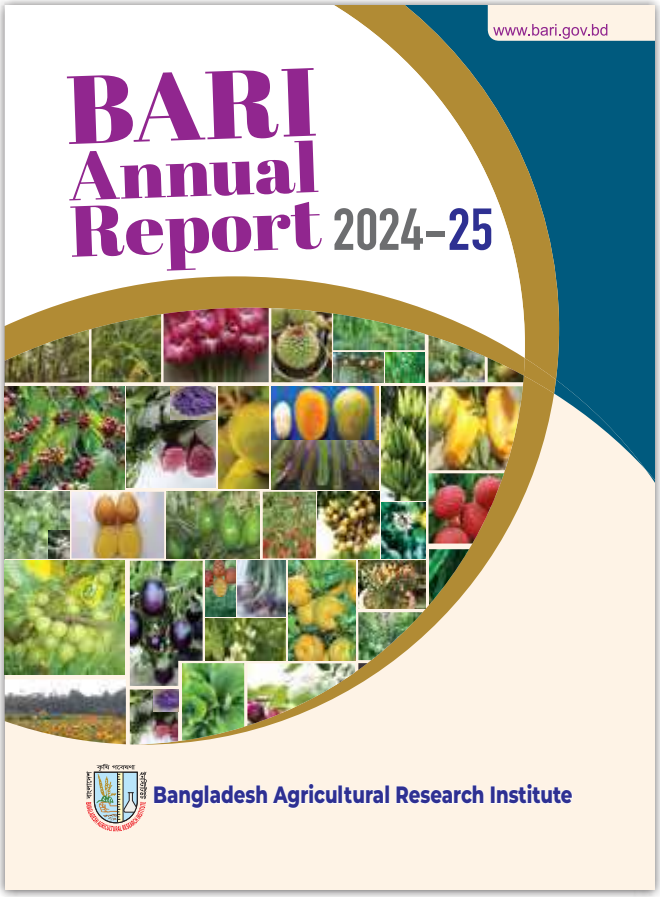
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BARI Annual Report 2024–25



Bangladesh Agricultural Research Institute



Compiled and Edited by:

Dr. Muhammad Ataur Rahman
Dr. Reshma Sultana
Dr. Mohd. Moniruzzaman
Dr. A. H. M. Fazlul Kabir
Dr. Md. Bazlur Rahman
Dr. Md. Mizanur Rahman
Md. Hasan Hafizur Rahman

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Foreword

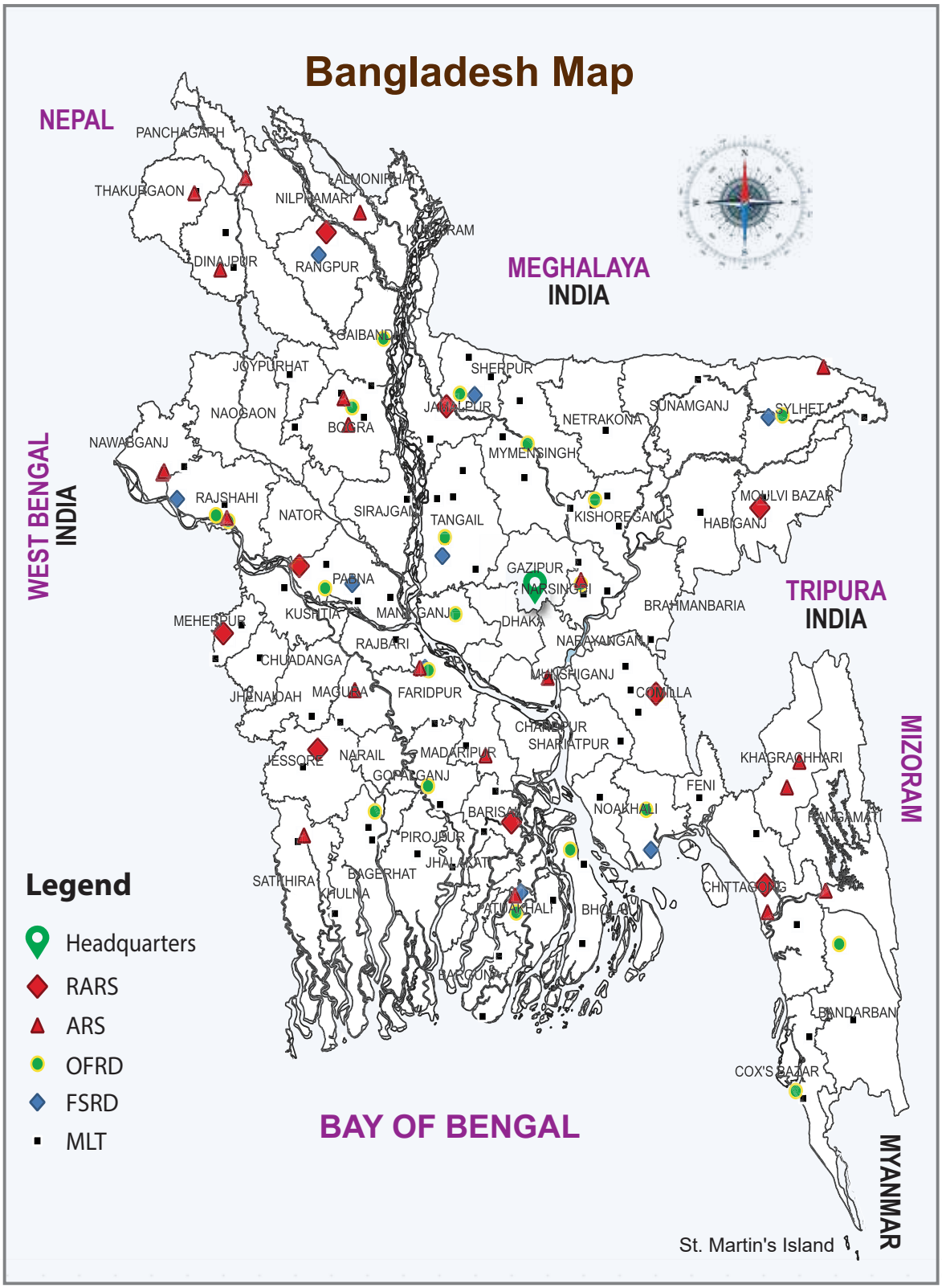
The BARI Annual Report for 2024–25 is more than a technical record; it is a testament to the resilience and ingenuity of our scientific community. As we navigate a rapidly shifting global agricultural landscape, this document serves as a vital roadmap of our progress.

Over the past year, BARI has pushed the boundaries of innovation across our core mandates—from the genetic improvement of tubers, oilseeds, and pulses to the climate-smart management of our soil and water resources. Beyond traditional variety development, our focus has sharpened on the "frontiers" of agriculture: biotechnological breakthroughs, low-cost mechanization, and high-impact strategies for our most challenged landscapes, including hill tracts, char lands, and saline-affected belts.

While a single volume cannot capture the full depth of our thousand-plus experiments, this report offers a strategic window into the milestones narrowing the gap between national food demand and sustainable production. For those seeking granular technical data, our specialized Center and Divisional reports remain an essential companion resource.

We extend our deepest gratitude to the scientists, editors, and contributors whose dedication made this publication possible. We are confident that these findings will empower policymakers, researchers, and stakeholders as we work together to secure the nutritional future of our nation.

Dr. Abdullah Yousuf Akhond
Director General, BARI


Bangladesh Map
NEPAL
PANCHAGARH
THAKURGAON
NILPHAMARI
DINAJPUR
RANGPUR
GAIBANDHA
JOYPURHAT
NAOGAON
BOGRA
NAWABGANJ
RAJSHAHI
NATOR
SIRAJGANJ
PABNA
KUSHTIA
MEHERPUR
CHUADANGA
JHENAIDAH
MAGURA
FARIDPUR
RAJBARI
TANGAIL
MANIKGANJ
DHAKA
GAZIPUR
NARSINGDI
MYMENSINGH
JAMALPUR
SHERPUR
NETRAKONA
SUNAMGANJ
SYLHET
KISHOREGANJ
HABIGANJ
MOULVI BAZAR
BRAHMANBARIA
NARAYANGANJ
MUNSHIGANJ
COMILLA
CHANDPUR
SHARIATPUR
MADARIPUR
GOPALGANJ
BARISAL
PIROJPUR
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BOARD OF MANAGEMENT

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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.



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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, organic culture, postharvest processing and socio-economics are the major concern groups to improve tuber crops. Achievements during 2024-2025 on varietal improvement, biotechnology approaches, production technology, soil, water and nutrient management, disease management, insect management, postharvest technology, organic culture and technology transfer have been given below.

Varietal Improvement

Potato Breeding

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

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

Hybridization was done at Debigonj 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, etc. For improving natural storage capacity targeted parents were BARI Alu-62, 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 F_1 seed (F_1C_0)

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

Hybrid true seeds which were produced in 2024-25 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season (2024-25). Around 590 crosses were grouped based on pedigree of parents. To facilitate field sowing, we used the "plug mix" methods. With "plug mix", seed is pre-germinated in a prepared soil mix and sown in tray which results good germination and seedling establishment. After harvesting of all plantlets, 210 single plants and 630 single tubers of 650 crosses were selected. In total 100 kg seedling tubers were stored for next year.

Field evaluation of F_1 Potato seedling tubers (F_1C_1)

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

During the selection process all potato clones are examined critically. Each generation materials are planted separately. Eight-five single tubers from 354 crosses were were selected and stored at BSPC, Debigonj for further evaluation.

Selection (POT, SOT and AOT) of Potato clones in subsequent generations (F_1C_2, F_1C_3 and F_1C_4)

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

During the selection process all potato clones are examined critically. Each generation materials are planted separately. From the planted clone's single

tuber (ST) F_1C_2, 25 hills (65 kg) were selected for secondary observation trial (SOT/F_1C_3); and 13 plant rows (Sing Row), F_1C_4 (172 kg) and 8 single plot (SP) (380 kg) F_1C_4were selected for subsequent generation. The sum total 671kg seed tubers of selected clones stored at BSPC cold storage. The selected potato clones will evaluate in the next season.

Secondary observation trial with Potato germplasm (F_1C_3)

M. A. Kawochar, A.T.M. T. Islam, S. Naznin, M. Rahman, T. Jahan 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 (F_1C_2) was planted separately. From the planted 30 single row (F_1C_2) a total of 15 single plot weighing 144 kg were selected. The harvested tubers of selected clones stored at BSPC cold storage. The selected potato clones will be evaluated in the next season.

Advanced observation trial with Potato germplasm (F_1C_4)

A.T.M.T. Islam, M. A. Kawochar, S. Naznin, M. Rahman, T. Jahan 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 (F_1C_3) was planted separately. In advanced observational trial (F_1C_4) 16 potato clones weighing 1450 kg were selected and stored at BSPC, Debiganj for further evaluation.

Preliminary yield trial with Potato clones (F_1C_5)

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

An evaluation study was conducted with 27 clones (21.9, 21.10b,21.60, 21.60a, 21.98, 21.99, 21.105, 21.113, 21.144, 21.146, 21.164, 21.177, 21.178, 21.185, 21.197, 21.205, 21.213, 21.224, 21.228, 21.239, 21.250, 21.260, 21.264, 21.273, 21.274, 21.303, and 21.382) along with four check varieties BARI Alu-13, BARI Alu-25, BARI Alu-28 and BARI Alu-62 at TCRC, BARI, Gazipur and BSPC, Debigonj, Panchagarh during 2024-25. In this study, it was noticed that most of the characters viz. days to start of emergence, days to 50% emergence, plant vigor, plant height, number of stem per hill, tuber weight per hill, tuber yield and dry matter (%) varied significantly across the environment. The clone 21.382 gave the highest yield (59.9 t/ha) imitated by 21.77 (58.5 t/ha) at Debiganj while the clone 21.185 gave the highest yield (35.0 t/ha) at Gazipur. Considering mean performance over the location, the top most result was obtained from the clone 21.177 (39.9 t/ha). All of the clones showed maturity between 85-97 days in Debiganj. Considering the performance of all the clones towards the studied parameters, the clones may be selected as superior for the next year trial. Multi-locational (SYT) trials need to be conducted to get performance against diverse weather to find out the more stable variety in the context of Bangladesh.

Secondary yield trial with clonal Potato hybrids (F_1C_6)

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

Thirteen genotypes (20.4, 20.7, 20.17, 20.25, 20.27, 20.34, 20.35, 20.85a, 20.146, 20.215, 20.268, 20.282 and 20.282a) along with three checks: BARI Alu-13 (Granola), BARI Alu-25 (Asterix) and BARI Alu 62 were evaluated at six agro-ecological locations during 2024-25 cropping season. The Clone 20.282 gave the significantly highest tuber yield (56.35 t/ha) at Bogura during final harvest. At Debigonj, the clone 20.27 produced the statistically highest (68.26 t/ha) tuber yield followed by 20.4 (60.71 t/ha), and 20.282 (59.30 t/ha). At Gazipur, the highest tuber yield came from the clone 20.35 (36.30 t/ha) which was statistically similar to the clone 20.17 (34.82 t/ha) and 20.282 (34.78 t/ha). At Jamalpur, clone 20.282 gave the significantly higher yield (54.10 t/ha) while clone 20.215 (35.98 t/ha) gave the significantly higher yield at Jashore. At Munshiganj, clone 20.17 (48.01 t/ha) provided the higher yield. Clone 20.282 gave the average higher yield over the location and all tested genotypes. The clones 20.4, 20.27, 20.215 and 20.282 can be selected for next year AYT due to their higher tuber yield potentialities and other yield contributing characteristics.

Regional yield trial with clonal hybrids of Potato

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

Three hybrids namely 16.62, 17.18 and 18.46 and three CIP germaplasm CIP402, CIP444 and CIP449 along with three check varieties BARI Alu-13 (Granola), BARI Alu-25 (Asterix) and BARI Alu-62 were evaluated at six agro-ecological locations during 2024-25 cropping season. Clone 18.46 gave the statistically highest tuber yield (42.06 t/ha) which was statistically similar to the clone 17.18 (38.04 t/ha), CIP 444 (38.52 t/ha) and BARI Alu-62 (38.16 t/ha) at Bogura during final harvest. At debigonj, clone 17.18 provided the significantly higher yield (54.72 t/ha) followed by 18.46 (51.80 t/ha), 16.62 (49.44 t/ha) and CIP 444 (49.55 t/ha). Clone 18.46 performed as the highest yielder at Jamalpur, Jashore and Munshiganj location providing 50.01 t/ha, 42.23 t/ha and 39.27 t/ha respectively. The average highest yield found in clone 18.46 (41.98 t/ha). This clone can be recommended for release as table varieties due to their higher tuber yield potentialities.

Regional yield trial of nutrient (Fe and Zn) enriched Potato variety development (set I)

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

Eight CIP germplasm namely CIP 405, CIP 408, CIP 412, CIP 413, CIP 414, CIP 420, CIP 432, CIP 442 along with three check varieties BARI Alu-13 (Granola), BARI Alu-25 (Asterix) and BARI Alu-62 were evaluated at Bogura, Debigonj, Gazipur, Jamalpur, Jashore and Munshiganj during 2024-2025 cropping season in RCB design with three replications. CIP 413 (42.34 t/ha) exhibited the highest statistically significant tuber yield, followed by CIP 412 (39.13 t/ha), BARI Alu-62 (38.20 t/ha), BARI Alu-25 (Asterix) (37.73 t/ha) and BARI Alu-13 (Granola) (36.26 t/ha) at Bogura during the final harvest. At debigonj, CIP 413 (50.50 t/ha) provided the significantly higher yield followed by CIP 412 (39.13 t/ha). The lowest significant yielder was CIP 405 (7.27 t/ha) at Debigonj. CIP 413 also provided the significantly highest yield (34.81 t/ha) followed by CIP 412 (32.16 t/ha), CIP 432 (31.41 t/ha), BARI Alu-25 (Asterix) (30.13 t/ha and BARI Alu-62 (27.21 t/ha) at Gazipur location. At Jamalpur, BARI Alu-62 gave the statistically higher yield (35.78 t/ha) followed by CIP 412 (32.79 t/ha), CIP 413 (34.43 t/ha), CIP 442 (28.19 t/ha) and BARI Alu-25 (Asterix) (31.44 t/ha). At Jashore, CIP 413 also gave the significantly highest yield (40.60 t/ha) which was statistically similar to BARI Alu 62 (37.17 t/ha) followed by CIP 412 (36.13 t/ha) and BARI Alu-25 (Asterix) (34.62 t/ha). At Munshigonj, CIP 413 also provided the significantly highest yield (40.06 t/ha) followed by CIP 412 (37.97 t/ha). The maximum average production recorded in CIP 413 (41.46 t/ha), while the lowest yield was observed in CIP 405 (10.07 t/ha). Consequently, the genotype CIP 413 is suggested for release as a variety high in zinc and iron.The maximum average production recorded in CIP 413 (41.46 t/ha), while the lowest yield was observed in CIP 405 (10.07 t/ha). The genotype CIP 413 is suggested for release as a variety with high in zinc and iron.

Regional yield trial of nutrient (Fe and Zn) enriched Potato variety development (set II)

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

Eight CIP germplasm namely CIP404, CIP421, CIP423, CIP424, CIP428, CIP433, CIP438, CIP441 along with three check varieties BARI Alu-13 (Granola), BARI Alu-25 (Asterix) and BARI Alu-62 were evaluated at Bogura, Debigonj, Gazipur, Jamalpur, Jashore and Munshiganj during 2024-2025 cropping season. CIP 433 (49.49 t/ha) exhibited the highest statistically significant tuber yield whereas the lowest yielder was CIP 424 (20.32 t/ha) at Debigonj during the final harvest. At Gazipur, BARI Alu-13 (Granola) (36.97 t/ha) provided the significantly higher yield which was statistically similar to CIP 433 (36.34 t/ha), CIP 441 (33.38 t/ha), BARI Alu-25 (Asterix) (33.14 t/ha) and BARI Alu-62 (36.14 t/ha). The highest significant yielder was BARI Alu-62 (35.53 t/ha) at Jamalpur. The maximum average production recorded in CIP

433 (36.04 t/ha) which was statistically similar to BARI Alu-62 (35.96 t/ha) while the lowest yielder was found from CIP 424 (19.33 t/ha). This CIP germplasm can be recommended for release as commercial varieties.

Advanced yield trial (AYT) with hybridized Potato lines (F_1C_7)

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.

Hybridization for heat and salt tolerant Potato variety development

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

Hybridization was done at both in BSPC, BARI, Debigonj 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. Eighty-two 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 potato seedling tubers from F1 seed (F_1C_0) for heat and salt tolerant Potato variety development

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

Hybrid true seeds which were produced in 2024-25 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2024-25. After harvesting of all plantlets, 86 single plants and 258 single tubers of 181 crosses were selected. In total 200 kg seedling tubers were stored for next year.

Field evaluation of F_1 seedling tubers (F_1C_1) for heat and salt tolerant Potato variety development (F_1C_1)

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

All available materials of F_1C_1 of potato were planted at BSPC, Debigonj following 70 cm × 40 cm spacing on 15 November 2024. All this experimental area was covered by net. Standard cultural practices were applied. Plants were selected at green stage well as at harvesting stage considering plant type, disease resistance, tuber size, shape, color and tuber yield and so on. During the selection process all potato clones are examined critically. Each generation materials are planted separately. Thirty-three single plants from 124 crosses were selected and stored at BSPC, Debigonj for further evaluation.

Hybridization for late blight resistant (LBR) Potato variety development

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

Hybridization was done at both in BSPC, BARI, Debigonj and TCRC, BARI, Gazipur using 37 parents for each locations under 16 hours extended photoperiod to create variability in the subsequent generations. To develop late blight variety, targeted parents were BARI Alu-77, BARI Alu-90 and BARI Alu-91. Different high yielding varieties were also used. Sixteen 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 F_1 seed (F_1C_0) for late blight resistant (LBR) Potato variety development

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

Hybrid true seeds which were produced in 2024-25 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2024-25. Around 181 crosses were grouped based on pedigree of parents. To facilitate field sowing, we used the "plug mix" methods. With "plug mix", seed is pre-germinated in a prepared soil mix and sown in tray which results good germination and seedling establishment. After harvesting of all plantlets, 25 single plants and 150 single tubers of 32 crosses were selected. In total 200 kg seedling tubers were stored for next year.

Field evaluation of F_1 seedling tubers (F_1C_1) for late blight resistant Potato variety development

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

All available materials of F_1C_1 of potato were planted at BSPC, Debigonj following 70 cm × 40 cm spacing on 15 November 2024. All this experimental area was covered by net. Standard cultural practices were applied. Plants were selected at green stage well as at harvesting stage considering plant type, disease resistance, tuber size, shape, color and tuber yield and so on. During the selection process all potato clones are examined critically. Each generation materials are planted separately. Seventeen single plants from 50 crosses were selected and stored at BSPC, Debiganj for further evaluation.

Production of seedling tubers from F_1 seed for nutrient (Fe and Zn) enriched Potato variety development

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

Hybrid true seeds which were produced in 2023-24 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2024-25. 45 cross TPS were collected from Dhaka and Debiganj in last year. These crosses were grouped into three based on pedigree of parents. First group consist of exotic parents, second group consist of CIP parents and third group consist of colanl parents mating with BARI released variety. To facilitate field sowing, we used the "plug mix" methods. With "plug mix", seed is pre-germinated in a prepared soil mix and sown in tray which results good germination and seedling establishment. After harvesting of all plantlets, 12 single tubers of 32 crosses were selected for late blight resistant potato. In total 6 kg seedling tubers were stored for next year.

Hybridization for Potato variety development containing processing attributes

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

Hybridization was done at both in BSPC, BARI, Debigonj and TCRC, BARI, Gazipur using 37 parents for each locations under 16 hours extended photoperiod to create variability in the subsequent generations. To develop potato variety containing processing attributes, targeted parents were BARI Alu-68, BARI Alu96, BARI Alu103 and CIP403. Different high yielding varieties were also used. Forty-four 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 F_1 seed (F_1C_0) for Potato variety development containing processing attributes

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

Hybrid true seeds which were produced in 2024-25 at Gazipur and Debiganj were sown at Breeder Seed Production Centre, BSPC, Debiganj, Panchagarh during this season 2024-25. After harvesting of all plantlets, 55 single tubers and 150 single tubers of 64 crosses were selected. In total 01 kg seedling tubers were stored for next year.

Field evaluation of F_1 seedling tubers (F1C1) for Potato variety development containing processing attributes

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

All available materials of F_1C_1 of potato were planted at BSPC, Debigonj following 70 cm × 40 cm spacing on 15 November 2024. All this

experimental area was covered by net. Standard cultural practices were applied. Plants were selected at green stage well as at harvesting stage considering plant type, disease resistance, tuber size, shape, color and tuber yield and so on. During the selection process all potato clones are examined critically. Each generation materials are planted separately. Ten single plants from 51 crosses were selected and stored at BSPC, Debiganj for further evaluation.

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 2024-25. 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), BARl AIu- 101 (P2), BARl Alu-90 (P3), BARI Alu-85 (P4), BARI Alu- 62 (P5), BARI Alu- 56 (P6). A di-allel 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

Morphological characterization of some advanced breeding lines of Potato

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

With a view to keep a record, morphological traits of twenty eight advanced lines with some BARI released varietes, a study was performed in the experimental field of TCRC, BARI, Gazipur during the last 2024-25 following the DUS descriptor. It is most important to know the diversity and to characterize any germplam before released. From this study it was noticed that there were lots of variations in morphological characters which is the desire and fountain to each breeder.

Sweet Potato Breeding

Collection and maintenance of Sweet potato germplasm

M. Rahman, M. A. Ali, M. A. H. Khan, T. Hasan, S. Mondol, E. H. M. S. Rahaman, D. Chanda, M. M. H. Molla and M. M. Rahman

In February 2022, thirteen sweet potato germplasm were acquired from the International Potato Center (CIP) in Peru and Mozambique. These germplasms 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

M. Rahman, M. A. Ali, M. A. H. Khan, T. Hasan, E. H. M. S. Rahaman, D. Chanda, M. M. H. Molla and M. M. Rahman

Sweetpotato (Ipomoea batatas L.) is an important root crop, valued for its high carbohydrate content and potential for food security. This study evaluated 1,006 genotypes derived from seven families to assess variation in commercial storage root number (CSRN) and commercial storage root weight (CSRW) and identify superior genotypes for breeding programs. Out of these, 70 genotypes were selected based on their performance, with 27 genotypes common to both CSRN- and CSRW-based selections. Substantial genotypic variation was observed across families. CIP117317 and CIP117620 exhibited higher mean CSRN and CSRW, while Moz.1.15 showed consistently lower values. Heritability estimates were moderate to high for both traits, indicating strong genetic control. The results highlight significant opportunities for selecting genotypes with superior storage root number and weight, providing a foundation for future sweetpotato improvement programs.

Advanced yield trial of Sweet potato germplasm (early)

M. A. H. Khan, M. Rahman, M. A. Ali, T. Hasan, M. M. H. Molla and M. M. Rahman

Sweetpotato (Ipomoea batatas L.) is a climate-resilient crop that contributes to food and nutrition security in Bangladesh. Developing early bulking genotypes with high and stable yield is a breeding priority for ensuring timely harvests and increased cropping intensity. In this study, six early bulking sweetpotato genotypes, including one released variety (BARI Misti Alu-12) and five CIP advanced clones, were evaluated across five agro-ecological environments in Bangladesh during the 2024-25 growing season. Data were analyzed using heatmaps, ANOVA, regression-based stability (Eberhart-Russell model), and genotype × environment interaction (GEI) models. Results revealed significant genotypic variation for storage root yield ($p < 0.001$). BARI Misti Alu-12 consistently produced the highest mean yield (16.2 t ha^{-1}), followed by CIP114410.2020.183 (12.7 t ha^{-1}), both showing stable performance across environments. Gazipur and Jamalpur were the most favorable locations, while Debiganj was the least productive. Stability analysis confirmed that BARI Misti Alu-12 combined high yield with wide adaptability, while CIP114410.2020.305 and CIP114706.2020.22 performed poorly. These findings suggest that BARI Misti Alu-12 remains the most suitable variety for wide-scale dissemination, while CIP114410.2020.183 can also be utilized in hybridization programs for its stability.

Regional yield trial of selected Sweet potato advanced lines for leafy vegetables

M. A. H. Khan, M. Rahman, S. Parvin, M. A. Ali, T. Hasan, M. M. H. Molla and M. M. Rahman

Sweetpotato (Ipomoea batatas L.) leaves are a nutritious leafy vegetable with potential for human consumption, but their sensory quality and nutritional composition vary among genotypes and growing environments. This study evaluated six sweetpotato genotypes, including advanced lines and released varieties, across five locations during the 2024–25 season (Panchagarh, Jamalpur, Chattogram, Bogura, and Gazipur). Leaves were collected, cooked under standardized conditions, and assessed by a trained sensory panel for full mouthfeel, bitterness, and presence of fiber. Results revealed significant differences among genotypes and locations for all attributes. An/22 consistently achieved the highest overall ranking, demonstrating superior mouthfeel, low fiber content, and moderate bitterness, followed by H16ej/10 and BARI Misty Alu 11. In contrast, BARI Misty Alu-17 and H9.10/12 were less preferred due to higher fiber content and less favorable mouthfeel. Nutritional profiling further confirmed the superiority of An/22, which recorded the highest vitamin C content (76.92 mg/100 g), elevated anthocyanin (0.68 mg/100 g), and higher carbohydrate levels (6.33%). These findings highlight the importance of integrating sensory and nutritional evaluation in identifying sweetpotato genotypes with superior leaf quality, providing valuable guidance for breeding programs and promoting the utilization of sweetpotato leaves as a nutrient-rich food source.

Regional yield trial of selected Sweet potato advanced lines

M. A. H. Khan, M. Rahman, M. A. Ali, T. Hasan, E. H. M. S. Rahaman, D. Chanda, M. M. H. Molla and M. M. Rahman

Sweetpotato (Ipomoea batatas L.) plays a vital role in food and nutritional security, particularly in developing countries. To enhance productivity and identify adaptable, high-yielding cultivars, twelve sweetpotato genotypes comprising nine advanced candidate lines and three BARI-released varieties as checks were evaluated in a Regional Yield Trial (RYT) during the 2024–25 season across five representative locations in Bangladesh (Gazipur, Bogura, Jamalpur, Panchagarh, and Chattogram). The trial was conducted in a Randomized Complete Block Design (RCBD) with three replications. Data were recorded on yield and yield-contributing traits, including number and weight of commercial and non-commercial roots, foliage weight, dry matter content, and storage root yield. Combined ANOVA revealed highly significant ($p < 0.001$) effects of location, genotype, and their interaction for most traits, highlighting the influence of both genetic and environmental factors. Among the locations, Bogura and Panchagarh supported the highest yields, while Gazipur and Chattogram were less favorable. Genotypic differences were evident, with BARI Mistialu-18 (24.7 t ha^{-1}), BARI Mistialu-12 (23.6 t ha^{-1}), and advanced line H16.ej/10 (22.6 t

ha^{-1}) ranking among the top performers. Fox's TOP third analysis confirmed the broad adaptability of H16.ej/10 and the BARI checks, while genotypes such as H5.ej/10, H9.10/12, and H9.48/11 showed potential for specific environments. Conversely, Moz. 1.9 and SPM-103 were consistently poor performers. The study highlights H16.ej/10 emerged as the most promising candidate for wide adaptation and future varietal release, while several other lines demonstrated potential for specific environments.

Participatory variety selection trial with Sweet potato clones

M. Rahman, M. A. Ali, M. A. H. Khan, T. Hasan, S. Mondol, E. H. M. S. Rahaman, D. Chanda, M. M. H. Molla 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 two check variety BARI Mistialu-12 and BARI Mistialu-17 during the winter season of 2024-25. 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 salt-tolerant Sweet potato genotypes in saline area

M. Rahman, M. A. Ali, M. A. H. Khan, T. Hasan, S. Mondol, E. H. M. S. Rahaman, D. Chanda, M. M. H. Molla and M. M. Rahman

An experiment was conducted during the 2024–25 sweet potato growing season at Shaympur Upazilla, Sathkhira, Bangladesh, to evaluate the performance of three sweet potato genotypes, H.16.ej/10, H.9.7/12, and BARI Sweet Potato-12, under saline conditions. The trial was set up in a Randomized Complete Block Design (RCBD) with three replications. Soil salinity, initially at 1.75 dS/m, increased to a peak of 7.15 dS/m in early March before declining. Analysis of variance (ANOVA) revealed highly significant genotypic differences ($p < 0.01$) for most traits, including yield and yield components, confirming genetic variability among the genotypes. Genotype H.16.ej/10 emerged as the superior performer, consistently showing the highest values for all measured traits, including length of the main vine (91.85 cm), land coverage (92.33%), total biomass (518.67 g), and marketable root yield (3106.67 g or 8.32 t/ha). In contrast, the check variety BARI Sweet Potato-12 had the lowest values for most traits. The superior performance of H.16.ej/10 under saline stress highlights its potential as a promising candidate for commercial cultivation in the coastal saline regions of Bangladesh, contributing to enhanced food security and farmer livelihoods.

Aroids Breeding

Collection and maintenance of aroids

F. Begum, M. S. Alam, M.T. Rahman, M. M. H. Molla, M.K.Alam and M. M. Rahman

Germplasm collection and documentation are necessary for effective conservation and management of plant genetic resources. Twenty two of Mukhikachu, fifteen of Panikachu and one of each of Panchamukhi kachu, Poidnal kachu, Dudhkachu, Moulovikachu/Sahebikachu and Ghataman kachu germplasms collected from home and abroad in recent past years and conserved at TCRC field, Gazipur.

Mukhikachu

Advanced yield trial of Mukhikachu lines

M. S. Alam, F. Begum, M. S. Rahman, M.T. Rahman, B. Anwar, M. M. H. Molla, M. K. Alam and M. M. Rahman

Seven lines of Mukhikachu (*Colocasia esculenta* var. *antiquorum*) viz. MK 179, MK 182, MK 184, MK 186, MK189, MK190 and MK 194 with two check varieties viz. Bilasi and BARI Mukhikachu 2 were evaluated under Advanced yield trial during February to November 2024 at TCRC research field, Gazipur, Jamalpur, Bogura and Jashore. The crop was planted following randomized complete block design with 3 replications. The yield and yield components were statistically significant among the lines.

The range of average corm per plant was 12.39 to 21.07 in where the highest average number of corm per plant was recorded in MK 189. The data shows that the highest weight of corm per plant (1200 g) was recorded in MK 179 followed by MK 194

(1043.33 g) at Jamalpur. The highest yield (40.45 t/ha) was recorded in MK 179 closely followed by MK 189 (39.32 t/ha) and BARI Mukhikachu 2 (38.00 t/ha) at Jamalpur.

Regional yield trial of Mukhikachu 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, S. Hasna, M. M. H. Molla, M. K. Alam and M. M. Rahman

Seven genotypes of Mukhikachu (*Colocasia esculenta*) viz. MK 122, MK 129, MK 131, MK 176, BDC 02, BDC 03, BDC 08 along with BARI released variety Bilasi and BARI Mukhikachu 2 as check were evaluated under regional yield trial during February to November 2024. The crop was planted following randomized complete block design with 3 replications. The yield components and yield were statistically significant among the lines.

On an average, the range of the number of corm per plant 15.03 to 23.82 in where the highest number of corm per plant was obtained in the check, BARI Mukhikachu 2 (23.82).

BDC 02 produced the highest weight of corm per plant (1160 g) which was at par with MK 122 (1120 g) and Bilasi (1093.33 g) at Jamalpur. The lowest weight of corm per plant (242.70 g) was obtained in BDC 08 at Barishal. The Mukhikachu line MK 122 produced the highest yield (36.74 t/ha) which was statistically similar with MK 129 (34.29 t/ha) and BDC 02 (34.28 t/ha) at Jamalpur.

Panikachu

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, S. Hasna, M. H. Molla, M. K. Alam, M. M. Rahman

Five lines of rhizome producing Panikachu (*Colocasia esculenta*) lines 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, Jashore and Barishal during January to September 2024. The crop was planted following randomized complete block design with 3 replications. The results showed significant variation among most of yield and yield attributes of rhizome producing Panikachu genotypes.

The highest number of stolon per plant (16.80) was obtained in PK 180 closely followed by BARI Panikachu 4 (16.33) at Bogura. The range of average stolon number per plant was 11.45 to 13.39. The highest mean marketable rhizome yield (52.58 t/ha) was obtained in BARI Panikachu 6. But the line PK 182 produced the second highest average stolon (13.74 t/ha) and rhizome (50.52 t/ha) yield.

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, S. Hasna, M. H. Molla, M. K. Alam, M. M. Rahman

Seven lines of stolon producing Panikachu (*Colocasia esculenta*) namely PK 134, PK 178, PK 179, PK 185, PK 188, PK 189, PK 190 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, Bogura and Barishal during January to August 2024. The crop was planted following randomized complete block design with 3 replications. Most of the yield and yield contributing characters were statistically significant between interaction effect of the genotypes and locations.

The highest number of stolon (23.60) was obtained in the check, Latiraj at Bogura which was at par with 3 lines of PK 188 (23.27), PK 134 (22.97) and PK 189 (22.83) at the same location. The highest stolon yield (28.02 t/ha) was recorded by the check, BARI Panikachu 1 (Latiraj) closely followed by BARI Panikachu 2 (26.54 t/ha) at Jamalpur. On an average, the highest stolon yield (21.64 t/ha) was obtained in PK 179 followed by BARI Panikachu 1 (Latiraj) (20.58 t/ha). The highest rhizome yield (110 t/ha) was obtained by PK 179 at Gazipur followed by same line, PK 179 (92.04 t/ha) at Jamalpur. On an average, the range of rhizome yield was 28.70 to 67 t/ha and the highest was recorded by PK 179.

Participatory variety selection trial on rhizome producing Panikachu lines

M. S. Alam, F. Begum, M. T. Rahman, M. S. Rahman, M. M. H. Molla, M. K. Alam and M. M. Rahman

Experiments were conducted at the farmer's field of Gazipur, Jamalpur and Bogura during the period from January to August, 2024. Five promising lines like PK 180, PK 181, PK 182, PK 186 and PK 187 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 (61.29 t/ha) and stolon (14.39 t/ha) but PK 182 gave the second highest rhizome (56.45 t/ha) as well as stolon yield (12.08 t/ha).

Participatory variety selection trial on stolon producing Panikachu lines

M. S. Alam, F. Begum, M. T. Rahman, M. S. Rahman, M. M. H. Molla, M. K. Alam and M. M. Rahman

Experiments were conducted at the farmer's field of Gazipur, Jamalpur and Bogura during the period from January to August, 2024. Six promising lines like PK 134, PK 178, PK 179, PK 185, PK 188, and PK 189 with two check varieties of BARI Panikachu 1 (Latiraj) and BARI Panikachu 2 were included in the experiment. Among the lines, PK 179 produced the highest yield of rhizome (66.08 t/ha) and stolon (20.01 t/ha).

