer tomato production is not common practice in Bangladesh. The most common practice is the traditional shed and flooding irrigation, which reduces crop productivity. Therefore, this study attempted to develop a prototype of the IoT-based automated smart shed and irrigation. The prototype of the smart shed was developed based on rain, temperature, and light sensors and automated irrigation (T₁) and compared with the manually operated shed without sensor (T₂), traditional shed (T₃), and open field without shed (T₄). T₁ system was tested and deployed in the field to monitor the data and operate the shed ON-OFF. The fruit yield of summer tomato was significantly affected by the treatments. T₁ produced greater tomato yield than others. Sensor-based automated smart shed ON-OFF needs further research and validation.

Yield and water productivity indices of garlic varieties under sprinkler irrigation

S.K. Biswas, K.K. Sarker, D.K. Roy, M.A. Hossain

A field study was conducted to develop a water – yield relationship for two garlic varieties with different irrigation regimes (0.6, 0.8, 1.0, 1.2, and 1.4 ETo) under sprinkler irrigation to quantify crop water productivity functions (CWPF) for optimum use of irrigation water. Marginal water productivity (MWP) and elasticity of water productivity (EWP) were calculated using the relationship between bulb yield and seasonal evapotranspiration (SET). A continuous increasing trend in yield was recorded

with the increase in SET up to 1.2 ETo. The critical levels of SET ranged from 180 – 248 mm for BARI Rashun-3 and from 191 – 253 mm for BARI Rashun-5 for obtaining maximum WP and yield, respectively, indicating almost the same irrigation practices are needed for the cultivation of these two garlic varieties.

Determination of optimal surface drainage for potato in southern Bangladesh

A. J. Mila, S.K. Biswas, R.W. Bell, M.A. Hossain

In the coastal saline area of Bangladesh, excess soil water at the end of the Kharif 2 season may cause a delay in the establishment of the following Rabi crops. Therefore, surface drainage could be a potential option. This study was conducted at the farmer's field of Dacope upazila in Khulna district using the potato crop, with three drainage depths (0 cm; no drain, 10, and 20 cm) replicated thrice. 24 hours of standing water was created artificially at the vegetative stage. We found that 20 cm depth of surface drainage gave the significantly highest seed yield than 10 cm drainage treatments. It released comparatively more water in less time than the 10 cm drainage depth. The SEW₃₀ was higher at no drain and gradually decreased with the increase of drainage depth. Therefore, a 20 cm depth of surface drainage technique can better facilitate the early establishment of the Rabi crop and increase sunflower yield in Southern Bangladesh.

Feasibility of surface drainage for winter crop for greater resilience of smallholder farm income and food security in southern Bangladesh

A.J. Mila, P.L.C. Paul, A.K. Chaki, R.W. Bell, D.S. Gaydon

Waterlogging at the end of the Kharif 2 season causes early Rabi crop establishment delay and faces plant other abiotic stresses that decrease yield. Therefore, surface drainage before early crop establishment would be a potential option. This study was conducted at the farmer's field at Dacope, Khulna at two to three locations (Factor A) and three drainage depths with farmer's practice (Factor B) replicated thrice. 30 cm surface drain gave the significantly highest yield for all locations followed by 15 cm drainage depth. It released comparatively more water in less time than the 15 cm drainage depth. The SEW₃₀ was higher at no drain and gradually decreased with the increase of

drainage depth. Farmers of Bangladesh can increase smallholder farm income using this surface drainage technique, consequently increasing food security in Southern Bangladesh.

Optimum water management of dwarf sunflower at various time of sowing

A.J. Mila, R.W. Bell, S.K. Biswas, M.A. Hossain

Proper sowing along with appropriate use of irrigation at actual crop growth stages can minimise misuse of these costly inputs and can increase water productivity. Dwarf sunflower (BARI Surjamukhi 3) was grown at three sowing dates (Factor A) using four irrigation combinations with full and 50% of full irrigation at 3 crop growth stages (Factor B). 18 Dec sowing gave the significantly highest seed yield. Three irrigations at vegetative, pre-flowering, and flowering produced the highest yield. Higher irrigation water productivity (IWP) was found by mid-Nov sowing and 50% of irrigation at vegetative, pre-flowering, and flowering which sacrificed 15% of yield. However, to meet our SDG goal we need to increase IWP just sacrificing 5% yield in situations of meeting the demand of 17.12 crore people by focusing on limited water resources. Therefore, it can be concluded that dwarf sunflower can be irrigated at 50% of full irrigation at three growth stages to get higher IWP with a 15% yield reduction compared to FI at the same crop growth stages in central Bangladesh.

Parameterisation, calibration, and validation of apsim-sunflower for irrigation at various sowing dates

A.J. Mila, R.W. Bell, S.K. Biswas, M.A. Hossain

Optimizing irrigation use of dwarf sunflower at various times of sowing by focusing on proper crop growth stages can minimize yield reduction and can increase water /irrigation water productivity. Dwarf sunflower (BARI Surjamukhi 3) was used to test the APSIM-Sunflower model for three sowings using four irrigations with full and 50% of full irrigation at 3 crop growth stages. We have made good progress in parametrizing APSIM using the field experimental dataset and setting up the APSIM for local environmental conditions (soil, climate, etc.), however, the work is not completed yet. We are having some issues with the response of the APSIM-sunflower module to yield, biomass, and soil water content. we are in the process of

improving the calibration by revisiting the relevant parameters responsible for capturing the above response to the APSIM-sunflower module.

Parameterisation, calibration, and validation of apsim-sunflower for various surface drainage depths in southern Bangladesh

A.J. Mila, P.L.C. Paul, A.K. Chaki, R.W. Bell, D.S. Gaydon

In the coastal saline area of Bangladesh, excess soil water at the end of the Kharif 2 season may cause a delay in the establishment of the following Rabi crops. Therefore, surface drainage could be a potential option. This study was conducted to test the APSIM-Sunflower by experimenting with the farmer's field of Dacope upazila in Khulna district using the sunflower, with three drainage depths (0 cm; no drain, 15, and 30 cm) replicated thrice. We have made good progress in parameterizing APSIM using field experimental data and setting the model for local environmental conditions (soil, climate, etc.). We have started calibration but not been completed yet. In addition, successful calibration and validation of the model can generate more insight for researchers and policymakers about the risks of long-term use of this technique on seed yield, soil health, and hydrology.

Impact of a small municipal solid waste dumpsite on groundwater quality: a case study in Gazipur city

D.K. Roy, M.P. Haque, S.K. Biswas

This study evaluates the impact of a small municipal solid waste dumpsite on groundwater quality in Konabari, Gazipur, Bangladesh. Specifically, it determines the travel time and direction of particles from the dumpsite to a pumping well and quantifies leachate migration into the subsurface system from the dumping site. The study utilizes finite difference-based numerical codes MODFLOW-MODPATH and MODFLOW-MT3DMS. This year, the methodology was developed using two pumping wells, one near the dumpsite and the other far away. Results revealed that MODFLOW-MODPATH modeling effectively delineates the direction of water particles from the dumpsite to the pumping well, along with the required travel time. Similarly, MODFLOW-MT3DMS-based contaminant transport modeling simulates the migration of leachate from the

dumpsite toward the well due to pumping. With satisfactory performance achieved, a more detailed modeling effort will be conducted next year for particle tracking and leachate migration quantification.

Deep learning emulators for saltwater intrusion management modelling in coastal aquifers

D.K. Roy, S.K. Biswas, B. Datta

The selected best DL-based emulators (DFNN and FFNN) at various monitoring locations (MLs) were coupled with two optimization algorithms: CEMOGA and MOFEPSO. This approach utilized the coupled S-O-based optimization formulation, deriving Pareto-optimal solutions for optimal pumping. The precision of these optimal pumping schedules was verified through a numerical model, showing that the S-O approach with DL surrogates substantially reduced the computational burden and provided reliable solutions. The best feasible bargaining solution from the Pareto front was selected using the SAW and TOPSIS methods. The findings indicated that the best DL-based emulators adequately provided optimal groundwater abstractions for both CEMOGA and MOFEPSO. Validation results suggested that MOFEPSO outperformed CEMOGA, with percentage RE values of 0 to 0.030% for CEMOGA and 0 to 0.025% for MOFEPSO.

Interpretable and explainable machine learning algorithms for predicting saltwater intrusion in coastal aquifers

D.K. Roy, S.K. Biswas, M.A. Hossain, B. Datta

Interpretability and explainability of the black-box models need to be explored to understand the relative importance of predictors in producing the output. Six interpretable and explainable machine learning models were developed to predict saltwater intrusion in coastal aquifers. These models provided adequate accuracies in predicting saltwater concentrations at designated monitoring locations, although they varied in their predictive abilities. The interpretability of the developed models was assessed through PDP, ICE, LIME, and Shapley plots. Results revealed that the adopted interpretability approaches can adequately interpret the model-predictor relationships in producing the desired output.

Accuracy and computational time of ga and pso based multi-objective optimization algorithms for saltwater intrusion management model in coastal aquifers

D.K. Roy, S.K. Biswas, B. Datta

The top-performing heterogeneous ensemble model was externally linked to two algorithms: CEMOGA and MOFEPSO. The CEMOGA algorithm employed a population of 2,597, a maximum generation of 32,000, a crossover fraction of 0.92, a function tolerance of 0.0001, and a constraint tolerance of 0.000001. It took 498 seconds to converge to optimal solutions. In contrast, the MOFEPSO algorithm utilized a swarm size of 2,000, a maximum iteration of 32,000, an increment factor of 0.3, a velocity initialization factor of 0.3, and a boundary tolerance of 0.01. It converged to optimal solutions in 461 seconds. Results indicated that the MOFEPSO algorithm outperformed CEMOGA in terms of convergence time and the value of the optimal beneficial pumping. The CRITIC method was used to select the optimal bargaining solution from the Pareto optimal front, assisting decision-makers in choosing the best solution. The optimal solutions from both algorithms were verified using a numerical simulation model, confirming their credibility with relative error values of less than 5%.

Assessment of groundwater quality for irrigation and drinking purposes in some selected BARI research station

S.K. Biswas, D.K. Roy, M.A. Hossain

The present investigation is aimed at understanding the temporal and spatial variability of groundwater quality for its use in irrigation and drinking purposes in different regional stations of BARI. Water quality indices, namely sodium adsorption ratio (SAR), exchangeable or soluble sodium percent (SSP or %Na), residual sodium carbonate (RSC), and Kelly's ratio (KR) were calculated for STWs, DTWs, and HTWs that used for irrigation and domestic uses. Besides, the composite influence of different water quality parameters on the overall quality of water was also assessed using the water quality index (WQI). According to the WQI values, all the samples were found to be "excellent" except a few were found "good" in post-irrigation season. Thus, the majority of the area is occupied by good water in both pre-and post-irrigation seasons.

Project (SACP-IWM part):

Dissemination of water saving technologies for non-rice crops in saline prone areas of Bangladesh

D.K. Roy, M.P. Haque, S.K. Biswas

Dissemination of solar-powered drip irrigation system for watermelon cultivation in saline prone areas of Bangladesh (Kuakata and Noakhali)

Traditionally farmers irrigate watermelon by carrying water in a container from a small pond which is laborious work and labor-intensive. Therefore, field demonstrations were conducted with solar-powered drip irrigation systems to mitigate the laborious work of water application, and save water and energy for irrigation. There were two treatments with four replications: solar-powered drip irrigation system (T_1) and farmer's practice as a control treatment (T_2). The demonstrations were conducted from 2019-20 to 2023-24 growing seasons. The results revealed that treatment T_1 was highly responsive to yield and more profitable than T_2 . The solar-powered drip irrigation treatments provided the highest BCR for the consecutive growing seasons. The farmers were benefited and interested in using this promising water and energy-saving irrigation technology.

Dissemination of solar-powered alternate furrow irrigation method for sunflower and maize cultivation in saline prone areas of Bangladesh (Kuakata and Noakhali)

Farmers usually apply irrigation water with flooding and furrow methods in sunflower production requiring more water which is a rarely attainable goal in the saline-prone areas of Bangladesh. Therefore, to motivate farmers to use water-saving irrigation technologies, a demonstration of solar-powered Alternate Furrow Irrigation (AFI) was carried out with BARI Surjomukhi-2 and Maize (Hybrid Provat-1) in the Kuakata district of southern Bangladesh during 2019-20 to 2023-24 growing seasons. Two treatments were selected: (i) alternative furrow irrigation (T_1) and (ii) farmer's practice (T_2). Results revealed the superiority of treatment T_1 over treatment T_2 in terms of profitability and water saving. AFI treatments provided the highest BCR for the consecutive growing seasons. The farmers

were benefited and interested in using this promising water and energy-saving irrigation technology.

Dissemination of solar-powered drip irrigation system for brinjal cultivation in saline prone areas of Bangladesh (Barguna)

Farmers irrigate brinjal fields mostly with furrow irrigation methods, which need more irrigation water. Therefore, field demonstrations were performed with a solar-powered drip irrigation system to minimize water loss and save energy. The demonstrations were conducted during 2020-21 to 2023-24 growing seasons in the southern region of Bangladesh. There were two irrigation treatments with four replications: (i) solar-powered drip irrigation system (T_1) and (ii) farmer's practice (T_2) as a control treatment. The results revealed that treatment T_1 was highly responsive to yield and more profitable than T_2 . The solar-powered drip irrigation treatments provided the highest BCR (~2.0) for the consecutive growing seasons. The farmers were benefited and interested in using this promising water and energy-saving irrigation technology.

Partner-dli 4: adaptive trials on water-saving irrigation technologies in water-scarce regions of Bangladesh

D.K. Roy, S.K. Biswas, K.K. Sarker, A.J. Mila, M.P. Haque, C.R. Paul

This study demonstrates the efficacy of various water-saving irrigation technologies through field trials conducted on farmers' fields. The study consists of 300 adaptive trials using 7 different efficient irrigation technologies across farmers' fields in the water-scarce regions of Bangladesh. During the growing season of 2023-2024, the adaptive trial involved 34 demonstrations across multiple sites, with the following distribution: alternate furrow irrigation (6 trials), conjunctive use of fresh and saline water (3 trials), deficit irrigation (3 trials), drip irrigation (7 trials), solar-powered drip irrigation (4 trials), sprinkler irrigation (8 trials), and solar-powered sprinkler irrigation (3 trials). These techniques were applied across representative crop types and soil conditions of the region. Key performance indicators included water use efficiency, crop yield, and water productivity. Preliminary results indicate that drip, sprinkler, and solar-powered drip and sprinkler systems

significantly reduced water usage and energy costs while maintaining or enhancing crop yields. Alternate furrow and deficit irrigation demonstrated promising water-saving capabilities but with variable impacts on crop performance. Conjunctive use of fresh and saline water optimized water resources by balancing the utilization of both types of water while maintaining crop yield. Farmers perceived the new irrigation technologies as promising solutions for mitigating water scarcity and reducing operational costs. They particularly appreciated the potential for increased crop yields and the sustainable use of water resources offered by these advanced methods. The study will continue for the next four years using similar irrigation technologies in different study locations.

Partner-dli 3: development of artificial intelligence (ai) and sensor based efficient irrigation technologies for sustainable crop production

D.K. Roy, M.P. Haque, C.R. Paul, S.K. Biswas

The application of AI and Machine Learning (ML) in sensor-based micro-irrigation systems facilitates automation in agriculture. This study integrates the forecasting capabilities of AI and ML into these systems to automate irrigation using drip and sprinkler methods. Initially, an LSTM network was developed to forecast weather parameters and reference evapotranspiration (ET_0). Before employing the LSTM for forecasting, the training and test performances were evaluated using the RMSE criterion. The minimal differences in RMSE values between the training and testing phases indicated that the model was not overfitted. Additional performance indices were computed on the test dataset to further evaluate the LSTM models' testing phase performance. The LSTM models were benchmarked against ARIMA and four system dynamic models, with results showing that the LSTM models consistently outperformed the benchmarks. Following satisfactory training and testing, the LSTM and the benchmark models were used to forecast weather parameters and ET_0 values for up to two years beyond the training and test datasets. The results demonstrated that the LSTM models effectively captured the historical data trends and provided better forecasts compared to their benchmarked counterparts.

FMP ENGINEERING

11

Development and evaluation of four-wheel tractor operated seeder

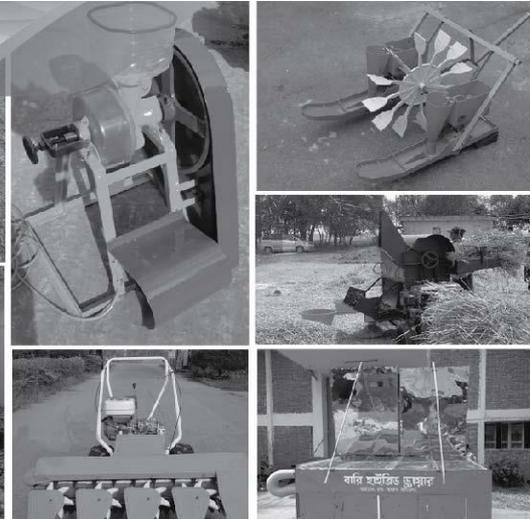
M. A. Hoque, M. S. Miah and M. N. Amin

Farming in Bangladesh is increasingly shifting towards mechanization, with a growing emphasis on the use of four-wheel tractors (4WT) for various farming activities. In recent years, 4WTs have gained popularity among farmers due to their efficiency and ability to handle larger workloads compared to traditional methods. These tractors are being used for tasks like land preparation, seeding, and crop management, helping to reduce labor, save time, and improve overall productivity in the farming sector. This trend reflects the broader move towards modernizing agriculture in Bangladesh. Therefore, this research has been undertaken to develop four-wheel tractor operated seeder (4WTOS) for sowing upland crops quickly and efficiently during 2023-24. With this seeder, tilling and seeding can be done in a single pass with maximum of 09-rows and the tilling width of 180 cm. Yield and yield contributing characters of sunflower sown by different methods using four-wheel tractor-operated seeder, both with and without a rotavator, were statistically similar to conventional planting. Similarly, wheat yields showed that using a four-wheel tractor-operated seeder, either with or without a rotavator, produced yields comparable to those from a two-wheel tractor seeder. The lowest grain yield was observed in conventionally broadcasted fields, which was similar to the yield from the two-wheel tractor seeder. Financial analysis showed that the four-wheel tractor seeder had a benefit-cost ratio (BCR) of 1.61, indicating it is a profitable machine. The highest wheat yield was found with 4WT operated seeder in both strip till and full tilled land in Rajshahi. The four-wheel tractor operated seeder may be recommended for the farmers for sowing of upland crops in line.

Design and development of a tractor operated vegetable seedling transplanter

M. S. Miah, M. J. Hasan, M. Asaduzzaman and M. A. Hossain

Vegetable production has increased fivefold over the past 40 years with 528 thousand hectares of land used for vegetable cultivation during the Rabi season. Currently, vegetable seedlings are transplanted manually, which is time-consuming, labor-intensive, and costly. In Bangladesh, there are 60000 active tractors, with around 6,000 imported annually. By removing the rotavator and attaching a transplanter, a tractor can be used for planting. This study aims to develop and evaluate a semi-automatic transplanter for various vegetable seedlings. A four wheel tractor operated furrow opener type vegetable seedling transplanter was designed and fabricated with an integrated irrigation system to reduce initial stress on seedlings. The transplanter's seedling holder can accommodate seedlings with or without cups. At a forward speed of 1.2 km/h, the field performance of the transplanter was assessed in the brinjal field during 2023-24 resulted a field capacity of 0.10 ha/h. For tomato seedlings, the planting depth was 32.1 mm, and the spacing between seedlings could be adjusted to either 344 mm or 709 mm. No observed missed seedlings, and the angle of inclination was 12.8°. It is semi-automatic, requiring two people to feed the seedlings. The transplanter can transplant seedlings in two rows at a time. In the laboratory test, there was no missing placement of seedlings in the soil. Seedlings showed a lower degree of vertical axis inclination after transplantation. The results revealed that there was no problem associated with the vegetative development and found the higher yield productivity as transplanted by hand. The field capacity of the transplanters was found to be 0.10 ha/h.



Energy use analysis of conservation agriculture tillage systems for rice-soybean cropping pattern

M. A. Hoque, M. S. Miah and M. A. Hossain

Conservation agriculture (CA) systems can reduce labor and energy use while increasing economic profits. CA supports improved crop establishment, timely sowing, stable or higher yields, lower production costs, and enhanced system resilience. To boost energy efficiency, either crop yield must increase without raising energy input, or energy use must be reduced without lowering output. A system-based evaluation of CA is crucial for understanding its effects on soil, crops, and energy use. Since agriculture consumes significant energy, efficient energy supply and use are essential for better production. This experiment assessed the productivity, energy flow, efficiency, and financial profitability of CA tillage practices in a Rice-Soybean-Fallow cropping pattern. Therefore, this experiment was undertaken for Rice-Soybean-Fallow cropping pattern to assess the system productivity, and quantify energy flow of conservation tillage methods. The experiment was conducted at the research field of FMPE Division, BARI during 2023-24 with eight treatments. Treatments were conventional tillage (CT) T. Aman-CT Soybean, CT machine transplanted T. Aman-CT Soybean, CT T. Aman-Strip tillage (ST) Soybean, CT T. Aman-Zero tillage (ZT) Soybean, STMT T. Aman-ST Soybean, Strip till followed by manual transplanting (STMT) T. Aman-ZT Soybean, Unpuddled tillage (UPT) T. Aman-ST Soybean and UPT T. Aman-ZT Soybean. The highest benefit cost ratio (BCR) and energy output-input ratio was found from UPT T. aman-ST soybean cropping systems. Therefore, the conservation tillage based cropping systems could be recommended for the farmers due to its energy efficiency.

Design and development of onion and garlic detopper

M. A. Hoque, M. A. Hossain, M. A. Mottalib and S. Brahma

Onion is a key spice crop in Bangladesh. After harvesting, onions are usually dried in the field for 3-5 days before removing the roots and tops. Tops are cut 38-50 mm above the bulb, while roots are completely removed, as short necks increase the risk of disease. The process of separating the tops from the bulbs, called de-topping, is labor-intensive

and traditionally done by women using sickles, making it physically demanding. Manual de-topping requires 12.5 woman-hours per ton (Rathinakumari and Kumaran, 2024), increasing costs due to high labor expenses. Additionally, labor shortages during harvest can lead to post-harvest losses in unfavorable weather. To address these challenges, an experiment was conducted to design and develop a mechanical detopper for small onions and garlic. The detopper was improved at the Farm Machinery and Postharvest Process Engineering Division of Bangladesh Agricultural Research Institute during 2022–23. The detopper was made with locally available materials and operated by a 0.37 kW electric motor. The capacity for onion and garlic was 175 and 90 kg/h whereas only 65 and 40kg/h could be trimmed by manually. Capacity of the detopper for onion and garlic was 2.7 and 2.4 times higher than that of the manual method. Stem length of garlic was maintained using the detopper like manual method. The capacity of the machine should be further verified with different size of onion and garlic in both green and dried condition. Thus the experiment will be continued in the next year.

Establishment of CA park at BARI and adaptive trial of conservation agriculture practices

M. A. Hoque, M. J. Alam, S. Akter, T. Jahan, N. Jahan and M. N. Amin

This experiment was undertaken to evaluate the long term effect of conservation agriculture and conventional tillage on crop yield and soil properties for different cropping systems and tillage methods at CA park established at BARI, Gazipur. Poor residue management in conventional tillage often leads farmers to burn crop residues or use them as cattle feed (Jat et al., 2017). Conservation agriculture has shown yield improvements in various crops worldwide (Parihar et al., 2016). Nitrogen fertilizer, crop residue, and zero tillage have increased net economic returns by 22%, 45.1%, and 31.8%, respectively (Delgado et al., 2019). The maize and mungbean experiments were conducted with four tillage methods such as conventional, strip tillage, zero tillage and bed planting. Rice experiment was conducted with the tillage methods as manual transplanted in conventional tilled soil, mechanical transplanted in conventional tilled soil manual transplanted in

unpuddled soil and mechanical transplanted in unpuddled soil. System rice equivalent yield (SREY) in maize-cover crop-rice pattern was varied for residue levels. The similar SREY was found among tillage treatments and residue treatments in Mustard-mungbean-rice pattern. The similar SREY was found among the treatments in rice-rice-rice based cropping pattern. The experiments will be continued in the next year to observe the long term impact of CA in the long run.

Development of a four wheel tractor operated garlic planter

M. A. Hoque, M. A. Mottalib and M. N. Amin

In Bangladesh, farmers typically grow onion and garlic in winter after rainfed Aman rice, using 3-4 rounds of ploughing followed by laddering. However, traditional garlic planting is time-consuming, labor-intensive, and costly, making large-scale production uneconomical. Due to the intensive labor and rising wages, farmers are gradually reducing garlic cultivation. To address this, there is a need for mechanized planting techniques. This research aims to design, develop, and evaluate a suitable four-wheel tractor-operated garlic planter as four-wheel tractors are becoming popular in recent years since they are now suitable option for farming works. The garlic planter was designed and fabricated in FMP Engineering Division, BARI, Gazipur during 2023-24. Maximum 12 lines of seeds can be sown with 4WT garlic planter and the tilling width of 180 cm. Cup performance of the imported 4WT planter was better than others but overall performance was better in developed 4WT planter. The field efficiency of the BARI 4WT operated planter, imported 4WT planter and self-propelled planter were found were 76.80%, 69.82% and 72.45%, respectively. The experiment will be conducted to evaluate the field performance of the garlic planters in the next year.

Development of a sprayer machine for coconut tree

M. Z. Hossain, M. S. Miah, M. M. Hasan, M. Z. Hasan, M. N. Amin, M. A. Hoque and M. A. Hossain

Coconuts are grown in homesteads across Bangladesh, providing a livelihood for many landless and marginal farmers. However, coconut yield remains low compared to neighboring

countries, mainly due to pests and diseases (Islam, 2014) Spraying chemicals is an essential intercultural operation to control coconut insects, mites, diseases, etc. Farmers typically control these issues by spraying chemicals using long nozzles from the ground, but since coconut trees can exceed 10 meters in height, this method leads to excessive pesticide use and environmental exposure. This research aims to develop a coconut spraying machine and evaluate its field performance. The ground-based sprayer cannot spray the top canopy or fruits of the coconut tree. Thus, a research program was conducted to develop a coconut climber-type spraying machine. The device was designed and fabricated at FMPE Division, BARI, Gazipur, from 2023 to 2024. The machine was fabricated using locally available materials such as MS flat bar, MS sheet, MS angle, DC motors, rubber roller, rechargeable batteries, etc. The climbing efficiency was found to be 72%. The maximum spray water distance was 9.7 m for maximum nozzle opening (100 % open), and there was an inverse relationship between spray length and width. Spraying a 7 m tall coconut tree canopy needed 10 minutes and 4 litres of water. The machine will be tested in farmers' fields next year.

Development of a power operated handheld weeder for hilly region

M. A. Rahman, M. T. Islam, N. Jahan, M. Z. Hossain, M. A. Hoque and M. N. Amin

Weeding involves removing unwanted plants that compete with main crops for sunlight, nutrients, and water. In Bangladesh's hilly regions, horticultural plantations and mixed fruit gardening are common, with 44 fruit varieties like mango and banana grown and contributing 1.4 million tonnes annually, or 15% of the national total (DAE, 2020). As fruit production increases and shifts to permanent orchards, controlling unwanted bushes remains a challenge. This experiment aims to develop a power-operated handheld weeder and to evaluate its performance in hill tracts. The hill farmers demanded a light weight portable bush cutter to cut soft grasses and bushes. A handheld weeder was evaluated with three types of blades at the research field. The different sized and shaped cutting blades (plastic blade, stainless steel blade and disc blade) were used to cut soft grasses, bushes and unwanted vines of mango trees. The backup time of a rechargeable 24 V, 50 Ah lithium

ion battery and angular speed at no load were measured around 2 h and 8000 rpm, respectively. The operators needed 1 minute resting time after every 10 minutes of continuous operation to avoid hand muscle pain. The cutting and field efficiency (99 % and 64 % for plastic blade, 98 % and 43 % for stainless steel blade and 97 % and 21 % for disc blade) were found satisfactory. The weeder improvement will be continued in the next year.

Design and development of a plastic mulch machine

M. Hossain, S. Akter, M. A. Hoque, M.S. Miah, M. A. R. Gazi and M. N. Amin

Mulching is the practice of covering the soil around plant roots to insulate them from extreme temperature fluctuations, helping to maintain a stable environment for plant growth. Mulches can be either organic, such as straw or compost, or inorganic, like plastic or rubber. A power tiller-operated machine designed for laying and punching mulch sheets can greatly benefit farmers by streamlining the mulching process. This machine reduces the time and labor required to apply mulch, minimizing human effort and lowering the overall cost of mulching, making it a more efficient and cost-effective solution for managing soil temperature and moisture. To meet the growing needs of the farmers who wish continuously to improve the profitability of their farming by using more efficient materials and machineries. The use of mulching paper in agriculture is increasing day by day to growing the importance in increasing the crop yield. A power tiller operated mulching machine was designed and developed. The working and parameters of mulch paper laying machine for minimizing the human efforts and increasing productivity of crops. The field efficiency was found 77.14%.

Improvement and evaluation of a new tunnel shed design for summer tomato production

M. R. Hasan, M. A. Hoque, and M. N. Amin

Tomato is a crucial vegetable crop due to its significant acreage, production volume, yield, commercial use, and consumption. It ranks as the most widely consumed vegetable after potatoes and sweet potatoes. However, summer tomato production faces challenges from excessive rainfall, which can damage plants and reduce yields. Additionally, high temperatures can hinder

pollination and fruit set, as the excessive heat in the canopy, meant to shield the plants from rain, negatively impacts fruit production. Traditional canopies made of polythene and bamboo are prone to wind damage, further affecting crop yields. Therefore, it is essential to develop a scientifically designed canopy that can withstand rain, provide effective air circulation, and ensure adequate lighting. Such a canopy would help protect the tomatoes from adverse weather conditions and facilitate smoother harvesting for farmers. This study explores a new tunnel shed design fabricated specifically for growing tomatoes in the summer. The innovative design focuses on better temperature control and airflow to keep the plants healthy and productive even in the heat. The dimensions of the both tunnels were kept as a length of 20 ft., a width of 8.2 ft. and a height of 9 ft. at the pick. The polythene was taken as 0.1 mm thickness to cover the tunnel shed. These results offer practical solutions for farmers looking to enhance summer tomato production with more efficiency. The study will be conducted in the next year.

Design and development of tractor operated potato harvester

M. S. Miah, M. A. Hoque and M. N. Amin

Potato is Bangladesh's third-largest crop, grown on 0.47 million hectares with a production of 9.25 million tonnes. Manual harvesting is labor-intensive and costly. Previous mechanization efforts, including a power tiller-operated digger and a two-wheel tractor harvester, faced issues with capacity, efficiency, and labour requirements. Farmers now prefer a four-wheel tractor-operated harvester to address these problems. Existing pull-style harvesters have limitations, such as obstructing plots, damaging potatoes, and inadequate wheel space. Therefore, a four-wheel tractor-operated harvester, designed to be mounted at the front, is being developed to resolve these issues. The field capacity and width of potato harvester were 0.10 ha/h and 1200 mm respectively. The forward speed of the machine was 1.25 km/h. The missing of harvesting and damage of potato were 5.92% and 5.52% respectively. Some potatoes have been damaged by tractor wheels pressing on them, thus a new potato harvester is being fabricated with this issue in consideration. The experiment, which is in its third

years, will be repeated in 2024-25 to make a precision potato harvester.

Improvement and validation of barley thresher

M. Hossain, M. Z. Hossain, M. A. Rahman and M. N. Amin

Barley is a minor crop in Bangladesh, primarily grown in the northern regions. BARI has released 9 barley cultivars and conserves 54 barley germplasm accessions at the PGRC (Sarwar and Biswas, 2021). However, there are no commercial machines available in the country for threshing barley. Barley genotypes are classified into two types based on the presence of a hull around the kernels: hull-less and hulled (Jood and Kalra, 2001). Threshing of barley is a tedious job which is done manually by the farmers. The present experiment aimed to develop a thresher that would make barley threshing process concise and efficient. In this endeavor, threshing part of the BARI Rice-wheat thresher was improved and modified by attaching two types of rasp bars on the threshing cylinder and adding a perforated MS sheet on the concave. The result showed that the machine had the maximum threshing capacity of 312 kg/h at feeding rate of 700 kg/h and drum speed of 750 rpm. The maximum threshing and cleaning efficiency 99.35% and 97.22% at above combination of 750 rpm and feed rate 700 kg/h.

Development of a power operated coconut tree climber

M. Hasan, M. N. Amin, M. A. Hoque, M. S. Miah, M. Z. Hossain & N. Jahan

Coconut tree climbing is a labor-intensive task that poses numerous challenges to workers due to its height, slippery trunk, and sharp leaves. To improve safety and efficiency, this experiment was taken. It aims to design, develop, and fabricate a power-operated coconut tree climber, to evaluate its performance, and to ensure operator safety. This research report focuses on the development of a power-operated coconut tree climber as an innovative solution to enhance productivity and reduce the risks associated with manual climbing. Thus, there is a huge demand for developing a power-operated coconut tree climber. So, a power-operated coconut tree climber is fabricated in FMPE Division, BARI, Gazipur with the climbing mechanism components include a stainless-steel frame, gear box, chain-sprocket, and specialized

wheels, which are applied to provide secure traction against the surface of the coconut tree with the help of 52cc petrol engine and 4.5 HP output.

Testing and evaluation of combine harvester for harvesting mungbean and soybean in coastal areas

M. S. Miah, M. A. Hoque and M. N. Amin

The aim of the research to evaluate the performance of the combine harvester for harvesting mungbean as well as to modify and improve combine harvester. The machine was tested at Lebukhali, Dumki, Patuakhali for combine harvesting of mungbean during the year. The combine harvester was tested through several conditions of testing: 1) in normal condition; 2) with the distance between the spike teeth and the cylinder sieve reducing; 3) with the shaker net and stick arrangement; and 4) with desiccant applied. The percentage of unthreshed mungbean grain pad and plant stem that remained in the storage tank was found to be 11.67% and 26.666% (normal condition), 4.33% and 23% (decreasing distance between spike tooth and sieve of cylinder), 5.66% and 22.66% (shaker net and stick arrangement), and 4% and 19% (desiccant apply). The average forward speed and field capacity of combine harvester for mungbean were 2.21km/h and 0.39 ha/h respectively. In order to improve the efficiency of mungbean harvesting, threshing, and cleaning, some problems with combine harvesters have already been identified. Thus the experiment will continue for the following next years with the necessary modifications to be made to improve the efficiency of the harvester.

Development of an oat dehulling machine

N. Jahan, M. N. Amin, M. M. Hossain, S. Akter and A. H. Akhi

Oat grains have an outer hull or husk that makes up 25-30% of their weight. This husk is high in crude fiber and not suitable for human consumption (Ganßmann et al., 1995). With the growing interest in plant-based diets, the demand for oat dehulling machines has increased. While one oat accession is conserved at PGRC, BARI, precise production data for oats in Bangladesh is lacking. BARI's Plant Breeding Division is researching oats, but no dehulling machine is available in the country. As oat cultivation spreads, there will be a need for such machinery. This study aims to develop a

small-scale oat dehulling machine and evaluate its performance. An oat dehulling machine removes the outer hull, enhancing the quality and palatability of oats for consumer use. An impeller-type oat dehulling machine was designed and tested with oats at 7.46% of moisture content (wb). The oat dehulling process is affected by different factors such as moisture contents, feeding rates, and operational times. In the first trial, the best results were obtained with a 300g sample and 3minute duration, yielding of a 74.62% groat percentage and 78% dehulling efficiency, but increased feeding rate and time also led to higher broken percentage. The second trial, with a modified impeller configuration produced the maximum groat percentage (95%) among all trials, though the broken percentage also increased slightly. The results demonstrate the importance of optimizing the various process parameters to achieve the desired oat dehulling performance.

Design and development of a mungbean dehuller

M. A. Hoque, M. Hasan, M. S. Miah, M. Z. Hossain, N. Jahan and M. N. Amin

Mungbean is a highly nutritious legumes with considerable health benefits, but its tough hulls containing mucilage and gums pose challenges for dehulling. To address this problem, an experiment was conducted at FMPE Division, BARI, Gazipur during 2023-2024 to develop a mungbean dehuller. The machine capacity was 60 kg/h with 5 minutes operating time and 600ml/100kg oil mixture for 2 hours with 83.6% grain recovery where the unhulled pulse, whole pulse, splitted pulse and broken pulses percentage were 0.91, 9.13, 89.95 and 0, respectively. The BCR of the dehuller was 1.84 and payback period was 0.21 year. Thus, this dehuller could be recommended for mungbean the farmers.

Design and development of a jute fiber extraction machine

M. A. Hoque, M. S. Miah, M. Z. Hossain, N. Jahan and M. N. Amin

Traditional jute fiber extraction needs lots of water, accounts higher cost and involves lots of drudgery. With the aim to minimize huge water availability, reduce the drudgery and fiber extraction cost, small-scale jute fiber extraction machine was

redesigned and tested at the FMPE division, BARI, Gazipur during 2023-24. Four different models were developed: M₁=Single person feeding which capable to use in both breaking and whole stick, M₂=Single person feeding which only used for getting whole sticks, M₃=Single person feeding but capable to get both breaking and whole stick and M₄=Double person feeding which capable to get both breaking and whole stick. Whole stick recovery by length in models M₁, M₂, M₃ and M₄ were 72.69%, 81.14%, 79.12% and 70.32%, respectively. The capacity of the machines for Tossa jute in models M₁, M₂, M₃ and M₄ during whole jute stick recovery were 2000, 2800, 2763 and 1909 sticks/h, respectively. Capacity of the machines during jute breaking in model M₁, M₃ and M₄ were 4800, 19565 and 8571 number of plants/h, respectively. The jute fiber extraction machine M₃ could be uses for retaining whole jute stick and for breaking sticks and M₂ could be used for only retaining whole jute stick based on demand by the farmers.

Development of a power operated cotton harvester

M. R. Hasan, M. A. Hoque, M. N. Amin and S. R. Roy

Cotton farming is an important aspect of Bangladesh's agriculture and economy, with a significant presence in domestic and international markets. However, manual cotton harvesting methods have drawbacks such as high labor costs and inefficiencies. To address these difficulties, modern cotton harvesters provide a possible answer by increasing efficiency, reducing labor needs, and improving cotton quality. This research investigates the transition from manual to mechanized cotton harvesting by focusing on designing and testing a new powered cotton harvester. After evaluating manual harvesters at the Cotton Research Centre in Gazipur, it became clear that the machines performed badly were expensive to operate, and lacked functionality for removing substances from cotton. To overcome these issues, a new harvester design will be developed and manufactured at the FMPE Division's workshop in BARI, Gazipur. This study will illustrate the advantages of using current technologies in cotton harvesting.

Development of a four blades automatic cashew shelling machine

S. Akter, N. Jahan, M. N. Amin, M. Hasan and M. Forid-Uz-Zaman

Cashew (*Anacardium occidentale L.*) is one of the high value crops in Bangladesh. It is cultivated in limited areas of Chittagong and Chittagong hill tracts. The cashew fruit is unusual in comparison with other tree nuts since the nut is outside the fruit. Removal of cashew kernel from its shell is a labour intensive operation. In the processing of the nut, the greatest difficulty is the removal of the shell without damaging the encased kernel. The semi auto four blades cashew nut sheller was designed and fabricated at FMPE Division, BARI, Gazipur. The performance test was conducted with steam boiled raw cashew nut. Whole recovery was 72%, half recovery was 15% and broken was 13% of BARI four blades auto cashew shelling machine.

Development of a suitable fruit bagging tool

M. Hasan, M. N. Amin, M. A. Hoque and M. Hossain

Fruit bagging is a protective technique widely adopted in fruit crops to enhance skin color and reduce the risk of diseases, pests, mechanical damage, and sunburn etc. Traditionally, manual methods are used for fruit bagging. At BARI, Gazipur, different fruit bagging tools were developed using materials such as plastic and metal pipes, nylon rope, and elastic garters etc. Three models were tested, with the second model incorporating a modified bag design featuring a special knot, proving more effective for various fruit types and tree heights. The average time required for bagging was 44.7 seconds for the first model and 68.0 seconds for the second. The third model is currently under refinement, utilizes a metal wire ring for tightening the bag, with copper rings showing the most promising results in preliminary tests.

Development of an IOT-based seed storage for high-value spices and vegetable seeds

M. Z. Hossain, T. N. Barna, M. S. Miah, M. A. Hoque, M. H. H. Khan, and M. N. Amin

A seed storage (1030 × 810 × 1150 mm) for high-value vegetables and spices was developed at FMPE division, BARI, Gazipur during 2023-2024. The structure is mainly made of MS angle and

sheet. The cooling system is run by a refrigerant-cooling system. The IoT system was made using ESP 8266 microcontroller, DHT 22 temperature and humidity sensor, etc. The energy consumption of the storage is 2.8 kWh/day billing 13 Tk/day. Regarding IoT system, we found an average temperature and humidity in the chamber and outside of 5 °C, 68%, and 30°C, 80% respectively.

Development of cost-effective, intensified and sustainable recirculating aquaculture system (RAS) in Bangladesh

M. A. Hoque, M. A. Hossain, and A. M. Shahabuddin

The most of all Recirculating Aquaculture System (RAS) used in Bangladesh, have been imported from abroad. The small and marginal entrepreneurs could not attempt to use RAS with experiences of traditional fish culture. That is why the present research project was designed to develop a low-cost RAS system using locally available technology for intensive culture and to validate RAS. A solar hybrid inverter was used to use solar energy and grid energy to operate the pump. In the day time, main power source is solar power and the grid electricity was used as a backup power when solar radiation was not up to the requirement especially in the night time. During the test run of the RAS, the fish growth of the tilapia was from 20 g to 90 g in 12 weeks. An improved solar hybrid inverter was installed at RAS of SAU which was taking input power from solar, grid and battery, respectively as per availability.

Detection of soil fertility status mapping using UV-VIS-NIR technology

S. Akter, M. S. Miah, M. Z. Hossain, M. N. Amin and J. Alam

The purpose of this research is to monitor the fluorescence properties of soil, organic matter, and fertilizer in order to create a system to detect the soil's current fertility level and, ultimately, for prescribing fertilizer for a particular crop. At the FMPE division workshop, materials that were readily available in the area were used to create a portable image acquisition system. Halogen and UV light are the two types of lighting used in this system. Two UV lights and four halogen lights are used as lighting sources. The system uses a Cannon Kiss 7i camera mounted with an 18-55 mm lens. This system used to develop images can be fully

customized to capture high-quality images. The experiment, which is in its initial year, will be repeated the following year in an effort to enhance the system and its field performance.

Development of an automated squirrel repellent

M. Z. Hossain, M. S. Miah, M. S. Alam and A. T. M. Hasanuzzaman

Squirrels are considered an agricultural pest because they destroy significant quantities of fruits and vegetables. Thus, a machine vision-based squirrel repellent was fabricated at FMPE division, BARI, Gazipur, in 2023-24. An Android mobile app was developed to detect squirrels and send signals to activate the actuator (ultrasound frequency, pepper water spray, message in mobile, and emergency alarm). The physical structure of the repellent was fabricated using locally available materials such as an MS angle bar, MS flat bar, MS sheet, wheel, GI pipe, etc. The overall accuracy of the squirrel detection model was 91%. Once the object is detected, the actuator works for 10 seconds. The water spray horizontal distance is 20 ft at its maximum nozzle opening. The device will be tested in the farmers' field next year.

Development of a fruit grader

M. Z. Hossain, M. S. Miah, M. A. Hoque, S. Akter and M. N. Amin

A load cell sensor-based fruit grader was developed at FMPE Division, BARI, in 2023-2024. The grader's physical structure was mainly made of SS sheets and an MS angle bar. The electronic components comprised a load cell, IR sensors, Arduino UNO microcontrollers, servo motors, etc. The control panel contains a digital touch display where the weighing range can be set manually. The fruit within the range falls into the accepted bin, while others move into the rejected bin. The grader was tested with guava (variety: local, amount: 6 kg, replication: 3), mango (variety: BARI Aam-4, amount: 3 kg, replication: 3) and malta (variety: BARI Malta 1, amount: 3 kg, replication: 3) and found an average capacity of 112 kg/h (518 fruit/h). The average grading efficiency was 78%. The load cell sensor provided good precision (coefficient of regression between the load cell sensor and a digital weighing scale, $R^2=0.99$). The developed grader is easy to operate, and there is negligible bruising damage (eye estimate) during operation. The grader will be improved in the next year.

Introduction of solar energy for operation of winnower

N. Jahan, M. A. Hoque, M. S. Miah, M. Z. Hossain and M. A. Rahman

The BARI winnower machine was modified by replacing the AC motor with a DC motor, and the power transmission system was also modified by using a chain sprocket instead of a belt pulley. The performance of the machine was evaluated with and without grain. It was observed that solar radiation fluctuation did not significantly affect the speed of the DC motor due to the use of a controller. The data were taken from both the AC and solar DC motor-operated winnower with grain on a cloudy day. The capacity of the AC motor was found to be 6% more than the DC motor, nevertheless, the cleaning efficiency was found to be almost the same (98%). The machine will be tested with batteries and inverters in the next year.

Adaptive trial of BARI developed agricultural machinery for crop production in the coastal areas of Bangladesh

M. S. Miah, M. N. Amin and P. C. Sarker

Farm mechanization part of Smallholder Agricultural Competitiveness Project (SACP) was implemented in three different coastal districts (Patuakhali, Barguna, and Noakhali) by Farm Machinery and Postharvest Process Engineering Division of BARI during 2023-24. BARI developed six types of agriculture machinery (BARI Seeder, BARI Bed Planter, BARI Weeder, BARI Axial Flow Pump, BARI Sunflower Thresher, BARI Compost Separator) were disseminated to farmers and local service providers through 15 adaptive trials and 3 training for trainer (ToT) with the help of OFRD, BARI. In each adaptive trial, 40 farmers and service providers participated who were practically demonstrated at least one machine in the farmers' fields. In ToT, Scientific Assistant (SA), Sub Assistant Agricultural Officer, mechanic (SAAO), NGO personnel, lead were participated in a day long training. They learn how to operate the machines, and operating techniques and troubleshooting in field condition. Seven local service providers (LSPs) in the working areas were developed and totally 2.05 ha of area was covered under trials and 110 ha of area was covered by LSPs. This program will be continued next year to train the machinery if needed.

Adaptation of BARI developed farm machinery in the selected areas of Bangladesh

M. N. Amin, M. A. Hoque, M. Hasan, M. S. Miah, M. Z. Hossain, T. N. Barna, M. A. Rahman, S akter and M. R. Hasan

Farm machinery technology development for profitable crop production project (FMDP) has been implemented in 10 different districts by Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute, Gazipur during 2023-24. BARI developed eighteen types of different agriculture machinery were disseminated to farmers and local service providers were developed through adaptive trial and training with the help of OFRD, BARI and Department of Agricultural Extension (DAE). This year 300 batches of farmers training and 985 adaptive trials were done in the project areas. Farmers opinioned that the machine reduced their drudgery and cost significantly and often obtained higher yields compared to hand sowing. One hundred thirty four local service providers (LSPs) in the working areas were developed. Three manufacturer in house training were done in Noakhali and Gazipur.

Adaptive trial of BARI tomato seed separator cum pulper

T. N. Barna, N. Jahan, M. N. Amin, P. Sen and M. A. Hoque

Tomato seed cultivation holds significant importance for Bangladesh as increasing tomato production through effective seed cultivation helps improve food security and nutrition for the population. Mostly, tomato seed separation is done manually throughout the country. So a power-operated tomato seed separator was designed and developed at the Farm Machinery and Postharvest Process Engineering Division, BARI, during the years 2023-24. The machine underwent a fresh redesign based on recommendations from prior years' results. It demonstrated an average throughput capacity of 207 kg/h, extractor productivity was 0.095 kg/h, with an average seed loss of 3% and extractor efficiency was 97%. Furthermore, the machine exhibited an average pulping capacity of 65 kg/h, an average pulping efficiency of 86.6%. The machine had a BCR of 1.49 and BEP of 35 days with 8 hours of daily use. Despite the lower flesh-to-seed ratio in hybrid tomatoes, the machine's performance was

satisfactory. The machine is ready for adoption in farmers' field.

Securing the food systems for climate and livelihood resilience through appropriate scale farm mechanization

M. A. Hoque and M. N. Amin

The vast area in the coastal region is cultivating with polder support. Food security of Bangladesh could be achieved if this region could be intensified. The coastal region of Bangladesh faces challenges in achieving food security due to limited agricultural intensification. By introducing appropriate-scale mechanization, such as the BARI seeder, it is possible to improve efficiency, reduce labor, and enhance productivity. This study explores the effectiveness of different tillage methods and fertilizer doses to identify strategies for climate-resilient farming. Adopting the right mechanization practices can significantly strengthen food systems and improve the livelihoods of coastal farmers in Bangladesh. Field experiments were conducted during 2023-24 at Barguna and Khulna with three treatments in main plot as T_1 = Full tillage by BARI seeder, T_2 = Strip tillage by BARI seeder, and T_3 = Conventional tillage and manual seeding. In subplot F_1 = BARI recommended dose, F_2 = 120% of BARI recommended dose and F_3 = Farmers' fertilizer dose. Farmers express their happiness on the use of BARI machinery during training and adaptive trial. Yield of mungbean, maize and sunflower for different planting methods and fertilizer doses in polder coastal region of Barguna was not significantly varied which showed a great scope for wide spread adoption of BARI seeder. The highest sunflower seed yield in Khulna was found in full tillage by BARI seeder which was also statistically similar with conventional planting method but the yield of sunflower was not varied with fertilizer treatments. Thus, the experiment will be continued to evaluate those machinery in the coastal polder regions.

Development of a tractor operated ridge maker cum bed planter

M. S. Miah, T. N. Barna and O. Ullah

Efficient land preparation and planting are crucial for enhancing agricultural productivity, particularly in regions where labor shortages and time constraints challenge traditional farming practices.

A tractor-operated ridge maker is a specialized agricultural implement designed to create ridges or raised beds in soil, typically used for planting wide row crops that benefit from elevated planting areas. The development of a tractor-operated ridge maker cum bed planter is essential to improve planting efficiency and soil management in modern agriculture. It enables precise bed formation and seed placement, reducing labor costs and enhancing crop yields in large and medium scale farming systems. Tractors equipped with modern technology provide better control over farming practices, such as planting depth, soil preparation, ridge making and seeding. The availability of various attachments for tractors allows farmers to perform a range of agricultural tasks efficiently. A design was made to develop a four-wheel tractor operated ridge maker cum bed planter. Based on the design, a set of parts were fabricated i.e. seed box, fertilizer box, bed shaper and ridge divider. The attachments were added to tractor with a power transmitting with tractor rear wheel to attachment shaft and from attachment shaft to seed meter. Laboratory primary trial is done. The experiment will be continued to the next year to improve machine performance.

Development of a multiple-capacity insect killer

M. Z. Hossain, M.Y. Mollah, M. Hossain, N. Amin and A.K.M.R.H. Ferdous

The development of a multiple-capacity insect killer is crucial for improving pest control in agricultural and domestic environments. It offers a versatile solution to manage various insect populations, reducing crop damage and minimizing the use of harmful chemical pesticides. This device promotes sustainable pest management while protecting both human health and the ecosystem. A multiple-capacity insect killer was developed at FMPE Division, BARI in 2023-2024. An SS sheet and MS angle bar mostly comprised the grader's physical structure. The overall dimension of the machine was 1280 × 500 × 500 mm, consisting of a solar panel, LED light, sealed lead acid battery, charge controller, relay circuit, bulb holding funnel, insect collecting chamber, battery box and adjustable three-leg support base frame. The machine was placed at Brinjal Field in March 2023. The machine has four insect-killing options: 1. Using a yellow sticky sticker, 2. Using detergent Solution, 3. Bird parchment, 4. Electric shock. The major insects were Brown planthopper

(*Nilaparvata lugens*), Moth (*Leucinodes orbonalis*), and silverleaf whitefly (*Bemisia tabaci*). The insect-killing capacity was 50 insects/hour. The machine will be tested in the farmers' field the following year.

Development of a digital portable android app based soil testing device

M. A. Rahman, N. Jahan, M. Z. Hossain, M. A. Hoque and M. N. Amin

Precision agriculture is mostly used in developed countries where farmers have solvency to invest in machinery and digital technologies. Precision farming techniques could have a significant impact in developing countries but many of the farmers in these countries are smallholders and cannot afford advanced technology. The development of a digital, portable Android app-based soil testing device is essential for providing farmers with real-time, accurate soil health data. It enables more precise fertilizer application and better crop management, leading to improved yields and reduced environmental impact. This technology promotes sustainable agriculture by making soil testing more accessible and affordable. So, a digital portable android app based soil testing device (Matir Pran) was developed during 2023-24 under "Agricultural Machinery Talent Hunting and Patronizing" funded by FMD project. It was suitable to find out some features of soil like measuring the pH level, NPK level, and soil moisture instantly and the developed android application in the smart device is also capable to prescribe crop management practices based on the testing parameters. Moisture content was tested by this device and checked with oven dry method. The device showed the moisture content of (40 "±" 3) % whereas the standard method showed the moisture content of (30 "±" 5) %. The pH was also checked by this device. The highest and lowest pH of FMPE research field were found as 6.70 and 5.88, respectively. The pH value was decreased as soil density increased. Machine improvement will be continued in the next year. The pH will be also cross-checked with standard method in next year.

Development of a banana pseudo-stem fiber extractor

T. N. Barna, M. A. Hoque, M. N. Amin, N. Jahan and M. S. Ali

Banana is a year-round popular fruit in Bangladesh. As the banana plant becomes unsuitable for the

subsequent harvest, the pseudo stem is typically cut and discarded as waste biomass. For every cycle of banana fruit production, four times the amount of biomass waste is also. Manual banana stem fiber extraction accounts higher cost and involves lots of drudgery. The development of a banana pseudo-stem fiber extractor is vital for efficiently utilizing banana plant waste, transforming it into valuable fiber for various industries. This innovation promotes sustainable agriculture by reducing waste and creating new income opportunities for farmers. Developed small-scale banana fiber extraction machine was tested under Farm machinery technology development for profitable crop production (FMDP) project's Talent Hunting program at the FMPE division, BARI, Gazipur. This machine is designed to efficiently extract fiber from banana waste portions, addressing the challenges of manual or semi-mechanical extraction. Capacity of the fiber extraction machine was 2100 Nos. plants/h (0.08 Bigha/h). The developed fibre extractor machine can retain 71% fibre without damage. The operational cost including both fixed and variable cost per hour was found 241 tk. The combing part of the machine needs an improvement. The improvement of the machine can be useful to reuse bio-waste.

Development of a handy solar weeder

N. Jahan, R. Ahmed and M. N. Amin

Efficient weeding is crucial for maintaining crop health and maximizing yields, particularly in narrow row crops. A battery-operated solar weeder was developed for weeding between narrow row crops having a row-to-row distance of 20 cm. This technology offers a sustainable and efficient solution by reducing manual labor and minimizing the use of chemical herbicides. It enhances crop productivity and environmental sustainability by providing precise and eco-friendly weed management. Two types of tines were developed and tested in the fields of barley, soybean, and sunflower with different soil moisture contents. During the field test, Tine 2 showed better performance in terms of the weeding index and plant damage parameters when compared to Tine 1, but the speed of the machine was found to be minimal. The weeding depth for Tine 1 and Tine 2 was found to be 2.5 cm and 3.6 cm, respectively. After the improvement of the front wheel and providing power to it, a better weeding index and increased weeding depth were found. In the next year, the capacity of the machine will be increased by improving its power transmission system.

AGRICULTURAL ECONOMICS

12

Cost and returns analysis of selected spices crops in Bangladesh

M. A. Rashid and M. Khatun

The study was undertaken to estimate the financial and economic returns and competitiveness of mustard varieties in Bangladesh. A total of 300 mustard growers were randomly selected from Tangail, Rajshahi and Bogura district for the study. The study revealed that the gross margins of producing BARI Sarisa-17, 18, 14 and Tory-7 varieties were found positive. BCR of producing BARI Sarisa-17, 18 and 14 and Tory-7 were 1.38, 1.38, 1.34 and 1.17 respectively. The estimates of DRC showed that Bangladesh had comparative advantage in mustard production as these estimates were less than one (0.47) implied that the production of mustard would be highly efficient for import substitution. Low market price and market syndicate, infestation of insect and diseases infection and labour crisis were the major constraints for mustard production. Ministry of commerce and Department of Agricultural Marketing (DAM) take initiatives for reasonable price at harvesting time. Mechanization should be introduced to the farmers field for minimize the labour crisis.

Farm level adoption and market status of BARI released major vegetable varieties in Bangladesh: a socio-economic study

M. A. Rashid, Moniruzzaman, Shamsul Hoq and M. Khatun

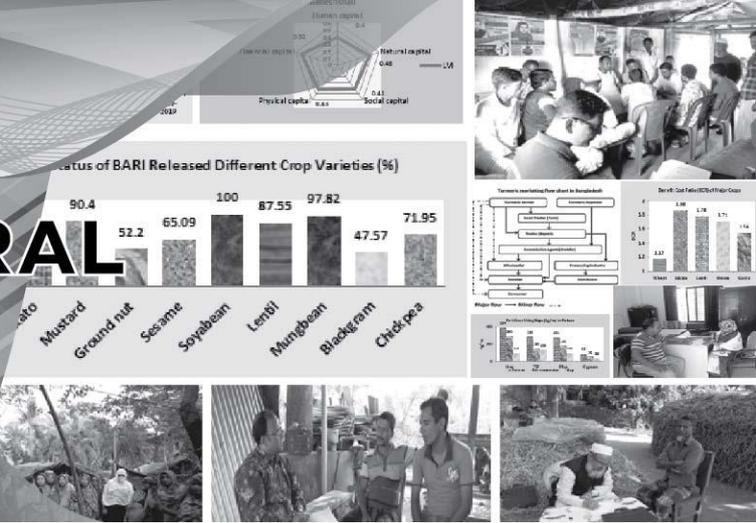
This study has been undertaken to conduct the financial profitability and economic impact of BARI Mango-4 to the society, the most popular mega variety of BARI. This is a two years study. Data were collected from BARI Mango-4 farmers of Chapainawabganj and Rajshahi districts this year. Sample size of the respondent farmers selected randomly was 60, 34 from Chapainawabganj district

and 26 from Rajshahi district. Owing to time constraints, analysis was done only for Chapainawabganj district. As many as 32 types of mango varieties were cultivated by the responded farmers in Chapainawabganj district. Per hectare average number of BARI Mango-4 trees of the respondent farmers was found 519. Average yield was found 16113 kg/ha from which farmers got return of Tk. 1,029,743 and the average price of BARI Mango-4 stood Tk. 63.91 per kg. Total variable cost and total cost were calculated Tk. 219,312 and Tk. 353,516. Gross margin and net return were estimated Tk. 810,431 and 676,227 with BCR 4.7 and 2.91 respectively. Respondent farmers cultivated BARI Mango-4 in place of 6 crops, namely rice, turmeric, guti Aam, aati Aam, fozly Aam, guava. They also grew BARI Mango-4 in fallow land (21% respondent farmers). Most replaced crop is rice (56% farmers). Among these six crops, guti AAM was the best alternative of BARI Mango-4 giving highest net return of Tk. 391,832 followed by Guava (net return Tk. 149,697), fozly Aam (net return Tk. 148,200), rice (net return Tk. 97,083). Farmers received an additional net benefit of Tk. 579,144 for cultivating BARI Mango-4 over rice and received an additional net benefit of Tk. 284,395 for cultivating BARI Mango-4 over Gutu Aam. Because of being late variety and sweetness the price of BARI Mango-4 was higher than that of many varieties, which would encourage the farmers to grow more BARI Mango-4 in future despite having some difficulties of cultivation such as disease prone than other varieties, stolen problem, inclination of tree towards soil etc.

Impact of climate change on net crop return in selected areas of Bangladesh

Moniruzzaman, Md Shamsul Hoq, Md Ripon Hasan and Md Abdur Rashid

This study is conducted with the overall objective of analyzing the economic impacts of climate



change on net crop return of Bangladesh. The study used a cross sectional Ricardian approach to analyze the impact of climate change on net return from crop farming. The analysis is based on cross-section data of the primary survey conducted to (January to February, 2024 on 200 crop farming sample farmers' selected randomly and secondary data on average long-term temperature and rainfall data from 1971 to 2023 (52 years) over 4 districts of Bangladesh. Results indicate that climate has a nonlinear effect on net return from crop farming. The marginal impact of the temperature and rainfall on farmers' net crop return are a significant ($p < 0.01$) and negative. The elasticity results showed that the changes in net crop return was very high for crop farming season. However, the predicted values of temperature and rainfall for these studies for the year 2030 to 2100 was based on three climate change prediction models (BCC-CSM1-1, CCSM4, and GFDL-CM3) to understand the likely impact of climate change on crop production. The impacts of these AOGCM scenarios were estimated on net crop return for the year 2030 to 2100 and under all scenarios; the negative effects in the net crop return per hectare is more by the year 2100 than in 2070, 2050 and 2030. Farmers have taken some adaptation strategies to reduce these adverse effects on crop production.

Production and handling of selected vegetables in Bangladesh: a concern of good agricultural practices adoption

M. Khatun, M.S.Hoq and M.A. Rashid

The study assessed the knowledge, attitude and practices (KAP) of different stakeholders toward production, and handling of vegetables. The study analyzed 300 household's data collected from pointed gourd and cabbage growers from three vegetables growing districts namely Bogura, Pabna, and Jashore. Descriptive statistics was used for analyzing the data. Farmers had a high degree of knowledge regarding GAP standards was held by 53% of cabbage farmers, followed by a medium level by 47% and a low level by 1%. Conversely, 58% of pointed gourd farmers had a high degree of understanding regarding GAP standards. Regarding the farmers' attitudes, 55% of the cabbage and 52% of pointed gourd farmers had a positive attitude toward the GAP standards adoption. Farmers' degree of experience showed that the majority of respondents cultivating cabbage (57%) and 76%

pointed gourd farmers came into the category of intermediate-level practitioners. There were no farmers found in having high level experiences in this aspect. The average KAP index value of the two groups does not differ significantly. Decent price is not ensured in local market (43%), can't get satisfactory production (42%), comparatively small in size (35%), increased attack of insects and diseases (30%) were the major causes of not adopting GAP standards. For adopting GAP standards in vegetable production, the first and foremost crucial way is motivating farmers ethically.

Marketing system of banana in some selected areas of Bangladesh

N. Nahar, M. Khatun, M.S. Hoq, M.R.Hasan and F.Rahman

The study analyzed the value chain of banana production in Narsingdi, Bogura, Jhenaidah District, involving 180 farmers and 60 traders. The results showed that banana production was profitable with a BCR of 2.65 with Channel-Chain-iii and chain - iv being more efficient. The average sales price per Quintal of banana received by retailers was Tk. 2570 and the total marketing cost was estimated at Tk. 548.3. Retailers' costs were highest and lowest for Arathdar. The net marketing margins for Faria, Bepari, Arathder, Wholesalers, and Retailers were Tk. 15, 73, 84, 81, and 90 respectively. The value addition of banana in the value chain for farmers, Faria, Bepari, Arathder, Wholesalers, and Retailers was 5.27, 10.02, 6.83, 9.59, and 11.284 percent for per Quintal of banana. Major problems faced by actors in the banana value chain included lack of capital, quality seeds, subsidy, adequate input availability, lower banana prices, transportation issues, market and storage facilities shortage, and dominance of value chain actors.

Value chain analysis of BARI summer tomato in the south-west region of Bangladesh

M. R. Hasan, Moniruzzaman, M. Khatun, F. Rahman and M. S. Hoq

The study was conducted in the Comilla, Rajshahi, and Jashore districts of Bangladesh to assess the effect of COVID-19 pandemic on agricultural production, income-generating activities and the nutritional status of farm households. A combination of purposive and random sampling

techniques was followed. The total sample size was 240 out of which 80 from each district. Household Dietary Diversity Score (HDDS), Crop Diversity Score (CDS) and Probit model was used. Majority of the farmers informed that COVID-19 affected their income generating activities to a greater extent. Both HDDS and CDS were low during COVID-19 period as compared to the normal period which indicates that the pandemic affected agricultural production and nutrition of farm households. Lower market price, unable to sell crop due to travel restrictions and business loss/business closer were the main factors which affected agricultural production and income of the farmers. The government needs to implement structural changes in social security schemes considering members' needs to aid in stabilizing incomes, access to food, and livelihood recovery after a pandemic like COVID-19.

Profitability of capsicum cultivation in selected areas of Bangladesh

F. Rahman, M. A. Rashid, M. Khatun and M. R. Hasan

This study's goal was to ascertain how profitable it is to grow capsicum in the districts of Bhola, Jeshore and Chuadanga. The study comprised 140 farmers. A purposive random sampling was chosen. Both tabular and descriptive statistics were applied in this investigation. In the study areas, the average total cost, net return, and gross margin of cultivating capsicum were Tk. 509957, Tk. 1098406, and Tk. 1212617 per hectare respectively. Capsicum production was profitable, BCR was found to be 3.15. The average cost of producing one kilogram of capsicum was calculated to be Tk. 22.56. Growers of capsicum faced several challenges, such as heavy infestations of pests and diseases, low capital. One of the main recommendations is that the relevant department of the government will take steps to guarantee that farmers can get fertilizers and pesticides at a fair price, as well as lower the cost of fuel to minimize transportation expenses.

Value chain analysis of organic vegetables production in Bangladesh

Mohammad Shamsul Hoq, Moniruzzaman, Morsalina Khatun^{and} M. A. Rashid

The study was conducted in Jhenaidah and Mymensingh district of Bangladesh for

understanding the value chain analysis of organic vegetables including profitability of organic vegetables production, value addition of organic vegetables marketing, and different drawbacks of production and marketing of organic vegetables production. Bitter gourd and country bean were selected as a representative to capture the value chain of organic vegetables. The study was conducted during the period of 2023-2024. Primary data were collected through face to face interview and secondary data were collected from different published sources. Purposive random sampling technique was used and total sample size was 240 consisting 180 farmers and 60 traders at different level. The study revealed that the net return of bittergourd and countrybean in organic farming system was Tk.4,87,842/ha and Tk. 3,27,055/ha respectively and the BCR was found 2.26 and 2.30 respectively. On the other hand, the net return from inorganic farming system was Tk.286253/ha for bittergourd and Tk. 206610 /ha for country bean production and the BCR was found 2.04 and 1.78 respectively. Six value chains of organic vegetables marketing were identified in the study areas. On the other hand, five value chains were identified in case of inorganic vegetables marketing. The net marketing margin was found Tk. 393/qt. for faria, Tk.257/qt. bepari, Tk. 173/ qt. for aratdar, Tk. 328 /qt. paiker and Tk. 665/qt. for retailer for bittergourd marketing. In case of country bean marketing, the net marketing margin was found Tk.296/qt. for faria, Tk.465/qt. bepari, Tk. 176/ qt. for aratdar, Tk. 432 /qt. paiker and Tk. 855/qt. for retailer. Lack of organic inputs, reluctant to adopt new technology, insect and pest attack, lack of training, lack of organic market outlet and lack of premium market price were found to be major constraints in organic vegetables cultivation.

Status and prospect of sunflower cultivation in selected areas of Jashore region

P. Hajong and K.U. Ahammad

Status and prospect of sunflower cultivation study was conducted at selected areas of Jashore region, where seventy sampling farmer sporadically selected. Sunflower cultivated area was 0.12 ha, which range was 0.03 to 0.27 ha and variety was BARI surjomukhi-2, BARI surjomukhi-3 and hysun variety in the study area. Farmer sown seed in the month of October-November and harvest at January-February in line. Total production cost of

sunflower cultivation was Tk. 136868ha⁻¹, where total variable cost was Tk. 55842ha⁻¹ (40.80%) and fixed cost was Tk. 81026ha⁻¹ (59.20%). Among the cost item hired labor was high (14.47%) followed by land preparation, chemical fertilizer, seed etc. Average yield was 1.60 tha⁻¹ and gross return was Tk. 159792ha⁻¹. Benefit Cost Ratio (BCR) on variable cost basis was 2.86, that means sunflower cultivation was profitable. The main problem of sunflower cultivation was birds infestation, fallen of tree by storm, less market demand etc. Sunflower cultivation was profitable crop with less production cost and good source of edible oil.

Present status and farmers perception of cultivating BARI malta-1 in Sylhet region

Rasheduzzaman, M. A. Rashid, M. H. Hossain

The study aims to identify the present status and farmer's perception of cultivating BARI Malta-1 in Sylhet region of Bangladesh. Problem Confrontation Index along with Problem and Solution Ranking technique was adopted. The results found that the variety is adopted by 85% Malta farmers of the study areas. A well-defined marketing channel prevails in the market. However, the results from problem confrontation index highlighted that lack of availability of quality sapling, un-attractive color, lack of technical knowledge, management practices, insect-pest infestation, lack of marketing facility and less juicy are the main problems. Furthermore, the top ranked solutions are availing quality sapling through BARI and DAE, providing training facility, developing marketing facility and promoting BARI Malta-1.

Profitability and efficiency analysis of pumpkin production in selected char lands of Rangpur district

M.S. Afroj, M.A. Rashid and A.K.Saha

The study analyzed the socio-economic characteristics of 70 pumpkin growers in Rangpur district, focusing on profitability and addressing production issues using a purposive random sampling technique. Per hectare gross return, gross margin and net returns of pumpkin growers were estimated TK. 469837.5, 315992.86 and 297946.02 respectively. Per hectare benefit cost ratio (BCR) was 2.73 which indicates that pumpkin cultivation was very profitable. Cobb-Douglas production function analysis indicated that out of seven variables cost of labor, fertilizer, irrigation, IPM

tools and machinery cost had positive and significant impact on gross return of pumpkin production. The resource use efficiency ratio was highest for machinery cost (10.37) which is underutilized and pesticides cost (-3.23) was found as over utilized resources. The study identified challenges in pumpkin production including poor seed quality, lower farm prices, insufficient pesticide sources, and weather issues like cold and fog etc.

Cost and return analysis of different vegetable cultivation

Rafiqul Islam

The study was conducted in major vegetable-growing regions of Bangladesh to assess the costs and returns of eight vegetables: BARI *Lalshak 1* (Red Amaranth), BARI *Palongshak 1* (Spinach), BARI *Puishak 1* (Indian Spinach), BARI *Mula 1* (Radish), BARI Hybrid *Mistykmra 1* (Pumpkin), BARI *Dheros 2* (Lady's Finger), BARI *Jharshim 1*, and BARI *Data 1*. Data were gathered through focus group discussions, revealing that all vegetables were profitable to cultivate. Among them, BARI *Jharshim 1* and BARI *Data 1* were the most profitable, while BARI *Dheros 2* was the least profitable. Labor costs accounted for the largest portion of production expenses across all vegetables, followed by fertilizer costs. Irrigation and pesticide costs contributed minimally to overall production expenses. Challenges such as labor shortages, high wages, and pest and disease infestations hindered vegetable cultivation in the study areas.

Studies on post-harvest losses of garlic and factors affecting for such losses in selected areas in Bangladesh

Md. Kamrul Hasan, Shailendra Nath Mozumder and Md. Zulfikar Haider Prophan

Garlic is one of the most economically important crops cultivated and consumed worldwide. Post-harvest losses have been accounted a major problem of garlic in Bangladesh. This study was conducted to quantify the post-harvest losses of garlic at various stages of supply chain viz. farm, wholesale market and retail market levels. Descriptive statistics and multiple regression models were used for data analysis. Maximum aggregate post-harvest losses (22.23 kg/q) have been found at producer level. Total losses in the

supply chain were estimated to be 24.53 kg/q in which 90.61 percent losses were observed at farm level and rest were contributed at wholesale and retail level. The total financial losses were estimated to be 3214.85 Tk/q from farm to retailer level of which 93.29 percent occupied by the farmers. The econometric estimation revealed that total production, garlic price, more farming experience, harvesting at matured stage, proper post-harvest activities, proper drying and proper storage condition had significant effect on losses at farm level whereas garlic price, more business experience, proper storage, structured selling place, proper loading and unloading method, and favourable weather reduced post-harvest losses significantly and market distance showed significant effect on losses at wholesale market level. Factors such as as garlic price, more business experience, proper storage, retailer as a shopkeeper and favourable weather reduced post-harvest losses, significantly at retail level. The study suggests there is an urgent need of training on all the activities of production, harvesting and marketing level to minimize post-harvest losses and to fetch maximum gains.

Factors affecting adoptions of BARI developed mustard varieties in some selected areas of Bangladesh

M N Islam, M Shalim Uddin and M.A. Rashid

Mustard is a leading oil crop in Bangladesh. Relevant data and information on the adoption of improved mustard varieties is very scanty and sporadic in Bangladesh. Therefore, an attempt was made to assess the extent of adoption of improved mustard varieties and their management practices at farm level. The study used data from 130 mustard growing farmers under Tangail, Jamalpur and Sirajganj districts. Logit regression model along with other descriptive statistics were used to analyze the collected data. The findings derived from the logistic regression analysis indicate that there are several factors that are correlated with the level of BARI Mustard Variety adoption in Bangladesh. Participation of women and total agricultural income are substantial determinants that enhance the probability of BARI mustard adoption. Active members in agriculture and education reduce the likelihood of adoption by a substantial margin. Adoption is not significantly influenced by age, primary occupation, highest

education of family members, total working family members, experience, total land, land type, or soil type.

Adoption and profitability of BARI developed potato varieties in Bangladesh

M.S. Akter M. A. Rashid, M.M.H. Molla

The study assessed the adoption status and profitability of BARI released potato varieties in Bangladesh. The study focused on adopters and non-adopters of the BARI potato variety, analysing data from 100 families in Bogura and Joypurhat districts. Descriptive statistics and profit equation were used to analyze data. The study reveals that among the BARI potato varieties the most adopted potato variety in the study areas is BARI Alu-25 (Asterix) which is 53%. The area coverage of BARI released varieties of potato about 86% ,87% and 86% of total potato in 2022-2023,2021-2022 and 2020-2021, respectively in study areas. Area under local variety cultivation is increasing from 12.73% in 2021-2022 to 13.47% in 2022-2023. The average total cost of cultivation was highest 377785 Tk./ha in BADC Alu-1 (Sunshine) where BARI Alu-25 and BARI Alu-54 were 362685 Tk./ha and 361417 Tk./ha. Though BARI Alu-90 has highest total return but it is not much popular in the study area due to non-availability of seed. On average, BCR of potato production was 1.71, where BARI Alu-90 had the highest 2.08. Unstable market, no fair price, storage problem were several challenges in marketing of potato.

Farmers' perceptions and adaptations to climate change in some selected areas of Kishoreganj district haor ecosystem

M. E. A. Begum, N. Sultana, M. Mohiuddin M. S. Rahman and M. Anwar

Climate change is predicted to adversely affect agricultural yields in Bangladesh where crop production relies heavily on environmental factors. Therefore, the study was conducted to explore farmers' perceptions and adaptation impacts on returns to land in haor. A total of 100 farmers were selected purposively for the interview and focus group discussion. A panel data set of five years was gathered using structured questionnaires with the sample of 500. A fixed effects quantitative model on the panel data was estimated to verify the effect of adaptation strategies on farm income of farmers. The major climate risk in the study areas were flash

flood, excessive fog in winter, extreme heat wave, drought and hailstorm. The study found that the main adaptation strategies that significantly influenced farm income were mixed cropping and relay cropping. The study recommends that innovative research, extension and favorable policies that support the synchronization of adaptation strategies, are crucial for improving the farm income.

Study on the impact of farming system research activities of BARI

M. S. Rahman, Nasima Akter, Mazharul Anwar

The study was conducted in Shyampur and Barind of Rajshahi, Kushtia and Pabna FSRD sites of OFRD, BARI in Bangladesh to see the impact of FSRD project activities of BARI during 2022-2024. Tabular analysis was followed. The production and consumption of vegetable and fruits were increased of the selected sampled farmers after intervention of the FSRD project. It is found positive impact. The production and consumption of survey period

were lower compared to that of end of project, but it was.

Productivity and profitability of summer chilli cultivation in some selected areas of Kishoreganj district

M. Mohiuddin

A survey was carried out in two upazillas of Kishoreganj district to assess the existing agronomic practices, productivity and profitability as well as to identify the problems of production of summer chilli during 2023-24. Tabular method was followed. The majority of the farmers sowed their seeds during the second to third week of February. The average yield and gross margin were observed at 4.68 t/ha and 259882 Tk./ha, respectively. Per kilogram cost and return were estimated at Tk. 55.34 and 105.51, respectively. Lack of quality seed, high insect pest infestation and lack of scientific production technology were the major problems found in the study areas.

PLANT GENETIC RESOURCES

13

Exploration and collection of plant genetic resources

M M Ali, Q M Ahmed, R Afroz, S Rahman, F B Hossain, M G Hossain, I Ahmed, N Jahan, M F Khatun and N Jahan

An exploration and collection program on different crops were implemented in twenty-nine (29) upazilas of eight districts in Bangladesh. Six hundred and sixteen (616) germplasm from fifty-six crops were collected. Among the germplasm six entries of cereals, two fruits, eight oilseeds, eight pulses, five spices, twenty-one vegetables and six other crops were collected. Germplasm were collected from fields, threshing floors, homestead gardens, markets, hilly areas and agricultural habitats etc. During collection, passport information was recorded. The samples were conserved in active collection chamber providing a collector's number.

Multiplication of bitter gourd, snake gourd, sesame and kangkong

M F B Hossain

The experiment was conducted at the experimental field of PGRC, BARI, Gazipur, during kharif season of 2024 to multiply the newly collected germplasm of bitter gourd, snake gourd, sesame and kangkong. Multiplied seeds of bitter gourd (124 g), sesame, kangkong and snake gourd (944 g) were conserved in the genebank.

Characterization of ridge gourd germplasm

M G Hossain, I Ahmed, N Jahan, M F Khatun, Q M Ahmed and M M. Ali

Ridge gourd (*Luffa acutangula*) is an important economic vegetable crop grown all over Bangladesh during lean period of vegetable scarcity. Morphological characterization was used to investigate the diversity within a germplasm

collection of 101 ridge gourd accessions at PGRC research field, BARI, Gazipur during kharif 2023-24 season following augmented RCB design. The most variable morphological characters were associated with the fruit. Growth habit, stem shape, tendril type, flower color and sex type of qualitative characters have no variation. In case of quantitative characters considerable variations were observed in internode length, stem thickness, days to 1st female flower appear, number of primary branches, peduncle length, fruit length, number of fruits per plant and individual fruit weight among the tested accessions. The accessions BD-2974 and BD-2979 were the earliest BD-2994, BD-3014 and BD-3024 produced highest number of fruits per plant.