Ghataman kachu

Advanced yield trial of Ghataman kachu in relation to spacing

F. Begum, M. S. Alam, M. M. H. Molla, M. K. Alam and M. M. Rahman

Three spacing like 60 cm × 60 cm, 75 cm × 60 cm and 75 cm × 75 cm on Ghataman Kachu (*Alocasia* sp.) were evaluated during March to December 2024 at the field of Tuber Crops Research Centre, Gazipur. The vegetative growth parameter, yield contributing characters and yield were influenced significantly.

The highest weight of individual rhizome (835 g) was recorded in the widest spacing of 75 cm × 75 cm and the lowest weight of individual rhizome (762.5 g) was obtained in the closest spacing of 60 cm × 60 cm. The highest yield (19.95 t/ha) was obtained in the closest spacing of 60 cm × 60 cm followed by the medium spacing of 75 cm × 60 cm (16.23 t/ha) whereas the lowest yield (14.18 t/ha) was recorded in the widest spacing of 75 cm × 75 cm. The percentage of dry matter was statistically influenced by spacing (Table 2). The highest dry matter (24.38%) was obtained in the medium spacing of 75 cm × 60 cm followed by the widest spacing of 75 cm × 75 cm (23.30%) whereas it was the lowest (22.88%) in the closest spacing of 60 cm × 60 cm.

Panchamukhi kachu

Advanced yield trial of Panchamukhi kachu in relation to spacing

F. Begum, M. S. Alam, M.S. Rhaman, M.M. Kadir, M. M. H. Molla, M. K. Alam and M. M. Rahman

Three spacings like 60 cm × 60 cm ,75 cm × 60 cm and 75 cm × 75 cm on Panchamukhi Kachu (*Colcasia esculenta*) were evaluated during March to December 2024 at the field of Tuber Crops Research Centre, Gazipur and Jamalpur. The yield and yield contributing characters were statistically significant in two locations.

The highest weight of individual rhizome (754.69 g) was recorded in the widest spacing of 75 cm × 75 cm at Gazipur which was statistically similar with the medium spacing of 75 cm × 60 cm (713.95 g) at Jamalpur and at Gazipur (708.92 g). On the contrary, the lowest weight of individual rhizome (600.09 g) was obtained in the widest spacing of 75 cm × 75 cm at Jamalpur. The highest yield (16.49 t/ha) was obtained in the closest spacing of 60 cm × 60 cm at Gazipur whereas the lowest yield (10.62 t/ha) was recorded in the widest spacing of 75 cm × 75 cm at Jamalpur.

Minor Tuber crops breeding

Yam

Regional yield trial of yam

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

Twenty-four yam genotypes, including breeding lines and local collections, 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 evaluated in Gazipur, Bogura, and Jashore. The unit plot size was 4.5m × 4.2m. Whole tubers were planted with a spacing of 1.2m x 1.2m. Fertigation, irrigation, weeding, earthing up and other intercultural operation were done as and where necessary for raising a good crop. 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. The RYT results reveal promising yam germplasm with high yield potential. HOM-47 was the top performer in terms of yield and consistency across locations. M.Man-2, KHG-1, Jas-7, and Jas-3 also demonstrated high yield and desirable agronomic traits. These genotypes are suitable candidates for further multiplication and potential release. In contrast, low-performing genotypes such as DAK-1 and DAC-2 may be eliminated or re-evaluated under improved management.

Secondary yield trial of yam

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

Eight yam genotypes—DABN-1, DAG-1, DAG-2, DAG-3, DAG-4, DAS-1, and DAN-1 were evaluated at Gazipur during 2022-2023 cropping season. Among the evaluated yam germplasm, DAG-2 demonstrated superior overall performance with high plant vigor, tuberlet production, and the highest yield (35.1 t/ha). DAG-3 and DABN-1 also performed well in yield and tuber characteristics. Genotypes such as DAG-4 and DAN-1, while producing more bulbils, had poor tuber yield and may be more suitable for bulbil-focused breeding programs. These findings suggest DAG-2 as a promising candidate for further multiplication and release in yam improvement programs.

Cassava

Regional yield trial of cassava

M. H. Rashid, K.A.M. M. Rahman, S. Sultana, F. Akhter, M.H. Molla and M. M. Rahman

Nine cassava lines (MEE-4, MEL-2, MEL-4, MEL-5, MEL-6, MEL-7, MEL-8, MEL-9, MEE-1) were assessed for their performance at research field, TCRC, Gazipur RYT in RCB design. The unit plot size was 3 m × 3 m. Cuttings were planted with a spacing of 1 m × 1 m. The RYT findings highlight significant genotypic variation among cassava lines for both vegetative and yield-related traits. MEL-4 emerged as the top performer with the highest yield (21.6 t/ha), good canopy development, and commercial root count. MEE-1 and MEE-4 also demonstrated desirable yield traits and vegetative growth, warranting further testing under multi-environment trials or participatory selection.

Collection and evaluation of cassava germplasm

M S Rahman and M. M. Kadir

Five cassava germplasm namely ME Jam-001, ME Jam-02, ME Jam-03, ME Jam-04 and ME Jam-005 evaluated at research field, RARS, Jamalpur during 2024-25 cropping season in RCB design with three replications. The yield and yield contributing characters of the lines of cassava are presented in table 1. Most of the parameters were significantly differed except plant height, base girth, number of leaf, number of stem, weight of single tuber, tuber length and tuber breadth. The highest plant height was observed in ME Jam-001 (3.90 m) and lowest was in ME Jam-002 (3.52 m). The highest weight of tuber per plant was recorded in ME Jam 002 (7.57 kg) and lowest was found in ME Jam-005 (2.80 kg). The highest yield was obtained from ME Jam 002 (75.67 t/ha) and lowest yield was recorded in ME Jam 005 (28.50 t/ha). Considering yield and yield contributing characters the lines ME Jam-002 and ME Jam-003 gave better performance. This is 3rd year experiment. The experiment will be continued.

Cultural management and organic production

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

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

The experiment was conducted at Tuber Crops Research Center, Gazipur, during the *Rabi* season of (2024-25) to find out optimum spacing and harvesting time for BARI Alu-102 (Spartan red) baby potato for maximum yield of baby potato. Seven spacing S_1 (50 cm × 15 cm), S_2 (50 cm × 20 cm), S_3 (50 cm × 25 cm) and S_4 (60 cm × 10 cm), S_5 (60 cm ×15 cm), S_6 (60 cm × 20 cm), S_7(60 cm ×

25 cm) with three harvesting date 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 (60 cm × 10 cm) with 85 DAP harvesting combination gave the highest tuber yield (23.26 t/ha). It may be concluded that closer spacing 60 cm ×10 cm with harvesting of at 85 DAP would be used for baby potato cultivation in the northern region of Bangladesh.

Performance of promising Potato varieties under organic cultivation system

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

An experiment was conducted to identify some promising potato varieties under organic production system. The experiment was executed at the organic block under TCRC research field, Gazipur during *rabi* season of 2024-25 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 (22.1 t/ha) was found from the variety BARI Alu -72 which was followed by BARI Alu-73 (21.7 t/ha) and was statistically identical.

Growth and yield performance of sweet potato as influenced by mixed fertilizer

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

A field experiment was conducted at the Tuber Crops Research Centre (TCRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during *rabi* season 2024-25 with five levels of fertilizer i.e., (F_1) RDF (FGR, 2021), (F_2) BENGAL mixed fertilizer (NPKS =8: 20: 14: 5), (F_3) ACI mixed fertilizer (Ratno) (NPKS =8: 20: 14: 5), (F_4) SEMCO mixed fertilizer (NPKS =12: 15: 20: 6), (F_5) control (native) and three varieties namely V_1 = BARI Mistialu-12, V_2 = BARI Mistialu-17 and V_3 = BARI Mistialu-18 with a view to find out the suitable mixed fertilizer for higher yield of sweet potato. The experiment was laid out in a randomized complete block design (RCBD) with three replications. Results revealed that among the variety BARI Mistialu-18 performed better in respects of tuberous root yield (37.67 t ha^{-1}) when ACI mixed fertilizer (Ratno) (NPKS =8: 20: 14: 5) was applied for sweet potato production. Therefore, ACI mixed fertilizer (Ratno) (NPKS =8: 20: 14: 5) may be practiced to cultivate sweet potato in our country for higher production.

Relaying of different crops with Potato at Gazipur region

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

An experiment was conducted during *Rabi* season of 2024-2025 at Tuber Crop Research Centre, BARI, Gazipur to find out suitable intercrop combination for higher profitability and economic return. Six relay crop combinations (T_1= Control, T_2= Relaying maize with potato, T_3= Relaying mung bean with potato, T_4= Relaying okra with potato, T_5= Relaying ash gourd with potato, T_6= Relaying brinjal with potato) were evaluated in the present study. Significantly the highest potato yield (36.12 t/ha) was obtained from T_3 treatment and lowest (29.47 t/ha) from T_6 treatment. Among the relay crop treatments, the highest potato equivalent yield (39.81 t/ha) was obtained from T_4 and the lowest (31.68 t/ha) from T_6 treatment. Relay cropping showed higher gross return than sole cropping except T_6 treatment. Although higher cost of production was involved in relay cropping system. The highest gross return (Tk 477720/ha) and net return (Tk 237720/ha) and marginal benefit cost ratio (2.78) was obtained from T_4 treatment and lowest was (0.35).

Effect of potato-wheat intercropping on reduction of pests, diseases and weeds incidence in Potato production

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 2024-25 with nine treatments namely i. Sole potato (BARI Alu-7), ii. Sole potato (BARI Alu-25), iii. Sole potato (BARI Alu-62), iv. Sole potato (BARI Alu-79), v. BARI Alu-7 + BARI Gom 30, vi. BARI Alu-25 + BARI Gom 30, vii. BARI Alu-62 + BARI Gom 30, viii. BARI Alu-79 + BARI Gom 30 and ix. Sole Wheat (BARI Gom 30) with a view to reduce pests, diseases

and weeds incidence of potato field and increase crop productivity for achieving higher economic return. The result showed that regarding equivalent potato yield, weed infestation, disease and insect's reaction and benefit cost ratio (BCR) potato-wheat intercropped treatments performed better than sole cropping practices. Therefore, in respects of equivalent potato yield, weed infestation and insect's infestation as well as economic analysis it may be concluded that potato-wheat intercropped practices were more profitable than the sole crop practices.

Effect of fertilizer dosages on total dry matter production and yield of Potato

M. Salim and M. K. Alam

An experiment was conducted at the research field of the Tuber Crops Research Sub-Center, Bangladesh Agricultural Institute, Munshiganj, during the potato growing season of 2024–25 with six treatments viz. T_1=N-P-K-S-Zn-B-Cowdung:80-22-75-11-1.75-0.75-5000 kg/ha, T_2= N-P-K-S-Zn-B-Cowdung:160-44-150-22-3.5-1.5-10000 kg/ha, T_3=N-P-K-S-Zn-B-Cowdung:240-66-225-33-5.25-2.25-15000 kg/ha, T_4=N-P-K-S-Zn-B-Cowdung:320-88-300-44-7-3-20000 kg/ha, T_5= Recommended fertilizer dosages (RFD)-FRG:2024 and T_6 = Native fertilization (Control). The objective of this experiment was to find out optimum dosages of fertilizer for maximum dry matter production and tuber yield of potato. Three different harvests were undertaken during the growing season to determine total dry matter (DM) production and yield of potato. The results revealed that during the 1st, 2nd and 3rd harvest i.e. at 60 DAP, 75 and 90 days after planting (DAP), respectively most of the parameters namely total dry matter production/ha, total tuber dry matter production and fresh tuber yield (t/ha) varied significantly. Fertlizer dose i.e. N-P-K-S-Zn-B-Cowdung:160-44-150-22-3.5-1.5-10000 kg/ha performed better than other treatments in respects of total dry matter production/ha, total tuber dry matter production/ha and fresh tuber yield (t/ha).

Effect of different organic manure on the severity of common scab disease and yield of Potato

M. Salim and M. K. Alam

An experiment was conducted at the research field of the Tuber Crops Research Sub-Center, Bangladesh Agricultural Institute, Munshiganj, during the potato growing season of 2024–25 with six treatments viz. i. T_1 = ACI Organic Fertilizer @3 t/ha ii. T_2 = Neem oil cake@3 t/ha iii. T_3 = Vermicompost @3 t/ha iv. T_4 = Cowdung @3 t/ha v. T_5 = Bioderma and vi. T_6 = Mustard oil cake@3 t/ha. The objective of this experiment was to evaluate the impact of organic manures for controlling potato common scab and yield of potato. Results showed that neem oil cake in respects of common scab incidence (%) and mustard oil cake in respects of scab severity performed better than other treatments The maximum marketable fresh tuber yield was produced obtained from mustard oil cake@3 t/ha) Therefore, considering the common scab incidence (%), scab severity and fresh marketable tuber yield; organic fertilizer namely mustard oil cake@3 t/ha followed by neem oil cake@3 t/ha may be applied to minimize potato common scab disease as well as to get good fresh yield in our country.

Integrated nutrient management on yield of Potato

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 2024-25 with four types of fertilizer dosages -i. F1=VC:@0 t/ha+100%RD, ii. F2=VC: @ 6 t/ha+75% RD, iii. F3=VC:@ 9 t/ha+75% RD, iv. F4=VC:@12 t/ha+75% RD and two varieties namely V_1=BARI Alu-25 and V_4=BARI Alu-62 with a view to evaluate the integrated use of vermicompost and chemical fertilizers on growth and yield of potato. Results showed that both of the variety i.e BARI Alu-62 and BARI Alu-25 performed better in respects of tuber yield when integrated nutrient management like vermicompost @ 9 t/ha+75% recommended fertilizer dose (RD) was applied for potato production. Therefore, vermicompost @ 9 t/ha+75% recommended fertilizer dose (RD) may be practiced to cultivate potato in our country for higher potato production.

Intercropping maize with potato for controlling bacterial wilt of Potato

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 2024-25 with six treatments namely i. BARI Alu-13 ii. BARI Alu-25, iii. BARI Alu-62, iv. BARI Alu-13+ BWMRI Hybrid Maize-2, v. BARI Alu-25+ BWMRI Hybrid Maize-2 vi. BARI Alu-62+ BWMRI Hybrid Maize-2 with a view to find out the incidence of bacterial wilt disease of potato in potato + maize intercropping system and increase cropping intensity and productivity. The result showed that the maximum (35.65 t/ha) equivalent potato yield was obtained from BARI Alu-62 but treatment BARI Alu-25+maize showed the highest gross return, net return and benefit cost ratio (BCR: 2.15). Moreover, production of BARI Alu-13 as intercropped with maize is more profitable than sole BARI Alu-13 production. Therefore, in respects of equivalent potato yield and economic analysis it may be concluded that potato-maize intercropped practices were more profitable than the sole crop practices specially for BARI Alu-25 and BARI Alu-13.

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 2024-25 with five treatments namely T_1 = BARI Alu-13, T_2 = BARI Alu-28, T_3 = BARI Alu-29, T_4 = BARI Alu-79, and T_5 = BARI Alu-86 with a view to select suitable potato variety (es) for the adverse climatic condition and make the potato production more profitable. Results showed that considering capability to survive in adverse climatic condition at the same time good yield and yield contributing characters BARI Alu-86, BARI Alu-28 and BARI Alu-13 performed better than the other treatments. Therefore, BARI Alu-86, BARI Alu-28 and BARI Alu-13 may be cultivated to get good early profit from potato production in Munshiganj region. may be cultivated to get good early profit from potato production in Munshiganj region.

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 2024-25 with five treatments viz. T_1 = Peppermint oil, T_2 = Eucalyptus oil, T_3 = Mahogany oil, T_4 = Neem oil and T_5 = 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 (2.30) 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 (3.40) and (2.20 cm) when eucalyptus oil was used as inhibitors on sprout suppression of stored potato in ambient condition. Mahagony 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, mahagony 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

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

Two varieties viz. V_1 = BARI Panikachu-1 and V_2 = BARI Panikachu-2 along with four levels of fertilizer doses viz. F_0-control, F_1-140-30-125 kg NPK/ha, F_2-160-50-145 kg NPK/ha, F_3-180-70-165 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 (27.54 t/ha) combination would be optimum for stolon productivity. On the other hand, BARI Panikachu-2 with 180-70-165 kg NPK/ha (29.03 t/ha) combination would be optimum for rhizome productivity.

Effect of plant spacing on yield of BARI alu-101

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

The experiment was conducted at TCRSC, Bogura during *Rabi* 2024-25 to find out optimum plant spacing for enhancing the productivity of BARI Alu-101. Four levels of plant spacing's viz. T_1 = (60×30) cm, T_2 = (60×25) cm, T_3 = (60×20) cm and T_4 = (60×15) cm were included in the study. The results revealed that T_3 = (60 × 20) cm gave the highest marketable yield (44.88 t ha^{-1}) and T4 = (60 × 15) cm gave the highest non-marketable yield (12.53 t ha^{-1}).

Effect of intercropping potato with leafy vegetables and spices on the equivalent yield of Potato

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

The experiment was conducted in the farmer's field of Sajhanpur upazila under Bogra district during *rabi* season 2024-25 to. In this study, to find out the performance of potato with vegetables and spices. There were five treatments viz. T_1= Sole potato (100%), T_2= 100% potato+ 50% red amaranth, T_3 = 100% potato + 50% coriander, T_4 =100% potato + 50% spinach, T_5 = 100% potato + 50% radish. The highest potato equivalent yield (35.33t/ha) and higher gross return (Tk 883350/ha) was obtained from T_1 which was followed by T_4 (32.05t/ha). The lowest equivalent yield (30.23t/ha) and BCR (1.92) were obtained from respective sole potato in the experiment. The result revealed that all the intercrops produced higher yield. Therefore, the suitable intercropping system potato with spices crop is more profitable than that of other intercropping system in Bogra region.

Effect of intercropping onion with Potato

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., T_1= Sole Potato, T_2 = 50% potato + 50% Onion, T_3 = 75% potato + 25 % Onion, T_4 = 25% potato + 75 % Onion, T_5 = Sole Onion. The highest potato equivalent yield (29.69 t/ha) was recorded in 25% potato + 75 % Onion intercropped treatment (T_4) treatment. The highest gross return (754000 Tk/ha), highest gross margin (34632 tk/ha) and BCR was also recorded from T_4 treatment.

Evaluation of BARI released high yielding Potato varieties for early planting in northern region of Bangladesh

M.K. Kubra, M.W. Rahman, S.Parvin, M.Z. Masud, A.K. Das

An experiment was conducted at Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh during the *Rabi* season of 2024-2025 to evaluate BARI released high yielding potato varieties for early planting in northern region of Bangladesh. This experiment was taken to find suitable variety for earlier cultivation in northern regions of Bangladesh prior to first week of October. Fifteen released potato varieties such as BARI Alu46, BARI Alu50, BARI Alu13, BARI Alu54, BARI Alu63, BARI Alu44, BARI Alu72, BARI Alu62, BARI Alu29, BARI Alu73, BARI Alu79, BARI Alu85, BARI Alu86, BARI Alu87 and BARI Alu90 were used in this experiment. The experiment was laid out in Randomized complete block design with three replications. Significant variation was observed on Emergence, plant height, stem per hill, tuber per hill ,tuber weight per hill and tuber yield (marketable and non-marketable) at 60 and 65 days were recorded to identify the early bulker varieties. For 60 DAP, BARI Alu86 had the highest marketable yield (15.47 t/ha), followed by BARI Alu29, BARI Alu79, and BARI Alu44. BARI Alu87 had the lowest yield (5.20 t/ha), while BARI Alu63 had the lowest yield (5.93 t/ha). Non-marketable tuber yield was highest in BARI Alu90 (4.47 t/ha), followed by BARI Alu62 (0.53 t/ha). For 65 DAP, BARI Alu86 had the highest marketable yield (20.69 t/ha), followed by BARI Alu79 and BARI Alu44. BARI Alu63 had the lowest marketable yield (9.71 tons/ha).Finally, BARI Alu86 followed by BARI Alu29, BARI Alu79 and BARI Alu44 can be selected for early yield variety on the basis of field performance.

Biotechnology and seed production

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

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

This study aimed to produce and maintain virus-free plantlets of BARI-released potato varieties and germplasm through meristem and sprout culture. Work was carried out at the Tissue Culture Lab, TCRC, BARI, Gazipur. Virus-free tubers confirmed by ELISA were cultured in MS medium under aseptic conditions at 21–22°C, 75–80% humidity, and a 16/8-hour light cycle. Plantlets were hardened in sand trays and transplanted to a net house for further multiplication. During 2024–25, a total of 9580 disease-free plantlets from 33 BARI potato varieties and 1390 germplasm plantlets were distributed to BSPC, Debiganj for G0 generation seed production. In total 63080 plantlets were produced from BSPC and TCRC together. Mother stocks were maintained by subculture for genetic preservation and future multiplication. This continuous tissue culture-based program supports breeder seed production, maintains varietal purity, and conserves valuable genetic resources for use in future breeding programs.

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

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

This experiment was conducted to develop virus-free plants of indigenous potato varieties, particularly Shilbilati, using meristem culture. Tubers of three indigenous cultivars—Shilbilati, Lalpakhri, and Sadaguti—were tested for viruses through DAS-ELISA. Virus-infected tubers were sprouted in sterilized sand under greenhouse conditions. Meristems (0.2–0.5 mm) were excised under a stereomicroscope, surface-sterilized using ethanol and Cl_2H_2O and cultured on hormone-free MS medium at 25 ± 2°C under a 16/8-hour photoperiod. The meristems developed shoots within 60–65 days and were sub-cultured for further growth. Plantlets were tested for viral infection, and virus-free Shilbilati plantlets were multiplied for minituber production. Eighty virus-free plantlets produced 750 g of minitubers in 2023–24, and replanting in 2024–25 yielded 3.8 kg of healthy tubers. These virus-free lines provide a foundation for producing clean, disease-free seeds, enhancing yield potential, and preserving indigenous germplasm for future breeding and seed programs.

Purification of virus(s) through meristem culture of Sweet potato

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

This study focused on eliminating viral infections from two popular BARI sweet potato varieties, BARI Misti Alu-8 and BARI Misti Alu-16, using meristem culture. Virus-infected tubers were grown in a greenhouse to produce shoots for meristem isolation. Shoot tips were excised, washed with 70% ethanol and 1% Cl_2H_2O, and rinsed thoroughly in sterile water. Under a stereomicroscope, the outer leaf primordia were removed, leaving a 0.2–0.5 mm meristem with one or two inner leaf primordia. These were cultured on Murashige and Skoog (MS) medium at 25 ± 2°C under a 16/8-hour light-dark photoperiod. The meristems showed growth within 60–65 days, forming light-green plantlets that were sub-cultured and hardened. PCR testing confirmed the successful elimination of viruses. Thirty virus-free plantlets were established, forming a healthy source for multiplication and field evaluation. This technique ensures clean planting material, protecting sweet potato yield and supporting sustainable seed production in Bangladesh.

Fingerprinting of BARI released Potato varieties using SSR marker

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

This study aimed to determine the genetic diversity of 83 BARI-released potato varieties using 20 Simple Sequence Repeat (SSR) markers. DNA was extracted from young leaves with the Promega Genomic DNA Extraction Kit and quantified using a NanoDrop spectrophotometer. SSR primers known for high polymorphism in tetraploid potatoes were used for PCR amplification. Phenotypic traits—including plant height, tuber shape, skin and flesh color, and yield—were recorded in the field to complement molecular data. Clear polymorphic bands were obtained for all markers, enabling

accurate discrimination among varieties. The SSR analysis successfully established DNA fingerprints that distinguish genetically similar cultivars and confirm varietal identity. Combining molecular and phenotypic variation improved the understanding of genetic relationships within BARI's breeding materials. This fingerprinting system will enhance germplasm characterization, prevent duplication, and support selection of parental lines in future breeding programs, ultimately strengthening varietal improvement and seed certification activities in Bangladesh.

Development of Potato populations for late blight resistance and biofortification using molecular marker-assisted selection (MAS)

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

At the TCRC crossing block, 20 hybridizations were made among resistant, local, and anthocyanin-rich potato genotypes to develop late-blight-resistant and nutrient-dense progenies. From these, 552 progenies were evaluated for plant height, tuber yield, and morphological traits. Average plant height was 78 cm, and mean tuber weight was 0.078 kg, showing wide variation across families. Tuber color ranged from white to red, and flesh color from white to light yellow, indicating strong genetic diversity. Crosses involving BARI Alu-53, 77, and 101 contributed to resistance, while anthocyanin-rich parents improved nutritional quality. The diversity in agronomic traits and color variation suggests successful gene recombination, creating potential for selecting high-yielding, late-blight-resistant, biofortified genotypes. The study demonstrates that marker-assisted selection (MAS) can effectively combine resistance genes with quality traits, providing a foundation for developing improved varieties that enhance yield, disease resistance, and nutritional value in future potato breeding programs.

Regional yield trial of marker assisted selection (MAS) for late blight resistance Potato lines

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

A regional yield trial was conducted across Rangpur, Bogura, and Gazipur during 2024–25 to evaluate ten genotypes from TB10 and TB11 families for late blight resistance and yield. Field assessments measured disease severity using AUDPC and recorded yield and morphological traits. Significant variation was observed across sites. Three genotypes—TB11-02, TB11-06, and TB11-07—showed strong resistance (AUDPC < 250) and high yield potential. TB11-06 achieved the highest mean yield (41.04 t/ha) with consistent performance across locations, while TB11-07 and TB10-19 performed well but exhibited location-specific adaptation. In contrast, TB11-26 and TB10-89 displayed lower resistance and yield. Molecular analysis confirmed the presence of late-blight resistance (R) genes in the best lines. These results identify TB11-02, TB11-06, and TB11-07 as promising candidates for advanced trials. The combination of field and molecular data ensures reliable selection of stable, high-yielding, late-blight-resistant potato lines suitable for large-scale cultivation.

Preliminary yield trial of marker assisted selection (MAS) for late blight resistance Potato lines

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

This experiment evaluated 17 late-blight-resistant potato genotypes at Rangpur, Debiganj, and Gazipur during the 2024–25 season. Trials were arranged in randomized replicated plots to assess yield and disease resistance under natural infection conditions. Considerable variation was observed in both traits. Three genotypes—TB13-01, TB59-05, and TB31-9-15—exhibited complete resistance to late blight (AUDPC = 0) and achieved the highest yields (up to 41.11 t/ha). TB24-02 showed location-specific performance, being resistant in Debiganj but susceptible in Rangpur, while TB31-02 and TB31-13 demonstrated site-dependent resistance patterns. These findings emphasize the influence of local environmental factors on disease expression and productivity. The identified resistant genotypes combine strong disease immunity with superior yield, offering valuable materials for future regional and multi-environment testing. The study confirms that integrating molecular-assisted selection with field screening can accelerate breeding of durable, late-blight-resistant varieties suited to Bangladesh's diverse agro-ecological zones.

Advanced yield trial of marker-assisted selected heat tolerant Potato lines

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

This experiment assessed ten heat-tolerant potato genotypes across Debiganj, Gazipur, Rajshahi, and Rangpur during 2024–25. The study evaluated yield performance, heat tolerance, and agronomic stability under high-temperature, late-sown conditions. TB19-95 produced the highest mean yield (48.74 t/ha), followed by TB19-80 (48.16 t/ha), TB19-25 (46.35 t/ha), and TB19-06 (44.96 t/ha). These genotypes maintained strong tolerance scores and consistent performance in Rajshahi and Rangpur. Conversely, BARI Alu-07, BARI Alu-73, and TB19-71 showed reduced adaptability. Tuber morphology revealed desirable oval shapes, light-red skins, and shallow eyes among the best lines. The work confirmed that these genotypes combined high yield, quality tubers, and heat resilience, making them prime candidates for release in heat-prone environments. The research demonstrates that marker-assisted selection effectively identifies heat-tolerant, high-yielding potato lines. Their stability across multiple sites supports sustainable potato production under climate-change stress and ensures productivity in late-season planting windows typical of Bangladesh's warmer regions.

Preliminary yield trial of marker assisted selected heat tolerant Potato lines

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

The 2024–25 Preliminary Yield Trial was conducted at Debiganj, Gazipur, Rajshahi, and Rangpur to identify heat-tolerant potato lines with high yield potential. Nine genotypes were tested along with check varieties BARI Alu-7, 25, 63, 72, and 73. Significant variation was recorded for yield and heat tolerance. TB67-02 had the highest average yield (44.71 t/ha) and excellent adaptability in Debiganj and Gazipur. TB64-04 and TB46-04 performed superbly in Rajshahi and Rangpur, while TB62-27 and TB62-08 showed consistent moderate performance across locations. Genotypic evaluation revealed oval to long-oval tubers with light-red skins and yellow flesh, desirable for market acceptance. Heat tolerance was rated on a 1–5 scale based on leaf wilting, confirming these five lines as promising for further testing. The study demonstrated the effectiveness of marker-assisted selection in developing climate-resilient genotypes. TB67-02, TB64-04, TB46-04, TB62-27, and TB62-08 will advance to the 2025–26 AYT for multi-location validation and potential release as commercial heat-tolerant varieties for Bangladesh's warmer agro-ecosystems.

Improvement of indigenous Potato through molecular approaches

S. Islam, F. Akhter, M. M. H. Molla., M. Rahman, M. Asjad, E. Haque and M.M. Rahman

To improve productivity and seed health of local potatoes, forty-three indigenous varieties were collected from seven regions of Bangladesh. Eleven high-performing types—including *Romana*, *Fatapakri*, *Jamalu*, *Lalpakri*, and *Gazipur Local*—were chosen for virus-free plant identification using RT-PCR. Sprouts from selected tubers were cultured on Murashige and Skoog (MS) medium to produce plantlets under controlled conditions. RNA was extracted, and eight major potato viruses were tested by RT-PCR. Plantlets free from all viruses were classified as virus-free and multiplied through tissue culture for disease-free seed production. Yield assessment showed notable regional variation, with *Romana-1* yielding 27.5 t/ha and *Patnaipakri* 21.1 t/ha. These virus-free lines combine local adaptation with clean seed status, helping to preserve indigenous genetic resources and enhance food security. The RT-PCR method proved a precise, cost-effective tool for eliminating viral pathogens and strengthening Bangladesh's foundation for sustainable potato seed systems.

Secondary yield trial of LBR bio-fortified Potato

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

This study evaluated 60 potato genotypes in Debiganj and Gazipur to assess yield and nutrient enrichment (Fe and Zn). Significant variation was found across genotypes. TB255-01 achieved the highest yield (46.16 t/ha) with Fe 394 mg/kg and Zn 57.1 mg/kg, followed by TB250-17 and TB255-07, which combined good yield and micronutrient content. TB256-19 and TB267-14 also performed well across sites. Ten elite genotypes were selected for further multi-location evaluation in 2025–26.

The integration of late-blight resistance with biofortification was confirmed through MAS screening. Results demonstrate the feasibility of developing nutrient-dense, disease-resistant varieties that address both yield and nutrition security. The selected lines show potential to provide farmers with profitable and nutritious cultivars, contributing to sustainable agriculture and human health improvement in Bangladesh through the production of biofortified, late-blight-resistant potatoes.

Molecular diagnosis of Potato viruses in Bangladesh and sequencing them

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

Forty potato varieties from BSPC G2 breeder plots at Debiganj were screened for eight major viruses (PVX, PVY, PLRV, PVS, PVM, PVA, PVH, and PAMV) using PCR. After two months of controlled sprouting, RNA was extracted with the FavorPREp Plant RNA Kit and converted to cDNA using ABScript II. PCR amplification with virus-specific primers was followed by agarose gel electrophoresis for virus identification. This approach enabled accurate detection of infected samples and identification of virus-free tubers for seed production. Preliminary results confirmed successful RNA and cDNA synthesis from all varieties. Subsequent PCR testing will verify virus-free lines to support clean seed propagation. This molecular diagnostic framework improves accuracy over traditional methods and ensures the distribution of healthy planting materials.

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

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

Sweet potato samples showing viral symptoms were collected from Gazipur, Bogura, Gaibandha, Chandpur, Rangpur, and Sherpur to detect major viruses using PCR. DNA and RNA were isolated from fresh leaf tissues, and cDNA was synthesized with GoScript™ Reverse Transcription System. Specific primers targeted SPFMV, SPCSV, SPVG, SPMMV, and TMV. Electrophoresis results showed clear bands confirming viral presence. SPFMV was the most common (16 % of samples), followed by SPCSV, SPVG, SPMMV, and TMV, mainly in Gazipur and Chandpur. Virus-free plants yielded 15.5–32.75 t/ha, while infected ones produced 7.33–17.57 t/ha—representing 28–67 % yield loss. The study provides the first comprehensive molecular survey of sweet potato viruses in Bangladesh and identifies key infection hotspots. Findings highlight the urgent need for integrated virus-management strategies and the production of virus-free planting materials to safeguard sweet potato productivity and ensure food security nationwide.

Production of nucleus seed Potato (mini tuber, G_0) using *in vitro* plantlet

M. Rahman, M.W. Rahman, F. Akther, S. Islam and A.K. Das

This project aimed to produce high-quality mini tubers from in vitro plantlets. During the 2024-25 season at BSPC, Debiganj, Panchagarh, 4820.82 kg of mini tubers were harvested from 63,080 plantlets. All varieties are stored at BSPC cold storage for future multiplication and organizational needs. Mini tubers of different lines were prepared for next year's trials, with BARI Alu-73 yielding the highest amount at 626 kg.

Production of breeder and foundation Potato seed at BSPC, Debiganj, Panchagarh during 2024-2025

M.W. Rahman, M. Rahman, M. Z. Masud, 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 517.995-ton nucleus, breeder, foundation and germplasm seed were produced from 105 acres of land during 2024-25 cropping season. To produce breeder seed, nucleus and G_1 seed were used and in case of foundation seed production breeder seed were used. Mini tuber varieties were multiplied for next year Breeder seed production to meet up requirement of BADC and other organizations. Mini tubers of different germplasms were multiplied for next year's trial setup. The highest amount of breeder and foundation seed was recorded by the variety BARI Alu-25 (96.436 ton & 42.501 ton).

Seed production and distribution of Sweet potato 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. 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 fifty thousand six hundred vine cuttings of sweet potato, around one lakh suckers (seedlings) of Panikachu and around one thousand kilogram corms (seed) of Mukhikachu varieties were distributed for farmers and used in the different experiments.

Diseases management

Survey on Potato diseases in northern part of Bangladesh

M.Z. Masud, M.M. Begum, M.I. Hossain and M. S. Hossain

A survey work was conducted to observe the incidence of potato diseases in northern part of Bangladesh. Late blight disease incidence was medium in Rangpur, Kurigram, Dinajpur, Thakurgaon and Panchagarh and lower in Nilphamary and Lalmonirhat districts. Bacterial wilt and Black leg disease incidence were medium in early season of potato cultivation whereas lower in season. Common scab, mosaic, stem rot, early blight, stem canker and black scurf, PVY were as less disease incidence of potato in Bangladesh.

Efficacy of fungicides in controlling late blight of Potato

M.Z. Masud, M.M. Begum, M.I. Hossain and M. S. Hossain

A total of 09 different new fungicides with one control fungicide were tested against late blight disease of potato at the BSPC, Debiganj, Panchagarh during the Robi season 2024-25. Results reveal that most of the tested fungicides reduced the disease significantly over control. Among the 09 fungicides Zampro and Acrobet MZ (32.22 t/ha and 31.99 t/ha respectively) showed excellent performance in controlling late blight disease.

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

Twelve potato varieties viz. BARI Alu-7, BARI Alu-37, BARI Alu-40, BARI Alu-46, BARI Alu-47, BARI Alu-48, BARI Alu-49, BARI Alu-62, BARI Alu-73, BARI Alu-78, BARI Alu-87 and BARI Alu-88 were evaluated to screen resistant varieties against scab disease at Tuber Crops Research Centre, BARI, Joydebpur, Gazipur during 2024-25 cropping year under the field condition at *Rabi* season. Considering scab incidence, BARI Alu-37, BARI Alu-47, BARI Alu-88, BARI Alu-87 and BARI Alu-62 provided lower scab incidence which was less than 5.0% and performed better and BARI Alu-49 found completely free from common scab of potato.

Evaluation of Potato lines for PLRV and PVY resistance under the infection pressure (seventh progeny)

M. M. Begum

Three potato lines were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2024-25. Based on field observation and according to ELISA test, all lines found infected with PLRV, PVY and other combine viruses.

Evaluation of Potato lines for PLRV and PVY resistance under the infection pressure (fifth progeny)

M. M. Begum

Six potato lines were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. 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 (fourth progeny)

M.I. Hossain, 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 2024-25 at Joydebpur. Though, potato line Chenoa was found free to virus infection, but potato line 18.19 and 18.43 performed better considering all the parameters and found less susceptible to viruses.

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

M.I. Hossain, 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 2024-25 at Joydebpur. All the exotic lines were found more susceptible to potato viruses than that of the Check Diamant at this year but germination, vigour and yield of all lines reduced gradually in every higher progeny.

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

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

Sixteen 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 2024-25 at Joydebpur. The hybrid clones 19.340, 19.870 and 19.113 were found free from any other viruses and performed better considering all the vigour and yield.

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

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

A total of twenty potato lines and variety Diamant (as a control) were evaluated against PLRV and PVY to find out the resistant source (s) at Joydebpur, Gazipur during 2024-25 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 475 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 85% and 15% found infected with different alone and combine viruses. Mixed virus found the highest about 21% had PLRV followed by 15% had PVY, 15% had PVS and 3% had PVX.

Observational trial of Sweet potato varieties/ germplasm against virus diseases

M.I. Hossain, M.M. Begum, 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 2024-25 cropping season at Tuber Crop Research Centre, Bangladesh Agricultural Research Institute, Gazipur. Six sweetpotatoe lines along with check BARISP-17 were evaluated against virus diseases where Sweetpotato feathery mottle virus and Sweetpotato Chlorotic Stunt virus were observed in the field. Among the tested lines, H16ej/10 and H9.48/11 were performed as the best lines for showing free to virus infection. The experiment will be repeated in the next season.

Monitoring of different released Potato varieties against post-harvest diseases

M. M. Begum

Fourteen varieties namely 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 post harvest rottage and shelf life at Joydebpur under natural storage conditions during 2024-25. Considering all parameter, BARI Alu-89, BARI Alu-100, BARI Alu-7, BARI Alu-87, BARI Alu-90, BARI Alu-104, BARI Alu-102, BARI Alu-77 and BARI Alu-73 found better for normal storage and longer shelf life.

Insect pest management

Development of bio-rational based management post-harvest up to storage condition against Potato tuber moth

M.M Khatun, M. M. H. Molla and M. M. Rahman

The entomology laboratory at TCRC, BARI, Gazipur, conducted a study on the bio-rational management of the potato tuber moth during the 2025 Robi season using five bio-pesticides, together with an untreated control, at room temperature. At 60 days after storage, the untreated control showed a mean infestation of 69.77%. On the other hand, *Bacillus thuringiensis* subsp. kurstaki yielded the lowest tuber infestation (7.02%), followed by neem seed kernel (7.81%) and rice husk (9.08%). These treatments also significantly reduced tuber damage compared to the control, with Btk showing the greatest decrease (89.94%), followed by neem seed kernel (88.82%) and rice husk (86.98%). All treatments were reduced infestation intensity of PTM compared to the untreated control. B. thuringiensis showed the lowest infestation levels across all parameter (2.31, 0.87 and 0.18 mean no. of tunnels, holes and infested eyes per tuber respectively. Significantly reducing larval penetration were B. thuringiensis and neem seed kernel (16.71% and 17.64%, respectively). The highest mortality rates were generated by B. thuringiensis (83.29%) and neem seed kernel (82.36%), with rice husk exhibiting notable mortality (80.80%). Conversely, the untreated control showed the highest rates of pupation (88.95%) and adult emergence (87.03%), suggesting that the larvae developed into adults more successfully. Therefore, considering the all parameters, the bio-pesticides decrease pupation and emergence rates, especially in Bacillus thuringiensis, Neem seed kernel and rice husk, which greatly inhibit development.

Screening of released Potato varieties and advanced materials against Potato cutworm (*Agrotis ipsilon*)

M.M Khatun, M. M. H. Molla and M. M. Rahman

Eleven (11) varieties and advanced materials of potato were evaluated against cutworm infestation during 2024-25, TCRC, BARI, Gazipur. Among them two varieties and advanced materials namely, advanced line 18.43 and BARI Alu-101 were shown comparatively less infestation (1.17 -1.97 %) caused by potato cutworm than the other varieties /advanced materials including two check varieties BARI Alu-62 and BARI Alu-25. Moderate infestation was observed in the remaining germplasm. Out of all materials BARI Alu-101 and advanced line's 18.43 were best performed in terms of productivity and performance against potato cutworm and can be used as breeding programs, respectively.

Screening of released Sweet potato varieties and advanced materials against Sweet potato weevil

M.M Khatun, M. M. H. Molla and M. M. Rahman

Eleven (11) varieties and advanced materials of sweet potato were evaluated against sweet potato weevil ((*Cylas formicarius*)) infestation during 2024-25, TCRC, BARI, Gazipur. Significantly the lowest damage root weight was recorded in the P12-179 (0.46 t/h) and followed by E-12P7-305, EP4-22 and E-11P8-629 which was less than check variety BARI SP-4. Advanced line P12-179 was also showed the lowest percentage yield losses (1.79%), followed by E-12P7-305 (2-40%). Considering the total root yield, damage root weight and percent of yield loss, the general assessment suggest that advanced line P12-179 and E-12P7-305 were the best performance against sweet potato weevil and this genotype can be used as breeding program.

Comparative efficacy of bio-acaricides against red spider mite (*Tetranychus urticae*) on aroids

M.M Khatun, M. S. Alam, M. M. H. Molla and M. M. Rahman

The study investigated the incidence of red mite of aroids (BARI Panikachu-6) and tested five bio-acaricides in *Kharif* 2024. The study investigated the incidence of red mite (*Tetranychus urticae*) of aroids (BARI Panikachu-6) and tested five bio-acaricides in *Kharif* 2024. The findings indicated that plants sprayed with acaricides were the lowest mite population, with 11.02 mites per 2 cm^2 area per leaf or plant compared to plots without acaricides. The plots treated with Oberon 240SC and Larsimite 10EC was the lowest percentage of infested leaves per plant, at 26.13% and 28.54%, respectively. Nonetheless, the plot treated with Spiromesifen (Oberon 240SC) was the highest mite population reduction (83.10%) compared to the control.

Post harvest management

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

T. Hasan, M. H. Rashid, M. M. H. Molla and M. M. Rahman

An experiment was conducted at Tuber Crops Research Center, BARI during March to July 2024. Tubers of six hybrid clones of AYT were evaluated for storage behavior under natural condition. Among the hybrid clones 18.8, 18.19, 18.37 and 18.102 showed better performance in terms of cumulative weight loss % and rottage loss %. At 90 DAS (days after storing) 18.102 was recorded with 26.75% cumulative weight loss which was statistically similar with BARI Alu-28 (15.25%) and BARI Alu-7 (21.31%) followed by 18.37 (32.58%), 18.8 (42.50%) and 18.19 (47.39%) while the maximum was recorded in 18.13 (66.92%). At 150 DAS maximum rottage loss was recorded in 18.46 (83.55%).

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

T. Hasan, M. H. Rashid, M. M. H. Molla and M. M. Rahman

An experiment was conducted at Tuber Crops Research Center, BARI during March to August 2024. Tubers of hybrid clones of SYT were evaluated for storage behavior under natural condition. In case of cumulative weight loss at 90 DAS all the tested hybrid clones were found with moderate weight loss ranged from 30-41.20% where 19.113 (30%) was the minimum and statistically significant with BARI Alu-7 (19%) and BARI Alu-13 (22.20%) and 19.99 (41.20%) was the maximum. For 120 DAS 19.34 (49.65%) was recorded with the minimum weight loss among the hybrid clones. Maximum rottage loss due to BSR was found in 19.96 (70.53%) and minimum in 19.3 (13.73%) and 19.113 (22.13%) at 90 DAS. A rapid and significantly higher rottage loss due to BSR than the check varieties were observed in the hybrid clones ranging from 62.93%-86.40% at 120 DAS.

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. H. Molla and M. M. Rahman

Hybrid clones under AYT and SYT were studied for their processing quality in the form of Chips and French Fries. Processing quality of hybrid clones 19.3, 19.34 and 19.113 obtained very good scores (16) under SYT. 19.34 performed excellent for producing french fries like the check varieties. Among the twelve hybrid clones under SYT 20.17, 20.25, 20.27, 20.35, 20.215 and 20.268 produced light golden to light whitish coloured (scored 8-10) crispy chips (20) with excellent appearance (scored 20). Again 20.17, 20.25, 20.27 and 20.215 performed excellent for producing french fries too.

Socio-Economics

Adoption and impact of BARI Potato varieties and zero tillage potato cultivation practice in saline coastal area

M. E. A. Begum, S.M.A. Shiblee, M. M. H. Molla, M. K. Alam, A. T. M. T. Islam and M. M. Rahman

This study aims to identify the adoption and impact of potato varieties and zero tillage potato cultivation (ZTPC) practice and determinants of the adoption of ZTPC practices and their impacts on potato farming in saline coastal area. To achieve the study objectives, the researchers employed Poisson regression, Propensity Score Matching techniques and the Adoption and Diffusion Outcome Prediction Tool (ADOPT). A total of 120 potato farmers were surveyed in 2025. The results show that the average yields of BARI Alu-72, BARI Alu-73, BARI Alu-78, and BARI Alu-79 under zero tillage with rice straw mulch were 21.59 t/ha, 19.41 t/ha, 26.76 t/ha and 24.13 t/ha which provided 218 %, 229%, 301% and 203% higher yields than that of conventional tillage (9.88 t/ha, 8.46 t/ha, 8.89 t/ha and 11.85 t/ha respectively. The results indicated their decision regarding whether to adopt ZTPC practice was significantly influenced by training and visit to demonstration field. The impact on productivity with the adoption of the ZTPC practices investigated in this study was from 5995.72 kg to 6017.33 kg greater for adopters than non-adopters. Socioeconomic studies into adoption and scaling approaches are necessary for a proper technological transfer. For that, investment in training facilities is warranted to adopt and sustain ZTPC and increase potato farmers' income.

Adoption and profitability of BARI developed Potato varieties in Bangladesh

M. S. Akter, M. A. Rashid, M. M. H. Molla and M. M. Rahman

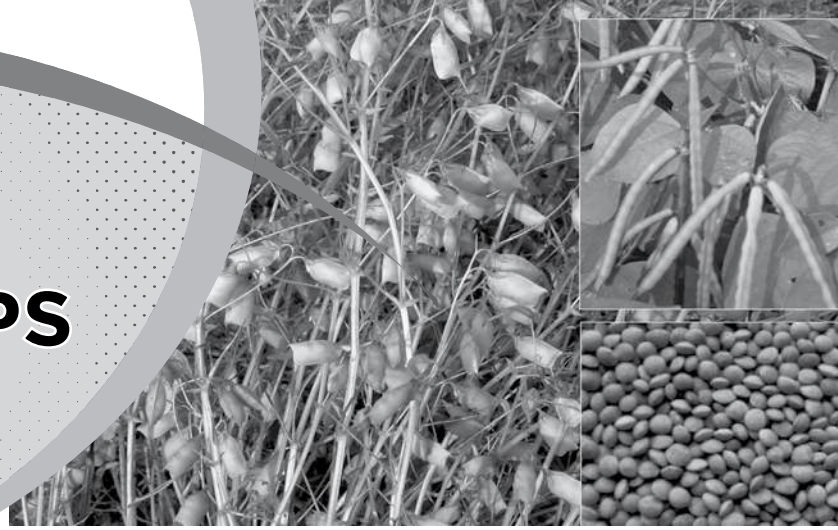
This study aimed to assess the adoption, input use, profitability, and marketing challenges associated with BARI developed potato varieties in Bangladesh. The study was conducted across three major potato growing districts namely Bogura and Joypurhat (in 2024), and Cumilla (in 2025). Data were collected from 150 households through random sampling between February and June of 2024 and 2025. Field survey data from 2024 and 2025 reveal that BARI Alu-7 (Diamont) dominates in Cumilla (82%), while BARI Alu-25 (Asterix) is most preferred in Bogura (44%) and Joypurhat (62%). The overall adoption of BARI varieties has increased from 86% in 2022–23 to 88.42% in 2024–25. BARI Alu-90 and BARI Alu-72 had low adoption, mainly due to seed unavailability and limited awareness. Region-wise Rangpur**,** Dinajpur, and Bogura contributed over 60% of total potato production. Input use analysis highlights excessive use of urea, TSP, and gypsum beyond recommended levels, while labour demand remains high (151 man-days/ha). In 2024, BARI Alu-90 in Bogura-Joypurhat achieved the highest BCR (2.08) and yield (34.48 mt/ha). BARI Alu-54, Alu-29, and Alu-25 also performed well. However, in Cumilla (2025**)**, BARI Alu-90's BCR dropped to 1.15 indicating a decline in profitability compared to the previous year, due to higher input costs and lower farmgate prices. Local varieties like Pakri and Sakila, though grown on small scales, achieved higher market prices but had lower yields. Farmers faced multiple challenges including high seed costs (96%), low-quality seeds (94%), and poor market access, especially in terms of unstable prices and limited storage. The declining BCR trend highlights the need for better input management, stable pricing and enhanced extension services to sustain profitability.

Technology transfer

Adaptive trial with high yielding Potato varieties in plain land ecosystems of Bangladesh

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

Adaptive trials with newly developed potato varieties were conducted at Bogura during 2024-25 to observe their performance. The adaptive trial was conducted at the farmer's field of Shibgonj, Bogura *Rabi*, 2024-25. The varieties viz. BARI Alu-7, BARI Alu-25, BARI Alu-35, BARI Alu-37, BARI Alu-40, BARI Alu-41, BARI Alu-47, BARI Alu-49 and BARI Alu-50 were evaluated in the study all the tested varieties produced satisfactory yield. Among them, the highest yield was recorded from BARI Alu-41 (44.67 t/ha), BARI Alu-40 (36.00 t/ha), BARI Alu-35 (37.66 t/ha), BARI Alu-47 (35.73 t/ha) and BARI Alu-37 (35.33 t/ha). Farmers accepted the varieties and demanded timely supply of quality seed.



PULSE CROPS

02

Varietal development

Blackgram (*Vigna mungo* L. Hepper) improvement

Confirmation F_1 generation of black gram

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

To confirm crosses between the parents is essential to advance the generation for variety development. Six F_1s obtained from *Kharif*-II, 2023 along with their parents were grown at Pulses Research Centre, Ishwardi, Pabna during *Kharif*-II, 2024. Based on phenotypic markers such as leaf color, stem pigmentation, leaf shape, time to flowering and maturity seventeen crosses were confirmed by comparing between two parents and harvested separately for the next year F_2 generation.

Growing and evaluation F_3 generation of black gram

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Eight F_3 populations were evaluated during *Kharif* II, 2024 at Pulses Research Centre, Ishwardi, Pabna to advance the generations. At maturity, one to two pods of each plant were collected and bulked crosswise/population wise. The bulked seeds from each population will be sown next year as F_4 generations.

Growing and evaluation of black gram F_4 generation

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Nine F_4 populations were evaluated during *Kharif* II, 2024 at Pulses Research Centre, Ishwardi, Pabna to advance the generations. At maturity, one to two seeds of each plant were collected and bulked crosswise/population wise. The bulked seeds from each population will be sown next year as F_5 generations.

Growing and evaluation of black gram F_5 generation

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Fourteen progenies of F_4s seed were grown as F_5S generation along with check BARI Mash-3 at Pulses Research Centre, Ishwardi, Pabna during *Kharif*-II, 2024. 15 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 F_6s generations.

Growing and evaluation of black gram F_6 generation

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Fifteen F_5 populations were sown on 22 August during *Kharif*-II, 2024 at Pulses Research Centre, Ishwardi, Pabna to advance the generation. At maturity, individual lines from each of the accessions 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.

Observation trial of black gram

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Sixteen entries selected from last season's F_6 trial were evaluated along with two check varieties BARI Mash-3 and BARI Mash-4 in *Kharif* II season of 2024 at Pulses Research Centre, Ishwardi, Pabna. Considering seed yield potential, five entries E14 (BBLXK2-018013-8), E7 (BBLXK2-018005-14),

E5 (BBLXK2-018005-3), E2 (BBLXK2-018001-4) and E4 (BBLXK2-018002-8) were selected for next year multi location trial under PYT

Preliminary yield trial of black gram

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Nine blackgram entries with two checks BARI Mash-3 and BARI Mash-4 were assessed for grain yield and its attributing traits under preliminary yield trial at Pulses Research Centre, Ishwardi in *Kharif* II, 2024. The genotypes were sown in randomized complete block design with three replications. Considering the plot yield and individual plant yield, four entries E3 (BBLXK2-017006-2), E8 (BBLXK2-017010-7), E10 (BBLXK2-017011-15) and E4 (BBLXK2-017006-4) were suggested for evaluating in next year as a RYT.

Candidate variety demonstration trial of black gram

M. S. Iqbal, M. J. Alam, M. S. U. Zaman, M. G. Azam, M. A. Zaman and M. M. Anwar

Seven blackgram entries with two checks BARI Mash-3 and BARI Mash-4 were assessed for grain yield and its attributing traits under candidate variety demonstration trial at Pulses Research Centre, Ishwardi in *Kharif* II, 2024. Considering the plot yield and individual plant yield, none of the entries outperformed the check varieties at Ishwardi location. However, the performance of these entries over other locations should be considered before the final recommendation.

Lentil (*Lens culinaris* Medik.) improvement
Hybridization of lentil

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Hybridization in lentil was carried out during the *Rabi* season of 2024–25 at the Pulses Research Centre, Ishwardi, Pabna, to develop high-yielding and Stemphylium blight-resistant varieties. Four parental lines were used in six different cross combinations, resulting in the successful harvest of 1281 hybrid seeds. These seeds will be sown in the upcoming season to confirm true F_1 plants.

Confirmation of F_1 plants in lentil

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Confirmation of successful crosses between parental lines is crucial for advancing generations in variety development. During the *rabi* season of 2024–25, fifteen F_1 hybrids developed in *rabi* 2023–24, along with their respective parents, were grown at the Pulses Research Centre, Ishwardi, Pabna. Phenotypic markers—including leaf color, stem pigmentation, flower color, leaf shape, presence or absence of tendrils, and time to flowering and maturity—were used to distinguish the F_1s from their parents. Based on these traits, fifteen true F_1 accessions were confirmed and harvested separately for advancing to the F_2 generation in the following season.

Growing and evaluation of lentil F_2 generation

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Four F_2 populations, along with the check variety BARI Masur-8, were grown at the Pulses Research Centre, Ishwardi, Pabna during the 2024–25 *rabi* season to advance the generation. Each population was harvested individually and bulked to retain greater genetic variability. The resulting seed lots will be grown in the next season as segregating F_3 populations.

Growing and evaluation of lentil F_3 generation

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Six F_3 populations were evaluated during the *Rabi* season of 2024–25 at the Pulses Research Centre, Ishwardi, Pabna, to advance generations. At maturity, one to two pods were collected from each plant and bulked by cross/population. The bulked seeds from each population will be sown in the following season as F_4 generations.

Growing and evaluation of lentil F_4 generation

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Five F_4 populations were evaluated during rabi2024-25 at Pulses Research Centre, Ishwardi, Pabna to advance the generations. At maturity, one to two seeds of each plant were collected and bulked

crosswise/population-wise. The bulked seeds from each population will be sown next year as F_5 generations.

Growing and evaluation of lentil F_5 generation

M. S. U. Zaman, M. A. Zaman, A. K. M. M Alam, and M. M. Anwar

Ten F_5 populations were evaluated during *rabi* 2024-25 at Pulses Research Centre, Ishwardi, Pabna to advance the generations. A total of 170 individual plants based on the disease reaction, number of branches, number of pods, days to maturity, plant height and plant type from ten crosses were selected and harvested separately for growing F_6 generation next year.

Preliminary yield trial of lentil

M. S. U. Zaman, M. A. Zaman, M. M. Hossain, M. J. Hossain, S. Kobir, A. K. M. M. Alamand and M. M. Anwar

The experiment was conducted during the *rabi* season of 2024–25 to evaluate the yield and yield-contributing traits of five promising lentil genotypes across five locations: Ishwardi, Gazipur, Madaripur, Jashore, and Jamalpur. Significant variation was observed across most locations for days to flowering, days to maturity, pods per plant, hundred-seed weight, and seed yield. Among the genotypes, BLX 16001-1 was the earliest to flower and mature. The highest number of pods per plant (83) was recorded in BLX 16009-15, followed by BLX 16009-5. In terms of yield performance, BLX 16009-5 produced the highest average seed yield (1209 kg ha^{-1}) across locations, representing an 8% increase over the check variety, BARI Masur-8.

Screening of lentil germplasm for resistance to stemphylium blight disease

M. S. U. Zaman, D. Sarker and M. A. Y. Akhond

Stemphylium blight (SB) is a major constraint to lentil production in Bangladesh. A total of 400 lentil germplasm were evaluated during 2023–24, followed by 133 germplasm in 2024–25, for their response to SB under field conditions at the PRC, Ishwardi, Pabna, and the RARS, Jashore. The analysis of variance revealed significant effects of genotype on disease severity and other yield-related traits. The mean disease severity varied across the geographical origin of germplasm (Bangladesh versus Canada), which was reflected in the frequency distributions of disease reactions. 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 SB resistance. Six accessions- 9507-4-1, LR26-138, LR59-121, LR26-78 and Crimson AGL in 2024 and seven accessions- 9527-22-1, LRIL 21-67, FLIP-95-1L, M-2, 9522-10-1, FLIP-87-70L and 87512 in 2025were found resistant to SB. 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. Zaman and M. A. Y. Akhond

Late-sown lentils face terminal heat stress during the reproductive stage, causing major yield losses. One hundred ninety-two germplasm were evaluated under field conditions, showing significant genotypic variation in stress response. Heat stress shortened phenology (DF, DM) by ~13–15%, reduced plant height by 5–14%, and decreased branching by 23–31%. The most severe effect was on filled pods (47–59% reduction), leading to yield losses of 58% at Rajshahi (Raj) and 68% at Ishwardi (ISD). Heritability was moderate to very high, while genotype × treatment interactions were limited. AMMI and GGE biplots revealed contrasting responses: genotype 188 had the highest yield but poor stability, while genotypes 22, 26, 85, and 167 performed moderately with high stability. The "which-won-where" analysis identified genotype 188 (along with 56 and 185) as superior in ISD in 2024, whereas genotypes 27, 136, and 134 were best adapted to Raj. Multi-trait selection (MTSI) highlighted several stable, high-yielding lines, including 188, 56, 34, 52, 116, 106, 153, 158, 59, 85, and 185.

Evaluation of lentil genotypes under controlled heat stress conditions

M. S. U. Zaman, M. Ashraful Alam and M. A. Y. Akhond

Heat stress significantly affected physiological and yield traits in lentil genotypes compared with the control. Total chlorophyll content declined across all genotypes, with M-2 retaining the highest relative level (78% of control), while BLX-13004-12 showed

the sharpest reduction (48%). Electrolyte leakage increased significantly under stress, indicating membrane injury, with BLX-13004-12 recording the greatest increase (126% of control) and ILL-5068 the least (87%). Leaf relative water content was generally reduced, although L-4147 maintained near-full levels (99% of control), contrasting with the marked decline in BLX-13004-12 (79%). Pod production was drastically reduced under heat stress, with BLX-13004-12 retaining only 3% of its control level, whereas M-2 and L-4147 showed better tolerance, maintaining about 30%. These findings highlight contrasting physiological responses among genotypes, with M-2 and L-4147 exhibiting superior heat tolerance compared to BLX-13004-12.

Abiotic Stress Breeding Approaches for Lentil Variety Improvement Program

Confirmation of heat tolerant F_1 generation of lentil through top and back crossing method

M. A. Zaman, M. Shahinuzzaman, M. J. Alam, M. G. Azam, and A. K. M. Alam

A total of 42 individual F_1s of heat tolerant lentil plants were confirmed from four top cross combinations and these individual single plants will be grown as a F_2s generation in the next growing season for advancement of segregating generations of heat tolerant lentil genotypes.

Growing of heat tolerant lentil F_2 generation

M. A. Zaman, M. Shahinuzzaman, M. J. Alam, M. G. Azam, and A. K. M. Alam

The maximum segregation and genetic variability is accomplished in F_2 generation of any hybridization program. With a close observation, selection of appropriate and desired combinations, Eight F_2s were grown along with BARI Masur-8 as a check variety at Pulses Research Centre, Ishurdi, Pabna during 2024-25. Selected individual plants were bulked and harvested from eight accession for advancement of segregating populations as F_3s generation in the next growing season.

Growing of lentil F_3 generation

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

Nineteen F_3 populations were evaluated during *rabi* 2024-25 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 F_4 generations.

On-farm trial of heat tolerant lentil genotypes

M. A. Zaman, Raziuddin, M. Shahinuzzaman, N. Nahar, M. S. Hossain, M. S. Kabir, M. M. Rohman, Akm. M. Alam, and M. M. Anwar

Before releasing the genotypes as a variety, 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-05002-3, LRIL-21-1-1-1-1-6, BLX-05002-6 including BARI Masur-8 as a check) for yield and yield contributing traits, stability and reaction against disease of root rot and *Stemphylium* blight of lentil at 6 different environment of lentil growing areas of Bangladesh during *Rabi* 2024-25. All genotypes were severely infested by foot rot disease of lentil except the genotypes BLX-05002-3, and BLX-05002-6. 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-05002-6were selected as advanced genotypes of lentil over the location for further evaluation in the next season under adaptive field trial at farmer's field of different lentil growing areas with replicated large plot.

Grass pea (*Lathyrussativus*, L.) Variety improvement

Season: *Rabi* 2024-25

Hybridization of grasspea (Set-I)

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

Hybridization of grass pea was conducted for creating diverse genetic variability with desired gene combinations within the existing germplasm at Pulses Research Centre, BARI, Ishurdi, Pabna during *rabi* 2024-25. Six parents with desired traits were used by following half diallel fashion and a total of 560 successful crossed seeds were collected from fifteen cross combinations that will be sown during the next season for confirmation of grasspea F_1 generations.

Hybridization of grasspea (Set-II)

M. A. Zaman, A. K. M. M. Alam, M. G. Azam, and M. M. Anwar

Hybridization of grasspea under set-ii were conducted within 6 parents during *Rabi* 2024-25 at PRC, BARI, BARI, Ishurdi, Pabna to develop a number of new segregates of grasspea with high yielding, early maturing and low ODAP content. Six parents with desired traits were used by following half diallel fashion. A total of 554 successful crossed seeds were collected and preserved in the -20ºC refrigerator for growing in the next growing season for confirmation of F_1s generation at Pulses Research Centre, BARI, Ishurdi.

Confirmation of grasspea F_1s generation

M. A. Zaman, M. M. Rahman, and A. K. M. M. Alam

Sixteen F_1s generation was grown for confirmation of F_1s generation based on single plant selection procedure comparing the phenotypic behavior of male parents at PRC, BARI, Ishurdi, Pabna during *rabi* 2024-25. A total of 49 single plants were confirmed as F_1s generation of grasspea from twelve cross combinations and these confirmed F_1s were harvested and preserved for growing in the next season as F_2s generation of grasspea at PRC, BARI, Ishurdi, Pabna

Growing of F_4 generation of grasspea

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

Nine F_4S progenies were sown on 29 November, 2024 at PRC, BARI, Ishurdi, Pabanin 4 meter long within 8 to 16 rows separately having a spacing of 50 × 10 cm under the generation advancement program of grasspea. Based on the their field performance and morphological view nine F_4S progenies for selected and seeds were bulked by single seed decent method and these bulked populations will be grown and evaluated as F_5s generation in the next season for advancement of grasspea segregating populations.

Growing of F_5 generation of grasspea

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

Genetic combination turns to more homozygous condition in F_5 and for this reason selection of family is done in this generation. To select appropriate and desired single plants from twelve F_5s cross combinations were grown along with check variety BARI Khesari-5 at Pulses Research Centre, Ishurdi, Pabna during *rabi* 2024-25. Finally, from these the bulked populations at total of 121 single plants were selected from the twelve cross combinations and these selected plants will be grown and evaluated as plant to rows system as F_6 generation in the next season for advancement of grasspea segregating populations.

Growing of grasspea F_6 generation

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

Genetic combination turns to more homozygosity in F_6s generations and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F_6s were grown along with check variety BARI Khesari-5 at Pulses Research Centre, Ishurdi, Pabna during *rabi* 2024-25. Finally, fourteen lines/families were selected which will be grown in the next year at observation trial (OT) for evaluation their yield performance in a replicated trial.

Observation trial of grasspea

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

Sixteen genotypes of grass pea along with two check BARI Khesari-3 and BARI Khesari-5 was evaluated as an "Observation Trail"at PRC, BARI, Ishurdi, Pabna during 2024-25 under Randomized Complete Block Design with 2 replications for evaluation their yield performance and agronomical traits. After evaluating the yield and yield contributing traits the genotypes BGX 18001-7, BGX 18001-11, BGX 18001-12, BGX 18002-1, BGX 18002-9, BGX 18002-10, BGX 18005-10, BGX 18006-1, and BGX 18006-2 were selected as higher yielder compare to the check varieties BARI Khesari-3 and BARI Khesari-5. So, these genotypes will be sown as the first multi-locational trial as Preliminary Yield Trail (PYT) at different grass pea growing region of Bangladesh.

Regional yield trial of grasspea

M. A. Zaman, M. M. Rahman, M. M. Hossain, N. Nahar, S. Mahmud, S. Kabir, and M. M. Anwar

The experiment was carried out consisting of five genotypes along with check variety BARI

Khesari-3, and BARI Khesari-5 at six different grass pea growing areasviz; Ishurdi, Madaripur, Jashore, Jamalpur, Joydebpur, Barishalduring *rabi* 2024-25 under Randomized Complete Block Design with three replicationto evaluate the performance yield and yield contributing traits. Considering the yield and yield contributing traits the genotypes IFLA 2736, IFLA 2781were selected for further evaluation as PVS trial at farmers field of the grasspea growing areas of Bangladesh.

Candidate variety demonstration trialof grass pea

M. A. Zaman, M. M. Rahman, M. Hossain, M. Z. Alam, S. Mahmud, M. M. Rahman, and A. K. M. M. Alam,

Three advance lines and two the check variety BARI Khesari-3 and BARI Khesari-5 were evaluated at different five locationsof grasspea growing regions of Bangladesh like Ishurdi, Madaripur, Jamalpur, Barishal,Gaibanda and Faridpur followed by a RCB design with 3 replications to evaluate the yield performance before release the variety. The check variety BARI Khesari-5 showed the maximum grain yield with maximum pods/plant, seeds/pod and bold seed. Considering mean value of yield, yield contributing traitsand other agronomical traits over the locations the genotypeIGYT-124 was selected by the variety evaluation committee for submission in National Seed Board under Seed Wing, Ministry of Agriculture, for registration as a new variety.

Adaptive yield trial of grasspea

M. A. Zaman, S. Mahmud, M. M. Rahman, M. Z. Alam. M. Rahman, and A. K. M. Alam

An adaptive yield trial of grasspea consisting of two promising lines along with BARI Khesari-5 as a check was conducted at four different locations of Bangladesh during the *rabi* 2024-25 to assess the yield performance over the locations. The trial was followed RCBD with three replications. Genotype IGYT-123 recorded the highest seed yield (1332 kg/ha), followed by IGYT-110 (1262 kg/ha), both exceeding the check BARI Khesari-5 (1197 kg/ha).

Evaluation of grass pea genotypes as a herbage (leafy vegetable) compare to yield in southern region of Bangladesh

M. M. Rahman, M. A. Zaman, S. Ahmaed, R. Uddin, M. M. R. Talikder and M. S. I. Khan

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 2024-25 at Regional Agricultural Research Station, BARI, Rahmatpur, Barishal 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 focuse 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 Kheseri-3 on the basis of herbage yield and organoleptic test. Among the tested entries these genotypes BGP-13010, IGYT-122 and BARI kheseri-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 Kheseri-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.

Evaluation of previously selected local and exotic grass pea advanced genotypes (3rd year) for genetic perspective (Earliness and high yielding) in Bangladesh

M. M. Rahman, M. A. Zaman, S. Ahmaed R. Uddin, M. M. R. Talikder and M. S. I. Khan

Thirty seven local and exotic grass pea germplasms were evaluated from previously selected 132 germplasm with five local checks BARI Kheseri-1, BARI Kheseri-2, BARI Kheseri-3, BARI Kheseri-5 and BARI Kheseri-6 at Regional Agricultural Research Institute (RARS), Rahmatpur, Barisal during *rabi* 2024-25. Among the thirty seven (37) genotypes

with 5 local checks; according to clustering on the basis of 80% days to maturity we found extra early 4 genotypes, early 10 genotypes and late 23 genotypes, on the basis of yield 15 genotypes high yield, 16 genotypes medium yield and 6 genotypes low yield. So we can consider 16 genotypes as an extra early and medium yield for observation trial in next year.

Evaluation of advanced grasspea genotypes in saline hotspot areas of Bangladesh

M. M. Rahman, M. Z. A. Talukder, S. Ahmed, M. K. Islam, M. Rahman, Ham. K Basher, M. Islam, S. Mandol, M. M. R. Talukder and M. S. I. Khan

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 biochemical responses in saline hotspot areas of Bangladesh on yield related traits in three locations *viz.*koera, Khulna; shamnagar, Sathkhira; and Kalapara, Patuakhali during *rabi* 2024-25. Significant variations were found among the genotypes across the environments. Considering yield and yield contributing characters with salinity label, among the tested ten genotypes 116690, 114585 and IGYT-125 were selected for earliness and yield in above three saline areas. The average yield of three tested genotypes across the locations were exceeded BARI Khesari-3. Therefore, these nine genotypes IGYT-125, 114585, IGYT-124, BGP-13010, BGP-13009, IGYT-123, IGYT-110, IGYT-122 and 116690 will be again selected in saline areas for next year. Among the grasspea lines, 116690, 114585, BGP-13009 and IGYT-125 had the highest levels of antioxidant enzymatic activity (POD, CAT, APX, GR and GST) in saline conditions. Considering yield, and antioxidant enzymatic activity, 116690, 114585, BGP-13009 and IGYT-125 were selected for next year trial. Overall observation we can say that above four genotypes showed a good performance in average salinity label (3.93 ds/m) was at germination stage, 5.56 ds/m was at reproductive stage and 8.06 ds/m was at mature stage in three locations.

Field screening of grasspea genotypes against heat

M. A. Zaman, S. Mahmud, M. M. Rahman, A. K. M. Alam, and M. M. Anwar.

High temperature at the terminal stage is a major abiotic constraint for the reduction of grasspea yield and seed quality. Thus, the selection of heat-tolerance genotypes is essential to identify either high yield potential or stable performance. Owning to select the genotypes of grasspea an experiment was conducted with 50 genotypes including local landraces, advanced breeding lines, commercial varieties and exotic germplasm under stress and non-stress conditions during 2024-25 at Pulses Research Centre (PRC), Ishurdi, Pabna and Regional Pulses Research Station (RPRS), Madaripur. Experiment were sown under two conditions: (1) set one was sown at optimum sowing time on 28-29 November (OS) at RPRS, Madaripur, and PRC, Ishurdi, Pabna respectively when day/night temperatures were below 32/8°C at their reproductive phase and (2) another set was sown on 29 December (LS), (one month delay compare to optimum sowing time) at both locations. All genotypes were arranged in an Alpha-lattice designand repeated two times with unit plot was 2.5 m long× three rows, the row to row distance was 50. Comparison the field performance and yield potentiality under stress and non-stress condition at both locations the genotypes BD 5651, BD 5667, BD 5659, BD 5515,BD 5654, BD 5556, Patuakhali local, BGP-13009, 114509, IGYT-122, BD 5648, and BD 5665 were selected for further evaluation in the next season with more stress condition.

Screening of grasspea germplasm for tolerance to waterlogging at seedling stage

M. S. U. Zaman and M. A. Zaman

Waterlogging is a major constraint to grasspea (Lathyrus sativus L.) productivity. Twenty-five genotypes were evaluated for yield-related traits under control and waterlogged conditions. ANOVA showed significant genotypic variation for all traits except total chlorophyll (Tchl), with waterlogging causing highly significant reductions across traits. Genotype × treatment interactions were significant for grain yield, branch, pods, shoot and root biomass, and root length, indicating differential stress responses. PCA of stress tolerance indices explained 56.7% of the variation, with shoot biomass and plant height strongly influencing genotype separation. Four contrasting genotypes were further assessed for physiological traits. BARI Khesari-2 and BK-2021-002 maintained comparatively higher biomass, yield (2.4–3.3 g/plant), and harvest index (33–47%) under stress, indicating strong tolerance, whereas

SEL-1327 exhibited pronounced reductions in these traits and was identified as highly susceptible. These results highlight key trait associations and identify tolerant genotypes for breeding waterlogging-tolerant grasspea.

Program: Chickpea (*Cicer arietinum* L.) Variety improvement

Season: *Rabi* 2024-25

Confirmation of chickpea F_1 generation

M. J. Alam, M. S. Iqbal, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

Fifteen cross combinations were grown along with their male and female parents in both sides during *rabi* season 2024-25 at PRC, Ishwardi, Pabna. A total of 32 individual F_1 S plants have been confirmed and harvested separately from fourteen cross combinations and those single plants will be grown as F_2 generation in next season.

Growing and evaluation of F_2 generation of chickpea

M. S. Iqbal, M. J. Alam, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

Fifteen F_2 segregates were grown along with two checks BARI Chola-5 and BARI Chola-10 to advance the generation at Pulses Research Centre, Ishwardi, Pabna during rabi, 2024-25. The total population was bulked and harvested for retention of more variability which will be grown as F_3 segregation generation in the next season.

Growing and evaluation of chickpea F_3 generation

M. S. Iqbal, M. J. Alam, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

Bulked population of ten F_{3s} accessions were grown along with two checks BARI Chola-5 and BARI Chola-10 to advance the generation at Pulses Research Centre, Ishwardi, Pabna during rabi, 2024-25. Again the population was bulked and harvested for retention of more variability which will be grown as F_4 segregation generation in the next season.