Characterization of rapeseed-mustard germplasm

R Afroz, S Rahman and N Jahan

The experiment was conducted with fifty-two (52) germplasm of rapeseed-mustard at PGRC, BARI, Gazipur during November 2023 to March 2024. Twenty-five (25) morphological characters were recorded, fourteen (14) were visually assessed and eleven (11) were measured. All the characters showed distinct variation among the germplasm except seedling leaf colour, axillary stem bud growth and siliqua attitude. Maximum co-efficient of variation was estimated in leaf blade width (55.10%), which was followed by seed yield per plant (46.72%) and number of siliqua per plant (46.11%) and the lowest was observed in siliqua length (23.29%) for quantitative characters.

Characterization of okra germplasm

N Jahan and M M Ali

The experiment was conducted with one hundred and fourteen (114) germplasm of okra (*Abelmoschus esculentus* L.) in the experimental field at PGRC, BARI, Gazipur, during kharif



season of 2023-24. Qualitative characters showed distinct variation among the germplasm except shape of epicalyx segments, leaf shape and position of fruit. The maximum variation was found in fruit shape followed by mature fruit color, early plant vigour and immature fruit color. The highest coefficient of variation was observed in plant height (22.38%) followed by fruit width (20.35%) and days to 50% flowering (16.58%). Eight accessions BD-1862, BD-1900, BD-1928, BD-1930, BD-1935, BD-1940, BD-1961 and BD-7064 found promising germplasm.

Characterization of brinjal germplasm

I Ahmed

The experiment was conducted at PGRC, BARI, Gazipur during rabi season of 2023-24. One hundred fourteen accessions (114) of brinjal were characterized of which 18 qualitative and 7 quantitative characters. Highest qualitative variation was found in fruit color at commercial ripeness. Significant variation was observed among the accessions. In quantitative traits, maximum coefficient of variation (CV%) was obtained from individual fruit weight and minimum in days to 1st flowering.

Characterization of yard long bean germplasm

N Jahan and S Rahman

The experiment was carried out with forty-five (45) germplasm of yard long bean (*Vigna sesquipedalis* L. Vercourt) at Plant Genetic Resources Centre during kharif season, 2024. Twenty-five (25) morphological characters were recorded, thirteen (13) were visually assessed and twelve (12) were measured. In case of qualitative characters, eight categories of seed colour were noticed. Maximum coefficient of variation (95.67%) was estimated in green pod yield per plant followed by number of pods per plant (74.99%). Seven (07) germplasm (SSR-65, IRM-122, IRM-154, NSR-30, IRM-364, SNR-100 and SRS-03) were identified as promising considering earliness, pod characters and yield.

Characterization of radish germplasm

Q M Ahmed

The experiment was conducted with forty-eight germplasm along with two check varieties of radish at PGRC, BARI during the rabi season of 2023-24. Germplasm were varied for twenty-two qualitative

and eleven quantitative characters. Variations in qualitative characters are found in leaf color, root shape, exterior color, silique color, and primary seed color. The longest root length was recorded 31 cm whereas the shortest was 16 cm. The maximum root width was 21.30 cm. Root weight ranged 21 to 461 g and average root weight was 249.71 g. The highest coefficient of variation was observed in root weight (36.04 %) followed by the number of seeds per silique (36.57%). Based on root size and weight nine germplasm IRM-173, IRM-244, IRM-130, NQ-73, NRI-14, N-61, IRM-361, RNF-110, and SS-52 found promising.

Preliminary evaluation of sorghum genotypes under drought condition

A N M S Karim, N Jahan, Q M Ahmed, R. Afroz and Z A Talukder

A total of 70 sorghum genotypes including one check variety (BARI Jowar-1) were evaluated at PGRC, BARI, Gazipur. The experiment was consisted of three sets based on providing irrigation (pre-flowering, post-flowering and control). Drought remarkably declined the yield and yield related traits of all the sorghum genotypes compared to control. In drought condition, plants were showed early maturity compared with the control condition. Yield was greatly reduced by drought stress at pre-flowering stage compare to post-flowering and control condition. Considering overall performance among the 70 genotypes, BD-750 and E-29 were effectively coped the drought stress and higher yielded over check variety in all conditions and the genotypes BD-724 and BD-730 also showed better performances.

Preliminary evaluation of mung bean germplasm under water logging condition

R Afroz, N Jahan, A N M S Karim, M F Khatun and M M Ali

This study was done to investigate waterlogging stress tolerant potential in mung bean (*Vigna radiata* L) at vegetative and flowering stage. Thirty (30) mung bean accessions were exposed to waterlogging stress artificially maintaining water height 3–5 cm above the soil surface for 3 days (40 days old seedling) and 4 days (57 days old seedling). The duration (41–43 DAE) and (58–61 DAE) were waterlogging period, and subsequent withdrawal of waterlogging condition (10 days) were regarded as a recovery phase. Based on their

survival performance, acute decreasing of survival and increasing of death percentage was observed in most of the accession under waterlogging and recovery. Among them BD-10733 showed the moderate tolerance while BD-10029 and BD-10589 expressed mild tolerance in both stage under waterlogging stress.

Molecular characterization of loti raj kachu (Joypurhat)

Iftekhar Ahmed

Loti Raj is an aroid cultivar and well-liked both outside and in country. Panchbibi upazila in the Joypurhat district was the original location of Loti raj cultivation. To evaluate genetic diversity at the molecular level, an experiment was carried out in the Molecular Lab of PGRC, BARI. Leaves of the Joypurhat Loti raj kachu and two released varieties, BARI Kachu-1 and BARI Kachu-6 were used. The modified CTAB technique was used to extract DNA. The molecular diversity of the aroid genotypes was assessed using fifteen SSR primers. Only four primers Ce_Ce1A06, Ce_Ce1C06, Ce_HK34, and Ce_HK26 showed distinct allelic polymorphism on the electrophoresis gel run, making it simple to identify aroid genotypes.

Molecular characterization of nac fazli mango

I Ahmed

Nac Fazli variety of mango has a nose like appearance having life span 120-130 days. Initially it was planted in Badalgachi Upazila of Naogaon district. To evaluate genetic diversity at the molecular level, an experiment was carried out in the molecular Lab of PGRC, BARI. From the original mother plant, the leaves of the Haribhanga, Fazli, and Nac fazli were harvested. Using the modified CTAB technique, DNA was extracted. To assess the molecular diversity of the genotypes of mangoes, twenty-four SSR primers were employed. Merely two primers (MiSHRS-O32 and mMiCIR009) demonstrated distinct allelic polymorphism on the electrophoresis gel run, making it simple to differentiate between mango genotypes.

Molecular characterization and dna fingerprinting of halda chilli

I Ahmed and Mm Ali

Molecular diversity and DNA profiling show exact genetic blue print of any crop to protect intellectual

property right. The experiment was design to establish the molecular diversity and polymorphism among six local chilli genotypes. Fifteen well-known SSR primers were used for the molecular characterization of the genotypes. Some total of 39 different alleles were generated with a range of 1 to 5 alleles per locus and an average of 2.6. An average value of Polymorphism Information Content (PIC) of SSR markers 0.708. UPGMA method separated the 6 genotypes into two major clusters (A and B). From the clusters, Halda chilli belonged to the sub-cluster (BII), that revealed its distinct variation from the others.

Germplasm conservation of PGRC

S Rahman, N Jahan and M M Ali

Genebank of PGRC acts as a germplasm store house of the BARI mandated crops viz. cereals, pulses, oilseeds, vegetables, fruits, spices, medicinal plants, cash crops and other crops etc., since 1987. The accessions were conserved in medium-term storage (at 4 to 6°C) and long-term storage (at -18 to -22°C). Viability (germination %), quantity and moisture were checked before conservation. Accessions having less than 80% viability and/or less quantity of seeds were regenerated. Generally, the seeds having 6-8% moisture content stored in genebank. Till now, the centre has conserved 13013 accessions of 152 different crops. In seed genebank 1792 accessions were cereals, 3720 pulses, 822 oilseeds, 523 spices, 5481 vegetables, 283 fruits, 54 cash crops and 8 other crops. In field genebank 31 accessions were spices, 165 vegetables, 124 fruits, 9 medicinal plants and 1 cash crop. A total of 140 new accessions were conserved in 2023-24.

Monitoring of germplasm in active collection

S Rahman, N Jahan and M M Ali

A total of 2206 accessions from different year (batch references) among 24 important crops viz. barely, mung bean, faba bean, sunflower, soybean, safflower, black cumin, musk melon, sweet gourd, brinjal, yard long bean, cucumber, radish, french bean, snake gourd, kangkong, buckwheat, fenugreek, fennel, celery, vetch, pearl millet, batishak and bazra were monitored by germination test. All the germplasm were taken from active collection. The viability test was conducted on germination paper, sands and pulverized gravels. 838 accessions showed germination 81-100%

followed by 416 (41-80%) and 952 (0-40%). The accessions having less than 80% germination and/or less quantity will be regenerated in the following year.

Distribution of germplasm

S Rahman, N Jahan and M M Ali

Germplasm distribution is one of the important activities of PGRC. In 2023-24, the centre distributed 1661 accessions of 21 crops among the researchers, MS and PhD students, plant breeder, horticulturist and teachers of different Universities and Institutes for conducting research. Among the germplasm, 666 accessions were cereals (Maize, foxtail millet, barley and wheat), 233 oil seeds (Sunflower, sesame, mustard and linseed,), 363 pulses (Grass pea, mung bean, lentil, chick pea, cowpea and rice bean), 20 spices (black cumin), 379 vegetables (Sweet gourd, cucumber, brinjal, tomato, snake gourd and okra).

Regeneration of rapeseed-mustard germplasm

R Afroz, N Jahan and S Rahman

The experiment was conducted with one hundred thirty-seven (137) accessions of rapeseed-mustard at PGRC, BARI, Gazipur during rabi season of 2023-24. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. Among the 137 germplasm, *B. rapa* (72), *B. juncea* (34) and *B. napus* (31) were identified. After completing all the post-harvest operations, the 35.33 kg seeds from one hundred thirty-seven accessions were conserved properly for future use.

Regeneration of chilli germplasm

M F Khatun and A N M S Karim

The experiment executed in the field of PGRC, BARI. A total of one hundred and forty-nine (149) accessions were regenerated to preserve genetic integrity and produce enough seed for conservation. Data on eight qualitative and five quantitative traits were collected. Variations were noted in plant growth habit, leaf color, leaf shape, flower position, fruit color, and seed color. After completing the post-harvest operations, all seeds were conserved properly for future use.

Regeneration of pumpkin germplasm

S Rahman and N Jahan

The regeneration of seventy-one (71) pumpkin (*Cucurbita moschata*) germplasm was done in the

experimental field at PGRC, BARI, Gazipur, during November'23-April'24. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. The most important qualitative and quantitative characters were recorded to know the variations among the germplasm. After completing all the post-harvest operations, the seeds were conserved in the genebank.

Regeneration of pea germplasm

N Jahan and M G Hossain

The regeneration of one hundred and forty-one (141) pea (*Pisum sativum* L.) accessions were done in the experimental field of PGRC, BARI, Gazipur, during rabi season of 2023-24. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. Qualitative and quantitative characters were recorded. After completing all the post-harvest operations, the 71.85 kg seeds were conserved properly for future use.

Regeneration of halim shak, china shak, chinese cabbage, and butterfly pea germplasm

Q M Ahmed

The experiment was conducted at the experimental field of PGRC, BARI, Gazipur during 2023-24 with crops namely halim shak (1), china shak (1), chinese cabbage (2), and butterfly pea (1) accessions which were successfully grown to assist the regeneration and conservation program. Germplasm regeneration leads to get a sufficient seed quantity with increased viability for future use. The crops were harvested from time to time for each accession. After completing all the post-harvest operations, the 429g seeds from Halim shak, 448 g from china shak, 1080 g from chinese cabbage, and 410 g from butterfly pea were conserved for future use.

Regeneration of roselle and kangkong germplasm

Q M Ahmed

The study was conducted at the Plant Genetic Resources Centre of BARI, Gazipur including crops namely roselle (7) and kangkong (3) accessions successfully grown to assist the regeneration and conservation program. The crops

were harvested time to time on the basis of different accession. Germplasm regeneration leads to get a sufficient seed quantity with increased viability for future use. After completing all the post-harvest operations, 795 g seeds from roselle and 1049 g seeds from kangkong were conserved for future use.

Regeneration of cowpea germplasm

M G Hossain, N Jahan, I Ahmed and M M Ali

The experiment was conducted at the research field of Plant Genetic Resources Centre, BARI, Gazipur during rabi season of 2023-24 to regenerate and increase the seeds of thirteen (13) conserved cowpea [*Vigna unguiculata* (L.) Walp.] germplasm. Different qualitative and quantitative characters were recorded. Variations in qualitative traits were observed in seed shape and seed color. A good range of variations were exhibited in number of pods per plant and pod length. Adequate amount of seeds were harvested. After completion of all the post-harvest operations such as; drying, cleaning, curing etc. the seeds were conserved for future use.

Regeneration of faba bean germplasm

M G Hossain, N Jahan, I Ahmed and M M Ali

The experiment was conducted at the research field of Plant Genetic Resources Centre, BARI, Gazipur during rabi season of 2023-24 to regenerate and increase the seeds of five (5) conserved faba bean (*Vicia faba* L.) germplasm. Some of the qualitative and quantitative characters were recorded. No qualitative variation was observed among the accessions. A good range of variations were recorded in plant height, number of pods per plant and number of seeds per pod. Adequate amount of seeds were harvested. After completion of all the post-harvest operations such as; drying, cleaning, curing etc. the seeds were conserved for future use.

Regeneration of peginon pea germplasm

M G Hossain, N Jahan, I Ahmed and M M Ali

The experiment was conducted at the research field of Plant Genetic Resources Centre, BARI, Gazipur during rabi season of 2023-24 to regenerate the twenty-one (21) conserved pigeon pea germplasm. Variations were observed in both qualitative and

quantitative traits. In general, most of the accessions were semi-spreading with broad-elliptic leaflet having green-purple immature pods. Huge variation was also observed in days to flowering and number of pods per plant. Adequate amount of seeds were harvested. After completing all the post-harvest operations such as; drying, cleaning, curing etc. the seeds were conserved for future use.

Regeneration of vetch germplasm

M G Hossain, N Jahan, I Ahmed and M M Ali.

The experiment was conducted at the research field of Plant Genetic Resources Centre, BARI, Gazipur during rabi season of 2023-24 to regenerate and increase the seeds of three (03) conserved vetch (*Vicia sativa* L.) germplasm. Different qualitative and quantitative characters were recorded. In general, all the accessions were prostrate type in growth habit having green colored immature pods. However, variations were also observed among the germplasm in both qualitative and quantitative traits like; leaf size, flower color, pod length, seed color and seed shape etc. Adequate amount of seeds were harvested. After completion of all the post-harvest operations such as; drying, cleaning, curing etc. the seeds were conserved for future use.

Regeneration of triticale germplasm

N Jahan

The experiment was conducted with three (3) accessions of triticale at PGRC, BARI, Gazipur during rabi season of 2023-24. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. After completing all the post-harvest operations, the 685 g seeds from three accessions were conserved for future use

Regeneration of oat germplasm

N Jahan

The experiment was conducted with one (1) accession of oat at PGRC, BARI, Gazipur during rabi season of 2023. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. After completing all the post-harvest operations, the 1650 g seeds from one accession were conserved for future use.

Regeneration of pearl millet germplasm

N Jahan

The experiment was conducted with two (2) accessions of pearl millet at PGRC, BARI, Gazipur during rabi season of 2023-24. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. After completing all the post-harvest operations, the 1040 g seeds from two accessions were conserved for future use.

Regeneration of foxtail millet germplasm

A N M S Karim and M F Khatun

The regeneration experiment was conducted at the research field of the Plant Genetic Resources Centre (PGRC) of Bangladesh Agricultural Research Institute (BARI), Gazipur during the rabi season of 2023-24. One hundred and ninety-nine (199) foxtail millet accessions were taken to increase sufficient seeds for the gene bank. Variations were observed in both qualitative and quantitative traits among the germplasm. Some qualitative and quantitative data were recorded and 53.4 kg seed have been collected from the accessions and conserved for future use.

Regeneration of grasspea germplasm

K U Ahamed and M S Uddin

The study was conducted at Regional Plant Genetic Resources Center, RARS, Ishurdi, Pabna during rabi season of 2023-2024 to regenerate seeds for conservation in the genebank. The experiment involved 302 grasspea accessions. Remarkable variations were observed in respect of qualitative and quantitative traits among the germplasm. Three types of uniformity among the accessions showed as poor, medium and high, maximum 55.23% showed medium type. Four types of flower colour were found as white blue, blue, pink and violet blue. Seven types of seed coat colour found and highest 73.18% showed as brown colour. Among the tested accessions, 288 accessions showed very low or no visible sign of susceptibility to biotic stress and 14 accessions showed susceptibility to biotic stress. Adequate amount of seeds has been harvested for conservation and future use.

Regeneration of chickpea germplasm

K U Ahamed and M S Uddin

The study was conducted at Regional Plant Genetic Resources Center, RARS, Ishurdi, Pabna during rabi season of 2023-2024 to regenerate seeds for conservation in the gene bank. The experiment involved 103 chickpea accessions. Remarkable variations were observed in respect of qualitative and quantitative traits among the germplasm. Four types of flower colour observed among the accessions and maximum 70.88% found as pink colour flower. Seed colour showed nine categories, highest 27.18% showed dark brown seed colour. Among the tested accessions, 69 accessions showed very low or no visible sign of susceptibility and 34 accessions showed susceptibility to biotic stress. Adequate amount of seeds has been harvested for conservation and future use.

Regeneration of sweet gourd germplasm

D Halder, Ms Kobir and Ku Ahammad

The experiment was conducted at Plant Genetic Resource Centre, RARS, BARI, Jashore during the rabi season of 2023-2024 to regenerate the conserved germplasm. The experiment was involved 47 sweet gourd accessions. Variations among sweet gourd accessions were observed in qualitative characteristics like fruit size and fruit shape. The highest standard deviation (13.98) was observed in the seed weight per germplasm and the lowest (0.71) standard deviation was observed in flesh thickness (cm). The highest co-efficient of variation (62.64%) was observed for seed weight per germplasm followed by TSS (%) (33.81%) whereas the lowest (4.57 %) was found in days to first male flower.

Conservation of germplasm at the field genebank

I Ahmed and M M Ali

Many perennial and horticultural crops are either difficult or impossible to conserve as seeds because they produce recalcitrant seeds or reproduce vegetatively. Hence, they should be conserved as live plants in Field Gene Banks (FGB). FGBs provide an opportunity for easy and ready access to conserved material for research and utilization. Plant Genetic Resources Centre

(PGRC) of Bangladesh Agricultural Research Institute, Gazipur maintaining a total of 330 accessions of 68 crops both indigenous and exotic germplasm in its field genebank. In 2023-24, new 13 germplasm of 3 crops were collected from different districts which has been maintaining in field gene. The fruits germplasm are mango, litchi, banana, guava, jackfruit, jujube, aonla, bael, bilimbi, bullocks heart etc. The vegetables germplasm are taro, yam, elephant foot, drumstick etc. The exotic germplasm are rambhutan, pear, tamarind, coffee, passion fruit, dragon fruit and gynura etc. The intercultural practices were done as and when necessary. The field gene bank has been maintained since 1985 and continued for the following years.

Documentation of germplasm

M G Hossain, N Jahan, Q M Ahmed, I Ahmed, S Rahman and M M Ali

The Plant Genetic Resources Centre (PGRC) maintains a local database using Microsoft Excel. Excel was chosen as a cost-effective and user-friendly tool enabled efficient and effective updates enhancing its accessibility, usability, and analytical capabilities. PGRC database highlights recent updates made during 2023-24, aiming to improve data quality, accessibility, and utilization. A total of 9865 data were updated of which 5376 were from passport data, 1682 conservation and monitoring data and 2807 were germplasm characterization and regeneration data.

ON-FARM STUDIES

14

Project: On-Farm Soil Fertility Management

Integrated nutrient management of onion in Faridpur

S. Ahmed and N. Sultana

A trial was conducted at the FSRD Site, Sholakundu, Faridpur during the rabi, 2023-24 to find out a suitable nutrient dose as well to increase sustainable yield and economic of onion under farmers' field situation. The experiment was laid out in randomized complete block design with six dispersed replications using cv. BARI Piaz-4 with the treatment of soil test based (STB) fertilizer dose: 85-25-45-15-0.15-0.5 kg NPKSZnB ha⁻¹, STB dose plus vermicompost 2 ton per hectare and Farmer's practice: 205-125-100-30-3-1-1.5 kg NPKSZnBMg ha⁻¹. On the basis of result, the application of vermicompost with soil test based fertilizer dose to the crop yield found to be good integrated nutrient management practice where it recorded highest bulb yield (21.65 t ha⁻¹). On the basis of gross margin (725400 Tk. ha⁻¹) and benefit cost ratio was 4.10 the T₂ was found to be profitable.

Nutrient management of oat production in Faridpur

S. Ahmed and N. Sultana

The fertilizer management on the yield of oat production were conducted at the FSRD Site, Sholakundu, Faridpur during the rabi 2022-23 & 2023-24. The experiment was designed in a randomized complete block design with four replications with cv. BARI Oat-1. The study was carried out with five treatments combinations ie. T₁ (Recommended dose of Barley): 80-30-30-10-3-1 kg NPKSZnB ha⁻¹, T₂:(FRG' 2018):50-7-15-0-1.25-0 kg NPKSZnB ha⁻¹, T₃:(T₂ + 25%):63-9-20-0-1.25-0 kg NPKSZnB ha⁻¹, T₄:(T₂ + 50%):75-11-

23-0-1.25-1 kg NPKSZnB ha⁻¹ and T₅ (Farmer's practice): 90-25-25 kg NPK ha⁻¹. The fertilizers of different doses differed significantly. However, the highest filled grain (37.55), 1000 grain weight (23.28g) and grain yield (both yr av. 1.70 t ha⁻¹) were recorded when the soil received FRG recommended fertilizer with extra 25% of all element. The highest gross return, gross margin and best benefit cost ratio 149375 Tk. ha⁻¹, 71531 Tk. ha⁻¹ and 1.95, respectively were obtained from the same treatment.

Development of fertilizer management package on potato-groundnut-fallow cropping pattern in nikli, Kishoreganj

M.Mohiuddin M.Y.H. Rayhan and N. Sultana

An experiment was executed at the MLT site Nikli during 2023-2024 to assess the fertilizer management package on potato-groundnut-fallow cropping pattern in Nikli, Kishoreganj. Four different fertilizers were taken as treatments T₁: 1.0 t Lime ha⁻¹ with Soil test based fertilizer dose (Potato:282-58-110-26-10-5, Groundnut:75-58-37-63-5-4 kg NPKSZnB ha⁻¹), T₂: 1.0 t Lime ha⁻¹ with 120% STB (Potato:338-70-132-31-12-6, Groundnut:90-70-44-76-6-5 kg NPKSZnB ha⁻¹), T₃: 1.0 t Lime ha⁻¹ with 80% STB (Potato:226-46-88-21-8-4, Groundnut:60-46-30-50-4-3 kg NPKSZnB ha⁻¹), T₄: Farmers practice (No lime with Potato:345-148-198, Groundnut:120-140-100 kg NPK ha⁻¹). The highest gross return (Tk.722400 ha⁻¹), gross margin (Tk.461948 ha⁻¹) and BCR (2.77) was calculated from T₂:Lime (1.0 t ha⁻¹) with 120% Soil test based recommended fertilizer dose (Potato:338-70-132-31-12-6, Groundnut:90-70-44-76-6-5 kg NPKSZnB ha⁻¹) the lowest gross return (Tk. 568900 ha⁻¹), gross margin (Tk. 329548 ha⁻¹) and BCR (2.37) were from treatment T₃:(Lime (1.0 t ha⁻¹) with 80% Soil test based recommended fertilizer dose).

Effect of rhizobium inoculum on the yield of BARI motorshuti-3 in the farmers field

S. Sultana, M.M. Zaman and N. Sultana

An experiment was conducted in the farmers' field of Muktagacha upazila under Mymensingh district with the close supervision of On Farm Research Division, Bangladesh Agricultural Research Institute, Mymensingh, during winter 2023-2024 to observe the effect of rhizobium on the yield of BARI Motorshuti-3. The experiment was conducted in Randomized Complete Block design with three replications and three treatments: Rhizobium inoculum plus recommended P and K (24 and 30 kg ha⁻¹, respectively), Rhizobium inoculum and rec. P and K i.e. 24 and 30 kg ha⁻¹, respectively with vermicompost (5 t ha⁻¹) and Uninoculated (Rec. 48-24-30 kg NPK ha⁻¹). The combined application of vermicompost, rhizobium and recommended chemical fertilizers gave the highest pod yield of 9.22 t ha⁻¹ followed by application of rhizobium with recommended chemical fertilizers (7.51 t ha⁻¹) and the lowest pod yield (5.33 t ha⁻¹) was recorded from uninoculated treatment. The maximum gross return (Tk. 691500 ha⁻¹) was recorded from rhizobium + vermicompost + recommended chemical fertilizers.

Development of fertilizer recommendation for potato production

N. Sultana and M.M. Zaman

A fertilizer trial on potato was conducted at Mymensingh region under close supervision of On Farm Research Division of Bangladesh Agricultural Research Institute, Mymensingh during robi season in the year 2023-2024 to evaluate the performance of different fertilizers dose and to develop a fertilizer recommendation for potato production in farmers' field. The trial was consisted of six fertilizer doses viz. T₁: Farmers practice (P from DAP and N from Urea), T₂: Farmers practice (P from DAP and N from Urea and rest N from DAP), T₃: Farmers practice (P from TSP and N from Urea), T₄: Upper limit of low fertility level, FRG' 2018, T₅: P from DAP and rest N from Urea and T₆: Control. The yield performance of those treatment on potato appeared to be promising. It was found that maximum number of tubers (12.8) plant⁻¹ and weight of tuber per plant (632.0 g) was recorded in plot, which received fertilizer through T₅ i.e. proposed fertilizer dose. In case of T₄ i.e. the FRG recommended

fertilizer dose recorded highest yield of potato (28.92 t ha⁻¹) which was statistically at par with T₁, T₂, T₃ and T₅. From the study the highest gross return (Tk. 867630 ha⁻¹) and gross margin (Tk. 651830 ha⁻¹) were estimated from the treatment T₄. The lowest gross return (Tk. 477900 ha⁻¹) and gross margin (Tk. 273949 ha⁻¹) were recorded from T₆ when lowest amount of fertilizers were applied. The result led to conclusion that the most effective and economic fertilizer application in potato is FRG' 2018 recommendation dose and it is 135-30-135-15-10-4-1.6 kg NPKSMgZnB ha⁻¹ along with 5 ton cow dung ha⁻¹ fertilizer are the promising level for excellent results in potato crop under plain land conditions at Gouripur, Mymensingh.

Effect of potassium on yield of Mukhikachu

N. Sultana and M.M. Zaman

Potassium is the most abundant element next to Nitrogen and phosphorus which is largely required by the plants. Potassium as fertilizer is seen to increase yield and productivity in protein and starch rich grain. Thus, a trial of response of mukhikachu to K fertilizer was conducted to evaluate the performance of different level of K fertilizers dose and to develop a judicious fertilizer recommendation for mukhikachu cultivation. The trial was consisted of five level of K in combination with recommended fertilizer doses viz. T₁: Recommended fertilizer dose (161-40-23-6-2 kg NPSZnB ha⁻¹ with 0.0 kg ha⁻¹ K of potassium, T₂: RFD + 50 kg K ha⁻¹, T₃: RFD + 100 kg K ha⁻¹, T₄: RFD + 150 kg K ha⁻¹ and T₅: Farmers practice (9-35-20-4 kg NPKS ha⁻¹ (P as a source of DAP where N=14 kg ha⁻¹)). The trial was conducted on cv. BARI Mukhikachu-2 in a randomized complete block design at Fulbaria upazila, Mymensingh. The yield performance of those treatment on mukhikachu appeared to be promising. However, significantly the highest number of corm (25.70) and corm weight (498.0 g) as thus of yield (38.16 t ha⁻¹) were obtained from the treatment T₃ where 100 kg K with recommended fertilizers dose which was followed by T₂ (corm plant⁻¹ 24.90 and yield 31.74 t ha⁻¹) when it received recommended fertilizer dose plus 50 kg K ha⁻¹. From the study the highest gross return (Tk. 2289600 ha⁻¹) and gross margin (Tk. 2096600 ha⁻¹) were estimated from the same treatment T₃. The lowest gross return (Tk. 1524000 ha⁻¹) and gross margin (Tk. 1349103 ha⁻¹) were recorded from T₅ where lowest amount of

fertilizers were applied. The result principally concluded that potassium fertilizer is most effective and economical method of fertilizer application in mukhikachu and 161-100-40-23-6-2 kg NPKSZnB ha⁻¹ fertilizer are the promising level of K for excellent result in mukhikachu cultivation at Fulbaria, Mymensingh region.

Integrated nutrient management for the yield of sweet gourd

N. Sultana and M.M. Zaman

The present investigation was carried out at farmers' field, Gouripur upazila under Mymensingh district of Bangladesh. The experiment was conducted in randomized complete block design with six replications using the variety BARI Hybrid Mistikumra-2 with the treatments of soil test based fertilizer, reduced doses of chemical fertilizers (IPNS with cow dung), 25% increased NPK plus STB were tested in comparison with control (farmer's practice). On the basis of results, in combination with highest level of inorganic and organic fertilizer application to the crop found to be sound integrated practice. Where it recorded maximum number of fruits (4.0) and fruit weight (2.20 kg) and fruit circumference (62.33 cm) and yield per hectare (41.66 t ha⁻¹). According to the economic point of view, the treatment T₄ also recorded the highest gross return (Tk. 624900 ha⁻¹) and gross margin (Tk. 525954 ha⁻¹) where the total variable cost was (Tk. 98946 ha⁻¹). Although this treatment was used by farmer but considering the cost of fertilizer and soil status, the treatment with integrated nutrient management system (T₂) might be profitable and remunerative judicious for sweet gourd cultivation in Mymensingh region.

On farm trial of mungbean to biofertilizer

M.M. Bashir, M.S. Islam and N. Sultana

The experiment was conducted at the farmers' field of Char Wapda, Sadar, Noakhali during the late rabi season of 2023-24 to popularize the rhizobium biofertilizer technology for producing mungbean. The (T₁) recommended: 18-27-8-1 kg PKSZn ha⁻¹, (T₂) rhizobium inoculum (2 kg ha⁻¹) with recommended: 18-27-8-1 kg PKSZn ha⁻¹ and (T₃) recommended chemical fertilizer: 22-18-27-8-1 kg NPKSZn ha⁻¹ were comprised in Randomized Complete Block design with three replications. Number of nodules plant⁻¹, number of seeds pod⁻¹ and seed yield varied significantly due to the

treatment effect. The maximum seed yield (1.35 t ha⁻¹) was obtained from the treatment with rhizobium inoculum plus recommended PKSZn which was statistically identical to that of the treatment with nitrogenous fertilizer. Treatment without urea or rhizobium produced the lowest seed yield (1.14 t ha⁻¹). According to top gross margin (Tk. 74230 ha⁻¹), treatment T₂ found to be profitable for mungbean cultivation.

Effect of different fertilizer doses and application methods for potato production under zero till condition in coastal area

M.M. Islam, H.M.K. Bashar, M.S.I. Khan and N. Sultana

The experiment was conducted at MLT site Kalapara, Patuakhali during Rabi season of 2023-24 on cv. BARI Alu-72 in Randomized Complete Block design with three replication and six treatments. Two levels of fertilizers T₁ (recommended): 125-50-100-30-2-1.5 kg NPKSZnB ha⁻¹ and T₂ (STB): 120-40-80-20-2-1.5 kg NPKSZnB ha⁻¹ were applied in three application methods P₁: ring placement, P₂: side placement and P₃: broadcasting. Methods of fertilizer application showed significant variation on number of tuber plant⁻¹, weight of tuber per plant, and tuber yield per hectare. Interaction showed significant differences in all the characters studied. It was found that maximum number of tubers (5.99) plant⁻¹, weight of tuber per plant (525 g) and tuber yield hectare⁻¹ (21.89 tons) was recorded in plots, which received fertilizer through side placement. In case of interaction, best results were recorded in plots where fertilizer was applied at the rate of 125-50-100-30-2-1.5 kg N-P-K-S-Z-B ha⁻¹ through side placement. The result lead to the conclusion that "side placement" is the most effective and economical method of fertilizer application in potato and 125-50-100-30-2-1.5 kg N-P-K-S-Zn-B ha⁻¹ fertilizer are the promising level for excellent results in potato crop under the zero tillage conditions at Kalapara, Patuakhali.

Response of vermicompost on growth, yield and fruit quality of watermelon in coastal saline soil

M.M. Islam, H.M.K. Bashar, M.S.I. Khan and N. Sultana

An experiment was conducted at MLT site Kuakata, Patuakhali in Rabi season of 2023-24 to observe the effect of vermicompost dose on yield

and fruit quality of watermelon under farmers' field condition. The trial was conducted in Randomized Complete Block design with three replications and four treatments. The treatment combinations were T₁: 1.0 t Vermicompost ha⁻¹ + 150-50-125-40-5-4 kg NPKSZnB ha⁻¹, T₂: 2.0 t Vermicompost ha⁻¹ + 150-50-125-40-5-4 kg NPKSZnB ha⁻¹, T₃: 3.0 t Vermicompost ha⁻¹ + 150-50-125-40-5-4 kg NPKSZnB ha⁻¹ and T₄: Farmers practice 150-50-125-40-5-4 kg NPKSZnB ha⁻¹ (no vermicompost). The highest yield (32.19 t ha⁻¹) were obtained when 3 ton vermicompost were applied with inorganic fertilizer. Total Soluble Solids was recorded in the highest in in the same treatment. The lowest TSS was found in Farmers' practice where no vermicompost was used. The highest gross return (Tk. 515040 ha⁻¹), gross margin (Tk. 326140 ha⁻¹) and BCR (2.73) in 3 ton vermicompost with recommended inorganic fertilizer was found to be judicious for watermelon cultivation in coastal region.

Effect of boron on the growth and seed yield of sunflower in acidic soil of Sylhet region

M.I. Nazrul and N. Sultana

Basal application of boron plays an important role in the growth and yield of sunflowers. Sunflower productivity is mainly affected by balance fertilizer and water availability. This study was undertaken to determine the growth and yield response of sunflower (*Helianthus annuus L.*) under five different levels of boron T₁: 0.0 kg boron ha⁻¹, T₂: 1.0 kg boron ha⁻¹, T₃: 1.5 kg boron ha⁻¹, T₄: 2.0 kg boron ha⁻¹ and T₅: 2.5 kg boron ha⁻¹. The experiment was conducted at Hakaluki haor in robi season in a randomized complete block design with six dispersed replications. Results showed that boron application significantly influenced the yield and yield attributes, and highest level of boron (2.5 kg ha⁻¹) provided highest plant height (110.67cm), head diameter (20.83 cm), 1000 seed weight (79.63 g), seeds head⁻¹ (1053) and seed yield (1.83 t ha⁻¹) of sunflower. Higher gross return and gross margin was obtained from T₅ (2.5 kg ha⁻¹ of boron), followed by T₃ (1.5 kg ha⁻¹ of boron).

Effect of liming on the growth and seed yield of sunflower in acidic soil of Sylhet region

M. I. Nazrul and N. Sultana

A field experiment was conducted at Hakaluki haor under multi locational testing (MLT) site,

Moulvibazar during winter in two consecutive year 2023-24 to quantify the proper dose of lime for cultivation of BARI Surjomukhi-3. Six lime treatments viz. T₁: 0.0 t dolomite ha⁻¹, T₂: 0.5 t dolomite ha⁻¹, T₃: 1.0 t dolomite ha⁻¹, T₄: 1.5 t dolomite ha⁻¹, T₅: 2.0 t dolomite ha⁻¹, T₆: 2.5 t dolomite ha⁻¹ were applied in a trial. The study was designed in Randomized Complete Block Design with six dispersed replications. The different characters of sunflower viz. plant height (cm), stem diameter (cm), head diameter (cm), achenes head⁻¹, 1000 achenes wt. (g), and achenes yield (t ha⁻¹) were significantly increased by the application of lime. The application of lime 2.5 tha⁻¹ significantly increased most of the growth parameters of sunflower compared to that of other doses including control. The application of lime had a significant effect on the seed yield of sunflower. The highest seed yield was found in T₅ (1.78 t ha⁻¹), which was statistically identical with the seed yields obtained in T₆ and T₄ treatments but superior to those found in T₁, T₂, T₃ treatments. Thus, the application of lime 1.50 tha⁻¹ is enough for satisfactory yield of sunflower with higher economic profit.

Effect of fertilizer on turmeric at madhupur tract under AEZ-28

T. Tasmima, M.A. Rahaman, S. Roy, K. Roy, G. Paul and N. Sultana

A field experiment was conducted at MLT site, Madhupur (AEZ-28), Tangail during 2023-24 to find out an optimum fertilizer dose on turmeric in Madhupur tract. Six treatment combinations viz. T₁: STB T₂: T₁ + 20% extra NK, T₃: T₁ + 20% extra NKS, T₄: T₁ + 20% extra NKSZn, T₅: IPNS basis fertilizer with cow dung (5 t ha⁻¹), T₆: Farmers' practice. The experiment was laid out in randomized complete block design with three compact replications. The treatments showed significant differences in terms of yield and yield contributing characters. The highest fresh rhizome yield (20.17 t ha⁻¹) was recorded from IPNS basis fertilizer with 5 t ha⁻¹ cow dung i.e. (91-20-66-8-1.5-1.2 kg NPKSZnB ha⁻¹) treatment combination. The highest gross return (Tk. 605100 ha⁻¹) and gross margin (Tk. 428827 ha⁻¹) were recorded from IPNS treatment (T₅) which received 5 t cow dung ha⁻¹ i.e. 91-20-66-8-1.5-1.2 kg NPKSZnB ha⁻¹. The lowest gross return (Tk. 413700 ha⁻¹) and gross margin (Tk. 235658 ha⁻¹) were obtained from

farmers practice (T_6). The results indicated that the application of IPNS basis fertilizer with 5 t ha⁻¹ cow dung ie. 91-19.5-65.5-8-1.5 kg NPKSZn ha⁻¹ dose is the optimum fertilizer dose to produce maximum rhizome yield and higher economic return.

Integrated nutrient management for growth and yield of BARI Begun-12

U. K. Laily, M. Z. Ferdous, M. K. Islam, M. U. S. Khatun and M. A. H. Talukder

The field experiment was conducted during the Rabi season of 2023-2024 in On Farm Research Division (OFRD), Bangladesh Agricultural Research Institute (BARI), Rangpur to observe the effect of organic fertilizer on the growth and yield of BARI Begun-12. Five fertilizer doses viz. T_1 : Soil test based fertilizer dose (STB), T_2 : Recommended fertilizer dose (RFD), T_3 : STB + Vermicompost 3.0 t ha⁻¹ and T_4 : STB + Cow dung 10.0 t ha⁻¹ and T_5 : Control. Among the treatments, the highest number of fruits plant⁻¹ (9.60) and fruit yield (53.22 t ha⁻¹) were obtained from T_3 (STB + Vermicompost 3.0 t ha⁻¹) treatment. The lowest number of fruits plant⁻¹ (7.02) and fruit yield (37.10 t ha⁻¹) were obtained from T_5 (control) treatment. The highest gross return (Tk. 1064400 ha⁻¹) and gross margin (Tk. 670260 ha⁻¹) was also recorded from T_3 (STB + Vermicompost 3.0 t ha⁻¹) treatment. The lowest gross return (Tk. 742000 ha⁻¹) and margin (Tk. 352815 ha⁻¹) were recorded from T_5 treatment, respectively.

Effect of gypsum fertilizer on groundnut in charland

Most. Ummay Salma Khatun, Md. Zannatul Ferdous, Md. Khairul Islam, Ummay Kulsum Laily and Md. Al-Amin Hossain Talukder

A field trial was conducted in the farmer's field under stable Charland of Bongram, Chilmari, Kurigram during Rabi 2023-24 to identify the suitable dose of gypsum as a source of calcium and sulphur fertilizer under water deficit condition. Four gypsum fertilizer treatments (T_1 : Recommended dose (RDCF), T_2 : RDCF+25% of recommended gypsum, T_3 : RDCF+50% of recommended gypsum and T_4 : Farmer's practice) were tested in the farmer's field. The variety was BARI Chinabadam-8. Among the treatments, the T_3 (2.38 t ha⁻¹) gave the maximum pod yield and 2nd highest yield produced by T_2 (2.10 t ha⁻¹). The

T_1 gave minimum yield (1.56 t ha⁻¹). The maximum gross return (309400 Tk. ha⁻¹) and gross margin (140475 Tk. ha⁻¹) was also obtained from T_3 .

Effect of potassium fertilizer on groundnut in charland

Most. Ummay Salma Khatun, Md. Zannatul Ferdous, Md. Khairul Islam, Ummay Kulsum Laily and Md. Al-Amin Hossain Talukder

A field trial was conducted in the farmer's field under stable Charland of Bongram, Chilmari, Kurigram during Rabi 2023-24 to identify the suitable dose of potassium fertilizer under water deficit condition. Four potassium fertilizer treatments (T_1 : Recommended dose of MoP (RDCF), T_2 : RDCF+25% of recommended MoP, T_3 : RDCF+50% of recommended MoP and T_4 : Farmer's practice) were tested in the farmer's field. The variety was BARI Chinabadam-8. The potassium fertilizer was tested for yield and yield components like plant height, no. of pods plant⁻¹, weight of pods plant⁻¹, 100 kernels wt. and pod yield etc. Among the treatments, T_3 (2.39 t ha⁻¹) gave maximum pod yield and 2nd highest seed yield produced by T_2 (2.07 t ha⁻¹). T_1 gave minimum yield (1.57 t ha⁻¹). The maximum gross margin (Tk. 142165 ha⁻¹) was obtained from T_3 .

Effect of nutrient management on the productivity of mustard (canola) in north-west Bangladesh

M.S. Hossain, M.T. Hasan, M.S. Alam, M.E.A. Pramanik and M.R.A. Mollah

The area of Rapeseed-Mustard in Bangladesh is increasing rapidly due to development of high yielding varieties and higher price of edible oil. However, unbalanced fertilization is one of the main challenges that affects its seed yield. A field trial was carried out at three locations viz., BARInd land of Godagari under Rajshahi (AEZ-26), char land of Bogura Sadar (AEZ-3) and on-station of Rangpur (AEZ-3) under supervision of OFRD of Bangladesh Agricultural Research Institute during Rabi 2023-24 to find out an optimum and economic fertilizer dose for BARI Sarisha-18. The experiment consists of four nutrient packages for all sites viz., T_1 : Soil test-based fertilizer (STB) (FRG, 2018), T_2 : T_1 +25% NPKS, T_3 : T_1 +50% NPKS, T_4 : Farmers Practices (Average of 20 Farmers). The additional one treatment namely Khamari app based nutrient package was for Rangpur. The experiment was laid

out in a randomized complete block design with three replications. In Rajshahi, the T₃ (2.17 t ha⁻¹) produced the highest seed yield which was similar that of T₂ (1.87 t ha⁻¹). The T₃ also gave the maximum gross return (Tk. 151900 ha⁻¹), gross margin (Tk. 123742 ha⁻¹) and MBCR (2.88). In Bogura, the T₃ also showed the highest seed yield (2.07 t ha⁻¹), gross return (Tk 143610 ha⁻¹) and gross margin (Tk 94110 ha⁻¹). But the T₁ gave the highest seed yield (1.79 t ha⁻¹), gross return (Tk 124999 ha⁻¹), gross margin (Tk 76717 ha⁻¹) and MBCR (1.59).

Phosphorus management in conservation agriculture under lentil-black gram-maize system: crop yield and productivity

M.A. Islam, D. Sarkar, M.G. Azam, M. Maniruzzaman, M.Z. Hasan, M. A. Suborna, M.S.H. Molla and M.F. Hossain

Lentil-black gram-maize cropping system is an emerging maize-based system in the Eastern Indo-Gangetic Plains. However, with the conventional method of crop establishment, crop residue management and imbalance phosphorus (P) fertilization, the productivity of the Lentil-maize cropping system is low. Thus, an effort was undertaken to create and assess the effectiveness of conservation agricultural technologies and P management under a maize-based system in the area in terms of crop performance, crop yield and system productivity. Treatments included three types of tillage - conventional tillage (CT), no-tillage (NT) and strip planting (SP), two levels of residue retention - high residue (HR) and low residue retention (LR) and three levels of phosphorus (50 % of recommended dose of P (P1), 100 % of recommended dose of P (P2) and 150 % of recommended dose of P (P3)) were evaluated. Results showed that improvement of yield contributing characters led to improve yield of lentil, black gram and maize under SP by 11 % and 10 %, 4 % respectively, and NT increased black gram yield by 6 %, but decreased maize and lentil yield by 2-5 % as compared to CT. In the case of P levels, the higher dose of P (150 % of recommended P) improved the yield contributing characters, the yield of component crop increased. The maize equivalent black gram yield (MEBY) and maize equivalent lentil yield (MELY) in SP and NT were significantly higher (by 0.4-0.6 t/ha and 0.7-1 t/ha) than MEBY in CT. The MEBY and MELY in HR, and in P3 were higher as compared to LR, and P1 and P2 treatments. Finally, the maize

equivalent system yield (MESY) was significantly higher in SP was 8-9 % higher than CT and NT treatments, and the MESY in HR was 6 % higher than LR treatment, and the MESY of P3 was 4-8 % higher than that of P2 and P1 treatments. As a result, growing lentil-black gram-maize cropping system under SP and HR with P3 is recommended in EIGP due to its potential of improvement of crop yield and productivity.

Effect of nitrogen levels on crop productivity and profitability of different rice-based cropping systems

M.A. Islam, A.K. Chaki, M. Maniruzzaman, M.Z. Hasan, M. A. Suborna and M.S.H. Molla

The rice-based cropping system is the mainstay for the food security of Eastern Indo-Gangetic Plain in South Asia but the productivity and profitability of the system is under threat. We hypothesized that legume-dominated rice-based cropping with optimum levels of nitrogen fertilizer will increase the productivity and profitability of the system. Therefore, an on-station field experiment was conducted to assess crop productivity, nutrient use efficiency and economic return in diversified rice-based cropping systems at Agriculture Research Station, Pabna, Bangladesh in 2021-22 and 2022-23. Three cropping systems: wheat-pre-monsoon rice-monsoon rice - CBS, mustard- sesame - monsoon rice - OBS, lentil - mung bean-monsoon rice- LBS in main plots and four levels of nitrogenous fertilizer - 0 % N of recommended N dose (RND) - control (N0), 50 % of RND (N50), 100 % of RND (N100) and 150 % of RND (N150) in a split-plot design with three replications. In Year 1, the rice yield was not significantly different due to different cropping pattern. However, the legume-based pattern (LBS) resulted in increased and economic return of rice crops in Year 2. Thus, indicating that the legume crops before and after rice crops increased yield of rice crops. With increasing N rates increased crop yield, productivity and economic returns in CBS and OBS. Conversely, above N50 rates, the yield, productivity and economic return of LBS decreased. In case of the rice equivalent yield (REY) of Crop 2 and Crop 5, the yield in CBS along with N150 (6.8 and 6.5 t/ha) were higher while the lowest was recorded in OBS with N0 (0.8 and 1.4 t/ha). However, the REY of Crop 5 under CBS and LBS (4.6 t/ha) was at a similar level. The Crop 3 in both Year 1 and Year 2, the highest REY was recorded from LBS along with N50 (6.7 and 5.6 t/ha) while

the lowest REY recorded from OBS with N0 treatments (1.1 and 1.6 t/ha). Finally, the highest system REY was recorded from CBS along with N150 (15.6 t/ha) while the lowest REY recorded from OBS with N0 treatments (4.7 t/ha) in Year 1. Regarding N levels, the gross return and gross margin increased with increasing N amount up to 150 kg/ha while the production cost reduced with decreasing the N levels. The result suggests that the system REY of LBS N50 and CBS N150 were higher while OBS N0 had the lowest system REY (6.7 t/ha). The legume dominated system (LBS) and reducing N fertilizer by half increased profitability through increasing crop productivity and

Effect of different levels of sulphur on bolting and yield of onion

M.A. Islam, M. Maniruzzaman, M.Z. Hasan, M. A. Suborna, M.S.H. Molla and M.R. Alam

Onion has a high sulphur (S) need, which impacts bulb quality and productivity. However, it should be applied cautiously in the field since it has acidic effects and negatively impacts the plant. The present on-farm trial was conducted to study the effect of different levels of S [0 % (0 kg/ha) - S₀, 50 % (13.2 kg/ha) - S₅₀, 75 % (19.8 kg/ha) - S₇₅, 100 % (26.4 kg/ha) - S₁₀₀, 150 % (39.6 kg/ha) - S₁₅₀, 200 % (52.8 kg/ha) - S₂₀₀, 250 % (66 kg/ha) - S₂₅₀] application on the yield and bolting of onion. The plant height, bulb diameter, individual bulb weight, bulb yield and straw yield of onion were increased significantly with application of S levels up to 200 kg/ha and afterwards it started to decline. The tallest plant (56 cm), the highest horizontal (14.3-14.4 cm) and vertical bulb diameter (12.1-12.3 cm) and individual bulb weight (32.5-33.4 g) were observed in S150 and S200 treatments. The lowest bolting number (86389 - 93333) and bolting percentage (13-14 %) was obtained from S150 and S200. Application of S150 and S200 also resulted in the highest bulb yield

Integrated nutrient management for cabbage under agroforestry system

M. Maniruzzaman, M. S. H. Molla, M. A. Isalm, M. Z. Hasan, M. A. Suborna and M. R. Alam

An experiment was carried out at the FSRD site, Ganggarampur, Pabna during the *Rabi* season of 2023-24 to evaluate the performance of different nutrient management options in mango-based agroforestry system. Four nutrient management

practices viz. recommended dose (FRG-18), IPNS with 5 t ha⁻¹ cow dung and IPNS with 3 t ha⁻¹ vermicompost along with farmers practice were evaluated in this study. The IPNS with 5 t ha⁻¹ cow dung and IPNS with 3 t ha⁻¹ vermicompost exhibited significantly higher card yield which were 21% and 18% higher than recommended dose, respectively. Regarding economic return higher gross margin (Tk. 431340 ha⁻¹) was also attained from IPNS + 5 t ha⁻¹ cow dung.

Development of fertilizer recommendation for foxtail millet at charland of Bogura

Md. Rahmat Ali Mollah, Md. Sahidul Alam and Md. Tanbir Hasan

The experiment was conducted in the farmer's field of Gozaria char, Sariakandi, Bogura during Rabi, 2023-2024 to develop a suitable fertilizer dose for foxtail millet. The treatments were T₁: recommended dose of FRG'2018 (28-20-37-10-0.5-0.5 kgha⁻¹ of NPKSZnB), T₂: T₁ + 25% NPKSZn, T₃: T₁ + 50% NK, T₄: T₁ + 1kg B ha⁻¹ and T₅: Farmers practice (46-15-20-14-1.5-1.3 kgha⁻¹ of NPKSZnB (Average of 20 farmers). According to the treatment specifications, the STB and other doses were estimated. Treatments were assigned randomly, and fertilizer doses were applied accordingly following RCB design. The maximum seed yield (2.18 tha⁻¹) was recorded from T₄ treatment that was statistically similar to T₅ and the minimum one (1.92 t ha⁻¹) from T₁ treatment. The highest gross return (Tk. 152600 ha⁻¹) was amounted from T₄ treatment against the cultivation cost of Tk. 35265 ha⁻¹ that together led to the higher gross margin (Tk. 117335 ha⁻¹). Lower gross return (Tk. 134400ha⁻¹) as well as gross margin (Tk. 99505 ha⁻¹) was obtained from the T₁ treatment.

Integrated nutrient management for pointed gourd

Md. Rahmat Ali Mollah, Md. Sahidul Alam and Md. Tanbir Hasan

The experiment was conducted in the farmer's field of Chack Shudo, Gabtoli, Bogura during Rabi, 2022-2023 to find out a suitable combination of organic and inorganic fertilizers dose and to increase maximum yield for pointed gourd. The treatments were T₁: recommended dose of FRG'2018, T₂: IPNS with CD 5 tha⁻¹, T₃: IPNS with VC 2 tha⁻¹, and T₄: Farmers practice (50-45-75-15-1.57-1.28 kgha⁻¹ of NPKSZnB (Average of 20 farmers). According to the treatment specifications, the STB and other doses were estimated. The treatments were

assigned randomly, and fertilizer doses were applied accordingly following RCB design. Maximum fruit yield (14.76 t ha^{-1}) was recorded from T_2 treatment that was statistically similar to all other treatment and the minimum (11.43 t ha^{-1}) from T_4 treatment (Farmers practice). The highest gross return (Tk. 221400 ha^{-1}) was amounted from T_2 treatment against the cultivation cost of Tk. 52500 ha^{-1} that together led to the higher gross margin (Tk. 168900 ha^{-1}). Lower gross return (Tk. 171450 ha^{-1}) as well as gross margin (Tk. 120850 ha^{-1}) was obtained from the T_4 treatment (Farmers practice).

Project: Improvement of Cropping Systems

Cropping patterns

Development of lentil-millet-t. Aman rice cropping pattern against lentil-fallow-t. Aman rice in BARInd area

M. S. Hossain and J. C. Barman

The experiment was made at farmers' field of FSRD site, Basantapur, Rajshahi during 2021-22 and 2022-23 to study productivity and economic return of some cropping patterns in High BARInd Tract. There were three cropping patterns in the study i.e., two improved cropping patterns over existing Lentil-Fallow-T. Aman rice. The improved cropping patterns were Lentil-Proso millet-T. Aman rice and Lentil-Foxtail millet-T. Aman rice. The experiment was conducted with randomized complete block design with three dispersed replications. The maximum rice equivalent yield was obtained from Lentil-Proso millet-T. Aman rice pattern (11.19 t ha^{-1}). However, Lentil-Proso millet-T. Aman rice cropping pattern resulted in higher variable cost; nevertheless, it gave the highest values gross return, gross margin and marginal benefit-cost ratio. This cropping pattern gave on an average 24.6% higher system rice equivalent yield (REY) compared to the existing Lentil-Fallow-T. Aman rice pattern.

Development of improved cropping pattern mustard-sesame-b. Aman rice in Cumilla

M. Jamal Uddin

A field experiment was conducted at the farmers' field of Kesobpur, Titas, Cumilla under AEZ 19 during (2022-23) in order to fit sesame in the

existing cropping pattern for increasing cropping intensity and farmer's income. Two treatments i.e., T_1 : Existing cropping pattern i.e Mustard (Tori-7) - Fallow-B. Aman (Local) and T_2 : Alternate cropping pattern i.e Mustard (BARI Sarisha-18)- Sesame (BARI Til-4)- B. Aman (BRRI dhan-91) was experimented. Findings revealed that Rice Equivalent Yield (REY) in improved cropping pattern is 10.338 t ha^{-1} , which is higher over existing pattern (3.194 t ha^{-1}) due to cultivate additional crop in fallow period. Higher gross return (Tk. 258450 ha^{-1}) and gross margin (Tk. 129560 ha^{-1}) as well as higher MBCR (2.65) was found in improved cropping pattern over existing one. This might be happened due to additional yield of sesame and higher yield of modern variety BARI Sarisha-18 and BRRI dhan91.

Development of improved cropping pattern potato-mungbean-t. Aus-yard long bean against potato-yard long bean-t. Aus-t. Aman rice

M. Jamal Uddin

A field experiment was conducted at the farmers' field of Gobindapur, Chandina, Cumilla under AEZ-19 with the following rice based cropping pattern during 2022-23 to fit Mungbean in the existing cropping pattern for increasing cropping intensity. Two treatments i.e., T_1 : Existing cropping pattern (Potato-Yard long bean-T. Aus-T. Aman) and T_2 : Improved cropping pattern (Potato-Mungbean-T. Aus-Yard long bean) was studied. Research findings revealed that Rice equivalent yield (REY) in improved cropping pattern was obtained 53.982 t ha^{-1} , which is almost double over existing pattern (27.036 t ha^{-1}). Higher gross return was found to be at Tk. 1619460 ha^{-1} and gross margin at Tk. 1270334 ha^{-1} . The MBCR was found to be 4.97 in improved cropping pattern implies that the improved cropping pattern over existing one is economically viable.

Development of improved cropping pattern mustard -t. aus - t. Aman against mustard-fallow-t. Aman

M. Jamal Uddin

A field experiment was conducted at the farmers' field of Usufpur, Debidwar in Cumilla under AEZ-19 with the following rice based cropping pattern during 2022-23 to utilize fallow land between two crops in the existing cropping pattern for increasing cropping intensity. Two treatments i.e., T_1 : Existing

cropping pattern (Mustard-Fallow-T.Aman) and T₂: Improved cropping pattern (Mustard-T.Aus-T.Aman) was studied. Research findings revealed that Rice equivalent yield (REY) in improved cropping pattern was obtained 5.14 t ha⁻¹, which is more than double over existing pattern (2.48 t ha⁻¹). Higher gross return was found to be at Tk. ha⁻¹) and gross margin at Tk. 179900ha⁻¹. The MBCR was found to be 42.51 in improved cropping pattern implies that the improved cropping pattern over existing one is economically viable.

Development of potato-jute leaf-cucumber-t. Aman cropping pattern against existing maize-fallow-t. Aman cropping pattern

M.Mohiuddin and M.Y.H. Rayhan

An experiment was executed at the MLT site Hossainpur during 2021-2022 and 2022-23 under AEZ # 9 increase cropping intensity, yields and economic return. It was laid out in RCB design with six dispersed replications. The results revealed that the mean rice equivalent yield of improved cropping pattern was 51.38 t/ha which was 231% higher than that of existing cropping pattern (15.54 t/ha). The improved cropping pattern gave higher gross margin (471267 Tk/ha) compared to existing pattern (139914 Tk/ha). Land use efficiency (76%) of improved cropping pattern was 15% higher than that of existing cropping pattern. Therefore, farmers in Kishoreganj could follow improved cropping pattern for higher crop productivity and profitability where lands remain fallow before transplanting of Aman rice.

Improvement of sweet gourd-kenaf-fallow cropping pattern against existing cropping pattern in haor areas of Kishoreganj

M. Mohiuddin

The experiment was conducted in Old Meghna Estuarine Floodplain Soils under the Agro-Ecological Zone (AEZ) 19 at Nunir haor and Pata chapra haor under the Multi-location Testing Site, Nikli, Kishoreganj, for 2021-22 and 2022-23 with a view to increase crop productivity and economic return. Two crops pattern Sweet gourd-Kenaf-Fallow was tested at on-farm condition over the existing single crop pattern only boro rice after flood water receded. Results showed that the highest rice equivalent yield (13.19 t ha⁻¹) was obtained from improved pattern. The highest - average gross return and gross margin of the two

crops pattern were obtained Tk. 292756 and Tk. 136006 ha⁻¹ which were 73 and 67% higher over farmers' pattern. The marginal benefit cost ratio (MBCR) was found 2.47 which indicated the superiority of two crops pattern over the farmers' existing pattern.

Development of potato-groundnut-fallow cropping pattern against existing fallow-boro rice-fallow

M.Mohiuddin and M.Y.H. Rayhan

An experiment was executed at the MLT site, Nikli during 2023-2024 to introduce two crops based Potato-Groundnut-Fallow cropping patterns as well as to increase crop production and economic return of the farmers. It was laid out in RCB design with four dispersed replications. The improved cropping pattern gave the highest yield (47 t ha⁻¹) against existing cropping pattern (7.57 t ha⁻¹). The improved cropping pattern gave the higher gross margin (357193Tk/ha) compared to existing pattern (87722Tk/ha). The MBCR (2.68) indicates the superiority of the improved two crop based cropping pattern over the farmer's one crops based cropping pattern.

Development of potato-jute-t. Aman cropping pattern against wheat-jute-t. Aman cropping pattern

M.Mohiuddin and M.Y.H. Rayhan

An experiment was executed at the MLT site, Hossainpur during 2021-2022 and 2022-23 under AEZ # 9 to improve the existing cropping pattern, increase cropping intensity, yields and economic return through incorporating of modern crop varieties and improved management practices. It was laid out in RCB design with six dispersed replications. The results revealed that the mean rice equivalent yield of improved cropping pattern was 33.83 t/ha which was 62% higher than that of existing cropping pattern (16.60 t/ha). The improved cropping pattern gave the higher gross margin (289095 Tk/ha) compared to existing pattern (87170 Tk/ha). Production efficiency (116.84%) of improved cropping pattern was 118% higher than that of existing cropping pattern. The average gross return (Tk. 806365 ha⁻¹) was recorded in improved cropping pattern which was 110% higher than that of existing pattern (383920). Therefore, farmers in the study area could follow

improved cropping pattern for higher crop productivity and profitability.

Development of sweet potato-kenaf-fallow cropping pattern against fallow-boro-fallow cropping pattern in haor area

M.Mohiuddin and M.Y.H. Rayhan

An experiment was executed at the MLT site, Nikli during 2022-2023 to introduce two crops based Sweet Potato-Kenaf-Fallow cropping patterns as well as to increase crop production and economic return of the farmers. It was laid out in RCBD design with six dispersed replications. The improved cropping pattern gave the highest rice equivalent yield (20.27 t/ha) against existing cropping pattern (7.5t/ha). The improved cropping pattern gave the higher gross margin (335403Tk/ha) compared to existing pattern (104390Tk/ha). The marginal benefit cost ratio was recorded 2.82 in improved cropping pattern over existing cropping pattern.

Development of t. Aman–mustard-boro cropping pattern against t. Aman-fallow-boro cropping pattern

M.Mohiuddin and M.Y.H. Rayhan

An experiment was executed at the MLT site, Nikli during 2023-2024 to introduce three crops based T. aman-Mustard-Boro cropping patterns as well as to increase crop production and economic return of the farmers. It was laid out in RCBD design with four dispersed replications. The total rice equivalent yield was (16.98 t/ha) in improved cropping pattern which was (3.68 t/ha) higher than the existing (13.3 t/ha) two crop based cropping pattern. Lower rice equivalent yield (13.3 t/ha) was obtained in the farmer's pattern due to fallow period and traditional management practices.). The MBCR (4.20) indicates the superiority of the improved three crop based cropping pattern over the farmer's two crops based cropping pattern.

Development of vegetable based cropping pattern using summer tomato trellis against blackgram-mustard-sesame

M. Maniruzzaman, M. Z. Hasan, M. A. Isalm, and M. S. H. Molla

The program was carried out at the farmers' field during 2023-24 at MLT site, Atghoria, Pabna to increase total system productivity and to ensure maximum utilization of summer tomato trellis. The

program was implemented in four farmer's fields with two summer tomato based cropping patterns i.e. i) summer tomato-sweet gourd/yard long bean, ii) summer tomato-bitter gourd/sponge gourd along with farmer's existing black gram-mustard-sesame cropping pattern. The system summer tomato equivalent yield (STEY) were recorded as 59.0 and 52.9 t ha⁻¹, respectively from summer tomato-sweet gourd/yard long bean and summer tomato-bitter gourd/sponge gourd cropping patterns whereas STEY 8.62 t ha⁻¹ were recorded from the existing cropping pattern. The gross margin, production efficiency and land use efficiency were higher in summer tomato based cropping patterns than existing pattern.

Improvement of t. Aman rice-mustard-sesame cropping pattern

M. Maniruzzaman, M. Z. Hasan, M. A. Isalm, and M. S. H. Molla

The program was carried out at the farmers' field during 2023-24 to improve T. Aman-Mustard-Sesame rice cropping pattern at MLT site, Atghoria, Pabna. The program was implemented in six farmer's field. Yield of T. aman, Mustard and Sesame rice were recorded as 4.98, 1.85 and 1.52 t ha⁻¹, respectively with rice equivalent yield (REY) 14.2 t ha⁻¹ in the improved cropping pattern whereas REY 12.2 t ha⁻¹ were recorded in the existing cropping pattern. The gross margin was higher in improved cropping pattern than existing pattern due to inclusion of modern high yielding varieties.

Pilot production program of oil seed based cropping pattern mustard-jute-t. Aman rice

Md. Zannatul Ferdous, Md. Eakramul Haque, Md. Akhter-Ul-Alam and Md. Al-Amin Hossain Talukder

The field experiment was conducted during 2023-24 to increase the cropping intensity and productivity by incorporation of oilseed crop in cropping patterns against the existing two crop-based cropping pattern. The developed cropping pattern (Mustard-Jute-T. Aman) were tested against existing cropping pattern (T. Aman rice-Grass pea) in the farmers field under stable charland of Chilmari, Kurigram. Fibre or grain or seed yield of jute, T. Aman, and mustard pea were recorded as 2.87, 4.87 and 1.88t ha⁻¹, respectively with rice equivalent yield (REY) 16.58 t ha⁻¹ in the improved

cropping pattern; whereas 4.49 and 2.62 t ha⁻¹ grain or seed yield of T. Aman and grass pea with REY 7.23 t ha⁻¹ were recorded in the existing cropping pattern. Production efficiency was 53.31 and 30.77 Kg ha⁻¹day⁻¹, and land use efficiency was 85.21 and 53.31 in alternate and existing cropping pattern, respectively. The whole pattern gross margin was higher in improved pattern (Tk. 294460 ha⁻¹) than existing pattern (Tk. 90420 ha⁻¹). The MBCR was 2.49 in alternate pattern over existing pattern.

Pilot production program of oil seed based cropping pattern potato-groundnut-t. Aman rice

Md. Zannatul Ferdous, Md. Eakramul Haque, Md. Akhter-UI-Alam and Md. Al-Amin Hossain Talukder

A set of alternate cropping pattern (ACP) were tested against farmers existing cropping pattern (FCP) at char jagotber, Rajpur, Lalmonirhat, under OFRD, Rangpur during 2023-24 to incorporate oilseed crop in cropping pattern and disseminate among the farmers in respective locations. Alternate cropping pattern consists of groundnut, potato and T. Aman crops was compared with three crop-based farmers' existing cropping pattern Maize-T.Aman-Tobacco. In all the replication, ACPs were more profitable and viable than those of FCPs in terms of agronomic and economic point of view. Rice equivalent yield (REY), crop productivity and profitability were higher in ACPs than FCPs. Inclusion of oilseed crops in the existing cropping pattern and replacing old and traditional varieties by modern varieties enhanced productivity and profitability.

Verification of yield gap minimization in potato – maize - t. Aman rice cropping pattern through recommended management system

S.M.A.H.M. Kamal, M.U.S. Khatun and M.A.H. Talukder

A study was meticulously conducted at the Lalmonirhat MLT site, Rangpur, under AEZ-3, to meticulously assess the yield gap between the research and farmers' management of the Potato-Maize-T. Aman Rice cropping pattern. The total pattern potato equivalent yield for farmer management (T₂) and research management (T₁) were robustly recorded at 80.57 t ha⁻¹ and 74.30 t ha⁻¹, respectively. The gross margin of total pattern was firmly established at Tk. 620672 ha⁻¹ and Tk. 547853 ha⁻¹ for T₂ and T₁ treatment, respectively.

The cropping pattern base BCR of T₂ treatment was notably higher at 2.80, surpassing the 2.59 recorded for T₁ treatment. The total variable cost of the farmer's management was determined to be 344624 Tk. ha⁻¹. The total variable cost for research management was decisively determined to be 343747 Tk. ha⁻¹. However, despite the higher production cost, T₂ treatment yielded a solid 6.20 t ha⁻¹ more and boasted a higher gross margin of 72823 Tk. ha⁻¹ compared to T₁ treatment.

Validation of fertilizer dose for potato-maize-t. Aman rice cropping pattern in rangpur

S. M. A. H. M. Kamal, Ummay Kulsum Laily and M. A. H. Talukder

An on-farm trial was meticulously conducted at the Lalmonirhat MLT site in Rangpur under AEZ#3 to pinpoint the optimal fertilizer dose for the Potato-Maize-T. Aman rice cropping pattern. Impressively, the highest potato equivalent yield of 58.40 t/ha was achieved from T₂, which is identical to T₃ and T₄. T₁ and T₅ yielded the lowest at 54.08 t/ha and 53.10 t/ha, respectively. Furthermore, the results show that T₂ produced the highest gross return (GR), while T₃ stood out with the highest gross margin (GM) and Benefit-Cost Ratio (BCR) of 2.19, attributed to the use of soil test-based fertilizers. From the above results, there is sound evidence to recommend the soil test-based (STB) fertilizer dose (T₃) as the optimal choice for this cropping pattern. It is evident that this approach will not only optimize yields but also ensure the long-term health of the soil.

Development of potato + maize (as intercrop) - jute - t. Aman ricecropping pattern against potato + cucumber -t. Aman cropping pattern

M. A. Rahaman, S. Roy, T. Tasmima, K. Roy and G. Paul

A field experiment was conducted at the MLT site Modhupur, Tangail during 2022-23 under AEZ #9 to improve the productivity of existing cropping pattern by introducing new crops and crop varieties as well as higher yield and economic return of the farmers. It was laid out in RCB design with six dispersed replications. Improved cropping pattern Potato+ Maize- Jute-T. Aman was tested against the existing pattern Potato+ Cucumber-T. Aman. The improve cropping pattern gave the higher gross margin (516565 Tk ha⁻¹) compared to existing pattern (361080 Tk ha⁻¹).

Development of mustard-sesame-t. Aman cropping pattern against boro-fallow-t. Aman in active brahmaputra jamuna floodplain of gaibandha

Md. Jahangir Alam, Md. Shohel Rana and Abdullah Al Mahmud

The experiment was conducted at Kamolpur, Saghata, Gaibandha during 2022-23 to increase the cropping intensity and productivity in rice-based cropping patterns. The system productivity based on rice equivalent yield (REY) in the alternate cropping pattern was 13.93 t ha⁻¹, which was 28% higher than that of the existing cropping pattern (10.89 t ha⁻¹). The gross return from the alternate cropping pattern was Tk. 348180 ha⁻¹, 28% more compared to the existing cropping pattern with a value of Tk. 272200 ha⁻¹. Similarly, the higher gross margin was recorded from the alternate cropping pattern (Tk. 95080 ha⁻¹) or 30% higher than the existing cropping pattern (Tk. 72900 ha⁻¹). Finally, the marginal benefit-cost ratio (MBCR) of the whole cropping pattern was 1.41 over the existing cropping pattern. Replacement of Boro rice, as well as the inclusion of oilseed crops (sesame and mustard) in the existing cropping system using modern improved varieties, has resulted in increased productivity and profitability.

Improvement of mustard-boro-t. Aman cropping pattern in kushtia

J. A. Mahmud, M. M. Morshed, M. M. Hossain

An experiment was conducted at Kushtia sadar upazila during 2023-2024 to improved Mustard-Boro-T.aman cropping pattern with improved varieties. The improved cropping pattern provided 43% higher system rice equivalent yield over existing pattern. Gross return and gross margin (Tk. 489150 ha⁻¹ and Tk. 265375 ha⁻¹ respectively) were higher in proposed pattern than existing cropping pattern. The marginal benefit cost ratio 1.45 of improved pattern was also satisfactory over farmer's practice.

Development of alternate cropping pattern sunflower – t. Aus - t. Aman against farmers existing pattern relay grasspea– fallow - t. Aman

M. M Islam, H M K Bashir and M S I Khan

The experiment was conducted at MLT site, Kuakata, Kalapara, Patuakhali during the year of 2023-24 to determine the profitability of Sunflower (BARI Surjomukhi-2)- T. Aus Rice

(BRRRI dhan48) - T. Aman Rice (BRRRI dhan49) cropping pattern against the farmers' existing Grasspea (BARI Khessari-3) - Fallow - T. Aman Rice (Sarnogota) pattern. Total grain yield in terms of REY of improve cropping pattern was 14.09 t/ha which was 68% higher than that of existing cropping pattern (8.39 t/ha). The highest gross return (Tk. 324280/ha), gross margin (Tk. 151330/ha) and satisfactory MBCR (2.49) were obtained from improve cropping pattern over existing pattern.

Development of alternate cropping pattern vegetable-vegetable-t. Aman rice against vegetable- fallow - t. Aman

M M Alam, M Ahmad and M H Rahman

The experiment was conducted at OFRD, BARI, Shibpur, Narsingdi during the year of 2020-2021, 2021-2022 and 2022-2023 to improve the existing cropping pattern by inclusion of vegetable and to increase crop yield and farmers' income. The experiment was laid out in 3600 m² of land under 6 farmers. Alternate cropping pattern Potato (BARI Alu-40) – Ladies finger (BARI Derosh-2) - T. Aman (BRRRI dhan72) gave higher whole pattern gross margin (Tk. 473499 ha⁻¹) against the existing pattern Cabbage (Atlas 70) – Fallow - T. Aman (BRRRI dhan49) ((Tk. 230620 ha⁻¹).

Development of alternate cropping pattern vegetable-jute-t. Aman rice against wheat- jute - t. Aman rice

M M Alam, M Ahmad and M H Rahman

The experiment was conducted at OFRD, BARI, Shibpur, Narsingdi during the year of 2021-2022 and 2022-2023 to improve the existing cropping pattern by inclusion of vegetable and to increase crop yield and farmer's income. The experiment was laid out in 4800 m² of land under 6 farmers. Alternate cropping pattern Potato (BARI Alu-40) - Jute (Deshi Pat-5) - T. Aman (BRRRI dhan71) gave higher whole pattern gross margin (Tk.596074 ha⁻¹) against the existing pattern Wheat (BARI Gam-21) - Jute (CVL-1) - T.Aman (BRRRI dhan87) ((Tk. 173196 ha⁻¹).

Improvement of existing cropping pattern fallow- fallow-t. Aman rice through inclusion of groundnut and rice in cox'sbazar region

M. Ahmed and M.S. Bhuiyan

The study was conducted at the farmer's field in Cox'sbazar during the year of 2023-2024 to

determine the productivity and profitability of cropping patterns viz. improved pattern (IP): Groundnut (BARI China Badam-9) -Fallow -T. Aman (BRRI dhan-49) by introducing high yielding varieties of Groundnut and rice in existing pattern (EP): Fallow- Fallow -T. Aman rice (Horidhan). Results showed that the improved pattern with improved management practices provided better yield and economic return than existing pattern. The higher mean gross margin (Tk. 196750 ha⁻¹) with marginal benefit cost ratio (5.21) was obtained over existing pattern.

Development of four crops based cropping pattern mustard-mungbean-t. Aus-t. Aman against mustard-d. Aman rice cropping pattern in bhola

G N Hasan, R H Anik and M Islam

The On-farm trial was conducted at MLT site Daulatkhan and Bhola sadar under AEZ-18 during 2023-2024 to increase cropping intensity and productivity through a four crop-based cropping pattern instead of farmer's existing practice of Mustard-D. Aus-T. Aman. The four crop-based cropping pattern was Mustard- Mungbean-T. Aus-T. Aman and variety of each crop were BARI Sarisha-14, BARI Mung-8, BRRI dhan82 and BRRI dhan72/87 respectively. It was observed that four crop patterns produced the highest rice equivalent yield (REY) (18.25 t ha⁻¹) than farmer's practice (12.23 t ha⁻¹) in Bhola district. Cost-benefit analysis showed that the four-crop pattern gave the highest gross return in both locations. The marginal benefit-cost ratio of the four crop patterns over the existing pattern was 3.53 which indicates four crops are a profitable venture.

Development of four crops based cropping pattern potato-mungbean-t. Aush- t. Aman against potato- d. Aman rice cropping pattern in bhola

G N Hasan, R H Anik and M Islam

The study was performed at MLT side Daulatkhan and Bhola sadar under Bhola district during 2023-24 cropping season. The experimental design was RCB with four dispersed replications In Alternate pattern, the yield of T. Aus, T. Aman, Potato and Mungbean rice was 4.17, 4.58, 20.79 and 1.19 t ha⁻¹ respectively where as in existing pattern, the yield of D. Aus, T. Aman and Potato was 3.53, 4.32 and 18.13 t ha⁻¹ respectively. The Alternate cropping

pattern gave higher Rice Equivalent Yield (30.09 t ha⁻¹) while existing one recorded 21.98 t ha⁻¹. The whole system Rice Equivalent Yield was 31 % higher in alternate pattern due to addition of high yielding improved varieties. The MBCR was calculated 4.82 indicating that alternate cropping pattern could produce more returns than the existing farmers, pattern

Development of onion-based cropping patterns against onion - jute- t aman rice cropping pattern

M. N. A Siddique, M. J. Islam, M. M. I. Chowdhury

The experiment was conducted at the experimental field of on-farm research division, Shyampur, Rajshahi during 2021-22 and 2022-23 to study productivity, production efficiency, land use efficiency and economics of onion based alternate cropping patterns (AP1: Onion (Leaf+Bulb)-Onion (Bulb)-T. Aus rice-T. Aman rice, AP2: Potato (Early harvest)-Onion (Bulb)- Jute- T. Aman, and AP3: Mustard- Onion (Bulb)-T. Aus rice-T. Aman rice) over the existing Onion (Bulb)-Jute- T Aman rice cropping pattern in High Ganges River Floodplain (AEZ 11). The experiment was conducted with randomized complete block design with three replications. The higher rice equivalent yield (55.41 t ha⁻¹) and (87.36 t ha⁻¹) was recorded from AP1: Onion (leaf+ bulb)-Onion (bulb)- T. Aus- T Aman over the existing cropping pattern EP: Onion-Jute-T Aman (26.37 t ha⁻¹) and (34.12 t ha⁻¹) in 2021-22 and 2022-23 respectively. The AP1 had a maximum gross return (Tk. 1697170ha⁻¹) and (Tk. 2654020 ha⁻¹) which also contributed to higher net return (Tk. 1020333 ha⁻¹) and (Tk. 1964746 ha⁻¹) and BCR (2.52) and (3.85) than EP in 2021-22 and in 2022-23 respectively.

Improvement of cropping patterns with summer vegetables and t. Aus rice

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

The experiment was conducted at the experimental field of on-farm research division, Shyampur Rajshahi during 2021-22 and 2022-23 to study the performance of alternate cropping patterns: AP1= Potato-Sweet gourd (Relay)-T. Aus rice-T. Aman rice and AP2= Potato-Stem amaranth- T. Aus- T. Aman against existing cropping pattern: EP= Potato-Boro-T. Aman rice. The experiment was

conducted with a RCB design with three replications. A higher rice equivalent yield (39.1 and 48.2 t ha⁻¹) was recorded from AP2 and Production efficiency (PE) was observed to be highest in AP2 (126.1 and 147.4 kg⁻¹ ha⁻¹ day⁻¹). The higher Land Use Efficiency (LUE (94% and 95.3%) was recorded in AP1. The AP2 had a maximum gross return (Tk. 1202900 and 1446950 ha⁻¹) and higher net return (Tk. 654694 and 840247 ha⁻¹) and BCR (2.19 and 2.38).