Growing and evaluation of chickpea F_4 generation

M. S. Iqbal, M. J. Alam, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

Nine F_4s progenies were evaluated and their seeds were bulked during rabi, 2024-25 and each of the individual single plants will be grown in an individual line as F_5s generation in the next season where family selection will be done.

Growing and evaluation of chickpea F_5 generation

M. J. Alam, M. S. Iqbal, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

Genetic combination turns to more homozygous in F_5 and for this reason selection of family is done in this generation. To select appropriate and desired combinations ten F_5s were grown along with check varieties at Pulses Research Centre, Ishwardi, Pabna. Finally seventy eight single plants were selected which will be grown in the next year following plant to row method.

Observation trial of chickpea

M. J. Alam, M. S. Iqbal, M. G. Azam, A. K. M. M. Alam and M. M. Anwar

The experiment was carried out to evaluate the performance of seventeen chickpea genotypes along with check varieties *viz.* BARI Chola-5 and BARI Chola-10 for yield and yield related traits at Pulses Research Centre, Ishwardi, Pabna during *rabi* 2024-25. Significant variations were observed for all the studied characters. Among the genotypes highest pods/plant was obtained from BCX-19003-13followed by BCX-19002-9. The genotype, BARI Chola-5 was small seeded and ICCV 171314 followed by ICCV 171315 was bold seeded among the tested entries. Highest yield was obtained from BCX-19007-10 followed by BCX-19009-3, BCX-19007-3, BCX-19009-8 and BCX-19002-9 while the lowest in ICCV 171309. Finally, eight entries were selected for next year PYT.

Regional yield trial of chickpea

M. J. Alam, M. S. Iqbal, N. Naher, M. S. Kobir, M. E. A. Pramanik, M. M. Rahman, S. Mahmud and M. M. Anwar

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 (1599 kg/ha) across the locations was found in genotype BCX-17007-3 followed by BCX-17007-

1 and BCX-17007-6 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-17007-3, BCX-17007-1 and BCX-17007-6were selected to evaluate next year under on-farm trial.

On-farm yield trial of promising chickpea genotypes

M. J. Alam, M. S. Iqbal, M. S. Kobir, M. E. A. Pramanik, M. A. Rahman, M. R. Hasan and M. M. Anwar

The trial was conducted at five 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 across the locations was found in genotype BCX 16006-4 followed by BCX 16006-2. 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 16006-4 is selected to release as a promising chickpea variety.

Program : fieldpea (*Pisumsativum*, L.) Improvement

Season : *Rabi* 2024-25

Hybridization of fieldpea

M. G. Azam, A. K. M. M. Alam, N. Naher and M. S. Uddin

Hybridization of fieldpea was conducted to obtain genotypes having desired gene combinations during rabi, 2024-25 at Pulses Research Centre, Ishurdi, Pabna. Five parents were used as half diallel fashion and a total of 346 successful crossed seeds were collected from ten cross combinations.

Growing and evaluation of F_2 generation of fieldpea

M. G. Azam, A. K. M. M. Alam, N. Naher and M. S. Uddin

The maximum segregation is attained in F_2 generation and with a view to select appropriate and desired combinations. Three F_2 segregates were grown along with check BARI Motor-3 to advance the generation at Pulses Research Centre, Ishurdi, Pabna during rabi, 2024. The total population was bulked and harvested for retention of more variability which will be grown as F_3 segregation generation in the next season.

Growing and evaluation of fieldpea F_4 generation

M. G. Azam, A. K. M. M. Alam, N. Naher and M. S. Uddin

Seven F_4S progenies were evaluated and their seeds were bulked during rabi, 2024-25 and each of the individual single plants will be grown in an individual line as F_5S generation in the next season where family selection will be done.

Growing and evaluation of fieldpea F_6 generation

M. G. Azam, A. K. M. M. Alam, N. Naher and M. S. Uddin

Genetic combination turns to more homozygosity in F_5 and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F_5s were grown along with check varieties at Pulses Research Centre, Ishurdi, Pabna. Finally, eighteen lines/families were selected which will be grown in the next year at observation trial.

Observation trial of short duration fieldpea

M. G. Azam, A. K. M. M. Alam, N. Naher and M. S. Uddin

Four families selected from last season's F_6 families were grown with check variety BARI Motor-2 during *rabi* season of 2024-25 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 highest yield (2350 kg/ha) was found in BFPX-17007-2 followed by BFPX-17006-1, BFPX-17008-1,BFPX-17004-2 and BFPX-17001-2. Based on yield performance, earliness nine entries were selected for next year PYT. Genotypes E6, E20, E10, E7, E4, E20, E24, E22, and E17 corresponding to breeding lines BFPX-17007-3, BFPX-17003-2, BFPX-17004-1, BFPX-17003-1, BFPX-17006-3, BFPX-17006-6, BFPX-17006-5, BFPX-17008-4, and BFPX-17005-1, respectively exhibited both early maturity and high yield potential. These traits make them particularly well-suited for cultivation in short-

season environments, where a limited growing window demands quick crop development without compromising productivity.

Preliminary yield trial of fieldpea

M. G. Azam, N. Naher, M. J. Alam, A. K. M. M. Alam, M. M. Rahman, R. Uddin, M. S. Kobir, M. M. Anwar and M. S. Uddin

The experiment was carried out to evaluate the performance of 11 fieldpea genotypes along with two checks BARI Motor-3 and BARI Motor-4 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 Agricultural Research Station, Barishal (Bar) during *rabi* 2024-25. 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 17002-7 flowered and matured earlier than the other genotypes. The highest plant height was recorded in BFPX 17001-3 followed by BFPX 17005-4 and BFPX 17001-11 in all locations. The genotypes BFPX 17001-3 exhibited the highest number of pods per plant among the tested genotypes. The highest hundred seed was found in BFPX 17001-11 and lowest showed in the genotype BFPX 17002-7. In the current study, as depicted by the mean seed yield of 13 genotypes ranged 1277 kg/ha (BFPX 17005-4) to 1583 kg/ha (BFPX 17002-7). The maximum yield was demonstrated in BFPX 17002-7 (1583 kg/ha) followed by BFPX 17005-1 (1578 kg/ha), BARI Motor-4 (1575 kg/ha) and BFPX 17001-3 (1567 kg/ha). The results reveal significant genotype × environment interaction. Jashore and Ishurdi emerged as high-potential sites for evaluating and selecting superior genotypes. Gazipur was the most challenging site, where no genotype performed satisfactorily, suggesting stress-prone conditions. Barishal offered moderate productivity, making it suitable for testing stability rather than maximum yield. As revealed by GGE biplots and average seed yield across locations, the genotype the genotypes BFPX 17003-8 (E11), BFPX 17001-3 (E12), BFPX 17005-7 (E9), 17002-7 (E13) and BFPX 17005-1 (E3) identified as most adapted line and stable performer with negligible G × E interaction and high yield could be used directly as variety.

Confirmation of cowpea F_1 generation

M. A. Zaman, M. M. Rahman and A. K. M. Alam

Advancement of F_1 generations, 9 F_1 generations and six parentage both sides of the cross combinations were grown at RARS, BARI Rahmatpur, Barishal during *rabi* 2024-25 for confirmation of theF_1 generations. at PARS, BARI, Rahmatpur, Barisal. F_1 generations were critically observed with the parentage and finally seven cross combinations weresuccessful confirmed and given the new accession number. A total of 142 pods were harvested from the seven confirmed F_1 generations stored at PRC, cool storage for further advancements of the generation as F_2 generations during the next coming season.

Candidate variety demonstration of cowpea

M. A. Zaman, M. M. Rahman, S. Hossain, K. M. K. Bashar, M. R. Hasan, A. K. M. M. Alam, M. M. Anwar

The experiment was conducted with consisting of four cowpea genotypes including BARI Felon-1 as a check variety during *rabi* 2024-25 at two research stations like Regional Agricultural Research Station (RARS), BARI, Hathazari, Chattogram, and Rahmatpur, Barishal at two different farmers field viz., Bhola, and Patuakhali district under supervision of OFRD for evaluation the yield performance of cowpea promising germplasm. The genotypes TVU-16253, and TVU-1637 was selected as maximum grain yielder and the genotype TVU-1886 was selected for synchronizing and early maturing genotypes that could be selected for as synchronized and shortmaturing variety of cowpea.

Mungbean (*Vigna radiata* L. Wilczek) improvement

Hybridization in mungbean

A. K. M. M. Alam, M. G. Azam, and M. J. Alam

Hybridization program was conducted during *Kharif*-I, 2025 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 F_1 genetration

A. K. M. M. Alam, M. G. Azam, and M. J. Alam

Eighteen F_1s obtained from *Kharif*-I, 2024 were grown along with their parents on both sides at Pulses Research Centre, Ishurdi, Pabna during *Kharif*-I, 2025. On the basis of desired characters 100 single plants were confirmed from twelve cross combinations and that were labelled with new accession number. The confirmed F_1s will be grown on the next season as F_2s generations.

Growing and evaluation of mungbean F_2 generation

A. K. M. M. Alam, M. G. Azam, and M. J. Alam

With a view to selecting appropriate and desired combinations, Eleven F_2s were grown along with BARI Mung-6 as a check at Pulses Research Centre, Ishurdi, Pabna during *Kharif* I, 2025. 10 -35 plants were selected from each progeny and harvested separately for retention of more variability which will be grown in F_3 generation in the next season.

Growing and evaluation of mungbean F_3 generation

A. K. M. M. Alam, M. G. Azam, and M. J. Alam

Six F_3s were evaluated and 16-31 plants were selected from each progenies during *Kharif*- I, 2025 and these plants will be grown and evaluated as F_4s generation in the next season for advancement of mungbean segregating populations.

Growing and evaluation of mungbean F_4 generation

A. K. M. M. Alam, M. G. Azam, and M. J. Alam

For advancement of the segregation generations of mungbean from F_4 to F_5 based on phenotypic view with desired genes combinations eleven F_4s generations were grown along with check BARI Mung-6 at Pulses Research Centre, Ishurdi, Pabna during *Kharif*-I, 2025. 9-19 plants were selected from each progeny and harvested separately which will be grown in F_5 generation in the next season.

Growing and evaluation of mungbean F_5 generation

A. K. M. M. Alam and M. G. Azam

Genetic combination turns to more homozygous condition in F_5 and for this reason selection of family is done in this generation. For advancement and attaining more homozygosity in filial generations of mungbean, six progenies of F_4s seed were grown as F_5S generation along with check BARI Mung-6 at Pulses Research Centre, Ishurdi, Pabna during *Kharif*-I, 2025. 14-18 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 F_6s generations.

Growing and evaluation of mungbean F_6 generation

M. G. Azam, A. K. M. M. Alam and M. J. Alam

Genetic combination turns to more homozygosity in F_5 and for this reason selection of family is done in this generation. To select appropriate and desired combinations nine F_5s were grown along with check varieties at Pulses Research Centre, Ishurdi, Pabna. Finally, thirty four lines/families were selected which will be grown in the next year at observation trial.

Observation trial of mungbean

M. G. Azam, A. K. M. M. Alam and M. J. Alam

Twenty six lines from ten families selected from last season's F_6 treated as lines. The twenty six lines with two check varieties BARI Mung-6, BARI Mung-7 grown in *Kharif*-I season during 2025 at Pulses Research Centre, Ishurdi, Pabna followed RCB design with two replications. Genotype BMXK1-18004-2 performed best in terms of yield (1852 kg/ha), with early maturity (65 days) and higher pod number (21.4). BMXK1-18010-13 also showed promising performance with the highest pods per plant (26.7) and good yield (1625 kg/ha). Early maturing line BMXK1-18002-9 combined short duration (64 days) with a reasonably high yield (1547 kg/ha), suitable for relay/intercropping. Compared to check varieties, five advanced lines BMXK1-18004-2, BMXK1-18002-9, BMXK1-18003-4, BMXK1-18005-14 and BMXK1-18010-13 outperformed BARI Mung-6 and BARI Mung-7, showing potential for evaluate as PYT in next *kharif* season.

Preliminary yield trial of mungbean (Set-I)

M. G. Azam, A. K. M. M. Alam, M. M. Rashid, S. Kobir, M. M. Rahman and M. M. Anwar

A preliminary yield trial (PYT) of twelve mungbean genotypes, including the checks BARI Mung-6 and

BARI Mung-8, was conducted during *Kharif*-I, 2025 at four locations in Bangladesh (Barishal, Ishurdi, Jashore, and Madaripur) to find out desirable genotypes of mungbean using yield and yield-contributing traits. Significant differences were observed among genotypes and environments for days to flowering, maturity, plant height, pods per plant, and seed yield. Days to flowering ranged from 36 to 38 days on average, while maturity was completed within 63–66 days. Plant height varied widely (49–57 cm), with taller plants generally recorded at Ishurdi. Pods per plant ranged from 21 to 26, and 100-seed weight varied between 3.74 g and 4.62 g, with Ishurdi producing the heaviest seeds. Mean seed yield across environments ranged from 919 to 1264 kg ha^{-1}, with BMXK1-17002-26-2, BMXK1-17004-17-1, and BMXK1-17008-2-1 outperforming the standard checks. Among locations, Jashore was identified as the most favorable environment (1317 kg ha^{-1}), while Barishal was the least productive (957 kg ha^{-1}). The study identified high-yielding and promising genotypes that may be advanced to Regional Yield Trials (RYT) for further evaluation and possible release as improved mungbean varieties adaptable to diverse environments in Bangladesh.

Preliminary yield trial of mungbean for export quality (Set-II)

M. G. Azam, A. K. M. M. Alam, M. M. Rashid, S. Kobir, M. M. Rahman and M. M. Anwar

The present study was conducted during *Kharif*-I, 2025 at four locations in Bangladesh (RARS, Barishal; PRC, Ishurdi; RARS, Jashore; and RPRS, Madaripur) to identify desirable mungbean genotypes for yield and yield-contributing traits. Ten genotypes, including the check variety BARI Mung-6, were evaluated in RCBD with three replications. Significant variability was observed among genotypes across environments for phenological, morphological, and yield-related traits. Days to flowering ranged from 25 to 44, while maturity varied between 64 and 66 days. Plant height differed considerably, with BMB-2023003 producing the tallest plants (61.17 cm). Pods per plant varied from 21 to 23, while 100-seed weight (HSW) ranged from 5.18 g (BMB-2018001) to 5.98 g (BMB-2023001). Seed yield varied between 978 kg ha^{-1} (BMB-2018001) and 1160 kg ha^{-1} (VI000470 AG). Overall, VI000470 AG emerged as the most promising genotype, combining higher seed weight (5.78 g) with the highest yield (1160 kg ha^{-1}), while BMB-2023003 and BMB-2023001 also showed potential by combining larger seed size with competitive yields. Among the genotypes, VI000470 AG, BMB-2023002, BMB-2023001 and VI001339 AGconsistently outperformed the standard check BARI Mung-6, demonstrating higher yield with bold seed and broader adaptability. The study identified high-yielding and promising genotypes that may be advanced to Regional Yield Trials (RYT) for further evaluation and possible release as improved mungbean varieties adaptable to diverse environments in Bangladesh.

Preliminary yield trial of aromatic mungbean (Set-III)

M. G. Azam, A. K. M. M. Alam, M. A. H. M. Kamal and M. M. Anwar

A preliminary yield trial (Set-III) was conducted during *kharif*-II, 2024 at two locations (Ishurdi and Thakurgaon) in Bangladesh to evaluate the performance of thirteen aromatic mungbean genotypes for yield and yield-contributing traits. Significant variability was observed among genotypes for phenology, growth, and yield attributes. Days to flowering ranged from 36 to 48 days, while maturity duration varied between 61 and 74 days. Plant height exhibited wide variation (30.83–51.32 cm), and pods per plant ranged from 8.5 to 20. Considerable differences in seed size were recorded, with 100-seed weight ranging from 2.28 g to 3.69 g. Grain yield varied substantially across genotypes and locations, with mean yields ranging from 755 kg/ha (BMB-2018008) to 1204 kg/ha (BMB-2018007). Genotypes BMB-2018007, BMB-2018005, BMB-2018006, BMLX900010/52/44 demonstrated superior performance by combining higher yields with desirable agronomic traits. These genotypes may be considered promising candidates for advancement to multi-location adaptive trials for potential release.

Observation trialof heat tolerant mungbean exotic lines

M. A. Zaman, A. K. M. M. Alam and M. M. Anwar

For mitigation the climate change effect heat tolerant mungbean is essential for enhancing the mungbean

production in the coastal and north-western part of Bangladesh. As collaborative research programs between BARI and World Vegetable Centre, PRC, BARI screened some heat tolerant mungbean genotypes on last two years. As continuing research under improvement of heat tolerant mungbean genotypes eight heat tolerant mungbean exotic genotypes viz., AVMU 21212 (142), AVMU 21214(144),AVMU 2121(145), AVMU 21231 (150), AVMU 21232(151), AVMU 21245(159), and AVMU 81were evaluated under the first replicated trial titled on "Observation Trial" with design RCB and two replications to evaluate the yield potentiality of the screening genotypes comparing our popular check variety BARI Mug-6. Finally six heat tolerant mungbean genotypes viz., AVMU 21232 (151), AVMU 81, AVMU 21231 (150), AVMU 21212 (142), AVMU 21214 (144), and AVMU 21245 (159) were selected for preliminary yield trial in the next year at multi-location yield trial under late sowing condition.

Observation trial of thrips resistance mungbean exotic lines

M. A. Zaman, A. K. M. M. Alam and M. M. Anwar

Mungbean is a climate smart food legume crops globally but its production is declining due to due to different biotic and abiotic constraints. Among biotic constraints insect pest infestation is the serious constraints for mungbean cultivation. About 64 insect pest have been reported in mungbean globally and among them insect pests thrips is one of the most devastating sucking pest. For mitigation thripsinfestation in mungbean World Vegetable Centre developed some thrips resistance mungbean breeding lines. As a part of collaborative research in between BARI and WVC, PRC received some thrips resistance mungbean lines in 2023. After last two years research in PRC identified 20 thrips resistance mungbean exotic lines. These 20 exotic lines and BARI Mug-6 were evaluated in the replicated trial titled on "Observation Trial" with RCBD and two replication at PRC, BARI, Ishurdi, Pabna during *Kharif*-1 2025. Considering the yield, yield contributing traits and morphological characters in research field nine genotypes viz; AVMU 1659, AVMU 908, AVMU 1690, AVMU 1694, AVMU 1024, AVMU 1683, AVMU 1681, AVMU 2017, and AVMU 2076 were finally selected for further evaluation in the multi-location trial in Preliminary Yield Trial (PYT) over mungbean growing areas of the country in next cropping season.

Crop management and climate change

Bio-fortification of chickpea through water soluble zinc sulfate

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, Ishwardi, Pabna during two years *rabi* season of 2023-2024 and 2024-2025, respectively to find out the response of chickpea to nodulation, zinc bio fortification, seed quality and yield. The experiment was laid out in RCBD with three replications and assigned 6 different treatments. The treatments were T_1= Native fertility, T_2= Soil $ZnSO_4$ @ 2 kg ha^{-1}, T_3= Soil $ZnSO_4$ @ 5 kg ha^{-1}, T_4= Foliar spray $ZnSO_4$ @ 0.1% at before flowering stage, T_5= Foliar spray $ZnSO_4$ @ 0.2% at flowering stage and T_6= Soil $ZnSO_4$ @ 2 kg ha^{-1} and foliar spray $ZnSO_4$ @ 0.2%at flowering and poding stage. The two years mean results revealed that all the treatment showed statistically identical effect on plant height, nodule number plant-1, pod plant-1, nutrient contents and seed yield of chickpea. The higher mean seed yield (2117 kg ha^{-1}) was found in (T_6) and the lower seed yield (1197 kg ha^{-1}) were obtained from the control (T_1). Yield increased over control was (43-31%). The maximum gross margin and BCR were found in soil application 2 kg $ZnSO_4$ and spray $ZnSO_4$ @ 0.2% solution at flower & poding (T_6).

Effect of biofertilizer and phosphorus levels on growth and yield of black gram

M. S. Alam, M. M. Kamal and M. M. Anwar

Bio-fertilizers are cost-effective and ecofriendly in nature and their continuous usage enhances soil fertility and the major responsibility of bio-fertilizer is availability phosphorus in soil. A field experiment was conducted at PRC, BARI, Ishwardi, Pabna during *Kharif*-2 season during two years 2024 and 2025 to find out the response of black gram to bio-fertilizer and levels of phosphorus on growth and yield. The experiment was laid out in RCBD with

assigned 7 different treatments. The treatments were T_1 = Native fertility, T_2= RD (Recommended dose), T_3= Rhizobium, T_4= Rhizobium + P_6 kg ha^{-1}, T_5= Rhizobium + P_{12} kg ha^{-1} T_6= Rhizobium + P_{18} kg ha^{-1} (RD) and T_7= Rhizobium + P_{27} kg ha^{-1}, $N_{18}K_{20}S_{10}B_2$ kg ha^{-1} are at blanket dose or flat rate for all treatment. The results revealed that Rhizobium + P_{18} kg ha^{-1} (RD) (T_6) showed significant effect on nodulation and yield of blackgram. The maximum mean seed yield (1427 kg ha-14 ha^{-1}) was obtained from (T_6) and the minimum mean seed yield (958 kg ha^{-1}) was recorded in the control (T_1). The higher mean nodule number plant^{-1} (49.58) was found in T_6 at flowering stage while the lower mean nodule number plant^{-1} (21.42) was in control at same stage. Mean yield increased over control (12.27-32.87 %). The upper mean gross margin (Tk 87105 ha^{-1}) and BCR (2.25) were found in Rhizobium + P_{18} kg ha^{-1}. Rhizobium treated seed with N_{18} $P_{18}K_{20}S_{10}B_2$ recommended dose of fertilizer performed better in blackgram production.

Effect of integrated weed management on growth and yield of mungbean

A. A. Begum, M. S. Alam, M. A. Rahman, M. R. Karim, M. Z. Ali, S. T. Zannat and M. A. K. Mian

An experiment was conducted at PRC field, Ishwardi, Pabna during *Kharif*-1season 2025 to find out suitable and economic weed management practice for mungbean. Treatments were:T_1 = Two hand weeding (HW) at 25 and 45days after sowing (DAS), T_2 = Bentazone 48 SL @ 1.5 L/ha at spraying at 2-3 leaf stage of weed, T_3 = Pendametheline 33% EC @ 2 L/ha at 3 DAS, T_4 = Pendametheline 33% EC @ 2 L/ha at 3 DAS + HW at 25 DAS, T_5 = Pendametheline 33% EC @ 2 L/ha at 3 DAS + Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 30 DAS, T_6 = Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 15 DAS, T_7 = Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 15 DAS + HW at 25 DAS, T_8 = BARI wider at 25 and 45 DAS, T_9 = Spading at 25 and 45 DAS, and T_{10} = Control (No weeding) were laid out in a RCB design with three replications. Among the treatments, Two hand weeding (HW) at 25 and 45 days after sowing (DAS), Pendametheline 33% EC @ 2 L/ha at 3 DAS + HW at 25 DAS, and Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 15 DAS + HW at 30 DAS performed better. If two hands weeding at 25 and 45 DAS gave higher yield, economic performanceand effective for weed control but the high production cost due to labor availability and wage associated with this method increases the overall production expenses. So, Pendametheline 33% EC @ 2 L/ha at 3 DAS + HW at 25 DAS showed also the higher seed yield (1645 kg ha^{-1}), weed control efficiency (90 %) and intensity of infestation was 1.3. Yield increased over control 51% in same treatment and also gave better economic performance representing higher gross return (Tk. 113200 ha^{-1}) and gross margin (Tk. 50853ha^{-1}).Therefore, Pendametheline 33% EC @ 2 L/ha at 3 DAS + HW at 25 DAS would be most remunerative and effective weeding method for controlling weeds with higher seed yield of mungbean during *kharif*-1 at Ishwardi, Pabna (AEZ 11). This technology can be adopted at field level.

Validation of performance of herbicides for controlling weeds in field pea

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

A field experiment was conducted at the Regional Pulses Research Station (RPRS), Madaripur during 2024-25 to find out the performance of herbicides for controlling weed in field pea. Six treatments were viz. T_1: Panida-33EC (Pendimethaline @ 5mlL^{-1} water), T_2: Weednil (Quizalofop-p-ethyle@ 1.5 ml L^{-1} water), T_3: Panida-33EC and Weednil, T_4: Panida + Hand weeding at 30 DAE,T_5: Hand weeding at 15 DAEand T_5: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Panida + Hand weeding gave the maximum weed control efficiency, higher seed yield and the maximum gross return. Therefore, Panida + Hand weedingwas a better option to control weeds in field pea.

Validation of performance of herbicides for controlling weeds in grasspea

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

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2024-25 to determine the performance of the herbicides for controlling weeds in grass pea. Six treatments were viz. T_1: Panida-33EC (Pendimethaline @ 5ml L^{-1} water), T_2: Weednil (Quizalofop-p-ethyle@ 1.5 ml L^{-1} water), T_3: Panida-33EC and Weednil, T_4: Panida + Hand weeding at 30 DAE, T_5: Hand weeding at

15 DAE and T_5: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Panida+ Hand weeding gave higher pods plant^{-1}, and consequently gave higher yield and the maximum return. On the other hand, Weednil gave higher gross margin and MBCR due to lower variable costs. Therefore, Panida+ Hand weeding was a better option to control weeds in grass pea.

Validation of the performance of herbicides for controlling weeds in chickpea

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

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur during 2024-25 to determine the performance of the herbicides for controlling chickpea weed control. Six treatments were viz. T_1: Panida-33EC (Pendimethaline @ 5ml L^{-1} water), T_2: Weednil (Quizalofop-p-ethyle@ 1.5 ml L^{-1} water), T_3: Panida-33EC and Weednil, T_4: Panida + Hand weeding at 30 DAE, T_5: Hand weeding at 15 DAE and T_5: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Panida+ 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+ Hand weeding was a better option to control weeds in chickpea.

Validation of performance of herbicides for controlling weeds in lentil

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

A field experiment was conducted at Regional Pulses Research Station (RPRS), Madaripur, during 2024-25 to find out the performance of herbicide for controlling weeds in lentil. Six treatments were viz. T_1: Panida-33EC (Pendimethaline @ 5ml L^{-1} water), T_2: Weednil (Quizalofop-p-ethyle@ 1.5 ml L^{-1} water), T_3: Panida-33EC and Weednil, T_4: Panida + Hand weeding at 30 DAE, T_5: Hand weeding at 15 DAE and T_5: Control (No Weeding). Herbicides were applied at moist condition of soil after seed sowing. Panida+ 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+ Hand weeding was better option to control weeds in lentil.

Growth and yield of grass pea 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 2024-25 in the research field of Regional Pulse Research Station, Madaripur to find out the effect of foliar spray of potassium nitrate on grasspea 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. Foliar spray of potassium nitrate at 50 % flowering stage in grass pea had the significant effect of yield and yield contributing traits.

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 2024-25 to assess the agronomic productivity, soil health and economic profitability of tillage and residue retention in rice-based systems. The results showed that the seed yield was the highest in Conventional tillage (1215 kg/ha) and the lowest in No-tillage (604 kg/ha). However, this study will be continued for a long-term period to a concrete conclusion.

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 2024-25 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 viz. CP_1 = Mustard (cv. BARI Shorisha-14) – Mungbean (BARI Mung-8) – Jute (Bongobir)-T. Aman (cv. BRRIdhan-75); CP_2 = Lentil (cv. BARI Masur-8) – Mungbean (cv.BARI Mung-8) – Jute (cv.Bongobir)-T. Aman (cv. BRRIdhan-75); CP3

= Fieldpea (cv. BARI Motor-3) – Mungbean (cv. BARI Mung-8) – Jute (cv.Bongobir) -T. Aman (cv. BRRIdhan-75); CP_4= Potato (cv. BARI Alu-75) – Mungbean (cv.BARI Mung-8) – Jute (cv. Bongobir)-T. Aman (cv. BRRIdhan-75); CP_5= Chickpea (cv. BARI Chola-11) –Jute (cv.Bongobir) -T. Aman (cv. BRRIdhan-75) ; CP_6= Grasspea (cv. BARI Kheshari-6) –Jute (cv.Bongobir). T. Aman (cv. BRRIdhan-75). The highest rice equivalent yield (REY) was obtained from the cropping pattern CP4 and the lowest rice equivalent yield was obtained from the cropping pattern CP_5 . 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 CP_1 [Mustard –Mungbean – Jute (Fibre) -T.aman] could be another profitable cropping pattern due to a higher gross margin than CP2, CP3, CP5 and CP6.

Response of rhizobium and trichoderma on yield of blackgram at Madaripur

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

A field experiment was conducted at Regional Pulses Research Station, Madaripur during the *Kharif*-II season of 2024–25 to assess the impact of *Rhizobium* and *Trichoderma* inoculants on the growth and productivity of blackgram (BARI Mash-3). The experiment was followed RCBD with six treatments. Treatments included applications of Lycomax and Bioderma (a *Trichoderma*-based product), Rhizobium (BARI RVm-301) and their combinations, alongside a control. Although none of the parameters showed statistical significance, numerical differences suggested that Rhizobium combined with Bioderma resulted in the highest seed yield (1132 kg/ha) and superior growth characteristics.

Response of rhizobium and trichoderma on yield of lentil at Madaripur

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

An experiment was conducted at Regional Pulses Research Station, Madaripur during the *rabi* season of 2024–25 to evaluate the impact of *Rhizobium* and *Trichoderma* inoculants on the growth and productivity of lentil. The study was laid out in RCBD with six treatments and replicated accordingly. The treatments included individual and combined applications of Rhizobium (BARI RLC-107), Lycomax and Bioderma (a Trichoderma-based product) and control. Significant differences were observed in yield, the combination of Rhizobium + Bioderma recorded the highest seed yield (1692 kg/ha) and lowest the control (1205 kg/ha) while other traits such as plant height, pods per plant, and seed weight did not show statistical significance.

Agronomic biofortification of chickpea with zinc through application of zinc fertilizer

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

The experiment was conducted at Regional Agricultural Research Station, Jashore during *Rabi* 2024-25. The experiment was conducted considering five different treatments. Among the treatments foliar $ZnSo_4$ (21% Zn) @ 0.5% at flowering and pod formation stage revealed the best method for agronomic biofortification of chickpea with Zn.

Lentil and chickpea intercropping performances

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

The experiment was conducted at Regional Agricultural Research Station, Jashore during *Rabi* 2024-25. The experiment was conducted considering different legume–legume intercropping system viz. T_1 =1:1 (Lentil: Chickpea), T_2 =2:1 (Lentil: Chickpea), T_3 =3:1 (Lentil: Chickpea), T_4=4:1 (Lentil: Chickpea), T_5=(80% lentil+20% chickpea) mixed cropping, Sole Lentil, Sole Chickpea in RCB design with 3 replications. Lentil and chickpea crop ratio of 2:1 in the same field was the best combination considering different intercropping performance indices.

Effect of rhizobium bio-fertilizer on productivity and nutritional quality of grasspea varieties

S. Aktar

The experiment was conducted at BARI, Gazipur during *Rabi* season of 2024-2025 to evaluate the effect of rhizobium bio-fertilizer on productivity and nutritional quality of grasspea varieties. The experiment consisted of eight treatment combinations and three replications and laid out in RCBD with two factors. The *Rhizobium* strain BARI RLs-10 was used for the experiment. The selected varieties were BARI Khesari-2, BARI Khesari-3, BARI

Khesari-5 and BARI Khesari-6. The above varieties were tested with or without *Rhizobium* inoculation. BARI Khesari-3 performed the best than other three varieties in respect of different parameters viz. plant height, nodule number, root and shoot dry weight and seeds pod^{-1}, N uptake by seeds and stover, N and protein content in seed. *Rhizohium* inoculation significantly increased plant height, nodule number, root and shoot dry weight, number of branch plant^{-1}, seed yield and stover yield. N content in seeds and stover, N uptake by seeds and stover, protein content in seed was increased significantly compared to non-inoculation treatment. Interaction effects revealed that BARI Khesari-3 with inoculation treatment gave the highest nodulation, seed yield and other parameters compared to other varieties with non-inoculation treatment.

Crop Protection

Identification and characterization of root rot pathogens of lentil

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

Root rot disease is one of the major threats to the production of 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 2024 to March 2025 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 resistance.

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 2024-25. Forty-seven lentil 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 to be 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 A. K. M. 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 A. K. M. M. Alam

The experiment was conducted at the Pulses Research Sub-center, BARI, Gazipur, and the Pulses Research Centre, Ishurdi, Pabna, during 2024-25 to identify effective fungicides and biological agents for

controlling foot and root rot disease of lentil. Eight fungicides were tested for their efficacy against the disease, with the susceptible variety BARI Masur-1 used as a control treatment. The lowest foot and root rot (5.56 % & 7.06 %) was obtained from seed treatment with Provax 200 WP (Carboxin + Thiram) and Companion (Mancozeb + Carbendazim) @ 3 g/kg, and the highest incidence (19.98 % & 40.40 %) was obtained from the untreated control. The highest yield (1760 & 1758 Kg/ha) was obtained from seed treatment with Provax 200 WP and Companion @ 3 g/kg, respectively, and the lowest yield was obtained from untreated control plots (1152 & 1263 Kg/ha).

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

M. Z. Rahman, D. Sarkar, Raziuddin and A. K. M. M. Alam

The experiment was conducted at Pulses Research Sub-Center, BARI, Gazipur, and Pulses Research Centre, Ishurdi, Pabna during 2024-2025 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, Cabritop, 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 the biological control approach.

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

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

The experiment was conducted at PRSC, BARI, Gazipur during 2024-25 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 (6.79 %) was obtained from the seed treatment with seed treatment with Autostin 50WDG (Carbendazim) @ 0.2%+ Spraying with Goldazim 500 SC (Carbendazim) @ 0.1% at 25 DAS and the highest incidence (23.31%) was obtained from untreated control. The highest seed yield (1321 Kg/ha) was recorded in seed treatment with Autostin 50WDG (Carbendazim) @ 0.2%+ Spraying with Goldazim 500 SC @ 0.1%, and the lowest yield was obtained from the untreated control plot (1047 Kg/ha).

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

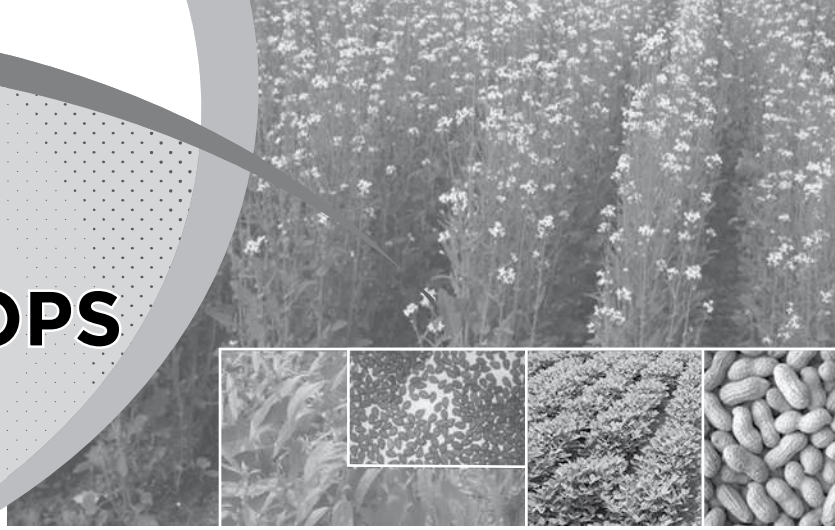
M. Z. Rahman, D. Sarkar, Raziuddin and A. K. M. M. Alam

The experiment was conducted at PRSC, BARI, Gazipur during 2024-25 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 Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 1 ml/L and the highest incidence (60.00%) was obtained from untreated control. The highest seed yield (2276 Kg/ha) was recorded in Amistar Top 325 SC treated plots, and the lowest yield was obtained from the untreated control plots (1587 Kg/ha).

Effects of tillage and P management under conservation agriculture on root rot disease management

D. Sarkar, Z. Rahman, A. Rahman and M. Anwar

The root rot disease is one of the major threats to the production of lentil in Bangladesh. A Conservation Agriculture (CA) experiment was conducted to identify suitable tillage systems for lentil production, as well as for managing root rot disease. Soil moisture is essential for the development of Root Rot disease (RRD). This season's root rot disease was relatively lower than last year's, since there was no rainfall following the sowing. Among the tillage systems, all tillage were provided good results for the management of root rot disease, but at the later stage, Stemphylium Blight disease was observed, and there is a significant difference among the tillage practices. The highest nodules per plant (9) at 60 DAS was observed in NT practice whereas lowest was found at ST practice STB disease was lower at NT with RD P fertilizer (30%) and ST with HD P fertilizer showed highest (60%) STB Disease. In grain yield, HD of P fertilizer showed higher yield (1369 kg/ha) compare to RD and LD. In the future, an in-depth study will be needed to further identify soil microorganisms under different tillage systems.



OILSEED CROPS

03

Oilseeds

Rapeseed-Mustard

Crop Improvement

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.

Collection of rapeseed mustard germplasm

D. R. Datta and M. S. Uddin

During the 2024-25 season, two germplasm of *Brassica juncea* were collected from Vietnam through online. The seeds, characterized by their brown color and bold seeded. These collected germplasm will be grown for further characterization and preliminary evaluation in the upcoming season.

Maintenance of rapeseed mustard germplasm

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

During the *rabi* 2024-25 season, a total of 149 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., 47 of *B. juncea* L., and 20 of *B. napus* L., all planted in a non-replicated trial at Joydebpur on November 25, 2024. 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 preservation and enhancing the germplasm.

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

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

In the *rabi* 2024-25 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 Skepherd, Sampad, Sambal, Din-2, SBC-8693, BC-100614(4)-9, BC-100614(4)-2, BC-100614(7)-8, BC-100614(7)-3, BC-100614(4)-5) as female parents and three varieties (BS-14, BS-17 and BS-20) as male parents, employing a Line × Tester method for crossing. The sowing date was November 21, 2024, 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 10,767 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. The collected seeds are properly stored for future evaluation.

Evaluation of F_1 generation of *Brassica Rapa*

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

During the *rabi* 2024-25 season, seeds from 15 cross combinations of *Brassica rapa* were harvested and bulked for growing the F_2 generation. The F_1 seeds from these crosses were sown on November 14, 2024, 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 F_1 plot and their parents for data collection. The harvested F_1 progenies were bulked and preserved for future F_2 generation trials.

Evaluation of segregating generations of *Brassica rapa*

M. S. Uddin and D.R. Datta

During the 2024-25 season at Gazipur, segregating generations of *Brassica rapa* were evaluated to develop homogeneous lines. The F_1 to F_6 seeds were sown using the cross-to-row method, with families from the F_5 and F_6 generations sown using the family-to-row method, alongside BARI Sarisha-14 as a check. The sowing took place on November 16, 2024, 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 F_1 to F_4 generations, desirable plants were selected based on earliness, seed yield, and yield attributes, with 27, 16, 14, and 13 plants selected from the F_2, F_3, F_4, and F_5 generations, respectively. For the F_6 generation, 5 progenies were chosen for seed yield evaluation in the observational trial for the following year.

Selection in segregating generation (F_2-F_6) 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 F_2 to F_6 generations of Brassica species were sown between November 16, 2024, 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)

D.R. Datta and M. S. Uddin

Thirty lines of *Brassica rapa* having yellow flower and yellow seed coat colour were selected last year from F_7 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* at Gazipur during 2024-25. The lines were sown on 21 November 2024 in 3 rows of 3 m long with spacing of 30 cm and 5 cm 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 (PH), number of branch

per plant (NBP), number of siliqua per plant (NSP), number of seeds per siliqua (NSS), 1000-seed weight (TSW) and yield per plot (Yield) etc. The plot yield was converted into kg per hectare to measure the yield of the line. Variations were observed among the lines and significant variations recorded all the studied traits except days to fifty percent of flowering and days to maturity. The trait days to maturity ranged from 79 to 86 days considering all the tested lines. The line BS-14 x BS-15-4 took the least time (79 days) to mature than all other lines followed by BC-100614(4)-14, BS-13 x BS-9, BS-17 x BS-11 and BS-17 x Nap-14001 which took 80 days to mature. Plant height ranged from 77.5 to108.75 cm. The number of branch per plant varied from 3.40 to 6.05. Besides, the trait number of siliqua per plant and number of seed per siliqua varied from 43.30 – 65.15 and 14.85- 36.30 respectively. On the other hand, thousand seed weight is varied from 3.89-4.22 and seed yield ranged from 1264.81-2518.51 Kg/ha. The line BC-100614(3)-1 showed the highest yield (2518.51 Kg/ha) which was significantly different from others including check. The second and third highest seed yield was recorded from the line BC-110714(7)-2 and BC-100614(4)-14 respectively.

Observation trial of *Brassica rapa* L. (Set-II) (Brown Seed)

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

An observational yield trial of *Brassica rapa* was conducted with 16 brown seeded genotypes with check varieties BARI Sarisha-9 and Tori-7 at RARS Jamalpur during the season of *Rabi* 2024-2025 to evaluate yield and yield contributing characters. The genotype BC-22023(B) produced the highest seed yield (1604 kg/ha) followed by BC-24037(B) and BC-23002(B). The genotype BC-22023(B) produced 15% and 22% higher yield than BARI Sarisha-9 and Tori-7, respectively. BC-24037(B) gave the second highest yield (1559 kg/ha), which was 12% and 18% higher than BARI Sarisha-9 and Tori-7, respectively. The third highest seed yield (1550 kg/ha) was recorded from BC-23002(B), which was 11% and 18% higher than BARI Sarisha-9 and Tori-7, respectively. Considering yield and yield contributing characters three genotypes i.e., BC-22023(B), BC-24037(B) and BC-23002(B) may be selected for the next year trial.

Observation yield trial of *Brassica rapa* L (Set-IV) (Yellow Seed)

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

An observational yield trial of *Brassica rapa* was conducted with 16 yellow seeded genotypes with two check varieties BARI Sarisha-14 and BARI Sarisha-20 at RARS Jamalpur during the season of *rabi* 2024-2025 to evaluate for yield and yield contributing characters. The genotypeBC-24011(y) was produced the highest seed yield (1844 kg/ha) followed by BC-24003(y), BC-24007(y) andBC-24005(y) among the entries including check varieties. BC-24011(y) was gave 32% and 30% higher yield (1620 kg/ha) than BARI Sarisha-14 and BARI Sarisha-20, respectively. The second highest yield (1620 kg/ha) was estimated by BC-24003(y) and gave 16% and 14% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively. The third highest yield (1607 kg/ha) and fourth highest yield (1529 kg/ha)was recorded by BC-24007(y) andBC-24005(y), respectively among the entries. Moreover, these four genotypes also showed better performance of yield contributing characters. Considering yield and yield contributing characters four genotypes viz., BC-24011(y), BC-24003(y), BC-24007(y), and BC-24005(y) may be selected for the next year trial.

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, M. S. Kobir, Ku Ahammad, S. Ghosh, T.A. Mujahidi, M.M. Kader and M.N. Islam

The experiment was conducted at Gazipur, Ishuardi, Jashore, Chattogram, Rangpur and Meherpur during *rabi* 2024-25 with 10 genotypes of *Brassica rapa* having yellow seed coat colour along with two checks as BARI Sarisha-14 and BARI Sarisha-20. The experiment was laid out in RCBD with three replications. The plot size was 3 m x 0.9 m. Seeding was done on 17 November 2024 at Gazipur, 16 November 2024 at Ishuardi, 01 November 2024 at Jashore, and 23 November 2024 at Meherpur as continuous sowing in rows of 30 cm apart. The seedlings were thinned after few days of germination 5 cm apart. Fertilizers were applied @ 120:80:60:40:4:1 kg/ha of N: P: K: S: Zn: B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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 maturity (DM), plant height (PH), number of primary branches per plant (NBP), number of siliquae per plant (NSP), number of seeds per siliqua (NSS), and seed yield per plot. The plot yield was converted into seed yield per hectare. Significant variations were observed for all of the studied characters such as days to maturity, plant height, number of branch per plant, number of siliqua per plant, number of seed per siliqua and seed yield. The trait days to maturity ranged from 83 to 88 days. The character number of branch per plant varied from 3.47 to 4.27 and the character plant height varied from 91.93 to 107.33 cm. On the other hand, the number of siliquae per plant ranged from 37 to 58 and number of seed per siliquae ranged from 20 to 36. The highest number of siliquae per plant was recorded 58 from the line BS-14 X BS-15-4. The seed yield ranged from 1544.44 to 2942.59 kg/ha (Table 1) at Gazipur location. The line BC-100614(4)-4 (1742.59 kg/ha) produced the highest seed yield both at Gazipur and over the locations.

Preliminary yield trial of *Brassica rapa* L. (Set-II) (Yellow Seed)

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

The experiment was conducted at Regional Agricultural Research Station, Jamalpur during the season of *rabi* 2024-2025 with 12 promising genotypes of *Brassica rapa*. It was laid out in RCBD with three replications. BARI Sarisha-14 and BARI Sarisha-20 were used as check. The plot size was 3 m x 2 m. Seeds were sown on the 26th November, 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after 7-11 days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn: and Boron from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to flowering, days to maturity, plant height, number of primary branches/plant, siliquae/plant, seeds/siliqua and yield per plot and yield (kg/ha). The plot yield was converted into hectare. Data were analyzed statistically using the software Statistics 10. Significant differences were found all the traits except primary branches per plant. The genotype BC-22004(Y) showed the highest yield (1820 kg/ha) which was 19% and 11% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively and required 78 days for maturity. The second highest yield (1710 kg/ha) was observed in the genotype BC-22002(Y), which was early maturity line among the entries and required 77 days. It gave 12% and 4% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively. The third highest seed yield (1690 kg/ha) was recorded in BC-18004(Y) genotype and required 79 days for maturity. It gave 11% and 3% higher yield than BARI Sarisha-14 and BARI Sarisha-20. Besides, these three genotypes BC-22004(Y), BC-22002(Y) and BC-18004(Y) also showed good results of yield contributing traits (Table-11). These three genotypes may be cultivated in between T. Aman & Boro rice. The highest standard error and coefficient of variation (CV) were found in the trait yield (88.74) and siliqua per plant (18.7%), respectively.

Preliminary yield trial of *Brassica rapa* (Set-III) (Brown Seed)

M. K. Alam, M. I. Riad, M. Kadir and D.R. Datta

The experiment was conducted at Regional Agricultural Research Station, Jamalpur during *rabi* 2024-2025 with 12 promising genotypes of *Brassica rapa*. The exprement was laid out in RCBD with three replications. BARI Sarisha-9 and Tori-7 were used as check. The plot size was 3 m x 2 m. Seeds were sown on the 26thNovember, 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after 7-11 days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn: B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to flowering, days to maturity, plant height (cm), number of primary branches/plant, number of siliquae/plant, seeds/siliqua and yield per plot and yield (kg/ha). The plot yield was converted into per hectare yield. Twelve brown seeded *Brassica rapa*

genotypes including two checks BARI Sarisha-9 and Tori-7 were evaluated for short duration and higher yield. Significant differences were observed for all the traits except plant height and number of siliqua per plant. The genotype BC-22025(B) showed the highest seed yield (1717 kg/ha), which was 32% and 37% higher yield than BARI Sarisha-9 and Tori-7, respectively and required 75 days for maturity. The second highest yield (1615 kg/ha) was observed in the genotype BC-18006(B) and required 78 days for maturity. It gave 24% and 29% higher yield than BARI Sarisha-9 and Tori-7, respectively. Besides, the third highest seed yield (1549 kg/ha) obtained fromBC-22091(B) followed by BC-22072(B) and BC-15008(B) and required 77days for maturity. Moreover, these five genotypes, (BC-22025(B), BC-18006(B), BC-22091(B), BC-22072(B)and BC-15008(B) also showed better performance in yield. Considering yield and yield contributing characters these five genotypes may be selected for the next year trial in between T-Aman & Boro rice. The highest standard error and coefficient of variation (CV) were found in yield (87.26) and number of siliquae/plant 18.6 (%).

Regional yield trial of *Brassica rapa* L.

D.R. Datta, M. S. Uddin, M. M. H. Khan, M. Akhteruzzaman, M. K. Alam, M. S. Kobir and KU Ahammad, S. Ghosh, M. M. Rahman and M.M. Kader

The experiment was conducted at Barishal, Chattogram, Gazipur, Ishwardi, Jamalpur, Jashore, Meherpur and Rangpur during *rabi* season 2024-25. It consisted of eight advanced lines of *Brassica rapa* along with two checks *viz.* BARI Sarisha-14 and BARI Sarisha-20. The experiment was laid out in randomized complete block design with three replications. The plot size was 3 m × 1.8 m. The seeds were sown on 11 November 2024 at Barisal, 26 December 2024 at Chattogram, 17 November 2024 at Gazipur, 25 November 2024 at Jamalpur, 16 November 2024 at Ishwardi, 7 November 2024 at Jashore, 23 November 2024 at Rangpur. The seeds were sown continuous and row to row distance was 30 cm apart from each. The seedlings were thinned after 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: B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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 80% maturity (DM), plant height (PH), number of branches per plant (NBP), number of siliquae per plant (NSP), number of seeds per siliqua (NSS), 1000 seed weight (TSW), seed yield (kg ha^{-1}). The data were analyzed statistically with STAR software. Significant variations were observed for most of the characters studied. The trait days to 50% flowering varied from 33 to 41 days and the trait days to maturity varied from 88-91 days. Plant height ranged from 92.70 to 103.23 cm. The number of branch per plant varied from 2.60-4.73. The number of siliquae per plant and number of seeds per siliqua ranged from 30.67 to 67.47 and 17.90 to 37.90 respectively. The trait 1000-seed weight recorded in a range of 3.32 to 4.00 g. Besides, the seed yield ranged from 1796.30 to 2490.48 kg ha^{-1} at Gazipur location and 1504.06 to 1644.22 kg ha^{-1} all over the locations. The highest seed yield (1822 kg ha^{-1}) was recorded in BC-100614 (8)-7 at Gazipur location followed by BC-100614 (4)-2 (2296.29 kg ha^{-1}). On the other hand, BC-100614(4)-2 (1644.22 kg ha^{-1}) and BC-100614(8)-1 (1636.38 kg ha^{-1}) showed the highest and second highest yield respectively all over the locations.

Regional yield trial of *Brassica rapa* (Set-II) (Yellow Seed)

M. K. Alam, M. I. Riad, M. M. Kadir and D. R. Datta

The experiment was conducted at Regional Agricultural Research Station, Jamalpur during the season of *rabi* 2024-2025 with twelve promising genotypes of *Brassica rapa*. The experiment was laid out in RCBD with three replications. BARI Sarisha-14 and BARI Sarisha-20 were used as checks. The plot size was 3.0 m x 2.0 m. Seeds were sown on the 25thNovember, 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after 7-11 days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn:B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations

were done timely to raise the crop uniformly. Data were taken on days to flowering, days to maturity, plant height(cm), number of primary branches/plant, siliqua/plant, number of seeds/siliqua, and seed yield per plot. The plot yield was converted into per hectare yield. Significant differences were observed for all the traits. The genotype BC-14043(Y) produced the highest yield (1797 kg/ha) and required 79 days for maturity. It gave 20% and 11% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively. The second highest yield (1647 kg/ha) recorded from BC-14010(Y), which was 10% and 2% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively. However, BC-14010(Y) recorded early maturity line and took 77 days for maturity among the genotypes. The third highest yield (1610 kg/ha) was estimated from BC-18009(Y), It gave 7% and 1% higher yield than BARI Sarisha-14 and BARI Sarisha-20, respectively. BC-18009(Y) genotype took 80 days for maturity and the highest weight in thousand seed weight (Table-2). Considering yield and yield contributing characters these three genotypes i.e., BC-14043(Y), BC-14010(Y) and BC-18009(Y) may be selected for the next year trial in between T-Aman & Boro rice. The highest standard error and coefficient of variation (CV) were found in seed yield (98.87) and number of seeds per siliqua (17.1%), respectively.

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 2024-25 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-20009 × Nap-18010 (86 seeds), Nap-15029 × Nap-15037 (72 seeds), and Nap-16036 × Nap-21070 (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 and D.R. Datta

The segregating generations of *Brassica napus* L. were evaluated for developing homogenous line (s) during 2023-24 at Gazipur. F_5 and F_6 seed were sown family to row method along with BARI Sarisha-18 as check. Considering earliness, seed yield, yield attributing characters. Considering earliness, seed yield, yield attributing characters 6 desirable plants were selected in F_5 respectively. From F_6, generation 5 progenies were selected for seed yield evaluation in observational trial next year.

Evaluation of F_1 generation of *Brassica napus*

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

The F_1 generation refers to the first filial generation. Filial generations are the nomenclature given to subsequent sets of offspring from controlled or observed reproduction. The initial generation is given the letter "P" for parental generation. The first set of offspring from these parents is the known as the F_1 generation. The F_1 generation can be reproduced to create the F_2 generation, and so forth. Scientists use this designation to track groups of offspring as they observe the genetics of various generations. Development of homogenous line through conventional breeding, it is essential to advance the filial generations from F_1 to F_6. The present investigation was therefore to know the hybrid performance of the crosses involving 8 parents and to advance F_1 to F_2 generation. F_1 seeds were obtained from 28 cross combinations from *Brassica napus*. It was made during 2024-25 and included in this trial. The seeds were sown on the 14 November, 2024. Each entry was grown in a single row of 2 m long plot with spacing 40 cm and 10 cm between row and plant respectively along with their parents as check. Five competitive plants were randomly selected from each F_1 plots and parents for data collection. Twenty eight hybrids were confirmed and selected for growing as F_2 in the next generation. F_1 progenies were harvested, bulked and seeds were preserved to grow F_2 population in next generation.

Observation yield trial of *Brassica napus*

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

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. Each plot measured 3.0 m x 2.0 m, and seeds were sown on 13th November 2024. 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. 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. 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. K. Alam, M. I. Riad, M. M. Kadir and D.R. Datta

The experiment was conducted at Regional Agricultural Research Station, Jamalpur during *rabi* 2024-2025 with 14 promising genotypes of *Brassica napus* including two checks BARI Sarisha-8 and BINA Sarisha-9. The experiment was laid out in RCBD design with two replications. The plot size was 3.0 m x 2.0 m. Seeds were sown on 3 December, 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after 11 days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N: P: K: S: Zn:B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the urea and all other fertilizers were applied during final land preparation. The rest of the urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to flowering, days to maturity, plant height, and primary branches per plant, siliqua/plant, seeds/siliqua, thousand seed weight and yield per plot. The plot yield was converted into per hectare yield. The genotype Nap-50021 produced the highest yield (1925 kg/ha) and gave 19% and 36% higher yield than BARI Sarisha-8 and BINA Sarisha-9, respectively. The second highest yield (1839 kg/ha) was recorded in Nap-33021, which was 13% and 30% higher yield than BARI Sarisha-8 and BINA Sarisha-9 respectively. The third highest yield (1804 kg/ha) obtained in Nap-20021 and followed by Nap-19021(1741kg/ha), Nap-19023(1735kg/ha). They took only 82-84 days for maturity. However, early maturity line recorded in Nap-19021 and required 80 days. It produced 1741 kg/ha yield and significantly fifth position among the entries. Moreover, these five genotypes Nap-50021, Nap-33021, Nap-20021, Nap-19021 and Nap-19023 are suitable for growing in between T.Aman and Boro rice and produced higher seed yield than check varieties and they became mature below 85 days. Considering yield and yield contributing characters, these genotypes may be selected for evaluation in preliminary yield trial in the next year. The highest standard error and coefficient of variation (CV) were recorded in the character yield (138.5) and siliqua/plant (15.02%), respectively.

Regional yield trial of *Brassica napus*

M. K. Alam, M. I. Riad, M. Kadir and D.R. Datta

The experiment was conducted at RARS Jamalpur during the season of *rabi* 2024-2025 with 12 promising genotypes of *Brassica napus.* The experiment was laid out in RCBD with three replications. BARI Sarisha-8 and BINA Sarisha-9 the released varieties of *Brassica napus* were used as checks. The plot size was 3.0 m x 2.0 m. Seeds were sown on the 3rd December, 2024 in continuous and

row was 30 cm apart from each. The seedlings were thinned after few days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn:B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to flowering, days to mature, plant height, primary branches/plant, siliqua/plant, seeds/siliqua, thousand seed weight and yield per hectare. Data were analyzed statistically using the software Statistics 10. Significant differences were observed for all the traits except plant height. The highest seed yield (2291 kg/ha) obtained in Nap-20002, which was 22% higher yield than BARI Sarisha-8 and 29% higher yield than BINA Sarisha-9. It took 88 days for maturity. This line also showed moderately higher number of primary branch per plant and number of siliqua/plant. The second highest yield (2224 kg/ha) was recorded in Nap-20008, which was 18% and 26% higher than BARI Sarisha-8 and BINA Sarisha-9, respectively. It took 88 days for maturity. Nap-20008 also showed moderately higher number of primary branches/ plant, and siliqua/plant. The third highest yield (2058 kg/ha) was obtained in Nap-21070, which was 10% and 16% higher than BARI Sarisha-8 and BINA Sarisha-9, respectively. The genotype Nap-21070 moderately showed number of siliqua per plant but it took maximum (91 days) days for maturity. Moreover, these three genotypes Nap-20002, Nap-20008 and Nap-21070 are suitable for growing in between T. Aman and Boro rice and produced higher seed yield and became mature below 91 days (Table-23). Considering yield and yield contributing characters, these three genotypes may be selected for evaluation in preliminary yield trial in the next year. The highest standard error and coefficient of variation (CV) were recorded in the character yield (130.1) and siliqua/plant (21.7%), respectively.

Evaluation of segregating generation of interspecific crosses

M. S. Uddin and D.R. Datta

F_2-F_4 seeds were sown cross/plant to row method along with parents during *Rabi* 2024-25 at Gazipur. Sowing was done on 16 November 2024. 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. Single plant selection among families was done based on short duration, erect and compact type having desirable agronomic characters, disease and insect tolerance. Selfing seeds were harvested from all generation to raise for next generation growing

Regional yield trial of entries developed from interspecific hybridization between *B. carinata* and *B. napus*

D.R.Datta, M. S. Uddin, U.Kulsum, S.Gosh and M. M. Rahman

The experiment was conducted with six accessions including two check varieties BARI Sarisha-13 and BARI Sarisha-18 at Gazipur, Meherpur and Rangpur during *Rabi* season 2024-25. The entries were developed crossing between the BARI Sarisha-13 with *B. carinata*. The seed was sown on 14 November 2024 at Gazipur. The experiment was laid out in RCB design having three replications. Each entry was grown in 3 m long 4 rows with row to row spacing of 30 cm. Fertilizers were applied @ 260:170:90:160:5 and 10 kg/ha as urea, TSP, MOP, Gypsum, Zn oxide and Boric acid. All fertilizers and half urea will be applied as basal and the remaining half at flower initiation. Other cultural operations were done when necessary. Data were collected from 10 randomly selected plants. Data were taken on days to 50% flowering, days to maturity, plant height (cm), no. of siliqua per plant, no. of seeds per siliqua, thousand-seed weight (gm), seed yield per plot, seed yield (kg/ha), disease and insect reaction. A significant difference was observed among the entries tested in the experiment for all the studied characters at Gazipur. Two lines 13CA12014-2 and 13CA12014-3 took less time to mature than check variety BARI Sarisha-18 and BARI Sarisha-13. Plant height ranged from 93.20 to 107.47 cm. The character number of siliqua per plant maximum for BARI Sarisha-18 while minimum in 13CA92014-3. The number of seeds per siliqua ranged from 23

to 42. The highest seed yield was obtained from 13CA52014-1 (1842.58 kg/ha) which is statistically similar to BARI Sarisha-18 (1983.85 Kg/ha) followed by 13CA32014-3 (1688.88 kg/ha). In the multi-location trial, on average 13CA52014-3 took three days and two days less time to mature compared to check variety, BARI Sarisha-18 and BARI Sarisha-13 respectively. In addition, three entries showed higher yield compared to our check variety BARI Sarisha-18 and BARI Sarisha-13.

Maintenances of CMS, maintainer and restorer lines of *B. napus*

D.R. Datta and M. S. Uddin

The experiment consisted of two CMS lines like $CMSZ_1$ (248) and $CMSZ_2$ (279), two maintainer lines like Nap-248M and Nap-279M and one restorer line like Nap-14-01R. The experiment was conducted at Gazipur during *Rabi* 2024-25. Unit plot size was four rows three meter long. Seeding was done on 17 November 2024. 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: B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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. CMS lines were crossed with maintainer lines. Maintainer lines and restorer line were selfed. Bagging was done to protect out crossing. Crossing and selfing were done by hand pollination. Days to flowering and maturity for CMS lines ranged from 45-50 days and 100 days, respectively. In total 93 buds of 17 plants of two CMS lines were crossed with two maintainer lines. Two thousand four hundred and seventy seven seeds were obtained from 87 siliquae. Seeds were stored for future breeding programme.

Exploration of new cytoplasmic male sterile and restorer line of *Brassica napus* L.

D.R. Datta and M. S. Uddin

Two CMS lines [$CMSZ_1$ (248) and $CMSZ_2$ (279)], and 22 *Brassica napus* line were used as experimental materials. The experiment was conducted during *Rabi* 2024-25 at Gazipur. 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:B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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. CMS lines were crossed with 22 *Brassica napus* lines. Bagging was done to protect out crossing. Crossing was done by hand pollination. Days to maturity for CMS lines ranged from 88-110 days. 1542 buds of 165 CMS plants were crossed with *Brassica napus* lines. 1214 siliquae were obtained. 10895 seeds were stored for using in the next year.

Development of short duration parental lines in *Brassica napus* L.

D.R. Datta and M. S. Uddin

Two CMS lines [$CMSZ_1$ (248) and $CMSZ_2$ (279)], three short duration (87-88 days) of *Brassica napus* lines (Nap-0876, Nap-0869 and Nap-205), were used as experimental materials. The experiment was conducted during *rabi* 2024-25 at Gazipur. 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:B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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. CMS lines were crossed with three short duration *Brassica napus* lines. Bagging was done to protect out crossing. Crossing was done by hand pollination. Days to maturity for CMS lines ranged from 98-99 days and days to 50% flowering ranged from 48-50 days. 322 buds of 50 CMS plants were crossed with short duration *Brassica napus* lines. 274 siliquae were obtained. 3180 seeds were stored for using in the next year.

Evaluation of hybrid rapeseed-mustard

M. S. Uddin, D.R. Datta, M. M. H. Khan, M. Akhteruzzaman, M. K. Alam, M. S. Kobir, Ku Ahammad, S. Ghosh, M. M. Rahman and M.M. Kader

The experiment was conducted at Gazipur, Barisal, Chattogram, Jamalpur, Jashore, and Ishwardi during *Rabi* season 2024-25. Two promising hybrids of rapeseed-mustard namely BHS-01 and BHS-02 were evaluated with four check varieties BS-18, BS-19, BS-20 and another Indian hybrid

Advanta (AHS-01). The unit plot size was 3.0 m x 2.0 m. Seeds were sown on 09 November, 2024 in line sowing. Line to line spacing was 30 cm. Fertilizers were applied at the rate of 115-33-43-27-2-1 kg/ha N-P-K-S-Zn-B. Half urea and all other fertilizer were applied as basal and remaining urea was top dressed at vegetative stage (22 Days after Emergence). All the intercultural operations were done as and when necessary. The seeds were sown on 21 November 2024 at Gazipur, 17 November 2024 at Ishwardi, 07 November, 2024 at Jashore, 28 November 2024 at Jamalpur. Data on yield and yield attributes were collected and analyzed statistically. Data have been taken from randomly taken 10 plants from each plot. Data were taken on days to flowering, days to maturity, plant height (cm), no. of primary branches/ plant, no. of siliquae/plant, length of siliqua (cm), no. of seeds/siliqua, 1000 seed weight (g) and yield/plot. The plot yield was converted into kg/ha. BHS-01 produced about 5%, 20%, 25% and 27% higher seed yield compared to the check variety Advanta, BARI Sharisha-18, BARI Sharisha-19 and BARI Sharisha-20 respectively. In case of maturity, BHS-01 also took statistically similar time to mature like BARI Sharisha-18 and BARI Sharisha-19.

Evaluation of segregating generation of *Brassica napus* (canola)

M. S. Uddin and D.R. Datta

A total of 15 double low lines of *Brassica napus* which were used as female parent one testers (BS-18) were used as male. Parent materials of the experiment consisted of two species (*Brassica rapa* and *Brassica napus*). BARI Sarisha-17 of *Brassica rapa*, Nap-0876 and Nap-0569 of *Brassica napus* [high erucic acid (30-45%) but short duration (80-85 days)]. Nap-14-001, Nap-14-004, Nap-14-007, Nap-14-010 and Nap-14-011 of *Brassica napus* [low erucic acid (less than 2%), high yielding (2.0-2.5 t/ha) but long duration (100-105 days)]. BARI Sarisha-17, Nap-0876 and Nap-0569 were crossed with Nap-14-001, Nap-14-004, Nap-14-007, Nap-14-010 and Nap-14-011 during last *rabi* 2015-16. Developed 15F_1s were selfed during 2016-2021 to develop F_6 generation. Developed 15F_6s (Nap-RIL-01 to 15) crossed with one tester BS-18 during 2024-25. These F_1 seeds were sown on 20 November 2024. 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:B from Urea, TSP, MOP, Gypsum, Zinc Sulphate and Boric acid, respectively. 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. Selfing was done to raise seedlings for next generation. Selfed seeds were collected from different interspecific cross combination and stored for growing in next generation.

Hybridization in *Brassica napus* (Canola)

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

Hybridization can contribute to the production of new species or the introgression of beneficial adaptive features between species. It has great potential in agricultural systems to boost the process of targeted crop improvement. 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.

Confirmation of F_1 generation of *Brassica napus* (canola) germplam

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

F_1 seeds were obtained from 12 cross combinations of *Brassica spp.* It was made during 2024-25 and was included in this trial. The seeds were sown on the 24 November 2024. Each entry was grown in a single row of 2 m long plot with spacing 40 cm and 10 cm between row and plant respectively along with their parents as check. Five competitive plants were randomly selected from each parents and F_1 plots for data collection. Twelve hybrids were confirmed and selected for growing as F_2 in the next generation. F_1 progenies were harvested, bulked and seeds were preserved to grow F_2 population in next generation.

Observation yield trial of *Brassica napus* (Canola)

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

The experiment was conducted at Regional Agricultural Research Station, Jamalpur during the

season *rabi* 2024-2025 with 15 promising genotypes of *Brassica napus* including two checks BARI Sarisha-18 and BARI Sarisha-22. The experiment was laid out in RCBD design with two replications. The plot size was 3.0 m x 2.0 m. Seeds were sown on 20 December 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after 11 days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N: P: K: S: Zn: B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to flowering, days to maturity, plant height, primary branches per plant, siliqua/ plant, seeds/siliqua, thousand seed weight and yield per plot. The plot yield was converted into per hectare yield. Fifteen genotypes of *Brassica napus* were evaluated for yield and yield contributing characters. Significant differences were observed for all the traits except days to maturity and primary branches per plant. The genotype Australia produced the highest yield (1960 kg/ha) and gave 15 % and 8 % higher yield than BARI Sarisha-18 and BARI Sarisha-22 respectively. The second highest yield (1894 kg/ha) was recorded in MGI-2023, which was 11% and 5% higher yield than BARI Sarisha-18 and BARI Sarisha-22, respectively. The third highest yield (1873 kg/ha) was obtained in Nap-50025 and took only 89 days for maturity. Moreover, these three genotypes Australia, MGI-2023 and Nap-50025, are suitable for growing in between T. Aman and Boro rice and produced higher yield and they became mature below 90 days. Considering yield and yield contributing characters, these genotypes may be selected for evaluation in preliminary yield trial in the next year. The highest standard error and coefficient of variation (CV) were found in the characters yield (105.5) and siliqua/plant (11.7%), respectively.

Regional yield trial of *Brassica napus* (Canola)

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

The experiment was conducted at RARS Jamalpur during *rabi* 2024-2025with 12 promising genotypes of *Brassica napus*. The experiment was laid out in RCBD with three replications. BARI Sarisha-18 and BARI Sarisha-22 released variety of *Brassica napus* were used as check. The plot size was 3.0 m x 2.0 m. Seeds were sown on 20 December 2024 in continuous and row was 30 cm apart from each. The seedlings were thinned after few days of germination 5 cm apart. Fertilizer were applied @ 120:80:60:40:4:1 kg/ha of N:P:K:S:Zn:B from Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied during final land preparation. The rest of the Urea was applied at the initial stage of flowering. All intercultural operations were done timely to raise the crop uniformly. Data were taken on days to mature, plant height, primary branches/plant, siliqua/plant, seed/siliqua, and yield per hectare. Data were analyzed statistically using the software Statistics 10. Significant differences were observed for all the traits except days to maturity. The highest seed yield (1730 kg/ha) obtained from BNC-23003, which was 9% and 11% higher yield than BARI Sarisha-18 and BARI Sarisha-22, respectively. The second highest yield (1724 kg/ha) was recorded in BNC-23002 followed by BNC-23019, BNC-23014. BNC-23002 gave 8% and 10% higher yield than BARI Sarisha-18 and BARI Sarisha-22, respectively. The third highest yield (1648 kg/ha) was recorded in BNC-23019, while it gave 3% and 5% higher yield than BARI Sarisha-18 and BARI Sarisha-22, respectively. The best performing lines BNC-23003, BNC-23002, BNC-23019 and BNC-23014 took 92-96 days for maturity. These lines may be selected for evaluation in adaptive yield trial for the next year.

Maintenance of BARI released rapeseed-mustard varieties

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

A total 21 BARI released rapeseed-mustard varieties were grown in *rabi* season 20 November 2024. Unit plot size was 5 rows 3 m long and row to row distance 30 cm and plant to plant distance 5 cm after thinning. Fertilizers were applied @ 120: 80: 60: 40: 4: 1 kg/ha of N: P: K: S: Zn:B from Urea, TSP, MOP, Gypsum, Zinc sulphate and Boric acid, respectively. Netting was done in whole plot to maintain proper genetic purity. The amount of seeds collected from each variety namely, Tori-7, SS-75 (Sonali), TS-72 (kallaynia), Daulat, Rai-5, BS-6, BS-7,BS-8,BS-9,BS-10,BS-11,BS-12,BS-13, BS-14, BS-15, BS-

16, BS-17, BS-18, BS-19, BS-20 were 155 g, 150 g, 205 g, 270 g, 390 g, 160 g, 272 g, 333 g, 170 g, 295 g, 352 g, 155 g, 378 g, 138 g, 160 g, 388 g, 185 g, 380 g, 433 g and 145 g respectively. Among them BS-7,BS-8, BS-13, BS-18 were napus group, Rai -5, Daulat, BS-10, BS-11, BS-16, BS-19 were in juncea group and Tori-7, SS-75, TS-72 (Kallaynia), BS-6, BS-9, BS-12, BS-14, BS-15, BS-17, BS-20 and BS-21 from rapa group.

Crop and Soil management

Validation of oilseed-based mixed cropping with boro rice across different regions of Bangladesh

M.M. Karim, M.U. Islam and M. J. Hussain

The present study evaluated the agronomic and economic impacts of mixed cropping mustard with *boro* rice within a four-crop rotation system to enhance cropping intensity, productivity, and resource use efficiency in rice-based farming systems of Bangladesh. The experiment was laid out in RCBD with two treatments. Treatments were: T_1: Traditional rice-based cropping pattern (Boro-Aus-T. Aman); T_2: Mixed cropping of Boro rice with BARI Sharisha-14, followed by Aus and T. Aman. Boro rice variety (local recommended variety). Results showed that mixed cropping significantly improved land use efficiency and total system productivity without reducing rice yield. Mustard varieties exhibited satisfactory growth and yield performance when mixed cropped, contributing to additional income and enhanced soil nutrient status. The findings suggest that mixed cropping of mustard with Boro rice is an effective strategy for diversifying crops, intensifying land use, and improving the sustainability of rice-based farming systems in Bangladesh.

Optimization of Fertilizer Management for Hybrid Rapeseed Varieties/Lines to Enhance Yield and Quality

M.U. Islam, M. J. Hussain, M.M. Karim and M. Islam

The experiment was conducted at ORC research field of BARI, Gazipur during 2024-25 followed by RCB design with 3 replications. There were 14 treatment combinations with different levels of fertilizer nutrients as: 1. Four levels of N: 0, 100, 150, 200 kg ha^{-1}; 2. Four levels of P: 0, 30, 60, 90 kg ha^{-1}; 3. Four levels of K: 0, 80, 120, 160 kg ha^{-1}; 4. Four levels of S: 0, 10, 30, 50 kg ha^{-1}. There were 14 treatment combinations with these levels of NPKS with a blanket dose of other fertilizers. From one-year study treatment T_{13} ($N_{150}P_{50}K_{120}S_{50}$ kg/ha) showed the best performance with the maximum seed yield of 2399 kg/ha followed by T_{12} and T_6. The maximum yield was recorded in T_{13} treatment as it was imposed as a balanced level of all the fertilizer nutrients. The experiment will be carried out for the next year for confirmation and recommendation.

Disease Management

Screening of rapeseed-mustard varieties/lines against *Alternaria* blight disease of mustard

N. A. Sultana and K. Jahan

The experiment was conducted at Oilseed Research Centre, BARI, Joydebpur during the 2024-2025 cropping season to find out the resistant lines of rapeseed-mustard against Alternaria blight. A total of thirty lines of Brassica spp (*B. rapa, B. napus, and B. juncea*) were tested. Seeds were sown on 14 November 2024 in a randomized block design with three replications. All test lines were sown in two rows of 3 m long separated by a single row of susceptible infector (BARI Sarisha-14). Cultural and intercultural operations were done as recommended by the Oilseed Research Center (ORC), BARI. 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 six (06) lines (NAP-20002, NAP-16036, NAP-21070, BJ-10-10104(Y), BJ-1110(12)-1 and BJ-11536(12)-6 were showed moderately resistant reaction to the disease. These lines may serve as valuable breeding materials for the development of Alternaria blight-resistant varieties.