Development of alternate cropping pattern mustard-proso millet (cheena)-t. Aus-t. Aman against existing mustard-maize-t. Aman rice

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

A comparative field trial was conducted at the farmer's field at Paba, Rajshahi, to study the comparative agronomic performance and economic return of four crops based on cropping patterns. The cropping patterns were as follows: AP = Mustard (BARI Sarisha-14)-Proso Millet (BARI China-1)-Maize (Premier 559)-Transplanted Aman Rice (Binadhan-17) and EP = Mustard (BARI Sarisha-14)-Maize (Premier 559)-Transplanted Aman Rice (Biadhan-17). The results showed that the higher rice equivalent yield (REY) of 16.09 t ha⁻¹ was obtained from the cropping pattern AP than EP, and it was 13.28. The higher gross return (Tk. 482700 ha⁻¹), Total variable cost (Tk. 275638 ha⁻¹), gross margin (Tk. 207062 ha⁻¹), and BCR (1.75) were obtained in AP. In EP, the gross return (Tk. 398400 ha⁻¹), total variable cost (Tk. 238138 ha⁻¹), gross margin (Tk. 160262 ha⁻¹), and BCR (1.67) were recorded.

Development of alternative cropping pattern mustard (sarisha-17)- boro- t. Aman rice against fallow- boro- t. Aman cropping pattern in rajshahi region

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

A field trial was conducted at the farmers' fields of Karomja, Paba and Mypara, Puthia, Rajshahi during 2022–2023 to develop the Mustard-Boro-T. Aman rice cropping pattern. There were two treatments, i.e., T₁: Existing Cropping Pattern: Fallow-Boro (Jirasail)-T. Aman (Swarna) and T₂: Alternate Cropping Pattern: Mustard (BARI Sarisha-17)-Boro (BINadhan-17)-T. Aman (BRRI dhan51/BRRI dhan87). In the alternate cropping

pattern of Paba and Puthia, rice equivalent yield was higher (16.18 t ha⁻¹) and (16.39 t ha⁻¹) than the existing cropping pattern (11.85 t ha⁻¹) and (12.21 t ha⁻¹) respectively. Total gross return of the improved cropping pattern also higher in Paba and Puthia were (Tk. 515910 ha⁻¹ and Tk. 527970 ha⁻¹) whereas gross margin (Tk. 286210 ha⁻¹ and Tk. 237113 ha⁻¹) respectively over existing cropping pattern and MBCR was 2.04, and 1.52

Development of alternative cropping pattern mustard- boro-t. Aman rice against fallow-boro- t. Aman cropping pattern in rajshahi region

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

A field trial was conducted at the farmers' field of Juranpur, Tanore and Mypara, Puthia, Rajshahi during 2022-2023 to develop Mustard- Boro- T. Aman rice cropping pattern. There were two treatments i.e., T₁: Existing Cropping pattern: Fallow- Boro (Jirasail)-T. Aman (Swarna) and T₂: Alternate Cropping pattern: Mustard (BARI Sarisha-14)- Boro (BINadhan17/ BRRI dhan81)-T. Aman (BRRI dhan51/ BINadhan17). In Paba, alternate cropping pattern gave higher rice equivalent yield (15.32 t ha⁻¹) against existing cropping pattern (11.70 t ha⁻¹). Total gross return and gross margin of improved cropping pattern were Tk. 496780 ha⁻¹ and Tk.267455 ha⁻¹ whereas in existing cropping pattern those were Tk. 387830 ha⁻¹ and Tk. 220010 ha⁻¹, respectively and MBCR was 1.78. On the other hand, in Puthia, Alternate cropping pattern gave higher rice equivalent yield (15.13 t ha⁻¹) against existing cropping pattern (11.87 t ha⁻¹). Total gross return and gross margin of improved cropping pattern were Tk. 489400 ha⁻¹ and Tk.198798 ha⁻¹ whereas in existing cropping pattern those were Tk. 392810 ha⁻¹ and Tk. 181490 ha⁻¹, respectively and MBCR was 1.22 due to introduction of new crops and varieties.

Development of alternative cropping pattern mustard- boro- t. Aman rice against fallow-boro- t. Aman cropping pattern in rajshahi region

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

A field trial was conducted at the farmers' field of Chanduria, Tanore, Rajshahi during 2020-2023 to develop Mustard- Boro- T. Aman rice cropping

pattern. There were two treatments i.e, T₁: Existing Cropping pattern: Fallow- Boro (BRRI dhan28)-T. Aman (Swarna) and T₂: Alternate Cropping pattern: Mustard (BARI Sarisha-18)- Boro (BRRI dhan81)-T. Aman (BRRI dhan87). Alternate cropping patterns gave higher rice equivalent yields (17.07, 15.32 and 16.3 t ha⁻¹), gross return (Tk. 488062, 520780 and 440646 ha⁻¹) and gross margin (Tk. 257057, 291455 and 210946 ha⁻¹) than those of existing cropping patterns in the 1st, 2nd and 3rd cropping, respectively. After inclusion of the alternate cropping pattern, MBCR was 2.48, 2.33 and 2.04 in the 1st, 2nd and 3rd cropping, respectively.

Development of alternative cropping pattern mustard- maize- t. Aman rice against fallow-boro- t. Aman cropping pattern in rajshahi region

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

A field trial was conducted at the farmers' field of Paba, Rajshahi, during 2021–2022, and 2022–2023, to develop a Mustard-Maize-T. Aman rice cropping pattern. There were two treatments, i.e., T₁: Existing Cropping Pattern: Fallow-Boro (BRRI dhan28)-T. Aman (Sharna) and T₂: Alternate Cropping Pattern: Mustard (BARI Sarisha-18)-Maize (Laltir Hybrid 559)-T. Aman (BRRI dhan75). Alternate cropping patterns gave higher rice equivalent yields (16.43 t ha⁻¹ and 16.4 t ha⁻¹), total gross return (Tk. 443722 ha⁻¹ and Tk. 442530 ha⁻¹) and gross margin (Tk. 215417 ha⁻¹ and 204390 ha⁻¹) in the 1st and 2nd cropping cycle respectively over existing cropping patterns. After inclusion of the alternate cropping pattern, MBCR was 2.0 and 1.75 in the 1st and 2nd cropping cycle respectively.

Comparative yield performance of BARI released short duration mustard variety (bari sarisha-14) against local (tori-7) popular variety in mustard-rice cropping system

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

The experiment was carried out at farmers' field, of Singra and Gurudashpur, Natore during Rabi season of 2023-24 to test the yield performance of BARI released mustard variety BARI Sarisha-14 against local mustard variety Tori-7. The experiment was consisted with two treatments i.e., T₁: BARI Sarisha-14 and T₂: Tori 7 (Local). BARI

released mustard variety BARI Sarisha-14 performed better over the local Tori 7. The higher seed yield was recorded from BARI Sarisha-14 in both the locations whereas the lower seed yield was obtained from Tori 7 in the same area. BARI released mustard variety of BARI Sarisha-14 showed better performance regarding yield over the local Tori 7. Farmers' can go for Boro rice cultivation after harvest of mustard varieties if they wish. Therefore, considering the farmers' preference, BARI Sarisha-14 can locally be adapted for greater extension.

Development of alternative cropping pattern mustard -sesame - t. Aman rice against mustard - fallow - t. Aman cropping pattern in hobiganj

M. I. Nazrul and F. Begum

A field trial was conducted at the farmers' field of Baniachang, Hobiganj during the year of 2022-2023 to develop Mustard-Sesame-T. aman rice cropping pattern. There were two treatments viz. EP (Existing Cropping pattern): Mustard (BARI Sarisha-18)-Fallow-T. Aman (BRRI dhan75) and AP (Alternate Cropping pattern): Mustard (BARI Sarisha-18)-Sesame (BARI Til-4)-T. aman (Binadhan-16). In alternate cropping pattern, yield of mustard, sesame and T. Aman rice were 8.13, 6.56, and 7.67 t ha⁻¹, respectively while in existing pattern, yields of mustard and T. Aman rice were 8.15 and 5.58 t ha⁻¹, respectively. Alternate cropping pattern gave higher amount of whole pattern rice equivalent yield (22.36 t ha⁻¹) against existing cropping pattern (13.73 t ha⁻¹); which was 62.85 % higher over existing pattern. Total gross return and gross margin of improved cropping pattern were Tk. 514280 ha⁻¹ and Tk. 327230 ha⁻¹ whereas in existing cropping pattern, those values were Tk. 315790 ha⁻¹ and Tk. 178190 ha⁻¹, respectively and MBCR was 1.84.

Improvement from fallow-t. Aus-t. Aman rice to mustard-t. Aus-t. Aman rice under aez 20 of Sylhet region

M. I. Nazrul

An experiment was executed at multilocation testing (MLT) sites, Moulvibazar during two consecutive years of 2021-2022 and 2022-2023 to see the performance of improved cropping pattern and to increase the productivity and income of the farmers. The experimental design was RCB with six (6) dispersed replications. The existing cropping

pattern (EP): Fallow-T. aus-T. aman rice and improved cropping pattern (IP): Mustard-T. aus-T. aman rice, respectively tested under this experimentation. BARI Sarisha-14, BRRI dhan98 of T. aus rice and BRRI dhan75 of T. aman rice were used in this trial. The improved pattern (IP) provided 15.72 t ha⁻¹ of T. aman rice equivalent yield which was almost 66 % higher than that of existing pattern EP. Similarly, the higher total gross margin (Tk. 164560 ha⁻¹) with marginal benefit cost ratio (2.28) was obtained over the existing pattern.

Duration mustard varieties in rice based cropping system (sherpur region)

N Sultana, M. M. Rahman and A.K.M.Z.U. Noor

The experiment was conducted at FSRD, Tarakandi, Sherpur of On-Farm Research Division, BARI, Sherpur during 2023-2024 to study the comparative agronomic performance of existing cropping pattern Fallow- Boro-T. Aman rice and improved cropping pattern Mustard- Boro-T. Aman rice by introducing a short duration mustard (BARI Sarisha-14) after T. Aman rice harvest. The higher rice equivalent yield (16.64 t/ha) was obtained from improved cropping pattern which was 52.66% higher over farmers existing pattern. At the same time improved cropping pattern Mustard- Boro-T. Aman rice gave higher gross return (Tk. 4,55,972/- ha⁻¹) and gross margin (Tk. 1, 86,832/- ha⁻¹) which was (65.65%) higher over farmers pattern. Farmers practice gave the lower gross return (Tk. 3,03,000/- ha⁻¹) and gross margin (Tk. 1,12,785/-ha⁻¹).

Increase cropping intensity and productivity by adoption of short duration mustard varieties in rice based cropping system (jamalpur region)

N Sultana, M. M. Rahman and A.K.M.Z.U. Noor

The experiment was conducted at Multilocation Testing site (MLT), Baoushi, Sarishabari, Jamalpur under On-Farm Research Division, BARI, Sherpur during 2023-24 to study the comparative agronomic performance of existing cropping pattern Fallow- Boro-T. Aman rice and improved cropping pattern Mustard- Boro-T. Aman rice by introducing a short duration mustard (BARI Sarisha-14) after T. Aman rice harvest. The higher rice equivalent yield (17.00 t/ha) was obtained from improved cropping pattern which was 57.4 % higher over farmers existing pattern. At the same

time improved cropping pattern Mustard- Boro-T. Aman rice gave higher gross return (Tk. 4,59,425/- ha⁻¹) and gross margin (Tk. 1,55,975/- ha⁻¹). Farmers practice gave the lower gross return (Tk. 2,95,800/- ha⁻¹) and gross margin (Tk 71,300/-ha⁻¹).

Development of alternate cropping pattern soybean-d. Aus /t. Aus-t. Aman cropping pattern in coastal saline area of Noakhali

M Shahidul Islam and Mia M Bashir

The experiment was conducted at the farmers' field during 2021-22 to 2023-24 at Subarnachar and Sadar upazilla of Noakhali district under AEZ-18 to evaluate the feasibility and financial viability of improved cropping pattern (Soybean-T.Aus-T.Aman) against existing cropping pattern (Soybean-Fallow-T.Aman). Average result of the two years revealed that the improved cropping pattern produced higher rice equivalent yield 12.92 t ha⁻¹ compared to existing cropping pattern 8.70 t ha⁻¹. Land use efficiency and production efficiency in the improved cropping pattern were higher 83.29% and 33.88 kg ha⁻¹ day⁻¹, respectively over existing cropping pattern 57.81% and 29.29 kg ha⁻¹ day⁻¹ respectively. Gross margin (GM) in the improved cropping pattern was Tk. 205070 ha⁻¹ whereas it was Tk. 144655 ha⁻¹ in existing cropping pattern. The marginal benefit cost ratio (MBCR) was 2.34 over existing cropping pattern.

Development of alternate cropping pattern sunflower-jute-t. Aman against farmers existing fallow-jute-t. Aman pattern in Gopalganj

M M Howlader and D Halder

The experiment was conducted at the MLT site, Tungipara, Gopalganj Sader and Moksedpur under Gopalganj district and Najirpur, Pirojpur during 2022-23 and 2023-24 to improve the productivity and profitability of existing cropping pattern Fallow-Jute-T.Aman by new cropping pattern. It was found that improved cropping pattern Sunflower-Jute-T.aman gave highest rice equivalent yield (REY) 21.25t ha⁻¹ where farmers practice gave 17.04t ha⁻¹. In case of economic return, improved cropping Sunflower-Jute-T.aman gave highest gross return Tk. 595000 ha⁻¹ and gross margin Tk. 210400 ha⁻¹. The MBCR of 1.44 in improved pattern meaning superiority of improved pattern over existing pattern.

Development of foxtail millet – jute – t. Aman cropping pattern against fallow – jute – t. Aman cropping pattern

M. A. Islam, E. Begum, N. Akther, S. Sultana, S. Akhtar, M.M. Zaman and N. Sultana

The experiment was conducted at the farmers' field of multi-location testing (MLT) site, Challisha, Netrokona under On-Farm Research Division (OFRD), Mymensingh during 2020-21, 2021-22 and 2022-23 to develop an economically viable cropping pattern by inclusion of Foxtail millet (kaon) in fallow period in fallow-Jute-T. aman cropping pattern. The inclusion of kaon in fallow period and replaced with high yielding varieties of rice and jute the three years average higher rice equivalent yield (19.27 t/ha) was obtained from improved cropping pattern which was 77.44% higher than farmer existing pattern. The gross return and gross margin were increased by 41.87% in Kaon-Jute- T.aman sequences compared to existing farmers practices. The marginal benefit cost ratio, land utilization index and production efficiency indicated the superiority of the improved pattern over the farmers' existing pattern.

Increase cropping intensity and productivity by adoption of short duration mustard variety in rice based cropping system in netrokona and mymensingh district

M. A. Islam, E. Begum, N. Akther, S. Sultana, S. Akhtar, M.M. Zaman, N. Sultana and F. Begum

The experiment was conducted at Multi-location testing (MLT) site at Netrokona and Trishal, Mymensingh under On-Farm Research Division (OFRD), Mymensingh during 2023-24 to study the comparative performances of existing cropping pattern (T. aman-Fallow-Boro) and improved cropping pattern (T. aman-Mustard-Boro). The improved cropping pattern resulted in significantly higher rice equivalent yields (17.24 t ha⁻¹ yr⁻¹ in Netrokona and 15.37 t ha⁻¹ yr⁻¹ in Mymensingh) compared to the traditional farmers' pattern (10.73 t ha⁻¹ yr⁻¹ in Netrokona and 10.14 t ha⁻¹ yr⁻¹ in Mymensingh). Economically, the gross return of the improved cropping pattern was substantially higher, with a 60.13% increase in Netrokona and 27.12% increase in Mymensingh compared to the farmers' pattern. The gross margin and mean marginal benefit-cost ratio (MBCR) also favored the improved pattern, with MBCR values of 3.56 in Netrokona and 1.49 in Mymensingh.

Improvement of mustard-boro-t. Aman cropping pattern in kushtia

J. A. Mahmud, M. M. Morshed, M. M. Hossain

An experiment was conducted at Kushtia sadar upazila during 2023-2024 to improved cropping pattern Mustard-Boro-T.aman with improved varieties. The cropping pattern Fallow-Boro (BRRD Dhan-28)-T.aman (Binadhan-7) were replaced by Mustard (BARI Sarisha-14)-Boro (Rod meni)-T.aman (BRRD Dhan-87). Gross return and gross margin (Tk. 489150 ha⁻¹ and Tk. 265375 ha⁻¹) were higher in proposed where existing cropping pattern were Tk. 354500 ha⁻¹ and Tk. 183750 ha⁻¹, respectively. The marginal benefit and cost ratio 1.45 was much higher over farmer's practice.

Intercropping

Intercropping of garlic with sugarcane

S. Roy, M. A. Rahaman, T. Tasmima, G. Paul and K. Roy

An experiment was conducted at the FSRD site, Atia, Delduar, Tangail during 2022-23 to find out the suitable crop for intercropping with sugarcane under farmers' field conditions for increasing cropping intensity and increasing productivity and economic returns. Four treatments viz., T₁ = sole sugarcane (100%), T₂ = Sugarcane (100%) + three rows of garlic (20%), T₃ = Sugarcane (100%) + four rows of garlic (26%), T₄ = Farmers' practice (Sugarcane 100% + two rows of garlic 13%). Analysis of intercropping treatments revealed that three rows of garlic in between two rows of sugarcane resulted in the highest sugarcane equivalent yield (181.59 t ha⁻¹) as well as gross margin (Tk. 1061870 ha⁻¹) and the lowest sugarcane equivalent yield (115.33 t ha⁻¹) as well as gross margin (Tk. 591790 ha⁻¹) was recorded in sole sugarcane.

Intercropping of tomato+sweet gourd with cauliflower

M. A. Islam, M.M. Zaman and N. Sultana

An experiment was carried out at Boror char, Mymensingh from August 2023 to May 2024 to find out the performance intercropping of Tomato + Sweet gourd with Cauliflower at medium-high land under AEZ-9 without trellis. The highest cauliflower equivalent yield (94.79 t/ha) was found

from Cauliflower + Tomato + Sweet gourd (T_1) and the lowest yield (40.20 t/ha) was found from sole cauliflower treatment. The highest gross return (Tk. 1420350 ha^{-1}), gross margin (Tk. 1212790 ha^{-1}) and benefit-cost ratio (6.84) was found from Cauliflower + Tomato + Sweet gourd (T_1) and the lowest gross return (Tk. 603000 ha^{-1}), gross margin (Tk. 499340 ha^{-1}) and benefit-cost ratio (5.82) was found from sole Cauliflower (T_4).

Effect of intercropping onion with okra at charland of mymensingh

N. Sultana and M.M. Zaman

The experiment was carried out at the farmers' field of Mymensingh region under OnFarm Research Division, Bangladesh Agricultural Research Institute, Mymensingh to find a suitable intercrop system in increasing the yield of onion and okra during two consecutive years 2021-2022 and 2022-2023. For this instance, the treatments consisted of T_1 : Sole okra (45cm \times 30cm), T_2 : Sole onion (15cm \times 10cm), T_3 : One row onion in between two rows of okra, T_4 : Two rows of onion in between two rows of okra, T_5 : Three rows of onion in between two rows of okra. Between the intercropped treatments, three rows of onion between two rows of okra showed higher okra equivalent yield (61.23 and 61.20 t ha^{-1}) and land equivalent ratio of 1.74 and 1.59 compared to other treatments. Based on intercultural operation, yield (okra equivalent yield 58.31 and 59.67 t ha^{-1}) and LER (1.67 and 1.59) two rows of onion in between two rows of okra are the best intercropping system to be followed in okra onion intercropping system.

Performance of bushbean intercropped with groundnut in haor areas of Sylhet region

M. I. Nazrul

An experiment was conducted at farmers field of Hakaluki Haor under MLT site, Moulvibazar during the two consecutive years 2022-23 and 2023-24. Five intercrop combinations, T_1 : sole groundnut, T_2 : sole bush bean, T_3 : alternate row of groundnut and bush bean, T_4 : Two rows of groundnut in between paired rows of bush bean and T_5 : Two rows of bush bean in between paired rows of groundnut were considered. The experiment was set up in randomized complete block design with six dispersed replications. The maximum average seed yield was obtained from the plot where bush bean grown as sole crop. The higher ground nut

equivalent yield (4.35 tha^{-1}) was obtained from T_3 (alternate row of groundnut and bush bean), the lowest yield (2.47 tha^{-1}) was found from the T_1 (sole bush bean). The highest gross return (Tk. 391500 ha^{-1}) and gross margin (Tk. 227028 ha^{-1}) was also recorded from T_3 (Alternate row of groundnut and bush bean), which was more than 76 and 331 percent higher over sole ground nut respectively. On the contrary, the lowest gross margin (Tk. 55505 ha^{-1}) was obtained from bush bean as sole crop.

Performance of intercrops with panikachu in charland of sherpur

M. M. Rahman, A.K.M.Z.U. Noor and N. Sultana

Field experiment was conducted to investigate growth and yield of vegetable and spices and taro grown alone as monocropping and in various combinations (intercropping). The experiment was conducted at FSRD site Tarakandi, under Sherpur district during the cropping season of 2022-23 at the farmer's field. The highest taro equivalent yield was resulted from t_3 treatments (87.95 t/ha.) which was 22.95% incremental over the sole crop, while lowest taro equivalent yield was obtained from t_1 treatments (71.53 t/ha.). The gross margin and return was also maximum in t_3 treatments 14, 11,503/- Tk/ha and 9, 55,970/- Tk/ha respectively.

Performance of early bulking potato variety as intercrop with winter hybrid maize at manikganj

M. R. Amin and M. E. Haque

The experiment was conducted at Kamta village under Sauria upazila of Manikganj district during Rabi season of 2023-24 to validate the developed potato and hybrid maize intercropping in farmers' field and its economic performance. Two intercrop combinations, T_1 = Maize normal row (60cm \times 25cm) +one row potato and T_2 = Sole maize (60cm \times 25cm) were evaluated. The experiment was laid out in RCB design with three replications. The variety of hybrid maize was Pacific hybrid-9217 and the variety of potato was BARI Alu-44. The highest maize equivalent yield (17.31 t ha^{-1}), gross return (Tk.484680 ha^{-1}), gross margin (Tk. 162120 ha^{-1}) and BCR (1.50) were obtained from treatment T_1 = Maize normal row (60cm \times 25cm) +one row potato). The lowest maize equivalent yield (8.99 t ha^{-1}), gross return (Tk.251720 ha^{-1}), gross margin (Tk. 81115 ha^{-1}) and BCR (1.47) were obtained from sole cropping of maize.

Mixed cropping

Mixed cropping of lentil with groundnut varying different plant population at the charland of tangail

M. A. Rahaman, S. Roy, T. Tasmima, K. Roy and G. Paul

The experiment was conducted in the farmers' field at the MLT site, Bhuapur, Tangail during Rabi 2023-24 under AEZ# 8 to verify the performance of lentil as mixed crop with groundnut in char lands and to increase production and farmers' income. The treatment combinations used for the experiment were T₁: Sole groundnut (100%), T₂: Groundnut (100%) + lentil (20%), T₃: Groundnut (100%) + lentil (30 %) and T₄: Groundnut (100%) + lentil (40%). Results revealed that the yield of groundnut decreased with the increase of lentil population. In addition, all the mixed cropping combinations showed superior in terms of gross return, gross margin and groundnut equivalent yield (GEY) than sole cropping. The highest groundnut equivalent yield (2.29 t ha⁻¹) was found in the treatment combination of 100% groundnut + 40% lentil. From cost and return analysis it was observed that the combination of 100% groundnut + 40% lentil (T₅) gave the highest gross return (Tk.206370 ha⁻¹) and gross margin (Tk. 94659 ha⁻¹) where sole groundnut (T₁) gave the lowest gross return and gross margin (Tk 174600 and 80289 ha⁻¹).

Performance of mixed cropping system of lentil, mustard, and linseed under AEZ-11

M. Maniruzzaman, M. S. H. Molla, M. A. Isalm, M. Z. Hasan, M. A. Suborna and M.R. Alam

The field experiment was carried out at MLT site, Atghoria during the rabi season of 2023-24 to verify the performance of mustard and linseed as mixed cropping with lentil. The treatment compositions used for the experiment were T₁= Lentil (80%) + Linseed (20%), T₂= Lentil (80%) + Mustard (20%), T₃= Lentil (75%) + Mustard (15%) + Linseed (10%), T₄= Lentil (100%), T₅= Mustard (100%) and T₆= Linseed (100%). Sole linseed, lentil, and mixed cropping of lentil + linseed performed better than sole mustard and mixed cropping of all these three crops. Maximum lentil equivalent yield (LEY) (1.68 t ha⁻¹) was obtained from sole linseed, which is identical to sole lentil, Lentil (80%) + Linseed (20%), and Lentil (80%) +

Mustard (20%). LEY was minimum (1.22 t ha⁻¹) in sole lentil which was statistically similar to Lentil (75%) + Mustard (15%) + Linseed (10%). Sole linseed, lentil, and two-crop mixed cropping systems produced a higher economic return than sole mustard and three-crop-based mixed crop cultivation.

Mixed cropping of maize with leafy vegetables in char areas of gaibandha

M. J. Alam and A. A. Mahmud

The experiment was undertaken at Haldia Char, Saghata, Gaibandha during 2023-24 to get more yield and return from a single land as well as ensure nutritional security. The experiment was designed in a randomized complete block design with four replications. The tested crops were Maize (Major), Lalshak (BARI Lalshak-1), Mulashak (BARI Mula-1) and coriander leaf (BARI dhania-1). Four treatments viz: T₁: Sole Maize, T₂: Maize+Lalshak, T₃: Maize+Mulashak and, T₄: Maize+ Coriander leaf was evaluated. The maximum Maize equivalent yield (18.71 t ha⁻¹), gross return (Tk. 467778 ha⁻¹) and gross margin (Tk. 331403 ha⁻¹) was recorded found from T₂ (Maize+Lalshak) treatment, followed by T₄ (Maize+Coriander leaf) and T₃ (Maize+Mulashak) treatment. The minimum Maize equivalent yield (10.91 t ha⁻¹), gross return (Tk.272778 ha⁻¹) and gross margin (Tk. 140403 ha⁻¹) was found from T₁ (Sole Maize) treatment. The maximum MBCR was also recorded in T₂ treatment and the minimum MBCR was also recorded from sole Maize cultivation (T₁).

Component technologies

Evaluation of apsim model for maize grown under different n rates in t.aman-canola-maize cropping system

Apurbo Kumar Chaki, Shanjida Afroz Supti, Mohammad Mamunur Rashid Sarker, Taslima Zahan, Md. Faruque Hossain, Md. Robiul Alam, Md. Akhtar Hossain, Quamrun Naher, and Md. Mazharul Anwar

Maize is an important cereal grown in the sub-tropical environment of the Eastern Gangetic Plains (EGP) and its area of cultivation is expanding in Bangladesh over time due to its high yield potential and economic profit. Maize cultivation, including

nitrogen (N) management and crop modelling provides numerous benefits, such as increased yield, resource use efficiency, climate resilience, research innovations and sustainable agriculture practices. In this aspect, a field experiment was conducted at the On-Farm Research Division (OFRD) research field, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur from October 2022 to April 2023. The experiment consisted of five levels of N viz., control, 125 Kg ha⁻¹, 250 Kg ha⁻¹, 375 Kg ha⁻¹ and 500 kg ha⁻¹. A robustly calibrated and validated model, when used from inputs of short-term experiments and long-term climate data, can help understand the risk of the crops grown and explore opportunities for agronomic interventions. We, therefore, aim to evaluate the performance of APSIM model for maize grown under different N rates in T.aman – Canola – Maize cropping system. The simulated grain yield and biomass yield were found 12.44 t ha⁻¹ and 24.96 t ha⁻¹ with the recommended dose of N (250 Kg ha⁻¹). The high value of the correlation coefficient (R²) in validation for both maize yield (R² = 0.953) and biomass yield (R²=0.961) indicated a strong agreement between the observed and simulated data.

Yield prediction of lentil by linking crop cuts with phenological analysis of sentinel-2 time series

Taslina Zahan, Istiak Ahmed, Md. Shakhawat Hossain and Apurbo K. Chaki

A study was conducted for two consecutive years (2021-22 and 2022-23) to predict the yield of lentil at Godagari Upazila of BARInd, Rajshahi. The sample data was collected from 117 farmer fields in 2021-22 and 203 farmer fields in 2022-23 by the survey using the Kobo Toolbox to get information on cultivated lentil variety, planting and harvest time, and yield. The study revealed that BARI masur-8 was mostly grown by farmers. Using satellite-derived maximum NDVI and EVI were used to develop a model for yield prediction of lentils. However, a limited number of data was collected and analyzed, a best-performing model was tried to identify to predict the yield. The study noticed that the linear regression model predicted yield by 17-24% whereas the support vector model performed well during 2021-22 and the ensemble model performed well in 2022-23.

Effect of nitrogen fertilizer and weed management on weed and yield of t. Aman rice-wheat-mungbean cropping pattern under conservation agriculture systems

Taslina Zahan, Apurbo K. Chaki, Md. Faruque Hossain Md. Akhter Hossain, Qumrun-Nahar, Md. Robiul Alam and Md. Mazharul Anwar

Management of nitrogen and weed can play a significant role in yield improvement of T. aman rice-wheat-mungbean cropping pattern under conservation agriculture systems. A study was designed and executed in three consecutive years (2022-24) to evaluate the effect of nitrogen and weed management on weed and crop yield of strip-tilled non-puddled T. aman rice. and strip-planted wheat and also to optimize management of nitrogen and weed for achieving maximum yield. The study was initiated with strip-tilled non-puddled T. aman rice in 2022 at the on-station field of On-Farm Research Division, BARI, Gazipur. Three nitrogen rates viz. no nitrogen fertilizer (0 kg N ha⁻¹), the recommended rate of nitrogen fertilizer (85 kg N ha⁻¹ for rice and 92 kg N ha⁻¹ for wheat), and double recommended nitrogen fertilizer rates (170 kg N ha⁻¹ for rice and 184 kg N ha⁻¹ for wheat); and four weed management treatments viz. no weeding control, weed-free control, application of one pre-emergence herbicide (pretilachlor for rice; pendimethalin for wheat) and application of pre-emergence followed by post-emergence herbicide (bispirybac-sodium for rice and carfentrazone-ethyl for wheat) were tested. The experiment was laid out in a factorial randomized complete block design with three replications. The study identified that nitrogen rate and weed management had significant effects on weed biomass and grain yields of strip-tilled un-puddled T. aman rice and strip-tilled wheat. The study suggests application of the recommended rate of nitrogen (85 kg N ha⁻¹ for rice and 92 kg N ha⁻¹ for wheat) with the spray of pre-emergence followed by post-emergence herbicides to control weeds of aman rice and wheat most effectively and to obtain optimum grain yields.

Growth and yield of chia influenced by sowing time and row spacing at different aezs

M. N. A Siddique, M. J. Islam, M. M. I. Chowdhury

The study of growth and yield of chia influenced by sowing time and row spacing was conducted at On-

station, OFRD Shyampur, Rajshahi during Rabi season of 2022-23 and 2023-24 in High Ganges River Flood Plain soil (AEZ-11) to determine the best sowing date and row spacing of chia for achieving higher yield. The experiment was laid out in RCB design with three replications. Four sowing time and two spacing was followed the experiment. The sowing times were D1= 15 November, D2= 30 November, D3= 15 December and S4= 30 December. The spacing was; S1= 30 cm X continuous in solid line and S2= 40 cm X continuous in solid line. The highest seed yield was found in the combination S2×D1 in both years. The combination S2×D1 indicated that 40 cm spacing (Line to Line) with 15 November seeding was the best combination for achieving a higher yield of Chia in the northwestern part of Bangladesh. However, higher to moderate seed yield can also be achieved by extending the seeding date up to 30 November following 30 cm or 40 cm spacing.

Effect of tillage and mulch on the yield performance of potato in AEZ-11

M. S. Rahman, M. N. A. Siddique, M. J. Islam, and M. M. I. Chowdhury

In the High Ganges River Floodplain of Bangladesh, intensive tillage and continuous cropping have depleted soil nutrients, leading to lower crop yields. Conservation agriculture (CA) practices such as minimal soil disturbance, crop residue retention, and crop diversification—can address these issues, especially in intensive rice-based rotations. We hypothesized that using more crop residue as mulch and reducing soil disturbance would increase crop productivity and profitability. To test this, an experiment was conducted both at an agricultural station and on farmers' fields, each with three replications and three treatments: (A) conventional tillage, (B) strip planting with straw mulch, and (C) strip planting with plastic mulch. The results showed that strip planting with high residue (both straw and plastic mulch) significantly improved potato yields compared to conventional tillage with low residue. At the station, the highest yield was 44.2 t/ha with plastic mulch, followed closely by 43.5 t/ha with straw mulch. The conventional method produced the lowest yield of 34.6 t/ha. On the farmers' fields, the yields were not significantly different, with 43.1 t/ha for strip planting with straw mulch, 40.1 t/ha with plastic mulch, and 40.8 t/ha with conventional tillage.

Economically, strip planting with straw mulch provided the highest net return (Tk. 777,073/ha at the station and Tk. 767,073/ha on the farm) and the best benefit-cost ratio (BCR of 3.50 at the station and 3.47 on the farm). Overall, the results suggest that strip planting with straw mulch significantly boosts yield and profitability in rice-based intensive cropping systems.

Effect of sowing date on the productivity of mustard (canola) in north-west Bangladesh

M. E. Haque, M. A. Alam, M. Z. Ferdous and M. A. H. Talukder

To observe the performances of BARI Sarisha-18 sown at different sowing dates, an experiment was set at the farmers' fields of Fatehpur, Vurarghat, Sadar upazila, Rangpur under OFRD, BARI, Rangpur during the rabi season of 2023-2024. The trial consisted of five sowing dates viz., 25-October, 05-November, 15-November, 25-November and 05-December. Flowering times varied slightly with the sowing date. The earliest flowering occurred on 05-Dec (39 days), while the latest was on 15-Nov (42.33 days). Maturity days decreased as sowing was delayed, with the earliest maturity at 95.33 days for 05-Dec sowing and the latest at 102 days for 25-Oct sowing. The number of pods per plant was significantly higher in the earliest sowing (134 on 25-Oct) compared to later dates, with a marked decrease observed for the last sowing date (91.80 on 05-Dec). Yields per hectare decreased with later sowing dates. The highest yields were observed on 25-Oct (2166.7a kg^{ha}⁻¹), and the lowest on 05-Dec (1566.7 kg^{ha}⁻¹). The earlier sowing dates lead to better performance across most parameters, including flowering and maturity rates, plant height, pod production, and overall yield. Earlier sowing dates are recommended to the farmers in North-West Bangladesh for greater adoption in extrapolation areas to optimize the productivity of Mustard (Canola).

Effect of different mulching materials on yield of eggplant

U. K. Laily, M. Z. Ferdous, M. K. Islam, M. U. S. Khatun and M. A. H. Talukder

In order to determine the impact of various mulching materials on eggplant production, a field trial was carried out at the On-Farm Research Division (OFRD), Bangladesh Agricultural

Research Institute (BARI), Rangpur in the Rabi season of 2023–24. Three different treatments were tested: T_1 = Polythene mulch, T_2 = Rice straw and T_3 = No mulch (control). The yield and yield components such as plant height, fruit length, fruit diameter, number of fruits plant⁻¹, single fruit weight and fruit yield were assessed for choosing the appropriate mulching materials. Among all the treatments, T_1 produced the highest number of fruits plant⁻¹ (9.8) and fruit yield (56.47 t ha⁻¹), whereas T_3 treatment had the lowest fruit yield (30.28 t ha⁻¹). The maximum gross margin (754600 Tk.ha⁻¹) was obtained from treatment T_1 .

Assessment of onion growing area in charland of gaibandha through geo-spatial techniques

A. Mahmud, M. A. Mottalib, M. J. Alam, M. R. Alam and M. S. H. Molla

Accurate and faster estimation of crop area is very essential for projecting yearly agriculture production for formulating national budget and deciding agriculture policies. The present investigation deals with the estimation of onion crop acreage of charland area of Saghatta upazila of Gibandha district using satellite remote sensing technique. In this study single-season optical remote sensing data of Sentinel-2 satellite having a spatial resolution of 10 m was used to generate onion distribution map for Saghatta upazila. Cloud-free single-date Sentinel-2 satellite images were acquired during the onion growth stages. The investigation presented that the multi-temporal satellite imagery dataset was adequate to accurately identify the garlic cropped area with high accuracy. This study gives inspiration in selecting the remotely sensed data source, the band, and phenology for accurately extracting onion planting areas, which could be transferred to other sites with larger areas and similar agriculture structures. Besides, this research provides valuable insights for policymakers by providing near-real-time, earlier onion acreage estimates at the local level, facilitating informed decision-making in attaining sustainable agricultural development.

Determination of suitable seed rate of proso millet in the char land

M. S. Islam, M. R. A. Mollah and M. T. Hasan

The experiment was conducted in the farmer's field of Khatiamaria, Sonatola, Bogura during Rabi, 2023-2024 to find out the suitable seed rate of proso

millet and to disseminate along with popularize BARI Cheena varieties to the farmers of Char land areas. The treatments were $T_1=25$ kg ha⁻¹, $T_2=50$ kg ha⁻¹, $T_3=75$ kg ha⁻¹, and $T_4=$ Farmer's practice 100 kg ha⁻¹. Maximum seed yield (1.54 t ha⁻¹) was recorded from the T_3 treatment that was statistically different from all other treatments. The highest gross return (Tk. 107100 ha⁻¹) amounted from T_3 treatment against the cultivation cost of Tk. 29924 ha⁻¹ which together led to the higher gross margin (Tk. 77176 ha⁻¹). Lower gross return (Tk. 88900 ha⁻¹), as well as gross margin (Tk. 58576 ha⁻¹), was obtained from the T_4 (Farmer's practice) treatment. Therefore, the optimum seed rate of proso millet is 75 kg ha⁻¹ at Charland of Sonatola, Bogura.

Effect of planting date on yield of summer hybrid tomato in the north-west Bangladesh

M. T. Hasan and M. S. Alam

The experiment was conducted at the OFRD, BARI, Bogura during 2022-23 and 2023-24 to find out the suitable planting time and increase production and economic return. BARI Hybrid Tomato-11 variety was considered as four sowing dates viz. $S_1 = 5$ August, $S_2 = 20$ August, $S_3 = 5$ September, $S_4 = 20$ September. The experiment was laid out in RCBD with three replications. The plant height, virus infestation and wt. of fruits per m² of tomato were significantly affected by different sowing dates. Significant influence on yield, 50% flowering, no. of fruits per plant and individual fruit weight because of climatic conditions such as rainfall, decreased and increased temperature of crop growing period.

Effect of planting time on yield of BARI begun-12 in tangail

M.A. Rahaman, S. Roy, T. Tasmima, K. Roy and G. Paul

An experiment was conducted at the MLT site, Bhuapur, Tangail during rabi 2023-24 to find out the optimum transplanting time of BARI Begun-12. Four transplanting dates such as, $T_1= 15$ October, $T_2= 30$ October, $T_3= 15$ November and $T_4= 30$ November, were tested in the experiment. BARI Begun-12 was used as planting materials. Transplanting dates influenced the yield of BARI Begun-12 significantly. Transplanting on 15 October (T_1) produced significantly the highest yield (33.10 t ha⁻¹) while the 30 November planting gave the lowest yield (1.85 t ha⁻¹). Considering

transplanting dates, the highest gross margin (1100240 Tk ha⁻¹) was obtained from the earliest planted (15 October) and no economic benefit was gained from 15 November and 30 November plantation.

Effect of sowing time of mustard variety in eastern surma-kushiyara floodplain soil of Sylhet

M. I. Nazrul

The present study was conducted at farming system research and development (FSRD) site under Sulhet and Multilocational Testing (MLT) site, Shaistagonj, Habigonj during consecutive years 2022-23 and 2023-24 to determine the effect of sowing date on flowering and seed yield of mustard (*Brassica juncea* L.). The studies were conducted in the mustard var. BARI Sarisha-18 by inducing the plant to flower early or late through different sowing dates viz. S₁: 15 November, S₂: 30 November, S₃: 15 December, S₄: 30 December, S₅: 15 January. Delay in sowing caused a significant reduction in the length of flowering period. The crop sown on S₁ had the longest flowering duration (41.63 days) followed by the crop sown on S₂ (39.83 days) and S₃ (35.17 days). In the present investigations, crops sown on S₁ took significantly more days from sowing to the flowering stage as compared to others. Delayed sowing of mustard resulted in the reduction of seed yields due to short flowering duration ultimately reducing the seed yield.

Effect of different application times of ethephon on off-season pineapple production in bandarban

M. T. Islam, I. Hossain, M. F. Hossain and M. M. Anowar

An experiment was carried out at four locations of Bandarban Sadar during 2023-24 to find out the response of pineapple plants (cv. Giant Kew) to ethephon in early, uniform flowering and off-season production of fruits. Ethephod had a significant effect on flower induction and fruit development in pineapple. The treatments were: T₁= September forcing, T₂= October forcing, T₃= November, and T₀=Control. The experiment was carried out in a randomized complete block design with three replications. Plant hormone (ethephon) treated plot in November showed maximum flowering (78.65%) followed by in September

(74.33%) and the lowest flowering percentage was observed in October treated plants (54.45%). Natural flowering occurred in the remaining plants along with untreated plants in mid-February. The appearance of 1st inflorescence took 45 to 58 days to initiate after forcing. The offseason harvesting of pineapple was possible in the months of September and October with a yield of 22.20 t ha⁻¹ and 16.12 t ha⁻¹ respectively.

Effect of drip irrigation on yield of robusta coffee in chittagong hill tracts (cashewnut & coffee)

M. T. Islam, I. Hossain, N. U. Ahmed, F. Arshad, M. F. Hossain, M. M. Anowar and M. A. Hossain

Field experiments were conducted at Bandarban Sadar and Hill Agricultural Research Station, Raikhali, Rangamati during January 2024 to evaluate the influence of drip irrigation on the growth and yield of coffee robusta. Four treatments viz. T₁= 75% of the recommended dose of water; T₂= 50% of the recommended dose of water; T₃= 25% of the recommended dose of water; and T₀= Control (No water). The experiment was outlined in a Randomized Complete Block Design with five replications. Significant variation was found with the treatments. In Raikhali, maximum canopy size (5.85 m), tree volume (14.20 m³), and length of flower branch (94.4 cm) was found in T₂ treatment. The highest plant height (3.17 m), no. of the flowering branch (61) and no. of node/branch (16.26) was found in T₃. T₀ gave the minimum result in all growth and yield-related parameters. In Bandarban sadar, the highest plant height (3.20 m), maximum canopy size (5.51 m), tree volume (12.82 m³), no. of flowering branch (58.8), length of flower branch (91.4 cm) and no. of node/branch (7.86) were found in T₂ treatment. The lowest was found in T₀ (2m, 3.21m, 2.76m³, 11.8, 50cm, and 4.63 respectively).

Effect of different sowing dates on the yield of mungbean in coastal area

M. M. Islam H. M. K. Bashar and M. S. I. Khan

The experiment was conducted at Badarpur, Patuakhali sadar, Patuakhali during late rabi season of 2023-24. Mungbean variety viz. BARI Mung-6 was sown at 10 days interval starting from 20 January to 10 February to find out suitable sowing date for increasing yield in coastal area. Plots

consisted of three sowing dates (20 January, 30 January and 10 February). The yield and yield contributing characters of mungbean plant was significantly affected by the different sowing dates. 30 January sowing seeds produced plants having maximum number of pods/plant (18.96). Maximum number of seeds/pod (10.67). higher pod length (10.19cm), 1000-seed weight (52.68 g) and yield (1.89 t ha⁻¹). The seed yield decreased 21.15% when seed sown late (10 February) due to production of lower yield components. Comparing different sowing dates yield and yield contributing characters 30 January performed better. The maximum gross return (Tk. 151200/ha) was obtained from T₂ as well as gross margin (Tk. 92700/ha) and BCR (2.58) was recorded from 30 January sowing. The lowest economic return was recorded from T₃ (Tk. 124800/ha) and BCR (2.13).

Effect of variety and sowing dates on sunflower varieties in southern region

M. M. Islam H. M. K. Bashar and M. S. I. Khan

High yields of grain and sunflower oil need to match of vegetative and reproductive growth stages of the plant with favorable weather conditions by selecting appropriate sowing date. The experiment was conducted at patuakhali and Barguna district with different locations during 2023-24 with different sunflower varieties i.e. BARI Surjomukhi-2, BARI Surjomukhi-3 and local popular hybrid hysun-33 to determine appropriate sowing time in coastal region for improving their yield. The experiment was design randomized complete block design (RCBD) with 6 dispersed replications. Three sowing date (15 December, 30 December and 15 January) and three sunflower cultivars (BARI Surjomukhi-2, BARI Surjomukhi-3 and local hybrid Hysun-33) were used to conduct the experiment. Results showed that between cultivars, was significant for grain yield, biological yield, head diameter, stem diameter, stem height, grain empty percent, head dry weight, dry weight of stems and leaves. The effect of sowing date was significant difference for thousand-grain weight and number of grains per head, so that delays in planting decrease final yield. The highest plant height (136.44 & 135.37 cm), head diameter (61.26 & 58.64 cm), number of seeds per head (416.53 & 410.53) and seed yield (1.82 & 1.79 ton/ha) was observed when sowing on 15th of December both the location. At the interaction between sowing

dates and varieties the highest days to maturity (113 & 114), plant height (138.1 & 134.01 cm), head diameter (57.41 & 55.31 cm), number of seeds per head (428.69 & 444.87), 1000 seed weight (77.79 & 79.12 gm) and seed yield (1.84 ton per hactor) was from BARI Surjomukhi-2 and 15 December sowing condition at Kuakata, Patuakhali and Barguna sadar, Barguna. Higher salinity observed in Kuakata and ranges 0.47 to 9.79 dS/m.

Performance of sunflower as influenced by sowing dates

R. Uddin and B.C. Kundu

Sunflower sowing at south central coastal region of Bangladesh is varies from region to region depending upon soil moisture condition and T. Aman rice harvesting. Optimum date of sowing for sunflower in different regimes of southern belt still not investigated. A field study was carried out at RARS, Rahmatpur, BARIshal during Rabi season of 2023-24 to observe the effect of different sowing dates on sunflower cultivation. *The experiment* was carried out with three sowing dates i) December 31 (ii) January 15 and (iii) January 30 and three variety/cultivars e.g. i) BARI Surjomukhi-2 ii) BARI Surjomukhi -3 and iii) Hysun-33 under factorial randomized complete block design with three replications. Results revealed that, optimum sowing contributed to the maximum seed yield, the commercial cultivar Hysun-33 has the late sown potentiality in respect of seed yield and Hysun-33 sown at December 31 gave the maximum seed yield (1776.7 Kg/ha) whereas the minimum seed yield can be observed from BARI Surjomukhi-3 at varying sowing dates.

Plant protection measures

Integrated management of foot rot disease of groundnut with seed and soil treatments

M.Y.H. Rayhan

An experiment was executed at the MLT site Nikli during 2023-2024 to assess the effect of integrated diseases management modules with chemical treatments, organic amendments, and bio-control agents on diseases incidence and yield of groundnut in comparison with untreated control. Five different treatments were taken. T₂ treatment (liming (1 tha⁻¹) and seed treatment with Provex 2.5 kg⁻¹)

significantly gave the highest nut yield (2.64 tha^{-1}), with the lowest foot rot (5%) infection of ground nut production. The highest gross return (Tk. 290400 ha^{-1}), gross margin (Tk. 174718 ha^{-1}) and BCR (2.51) were calculated from treatment and the lowest gross return (233200 Tk/ha), gross margin (Tk.119635 ha^{-1}) and BCR (2.05) were from treatment T₅ (farmers practice).

Integrated management approach of thrips, white fly, jassid and fruit borer complex in chilli at Bogura region

An experiment was conducted at the MLT site, Sariakandi, Bogura during 2023-24 to observe the performance of integrated management practice against thrips, white fly and jassid complex in chilli under char land conditions. Crops under T₂ (cover crops with 60 mesh net) resulted in comparatively lower fruit damage and produced higher yields than T₁ (Blue + Yellow + white sticky trap + Use of pheromone mask trap + Success) and T₃ (farmers practice with insecticide). Cover crops with net insects cannot be in the field. So, the insect infestation percentage is lower than the other treatments.

Management of gummosis disease of citrus at Shibpur, Narsingdi

M. M. Alam, M. Ahmad and M.H. Rahman

The experiment was conducted with Colombo lebu at Dattergaon and Joymongal, Shibpur, Narsingdi during 1st week of March 2023. The experimental was laid out randomized complete block design with three replications. Five to eight years aged, 20 disease infected plants were selected for the experiment and five tree was considered one replication. Treatments were (i) Ridomil gold pest. (ii) Bordeaux mixture (iii) Alkatra (iv) control. Clean the wounded portion and applied redomil pest and spray four times 5gm L⁻¹ after 15 days' interval. Length and diameter of lesion was measured and remarkable reduction was observed after thrice application. The length and diameter reduced about 61.86 and 71.94% respectively in Redomil gold treatment. While it reduced about 51.20 and 63.24% respectively in Bordeaux mixture treatment and 52.31 and 73.16%, respectively in Alkatra treatment.

Agroforestry systems

Performance of different spices intercropping within betel nut orchard

G N Hasan, R H Anik & M Islam

The trial was conducted at Bhola sadar and Doulatkhan under Bhola districts during rabi season of 2023-24 in farmer's field to select suitable variety of **spices** which can be produced in betelnut orchard as well as to increase farmer's income. A total of 4 different spices ginger (BARI Ada-1), turmeric (BARI Holud-4), black pepper (BARI Golmorich-1) and chuijhal (local) were tested. Among the spices BARI Golmorich-1 and Chuijhal were in growing stage and for that yield and yield contributing data of those two spices were not tabulated in 2023-24. The rhizome yield of BARI Ada-1 and BARI Holud-4 were 6.49 and 7.10 t ha^{-1} respectively. The gross return and gross margin of BARI Ada-1 was 973500 and 639760 Tk. ha^{-1} respectively whereas the gross return and gross margin of BARI Holud-4 was 248500 and 124460 Tk. ha^{-1} respectively.

Performance of mixed vegetables in newly established mango orchard in Cumilla

M. Jamal Uddin

The experiment was conducted at the 1-3 years old mango gardens of the farmers' field of Barura, Chandina and Debidwer of Cumilla during 2023-24. Average spacing of mango trees were 8m×6m, clean bole height was 1.5m, canopy spread was 1.5m×1.5m and tree height was 1.5-3m. So, there was some gaps between the tree canopy in the garden, where direct sunlight may reach to the under-storey crops. Vegetables varieties were cabbage (Hybrid Quiker), Cauliflower (Hybrid Snow white), Sweetgourd (BARI Mistikumra-2), tomato (BARI Tomato-17) and Garden pea (BARI Motorshuti-3) were used as under storey crop in this experiment. The treatments were designed as Mango+Cabbage (T₁), Mango+Cauliflower (T₂); Mango+Sweet gourd (T₃), Mango+Tomato (T₄) and Mango+Garden pea (T₅). Highest yield (55.43 t ha^{-1}) was found from cabbage (Hybrid Quiker) followed by cauliflower (Hybrid Snow white) (31.87 t ha^{-1}). Garden pea (BARI Motorshuti-3) produced the lowest yield (1.1 t ha^{-1}) when grown in an agroforestry system. Gross return, gross margin and BCR also found higher in cabbage (1.72) followed by tomato (1.44) and calliflower

(1.42). This agroforestry system provided additional care to mango orchards along with additional income.

Integrated nutrient management for cabbage under agroforestry system

M. Maniruzzaman, M. S. H. Molla, M. A. Isalm, M. Z. Hasan, M. A. Suborna and M. R. Alam

An experiment was carried out at the FSRD site, Ganggarampur, Pabna during the rabi season of 2023-24 to evaluate the performance of different nutrient management options in mango-based agroforestry system. Four nutrient management practices viz. recommended dose (FRG-18), IPNS with 5 t ha⁻¹ cow dung and IPNS with 3 t ha⁻¹ vermicompost along with farmers practice were evaluated in this study. The IPNS with 5 t ha⁻¹ cow dung and IPNS with 3 t ha⁻¹ vermicompost exhibited significantly higher card yield which were 21% and 18% higher than recommended dose, respectively. Regarding economic return higher gross margin (Tk. 431340 ha⁻¹) was also attained from IPNS + 5 t ha⁻¹ cow dung.

Performance of high value crops in mango based agro forestry systems

M. S. Rahman, M. N. A. Siddique, M. J. Islam and M. M. I. Chowdhury

Fruit orchard are the principal agricultural crops that generate sustainable economic income to the farmers in Rajshahi. The experiment was conducted at farmers' field under MLT site, Shibpur and Paba, Rajshahi during 2023-24 to assess the performance of mango-based agroforestry with high value crops to increase cropping intensity and productivity. Four crops i.e. potato, cabbage, cauliflower and tomato were evaluated in mango orchard. The mango + tomato system recorded the highest mango equivalent yield (MEY) (28.51 t ha⁻¹) followed by mango+ cabbage (27.28 t ha⁻¹), mango+ cauliflower (26.54 t ha⁻¹) and mango+ potato (22.71 t ha⁻¹). However, the sole mango system (18.9 t ha⁻¹) recorded the lowest MEY. Similarly mango+ tomato (Tk. 1557843 ha⁻¹) had maximum gross margin followed by mango+ cabbage (Tk. 1557753 ha⁻¹), mango+ cauliflower (Tk. 1480858 ha⁻¹), sole mango system (Tk. 1131795 ha⁻¹) whereas the mango + potato system (Tk. 1103214 ha⁻¹) had the lowest gross margin. On the other hand the highest MBCR was observed in

mango+ cabbage (3.65) followed by mango+ cauliflower (2.87), mango+ tomato (2.72) and lowest was observed in mango + potato system (0.90).

Floating agriculture

Intercropping of non-creeper with creeper vegetables on floating bed cum trellis (non-tidal model) in Noakhali and Kishoreganj

M.S. Islam, M. M. Bashir, M. Mohiuddin and M. Y. H. Rayhan

The experiment was conducted at Ramgong and Kishoreganj sadar under OFRD, Noakhali and Kishoreganj during the cropping season of 2023-24 to increase the crop productivity of floating bed agriculture system as well as to increase the economic return of farmers. Four treatments were tested viz., T₁: Bottle gourd + Radish, T₂: Cucumber+ Red amaranth, T₃: Sweet gourd + Coriander leaf, and T₄: Yard long bean + Indian spinach. The variety of creeper vegetables were for bottle gourd (BARI Lau-4), sweet gourd (Maya), cucumber (Alavi green) and yard long bean (BARI Borboti-1) and non-creeper vegetables were like radish (BARI Mula-1), red amaranth (BARI lalshak-1), coriander leaf (var. local) and Indian spinach (var. local). Among the creeper vegetables, yield sweet gourd and bottle gourd were obtained highest in Kishoreganj (36.97, 35.48 t/ha) and Cucumber and yard long bean was found highest in Noakhali (26.09, 7.23 t/ha), respectively. Results revealed that the average gross return and gross margin was calculated highest in Cucumber+ Red amaranth (460850 Tk./ha and 206400 Tk./ha) due to high price and market demand followed by Sweet gourd + Coriander leaf (425350 Tk./ha and 224900 Tk./ha) and Bottle gourd + Radish (402475 Tk./ha and 202025 Tk./ha), respectively.

Intercropping of non-creeper with creeper vegetables on floating bed cum trellis (non-tidal model)

M. Mohiuddin, T.S. Munmun, M.K. Islam, M.H. Rashid and M. Rahman

An intercropping based activity was conducted at Dumuria, Khulna district and Fakirhat, Bagerhat district during the Kharif II and Rabi season, 2023-24 to increase the crop productivity and intensity of

farmers by floating agriculture system. Two treatments were considered as T_1 = Bottle gourd + Red amaranth and T_2 = Sweet gourd + Red amaranth. The variety of creeper vegetables were for bottle gourd Jhinia (F1) and sweet gourd (Bengle sweet (F1) and non-creeper vegetables were like Red amaranth (var. BARI lalshak-1). The fruit yield of creeper vegetable was 42.65t h⁻¹ and 33.3t h⁻¹ for bottle gourd and sweet gourd at Dumuria Khulna and yield of bottle gourd and sweet gourd were 44.63t/ha and 31.34t/ha respectively. Bottle gourd performed better followed by Sweet gourd. Among the non-creeper vegetables, red amaranth was (8.56t h⁻¹ and 10.5 t h⁻¹) at Dumuria and Fakirhat respectively. Among the intercropping of bottle gourd with red amaranth in Kharif II season showed the best performance in floating agriculture system.

Intercropping of snake gourd with kangkong on modern vs traditional floating bed cum trellis in Madaripur

M. Mohiuddin, Selim Ahmed

An intercropping based activity was conducted at Tetulbari area under Rajoir upazila in Madaripur district during Kharif-I season, 2023 to select the best one floating bed for crop productivity & to find out the cost and return both bed. Two treatments were considered as T_1 = Modern floating bed cum trellis, T_2 = Improved traditional floating bed cum trellis. Here, in modern system has bamboo structure beneath the floating bed whereas, improved traditional system doesn't possess any such structure beneath the floating bed. Three replications were placed. The variety of creeper vegetable was snake gourd (BARI Chichinga-1) and non-creeper vegetable was Kangkong (BARI Gimakolmi-1). Vegetables production using modern floating bed showed somehow higher compared to the improved traditional in terms of higher number of fruits plant⁻¹, larger fruit and higher yield. Improved traditional floating produced 256 kg together Sanke gourd and Kangkong whereas modern floating bed produced 246 kg. Only 5% vegetable increased over traditional. But improved traditional bed was more profitable in terms of economy because setting up a bamboo structure requires extra money. The gross margin was -3450 taka in modern but 955 taka was in improved traditional method.

Intercropping of watermelon with red amaranth & kangkong on traditional floating bed cum trellis in Madaripur

M. Mohiuddin, Selim Ahmed

An intercropping based activity was conducted at Aamgram area under Rajoir upazila of Madaripur district during the Kharif II season, 2023 to evaluate the performance of vegetables as intercrops growing on improve traditional bed and to find out cost and return. Two treatments were considered as treatment, T_1 = Water melon with red amaranth and T_2 = Water melon with kangkong. The variety of creeper vegetable was for Water melon (BARI Tormuj-1) and non-creeper vegetables were like Red amaranth (var. BARI Lalshak-1) and Kangkong (var. BARI Gimakolmi-1). Three replications were conducted. The result reveals that, the highest yield was obtained Water melon intercropped with Kangkong. The income increased 30.43% in Water melon with Kangkong intercropped combination in against of Water melon with Red amaranth.

On-farm assessment of yield and return from vegetable and spices under floating bed in north-eastern part of Bangladesh

M. Mohiuddin, M. I. Nazrul, M. A. Rahman and M. M. R. Talukder

This trial was conducted at waterlogged haor ecosystem of Fenchuganj upazilla under Sylhet district during two consecutive years of 2022-23 and 2023-24 to evaluate the performance of vegetable and spices under floating beds cultivation. Relay intercropping of seven different crops have been selected based on the previous performance trial and farmers' choice. Two sets of trials with five crop sequences including farmers practice viz. set-A [CS₁: sweet gourd (var. BARI Mistikumra-2) + tomato (var. BARI Hybrid Tomato-4) + kangkong (var. BARI Gimakol-1); CS₂: sweet gourd (var. BARI Mistikumra-2) + brinjal (var. BARI Begun-8) + kangkong (var. BARI Gimakol-1); CS₃: sweet gourd (var. BARI Mistikumra-2) + onion (var. BARI Paj-3) + kangkong (var. BARI Gimakol-1); CS₄: sweet gourd (var. BARI Mistikumra-2) + chilli (var. BARI Morich-2) + kangkong (var. BARI Gimakol-1); and CS₅ (FP): sweet gourd (local cultivar) + kangkong (local cultivar)]; set-B [CS₆: bottle gourd (var. BARI Mistikumra-2) + tomato (var. BARI Hybrid Tomato-4) + kangkong (var. BARI

Gimakol-1); CS₇: bottle gourd (var. BARI Mistikumra-2) + brinjal (var. BARI Begun-8) + kangkong (var. BARI Gimakol-1); CS₈: bottle gourd (var. BARI Mistikumra-2) + onion (var. BARI Pijaj-3) + kangkong (var. BARI Gimakol-1); CS₉: bottle gourd (var. BARI Mistikumra-2) + chilli (var. BARI Morich-2) + kangkong (var. BARI Gimakol-1); and CS₁₀(FP): bottle gourd (BARI Lau-4) + kangkong (local cultivar)] were used in this experiment. The yields of each non-creeper crops were determined in terms of respected creeper vegetables (sweet gourd and bottle gourd) equivalent yields (EY), which was computed by converting the yields based on the existing market price of each non-creeper crops. The highest fruit yields of sweet gourd (44.63 t ha⁻¹) and bottle gourd (54.36 t ha⁻¹) was observed in CS₄ (sweet gourd + chilli + kangkong) and CS₆ (bottle gourd + tomato + kangkong), which were statistically higher over other treatments whereas farmer's practices CS₅ (sweet gourd + kangkong) and CS₁₀ (bottle gourd + kangkong) gave the lowest fruit yields of 36.57 and 41.00 t ha⁻¹, respectively. The component crops performed better and produced higher yields in sequence of sweet gourd as compared to bottle gourd. Among the ten cropping sequences, the higher total equivalent yields 98.27 and 98.61 t ha⁻¹ and BCR 2.00 and 2.21 were obtained from CS₁ followed by CS₆, respectively. Based on the yields and monetary benefits, CS₁ (sweet gourd + tomato + kangkong) followed by CS₆ (bottle gourd + tomato + kangkong) is more suitable crop sequences for floating cultivation in haor region.

Performance of different intercropping system red amaranth with cole crops in floating bed at Gopalganj region

M. Mohiuddin, M Mhowlader and D Halder

Three intercropping system viz. cauliflower + red amaranth, cabbage + red amaranth and knolkhol + red amaranth were taken to test the suitability for intercrop in floating agriculture. The experiment was conducted at Tungipara and Sadar, Gopalganj during the rabi season of 2023-24. Among the three intercropping cauliflower + red amaranth gave the highest red-amaranth equivalent yield (9.93 t/ha), Gross return (248465Tk./ha) and BCR (2.17) while the lowest red-amaranth equivalent yield (8.50 t/ha), gross return (222425Tk./ha) and BCR (1.94) was recorded from cabbage + red amaranth intercropping.

Adaptive trial of winter onion varieties on floating bed in Laxmipur district

M. Mohiuddin, M.S. Islam and M.M. Bashir

Adaptive trial of winter onion varieties was conducted at Ramgong upazilla under Laxmipur district during 2023-24 to examine a suitable winter onion variety for the floating bed in the area. One BARI developed variety BARI Peaz-1 and Local were tested. Yield and yield contributing characters were observed higher in BARI Peaj-1. Bulb yield from BARI Peaz-1 was 9.74 t ha⁻¹ next to from local variety (7.52 t ha⁻¹). As output price was same for the two varieties cost and return performance followed the bulb yield. Gross return (Tk. 292200 ha⁻¹), gross return (Tk. 124800 ha⁻¹) and BCR (1.75) was found from BARI Peaz-1.

Adaptive trials of creeper vegetables on floating bed cum trellis (non-tidal model)

M.S. Islam, M.M. Bashir, M M. Howlader, D Halder, M. Mohiuddin and M. Y. H. Rayhan

The experiment was conducted at Laxmipur, Gopalganj and Kishoreganj districts during the cropping season of 2023-24 to increase the crop productivity of floating bed agriculture system as well as to increase the farmers' income. The variety of creeper vegetables were for bottle gourd (BARI Lau-4), sweet gourd (BARI hybrid Misti Kumra-1 and sweety), bitter gourd (Tiya), cucumber (Alavi green) and yard long bean (BARI Borboti-1). In case of Noakhali, the fruits yield of creeper vegetables obtained from bottle gourd, sweet gourd, bitter gourd, cucumber and yard long bean were 31.08, 26.43, 12.16, 20.64 and 6.72 t ha⁻¹, respectively. In case of Gopalganj, the fruits yield obtained from bottle gourd, sweet gourd and bitter gourd were 8.43, 5.95 and 3.78 t ha⁻¹, respectively. In case of Kishoreganj, the fruits yield obtained from bottle gourd, sweet gourd, bitter gourd, cucumber and yard long bean were 54.68, 39.64, 23.65, 22.82 and 8.17 t ha⁻¹, respectively. Bottle gourd produced the highest gross return, gross margin and BCR in all location.

Adaptive trial of BARI tomato varieties on floating bed

M. Mohiuddin

Adaptive trial of BARI tomato varieties was conducted at the Kishoreganj sadar and Karimganj upazilla of Kishoreganj district during 2023-24 to

examine a suitable tomato variety for the area. Two BARI developed varieties such as BARI tomato-19 and BARI tomato-21 were tested. The significantly highest yield was found from BARI tomato-21 (47.56 t/ha) and the lowest from BARI tomato-19 (44.94 t/ha). From financial analysis, BARI tomato-21 gave the highest gross return (332920 Tk./ha), gross margin (159420 Tk./ha) and benefit cost ratio (1.92) followed by BARI tomato-19.

Adaptive trial of selected turmeric varieties on floating bed

M M Howlader, D Halder and M. Mohiuddin

The experiment was carried out on water hyacinth based floating bed at Gopalganj and Kishoreganj during the cropping season 2023-24. Under this experiment four turmeric varieties in Gopalganj and Two varieties in Kishoreganj were used to evaluate their performance viz. BARI Holud-3, BARI Holud-4, BARI Holud-5 and local variety. Among the varieties, the highest yield was found from BARI Holud-4 (17.04 t/ha) in Kishoreganj and BARI Holud-5 (7.06t/ha) in Gopalganj.

Adaptive trial of different leafy vegetables on floating bed

M. Mohiuddin, M M Howlader and D Halder

The experiment was carried out on water hyacinth based floating bed at Metrodanga, Tungipara, Gopalganj during the cropping season 2023-24. The aim of the study was to identify the suitable leafy vegetable for floating bed and increase farmers income. Three leafy vegetables viz. Red amaranth, Amaranth and Spinach were tested under this experiment. Among the leafy vegetables red amaranth gave highest gross return and BCR which were 181350 Tk./ha and 1.63.

Production program of different non-creeper with green amaranth as intercropped on traditional bed in Madaripur

M. Mohiuddin, Selim Ahmed

Production program of creeper (Water melon, Bottle gourd, Sweet gourd and Yard long bean) and non-creeper vegetable (Green Amaranth) as intercropped system like Sweet gourd with Red amaranth, was conducted on traditional floating bed at Tetulbari area under Rajoir upazila of Madaripur during the year 2023-24 to study the performances of selected vegetables on floating bed system and to popularize those varieties among the farmers.

The program was performed with improved floating bed. An improved floating bed is to be made by only using of water hyacinth but water hyacinth is to be gathered on bamboo made platform in modern floating bed. As a result, production cost becomes lower in improved floating bed than modern bed. The size of each improved floating bed was 10 m² (7.5m x 1.3m) and trellis was 40 m² (8mx5m). The number of rows of sweet gourd per bed was 2, plant to plant distance was 1.5m and number of seedling/hill was 2. Weeding and cleaning of bed was done timely and pest management was also done by use of organic pesticide like sex pheromone trap, bio-pesticide etc.

Production program of different spices on plain land using decomposed water hyacinth in Madaripur

M. Mohiuddin, Selim Ahmed

Production program of different spices (garlic and onion) were conducted at Aamgram, Rajoir, Madaripur during 2023-24. All spices were grown on plain land mixing decomposed water hyacinth that was used in floating bed material. The objective was to observe the performances of selected spices and to popularize BARI varieties among the neighbour farmers. Intercultural operation (weeding and watering etc.) were done timely and pest management was also done by use of organic pesticide like sex pheromone trap, bio-pesticide etc.

Performance of selected vegetable and spices in floating bed in Brahmanbaria

M. Mohiuddin, M. Jamal Uddin, M. M. R. Talukdar

A performance trial was carried out on floating bed at the village of Kulikonda under Nasirnagar upazilla in Brahmanbaria district during 2023-24 under floating agriculture project with view to observe the performance of suitable Sweet gourd, Bottlegourd and Chilli hybrid variety in-terms of profitability and adaptability in that area. The hybrid variety sweetgourd variety (Chita), Bottlrgourd (Badsha) and Chill(1701) at the floating bed. Results shows that the hybrid bottlegourd (Badsha) gave the highest yield (52.0 t/ha) followed by Hybrid Misty Kumra Chita, 46.42 t/ha and 42.29t/ha green chilly for hybrid(1701). The highest benefit cost ratio (BCR) was found to

3.66 from Chilli followed hybrid bottlegourd 2.70 and 1.97 for sweetgourd.

Production programme of vegetables and spices on floating bed in Bangladesh

M. Mohiuddin, Selim Ahmed, M M Howlader and D Halder, T.S. Munmun, M.K. Islam, M.H. Rashid and M. Rahman

The Production programme for creeper, non-creeper vegetables and spices were conducted at 3 districts of Bangladesh such as Faridpur, Gopalganj and Khulna during 2023-2024 to popularize different varieties of creeper and non-creeper vegetables and spices at the farmers' field condition on floating bed. Tested all varieties were performed well.

Seaweed cultivation

Performance of BARI seaweed-1 and BARI seaweed-2 in different months in nuniarchara, cox'sbazar

R. A. Kanta, M. S. Bhuiyan and M. Ahmed

Seaweeds are crops of winter season. The best time to cultivate seaweed is from October to March of the year, i.e. six months a year. During these six months six cuts can be made which means that we can harvest seaweeds after one month of each seeding. But each harvest does not produce the same yield because of variation in water quality and wave pressure from month to month during the cultivation season. Monthly production of BARI Seaweed-1 and BARI Seaweed-2 was carried out at Nuniarchara sand-flat, Cox'sbazar during Rabi season 2023-2024. The estimated total fresh yield of *Gracilaria tenuistipitata* and *Ulva lactuca* was 99.75 ± 8.02 ($\approx 16.32 \pm 2.30$ ton dry) ton and 31.25 ± 4.44 ($\approx 4.25 \pm 0.77$ ton dry) ton per hectare respectively in open sea of Nuniarchara during October/2023 to March/2024.

Performance of BARI seaweed-1 and BARI seaweed-2 in different months in rejukhal, cox's bazar

R. A. Kanta, M. S. Bhuiyan and M. Ahmed

Monthly production of BARI Seaweed-1 and BARI Seaweed-2 was carried out at Rejukhal, Ukhiya during Rabi season 2023-2024. The seaweed was cultivated using semi-floating

method. The estimated total fresh yield of *Gracilaria tenuistipitata* was 89.95 ± 9.66 ($\approx 14.45 \pm 2.38$ ton dry) ton during October/2023 to March/2024 and 7.72 ± 1.32 ($\approx 1.78 \pm 0.60$ ton dry) ton per hectare for *Ulva lactuca* during November/2023 to March/2024 in open sea of Rejukhal.

Production program of *Hypnea boergesenii* in open-sea using floating raft technique

R. A. Kanta, M. S. Bhuiyan and M. Ahmed

Hypnea boergesenii is an indigenous red seaweed species which has high commercial value for its carrageenan content. Due to its fragile body structure, it is very difficult to grow in open sea due to high wave pressure. Floating raft technique is newly introduced seaweed cultivation technology and it has been observed that the yield of BARI Seaweed-1 was relatively higher in this method than other existing methods. Therefore, this study was conducted during Rabi season 2023-24 to find out the feasibility of the technique to grow *Hypnea boergesenii* and estimate the yield in open sea. The performance of *Hypnea boergesenii* by floating raft method at Nuniarchara was good and the fresh yield was 11.95 t/ha, dry yield was 1.43 t/ha with an average length of 52 cm.

Project: On-Farm Trials with Advance Lines and Technologies

Tuber crops

Adaptive trial with newly released potato varieties in different locations

M.J. Alam, A.A. Mahmud, M.J. Uddin, M.I. Nazrul, M.R. Amin, M.E. Haque, M.K. Islam, S. Roy, M.A. Rahaman, T. Tasmima, K. Roy, G. Paul, M. Mohiuddin, M. Y.H. Rayhan, M.M. Howlader and D. Halder

Two set of trials were carried out at farmers' fields in 7 (Seven) locations under two ecosystems, viz low land/haor and plain land ecosystem during the rabi season of 2023–2024 to assess the performance of high-yielding potato varieties and learn about farmers' preferences regarding the varieties. Considering the low land ecosystem, the average tuber yield varied from 25.13 to 35.28 across different testing locations. Sylhet was identified as

the most favorable environment for potato production, with an average yield of 35.28 tons per hectare, followed by Manikganj with 32.81 tons per hectare. On the other hand, the environmental conditions in Cumilla were less conducive to potato cultivation, resulting in an average yield of 24.40 tons per hectare. Again, in plain land ecosystem, the average potato yield varied between 37.50 and 39.08 across different locations. The Gopalganj region was identified as the most favorable environment for potato production, with a yield of 39.08 tons per hectare, followed by Rangpur with a yield of 37.50 tons per hectare. In contrast, Tangail was found to be less productive with a yield of 37.45 tons per hectare. The choices made by farmers for potato variety selection varied based on tuber shape and size, skin color, plant growth, yield potential, and market price. This variation was observed across different locations. However, in lowland and haor ecosystems, BARI Alu-47, BARI Alu-62, BARI Alu-87, and BARI Alu-88 were found to be the best-performing potato varieties. For plain land ecosystems, BARI Alu-62, BARI Alu-79, BARI Alu-87, BARI Alu-88, and BARI Alu-91 were the top performers. Considering both ecosystems, BARI Alu-62, BARI Alu-87, and BARI Alu-88 are suitable for cultivation and may be recommended for growing nationwide.

Selection and dissemination of drought resistant potato varieties for char land areas from existing mega varieties

M.J. Alam, A.A. Mahmud, M.J. Uddin, M.R. Amin, M.E. Haque, and M.K. Islam

These trials were conducted at farmers' field of Gaibandha, Brahmanbaria, Manikgonj and Kurigram charland area during the rabi season of 2023-24 to select the suitable potato varieties suitable to char areas. Eight potato varieties viz. BARI Alu-7, BARI Alu-13 BARI Alu-25, BARI Alu-62, BARI Alu-72, BARI Alu-73, BARI Alu-78 and BARI Alu-79. Among the tested potato varieties BARI Alu-62, BARI Alu-72, BARI Alu-78 and BARI Alu-79 performed better in char areas of different districts. The average highest tuber yield recorded from BARI Alu-79 (33.51 t ha⁻¹) followed by BARI Alu-62 (28.80 t ha⁻¹) and BARI Alu-78 (28.25 t ha⁻¹) whereas the lowest was from BARI Alu-25 (20.68 t ha⁻¹).

Promotion and dissemination of newly released climate-smart (heat and salt tolerant) potato varieties in the coastal areas of Bangladesh

M.J. Alam, A.A. Mahmud, M. H. Rashid, M. Rahman, M. K. Islam, T. S. Munmun, M. Ahmed, M.S. Bhuiyan, M.M. Islam, H.M.K. Bashar and M.S.I. Khan

Three climate-smart (heat and salt tolerant) potato varieties BARI Alu-72, BARI Alu-73, and BARI Alu-78 were evaluated at the farmer's field in three locations. The tuber yield ranged from 20.40-33.60 t ha⁻¹, where the highest yield was recorded from BARI Alu-78 (33.60 t ha⁻¹) in Cox's Bazar and the lowest from BARI Alu-7 is the same location. Considering the varieties, the maximum tuber was produced by BARI Alu-78 (29.98 t ha⁻¹), followed by BARI Alu-72 (28.28 t ha⁻¹). Among the three locations, the average maximum tuber yield was produced in Cox's Bazar (26.38 t ha⁻¹) and the minimum was in Patuakhali (24.86 t ha⁻¹).

On farm trial of sweet potato varieties in different locations

M.J. Alam, A.A. Mahmud, M.M. Rahman, A.K.M.Z.U. Noor, S. Ahmed, N. Sultana, M.M. Zaman, M.M. Howlader and D. Halder

The field trial was conducted with seven sweet potato varieties at four different sites in 2023-2024 to compare the performance of each variety and get farmers' choice. The root yield of sweet potato varieties ranged from 10.83 to 42.10 t ha⁻¹, where BARI Mistialu-14 produced the maximum root yield (42.10 t ha⁻¹) in Gopalganj whereas BARI Mistialu-8 produced the lowest root yield (10.83 t ha⁻¹) in Rajbari. Considering location, Gopalganj showed the maximum mean root yield (38.43 t ha⁻¹), followed by Mymensingh (25.96 t ha⁻¹) and Jamalpur (20.21 t ha⁻¹) while Rajbari showed the minimum (14.68 t ha⁻¹).

Demonstration of BARI released varieties of mukhikachu in different locations

M.J. Alam, A.A. Mahmud, G. Paul, M.A. Rahaman, S. Roy, K. Roy, T. Tasmima, M.I. Nazrul, M.M. Rahman, A.K.M.Z.U. Noor, N. Sultana, M.S. Rahman, M.N.A. Siddique, M.J. Islam, M.M.I. Chowdhury, M.J. Uddin, M.S. Alam, M.M. Alam, M. Ahmed and M.H. Rahman

The experiment was carried out at seven different places with three different Mukhikachu

varieties during kharif season of 2023 to assess their performance in farmers' fields and to gain popularity among them. The corm yield varied from 15.32 to 30.53 t ha⁻¹ across the locations where the maximum yield (30.53 t ha⁻¹) was recorded from BARI Mukhikachu-1 in Sylhet and the lowest (15.32 t ha⁻¹) was recorded from local cultivar in Narsingdi. According to location, Cumilla had the highest average corm yield (27.87 t ha⁻¹), followed by Gaibandha (26.79 t ha⁻¹) and Sylhet (25.74 t ha⁻¹) whereas Rajshahi had the lowest average corm yield (18.46 t ha⁻¹). Among the varieties, the average maximum yield observed in BARI Mukhikachu-1 (25.71 t ha⁻¹), similar to BARI Mukhikachu-2 (25.31 t ha⁻¹).

Demonstration of BARI released varieties of panikachu in different locations

M.J. Alam, A.A. Mahmud, S. Roy, M.A. Rahaman, T. Tasmima, G. Paul, K. Roy, M.M. Rahman, A.K.M.Z.U. Noor, M.J. Uddin, M. Mohiuddin, M.Y.H. Rayhan, M.A. Islam, M.M. Zaman and N. Sultana

The experiment was carried out in six distinct places during the kharif season of 2022-2023 to assess the performance of Panikachu varieties. The stolon yield of the Panikachu varieties ranged from 5.87 to 32.40 t ha⁻¹, where BARI Panikachu-1 in Cumilla recorded the highest yield (32.40 t ha⁻¹) and BARI Panikachu-5 in Gaibandha recorded the lowest (5.87 t ha⁻¹). On the other hand, the rhizome yield varied from 8.00 to 77.87 t ha⁻¹, with BARI Panikachu-6 in Mymensingh recorded the highest yield (77.87 t ha⁻¹) and BARI Panikachu-1 in Tangail recorded the lowest (8.00 t ha⁻¹). Considering the locations, the average maximum stolon (22.46 t ha⁻¹) and rhizome (39.37 t ha⁻¹) were produced in Cumilla and Mymensingh whereas the average minimum stolon (11.80 t ha⁻¹) and rhizome (8.45 t ha⁻¹) were produced in Gaibandha and Tangail, respectively.

Demonstration of BARI released varieties of elephant foot yam

M.J. Alam, A.A. Mahmud, M. Mohiuddin and M.Y.H. Rayhan

The field trial was executed at Sadar upazila of Kishoreganj during the year 2022-23 to know the performance of BARI released Ol kachu varieties in the study area. Three varieties were selected for this experiment viz; BARI Olkachu-1, BARI Ol

kachu-2 and local. The highest rhizome yield was obtained from BARI Olkachu-1 (30.32 t ha⁻¹) and the lowest from local variety (25.31 t ha⁻¹). The highest gross return (303200 Tk. ha⁻¹) gross margin (116620 Tk. ha⁻¹) was calculated from BARI Olkachu-1 and the lowest from local variety (Gross return 253700 Tk. ha⁻¹ and gross margin 67120 Tk. ha⁻¹).

Horticultural crops

On-farm trial of BARI hybrid tomato varieties during winter season

The experiment was conducted at Noyadingi village under Satura upazila, Boinna village under Ghior upazila of Manikganj; Panchbaria, Shercol, Singra of Natore; Shibpur of Narsingdi; and FSRD site, Gopalganj Sadar and Tungipara of Gopalganj district during Rabi season of 2023-24 to evaluate the performance of BARI released winter hybrid tomato varieties in the farmers' field. Different BARI winter hybrid tomato varieties, viz. BARI hybrid Tomato-5, BARI hybrid Tomato-7 and BARI hybrid Tomato-9 along with commercial hybrids were evaluated in Manikganj and Narsingdi district. Moreover, two varieties viz. BARI Tomato-19 and BARI Tomato-21, and four varieties viz. BARI Tomato-15, BARI Tomato-16, BARI Tomato-18 and BARI Tomato-21 were evaluated in Natore and Gopalganj, respectively. The highest fruit yield (67.16 t ha⁻¹) was recorded in Bahuboli hybrid followed by BARI hybrid tomato-5 (62.62 t ha⁻¹) and BARI hybrid tomato-9 (62.14 t ha⁻¹) in Manikganj. BARI Hybrid Tomato-5 produced the highest fruit yield 95.20 t ha⁻¹ in Narsingdi. Among two varieties, BARI Tomato-21 produced the higher yield (61.72 t ha⁻¹) in Natore, and BARI tomato-15 produced significantly highest fruit yield (78.40 t ha⁻¹) over BARI Tomato-21 in Gopalganj farmer's field.

On farm trial of BARI developed summer hybrid tomato varieties

The experiment was conducted at Katigram village under Manikganj Sadar upazila and Banglabazar, Cox'sbazar sadar during Kharif season of 2023. Two summer hybrid tomato varieties viz. BARI Hybrid Tomato-8 and BARI Hybrid Tomato-11 along with local cultivar were evaluated in the study. BARI Hybrid Tomato-11 (14.30 t ha⁻¹) gave

18.64% higher yield compared to BARI Hybrid Tomato-8 (11.21 t ha⁻¹) in Manikganj. In contrast, BARI Hybrid Tomato-8 produced 11% higher fruit yield (48.40 t ha⁻¹) than BARI Hybrid Tomato-11 (43.56 t ha⁻¹) in Cox's Bazar. Higher gross margin (Tk. 379105 ha⁻¹) and BCR (2.12) was also obtained from BARI Hybrid Tomato-11 than BARI Hybrid Tomato-8 with gross margin Tk. 224605 ha⁻¹ and BCR (1.66) in Manikganj.

On-farm trial of BARI hybrid brinjal varieties

An on-farm trial was conducted at Gopalganj Sadar and Tungipara under Gopalganj district, Noyadingi., Kamta and Mohishaloha village under Saturia upazila of Manikganj, and MLT site Bhuapur Tangail during Rabi season of 2023-24 to evaluate the performance of BARI released hybrid brinjal varieties at farmers' field. There are three hybrid Brinjal varieties like BARI Hybrid Begun-4, BARI Hybrid Begun-6 and Super Singnath (check) in Gopalganj; BARI hybrid begun-4, BARI hybrid begun-5, BARI hybrid begun-6 and Lalteer hybrid in Manikganj district; and BARI Begun-12 and local as check were evaluated in Tangail. In Gopalganj, BARI Hybrid Begun-6 gave highest yield 36.5t ha⁻¹ and lowest yield 24.85t ha⁻¹ was recorded by Super Singnath (check). In Manikganj, higher yield was obtained from BARI hybrid begun-5 (35.00 to 43.32 t ha⁻¹) followed by BARI hybrid begun-6 (38.04 to 40.03 t ha⁻¹), BARI hybrid begun-4 (30.82 to 33.63 t ha⁻¹ and the lowest yield was recorded in Lalteer hybrid (26.50 to 30.47 t ha⁻¹). At Tangail, BARI Begun-12 produced the highest yield (31.93 t ha⁻¹) whereas local variety produced the lowest yield (22.40 t ha⁻¹).

On-farm trial of BARI developed sweet pepper varieties

An On-Farm trial of sweet pepper varieties was conducted at Reicha and Sualok of Bandarban Sadar and FSRD site Atia, Tangail under two different technologies (Net and Without net) during Rabi season of 2023-24. The capsicum varieties T₁= BARI Mistimorich-1, T₂= BARI Mistimorich-2, T₃= Astha Mistimorich, and T₄= Green Cape were used in Bandarban hilly areas, and BARI Mistimorich-1 and BARI Mistimorich-2 were evaluated in Tangail. The experiment was conducted in RCB design with three replications. In both open field (without net) and protective condition of Bandarban, the highest average fruit yield 21.65 t ha⁻¹ and 25.84 t ha⁻¹, respectively were

found from Green Cape and the lowest from BARI Mistimorich-1 (12.96 t ha⁻¹ and 17.18 t ha⁻¹). Maximum pest infestation was found in Astha mistimorich (20.83%) in open fields. In Tangail, the highest fruit yield (14.18 t ha⁻¹) was recorded from the variety BARI Mistimorich-1 compare to BARI Mistimorich-2 (13.40 t ha⁻¹).

On-farm trial of BARI developed stem amaranth varieties

An on-farm trial was conducted with three amaranth varieties during rabi season of 2023-24 to find out the performance of new released amaranth varieties among the farmer's at FSRD Site, Tarakandi, Sherpur sadar, Sherpur. Three amaranth varieties viz., BARI Danta-3, BARI Danta-4, and Local one were included in this trial. Results obtained from the study indicated that the highest stem yield (48.55 t ha⁻¹) was recorded from BARI Danta-3 which was followed by BARI Danta-4 (41.02 ha⁻¹) and local one produced the lowest stem yield (25.70t ha⁻¹). The highest gross return (Tk. 7,28,250/-ha⁻¹) and gross margin (Tk. 6,00,375/-ha⁻¹) was recorded from BARI Danta-3 and local one gave the lowest gross return (Tk.3,85,500/-ha⁻¹) and gross margin (Tk.2,57,225/-ha⁻¹).

On-farm trial of yard long bean varieties

The experiment was conducted in the farmer's field at Trishal Upazila, Mymensingh during the summer of 2022-2023 to evaluate the performance of yard long bean varieties. The BARI Borboti-1 performed better in the tested location. BARI Borboti-1 gave the highest yield (17t ha⁻¹), followed by the local cultivar Toki (13.9 t ha⁻¹). The highest gross return (766,350 Tk ha⁻¹) and gross margin (578,400 Tk ha⁻¹) were recorded from BARI Borboti-1 while BARI Borboti-2 gave the lowest gross return (547,200Tk ha⁻¹) and gross margin (409,250 Tk. ha⁻¹).

On-farm trial of BARI developed winter country bean varieties in hilly areas of bandarban

An On-Farm trial was conducted at hill valleys of Bandarban sadar during the rabi season, 2023-24 to evaluate the performance of BARI-developed winter Country bean varieties in farmers' fields. The treatments were T₁= BARI Sheem-1, T₂= BARI Sheem-6, T₃= BARI Sheem-10, and T₄=Local variety as check. The experiment was laid out in RCB design with three dispersed replications.

BARI Sheem-6 gave the highest fruit length, individual fruit weight, and yield (18.53 cm, 13.05 g, and 16.73 t ha⁻¹) whereas the local variety gave the lowest yield (13.12 t ha⁻¹). From the cost-return analysis it was found that the highest gross return was found from BARI Sheem-6 (Tk.585550 ha⁻¹) with BCR of 3.71 followed by BARI Sheem-1 (Tk.505750 ha⁻¹ and 3.20). The lowest gross return (Tk.419840 ha⁻¹) and BCR (2.66) were found from the local sheem.

On-farm trial of BARI developed hybrid pumpkin variety

The trial of hybrid sweet gourd varieties was conducted at the MLT site, Madhupur, Tangail during the Rabi season of 2023-24 to evaluate the performance of BARI developed sweet gourd varieties in the farmers' field. BARI released hybrid sweet gourd varieties viz. BARI Hybrid Mistikumra-2, BARI Hybrid Mistikumra-3 were tested against locally available hybrid namely sweet ball. The experiment was laid out in RCB design with five replications. BARI Hybrid Mistikumra-2 produced the highest fruit yield (45.97 t ha⁻¹) resulting in a maximum gross margin (Tk. 543093 ha⁻¹) whereas the lowest fruit yield (Tk. 35.90 t ha⁻¹) and gross margin (Tk. 392043 ha⁻¹) obtained from Sweet ball.

On-farm trial of BARI hybrid bitter gourd varieties at manikganj

The experiment was conducted at Kamta village under Saturiapazila and Ramnagar village under Shibaloya upazila of Manikganj district during Kharif-I season of 2023-24. The experiment was laid out in RCB design with six dispersed replications. Two BARI varieties viz. BARI Hybrid Korola-2, BARI Hybrid Korola-3 were evaluated with a locally available hybrid (Glory hybrid) as check. Higher yield was obtained from BARI Hybrid Korola-2 (25.10 to 26.16 t ha⁻¹) followed by glory hybrid (21.70 to 22.26 t ha⁻¹) and the lowest yield were recorded in BARI Hybrid Korola-3 (19.22 to 19.55 t ha⁻¹). Higher gross margin (Tk. 919790 to 877390 ha⁻¹) and BCR (8.27 to 7.92) were also obtained from BARI Hybrid Korola-2 and gross margin (Tk. 763790 to 741390 ha⁻¹) with BCR (6.84 to 7.04) from Glory hybrid. The lowest gross margin (Tk. 642190 to 655390 ha⁻¹) with lower BCR (6.08 to 6.18) was obtained from BARI Hybrid Korola-3.

On farm trial of watermelon varieties in joypurhat and faridpur

The experiment was carried out at the MLT site, Joypurhat and FSRD site, Faridpur during the kharif II season of 2023, to observe the performance of two promising BARI watermelon varieties, i.e., BARI Tarmuj -1, BARI Tarmuj -2 among the farmers regarding its yield potentiality. The experimentation consisted of three treatments, i.e., BARI Tarmuj -1, BARI Tarmuj -2 and Bangla Link and/ or Sugar king (local). The highest yield of was recorded from BARI Tarmuj -1 and it was 36.18 t ha⁻¹ in Joypurhat and 25.17 t ha⁻¹ in Faridpur. The highest market price contributed to the highest gross return Tk 1548450 ha⁻¹ (Joypurhat) obtained from Bangla Link.

On farm trial of BARI gladiolus varieties in mymensingh region

A trial on gladiolus was conducted at Mymensingh and Sherpur region under close supervision of On Farm Research Division of Bangladesh Agricultural Research Institute, Mymensingh and Sherpur during 2023-2024 to evaluate the comparative performance and to disseminate the BARI released gladiolus varieties at farmers' field. The trial was consisted of three gladiolus varieties viz. BARI Gladiolus-2, BARI Gladiolus-3 and local for Mymensingh region, and BARI Gladiolus-3, BARI Gladiolus-4 and BARI Gladiolus-5 for Sherpur region. The yield performance of those varieties appeared to be promising in these regions. In Mymensingh, significantly the highest spike yield was obtained from BARI Gladiolus-3 (219000 spike ha⁻¹) followed by BARI Gladiolus-2 (165000 spike ha⁻¹) and in Sherpur, The highest spike yield was obtained from BARI Gladiolus-4 (232933 spike ha⁻¹) followed by BARI Gladiolus-5 (225666 spike ha⁻¹). The lowest yield of gladiolus as per spike was recorded from local (163667 spike ha⁻¹, in Mymensingh) and BARI Gladiolus-3 (215733 spike ha⁻¹, in Sherpur). From the study in Mymensingh region, the highest gross return (Tk.2847000ha⁻¹) was estimated from BARI Gladiolus-3 followed by BARI Gladiolus-2 (Tk. 2145000ha⁻¹). Maximum gross return (Tk.3139330 ha⁻¹) was estimated from BARI Gladiolus-4 in Sherpur. Considering the yield potentiality, disease and insect infestation, BARI Gladiolus-3 and BARI Gladiolus-2 might have been chosen for promotion and dissemination in Mymensingh region.

Oilseed crops

On-farm trial of short duration mustard varieties in different location of Bangladesh

An on-farm trial was conducted at Char Komorpur, Pabna, BARInd, Rajshahi, Bholasadar and Doulatkhan under Bhola district, Chokoria under Coxsbazar district and Bandarban during the Rabi season of 2023-24 to assess the performance of short duration mustard varieties in different ecosystems. Six varieties (viz. BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-20, Binasarisha-9, Binasarisha-11 and Tori-7), four varieties (viz. BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-20 and BinaSarisha-9), three varieties (viz. BARI Sarisha-17, BARI Sarisha-18 and BARI Sarisha-20), four varieties (viz. BARI Sarisha-14, BARI Sarisha-15, BARI Sarisha-17 and local) and three varieties (viz. BARI Sarisha-14, BARI Sarisha-19 and local) were used for the trial in Pabna, Bhola, BARInd, Bandarban and Coxsbazar respectively. Different varieties performed better in different locations. All tested BARI varieties of Mustard produced significantly higher yield ranging from 20-71% in every locations against local check varieties. Maximum grain yield (1.88 t ha⁻¹) was obtained from BARI Sarisha-20 in Pabna, BARI Sarisha-18 (1.93 t ha⁻¹) in BARInd, BARI Sarisha-17 (1.41 t ha⁻¹) in Bhola, BARI Sarisha-14 (1.46 t ha⁻¹) in Bandarban and BARI Sarisha-19 (1.93 t ha⁻¹) in Coxsbazar. Obviously, the gross margin was maximum in the BARI developed

On farm trial of sesame varieties in different locations in Bangladesh

The on-farm trial was conducted in charland situation at the MLT site Bhuapur, Tangail and at farmers' field of Rajendrapur, Netrokona during the Kharif 2023 to test the performance of newly developed BARI sesame varieties and to popularize them among the farmers. The trial was laid out in RCB design in three farmers' fields considered as three replications in Bhuapur, Tangail and six replications in Rajendrapur, Netrokona. Three varieties viz., BARI Til-4, BARI Til-5, and BARI Til-6 variety were tested in Bhuapur, Tangail and four varieties viz., BARI Til-2, BARI Til-4, BARI Til-6 and local cultivar in Rajendrapur, Netrokona. The highest numerical seed yield was observed in BARI Til-4 (1.46 t ha⁻¹) in Bhuapur, Tangail and the highest seed yield was also found in BARI Til-6 (1.38 t ha⁻¹) in Rajendrapur, Netrokona. Obviously,

the gross margin was maximum in BARI Til-4 and BARI Til-6 varieties against check variety due to their highest yield potentiality.

On-farm trial of groundnut varieties in different locations in Bangladesh

On-Farm trial of groundnut was conducted in farmer's field at Gopalgong sadar, Pirojpur sadar and Chilmari, Kurigram during Rabi season of 2023-24 to find out the suitable groundnut variety(s) for different locations. Four BARI developed groundnut varieties viz., BARI Chinabadam-8, BARI Chinabadam-9, BARI Chinabadam-10 and BARI Chinabadam-11 were evaluated in Chilmari, Kurigram and BARI Chinabadam-8, BARI Chinabadam-9 at Gopalgong sadar and Pirojpur sadar in the study. In every location Chinabadam Dhaka-1 was used as check. All tested BARI varieties of groundnut produced significantly higher yield ranging from 21-61% in every locations against local check variety Dhaka-1. Among the locations, BARI Chinabadam-9 produced the highest nut yield in all tested locations where 2.49 t ha⁻¹ was produced in Gopalgong sadar and Pirojpur sadar and 2.36 t ha⁻¹ in Chilmari, Kurigram. Obviously, the gross margin was maximum in the BARI developed varieties against check variety due to the highest yield potentiality and similar market price. Thus BARI varieties can be extended in tested areas by replacing local check variety to boost up groundnut production in Bangladesh.

On-farm trial of soybean varieties in saline area

The experiment was conducted in the farmer's field of Noakhali and khulna region during Rabi season of 2023-2024 to select suitable soybean variety(s) for saline condition. The experiment was laid out in RCB design with six dispersed replications. Twelve soybean varieties developed by different research organizations and universities were used in the experiment in Noakhali and four soybean varieties were included in the experiment in Khulna. In Noakhali, the highest seed yield was obtained from BARI Soybean-6 (3.26 t ha⁻¹) which was at par with that of BU Soybean-2 (3.11 t ha⁻¹) and the lowest yield (1.92 t ha⁻¹) was obtained from Shohag. BARI Soybean-6 gave the highest gross margin (Tk. 145850 ha⁻¹) next to BU soybean 2 (Tk. 136850 ha⁻¹). On the other hand, the highest seed yield was produced by BARI Soybean-7 (2.13 t ha⁻¹) and BARI Soybean-6 (1.91 t ha⁻¹) and got farmers preferences in Khulna.

Pulse crops

On-farm trial of lentil varieties in high BARInd tract

M.E.A. Pramanik and M.S. Hossain

An experiment was carried out at FSRD site Basantapur under FSRD site, Godagari, Rajshahi during rabi season of 2023-24. Six treatments viz. E₁=BLX-09015, E₂=BLX-05002-3, E₃=LRIL-21-1-1-1-1, E₄=LRIL-21-1-1-1-1-6, E₅=BLX-05002-6, E₆=BARI Masur-8 were used in the experiment. The experiment was laid out in RCB design with 6 replications. The highest yield (1.85 t ha⁻¹) was obtained from BARI Masur-8 followed by E₂=BLX-05002-3 (1.76 t ha⁻¹) and the lowest was recorded from E₄=LRIL-21-1-1-1-1-6 (1.40 t ha⁻¹).

Yield and odap content variation of advanced grass pea genotypes in drought prone areas in Bangladesh

M.E.A. Pramanik, M.S. Hossain and M.M. Rahman

An experiment was carried out at FSRD site, Basantapur, Godagari, Rajshahi during Rabi season of 2023-24 to identify drought tolerant grass pea genotypes considering yield and ODAP content variation of among the genotypes in selected areas. Ten treatments viz. E₁=IGYT-110, E₂=IGYT-122, E₃=IGYT-123, E₄=IGYT-124, E₅=IGYT-125, E₆=BGP-1309, E₇=BGP-1310, E₈=116690, E₉=114585, E₁₀=BARI Kheshari-3 were used in the experiment. The experiment was laid out in RCB design with 3 replications at BARInd Region. The highest yield (1.93 t ha⁻¹) was obtained from E₅=IGYT-125 and the lowest was from E₇=BGP-1310 and E₉=114585 (1.18 t ha⁻¹).

Adaptive trial with BARI released grasspea varieties in Gopalganj district

M.M. Howlader and D. Halder

The experiment was conducted at four locations Gopalganj Sader and Tungipara under Gopalganj district and Najirpur and Pirojpur under Pirojpur district during rabi season in 2023-24 to evaluate the performance of tested grass pea varieties. Four selected Grass pea varieties viz. BARI Kheshari-2, BARI Kheshari-3, BARI Kheshari-5 and local were evaluated in the trial. Among the varieties, the highest seed yield was founded by BARI Kheshari-5 (1.71 t ha⁻¹) and the lowest grain yield (1.14t ha⁻¹)

recorded by BARI Kheshari-2 and it followed by yield of (1.15 t ha⁻¹) local variety.

Regional yield trial of field pea in high BARInd tract

M.E.A. Pramanik and M.S. Hossain

The field trial was carried out at the farmer's field of FSRD site, Basantapur, Godagari, Rajshahi during rabi season 2023-24 to select suitable field pea variety through regional yield trial (RYT) under drought prone area. Three genotypes of field pea viz. BFPX-16003, BFPX-16005, BFPX-16008 and two varieties BARI Motor-1 and BARI Motor-3 as check were tested in the farmer's field. Among the tested genotypes and variety, BFPX-16005 gave the maximum seed yield (1.15 t ha⁻¹) followed by BARI Motor-3 (1.11 t ha⁻¹) and the minimum seed yield was obtained from BARI

Regional yield trial of chickpea in high BARInd tract

M.E.A. Pramanik and M.S. Hossain

The field trial was carried out at the farmer's field of FSRD site, Basantapur, Godagari, Rajshahi during rabi season 2023-24 to select suitable chickpea g through regional yield trial (RYT) under drought prone area. Four genotypes of chickpea viz. BCX-16005-4, BCX-16010-2, BCX-16006-1, BCX-16006-2 and two varieties namely BARI Chola-5 and BARI Chola-10 as a check were tested in the farmer's field. Among the tested genotypes BCX-16006-2 gave the maximum seed yield (1.43 t ha⁻¹) followed by BARI Chola-5 (1.32 t ha⁻¹) and minimum seed yield obtained from BCX-16005-4 (1.21 t ha⁻¹) and BCX-16010-2 and BARI Chola-10 (1.22 t ha⁻¹) which were statistically similar.

Preliminary yield trial of chickpea

M.E.A. Pramanik and M.S. Hossain

The field trial was carried out at the farmer's field of FSRD site, Basantapur, Godagari, Rajshahi during rabi season 2023-24 to select suitable chickpea variety through regional yield trial (RYT) under drought prone area. Eight genotypes of chickpea viz. BCX-17002-3, BCX-17005-8, BCX-17006-6, BCX-17007-2, BCX-17007-6, BCX-17008-10, BCX-17009-1, BCX-17009-3 and two BARI released varieties BARI Chola-5 and BARI Chola-10 as check were tested in the farmer's field. Among the tested genotypes, BCX-17007-6 gave the maximum seed yield (1.69 t ha⁻¹) followed by

BCX-17007-2 (1.51 t ha⁻¹) and minimum seed yield was obtained from BCX-17008-10 (1.19 t ha⁻¹) due to minimum pods per plants.

On-farm adaptive trial of chickpea varieties in high BARInd tract

M.E.A. Pramanik and M.S. Hossain

The on-farm field trial was carried out at FSRD site, Basantapur, Godagari, Rajshahi, during 2023-24 to evaluate the performance of BARI developed chickpea varieties. The tested varieties were BARI Chola-5, BARI Chola-9, BARI Chola-10 and BARI Chola-11 evaluated at the farm level. BARI Chola-9 gave the maximum seed yield (1.66 t ha⁻¹) followed by BARI Chola-5 (1.46 t ha⁻¹) and the minimum seed yield was obtained from BARI Chola-10 (1.27 t ha⁻¹) among the tested varieties.

On farm trial of promising chickpea varieties in high BARInd tract

M.E.A. Pramanik and M.S. Hossain

The field trial was carried out at the farmer's field of FSRD site, Basantapur, Godagari, Rajshahi during rabi season 2023-24 to select suitable chickpea variety under drought prone area. Three genotypes of chickpea viz. ICCV 181634, BCX-1300z-2, ICCV 181627 and two varieties BARI Chola-5 and BARI Chola-10 as check were tested in the farmer's field. Among the genotypes, ICCV 181627 showed the maximum pods plant⁻¹ (74.66) followed by ICCV 181634 (62.00) while minimum pods plant⁻¹ (34.66) from BARI Chola-10. The ICCV 181627 gave the maximum seed yield (1.57 t ha⁻¹) followed by line ICCV 181634 (1.47 t ha⁻¹) and minimum from BARI Chola-10 (1.26 t ha⁻¹).

Adaptive trial with mungbean varieties

R. Uddin and B. C. Kundu

Mungbean productivity in south central coastal region of Bangladesh is declining due to lack of adoption of improved varieties. Suggestions on location specific performance and economic profitability of mungbean varieties are necessary for rapid adoption. A field trial was conducted at RARS, Rahmatpur, BARIshal during Rabi season of 2023-24 to evaluate the performance of existing improved mungbean varieties. Four selected mungbean varieties including BARI and BINA mungbean varieties viz BARI Mung-6, BARI Mung-7, BARI Mung-8 and Bina moog-8 were evaluated in the trial. Results showed that, the

highest seed yield (1551.6 kg/ha) was produced by the variety BARI Mung-6 which was followed by BARI Mung-7 (1448.9 kg/ha) and Bina moog-8 (1409.7 kg/ha) and the lowest grain yield (1372.2 kg/ha) was obtained in BARI Mung-8.

On farm trial of blackgram varieties in netrokona

M. A. Islam, M.M. Zaman and N. Sultana

An adaptive trial of blackgram and a local check was conducted in the farmer field of Rajendrapur, Challisha under Netrakona district during Kharif-II season of 2023 to evaluate the performance and adaptability. The highest seed yield was recorded from BARI Mash-4 (1480 kg ha⁻¹) followed by BARI Mash-3 (1399kg ha⁻¹) and the lowest seed yield was obtained from local check (1280 kg ha⁻¹). The highest gross return (Tk.222000.00 ha⁻¹) and gross margin (Tk.186125.00 ha⁻¹) was recorded from BARI Mash-4. BARI Mash-3 also gave an attractive gross return (Tk. 210000.00) and gross margin (Tk. 174125.00 ha⁻¹), respectively. The local check gave lowest gross return (Tk. 192000.00) and gross margin (Tk. 156125.00 ha⁻¹).

Adaptive trial of different genotypes of cowpea in coastal area

M.M. Islam, H.M.K. Bashar and M.S.I. Khan

The experiment was conducted at Kuakata, Kalapara, Patuakhali during rabi season of 2023-24 to evaluate the performance of cowpea genotypes in coastal area. Two Variety Viz. BARI Felon-1 and Local Felon (Bhola) were evaluated as planting materials for this study. Data were collected on days to maturity, plant height, number of branches per plant, number of leaves per plant, number of pods per plant, number of seeds per pod, 1000-seed weight (g) and seed yield per hectares. BARI Felon-1 gave the better performance in respect of all growth and yield parameters. Higher seed yield (1.52 t ha⁻¹) was obtained from BARI Felon-1 variety whereas lower seed yield (1.15 t ha⁻¹) was obtained by variety Local one (Bhola). The maximum gross return (Tk. 106400/ha) was obtained from BARI Felon-1 as well as gross margin (Tk. 48400/ha) and BCR (1.83) was recorded from same variety. Lower economic return was recorded from Local Felon (Bhola) (Tk. 80500/ha) and BCR (1.38). On the basis of these findings, BARI Felon-1 was the most productive variety in the coastal area.

Spices Crops

On-farm trial of winter type onion varieties in different location of Bangladesh

A field trial on onion was carried out at charland of Saghata, Gaibandha during the winter season of 2023-24 to evaluate the performance of onion varieties in winter season and to popularize onion varieties among the farmers in char areas. The varieties were BARI Piaz-1, BARI Piaz-4 and BARI Piaz-6. The bulb highest yield produced by BARI Piaz-4 (15.57 t ha⁻¹), followed by BARI Piaz-6 (11.38 t ha⁻¹) and BARI Piaz-1 (9.58 t ha⁻¹) whereas the lowest yield was produced by local cultivar (8.95 t ha⁻¹). Similarly, the highest gross return and gross margin of Tk. 544950 ha⁻¹ and Tk. 338700 ha⁻¹, respectively, was also found from BARI Piaz-4.

On-farm trial of coriander leaf cultivation in kishorganj

M.Mohiuddin and M.Y.H. Rayhan

The experiment was conducted at Kuliarchar, Kishoreganj during the rabi season of 2023-2024 to popularize the coriander varieties at farmers' fields. Six varieties were selected for this experiment viz; BARI Dhonia-2, Faizer, Ispahani, Jamal and Vairab seed. The highest leaf yield was obtained from Jamal seed variety (6.89 t/ha) and the lowest from BARI Dhonia-2 (4.20 t/ha). The highest gross return (137800 Tk/ha), gross margin (69300 Tk/ha) and BCR (2.01) were calculated from Jamal seed and lowest from Vairab (96000 Tk/ha, 27500 Tk/ha and 1.40, respectively).

On-farm trial of chilli varieties at farmers filed

M.A. Islam, M.M. Zaman and N. Sultana

The experiment was conducted at farmers' field of Rajendrapur, Netrakona during rabi season of 2023-2024 to evaluate their performance. Highest chilli yield was obtained from BARI Morich-4 (13.82 t ha⁻¹) followed by BARI Morich-3 (11.43 t ha⁻¹) while lowest yield was observed in local cultivar (9.59 t ha⁻¹). The highest gross return and gross margin was observed (Tk. 553000 ha⁻¹, Tk.434480 ha⁻¹, respectively) in BARI Morich-4. The variety BARI Morich-3 also gave an attractive gross return and gross margin (Tk. 457000 ha⁻¹ and Tk. 338480 ha⁻¹, respectively) while lowest gross

return (Tk. 383000 ha⁻¹) and gross margin (Tk. 164480 ha⁻¹) was recorded in local cultivar.

On farm trial of turmeric varieties

M M Howlader, D Halder, Mm Alam, M Ahmad and Mh Rahman

On farm trial of turmeric varieties were conducted at the farmers' field of Gopalganj and Narsingdi region during rabi season in 2023-24. Four turmeric varieties are evaluated under this experiment viz. BARI Halud-3, BARI Halud-4, BARI Halud-5 and local turmeric to select a suitable variety. The significantly highest yield was found from BARI Halud-4 (34.74 and 28.76 t/ha) and the lowest found from local variety (20.49 and 11.50 t/ha) in Gopalganj and Narsingdi respectively. In case of, financial analysis, BARI Halud-4 gave the highest gross return (1042200 and 488920 Tk/ha), gross margin (783700 and 3337304 Tk/ha) in Gopalganj and Narsingdi respectively. The lowest gross return (614700 and 195500Tk/ha), gross margin (356200 and 43884Tk/ha) found in local variety in Gopalganj and Narsingdi respectively.

On-farm trial of BARI developed sweet pepper varieties in hilly areas of bandarban

M. T. Islam, I. Hossain, M. F. Hossain and M. M. Anowar

On-Farm trial of sweet pepper varieties was conducted at Reicha and Sualok of Bandarban Sadar under two different technologies (Net and Without net). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The treatments were: T₁= BARI Mistimorich-1, T₂= BARI Mistimorich-2, T₃= Astha Mistimorich, and T₄= Green Cape. There were significant differences among the treatments. In the case of open field, the highest individual fruit weight (164.92 g) and average fruit yield (21.65 t ha⁻¹) were found from Green Cape and the lowest from BARI Mistimorich-1 (115.90 g, 12.96 t ha⁻¹). At protective condition, the highest individual fruit weight (171.32 g) and average fruit yield (25.84 t ha⁻¹) were also found from Green Cape and the lowest from BARI Mistimorich-1 (120.23 g, 17.18 t ha⁻¹). Maximum pest infestation was found in Astha mistimorich (20.83%) in open fields.

Minor Cereal Crops

Adaptive trials with BARI barley varieties in char areas and high BARInd tract

M.U.S. Khatun, G. Paul, M.A. Rahaman, S. Roy, K. Roy, T. Tasmima, M.J. Alam, M.S. Rana, A.A. Mahmud, M.E.A. Pramanik and M.S. Hossain

A set of experiment were conducted to assess the performance and popularize of BARI barley varieties (BARI Barley-7, BARI Barley-8 and BARI Barley-9) in char areas of Tangail and Gaibandha districts, and drought-prone areas Godagari Rajshahi district during 2023-24. Among the tested barley varieties BARI Barley-9 performed better in char areas of Gaibandha and drought prone areas of Rajshahi. The average highest grain yield recorded from BARI Barley-9 (1.96 t ha⁻¹) followed by BARI Barley-7 (1.93 t ha⁻¹) whereas the lowest was from local variety (0.99 t ha⁻¹).

Adaptive trial of foxtail millet in char areas and high BARInd tract

M.U.S. Khatun, T. Tasmima, M.A. Rahaman, S. Roy, K. Roy, G. Paul, M.M. Rahman, A.K.M.Z.U. Noor, N. Sultana, M.E.A. Pramanik and M.S. Hossain

These adaptive trials were conducted to observe the performance and popularize BARI Kaon varieties (BARI Kaon-2, BARI Kaon-3 and BARI Kaon-4) under the char land situation at the MLT sites, Bhuapur, Tangail during Kharif 2023, Melandah Jamalpur and drought-prone areas Godagari Rajshahi district during Rabi 2023-24. Among the tested varieties BARI Kaon-4 performed better in drought prone areas of Rajshahi and char areas of Tangail than Jamalpur districts. The average highest grain yield recorded from BARI Kaon-4 (1.74 t ha⁻¹) followed by BARI Kaon-2 (1.62 t ha⁻¹) whereas the lowest was from BARI Kaon-3 (1.46 t ha⁻¹).

Adaptive trials with finger millets in high BARInd tract and char areas

M.U.S. Khatun, M.E.A. Pramanik, M.S. Hossain, M.J. Alam, M.S. Rana and A.A. Mahmud

A set of trial were conducted at farmers' field of FSRD site Basantapur, Godagari, Rajshahi to observe the performance of four finger millet lines

with one check variety and at the MLT sites in Saghata, Gaibandha to assess the performance of various BARI Raghi-1 in 2023-24. Four finger millet lines viz. IE-2043, IE-2619, IE-3077, IE-3392, and BARI Raghi-1 were tested in Rajshahi. The millet matured during 124-127 days. The maximum grain yield was harvested from IE-3392 (1.96 t ha⁻¹) and BARI Raghi-1 (1.93 t ha⁻¹). In Gaibandha it matured during 116-120 days and average grain yield of BARI Raghi-1 was 2.03 t ha⁻¹.

Adaptive trials with BARI chia variety in char areas and plane land

M.U.S. Khatun, M.J. Alam, M.S. Rana, A.A. Mahmud, G. Paul, M.A. Rahaman, S. Roy, K. Roy, T. Tasmima, M.R. Amin and M.E. Haque

A set of experiment were conducted to assess the performance and popularize of BARI Chia-1 in char lands of Saghata, Gaibandha; Bhuapur, Tangail and plane lands of Shibaloya, Manikganj in 2023-24. BARI Chia-1 achieved the grain yield with an average of 0.96 t ha⁻¹, ranging from 0.86 to 1.02 t ha⁻¹. The highest grain yield (1.02 t ha⁻¹) was obtained from Saghata, Gaibandha followed by Bhuapur, Tangail (0.99 t ha⁻¹) and Shibaloya, Manikganj (0.86 t ha⁻¹).

Adaptive trials with BARI oat variety in char areas

M.U.S. Khatun, M.J. Alam, M.S. Rana and A.A. Mahmud

An experiment was conducted on the char lands at the MLT sites in Saghata, Gaibandha to assess the performance and popularize of BARI Oat-1 in char areas during 2023-24. BARI Oat-1 achieved

Up scaling of proso millet variety in char areas

M.U.S. Khatun, M.M. Rahman, A.K.M.Z.U. Noor and N. Sultana

The experiment was conducted to up-scale BARI released proso millet variety BARI Cheena -1 at char lands of Shahjatpur, Melandah Jamalpur, during rabi season 2023-24. Results obtained from the study indicated that BARI Cheena -1 produced the yield 1.2 t ha⁻¹. The Gross return and Gross margin of BARI Cheena -1 was Tk. 844000 ha⁻¹ and Tk. 3910 ha⁻¹, respectively.

Project: Integrated Farming

Integrated farming for improving livelihood of resource poor farm households in a participatory approach (plainland ecosystem)

M.S.H. Molla, M.A.H. Talukder, Z. Ferdous, S. Ahmed, S. Sultana and M.A. Rahman

Enhancing one's livelihood is a complicated process that requires one to obtain the basics necessary to meet one's basic demands. To increase family income and livelihood, integrate component technologies with effective use of farm resources, develop integrated farming technologies, and fine-tune innovations generated by NARS institutes, the program was conducted in a participatory way in 2023–2024 and continued from the previous year. It was conducted at 5 Farming Systems Research and Development (FSRD) Sites viz., Gangarampur (Pabna), Ajoddhapur (Rangpur), Tarakandi (Sherpur), Sholakundu (Faridpur) and Atia, Delduar (Tangail). The homestead vegetables and fruits, field crops, livestock, fisheries, and off-farm components of farming systems were all or partially taken into consideration by the marginal, small, and medium-sized farmers who participated in the group. The used components were brought under improved technological intervention. At the FSRD sites in Rangpur, Pabna, Sherpur, Faridpur, and Tangail, the average homestead size was 0.14, 0.05, 0.07, 0.09, and 0.13 ha, respectively. Over the location, the average vegetables produced per homestead 821 kg after intervention (AI), which was only 237 kg before intervention (BI). The average vegetables consumption during AI was 294 g head⁻¹day⁻¹, which was 303% higher than BI. The average fruits produced per homestead 503 kg, which was only 301 kg during BI. The average consumption of fruits was also increased (Avg. 92%) during AI. The daily nutritional requirements of a family members were supplemented considerably especially carotene and Vit-C through more consumption of vegetables and fruits from the homestead gardening. Animal products from fish, chicken, duck and cattle also could help to minimize the protein deficiency. Fruit tree management created a good impact on farm households and a total of 728 fruit trees were brought under pest management and a total of 1454 saplings of different fruits were distributed in different FSRD sites. Women participation (25-80%) in different agricultural activities increased to a great extent that showed some positive effect on gender

equity within the family. The average crop land size was 0.43, 0.84, 0.54, 0.64 and 0.61 ha⁻¹ in Rangpur, Pabna, Sherpur, Faridpur and Tangail area, respectively. The improved cropping patterns at field levels were practiced with including improved crops/varieties. Among them T. Aman rice-Pea-Boro rice and T. Aman-Lentil-Sesame produced higher REY 32.83 and 15.58 t ha⁻¹, respectively. In livestock component, after deworming and vaccination, the frequency of major diseases of cattle were reduced to below 5%. Cattle fattening programs were created interest among the farmer. Goat rearing was found promising as low cost required for rearing. In poultry system, Sonali breed, Naked-neck (Garchila) chicken and Khaki Campbell duck rearing were continued in some homestead and area created a good impact among the farm families as a good source of income and child nutrition. Mortality of poultry reduced and was ranged 3-5% after vaccination. Moreover, production of farmyard manure (3550 kg homestead⁻¹) and vermicompost (320 kg homestead⁻¹) and their utilization, and also green fodder production (68 t ha⁻¹) in some homestead area were created a good impact among the farm families. The average pond size was 0.04-0.06 ha over the locations. Seasonal fish culture with carp polyculture in seasonal pond was found promising and some farmers were continued with their own initiatives. Carp polyculture gave a satisfactory fish yield (avg. 3435 kg per ha). From different types of off-farm activities, farmers also earned some extra money (avg. gross margin Tk. 5500 household⁻¹). Among the different production components, field crop sector gave maximum gross margin but gross margin increased maximum at homestead vegetable production sector, where total gross margin increased 101-772% per farm. The activities (seed and seedling collection, production and distribution/sell, vaccination, spraying and other activities) of Local Service Provider (LSP) was found promising for home gardening, at FSRD site, Gangarampur, Pabna. It was found that partially integrating farm components was a cost-saving strategy.

Integrated farming for improving livelihood of resource poor farm households in a participatory approach

M.S. Hossain, M. I. Nazrul and M.E.A. Pramanik

Prolonged drought, high temperatures, uneven distribution of rainfall due to climate change, soil

acidity and low soil fertility are major stresses affecting agricultural production in drought and rainfed ecosystem. Furthermore, resource poor farm households are more concern with the decreasing of agricultural land. It needs to manage properly all the resources of a farm household in integrated approach. The integrated farming activities were carried out at FSRD site, Basantapur, Godagari, Rajshahi and Kamalbazar, Sylhet during 2023-24 to utilize available farm resources and to improve livelihood of the resource poor farm households. The research areas were i) Homestead production system ii) Crops and cropping system. Main components of integrated farming such as vegetables, fruits, cereal crops, were brought under improved technological intervention and accordingly income was increased from these components. In BARInd areas, the overall results of those experiments showed that farmers obtained higher yield and economic return from their improved cropping pattern with improve variety (s). Two improved cropping patterns were conducted of which Tomato-Boro-T. Aus gave the highest productivity and economic return. Newly released high yielding crop varieties were also introduced through on farm validation program where farmers obtained higher crop yields and gross margin. Results of homestead production program revealed that intake of vegetable were markedly increased (avg. 250%) by all families included in this system. Average intake of fruits per year was also increased (Avg. 156.25%) after intervention of the technology. Moreover, farm yard manure (FYM) production and utilization were created a good impact among the farm family. Finally, it can be concluded that interventions made in different components exerted a visible positive impact in improving farmers' socio-economic condition and livelihood as well. The results of FSRD activates imply that by implementing the coordinated approach of farming systems at FSRD sites has brought a good impact on the resource-poor farmers for the betterment of livelihood. In Kamalbazar, Sylhet region, six farm households from each category of marginal, small and medium farms were intervened under integrated farming study. Results found that farmers introduced several alternatives practices and new enterprises in almost all farming subsystems after intervention. Results revealed that after intervention of the proven and improved technologies in the homestead following the Golapgonj model,

vegetable production has been increased 5.45 compared to before intervention of the program. The vegetables and fruit productions per homestead were 619 and 521 kg, respectively. The gross margin of produced vegetables and fruits were Tk. 7830 and 12160, respectively based on the present market price in the locality. Inclusion and production of high yielding crop varieties eg. Potato (BARI Alu-41), BRRI dhan48 and Binadhan-7 in T. aus and T. aman rice season, respectively in the improved cropping pattern was enhanced higher economic return over farmers existing pattern. BARI Sarisha-14 would also be well-fitted into farmers existing cropping system. Involvement of women and children in homestead gardening were more compared to men. However, all these led to full utilization of both physical & other farm resource available in the disposal of the farm and helped to mobilize resources for food security, income generation and improvement of livelihoods.

Climate resilient farming systems research and development for the coastal ecosystem

H M K Bashar, M. M. Islam, M.S. ISLAM, M.M. BASHIR and M M Anower

Among various hydrometrological calamities, coastal regions of Bangladesh are severe prone to cyclones, tidal surges, floods, droughts, salinity in the soil, saline water intrusion and water logging, among other hydrometeorological calamities. This directly affects the livelihoods of the inhabitants because, in Bangladesh, agriculture employs more than 60% of the workforce and is a major source of income for the 40 million people who live along the shore. The environment has a major influence on the agricultural systems. Instead of using a seasonal or crop-specific method in coastal areas, it is now urgently necessary to exhibit current agricultural technologies through "Integrated farming or Mixed Crop-Livestock System Approach". Farmers have a limited number of resources, despite the fact that there are various production options. In order to maximize the complementary interactions among various farming enterprises/production systems and the biophysical and socioeconomic environment, a holistic approach to technology generation and packaging is necessary to achieve this goal. The activities under integrated farming were carried out at two new project area located at Umidpur and Diaramkhola of Kalapara, Patuakhali and North

Wapda, Sadar, Noakhali during 2023-2024 to develop integrated farming technologies, fine tune the technologies generated by NARS institutes, integrate component technologies with efficient use of farm resources and thereby improve family income and livelihoods. The research areas were i) Homestead production system ii) Crops and cropping system iii) Poultry and Livestock production system and v) Off-farm activities. All components of integrated farming such as vegetables, fruits, cereal crops, livestock and off-farm activities were brought under improved technological intervention and accordingly income were increased from these components. On the basis of PRA and base line survey report, farmers need based technologies were intervened among small, marginal and resource-poor farmers. Year round homestead vegetables and quick growing fruits production, intervention of new modern varieties such as sunflower, mungbean, cowpea, grasspea, T.Aus and T.Aman rice, Fodder production, De-worming and vaccination program have been brought under the program in Patuakhali. On the other hand, In Noakhali, intervention many modern field crops such as mustard, soybean, mungbean, sunflower, groundnut, grasspea, T. Aus rice and T. Aman rice. It is revealed that vegetables production as well as income increased by 169%, 380%, 104% of marginal, small and medium farmers, respectively in Patuakhali after project intervention, where intake of vegetables was markedly increased (48-113%) as compared to before intervention. Contrary, in Noakhali, it was increased about 90%, 65% and 90% of marginal, small and medium farmers, respectively and intake of vegetables was increased 30-75%. Average intake of fruits per year will be increased next years as the existing fruit trees are managed properly. A total of 168 saplings were distributed to enrich agroforestry system with 4 types of fruit trees in Noakhali, whereas 4 types of fruit trees a total of 192 saplings were distributed at Patuakhali site. In case of field crops, many modern new varieties were intervened and increased income as compared to existing one. Mortality of existing poultry reduced to 4 to 8% after vaccination in Patuakhali. Off-farm activities were very poor or absent in the sites. Women participation in agricultural activities especially in homestead vegetable production and poultry rearing was observed remarkable that may help to create positive effect on gender equity within the family. The results of FSRD activities

imply that by implementing the program of integrated farming at project sites has created an opportunity to improve livelihood of the resource-poor farmers.

Project: Socioeconomic Studies

Productivity and profitability of summer chilli cultivation in some selected areas of Kishoreganj district

M. Mohiuddin

A survey was carried out in two upazillas of Kishoreganj district to assess the existing agronomic practices of summer chilli production, to estimate productivity and profitability as well as to identify the problems of production of summer chilli in the farmers field during 2023-24 cropping season. Tabular method was followed. The majority of the farmers sowed their seeds during the second to third week of February. Farmers used fertilizers in irrational dose. The average yield of summer chilli was found to be 4.68 ton per hectare. The average gross margin was estimated at Tk. 259882 on variable cost basis. The production cost of chilli per kg was Tk. 55.34 and return was Tk. 105.51. Lack of quality seed, high insect pest infestation, lack of scientific production technology, low germination of seed, scarcity of labour and low output price were the major problems in the study areas. Farmers cultivate summer chilli for getting higher profit, maximum use of seasonal fallow land and easy growing.

Farmers' perceptions and adaptations to climate change in some selected areas of Kishoreganj district haor ecosystem

M. E. A. Begum, N. Sultana, M. Mohiuddin M. S. Rahman and M. Anwar

Climate change is predicted to adversely affect agricultural yields in Bangladesh where crop production relies heavily on environmental factors. Therefore, the study was conducted to explore farmers' perceptions and adaptation impacts on returns to land in haor. A total of 100 farmers were selected purposively for the interview and focus group discussion. A panel data set of five years was gathered using structured questionnaires with the sample of 500. A fixed effects quantitative model on the panel data was estimated to verify the effect of adaptation strategies on farm income of farmers.

The major climate risk in the study areas were flash flood, excessive fog in winter, extreme heat wave, drought and hailstorm. The study found that the main adaptation strategies that significantly influenced farm income were mixed cropping and relay cropping. The study recommends that innovative research, extension and favorable policies that support the synchronization of adaptation strategies, are crucial for improving the farm income.

Adoption and cost effectiveness of vegetables production under raised bed systems in patuakhali

M. A. Hossain, H. M. K. Bashar, M. M. Islam and M.M Anwar

The study was executed in Kumirmara under Kolapara upazila of Patuakhali districts. Data were collected from randomly selected of 40 sample farmers by purposive sampling during April to May 2024 to estimate cost and return of vegetables and to identify constrains of vegetables production in raised bed. The total number of human labor was used 311 man-days ha⁻¹. Farmers used bitter gourd seeds at the rate of 2 kg ha⁻¹. The application of manu re, urea, TSP, MoP, gypsum and Borax for bitter gourd were 1230 kg ha⁻¹, 58 kg ha⁻¹, 136 kg ha⁻¹, 48 kg ha⁻¹, 71 kg ha⁻¹ and 3 kg ha⁻¹, respectively. The total cost of production was Tk. 439071 ha⁻¹. Human labor costs were the lion share (49.58 %) in cost of Production. The average yields were 29.81 t ha⁻¹ Gross return was calculated Tk.400243 ha⁻¹. Benefit cost ratio over total cost was 1.70. Farmers reported that pest and disease infestation especially fruit borer were the main constrains (93%) for bitter gourd cultivation in raised bed in the study area.

Project: Transfer of Technology

On-farm trial of BARI released bt brinjal varieties in Bangladesh

M.H. Rashid, M.K. Islam, T.Z. Munmun; M. Rahman, M.S. Alam, T. Hasan; M. Ahmed, M.S. Bhuiyan; M. Jamal Uddin, M.S. Huda; M.M. Khanum, A. A. Tithi, Q. Naher, M.M. Anwar

The field trial was conducted at 30 farmers field of 05 districts in Bangladesh such as Bogura, Cox's Bazar, Cumilla, Dinajpur and Khulna during 2023-24 to observe the performance of transgenic BARI

Bt brinjal varieties at the farmers' field. Tested three BARI Bt brinjal varieties performed better against non Bt counterparts, reduced brinjal shoot and fruit borer (BSFB) infestation produced maximum healthy fruit and offered higher gross margin in all locations. The yield of BARI Bt Begun-4 range from 25.20-42.86 ton per hectare. BSFB infestation in shoot 0.00-3.90 percent and in the fruit (by no.) 0.00-0.73 percent as well as infestation (by wt.) 0.00-0.85 percent in BARI Bt Begun-4. The non-Bt counterpart of the variety BARI Begun-6 and BARI Begun-12 was infected by BSFB both in shoot and fruit and infestation observed 13.88-26.24 percent shoot and 14.99-59.25 percent fruit (by no.) along with 11.16-57.30 percent (by wt.) was infected by BSFB. The average marketable yield of non-bt-brinjal was recorded as 18.65-31.35 ton per hector. Among the five districts, field trial under two districts totally free from BSFB infestation.

Pilot production programme of potato varieties at different locations in Bangladesh

M. A. Rahaman, M. S. Huda, M. Mohiuddin, M. J. Mahmud and M. M. Howlader

The pilot production programme of BARI released potato varieties was conducted across multiple locations in Bangladesh during the 2023-24 growing season. This study evaluated the performance, cost, and return of various BARI potato varieties, including BARI Alu-25, BARI Alu-35, BARI Alu-47, BARI Alu-49, BARI Alu-62, BARI Alu-72, BARI Alu-73, and BARI Alu-78. The findings reveal significant variations in yield, gross return, and gross margin across different locations, highlighting the adaptability and economic potential of these varieties in various agro-ecological zones. The results offer valuable insights for optimizing potato production and enhancing farmer profitability in Bangladesh.

Production program of pani kachu variety

M. M. Rahman, A.K.M.Z.U. Noor and N.Sultana

A production program with BARI Pani kachu variety BARI PK-1 was conducted at Khunua, Sherpur sadar under Sherpur district during 2022-23 to increase Panikachu production and to popularize the variety among the farmers. The stolon yield of BARI Pk-1 was recorded 23.40 t ha⁻¹ and rhizome yield of BARI Pk-1 was recorded 25.0 t ha⁻¹. Gross return and gross margin per

hectare were found Tk. 8, 27,000/-and Tk. 6, 13,280/-respectively.

Pilot production of BARI panikachu-2

M.A. Islam, M.M. Zaman and N. Sultana

The pilot production program of BARI Panikachu-2 was conducted in the farmers' field of Trishal during Kharif 2023 to observe the performance of BARI Panikachu-2 and popularize it among the farmers. The stolon and rhizome yield of BARI Panikachu-2 was 19.12 t ha⁻¹ and 19.05 t ha⁻¹, respectively. The total gross return and gross margin from stolon and rhizome were obtained Tk. 897800 ha⁻¹and Tk. 576480 ha⁻¹, respectively while the farmer expenses only Tk. 321320 ha⁻¹.

Production program of mukhikachu

S. Sultana, M.M. Zaman and N. Sultana

This study evaluates the performance and economic benefits of two varieties of elephant foot yam (BARI Mukhikachu-1 and BARI Mukhikachu-2) cultivated in Mymensingh and Cumilla during the 2023-24 growing season. Data were collected on the number of farmers involved, area cultivated, transplanting and harvesting dates, yield, gross return, and gross margin. The results showed that BARI Mukhikachu-2 outperformed BARI Mukhikachu-1 in terms of yield and economic returns. BARI Mukhikachu-2 yielded 24.2 t ha⁻¹ in Mymensingh and 30 t ha⁻¹ in Cumilla, with corresponding gross returns of Tk. 1694000ha⁻¹ and Tk. 1275000 ha⁻¹, respectively. Farmer feedback was positive, indicating a preference for BARI Mukhikachu-2 due to its higher yield and profitability. The study concludes that BARI Mukhikachu-2 is a superior variety for both regions, providing significant economic benefits to farmers.

Production program of sweet potato varieties at different locations in Bangladesh

N. Sultana, M. J. Mahmud and M. Mohiuddin

This report evaluates the performance of BARI-released sweet potato varieties across three locations in Bangladesh Kristopur (Netrakona), Kalukhali (Rajbari), and Nikli (Kishoreganj) during the 2023-2024 growing season. The study assessed yield, economic returns, and farmers' opinions regarding the varieties. Results showed that BARI

Mistialu-12 achieved the highest yield of 35.61 t ha⁻¹ at Nikli, Kishoreganj, while BARI Mistialu-17 provided the highest gross margin of Tk. 395,960 at Kristopur, Netrakona. BARI Mistialu-8 also performed well, particularly in terms of yield and market price. Farmers expressed satisfaction with the performance of BARI Mistialu-8 and BARI Mistialu-17, noting their high yield, attractive color, and market demand. The findings underscore the need for location-specific variety selection to enhance sweet potato production and economic benefits. Future efforts should focus on optimizing production practices and expanding extension services to support sweet potato cultivation across Bangladesh.

Production program of BARI developed bottle gourd variety

M. S. Huda and M. H. Howlader

The cultivation of BARI Lau-4 bottle gourd variety has shown promising results in Bangladesh, particularly in the regions of Dinajpur and Gopalganj during the 2023-2024 growing season. This study evaluates the yield, economic returns, and gross margins associated with BARI Lau-4 across these locations. The findings reveal significant differences in yield and economic benefits, with Gopalganj reporting higher yields and gross margins compared to Dinajpur. This research highlights the potential of BARI Lau-4 as a profitable crop choice for farmers, particularly in regions with favorable growing conditions.

Pilot production program of BARI begun-12 at different locations of Bangladesh

M. A. Rahaman, M.S. Huda, J.A.Mahmud, S. Ahmed, M. T. I. Lelin, M.Mohiuddin, M. M. Howlader and M. J. Uddin

Eggplant (*Solanum melongena* L.) is a crucial vegetable crop in Bangladesh, significantly impacting the national economy and dietary needs. This study evaluates the performance of BARI Begun-12, an improved variety developed by the Bangladesh Agricultural Research Institute (BARI), known for its high yield potential, pest and disease resistance, and adaptability. Conducted across nine districts-Tangail, Dinajpur, Kushtia, Faridpur, Bandarban, Netrakona, Kishoreganj, Gopalganj, and Cumilla-the study involved 16 farmers covering 4.63 hectares. The multi-location trial assessed regional variations in yield, pest and

disease resistance, and economic benefits. Results indicated an average yield of 43.52 t ha⁻¹, with the highest in Kushtia (63.45 t ha⁻¹) and the lowest in Kishoreganj (31.67 t ha⁻¹). The average gross return was Tk. 885368 ha⁻¹, peaking in Gopalganj (Tk. 1375000 ha⁻¹) and lowest in Kishoreganj (Tk. 316700 ha⁻¹). These variations were attributed to differences in soil fertility, climate, and farming practices. Farmer feedback highlighted BARI Begun-12's high yield, disease resistance, and market demand. The study concludes that while BARI Begun-12 is promising, its success depends on regional growing conditions, necessitating improvements in soil fertility and farming practices to enhance productivity and economic returns.

Pilot production programme of summer tomato varieties at different locations of Bangladesh

M.S. Huda, M. A. Rahaman and N. Sultana

This study evaluates the performance and economic benefits of BARI Hybrid Tomato-11, BARI Hybrid Tomato-4, and BARI Hybrid Tomato-8 at various locations in Bangladesh during the 2023-24 agricultural year. Conducted across Dinajpur, Tangail, Sherpur, Netrokona, and Cumilla, the pilot production program aimed to assess the yield, gross return, and gross margin of these summer tomato varieties. BARI Hybrid Tomato-11 demonstrated an average yield of 37.62 t ha⁻¹, with the highest gross return and gross margin observed in Sherpur. BARI Hybrid Tomato-4 and BARI Hybrid Tomato-8 in Netrokona exhibited yields of 52.25 t ha⁻¹ and 68.61 t ha⁻¹, respectively. The study highlights the potential of these varieties to enhance tomato production and profitability in Bangladesh.

Production program of stem amaranth at different locations of Bangladesh

S. Akhtar, S. Sultana, M.M. Zaman, N. Sultana and M. J. Uddin

The study was conducted in Cumilla and Mymensingh, Bangladesh, during the year 2023-24 to evaluate the performance and economic benefits of BARI-released stem amaranth varieties, BARI Danta-1 and BARI Danta-3. The assessment included yield, gross return, and gross margin. The findings indicated that the BARI Danta-3 variety showed superior performance in both locations, particularly in Mymensingh, with a yield of 65 t ha⁻¹, gross return of Tk. 650,000 ha⁻¹, and gross margin of Tk. 567,500 ha⁻¹. Cumilla showed an

average yield of 73.30 t ha⁻¹, with a gross return of Tk. 366,500 ha⁻¹ and gross margin of Tk. 237,250 ha⁻¹. The study highlights the economic viability and agronomic performance of these varieties, offering significant benefits to farmers.

Pilot production program of garlic at dinajpur

M. S. Huda and M. J. Uddin

This study evaluates the garlic production program in Dinajpur and Tangail, Bangladesh, during the 2023-24 growing season, focusing on the performance of the BARI Rosun-1 variety. The program involved one farmer in Dinajpur cultivating 0.2 hectares and two farmers in Tangail cultivating 0.26 hectares. Sowing occurred in November 2023, with harvesting completed by March 2024 in Dinajpur and April 2024 in Tangail. The average yields were 6.46 t ha⁻¹ in Dinajpur and 5.7 t ha⁻¹ in Tangail, resulting in gross returns of Tk. 646,000 and Tk. 627,000 per hectare, respectively. The gross margin was slightly higher in Dinajpur (Tk. 449,250 ha⁻¹) than in Tangail (Tk. 447,855 ha⁻¹). These results indicate the profitability of garlic production, particularly with the BARI Rosun-1 variety, under the prevailing agronomic practices.

Pilot production of onion variety

M. S. Huda, M. M. Rahman, A. K. M. Z. U. Noor, N. Sultana, J. A. Mahmud, M. M. Morshed and M. M. Hossain

This study aimed to assess the yield and economic returns of BARI Piaz-4 onion variety during the Rabi season of 2023-24 across three distinct locations in Bangladesh: Dinajpur, Sherpur, and Kushtia. Six farmers participated, covering a total area of 0.89 hectares. The results demonstrated a notable variation in bulb yield, ranging from 22.0 to 27.8 t ha⁻¹, with Kushtia recording the highest yield. The gross margin also varied significantly, with the highest margin observed in Sherpur due to higher onion prices. This study highlights the potential of BARI Piaz-4 for improving onion productivity and profitability, suggesting that location-specific management practices could further enhance yields.

Production program of BARI piaz- 5

M. M. Howlader and D. Halder

Onion (*Allium cepa*), one of the most important spice crops in Bangladesh, is primarily cultivated

during the rabi season. A production program for BARI Pij-5 was conducted during the 2023-24 rabi season under farmer field conditions at the MLT sites of Tungipara and Muksudpur in the Gopalganj district. The study aimed to evaluate the yield, economic returns, and farmer acceptance of the BARI Pij-5 variety. Seedlings were transplanted on November 8 and 14, 2023, and the crop was fertilized using a specific nutrient management regime. Results indicated a mean yield of 23.62 t ha⁻¹, a gross return of 944,800 Tk. ha⁻¹, and a gross margin of 664,300 Tk. ha⁻¹ with a benefit-cost ratio (BCR) of 2.36. Farmers expressed strong interest in cultivating BARI Pij-5 due to its higher yield and profitability.

Pilot production program of BARI developed turmeric varieties at different locations of Bangladesh

M.Mohiuddin, M.Y.H. Rayhan and M.J. Uddin

A pilot production study was conducted in Kishoreganj and Cumilla during the 2023-24 growing season to evaluate the performance of BARI-developed turmeric varieties, particularly BARI Halud-4. The study revealed that BARI Halud-4 produced a yield of 18.75 t/ha in Kishoreganj and 24.15 t/ha in Cumilla, with corresponding gross returns of Tk. 375,000/ha and Tk. 374,325/ha, respectively. BARI Halud-4 demonstrated superior yield and economic benefits compared to BARI Halud-3, indicating its potential for wider adoption by farmers.

Production program of BARI mustard varieties

M.R.Amin, M.Mohiuddin, N.Sultana, M.S.Islam, H.M.K.Basar, M.S.Hossain, M.A.H.Talukder, J.A.Mahmud, M.J.Uddin, G.N.Hasan, S.Mandol, M.T.Islam, M.Ahmad, M.I.Nazrul, S.Ahmad, M.S.H.Molla

A production program under OFRD, BARI, conducted in the farmer's field at 898 farmers field of 17 district such as Kishoregan, Manikgong, Mymensingh, Noakhali, Patuakhali, Rajshahi, Rangpur, Kustia, Cumilla, Bhola, Satkhira, Jhenaida, Bandarban, Coxsbazar, Sylhet, Faridpur, Pabna and Gopalgong district during the rabi season in 2023-24 to assess the performance of BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-18, BARI Sarisha-19 and BARI Sarisha-20 at the farmers field. All the varieties of Mustard in different locations gave better seed yield than that of the national average (1154 kg ha⁻¹). However,

among the short-duration tested mustard varieties (BARI Sarisha-14 and 17) the highest seed yield (1.77 t/ha) was found in BARI Sarisha-17 at Kushtia district. BARI Sarisha-18 gave the highest seed yield in Sherpur (2.35tha⁻¹) through the variety took more duration for its maturity. The highest gross return (204250Tk/ha), gross margin (140750 Tk/ha) from Sylhet and BCR 3.28 were calculated from BARI Sarisha-18 at Rajdhani and the lowest gross return (88400Tk/ha) at Tangail, gross margin (29720 Tk/ha) and BCR (1.45) from BARI Sarisha-14 at Narshindhi.

Production program of BARI groundnut varieties

M. M. Rahman, M. Ahmad, M. S. Islam, G. N. Hasan, M. Mohiuddin and M. M. Howlader

The Production program of BARI Chinabadam-8 and BARI Chinabadam-9 was carried out at different Agro Ecological Zones of Bangladesh during Rabi season of 2023-2024 to popularize and increase oil seed productivity as well farmers' income. BARI high yielding groundnut variety such as BARI Chinabadam-8 and BARI Chinabadam-9 was distributed among the four (60) farmers at different district where the total land area was one (15.25) hectare. Average highest seed yield of BARI Chinabadam-09 was 2.54 t ha⁻¹, which offered a gross margin of TK.162800 ha⁻¹.

Pilot production programme of barley varieties at tangail and faridpur

S. Ahmed and M. A. Rahaman

This study evaluates the performance and economic benefits of three barley varieties BARI Barley-7, BARI Barley-8, and BARI Barley-9—under pilot production in Tangail and Faridpur districts during the 2023-24 cropping season. Results indicate that BARI Barley-9 had the highest yield and gross margin in both locations, outperforming the other varieties. Economic analysis showed that barley cultivation is profitable, with variations in gross returns and margins depending on the variety and location. The findings suggest that BARI Barley-9 is a favorable choice for farmers in these districts.

Production program of garden pea variety

M. M. Rahman, A.K.M.Z.U. Noor, N.Sultana, M. M. Zaman, N. Sultana and Mst Esmat Ara Begum

A production program with Garden pea variety BARI Motorsuti-3 was conducted at FSRD Site,

Tarakandi Sherpur Sadar, Sherpur and Char kharicha under the Mymensingh upazila during rabi 2023-2024 to increase motorsuti production and to popularize the variety among the farmers. The green pod yield of motorsuti was found 8.40 t ha⁻¹ from tarakandi village under Sherpur district and 5.98 t ha⁻¹ from Mymensingh. The crop duration was 69 days.

Up-scaling of BARI foxtail millet and proso millet varieties in char areas

Md. Jahangir Alam, Md. Shohel Rana and Abdullah Al Mahmud

A trial with BARI developed foxtail millet and proso millet varieties was conducted at Kanaipara Char, Saghata, Gaibandha during 2023-24 to disseminate and popularize BARI foxtail millet and proso millet varieties to the farmers of char areas. BARI Kaon-2, BARI Kaon-4 and BARI Cheena-1 were tested. All the tested varieties produced satisfactory yield. Among them, the average highest yield was recorded from BARI Kaon-4 (3.06 t ha⁻¹), 11% more than that of BARI Kaon-2 (2.76 t ha⁻¹) whereas the mean yield of BARI Cheena-1 was 2.73 t ha⁻¹.

Production program of BARI lentil variety (bari masur-8) in kushtia

The Production program of BARI Masur-8 was conducted at Kshtia sadar, MLT site: Bheramara, Chuadanga Gangni, and Mujibnagar, Meherpur during Rabi season 2023-2024 to popularize BARI Masur-8 in block approach. It was found that the average seed yield of BARI Masur-8 was (2.15 t ha⁻¹). Farmers were benefited to cultivate BARI Masur-8 due to higher seed yield and higher income.

Production program of BARI til-5 in kushtia

J. A. Mahmud, M. M. Morshed, M. M. Hossain

The production program of BARI Til-5 was conducted at Kushtia sadar and MLT Site, Bheramara during the season of 2023-2024 to observe the yield performance of BARI Til-5 in block approach. Five farmers were involved in the production program covering land area of 1.00 ha. Farmers were benefited to cultivate BARI Til-5 due to higher seed yield and economic return.

Production program of BARI oat-1 in faridpur

Selim Ahmed

A production program of BARI Oat-1 was conducted at the FSRD site of Faridpur during the

rabi 2023-24 to observe the performance and to popularize BARI Oat-1 among the local farmers. The program was conducted in about 33 decimal of land. One farmer was selected. Different crop management practices like date of sowing, intercultural operations, date of harvest etc. are stated in Table 1. Seeds were sown at 70 kgha⁻¹ with 25 cm line to line spacing by continuous sowing on 17 December 2023. The crop was fertilized with 80-30-30-10-3-1 kg of N-P-K-S-Zn-B ha⁻¹ in the form of urea, TSP, MoP, gypsum, zinc sulphate mono hydrate and boric acid, respectively. All of P, S, Zn and B, and half of N was applied as basal during final land preparation. Remaining N was applied at 28 DAS under moist soil condition and mixed thoroughly with the soil. Weeding was done once at 25 DAS. The crop was harvested at 09 April, 2024 (114 DAS). The yield was recorded by crop cut from a total of 6m² area having three spots (2 m² in each) of the plot and converted to yield ha⁻¹. The yield and economic performance are presented in Table 2.

Production program of sunflower

S. Sultana, M.M. Zaman and N. Sultana, M.Mohiuddin and M.Y.H. Rayhan, J. A. Mahmud, M. M. Morshed, M. M. Hossain

The trial on sunflower production was conducted in farmers' field of Mymensingh, Kishoregang and Kustia district with the close supervision of On-Farm Research Division, Bangladesh Agricultural Research Institute during rabi 2023-2024 to observe the performance of BARI Surjomukhi-3 variety. Tested BARI Surjomukhi-3 performed better in all sorts of yield in these location thereby the highest yield was obtained in an average 1900 kg ha⁻¹ at Kustia and lowest 1170 kg ha⁻¹ at Mymensingh.

Seed production program of mustard through block approach

M. Maniruzzaman, M. S. H. Molla, M. A. Isalm, M. Z. Hasan and M. A. Suborna

The seed production program was conducted at MLT site, Sirajganj of Sirajganj district during the rabi season of 2023-24 to produce quality seed as well as to disseminate the BARI Sarisha-18 at the farmers' level. The average seed yield of BARI Sarisha-18 was recorded as 2.15 t ha⁻¹ with gross margin of Tk. 132070 ha⁻¹.

PLANT PATHOLOGY

15

Activities: Tuber crops

Potato

Screening of selected potato varieties/germplasm/lines against late blight of potato

M.Z. Masud, M.M. Rahman, A.K. Saha, M.M. Begum, M.I. Hossain and A.K. Das

Late blight of potato, caused by *Phytophthora infestans* (Mont.) de Bary, is one of the most important diseases of potato (*Solanum tuberosum* L.) in Bangladesh. The experiment was conducted under natural field condition in the isolated field of BSPC, BARI, Debiganj, Panchagarh to evaluate 39 (Thirty-nine) potato varieties/germplasm/lines against late blight disease during 2023-24 crop season. None of the variety/germplasm was found immune. BARI alu-90 were found highly resistant BARI Alu-46 and BARI alu-91 was found resistant. but BARI Alu- 47and BARI Alu-77 were moderately resistant. Yield of BARI Alu-90 produced the significantly highest yield (35.93 t ha⁻¹) and it was almost similar with BARI Alu-46 (33.50 t ha⁻¹), followed by BARI Alu-77 (28.65 t ha⁻¹) and BARI Alu-53 (27.92 t ha⁻¹).

Lima Peru. pp. 13

Efficacy of new fungicides in controlling late blight of potato

T. H. Tabassum

Effectiveness of fourteen sole and combined chemical fungicides was evaluated against late blight of potato at RARS Cumilla in 2023-24 cropping season. Fungicides and fungicidal combinations were sprayed in research field of potato and disease data were observed to evaluate the most effective fungicide against late blight disease of potato. The fourteen selected fungicides were Cypa 52.5 WG (Cymoxalin 30% +

Famoxadone 22.5%), Pyrazole 38 SC (Pyraclostrobin 25 + Tricyclazole 13 SC), Prapti 50WP (Iprodione 25% + Carbendazim 25%), (Mancozeb 64% + Cymoxalin 8%), Dia-trizole 38 SC (Pyraclostrobin 25 + Tricyclazole 13 SC), Chloronil 80 WP (Chlorothalonil + Cymoxanil 80%), Celifin 75 WP (Mancozeb 63% + Carbendazim 12%), Avalon 38 SC (Pyraclostrobin 25 + Tricyclazole 13 SC), Kolon 77WP (Copper Hydroxide 77WP), Hyco 77WP (Copper Hydroxide 77 WP), Manzim 75 WP (Mancozeb 63% + Carbendazim 12%), Incharge 80 WDG (Dinotefuran 20%+ Pymetrozine 60%), Nabik 80% WP (Tricyclazole 60% + Bismathiazole 20%), Pogozeb 75% WP (Mancozeb 63% + Carbendazim 12% 75WP), Autozeb 80% WP and Mancozeb 80% WP. Out of 14 fungicides Cypa 52.5 WG (Cymoxalin 30% + Famoxadone 22.5%) @ 2mg/L showed significantly less disease severity (38.33%) in the research field.

Efficacy of new fungicides in controlling late blight of potato

H Rahman

An experiment was conducted at the Regional Agricultural Research Station, Jamalpur during rabi season of 2023-24 to find out the appropriate chemical fungicide to control the Late blight disease of Potato. The evaluation of thirty-four new fungicides from Pesticide Technical Advisory Committee (PTAC) along with standard control (Ridomil Gold) and control against late blight of potato under natural inoculum pressure. More than 70% disease suppression was observed due to the spray with 1209 encoded fungicide. More than 50% disease suppression was observed due to the spray with 1051 and 1090 encoded fungicides. Among the fungicides, 1209 encoded fungicide most effectively managed late blight disease of Potato and produced tuber yield 17.72 t/ha.

Monitoring of disease status of BARI released potato varieties against common scab

M.M. Begum, M.M. Rahman, M.I. Hossain and M.M. Rahman

Fourteen potato varieties viz. BARI Alu-7, BARI Alu-73, BARI Alu-77, BARI Alu-78, BARI Alu-79, BARI Alu-86, BARI Alu-87, BARI Alu-88, BARI Alu-89, BARI Alu-90, BARI Alu-91, BARI Alu-100, BARI Alu-102, and BARI Alu-104 were evaluated to screen resistant varieties against scab disease at Tuber Crops Research Centre, BARI, Joydebpur, Gazipur during 2023-24 cropping year under the field condition at Rabi season. Considering scab incidence, BARI Alu-86, BARI Alu-87, BARI Alu-89, BARI Alu-90, and BARI Alu-102 performed better and found completely free from common scab of potato.

Evaluation of potato hybrid clones and exotic lines for PLRV and PVY resistance under the infection pressure (1st Progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

A total of six exotic lines and variety Diamant (as a control) were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24 as a first generation. All tested lines were found completely free from any type of virus including the check variety Diamant. This experiment will be repeated in the next year.

Evaluation of potato hybrid clones and exotic lines for PLRV and PVY resistance under the infection pressure (1st Progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

Ten exotic potato lines and potato variety Diamant as check material were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24 as a first generation. All tested lines were found completely free from any type of virus including the check variety Diamant. This experiment will be repeated in the next year.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (2nd progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum and M.M. Rahman

Three exotic potato lines along with check Diamant were evaluated against PLRV and PVY to find out

resistant source (s) at Joydebpur, Gazipur. All lines including a check variety Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The exotic lines Sound and Lady Alica were found free from any other viruses.

Evaluation of potato lines for plrv and pyv resistance under the infection pressure (2nd progeny)

M.I. Hossain, M.M. Rahman, M.M. Begum, and M.M. Rahman

Fourteen potato lines along with check Diamant were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. All lines including a check variety Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The hybrid clones 18.102, 18.117 and 18.12 performed better considering all the parameters and found free from any other viruses.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (6th progeny)

M. M. Begum

Three potato lines were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2023-24. Based on field observation and according to ELISA test, one line namely 15.35 found free from PLRV, PVY and other combine virus infection compared to other lines.

Evaluation of potato lines for PLRV and PVY resistance under the infection pressure (4th progeny)

M. M. Begum

Six potato lines were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. All lines were exposed to the infection pressure of PLRV and PVY in the cropping season of 2023-24 at Joydebpur. The hybrid clones namely 16.16, 16.28, 16.62 and 16.7 performed better and found free from any other viruses under ELISA test in the laboratory.

Detection of potato viruses (PLRV, PVY, PVX, PVM and PVS) in the supplied samples of different companies through das-elisa

M. M. Begum

A total of 760 plantlet samples from different government and non-government organizations

were tested for the presence of viruses by using specific DAS-ELISA detection separate kits as PLRV, PVY, PVX, PVS and PVM according to manufacturer's instructions (Bioreba AG, Switzerland). Among the tested samples, virus free found about 71% and 29% found infected with different alone and combine viruses. Mixed virus found the highest about 36% followed by PVX (26%), PVY (17%), PVS (13%), PVM (5%) and PLRV (3%)

Heterologous expression of recombinant truncated coat protein of three potato infecting viruses (PVY, PLRV and PVX) in *escherichia coli*

M.S. Akhter, M.S. Rahman, K.E. Jahan, M. M. Islam, M.I. Faruk and M. Rahman

Cocktail of polyclonal antibodies (PAb) would help detection of multiple viruses by serological method like ELISA. With a view to expressed the truncated recombinant fusion protein in *E. coli* and purification of considerable amount of the fusion protein successfully joined the conserved truncated coat protein of three potato infecting viruses such as Potato Virus Y (PVY), Potato virus X (PVX) and Potato leaf roll virus (PLRV) by overlapping PCR. The heterologous expression of the recombinant fusion protein in *E. coli* were in progress.

Sweet Potato

Observational trial of sweet potato varieties/germplasm against virus diseases

M.I. Hossain, M.M. Begum, M.M. Rahman, M.A.H. Khan, M.S. Alam and M.M. Rahman

An experiment was conducted to screen the sweet potato lines against different virus diseases in 2023-24 cropping season at Tuber Crop Research Centre, Bangladesh Agricultural Research Institute, Gazipur. Twelve sweet potatoes germplasms were evaluated against virus diseases and only mild mosaic virus was observed in the field. Among 12 tested lines, five lines SPM-103, H9.48/11, BARI SP-12, H 6.52/11, and H 9.7/12 performed as the best lines for showing less than 0.8% virus infection. The experiment will be repeated in the next season.

Survey and monitoring of new tuber crops diseases in Bangladesh

M.M. Rahman, M.I. Hossain, M.Z. Masud, M.M.E. Rahman, M.M. Begum, and M.M. Rahman

A survey work was conducted to observe the incidence of Tuber crops diseases mainly potato and sweet potato in some districts of Bangladesh. In case of potato Late blight disease incidence was highest in Panchagarh, Thakurgaon, Nilphamary, Rangpur, Bogura and Gazipur and lower in Kurigram, Dinajpur, Lalmonirhat and Gaibandha districts. Bacterial wilt and Blackleg disease incidence were medium in the early season cultivation whereas lower in season. Common scab, mosaics, stem rot, early blight, stem canker, and black scurf, PVY were less disease incidences of potato in Bangladesh. Four sweet Potato diseases were observed among them sweet potato feathery mottle virus was medium infestation.