Efficacy of different groups of chemical fungicides and botanicals against *Alternaria* blight of mustard

N. A. Sultana and K. Jahan

The experiment was conducted at Oilseed Research Centre, BARI, Joydebpur during the 2024-2025 crop season. Seeds of BARI Sarisha-14 were sown on 16 November 2024. The experiment was designed in RCB with 3 replications, where plot size was 3m x 2m. Fertilizers were applied @

120:80:60 40:4:1 kg/ha of N:P: K:S: Zn:B from Urea, TSP, MP, Gypsum, Zinc Sulfate and Boric acid respectively. Seven fungicides namely: Rovral 50 WP (Iprodian), Nativo 75WG (Tebuconazole50% and Tryfloxystrobin 25%), Folicur250 EC (Tebuconazole**),** Autostin(Carbendazim), Navara 28 SC (Azoxystrobin20% and Cyproconazole 8 %), Amister Top 325 SC (Azoxytrobin + Difenoconazole), Luna sansation (Flupyrum Tricyclazole), Neem leaf extract, and Garlic clove extract. A control treatment was maintained for comparison. Rovral, Autostin, and Nativo were sprayed @ 0.2 % and Amister top, Folicur, Navara and Luna sensation were sprayed @ 0.1% at 10 days intervals beginning from the first appearance of the disease and continued 3 times. All fungicides significantly improved mustard growth and yield. Among treatments, Rovral was most effective, giving the highest plant height (98.6 cm), siliqua per plant (83.4), seeds per siliqua (42.8), and seed yield (1796.3 kg/ha), a 34.66% increase over control. Amistar Top and Nativo also performed well with yields of 1755.7 kg/ha (31.6% increase) and 1738.7 kg/ha (30.33% increase). The control showed the poorest results (1334 kg/ha). Botanical extracts like Neem and Garlic had moderate effects, raising yields by 15.12% and 12.27%, but were less effective than chemical fungicides. Based on the findings, Rovral, Amister Top, and Nativo are recommended for effective management of Alternaria blight and for maximizing mustard yield.

Insect Management

Development of a management approach against flea beetle (*Phyllotreta 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 2024-25 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 19, 2024, and January 10, 2024, respectively, using a RCBD 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. Results revealed highly significant treatment effects in reducing flea beetle populations. T_1 and T_2 achieved the lowest pest densities and highest percent reduction in infestation (61.65% and 47.65%, respectively), with T_1 outperforming all other treatments. In contrast, the untreated control (T_6) showed the highest level of plant infestation (68.89%), confirming high pest pressure in absence of intervention. Correlation analysis indicated average association between flea beetle abundance and meteorological variables (temperature and relative humidity), implying that climatic factors may be the primary drivers of pest dynamics in this context. The findings underscore the efficacy of integrated strategies particularly the combination of white sticky traps with reduced-risk insecticides like Spinetoram and Bio-chamak as sustainable alternatives to conventional pesticides.

Sesame

Crops Improvement

Maintenance of germplasm of sesame

M. H. Rashid, M. S. Kobir and M. R. Humayun

Sixty-six entries including three check varieties of BARI Til-2, BARI Til-3 and BARI Til-4 were shown without replication in three locations. The seeds were sown on 27 February at Gazipur, 29 February in Jashore and 25 March in Ishurdi during 2025. Sesame is very much susceptible to water logged condition. To maintain sufficient seed stock a set of 66 materials were grown in three different locations Gazipur, Ishurdi and Jashore. Seeds were collected and preserved properly for further evaluation of all the genotypes.

Hybridization of sesame

M. H. Rashid

Six released varieties and one advanced line were sown in *Kharif*-2 on 29 August 2024 at Gazipur

under net house conditions. Seeds of individual parents were planted in 2 rows of 2-meter-long plots, with a spacing of 50 cm between rows and 10 cm between plants. Hybridizations were carried out in the first week of October 2024. A total of 361 capsules were produced out of 629 pollinated buds in 24 cross combinations, which yielded 11,730 F1 seeds. The seeds will be sown next year as F1 populations for further evaluation.

Confirmation of F1 generation of sesame

M. H. Rashid

F_1 generations from 30 cross combinations were evaluated at Joydebpur during *Kharif*-1, 2025. Seeds of the F1 plants were sown on 27 February 2025 along with the respective parental lines. The spacing was maintained at 30 cm between rows and 8 cm between plants. Some cross delted due to inferior or not cross yet. Rest cross confirmed.

Evaluation of F_3, F_5 and F_6 generation of sesame

M. H. Rashid, M S Uddin and K C Saha

F_3 generation of five cross combinations, F_5 generation of eight families, and F_6 generation of six families were evaluated at Gazipur during *Kharif*-1, 2025. Seeds were sown on March 12, 2025. The spacing used was 30 cm between rows and 8 cm between plants. Five F_3, eight F_5 and six F_6 generations of sesame were evaluated at Gazipur in order to advance generation and to select desirable plants. Considering plant growth, maturity, size and number, seed color, disease and insect reactions, 27 plants from F_3, 68 plants from F5 and 39 plants from F_6 were selected.

Observation trial of sesame

M. H. Rashid, M S Uddin and K C Saha

Seven entries of sesame along with BARI Til-6 as check were evaluated at Gazipur during *Kharif*-1, 2025. Seeds were sown on 28 February 2025. The experiment was laid out in RCBD with three replications. The unit plot size was 3 rows, 4 m long with 40 cm between rows and 8 cm between plants. Ses-26 gave the highest seed yield (1445 kg/ha). Ses-24 gave 1375 kg/ha, followed by Ses-27 (1385 kg/ha) and Ses-23 (1340 kg/ha). Considering seed yield and other yield-contributing characters, entries Ses-26, Ses-24, Ses-27, and Ses-23 were selected for the next yield trial.

Preliminary yield trial of sesame

M. H. Rashid, M. M. Hawlader, J. A. Mahmud, M. S. Kobir, M. Akther, M. M. Hasan and M. S. Huda

Seven sesame lines were evaluated at Gazipur and four other locations RARS Jashore, Ishurdi, Barisal, and ARS Dinajpur during *Kharif*-1, 2025. Sowing took place on 25 February at Gazipur, 26 February at Jashore, 10 March at Dinajpur, and 18 March at Ishurdi. BARI Til-6 served as the check. A randomized complete block design with three replications was used. Each plot consisted of six rows, each 4 m long, with 30 cm between rows and 8 cm between plants. All sesame entries, including the check variety, required 85–98 days to mature. At Gazipur, Ses-115 produced the highest seed yield (1530 kg/ha). Across all locations, Ses-115 and Ses-JP-25 exhibited the highest average yields of 1530 kg/ha and 1385 kg/ha, respectively. Other entries like Ses-JP-69Y, Ses-0265, and Ses-JP-47Y produced yields statistically similar to Ses-115 and higher than the check variety BARI Til-6.

Regional yield trial of sesame

M. H. Rashid, M M Hawlader, J. A. Mahmud, M. S. Kobir, M Akther, M M Hasan and M S Huda

Seven lines including one check were evaluated at five locations during *Kharif*-1, 2025. One released variety, BARI Til-6 was used as check. The experiment was sown on 13 March 2025 at HQ, Gazipur, 20 March at RARS, Ishurdi and Jashore, 25 March at OFRD Kushtia and Agricultural Research Centre, Dinajpur. The lines were laid out in a randomized complete block design with 3 replications. Unit plot size was 6 rows, 4 m long with spacing of 40 cm between rows and continuous sowing. All matured similarly. Ses-05178 showed the highest yield, followed by Ses-79 and Ses-65. Based on yield and related traits, Ses-65, Ses-79, and Ses-05178 were selected for adaptive trial.

Screening of sesame genotypes under water logged condition

M. H. Rashid

Fifty-one genotypes of sesame including T-6, BARI Til-3, BARI Til-4 and BARI Til-5 were evaluated at Gazipur during *kharif*-2, 2024 in net house. Fifty-one entries were grown in plastic container. Soil of plastic pot were prepare with 50% organic

manure and 40% cow dung and 10% garden soil. Intercultural operations were done as and when necessary. Depth of applying water was about 4 cm above soil level. Standing water remained a set for 24 hour and another set for 48 hour. No. of initial plants/plot and no. of survived plants/plot were recorded for both set. Water logged condition was created by applying excess water during flowering stages. Most of the genotypes could not survive in water logged condition for 48 hour. Only six genotypes could survive for 48 hour.

Maintenance of released varieties and advanced line of sesame

M. H. Rashid

A total 20 accession of which 6 release varieties and 14 advanced line were grown in *Kharif*-1 2025 in order to maintain the genetic purity of existing germplasm and varieties to use in future breeding programme. The seed were sown on 12 March 2025 in Gazipur. Unit plot size was 3 rows 4 m long and row to row distance 40 cm and plant to plant distance 5 cm after thinning. 100 plants were selected on the basis of agronomic traits from middle row of the plot. Genetically pone seed of 20 line/varieties were collected and store for next breeding purpose.

Morphological variation in sesame (*Sesamum indicum* L.) induced by EMS treatment in M_1 generation

M. H. Rashid

The application of 0.5% EMS successfully induced significant morphological changes in the M1 generation of sesame. The observed mutant traits demonstrate the potential of mutation breeding to enhance genetic diversity and improve yield-related characteristics. Further screening and selection in subsequent generations are essential to identify stable and heritable traits for potential incorporation into breeding programs

Healthy sesame seeds were soaked and treated with 0.5% Ethyl Methane Sulfonate (EMS) for a specified duration under controlled laboratory conditions. Post-treatment, seeds were thoroughly washed and sown to raise the M1 generation. The experiment included a control group (untreated) for comparative observation. **Quadra-fruits per node:** Some mutants produced up to four fruits per node, a trait potentially beneficial for yield improvement. **Tri-fruits per node:** Another set of plants displayed three fruits per node, deviating from the normal dual-fruit pattern. **Multiloculated fruits:** Enlarged capsules with multiple locules were observed, which may impact seed content and capsule architecture. **Unbranched plants:** Certain plants lacked lateral branching, which may influence plant architecture and light capture. **Thick stems with long petioles:** This robust growth form may suggest altered hormonal responses and structural reinforcement.

Disease management

Evaluation of sesame (*Sesamum indicum* L.) germplasm against major diseases

K. Jahan and N. Sultana

Sesame (*Sesamum indicum* L.) is one of the most important oil-seed crops in the world since ancient times and being one of the oldest oilseed crop is affected by various diseases. *Alternaria* leaf spot, Cercospora leaf spot, stem spot, Phyllody, powdery mildew and leaf curl are the major foliar diseases affecting cultivation of sesame. The root rot disease caused by *Macrophomina phaseolina* and wilt disease caused by *Fusarium sp.* are the serious soil-borne disease affecting sesame. A total five germplasm including 4 advanced lines (Ses-65, Ses-05178, Ses-31, and Ses-05115) and one released variety (BARI Til-6) were screened against important diseases of sesame under natural field conditions at research field of Oilseed Research Centre (ORC), BARI during *Kharif*-1, 2025. Observations on disease incidence and severity were recorded at 60 days after sowing. In the field trial under natural condition, among the entries several diseases namely, Alternaria leaf spot, Cercospora leaf spot, Fusarium wilt, Stem spot, Phyllody and leaf curl diseases were observed during 2024-25 *Kharif*-1 season. The disease incidence of Alternaria leaf spot ranged between 0 to 74.07%. In case of Ses-05178, no Alternaria leaf spot was observed in this year. The highest disease incidence (74.07%) was recorded in Ses-31. Among the entries only in Ses-65, Cercospora leaf spot was observed with 35.97% disease incidence, whereas rest of the four entries showed no Cercospora leaf spot disease. Fusarium wilt was recorded in Ses-05178 and Ses-

31 with 35.69% incidence, while the rest three entries did not show Fusarium wilt symptom. Stem spot was observed in all the entries with ranged between 18.93 to 76.84% diseases incidence. The lowest stem spot was recorded in BARI Til-6 with 18.93% disease incidence. Phyllody disease was also observed in all of the entries ranged between 6.72 to 11.90%. Leaf curl disease was observed only in BARI Til-6 with 6.52% incidence.

Insect Management

Insect pollinators and their role on yield of sesame (*Sesamum indicum*)

R. Islam, A. Islam and A. Samiha

Pollinators play a vital role in maintaining agricultural ecosystems and enhancing crop yields. This study investigated the diversity and abundance of insect visitors to sesame and their effects on yield parameters at BARI, Gazipur, during the 2024-25 cropping season. Nine plots (4.0 x 5.0 m each) were established in three random blocks. Before any floret had opened, five plants covered with white mosquito net bags (1 mm mesh width) to exclude insect visitors, allowing for self-pollination, For each one of the other five sesame plants were tagged and left open to be accessible to visitors. Another five plants applied hand pollination and covered with mosquito net bag. At the end of the flowering period, the open plants were also bagged, in order to avoid seed predators, and all sesame plants (n =15 plants) were left that way up to seed maturation and the set was assessed. Flower-visiting insects were observed weekly intervals. A total of 25 insects, representing five species from two orders and three families, were recorded on sesame flowers (Table 1). Hymenoptera were the most abundant, dominated by *Apis dorsata*, *A. mellifera*, and *A. cerana.* Among Diptera, *Musca domestica* (Muscidae) and a Syrphid species were common. 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. The observed 20–21% increase in yield under open pollination emphasizes the contribution of natural insect visitors. Honeybees (*Apis* spp.) were particularly effective, highlighting their importance in sesame ecosystems.

Relative susceptibility of sesame cultivars against green tobacco capsid (*Nesidiocoris tenuis* Reuter)

M. A. Islam, A. Samiha and R. Islam

The experiment was conducted during the *rabi* season of 2024-25 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. Sesame seeds were sown in a well prepared seed bed on 03 March 2025. The unit plot size was 4.0 m x 3.0 m with 30 cm row to row and 5 cm plant to plant distance. Pest assessments focused on whitefly, leafhopper, hairy caterpillar, and green tobacco capsid, with weekly monitoring from March 25 to May 25, 2025. Among the tested cultivars, BARI Till-5 exhibited the highest susceptibility to GTC (6.75 ± SE), significantly exceeding that of the other varieties, which grouped statistically as more resistant (Till-3: 3.12; Till-4: 2.38; Till-6: 1.95). In contrast, BARI Till-5 demonstrated notable resistance to other pests, indicating a unique interaction between varietal traits and GTC. The Pearson correlation matrix revealed a highly significant negative correlation between GTC incidence and maximum temperature ($r = –0.931$, $p < 0.01$), suggesting thermal suppression of GTC activity. Relative humidity at 2:00 PM showed a moderately positive, though non-significant, relationship ($r = 0.740$), indicating potential humidity-facilitated pest proliferation. These findings underline GTC as a dominant and distinct pest in sesame agroecosystems, capable of inflicting damage independent of varietal resistance to other insects. BARI Till-5, while promising against general pests, may be unsuitable in GTC-prone regions unless managed through targeted IPM. The varietal differences and climate interactions observed here provide critical insights for breeding programs and pest forecasting models. This study reinforces the urgency of GTC-focused surveillance and cultivar screening to ensure sustainable sesame production under changing climatic conditions. These findings suggest BARI Till-5 is more susceptible, warranting further investigation in the next season.

Groundnut

The groundnut or peanut (*Arachis hypogaea*) is a species in the family Fabaceae. The peanut was probably first domesticated and cultivated in the

valleys of Paraguay. The domesticated peanut is an amphidiploid or allotetraploid, meaning that it has two sets of chromosomes from two different species, thought to be *A. duranensis* and *A. ipaensis.* These probably combined in the wild to form the tetraploid species *A. monticola*, which gave rise to the domesticated peanut. This domestication might have taken place in Paraguay or Bolivia, where the wildest strains grow today. Groundnut is the most important oil legume crop cultivated in the world. Among the oil crops grown in Bangladesh, groundnut stands third position both in area and production. Apart from its rich sources of oil content (48-52%), groundnut seed is a good source of protein (22-25%), carbohydrate (20%) and vitamin B and E. Being highly digestible, the children's food made from groundnut can help in meeting part of the nutritional needs. The Oilseed Research Centre of BARI has developed 12 groundnut varieties, which comprises 8 Spanish, 3 Valencia and 1 Virginia type of groundnut. The objective of groundnut breeding programme is to develop high yielding, early maturing, determinate type, widely adapted, disease and insect resistant/tolerant, dwarf varieties suitable for *kharif* season as well as suitable for the existing cropping pattern.

Crops Improvement

Maintenance and evaluation of groundnut germplasm

M. Q. I. Matin, D. R. Datta and M. H. Rashid

A total of 281 genotypes were evaluated and maintained just to rejuvenate the seeds of germplasm. The highest CV% was observed from the character mature pods per plant followed by 100 kernel weight (g). Minimum variation was observed in the character days to maturity. The character100 kernel weight (g) and plant height (cm) showed moderate variation. The seeds of the germplasm were stored for using in the future breeding programme. The sowing date was 19 and 23 December, 2024. Seeds were sown in two rows of 4 m long plot with the spacing of line to line 30 cm and plant to plant 15 cm. Recommended doses of fertilizers were applied@10:70:50:30:4:2 kg/ha of NPKSZnB respectively. Intercultural operations were done properly as and when necessary to obtain optimum plant growth. Data on days to 1st flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like no. of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. The ranges for days to 1st flowering, days to maturity, plant height, mature pods/plant, 100 kernel weight (g), shelling % and plot yield were 46-63 days, 142-152 days, 29.2- 66.6 cm, 5.8-57.4, 24.77- 83.19 g, and 41.36- 86.52 respectively. The highest coefficient of variation (CV%) was recorded for the character mature pods per plant (35.96 %). Minimum variation was observed in the character days to maturity. The seeds of the germplasm will be grown in the next year and stored for using in the future breeding program. Higher CV% indicated higher variation in the characters and thus there were higher variations among the genotypes for mature pods per plant and plot yield, medium variation in plant height, 100 kernel weight and least variations in days to maturity, days to flower and shelling %. The seeds of the germplasm were stored and will be maintained in next year for using in the future breeding programme.

Hybridization in groundnut

M. Q. I. Matin and M. H. Rashid

Five parental lines were sown in two batches were crossed in 10 (5×5 half diallel fashion) different cross combinations. A total of 435 buds were pollinated at Joydebpur. Two batches of five parental lines were sown on ten days interval in 24 December, 2024 and 03 January, 2025 at Joydebpur. The unopened matured buds were emasculated at afternoon (12.00 pm to 3.00 pm) and the emasculated buds were pollinated in the following morning (6.00 am to 8.00 am.). A total of 102 pods were harvested from 435 pollinated buds out of ten crosses. On an average 23 % crosses were successful. The pollinated pods will be grown in the next *rabi* season for F_1 confirmation.

Evaluation of segregating generations of groundnut

M. Q. I. Matin and M. H. Rashid

A total of 65, 39, 78, 24 and 35 single plants were selected from F_2, F_3, F_4, F_5 and F_6 generations respectively based on number of mature pods per plant, cluster pod formation, dwarf canopy of the plant, pod surface and diseases and insect reaction. Seeds of 14 cross combinations from F_2, 8 entries

from F_3, 16 entries from F_4, 05 entries from F_5 and 07 entries from F_6 respectively were sown on December 19, 2024 at Joydebpur. Recommended doses of fertilizers and proper crop management practices were applied. The seeds from selected single plants of F_2 were collected and stored for advancing the generation as F_3 in the next season. On the other hand, the seeds from selected plants of F_3 were collected and stored according to the cross and generation will be advanced as F_4 generation. From the F_4 generation 78 plants were selected from 16 accessions and will be tested their performance as F_5 generation in the next season. From the F_5 generation 24 plants were selected from 05 accessions and will be tested their performance as F_6 generation in the next season. From the F_6 generation 35 plants were selected from 07 accessions and will be tested their performance as observation trial in the next season.

Observation trial of groundnut (Set-I)

M. Q. I. Matin, D. R. Datta and M. H. Rashid

Nineteen genotypes including two checks Dhaka-1 and BARI Chinabadam-8 were evaluated at Joydebpur during *rabi*, 2024-25. Seeds were sown on 19 December, 2024 in RCBD design with three replications. Unit plot size was 2 rows 4 m long with the spacing of 40 cm x 15cm between rows and plants respectively. Recommended doses of fertilizers were applied @ 10:70:50:30:4:2 kg/ha of N P K S Zn B, respectively. Intercultural operations were done properly as and when necessary to obtain optimum plant growth. Data on days to 1st flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like no. of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. Pod yield per plot were converted pod yield per hectare. Recorded data were analyzed statistically. Maximum shelling percentage was found in the genotype ICGV 94365 (75%). Highest pod yield (2000 kg/ha) was obtained from the genotype ICGV 87055 followed by the genotype ICGV 94365 (1937.5 kg/ha), ICGV 88409 (1875 kg/ha), ICGV 93382 (1812.5 kg/ha), ICGV 93389 (1750 kg/ha), ICGV 94366 (1662.5 kg/ha), ICGV 94347 (1637.5 kg/ha which were 39%, 34%, 30%, 26%, 21%, 16% and 14% higher than the check variety BARI Chinabadam-8, respectively. Maximum number of mature pods per plant was observed from the entry ICGV 93382 (35.4).Highest 100 kernel weight (61.18 g) was obtained from the entry ICGV 87055. Considering the pod yield seven genotypes ICGV 87055, ICGV 94365, ICGV 88409, ICGV 93382, ICGV 93389, ICGV 94366, ICGV 94347 have been selected for Preliminary Yield Trial.

Preliminary yield trial of groundnut (Set-I)

M. Q. I. Matin, D. R. Datta and M. H. Rashid

Twenty genotypes including two checks Dhaka-1 and BARI Chinabadam-8 were evaluated at Joydebpur during *rabi*, 2024-25. Seeds were sown on 18 December, 2024 at Joydebpur in RCBD design with three replications. Unit plot size was 6 rows 4 m long with the spacing of 40cm x 15cm between rows and plants respectively. Recommended doses of fertilizers were applied @ 10:70:50:30:4:2 kg/ha of N P K S Zn B respectively. Intercultural operations were done properly as and when necessary to obtain optimum plant growth. Data on days to 1st flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like no. of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. Pod yield per plot were converted pod yield per hectare. Recorded data were analyzed statistically. Maximum shelling percentage were found in the genotypes ICGV 92229 (70.20 %), ISD 3014 (68.12 %), JL-24 (67.42%) and TG51Bom15 (67.42%). Highest pod yield (2104.68 kg/ha) was obtained from the genotype ICGV 07210 and F3-5 followed by the genotype ICGV 01105 (2019.53 kg/ha), ICGV 9118 (1952.65 kg/ha), BDGV 9112-2-1-2 (1938.54 kg/ha) and ICGV 3479 (1936.45 kg/ha), which were 12%, 07%, 04% and 03% higher than the check variety BARI Chinabadam-8 respectively (1882.81 kg/ha). Maximum number of mature pods per plant was observed from the entry ISD 3014 (29.1). Highest 100 kernel weight (59.82 g) was obtained from the entry BDGV 9112-2-1-2. Considering the pod yield six genotype ICGV 07210, F3-5, ICGV 01105, ICGV 9118, BDGV 9112-2-1-2 and ICGV 3479 have been selected for Regional Yield Trial.

Preliminary yield trial of groundnut (Set-II)

M. Q. I. Matin, D. R. Datta and M. H. Rashid

Nineteen genotypes including two checks Dhaka-1 and BARI Chinabadam-8 were evaluated at

Joydebpur and Burirhat, Rangpur during *rabi*, 2024-25. Seeds were sown on 18 December, 2024 at Joydebpur in RCBD design with three replications. Unit plot size was 6 rows 4 m long with the spacing of 40cm x 15cm between rows and plants respectively. Recommended doses of fertilizers were applied @ 10:70:50:30:4:2 kg/ha of N P K S Zn B respectively. Intercultural operations were done properly as and when necessary to obtain optimum plant growth. Data on days to 1 flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like no. of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. Pod yield per plot were converted pod yield per hectare. Recorded data were analyzed statistically. Highest pod yield (1584.71 kg/ha) was obtained from the genotype ICGV 1352 followed by the genotype BDGV 9112-2-1-1 (1411.11 kg/ha), BDGV 9112-5-1-1 (1341.66 kg/ha), ICGV 93471 (1178.72 kg/ha). Among them ICGV 1352 and BDGV 9112-2-1-1 were 14% and 01% higher than the check variety BARI Chinabadam-8, the rest ICGV 93471 was 12% higher than the check Dhaka-1 respectively. Highest hundred kernel weight were found in Beijing-3 (66.54 g) followed by ICGV 864017 (61.18 g), BDGV 9112-5-1-1 (56.24g) and BDGV 9112-2-1-1 (55.96 g). Maximum number of mature pods per plant was observed from the entry BDGV 9112-5-1-1 (28.3). Considering the bold seeded, pod yield and duration nine genotypes ICGV 1352, BDGV 9112-2-1-1, BDGV 9112-5-1-1 and ICGV 93471 have been selected for Regional Yield Trial.

Regional yield trial of groundnut (Set-I)

M. Q. I. Matin, M. H. Rashid, M. K. Alam and S. Ghosh

The experiment was conducted with 17 groundnut genotypes including 2 checks as Dhaka-1 and BARI Chinabadam-8 at Joydebpur, RARS, Jamalpur and RARS, Burirhat, Rangpur in a randomized complete block design with 3 replications. Seeds were sown on 18 December, 2024 at Joydebpur, 17 December, 2024 at Jamalpur and 09 February, 2025 at Burirhat. Unit plot size was 6 rows 4m long with the spacing of 40cm between rows and 15 cm between plants. Recommended doses of fertilizers were applied @ 10:70:50:30:4:2 kg/ha of N P K S Zn B respectively. Intercultural operations were done as and when necessary. Data on days to 1st flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like number of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. Pod yield per plot were converted into pod yield per hectare. Recorded data were analyzed statistically. Average days to maturity at three locations were 139.89 - 145.44 days and PK-1took lowest no. of days to mature (139.89) over three locations followed by 14-103 (140.33), ICGV 38-3 (140.78), 502-4-3-1 (141.00) and ISD 0414 and Choko 0314 (141.11). On an average the entry Choko 0314 produced maximum pod yield (2274.78 kg/ha) followed by ICGV 38-3 (2078.86 kg/ha), ISD 0414 (2026.89 kg/ha) which were 15%, 5%, and 2% higher than the best check variety BARI Chinabadam-8 (1977.89 kg/ha). Three genotypes Choko 0314, ICGV 38-3, ISD 0414 were selected for Adaptive Trial.

Regional yield trial of groundnut (Set-II)

M. Q. I. Matin, M. H. Rashid and S. Ghosh

The experiment was conducted at Joydebpur, Jamalpur and Burirhat, Rangpur during *Rabi* 2024-25 with 18 promising genotypes of groundnut including 3 checks Dhaka-1, BARI Chinabadam-8 and BINA Chinabadam-4. The experiment was laid out in RCBD having three replications. Seeds were sown on 18 December, 2024 at Joydebpur and 13 February, 2025 at RARS, Burirhat, Rangpur. The plot size was 4m x 2.4m. Spacing was 15 cm seed to seed and 40 cm row to row. Recommended doses of fertilizers were applied @ 10:70:50:30:4:2 kg/ha of N P K S Zn B respectively. Half of the urea and all other fertilizers were applied during final land preparation. The rest of the urea was applied at the initial stage of peg development. All intercultural operations were done timely to raise the crop uniformly. Data on days to 1st flowering, days to maturity and pod yield per plot were taken on plot basis. The other yield contributing characters like number of mature pods per plant, 100-kernel weight and shelling percentage were recorded from 5 randomly selected plants of each plot. Pod yield per plot were converted into pod yield per hectare. Recorded data were analyzed statistically. Average

days to maturity at two locations were varied from 143-151 days and Dhaka -1 took lowest no. of days to mature (143) over two locations followed by ICGV 09516 (144), 14-203(145), ICGV 0107 (145), ICGV 02841 (145), ICGV 35-1, (145) and ICGV-95090 (145). On an average the entry ICGV-95090 produced maximum pod yield (2574.23 kg/ha) followed by ICGV 35-1 (2507.39 kg/ha), ICGV 09516 (2495.55 kg/ha), ICGV 0207 (2376.77 kg/ha), ICGV 0107 (2321.24 kg/ha), ICGV 0704 (2269.83 kg/ha) and ICGV 91176 (2258.69 kg/ha) which were 17%, 14%, 13%, 8%, 5%, 3% and 2% higher than the check varieties. Seven genotypes ICGV-95090, ICGV 35-1, ICGV 09516, ICGV 0207, ICGV 0107, ICGV 0704, ICGV 91176 have been selected for Adaptive Trial.

Disease management

Evaluation of different group of commercial fungicides against tikka (leaf spot) and rust disease of groundnut (*Arachis hypogaea*)

K. Jahan and N. A. Sultana

Groundnut (*Arachis hypogaea* L.), is a promising leguminous oilseed crop, belonging to the family Fabaceae. The crop is susceptible to a variety of plant pathogens, among the fungal diseases of groundnut, early leaf spot (*Cercospora arachidicola*), late leaf spot (*Cercosporidium personatum*, and groundnut rust (*Puccinia arachidis*) are most devastating. 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 2024-25 growing season. Nine treatments namely, Score (Dyfenoconazole), Nativo (Tebuconazole 50% + Tryfloxystrobin 25%), Folicure (Tebuconazole), Tilt (Propiconazole), Autostin (Carbendazem), Rovral (Iprodian), Amister top (Azoxytrobin + Difenoconazole), Navara (Azoxystrobin20% + Cyporoconazole 8%), Ridomil (Mancozeb 64% + Metalaxyl 4%) were sprayed three times according to disease prevailing conditions. For Tikka disease, Amister top (Azoxytrobin + Difenoconazole) showed minimum disease incidence (24.09%) which was 63.62% disease reduction over untreated control treatment. For Rust disease, Navara (Azoxystrobin20% + Cyporoconazole 8%) showed minimum disease incidence (23.25%) which was 60.75% disease reduction over untreated control treatment.

Screening of groundnut varieties/lines against tikka rust and other soil borne diseases

K. Jahan and N. A. Sultana

Groundnut (*Arachis hypogaea* L.) is a promising oil legume crop in Bangladesh. More than 40 fungal diseases have been reported in groundnut. Among them, Tikka/leaf spot caused by *Cercospora arachidicola* and *Cercosporidium personatum* Berk. and Curt., and rust caused by *Puccinia arachidis* Speg. are serious foliar fungal diseases. An experiment was conducted at Oilseed Research Centre, BARI, Gazipur during *rabi* 2024-25 cropping season under natural epiphytotic condition to evaluate groundnut entries against Tikka (leaf spot) and Rust diseases. Disease data were recorded at 141 days of plant age using '0-5' scale for Tikka and "1-9" scale for Rust. Among the 35 tested varieties/lines, 27 entries showed Moderately Susceptible and 8 entries showed Susceptible reaction against Tikka. Percent disease severity for Tikka ranges between 32.22 to 63%. The lowest disease severity 32.22% obtained from ICGV-95090 (T_{14}), followed by ICGV 0207 (T_{11}), ICGV 91176(T_8), ICGV 35-1 (T_{13}) and ISD-94323 (T_5). For Rust disease percent disease severity ranges between 29.85 to 59.49%. The lowest disease severity 29.85% obtained from ISD-502-4-3-1(T_{18}), followed by ISD-2914 (T_{25}), ISD-94062 (T_6), ISD-94323 (T_5), and 14-403 (T_{24}). No entry was observed either Resistant or Moderately Resistant against Cercospora leaf spot and Rust (*Puccinia arachidis*) disease of groundnut.

Insect Management

Development of a management approach against major insect pests of groundnut

M. A. Islam, A. Samiha and R. Islam

The experiments were conducted during *robi* season 2024-25 at ORC research field, BARI, Gazipur and to develop effective management approach against major insect pests of groundnut. The experiment was laid out in RCBD with three replications. Groundnut seeds (BARI Chinabadam-9) was sown on 06 January 2025 at Gazipur. The unit plot size was 5.0 m x 4.0 m with 1.0 m and row to row 30 cm

distance. The normal intercultural operations were done as and when necessary. The treatments were as follows: T_1= White sticky trap + Spinetoram (Delegate 11.7 SC) @ 1.0 ml/L of water, T_2= White sticky trap + Bio-chamak (Celastras angulatas 1% EW) @ 2.5 ml/litre of water, T_3= White sticky trap+ Spraying of (Chlorfenapyr + Emamectin benzoate) (Benapore 12 SC) @ 1ml/L of water, T_4= White sticky trap+ Spraying of Spinosad (Success2.5 SC) @ 1.2 ml/ L of water, T_5= Spraying of (Chlorpyrifos + Cypermethrin) Nitro 505 EC @ 1ml/L of water, T_6= Untreated control. Results demonstrated that T_1, comprising white sticky traps combined with Spinetoram (Delegate 11.7 SC) at 1.0 ml/L, significantly suppressed all major pest populations. T1 recorded the lowest infestations of whitefly (0.92 ± 0.10/leaf), jassid (1.28 ± 0.12/leaf), and thrips (1.15 ± 0.18/twig), as well as the lowest counts of leaf roller (1.33 ± 0.16/10 plants) and hairy caterpillar (0.88 ± 0.09/10 plants). Correspondingly, T_1 also yielded the highest productivity (2.18 ± 0.15 t/ha), surpassing the control (1.46 t/ha). Economic analysis confirmed the cost-effectiveness of T_1, which yielded the highest net return (Tk 118,000/ha) and the most favorable marginal benefit-cost ratio (MBCR = 2.40), outperforming all other treatments. The study concludes that integrating physical trapping with a selective insecticide like Spinetoram offers a robust and economically viable solution for managing key insect pests in groundnut cultivation.

Screening of groundnut entries against major insect pests under natural field condition

A. Samiha, R. Islam and M. A. Islam

Seventeen groundnut entries were evaluated for resistance to major insect pests during the 2024-25 season at the Oilseed Research Centre (ORC), BARI, Gazipur. The study included 18 entries, with BARI Chinabadam-8 as the check variety. Seeds were sown on December 29, 2024, in a RCBD with three replications, and no insecticides were applied. Visual assessments of foliage damage from jassids, thrips, leaf roller and hairy caterpillar were conducted on five randomly selected plants from each entry every seven days across various growth stages. The lowest no. of jassid population was recorded in ICGV-0207 (1.7%), similar to ISD 3814 (2.3%) and ICGV-0704 (2.7%). Additionally, the lowest no. of thrips population was in ICGV-0704 (1.7%). The lowest infestation by leaf roller was found in ISD 3814 (7.67%), similar to ICGV-0207 (9.67%). ICGV-0704 (8.33%) exhibited the lowest hairy caterpillar infestation (12.7%), comparable to ICGV-0207 (9.67%). Overall, the entries ICGV-0207, ICGV-0704 and ISD-3814 exhibited lower pest infestations and better performance, making them suitable candidates for further breeding programs aimed at developing insect-resistant groundnut varieties.

Soybean

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.

Crops Improvement

Maintenance and evaluation of soybean

H. Kohinoor, U. Kulsum, M. H. Rashid, M. S Uddin and M. Monirul Islam

A total of 123 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,

2025, 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 parameter days to flowering ranged from 57 to 64 days. The minimum days to maturity were observed for USDA-3, BARI Soybean-6 and USDA-4 which was 97 days while the entry Richmond took maximum days (120 days) to mature. Among the entries, BARI Soybean-7 was the shortest (28 cm) and USDA-107 was the tallest (44 cm) in plant height. The range of number of pods per plant and hundred seed weight were from 24 to 37 g and 10 to 16 (g), respectively. The seed yield ranged from 1389 kg/ha in USDA-107 to 2654 kg/ha in BARI Soybean-6. None of the entries over-yielded as compared to the check variety BARI Soybean-6. But as well as MTD-453, USDA-3, USDA-4, USDA-72 and BARI Soybean-6 had more yield than another check BARI Soybean-7. 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.

Regional yield trial of soybean

H. Kohinoor, U. Kulsum, M. H. Rashid, M. S Uddin and M. Monirul Islam

Ten entries, including two check varieties, BARI Soybean-6 and BARI Soybean7, were evaluated for seed yield and others yield contributing characters in RCB design with three replications at Gazipur and and Noakhali in 2024-2025. The unit plot size was 6 rows of 4 m with spacing 40 cm apart. The sowing date was 16, January 2025 at Gazipur. Fertilizers were applied @ Urea 55kg, TSP 165 kg, MP 110 kg, Gypsum 100 kg and Boric acid 9 kg per ha. Half of the Urea and all other fertilizers were applied at the time of final land preparation. The remaining half of the Urea was applied as a top dress before the flowering stage. Irrigation and intercultural operations were done when necessary. Data on days to flowering. 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. A highly significant difference was observed among the entries for yield and yield contributing characters at Gazipur. The parameter days to flowering ranged from 57 to 64 days. The minimum days to maturity were observed for USDA-3, BARI Soybean-6 and USDA-4 which was 97 days while the entry Richmond took maximum days (120 days) to mature. Among the entries, BARI Soybean-7 was the shortest (28 cm) and USDA-107 was the tallest (44 cm) in plant height. The range of number of pods per plant and hundred seed weight were from 24 to 37 g and 10 to 16 (g), respectively. The seed yield ranged from 1389 kg/ha in USDA-107 to 2654 kg/ha in BARI Soybean-6. None of the entries over-yielded as compared to the check variety BARI Soybean-6. But as well as MTD-453, USDA-3, USDA-4, USDA-72 and BARI Soybean-6 had more yield than another check BARI Soybean-7.