Activities: Pulse Crops

Identification and characterization of root rot pathogens of lentil

D. Sarkar, M. Z. Rahman, M.A.A. Momin, M. Akhterruzzaman, M. Hossain, J. Hossain, M. and R. Humauan

A survey was conducted from November 2023 to March 2024 at different pulse-growing regions of Bangladesh to identify the soil-borne pathogens associated with root rot disease of lentil and also to determine the prevalence of the disease, the major threats to lentil production in Bangladesh. Lentil root rot symptoms showing samples were collected from seven Research plots in various Agro-ecological Zones. Rotted roots were washed, potential pathogens were cultured, and isolates were putatively identified into the major pathogen groups based on morphology and cultural variation. The percentage of *Fusarium* spp. during the survey was the most dominant (38%) compared to other pathogens. The species of *Rhizoctonia*, *Sclerotium*, and Oomycetes including unidentified isolates were 18%, 13%, and 31%, respectively. The *Rhizoctonia* and unidentified isolates attacked the crop early compared to the *Fusarium* and *Sclerotium* isolates. This survey provided baseline information on the prevalence of critical soil-borne pathogens.

Screening of lentil germplasm for root rot and wilt resistance

D. Sarkar, M. Z. Rahman, M. R. Humauan, and B. Akhter

The experiment was conducted at Pulses Research Centre (PRC), Ishurdi, Pabna, during 2023-24. Forty-seven lentils advanced entries were selected from the previous year's trial to search for root rot disease resistance. Fifteen germplasm lines were found Resistant to lentil root rot disease and these genotypes could be used in future breeding programs to get stable and higher yields of lentil in the country.

Evaluation of biosynthesized agnps against foot and root rot pathogens of lentil

M. Z. Rahman, D. Sarkar, A. K. M. Sahfiqul Islam and Akm Alam

Foot and root rot disease caused by *Sclerotium rolfsii*, *Rhizoctonia solani*, and *Fusarium oxysporum* incurred significant yield losses of about 100%. To address this, the green synthesis of AgNPs using leaf extracts of *Azadirachta indica* (Neem), *Moringa oleifera* (Moringa) and silver nitrate (AgNO₃) and examined their efficacy against foot and root rot disease. The biosynthesized AgNPs were characterized through various analytical techniques. The results of UV-visible spectrophotometers revealed an absorption peak ranging from 421 to 434 nm, validating the synthesis of AgNPs in the solution. *In vitro* assays demonstrated the significant inhibitory effects of AgNPs on mycelial growth of *F. oxysporum*, *R. solani*, and *S. rolfsii* particularly at Ag:N (10:3) and Ag:NM (10:1) concentrations. The findings highlighted the potential of AgNPs as a sustainable and effective alternative for managing foot and root rot disease in lentil, offering a safer solution amidst environmental concerns associated with conventional fungicides.

Effect of biological agents and chemical fungicides for controlling foot and root rot of lentil

M. Z. Rahman, D. Sarkar, Raziuddin and Akm Mahbulul Alam

The experiment was conducted at Pulses Research Sub-center, BARI, Gazipur and Pulses Research Centre, Ishurdi, Pabna during 2023-24 to find out the effective fungicide as well as biological agents

in controlling foot and root rot disease of lentil. Eight fungicides were tested for their efficacy against the disease, and the susceptible variety BARI Masur-1 was used as control treatment. The lower foot and root rot of 5.59% and 17.16% was obtained from seed treatment with Provax 200 WP (Carboxin + Thiram) @ 3 g/kg and the highest incidence of 10.30% and 55.79% was obtained from untreated control in two locations, respectively. The highest yield (1333 and 1446 Kg/ha) was yielded seed treatment with Provax 200 wp @ 3 g/kg, and the lowest yield was obtained from untreated control plots (1000 and 1146 Kg/ha).

Screening of different groups of fungicides and bio-agents against stemphylium blight of lentil

M. Z. Rahman, D. Sarkar, Raziuddin and Akm Mahbulul Alam

The experiment was conducted at Pulses Research Sub-Center, BARI, Gazipur and Pulses Research Centre, Ishurdi, Pabna during 2023-2024 to find out the effective and economic fungicide in controlling stemphylium blight of lentil. Eight fungicides were tested for their efficacy against the disease. The susceptible variety BARI Masur-1 was used and stemphylium blight disease severity was measured using 0 to 5 rating scale. Every fungicidal treatment decreased the severity of the disease and enhanced seed output compared to the control except for biological control approach. The fungicides Luna sensation, Navara, and Stromin were better and reduced the stemphylium blight disease, as well as increased the grain yield of lentil.

Bio-agent based management practice against foot and root rot of lentil

Mb Anwar and Ms Ali

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out the effective bio-control agent against foot and root rot disease of lentil. Seven different bio-control agents and one chemical fungicide were evaluated in this study. The highest percent reduction of seedling mortality (75.10%) was found from Provax treated plots. In case of bio-control agents, the highest percent reduction of seedling mortality (68.47%) was found from Tricomax treated plots which was statistically similar to Tricho-compost treated plots and the lowest percent reduction of seedling mortality

(27.80%) was found from Lycomax treated plots. The highest yield (1430 kg/ha) was found in Provax treated plot followed by Tricomax and Tricho-compost treated plot and the lowest (850 kg/ha) was found in Control plot.

Effect of biological agents and chemical fungicides on fusarium wilt disease in chickpea

M. Z. Rahman, D. Sarkar, and Raziuddin

The experiment was conducted at PRSC, BARI, Gazipur during 2023-24 to find an effective management practice for Fusarium wilt disease of chickpea. Five management practices and one control were used as treatment. The lowest wilt disease incidence (8.92 %) was obtained from the seed treatment with Provax 200 WP (Carboxin + Thiram) @ 3 g/kg seed and the highest incidence (34%) was obtained from untreated control. The highest seed yield (1650 Kg/ha) was recorded in seed treatment with Provax 200 wp @ 3 g/kg, and the lowest yield (1093 kg/ha) was obtained from the untreated control plot.

Screening of field pea germplasm against rust disease

M. Z. Rahman, N. Jahan, N. Naher, D. Sarkar and Akm Mahbulul Alam

Field screening of 141 field pea germplasm against rust diseases was conducted at the Plant Genetic Resources Centre (PGRC), BARI, Gazipur under natural conditions. These accessions showed varying levels of resistance against the disease. The field pea variety BARI Motor-3 was used as a check throughout the experiment. Among the evaluated lines 121 germplasm were identified as resistant and three lines showed moderate resistant to rust disease.

Effect of fungicides on rust diseases in field pea

M. Z. Rahman, D. Sarkar, Raziuddin and Akm Mahbulul Alam

The experiment was conducted at PRSC, BARI, Gazipur during 2023-24 to find an effective fungicide for controlling rust diseases of Field pea. Eleven fungicides and one control were used as treatments. The lowest disease incidence (10%) was obtained from spraying with Nativo 75 WP (Tebuconazole + Trifloxystrobin) and the highest incidence (60%) was obtained from untreated control. The highest seed yield (2400 kg/ha) was recorded in Nativo 75 WP treated plots, and the

lowest yield was obtained from the untreated control plots (1633 kg/ha).

Activities: Oilseed Crops

Morpho-physiological characterization of selected new isolates of *sclerotinia sclerotiorum*

M.M.E Rahman and A.K. Saha

White mold is an emerging disease for many crops including mustard. For morphological characterization, different mycelial characteristics such as texture of colony, type of mycelial mat, aerial mycelia, and colour of colony were recorded. In addition, sclerotial characteristics such as shape and size, number of sclerotia per plate, weight of sclerotia per plate were recorded. Variation of mycelial and sclerotial characteristics were observed in collected isolates of *S. sclerotiorum*.

Surveillance, isolation and preservation of *sclerotinia sclerotiorum* from different hosts including mustard

M.M.E Rahman and A.K. Saha

White mold is a very unwelcome disease that has several infectious forms in leaves and stems. A total of eight districts were surveyed for white mold disease considering different crops and alternative hosts. From collected 33 samples, a total of 15 isolates were purified and preserved for further studies.

Surveillance of *plasmiodiophora brassicae* causing clubroot of mustard

M.M.E. Rahman, S. Ghosh, M.M. Islam and A.K.Saha

A primary surveillance for monitoring of clubroot disease was conducted in some selected districts including major mustard growing areas considering current disease out-break situation. During the survey, clubroot disease was observed in various commercial mustard fields, exhibiting increasing levels of disease intensity and severity. The disease was found to be prevailed in all the seven surveyed districts with a range from 2 to 15% disease incidence and low to high disease severity. The disease out-break caused by the pathogen is escalating from its first report and posing a significant threat to mustard production in the country.

Screening of rapeseed-mustard varieties/lines against alternaria blight disease of mustard

N. A. Sultana and K. Jahan

The experiment was conducted during 2023-2024 at Joydebpur to find out the resistant lines of rapeseed-mustard against *Alternaria* blight. A total of thirty lines of Brassica spp. were tested. Susceptible variety BARI Sarisha-14 used as standard check. Among the 30 test lines; none of the varieties/lines screened against *Alternaria* blight of the rapeseed-mustard was found immune or highly resistant. Only five (05) lines (NAP-20002, NAP-16036, BJ-2014-Y-04, BJ-10-10104(Y), and BJ-1110(12)-1) were showed moderately resistant reaction to the disease.

Screening of mustard varieties/lines against alternaria blight and white mold disease

M.M.E Rahman, S. Ghosh, M.S. Uddin and A.K.Saha

Alternaria blight (*Alternaria brassicae*, *A. brassicicola* and *A. raphani*) and white mold (*Sclerotinia sclerotiorum*) are considered the most important diseases of mustard. Varying level of disease resistance was recorded against *Alternaria* blight of mustard. No entry was observed either immune or resistant against *Alternaria* blight. In case of white mold disease, among the 387 entries, a total of 107 entries showed resistant or tolerant under natural condition and rests of the entries were found susceptible to highly susceptible.

Efficacy of fungicides against white mold of mustard

M.M.E Rahman and A.K. Saha

A total of fifteen different fungicides from different groups were tested for controlling white rot disease caused by *Sclerotinia sclerotiorum*. All the fungicides significantly suppressed the disease over control. A range of 62.82 to 83.15% and 57.16 to 77.15% diseases suppression occurred in *Alternaria* blight and white mold disease, respectively. Among the fungicides, Rovral 50 WP (Iprodione) was found to control *Alternaria* blight (83.15%) and white mold (77.15%) disease significantly. Moreover, Amistar Top (Azoxystrobin + Difenoconazole) was also found to control the disease effectively considering both the diseases.

Efficacy of different group of chemical fungicides against alternaria blight of mustard

N.A. Sultana and K. Jahan

An experiment was conducted during 2023-2024 cropping season in the field of Oilseed Research Centre (ORC), BARI, Joydebpur to evaluate Seven fungicides of different groups in controlling *Alternaria* blight disease of mustard. The fungicides were Rovral 50 WP, (Iprodian), Nativo75WG (Tebuconazole50% and Tryfloxystrobin 25%) Tilt250 EC (Propiconazole), Folicur250 EC (Tebuconazole), Score 250EC (Dyfenonazole), Navara28 SC (Azoxystrobin20% and Cyproconazole 8 %), Amister Top 325 SC (Azoxystrobin + Difenoconazole), The fungicides were sprayed 3 times at 10 days interval. All the fungicides significantly reduced the disease as compared to control. Among the fungicides Rovral, Amister top, and Navara performed better than the other fungicides. In case yield the highest yield was obtained from Rovral followed by Amister top.

Evaluation of different group of commercial fungicides against tikka (leaf spot) and rust disease of groundnut (*arachis hypogaea*)

K. Jahan, N. Sultana, R. Islam, S. Akhtar, Mme. Rahman

A field trial was performed to assess the effect of various fungicides against Tikka/leaf spot disease of groundnut in natural epiphytotic conditions. Groundnut variety, "Dhaka-1" was cultivated at Research field of ORC, BARI, Gazipur during 2023-24 growing season. Nine treatments namely, Score, Nativo, Folicure, Tilt, Autostin, Rovral, Amister, Tip off, Ridomil were sprayed three times according to disease prevailing conditions. Amister Top showed minimum disease incidence (18.48%) which was 74.60% disease reduction over untreated control treatment. The fungicides Ridomil, Tilt and Nativo also significantly reduced the disease severity and increased crop yield.

Screening of groundnut varieties/lines against tikka rust and other soil borne diseases

K. Jahan, N. Sultana, R. Islam, S. Akhtar, Mme. Rahman

An experiment was conducted at Oilseed Research Centre, BARI, Gazipur during Rabi 2023-24 cropping season under natural epiphytotic condition to evaluate groundnut entries against leaf spot and

rust diseases. Disease data were recorded at 153 days of plant age using '0-5' scale for leaf spot. Among the 35 tested varieties/lines, 22 varieties/lines were selected as moderately resistant and rest of the entries were found moderately susceptible. No entry was observed either immune or resistant against *Cercospora* leaf spot disease of groundnut. The rust disease caused by *Puccinia arachidis* was not prominent.

Variability of *sclerotium rolfsii* causing collar rot disease of sunflower

M. R. Humauan, B. Akhter and D. Sarkar

Twelve isolates of *Sclerotium rolfsii* causing collar rot were collected from different sunflower breeder seed production and experimental field. The isolates were studied for morphological and cultural characters. Significant variations were found in colony morphology, mycelial growth and number of sclerotia. Seven isolates showed fast and 5 showed slow mycelial growths compare to other isolates. Three Isolates (S₁, S₄ and S₁₀) did not produce any sclerotia, where the highest number of sclerotia (367/plate) was found in isolate S₈. All isolates formed white cultures with fluffy, fibrous or compact mycelia.

Survey of oilseed crop diseases and their existing disease management practices

K. Jahan, N, Sultana, R. Islam, S. Akhtar, Mme. Rahman

A survey on Rapeseed-mustard and sunflower disease occurrence and incidence was conducted in Tangail, Patuakhali, Borguna, and Bhola in 2023-24 cropping season. A total of 18 locations under 4 Upazila viz., Mirzapur, Delduar, Madhupur and Dhanbari in Tangail district were surveyed for disease occurrences of mustard. Five varieties viz., BARI Sharisha-14, BARI Sharisha-17, BARI Sharisha-18, BARI Sharisha-20 and Tori-7 were cultivated in 33.3%, 27.5%, 33.3%, 5.5% and 5.5% fields in surveyed locations. *Alternaria* blight, White mold, Club root, nematode root knot and dead floescence diseases were recorded from these locations, where *Alternaria* blight was so frequent in most of the fields with 80-100% incidence. Club root was observed in one field with 80% incidence in Dhanbari upazila. Nematode root knot symptoms were observed also in one field in Madhupur upazila with 10% incidence, also 10% dead inflorescence were observed in the same field. For

Sunflower disease survey a total of 17 locations under Patuakhali, Barguna and Bhola districts were visited. Five varieties namely BARI Sunflower-2, BARI Sunflower-3, Hysun-33, Hysun-36 and Unisun were cultivated in 47%, 5.88%, 29.41%, 5.88% and 11.76% observed fields. *Alternaria* leaf blight with 55-90%, soft rot with 2-30% disease incidence were recorded. Dwarf plant and Mosaic virus symptoms in sunflower was also observed in one field.

Activities: Spices Crops

Onion

Screening of onion varieties and lines against purple blotch disease

M. Monirul Islam, K.M. Alam, M. A. Wadud, M.I. Faruk and A.K. Saha

A screening experiment was conducted with 36 varieties and lines of onion to search for resistant variety against purple blotch disease of onion at the field of Plant Pathology Division, BARI, Gazipur during 2023-2024 cropping season. The highest disease incidence of 73% purple blotch was found in AB8(422) and the lowest disease incidence 5% was found in AC-GAZ-384 treated plots. The maximum disease severity (4.0) of purple blotch was found in the line AB8(422) treated plot. The minimum disease severity (1.0) was found in the plots treated with AC-GAZ-384, AC-GAZ-380, ACBog423-AF5 and AB4(379).

Effect of bio-fungicides in controlling purple blotch disease of onion

M. Monirul Islam, K.M. Alam, M. A. Wadud, M.I. Faruk and A.K. Saha

The efficacy of six bio-fungicides viz. Decoprime, Paenamaxi, Biosida, Dynamic, Lycomax, and Clybion was tested under the field conditions of Plant Pathology Division, BARI, Gazipur against purple blotch disease of onion. The onion variety BARI Piaz-4 was used in the experiment. The highest disease incidence of 72% was recorded in control treatment and the lowest of 25 % was recorded in treatment Lycomax treated plot. The highest disease severity of 4.67 was recorded in control treatment and the lowest of 2.00 was recorded in treatment Lycomax. The maximum yield 20.33 t/ha was recorded in treatment

Lycimax and the lowest 5.00 t/ha was recorded in control treatment.

Validation of developed idm package in controlling purple blotch disease of onion

M. Monirul Islam, K.M. Alam, M. A. Wadud, M.I. Faruk and A.K. Saha

The experiment was conducted at BARI, Gazipur, SRSC, Faridpur and SRC, Shibgonj, Bogura during 2023-24 cropping season to validate the IDM package in controlling purple blotch disease of onion. Three IDM package was evaluated against purple blotch disease of onion. The highest disease incidence of 80.33% was found in control treatment at Faridpur and the lowest disease incidence of 3.66% was recorded in Luna sensation (0.1%) + N₁₅₀P₂₀₀K₁₀₀S₂₀Zn₄B₁ kg/ha + 10cm plant spacing + Cow dung (3 t/ha) at Gazipur. The highest disease severity of 5.00 was observed in control treatment at Faridpur and Bogura and the lowest disease severity of 1.33 was observed in Luna sensation (0.1%) + N₁₅₀P₂₀₀K₁₀₀S₂₀Zn₄B₁ kg/ha + 10cm plant spacing + Cow dung (3 t/ha) at Gazipur. The highest yield of 30 t/ha was recorded in Luna sensation (0.1%) + N₁₅₀P₂₀₀K₁₀₀S₂₀Zn₄B₁ kg/ha + 10cm plant spacing + Cow dung (10 t/ha) at Gazipur and the lowest yield of 4.33 t/ha was recorded in control treatment at Faridpur.

Efficacy of new fungicides in controlling purple blotch of onion

M. R. Islam, M.M. Rahman, M. I. Faruk

The experiment was conducted at Regional Spices Research Centre, BARI, Magura during 2023-24 to find out the effect of different fungicides for controlling purple blotch disease of onion. BARI piaz-4 was used as the test variety. The experiment was laid out in randomized complete block design with three replications. Total of 18 different fungicides were evaluated. Significant differences regarding yield and yield attributes of onion were observed among different treatments. The highest yield of 20.11 t/ha was found from fungicide code name 895 which was significantly higher than those of other treatments. The lowest yield of 13.68 t/ha was found from the control plot. The lowest disease incidence of 4.87% was observed from fungicide code name 1080 plot and the highest disease incidence of 19.25% was observed from control plot.

Evaluation of new fungicides for controlling purple blotch disease of onion

Ms Ali and Mb Anwar

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out the effective new chemical fungicides against purple blotch disease of onion. Fourteen new fungicides were evaluated in this study. Among the fungicides, the lowest disease severity (11.00%) was recorded in T₇ (1266) treated plot which was statistically similar to T₈, T₄, T₂ and T₁₀ treated plots, respectively. On the other hand, the highest disease severity (75.00%) was found in T₁₅ (control) plot. Maximum reduction (85.33%) of disease severity over control was found in T₇ (1266) treated plot and minimum (51.12%) was found in T₃ (1130) treated plot. The highest yield (24.58 t/ha) was recorded in T₇ (1266) treated plot followed by T₈, T₄, T₂ and T₁₀ treated plots, respectively and the lowest (12.16 t/ha) in T₁₅ (control) plot.

Survey on pre and post-harvest diseases of onion in Bangladesh

M. Monirul Islam, K.M. Alam, M. A. Wadud, M.I. Faruk and A.K. Saha

A survey on purple blotch, black mould and soft rot diseases of onion was conducted at Faridpur, Rajbari, Bogura, Magura, Pabna, Lalmonirhat and Gazipur districts during 2023-2024 cropping season. Purple blotch, black mould and soft rot diseases of onion are predominant in all surveyed locations. The highest incidence of purple blotch disease (78%) was found in Rajbari district and the lowest incidence of purple blotch disease (56%) was recorded in Magura district. The maximum incidence of black mould disease of 29% and soft rot disease of 26% were found in Lalmonirhat. The minimum incidence of black mould disease (19%) and soft rot disease (15%) were found in Magura. The highest severity of purple blotch, black mold and soft rot diseases were found 4.23, 3.34 and 3.13 in Rajbari, Lalmonirhat and Lalmonirhat, respectively. The lowest severity of these three diseases 3.53, 2.66 and 2.35 were found in Magura. The *Alternaria porri* was identified in purple blotch, *Aspergillus niger* was identified in black mold and *Pectobacterium carotovum* (Syn. *Erwinia carotovora*) was identified in soft rot samples, respectively.

Survey and identification of new diseases of spice crops in Bangladesh

M. A. Wadud, M. Z. H. Prodhan, N. Nath, M. S. Akhter, M. M. Islam and M. N. A. Chowdhury

Survey was conducted at different spices growing areas during 2023-24 to identify the new disease of spice crops with their causal organisms. Eleven new diseases were their causal organisms found to infect on 8 different spice crops. Most of the pathogens caused damage on different crops in Bangladesh but they are new in spice crops. Among them, seedling rot and leaf spot of onion (*Curvularia* spp.), inflorescence blight of onion (*Botrytis* spp.), seedling rot (*Curvularia* spp.) of chilli, leaf and stem rot (*Fusarium* spp.) of chilli, wilt (*Fusarium* spp.), leaf spot of celery (*Alternaria* spp.), root rot of celery (*Fusarium* spp.), leaf spot of ginger (*Colletotrichum* spp.), leaf spot of plum (*Colletotrichum* spp.), leaf spot of chaba (*Colletotrichum* spp.) and leaf rot of vanilla (*Colletotrichum* spp.) were new. The identification of these new diseases of different spice crops with their causal organisms would help to manage these diseases on spices crops in Bangladesh.

Black Cumin

Cultural and morphological characteristics of fusarium wilt causing organisms of black cumin

M. A. Wadud, M. Z. H. Prodhan, M. M. Kamal and N. Nath

The research was conducted at of four AEZ of Spices Research Centre, Bogura, Regional spices Research Centre Gazipur and Magura and Spices Research Sub-Centre, Faridpur during 2023-24 to identify the causal organisms of black cumin wilt disease with their morphological characteristics. This research was focused to identify *Fusarium* spp., wilt causing pathogens of black cumin of all isolates of *Fusarium* spp. in BARI Black cumin-1. In an attempt to identify the causal organism of the wilt of black cumin by using molecular tools, a total of thirty plant samples were collected from the plants showing wilt symptoms of four AEZ in Bangladesh. According to cultural and morphological variation all the isolates were *Fusarium* spp. The findings of this experiment would help for designing proper management strategies against wilt of black cumin in Bangladesh.

Chilli

Induce systemic resistance against cucumber mosaic virus of chilli by trichoderma harzianum

M. S. Rahman, M. I. Fruk, and A. K. Saha

The ability of *Trichoderma harzianum* (Bioderma), to induce resistant against Cucumber mosaic virus (CMV) in chilli plants were examined in growth chamber of Plant Pathology Laboratory, BARI during the year 2023-2024. The plants treated with *Trichoderma harzianum* (TH) led to a significant modulation of symptoms, in two conditions that was plant's leaves (T1) and root (T2) first treated with TH, and after 7 days inoculated with CMV. These two conditions the disease severity was very low and few leaves showed only mild mosaic (Severity point 2.65 and 2.25). Cucumber mosaic virus accumulation in systemically infected leaves was measured by DAS-ELISA. The highest OD value was found 2.38 in plants treated with CMV and the lowest was found 0.115 in healthy control followed by only treated with TH (OD value 0.119). The plants first treated with TH (leaves or root T₄ & T₅) and after 7 days inoculated with CMV, showed positive but the mean absorbance value (OD at 405nm) was very low (0.304 & 0.294). The virus accumulation was higher in only CMV inoculated plants as compared to plants treated with TH. TH enhanced chilli growth in terms of plant height, led to a systemic resistance by jasmonic acid/ethylene and salicylic acid signaling pathways. In conclusion, the data reported here indicate that the TH based strategy might be effective against CMV.

Turmeric

Survey and identification of bacterial wilt of turmeric

M. A. Wadud, M. Z. H. Prodhan, M. N. Farid, N. Nath and M. N. A. Chowdhury

A survey program was conducted in five districts namely Bogura, Rangpur, Lalmonirhat, Magura and Meherpur to find out the incidence and causal organism of rhizome rot of turmeric. The rhizome rot disease was considered as a severe and danger to turmeric cultivation due to infection of *Ralstonia solanacearum*. The bacterial disease was observed on turmeric in surveyed areas at maturity stage. The leaves suddenly wilted, curled and yellowed, and

the whole plant finally died. The highest incidence was recorded in Lalmonirhat and the lowest in Meherpur district. Creamy-whitish bacteria were isolated from the rhizomes of the infected turmeric. These bacteria were identified as *Ralstonia solanacearum* and were isolated from diseased plants using TZC medium as a selective medium for identification of *Ralstonia solanace*

Activities: Vegetable crops

Tomato

Screening of fungicides to control stem rot/blight disease of tomato

M. R. Humauan, B. Akhter and D. Sarkar

The experiment was conducted at Regional Agricultural Research Station Ishurdi, Pabna during rabi season of 2023-24 to select the effective fungicides against stem rot/blight disease of tomato plant. Nine different fungicides and one untreated control were used in this experiment. All the fungicides significantly reduced the disease as compare to control. The lowest PDI (7.31) was found in Luna sensation 50 SC @ 1ml/l treated plots which statistically similar to Score 250 EC @1 ml/l (8.16) treated plots, where the highest PDI (75.52) was recorded in control plots. The highest yield (41.30 t/ha) was observed in Luna sensation 50 SC @ 1ml/l treat plots followed by Score 250 EC @ 1 ml/l (37.59 t/ha) treated plots whereas the lowest (9.86 t/ha) was found in control plots. The highest net income (Tk. 754250/ha) was recorded from Luna sensation 50 SC treated plots followed by Tk. 680250/ha from Score 250 EC, Tk. 580200/ha from Nativo 75 WG, Tk. 559250/ha from Amistar Top 325 SC and Tk. 553500/ha from Indofil M 45.

Evaluation of new fungicides against early blight of tamato

M.S. Ali and M.B. Anwar

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out appropriate new chemical fungicides for controlling early blight disease of tomato. Fifteen new fungicides were evaluated in this study. Among the fungicides, the lowest disease severity (10%) was recorded in T₁₁ (1134) treated plot which was statistically to T₆, T₅, T₁₀, T₁₄ and T₁₅ treated plot, respectively. On the other

hand, the highest disease severity (80) was found in T₁₆ (control) plot. Maximum percent reduction (87.50%) of disease severity over control was found in T₁₁ (1134) treated plot and the lowest (50%) was found in T₇ (1046) treated plot. The highest yield was recorded (45.48 t/ha) from T₁₁ (1134) treated plot followed by T₆, T₅, T₁₀, T₁₄ and T₁₅ treated plot, respectively and the lowest (14.92 t/ha) in T₁₆ (control) plot followed by T₆ treated plot.

Integrated management for controlling early blight of tomato

M.B. Anwar and M.S. Ali

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out suitable integrated management practice for controlling early blight of tomato. Six bio-fungicides and one chemical fungicide were evaluated in this study. The lowest disease severity (10%) was obtained from T₇ treated plot which was statistically identical to T₃, T₂ and T₁ treated plot, respectively. On the other hand, the highest disease severity (50%) was found in T₈ (control) plot. Maximum reduction (80%) of disease severity over control was found in T₇ treated plot. In case of bio-fungicides, maximum reduction of disease severity over control (74%) was found in T₃ treated plot and the lowest (46.68 %) was found in T₅ and T₆ treated plot. The highest yield was recorded (42.39 t/ha) in T₇ treated plot followed by T₃, T₂ and T₁ treated plot, respectively and the lowest (20.59 t/ha) in T₇ (control) plot.

Screening of tomato germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin and M. M. Rahman

Nineteen tomato varieties/accessions were screened to find out bacterial wilt resistant source grown under artificial epiphytotic field conditions during 2023-2024 cropping seasons. Among the varieties/accessions, only one variety and seven lines of tomato such as BARI Tomato-11, AV-135, AV-1616, 1008, AVTO-1315, AV-1306, AVTO-1921 and 1903 showed resistant reaction against bacterial wilt. Eight lines such as 1711, AV-1712, AVTO-1010, AV-1907, AVTO-1911, AVTO-1713, 1719 and AVTO-1718 were grades as moderately resistant. Rest of the accessions of tomato showed moderately susceptible reaction to *R. solanacearum*.

Integrated disease management of bacterial wilt in tomato

M. Afroz, L. Yasmin and M. M. Rahman

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during November, 2023 to April, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of tomato. The treatments were T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 4.8 t/ha (in pit) (ii), T₂= Stable Bleaching Powder @ 25 kg/ha + *Bacillus subtilis* 38, T₃= Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38, T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 4.8 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), T₅= Farmer's practice and T₆= Susceptible check (BARI Tomato-15). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided the highest yield.

Integrated management of tomato leaf curl virus (toLCV) of tomato

M.S. Rahman, M. S. Akhter, M. I. Faruk, A. K. Saha

An experiment was conducted to find out the effective management option against *Tomato leaf curl virus* (ToLCV) of Tomato. BARI Tomato 14 was planted at the research field of Plant Pathology Division, BARI Gazipur on January 2024 with three replications. Significant variation of disease incidence and severity was found in different treatment packages. Disease incidence and severity ranged from 12 to 35% and 1.0 to 3.0, respectively in different treatment packages. The lowest disease incidence and severity was found in treatment package T₁ (One spray of Imidacloprid 0.1% at 5 Days before transplanting + Sticky yellow + 3 sprays of Imidacloprid 0.1% at 15 days interval). The highest yield (67.70 t/ha) was also recorded from T₁ where the highest reduction of disease incidence (65.71 %) and maximum increase of yield (31.34 %) was found in the same treatment package.

Management of leaf curl disease of tomato using beneficial microbes and vector control

M.B. Anwar, M.S. Ali and M.S. Akhter

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi

season of 2023-24 to find out beneficial microbes for controlling leaf curl virus of tomato. Seven different treatments including control were evaluated in this study. The lowest disease incidence (12.34%) was found in T₆ treated plot followed by T₃, T₄ and T₅ whereas the highest disease incidence (33.33%) was found in T₇ (control) plot. The highest yield was recorded (45.93 t/ha) in T₆ treated plot followed by T₃, T₄ and T₅ treated plot, respectively and the lowest (15.50 t/ha) in T₇ (Control) plot.

Identification of resistance sources of bari released tomato varieties/lines against leaf curl viruses

H Rahman

An experiment was conducted at the Regional Agricultural Research Station, Jamalpur during rabi season of 2023-24 to identify noble sources of resistance in BARI released Tomato varieties/lines against leaf curl viruses. The evaluation of Thirty-nine Tomato genotypes was performed against Tomato Leaf Curl Viruses (ToLCV) under natural conditions where the viruses were transmitted by white fly. However, ToLCV-infected plants ranged from 14.58 to 58.33%. Twenty-six varieties/lines resulted in >10-30% ToLCV infection (MR), 12 varieties/lines exhibited >30 to 50% ToLCV infection (MS) and 1 variety exhibited 58.33% ToLCV infection (S). Plants that were likely ToLCV resistant ranged in percentage from 41.67 to 85.42. Comparatively, 1 variety indicated 41.67% ToLCV apparent resistance, while 30 varieties/lines showed 50–80% ToLCV apparent resistance. More than 80% of the ToLCV apparent resistance was created by 8 varieties/lines. BARI Tomato-16 variety produced the maximum fruit yield (65.63 t/a), followed by BARI Tomato-17 (59.15 t/ha), and BD-10950 (57.70 t/ha) which were statistically at par. BD-10321 lines (26.77 t/ha) produced the least amount of fruit yield. Different varieties and lines with minimal ToLCV infection have higher fruit yields, indicating that they are probably resistant to the infection.

Screening of tomato germplasm for resistance to tomato leaf curl virus under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and Siddique Alam

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-

2024 cropping season with promising germplasm and variety of tomato to find out resistant sources against Tomato Leaf Curl Virus (TLCV) disease. A total of 16 tomato variety/ accessions were evaluated including susceptible check. Nine germplasm were resistant and twelve germplasm were found moderately resistant to disease and rest of the moderately susceptible. The highest yield was recorded in BARI Hybrid tomato 8 (22.73 ton/ha) and lowest yield was obtained from GP-0093 (6.49 ton/ha).

Screening of tomato germplasm against root-knot nematode

L. Yasmin, M. Afroz and M. M. Rahman

Twenty tomato varieties/accessions were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-2024 cropping season. Among them, six accessions (AVTO-1315, BARI Tomato-11, AVTO-1010, AV-1907, AVTO-1921 and AV-195) showed resistant, nine accessions (AVTO-1911, 1719, AV-1306, 1711, AV-1712, AV-1616, AV-1306, AVTO-1911 and AVTO-1314) showed moderately resistant, four accessions (1409, 1717, AV-1711 and AVTO-1718) showed susceptible and one accession (AVTO-1713) showed highly susceptible reaction to root knot nematode.

Screening of new bio-fungicides against root-knot nematode *Meloidogyne incognita* of tomato

Md. Iqbal Faruk, R. Momotaz and M. M. Rahman

The experiment was conducted to observe the efficacy of new bio-pesticides viz. Bio-Nemasis, CAD Tricho 1.5 WP, Hariz 1% WP, Tricho-plus, Pangery old, Bio-Trin, Richoderma, Derma plus, Tricost, Biolead, Velum Prime, Kixona, BAU bio-char and nematicide Rugby 10 against root knot nematode of tomato caused by *Meloidogyne incognita* in the field of Plant Pathology Division, BARI, Gazipur. Root knot nematode infested field soils were treated with those bio-pesticides as well as nematicide Rugby 10G. All bio-pesticides significantly reduced root knot nematode disease severity and gave higher plant growth parameters as well as yield of tomato compared to control. Among the bio-fungicides, CAD Tricho 1.5 WP, Tricost, Biolead, Tricho-plus, Hariz 1% WP, Pangery Gold and Derma plus were found better for reduction of root-knot disease severity compared to other treatments in the pot house

condition but in the field CAD Tricho 1.5 WP Tricost and Biolead performed better against root knot nematode.

Test of composts and biochars against root-knot nematode of tomato

Md. Iqbal Faruk, R. Momotaz and M. M. Rahman

The experiment was carried out in the field Plant Pathology Division, Bangladesh Agricultural Research Institute, Gazipur to observe the efficacy of Tricho-compost, vermi-compost, organic-compost and four different biochars against root knot nematode, *Meloidogyne incognita* of tomato. All treatments significantly reduced root-knot nematode disease severity and increased plant growth as well as yield of tomato compared the control. Utilization of Tricho-compost, composts and biochars had positive effect on the improvement plant growth and crop productivity as well as disease suppression of tomato.

Cucumber

Efficacy of new fungicides in controlling powdery mildew of cucumber

T H Tabassum

The experiment was conducted at RARS, Cumilla during 2023-2024. Management trial of powdery mildew of cucumber was conducted by foliar application of 7 new fungicides (Roccka 70 WP @0.5 gm/L water, Physcion 0.05% @3.0 gm/L, RD- Carb 50 WP 2.0 gm/L, Ippy 45 WP 2.0 gm/L, MZEB 80 WP 2.0 gm/L, Tebubin 75 WDG 2.0 gm/L and BT-Zim 50 WP @ 0.5 gm/L) in research field and control was observed as check. It was found that spraying Physcion 0.05% @ 3ml/L water showed effective against powdery mildew of cucumber.

Efficacy of fungicides and bio-fungicides against downy mildew disease of cucumber

Md. Iqbal Faruk and M. M. Rahman

The experiment was conducted in the field of Plant Pathology Division, BARI during 2023-24 cropping season to test the efficacy of different group of fungicides and bio-fungicides against downy mildew diseases of cucumber caused by *Pseudoperonospora cubensis* under natural field condition. Results from the study revealed that bio-pesticides gave 30.80 to 69.19% and 49.99 to

61.02% reduction of downy mildew disease incidence and disease severity of cucumber, respectively compared to control. Application of chemical fungicides Xivana (Fluoxapiprolin 20%) and Ridomil Gold 72 WP reduced 91.47% and 81.98% disease incidence, 85.58% and 77.93% disease severity, respectively compared to control and also gave the higher yield that appeared 47.49% and 43.89% higher yield of cucumber compared to control.

Development of bio-rational based integrated management package against foot and root rot disease of cucumber

Md. Iqbal Faruk and M. M. Rahman

The experiments were conducted in the field of Plant Pathology Division, BARI during 2023-24 cropping season to develop eco-friendly integrated management technology against foot and root rot disease caused by *Fusarium oxysporum* and *Sclerotium rolfsii*. Pathogens infested field soils were treated with different treatment viz. *Trichoderma* based Tricho-composts, mustard oil cake and saw dust burning with bio-fungicide Lycomax, poultry refuse with chemical fungicide Autostin. It was revealed that all the treatments gave appreciable reduction of foot and root rot disease incidence, root knot nematode disease severity and increasing plant growth parameters as well as yield of cucumber. Among the treatments, integration *Trichoderma* based bio-fungicides Tricho-composts with bio-fungicide Lycomax or mustard oil cake with bio-fungicide Lycomax or poultry refuse with Autostin were the better treatments in reducing foot and root rot and also root-knot nematode diseases as well as increasing plant growth and yield of cucumber.

Screening of cucumber germplasm for resistance to cucumber mosaic virus under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and Bahauddin Ahmed

The experiment was conducted in Horticulture research field, BARI, Gazipur during summer 2023-24 cropping season with promising germplasm of cucumber to find out resistant sources against cucumber mosaic virus (CMV) disease. A total of 20 cucumber germplasm was evaluated including susceptible check (MynamatiF1 & AlviF1). Seven germplasm were

showed highly resistant and four germplasm were found moderately susceptible to disease and rest of the susceptible to the disease. The highest yield was recorded in 5G (12.71 t/ha) followed by CS-79 (7.82 ton/ha), CS-25-20-42 (7.09 ton/ha) with 0.00%, 0.00% and 75% disease incidence and the lowest yield was obtained in CS-34-2 (3.67 t/ha) respectively with 41.67% disease incidence.

Bringal

Screening of BARI Bt- brinjal varieties against bacterial wilt under pot condition

R. Islam, M.S. Akhter, K. Jahan, M. Naznin, M I. Faruk and A.K. Saha

The experiment was conducted at pot house/green house of plant pathology division in 2023-2024 cropping season at BARI, Gazipur, to observe the performance of four Bt brinjal and three non Bt brinjal varieties against bacterial wilt. Among the varieties BARI Bt-begun 1, BARI Bt- begun 3, BARI begun 5, and BARI begun 6 were found highly susceptible to bacterial wilt with the incidence more than 40%. The BARI Bt- begun 4 and BARI begun 4 were highly resistant to bacterial wilt disease with the incidence of 0%. Only one variety (BARI Bt- begun 2) showed susceptible to bacterial wilt and incidence percentage was 33.33.

Screening of eggplant germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin and M. M. Rahman

Nineteen varieties/accessions of eggplant were evaluated in Kharif season and and twenty-five eggplants were tested in Rabi season for resistance to *Ralstonia solanacearum* grown under artificial epiphytotic conditions during 2023-2024 cropping seasons. Among them, six germplasm, 215X83-B3, Paler Hazarijhuri Begun, 18X223, SM-233, 253BX83B3 and BARI Begun-8 were graded as resistant in Kharif season. Only one 357X220 showed moderately resistant reaction. In Rabi season, one variety and seven lines such as BARI Begun-8, 21X11, 20X5, 12X11, 18X405, SM-332, 407 X 332 and SM-405 showed resistant reaction. Seven lines such as SM-18, 275X11, 21x220, SM-105, 5X405, 5X216 and SM-275 showed moderately resistant reaction. The rest of the

germplasm were moderately susceptible to highly susceptible to *R. solanacearum* in both seasons.

Integrated disease management of bacterial wilt in eggplant

M. Afroz, L. Yasmin and M. M. Rahman

The experiment was conducted at Horticulture Research Centre, BARI, Joydebpur, Gazipur during December, 2023 to May, 2024 to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of eggplant. There were seven treatments were used, such as T₁= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 2.13 t/ha (in pit) (ii), T₂=Stable Bleaching Powder @ 25 kg/ha + *Bacillus cereus*, T₃= Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus*, T₄= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 2.13 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T₅=Farmer's practice and T₆= Susceptible check (BARI Begun-4). Among the treatments, T₄ and T₅ showed the lowest incidence of the disease and provided highest yield.

Validation trial of emos for controlling bacterial wilt in solanaceous vegetable

M. T. Hossain, S T Nira, M. M. Rahman and M S. I. Khan

The study was conducted in Bangladesh on the application of endophytic new *Bacillus oryzicola* YC7007 and *B. velezensis* GL6 to prevent bacterial wilt in solanaceous crops. The *in vitro* antagonistic activities by formulated product of EMOs called BHAT-01 WP and their active inocula levels 2.0×10^7 CFU/ml or CFU/gm had been scrutinized against the bacterial pathogen *Ralstonia solanacearum* for controlling bacterial wilt. Strain YC7007 and GL6 suppressed the wilt and promoted the plant growth compared with control. Bacterial wilt of the solanaceous crops especially on eggplant (susceptible variety BARI Begun 12 and BARI Bt Begun 4), tomato (BARI Tomato 15, Profit early hybrid CHIA TAI Seeds of Thailand) was successfully controlled *in vivo* at RARS, Hathazari, Mirsharai, and Banshkhali areas. Granular EMOs were scrutinized by one time drenching as a basal dose and formulated powder EMOs, BHAT-01 WP were conducted by three-time sprayings to the rhizosphere till to droplet. There were no diseases at 2-MAT (Months after transplanting) in the treated plot. Granular form for basal application, EMOs (1×10^8 CFU/g, 80 gm/m²)

and powder form formulated bacterial product (1×10^9 CFU/g, 1g/L) together revealed significantly (Tukey HSD, $P < 0.05$) lower disease severity by 1.6 ± 0.6 and 0.6 ± 0.4 than the control by 2.6 ± 0.5 and 1.6 ± 0.5 in the BARI Begun 12 and BARI Bt Begun 4, respectively at 3-MAT. However, EMOs, BHAT-01 WP revealed significantly (Tukey HSD, $P < 0.05$) lower disease severity by 0.56 ± 0.07 and 0.4 ± 0.02 than the control by 1.03 ± 0.08 and 1.0 ± 0.02 at BARI Tomato 15 and Profit early at 3-MAT out of 0-5 disease rating scales. It showed significantly consistent disease suppression.

Screening of eggplant germplasm against root-knot nematode

L. Yasmin, M. Afroz and M. M. Rahman

Ten varieties/accessions of eggplant viz. SM-405, 217 (A), 20 x 5, 5 x 405, BARI Begun- 4, BARI Begun- 8, 5 x 216, 216-A, 12 x 11 and 18 x 405 were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2023-2024 cropping season. Among them 5 x 405 showed resistant reaction, eight accessions such as SM-405, 217 (A), 20 x 5, BARI Begun-4, BARI Begun-8, 5 x 216, 216-A and 18 x 405 were moderately resistant and 12 x 11 showed moderately susceptible reaction to root knot nematode.

Pumpkin

Efficacy of new fungicides in controlling powdery mildew of sweet gourd

M.S. Ali and M.B. Anwar

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out the effective new chemical fungicides against powdery mildew disease of sweet gourd. Fifteen new fungicides were evaluated in this study. Among the fungicides the lowest disease severity (4.00) was recorded in T₄ (364), T₁₄ (723) T₁₀ (486), T₇ (487) and T₈ (431) treated plot. On the other hand, the highest disease severity (3.00) was found in T₁₆ (control) plot. The highest reduction (86.66%) of disease severity over control was found in T₄ (364) and T₁₄ (723) treated plot and the lowest (66.66%) in T₃ (349) treated plot. The highest yield (35.10 t/ha) was recorded in T₄ (364) treated plot followed by T₁₄ (723), T₁₀ (486), T₁₁ (487) and T₈ (431) treated plot, respectively and

the lowest (15.25 t/ha) in T₁₆ (control) plot followed by T₃ (349) treated plot.

Comparison for effectiveness of a bio-fungicide with two chemical fungicides for the management of powdery mildew of pumpkin on floating bed

M. G. Kibria, M. M. R. Talukder, M.R. Islam and B.C. Kundu

The experiment was conducted at RARS, Rahmatpur, Barishal during 2023-24 Bio-fungicide and chemical fungicides both were effective in controlling the powdery mildew disease in floating bed agriculture. It was found that spraying with Thiovit 80 WG @ 0.2% and Bio-derma (0.3%) can effectively control the powdery mildew of pumpkin as well as yield was increased over control.

Evaluation of pumpkin genotypes to mosaic viral disease under field condition

M. Mahfuzur. Rahman, L. Yasmin and M. Afroz

The experiment was conducted in Horticulture research field, BARI, Gazipur during 2023-24 cropping season with promising germplasm of pumpkin to find out resistant sources against mosaic viral diseases. A total of 20 pumpkin germplasm was evaluated including susceptible check (sweet). Among the germplasms, ten germplasm were showed resistant and five germplasm were found moderately resistant and rest of the germplasm were showed moderate susceptible to the disease. The highest yield was recorded in BD-232 (13.00 t/ha) followed by BD-269 (11.00 ton/ha) with 0.00% disease incidence and the lowest yield was obtained in BD-2214 (6.78 ton/ha) respectively with 0.00% disease incidence.

Bottle Gourd

Development of bio-rational based disease management package against root-knot nematode disease of bottle gourd

Md. Iqbal Faruk and M. M. Rahman

The experiments were conducted in the field of Plant Pathology Division, BARI during 2023-24 cropping season to develop eco-friendly integrated management technology against root knot nematode caused by *Meloidogyne incognita* of bottle gourd. The root-knot nematode infested pit

soils were treated with different treatment of *Trichoderma* based Tricho-composts with lower dose of chemical nematicide Rugby 10G, poultry refuse, mustard oil cake and saw dust burning with lower dose of chemical nematicide Rugby 10G. Rugby 10 G was also used for comparison. All the treatments gave appreciable reduction of gall development on roots and increased plant growth parameters such as shoot and root growth as well as yield of bottle gourd. Among the treatments, integration poultry refuse with Rugby 10G or *Trichoderma* based bio-fungicides Tricho-composts with Rugby 10G or mustard oil cake with Rugby 10G were the better treatments in reducing root-knot nematode disease as well as increasing plant growth and yield of bottle gourd.

Okra

Screening of okra germplasm resistance to okra yellow vein mosaic virus

L. Yasmin, M. Afroz & M. A. Rahman

Twenty okra germplasm were evaluated for resistance to Okra yellow vein mosaic virus (OYVMV) grown under natural conditions during 2024 cropping seasons. Among them, three accessions of okra such as BD-12109, BD-12110 and BD-12116 showed tolerant reaction, nine accessions such as Sabuzshathi (shek agro seed), Sabuzshathi, Duranta (Munir seed), Agam plus, OK-285, BD-12108, BD-12123, BD-12122, BD-12117 showed moderately susceptible reaction. Four accessions showed (BD-12119, BD-12112, Krishan seed and BD-12128) susceptible reaction. Four accessions showed (BD-12107, BD-12121, BD-12125 and BARI Derosh -1) highly susceptible to Okra yellow vein mosaic virus (OYVMV).

Efficacy of chemicals, botanicals and plant defense activators in managing okra yellow vein mosaic virus

M. Mahfuzur. Rahman, L. Yasmin and M. Afroz

The experiment was conducted to manage okra yellow vein mosaic disease through the chemical, botanical and plant defense activators. The experiment was conducted in Plant Pathology Section, HRC, BARI, and Gazipur during 2024-2025 summer seasons. There were six treatments such as: i) Imidacloprid ii). Neem oil iii). Moringa oleifera leaf extract iv), *Allium sativum* v).

Salicylic acid vi) Untreated control were carried out with three replications. Among the treatments, treatment, imidacloprid at 15 days interval were showed lowest disease incidence and increase the yield of tomato.

Integrated management of enation leaf curl disease of okra

M. R. Humauan, B. Akhter and D. Sarkar

The experiment was conducted at Regional Agricultural Research Station Ishurdi, Pabna during kharif-1 season of 2024 to eco-friendly management of white fly and enation leaf curl virus disease of okra. Nine treatments viz. T₁ = Imidacloprid @ 0.5 ml/l, T₂ = Biotrin @ 1.4 ml/l, T₃ = Bio clean@ 1 ml/l, T₄ = Bio-Anvir @ 1 ml/l, T₅ = Barrier crop (maize) + Imidacloprid@ 0.5ml/l, T₆ = Barrier crop (maize) + Biotrin @ 1.4 ml/l, T₈ = Barrier crop (maize) + Bio-Anvir @ 1 ml/l and one untreated control were used in this experiment. The lowest number of white fly population (1.83) was recorded in treatment T₈ treated plots which was statistically similar to T₅, T₆ and T₇ where the highest population (17.67) was count in control plots. The lowest ELCV incidence (2.78%) was found in treatment T₈ which was statistically similar to T₆ (3.26%), T₅ (4.43%) and T₇ (6.28%) while the highest incidence (88.77%) was recorded in control plots. The highest yield (17.58 t/ha) was observed in treatment T₈ treated plots followed by T₆ (17.03 t/ha) and T₅ (16.27 t/ha) treated plots whereas the lowest (5.39 t/ha) was found in control plots.

Country Bean

Screening of country bean germplasm for resistance to multiplex virus complex under field condition

M. Mahfuzur. Rahman, L. Yasmin, M. Afroz and Siddique Alam

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2023-24 cropping season with germplasm and variety of country bean to find out resistant sources against country bean common mosaic virus (BCMV) disease. A total of 20 country bean variety/germplasm were evaluated including susceptible check. Among the germplasm, four germplasm have been performed resistance to the mosaic virus

disease, three germplasm were showed moderately and rests of the germplasm were found susceptible to the disease. LP Pah -025 germplasm produced the highest yield (29.72 ton/ha) with 33.337% disease incidence followed by LP Jam-004 (26.22 ton/ha), LP Pah-006 (24.48 ton/ha) with disease incidence 50% and 33.33% disease incidence whereas the lowest yield was obtained from BD10516 (8.74 ton/ha) respectively. Yield of BARI Sheem-1 was 21.85 t/ha with disease incidence 33.33%.

Identification of the viruses that infecting country bean and associated weeds which acts as a reservoir of the viruses

M.S. Akhter, M.S. Rahman, Mi Faruk, M.M. Karim and Matiar Rahman

The serological and molecular results revealed that two species of potyvirus and several geminivirus species were associated with yellowing disease of country bean in Bangladesh. On the other hand, six weeds namely *Ageratum conyzoides*, *Croton bonplandianus*, *Physalis angulate*, *Acalypha indica*, *Senna occidentalis* and *Parthenium hysterophorus* were frequently infected by viral diseases. The presence of viruses mostly whitefly transmitted geminivirus species were identified by symptomatology and PCR based

Activities: Fruit Crops

Mango

Efficacy of chemicals in controlling floral malformation of mango

M. M. Hossain, M. M. Rahman and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Chapainawabganj during October 2023 to June 2024, to test the efficacy of different chemicals to control floral malformation of mango. The treatments were Goldazim 500 SC, Tilt 250 EC, Napthalene Acetic Acid (NAA), Goldazim 500 SC + NAA, Tilt 250 EC + NAA and Control. The treatments were applied on BARI Aam -3. Among the chemicals mixture of Goldazim and NAA performed better compared to other chemicals to control the floral malformation of mango.

Development of fungicides based management

against anthracnose of mango fruits

M. M. Hossain, M. M. Rahman and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Chapainawabganj during February to July 2024, to test the efficacy of twelve fungicides from different groups that are available in the market and are using by the mango growers against anthracnose of mango fruits. The fungicides are Indofil M-45, Jazz 80 WP, Agrizeb 80 WP, Dithane M-45, Tilt 250 EC, Proud 25 EC, Knowing 50WP, Goldazim 500 SC, Arba 50 WP, Cabrio top, Navara 28 SC and Amister top. Results indicated that none of the fungicides under investigation was able to control the disease completely but all the tested fungicides were very much effective in against anthracnose disease. In respect of incidence, severity, disease reduction and fruit retention, fungicidal treatments are arranged from higher to lower efficacy as: Arba 50 WP > Goldazim 500 SC > Knowing 50WP >> Amister top > Cabrio top > Indofil M-45 > Dithane M-45 > Agrizeb 80 WP > Jazz 80 WP > Tilt 250 EC > Proud 25 EC > Navara 28 SC.

Evaluation of new fungicides against anthracnose of mango

M. M. Hossain, A. S. M. Yousuf Ali and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Chapainawabganj in Bangladesh during February to July 2024, to test the efficacy of 15 new fungicides against post-harvest anthracnose of mango fruits. None of the fungicides under investigation was able to control the disease completely. Out of 15 fungicides code no 224 was the best fungicide to control postharvest anthracnose as this fungicide able to control 83.64 % of the disease. Rest of the fungicides control less than 80 % of the disease.

Control of bacterial black spot in mango by bacillus based induction and different foliar sprayings

M. T. Hossain, S. T. Nira, M. M. Rahman and M. S. I. Khan

Bacillus species were employed in agriculture to promote plant development, increase yields, and combat with a number of diseases for the last decade but not in Bangladesh. The *in vitro* and *in*

vivo experiments were conducted using reasonable chemical pesticides comparing effective microbial organisms called BHAT-04 WP (*Bacillus oryzae* YC7007, *Bacillus velezensis* GL6, and *B. subtilis* GBO3) against mango bacterial black spot (MBBS) disease of exotic Banana mango. The strong antagonistic bioassay was conducted where the *Bacillus* strains revealed significant inhibition zone compared to control. A very clear and distinct inhibition zones were observed at *in vitro* cell bioassay, indicating strong antagonistic strains to *Pantoea dispersa* that had been identified by the MALDI-TOF and 16s RNA sequencing. Previously it was known as a *Xanthomonas campestris* pv. *mangiferae-indicae* for causing MBBS. Granular EMOs + formulated powder EMOs revealed significantly (Tukey HSD, $P < 0.05$) lower disease severity by 1.1 ± 0.7 , than the control by 4.0 ± 0.0 in the exotic Banana mangoes out of 0-4 disease rating scales. It also showed significantly PGP (plant growth promotion) performances in the different parameters compared to control. EMOs (Granular EMOs + formulated powder EMOs) also revealed significantly (Tukey HSD, $P < 0.05$) higher healthy yield of mango compared to control.

Survey of floral malformation of mango in Rajshahi region of Bangladesh

M. M. Hossain, M. M. Rahman, A. S. M. Yousuf Ali and M. M. Rahman

A study was conducted to assess the prevalence and severity of mango floral malformation during March to April 2024. Fifty locations were visited in five upazillas of Chapainawabganj districts with the objectives to confirm the status and update the existing statistics for the future planning and management. The disorder was found widely distributed in all over the survey area. The maximum severity (6.41%) was observed in Gomostapur upazilla followed by Nachol (6.28%). All the traditional cultivars were more or less affected by the disease. Among the varieties the highest severity (21.63 %) was recorded from Ashwina followed by BARI Aam-3 (18.85%). Ashwina and BARI Aam-3 are moderately susceptible (MS) while BARI Aam -1 is moderately resistant and others are tolerant variety to the malady.

Guava

Characterization and efficacy test of antagonistic endophytic microorganism against *Nalanthamala psidii* of guava

K. M. Alam, M. Arifunnaher, M. Monirul. Islam, M. M. Rahman, and A. K. Saha

An experiment was carried out in Pot house of Plant Pathology Division, BARI during 2024 to evaluate eight endophytic microbes against wilt disease of guava caused *Nalanthamala psidii*. The endophytes Iso-16 and Iso-37 increased plant height and chlorophyll content of guava. The highest disease reduction of 75% was observed in Iso-16 treated seedlings in pot.

Screening of guava lines/varieties against wilt disease caused by *Nalanthamala psidii* in pot

K. M. Alam, M. Arifunnaher, M. Monirul. Isla, M. M. Rahman, A. K. Saha

An experiment was carried out during November, 2023- July, 2024 in pot house, Plant Pathology Division, BARI to evaluate the resistance of nine guava lines/varieties in artificially inoculated condition against wilt disease causing pathogen *Nalanthamala psidii*. After six month the post inoculation, different symptom was appeared such as leaf and stem lesion, yellowing of leaves, and wilting of side branch. Disease severity was varied from 1.2 to 3.4. The lowest disease incidence (1.2) was observed in red diamond and the highest disease was observed in super 10 (3.4).

Banana

Control of sigatoka in banana by bacillus based ISR and different foliar approaches

M. T. Hossain, S. T. Nira, M. M. Rahman and M. S. I. Khan

The effective micro-organisms (EMOs), BHAT-03 WP using rational chemical pesticides against Sigatoka leaf spot disease (SD) disease of BARI Kala 1 through both *in vitro* and *in vivo* experiments. *Bacillus tropicus* K3 and *Bacillus velezensis* GL6, two unique strains were used to produce BHAT-03 WP using the sterilized carrier materials separately. The strong antagonistic bioassay was conducted and *Bacillus* strains revealed significant inhibition zone. A very clear and distinct inhibition zones were observed in cell bioassay, indicating strong antagonistic strains to

Mycosphaerella musicola. The EMOs, BHAT-03 WP revealed significantly lower disease severity by 1.67 ± 0.04 , than the control by 3.5 ± 0.04 in the banana seedlings with artificial inoculation. There was no significant differences among the treatments in case of sigatoka disease severity index compared to chemical pesticides. Besides, EMOs+ formulated powder, BHAT-03 WP sowed significantly lower disease by 2.00 ± 0.04 and higher plant growth promotion in the different parameters.

Efficacy of different new fungicides in controlling sigatoka disease of banana

Ms Ali and Mb Anwar

The experiment was conducted at farmer's field of Mohinikati, Jhikargacha, Jashore district during 2023-24 to find out the effective new chemical fungicides against sigatoka disease of banana. Fifteen new fungicides were evaluated in this study. Among the fungicides, the lowest disease severity (8.66%) was recorded in T₈ (843) treated plot which was statistically similar to T₂, T₉, T₁₃, T₁₄, T₁₅ and T₇ treated plots, respectively. On the other hand, the highest disease severity (60%) was recorded in T₁₆ (control) plot. Maximum reduction (85.56%) of disease severity over control was found in T₈ (843) treated plot and minimum (61.12%) in T₃ (840) treated plot. The highest yield (50 t/ha) was recorded in T₄ (843) treated plot followed by T₂ and T₉ treated plots and the lowest (20 t/ha) was recorded in T₁₆ (control) plot followed by T₃ treated plot.

Citrus

In-vitro and *in-vivo* test of bacillus based emos with molecular study for controlling greening disease on sweet orange

M. T. Hossain, S T Nira, M. M. Rahman and M S. I. Khan

The *in vitro* and *in vivo* study had been conducted successfully at the Regional Agricultural Research Station, Hathazari, Chattogram to get the successful grafting projection without infection of greening disease by the *Bacillus oryzicola* YC7007 and *B. siamensis* YC7012 since 2017. Those two strains revealed significantly lower greening disease severity. The EMOs made by the YC7007 and YC7012, called BHAT-02 WP revealed significantly ($p < 0.01$) lower greening disease

indices by 1.2 ± 0.05 compared with control by 3.4 ± 0.1 in the BARI Malta 1.

Identification of the citrus tristeza virus genotypes and their interactions on different citrus species

Ms Akhter, Ms Rahman, M M H Tipu, Ke Jahan, M M Islam, Mi Faruk and Matiar Rahman, M G Kibria, Mm-E-Rahman

Citrus is an important fruit crop in Bangladesh. Now a day's citrus cultivation in Bangladesh is severely hampered by yellowing and decline disease. Viral disease of citrus is severe threats to citrus cultivation globally and recently Citrus tristeza virus (CTV), the causal agent of tristeza disease has been identified in Bangladesh. The molecular characterization based on the partial CP gene sequencing and genotype specific RT-PCR of the Bangladeshi CTV isolates revealed that the Bangladeshi CTV isolates closely related to the Resistance Breaking (RB) genotypes. The characteristics symptoms induced by CTV are yellowing, stem pitting and vein clearing also observed in Citrus reticulata, Citrus sinensis, Citrus aurantifolia.

Strawberry

Efficacy of different fungicides in controlling leaf spot and fruit rot caused by *pestalotia* sp. Of strawberry

M. Arifunnahar, K. M. Alam, R. Momotaz, M.S. Akhter, M. I. Faruk and A. K. Saha

A field experiment was conducted in the research field of Horticulture Research Centre (HRC), BARI, Gazipur during 2023-24 cropping season to know the efficacy of Companion (Mancozeb 63% + Carbendazim 21%) @ 2 gm/L water, Autostin (Carbendazim) @ 2gm/L water, Sunfonate 70 wp (Thiophanate- methyl) @ 1 gm/L water, Score (Difenoconazole) @ 0.5ml/L water, Ridomil gold MZ 68 WG (Mancozeb 64% + Metalaxyl 4%) @ 2 gm/L water, Sunvit 50 wp (Copper oxychloride 50%) @ 1.5gm/ L water, Rovral (Iprodione) @ 2 gm/L water, Champion (Copper hydroxide 77%) @ 2 gm/L water, and Contaf (Hexaconazole) 2 ml/L water in controlling the leaf spot and fruit rot disease of BARI Strawberry 1. The disease incidence was ranged from 37.37 % to 85.89% among the treated plants. The maximum good fruits

were obtained from the Rovral treated plants. Minimum damaged fruits and PDI value was found in Rovral treated plot and maximum in Control treatment. The maximum fruit yield with higher disease reduction was obtained from Rovral treatment as compared to other treatment.

Development of integrated disease management (IDM) packages in controlling root rot and anthracnose disease of strawberry

B. Akhter, M. R. Humauan and D. Sarkar

A field experiment was conducted at Regional Agricultural Research Station Ishurdi, Pabna during Rabi season of 2023-2024 to find out the effective management packages against root rot and anthracnose disease of strawberry. Seven different treatment packages and one untreated control were used in this experiment. The lowest incidence of root rot (4.44%) and anthracnose (15.38 %) was recorded in poly mulch before planting + Rugby 10G @ 25 kg/ha + Mul care @ 10 g/pit (during planting and 25-30 DAP) + Indofil M 45 (Mancozeb) @ 2 g/l treated plots and the highest incidence of root rot (17.78 %) and anthracnose disease (43.51 %) was recorded in control plots. Root rot disease reduction ranged from 6.24 to 75.03% and anthracnose disease reduction ranged from 36.80 to 64.65% among the treatment packages. Better plant growth and fruit yield were recorded from the treatment poly mulch before planting + Rugby 10G @ 25 kg/ha + Mul care @ 10 g/pit (during planting and 25-30 DAP) + Indofil M 45 (Mancozeb) @ 2 g/l treated plots.

Survey and identification of diseases of strawberry in gazipur and rajshahi region

M. Arifunnahar, K. M. Alam, R. Momotaz, M. S. Akhter, M. M. Islam, M. I. Faruk and A. K. Saha

The strawberry (*Fragaria ananassa* Duch.) cultivating area of Rajshahi and Gazipur were surveyed and diseased plant samples viz. leaf, root, crown and fruit were collected and the pathogens were identified based on morphological characteristics. Different fungi namely *Pestalotia* sp., *Alternaria* sp. and *Botrytis cinerea* were isolated from the infected plant parts of strawberry which were responsible for leaf spot, leaf blight, root rot and fruit rot disease of strawberry.

Watermelon

Cultural, chemical, and biological control of fusarium wilt in watermelon

M. Z. Rahman, M. G. Kibria, Hafsa Bintay Harun and B. Kundu

The experiment was conducted at RARS, Rahmatpur, Barishal during 2023-2024. Management of Fusarium wilt disease on watermelon was conducted by spraying with Azonil 56 EC (Azoxystrobin + Chlorothalonil) @ 1 ml/L; Spraying with TRICOST 1% WP (Trichoderma sp.) @ 5 g/L; Lycomax (Soil Recharge) @ 5 g/L; Dynamic WP (Bacillus amyloliquefaciens) @ 5 g/L; Trooper 75 WP (Tricyclazole) @ 3 g/L; Amistar top 325 SC (Azoxystrobin + Difenconazole) @ 1 ml/L; Bactroban 20 WP (Bismethiazol) @ 2 g/L; Dithane M-45 (Mancozeb) @ 4 g/L; Provax 200 WP (Carboxin + Thiram) @ 3 g/L; Autostin 50WDG (Carbendazim) @ 2 g/L. It was found that the treatment with Autostin 50WDG @ 2 g/L effectively controlled the Fusarium wilt of watermelon.

Survey and identification of watermelon diseases in Bangladesh

M.S. Akhter, M.S. Rahman, M.M. Karim, K-E-Jahan, M.N. Islam, M.I. Faruk (Ppd); M.G. Kibria, Rars Barishal; M.M. Hossain (Planning & Evaluation Wing) & M. Z. Ferdous, Ofdr, Rangpur

A survey was conducted for identification of watermelon diseases in Barishal, Patuakhali, Bhola and Cox bazar districts of Bangladesh in 2023-24 cropping season. Growth stunting, short internode with necrosis of twig of watermelon was observed with a high prevalence (60-70%) in the surveyed area. The symptomatic samples were further tested by serological and molecular diagnosis that revealed the occurrence of thrips transmitted member of the Orthospovirus a watermelon bud necrosis virus and groundnut bud necrosis virus. Watermelon bud necrosis virus (WBNV), groundnut bud necrosis virus (GBNV) which were the member of Orthospovirus and were the major threats to watermelon production in Bangladesh. Among the fungal diseases Fusarium wilt, gummy stem blight and Alternaria leaf blight disease were observed.

Etiological study and management of the

watermelon bud necrosis disease (WBNV)

M.S. Akhter, R. Islam, M.S. Rahman, Mi Faruk, B. Anowar, M.Z. Rahman

A survey was conducted for estimation of prevalence and disease incidence of bud necrosis disease of watermelon in major watermelon growing region namely Rajshahi, Natore, Rangpur, Barishal, Patuakhali and bhola. Growth stunting, short internode with necrosis of twig of watermelon was observed with a high prevalence (70-90%) in the surveyed area. The symptomatic samples were further tested by serological (DAC-ELISA) and revealed that all the tested samples are positively reacted with the WBNV.

Papaya

Ecofriendly management of papaya ring spot virus (PRSV).

M.S. Rahman, M. S. Akhter and A. K. Saha

The research work was undertaken to develop eco-friendly disease management option against Papaya ringspot virus (PRSV) of papaya (*Carica papaya* L). The experiment was conducted in the research field of Bangladesh Agricultural Research Institute, Gazipur during rabi season 2023-24. Five treatments including an untreated control were tested under field condition. All the treatment packages appreciably reduced PRSV incidence of papaya over control. Disease incidence was reduced from 22.23 % to 82.22 % over control. Two treatments i.e. T₁ - Spray Imidacloprid 0.1 % 4 times at 15 days interval + sticky yellow trap and T₂-Spray Phytomax 0.2 % 4 times at 15 days interval + sticky yellow trap was found better on the basis of disease reduction.

Survey of major diseases of selected fruits and vegetables in northern region

M.M.E Rahman, M.S. Akhter, M.S. Huda, M. Afroz and A.K.Saha

Diseases of some exotic fruits and commercially grown fruit and vegetables were being considered as an important bottle neck for the production these crops in the country. A total of 16 different fruits and vegetables including malta, dragon, mango, litchi, custard apple, coconut, date palm, fig, papaya, watermelon, melon and capsicum were surveyed in the Northern region to know their

disease status from 2021 to 2024. Depending on the disease's nature and crop type, disease incidences and severity ranged from 1 to 50% and low to high, respectively. Some new diseases were recorded in some selected commercially important fruits and vegetables. Several symptoms like citrus yellowing, extensive inflorescence and fruit rot of mango and litchi were observed. Some minor diseases were observed to become severe threats in some areas.

Activities: Flower Crops

Efficacy of chemical fungicides in controlling botrytis blight of marigold

M. Arifunnahar, K. M. Alam, R. Momotaz, M. I. Faruk and A. K. Saha

An experiment was conducted at Plant Pathology division, BARI, Gazipur during 2023-24 cropping season to know the efficacy of chemical fungicides in controlling botrytis blight of marigold disease. Seven fungicides viz., Secure (Fenamidone + Mancozeb 600 WG) @ 1gm/L water, Folicur 25EC (Tebuconazole 25%) @ 1 ml/L water, Sunca 50Sc (Boscalid) @ 1ml/L water, Score (Difenoconazole) @ 0.5ml/L water, Amister top (Azoxystrobin 20% + Difenoconazole 12.5%) @ 1ml/L water, Novera 28SC (Azoxystrobin 20% + Cyproconazole 8%) @ 1ml/L water, Rovral (Iprodione) @ 2 gm/L water were tested against the disease on Inka Gadha variety of marigold. All the fungicides reduced the disease as compare to control. Maximum numbers of flowers were obtained from Novera 28SC treatment after 2nd and 3rd spray. The lowest number of infected flower and PDI were observed in treatment Novera 28SC followed by Amister top in after 2nd and 3rd spray and highest number was from control. Maximum disease reduction over control was observed in Novera 28SC treatment as compared to other treatment.

Integrated management of white mold disease of marigold

B. Akhter, M. R. Humauan and D. Sarkar

A field experiment was conducted at Regional Agricultural Research Station Ishurdi, Pabna during rabi season of 2023-2024 to find out the effective management package against white mold disease of marigold. Hybrid variety (Inka) of marigold was used in this study. Seven different treatment viz. T₁=Tricho compost @ 1 t/ha +Foliar spray with

Rovral 50WP @ 2 g/l, T₂=Poultry litter @ 5t/ha + Foliar spray with Rovral 50WP @ 2 g/l, T₃=Mustard Oil cake @ 800 kg/ha + Foliar spray with Amistar Top 325 SC @ 1ml/l, T₄=Neem oil cake @ 800 kg/ha + foliar spray with Amistar Top 325 SC @ 1ml/l, T₅=Bioderma (*Trichoderma harzianum* 2x10⁶ CFU/g) @ 10 g/kg Cow dung + Foliar spray with Nativo 75 WG @ 0.5 g/l, T₆=Trichoderma biofertilizer (*Trichoderma harzianum* 2x10⁶ spore/g) @ 5 g/kg Cow dung + Foliar spray with Nativo 75 WG @ 0.5 g/l and one untreated Control were used in this experiment. Among the treatments the lowest disease incidence (16.67%) was found in Neem oil cake @ 800 kg/ha + Foliar spray with Amistar Top 325 SC @ 1ml/l treated plot while, the highest (63.33%) was found in control plots. Highest (805000) number of total fresh flower/ha was recorded in Neem oil cake @ 800 kg/ha + Foliar spray with Amistar Top 325 SC @ 1ml/l treated plots whereas, the lowest (416111) was recorded in control plots.

Evaluation of bio-agents botanicals and chemical fungicides against alternaria leaf spot of gerbera

Mb Anwar and Ms Ali

This experiment was conducted at Regional Agricultural Research Station, Jashore during rabi 2023-24 to find out appropriate management practice against alternaria leaf spot of gerbera. Bioderma, Tricomax, Tricost, Neem leaf extract, Mahogoni seed extract, Rovral 50WP, Luna sensation 50WP were used in this study. The lowest disease severity (10%) was obtained from Luna sensation 50WP treated plot which was statistically similar to Rovral 50WP, Neem leaf extract and Tricomax treated plot, respectively. On the other hand, the highest disease severity (45%) was found in Control plot. Maximum percent reduction of disease severity over control was found, in case of chemical fungicides, in Luna sensation 50WP (76.63%) treated plot, in case of bio-agents, in (66.66%) Tricomax treated plot and in case of botanicals, (62.98%) in Neem leaf extract treated plot and the lowest (48.16%) was found in Mahogoni seed extract treated plot. The number of flowers/plot (10 plants per plot) was recorded from five times harvest within three months. The highest number of flowers per plot (126.00) was recorded in Luna sensation 50WP treated plot which was statistically similar to Rovral 50WP, Tricomax and

Neem leaf extract treated plots, respectively and the lowest (70.66) in T₈ Control plot.

Survey on botrytis blight disease in liliium

L. Yasmin, M. Afroz and M. M. Rahman & F. N. Khan

Survey was conducted in Floriculture research field of Horticulture Research Centre, BARI, Gazipur during December 2023 to March 2024 to record the incidence and severity of botrytis blight disease of liliium. The surveyed germplasm was Lil-001, Lil-002, Lil- 018, Lil -021, Lil -022, Lil- 023, Lil -024, Lil- 025, Lil- 027, Lil -028, Lil -029, Lil -036, Lil-041 and Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence of botrytis blight of liliium was 0-35% in Lil-001, Lil-002, Lil- 018, Lil -021, Lil- 025, Lil -028, Lil -029, Lil -036, Lil-041, Lil- 042, Oriental (white) and Oriental (Pink). Disease incidence was 60-70% in Lil- 023, Lil -024, Lil- 027 and Lil -022. The highest PDI was 67% in Lil-028 and lowest was 0% in Lil-002. The PDI was 10-56% in Oriental (white), Oriental (Pink), Lil -036, Lil- 018, Lil -021, Lil -027, Lil-001, Lil -042, Lil -023, Lil -024, Lil -022, Lil -041, Lil -025 and Lil -028.

Management of leaf spot disease of aloe vera

B. Akhter, M. R. Humauan and D. Sarkar

The experiment was conducted at Regional Agricultural Research Station Ishurdi, Pabna during Rabi season of 2023-24 to find out the effective treatments against leaf spot disease of Aloe vera. Seven different fungicides viz. Autostin (Carbendazim), Rovral (Iprodione), Folicure 250 EC (Tebuconazole), Score 250 EC (Difenoconazole), Indofil M 45 (Mancozeb), Calcium carbonate, and Soil application of Dolomite were used in this experiment. The lowest severity of leaf spot disease (4.67%) was recorded in Calcium carbonate treated plots while the highest severity (45%) was found in control plots. Disease reduction over untreated control ranged from 9.62 to 89.62% among the treatments. The maximum disease reduction over untreated control (89.62%) was found in Calcium carbonate treated plots. The highest plant height (49.33 cm) was also recorded from the Calcium carbonate treated plots where the low

Others

Isolation and characterization of entomopathogenic fungi

M. S. Rahman, M. Arifunnahar, M. E. K. Chowdhury, M. I. Faruk and A. K. Saha

Entomopathogenic fungi (EPFs), *Beauveria*, *Metarhizium* spp. *Cordyceps* spp., etc. existed in many different ecosystems played an important role for regulating insect pest populations in nature. Two entomopathogenic fungi were isolated and characterized. One was *Cordyceps javanica* from dead insect and another was *Beauveria* sp. from forest soil. *Cordyceps javanica* was characterized through morphological and molecular and *Beauveria* sp. through morphological technique. The ITS gene sequence of the *Cordyceps javanica* isolate was submitted to the NCBI database with the GenBank accession number PQ098453.

Molecular characterization of root-knot nematodes (*Meloidogyne* spp.) Of different crops in Gazipur, Bangladesh

Ferdous-E-Elahi

Root-knot nematode infected bottle gourd, okra, red amaranth and spinach root samples were collected from different locations of Gazipur, Bangladesh. Two methods of PCR were used to detect *Meloidogyne* spp. infecting vegetables crops. One was molecular characterization by DNA sequencing of the ribosomal DNA (rDNA) 28SD2/D3 gene and another was PCR using species-specific SCAR primers. Blast analysis of the obtained sequences of the isolates OR902191, OR863612, OR899596 and OR896540 were found 99-100% nucleotide homology with different *M. incognita* isolates those were previously submitted in GenBank database. Species-specific primers produced a fragment of 399 bp for *Meloidogyne incognita*. Thus, utilizing species-specific marker and analyzing result of BLAST search made from amplified 28S D2/D3 gene region revealed the association of *Meloidogyne incognita* of root-knot disease of vegetables in Gazipur, Bangladesh.

Collection and isolation of endophytic bacteria to suppress bacterial wilt pathogens

R. Islam, M.S. Akhter, K. Jahan, M. Naznin, M I. Faruk and A.K. Saha

An experiment was conducted in the laboratory of plant pathology division in 2023-2024 cropping season at BARI, Gazipur to isolate endophytic bacteria from different healthy vegetable plants and

also to determine their antimicrobial properties. A total of 32 different probable endophytic colonizing bacterial strains were isolated from two solanaceous vegetable crops, brinjal and chilli. Among 32 isolates, 2 isolates were found to possessed antagonistic effect on *Ralstonia Solanacearum* by producing inhibition zone from 1 to 2 mm diameter or ability to suppress population in agar disc diffusion assays. The endophytic bacterial communities of healthy roots, stems and leaves of these plants were assessed on nutrient agar medium.

Identification of post harvest diseases of fruits and vegetable

L. Yasmin, M. Afroz and M. M. Rahman,

Disease samples of capsicum, brinjal, tomato, banana, strawberry and beal were collected from vegetable and fruit research field of Horticulture research centre, BARI, Gazipur during October 2023 to May 2024. The isolated pathogens were *Fusarium* sp. and *Alternaria* sp. in capsicum, *Fusarium* sp., *Alternaria* sp. and *Diplodia* sp. in brinjal, *Chladosporium* sp., *Odiendron* sp., *Candida* sp. and *Alternaria* sp. in cauliflower, *Fusarium* sp., *Chladosporium* sp. and *Colletotrichum* sp. in banana, *Fusarium* sp., *Chladosporium* sp., *Pestalotia* sp., *Aspergillus* sp., *Penicillium* sp. and *Rhizopus* sp. in straw berry, and *Fusarium* sp., *Chladosporium* sp. and *Diplodia* sp. in beal.

Survey on major diseases of commonly grown fruits in cumilla region

T H Tabassum, A Siddiky

A survey was conducted to observe disease prevalence of commonly grown fruits in Cumilla region. Through the survey, 8 diseases of different major fruits with their incidence and severity were recorded. Among the diseases we observed anthracnose, powdery mildew and sooty mould of mango, fruit rot of jackfruit, scab, gummosis and canker disease of citrus (lemon and lime). Among the diseases, guava wilting showed highest infection (30%) on guava plants in homestead gardens in Adarsha sadar. In case of mango, anthracnose (10%), powdery mildew (15%) and sooty mould (20%) infection prevailed in the orchard plants. An established citrus orchard located in Borura, where bacterial canker disease (25%) was found to harmed the crop.

Survey on major diseases of commoercially grown vegetables in Cumilla region

T H Tabassum, A Siddiky⁴

A survey was conducted to observe disease prevalence of commercially grown vegetables in Cumilla region. Through the survey, 10 diseases of different major vegetables with their incidence and incidence were recorded. The diseases were late blight of potato, late blight of tomato, early blight of tomato, powdery mildew and downy mildew of cucumber, cucumber mosaic virus (CMV), bean anthracnose, BMV, chilli anthracnose and bacterial wilt of brinjal. The highest leaf infection in late blight of potato (80%) was followed by leaf and fruit infection of late blight of tomato (70%). Anthracnose of bean was observed at 60% of incidence causing a major yield loss. Cucumber mosaic virus (CMV) showed up as the major problem for cucumber in Chandina area (50-60% disease incidence) while 40% incidence of powdery mildew and 50% downy mildew were observed. Bacterial wilt in BARI Begun-12 appeared with an incidence of 50% as the major hindrance of brinjal production in Cumilla region.

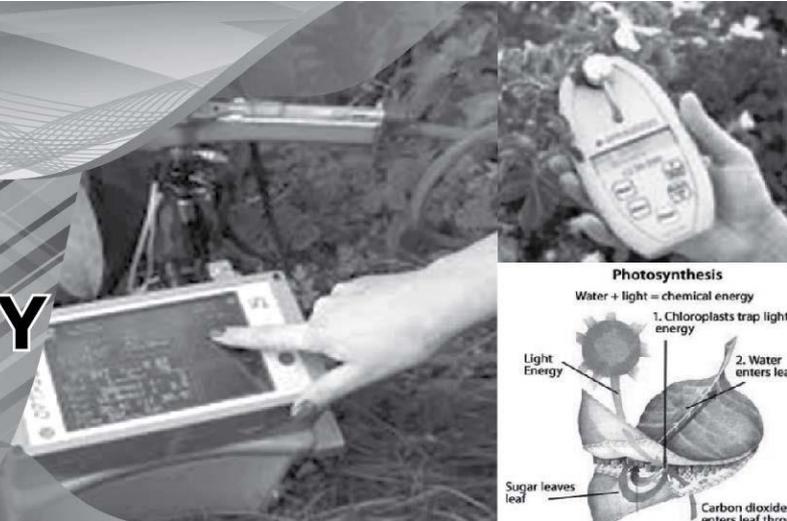
Survey on bacterial wilt of solanaceous vegetable crops

M. Afroz, L. Yasmin and M. M. Rahman

A comprehensive survey was conducted during July-June, 2023-2024 cropping season in Thakurgaon district to record the incidence of bacterial wilt of eggplant. Data on area surveyed, wilt incidence (%), etc. were recorded at the time of survey. A total of 180 wilt infected plant samples of eggplant and tomato were collected from Bogura, Thakurgaon, Sylhet, Gazipur and Rangpur districts during January-December-June 2023-2024. A total 150 isolates *R. solanacearum* were isolated from eggplant, tomato, chili and potato. Biochemical tests such as Gram reaction/Potassium hydroxide test, Kovac's oxidase test, Catalase test, urease test and biovar test were performed for biochemical characterization of the isolates. All biochemical tests were found positive, which confirm identification of those isolates. Molecular Characterization of *R. solanacearum* were also performed.

PLANT PHYSIOLOGY

16



Morpho-physiological and biochemical evaluation of selected bottle gourd genotypes under elevated temperature

S.N. Mahfuza, N. Mocarroma, F. Ahmed, A.H.M.M Rahman, L. Akter and A.K.M Quamruzzaman

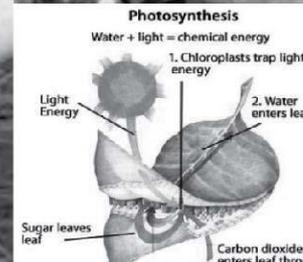
Heat stress is a major abiotic factor limiting crop production, causing direct damage to plant tissues. An experiment was conducted at the vinyl house of Plant Physiology Division, BARI Gazipur during December, 2023-March, 2024 to evaluate the effect of high temperature stress on physiological responses of selected bottle gourd genotypes. Four selected bottle gourd genotypes (LS-231, LS-232, LS-171 and BARI LAU-4.) were treated under two condition i.e. control (open field) and elevated temperature (ambient \pm 5~6°C). The high temperature was imposed by using transparent white polythene chamber (4m \times 3m). Daily air temperature was monitored using maximum and minimum thermometer inside and outside of the chamber. The experiment was laid out in randomized complete block design. 25 days old seedling were transplanted 10 December, 2024. Irrigation was done as and when required for maintaining adequate soil moisture. At 80 days after transplanting (DAT) samples were taken from both control and stressed plants to assess several physiological and biochemical parameters, such as photosynthetic parameter, relative water content (RWC), Cell membrane stability Index (CMSI), malondialdehyde (MDA) content, superoxide ($O_2^{\cdot-}$) generation, and hydrogen peroxide (H_2O_2) generation. Elevated temperatures significantly reduced net photosynthetic rate (Pn), stomatal conductance (Gs), cell membrane stability index (CMSI), relative water content (RWC), and increased reactive oxygen species (ROS) and malondialdehyde (MDA) in the leaves. Among the genotypes, LS-232 exhibited higher Pn, Gs, CMSI,

and less reduction in RWC and MDA content, indicating greater heat tolerance. Additionally, heat stress reduced sex ratio, fruit yield, and fruit weight, with LS-232 showing the lower reduction rates, making it the most heat-tolerant genotype for varietal development.

Morpho-physiological responses of selected sesame genotypes to waterlogging stress

Sn Mahfuza, Afms Ahsan, Ahmr Talukder, Aamm Mustakim, N Mocarroma, H Rashid and F Ahmed

Water logging stress is a key factor limiting sesame growth and yield potential. A pot-culture experiment was conducted at the pot-house of the Plant Physiology Division, BARI, Gazipur, from March 2024 to June 2024. The experiment followed a randomized complete block design (RCB) with three replications. Five selected sesame genotypes (screened from earlier experiment) were assessed under control, 48 and 72 hrs waterlogging stress. Ten seeds of each genotype were sown in each pot on 14 march, 2024. After emergence excess plants were thinned out and three plants pot⁻¹ were maintained. Fertilizers were applied 100-30-55-25-3-1kg ha⁻¹ N-P-K-S-Zn-B. Waterlogging was imposed 55 days after sowing (DAS) at the pots in a cement concrete made water tub. Duration of waterlogging was 48 and 72 hours and water level was maintained about 3 cm above the soil surface of the pots. The present study proved that waterlogging stress causes severe damage to different attributes of the sesame genotypes. The treated genotypes showed an increasing trend in lipid peroxidation as well as hydrogen peroxide (H_2O_2) contents that corresponded to increased stress duration. The results also showed that the plants exposed to water stress presented a significant decline in yield and yield contributing characters, but the reduction rate was significantly lower in G4, G1 and which was identical with G5.



Morpho-physiological and biochemical response of groundnut genotypes to drought stress

A F M S Ahsan, A A M M Mustakim, H M M Rahman, M M Kadir and F Ahmed

Drought stress poses a major challenge for groundnut cultivation in Bangladesh. A pot-culture experiment was conducted at the Plant Physiology Division, BARI, Gazipur, from December 2023 to May 2024. This study assessed three groundnut genotypes: BARI Chinabadam-9 (a relatively susceptible genotype), and two advanced lines, DF-090035 and ICGV-07220 (both tolerant genotypes). These genotypes were selected based on the results of the previous year's study. Drought stress was imposed during the flowering stage, with three treatments: a control group with adequate humidity (around 100% field capacity), and two stress levels at 60% and 40% field capacity. The experiment followed a randomized complete block design with three replications. Soil moisture was regularly monitored using a digital TDR 300 soil moisture meter, calibrated twice using gravimetric methods to ensure accuracy. At 120 days after sowing (DAS), samples were collected from both control and stressed plants to evaluate various physiological and biochemical parameters, including leaf area, relative water content, proline content, malondialdehyde content, total chlorophyll content, Fv/Fm ratio, superoxide ($O_2^{\cdot-}$) generation, and hydrogen peroxide generation. Additionally, at different time points (150 DAS for the groundnut varieties and 158 DAS for the advanced line), the plants were harvested, and measurements were taken for plant height, total dry matter, pod number plant⁻¹, and seed yield plant⁻¹. The results revealed significant genetic variation in drought tolerance, with some genotypes demonstrating superior water retention, efficient photosynthesis, and better oxidative stress management under drought conditions. Notably, the genotype DF-090035 exhibited the highest resilience, maintaining favorable RWC, SLA, and Fv/Fm ratios, alongside lower MDA and ROS levels, indicating robust drought tolerance mechanisms. Notably, DF-090035 demonstrated the highest resilience, making it a promising candidate for cultivation in drought-prone areas, supporting sustainable agriculture and food security.

Morpho-physiological and biochemical responses of selected sweet-potato genotypes to salinity stress

A F M S Ahsan, S N Mafuza, N Mokarroma, A H Khan, Z Alam and F Ahmed

A pot experiment was carried out at the Plant Physiology Division of BARI in Gazipur during the rabi season of 2023-24. Four types of sweet potato, named H-16-EJ/10, H 9.7/12, H 9.48/11, and CIP-TCRC-4, were tested under three levels of salinity: no salt (control), 8, and 12 dSm⁻¹. Sweet-potato genotypes H-16-EJ/10, H-9.7/12, and H-9.48/11, were previously selected as salt-tolerant, while CIP-TCRC-4 was identified as sensitive to salt (TCRC, 2022-23). Salinity was imposed at 35 days after planting (DAP) by adding NaCl solution. Salt solution was applied with an increment of 5 dSm⁻¹ in every alternate day until the desired level of salinity had been reached in each container within the next 15 days. In control treatment, pond water was used which salinity levels was 0.3 dSm⁻¹. Salinity levels were maintained by monitoring and adding salt solution when require up to maturity. The experiment followed a randomized complete block design with three replications. Four sweet potato vines were planted in each pot, and at 20 DAP, the vines were thinned down to two per pot. Leaf samples were collected at 100 DAP for chlorophyll estimation and biochemical analysis. At harvest, data on yield and yield components were collected from three pots. Results showed significant reductions in chlorophyll content, cell membrane stability, and antioxidant capacity, particularly in CIP-TCRC-4. In contrast, H-16-EJ/10 and H-9.7/12 exhibited enhanced antioxidant defenses and better ionic balance, correlating with improved salt tolerance. The findings suggest the importance of selecting genotypes with strong antioxidant systems and effective ion regulation to improve salinity tolerance in sweet potatoes.

Screening for drought tolerance in foxtail millet genotypes

A.H.M. Motiur Rahman Talukder, Faruque Ahmed, Md. Motiar Rohman, Mohammad Motasim Billah

A vinyl house and field study was conducted separately including genetically diversify two sets of Foxtail millet genotype under Plant Physiology Division of Bangladesh Agricultural Research Institute (BARI) during November, 2023 to March 2024. The objective of these study was to examine

and identify the comparatively drought tolerant materials from Foxtail millet's genotypes. In these study total thirty foxtail millet's genotypes were used as tested materials with a collaboration program of Plant Breeding Division, BARI. Therefore, for the convenience of work two trials were set up separately in vinyl house under pot culture system and field with 15 genotypes for each. Under pot culture system, total 150 (26 cm top diameter, 20 cm base diameter and 25 cm height) plastic pots were arranged with placement of 10 pots in 15 replicate block in the vinyl house. The experiment was initiated on 06 December 2023 following Randomized Complete Block Design with ten replications. Fertilizers @ 40-16-28-6-1 kg ha⁻¹ N-P-K-S-Zn were applied (FRG, 2018). Foxtail millet genotypes were allowed to grow under moisture level at field capacity (FC) from seedling up to booting stage in this study. At booting stage, total 150 pots were divided into two sets and each set contained 75 pots. One set was allowed to grow under control condition (no drought) (moisture level 95-100%; field capacity (FC) at booting stage to harvest and another set was allowed to grow under drought stress (50% moisture of FC) at booting stage to harvest. The moisture content of the pot soil was determined 7-days intervals after stress application at booting stage by digital TDR (Time Domain Reflectometry) 300 soil moisture probe until harvest. Under field condition, fifteen foxtail millet genotypes were sown in 9m × 2m sized two blocks separately. One block genotypes were allowed to grow under control (irrigated) condition and another was allowed for drought (rainfed) condition. Each genotype was planted in two lines two-meter rows in each block and with a line-to-line distance of 30 cm in the last week of December. Significant differences among the genotypes, stress and their interactions were observed regarding morpho-physiological, yield and yield components and indicated differential response of foxtail millet genotypes. The genotypes BD-1105, BD-1116 (higher relative value of SPAD chlorophyll, leaf area, leaf dry weight); BD-1063 (higher relative value of CMSI); BD-922, BD-1063 (higher relative of root length, root volume); BD-160, BD-922, BD-1063, BD-1116 (higher relative grain yield) were comparatively drought tolerant. The BD-160 followed by BD-922, BD-1063, BD-1105 and BD-1116 were found as a comparatively

drought-tolerant genotype. Hence, we recommend it for drought-prone areas of Bangladesh. Based on drought tolerant and susceptible indices, genotype BD-7196 and BD-7202 showed the highest mean productivity, geometric mean productivity, stress tolerance index, relative yield and lowest yield loss.

Phenology, growth and yield of potato as influenced by sowing time

A.H.M. Motiur Rahman Talukder and Faruque Ahmed

A field study was conducted to observe the Phenology, growth and yield of potato varieties as influenced by sowing time during *rabi* season of 2023-2024 at the research field of Plant Physiology Division, BARI, Gazipur-1701. In this study two potato varieties like BARI Alu-25 and BARI Alu-41 were sown on four different sowing time

viz. 20 November, 2023, 30 November, 2023, 17 December, 2023 and 20 December, 2023. The experiment was laid out in Randomized Complete Block factorial design with three replications and four sowing dates were randomly distributed in each of the three blocks. The unit plot size was 2.4 m × 3.0 m. The seeds tuber of each variety was planted by hand with spacing of 60 cm × 25 cm in the depth of 5 cm in furrow followed by earthing up. Fertilizers were applied in accordance with FRG's (2015) general suggestion. Accordingly, the soil was fertilized @ 150-45-125-20 kg ha⁻¹ N-P-K-S respectively. The emergence and maturity date was established when about 90% of the plants emerged and the leaves of plants turned yellow respectively, from the observations of 2 to 3 days intervals. To observe the stolon formation, four plants from each plot two or three times in a week from about two weeks after emergence were dug up and were analyzed. Plant height, leaf area plant⁻¹ and plant parts dry weight was determined by collecting two plants from each plot from 30 DAS at 15 days intervals and up to harvest. Two plants were harvested from each plot at 30, 45, 60, 75 DAS and at harvest. Green leaf area (cm²) was measured for the purpose of computation of LAI with the help of a leaf area meter ((LI-3100 C; Licor, USA). Results showed that the growth duration was shortened by up to ~15 days for scheduling 20-day delayed in sowing. Differences in leaf and tuber growth rate as well as tuber yield were found among the sowing times, potato varieties sown on 30 November followed by 20 November provided

the maximum leaf and tuber growth as well as tuber yield. Sowing time significantly decreased the productivity of potato varieties with greatest suppression sown under 20 December.

Screening of groundnut genotypes against heat stress

Aamm Mustakim, Afm Shamim Ahsan, Ahmm Rahman, Sn Mahfuza, Nadira Mokarroma, Kc Saha

In Bangladesh, groundnut cultivation in Char land areas faces significant heat stress challenges, particularly during reproductive stages. An experiment was conducted in the Pot House of the Plant Physiology Division at BARI, Gazipur during the 2023-2024 *rabi* season. Fifteen groundnut genotypes were sown on December 18, 2023, to evaluate their response to heat stress. The experiment involved two temperature conditions: normal (24°C in an open field) and elevated, where the temperature was raised by 5±1°C using a polythene chamber after pegging and flowering. This chamber, measuring 4m × 3m, was used to simulate heat stress. Three treatments were applied i.e. open field (control), flowering to maturity under the polythene chamber, and pegging to maturity under the polythene chamber. Air temperature was recorded daily inside and outside the chamber using maximum and minimum thermometers. The chamber raised the minimum temperature by 1~3°C and the maximum by 4~6°C compared to the open field. The experiment followed a randomized complete block design with five replications. Groundnut seeds were sown in plastic pots on December 18, 2023. Fertilizers were applied at rates of 90-45-120-30-3-1.4 kg/ha for N-P-K-S-Zn-B. At harvest, data on yield and its components were collected from five pots per genotype. Heat stress was found to negatively affect chlorophyll content and grain filling. However, some genotypes showed better tolerance, as indicated by higher relative water content, chlorophyll content and membrane stability index, and grain weight under elevated temperatures. Genotypes G-12, G-7, G-10, and G-2 performed the best, with G-12 being the most heat-tolerant, making it the top recommendation for high-temperature environments during the flowering and pegging stages.

Screening of black barley genotypes for drought tolerance

N. Mokarroma, A.F.M Shamim Ahsan and F. Ahmed

Black-seeded barley can be a valuable raw material for functional food. However, its restoration to cropping should be preceded by the identification of the characteristics determining productivity. Screening of black barley genotypes for drought tolerance was done at the field of Plant Physiology Division, Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh during November, 2023 to March 2024. The soil was fertilized with the rate of 120 kg ha⁻¹ of triple super phosphate, 110 kg ha⁻¹ muriate of potash, 50 kg ha⁻¹ gypsum. Nineteen genotypes of black barley were used in this experiment. Ten seeds of each genotype were sown on 19 November 2023. This experiment included the following 2 treatments: (1) Irrigated where irrigation was applied when necessary (2) drought stress treatment. The experiment was done using a randomized complete block design with three replications. Soil moisture was measured every alternate day. Plants sampling were done after imposing the treatment for measurement of physiological parameters, plant height and dry weight. Our research showed that each genotype has a set of specific characteristics that best describe it at a given developmental stage. Finally, compared with control, stress treatment significantly reduced grain yield and 1000-grain weight; however, G-19, G-12 and G-1 were less affected than G-16. Further research should focus on the response of black-seeded barley genotypes to abiotic stresses especially efforts should be made to increase the number of grains per spike and 1000-grain weight and physiological and molecular investigation needed.

Screening of rapeseed-mustard genotypes under low phosphorus stress

N. Mokarroma, M Shalim Uddin, Ahmm Rahman, F. Ahmed

Rapeseed/mustard (*Brassica* spp.) is one of Bangladesh's most important oilseed crops. A hydroponic experiment was conducted at the laboratory of Oilseed Research Center, BARI, Gazipur during *rabi* season of 2023-2024. The twenty four (24) Recombinant Inbred Lines (RIL) of *Brassica* sp. L. including 8 RILs from *B. rapa*

L., 5 RILs from *B. juncea* L. and 11 RILs from *B. napus* L. were used in the study. Two levels of phosphorus treatment, namely, low phosphorus (LP) (2.5×10^{-6} mol L⁻¹ of KH₂ PO₄) and optimum phosphorus (NP) (2.5×10^{-4} mol L⁻¹ of KH₂ PO₄), were used for this study. The perfect combination and inclusion of macro and micronutrients in Hoagland's solution made it an ideal nutrition medium for plants. To provide enough nutrient content and avoid imbalances, the solution was replaced every five days. In response of phosphorus level, morphologically, plants behave differently in low phosphorus conditions than in normal

phosphorus environments. Large augmented roots were found in the plant in low phosphorus conditions. The results revealed that shoot length, root length shoot dry weight, root dry weight, leaf area, and root/shoot ratio might be considered critical traits for screening low phosphorus tolerant mustard at the seedling stage. Twenty-four mustard genotypes formed four main groups or clusters. Based on the performance, G-20, G-21 and G-22 could be considered low phosphorus tolerant genotypes.

SEED TECHNOLOGY

17

Influence of paclobutrazol on growth, seed yield and quality in onion

S.A. Bagum and P. C. Sarker

The experiment was conducted at the research field of Seed Technology Division, BARI, Gazipur, during the period from 2022-23 and 2023-24 to find out the effect of different concentrations and stages of application of paclobutrazol on growth, yield and quality seed production of onion. The experiment was laid out in randomized complete block design with three replications. Significantly the highest seed yield (795 kg ha^{-1}) was obtained from foliar spray of paclobutrazol @ 100 ppm at seedling stage. lowest seed yield (587 kg ha^{-1}) was obtained from control treatment. In the case of seed quality parameters, the germination %, root length, shoot length, seedling dry weight and seed vigour were significantly influenced by different doses of treatments. From the study it can be concluded that foliar spray of paclobutrazol @ 100 ppm at seedling stage (795 kg/ha) is given for higher seed yield and higher value for good quality seed.

Effect of gibberellic acid seed priming on soybean germination and quality seed production

S.A. Bagum and P. C. Sarker

The experiment was carried out at the Seed Technology Division's research field in BARI, Gazipur, from November 2023 to April 2024, to determine the effect of seed priming with various doses of GA3 on soybean emergence and quality seed production. The experiment featured a two-factor randomized complete block design with three replications. The first component contained four concentrations of plant growth regulators, GA3 (Control, 100, 150, and 200 ppm), whereas the second factor included three soybean types

(BARI Soybean-5, BARI Soybean-6, and BARI Soybean-7). All the yield and yield attributes and seed quality parameters were significantly influenced by different BARI soybean varieties and also affected by doses of GA3 priming and interaction between soybean varieties and GA3 doses. The highest seed yield per plant was obtained from GA3 (100ppm) priming from most soybean varieties. Hormonal priming enhanced the soybean's field performance, yield, and seedling characteristics. Gibberellic acid (GA3) at a 100 ppm dose has been shown to highest yield, improve seed germination and vigor index in soybean varieties. This is only a first-year research, so fieldwork and laboratory experiments will be continued the following year.

Effect of foliar application of growth regulators on seed quality of garden pea

A. Hannan, M.N. Islam, M. A. Hossain, M.S. Rahman, M. M. Rohman, P.C. Sarker

The experiment was carried out at the research field of Seed Technology Division, BARI, Joydebpur, Gazipur during rabi season 2023-2024 to find out the effective growth regulator on yield and seed quality of Garden pea. The experiment was laid out in RCBD with four treatments Viz., T_1 = Control (Distilled Water), T_2 = Acetylsalicylic Acid (50 ppm at seedling + pod filling stages), T_3 = K_2HPO_4 (2% at flowering + pod filling stages), T_4 = α -tocopherol (100 ppm at flowering + pod filling stages). The results indicated that there was much variation among the treatments. Among the different treatments, α -tocopherol gave the highest plant height which is favorable for higher dry matter production. The highest number of branches plant^{-1} , pods plant^{-1} , seeds pod^{-1} , 100-seed weight, seed yield, germination%, shoot length and Seed Vigor Index (SVI) was recorded from α -tocopherol when applied with 100 ppm at flowering + pod filling stages.

Evaluation of selected salt tolerant soybean genotypes in respect of seed yield and quality in southern saline soil of Bangladesh

A. Hannan, M.N.Islam, M. A. Hossain, M.S. Rahman, O. A. Fakir, S. Mondal, P.C. Sarker

The experiment was carried out at the research field of Agricultural Research Station, Binerpota, Satkhira during rabi season 2023-2024 for evaluation of selected salt tolerant soybean genotypes in respects of seed yield and quality in southern saline soil of Bangladesh. The experiment was laid out in RCBD with 5 soybean genotypes viz., T₁= Vietkhai, T₂= BSMRAU Soybean-02, T₃=USDA-15, T₄=BINA Soybean-4, T₅= BARI Soybean-6. The results indicated that there was much variation within the tested soybean genotypes. Among the different soybean genotypes BARI Soybean-6 gave the highest plant height which is favorable for higher dry matter production. The highest number of branches plant⁻¹ and 100-seed weight was recorded from BARI Soybean-6 genotypes and the yield contributing parameters were favorable for yield maximization of BARI soybean-6 genotypes. Pods plant⁻¹ and seed pod⁻¹ was recorded maximum from the genotype Vietkhai but 100-seed wt. was lowest among the tested genotypes and could not give reasonable yield. BINA Soybean-4 gave the lowest plant population m⁻², lower other yield attributes and gave the lowest seed yield among the tested genotypes.

Influence of sulphur level on yield and seed quality of soybean

A. Hannan, M.N.Islam, M. A. Hossain, M.S. Rahman, M. Isam, M. M. Masud, P.C. Sarker

The experiment was carried out at the research field of Seed Technology Division, BARI, Gazipur during rabi season 2023-2024 to find out the optimum dose of sulphur on yield and seed quality of soybean. The experiment was laid out in Split-plot design with two soybean variety in main plot and five sulphur doses in sub-plot with three replications. Soybean genotypes were, V₁= BARI Soybean-6 and V₂=BARI Soybean-7. Sulphur level was S₀= Control, S₁= 10 kg, S₂=20 kg, S₃= 30 kg and S₄= 40 kg "S" ha⁻¹. The results indicated that there was much variation within the tested soybean genotypes and different doses of sulphur on yield contributing parameters and seed quality parameters of soybean. Among the

soybean genotypes BARI Soybean-6 gave the highest plant height. The highest number of branches plant⁻¹ pods plant⁻¹, pod length, 100 seed weight and seed yield were recorded from BARI Soybean-6 and seed pod⁻¹, 100-seed weight was recorded highest from BARI Soybean-7. Among the sulphur doses, S₂ (20kg "S") gave the highest yield attributes and seed yield of soybean. Considering the seed quality parameters, BARI Soybean-6 performed better in respect of seed germination and germination speed but BARI soybean-7 gave the higher seedling dry weight and seed vigor index. Considering the seed quality parameter, S₂ (20kg "S") gave the highest germination rate, germination speed, seedling dry weight and seed vigor index whereas control treatment gave the lowest performance in all yield attributes and seed quality parameters of soybean.

Effect of different weed management practices on yield and seed quality of groundnut

A.N.M. Akarim, M.A. Hossain and Sarker, P.C

The experiment was carried out at the research field and laboratory of Seed Technology Division, BARI, Gazipur during 2023-24 to find out the suitable weed management practices on yield and seed quality of groundnut. The experiment was laid out in a RCBD with BARI Chinabadam-9 and four weed management practices viz. 1. control (no weeding), 2. hand weeding at 25 DAS and 45 DAS, 3. pre sowing weedicide: Gluconate 25 days before sowing 4. post emergence weedicide: Fenoxaprop P ethyl 9.3% EC at 25 DAS. Among the treatment hand weeding at 25 DAS and 45 DAS showed significantly better seed yield and quality parameters such as plant height (43.76cm), number of branches/plant (48.0), number of seed/pod (2.79), 100 seed weight (37.36 g), seed yield (2.80 t ha⁻¹), seedling root length (17.47 cm), seedling shoot length (16.68 cm) and vigor index (534.33).

Effect of different threshing method(s) on seed quality of mungbean

A.N.M. Akarim, M.A. Hossain and Sarkar, P.C.

The experiment was conducted in the laboratory of Seed Technology and Farm Machinery and Post Harvest Engineering Division, to find out suitable threshing method(s) for better seed quality of mungbean. The experiment was laid out in CRD with BARI Mung- 6 and two threshing methods viz.

1. Open stick beating 2. Multi crop power thresher with 600,700,800 and 900 rpm. Among the treatment in threshing method of multi crop power thresher with 700 rpm showed significantly better seed quality such as lowest unseparated seeds(2.74 %), highest germination(91.66%), root length(10.18cm), shoot length(8.54cm) and vigour index(1019.0)

Effect of drought stress on seed yield and seed quality of tomato

A.N.M E. Karim, M. A. Hossain and P.C.Sarker

The experiment was carried out at the research field and laboratory of Seed Technology Division, BARI, Gazipur during 2023-2024 to find out the effect of drought stress on seed yield and seed quality of tomato. The experiment was laid out in split plot with 8 treatment combination of four drought stress viz., T₁=Control (no stress imposed), T₂= Early stress (when first truss has set the fruit), T₃= Middle stress (when fruits in first truss where fully mature and started changing their colour) and T₄=Late stress (when fruits on first truss were ripened fully) and two tomato variety i.e. V₁= BARI Tomato -19 and V₂= BARI Tomato -20. The results indicated that the in late stage drought BARI Tomato -20 noticed significantly higher plant Height (91.09cm), no. of fruit plant⁻¹(54.00), fruit wt plant⁻¹(3084.0 g), number of seeds fruit⁻¹(293.67), seed wt plant⁻¹(1.33 g) and germination(91.00 %)

Seed yield and quality of sweet pepper as influenced by nutrient management

M. A. H. S. Jahan, M. S. Rahman, M. A. R. Gazi, M. N. Uddin, M. H. H. Khan, M. M Rahman, H. M. Naser, R. Chakma and P. C. Sarker

This experiment is conducted at STD research field during Rabi season 2023-24 to find out a suitable nutrient management system of sweet pepper on aspect of seed yield and quality. The experiment design was carried out in a RCB design with three replications. The experiment comprises five treatments viz. T₁= Control (Native nutrient), T₂= Organic fertilizer only (STB) – Biologically Active Organic Fertilizer (BIOFER) + BARI IMO-1 + BARI IMO-2, T₃= Inorganic fertilizer only (STB), T₄= Both organic and inorganic fertilizer – IPNS (25% organic + 75% inorganic) and T₅= Recommended fertilizer. Individual fruit weight, number of fruit/plant, fruit yield (kg/ha), seed yield

(kg/ha), 1000 seed weight, germination per cent and vigour index were significantly influenced by different treatments. Treatment 4 better performance in terms of number of fruit/plant, fruit yield (kg/ha), seed yield (kg/ha), germination per cent and vigour index.

Determination of optimum harvesting time of chia seed for getting quality seed

M. A. Hossain, M. Islam, A. Hannan, R. Chakma, M. S. Rahman, and P.C Sarker

A field experiment was conducted at the research field and laboratory of Seed Technology Division, BARI, Gazipur, during 2023-2024 to know the determination of optimum harvesting time of chia for getting quality seed. Plant height at harvest, number of inflorescence per plant, main inflorescence length, average inflorescence length, percent sterile florets, number of seeds per floret, seed yield, 1000 seed weight, seed germination, seedling dry weight and vigor index significantly varied with respect to different treatments except the length of main inflorescence. The optimum harvesting time was observed from 110 days after sowing of chia seed in respect of 1000 seed weight, seed germination, seedling dry weight and vigor index.

Effect of fruit retention on seed quality of brinjal

M. A. Hossain, M. S. Rahman, M.N Islam A. Hannan, R. Chakma, M. Islam and P.C Sarker

The experiment was conducted to the field and laboratory of seed technology division, BARI, Gazipur during Rabi season of 2023-2024 to determine the effect of fruit retention on seed quality of Brinjal (BARI Begun-12). The experiment consisted of different types of fruit retention (T₁:3 fruit retention, T₂:5 fruit retention, T₃:7 fruit retention and T₄: all fruit retention) of brinjal plants conducted in a Randomized Complete Block Design (RCBD) with three replications. Significantly the maximum fruit weight, fruit length, fruit girth, root length, shoot length, seedling length, number of seeds per fruit, seed weight per fruit, seed germination, seedling dry weight and seedling vigour index were recorded in retention of five fruits per plant, while retention of all fruits per plant recorded significantly the highest mature fruit yield per plant and seed yield per plant. It may therefore be concluded that 5 fruit

retention was suitable for better seed quality and higher seed yield of BARI Begun-12.

Identification of fruit maturity stages for quality seed of brinjal

M. A. Hossain, M. S. Rahman, M.N Islam A. Hannan, R. Chakma, M. Islam and P.C Sarker

The experiment was conducted to the field and laboratory of seed technology division, BARI, Gazipur during Rabi season of 2023-2024 to identify the best period for harvesting eggplant fruits, associated with ideal resting period of the fruit for extracting seeds (BARI Begun-12). The experiment consisted of different types of fruit maturity stages (T₁:35days after pollination (DAP), T₂:45 days after pollination (DAP), T₃:55 days after pollination (DAP), T₄:65 days after pollination (DAP) and T₅:75 days after pollination (DAP) of brinjal plants conducted in a Randomized Complete Block Design (RCBD) with three replications. Significantly the maximum germination percentage, thousand seed weight, seedling vigour index and the lowest value of electrical conductivity was recorded among the different harvesting stages of brinjal from the fruits harvested at 55 days after pollination (DAP).

Effect of seed priming for enhancing quality of long aged seed of onion

M. S. Rahman, I. Ahmed, M. A. Hannan and P. C. Sarker

To improve the germination characteristics of long-aged onion seeds, a lab experiment was carried out in Rabi 2023–2024 at the Seed Technology Division, BARI, Gazipur, Bangladesh, to identify a suitable priming approach. The results showed that germination was enhanced when long-aged onion seeds were primed with milk and 100 ppm of GA₃.

Quality seed production of mustard under different irrigation level

M. Islam, M. A. Hossain and P.C. Sarker

An experiment was conducted in the experimental field and laboratory of Seed Technology Division, BARI, Gazipur, Bangladesh during 2023-24 to know the effect of irrigation at different growing stage on seed yield and seed quality of rapeseed mustard. The experiment was done following RCBD with three replications. Rapeseed was grown given no irrigation, two irrigations and three irrigations at different growth stages. Maximum

seed yield (1.72 MT/ha) was recorded in case of three irrigation given at vegetative, flowering and seed development stage due to higher number of branches and siliqua per plant, higher number of seed per siliquae and thousand seed weight. But early maturity found in rainfed condition. Good seed quality parameter like germination (100%), seedling dry weight and vigor index was also found higher in case of three irrigations. Minimum plant height, number of seed per siliquae, seed yield and seedling vigor index was found in case of rainfed condition. Therefore, to get higher seed yield with better quality seed it would be wise to give three irrigation at vegetative, flowering and seed development stage in rapeseed cultivation.

Germination and seedling performance of watermelon as influenced by seed priming

M. Islam, M. S. Rahman and P.C. Sarker

An experiment was conducted in the laboratory of seed technology division, BARI, Gazipur-1701 during 2023-24 to know the effect of seed priming in watermelon to overcome germination problem. There were six treatments including a control. Seeds of BARI Tormuj- 2 was subjected to priming with 1% KNO₃, 0.5% KNO₃, 0.1% KNO₃, 1% CaCl₂ and fresh water for 20 hours and no seed priming as control. Priming of watermelon seed with 1% KNO₃ and hydro priming gave higher germination (95.67%) & (94%) respectively and emergence index (93.33%) & (91%) respectively than the other treatments. Higher germination speed was recorded from seed priming with 0.5% KNO₃, 0.1% KNO₃ solution and hydro priming. Maximum shoot length (8.84cm), seedling length (14.58cm), vigor index length (1370) was obtained from hydro priming where maximum root length was found in seed priming with 0.5% KNO₃ solution. Maximum dry weight of seedling and vigor index mass was found in seed priming with 1% KNO₃ solution. Therefore, priming of watermelon seed with 1% KNO₃ and hydro priming would be helpful to increase germination and develop better quality seedling.

Adaptive trial of BARI tomato seed separator cum pulper

T. N. Barna, N. Jahan, M. N. Amin, P. Sen and M. A. Hoque

Tomato seed cultivation holds significant importance for Bangladesh as increasing tomato

production through effective seed cultivation helps improve food security and nutrition for the population. Mostly, tomato seed separation is done manually throughout the country. So, a power-operated tomato seed separator was designed and developed at the Farm Machinery and Postharvest Process Engineering Division, BARI, during the years 2023-24. The machine underwent a fresh redesign based on recommendations from prior years' results. It demonstrated an average throughput capacity of 207 kg/h, extractor productivity was 0.095 kg/h, with an average seed loss of 3% and extractor efficiency was 97%. Furthermore, the machine exhibited an average pulping capacity of 65 kg/h, an average pulping efficiency of 86.6%. The machine had a BCR of 1.49 and a break-even use of 35 days with 8 hours of daily use. Despite the lower flesh-to-seed ratio in hybrid tomatoes, the machine's performance was satisfactory. The machine is ready for adoption in farmers' field.

Response of seed priming by salicylic acid to germination and seedling growth of tomato under salinity

M.S.U. Khan and S. Mondal

Seed priming is known to improve germination and seedling emergence under different environmental stresses. Salicylic acid (SA) also plays a major role in regulation of many physiological processes e.g. growth, development, ion absorption and germination of plants. An experiment was carried out in completely randomized design with three replications in the Plant Physiology laboratory of Agricultural Research Station (ARS), BARI, Binerpota, Satkhira the rabi season of 2023-2024 in

order to alleviate salinity-induced growth inhibition at the early stage of tomato (BARI Tomato-21) seedlings. Experimental treatments included 4 levels of seed priming ($SA_0 = 0\text{mM}$, $SA_{0.1} = 0.1\text{mM}$, $SA_{0.3} = 0.3\text{mM}$ and $SA_{0.5} = 0.5\text{mM}$) and 2 levels of salinity stress ($S_0 = 0\text{dS/m}$, $S_5 = 5\text{dS/m}$ and $S_{10} = 10\text{dS/m}$). The results showed severe reduction in germination and seedling growth with increasing stress levels. Seed-priming with $SA_{0.1} = 0.1\text{mM}$ not only enhance Na^+/K^+ uptake but also reduced mean germination time compared to the untreated seeds. Seedling growth of SA-primed seeds had significantly higher root and shoot length than non-primed seeds. Such results indicated reduction in severity of the effect of salinity stress on germination and seedling growth parameters of tomato by priming with $SA_{0.1} = 0.1\text{mM}$ which ultimately could tolerate saline conditions to some extent.

Seed quality status of soybean as influenced by packaging materials and time after outlet from the cool room

M. S. Rahman, M. A. Hossain, M. I. Islam and P. C. Sarker

During Rabi 2023-2024, a laboratory experiment was carried out at the Seed Technology Division, BARI, Gazipur, Bangladesh, to standardize the duration of germination potential and vigor of soybean (BARI Soybean-7) seed shortly after exit from the cool room. The results showed that BARI Soybean-7 should be planted in the field within 15 days for cloth bag and within 21 days for polythene bag and aluminum foil bag, of being removed from the cool room.

VERTEBRATE PEST

18



Rodent problem in mushroom cultivation and their safe management strategies

A T M Hasanuzzaman and M S Alam

The experiment was conducted in outdoor rat enclosure at vertebrate pest division BARI, Joydebpur, Gazipur during 2023-24 to know the nature and extent of rodent damage in mushroom and to develop safe and effective control technique for controlling rodent in mushroom. Rats gnaw mushroom spawns and eat mushroom fruiting bodies. In mushroom house, 2.02 mushroom spawn were damaged per rat per day. Rat consumed significantly higher amount of mushroom than wheat. In management test, the average success of commonly used live trap and china snap trap was 46.67% and 33.33% respectively whereas commonly used kill trap showed only 20.00% success.

Questionnaire survey of squirrel damage in common fruits in selected areas of Bangladesh

A.T.M. Hasanuzzaman and M. S. Alam

A study was conducted among the farmers on squirrel problem in different fruit crops in Sylhet and Chapai Nawabgonj districts during 2023-24. Questionnaire survey on squirrel damage in fruit was conducted amongst fruit and vegetables growing farmers. Scientists of Vertebrate Pest Division took the farmers interview with a prescribed questionnaire sheet. It included different questions such as on species composition, crops damaged by the squirrels, intensity of damage, amount of loss, breeding season, number of parturitions per year, control method used by the farmers etc. According to the farmers' opinion, vegetables and fruit crops were frequently damaged by the squirrels whereas striped squirrel was pre dominant in Chapai Nawabganj and brown squirrel was in Sylhet. Most affected fruits were ber, mango, litchi, coconut, guava and pumelo. Farmers

reported that they lost 9.63% guava, 8.41% mango, 8.67% ber, 9.57% litchi and 18.70% pumelo due to squirrel in last year. Farmer lost 900.84 taka per guava tree per year due to squirrel attack while it was 6.9.43 taka for mango tree, 787.50 taka for ber, 1131.57 taka for litchi and 224.00 taka for pumelo tree. Farmers were unknown about breeding habit of squirrel.

Efficacy of different repellent techniques against pest birds in sunflower

M. S. Alam and ATM Hasanuzzaman

The experiment was conducted at BARI central research field, Gazipur and during rabi season in 2023-24 to find out the efficacy of different combination of repellent on sunflower against pest birds. Four treatments viz., Plastic bottle wind mill, only top netting, whole plot netting and Untreated control (without repellent) were used in this experiment. In control plots maximum 52.5% plant damage and 24.19% head damage were happened by the birds whereas the lowest damage was recorded in treatment where whole plot covered by net (0% plant and 0% head damage) treated plots and only top netting treated plot (30.0% plant and 8.39% head damage). Highest Marginal Benefit cost ratio was found in whole plot netting (0.74) followed by only top netting treated plots (0.66) and lowest Plastic bottle windmill (0.27).

Evaluation of attractant and repellent properties of some plant extract against rat in laboratory

M. S. Alam and ATM Hasanuzzaman

Rat damage of agricultural crops is a worldwide problem. Different approaches for controlling rodent including attractant and repellents are needed to mitigate crop losses. Seven plant materials such as Cumin, Coriander, Anise, Clove, Black pepper, dust of Calendula flower and Akanda leaves Calendula flower powder, Akanda leaf) 10%

and 20% were evaluated as rat repellents or attractant in laboratory trials.

According to the mean consumption during 5 days, it was observed that the consumption was low of all the treated bait compared to control bait (only wheat). All the treated bait was significant different compared to control except Calendula flower dust 10% and 20% concentration. All the treated bait of 10% and 20% concentration showed higher feeding deterrent with the increase of concentration except coriander and akanda powder. This two treatment showed lower feeding deterrent with the increase of concentration. Calendula flower powder indicated the lowest feeding deterrent compared to all other treatment. Calendula flower dust have some attraction power to rodent for feeding activity.

Survey on vertebrate pest damage in coffee and cashew nut in selected areas of Bangladesh

M. S. Alam and ATM Hasanuzzaman

Questionnaire survey was conducted among the farmers Hill growing region on vertebrate pest problem in Coffee and Cashew nut in in the area of Khagrachhari and Rangamati hill districts regions during 2023-24. No severe damage of vertebrate pest attack to Cashew nut was observed. No coffee damage was observed in farmer's field but Hill Agricultural Research Station, Raikhali, Rangamati was observed wild mammalian pest attacked, which is primarily identified as civet.

Survey of squirrel damage in common fruits in selected areas of Bangladesh

A T M Hasanuzzaman and M S Alam

The study was conducted in the squirrel infested area of Rajshahi and Naogaon regions during 2022-23. Four upazillas of Rajshahi and one upazilla of Naogaon district were selected for this study.

Questionnaire survey on squirrel damage in fruit was conducted amongst fruit and vegetables growing farmers. Scientists of Vertebrate Pest Division took the framers interview with a prescribed questionnaire sheet. It included different questions such as on species composition, crops damaged by the squirrels, intensity of damage, amount of loss, breeding season, number of parturitions per year, control method used by the farmers etc. According to the farmers' opinion, vegetables and fruit crops were frequently damaged by the squirrels whereas striped squirrel was pre dominant in study areas. Most affected fruits were ber, mango, litchi, coconut, guava and pumelo. Farmers reported that they lost 37.09% guava, 12.47% mango, 27.15% ber, 7.47% litchi and 16.29% pumelo due to squirrel in last year. Farmer lost 725.00 taka per guava tree per year due to squirrel attack while it was 424.17 taka for mango tree, 731.50 taka for ber, 447.71 taka for litchi and 530.00 taka for pumelo tree. Farmers were unknown about breeding habit of squirrel.

Field evaluation of rodenticide for controlling rats

A.T.M. Hasanuzzaman and M. S. Alam

The experiment was conducted at Vertebrate Pest Division, BARI, Gazipur and ARS, Rajbari, Dinajpur to study the effectiveness of Bromadiolone 0.005% (Bromapoint Gold) and Zinc phosphide 80% (Meghla, Tataphide and Finix Rat Killer) supplied from company. In field trial test three rodenticide showed more than 80% rodent control success was recorded. The average poison bait consumption was 0.53 to 1.34 g/rat/day in zinc phosphide bait and 4.44 to 4.99 g/rat/day in case of bromaliolone of all the tested bait.

POSTHARVEST TECHNOLOGY

19



Efficacy of clove essential oil and carnauba wax in extending shelf life of mango

M.M. Rahman, M.G.F. Chowdhury, M.H. H. Khan

The effects of clove essential oil, gibberellic acid and carnauba wax coating for controlling stem end rot and anthracnose caused by *Botryodiplodia theobromae* and *Colletotrichum gloeosporioides*, respectively of mango to extend shelf life was investigated. BARI Aam-3 (Amrapali) was collected from farmers' orchard in Naogaon District and transported to the laboratory of Postharvest Technology Division (PHTD), BARI. No fruits had been treated with a fungicide after harvest. Fruits were sanitized with calcinated calcium (1g mL^{-1}). Again, clove essential oil was extracted in the laboratory of PHTD using steam-distillation apparatus. Surface sterilized fruits were arranged in rotating wax coating machine. Clove EO 1 mL L^{-1} premix with ethanol (1 mL L^{-1}) as stabilizer and Triton-X100 (40 mg L^{-1}) as surfactant was applied by hand spraying on the rotating fruits and at the same time Carnauba wax coating was also sprayed after the spraying of EO. Then, the treated fruits were placed in the plastic foam packaging cup liner and kept in 24°C . Fruits were also treated with GA (@400 ppm). Clove EO extracted in the laboratory by steam-distillation method yielded approximately 5% oil. According to Ratri et al. (2020) eugenol (85%), caryophyllene (1.14%) and humulene (0.18%) are the main compounds in clove oil. Clove essential oil at 1 mL L^{-1} premixed with ethanol (1 mL L^{-1}) as stabilizer and Triton-X100 (40 mg L^{-1}) as surfactant in combination with carnauba wax has shown potential inhibition of the fungi with shelf life extension of mango. To identify the exact causal component of clove EO for inhibiting stem end rot and anthracnose of mango the *in vitro* test and effect of temperature and relative humidity will be investigated next year.

Shelf-life extension of fresh guava fruits through postharvest treatments

M.M. Rahman, M.G.F. Chowdhury, M.H. H. Khan

The experiment was conducted to evaluate the effect of gibberellic acid and cling wrap packaging on the quality and shelf life of guava. Commercial matured guava 'BARI Peyara-2' commonly known as "Thai Peyara" was obtained from local grower's orchard (Jhikargacha, Jessore, Bangladesh) and transported to the laboratory of PHTD, BARI, Gazipur. Each batch of fruit was randomly distributed into the required number of treatment units with 15 fruits per unit with three units/replicates assigned to each treatment. Each replicate was prepared and treated separately. The required number of fruits were dipped in gibberellic acid solution (@400 ppm) for 10 minutes. The control fruits were dipped only in water. After dipping all the fruits were kept on the table for 30 minutes for surface drying. Then, one group of the treated fruits were wrapped with cling wrapping cellofen and the other group kept unwrapping. A group of non-dipping fruits also wrapped with the cling wrapping cellofen as a control of farmers' practice. Another group of gibberellic acid treated fruits also kept without cling wrapping. Then, the treated fruits were placed in the plastic foam packaging cup liner and kept in 25°C .

The guava fruits treated with gibberellic acid and wrapped in cling wrap cellofen resulted in the most firmness (120.20N and 102.48N) compared to the control (71.12N and 37.11N) and other treatments throughout the storage periods. GA in combination with cling wrap maintained the qualitative characteristics of guava fruit by reducing the ripening rate by acting as an excellent ethylene inhibitor. During storage, changes in firmness, TSS, ascorbic acid, and beta carotene decreased in treated fruits which might be due to an

altered atmosphere around the fruit and decrease in water loss. This altered atmosphere also can reduce the changes in pectin materials and the activity of cell wall degrading enzymes, which finally maintains the fruit firmness. This study implies that gibberellic acid in combination with cling wrap has potential to extend the shelf life of guava. Fruits pre-treated with gibberellic acid then packing with cling wrap gave comparatively acceptability quality and shelf life for 14 days of storage at 25° C. However, this is a first year trial and some more treatments will be added to the current treatments in the next year.

Effect of postharvest treatment and edible wax coating on improving quality retention and shelf life of BARI aam-3

M.G.F. Chowdhury, M.H.H. Khan, M.M. Rahman, M.S.Uddin

This experiment was conducted to study the effect of different postharvest treatments and fruit coatings that stimulate the fruit antioxidant system and will maintain postharvest quality of mango at ambient storage condition. BARI Aam-3 was collected and then washed with 1000 ppm thiabendazole and 0.1% calcinated calcium and then treated with hot water at 55°C for 5 mins. After that, food grade wax coating (Endura fresh TM9000 & Endura Fresh ^R2400) and another commercial postharvest treatment such as multi-fresh ethylene absorber and antimicrobial agent (Greenpod lab, India) were applied. Treated mango were washed appropriately by required amount of detergent conc. in the BARI fabricated brush pad @8-10 rpm for few seconds and then washed again with ambient water. For uniform surface coating a hand sprayer was used to apply wax @500 fruit/L on the fruit peel.

On Day-1, treatment Endura Fresh TM9000 combined with an antimicrobial agent exhibited the highest respiration rate (61.31 ml CO₂/kg-hr.), which was significantly higher (p<0.05) than all other treatments. In contrast, Endura Fresh ^R2400 combined with an antimicrobial agent demonstrated the lowest respiration rate 16.21 ml CO₂/kg-hr.), marking a significant difference (p<0.05) from the other treatments. In case of weight loss, control treatment exhibited the highest weight loss percentage (4.30%), which was significantly higher (p<0.05) than other treatments at Day-1. Among the treated samples, Endura fresh TM9000 and

Endura Fresh ^R2400 found the lowest weight loss percentages (2.11% & 1.85%, respectively). The analysis of Total Soluble Solids and ascorbic acid content across various treatments reveals distinct trends in fruit quality over time. Titratable Acidity for all treatments, except for Carnauba wax 9000 with its unusual value on Day-8, generally exhibited a decreasing trend in acidity over time. Antioxidant Activity for treatments Endura Fresh ^R2400, Carnauba 9000+Antimicrobial treatment; and Endura Fresh ^R2400+ Antimicrobial treatment observed the highest levels of antioxidant activity. Mango treated with carnauba wax combined with antimicrobial agents was effective in reducing both respiration rate and weight loss, suggesting potential for extending the shelf life and maintaining quality.

Standardization of doses of ethylene gas for uniform ripening of tomato in low-cost ripening chamber

M.G.F. Chowdhury, M.H.H. Khan, M.M.Molla, R.Islam

The experiment was conducted to standardize the doses of ethylene for uniform ripening of tomato (*Solanum lycopersicum* L.) in low-cost ripening chamber. Udayan variety tomato at breaker stage was harvested at HRC field of BARI and treated with 0, 50, 100, 150 and 200 ppm concentration of exogenous ethylene gas at BARI developed low-cost ripening chamber at PHTD, Gazipur where temperature maintained at 20±2°C and 80±5% RH. Udayan varieties of tomatoes turned to breaker stage were collected and washed and then exposed to different ethylene gas concentrations such as 0, 50, 100, 150 and 200 ppm for overnight in a fruit ripening chamber of PHTD, BARI. After that, the fruits were kept at 20±2°C with 80±5%RH and at ambient temperature for 12 days. Physical appearance and nutritional quality with shelf life were evaluated.

Textural properties of fried pineapple chips were determined to estimate resistance by a texture analyzer.

The application of exogenous ethylene significantly influences the ripening process of tomatoes. Tomato treated with 50 ppm C₂H₄, respiration increased from 20.64 ml CO₂ /kg-hr. on Day-1 to 44.59 ml CO₂ /kg-hr. by Day-4, indicating accelerated ripening. Higher concentrations, such as 100 ppm, showed a rise from 24.85-61.15 ml

CO₂ /kg-hr., while 200 ppm peaked at 68.86 ml CO₂ /kg-hr., demonstrating a more pronounced effect. The stabilization of respiration rates from Day-4 suggests a saturation point in the ripening process, where ethylene receptors may be fully activated. Besides, Weight loss was lowest at Day-8 in 200 ppm treated tomatoes but it is similar for 100 ppm treatment. Firmness and carotene were better in 100 ppm treated tomatoes. Overall, 100 ppm was the optimum doses of ethylene gas for uniform ripening of tomatoes. Optimum ripening of tomato achieved after 4 days of ripening at 20°C through exogenous ethylene gas concentration at 100 ppm.

Standardization of doses of ethylene gas for uniform ripening and postharvest quality of banana during storage

M.G.F. Chowdhury, M.H.H. Khan, M.M.Rahman, R.Islam

The experiment was conducted to evaluate the effect of ethylene for standardization of doses exogenous ethylene gas concentration for uniform ripening of banana (*Musa spp.*) in low-cost ripening chamber at PHTD, BARI. Uniform with physiologically matured green banana (BARI kola-1) were collected and treated with 0, 50, 100 and 150 ppm concentration of ethylene gas at BARI developed low-cost ripening chamber (L3.5m×W2m×H2m) where temperature maintained at 20±2°C & 80±5% RH. The respiration rate in the control treatment shows a gradual increase from initially (Day-1) (20.18 ml CO₂/kg-hr.) to Day-6 (136.09 ml CO₂/kg-hr.). This treatment consistently states the lowest respiration rates across all days during the study. Ethylene production in the control treatment (0 ppm) steadily increases from Day-1 (92.73 nmol/kg-s) to Day-4 (323.52 nmol/kg-s), followed by a decrease on Day-6 (120.82 nmol/kg-s). This is the lowest ethylene production across all treatments. Control treatment exhibits the highest physiological weight loss (PWL) on both Day-4 (3.11%) and Day-8 (5.77%), indicating significant weight loss in the absence of ethylene treatment.

Total soluble solids (TSS) increases in all treatments over time, indicative of the ripening process where starch is converted into sugars. The titratable acidity decreases across all treatments over time, which aligns with the typical reduction of organic acids during fruit ripening. Ascorbic

acid levels decline for all treatments during storage, reflecting the natural degradation of vitamin C as the fruit ripens. Exogenous ethylene treatments, particularly at higher concentrations of C₂H₄ gas (100-150 ppm), significantly enhance the ripening process in bananas by increasing TSS and reducing weight loss.

Standardization of doses of ethylene gas for uniform ripening and postharvest quality of mango during storage

M.G.F. Chowdhury, M.H.H. Khan, M.M.Rahman, R.Islam

The experiment was conducted to standardize the doses of exogenous ethylene gas for uniform ripening of mango (*Mangifera indica* L.) in BARI developed Low-Cost Ripening Chamber. Uniform with physiologically matured mango (BARI Aam-2) were collected from Bagha, Rajshahi and treated with 0, 50, 100 and 150 ppm of exogenous ethylene gas at PHTD, BARI where temperature maintained at 20±2 °C with 80±5% RH. Three replications of selected clusters were taken at initially and 2 days interval up to 8 days for respiration rate 4 days interval up to 12 days for physicochemical analysis. The study involved treating mature green mangoes with different concentrations of exogenous ethylene gas application to evaluate ripening responses and shelf life. Mangoes were stored at ambient temperature (26±2°C and 75±5%RH) and nutritional composition were recorded initially and 4 days interval up to 12 days.

Initially (On Day-1), 100 ppm and 150 ppm exhibited the highest respiration rates (39.93±3.93 CO₂/kg.hr. and 39.95±0.52 ml CO₂/kg.hr., respectively), significantly surpassing control and lower concentrations. The control treatment (0 ppm) exhibited the highest PWL by Day-12 (11.78%), indicating substantial moisture loss. In contrast, T₂ (50 ppm), T₃ (100 ppm), and T₄ (150 ppm) exhibited lower PWL initially, suggesting that ethylene treatments assist to reduce moisture loss by modulating transpiration rates. The highest TSS levels were observed in 100 ppm and 150 ppm by Day-12 (18.16 °B & 18.17 °B, respectively), indicating enhanced carbohydrate metabolism due to ethylene. In case of titratable acidity (TA), treatment 50 ppm maintained higher acidity levels until Day-8 (0.20%) but observed a decline trend by Day-12 (0.05%). Similarly, vitamin A content, a

critical nutritional parameter, was significantly influenced by ethylene application. Among the treatment, mango treated with 100 ppm performed better quality and noted optimum ripening at ambient condition ($26\pm 2^{\circ}\text{C}$ & $75\pm 5\%$ RH).

Effect of maltodextrin and sodium chloride on the quality attributes and storage life of vacuum fried mango chips

M.G.F. Chowdhury, M.H.H. Khan, M.M. Molla, P.Sen, R.Islam

The aim of the study was to evaluate vacuum fried mango chips processing using BARI developed vacuum fryer at suitable frying temperature and time. Early harvested green mangos (unknown commercial) were collected from Gazipur and peeled and then thinly sliced (2-3 mm). Six treatments such as 20% maltodextrin (MD), 20% MD with 10% NaCl, 20% MD with 10% NaCl and freezing (-14°C), 20% MD and direct frying, preserved 10% salted mango (>6 months storage) and without any treatment were examined. Raw mango slices were vacuum fried at 105°C for 30 mins was used for frying and then were de-oiled at 1400 rpm for 2-3 mins. Final products were packed in metalex foil packet (3 layer, ~60 micron) and nutritional quality with storage life was observed for 3 months.

Control treatment exhibits an increase from 3.94% initially to 7.84% after 3 months of storage, while 20% maltodextrin (MD) presents a significant increase from 1.038% initially to 3.65% after 2 months and then decreases to 3.16% after 3 months of storage. Preserved mango maintains a higher moisture content from 1st month to 3rd month compared to other treated samples. In case titratable acidity (TA) values treatment 20% MD and 20% MD with 10% NaCl, remain relatively stable, with slight fluctuations over time. Similarly, ascorbic acid content varies significantly among the treatments. Treatment control observes high initial values (69.07 mg/100g), while treatment preserved salted mango starts with the lowest value (21.47 mg/100g). The use of certain preservatives appears to help retain some antioxidant properties. 20% MD with direct frying) tends to retain more energy over time compared to other treatments. Mango treated with 20% MD, 10% NaCl and freezing includes both freezing and salted mango, exhibits

significant energy losses initially but stabilizes somewhat after 2 months where the energy value range from 951 to 709 kcal/100g. Among the treatments, 20% MD with 10% salt and then freezing performed better in terms of nutritional quality and 3 months of ambient storage ($26\pm 2^{\circ}\text{C}$ & $75\pm 5\%$ RH).

Effect of maltodextrin on nutritional and bioactive compounds of freeze-dried mango chips

M.G.F. Chowdhury, M.H.H. Khan, S. Pervin, R.Islam

The aim of the study was to standardize the freeze-dried mango chips processing protocol by application of maltodextrin (MD) as food additives for cell integration. Mango chips were prepared from matured semi-ripe mango. The harvested mango (Fazli) was collected from Bagha, Rajshahi to PHTD, BARI. Then mangoes were washed and cut into slices about 3-5 mm thickness and treated with different concentration such as 1.5%, 3%, 4.5% & 6% of MD then kept in high density polyethylene packet (HDPE) (~60 micron) and frozen at -18°C for 24-36 hrs. The frozen slices were dried in freeze dryer at -55°C for 48-72 hrs. and the dried mango chips were packaged in foil (~50 micron) packet without nitrogen flashing.

Control treatment exhibited the highest moisture at 9.77% where 1.5% MD and 3% MD found moisture 8.41% and 9.42%, respectively. In case of titratable acidity, control found the highest titratable acidity at 2.41%. 1.5% MD and 3% MD were significantly lower ($p<0.05$) titratable acidity levels compared to control treatment. In case of the phenolic content, with addition of MD up to 3% (9.19 mg GAE/100g), it slightly decreased in treatment 4.5% MD (8.32 mg GAE/100g) and treatment 6% MD (7.57 mg GAE/100g). Treatment 3% MD was the most effective ($p<0.05$) in enhancing phenolic content. The antioxidant activity varies among treatments, with treatment 1.5% MD (58.09%) and treatment 6% MD (56.18%) had the highest inhibition percentages, indicating strong antioxidant properties. Treatment 4.5% MD had the lowest energy value (553.07 kcal/100g) while treatment 6% MD had the highest (579.79 kcal/100g). It can be concluded that 6% MD treated mango chips exhibited better quality in

terms of physical appearance and nutritional quality in metalex foil packet. Improper freeze-drying of mango chips the product may reduce its crispiness or increase moisture of the product.

Physicochemical properties and bioactive compounds of coffee bean and coffee powder at madhupur of tangail

M.G.F.Chowdhury, M.H.H. Khan, M.A. Hossain, R. Islam

This study examines the physicochemical composition and nutritional properties of selected coffee bean and coffee powder. Coffee bean and coffee powder were collected from Madhupur, Tangail and transferred to PHTD Lab, BARI, Gazipur. Physicochemical and bioactive compounds were evaluated through laboratory analysis. A significant ($p < 0.05$) decrease in moisture content was observed, from 8.76% in raw beans to 2.68% after roasting, which is expected due to the high temperatures involved in roasting that drive off water. The ash content decreased from 2.81% in raw beans to 1.89% in roasted coffee, while the total soluble solids (TSS) showed a minimal increase from 2.93 °B to 2.97°B, indicating that roasting slightly affects the soluble solids that contribute to coffee's flavor and aroma. Anthocyanin content which has antioxidant properties, increased from 0.29 mg/100g to 0.90 mg/100g. The calorific value (Energy) increased from 756.91 Kcal/100g in raw beans to 794.84 Kcal/100g after roasting, probably due to moisture loss and chemical transformations such as Maillard reactions that make some compounds more caloric. Vitamin C content significantly decreased from 21.60 mg/100g in raw beans to 10.21 mg/100g in roasted coffee. The pH levels remained stable, with a slight increase from 6.76 to 6.77. Besides, the titratable acidity increased significantly from 0.61% to 1.85%, indicating a higher acid profile in roasted coffee. Beta-carotene increased from 18.42 mg/100g to 32.21 mg/100g. In contrast, the total carotenoid content slightly decreased from 2.72 mg/100g to 2.34 mg/100g after roasting. The roasting process leads to various chemical changes in coffee beans, including moisture reduction, changes in antioxidant compounds, and variations in energy and nutrient content. These transformations affect the coffee's flavor, aroma, and health-related properties.

Consumers preference and comparison of nutritional quality of selected fresh-cut vacuum fried chips in selected locations of bangladesh

M.G.F. Chowdhury, M.M. Rahman, M.H.H. Khan, M.M. Molla, R. Islam

The assessment was conducted to evaluate the consumer preference of selected vacuum fried (VF) chips and comparison of nutritional quality of existing real chips at selected locations of Bangladesh for improving quality to marketable the products. The organoleptic test was conducted to assess VF jackfruit, banana, mango and potato chips by the entrepreneurs. Ten experts panel members were participated and nutritional quality were examined both entrepreneurs developed and existing market sample of real chips.

Jackfruit chips was the most favored chips among consumers group in most locations, particularly in Rajshahi, Tangail, and Bogura. They received the highest scores in several sensory attributes, including color (8.4), taste (8.2), flavor (8.4), and overall acceptance (8.4). However, in Jashore, the scores were moderate, ranging from 7.6 to 7.8 across all attributes, indicating a slightly lower preference. Banana chips observed a generally favorable response, especially in Tangail, where they were highly rated in taste (8.7), flavor (8.6), crispiness (8.6), and overall acceptance (8.6). It also performed well in Bogura with overall acceptance at 8.4, although the crispiness was rated slightly lower at 8.1. Rajshahi consumers rated the color (8.5), flavor (8.4), and overall acceptance (8.6) highly but gave lower scores for taste (6.4) and crispiness (6.8). In Jashore, banana chips received moderate ratings in taste (8.0) and flavor (7.8), but lower in oiliness (7.4) and overall acceptance (7.6), reflecting a mixed response. Mango chips consistently received lower scores across most locations. Rajshahi consumers gave low scores for taste (6.8), flavor (6.6), and overall acceptance (7.2). In Tangail, the scores were mixed, with a high rating for flavor (8.0) and crispiness (8.2) but lower for taste (6.5). Overall acceptance was moderate at 8.2. In Bogura, mango chips received the lowest scores, particularly for color (6.4), taste (6.4), and overall acceptance (6.9). In Jashore, the chips scored moderately to well, with taste (7.4) and overall acceptance (7.6). Potato chips was varying levels of acceptance, with

Bogura group rated the strongest preference and Jashore the weakest. In Rajshahi, potato chips scored moderately across all attributes, with overall acceptance at 7.8. Tangail consumers gave high ratings for taste (8.3) and oiliness (8.1) but lower scores for color (6.9). In Bogura, potato chips were well-received, with consistent scores ranging from 8.2 to 8.4. In Jashore, they received lower ratings across several attributes, with taste (7.6) and crispiness (7.0) being the most notable, indicating a less favorable. Jackfruit, banana and potato chips were accepted for marketable except mango chips require a bit improvement for color, crispiness and proper seasoning. The energy values were found a ranged from 480 to 577.52 Kcal/100g and acrylamide were observed also below TDI.

Effect of different organic acids on fermentation of vegetables and pomaces as probiotic pickle

M.M. Molla, M.H.H. Khan, B.C. Dey, M.G.F. Chowdhury, M.M. Rahman, S. Pervin and P. Sen

The present investigation was undertaken to find out the effect of organic acids for increasing the shelf life of selected vegetables and enhances fermentation of the stored vegetables under different strain of the selected bacteria. No data on fermentation were recorded due to time limitation. The vegetables were treated with three different organic acids namely T₁= lactic acid, T₂= acetic acid and T₃= apple cider vinegar. The experiment was laid out in complete randomized design (CRD) with 3 replications. The vegetables treated with different organic acids were shelf stable 9 months more. Results indicate that the acidity level of the stored vegetables were increased due to increasing total acidity of the treated samples. The decreased acidity might be due to an inverse relation with acidity. In opposition, the increasing acidity level by the organic acid treated vegetables might be due to formation of acid and breakdown of pectic substances over the storage periods. Vitamin C and β -carotene was gradually changed entire the storage periods due to leaching behavior of vitamin C into water solution, light intensity of the stored room and oxidation during long concentration steps in room temperature and atmospheric pressure. The highest vitamin C and β -carotene content was retained by the apple cider vinegar compared to lactic acid and acetic acid.

Effect of salt concentration on preservation of vegetables as probiotic pickle

M.M. Molla, M.H.H. Khan, B.C. Dey, S.Pervin, M.G.F. Chowdhury and M.M.Rahman

The purpose of the study was to find out the effect of salt concentration on increasing the shelf life of vegetables and determination of proper concentration of salt how much salt penetrated in the preserved sample in light of sensory evaluator preferences. There were three treatments namely T₁= 4 % salt + 0.10 % acetic acid + 0.01% KMS+ 94.90 % H₂O, T₂= 6 % salt + 0.10 % acetic acid + 0.01% KMS+ 92.90 % H₂O and T₃= 8 % salt + 0.10 % acetic acid + 0.01% KMS+ 90.90 % H₂O. The experiment was laid out in complete randomized design (CRD) with 3 replications. The vegetables treated with different salt concentration were stored for 12 months in food grade plastic container at ambient condition. Results confirm that vegetables treated with 4 %, 6 % and 8 % salt concentration were slightly penetrated into the vegetables (2.12-3.57 %) whereas most of the salt were present into H₂O solution (2.95-5.30 %). Vegetable treated with 4% salt under cooking condition was acceptable by the sensory evaluator.

Utilization of pineapple pomaces to develop bakery products (cake) for its physicochemical, nutritional, textural and functional properties

M.M. Molla, M.H.H. Khan, B.C. Dey, M.M. Rahman, S. Pervin, P. Sen, M.G.F. Chowdhury

The purpose of the study was to utilize the pineapple pomace to develop by-product especially pomace cake using different proportions of pomace flour. The study was laid out in complete randomized design (CRD) with five treatments viz. T₁= 100 % wheat flour (control), T₂= 25 % pineapple pomace flour + 75 % wheat flour, T₃= 50 % pineapple pomace flour + 50 % wheat flour, T₄= 75 % pineapple pomace flour + 25 % wheat flour and T₅= 100 % pineapple pomace flour with 3 replications. The developed cake was stored in pouches at ambient condition to observe nutritional changes, texture, color, shelf life and sensory attributes. Results check that 25-75 % pomace flour (T₂-T₄) treated cake was acceptable more by the panel members as compared to 100 % wheat (T₁) and pomace flour (T₂). T₅ (100 % pomace flour) treated

pomace cake found to be the best results to retain more nutritional compositions than others. These finding could be the best way to apply this technology by the agro-food processing industries for utilization of pineapple pomace as a by-product.

Development of mixed dry fruit products and its packaging technique

M.M. Molla, M.H.H. Khan, B.C. Dey, P. Sen, S. Pervin, M.G.F. Chowdhury and M.M. Rahman

The study explored to develop mixed dry fruit using blanching, sugaring and sulphuring process. The study was laid out in complete randomized design (CRD) with three replications. There was three treatments viz. T₁= Blanching + sugaring, T₂= Blanching + sulphiting and T₃= without blanching + sugaring + sulphiting (control). The developed mixed dry fruit was stored in food grade mini plastic boxes at ambient condition to observe microbial studies, nutritional changes, shelf life studies and sensory attributes. Results reveal that blanching and sugaring treated fruit (T₁) lost their vitamin C and β-carotene content compared to non-blanching, indicates that blanching involves thermal processing that might be contributed to decrease the vitamin C and β-carotene content. The sugar treated fruit found to be maximum total and reducing sugar content than control whereas it was gained maximum score by the sensory evaluator. Blanching and sugaring (T₁) improved the fruit color with maximum hardness that was more acceptable by the evaluator. Further study needs to be continued to be continued by preservation of papaya fruit into brine solution before processing and commercial preservation and marketing of the papaya tutfritti without any quality deterioration.

Preservation of BARI Motorshuti-1 by application of hurdle technology

M.M. Molla, M.H.H. Khan, B.C. Dey, S. Pervin, M.M. Rahman, P. Sen and M.G.F. Chowdhury

The present study was undertaken to find out the effect of hurdle technology to preserve the BARI Motorshuti-1 for long time. The harvested motorshuti were treated with four treatments viz. T₁= salt 1% + sugar 6% + citric acid (CA) 0.05% + potassium metabisulphite (KMS) 0.1% (control), T₂= salt 1% + sugar 6% + CA 0.05% + KMS 0.1% + ascorbic acid (AA) 1%, T₃= salt 1% + sugar 6%

% + CA 0.05% + KMS 0.1% + AA 1% + potassium sorbet (KS) 0.1% and T₄= salt 1% + sugar 6% + CA 0.05% + KMS 0.1% + AA 1% + KS 0.1% + UV treatment and 3 replications. The experiment was laid out in complete randomized design (CRD). Results revealed that pH, total sugar and reducing sugar were insignificantly differed entire the storage periods. The TSS were significantly different on the day of storage and after 6 months of storage. Although the insignificant differences were observed but the pH, total sugar and reducing sugar of the stored motorshuti were increased over the storage periods. The highest vitamin C content was recorded in fresh motorshuti where a non-significant difference was observed on the day of storage. After 6 months of storage, the vitamin C were drastically decreased. The addition of ascorbic acid and hurdle technology contributed to achieve the highest vitamin C content than control. The microbial activities also stopped by the hurdle technology that contributed to increase the shelf life of BARI Motorshuti compared to others.

Development of lemon juice by application of thermal and non-thermal treatments

M.M. Molla, M.H.H. Khan, B.C. Dey, S. Pervin, M.G.F. Chowdhury, P. Sen, M.M. Rahman and P.C. Sarker

The study explored to develop lemon juice by application of thermal and non-thermal UV treatment. The study was laid out in complete randomized design (CRD) with three treatments namely control sample (T₁), thermal treatment (T₂) and non-thermal UV treatment (T₃) with 3 replications. The developed juice was stored in PET bottles at ambient condition to observe microbial studies, nutritional and bioactive compound analysis, shelf life and sensory attributes. Results reveal that all the treated juice contained bacteria, yeast and molds. No fungus, bacteria, yeast and mold activities were detected by pasteurized (T₂) and UV (T₃) treated juice as compared to control during the study periods. Control sample (T₁) contained highest nutritional composition than others. UV treated juice (T₃) contained higher vitamin C than pasteurized treatment (T₂). But increasing UV time decreased the vitamin C content. Further observation may be need to increase the marketable life for its commercial application to the stake holders.

Nutritional, physicochemical and bioactive compounds analysis of developed fortified extruded lentil chips

M.M.Molla, M.H.H.Khan, M.G.F. Chowdhury, M.M.Rahman, S.Pervin, B.C.Dey, P.Sen, M.S.Zaman, R.Podder, P.Bhowmik and A.Khatun

This study sought to explore the fortification of the developed lentil chips using hot extrusion technology. There were five treatments viz. developed chips without fortification (control sample: T₁), fortification with FAO recommended vitamin and mineral mixtures (T₂), fortification with carrot powder (T₃), fortification with pumpkin powder (T₄) and fortification with carrot + pumpkin powder (T₅). The experiment was laid out in complete randomized design (CRD) with 3 replications. All the analysis was performed using HPLC and UV-Vis Spectrophotometer. Results revealed that the vitamin C and β -carotene of the control sample of the treated lentils were 3.52 mg/100 g and 18.27 mg/100 g but after fortification the vitamin C was increased from 5.81 to 7.49 mg/100 g and 5.04 to 25.54 mg/100 g by all the treatments, indicates that the level of vitamin C and β -carotene was increased after fortification into chips as compared to the control. Likely the processing loss of vitamin C and β -carotene was also recorded as 17-36 % and 2-40 % during fortification but actually the fortification process increased the vitamin C and β -carotene than the control sample.

Design and fabrication of smart packages in terms of storage and marketing of the developed lentil chips

M.M. Molla, M.H.H. Khan, M.G.F. Chowdhury, M.M. Rahman, S. Pervin, B.C. Dey, P. Sen, M.S. Zaman, R. Podder, P. Bhowmik and A. Khatun

The study was conducted to develop 3D attractive smart package to increase the marketable life of the product and cost-benefit ration of the developed lentil chips under smart packages. The packages has been developed with the technical assistance of the Quality Management System Certified Company “Phoenix” (ISO 9001:2015), Naya Paltan, Dhaka. The smart packages was printed under the the BDS code 1556 approved by the Bangladesh Standard and esting Institute (BSTI) with nutrition facts and detailed information of the manufacturer. The packet was designed in favor of ‘South Asian Agro Products (brand RESCO)’ as

‘Chips Dal’ as net weight 15 g of chips during packing. In commercial aspect, the chips were packed with nitrogen flash and were stored at ambient conditions to record their marketable life and cost-benefit ratio of the chips. The mmarketable life of the chips was monitored at 15 days of intervals until the chip’s loss of their crispiness due to the leaching of nitrogen and mechanical error over the storage periods. No crispiness and odd flavor were recorded up to 5 months. The better crispiness and good appearances without deteriorating any quality is considered as maximum marketable life limit.

Effect of blanching on the quality and shelf life of BARI Panikochu

S. Pervin, M.H.H Khan, M.G.F. Chowdhury and M.M. Molla

Panikochu (*Colocasia esculenta*) is an important tropical root crop, widely grown and consumed in Bangladesh for its rich nutritional content and culinary applications. Despite its popularity, fresh panikochu are highly perishable, creating challenges in terms of storage and distribution. Panikochu is a starchy vegetable with a mildly sweet flavor and a potato-like texture. Its high fiber content and essential nutrients offer various health benefits, such as improved blood sugar regulation and enhanced gut and cardiovascular health. Blanching, a vital pre-freezing step, is employed to deactivate endogenous enzymes in vegetables, which helps preserve their quality during storage. The present study aims to assess the physicochemical properties of frozen panikochu and to examine the shelf life of blanched panikochu during extended storage.

Fresh Panikachu of two varieties BARI Panikachu 4 and 5 were obtained from local farmers and prepared through sorting, grading, washing, and cutting. The cut panikochu were soaked in a potassium metabisulfite (KMS) solution (1g/L) for 10 minutes. Blanching was performed using both water and steam for durations of 0, 1, 2, and 3 minutes, followed by immediate cooling. The treated panikochu were packed in high-density polyethylene bags and stored in a deep freezer.

The effects of blanching and storage on the quality and shelf life of two panikochu (*Colocasia esculenta*) varieties, BARI Panikochu-4 and BARI Panikochu-5 were observed. Blanching times of 0, 1, 2, and 3 minutes were used to determine their

impact on antioxidant, energy, and phenolic content during six months of storage. Results showed that extended blanching (3 minutes) significantly improved antioxidant, energy, and phenolic retention in both varieties. BARI Panikochu-5 blanched for 3 minutes demonstrated the highest antioxidant and energy values, while BARI Panikochu-4 blanched for 3 minutes had the highest phenolic content. Blanching time and variety play crucial roles in maximizing nutrient retention and extending shelf life. Longer blanching times are recommended for enhanced quality and shelf life.

Kinetics of drying and rehydration on green peas using cabinet dryer

S. Pervin, M.M. Rahman, M.G.F. Chowdhury, and P. Sen

Green peas (*Pisum sativum*), a leguminous vegetable, have long been a staple in human diets due to their rich nutritional profile. They are a valuable source of protein, vitamins, and minerals, while being low in fat, high in fiber, and free from cholesterol. However, fresh green peas, containing approximately 78% moisture, are highly perishable. To extend their shelf life, various preservation techniques, including drying, canning, freezing, and cold storage, are commonly employed (Doymaz and Kocayigit, 2011). Among these methods, drying is increasingly popular as it enhances shelf life, improves handling and transportation, and preserves palatability (Jadhav et al., 2010). The study of rehydration kinetics for dried food products has been explored in previous research (Madamba and Liboon, 2011). In this context, the present study aims to evaluate traditional methods for processing green peas, investigate their drying kinetics, and identify optimal drying parameters for efficiency. Additionally, the study assesses the rehydration characteristics of the dried green peas. Fresh green peas were sourced directly from local farmers and underwent sorting, washing, and cleaning. Following this, water blanching was performed and immediately followed by cooling. The peas were then dried using a cabinet dryer. Once dried, the peas were packed in high-density polyethylene (HDPE) bags and stored at ambient temperature for duration of 12 months.

Drying and rehydration kinetics of green peas using a cabinet dryer at three different temperatures (48°C, 58°C, and 68°C). Fresh green peas were either blanched or unblanched before drying, and

the experiment followed a completely randomized design (CRD). The moisture ratio (MR) and rehydration properties were analyzed. Results indicated that higher temperatures led to quicker drying rates, with blanched peas demonstrating superior rehydration ratios. The highest rehydration ratio (2.36) was observed in blanched peas dried at 48°C (T₂), while the highest coefficient of reconstitution (10.90) occurred in blanched peas dried at 58°C (T₄). This study emphasizes the importance of blanching and appropriate drying temperatures for producing high-quality, dehydrated green peas with better shelf life and rehydration characteristics.