The mean performance of seed yield (kg/ha), hundred seed weight (g) and number of pods per plant of ten soybean entries in two different locations are presented in Table 2a and 2b. The parameters number of pod per ranged from 36 to 41. MTD-453 was the boldest seeded entries (13.4 g). The average seed yield ranged from 1368 to 2322 kg/ha.

Maintenance of released variety and advanced lines of soybean

H. Kohinoor, U. Kulsum, M. H. Rashid, M. S. Uddin and M. Monirul Islam

During the *rabi* season of 2024-25, five BARI-released soybean varieties and five advanced lines were cultivated at ORC, BARI, Gazipur to ensure genetic purity. The seed production yielded 9 kg of Shohag, 14 kg of Bangladesh Soybean-4, 5 kg of BARI Soybean-5, 10 kg of BARI Soybean-6, and 0.18 kg of BARI Soybean-7. Additionally, 0.5 kg

of ST-1, 1.5kg of MTD-453, 0.2 kg of Richmond, 0.15 kg USDA-40 and 0.1kg 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.

Hybrid development, F1 confirmation, and evaluation of F1 performance in soybean

U. Kulsum and Hosna Kohinoor

Eleven parental lines, namely Bangladesh Soybean-4, BARI Soybean-6, BARI Soybean-7, Richmond, Australia-1, MTD-453, BR-33, BS-33, BINA Soybean-2, BU Soybean-2, and BU Soybean-4, were used as parents for hybridization. Hybridization was conducted at the ORC net house during *kharif* 2024. Data were recorded on the number of soybean buds pollinated, pod set, seeds produced, and pod set percentage. Immature flowers were emasculated in the afternoon before anther dehiscence, and pollination was done the following morning to improve seed set.

F_1 seeds from each cross were sown on 24 January 2025 in single 4-meter rows alongside parents. Data collected included final plant stand, pods per plant, and seed yield per plant. Five plants from each parent line were also selected for data comparison.

A total of 557 buds from 35 crosses were crossed, resulting in 121 pods and 224 seeds. Approximately 22.3% of single crosses succeeded in producing pods.

All F_1 seeds were planted in rows with their parents and evaluated for pods per plant and yield (Table 3). Hybridity was confirmed using flower and seed coat color, where purple flowers and cream seed coats indicated dominant hybrid traits. Seventy-eight individual F_1 plants from 28 cross combinations were selected based on yield-contributing traits and harvested separately. Selected plants exhibited pod numbers ranging from 7 to 105 and seed yield per plant up to 23.8 g. Seeds from these plants were stored for developing the F_2 generation in the next season.

Evaluation of segregating F2 generation in soybean

U. Kulsum and H. Kohinoor

Eleven parental lines (Shohag, Bangladesh Soybean-4, BARI Soybean-5, BARI Soybean-6, BARI Soybean-7, Richmond, ST-1, Australia-1, MTD-453, BINA Soybean-2, and BU Soybean-2) were crossed in 27 combinations during the *kharif* 2023 to produce F_1 seeds. These F_1 seeds were grown during the *rabi* 2024 in different rows to develop the F_2 population. In the following season, F_2 seeds from 24 cross combinations were sown on 24 January 2025 using the plant-to-row method. The row-to-row spacing was maintained at 40 cm, and plant-to-plant spacing to 10 cm. All recommended intercultural operations were carried out as needed throughout the growing period. Individual F_2 plants were selected and evaluated based on their phenotypic performance.

A total of 38 individual plants were selected from 17 different F_2 cross combinations based on their phenotypic performance. Plant height among the selected plants ranged from 24 to 44 cm, while branches per plant varied from 1 to 5. The number of pods per plant ranged between 22 and 110, and the number of seeds per pod was between 2 and 3. Seed yield per plant varied from 5.2 to 25.1 grams. These variations reflect the expected segregation in the F_2 generation. Seeds from these selected plants were stored separately for growing the F_3 generation in the next season.

Evaluation of waterlogging tolerance in soybean germplasm at vegetative stage

U. Kulsum, H. Kohinoor and S. H. Habib

Thirty-two soybean genotypes, including BARI-released varieties, were evaluated under two treatments: waterlogged (WL) and control (C), in a pot experiment conducted during the *rabi* season of 2024–2025 at Gazipur. Waterlogging stress was imposed at 20 days after sowing (DAS) and maintained for 21 days by keeping the water level consistently 2.0 inches above the soil surface. Following the stress period, the pots were drained, and the plants were kept for a 7-day recovery period under normal conditions. Data were recorded on the number of plants before and after stress, post-recovery survival, number of leaves, shoot and

root length, and fresh weight of shoots and roots. Mortality percentage was calculated as the proportion of plants that died during the waterlogging period, while recovery percentage reflected the proportion of plants that survived and resumed growth during the recovery phase.

Based on mortality and recovery percentages, genotypes were classified into three tolerance categories: Tolerant (mortality ≤ 20% and recovery ≥ 70%), Sensitive (mortality ≥ 70% and recovery ≤ 20%), and Moderately Tolerant (those falling between these thresholds). To analyze clustering patterns based on these predefined tolerance levels, supervised classification was performed using Linear Discriminant Analysis (LDA). Prior to analysis, all quantitative traits (mortality, recovery, shoot and root traits) were standardized. LDA was used to reduce dimensionality and maximize group separation, allowing clear visualization of genotype clustering according to waterlogging tolerance. All data analysis and visualization were performed using R software.

Waterlogging stress at the vegetative stage resulted in considerable variation among the 32 soybean genotypes in terms of mortality and recovery percentages. Genotypes such as GMOT-95, BD-2341, and BD-2348 exhibited low mortality (≤ 20%) and high recovery (≥ 70%), which indicates high waterlogging tolerance. These genotypes were also clustered together under the Tolerant group in the LDA classification (Figure 2). In contrast, genotypes like USDA-92, USDA-40, BD-2332, and LG-92P-1176-1 showed high mortality rates (above 70%) with poor recovery, aligning with the Sensitive cluster in the LDA. Rest of the genotypes like Shohag, BARI Soybean-5, and MTD-453, demonstrated moderate stress effects and post-flood recovery, and were categorized as Moderately Tolerant.

Waterlogging stress caused a significant reduction in morphological traits across genotypes, including leaf number, shoot length and shoot fresh weight. All the untreated plants had more number of leaves than the treated plants. The average shoot length under control was 30.1 cm, which decreased significantly under waterlogged conditions to 20.7 cm. Similarly, shoot fresh weight dropped from 2.3 g in the control to 1.2 g under waterlogging that indicates substantial growth inhibition. The reduction is likely due to hypoxia in the root zone that reduces nutrient uptake and impairs physiological processes. These findings are consistent with previous studies that reported similar effects of waterlogging on soybean growth.

Root traits also displayed significant genotypic variation under waterlogging. Interestingly, a slight increase was observed in average root length (from 10.8 cm to 10.9 cm) and root fresh weight (from 1.4 g to 1.6 g) under stress. Genotypes in the tolerant and moderately tolerant groups exhibited better root development. This may be due to the formation of adventitious roots, which are commonly induced under waterlogged conditions and typically emerge from the basal stem region in the upper soil layers. These roots improve access to atmospheric oxygen, aiding plant survival in anaerobic conditions. Nguyen et al. (2015) also reported similar increases in root traits under flooding stress.

Study of genetic diversity of soybean (*Glycine max* (L.) MERR.) genotypes using SSR markers

U. Kulsum, P. Roy, A. Samiha and S. H. Habib

Total forty-five genotypes collected from different countries and currently maintained in BARI were used as study materials. Total genomic DNA from fresh and young leaves was isolated and purified following ORC Molecular Biology Lab standardized CTAB protocol. The concentration and quality of the DNA samples was estimated using NanoDrop 2000™ spectrophotometer (Thermo Fisher Scientific, USA) by determination of A260/A280 absorbance ratio. Finally, a portion of DNA was diluted in molecular grade water to a concentration of 50 ng/µl and stored at −20 °C.

Polymerase chain reaction (PCR) amplification was conducted using the standardized protocol. The amplified PCR products were then separated by electrophoresis on 2% (w/v) agarose gel, stained with SYBR safe (1 mg/mL) and photographed under UV light using BioRade software. The size of the amplified products was determined using 50 and 100 bp DNA ladder as size standard. SSR markers developed by Cregan et al.1999 were used in the present study. A total of 35 SSR markers representing all the 20 linkage groups of soybean were chosen for genotyping from SSR database (http://www.soybase.org).

Data from the SSR primers were analyzed to obtain the information on genetic diversity of the soybean entries. The summary statistics including the number of alleles per locus, major allele frequency, gene diversity, Polymorphism Information Content (PIC), genetic distance-based clustering were calculated with the unweighted pair group method arithmetic average (UPGMA) using Power Marker v 3.25 (Liu and Muse, 2005) and a UPMA dendrogram was constructed based on the dissimilarity matrix from MEGA 11.0 software.

Molecular characterization of germplasm reveals underlying allelic diversity and genetic base within soybean germplasm collection in BARI. The 45 promising soybean genotypes were profiled with 35 crop specific SSR markers. Among the 35 SSR primer pairs, 22 primer pairs produced scorable bands and were found to be polymorphic. A total of 87 alleles were detected from these 22 primer pairs of which, 81 alleles were polymorphic with an average of 3.68 alleles per primer pair.

The number of alleles generated from each primer pair ranged from 2 (seven primer pairs) to 10 (Satt460). The highest major allelic frequency of 0.96 was observed using marker Satt336 and lowest frequency of 0.27 was detected using Satt600. Genetic diversity ranged from 0.08 for marker Satt336 to 0.83 for marker Satt600 and Satt460 with a mean value of 0.52. The highest PIC value (0.81) was observed in Satt600 and Satt460 and lowest value (0.08) was recorded for the primer Satt336 with average of 0.47. The H values for the markers ranged from 0.0 to 1.0 with an average of 0.16.

The UPGMA based dendrogram grouped the 49 genotypes of soybean into two major clusters viz., I and II comprising of 26 and 19 genotypes respectively. Cluster I is further divided into two sub-groups Ia and Ib with 14 and 12 genotypes, respectively. The cluster II with 19 genotypes is also divided into another two sub-groups IIa and IIb comprising of 4 and 15 genotypes, respectively. This indicated that dissimilar accessions are grouped into distantly related clusters. This dissimilar grouping or distant clusters is so important because it helps the breeders to select the accession(s) with important dissimilar traits from the studied accessions for hybridization to get the higher heterotic responses.

Disease management

Screening of soybean genotypes against soybean yellow mosaic virus

N. A. Sultana and K. Jahan

The experiment was conducted during 2024-2025 at Joydebpur to find out the resistant lines of soybean yellow mosaic virus. A total of twenty-six lines/ varieties of soybean were tested. A susceptible variety, BARI soybean-6, was used as a standard check. Foliar disease was recorded at the pod development stage using a 0-9 scale. Among the 26 test lines, only one line (VIETKHAI) showed a highly resistant reaction. Four lines (Richmond, MTD 453, ST-1, KADSING) showed resistant reaction, and six lines (Shohag, Bangladesh Soybean-4, BARI Soybean-5, Australia-1, BINA Soybean-2, BINA Soybean-6) showed moderately resistant reaction against soybean yellow mosaic virus disease. These promising lines may be considered for further evaluation in the following season.

Insect Management

Screening of soybean entries against major insect pests under natural field condition

A. Samiha, R. Islam and M. A. Islam

Fifteen soybean entries were evaluated for resistance to major insect pests during the 2024-25 season at the Oilseed Research Centre (ORC), BARI, Gazipur. The study included 16 entries, with BARI Soybean-7 as the check variety. Seeds were sown on January 29, 2025, in RCBD with three replications, and no insecticides were applied. Visual assessments of foliage damage from leaf roller, common cutworm, whitefly and hairy caterpillar were conducted on five randomly selected plants from each entry every ten days, from the 3rd 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 ST-1 (6.52%), similar to Richmond (8.74%), MTD-453 (8.87%), Shohag (9.53%), Australia-1 (11.25%) and VIETKHAI (13.08%). MTD-453 exhibited the lowest hairy caterpillar infestation (12.9%), comparable to ST-1 (13.5%) and Richmond (14.9%). Additionally, the lowest cutworm infestation was in Richmond (9.61%), similar to MTD-453 (10.40%) and ST-1

(11.56%). The highest no. of whitefly population was found in entry BR-33 (5.9 per three leaves). Overall, the entries ST-1, Richmond and MTD-453 exhibited lower pest infestations and better performance, making them suitable candidates for further breeding programs aimed at developing insect-resistant soybean varieties.

Sunflower
Crops Improvement

Maintenance and evaluation of sunflower germplasm

S. H. Habib and Md. Nazrul Islam

Forty-eight existing sunflower (*Hellianthus annus* L.) genotypes along with two varieties were grown in the experimental field of Oilseed Research Centre, BARI, Gazipur during the *rabi* season 2024-2025. Five plants from each genotype were intermate to maintain the heterozygosity. At maturity that heads were harvested and bulked seeds were collected which will be grown in the next season for maintain the germplasm.

Preliminary yield trial of sunflower

S. H. Habib, U. Kulsum, M. S. Kobir, M. Hussain and M. N. Islam

Ten sunflower lines along with three check varieties BARI Surjamukhi-2, BARI Surjamukhi-3 and Pacific Hysun-33 were evaluated for yield and yield contributing characters at Joydebpur, Ishurdi, and Cumilla region during the *rabi* season of 2024-25. Experiments were laid out in RCB design with 3 replications. Unit plot size was 10 m^2. Each plot consisted of 6 rows which were 4 m long with 50 cm row to row and 25 cm plant to plant distance. Fertilizers were applied @ 90:35:80:30:3.6 and 1.8 kg/ha of NPKSZnB, respectively, from urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and the other fertilizers were applied at the time of final land preparation. The remaining half of the urea was applied as top dress during flower primordial stage. Other intercultural operations were done properly to obtain optimum plant growth. Data on days to flowering, days to maturity and seed yield were taken on plot basis. The other yield contributing characters were recorded from 10 randomly selected plants of each plot. Seed yield was converted into yield/ha.

Among the genotypes Composite-5 was medium dwarf (108.94 cm) genotype over the locations. Over the location hybrid variety Hysun-33 gave highest yield (2.7 t/h) followed by variety BARI Surjamukhi-2 (2.1 t/h), while the line Composite-5 and BUZZY TALL ranked third for yield (1.7 and 1.8 t/h, respectively).

Screening and evaluation of M8 mutant's family created by gamma radiation

S. H. Habib and U. Kulsum

Gamma radiation-treated M_7 seeds from different families were used in this study. All M_7 seeds were sown in the research field of ORC, BARI, Gazipur on 19 November 2024 to generate the M_8 population. Seeds from each family were sown on a plot basis in 4-meter-long plots, with the required number of lines, maintaining row-to-row and plant-to-plant spacing of 50 cm × 25 cm, respectively.

The plants height varied significantly, ranging from 61 cm (shortest) to 155 cm (tallest). The thickness of the plant stems ranged from 1.8 cm to 3.2 cm. The size of the flower head ranged from 16.0 cm to 27.8 cm. Plants from each family were harvested and preserved. The selected family mutants will be grown in the next season for yield and yield-attributing trait evaluation, while the remaining families will be maintained and utilized in future breeding programs.

Screening and evaluation of ems induced M6 mutant's family

S. H. Habib and U. Kulsum

EMS-treated (0.5%) M_6 seeds from different families of the sunflower variety BARI Surjamukhi-2, obtained during the *rabi* season 2023–24, were sown in the research field of ORC, BARI, Gazipur on 20 November 2024 to generate the M_7 families. Each family was grown in a 4-meter-long plot with the required number of rows, maintaining a spacing of 50 cm between rows and 25 cm between plants.

In M_6 generation, a total of 56 mutants family were evaluated for most important quantitative morphological traits of plant height, stem and head diameter. The plants height ranging from 60 cm (shortest) to 129.60 cm (tallest). The stem thickness ranged from 1.25 cm to 3.12 cm and the head size ranged from 16.0 cm to 27.8 cm. Plants from each

family were harvested and preserved separately. The selected family mutants will be evaluated in the next season for yield and yield-attributing trait, while the remaining families will be maintained for utilization in future breeding programs.

Maintenance and seed increase of dwarf advance lines of sunflower

S. H. Habib

For seed increase of advance lines, seeds from 17 advance lines of sunflower namely (as on Table 1) were grown separately at ORC research field, BARI, Gazipur during *rabi* season 2024-25. The genotype were sown on 19 November 2024 in an 8 X 4 m long plot. The advance lines Comp-5 and Syn-3 were also sown on 14 and 15 November 2024 in a plot size of 1000 m^2 and 645 m^2, respectively. The spacing was followed 50 cm between the rows and 25 cm between the plants. Fertilizers were applied @ 90:35:80:30:3.6 and 1.8 kg/ha of NPKSZnB, respectively, from urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid. Half of the Urea and all other fertilizers were applied at the time of final land preparation. The remaining half of the Urea was applied as top dress during flower primordial stage. To obtain optimum plant growth other intercultural operations were done properly when necessary. Each plot was covered with nylon net to protect out crossing. The plants in each genotype were allowed to intermate by rubbing the pollen collecting within the same genotype.

At maturity, desired heads were harvested, threshed, dried and clean, disease free healthy seeds were obtained from each inbreeds. Different amount of seeds was obtained from different inbreeds and preserved which will be utilize in further varietal development program.

Crop and Soil Management

Performance of sunflower varieties in the southern region of Bangladesh

M.U. Islam, M. M. KARIM and M. J. Hussain

A field experiment was conducted at the research field of Oilseed Research Centre, BARI, Gazipur during *rabi* season of 2024-25 to evaluate the performance of different sunflower genotypes. Four sunflower varieties viz, BARI Surjamukhi-2, BARI Surjamukhi-3, Pasific Hysan-33 and one advance line SYN-33 were evaluated. The experiment was laid out in RCB design with three replications. Sunflower seeds were sown on 25 November 2024, and the crop was harvested on 27 March 2024. The seed yield was highest in Hysun-33 (2.24 t ha^{-1}) which might be due to higher 1000-seed weight (72.66 g). Yield of other sunflower varieties were 1.77, 1.46 and 1.99 t ha^{-1} of BARI Surjomukhi-2, BARI Surjomukhi-3 and SYN-33, respectively. The Gross Margin of BARI Surjomukhi-2, BARI Surjomukhi-3, SYN-33 and Hysun-33 were Tk 50700.00, Tk 32100.00, Tk 63900.00 and Tk 59400.00 ha^{-1}, respectively. Highest BCR were found in Advanced line (2.15) followed by BARI Surjomukhi-2 (1.91) and Hysun-33 (1.79). These results suggest that the Advanced Line has strong potential for future varietal development, while Hysun-33 remains a high-yielding commercial check under the tested conditions.

Effect of two different plant growth regulators on grain filling of sunflower

M.U. Islam, S. H. Habib, and M. M. KARIM and M. J. Hussain

A field experiment was carried out at the research field of the Oilseed Research Centre, Bangladesh Agricultural Research Institute, Gazipur during the *Rabi* season of 2024–2025 to investigate the effect of foliar application of plant growth regulators (PGRs) on grain filling and yield of sunflower. The experiment was conducted followed by factorial in Randomized Complete Block Design with three replications. Factor A included three crop growth stages: vegetative (S_1), anthesis (S_2), and vegetative plus anthesis (S_3), while Factor B comprised four hormone treatments: H_0 (control), H_1 (BA 150 mg/L), H_2 (GA 150 mg/L), and H_3 (BA+GA 150 mg/L). Seeds of BARI Surjomukhi-3 were sown on 25 November 2024. Results showed that foliar application of BA at anthesis stage (S_2H_1) produced the highest matured seed (91.22%) and maximum seed yield (2.12 t/ha), followed by GA at vegetative and anthesis stage (S_3H_2). All PGR treatments enhanced the percentage of mature seeds compared to the control. The findings suggest that appropriate timing and concentration of PGRs, especially BA at anthesis, can significantly improve grain filling and yield in sunflower. Further multi-year trials are needed for final recommendation.

Intercropping red amaranth and spinach with sunflower at different row arrangement

M. M. Karim, M.U. Islam, P. Roy and M. J. Hussain

A field experiment was conducted at the Oilseed Research Centre, BARI, Gazipur during the *rabi* season of 2024–25 to evaluate the optimal row arrangement of red amaranth and spinach intercropped with sunflower for enhanced productivity and economic return. The study comprised nine treatments: sole sunflower (T_1), various combinations of red amaranth (T_2–T_4) and spinach (T_5–T_7) intercropped with sunflower, and sole red amaranth (T_8) and spinach (T_9). The experiment was laid out in RCBD with three replications. Although intercropping slightly reduced sunflower yield, overall productivity increased due to the additional yield of companion crops. The highest sunflower equivalent yield (SEY) was recorded in T_9 (sole spinach, 2.36 t/ha), followed by T_5 (one row of spinach with sunflower, 2.30 t/ha), while the lowest SEY was observed in sole sunflower (T_1, 1.64 t/ha). The highest benefit-cost ratio (BCR) of 1.28 was obtained in T_5, attributed to its higher SEY, gross return, and gross margin (Tk. 23,000/ha). These results suggest that intercropping one row of spinach with sunflower is a productive and economically viable practice.

Effect of foliar application of boron on seed setting and yield of sunflower

M.U. Islam, M. M. KARIM and M. J. Hussain

A field experiment was conducted during the *rabi* season of 2024–2025 at the research field of the Oilseed Research Centre, BARI, Gazipur to evaluate the effect of foliar application of boron (B) on seed setting and yield of sunflower. The experiment followed a factorial arrangement in RCBD with three replications. Treatments included three crop growth stages: S_1 – vegetative stage, S_2 – anthesis stage, and S_3 – flowering and anthesis stage, combined with five boron concentrations: B_0 – control (distilled water), B_1 – 50 mg/L, B_2 – 100 mg/L, B_3 – 150 mg/L, and B_4 – 200 mg/L. Seeds of BARI Sunflower-3 were sown on 25 November 2024. The results showed that foliar application of 150 mg/L boron, particularly when applied during both the vegetative and anthesis stages, significantly increased the number of mature seeds per head, 1000-seed weight, and seed yield of sunflower. A consistent trend of increased mature seed percentage and decreased immature seeds was observed with increasing boron concentration. These findings suggest that proper timing and dosage of boron application play a critical role in improving reproductive success and yield in sunflower. Based on the consistent outcomes over two seasons, foliar application of boron at 150 mg L^{-1} during both the vegetative and anthesis stages is recommended as an effective agronomic practice to enhance sunflower yield under similar environmental conditions.

Integrated nitrogen and boron management to improve the productivity and seed quality of sunflower grown under coastal ecosystem

M. J. Hussain, M. M. Karim, M.U. Islam M. Islam and S. Mondal

A field experiment was conducted at Agricultural Research Station (ARS), BARI, Binerpota, Satkhira, MLT site, Quakata, Potuakhali and RARS Burirhat, Rangpur during the *rabi* season of 2024-25 to assess the interaction behaviour of nitrogen with boron on sunflower growth, yield and its oil quality in alkaline-calcareous soils of coastal area and also in Rangpur area. There were twelve treatment combinations in two factorial RCBD approach where factor A was three different levels of nitrogen fertilizer (N_1= RF + N100%; N_2=RF + N 75%; N_3=RF + N 125%) based on FRG, 2018. On the other hand, factor B was four levels of boron application (B_0=0, B_1=1.5, B_2=3 and B_3=4.5 kg/ha). From the result it is evident that among different treatment combinations, the highest total seed yield was recorded in N_3B_2 (1397 kg/ha), N_3B_2 (1.723 t/ha) and N_3B_3 (2334 kg/ha) for Sathkhirta Quakata and Burirhat, respectively may be ascribed to the application of nitrogen 125% with 3 kg B/ha for Sathkhira and Quakata and nitrogen 125% with 4.5 kg B/ha for Burirhat which could improve synthesis of sufficient photosynthates. The minimum (597 kg/ha, 1.397 t/ha and 1828 kg/ha) seed yield was observed by the treatment N_1B_0, N_2B_0 and N_2B_0, respectively, where there was no application of boron fertilizer. During crop growing period the average soil salinity ranged from 1.80 to 9.10 dS/m at Sathkhira and from 1.15 to 12.78 dS/m at Quakata.

Nutrient deficiencies, particularly in nitrogen and boron, severely limit crop performance in coastal calcareous soils as well as the light soil of Rangpur region. These findings underscore the importance of tailored nutrient management to optimize sunflower cultivation in similar agro-ecological zones. The experiments will be carried out for the next year to finalize application rates and validate long-term benefits.

Disease Management

Effect of sowing date on the Alternaria blight diseases severity and yield contributing characters of sunflower

K. Jahan and N. A. Sultana

A field experiment was carried out during winter season, 2024-25 at Oilseed Research Centre, BARI, Gazipur to find out *Alternaria* leaf blight incidence and severity in sunflower varieties sown at early, mid and late sowing dates in November, December and January. *Alternaria* leaf blight caused by *Alternaria helianthi* is considered as most dangerous that reduce productivity. A survey has revealed that losses due to this in seed yield ranging from 27-80%, oil yield from 17-33%. The experiment was conducted in randomized block design with three replications. Two varieties BARI Sunflower-3 and Hysun-33 and nine sowing dates were used in this field trial. Disease severity, under natural conditions in the field, was evaluated at four growth stages of the crop, with reference to "0-5" scale of this disease. Marked plants were harvested individually according to their maturity for evaluation of yield and yield contributing characters. The results showed significant effects of sowing dates and varieties on yield and yield components of sunflower. BARI Sunflower-3 always showed higher disease severity e.g. 41.8% at vegetative stage at 30 January compared to Hysun-33 where severity was 21.8%. Lowest percent diseased leaf area (10%) was observed in December sowings, whereas higher percent diseased leaf area (40-45%) in late January sowings. November sowings also show moderately high percentage of leaf area covered by the disease (30-35%). Hysun-33 gave the highest seed yield at 10 November followed by 20 November with 272 gm and 230.33gm/5plants seed weight, respectively. Whereas, BARI Sunflower-3 showed higher seed yield (151.33 gm/5plants seed) at 20 November. The higher plant height, stem diameter, head diameter, 500-seed weight and no. of mature seed/head were also observed in mid-November to early-December sowings. Delayed sowing also shortened the crop duration of sunflower in the field. For BARI Sunflower-3 and Hysun-33, crop duration reduces by about 34 and 26 days when sowing is delayed from early November to late January, respectively. The study recommended mid-November to early-December as optimal sunflower planting dates For BARI Sunflower-3 and Hysun-33.

Evaluation of some fungicides against leaf blight of sunflower

N. A. Sultana and K. Jahan

A field experiment was conducted at the Oilseed Research Centre (ORC), Gazipur, during the 2024–2025 cropping season to evaluate the efficacy of seven fungicides namely, T_1 = Rural (2g/L), T_2 = Amistar Top (1 ml/L), T_3 =Folicure (1ml/L), T_4 =Mancer(2g/L), T_5 =Tilt(1ml/L), T_6 = Mancozeb (2 g/L), $T_{7=}$Score(1ml/L and T_8 = Control In managing Alternaria leaf blight of sunflower (Helianthus annuus L.) and their impact on yield and yield-contributing traits. The study followed a Randomized Complete Block Design with eight treatments, including a control. Fungicides were applied at disease onset and repeated at 10-day intervals. Results revealed that Rovral (0.2%) was the most effective, significantly reducing disease incidence by 65.49% over the control and achieving the highest seed yield (1722.3 kg/ha), representing a 34% yield increase. Amistar Top (0.1%), was the second highest, significantly reducing disease incidence by 58.89% over the control and achieving the seed yield (1673 kg/ha), representing a 32% yield increase. Score (0.1%), and Folicure (0.1%) also provided moderate disease control and yield enhancement. In contrast, Mancer, Tilt, and Mancozeb were less effective. The untreated control exhibited the highest disease severity and the lowest yield. These findings suggest that Rovral, followed by Amistar Top and score, can be effectively integrated into disease management strategies to control Alternaria blight and improve sunflower productivity. Considering the benefit cost

ratio, the fungicide Amistar Top (0.1%), was found to be highly economic (BCR 3.8).

Insect Management

Development of IPM package against the major insect pests of sunflower

M. A. Islam, A. Samiha and R. Islam

The experiment was conducted during Robi season 2025 at ORC research field, BARI, Gazipur to develop an effective management approach against major insect pests of sunflower. The experiment was laid out in RCBD with three dispersed replications. Sunflower seeds (BARI Surjamukhi-3) were sown on 29 December 2024 at Gazipur. The unit plot size was 4.5 m x 4.0 m, with 30 cm row-to-row distance and 1 m plot-to-plot distance. Normal intercultural operations were performed as needed. The treatments were as follows: T1 (IPM Package-1) = Hand picking of larvae + Sex pheromone mass trapping of Spodoptera litura + Application of Spinosad (Success 2.5 SC) @ 1.2 ml/litre of water; T2 (IPM Package-2) = Hand picking of larvae + Sex pheromone mass trapping of Spodoptera litura + Application of Bioclean (D-limonene 5% SL) @ 1 ml/litre of water; T3 (IPM Package-3) = Hand picking of larvae + Sex pheromone mass trapping of Spodoptera litura + Application of SNPV @ 2 g/10 litre of water; T4 (IPM Package-4) = Hand picking of larvae + Sex pheromone mass trapping of Spodoptera litura + Bio-chamak (Celastras angulatus 1% EW) @ 2.5 ml/litre of water; T5 = Farmers' practice (Application of Nitro 505 EC [Chlorpyriphos + Cypermethrin]) @ 1 ml/litre of water; T6 = Untreated control.The study monitored the population dynamics of major pests, including whitefly (Bemisia tabaci), aphid (Aphis gossypii), jassid (Amrasca biguttula), thrips, hairy caterpillars, and Spodoptera litura, along with their effects on yield. Statistical analysis showed that IPM Package T4 (hand-picking + pheromone trapping + Bio-chamak) significantly lowered pest populations across all species, leading to the highest yield (1.78 t/ha), followed by T1 and T5. T4 also exhibited the highest net return (Tk 86,400) and marginal benefit-cost ratio (MBCR) of 2.89, indicating strong economic feasibility. Conversely, T2 and T3 displayed lower pest control and returns, falling below the profitability threshold. The findings demonstrate that a comprehensive IPM approach, especially the combination used in T4, can effectively reduce pest incidence while increasing yield and farm profitability.

Molecular Study of Oilseed Crops

Molecular characterization of sunflower dwarf mutants for dwarfiing character: by the expression analysis of genes regulating Gibberalic Acid (GA) pathway

S. H. Habib, P. Roy and U. Kulsum

Mutant populations treated with gamma radiation and EMS were examined to identify the dwarfing gene for the development of a dwarf sunflower variety. During the study, 24 mutants treated with gamma radiation and 12 mutants treated with EMS from the variety BARI Surjamukhi-2 sunflower were analyzed at a molecular level for gibberalic acid pathway genes. The expression of the dwarfing gene in mutants could lead to the development of a dwarf phenotype. Expression analysis of this plant height manipulating dwarfing gene both in EMS and gamma radiation treated and control plants are ongoing

Identification and molecular characterization of the gene families controling fatty acid biosynthesis in mutant sunflower: by the expression analysis of FAD, SAD and Oleic gene sequences

S. H. Habib, P. Roy and U. Kulsum

High oleic acid content is a desirable quality trait for oilseed crop, which makes it more beneficial to human health. Gamma radiation and EMS treated 24 and 12 mutants respectively, were characterized molecularly for fatty acid controlling bio synthesis gene *SAD*, *FAD* and *Oleic*. The results come up with high oleic acid accumulation by the expression of *SAD*, *FAD* and *Oleic* gene and highlighted the use of new high oleic mutant sunflower. Screening of the other mutant plants for these genes is ongoing.

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, P. Roy and U. Kulsum

Rapeseed (*Brassica* spp.) is the most important source of edible oil in Bangladesh, contributing a

significant percentage to the country's domestic oil production. However, the varieties developed by the Oilseed Research Centre (ORC), BARI, typically contain high levels of glucosinolate and erucic acid. Reducing erucic acid and glucosinolate content is a major breeding objective to improve the edible oil quality of *Brassica* species. In this study, 24 *Brassica* genotypes were molecularly screened using trait-specific markers to identify candidates for the development of low erucic acid and low glucosinolate cultivars. Genotypes exhibiting low levels of both traits will be used in breeding programs to develop double low *Brassica* varieties.

Study of genetic diversity of soybean (*Glycine max* (L.) Merr.) genotypes using SSR markers

U. Kulsum, P. Roy, A. Samiha and S. H. Habib

Soybean is a vital oilseed crop. Evaluation of genetic diversity and associations among breeding materials using molecular markers holds significant implications for improving crop plants. A total of 35 SSR markers were developed to study the genetic divergence among 45 soybean genotypes. Among them, 22 primer pairs were found to be polymorphic producing a total of 81 polymorphic alleles; and the allele number for each locus ranged from two to ten with an average of 3.68 alleles per primer pair. Polymorphic information content (PIC) values of SSRs ranged from 0.08 to 0.81 with an average of 0.47. The dendrogram constructed based on dissimilarity indices clustered the 45 genotypes into two major groups and four sub-groups. These 22 polymorphic markers could be used for further diversity analysis of soybean.

Biochemical and molecular variability analysis for high oleic acid contents in sunflower mutants

S. H. Habib, P. Roy, R. Islam and U. Kulsum

High-oleic sunflower, is valued for the oxidative stability and health benefits. In this study, a number of EMS induced sunflower mutants were evaluated using both biochemical and molecular approaches to identify lines with elevated oleic acid expression and increased seed oil percentage. A set of insertion-deletion (InDel) primers targeting *FAD2-1*, *SAD*, and high-oleic-associated genes were used to identify gene expression in the sunflower mutants. Most mutants showed higher oil content than the control (40.09%), except MFA9 (27.63%) and highest was in MFA2 (51.55%). Mutants with elevated oil content and higher expression of key genes (*FAD2-1, SAD, high oleic*) are promising candidates for breeding sunflower varieties with improved oil content and fatty acid composition.

Genetic analysis of honeybee, apis mellifera populations using rapd markers

R. Islam, A. Samiha, S.H. Habib and M. A. Islam

Honey bees (*Apis mellifera*) are essential pollinators that contribute significantly to global food production, with over one-third of crops depending on insect-mediated pollination. This study aimed to investigate the genetic diversity of western honeybee (*Apis mellifera*) populations using the Randomly Amplified Polymorphic DNA (RAPD) marker technique. Specimens of *Apis mellifera* were collected from four geographically distinct districts in Bangladesh: Gazipur, Munshiganj, Satkhira, and Brahmanbaria and preserved in plastic containers filled with 70% ethanol, appropriately labeled with sample number, collection site, and date at 4 °C. After DNA extraction from the thorasic tissue of thec specimens, Random Amplified Polymorphic DNA (RAPD) analysis was performed using 12 oligonucleotide primers. PCR products were analyzed using agarose gel electrophoresis in a 1.6% gel prepared with 1x TAE buffer and gel images were captured and archived using a gel documentation system. RAPD primers amplified 100 bands. The percentage of polymorphic loci ranged between 0 and 37.5%. Total 15 polymorphic segments of DNA were recorded from all honeybee. Genomic differences were found in the similar species from various areas in terms of polymorphic band with varying molecular weight and size with same primer.