Standardization of osmotic dehydration process for toddy palm

S. Pervin, M.H.H Khan, M.M. Rahman and B.C. Dey

The toddy palm (*Borassus flabellifer*) is a highly valued fruit, renowned for its medicinal and nutritional properties. Referred to as the "Wishing Tree" due to its ability to produce a wide range of economically significant products, the palm holds considerable potential for value addition. Despite this, processed toddy palm products remain scarce in the market, representing an untapped opportunity for diversification. Osmotic dehydration, a promising preservation method particularly suited for small-scale processing, can extend the shelf life of seasonal toddy palm products while maintaining their quality. This study aims to optimize the osmotic dehydration process for toddy palm, with a focus on preserving its physicochemical qualities. By doing so, it seeks to minimize post-harvest losses, increase availability, and meet consumer demand throughout the year. Toddy palm were collected from the farmer's field. Fruits were sort, wash and clean. After preparation of osmose palm by osmotic dehydration method and kept into glass jar. All packaged products were properly labeled and stored at ambient temperature (25-35°C).

Osmotic dehydration is a process for toddy palm to enhance its physicochemical qualities and extend shelf life. Six treatments with varying sugar concentrations (0%–25%) were applied. The texture, energy content, and overall acceptability were evaluated over a six-month storage period. Results showed that the higher sugar concentrations improved texture firmness and energy content, with the 25% sugar treatment (T₆) exhibiting the best

performance. However, overall acceptability decreased over time, particularly in samples with lower sugar concentrations. Osmotic dehydration proved effective in extending the shelf life of toddy palm while maintaining its physicochemical properties, making it a promising method for small-scale processing and value-added product development.

Standardization of processing method for green coconut water jelly

S. Pervin, M.H.H Khan, M. M. Molla and M.G.F. Chowdhury

Coconut (*Cocos nucifera* L.) is a vital commercial crop in tropical regions, often referred to as the "tree of heaven" or "tree of abundance." It is a versatile crop with uses ranging from foods to cosmetics (Prasad *et al.*, 2011). Coconut water jelly is a product made by boiling coconut water with sugar, pectin, and acid to create a gelatinous consistency containing fruit pieces suspended in the jelly. The aims of this study were to standardize processing method for green coconut water jelly and to evaluate its nutritional quality and storage life. Green coconuts were collected from local farmers. The coconut water jelly was prepared and stored in plastic jars under refrigeration.

Green coconut water jelly was prepared using six different formulations, with varying amounts of sugar and citric acid. The physicochemical properties, including total soluble solids (TSS), phenolic content, and overall acceptability, were evaluated over 15 days of refrigerated storage. Treatments with higher sugar content (T₃, T₆) maintained higher TSS, while citric acid-containing treatments (T₄, T₅, T₆) retained more phenolic content. The overall acceptability of the jelly decreased during storage, with sugar and citric acid contributing to better sensory properties. Formulations with higher sugar and citric acid showed better preservation of TSS, phenolic content, and sensory acceptability over a 15-day storage period, indicating their importance in maintaining product quality.

Standardization of processing method for osmo dehydrated sugar coated plum

S. Pervin, M.H.H. Khan, M. M. Molla and M.G.F. Chowdhury

Plum (*Prunus domestica*) is a valuable spice crop known for its antioxidant properties and mild

laxatives. However, postharvest losses due to perishability are significant in Bangladesh. The release of the high-yielding variety "BARI Alu bukhara-1" offers potential to enhance plum production. Osmotic dehydration, a promising preservation method, improves quality and reduces drying time. The study aims to enhance plum utilization, minimize losses, and extend shelf life through value-added product development. The present study standardizes and produces high-quality osmo-dehydrated plum products. Plum (*Prunus domestica*) with optimal ripeness was collected from local farmer. Fruits were sorted, washed and cleaned. Then, the fruits were dipped in 40, 50 and 60 °Brix sugar syrup for 24 h and then it boils for 15 min. The drying temperature was maintained at 60 °C. After drying, the plum was preserved in a glass container.

Plum fruits were treated with 40, 50, and 60 °Brix sugar syrup and sugar coating. Texture analysis revealed a decrease in firmness during storage due to cell structure breakdown and enzymatic activity. Color intensity decreased significantly over 12 months of storage, while total phenolic content declined with increasing brix and prolonged storage. Osmo-dehydrated plum exhibited excellent energy content. The highest overall rating was given to plum treated with 50 °Brix sugar syrup and sugar coating. Osmotic dehydration with sugar coating at 50 °Brix showed the most promising results for preserving plum, enhancing overall quality and energy content. This technique presents an effective method for extending plum shelf life and creating value-added products for commercial use.

Optimization of processing method for dragon fruit jam

S. Pervin, M.H.H Khan, M.M. Molla and A.S.M.H. Rashid

Dragon fruit (*Hylocereus undatus*) is a tropical fruit that has become increasingly popular in recent years. Processed dragon fruit products are rarely available in our markets and very little work has been done on processing of dragon fruit in our country. A number of locally processed fruit products are now available in the market. If quality products from dragon fruit are developed, it might be welcomed by the consumers who have affinity for dragon fruit round the year. Therefore, the present study was carried out to optimize the

processing method for dragon fruit jam and to evaluate its quality parameters for long time storage at ambient temperature.

There were five treatments employed, varying the sugar content in the dragon fruit pulp. The pH, acidity, TSS (%), color, microbial growth, and sensory evaluation were conducted over a storage period of six months. The results revealed that higher sugar content led to lower initial pH and higher acidity in the jam. TSS values were highest in treatment T₅ (100% sugar in pulp). Color intensity decreased during storage, and microbial growth remained within acceptable limits. Sensory evaluation indicated that jam with 80% sugar in pulp (T₄) received the highest overall rating. The research outcomes contribute to enhancing the production of high-quality dragon fruit jam with improved shelf life and consumer acceptance.

Effects of different drying methods on physicochemical and functional properties of BARI sweet potato 17

B.C. Dey, M.M. Rahman, M.H.H.Khan, M.G.F. Chowdhury, M.M. Molla, S. Pervin, A.A. Sabuz, P. Sen, and M.S. Alam

The main objective of our study was to investigate the effects of various drying techniques on the physicochemical and functional characteristics of BARI sweet potato 17. Three distinct techniques of drying sweet potatoes (i.e., sun drying, cabinet, and freeze drying) were used, and the changes in food components were evaluated. In this experiment, the initial moisture content of fresh sweet potatoes was found to be 67.22 %, whereas the moisture content of dried sweet potatoes varied from 4.89 % to 7.78 %. The findings corroborate with the observation of Rodrigues et al., 2016. The ash content in fresh sweet potatoes was 1.01% which was increased for all drying methods and the values varied from 1.89 %, 2.20 %, and 2.42 % for sun, cabinet, and freeze-dried sweet potatoes, respectively. These experimental observations for ash content were close to the values reported by Mohammad et al., 2016. The present study reveals that the anthocyanin content of freeze-dried sweet potatoes (0.63 mg/100 g) was significantly higher than other samples. Our findings were lower than the previous study by Rodríguez-Mena et al., 2023. Results also showed that freeze-dried sweet potatoes' β -carotene and ascorbic acid content were significantly higher than sun and cabinet-drying samples. The total

phenolic content for sun drying, cabinet, and freeze drying was 18.49, 19.49, and 25.07 mg/100 g, respectively. The carotenoid content of freeze-dried sweet potatoes (2.79 mg/100 g) was significantly higher than sun and cabinet-dried samples (2.18, 2.42 mg/100 g respectively). Compared to other samples, sun-dried sweet potatoes had higher losses of nutritional content. The color attributes for sun drying, cabinet, and freeze drying were significant, and the findings were consistent with a former study by Bakar et al., 2022. The results revealed that the water absorption capacities of the sun, cabinet, and freeze-dried sweet potatoes were 130.89, 154.89, and 181.33 % respectively and oil absorption capacities were 121.22, 130.56, and 162.67 % respectively. Our findings stated that the water and oil absorption capacities (WAC/OAC) of freeze-dried samples were significantly ($p \leq 0.05$) higher than those of sun and cabinet drying. These functional properties are useful in structure interaction in food, especially in flavor retention, palatability improvement, and shelf-life extension, particularly in bakery products (Adebowal and Lawal, 2004). Therefore, it could be concluded that freeze-drying techniques produced superior quality sweet potato flour with retaining color and nutrients than cabinet and sun drying.

Development of bakery products from sweet potato flour and evaluation of its quality

B.C. Dey, M.M. Molla, M.H.H.Khan, M.M. Rahman, M.G.F. Chowdhury, S. Pervin, A.A. Sabuz, P. Sen, and M.S. Alam

The blending of wheat flour with sweet potato flour (SPF) in five different formulations (10 %, 20 %, 30 %, 40 %, and 50 %) was used to produce composite biscuits, and control was considered without the addition of sweet potato flour. The physical properties of composite biscuits in weight, diameter, and thickness were changed with the enhancement of sweet potato flour. The weight of the control and developed biscuits ranged from 11.28 to 11.85 g with a maximum value in T₆. The diameter of biscuits sample T₃ was found slightly higher and other samples were lower than that of control biscuits. The thickness of the biscuits ranged from 0.79 to 0.85 cm. The changes in diameter and thickness were reflected in the spread ratio. The spread ratio of control biscuit was 7.91, whereas T₂, T₃, T₄, T₅, and T₆ showed lower spread ratios. The energy content of the T₆ biscuits

was significantly higher than other treatments. The quality of the biscuits is primarily defined by color and textural profile. Results revealed that the color of the biscuit samples was significant. The trend of diminishing the color of biscuits with higher incorporation of that composite flour. Control biscuits had a hardness value of 21.97 N which increased to 23.71 N in T₂, 24.68 N in T₃, 26.17 N in T₄, 27.09 N in T₅, and 34.25 N in T₆. Among all formulations, T₆ biscuit samples showed more hardness (34.25 N) indicating that hardness increased with the increase of substitution and provided significantly higher amounts of energy than other formulations. The control and developed biscuits were subjected to evaluate sensory attributes according to a nine-point hedonic scale. Results also depicted that overall acceptability for composite biscuits achieved the maximum score for T₆ followed by T₅, T₄, T₃, and T₂ as compared to the control (T₁). Sensory attributes of composite biscuits also revealed that there was a significant difference ($P \leq 0.05$) in color, flavor, taste, texture, and overall acceptability.

Effect of coatings on the physicochemical properties of air fried jackfruit chips

P. Sen, M.H.H. Khan, M.G.F. Chowdhury, M.M. Molla

Jackfruit (*Artocarpus heterophyllus*), the world's largest edible fruit, is celebrated for its rich nutritional value and is the national fruit of Bangladesh. But despite being the second largest producer country in the world, 45% of national fruits are wasted every year in Bangladesh. The high rate of wastage presents a critical challenge, emphasizing the urgent need for innovative solutions to harness the fruit's full potential. Nowadays the popularity for fried products increased considerably. The mounting health concerns regarding the consumption of fried product due to its fat content has raised an alarm to search for an alternative way in frying mechanisms. Air fried Jackfruit bulb chips can be that wanted option as low fat snacks with traditional flavor and texture characteristics. The objectives of the experiments were; to evaluate the effectiveness of different coatings on air fried jackfruit chips, to assess and compare the quality characteristics of the prepared air fried jackfruit chips.

This study investigated the effectiveness of different coatings like maltodextrins, sugar, rice

flour, corn flour; to assess and compare the various physicochemical properties of air fried jackfruit chips. Five treatments were evaluated for their moisture content (MC), ash content, pH, total soluble solids (TSS), acidity, vitamin C, energy content, carotenoid, phenol levels, and color attributes (L^* , a^* , b^*) were analyzed. Results revealed significant variations across treatments. Control samples exhibited the lowest moisture content (3.46%) and ash content (1.21%), with moderate pH (6.13) and TSS (3.70). It also had the lowest acidity (0.51%) and vitamin C (3.66 mg). Maltodextrin treatment showed the highest moisture content (7.12%) and energy (6260.63 kJ), with the highest TSS (4.13) and acidity (1.02%). Sugar flour coating presented high carotenoid levels (21.63 mg) and vitamin C (4.33 mg), alongside a high TSS (4.63) and pH (6.14). Rice flour coatings had the highest ash content (1.60%) and exhibited the highest color parameter L^* (53.14), indicating a lighter color, while corn flour coated samples displayed the highest vitamin C content (7.33 mg) and lowest color parameter b^* (28.95), indicating a more intense color. The findings highlight the significant differences in physicochemical properties among treatments, suggesting varying nutritional and sensory profiles that may influence the choice of treatment based on desired product characteristics.

Standardizations of mixed foxtail millet-jackfruit sourdough bread

P. Sen, M.H.H. Khan, M.M. Molla, S. Pervin

Foxtail millet (*Setaria italica* L. Beauv.); an underused, drought-resistant and nutritionally enriched crop. It can play an important role in an upcoming possibly much warmer and dryer environment. The weather of Bangladesh is also perfect for the delicious and nutritionally enriched jackfruit cultivation. But the current trend of foxtail millet and jackfruit production is declining due to low return and high post-harvest losses, and it is alarming. In this connection, tuning foxtail millet and jackfruit into flour may be appreciated by a wide range of consumers. However, health-conscious people cannot find option to choose bakery products as nutritious snacks due to high level of sugar and oil content. Sourdough bread confides on a combination of wild yeast and lactic acid bacteria to leaven the dough. It is highly nutritious and control blood sugar by reducing the

GI of bread. The low gluten content of sourdough bread aids digestibility and sourdough fermentation enhanced the nutrient bio accessibility. For this reason, a sugar and oil free, healthy and value-added foxtail millet-jackfruit sourdough bread technology for all through the year, will be an option to satisfy the cultivars and the consumer's needs.

This study investigated the impact of varying proportions of millet and jackfruit flours on the physicochemical and physical properties of sourdough bread. The standardization of mixed foxtail millet-jackfruit sourdough bread involved six treatments: T1 (100% wheat flour), T2 (100% jackfruit flour), T3 (25% millet:75% jackfruit), T4 (50% millet:50% jackfruit), T5 (75% millet:25% jackfruit), and T6 (100% millet flour). Six formulations (T₁–T₆) were analyzed for moisture content, ash, pH, total soluble solids (TSS), acidity, phenol content, carotenoids, energy value, color

parameters (L*, a*, b*), and bread dimensions (specific volume, height, diameter, weight, and volume). Results indicated that moisture and carotenoid content increased with jackfruit flour, while millet flour enhanced phenolic content, acidity, and reduced energy value. The combination of millet and jackfruit flour significantly influenced bread structure, with wheat-based bread (T₁) showing the highest specific volume, while millet-rich breads were flatter with greater diameter. Jackfruit flour lightened the bread color, contributing to higher yellowness, while millet darkened it. T₄ (50% millet: 50% jackfruit) offered a balanced profile in terms of flavor, nutrition, and physical attributes. These findings suggest that millet and jackfruit flour can enhance the nutritional value and sensory qualities of gluten-free sourdough bread, making it a viable alternative for health-conscious consumers.

BIOTECHNOLOGY

20

Standardization of *in vitro* propagation protocol for gerbera

M.M. Khatun and N. Bilkish

Capitulum explants of purple pink, magenta and red cultivars were cultured on MS medium supplemented with four different concentrations and combinations of BAP, NAA and IAA. Maximum (66%) survival of explants was achieved when explants sterilized with Clorox solution (60%) for 20 minutes both magenta and purple pink cultivar. The maximum root number (3.6) was obtained from MS medium supplemented with 1.0 mg/l each of IAA and IBA. For *ex vitro* establishment, well developed plantlets were transferred to greenhouse in five different potting media. Highest percent (100%) of plantlets survived in potting media which comprised of one part of soil and two parts of cocodust mixture.

Standardization of micropropagation protocol of liliium (*Lilium longiflorum*)

M.M. Khatun, S.C. Halder and M. Zannat

To establish a micropropagation protocol for liliium, stem node and bulb scale explants were used for continuous *in vitro* multiplication. The MS medium supplemented with eight different concentrations and combinations of BAP, NAA, IAA and IBA were used for bulblets and plantlets formation. BARI Lilium-1 produced maximum shoots, shoot length and direct bulblet from treatment combination of IAA and IBA. Root number was higher in IBA treated media than NAA. One part soil and two parts cocodust potting media found most suitable for *ex vitro* establishment. In bicolor pink variety, the early shoot initiation was noticed from the media combination of BAP and IBA and the highest fresh weight was obtained from the media combination of BAP and NAA after one month (0.53 g) and three month (1.48 g). The media combination of

IAA and IBA was found better for direct bulblet formation.

Tissue culture propagation of BARI strawberry varieties for field evaluation

M.M. Khatun

Shoot tip and node explants of BARI Strawberry-2 and BARI Strawberry-3 were cultured on MS medium supplemented with different concentrations and combinations of BAP, Kn and GA₃. For shoot elongation, 1.0 mg/l BAP + 0.5mg/l Kn + 1.5mg/l GA₃ was found most suitable for BARI Strawberry-2 and 0.5 mg/l BAP + 0.5 mg/l Kn + 1.5mg/l GA₃ was for BARI Strawberry-3. For *ex vitro* establishment, 100 percent plantlets were survived in potting media with equal proportion of soil and cocodust mixture for 4 days hardening. In 2023-2024, all together 586 plantlets were produced in Lab and 344 plantlets were distributed for field trial and rest of the plantlets were distributed among the interested people.

Large-scale production of BARI released banana varieties through tissue culture

S.C. Halder, M.M. Khatun and M.A.Y. Akhond

Sword suckers of different banana varieties developed by BARI were collected from mother orchard of Biotechnology Division. Shoot tips were separated from those suckers and cultured on different shooting and rooting medium for *in vitro* plantlet production. In BARI Kala-3, 54% explants was survived and average number of shoots per explant was 7, whereas in BARI Kala-4, 58% was survived and average number of shoots per explant was 6.5.

Development of an efficient *in vitro* regeneration protocol for BARI mungbean varieties

M.M. Khatun, M.K. Hasan and M. Zannat

A study was undertaken to develop an efficient regeneration protocol for BARI Mungbean

varieties. Embryonal axis of BARI Mung-6 were used as explants source. There were six treatments which consist of different concentrations of BAP, BAP with NAA and 2,4-D for shoot regeneration. Shoot bud initiation started earlier at 8 days and latter at 12 days after inoculation of explant. The maximum shoot number (3.00) was obtained from 2 and 3 mg/l BAP concentration. The highest responsive explants (100%) were obtained from 2mg/l BAP.

***In vitro* regeneration of country bean (*Lablab purpureus* L. Sweet)**

N. Bilkish, M.k. Hasan, MM. Khatun and M.A.Y. Akhond

Cotyledonary node and embryonal axis explants of BARI Sheem-3 and BARI Sheem-8 were cultured on MS medium supplemented with different concentrations and combinations of growth regulators. Shoot bud initiation started at 5-6 days after inoculation of explant in the medium using double cotyledonary node explant. Among the different treatments, 2 mg/l BAP showed better response for shoot formation in both varieties BARI Sheem-3 (88%) and BARI Sheem-8 (77%). The maximum shoot number (3.6) and highest shoot length (2.0 cm) were obtained from 2 mg/l BAP treatment in double cotyledonary node explant. The highest responsive explants (90%) were obtained from 1 mg/l BAP and 2 mg/l BAP treatment in embryonal axis explant. In root formation, highest rooting (80%) and maximum number of roots (3.0) per explant were found from MS medium treatment.

Rescue of Amritsagar banana from extinction through biotechnological approaches

S.C. Halder and M.A.Y. Akhond

Several clones of Amritsagar banana was collected from different locations of the country and a mother orchard has been established at research field of Biotechnology Division, BARI, Gazipur. Amritsagar banana collected from Gafargaon and Kapashia were found to be better than other varieties and were compared with each other by following the standard Descriptor for Banana (*Musa* spp.). Among the two varieties for morphological data, Amritsagar Gafargaon performed better in average number of fruits per plant (62), number of hands per plant (6), weight of single fruit (110.4 gm) and bunch weight (8.7kg).

Shoot tips of Amritsagar banana (Gafargaon & Kapashia) were cultured on MS medium supplemented with BAP. Amritsagar Gafargaon produced maximum number of shoots than Amritsagar Kapasia.

Development of an efficient *in vitro* regeneration protocol for field pea (*Pisum sativum* L.)

A. Saha, K. Nahar, M.M. Khatun and M.A.Y. akhond

A study was undertaken to develop an efficient regeneration protocol for BARI Motor-2. Sliced embryonic axis was used as explants source. There were four different treatments and one control which consist of modified MS media containing different concentrations of BAP and NAA for multiple shoot induction. Explant treated with 2.5 mg/l BAP + 1 mg/l NAA showed highest regeneration (52%) and maximum number of shoots (11.2). For induction of roots individual shoots were placed in five treatments and one control. The highest percent (55%) of roots and the highest number of roots (10.7) were found from 2 mg/l NAA.

Varietal improvement of Oyster mushroom (*Pleurotus* sp.) through induced variation

S. Yesmin, K. Nahar and M.M. Khatun

Monokaryotic spore was isolated from spore print of *Pleurotus ostreatus* (PO2) using serial dilution in tissue culture laboratory, Biotechnology Division. This monokaryotic spore, monokaryotic mycelium (germinated from spore) will be used for radiation to develop new strain with desirable character.

***In vitro* conservation of mycelia of Oyster mushroom (*Pleurotus* sp.)**

S. Yesmin, M.K. Hasan and M. M. Khatun

Three strains of Oyster mushrooms (OS, POP, WS) were preserved in sterile distilled water and paraffin oil at 4°C refrigerator. Mycelial growth (cm) of these strains were recorded before preservation on PDA culture medium showed results of 3.11, 0.98 and 3.01cm per seven days of culture. The highest mycelial growth was observed (3.6 cm) in case of OS strain after 3 months of preservation in sterile distill water. After that the growth was decreased in 6 and 12 months later of both preservation techniques. But in case of POP strain, the highest mycelial growth was observed (1.25 cm) when stored in paraffin oil after 3 months of

preservation. No mycelial growth was found after 6 and 12 months of storage in all condition. In WS, the highest growth was observed (3.19 cm, 3.05 cm) after 6 months of storage in both of control and sterile distilled water condition but growth was decreased after 12 months of storage.

Transformation of tomato for broad spectrum resistance against leaf curl viruses

M.A.Y. Akhond, K. Nahar, and S. Ahmed

The experiment was conducted with a view to genetically transform tomato plants for broad-spectrum resistance against leaf curl viruses. To achieve the goal the binary vector harbouring CaMV35S promoter-terminator combination has been constructed. Based on the genome sequence of various ToLCV strains, DNA fragments from three diverse ToLCV species along with potato intron were amplified and cloned. Standard protocols were used to assemble the virus and intron sequences into sense/antisense configurations in *Escherichia coli*. The in-house made vector was tentatively named pBPA-BARI 1.4. The plasmid vector was mobilised into electro-competent *Agrobacterium* cells prepared in-house and their presence in the *Agrobacterium* was confirmed by PCR analyses. Plant regeneration was achieved by transforming tomato cotyledons and hypocotyls using the confirmed *Agrobacterium* clones. The observed transformation frequencies for cotyledons and hypocotyls were 8% and 10% respectively.

Development of an *Agrobacterium*-mediated transformation and gene editing protocol for an elite BARI lentil variety

K. Nahar, P. Bhowmik, A.G. Sharpe and M.A.Y. Akhond

For regeneration of lentil embryonic axis from imbibed seeds were sliced and cultured on MS medium supplemented with B5 vitamins and different growth regulators. Total 325 explants of BARI Masur-4 (BM-4) were cultured and 270 calli were produced. Many shoots were produced by BM-4. Clusters of shoots of BM-4 were separated and sub-cultured in fresh medium every 7 days until they were ready to be used for root induction and grafting. For root induction, elongated shoots of about 1.5-2.0 cm were placed in different media compositions supplemented with various concentrations of hormones. Few roots were observed in media RT1, RT5, RT6 and RT10. Regenerated whole plants transferred in pot soil and kept in growth room. No

root was developed in shoots placed in other medium. *In vitro* rooted plants were weak and produced one or two pods per plant. The higher number of shoots produced pods and seeds cultured in RT5 medium without rooting. Few shoots produced pods and seeds cultured in RT1, RT6 and JR7 medium. Grafting is an alternative approach which avoid root induction problem in lentil for production of healthy plants and seeds from regenerated shoots. Grafting has been done successfully in 50 plants and 33 plants were survived. Grafted plants were healthy and produced higher number of pods and seed i.e. 2-6 pods per plant.

Proof of concept studies in gene-edited crop development at BARI

K. Nahar, M. Jannat, S. Ahmed and M.A.Y. Akhond

Genome-editing tools provide advanced biotechnological techniques that enable the precise and efficient targeted modification of an organism's genome. For construction of genome editing vectors, RNA was extracted and cDNA was synthesized. *PDS* gene from tomato, tobacco and brassica were amplified by PCR. PCR products were purified and cloned into puc19 plasmid vector. Insertion of the gene was confirmed by colony PCR and will be confirmed by Sequencing.

Cloning and characterization of genes related to salt stress tolerant from Sorghum and *Arabidopsis* through molecular techniques

K. Nahar, M. Jannat, N. Bilkish and M.A.Y. Akhond

Salinity is the major constraint for crop production. Development of stress tolerant crop is the most suitable solution for this problem. For development of stress tolerant variety *AVPI* gene responsible for salt stress tolerant was PCR amplified from *Arabidopsis thaliana* and cloned into a binary vector pBPA-BARI2.1. The vector was transformed into *E. coli* competent cell. Integration of the gene into plasmid vector was confirmed by colony PCR and will be confirmed by sequencing. This vector will be used in future for salt tolerant transgenic crop development.

Validation trial of tissue cultured plantlets of BARI strawberry varieties under field condition

M.M. Khatun, S.C. Halder and B. Akhter

Tissue cultured plantlets of BARI Strawberry-2 and BARI Strawberry-3 were used in this study. For

morphological traits, BARI Strawberry-2 plantlets performed better in leaves number per plant at different days after planting (DAP). The maximum leaves per plant 21.1 and 36.5 were counted at 55 DAP and 80 DAP. In plant height, BARI Strawberry-3 gave higher plant height at 55 DAP (18.5 cm) and 80 DAP (20.4 cm). In yield contributing characters, the higher fruits/plant (37) and fruit yield/plant (602.4 g) was observed from BARI Strawberry-3 plantlets. Results also revealed that the higher yield could be obtained using tissue cultured plantlets as planting material.

Sustaining of Bt eggplant in Bangladesh by implementing effective stewardship

M.K. Hasan, A. Saha, A.K.M. Quamruzzaman, M.M. Khatun and M.A.Y. Akhond

The overall aim of the stewardship approach is to maximize the benefits, minimize any risk, and make the technology durable. To sustain the first GE crop Bt brinjal in the long run some activities were performed like maintenance and purification of the Bt Brinjal varieties, seed production, Bt trait assessment, field visit etc. Shiny and oval shaped fruits were selected from desired fruits of BARI Bt Begun-3 and seeds were kept separately. Total 357.5 Kg seeds of BARI Bt Begun varieties were harvested in this year. Some locally collected cultivars and lines were tested to see the performance. Bt protien varied from 14.29 to 30.57 ppm in shoots and 21.73 to 28.31 ppm in fruits irrespective of locations and varieties.

Study on relative bacterial wilt tolerance of Bt eggplant varieties and their non-Bt parent lines

A. Saha, K. Nahar, M.K. Hasan, N. J. Bristy and M.A.Y. Akhond

Twenty eight samples of wilt affected brinjal plants were collected from 9 locations of Bangladesh

during 2023-24. From the collected wilted plants, bacteria were isolated and cultured in TZC medium and pure culture of virulent strains was done by morphological identification. Samples with typical symptom were further used in strip test (*Ralstonia solanacearum* specific strip). PCR of the samples which were positive in strip test was done using *R solanacearum* specific primer. Ten samples were identified positive from total collection. The positive bacterial samples were preserved in 40 percent glycerol stock solution in -80°C for further molecular and genomic study.

Confined field trial of transgenic 3R-gene late blight resistant potato events

M.M. Khatun, S. Yesmin, S.C. Halder, N. Bilkish, M.M. Begum, M.M.E-Rahman, M. Salim, R. Sarker, M.A. Madobe, S. P. Wharton, D. Douches and M.A.Y. Akhond (PD)

The confined field trial for 3R-gene late blight resistant GM potato events (DIA-MSU-UB015 and DIA-MSU-UB255) with the check Non-GM Diamant was conducted at four locations in Bangladesh (Gazipur, Rangpur, Chattogram, Munshigonj). Agronomic performance data-emergence, plant height, plant width, number of stems/hill, yield and efficacy data were recorded. The results showed that when fungicide was sprayed, GM events performed better in all parameters studied, but did not significantly differ from the Non-GM Diamant. However, the efficacy report showed that when no fungicide was applied, the GM events gave 100% resistance against late blight disease than the Non-GM Diamant (95-100% mortality). In Gazipur and Rangpur, approximately 4-6 times higher yield was observed in the GM events compared to their Non-GM counterparts without fungicide application.

SOIL MANAGEMENT

21



Physical Aspects of Soil Management

Assessment of leaching loss of nutrients and determination of crop coefficient (kc) values of cauliflower through lysimeter

A.T.M.A.I. Mondol, M.J. Alam, R.S. Smriti and H.M. Naser

A study was conducted to determine the Kc value of cauliflower and estimation of nutrients leaching loss using a Lysimeter for the Gazipur region (AEZ-28). Four irrigation water regimes viz; T₁: Irrigation up to saturation point (SP) at 5-day intervals (13 irrigations), T₂: Irrigation up to SP at 10-day intervals (7 irrigations), T₃: Irrigation up to SP at 15-day intervals (5 irrigations), and T₄: Irrigation up to SP at 20-day intervals (3 irrigations) were tested based on SP following the RCB design with three replications. The irrigation scheduling significantly influenced the yield of cauliflower. The highest pooled yield of two seasons (73.4 t ha⁻¹) was obtained in T₂ treatment. Similarly, the same treatment has been provided the estimated Kc values of 0.95, 0.95, 1.22, and 0.95 for initial, crop development, mid-season, and late-season stages, respectively. Plant nutrients (NO₃-N, P, K and S) were lost through leaching. However, the Kc value can be utilized to quantify the amount of the irrigation water for cauliflower considering the leaching loss of nutrients.

Effect of different tillage practices and rice straw mulch on soil temperature, soil moisture content and yield of onion

A.T.M.A.I. Mondol, M.J. Alam, R.S. Smriti and H.M. Naser

The study was conducted at the central research field of BARI, Gazipur during rabi season of 2023-24 to determine the changes in soil moisture content & soil temperature and to observe the yield performance of onion (AEZ-28). There were 3

types of tillage such as strip tillage (T₁), bed panting (T₂), and conventional tillage (T₃). In addition, mulch such as rice straw mulch (M₁), and no mulch (M₀) in a split plot design with 6 treatments and 3 replications. The different tillage and mulch significantly affected the crop performance. Strip tillage provided higher yield (39.8%) over conventional tillage whereas rice straw mulch gave higher yield (16.9%) over no mulch. Both strip tillage and rice straw mulch improved soil physico-chemical properties & soil moisture and soil temperature than traditional cultivation system.

Effect of conservation tillage and ipns based nutrient management on cabbage-indian spinach-t. Aman cropping system and soil properties

M.J. Alam, A.T.M.A.I. Mondol, R.S. Smriti and H.M. Naser

A field experiment was conducted on the cabbage-Indian spinach-T.aman rice cropping pattern in Grey Terrace soil (AEZ-28) to assess crop performance and track soil properties changes. The study used strip tillage and conventional tillage, along with three nutrient management practices: 100% organic fertilizer (OF), integrated plant nutrition system (IPNS), and 100% chemical fertilizers (CF), in a split plot design with 6 treatments and 3 replications. ST outperformed CT in terms of system productivity (SP) and rice equivalent yield (REY). More REY and SP than CF were revealed by the IPNS package than other two nutrient packages. The field capacity, pH, OM, and microbial population were enhanced, while bulk density was decreased through minimal soil disturbance and organic-based nutrient management. Based on the results, a vegetable-based cropping system can sustain from improved soil characteristics and higher crop productivity

when used ST in conjunction with an IPNS package.

Requirement of nitrogen for mustard-okra-t. Aman cropping system under conservation tillage practices

M.J. Alam, A.T.M.A.I. Mondol, R.S. Smriti and H.M. Naser

A field experiment on the Mustard-Okra-Taman rice cropping system was conducted under AEZ-28 to investigate the effect of suitable tillage and nitrogen rate on crop performance and to evaluate the effect of treatments on soil physico-chemical properties. There were three types of tillage: strip tillage (ST), zero tillage (ZT), and conventional tillage (CT). Furthermore, nitrogen rates such as 100% nitrogen (N₁), 125% nitrogen (N₂), 75% nitrogen (N₃), and 50% nitrogen (N₄) in a split plot design with 12 treatments and 3 replications. ZT performed the best rice equivalent yield (REY) and system productivity (SP) compared to the other two tillages. 25% less nitrogen than the recommended dose exhibited the superior for component crop, REY and SP. Conservation tillage combined with 25% low nitrogen rates improved the physico-chemical properties of the soils. Further trials are necessary to confirm the true image of deployed treatments.

Role of organic amendments on improvement of nitrogen use efficiency in grey terrace soil

R.S. Smriti, A.T.M.A.I. Mondol, M.J. Alam and H.M. Naser

The experiment was carried out during rabi season, 2023-24 under pot culture in the net house of SSD, BARI, Gazipur under AEZ-28 to observe the changes in soil physio-chemical properties and estimate nitrogen use efficiency. There were six treatments i.e. T₁: 80% Recommended Dose of Chemical Fertilizer (RDCF) + 20% RDCF form Cowdung (CD), T₂: 60% RDCF+ 40% RDCF form CD, T₃: 40% RDCF+ 60% RDCF form CD, T₄:20% RDCF+ 80% RDCF form CD, T₅: 100% RDCF form CD, T₆: 100% RDCF and three replication in CRD design. The tested crop was Spinach (BARI Palongshak-2). Organic amendments have significant influence on both soil physical and chemical properties and yield of crop. T₂ treatment gave the highest yield along with maximum nitrogen use efficiency whereas T₅

treatment gave the lowest result in term of yield and nitrogen use efficiency.

Effect of tillage and organic mulch on soil physico-chemical properties and yield of potato

R.S. Smriti, A.T.M.A.I. Mondol, M.J. Alam and H.M. Naser

The study was conducted at the central research field of BARI, Gazipur (AEZ-28) during rabi season of 2023-2024 to evaluate the suitable tillage and mulch for higher yield of potato and to observe the changes in soil moisture, temperature and trend of nutrient availability as governed by mulches. There were 2 types of tillage such as strip tillage (ST) and conventional tillage (CT) and 4 mulches such as water hyacinth mulch (WHM), rice straw mulch (RSM), jute gunny bag mulch (JBM) and no mulch (NM) in a split plot design with 8 treatments and 3 replications. In this experiment, tillage had significant effects on soil moisture, OM, total N and P and insignificant effect on yield. Mulch had significant effects on physico- chemical parameters and yield compare to no mulch. Strip tillage provided the highest yield (6.57%) over conventional tillage whereas water hyacinth mulch gave highest yield (26.14%) over no mulch. Combination effect of tillage and mulch had no significant influence on crop performance.

Effects of cowdung on composting maize residue for the preparation of high-quality compost

Ms Islam, F. A. Anik, A.T.M.A.I. Mondol, S. Brahma, M.J. Alam, R.S. Smriti and H.M. Naser

A study at SSD, BARI investigated the effects of co-composting maize stalks with cow dung on compost quality. The research evaluated four ratios: (i) 10% cow dung and 90% maize stalks, (ii) 20% cow dung and 80% maize stalks, (iii) 40% cow dung and 60% maize stalks, and (iv) 60% cow dung and 40% maize stalks. The composting occurred over 89 days in an open aerobic chamber, with turning every seven days. Although not replicated, bulk samples from each ratio were analyzed in triplicate. Results showed that the 10% cow dung and 90% maize stalks ratio (T₁) led to a 23-day longer thermophilic phase, the lowest moisture content (33%), and a more porous texture with a particle size of 4-0.25 mm. In addition, T₁ demonstrated higher microbial biomass carbon (52%), microbial biomass nitrogen (44%), dehydrogenase activity (144%), and nutrient levels,

with faster compost maturation (37 days earlier) than T₂. However, all final compost was registered non-toxic (GI > 80%) via seed germination test. Therefore, a 10% cowdung to 90% maize stalks ratio is recommended for producing high-quality compost, beneficial for sustainable soil health and crop production.

Effects of tillage and maize stalks-based compost on soil organic carbon and aggregate stability under pea-okra-t. Aman cropping systems

Ms Islam, F.A. Anik, M.J. Alam, A.T.M.A.I., Mondol, S. Brahma, A. Barman and H.M. Naser

A study was conducted at the Soil Science Division, BARI, compared two tillage methods (conventional (T₁) and strip tillage (T₂)) and four nutrient management strategies: F₁ - Recommended chemical fertilizers (RDCF), F₂ - 80% RDCF from compost + 20% RDCF, F₃ - 60% RDCF from compost + 40% RDCF, and F₄ - 40% RDCF from compost + 60% RDCF. Results showed strip tillage significantly increased the small aggregate fraction in water-stable aggregates and large macro aggregates in mechanically stable soils compared to conventional tillage. Combining 40% compost with 60% RDCF under strip tillage improved SOC in the small fraction of aggregates (0.25-2.0 mm), MBN, MBC (15%), and total glomalin (97%) over sole chemical fertilizers. This increase was reflected in enhanced water-stable aggregate stability by 23% and promoted seed yields of field pea and okra over sole chemical fertilizers. Thus, the study suggests that T₂F₃ or T₂F₄ may enhance carbon sequestration, aggregate stability, soil fertility, and crop production in grey terrace soils.

Chemical Aspects of Soil Management

Nutrient management for sustaining soil fertility and yield of wheat-mungbean-t. Aman cropping pattern at Ishwardi

M A Rahman, M S Alom, M M Masud and H M Naser

A field experiment was conducted in High Ganges River Floodplain Soils to evaluate the impact of different levels of nutrients on Wheat-Mungbean-T.aman cropping pattern in 2023-24. The study had six treatments, including one recommended dose and four treatments were without NPKS of the recommended dose and rest the treatments was

native fertility, each replicated three times. The recommended dose for wheat was NPKSZn @ 120,35,75,20 and 5 kg ha⁻¹, respectively, and for T.Aman was 160,36,70,40 and 3 kg ha⁻¹, respectively. The highest yield and yield contributing characters was contributed from the treatment of the recommended dose of fertilizers and the lowest was in native fertility treatment. The rice equivalent yield and total system yield were also found the highest in the treatment which received the recommended dose of fertilizers and the lowest in control treatment.

Nutrient management for sustaining soil fertility and yield of mustard-mungbean-t. Aman cropping pattern at ishwardi

M A Rahman, M S Alom, M M Masud and H M Naser

A field trial at the Regional Agricultural Research Station, Ishwardi, Pabna (2023-2024), in High Ganges River Floodplain soils (AEZ-11), aimed to determine sustainable fertilizer doses for the Mustard-Mungbean-T.aman cropping pattern while monitoring soil health and productivity. Six treatments were tested, with T₁ being the recommended dose, containing NPKSZnB @ 160, 54, 105, 40, 3, and 1 kg/ha for mustard, and NPKSZn at 160, 36, 70, 40, and 3 kg/ha for T. Aman. The other treatments lacked NPKS, and the sixth was a control. T₁ consistently yielded the highest values across all parameters, while the control had the lowest. The rice equivalent yield and total system yield were also highest in T₁ and lowest in the control.

Ment for sustaining soil fertility and yield of wheat-mungbean-t.aman cropping pattern at Jessore

N. U. Mahmud, N. Salahin, M M Masud and H. M. Naser

A long-term experiment (2000-2023) in High Ganges Floodplain Soils (AEZ-11) at RARS, Jashore evaluated fertilizer use, soil health, and nutrient balance for the Wheat-Mungbean-T.Aman cropping pattern using six treatments in a randomized block design. The study evaluated the impact of different fertilizer recommendations on wheat-mungbean-T.Aman cropping pattern. The highest rice yield (13.39 t ha⁻¹yr⁻¹) was achieved with 125% Recommended Dose (RD), which was statistically similar to 100% RD. The 125% RD

treatment also demonstrated superior economic performance, with the highest gross margin and benefit-cost ratio. However, the study revealed a negative balance of nitrogen and potassium in the soil, indicating the need for additional nutrient application. Proper nutrient and crop residue management are crucial for maintaining soil fertility and sustainable crop yields.

Nutrient management for sustaining soil fertility and yield of mustard-mungbean-t. Aman cropping pattern at Jessore

N. U. Mahmud, N. Salahin, M M Masud and H. M. Naser

A long-term field trial (2000-2023) in Jashore's High Ganges Floodplain Soils (AEZ-11) evaluated sustainable fertilizer doses for a Mustard-Mungbean-T.aman cropping pattern. Different levels of N, P, and K were applied, with the best results from 120-54-70-40-3-1 kg ha⁻¹ NPKSZnB (T₅), yielding 1.54 t ha⁻¹ of mustard and the highest system rice yield (14.92 t ha⁻¹yr⁻¹). T₅ also provided the highest gross margin (1,37,151 Tk ha⁻¹yr⁻¹) and BCR (1.85). Over 18 cropping cycles, nutrient removal exceeded additions for N and K, while P, S, and Zn levels improved due to mungbean biomass incorporation. Control treatment showed the lowest yield (8.61 t ha⁻¹yr⁻¹).

Long-term integrated nutrient management for sustaining soil fertility and yield of maize-mungbean-t. Aman Cropping pattern

M. M. Masud, M. M. Sultana, S. Islam and H. M. Naser

A long-term field experiment (2008-2023) in Gazipur's Grey Terrace Soil (AEZ-28) examined the Maize-Mungbean-T.Aman cropping pattern to determine a sustainable fertilizer regime and assess soil health. The study tested six treatments, with T₅ (100% Soil Test Based chemical fertilizer + 3 t ha⁻¹ poultry manure) yielding the highest maize and T.Aman rice outputs over 15 cycles. Mungbean contributed 10 t ha⁻¹ green biomass. T₁ (native fertility) produced the lowest yields and negative nutrient balances. Poultry manure incorporation improved soil pH and organic matter. T₅ also recorded the highest gross margin (173,144 Tk ha⁻¹) and marginal benefit-cost ratio (2.28), making

it the most effective choice for improving both crop yield and soil fertility.

Performance evaluation of biochar enriched nitrogen fertilizers in maize

M. M. Masud, M. M. Sultana, S. Islam and H. M. Naser

A field experiment conducted during the 2023-24 rabi season at BARI Central Research Station, Gazipur, assessed the impact of various biochar-coated urea formulations on BWMRI hybrid maize 2. Utilizing a randomized complete block design, six treatments, including different biochar-coated urea types and a control, were evaluated. The results revealed that biochar-coated urea significantly enhanced maize growth and yield, achieving the highest grain yield of 12.48 t ha⁻¹, compared to 6.05 t ha⁻¹ in the control. This treatment also improved nutrient uptake, notably nitrogen, phosphorus, and potassium. Nitrogen recovery efficiency (NRE) was highest (0.27 kg kg⁻¹) with the biological biochar-coated urea, while the lowest efficiency was observed with prilled urea. Cost-benefit analysis favored the biochar-coated urea treatment, highlighting its potential as a sustainable option for maize production.

Nutrient use efficiency through NK nano fertilizers and the yield of cabbage

M. M. Masud, M. M. Sultana, S. Islam and H. M. Naser

Field experiments conducted during 2023-2024 at BARI's Central Research Field, Gazipur, evaluated the effects of Nano N and Nano K fertilizers on cabbage growth and yield. Using a randomized complete block design with six treatments replicated thrice, the study found that applying 75% recommended dose (RD) of potassium (K) with two foliar sprays of Nano N and Nano K produced the highest agronomic parameters and a marketable yield of 69.15 t/ha. This was comparable to the yield from 100% recommended chemical fertilizer doses. The control plot had the lowest yield. Additionally, the 75% RD K treatment with nano fertilizers had the highest marginal benefit-cost ratio (3.48) versus 3.39 for the 100% RD chemical fertilizer. Further research is needed to fully assess

nano fertilizers' impact on crop production in Bangladesh.

Performance evaluation of composite fertilizers using rice crop at different soil type

M. M. Masud, M. M. Sultana, S. Islam and H. M. Naser

This study assessed the impact of composite fertilizers with biochar on rice growth and yield across different soil types. Conducted as a pot experiment with soils from Kolapara Potuakhali (acidic), Patuakhali Sadar (alkaline), Pachbibi Joypurhat (saline), and Gazipur (standard), the study utilized a complete randomized design with two factors: soil types and fertilizer amendments, replicated four times. Results showed significant variations in plant height, tiller number, panicle count, grain weight, straw yield, and root weight. Saline soil combined with 80% composite fertilizer and 20% biochar (S3F1) achieved the highest grain weight and nutrient uptake. Conversely, lower yields were observed in treatments like S2F4 and S4F4, underscoring the need for tailored fertilizer applications for different soil conditions. The study highlights the effectiveness of composite fertilizers and biochar in improving rice productivity in diverse soil environments.

Combination of soil sampling and drone mapping effects on fertilizer recommendation for crop production

I. Ahmed, M. M. Masud, M. M. Rahman, N. Mohammad, K. K. Saha and H. M. Naser

This study explores the use of deep learning techniques to map the spatial variability of soil nutrient content in agricultural fields using UAV multispectral imagery. A total of 13 soil nutrient parameters were considered across 30 samples. Approximately 50% of the soil nutrients were found to deviate from a normal distribution, with significant variability observed between plots for several key nutrients. An autoencoder was used to extract latent features from the multispectral image data, which were then clustered using the K-Means algorithm. The integration of autoencoder-based feature extraction with traditional clustering methods significantly improved the classification accuracy, allowing for the identification of 20 distinct classes within the study area. The spatial distribution of these classes was further analyzed, revealing clusters of plots with specific nutrient enrichments.

Effect of varied nitrogen levels and cultivars on yield of cauliflower

M Yasmin, F S Shikha, M M Kadir, M M Masud and H M Naser

The experiment was conducted at Regional Agricultural Research Station (RARS), Jamalpur during the period of 2023-24 to assess the response of different nitrogen dose and cultivar on curd yield of cauliflower and to find out suitable combination for commercial production. Twelve treatments were tested including four nitrogen doses (0, 80, 100, 120 % RDN) and three cauliflower cultivars (White, Yellow and Purple cauliflower). The results showed that, the highest yield (19.83 t ha⁻¹) was obtained from treatment combination of (N₁₀₀ x Yellow) which was significantly higher than control (N₀ x White) combination (11.04 t ha⁻¹). Moreover, application of 100% N registered the highest apparent gain in soil available N irrespective of cultivar response.

Integrated effect of rice husk ash and chemical fertilizers on yield of sweet potato

M Yasmin, F S Shikha, M M Kadir, M M Masud and H M Naser

The experiment was conducted at Regional Agricultural Research Station (RARS), Jamalpur during the period of 2023-24. The objectives were to assess the effectiveness of combining chemical fertilizers and rice husk ash for sweet potato production and to enhance potassium uptake. Six treatments were tested, including rice husk ash (RHA) and chemical fertilizer at varying rates. The results revealed that, treatment package receiving 85% K and 100% other RDCF with rice husk ash @ 1.5 t ha⁻¹ yielded highest tuber yield (33.60 t ha⁻¹) and produced maximum BCR (3.61). The highest potassium uptake (312.48 kg ha⁻¹) was also found in the same treatment. So, treatment package consists of chemical fertilizers with rice husk ash @ 1.5 t ha⁻¹ is more effective than other packages in respect of yield, nutrient uptake and economic return.

Fertilizer recommendation for BARI sarisha-18

M Yasmin, F S Shikha, M M Kadir, M M Masud and H M Naser

A field trial was conducted in 2022-23 and 2023-24 at RARS, Jamalpur to determine suitable fertilizer dose for growth and yield of BARI Sarisha-18.

Fourteen treatments were tested including four levels of four nutrients (nitrogen, phosphorus, potassium and sulfur). Results revealed that, the highest seed yield (2455 kg ha⁻¹ and 2287 kg ha⁻¹, respectively) were found in treatment T₇ employing N₁₆₀ P₂₀ K₁₀₀ S₃₀ kg ha⁻¹, where the moderate dosage of N, P, K, and S were utilized. The yield decreased with higher doses of these nutrients. Conversely, control treatment recorded the lowest seed yield (1231 kg ha⁻¹ and 1219 kg ha⁻¹, respectively). From an economic perspective, T₇ treatment was appropriate and useful. Response curve showed the optimum dose for mustard cultivation was N₁₅₃ P₃₀ K₁₀₁ S₂₈ kg ha⁻¹. As a result, this dosage can be advised for BARI Sarisha-18 in the Jamalpur area.

Integrated nutrient management for potato productivity and soil health

M Yasmin, F S Shikha, M M Kadir, M M Masud and H M Naser

The experiment was conducted at Regional Agricultural Research Station (RARS), Jamalpur during the period of 2022-23 and 2023-24 to investigate the effects of integrated nutrient management for better yield of potato and to improve soil health. Six treatments were tested, including different compost (compost, kitchen waste compost, vermicompost and trichocompost) and STB dose at varying rates. Results revealed that, the highest tuber yield (35.94 t ha⁻¹ and 33.50 t ha⁻¹, respectively in two seasons) were found in treatment getting 80 % STB with vermicompost @ 2.5 t ha⁻¹ compare to 100% STB. The maximum benefit cost ratio and maximum carbon accumulation were also found in vermicompost treated treatment. Therefore, 80 % STB and vermicompost @ 2.5 t ha⁻¹ may be recommended for higher tuber yield of potato and maintaining soil fertility.

Effect of organic and inorganic fertilizer on soil properties and yield and quality of safflower

Marufa Sultana, M M Masud, M S Islam and H M Naser

This study examined the effects of combining organic and inorganic fertilizers on soil properties, safflower seed yield, and quality. Six nutrient management strategies were tested: applying the full recommended dose of chemical fertilizers (T₁), various reduced doses with increasing compost (T₂-

T₅), and a control with no treatment (T₆), all in triplicate using a randomized complete block design. The results showed that using 50% of the recommended dose of chemical fertilizers with 4 tons of compost per hectare (T₅) achieved the highest straw yield (3110 kg/ha), seed yield (483 kg/ha), and fatty acid content (126 g/kg) compared to T₁. T₅ also improved nitrogen, phosphorus, and potassium levels by 18%, 6%, and 37%, respectively, over chemical fertilizers alone. Post-harvest soil analysis revealed that T₃ (using a different compost and fertilizer mix) improved soil properties, including a 0.58 unit increase in pH, 15% more soil organic carbon, 16% more total nitrogen, 20% more phosphorus, 11% more calcium, and 75% more magnesium compared to T₁. Therefore, T₃ effectively enhances safflower yield and quality while maintaining soil fertility.

Effect of organic and inorganic fertilizers on growth, yield, quality and nutrient uptake of linseed

Marufa Sultana, M M Masud, M S Islam and H. M. Naser

A field experiment was conducted during the rabi season of 2023-24 at Bangladesh Agricultural Research Institute, Gazipur, aiming to identify an optimal and cost-effective fertilizer dose for maximizing linseed yield. The experiment consisted of eight treatments with varying fertilizer compositions, replicated three times in a randomized complete design. The results indicated that the combined application of 75% of the recommended dose along with 5 tha⁻¹ vermicompost (VC) yielded significantly superior outcomes compared to other treatments. This treatment exhibited remarkable results, including maximum plant height (82.53 cm), number of branches per plant (12.14), number of capsules per plant (69.83), number of seeds per capsule (9.43), thousand seed weight (5.67g), straw yield (2.35 tha⁻¹), and seed yield (1.47 tha⁻¹) and fat (232.59g/kg). This integrated approach using inorganic fertilizers and VC can enhance linseed production and soil fertility.

Effect of microbial amended organic fertilizers on yield and quality of broccoli

Marufa Sultana, M M Masud, M S Islam and H M Naser

Continuous use of synthetic fertilizers affects soil structure. Nitrates accumulate in broccoli (*Brassica*

oleracea) and can have detrimental health effects in humans. Nitrate levels increase with the use of synthetic fertilizers compared with organic manures. Manures can serve as an alternative to synthetic fertilizers. The study evaluated performance of vermicompost, cowdung or poultry litter, on growth and yield of broccoli. The number of leaves, plant height, broccoli head weight and diameter, contents of vit C and TSS, Chlorophylls and total yield were determined. Plants treated with poultry litter had the high yield (23.44t/ha) and Vit-C (89.05%). The poultry litter produced more sulfur in heads than cow manure and vermicompost was intermediate. Poultry litter produced a higher yield than sheep manure, and cow manure produced a yield that was intermediate.

Effect of n and k on the growth and yield of shahebikachu

M.R. Islam and B. C. Kundu

A field experiment was carried out at the Regional Agricultural Research Station, Rahmatpur, Barishal during January 2022 to May 2024 to develop proper dose of fertilizer for Shahebikachu production in Barishal region. The crop variety was BARI Shahebikachu-1. There were nine treatments viz. 4 levels of N - 0, 50, 75 and 100 kg/ha. and 4 levels of K - 0, 50, 100 and 150kg/ha. which were replicated for three times. Fertilizers management had influence on plant height (m), base girth, rhizome weight plant⁻¹ as well as yield ha⁻¹. The highest Rhizome yield (25.63t ha⁻¹) was obtained from T₈ (N₇₅P₂₀K₁₅₀S₁₀ kg/ha) treatment which was statistically identical to T₃ (N₇₅P₂₀K₁₀₀S₁₀ kg/ha) treatments but significant over T₀ (Native fertility) treatment. The highest % yields (128.21%) over control obtain from T₈: N₇₅P₂₀K₁₅₀S₁₀ kg/ha) treatment in the year of 2022 -2024.

Development of fertilizer recommendations for onion-linseed intercropping

M. R. Khatun, M. M. Masud, M. M. Sultana, I. S. M. Farhad, A. Barman and H. M. Naser

The experiment conducted at Gazipur (AEZ-28) aimed to develop a fertilizer recommendation for onion-linseed intercropping. Six treatments (T₁: 100% RDCF of Onion, T₂: T₁ + 20% RDCF of Linseed, T₃: T₁ + 30% RDCF of Linseed, T₄: T₁ + 40% RDCF of Linseed, T₅: T₁ + 50% RDCF of Linseed, T₆: T₁+ 60% RDCF of Linseed) were tested in a RCB design with three replications.

Onion (var. BARI Pia-4) and linseed (var. Nila) were used in the experiment. The results showed significant effects of different treatments on onion and linseed yield and yield-contributing characters. The highest yields (onion: 15.1 t ha⁻¹ and linseed: 1.09 t ha⁻¹ in 2024) were obtained in T₆ treatment, which received 100% RDCF of onion and 60% RDCF of linseed. The yield increase over the control was 41.0% for onion and 45.9% for linseed. Economic analysis indicated that, T₆ had the highest gross margin (357670/-) and highest BCR (3.37). T₆ showed better performance in case of nutrient content in post-harvest soil and nutrient uptake by the crops. However, as it was the 2nd-year experiment, repetition is necessary.

Effect of different organic manures on carbon accumulation in soil and yield of crops in mustard-mungbean-t. Aman rice cropping pattern

M. R. Khatun, M. M. Masud, M. Sultana, I. S. M. Farhad, A. Barman and H. M. Naser

A field experiment in Gazipur (AEZ-28) from 2021 to 2023 assessed the effect of different organic manures on soil carbon accumulation and crop yield under Mustard-Mungbean-T.Aman rice cropping pattern. Nine treatments, including different type and rate of organic manures combined with integrated plant nutrient system (IPNS) and a control, were tested. Mustard (var. BARI Sarisha-17), mungbean (BARI mung 6), and T. Aman rice (BRRIdhan 75) were the tested crops and varieties. The data indicated that IPNS treatments significantly influenced yield characteristics and grain yield. The highest average grain yields for mustard (2.05 tha⁻¹), mungbean (1.46 tha⁻¹), and T. Aman rice (5.27 tha⁻¹) were observed in the T₄ treatment (7.5 t ha⁻¹ Bioslurry + IPNS). T₄ treatment also resulted in improved nutrient status in soil after harvest. Cost and return analysis revealed, T₄ had the highest gross return and gross margin, while the highest BCR was found in the T₃ treatment (5 t ha⁻¹ Bioslurry + IPNS).

Development of fertilizer recommendation for winter stem amaranth in cumilla region

M M H Bhuyian, Sabikunnahar, M Rahman, and M A Siddiky

The study evaluated the impact of nitrogen (N), phosphorus (P), potassium (K), and sulfur (S) on

yield and yield attributes of winter stem amaranth (*Amaranthus tricolor* L.) at 45, 75, and 120 days after sowing (DAS) to determine the optimal fertilizer dose. Fourteen treatment combinations, including a control, were tested in a randomized complete block design with three replications. Results from 2022-23 and 2023-24 showed that nitrogen significantly increased plant height, number of leaves, stem length, diameter, and yield, with the highest yield at 120 kg N ha⁻¹. Nitrogen management is crucial for optimizing stem amaranth production, while P, K, and S had less impact.

Micronutrient Aspects of Soil Management

Nanoscale zinc oxide particles for improving yield and quality of tomato

H. M. Naser, S. Sultana, M. Akter, M. B. Banu and M. R. Khatun

A field experiment was carried out to study the effectiveness of soil and foliar application of Zn on the yield of tomato. The micronutrients - zinc (Zn) in the form of zinc oxide (ZnO) nanoparticles (NPs) and zinc sulphate heptahydrates (ZnSO₄·7H₂O) were applied as foliar and basal on the yield of tomato. Zinc supplied to the soil boosted yields, however they were lower than Zn nutrients foliar applied either ZnO nanoparticles or ZnSO₄·7H₂O. The increments of yield were 9.47 to 56.0; 12.8 to 36.0 and 9.43 to 23.7%, respectively over control, foliar application of ZnO nanoparticles and soil application of ZnSO₄·7H₂O. The treatment with 15 ppm of ZnO nanoparticles produced the highest levels of TSS (5.10 °Brix), vitamin C (32.3 mg 100g⁻¹) and β carotene (22.3 mg 100g⁻¹). Nanotechnology has provided better results than conventional method.

Influence of boron in increasing yield and seed quality of garden pea

M. Rokeya. Khatun, S. Sultana, M. Akter, M. B. Banu and H. M. Naser

A field experiment was conducted at Gazipur (AEZ-28) during 2023-24 to determine the optimal boron dose for enhancing garden pea yield and quality. Six treatments were tested, including 100% recommended doses of chemical fertilizer (RDCF) with varying boron levels (0.5, 1.0, 1.5, 2.0 & 2.5

kg ha⁻¹). The garden pea variety BARI Motorshoti-3 was used. Results showed that the highest yield (15.40 t ha⁻¹) and highest protein % in pea were achieved with 2.5 kg ha⁻¹ boron (T₆). The highest gross margin (2,14,336 Tk ha⁻¹) and highest BCR (2.3) were also found in T₆. T₆ also resulted in the highest nutrient content and nutrient uptake by pea plant. Post-harvest soil analysis indicated that T₆ improved nutrient content compared to the initial soil condition. These results are from the first year and need to be repeated next year for confirmation.

Application of nano boron particle on the yield and quality of broccoli

M. B. Banu, M. Akter, S. Sultana, M. R. Khatun and H. M. Naser

A field experiment was carried out to study the application of nano boron (NB) particle on the yield and quality of broccoli (cv. Green Crown) at Soil Science Division, BARI, Joydebpur, Gazipur (AEZ-28) during Rabi 2023 - 2024. The objectives of the study were to determine the appropriate concentration of NB to the yield and quality of broccoli and to calculate boron content and uptake of broccoli. The micronutrient boron (B) in the form of boric acid (H₃BO₃) having 17% boron and Khazra Nano Chelated Boron (9% B) fertilizers were applied. The treatment combinations were seven. The highest yield (21.47 t ha⁻¹), Vit. C (79.12 mg/100g) and TSS (8.57) was observed in T₃ (NB @ 10 mg L⁻¹) treatment and it was significantly higher than control plants. Application of nano B is effective for yield and quality of broccoli.

Response of black cumin to foliar application of zinc

M. B. Banu, M. Akter, S. Sultana, M. R. Khatun, M. N. Yousuf and H. M. Naser

A field experiment was carried out to study the response of black cumin to foliar application of Zinc at Soil Science Division, BARI, Joydebpur, Gazipur (AEZ-28) during rabi 2023- 2024. The objectives of the study were to determine the effect of foliar spray of Zn on yield contributing characters of black cumin and to find out the optimum concentration of zinc for maximizing the yield and oil content of black cumin. The experiment was laid out in RCBD replicated thrice. The micronutrient Zn in the form of zinc sulphate monohydrate (ZnSO₄·H₂O) were applied at

flowering stage. The treatment combinations were T₁: control, T₂: 50 mg L⁻¹, T₃: 100 mg L⁻¹, T₄: 150 mg L⁻¹, T₅: 200 mg L⁻¹ as foliar spray and T₆: Soil application @ RDF. The highest seed yield (1110.0 kg ha⁻¹) was observed in T₅ (200 mg L⁻¹Zn) and which was produced equal yield with T₄ (150 mg L⁻¹ Zn) treatment and lowest in control one. Foliar application of Zn is effective on growth and yield of black cumin in the study area of Grey Terrace Soil of Gazipur (AEZ-28).

Bioremediation of heavy metals polluted soil from industrial effluents polluted areas using microbes and biochar

S. Sultana, H. M. Naser, M. Akter, M.B. Banu and M.R. Khatun

This study was conducted to determine the effects of microbes and biochar to remediate soil contaminated with heavy metals. The lead (Pb), cadmium (Cd), and nickel (Ni), uptake was increased by application of microbes. Biochar immobilized metals in soil and decreased the metal content in plants, except chromium (Cr). Uptakes of metal were increased in amaranth with application of microbes by 1.98 to 44.5, 10.7 to 32.2, and 5.64 to 20.6%, respectively for Rhizobium, Azotobacter, phosphorus solubilizing bacteria. While metal uptake decreased for water hyacinth, barnyard grass and fern plant biochar were 25.8 to 44.6, 31.4 to 49.1 and 24.0 to 47.9%, respectively. The highest value of transfer coefficient was found for (Ni– 0.52) in plant grown in Rhizobium treatment and lowest for (Cd– 0.07) in water hyacinth biochar. However, mobilization or immobilization techniques might be used to remediate soil which contaminated with heavy metals.

Role of micronutrients in improving productivity and seed quality of chia seeds.

S. Sultana, H. M. Naser, M. Akter, M.B. Banu and M.R. Khatun

A field experiment was carried out in the micronutrient experimental field, Soil Science Division of the Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, 2023-24 with a view of study the role of micronutrients in improving productivity and seed quality of chia seeds. The experiment was laid out in a split plot design with three replications. There were 16 treatment combinations comprising 4 levels each of

zinc (0, 2, 4 and 6) and boron (0, 1, 1.5 and 2). The integrated use of zinc and boron was found superior to their single applications. The interaction effect between zinc and boron was significant in case of seed weight and yield of chia. The highest grain yield (1.67 t/ha) was found in T₁₂ (Zn₄B₂) treatment which was significantly higher over single application of either zinc or boron and control.

Effect of zinc and biochar on the yield and nutrient content of sweet gourd

M. Akter, S. Sultana, M. B. Banu, R. Khatun and H. M. Naser

An experiment was conducted to assess the effect of zinc and biochar on the yield of sweet gourd, to determine the Zn concentration and uptake of sweet gourd, and to identify a suitable combination of Zn application with biochar. Among the eight treatments, the highest yield (31.8 t ha⁻¹), highest B-Carotene content (39.0 mg 100 g⁻¹) and highest TSS content (7.33°Brix) were obtained in T₆ treatment (2 kg Zn ha⁻¹ and biochar 3 t ha⁻¹). The highest zinc content (38.7 mg kg⁻¹) and highest uptake (0.153 kg ha⁻¹) in sweet gourd fruit were found in T₆ treatment. Applying Zn and biochar together enhances yield more than applying either one alone. Combined application of 2 kg Zn ha⁻¹ and biochar 3 t ha⁻¹ could be a promising strategy for enhancing sweet gourd production in Bangladesh.

Determination of critical limit of zinc for chickpea

M. Akter, S. Sultana, M.B. Banu, R. Khatun and H. M. Naser

A pot experiment was conducted to determine the critical limit of zinc for chickpea grown in twenty soils collected from five AEZs in Bangladesh. The experiment was laid out in a factorial and completely randomized design with two levels of Zn (0 and 5 ppm) using three replications. The available Zn content of soils was estimated by the extraction method using 0.005 M Diethylene Triamine Penta acetic Acid (DTPA). The amount of DTPA extractable Zn in different soils ranged from 0.51 to 3.16 ppm. The soil available Zn was negatively and significantly correlated with soil pH, Ca and Mg. However, the point below which chickpea shows Zn deficiency were 0.78 ppm in soils and 27.2 ppm in plant tissue as determined by Cate and Nelson's graphical procedure.

Microbiological Aspects of Soil Management

Assessment of arbuscular mycorrhizal association in different field crops

M.E. Ali, M.F.A. Anik, M. Rahman, A. Barban and H.M. Naser

Rhizosphere soils including fine roots of some field crops were collected from Central Research Farm, Bangladesh Agricultural Research Institute, Gazipur during 2023-2024 for counting Arbuscular Mycorrhiza (AM) spore population and determining colonization (%) in their roots. The spore numbers of 100-gram rhizosphere soil were recorded ranging from 92.33 (Black cumin) to a maximum of 312.0 (Barley). A considerable variation was observed in average spore numbers recorded in different field crops. Among the field crops, the highest root colonization (40.0%) was found in barley and lower colonization (10.0%) was found in some of the crops like chilli, potato, garlic, brinjal etc.

Study on microbial population status in soils of different AEZS of Bangladesh

M.E. Ali, M.F.A. Anik, M. Rahman, A. Barman and H.M. Naser

Ten rhizosphere soil samples were collected from selected locations of different AEZs of Bangladesh to know the total bacteria, *Rhizobium*, Actinomycetes, Phosphate Solubilizing bacteria (PSB) and Fungal population at different AEZs of Bangladesh. *Rhizobium* was grown in YMA media and *Rhizobium* colonies were counted. Different types of media were prepared for growing of total bacteria, *Rhizobium*, Phosphate Solubilizing bacteria (PSB), Actinomycetes and Fungal colonies. After serial dilution one drop of solution was poured in a petridish having different types of media. The petriplates were incubated three days for counting total bacteria, *Rhizobium*, Actinomycetes, PSB and Fungal colonies. The population of different microbes varied in respect of crop and location.

Effect of azotobacter on growth and yield of chilli

M.E. Ali, M.F.A. Anik, M. Rahman, A. Barman and H.M. Naser

The experiment was carried out during Robi season of 2023 - 2024 in research field of Soil Science

Division, BARI, Joydebpur, Gazipur to find out the effect of Azotobacter inoculum along with different doses of N fertilizer on growth and yield of Chilli. The experiment was designed in RCBD with 6 treatments and 4 replications. Chilli (F1 Hybrid-Sun Drop) was used as a test crop. Liquid azotobacter inoculum was used in this experiment. The population density of used inoculum was more than 10^8 cfu g^{-1} inoculant. There were six treatments viz. T₁: 100% N of Recommended Dose, T₂: 90% N + Azotobacter inoculum, T₃: 80% N + Azotobacter inoculum, T₄: 70% N + Azotobacter inoculum, T₅: Azotobacter inoculum and T₆: Control. Results of the experiment revealed that highest fruit yield of chilli (14.97 t ha⁻¹) found in T₂ treatments which was statistically identical with T₁ (14.32 t ha⁻¹) treatment. This result suggested that use of azotobacter inoculum in combination with reduced dose of N fertilizer was beneficial for onion and we could reduce 20% of nitrogenous fertilizer.

Effect of different biofertilizer on yield of onion

M.E. Ali, M.F.A. Anik, M. Rahman, A. Barman and H.M. Naser

The experiment was carried out during Rabi season of 2023-2024 in the research field of Soil Science Division, BARI, Joydebpur, Gazipur to find out the effect of different biofertilizer inoculation along with different doses of N & P fertilizer on the yield of Onion. The experiment was designed in RCBD with 9 treatments and 4 replications. Onion (BARI piyaj-4) was used as a test crop. Liquid *Azotobacter* and phosphate solubilizing bacterial (PSB) inoculum was used in this experiment. The population density of *Azotobacter* and PSB inoculum were more than 10^8 cells ml⁻¹ liquid inoculant. Arbuscular mycorrhiza (AM) was used in the seed bed while producing seedling. There were nine treatments viz. T₁ : 100% NPKSZn of RD (Recommended Dose), T₂ : 80% N + *Azotobacter* inoculum, T₃ : 80% P + *PSB* inoculum, T₄ : 50% P + *AM* inoculum, T₅ : 80% NP + *Azotobacter* + *PSB*, T₆ : 80% N+ 50% P + *Azot.* + *AM*, T₇ : 50% P + *AM*+*PSB*, T₈ : 80% N+ 50% P + *Azot.* +*AM*+*PSB* and T₉: Control. Results of the experiment revealed that the highest bulb yield of onion (21.25 t ha⁻¹) was found in T₆ (80% N+ 50% P + *Azot.* + *AM*) treatments which was statistically identical with T₃, T₄, T₅ and T₈ treatments. This result suggested that use of *Azotobacter* and AM

inoculum in combination with reduced dose of N and P fertilizer was beneficial for onion production in the Grey Terrace soils of Gazipur (AEZ 28) and it could reduce 20% of nitrogenous and 50% of phosphatic fertilizer.

Effect of arbuscular mycorrhizal fungi and phosphorus on broccoli

M.E. Ali, M.F.A. Anik, M. Rahman, A. Barman and H.M. Naser

A field experiment was conducted at Central Farm, Soil Science Division, Bangladesh Agricultural Research Institute, Gazipur during Rabi season of 2023-2024 with the objectives to study the effect of combined use of arbuscular mycorrhizal fungi and phosphorus on growth and yield of broccoli, and to reduce to the use of P-fertilizer under field condition. The experiment was designed in factorial RCBD with six treatments and four replications. The cauliflower variety was snow white as test crop. Soil based arbuscular mycorrhizal (AM) inoculum and infected root pieces of the host plant were used at the rate of 1 kg soil m⁻² in seedbed for producing broccoli seedlings. The treatment combinations were: T₁P₁U: 0% P × without AM, T₂P₂U: 50% P × without AM, T₃P₃U: 100% P × without AM, T₄P₁AM: 0% P × with AM, T₅P₂AM: 50% P × with AM, T₆P₃AM: 100% P × with AM. Mycorrhizal inoculation significantly increased plant height (cm), curd height (cm) and curd yield (t ha⁻¹). Root length (cm), and curd circumferences (cm) were non-significant. The plant that received AM in nursery bed produced higher curd yield than without AM in all phosphorus levels of broccoli. The highest broccoli curd yield 30.56 t ha⁻¹ was recorded in 50% P with AM (AM was used in nursery bed) in Madhupur Tract soil (AEZ 28). The result indicates that inoculation of AM used in nursery bed can save 50% P in the field. The plant which did not receive AM in nursery bed produced lower yield in all phosphorus levels in the field.

Effect of biofertilizer, vermicompost and chemical Fertilizers on cowpea

M.E. Ali, M. F.A. Anik, M. Rahman, A. Barman and H.M. Naser

A field experiment was conducted at Central Research Farm, Soil Science Division, Bangladesh Agricultural Research Institute, Gazipur during Rabi season of 2023-2024 with the objectives to evaluate the effect of *Rhizobium* biofertilizer,

vermicompost and chemical fertilizers on cowpea. The crop variety was cowpea (BARI Fellon-1) and *Rhizobium* strain was BARI RVu-602. There were nine treatments viz. T₁: Control, T₂: Vermicompost (VC) @ 2.5 t ha⁻¹, T₃: VC @ 5 t ha⁻¹, T₄: VC @ 2.5 t ha⁻¹ + Integrated Plant Nutrient System (IPNS) based NPKSZnB, T₅: VC @ 5 t ha⁻¹ + IPNS based NPKSZnB, T₆: VC @ 2.5 t ha⁻¹ + *Rhizobium* + IPNS based PKSZnB, T₇: VC @ 5 t ha⁻¹ + *Rhizobium* + IPNS based PKSZnB, T₈: 100% NPKSZnB, T₉: *Rhizobium* + 100% PKSZnB which were replicated three times. Peat based rhizobial inoculum was used at the rate of 1.5 kg ha⁻¹ as seed inoculant. *Rhizobium* inoculated cowpea with vermicompost @ 5 t ha⁻¹ and IPNS based PKSZnB increased nodule number and nodule weight. It was observed that the same treatment produced the highest seed yield (1.46 t ha⁻¹, 114.70% higher over control) of cowpea. This indicates that application of vermicompost @ 5.0 t ha⁻¹ plus *Rhizobium* inoculant can reduce a considerable amount of chemical fertilizers during cowpea production.

Effect of microbial inoculants on microbial community, biomass carbon and nutrient uptake by chickpea in red brown terrace soil

M.F.A. Anik, M.E. Ali, M. Rahman, A. Barman and H.M. Naser

A field experiment was conducted at the Central Research Field of Soil Science Division during 2023-2024 to find out the microbial population status of soil, nutrient uptake by chickpea and monitor the soil fertility status. The experiment was designed in randomized complete block (RCB) having 3 replications in each treatment. The seven treatment combinations were used in the experiment such as T₁: 100% RDF; T₂: *Rhizobium* + PSB + AMF; T₃: 75% RDF + *Rhizobium*; T₄: 75% PSB; T₅: 75% RDF + AMF; T₆: 75% RDF + *Rhizobium* + PSB + AMF and T₇: Absolute control, respectively. The vegetative and reproductive growth of chickpea was influenced by the application of 75% RDF + *Rhizobium* + PSB + AMF treated plot which was statistically similar with 100% RDF applied plot during 2023-2024 at Gazipur. The maximum nodule number per plant (45 per plant), plant height (63.13 cm), 100-seed weight (21.66 gm), seed yield (2.10 t/ha) and stover yield (3.20 t/ha) was found in the same treatment. Besides that the huge amount of total nutrients uptake was recorded in 75% RDF + *Rhizobium* +

PSB + AMF treated plot which were N (114.12 kg/ha), P (20.12 kg/ha), K (69.73 kg/ha), S (22.91 kg/ha), Zn (19.93 kg/ha), respectively.

Role of microbes for nutrient availability and uptake by soybean

M.F.A. Anik, M.E. Ali, M. Rahman, A. Barman and H.M. Naser

A field experiment was conducted at the Central Research Field of Soil Science Division at BARI, Gazipur during 2023-2024 to find out the role of microbes on nutrient availability and uptake by soybean. The experiment was designed in randomized complete block (RCB) having 3 replications in each treatment. The six treatment combinations were used in the experiment such as T₁: *Bradyrhizobium* + PSB; T₂: 75% RDF + *Bradyrhizobium*; T₃: 75% RDF + PSB; T₄: 75% RDF + PSB; T₅: 75% RDF + *Bradyrhizobium* + PSB; T₆: Absolute control, respectively. The vegetative and reproductive growth of soybean was influenced by the application of 75% RDF + PSB and 75% RDF + *Bradyrhizobium* + PSB treated plot which was statistically similar with 100% RDF applied plot during 2023-2024 at Gazipur. The maximum nodule number per plant (19.50 per plant), plant height (56.33 cm), 1000-seed weight (93.33 gm), seed yield (2.03 t/ha) and stover yield (3.38 t/ha) was found in the 75% RDF + PSB treated plot as well as 75% RDF + *Bradyrhizobium* + PSB treatment those were statistically similar. Besides that, the huge amount of total nutrients uptake was recorded in 75% RDF + *Bradyrhizobium* + PSB treated plot which were N (189.39 kg/ha), P (14.14 kg/ha), K (99.67 kg/ha) and S (12.15 kg/ha), respectively.

Mono culture production of arbuscular mycorrhizal fungi

M. Rahman, M. E. Ali and H. M. Naser

The study aimed to produce the contamination-free monoculture of mycorrhizal biofertilizer production. The experiment was designed in a completely randomized block design (CRD) in laboratory settings. Experimental materials like soil, sand, and cowdung were sterilized. Seeds and pots were also disinfected by using sodium hypochlorite and alcohol. The results showed that $374 \text{ g} \times 55 = 20570 \text{ g} = 20.57 \text{ kg}$ contamination-free mycorrhizal inoculum was produced after five

months, which contained 16.67 spores/100 g soil. Thus, the produced inoculum will be used as a mother culture and could be multiplied accordingly per the stakeholder's requirement.

Validation of biofertilizer on lentil

S. Ahmed, M.E. Ali, M.M. Rahman, A. Barman and H.M. Naser

A field trial was conducted at the Bashunaroshinghadia, Sadar, Faridpur during the *rabi* 2023-24 to find out the effects of rhizobium bio fertilizers on the performance of lentil. The trial was laid out in RCB design with four dispersed replications. The lentil variety BARI Masur- 8 and peat based rhizobium strain (BARI RLC-104) were used for the experiment. Unit plot size was 6 m × 5 m. Three treatment combinations viz., T₁ (without Rhizobium inoculant+ P₂₂ K₄₂ S₂₀ Zn₅ kg ha⁻¹), T₂ (with Rhizobium inoculant+ P₂₂ K₄₂ S₂₀ Zn₅ kg ha⁻¹) and T₃ (N₅₀P₂₂ K₄₂ S₂₀ Zn₅ kg ha⁻¹) were considered in this regard. The higher seed yield was obtained (1.96 t ha⁻¹) where Rhizobium inoculant along with P₂₂ K₄₂ S₂₀ Zn₅ kg ha⁻¹ was used (T₂). Benefit cost ratio was also higher in T₂ treatment (2.82) as well as gross margin (Tk 124533 ha⁻¹) over those of other two treatments.

Validation of biofertilizer on chickpea

S. Ahmed, M.E. Ali, M.M. Rahman, A. Barman and H.M. Naser

A field trial was conducted at the Farming Systems Research and Development site (FSRD), Faridpur during the *rabi* 2023-24 to find out the effects of rhizobium bio fertilizers on the performance of chickpea. The trial was laid out in RCB design with four dispersed replications. The chickpea variety BARI Chola-11 and peat based rhizobium strain (BARI RCa-203) were used for the experiment. Unit plot size was 6 m × 5 m. Three treatment combinations viz., T₁ (without Rhizobium inoculant+ P₂₄K₁₆S₁₂Zn₂B_{1.2} kg ha⁻¹), T₂ (with Rhizobium inoculant+ P₂₄K₁₆S₁₂ Zn₂B_{1.2} kg ha⁻¹) and T₃ (N₃₆P₂₄K₁₆S₁₂Zn₂B_{1.2} kg ha⁻¹) were considered in this regard. The highest seed yield (1.78 t ha⁻¹) was where Rhizobium inoculant along with P₂₄K₁₆S₁₂ Zn₂B_{1.2} kg ha⁻¹ was used (T₂). Benefit cost ratio was also highest in T₂ treatment (2.51) as well as gross margin (Tk 93651 ha⁻¹) over those of other two treatments.

ENTOMOLOGY

22

Integrated Pest Management

Biorational based management of fruit borer in tomato

A. K. M. R. H. Ferdous, K. Begum, M. K. Uddin, M. A. Sarkar & A. Saha

The experiment was carried out in the research field of Entomology Division, BARI during rabi season of 2023-24 to develop biorational based management package of fruit borer in tomato. The seedlings were transplanted in 11 November 2023. There were seven treatments, viz. T₁ = Collection and destruction of infested fruits; T₂ = Collection and destruction of infested fruits + spraying Bt (Kurstaki) @ 1 g/litre of water; T₃ = Collection and destruction of infested fruits + spraying *Celastrus angulatus* (Bio Chamak 1.0% EW) @ 2.5ml/L of water; T₄ = Collection and destruction of infested fruits + spraying Spinosad (Bt+ Spinosad) @ 2 ml/ litre of water; T₅ = Collection and destruction of infested fruits + spraying of Spinetoram (Delegate 11.7 SC) @ 1 ml/l of water; T₆ = Collection and destruction of infested fruits + Spraying of Spinosad (Success 2.5SC) @ 1.2 ml/L of water; and T₇ = Untreated control. The experiment was laid out in RCBD with 3 replications.

The results indicated that T₆ (Collection and destruction of infested fruits + spraying of spinosad 2.5 SC @ 1.2 ml/L of water) offered significantly the lowest fruit infestation (3.09%). Similarly, T₆ offered highest fruit infestation reduction over control. The highest yield (46.67 t/ ha) was also obtained from this treatment which varied significantly with other treatments.

Field validation of integrated pest management (IPM) package of sunflower

N. K. Dutta, M. A. Munim, M. I. Faruk, K. Begum, M. K. Uddin & A. K. M. R. H. Ferdous

Field validation trials were conducted to validate IPM package of sunflower in Krishnapur,

Banaripara, Barishal during 2024. Sunflower seeds (variety Hysun 33) were sown on 25-30 January 2024. The crop was attacked by jassid and common cutworm (*Spodoptera litura*). The crop was infected with foot & root rot disease.

There were two treatments and these were assigned as follows:

T₁ = IPM Package: Sex pheromone traps for common cutworm @ 40 lures /ha + Single spraying of SNPV (Spodo-NPV) @ 0.2 g/ litre of water for common cutworm+ single spraying of Matrine (Biotrin 0.5%) @ 1 ml/ litre of water for jassid + single spraying of Trichoderma powder (Bioderma) @ 5g/ litre of water for foot and root rot + Hand weeding

T₂ =Farmers' practice (FP): Four (4) sprays of chemical insecticide: Voliam flexi 300 SC (Chlorantraniliprole + Thiamethoxam) @ 0.5 ml/ litre of water + For foot & root rot disease, 2 sprays of carbendazim (Autostin 50 WDG) @ 2 g/ litre of water + Hand weeding.

The study was replicated in 3 farmers' fields for each treatment; as a result, 6 farmers' fields were involved in the study having almost 0.30 acre land per treatment replicate.

Results of the present field validation study indicated that, *Spodoptera litura* population was significantly less in IPM plot compared to Farmers' practice (FP) fields. Jassid population was less in IPM plot compared to farmers' practice which did not vary significantly between the treatments. Percent foot and root rot although was less in farmers' practice, it did not vary significantly with IPM plots. Seed yield of sunflower was higher in IPM fields although it was statistically at par with FP fields. On an average, IPM fields offered BDT 18885 per hectare additional income over farmers' practice in managing sunflower pests.

Field validation of integrated pest management (IPM) package of mung bean

N. K. Dutta, M. A. Munim, M. I. Faruk, K. Begum, M. K. Uddin & A. K. M. R. H. Ferdous

Field validation trials were conducted to validate IPM package of mung bean in Chowaripara, Banaripara, Barishal during 2024. Mung bean seeds (variety BARI Mung 6) were sown 5-10 February 2024. The target pests were thrips and pod borer complex. Two species of pod bores viz. *Spodoptera litura* and *Maruca vitrata* were noticed. Yellow mosaic virus infection was not noticed during the cropping period.

There were two treatments as follows:

T₁ = IPM Package: Sex pheromone traps for common cutworm @ 40 lures /ha + installing blue sticky trap @ 40 traps /ha + 2 sprayings of spinosad (success 2.5 SC @ 1.2 ml/ litre of water). + Hand weeding.

T₂ =Farmers' practice (FP): Four (4) sprays of chemical insecticide: Voliam flexi 300 SC (Chlorantraniliprole + Thiamethoxam) @ 0.5 ml/ litre of water at flower initiation, pod setting, pod development and seed development stages + Hand weeding.

The study was replicated in 3 farmers' fields for each treatment; as a result, 6 farmers' fields were involved in the study having almost 0.35 acre land per treatment replicate.

Results of the field validation study indicated that flower thrips population and per cent pod borer infestation was significantly less in IPM plot compared to Farmers' practice (FP) fields. Seed yield of mung bean did not vary significantly between IPM and Farmers' practice (FP) field. On an average, IPM fields offered BDT 14500 per hectare additional income over farmers' practice in managing mung bean pests.

Biological Control

Evaluation of different microbial bio-pesticides against rugose spiralling whitefly attacking coconut

A. K. M. R. H. Ferdous, N. K. Dutta, K. Begum, M. A. Sarkar & M. K. Uddin

Field experiment was carried out at BARI, Gazipur during 2023-24 to select the best microbial bio-

pesticides against rugose spiralling whitefly infesting coconut. The experiment was laid out in RCB design with 04 treatments and 03 replications. The treatments were assigned as follows: T₁= Spraying Bio-catch (*Verticillium lecani* 1.15 WP) @ 6 g/litre of water; T₂= Spraying Bio-power (*Beauveria bassiana* 1.15 WP) @ 6 g/litre of water; T₃= Spraying Bio-magic (*Metarhizium anisopliae* 1.15 WP) @ 6 g/litre of water; T₄= Control (Water spray only)

Results revealed that, at 7 days after spray (DAS), the lowest mean nymph population /leaflet (5.54) was noticed in Bio-catch 1.15 WP treated plants followed by Bio-power 1.15 WP treated plants (6.50). The control treatment recorded the highest nymphal population/leaflet (13.87) at 7 DAS. Among the bio-pesticides tested, significantly the highest per cent reduction of whitefly nymphal population over pretreatment was recorded in Bio-catch 1.15 WP (61.23%), followed by Bio-power 1.15 WP (53.07%) and Bio-magic 1.15 WP (52.57%).

On the other hand, at 7 days after spray (DAS), the lowest mean adult whitefly population /leaflet (5.16) was noticed in Bio-catch 1.15 WP treated plants which was statistically at par with Bio-power and Bio-magic treated plants. The control treatment recorded the highest whitefly population/leaflet (11.82) at 7 DAS. Among the microbial pesticides tested, significantly the highest per cent reduction of whitefly adult population over pretreatment was recorded in Bio-catch 1.15 WP (57.92%), followed by Bio-power (54.23%) and Bio-magic 1.15 WP (53.74%).

Mass rearing of *trichogramma pretiosum* and *telenomus remus* on eggs of *corcyra cephalonica* under laboratory condition

K. Begum, M. K. Uddin, A. K. M. R. H. Ferdous, F. Yasmin & N. K. Dutta

Studies were conducted to develop mass rearing protocol of the egg parasitoids *Trichogramma pretiosum* and *Telenomus remus* using fictitious host, *Corcyra cephalonica* and its natural host fall armyworm at IPM lab, BARI during 2023-24. The study was designed as completely randomized (CRD) with 5 replicates. The eggs of *Corcyra cephalonica* and FAW were glued two different white paper strip (10 × 1.5 cm) with gum acacia diluted in distilled water. For the parasitization, one strip containing 100 eggs of *Corcyra cephalonica*

and 10 pairs of *Trichogramma pretiosum* were placed together in individual test tube (15cm x 3cm). Similarly 100 eggs of FAW and 10 pairs of *Trichogramma pretiosum* were placed together in individual test tube (15cm x 3cm). Similar procedure was followed for parasitization by *Telenomus remus*. Female wasps of *Trichogramma pretiosum* and *Telenomus remus* up to 24-h-old were allowed to parasitize the eggs of *Corcyra cephalonica* and FAW for 48 h. Results revealed that *Trichogramma pretiosum* parasitized 83.75% eggs of *Corcyra cephalonica* with 81.66% adult emergence with 74.21% female. But *T. remus* did not show preference in the eggs of *Corcyra cephalonica* for parasitization.

Insect Pest Surveillance

Survey and identification of naturally abundant predators and parasitoids of rugose spiralling whitefly attacking coconut

N. K. Dutta, K. Begum, F. Yasmin, M. A. Monim, M. A. A. Mumin & A. K. M. R. H. Ferdous

Field surveys were conducted in Gazipur, Barishal, Patuakhali, Jashore, Satkhira, Bogura, Rangpur and Noakhali districts to identify and assess the abundance of natural enemies of rugose spiralling whitefly attacking coconut crop during September 2023 to March 2024. In each location five infested plants were selected for collecting natural enemies. Each plant was considered as a treatment replicate. From each plant, 20 severely infested leaves were collected with different life stages of parasitoids and predators, kept in polythene bags, brought to IPM lab, BARI, Gazipur, and observed under stereo zoom microscope. Collected bio-control agents were identified taxonomically and a few are yet to be identified. Parasitism (%) and adult emergence (%) of nymphal parasitoids were also recorded.

Through the survey, two parasitoids of the rugose spiralling whitefly viz. *Encarsia guadeloupa* and *Encarsia dispersa* have been identified. It was observed that, parasitization (%) and adult emergence (%) of nymphal parasitoids of rugose spiralling whitefly varied significantly among different locations. Natural parasitism by these parasitoids ranged 9.8 to 26.47 % across different locations with highest parasitism recorded in Barishal and lowest in Rangpur, while parasitoid

adult emergence ranged 7.87 to 20.05 %, with highest emergence recorded in Barishal and lowest in Rangpur. One predatory beetle and one predatory mite were also recorded as the predators of RSW. Predatory beetle was identified as *Nephaspis oculata*, but predatory mite species is yet to be identified. Predatory mite population per leaflet was recorded the highest (2.8) from Rangpur and Jashore, while the lowest from Noakhali (1.8).

Pesticide Residue Analysis

Quantification of pesticide residue load in major vegetables collected from different regions of Bangladesh

M. S. Ahmed, M. D. H. Prodhan, A. Begum, M. Afroze & N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2023-24. The modified QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) method was used to extract, separate and clean-up of the samples. Sampling was performed by random collection from markets of two different locations such as Dhaka (Kawran bazar, Mohammadpurkacha bazar, Motijheel AGB colony kacha bazar) and Bogura (Mohasthangarh bazar, Sadarboro bazar, Kahalu bazar). Samples of vegetables (1 kg) were taken to the laboratory for the extraction, separation and clean-up procedures. Samples were then kept in refrigerator at -20°C until analysis. The final concentrated extracts were subjected to analysis by GC-ECD and GC-FTD to detect above mentioned pesticides. The method validation was done properly according to the standard document.

Among 72 samples of broccoli was collected from Dhaka and Bogura during December 2023 to February 2024 and were analyzed for the quantification of pesticide residues. Among them, 15 samples (about 20.83% of the total number of samples) were contaminated with the residues of lambda-cyhalothrin, dimethoate, acephate, chlorpyrifos and cypermethrin. Out of 15 contaminated samples, 9 samples (12.5% of the total number of samples) of broccoli contained residues (lambda-cyhalothrin, dimethoate, acephate and chlorpyrifos) which were above respective EU-MRLs. In case of cucumber, among 72 analyzed

samples, 11 samples (15.28% of the total no. of sample) contained acephate, dimethoate, lambda-cyhalothrin, chlorpyrifos and cypermethrin residues. Among the 11 contaminated samples, 6 samples (8.33% of the total no. of sample) had acephate (0.064-0.206 mg/kg), dimethoate (0.103 mg/kg), lambda-cyhalothrin (0.086 mg/kg) and chlorpyrifos (0.239 mg/kg) residues which were above EU-MRLs. Furthermore, a total of 72 analyzed samples of chili, 14 samples contained acephate, dimethoate, chlorpyrifos, lambda-cyhalothrin and cypermethrin residues. Among the 14 contaminated samples, 7 samples (9.72% of the total no. of sample) had acephate (0.074 mg/kg), dimethoate (0.023-0.045 mg/kg), lambda-cyhalothrin (0.043mg/kg) and chlorpyrifos (0.025-0.295 mg/kg) residues which were above EU-MRLs. Other 7 samples, three had lambda-cyhalothrin (0.032-0.047 mg/kg) and 4 had cypermethrin (0.284-0.431 mg/kg) residues which were below MRL.

Monitoring of multiple pesticide residues in fruits collected from different regions of Bangladesh

M. D. H. Prodhan, M. Afroze, A. Begum, S. Jahan, M.S. Ahmed & N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2023-24. Pesticide standard stock solutions of cypermethrin, deltamethrin, lambda-cyhalothrin, fenvalerate, acetamiprid, thiram and difenoconazole were prepared separately in acetonitrile (MeCN) at a concentration of 1000 mg/L and stored at -20°C until use. A mixed standard solution of 50 mg/L in MeCN containing all the aforementioned pesticides was prepared by adding the appropriate volume of each individual stock solution in a 50 ml volumetric flask and made to volume by addition of acetone. An intermediate mixed standard solution of 10 mg/L in MeCN was prepared from the mixed standard solution of 50 mg/L. Then working standard solutions of 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, and 5.0 mg/L in MeCN were prepared by transferring the appropriate amount from 10 mg/L intermediate mixed standard solution into seven separate 10-mL volumetric flasks. All the standard solutions were kept in a freezer at -20°C until use. In this study, the modified QuEChERS extraction technique was used for the extraction and clean-up of samples.

The concentrated extracts of the selected matrices were analyzed by GC-2010 (Shimadzu) coupled with Electron Capture Detector (ECD). The capillary column was Rtx-CLPesticides2 (length was 30m, ID was 0.32 mm and film thickness was 0.2 µm). Nitrogen was used as carrier and make up gas for GC-ECD. The method used for this study has been validated following the EC document (SANTE/11312/2021) in our previous studies by evaluating the accuracy, precision, linearity, limit of detection and limit of quantification.

A total of 80 samples were analyzed. Out of 80 samples, 4 (5.0 % of the total number of samples) contained detectable residues and 76 samples (95.0 % of the total number of samples) contained no detectable residues of the sought pesticides. Out of 16 apple samples, 1 had chlorpyrifos residue with a level above the EU-MRL. In case of grape, among the 16 analyzed samples, 1 had thiram and 1 had acetamiprid residue, the level of thiram residue was above EU-MRLs and the level of acetamiprid residue was below the EU-MRL. In case of 10 hog plum samples, 1 had chlorpyrifos residue with a level above the EU-MRL. However, none of the analyzed samples of dates fruit and dragon fruits were contaminated with the sought pesticides.

Determination of pre harvest interval for acetamiprid in selected vegetables under supervised field trial

M. D. H. Prodhan, A. Begum, M. Afroze, S. Jahan, M. S. Ahmed & N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2023-24. Pesticide standard stock solution of acetamiprid was prepared separately in acetonitrile (MeCN) at a concentration of 1000 mg/L and stored at -20°C until use. An intermediate standard solution of 10 mg/L in MeCN was prepared from the standard solution of 1000 mg/L. Then working standard solutions of 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, and 5.0 mg/L in MeCN were prepared by transferring the appropriate amount from 10 mg/L intermediate mixed standard solution into seven separate 10-mL volumetric flasks. All the standard solutions were kept in a freezer at -20°C until use. In this study, the modified QuEChERS extraction technique was used for the extraction and clean-up of samples. The concentrated extracts of the selected matrices were analyzed by GC-2010 (Shimadzu) coupled

with Electron Capture Detector (ECD). The capillary column was Rtx-CLPesticides2 (length was 30m, ID was 0.32 mm and film thickness was 0.2 μ m). Nitrogen was used as carrier and make up gas for GC-ECD.

The residue level of acetamiprid was 1.026 mg/kg at 0 DAS and gradually the level of residues were decreased and at 13 DAS (0.016 mg/kg), it was below the EU-MRLs (0.2 mg/kg), at 15 DAS the level of residue was not detected and the level of residue was above MRL up to 7 DAS. Therefore, the PHI of actamiprid was determined at 09 DAS for eggplant. In case of cabbage, the residue level of acetamiprid was 1.246 mg/kg at 0 DAS and gradually the level of residues were decreased and at 15 DAS (0.050 mg/kg), it was below the EU-MRLs (0.4 mg/kg), at 17 DAS the level of residue was not detected, and the level of residue was above MRL up to 7 DAS. Therefore, the PHI of actamiprid was determined at 09 DAS for cabbage.

Detection and quantification of different pesticide residues in dry fish and their associated health risk assessment

A. Begum, M. D. H. Prodhana, M. S. Ahmed, M. Afroze, S. Jahan, & N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2023-24. Certified Reference Materials (CRM) of 19 organochlorine pesticides, cypermethrin and chlorpyrifos were used in the present study having purity > 99.99 per cent and analytical graded acetonitrile (MeCN), anhydrous MgSO₄ and NaCl manufactured by Scharlau were purchased from M/s Sigma Aldrich, Germany through SF Scientific, Dhaka. The modified QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) method was used to extract, separate and clean-up. Sampling was performed by random collection from different market of Chattogram, Dhaka, and Gazipur. Samples of dry fish (about 250g) were taken to the laboratory for the extraction, separation and clean-up procedures. The final concentrated extracts were subjected to analysis by GC-ECD to detect above mentioned pesticides. The method validation was done properly according to the standard document no. SANTE/11312/2021.

A total of 40 dry fish samples were collected and analyzed, among them 2 samples of Loitta and 2

Pysa were found to be contaminated with chlorpyrifos residue. The levels of contamination were ranged from 0.87-1.401 mg/kg and 0.091-0.142 mg/kg, respectively. Thus, only 10% of the analyzed samples were contaminated with sought pesticides which were not hazardous for human consumption and no contaminations were detected in the 90% of analyzed samples.

Monitoring of multiple pesticide residues in betel leaf collected from different regions of Bangladesh

M. D. H. Prodhana, M. Afroze, A. Begum, S. Jahan, M. S. Ahmed & N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2023-24. Pesticide standard stock solutions of cypermethrin, deltamethrin, lambda-cyhalothrin, fenvalerate, acetamiprid, thiram and difenoconazole were prepared separately in acetonitrile (MeCN) at a concentration of 1000 mg/L and stored at -20°C until use. A mixed standard solution of 50 mg/L in MeCN containing all the aforementioned pesticides was prepared by adding the appropriate volume of each individual stock solution in a 50 ml volumetric flask and made to volume by addition of acetone. An intermediate mixed standard solution of 10 mg/L in MeCN was prepared from the mixed standard solution of 50 mg/L. Then working standard solutions of 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, and 5.0 mg/L in MeCN were prepared by transferring the appropriate amount from 10 mg/L intermediate mixed standard solution into seven separate 10-mL volumetric flasks. All the standard solutions were kept in a freezer at -20°C until use. In this study, the modified QuEChERS extraction technique was used for the extraction and clean-up of samples.

A total of 45 samples were analyzed. Out of 45 samples, 2 (4.4 % of the total number of samples) contained detectable residues and 43 samples (95.6 % of the total number of samples) contained no detectable residues of the sought pesticides. Among the 2 contaminated samples, 1 was contaminated with chlorpyrifos residue (0.105 mg/kg) with a level above the EU-MRLs; 1 was contaminated with difenoconazole residue (0.580 mg/kg) with a level being below the EU-MRLs.

HILL AGRICULTURE

23



Evaluation of promising coffee germplasm in the hilly region of Bangladesh

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

The experiment was carried out at the existing plantation of Hill Agricultural Research Station at Khagrachari during 2021 to present to identify high yield potentiality and better quality coffee beans. 04 (four) genotype of *Coffea Arabica* commonly known as arabica coffee from the existing coffee orchard of HARS, Khagrachari was selected for the study. The maximum plant height of evaluated line was (228.6cm) and minimum was (176.78cm) in CA Kha- 022 & CA Kha- 011 respectively. The maximum length and width of leaf was 12.64 cm & 5.92 cm in CA Kha- 022. In last year the average length and width of individual fruit was 13.49mm & 12.09mm respectively. Harvesting duration of fruit was mid-October to mid-November. The average length and width of individual seed was 12.91 to 12.95 mm & 10.1 to 10.43mm respectively in last three years. Average weight of 100 beans was 120.32gm & total fruit weight (kg) per plant was 3.69 in accession CA Kha- 022.

Evaluation of indigenous ber germplasm at Khagrachari

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

A study was conducted at Hill Agricultural Research Station in Khagrachari hill district with thirtyone local Ber genotypes during 2018 to March 2024. Average individual fruit weight ranged from 5.25g to 13.08 g. The genotype ZM Kha 013 produced the highest individual fruit weight (13.08g) and lowest in ZM Kha 005(5.25g). Fruit weight (12 fruits) of different ber genotypes ranged from 63-157g. The genotype ZM Kha 013 produced the highest fruit weight (157g) and lowest

(63g). Edible portion (%) ranged 65.08g (ZM Kha 008) to 72.29% (ZM Kha 023). % TSS of ber genotypes varied from 10.2% (ZM Kha 021%) to 25.0% (ZM Kha 024).

Evaluation of sweet orange germplasm in the hilly region

M. A. A. Malek, M R Hossain, M. R. Mia, A. Paul, M. R. Ahmad and M. A. Hossain

The experiment was conducted to study the performance of sweet orange germplasm collected from different locations of CHT and planted at HARS, Khagrachari. Two germplasm viz. CS Kha-001, CS Kha-002 and a check variety BARI Malta-1 were evaluated to identify promising sweet orange germplasm in respect of fruit bearing, fruit quality and yield potentiality. Flowering time ranges from February to March. Harvesting time was late November-December in case of CS Kha-001. All the germplasm produced profuse fruits. No. of fruits per plants was the highest (227) in BARI Malta-1 while the lowest (142) was in CS Kha-002. Individual fruit weight was also varying from 131.67-168.33g. The biggest (168.33g) fruit were recorded in CS Kha 002 and the smallest (131.67) was observed in BARI Malta-1. Weight of fruits per plant was (29.82 kg) in BARI Malta-1 while in case of CS Kha-001 it produces yield of 30.04 kg/plant and the lowest (23.87 kg) was in CS Kha-002. TSS 8.5 and 8.6 were found in CS Kha-001 and BARI Malta-1 in respectively. Fruit aroma was strong in all the germplasm.

Studies on different methods and time of vegetative propagation of Robusta Coffee (*Coffea canephora*)

M. R. Hossain, M. A. A. Malek and M. A. Hossain

The purpose of this study was to assess the success of vegetative propagation of coffee Robusta (*Coffea canephora*) by grafting and cutting. The

experiment was conducted at nursery site of Hill Agricultural Research Station, Khagrachhari during 2023-24. Scions and cuttings were collected from the existing coffee germplasm orchard at HARS. In case of grafting maximum success rate (84.40%) was found in M₁T₂ treatment combination and minimum success rate (62.22%) was found in M₁T₄ treatment combination. In case of cutting maximum success rate (53.33%) was found in M₂T₂ treatment combination and minimum success rate (33.33%) was found in M₂T₄ treatment combination. In a nutshell the present findings shows that appropriate time for grafting and cutting of Robusta coffee was mid june (T₂) and success rate of graftings were higher than cuttings.

Rowth and yield of selected vegetables in soilless substates

M. A. A. Malek, M Asaduzzaman, Akm Quamruzzaman and M. A. Hossain

A study was conducted in the Hydroponics and Controlled Environment Agriculture (CEA) research facility of Hill Agricultural Research Station, of Bangladesh Agricultural Research Institution (BARI), Khagrachari, Bangladesh. Capsicum and tomato were planted in coco coir in late session. IoT based fertigation system was used during crop production. Research activities such as nutrient solution preparation, analysis for physical properties determination and plant growth bioassay using eleven fruit vegetables were done during February to May 2024. Physical properties of the test nutrient solution were like water having no flammability and toxicity. In Capsicum and tomato, the growth performance of the vegetables showed significantly similar performance in term of growth & yield. Two Capsicum and two tomato varieties were used in soilless culture.

Survey and monitoring of insect pests of cashew nut and coffee in hill tracts region of bangladesh

M. R. Mia, M. M. Hasan, F. Arshad, A.A. Malek and M. A. Hossain

A field survey was conducted at HARS, Khagrachari, HTARS, Ramgarh, HARS, Raikhali and OFRD, Bandarban research fields during August 2023 to April 2024 to document the major and minor insect pests of cashew and coffee. Five types of insect pest namely Mealybug, coffee stem borer, scale insect, grasshopper and Ant were observed in coffee plants and Tea mosquito bug

(TMB), Chafer beetle, Tussock moth, spiraling whitefly and mealybug were found to attack cashewnut during the study period. Among them, Tea mosquito bug (TMB) caused major damage in cashew and mealybug, ant and grasshopper caused major damage in coffee plants.

Efficacy of some bio-pesticides against mango hopper, weevil and fruit fly in khagrachari hill tracts

M. R. Mia, M. R. Hossain, F. Arshad, A.A. Malek and M. A. Hossain

The experiment was conducted in HARS, Khagrachari during the year 2023-2024 with the objective to find out the efficacy of some bio-pesticides against major insect pest of mango and to develop bio-rational based management option against major insect pest of mango. Results indicated that the number of mango hopper ranged from 1.61 to 16.41 and there was significant difference among the treatments. All treatment applications significantly reduced the number of mango hopper, number of infested leaves and percentage of leaves over untreated control. The lowest number mango hopper (1.61) and lowest percentage of leaves infestation (11.67%) were recorded from Sanitation + application of soil recharge @ 5g/l of water + spraying of spinosad (Success 2.5EC) @ 1.3 ml/l of water followed by Spraying of Imidacloprid 70 WG @ 0.2 g/l of water with Mancozeb M 45 @ 2.0 g/litre (15.83%).

HTARS, Ramgarh

Yield response of promising velvet bean lines in response to different sowing date

S. M. Faisal and R. H. Nitol

An investigation was carried out at HTARS, Ramgarh during the winter of last year to see the effect of sowing date on growth and yield of velvet bean in hilly area. There were three velvet bean germplasm collected from aboriginals under different locations of Ramgarh area. Those germplasms were named as G₁=MPRAM001, G₂=MPRAM002, G₃=MPRAM003 and G₄=BARI Sheem-8 was used as check. BARI sheem-8 took the shortest time (49 days) for harvest whereas MPRAM002 took the longest (80 days) time to harvest from flowering. The highest (117.67) no. of pods were obtained from BARI sheem-8 and the

lowest (2.66) no. of pods were obtained from MPRM002 when it was planted on October 30. The highest pod yield was observed in MPRAM001 (13.26 t/ha) when it was planted on October 15 followed by BARI sheem-8 (9.08 t/ha) when it was planted on same date.

Evaluation of promising cashew nut germplasm in hill tract

R. H. Nitol and S. M. Faisal

Twenty promising cashew nut germplasm out of 121 were selected in different locations at HTARS, Ramgarh, Khagrachari Hill District to see their yield potentiality and quality nut in order to develop a variety. There were lot of variabilities among the parameters studied. Average plant spread in E-W was 2.63 m. Average plant spread in N-S was 2.68 m. Average tree volume was 7.81 m³. Flower from most of the cashew nut germplasm were cream in color. Some of them viz. AORAM003, AORAM047 and AORAM049 were pink. Flower was first was initiated at mid-February and fruit formation was started from mid-march. It was very unfortunate that most of the flowers were desiccated due to severe heat wave and scarcity of water

Evaluation and adaptability of promising coffee germplasm at Ramgarh

S. M. Faisal and R. H. Nitol

Ninety-nine germplasms of Coffee (*Coffea robusta*) exist at HTARS, Rammagr, khagrachari which

were planted in July 2019. Screening of available coffee germplasm is an important task in order to develop a variety suitable for our local environment. The overall appearance of the plants is elongated conical in addition sympodial vegetative development was observed. The average plant height was 2.25 m whereas the maximum plant height was 2.95 m recorded in CCRAM023. Maximum plant leaf length was 20 cm found line in CCRAM003 and CCRAM075. Berries were produced in CCRAM001 and CCRAM098.

Effect of irrigation on cashew nut germplasm during dry season at Ramgarh hilly area

R.H. Nitol and S.M. Faisal

Twenty promising cashew nut germplasm of two 3.5 years' age were selected randomly in different locations at HTARS, Ramgarh, Khagrachari Hill District. There morphological data were measured at May, 2024 influenced by four types of irrigation frequency were applied in each five cashew plant randomly. Treatments were, T₁ =Control (no irrigation), T₂ = Irrigation application at one-week interval, T₃ = Irrigation application at two weeks' interval, T₄ = Irrigation application at one-month interval. Through observation it was revealed that plat no. 7 and plant no 18 has some potentiality to combat drought.

AGRICULTURAL STATISTICS AND ICT

24



Detection of differences in vegetation and chlorophyll content in agricultural field using unmanned aerial vehicles

M. Mukhlesur Rahman, Nur Mohammad, Istiak Ahmed, M. A. Monayem Miah and M. J. Alam

This reports a field-scale study to detect differences in the amount of vegetation and chlorophyll content of crops using an unmanned aerial vehicle (UAV) fitted with a multispectral camera. The purpose of this study, on the experimental farm of TCRC, Bangladesh Agricultural Research Institute. The normalized difference vegetation index (NDVI) and normalized difference red edge (NDRE) were obtained from five spectral band images (red, green, blue, infrared (NIR), and red edge (REDGE)) that were processed by software into a full image map. We used the image map obtained to analyze the farmland and identify variations in the greenness of plants. We compared two layers with different indices and indicated differences in vegetation activity for NDVI and NDRE. NDVI showed a visible green color wherever vegetation was present. With NDRE and NDCI we observed crops with low chlorophyll content, indicating nitrogen limitation in the leaves. These observations demonstrate the efficacy of using NDRE and NDCI as a sensitive index for monitoring chlorophyll content. Therefore, we propose that different indices may be most useful for different crops, plant density, and growth stages.

Yield prediction of mustard crop by using satellite based remote sensing technique in Bangladesh

M. Mukhlesur Rahman, Nur Mohammad, Istiak Ahmed, M. A. Monayem Miah and Suman Biswas

Mustard (*Brassica spp.*) is one of the important oilseed crops which has potential demand as the

preferred edible oil for the majority of people of Bangladesh. The accurate estimation of both harvested area and yield of mustard are equally important in ensuring the accurate determination of their product. The traditional measurement of these statistics is time-consuming, tedious, and costly. Whereas remote sensing techniques are being used to easily measure these statistics at high spatial and temporal resolutions. Therefore, an attempt was made to predict the mustard yield through satellite-based remote sensing techniques before its harvesting. To get this done, the high spatial-temporal resolution Satellite imageries of Sentinel 2A (~10m) and Landsat 8 (~30m) were acquired for the three study locations after setting the experiment in a farmer's field for three consecutive mustard growing seasons of 2022-23, 2023-24 and 2024-25. The mean Normalized Difference Vegetation Index (NDVI) was extracted from the maximum NDVI-produced temporal satellite imageries within the growing season from 20 farmer's mustard fields of each study location. The first year's results revealed that in most cases the yield was maximum for the field where the NDVI values were not maximum and vice-versa. However, the relationships of the extracted mean NDVI and yields will be established using the classical linear regression model where the model will be developed using the first two years' data and will be validated using the data of the last study period.

Forecasting of onion production in Bangladesh using different models and machine learning algorithm

Nur Mohammad, Mohammad Mukhlesur Rahman and Istiak Ahmed

Agriculture is important to the economy and employment of Bangladesh. Onion is the largest area coverage and maximum production capture

among all the spices crops in Bangladesh. Onion is the most demandable crop for multiple uses especially in daily consumption in our country. Time series prediction is a vital problem in many applications in nature science, agriculture, engineering and economics. Here, we have considered time series data for the years from 1970-71 to 2022-23 published by the Bangladesh Bureau of Statistics (BBS). Two classical linear model like Autoregressive Integrated Moving Average (ARIMA) and Mixed-model approach (Dynamic regression model) and also two machine learning algorithm (MLA) like Artificial Neural Network (ANN) and Autoregressive neural Network (ARNN) have been considered in this study. Both of these models have been considered to forecast the productions of onion in Bangladesh. The forecasting performances of those models have been compared by using RMSE, MAE, and MAPE. Result revealed that the mixed-model with ARIMA (0, 1, 1) was outperformed than ARIMA, ANN and ARNN for considering area of onion. The length of the 95% confidence interval of the forecast values of the mixed-model is smaller than that of the rest of model indicating its better predictive performance. These forecast values are helpful for collecting information and planning resources for the government, researchers, and businesspeople, as well as farmers making key decisions about onion crop production prior to the harvesting in Bangladesh.

Forecasting onion yield by using satellite-based remote sensing technique in Bangladesh

Nur Mohammad, Mohammad Mukhlesur Rahman, Istiak Ahmed, Mohammad Rasel, and Md. Abdul Monayem Miah

Onion is one of the major vegetables as well as spices crops with the largest production worldwide. Onion plays as a major contribution as spices crop which is used in daily meal in Bangladesh. Therefore, it is imperative to do research aimed at forecasting the yield of onion crops. Pre-harvest prediction of a crop yield may prevent a disastrous situation and help decision-makers to apply more reliable and accurate strategies regarding food security. Remote sensing can be used for yield estimation prior to harvest at the field level to provide helpful information for agricultural decision making. Remote sensing images are capable of identifying crop health, as well as

predicting its yield. Vegetation indices (VIs), such as the normalized difference vegetation index (NDVI) calculated from remotely sensed data have been widely used to predict crop yield. Yield prediction models based on a time series of satellite images and high-density yield data, and to indicate the best phenological stage of onion crop to obtain satellite images for this purpose. The study used 16-day (~ 30 m) Landsat 8/9 OLI (Operational Land Imager) high resolution reflectance data for the two years viz. 2022-2023; 2023-2024 at three different locations viz. Sujanagar, Pabna; Baliakandi, Rajbari and Durgapur, Rajshahi in Bangladesh. The single date of cloud free image acquisition based on maximum NDVI for Landsat 8/9 OLI satellite image was used for 2022-2023 and 2023-2024 onion growing period to develop the yield prediction model. Regression model was performed between NDVI values and 35 farmers filed level onion yields for all locations. The yield vs. NDVI relationship for Landsat 8/9 image exposed that the multiple determination of coefficient (R^2) along with MAPE, RMSE and NRMSE for second year onion growing season i.e. 2023-2024 is fitted well than first year onion growing season i.e. 2022-2023 for all selected locations.

In silico genome-wide identification, characterization, and phylogenetic analysis of the dicer-like (DCL), argonaute (Ago), and rna-dependent RNA polymerase (RDR) gene families in brassica species (*Brassica napus* L.)

Zobaer Akond, Sheikh Hasna Habib, Nurul Haque Mollah

Three major gene families including Dicer-like (DCL), Argonaute (AGO), and RNA-dependent RNA polymerase (RDR) are popularly known as the RNAi-related genes in eukaryotes to control gene expression at the transcriptional or post-transcriptional level and often maintains plant growth and development. These gene families also control gene expression in response to various pathogens and abiotic factors. This mechanism is typically continued by the 19-24 nt size non-coding small RNA molecules (miRNA and siRNA). However, detailed and updated bioinformatics investigation including phylogeny analysis, domain and gene structures, GO enrichment, subcellular localization, etc. have not been done yet. Our study finally identified 8 *DCL*, 27 *AGO*, and 17 *RDR*

RNAi-related genes in *Brassica napus*. The phylogenetic analysis of the total 52 BnRNAi proteins with the 20 AtRNAi proteins showed that protein members of BnDCL, BnAGO, and BnRDR groups clustered into four, nine, and five subgroups. Domain and exon-intron composition demonstrated that the protein/gene members also hold the same characteristics similar to their AtRNAi counterparts. Some replacements (R-arginine, S-serine-S, and P-proline) in 14 BnAGO proteins were also found in DDH/H motifs of the PIWI domain which signifies their role in yield production and different pathogenic responses. GO enrichment analysis for BP and MF also concluded that a pool of biological and molecular functions is significantly linked ($p\text{-value} < 0.05$) to the RNAi pathway mechanism in *B.napus* like other crops. Subcellular localization analysis illustrated that the maximum BnRNAi proteins were the nucleus, chloroplast, and cytoplasmic-oriented. Thus, our results would deliver an excellent source for deep molecular investigation of these genes/proteins to explore their functional potentiality for future rapeseed-mustard crop improvements against different environmental factors in Bangladesh.

Combination of soil sampling and drone mapping effects on fertilizer recommendation for crop production

Istiaq Ahmed, Mohammad Masuduzzaman Masud, Mohammad Mukhlesur Rahman, Nur Mohammad, Koushik Kumar Saha and Habib Mohammad Naser

This study explores the use of advanced machine learning techniques to map and analyze the spatial variability of soil nutrient content in agricultural fields using multispectral imagery captured by a DJI Phantom 4 Multispectral UAV. A total of 13 soil nutrient parameters were measured across 30 samples, with the distribution and variability assessed using boxplots and Completely Randomized Design (CRD) tests. Approximately 50% of the soil nutrients were found to deviate from a normal distribution, with significant variability observed between plots for several key nutrients. To capture and map this variability, an unsupervised deep learning approach was employed. An autoencoder was used to extract latent features from the multispectral image data, which were then clustered using the K-Means algorithm. The integration of autoencoder-based feature extraction with traditional clustering

methods significantly improved the classification accuracy, allowing for the identification of 20 distinct classes within the study area. The spatial distribution of these classes was further analyzed, revealing clusters of plots with specific nutrient enrichments. The findings underscore the limitations of traditional parametric and unsupervised learning methods in capturing complex spatial patterns in soil nutrient content, particularly when using multispectral data during the bare soil period. The study demonstrates the potential of deep learning techniques, such as autoencoders, to enhance the analysis of soil properties and support more precise soil management practices. The results have important implications for the development of targeted agricultural interventions aimed at optimizing soil fertility and improving crop yields.

Monthly heatwave prediction and its effect on the yield of summer tomato in Bangladesh

Mohammad Rasel, Istiaq Ahmed and M.A. Monayem Miah

The global mean temperature is gradually increasing, which is a concerning issue. The prolonged high temperatures cause heatwaves (HWs), leading to extensive damage to crop production. Summer tomatoes, particularly the heat-tolerant BARI-released hybrid varieties (BARI-4 and BARI-8), are important due to their increasing demand and profitability. This study used the Zero-Inflated Poisson (ZIP) model to predict monthly Heat Wave Count (HWC). It examined the impact of HWs, using simple linear regression (LR), on the yield of summer tomatoes cultivated in Gazipur district. The study utilized agro climatological gridded data from the assimilation model (MERRA-2) of the POWER project, supported by NASA (1982- 2023), as well as summer tomato yield data (2004-2023) provided by the Olericulture Division of Horticulture Research Center (HRC), Bangladesh Agricultural Research Institute (BARI). The study revealed that heat waves occurred in Gazipur district from March to May, with the highest frequency observed in April. Additionally, the number of heat wave days (HWDs) peaked in April, and the duration of HWDs increased over the years. The performance of the ZIP model showed its reliability possessing low Mean Square Error (MSE) and Mean Absolute Error (MAE) during the validation period 2022-

2023. The result revealed the potential of the ZIP model to be used for reliable prediction of heatwaves in the context of climate change. Furthermore, the study found a significant negative association between HWs and the yield of summer tomatoes at a 5% significance level with a p-value of 0.029.

Predictive modeling of climate change impacts on potato yield: a statistical investigation

Jamila Khatun Prioty, Istiak Ahmed and M.A. Monayem Miah

Amidst the shifting climate of Bangladesh, it is essential to study potato yield and climate change. This study has predicted the impacts of climate change on potato yield using machine learning models. We have used potato yield and agro-climatological data from the past 16 years (2006-07 to 2021-22) for major potato-growing districts like Bogura, Munshiganj, Rangpur, Joypurhat, and Rajshahi. The study analyzed climate data for long-term trends and changes, investigated the relationship between climate variables and potato yield, developed predictive models for future potato yield, and assessed the vulnerability of potato yield to climate change. Trend analysis has been used to identify significant shifts in historical climate data, while Pearson's correlation coefficient explored the link between climate variables and potato yields. Different predictive models such as multiple linear regression, Random Forest (RF), and Support Vector Machine (SVM) have been used to estimate the impacts of climate change on potato yield. The dataset is divided into an 80% training set (2006-07 to 2017-18) and a 20% testing set (2018-19 to 2021-22) for robust model training and validation. Results show that root zone soil wetness, surface soil wetness, profile soil moisture, surface pressure, and relative humidity at 2 meters exhibit an increasing trend with some fluctuations, while other climate variables display random patterns. Significant climate variables at the 10% level have included minimum temperature at 2 meters, root zone soil wetness, profile soil moisture, surface soil wetness, and maximum wind speed at 2 meters. SVM model is the best predictive model for Bogura, Munshiganj, Joypurhat, and Rajshahi. In contrast, the RF model performs best for Rangpur, based on root mean square error. Potato yields in the study areas showed a stable or increasing

pattern despite fluctuations in significant climate parameters.

GGE biplot analysis for yield performance and stability assesment of BARI released bt brinjal varieties

Md. Shakil Hossain, Istiak Ahmed, Taslima Zahan, Zobaer Akond, and M.A. Monayem Miah

The stability and high yield of Bt brinjal variety is an important factor for long-term development and food security. The study investigated the effects of genotype (G) and environment (E) interaction on yield stability in four Bt brinjal varieties in seven different environments of Bangladesh. The study considered G and E as treatments, year as replication, and used a randomized complete block design (RCBD) with to construct the genotype plus genotype-vs-environment interaction (GGE) model. The joint analysis of variance revealed significant differences among the genotypes and environments (GE). The GGE biplot graphically showed the interrelationships between the tested environment and genotypes. The scores of PC1 (principal component 1) and PC2 (principal component 2) cumulatively explained approximately 88.09% of the total variation in GE interactions and were used to construct the GGE biplot. Bt brinjal-4 was the best genotype, with high average yields and high stability across the multi-locations. Sherpur and Satkhira were identified as the desired locations among the tested environments for growing all the genotypes. This study will help Bt brinjal growers select highly stable and high-performance varieties for a particular environment to achieve maximum production.

UAV-SFM-based 3d reconstruction of fruit trees to estimate tree parameters

Kowshik Kumar Saha, Istiak Ahmed, Mohammad Mukhlesur Rahman, Nur Mohammad, Monirul Islam

Plant characteristics such as height, width, volume, and leaf area are crucial for assessing plant growth, health, and yield predictions. In orchard conditions, these parameters guide the application of targeted treatments for individual trees. Traditionally, these measurements have been taken through direct observation or manual measurement, often relying on visual inspection. This study utilized UAV-SFM (Unmanned Aerial Vehicle - Structure from Motion) technology to generate a detailed point

cloud of a mango orchard, capturing the spatial information of mango trees with high resolution. The reconstructed point cloud of the orchard displayed a detailed and precise representation, capturing both the canopy structure and the topography of the orchard with high density and accuracy. Application of Cloth Simulation Filter (CSF) classifier was utilized to differentiate between ground and non-ground points, resulting in clear segmentation essential for precise analysis.

The segmented point clouds were used for height estimation and measurement of tree canopies. The linear regression analysis between the measured tree heights and the tree heights estimated from the UAV-SfM 3D point cloud yielded an R^2 value of 0.75. Collectively, these results showed the effectiveness of UAV-SFM and advanced filtering techniques in providing detailed, usable information for precision horticulture and orchard management.

Information on Right to Information: RTI of BARI

Designated Officer

Officer's name : Dr. Syed Md. Abdullah Shiblee
 : ড. সৈয়দ মুহাম্মদ আবদুল্লাহ শিবলী

Designation : Chief Scientific Officer

Phone : 49270129

Mobile : 01670051341

Email : cso.asict@bari.gov.bd

Website : www.bari.gov.bd

Office : ASICT Division, Bangladesh Agricultural Research Institute (BARI). Gazipur-1701

Designated Officer (Alternative)

Officer's name : Nur Mohammad
 : নূর মোহাম্মদ

Designation : Senior Scientific Officer

Phone : 4970041-8 (Ext. 5662)

Mobile : 01717354341

Email : nurbari2011@gmail.com

Website : www.bari.gov.bd

Office : ASICT Division, Bangladesh Agricultural Research Institute (BARI). Gazipur-1701

Designated Officer (Appeal)

Officer's name : Dr. Mohammad Emdad Ullah Mian
 : ড. মোহাম্মদ এমদাদ উল্লাহ মিয়ান

Designation : Secretary

Phone : 55100100

Mobile : 01315187804

Email : secretary@moa.gov.bd

Website : www.moa.gov.bd

Office : Building # 04, Ministry of Agriculture, Bangladesh Secretariat, Dhaka

Table. Citizen's access to information in 2023-24

Sn	Name of the Authority	No. of application received as of format of Right to Information Act, 2009	No. of application which has solved through providing information	No. of decisions for not providing requester information and the reason for that decision	No. of appeals against the decision of the officer in charge	No settlement appeals	No of disciplinary action taken by the authorities against the officer in charge	Amount received as the value of information as per rule 8 of Right of Information Act, 2009	Details of different activities taken by the authorities
1	2	3	4	5	6	7	8	9	10
1	BARI, Gazipur	05	05	-	-	-	-	-	-

Training & Communication Wing

25

Training & Communication

During 2023-24, due to COVID-19 pandemic situation only 1 (one) scientist was sent abroad for higher study (PhD) and for the same reason all the overseas training/ workshop/study tour/ visit/meeting/ conference were suspended. In case of in country higher education not a single scientist was admitted in the university for higher study (MS/PhD) as all the educational institutions were check closed since March 2020 to June 2021. Total 217 scientists, officer and staff have been sent in 61 different training courses, 81 scientists attended 21 workshops and 67 scientists attended 6 seminars organized by various organizations in the country.

Seminar & Workshop

Communication Section of T&C Wing arranges seminars and workshops in various fields of agricultural research and related issues. A total of 12 (twelve) seminars and 08 (eight) workshops were organized at BARI during the year 2022-23 on different aspect of agricultural Knowledge share to achieve the goal of Annual Performance Agreement (APA). A total of 1472 participants of BARI and other national research organization were actively participated in these seminars and workshops.

MoU signed

During the period 2023-24, BARI signed 8 (eight) MoU with 8 (eight) different organizations. All the organizations under MoU with BARI were voluntary organization. The purpose of the MoU were to promote collaboration between agricultural research and development and also for promotion of technology transfer activities.

Editorial & Publication

BARI regularly publishes journal, newsletters (Bengali and English), annual report, books and

booklets on the evolved technologies in order to disseminate information to the users including farmers. Brochure, manuals, and other literatures on BARI are also being published. During the year under report, 4 issues of newsletter, brochure of the institute, annual report, a few booklets and some other literatures have been compiled, edited and published. Further, more than hundred science articles revived from scientists of home and abroad has been processed for publication in the journal.

Library Section

A. Library section is responsible for the management of BARI central library. BARI central library was established to help and fulfill the purpose of the institute, as an adjunct of the researcher's tool and tends to play a significant role for providing appropriate information to the researchers at the right time. The mandates of the BARI central library is to -

- Building up a balanced and comprehensive collection in the sphere of agriculture and its allied fields based on the scientists needs with a bit focus on the generalist's interests.
- Preparing and processing the procured materials to ensure users effectiveness.
- Making the research community aware of new information and technology collected in and organized technically.
- Participating inter-library loan and network system to serve the researchers effectively.
- Providing aid on the use of the library and help to find, locate and evaluate the information available in the library.
- Establishing Management Information System (MIS) i.e. digital library and

library automation system using library management software in the library.

- Adopting the technique of economic method to preserve and repair the collection to ensure its continued use.
- Developing the mini-libraries at the regional and sub-regional station to feed the scientists with their needed information.

B. Existing facilities: A total of 86,840 collections are existed till 2023-2024 from the establishment of the library. Information of collected resource materials so far have been properly catalogued, classified and organized. The information on library resource materials are furnished in Table 1.

Table 1. Existing collections of BARI Central Library: 86,840

Items	No. of collection 2023-24	Total (Upto June 2024)
Books, Reports, Proceedings, etc.	175	47,024
Archival collection	0	2,670
Thesis	42	961
Periodicals (bound in book form)	0	4,247
Journal	47	24,653
Newsletter	30	701
Bulletin	3	167
Pamphlets & Booklets	20	982
Reprint	0	518
Leaflets	0	4,917

Table 1 a. List of Books, Reports, Proceedings etc. and Thesis: 217

Items	Purchased	Exchanged	Gift / Complimentary	Total
Books	25	01	80	106
Research reports, project reports & proceedings	-	14	55	69
Thesis (MS & Ph.D)	-	-	42	42

Table 1 b. List of Journal, newsletters and bulleting published :100

Items	Purchase	Exchange	Gift / Complimentary	Total
Journals	-	16	31	47
Newsletters	-	04	26	30
Bulletins	-	-	03	03
Pamphlets & Booklet	-	-	20	20

Table 2. List of documentation service processed.

SI No.	Procured material processed	No. of collection 2023-24	Total (Last 2 Years)
01	Document Accessioned	264	451
02	Catalogued & Classified and pasted with call numbers, book pockets and due slips	217	353
Total		481	804

Table 3. Services provided to users .

SI No.	Services provided to the Scientists	No. of collection 2023-24	Total (Last 2 Years)
1.	Documents Charged/Discharges	63	179
2.	Users Referenced	367	930
3.	Photocopies	791	1,908
4.	Correspondence made	74	136
Total		1,295	3,153

Complementary Online Journal

(<https://www.research4life.org/>)

Hinari AGORA ARDI GOALI OARE

ID: ag-bgd026

Password: WQ23pm7

BARI Digital Library: BARI Central library has lunched “BARI Digital Library” which is associated with both digital and automated library system. Now this digital library is available for user access through internet from anywhere. The web address is www.barilibrary.org. Here SLiMS library software has used.

Table 4: Type of resources uploaded for BARI Digital Library during 2023-2024.

Sl. No.	Icons	Document uploaded (no.)
1.	BARI Publications	263
2.	Bengali Books	1962
3.	Reference	6313
4.	Booklet	64
5.	Fiction	12
6.	Center's Publication	275
7.	Divisional Publications	161
8.	Newsletter	45
9.	Report	68
10.	Journal	1759
11.	Thesis – MS	336
12.	Thesis –Ph.D	441
13.	Leaflet	304
14.	Personal Publications	167
Total		12,170

Photography Section

Pankaj Sikder and Naznin Akter

Photography Section of BARI is one of the big service provider in research and technology transfer events. The photography section is involve in processing photographs and video clips to ensure effective use of its parent institute and is assigned to support the researchers in print, soft images and electronic form of the important images at the right time.

Major functions of photography section:

- ❖ To expose, collect, preserve and display photographs of different research activities and events held in BARI.
- ❖ To display photographs of visitors, research activities, agricultural fairs, BARI technology village activities, publications and other activities on the central display board.
- ❖ To ensure all kind of photographic equipment's information.
- ❖ Make video documentary for broadcasting technology based on the scientists demand.
- ❖ To arrange and supply the photography news of different programmes for publishing in the newspapers, magazine, journal, TV etc.

- ❖ To supply the photographs and news info to the editorial and publication section for newsletter.
- ❖ To supply the photographs and news info to the ICT for BARI Facebook and website.
- ❖ Coverage the Director General and Directors visit at different stations of BARI.

Considering the above events, a total of 44,516 activities were performed by this section during 2023-2024. Among of them 30,000 were still photograph, 20,000 were photo editing and 22 were video recording are presented in Table 29.

Table 29. Total activities of photography section during 2023-2024

Sl. No	Activities	Number
1	Photograph exposed in Digital Camera	30,000 above
2	Photo Editing	20,000 above
3	Video Recording program	22 above

Program of Photography Section for 2024-2025

- ❖ Make video documentary for broadcasting based of the scientists demand.
- ❖ To expose photographs of different crop varieties. research, agricultural fairs, BARI technology village activities, Field day, Visitors etc.

Proposed Budget for the Photography Section for 2024-2025

Sl. No.	Item	Tentative Budget
1	Procurement of Professional Video Camera, Lens, Tripod & Accessories (1 set), Editing Panel, Audio recording Accessories (1 unit)	2,00,00,000/-
2	Procurement of Professional DSLR Camera, Lens, Tripod & Accessories (1 set)	40,00,000/-
3	Procurement of Desktop Computer, Scanner, Printer (1 Pieces)	10,00,000/-
4	Photographs Print, Lamination, Binding etc.	5,00,000/-
5	Procurement of Furniture	5,00,000/-
Total =		2,60,00,000/-

Planning & Evaluation Wing

26



Introduction

The Planning and Evaluation Wing of the Bangladesh Agricultural Research Institute (BARI) plays a pivotal role in steering the nation's agricultural development towards sustainable and innovative pathways. As the foundation upon which BARI's strategic initiatives are built, this wing serves as the compass for agricultural research and policy formulation in Bangladesh. Its multifaceted responsibilities encompass meticulous planning, rigorous evaluation, and the alignment of research activities with the ever-evolving needs of the agricultural sector.

Activities of the Planning and Evaluation Wing

Planning and Evaluation Wing is playing a pivotal role for BARI. Planning is a process of deciding in advance what we want to get (our goal) and how we will get it. Evaluation enables us to assess how well we are doing and to learn from this. The activities of planning & evaluation wing of BARI are:

- Preparation and processing of Project Proposal (DPP/RDPP/TAPP)
- Preparation of new scheme (Karmasuchi) under revenue budget.
- Preparation of monthly report (IMED-05) and quarterly report (IMED 02 and 03)
- Preparation of project director's profile (IMED-01)
- Preparation of procurement plan (works, goods & services), work plan of projects and their subsequent approval by the authority.
- Monitoring and evaluation of development projects including procurement status (tender related activities).
- Preparation of Project Completion Report (PCR).
- Preparation of financial and physical progress report of the project and send to the Ministry of Agriculture
- Co-ordination of Project Implementation Committee (PIC) meeting.
- Co-ordination of planning and development of co-ordination committee (P&DC) meetings of BARI
- Liaison with IMED, planning commission and different ministries as and when necessary.
- Performing other activities as directed by the Director General, BARI.
- Participate in the monthly ADP review meeting in Ministry of Agriculture.
- Prepare quarterly/half yearly report according to "Annual Performance Agreement"
- Preparation of budget and report for "Sustainable Development Goals target, 2030".
- Preparation of ADP and RADP for on-going & proposed development projects.
- Preparation of monthly progress report on work plan for prime minister's office and Ministry of Agriculture.
- Preparation of monthly progress report of "Implementation of Guidelines issued by Honorable Prime Minister"
- Preparation of answers to the questions of Jatiya Sangshod (National Parliament).
- Participation in Mid-term budget framework meeting.
- Preparation of Five Year Plan (FYP).

- Preparation of research activities according to Sustainable Development Goals (SDGs) which was instructed by cabinet division as well as collaborated with United Nations (UN) and Food and Agricultural Organization (FAO).
- Preparation of Projects for Delta Plan-2100.
- Participation in different meetings conducted by Ministry of Agriculture (MoA).
- Arranging project implementation committee meeting (PIC) of on going projects supervised by BARI
- Arranging monthly progress meeting of PARTNER programme.

Table 1: Post and Position of Planning & Evaluation Wing

Designation	Organogram	Existing
Officer		
Director	1	1
Chief Scientific Officer	1	1
Principal Scientific	3	2

Designation	Organogram	Existing
Officer		
Senior Scientific Officer	2	2
Scientific Officer	3	2
Scientific Officer (Coffee and Cashew Nut Project)	-	1
Sub total	10	9
Staff		
Steno-Typist	1	0
UDA	1	1
Computer Operator	2	1
Office Assistant Cum Computer Typist	4	2
Office Support Staff	2	1
Sub total	10	5
Total:	20	14

Table 2: Progress report of development projects during FY 2023-24 (In lakh Tk.)

Sl. no.	Name of the Projects (Implementation period)	Total Project Cost	Allocation of 2023-24	Expenditure up to June 2024 & % of allocation		Cumulative Progress of Project from beginning to June 2024
				Financial	Physical (%)	
1.	Research, Extension and Popularization of Vegetables and Spices Cultivation on Floating Bed (2nd Revised) (July 2017 to June 2024)	4150.51	454.00	447.70	98.61%	4145.26 (99.87%)
2.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part) (2nd Revised) (July 2018 to June 2026)	1725.14	260.00	257.45	99.02%	1211.00 (70.23%)
3.	Farm Machinery Technology Development for Profitable Crop Production (1st Revised) (July 2020- June 2025)	5600.00	1160.00	1154.64	99.54%	4036.00 (72.08%)
4.	Enhance Production of Oil Crops Project (BARI Part) (1st Revised) (July 2020- June 2025)	2044.17	503.00	496.83	98.77%	1434.00 (70.16%)
5.	Conservation of Ground Water and Raising its Use Efficiency and Productivity in Irrigated Agriculture in Bangladesh (BARI Part) (1st Revised) (July 2020- June 2024)	241.47	49.00	46.00	93.88%	234.00 (97.00%)

Sl. no.	Name of the Projects (Implementation period)	Total Project Cost	Allocation of 2023-24	Expenditure up to June 2024 & % of allocation		Cumulative Progress of Project from beginning to June 2024
				Financial	Physical (%)	
6.	Research, Development & Extension of Cashew nut and Coffee (BARI Part) (January 2021- December 2025)	5330.75	1395.00	1373.34	98.94%	3570.00 (67.00%)
7.	Strengthening Regional Pulse Research Station, Madaripur and increase production of pulse crops at greater Barishal, Faridpur Region (1st Revised) (July 2021- June 2026)	16880.00	1052.00	922.06	87.65%	11233.00 (67.00%)
8.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship and Resilience in Bangladesh (PARTNER) (BARI Part) (July 2023- June 2028)	61286.55	4538.00	4470.92	99.11%	4471.00 (7.29%)
Total:		97258.59	9411.00	9168.94	-	30334.26

Table 3: List of Completed Projects during FY 2023-24 (In lakh Tk.)

Sl.no.	Name of the Projects (Implementation period)	Total Project Cost	Cumulative Progress
1.	Research, Extension and Popularization of Vegetables and Spices Cultivation on Floating Bed (2nd Revised) (July 2017 to June 2024)	4150.51	4145.26 (99.87%)
2.	Conservation of Ground Water and Raising it's Use Efficiency and Productivity in Irrigated Agriculture in Bangladesh (BARI Part) (1st Revised) (July 2020- June 2024)	241.47	234.00 (97.00%)

Table 4: List of on going projects during FY 2024-25 (In lakh Tk.)

Sl.no.	Name of the Projects (Implementation period)	Total Project Cost	Allocation 2024-25	Status
1.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part) (2nd Revised) (July 2018 to June 2026)	1725.14	216.00	7 th year
2.	Farm Machinery Technology Development for Profitable Crop Production (1st Revised) (July 2020- June 2025)	5600.00	1340.00	5 th year
3.	Enhance Production of Oil Crops Project (BARI Part) (1st Revised) (July 2020- June 2025)	2044.17	591.00	5 th year
4.	Research, Development & Extension of Cashew nut and Coffee (BARI Part) (January 2021- December 2025)	5330.75	1509.00	5 th year
5.	Strengthening Regional Pulse Research Station, Madaripur and increase production of pulse crops at greater Barishal, Faridpur Region (1st Revised) (July 2021- June 2026)	16880.00	1052.00	4 th year

Sl.no.	Name of the Projects (Implementation period)	Total Project Cost	Allocation 2024-25	Status
6.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship and Resilience in Bangladesh (PARTNER) (BARI Part) (July 2023- June 2028)	61286.55	4538.00	2 nd year
7.	Establishment of Regional Agricultural Research Station, BARI, Meherpur Sadar and Strengthening of Eco-Friendly Research activities in Mid-Western Region of the Country (July 2023-June 2028)	20996.00	2600.00	1 st year
Total		118254.59	11846.00	

Table 5: List of new projects under process

Sl. No.	Name of the Projects (Implementation period)	Total Project Cost (In Lakh Tk.)
1.	Establishment of Floriculture Research Centre (July 2023- June 2028)	25420.00
2.	Strengthening Research Facilities and Research Activities of Bangladesh Agricultural Research Institute (July 2023- December 2028)	64000.00
3.	Tuber Crops Research Strengthening Project (TCRSP) (July 2023- June 2028)	10000.00
4.	Upgrading of On-Farm Research Division to On-Farm Research Centre of BARI through Strengthening of Location Specific Technology Development and Transfer Project (July 2023- June 2028)	10000.00
5.	Development and expansion of bio-rational based integrated pest management of vegetables, fruits and betel leaf (2nd Phase) (July 2023- June 2028)	4316.00
6.	Establishment of Agricultural Research Center (ARS) in Gaibandha District for Expanding the Crop Cultivation and increasing productivity in northern char areas. (July 2024- June 2029)	4974.00
7.	Research and development of pulses, oilseeds, vegetables along with different crops in coastal eco-system of greater Noakhali district through establishment of agricultural research station at Subarnachar. (July 2024- June 2029)	4560.00
8.	Strengthening of Spices Crop Research in Bangladesh (2nd Phase) (July 2024- June 2029)	30000.00
9.	Hill agricultural research strengthening project (July 2024- June 2029)	48963.00
10.	Strengthening Citrus Research and Technology Dissemination Project (2nd Phase) (July 2022-June 2026)	10422.36
11.	Climate Resilient Crop Production Technology Generation and Development Project (July 2023- June 2027)	36600.50
12.	Horticultural Crops Research Strengthening Project (2nd Phase) (July 2023- June 2028)	66912.00
13.	Extension, Management and Production Increase of Citrus (BARI Part)	-

Table 6: Progress report of several scheme (Kormosuchi) of BARI during FY 2023-24 (In lakh Tk.)

Sl No.	Title and Duration	Estimated cost	Cumalative progress upto June 2024 (%)
1.	Strengthening of food and nutrition security program through gene pool enrichment, research, technology development and improved variety dissemination of Aroids. (July 2021 - June 2024)	652.35	639.52 (98.03%)
2.	Development of Canola type rapeseed variety for cultivation between T. Aman and Boro Rice. (July 2021 - June 2024)	750.00	715.45 (95.45%)
3.	Year round bulb production, reduction of post-harvest losses and storage technologies development of summer onion and its dissemination. (July 2022 - June 2025)	250.00	70.50 (28.20%)
4.	Production of micro-propagated sapling of BARI Kola-1, BARI Kola-5 and G-9 banana varieties through tissue culture technique & its dissemination. (July 2022- June 2025)	175.00	93.00 (53.14%)
Total		1827.35	1518.47

Table 7: On going Scheme (Kormosuchi) during FY 2024-25 (In lakh Tk.)

Sl. No.	Title and Duration	Estimated cost
1.	Year round bulb production, reduction of post-harvest losses and storage technologies development of summer onion and its dissemination. (July 2022 - June 2025)	250.00
2.	Production of micro-propagated sapling of BARI Kola-1, BARI Kola-5 and G-9 banana varieties through tissue culture technique & its dissemination. (July 2022- June 2025)	175.00
Total		425.00

Table 8: List of Proposed Future Projects Aligned with SDG (2021-2030) & 9th FYP (2025-2023) (In lakh Tk.)

SL. No	Name of the Projects	Estimated cost
1.	Strengthening of Pulses Research Centre & Development of Stress Tolerance Pulse Variety for Increasing Production Project	22436.30
2.	Strengthening of Research Activities of Oilseed Research Centre (ORC), BARI	65300.00
3.	Establishment of Haor Agricultural Research Station in Bangladesh	20000.00
4.	Establishment of Agricultural Research Station for Coastal Agricultural Development in Cox's Bazar District	6000.00
5.	Research, Extension and Popularization of Vegetables and Spices Cultivation on Floating Bed (2 nd Phase)	5000.00
6.	Collection and Conservation of Genetic Resources of BARI Mandated Crops	4000.00
7.	Maintenance Breeding and Generation of Improved Technology for Quality Seed Production, Processing and Preservation of BARI Mandated Crops	5000.00
8.	Maintenance Breeding and Generation of Improved Technology for Quality Sapling Production of BARI Released Fruit Varieties	5000.00

SL. No	Name of the Projects	Estimated cost
9.	Strengthening of Biotechnological Research in BARI	5500.00
10.	Development of Bio-Rational Based Integrated Disease Management & Safe Vegetables Production Techniques	4500.00
11.	Development of Vertebrate Pest Management Technology	1500.00
12.	Development of Sustainable Irrigation and Water Management Technology for Saline and Drought Prone Areas	5000.00
13.	Maintenance Breeding and Quality Seed Production of Onion and its Dissemination	5000.00
14.	Study on Adoption Level of BARI Released Varieties and Constraints	2000.00
15.	Development of Post Harvest Processing of Fruits & Vegetables	1500.00
16.	Providing Training to Farmers and Personnels of GO and NGO	1000.00
17.	Setting of Network Connection of Eight Outer Research Station with BARI Head Quarter and MoA	2500.00
18.	Strengthening of Remote Sensing, 4IR and Geo-Informatics Using Data Science in Agricultural Research	5000.00
19.	Development of Skilled Manpower (Ph.D, MS, Long/Short term training)	7500.00

BUDGET

27

Fund for the Institute was received from development and revenue budget of the Government of Bangladesh. The development budget was made available through the annual development program (ADP) for the on-going development projects under the Institute (Table 2). Out of total ADP allocation of Tk. 9872.36 lakh. The GoB funding was Tk. 9872.36 lakh, which was offered by different aid-giving agencies as Project Aid (PA).

Besides, an amount Tk. 30229.78 lakh was made available from the revenue budget to meet the recurring expenditure of the already complied projects of the Institute (Table).

Table-1: Budget provision of BARI for 2023-2024 (in lakh Tk.)

Total	GOB Head			Project Aid (PA/RPA)	Expenditure		Total
	ADP	Revenue	Total		ADP	Revenue	
41710.17	5757.53	31757.64	37515.17	4195.00	9872.36	30229.78	40102.14

Table-2: Development Budget (Annual Development Programs) of BARI for 2023-2024 (in lakh Tk.)

No.	Name of Projects & Programs	Total	GOB		PA/RPA	Expenditure		Total
			Revenue	Capital		Revenue	Capital	
	A. Development Projects							
1.	Research, Extension and Popularize of Vegetables and Spices Cultivation on Floating Bed	449.70	449.70		0	449.70	0	449.70
2.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part)	257.95	256.10	1.85	185.00	256.10	1.85	257.95
3.	Farm Machinery Technology Development for Profitable Crop Production	1157.00	857.00	300.00	0	857.00	299.34	1156.34
4.	Enhance Production of Oil Crops Project (BARI Part)	496.84	496.84	0	0	496.83	0	496.83
5.	Conservation of Ground Water and Raising it's Use Efficiency and Productivity in Irrigated Agriculture in Bangladesh (BARI Part)	47.35	47.35	0	0	47.35	0	47.35

No.	Name of Projects & Programs	Total	GOB		PA/ RPA	Expenditure		Total
			Revenue	Capital		Revenue	Capital	
6.	Research, Development & Extension of Cashew nut and Coffee(BARI Part)	1383.00	468.44	914.56	0	468.44	894.56	1363.00
7.	Strengthening Regional Pulse Research Station, Madaripur and increase production of pulse crops at greater Barishal, Faridpur Region.	1046.56	502.56	544.00	0	502.56	514.00	1016.56
8.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship, and Resilience (Partner) (BARI Part)	4506.00	2633.00	1873.00	4010.00	2633.00	1847.40	4480.40
Sub-Total -A Development Projects:		9344.40	5710.99	3633.41	4195.00	5710.98	3557.15	9268.13

P.T.O

Table-3: Development Budget (Annual Programs) of BARI for 2023-2024 (in lakh Tk.)

No.	Name of Projects & Programs	Total	GOB		PA/ RPA	Expenditure		Total
			Revenue	Capital		Revenue	Capital	
	B. Programs							
1.	Development of Canola Type Rapeseed Variety for Cultivation between T.Aman and Boro Rice	200.48	200.48	0	0	200.48	0	200.48
2.	Strengthening of Food and Nutrition Security program Through Gene Pool Enrichment, Research, Technology Development and Improved Variety Dissemination of Aroids.	247.15	220.77	26.38	0	220.77	26.38	247.15
3.	Year round bulb production, reduction of post-harvest losses and storage technologies development of summer onion and its dissemination.	70.00	70.00	0	0	70.00	0	70.00
4.	Production of micro-propagated sapling of BARI Kola-1, BARI Kola-5 and G-9 banana varieties through tissue culture technique & its dissemination.	90.50	30.00	60.50	0	30.00	56.60	86.60
Sub-Total -B Programs:		608.13	521.25	86.88	0	521.25	82.98	604.23
Grand Total (A+B):		9952.53	6232.24	3720.29	4195.00	6232.23	3640.13	9872.36

INFORMATION REPORT

(As per Information Commission Requirements)

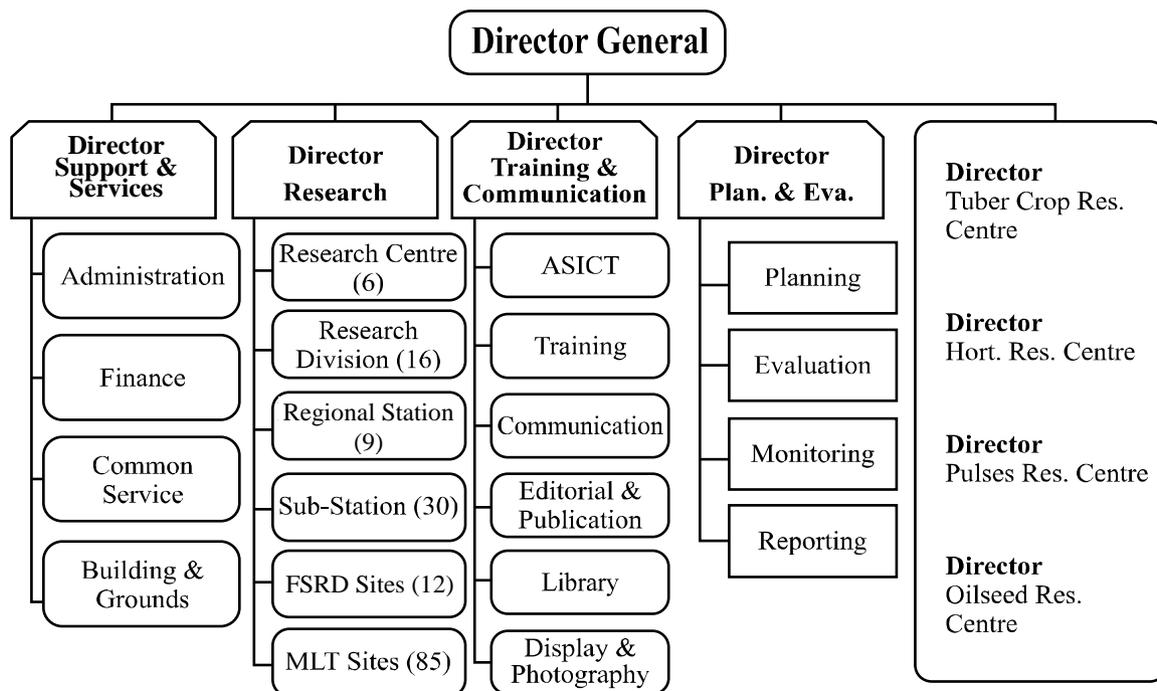
28

Institutional information:

BARI (Bangladesh Agricultural research Institute) is the largest multi-crop research institute conducting research on a wide variety of crops such as tubers, pulses, oilseeds, vegetables, fruits, spices, flowers, cereals, etc. Besides variety development, this institute carries out research on such areas as soil and crop management, disease and insect management, water management and irrigation, development of farm machinery, improvement of cropping and farming system management, post-harvest handling and processing, and socio-economic studies related to production, processing, marketing and consumption. The institute functions with the Director General as the chief executive along with four directors of its four major wings such as Research Wing, Support Services Wing, Training & Communication Wing and Planning & Evaluation Wing.

BARI has a long historical background of its own. The emergence of the Institute in its present status has occurred through a number of changes starting from simply a sub-ordinate status under the Department of Land Records in the then Bengal. On the recommendation of the famine commission in 1880, the Bengal Department of Agriculture was established as a sub-ordinate part of the Department of Land Records in the then Bengal. In 1906, Lord Curzon, the then Vice Roy of India had granted separate status to the Bengal Department of Agriculture and in the same year, a Nuclear Agriculture Research Laboratory under this department was established at Tajgaon, Dhaka. In 1908, an experimental station what has become known as Dhaka Farm was established on an area of 161.20 hectares of land. This Dhaka Farm was the predecessor of BARI and some other research institutes. Establishment of Dhaka Farm offered a good scope for conducting research in the field level in 1947, Bengal Department of Agriculture

was renamed as East Pakistan Department of Agriculture. The two constituent divisions of the department were Research and Extension. In 1962, there was a severe blow to agriculture research when the land of Dhaka Farm was acquired for establishing Second Capital (today called Sher-e-Bangla Nagar). In 1968 two separate directorates were established – one was Directorate of Agriculture (Extension and Management) and the other was Directorate of Agriculture (Research and Education). The Directorate of Agriculture (Research and Education) was mostly concerned with research. This directorate was also responsible for the management of Bangladesh Agriculture Institute (BAI) at Sher-e-Bangla Nagar, Dhaka. Later in 1980s and 1990s, two other agriculture colleges, one in Patuakhali and the other in Dinajpur, were established. These two agriculture colleges were also administered by BARI until these became universities, the former provincial organization took on national responsibilities. Like many other sectors, agriculture sector inherited poor manpower and insufficient administrative set ups as well. Therefore, it was rightly thought to have established a coordinated and comprehensive research and some major decisions were taken up in 1973. Another important development in the year was the presidential Order No. XXXII that helps strengthen and reconstitute agricultural research organizations and system in the country. Upon subsequent developments of research institutions led to further restructuring in 1976, through the presidential Order No. LXII, the Bangladesh Agricultural Research Institute (BARI) emerged as an autonomous and effective research organization following the dissolution of the Directorate of Agriculture (Research and Education) with sufficient operational flexibility, structural modification and improvement of regional and sub-stations.

Organizational Information:**Operational information:**

Director General who is the Chief Executive of the institute has overall responsibility for administration, finance, development and execution of program related to research, manpower development, dissemination of information, transfer of technology and other extension activities. The Director General is assisted by four directors: Director (Research), Director (Support & Service), Director (Training & Communication) and Director (Planning & Evaluation).

Director (Research) is responsible for program planning, monitoring and evaluation of the research activities as performed by the research centers, divisions and the regional and sub-stations.

Director (Support & Service) is responsible for personal management, finance & accounts, procurement, infrastructure development, security, transportation and repair & maintenance.

Director (Training & Communication), on the other hand, is responsible for the transfer of technologies to the users through trainings, seminars, workshop, print & electronic media. Human resource development through training and arrangement scholarships for higher studies at home and abroad also fall within his responsibilities.

Director (Planning & Evaluation) is responsible for developing, executing, monitoring, evaluation of different projects under development budgets and Programmes (Karmosuchi) under revenue budget of GoB with the help of crop centers, sub-centers, divisions, Regional Agricultural Research Station (RARS) and Agricultural Research Station (ARS). Also involves in financial management, procurement activities, infrastructure development and arrange meetings like Project Implementation Committee (PIC), Project Evaluation Committee (PEC) of different projects and Planning & Development Committee (P&DC) meeting of the institute.

Each research division is headed by a Chief Scientific Officer (CSO) who is also designated as divisional head whereas a research center is headed by a Director/CSO. Each divisional head is assisted by the concerned scientists starting from Scientific Officer (SO) to Principal Scientific Officer (PSO). On the other hand, each research center is comprised of scientists from various disciplines in the rank of Scientific Officer (SO) to Chief Scientific Officer (CSO).

Regional Stations are headed by senior scientists equivalent to the status of CSO, while the sub-stations are headed by the scientists in the rank of either PSO or SSO.

Information on Right to Information: RTI of BARI

Designated Officer	
Officer's name	: Dr. Syed Md. Abdullah Shiblee ড. সৈয়দ মুহাম্মদ আবদুল্লাহ শিবলী
Designation	: Chief Scientific Officer
Phone	: 49270129
Mobile	: 01670051341
Email	: cso.asict@bari.gov.bd
Website	: www.bari.gov.bd
Office	: ASICT Division, Bangladesh Agricultural Research Institute (BARI). Gazipur-1701

Designated Officer (Alternative)	
Officer's name	: Nur Mohammad নূর মোহাম্মদ
Designation	: Senior Scientific Officer
Phone	: 4970041-8 (Ext. 5662)
Mobile	: 01717354341
Email	: nurbari2011@gmail.com
Website	: www.bari.gov.bd
Office	: ASICT Division, Bangladesh Agricultural Research Institute (BARI). Gazipur-1701

Designated Officer (Appeal)	
Officer's name	: Dr. Mohammad Emdad Ullah Mian ড. মোহাম্মদ এমদাদ উল্লাহ মিয়ান
Designation	: Secretary
Phone	: 55100100
Mobile	: 01315187804
Email	: secretary@moa.gov.bd
Website	: www.moa.gov.bd
Office	: Building # 04, Ministry of Agriculture, Bangladesh Secretariat, Dhaka

Table. Citizen's access to information in 2023-24

SN	Name of the Authority	No. of application received as of the format of Right to Information Act, 2009	No. of application which has solved through providing information	No. of decisions for not providing requested information and the reason for that decision	No. of appeals against the decision of the officer in charge	No. of settlement appeals	No. of disciplinary action taken by the authorities against the officer in charge	Amount received as the value of information as per rule 8 of Right (Regulation of Information) to Information Act, 2009	Details of different activities taken by the authorities
1	2	3	4	5	6	7	8	9	10
1	Bangladesh Agricultural Research Institute, Gazipur	05	05	-	-	-	-	-	-

** BARI has provided answers to all 735 questions received through the website and mobile apps.



Bangladesh Agricultural Research Institute

Joydebpur, Gazipur-1701, Bangladesh

+88-02-49270038 ✉ editor.bjar@gmail.com

www.bari.gov.bd