Cropping Pattern

Development of Mustard - Sesame - T. Aman cropping pattern against farmers pattern for increasing cropping intensity and productivity

M.M. Karim, M.U. islam, P. Roy and M. J. Hussain

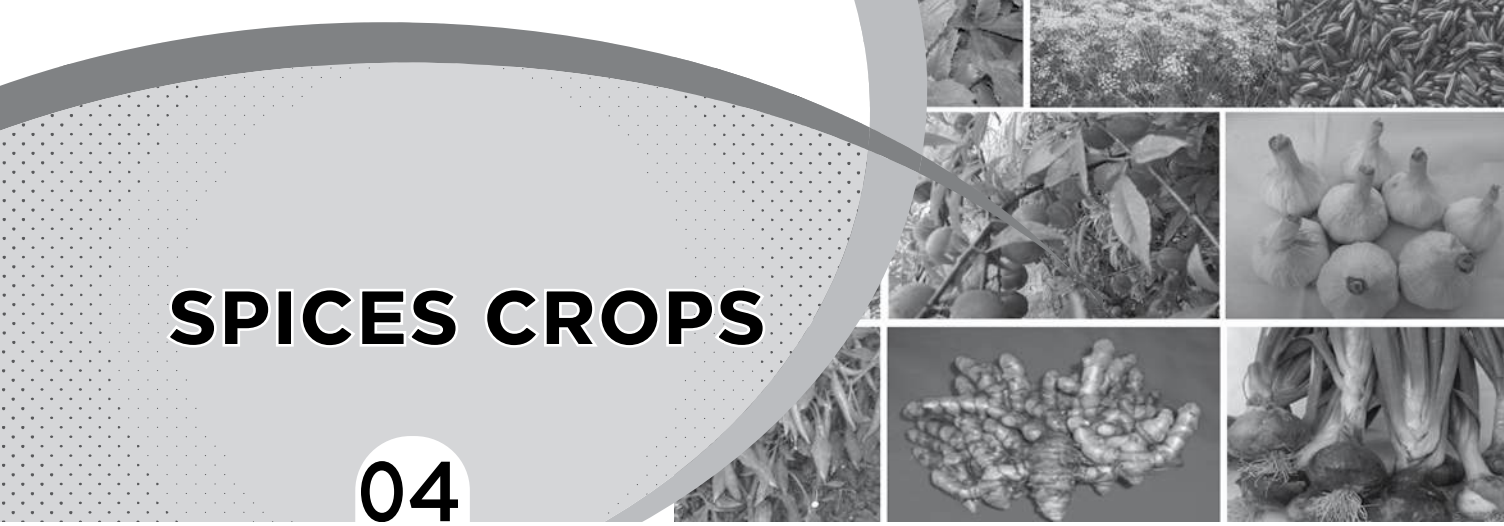
A field experiments were conducted at the Oilseed Research Centre, BARI, Joydebpur during 2023-2024 season to evaluate an improved cropping pattern aimed at increasing cropping intensity and

productivity in rice-based cropping systems. The experiment followed RCBD with four replications. The tested cropping pattern was Mustard (BARI Sarisha-18) – Sesame (BARI Til-5) – T. aman rice (BRRI dhan75). The seed yields of mustard, sesame, and T. aman rice were 1.33 t/ha, 0.9 t/ha, and 3.48 t/ha, respectively. The rice equivalent yield (REY) of the cropping pattern was 9.51 t/ha with a gross return of Tk. 285,300 per hectare. The benefit-cost ratio (BCR) of the improved cropping pattern was 1.73, indicating higher profitability than the existing farmers' cropping pattern. With a benefit-cost ratio of 1.73, this pattern offers a profitable alternative to traditional rice-based systems, maintaining soil health and increasing overall cropping intensity.

Development of four crop based cropping pattern for increasing cropping intensity and productivity

M.M. Karim, M.U. Islam and M. J. Hussain

Field experiments were conducted at the Oilseed Research Centre of BARI during 2023–24 to evaluate the agronomic performance and economic returns of four crop-based cropping patterns compared to the existing rice-based system. The study was laid out in RCBD with four replications. The cropping patterns included: CP_1 = Mustard–Indian Spinach + Onion–T. Aman; CP_2 = Groundnut + Onion–T. Aus–T. Aman; CP_3 = Groundnut + Lentil–T. Aus–T. Aman; CP_4 = Sunflower + Garden Pea–T. Aus–T. Aman; and CP_5 (control) = Fallow–Boro–Fallow–T. Aman. Among the patterns, CP_1 recorded the highest rice equivalent yield (REY) of 29.94 t/ha, while CP_3 achieved the highest benefit-cost ratio (BCR) of 4.07. All four cropping patterns outperformed the control (CP_5) in terms of productivity and profitability, indicating the potential of diverse, short-duration crop integrations to enhance system intensification, farm income, and food and nutritional security. These intensified systems not only improve farm profitability but also generate increased employment opportunities for both male and female laborers. Additionally, the diversified production contributes to improved household food and nutritional security, supporting the broader goals of sustainable and resilient agricultural development.



SPICES CROPS

04

Development of diverse onion germplasm through hybridization (Set I-III)

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib 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. An amount of approximately 1-12 g seeds was harvested from the bulbs of segregating population.

Development and evaluation of onion F_1 progenies through hybridization

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

An experiment was conducted at the Spices Research Centre, Shibganj, Bogura during the 2024-25 season to evaluate F_1 progenies of onion developed through hybridization in 2023-24. A total of 56 F_1 crosses were evaluated for vegetative growth, bulb characteristics, and yield performance. Considerable variation was observed among the progenies for plant height, number of leaves, bulb length, bulb diameter, neck diameter, individual bulb weight, number of bulbs, and total bulb yield. Several F_1s such as Ac Bog-413 × BARI Piaz-6, Ac Bog-409 × BARI Piaz-4, Ac Bog-426 × Ac Bog-413, and Ac Bog-431 × BARI Piaz-6 exhibited superior bulb yield and size, indicating their potential as promising materials for future hybrid development and inbred line advancement.

Development of inbred lines of onion through hybridization (Advancing of generation F_2 seed to F_2 bulb)

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

An experiment was conducted to develop inbred lines of onion at Spices Research Centre, Shibganj, Bogura during 2024-2025. A total of five experimental test cross F_2 progenies were evaluated in this study. Hybridization was initiated during the season 2021-2022, and F_2 seeds were sown in 2024-2025 to advance the generation to F_2 bulb stage. Considerable variation was observed among the crosses for plant height, number of leaves, bulb length, bulb diameter, neck diameter, individual bulb weight, and bulb yield. The performance of some crosses, particularly Ac Bog-413 × Ac Bog-420 and BARI Piaz-4 × Ac Bog-413, was promising and may be utilized in future breeding programs to develop superior inbred lines or as base populations.

Development of inbred lines of onion through hybridization (Advancing of generation of onion cross derivatives)

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

An experiment was conducted at Spices Research Centre (SRC), Shibganj, Bogura during 2024-25 to advance onion breeding lines developed through backcrossing and single crossing. The parental F_1s used in these crosses originated from hybridization during 2021-22, and further crossing (hand emasculation and pollination) was performed in 2023-24. A total of 20 cross derivatives were evaluated at the bulb stage for plant growth and yield-related traits. Wide variability was observed among the progenies. The cross Ac Bog-420 × (Ac Bog-413 × Ac Bog-420) produced the highest bulb yield (1548 g/plot), while Ac Bog-413 × (Ac Bog-

413 × Ac Bog-420) and (BARI Piaz-1 × Ac Bog-413) × Ac Bog-413 also performed well for bulb weight and size. These progenies may be further advanced to stabilize inbred lines and serve as potential hybrid parents.

Inbreed development of summer onion through random matting

M. N. A. Chowdhury, M. M. Haque, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, Shibganj, Bogura, during 30 November 2024 to May 2025 with a view to developing inbreed lines/varieties with brownish skin colour of bulbs (outer and inner side) and longer shelf life of summer onion. Four winter onion varieties (BARI Piaz-1, BARI Piaz-4, and BARI Piaz-6 & BARI Piaz-7) with BARI Piaz-5 (summer variety) were used in this study. After harvest seeds were processed and storage for next year study.

Inbreed development of winter onion through random matting

M. N. A. Chowdhury, M. M. Haque, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, during 30 November 2024 to May 2025 with a view to developing winter inbreed lines/varieties with brownish skin colour and bulb is slightly elongated in lower portion.Three winter onion varieties (BARI Piaz-1, BARI Piaz-6 & BARI Piaz-7) were used in this study. After harvest seeds were processed and storage for next year study.

Evaluation of winter onion lines

M. N. A. Chowdhury, M. M. Haque, M. A. Oadud, M. S. Naher and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, during November 2024 to April 2025 with a view to to evaluating the onion lines for winter season and to select promising winter onion line(s). Four onion lines ON0378, ON0380, ON0381 and ON0382 with BARI Piaz-6 and BARI Piaz-7 were used as check in this study. The experiment was laid out in randomized complete block design with five replications. The lowest neck diameter (0.82 cm) was found from ON0382 and the highest (1.07 cm) was recorded from ON0381. The highest bulb yield (28.72 t/ha) was found from ON0378 and the lowest (13.94 t/ha) was recorded from ON0381. The highest dry matter (16.16%) was recorded from BARI Piaz-7 and the lowest (12.60%) was found from ON0381. Considering all the characters, ON0378, ON0380 and ON0382 were performed promising.

Advanced yield trial of onion

M. A. Alam, M. M. Hasan, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

An advanced yield trial (AYT) on onion was conducted during the 2024–2025 *rabi* season at the Spices Research Centre, BARI, Bogura, to evaluate the performance of four advanced breeding lines along with two check varieties (BARI Piaz-4 and BARI Piaz-6). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Substantial genetic variability was observed across most traits. The line Ac Bog-409 performed well in terms of FY (14.56 g) and bulb shape (BSI: 1.19), while BARI Piaz-4 maintained its superior position with the highest yield (19.92 g) and bulb weight (51.00 g). High heritability, along with high genetic advance in traits like IBW, BD, and BL, indicates significant potential for genetic gain through selection.

Regional yield trial of onion

M. A. Alam, M. A. Hossain, M. A. A. Khan, M. M. Kamal, A. H. F. Fahim and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, Shibganj, Bogura; Regional Spices Research Centre, Gazipur; and Spices Research Sub-Centre, Lalmonirhat during 2024-2025. Six onion genotypes including BARI Piaz-1, BARI Piaz-4, BARI Piaz-6 and BARI Piaz-7 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.

Regional yield trial of white onion

M. N. A. Chowdhury, M. M. Haque, M. A. Hossain, M. M. Kamal, M.r. Islam, M. M. Rahman, M. A. Oadud, M. S. Naher, S. N. Mozumder and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, Regional Spices Research Center, Gazipur, Magura and Cumilla and Spices Research

Sub-center Faridpur and lalmonirhat during November 2024 to April 2025 to study the regional adaptability of the selected white onion lines at different onion growing areas and to select promising white onion line(s) for releasing a variety specially dry onion powders. Two onion lines ON0331, ON0357 with BARI Piaz-6 were used in this study. The experiment was laid out in randomized complete block design with five replications. The highest (37.87 g) single bulb weight was noticed at Magura location and the lowest (33.72 g) was found at Faridpur location. In Lalmonirhat location bulb yield (17.40 t/ha) was highest while the minimum yield (10.93 t/ha) was found at Bogura location. The highest bulb yield (15.51 t/ha) was found from ON0331 and the lowest (14.14 t/ha) was recorded from ON0357. The highest bulb yield (18.21 t/ha) was found from BARI Piaz-6 at Bogura location and the lowest yield (10.50 t/ha) was recorded from ON0331 at the same location.

Regional yield trial of winter onion against thrips

M. N. A. Chowdhury, M. A. Hossain, M. M. Kamal, M.R. Islam, M. M. Rahman, M. A. Oadud, M. S. Naher, S. N. Mozumder and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, Regional Spices Research Center, Gazipur, Magura and Cumilla and Spices Research Sub-center Faridpur during November 2024 to April 2025 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 (11.73 and 16.61, respectively) was recorded at Magura location and the lowest (9.32 and 12.14, respectively) was found at Lalmonirhat location. In case of bulb yield, the highest yield (17.00 t/ha) was obtained at Cumilla location and the lowest (9.58 t/ha) was recorded at Faridpur location. The line ON0332 gave the lowest number of thrips and IYSV per plant (3.24 and 4.91, respectively) and the highest (16.69 and 20.16, respectively) was found from BARI Piaz-6. Significantly the highest bulb yield (12.05 t/ha) was found from ON0332 while the lowest (11.24 t/ha) was found from ON0326. 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 winter onion (Set-IV)

M. N. A. Chowdhury, M. M. Haque, M. A. Hossain, M. M. Kamal, M.r. Islam, M. M. Rahman, M. A. Oadud, M. S. Naher, S. N. Mozumder and M. Z. H. Prodhan

The study was conducted at Spices Research Centre, Shibganj, Bogura, Regional Spices Research Center, Gazipur, Magura and Cumilla and Spices Research Sub-center Faridpur and Lalmonirhat during November 2024 to April 2025 to study the regional adaptability of the selected winter onion lines at different onion growing areas and to select promising winter onion line(s) for releasing a potential winter variety. Three onion lines ON0353-1, ON0374-1, ON0376 with BARI Piaz-6 and BARI Piaz-7 were used in this study. The experiment was laid out in randomized complete block design with five replications. In Bogura location bulb yield (18.54 t/ha) was highest while the minimum yield (13.66 t/ha) was found at Lalmonirhat location. Significantly the highest bulb yield (17.46 t/ha) was found from ON0374-1followed by BARI Piaz-7 (16.95 t/ha) while the lowest (14.51 t/ha) was found from BARI Piaz-6. Considering the location and advanced lines, the highest bulb yield (20.33 t/ha) was found from ON0374-1 at Bogura location and the lowest yield (11.90 t/ha) was recorded from BARI Piaz-6 at Lalmonirhat location.

Regional yield trial of winter onion (Allium cepa L.) (Set-V)

M. A. Khan, M. A. Alam, M. M. Haque, M. M. Rahman, R. Sarker, M. A. Alam, M. I. Hoque, M. R. Islam, M. A. Hossain, Z. H. Prodhan and N. A. Chowdhury

A study on Regional Yield Trial for winter onion was conducted at SRSC, BARI, Faridpur; RSRC, BARI, Magura; SRC, BARI, Bogura and SRSC, BARI, Lalmonirhat during winter season of 2024-2025. One advance line such as AC Bog 413 was tested under the study to see regional performance. The check varieties used in the trial were BARI

Piaz-4 and BARI Piaz-6. The trial was evaluated in a randomized complete block design with four replications. The results revealed that advance line AC Bog 413 exhibited superior performance at all regional stations in bolting, split bulb, disease & thrips severity score, days to maturity, individual bulb weight, bulb size and bulb yield over the check varieties. Shape, skin colour and flesh colour of bulb in AC Bog 413 were globular, pink red and reddish, respectively. Pungency of AC Bog 413 had medium.

Maintenance of onion germplasm

M. A. Alam, A. H. F. Fahim and Z. H. Prodhan

The present experiment was conducted to maintain the existing onion germplasm with the aim to preserve the existing variability for future breeding program at Spices Research Centre, Shibganj, Bogura during 2024-2025. Observations were recorded for limited numbers of traits to capture the variability.

Evaluation of garlic germplasm

M. A. Islam, M. S. Naher and Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during *rabi* Season 2024-2025 to select the promising garlic germplasm for releasing a variety. Fourteen different garlic germplasm (GC0012, GC0042, GC0027, GC0059, GC0040, GC0048, GC0035, GC0056, GC0030, GC001, GC0055, GC005, GC0031, GC0043) and BARI Rashun-1 as check were collected and evaluated based on their yield and other desirable characters Among the germplasm, the highest yield (13.83t/ha) was obtained from GC0055and the lowest (5.6 t/ha) was found from GC0031. Disease severity was also lower in GC0055.

Advance yield trial of garlic line

M. A. Islam, M. S. Naher and Zulfikar Haider Prodhan

The study was conducted at the farm of Spices Research Centre, BARI, Shibgonj, Bougra during *rabi* Season 2024-2025 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 were evaluated based on their yield and other desirable characters. Among the germplasm, the highest yield (11.87 t/ha) was obtained from GC0058 and the lowest (8,26. t/ha) was found from BARI Rashun-1. Disease severity was also lower in GC0058.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 GC0058 and GC0029 were found promising and selected for next year RYT trial.

Regional yield trial of promising garlic line

M. A. Islam, M. S. Naher and M. Z. H. Prodhan

The experiment was carried out in the Spices Research Center in Bogura, the Spices Research Sub-center in Lalmonirhat, and the Regional Spices Research Center in Magura and the Regional Spices Research Center in Gazipur. Included in the study were nine advanced lines of garlic (GC0050, GC0045, GC0054, GC0017, GC0049, GC0046, GC0035, GC0038, GC0044, and BARI Rashun-1 as check). Regarding location, Spices Research Center in Bogura had the maximum yield (9.87 t/ha), while RSRC, Lalmonirhat recorded the lowest yield (6.3 t/ha). Regarding germplasm/line, GC050 yielded the maximum yield (11.16 t/ha), whereas GC0038 yielded the lowest (5.87 t/ha). Out of all the characters, GC0050, GC0045 and GC0054 were the three that showed the most promise.

Morphological characterization of collected perennial chilli genotypes

S. Brahma, M. N. Yousuf, M. M. Akand, M. M. Kamal, M. I. Haque, N. Nath and M. M. Haque

A field study was conducted to characterize morphologically and evaluate perennial chilli genotypes for potential use in breeding programs. Fourteen chilli genotypes collected from different regions of Bangladesh were evaluated using qualitative descriptors under a randomized complete block design at the Regional Spices Research Center, BARI, Gazipur during 2024-2025. The study revealed considerable morphological variation. Certain traits such as perennial life cycle, intermediate growth habit, flattened stem shape, entire leaf margin, and green anthers with white filaments were consistent across all genotypes. High frequencies were observed for dense branching, ovate leaf shape, white corolla color, and intermediate flower position, green fruit color at intermediate stage, elongate fruit shape, and pointed blossom-end fruit shape. The findings suggest significant

genetic diversity among the genotypes, which may be utilized in developing improved chilli varieties.

Development of inbred lines of chilli (advancing of generation S_5 to S_6)

M. A. Alam, M. M. Haque, M. M. Hasan, A. H. F. Fahim and M. Z. H. Prodhan

The present study was conducted to advance S_5 generation progenies to S_6 with the aim of developing superior homozygous inbred lines of chilli (*Capsicum annuum* L.). The experiment was carried out at Spices Research Centre, BARI, Shibganj, Bogura during 2024-2025, using segregating progenies derived from hybridizations between OC-20 and BARI Morich-2, and OC-20 and BARI Morich-3, along with their parents. A total of thirteen progenies were evaluated for yield and yield-contributing traits. Several progenies exhibited superior performance compared to both parental checks. Notably, lines such as (ON-20XBM-3)1-2-1-9-10-7, (ON-20XBM-3)1-1-2-8-3-8, and (ON-20XBM-2)3-1-2-6-2-7 produced significantly higher fruit yield per plant (13.23 g, 11.38 g, and 10.75 g respectively) compared to the parental checks BM-2 (2.91 g) and BM-3 (5.07 g). These promising lines will be further advanced for S6 generation and considered for future inbred line development programs.

Development of inbred lines of chilli through hybridization (set-1: advancing of generation S_2 to S_3)

M. A. Alam, M. M. Haque, A. H. F. Fahim and M. Z. H. Prodhan

The present study was undertaken to advance S_2 progenies to the S_3 generation with the goal of developing superior homozygous inbred lines of chilli (*Capsicum annuum* L.). The experiment was conducted during the winter season of 2024–2025 at the Spices Research Centre, BARI, Shibganj, Bogura. A total of 36 S_2 progenies derived from diverse hybridizations among elite breeding lines and released varieties (including TOZP-11, OC-22, BARI Morich-2, BMCMA, BGCMA, and BGCOMA) were evaluated for yield and yield-contributing traits. Substantial variation was observed for key traits including plant height, fruit length, fruit diameter, and fruit yield per plant. Fruit yield ranged from 0.40 t/ha to 13.23 t/ha per plant, indicating wide genetic variability and scope for selection. Notably, progenies such as (BARI Morich-2 × BGCMA-17)-4 (13.23 t/ha), (BARI Morich-2 × BGCMA-17)-1 (11.93 t/ha), and (BARI Morich-2 × BGCMA-17)-6 (12.00 t/ha) demonstrated superior yield performance compared to the parental checks. These elite lines will be advanced to the S_3 generation and further evaluated for stability and performance in subsequent breeding programs. The results highlight the effectiveness of early-generation selection for genetic improvement in chilli.

Preliminary evaluation and germplasm maintenance of chilli genotypes (Set-I and II)

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, M. M. Haque and M. Z. H. Prodhan

This study presents the preliminary evaluation of 50 (Set I) and 36 (Set-II) chilli genotypes grown in a single plot (3 m²) setup. The objective was to evaluate basic phenological and yield-related traits, including plant height (PH), number of branches (NB), flowering length (FL), pedicel length (PL), fruit diameter (FD), individual fruit weight (IFW), and fruit yield per plant (FY). Descriptive statistics in Set-I revealed moderate to high variability across genotypes. Notably, FY ranged from 0.8 to 22.9 g, indicating significant potential for selection in future replicated trials. In case of Set-II descriptive statistics indicated wide phenotypic diversity, with FY ranging from 1.83 to 15.00 g per plant. Genotypes CO-634 and CO -611-2 performed best in terms of FY and associated traits. The findings provide a baseline reference for selecting elite lines for further multi-location evaluations and genetic improvement.

Evaluation of chilli genotypes

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, M. M. Haque and M. Z. H. Prodhan

An evaluation trial was conducted to evaluate the performance of 11 chilli genotypes including one check variety (BARI Morich-4) at the Spices Research Centre, BARI, Bogura, during the 2024–25 winter season. The experiment followed a Randomized Complete Block Design (RCBD) with three replications. Data were collected on seven agronomic and yield-related traits. Substantial variability was found among the genotypes for most

traits, with high heritability and genetic advance observed for traits like fruit yield per plant (FY), plant height (PH), and fruit length (FL). The highest yield (13.75 g) was observed in AFMAG-001, followed by BGCMA-5 (9.91 g) and BGCOMA-1 (9.12 g), indicating their potential for advancement. The study identified key traits contributing to yield, and recommended promising entries for future inclusion in breeding and varietal development pipelines.

Evaluation of test cross hybrids of chilli

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, M. M. Haque and M. Z. H. Prodhan

A field experiment was conducted at the Spices Research Centre (SRC), BARI, Bogura during the winter season to evaluate the performance of ten chilli test cross hybrids involving diverse parental lines. The trial followed RCBD with two replications. Significant genetic variability was observed among the hybrids for all studied traits. High heritability coupled with moderate to high genetic advance was recorded for fruit yield per plant (97.39%), individual fruit weight (96.24%), and fruit diameter (96.81%), indicating the potential for selection-based improvement. Among the hybrids, BARI Morich-2 × BGCOMA-4, (OC-22 × BARI Morich-2) × BARI Morich-2, and BARI Morich-2 × AF-001 exhibited superior yield potential. These results offer valuable insights for developing high-yielding chilli hybrids suitable for the winter season in Bangladesh.

Advanced yield trial of chilli

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, M. M. Haque and M. Z. H. Prodhan

An advanced yield trial (AYT) was conducted during the 2024–2025 winter season at the Spices Research Centre, BARI, Bogura, to evaluate ten advanced chilli genotypes along with the check variety BARI Morich-6. The experiment followed RCBD with three replications. Substantial genotypic variability was observed, with high heritability for most traits. The highest fruit yield per plant (13.50 t/ha) was recorded in AVPP-1236, while BARI Morich-6 showed lower yield (2.71 t/ha) under the same conditions. The results indicated the presence of promising genotypes for future varietal development and release programs.

Regional yield trial of chilli

M. A. Alam, M. A. Hossain, R Sarkar, A. H. F. Fahim and M. Z. H. Prodhan

The performance of nine chilli genotypes was evaluated across three locations during the 2024–2025 growing season. The trial was conducted at the Spices Research Centre (SRC), Shibganj, Bogura; Spices Research Centre (RSRC), Faridpur; and Spices Research Sub-Centre (SRSC), Lalmonirhat, using a randomizeSubd complete block design (RCBD) with three replications. Measured traits included plant height, number of branches, fruit length, fruit diameter, single fruit weight, and fruit yield. Significant genetic variation was observed for most traits, with high heritability estimates for single fruit weight (0.69) and fruit yield (0.85), indicating strong genetic control and potential for selection. VTNMCH-1 (13.18 t/ha) and BARI Morich-2 (13.62 t/ha) were the highest-yielding entries, while BGCOMA-4 recorded the lowest yield (4.11 t/ha). Across environments, Bogura and Faridpur provided more favorable yield outcomes than Lalmonirhat. Genotypes such as VTNMCH-1, BARI Morich-2, and INDCH-23 displayed consistent performance across sites, indicating potential for broader adaptation. These findings reinforce the importance of genotype-environment interaction studies for optimizing chilli yield under diverse growing conditions.

Evaluation of ginger germplasm

M. A. Islam, M. S. Naher and Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during April 2024 to February 2025 to select the promising ginger germplasm for releasing a variety. Twenty six different ginger germplasm (G0042, G0023, G0010, G0020, G0047, G0025, G0021, G0045, G0022, G0036, G0032, G0043, G0033, G0040, G0034, G0024, G0050, G0051, G0052, G0053, G0054, G0055, G0056, G0057, G0058 and G0044) with BARI Ada-1 as check were evaluated based on their yield and other characters. The experiment was laid out in RCBD 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 G0044. The highest yield (43.79 t/ha) was also obtained

from G0044 and the lowest yield (17.81 t/ha) was found from G0033 line.

Advanced yield trial of promising ginger lines

M. A. Islam,, M. S. Naher and Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura during April 2024 to Febuary 2025 to select the promising ginger germplasm for releasing a variety. Three promising ginger germplasm (G0034, G004 and G0023) were included in the study with BARI Ada-1 as check. The experiment was laid out in RCBD with three replications. The highest yield (32.95 t/ha) was recorded from GOO34 and the lowest yield (23.0 t/ha) was recorded from G0023. 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 G0034. The highest dry matter (%) of 26.33 was found from G0034. The lowest dry matter % 22.6 was obtained from BARI Ada-1.

Regional yield trial of promising ginger line

M. A. Islam, M. S. Naher and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura and Spices Research Sub Center Lalmonirhat during April 2024 to Febuary 2025. Five promising ginger germplasm (G001, G0028, G0027, G0046 and G005) were included in the study with BARI Ada-1 as check. In case of location, the highest yield (24.95 t/ha) was recorded at SRC, Bogura and the lowest yield (18.74 t/ha) was recorded at SRSC, Lalmonirhat. In case of advance line, the highest yield (27.01 t/ha) was found from G0046, and the lowest yield (16.90 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 (31.69 t/ha) was obtained from G0046 at SRC, Bogura location, while the lowest yield (14.60 t/ha) was obtained from BARI Ada-1 at SRSC, Lalmonirhat location.

Collection and evaluation of turmeric

M. N. Yousuf, S. Brahma, M. M. Kamal, M. M. Akand, M. I. Haque and M. M. Haque

A field experiment was conducted in order to identify the productive genotype of turmeric. In 2023-2024, two promising turmeric genotypes (CL Gaz-010 and CL Gaz-011) were compared with TO 0137 and BARI Holud-4 in RCBD having three replications at Regional Spices Research Centre, BARI, Gazipur 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 (37.27 t ha^{-1}) was recorded in CL Gaz-010 as one of the potential turmeric genotype.

Advanced yield trial of turmeric

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

An advanced yield trial (AYT) on turmeric (*Curcuma longa* L.) was conducted at the Spices Research Centre, BARI, Bogura, during the 2024–2025 growing season to evaluate nine turmeric genotypes including two check varieties (BARI Holud-4 and BARI Holud-5). The objective was to evaluate genetic variability and identify high-performing lines under Bogura conditions. The experiment was laid out in RCBD with three replications. Fourteen agro-morphological and yield-related traits were measured. High genotypic variability was found for traits such as number of primary fingers (NPF), weight of primary fingers (WPF), and weight of secondary fingers (WSF). The highest yield was recorded in genotype T0107 (39.53 t/ha), followed by Patnai (38.20 t/ha) and T0095 (37.33 t/ha). Heritability estimates were high (>0.90) for traits like plant height (PH), number of tillers (NT), number of leaves (NL), and number of mother rhizomes (NMR), indicating strong genetic control. The findings suggest T0107, T0095, and Patnai as promising candidates for future breeding and possible release.

Regional yield trial of turmeric

M. R. Islam, M. A. Alam, M. I. Haque, M. A. Alam, A. H. F. Fahim, M. N. Yousuf, M. M. Rahman, M. A. Hossain.

The experiment was conducted at different agro-ecological zones during 2022-23, 2023-24 and 2024-2025 to study the regional adaptability of the selected turmeric lines and to select the promising one for releasing as a variety. The experiment was laid out in randomized complete block design with three replications. Three different turmeric lines (T0073, 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 (60.33 t/ha in 2022-23, 38.64 t/ha in 2023-24 and 36.67 t/ha in 2024-25) was found from BARI Holud-4 whereas the lowest fresh yield (42.00 t/ha in 2022-23, 22.75 t/ha in 2023-24 and 23.46 t/ha in 2024-25) was found from BARI Holud-5. Significantly the highest dry yield (12.44 t/ha in 2022-23, 8.41 t/ha in 2023-24 and 7.62 t/ha in 2024-25) was observed from T0137 turmeric line followed by T0073, whereas lowest dry yield (8.92 t/ha in 2022-23, 5.17 t/ha in 2023-24 and 4.42 t/ha in 2024-25) was observed in BARI Holud-4.

Maintainance of turmeric germplasm

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, S. Naher and M. Z. H. Prodhan

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 2024-2025. 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 coriander (*Coriandrum sativum* L.) Germplasm

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

A comprehensive evaluation trial was conducted during the 2024–2025 *rabi* season at the Spices Research Centre, BARI, Bogura, to assess the performance of 29 coriander genotypes, including two check varieties (BARI Dhonia-1, BARI Dhonia-2 and BARI Dhonia-3). The experiment aimed to identify high-yielding and agronomically superior lines for potential future release. The trial was laid out in RCBD with three replications. High heritability and genetic advance were observed for WPP, NU, and TGW. The highest yield was recorded in CR-38 (623.33 g), followed by CR-4 (532.33 g), CR-17 (507.33 g), and CR-37 (509 g). These genotypes showed strong yield performance over the checks and hold promise for varietal development.

Maintainance of black cumin germplasm

A. H. F. Fahim, M. M. Hasan, M. A. Alam, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

The present study was conducted to maintain different black cumin germplasm collected from different sources and to preserve nuclear seeds for further research work. The experimental site was at Spices Research Centre, Shibganj, Bogura and the cropping season was *rabi*, 2024-2025. Observations were recorded for several traits to capture the variability among germplasm. A total of 8.92 kg black cumin seeds were harvested from 19 germplasm along with the check variety BARI Kalozira-1.

Regional yield trial of black cumin

A. H. F. Fahim, M. A. Hossain, M. N. Yousuf, M. R. Islam, R. Sarker, M. A. Alam, M. A. Rahman and M. Z. H. Prodhan

The trial was conducted during *rabi* season 2024-25 to evaluate the performance of advanced black cumin germplasm at the different Agro-Ecological Zones (AEZs) and to select the promising one(s) for releasing a variety. The experiment was laid out in a factorial RCBD with four replications. Two advanced black cumin germplasm BC 019-5 F and BC 026 F were evaluated against recommended variety BARI Kalozira-1 as check. The trial was conducted at 5 different locations viz. SRC, Bogura, RSRC, Gazipur, RSRC, Magura, SRSC, Faridpur and SRSC, Lalmonirhat. Seed yield and other yield contributing characters varied significantly due to the combined effect black cumin germplasm over the locations. The higher number of chambers/capsule (13.9) and seeds/capsule (143.42) was counted from the advanced black cumin line BC 026 F in Bogura location and the lowest number of chambers/capsule (5.36) and seeds/capsule (62.65) was counted from the check variety BARI Kalozira-1 in Lalmonirhat location. The higher seed yield 1.37 t/ha was harvested from the advanced black cumin germplasm BC 026 F in Bogura location which was identical to BC 019-5 F in Gazipur location (1.29 t/ha). On the other hand, the lowest seed yield (0.54 t/ha) was harvested from the check variety BARI Kalozira-1 in Lalmonirhat location. It was found that the advanced black cumin germplasm BC 026 F performed better in all locations. This is the first year of the experiment. It will be repeated next year for more confirmation of the result.

Advanced yield trial of fenugreek germplasm

A. H. F. Fahim, M. M. Hasan, M. A. Rahman, M. A. Alam, M. A. Mottalib and M. Z. H. Prodhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during *rabi* season 2024-2025 to evaluate two advanced fenugreek germplasm and to identify the superior one(s) for regional yield trail. The land was medium-high and the soil was clay loam in texture. The experiment was laid out in RCBD with four replications. Two advanced fenugreek germplasm viz. FK 036 and FK 042 were evaluated against BARI Methi-3 as check. The advanced germplasm was selected prior to its simultaneous fruit production efficiency, shorter crop duration and higher yield potentiality. Significant variations were observed among the different germplasm in respect of yield and yield contributing characteristics. The higher amount of seed (3.30 t/ha) was harvested from the advanced fenugreek line FK042 and the lower amount of seed (1.96 t/ha) was harvested from FK036. Among the advanced fenugreek germplasm FK042 performed better. This germplasm may be selected for Regional Yield Trial in the next year.

Evaluation of black pepper germplasm

A. H. F. Fahim, M. A. Alam, M. A. Rahman, M. A. Mottalib and M. Z. H. Prodhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during 2024-2025 to evaluate the performance of collected black pepper germplasm for releasing a new variety which can be grown all over the Bangladesh. The land was medium-high and the soil was clay loam in texture. The experiment was laid out in RCBD with ten replications. One black pepper germplasm PN Bog 001 against BARI Golmorich-1 as check was used for the study. The significant variations were observed among the black pepper line and the variety in respect of yield and yield contributing characters excepts leaf length. The longest spike (17.00 cm), higher number of fruits per spike (98.88), highest number of spikes per plant (242), highest green fruit yield (1.39 kg/plant) and dry fruit yield (0.455 kg/plant) was recorded from the black pepper line PN Bog 001. On the other hand, the shortest spike (9.58 cm), lower number of fruits per spike (43), lowest number of spikes per plant (98), lowest green fruit yield (0.36 kg/plant) and dry fruit yield (0.09 kg/plant) was recorded from the check variety BARI Golmorich-1.

Evaluation of cumin germplasm

M. A. Wadud and M. Z. H. Prodhan

The trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura during *rabi* season of 2024-2025 to evaluate the best genotype with appropriate desirable characters for releasing a new variety. The experiment was laid out in RCBD design with three replications. Eighteen cumin genotypes were used in this study. Seed yield and yield contributing characters were significantly different among the germplasm. The maximum germination (76.33%) was recorded from CN050 and the minimum (43.33%) was recorded in CN030 genotype. The highest number (112.60) of umbels/plant was recorded from CN050 and the lowest (72.20) was recorded in CN027 genotype. The highest seed yield was obtained from CN016 (500.11 kg/ha) and the lowest seed yield was recorded from CN020 (213.33 kg/ha).

Germplasm maintenance and evaluation under-utilized spice crops

M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Mottalib, S. Naher and M. Z. H. Prodhan

This report summarized the evaluation and maintenance strategy for germplasm lines of five spice crops: Firingi, Ajowan, Mouri, and Sholuk, based on one-season field data collected from field trials at Spices Research Center, BARI. Seven key traits—plant height (PH), number of branches (NB), number of umbels (NU), fruits per umbel (FPU/UPU), seeds per fruit (SPF/SPU), thousand grain weight (TGW), and weight per plant (WPP)—were measured. Firingi line FR-02, Ajowan line TA-07, Mouri line FN-17, and Sholuk line Dill-02 were identified as the best performers. The results suggest strong genetic control over key traits, facilitating targeted selection in future breeding. The report recommends priority lines for seed maintenance and outlines a strategy for germplasm conservation based on genetic variability, trait performance, and breeding value.

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. Prodhan

The present experiment was conducted to evaluate betel vine genotypes for higher leaf production at

Spices Research Centre, Shibganj, Bogura during 2024-2025. Lines BL0025, BL0026, BL0027, BL0028, BL0030, and BL0042 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.

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. Prodhan

A germplasm maintenance study was conducted during the 2024-25 season to evaluate morphological and productivity-related variation in 52 genotypes of betel vine (*Piper betle* L.). Substantial phenotypic variability was recorded across traits including vine length (6.00-207.30 cm), vine growth (111.30-1201.30 cm²), and vine growth per day (0.93-10.01). Leaf morphological traits such as leaf length, width, and number per vine varied widely, with weight of leaves ranging from 15.40 g to 39.10 g. The number of leaves per meter of vine (1.00-14.66) and per hectare per year (36.00-61.20) exhibited strong variation, reflecting potential for genetic gain in commercial leaf yield. The results provide a strong foundation for maintaining genetic diversity and guiding future breeding programs aimed at improving vigor, biomass, and yield potential in betel vine.

Regional yield trail of naga chili lines

F. Ahmed, J. C. Sarker and M. H. M. B. Bhuyan

Regional yield trial was conducted with selected two advance Naga chili lines at five different locations of BARI research stations during winter season of 2024-25 to observe their yield and yield potentiality as well as quality of chili produced. Maximum plant height was recorded in CC Jai-010 (170 cm) at Jaintapur, whereas the shortest plant was recorded in CC Jai-018 (82.03 cm) in Cumilla. CC Jai-010 produced the highest number of fruits per plant (180) at Jaintapur while CC Jai-018 produced the lowest number of fruits per plant (89.23) at Akbarpur. Fruit length found maximum in CC Jai-018 (6.08 cm) at Jaintapur but the shortest fruit was found in CC Jai-010 (3.53 cm) in Cumilla. Fruit diameter was found maximum in CC Jai-010 (3.17 cm) at Jaintapur, whereas the lowest fruit diameter (1.52 cm) was found in CC Jai-018 at Akbarpur. Maximum individual fruit weight 6.73 g) was obtained from Akbarpur but the minimum fruit weight (3.57 g) was obtained in Cumilla. The line CC Jai-010 recorded the maximum fruit yield (1211.5 g plant-1) at Jaintapur while the line CC Jai-018 recorded the lowest fruit yield (323.01 g plant-1) at Akbarpur. The line CC Jai-010 produced maximum yield (20.19 t ha−1) at Jaintapur whereas, the line CC Jai-018 produced the lowest yield (5.38 t ha−1) at Akbarpur. Considering growth, yield and yield contributing characteristics the line CC Jai-010 can be proposed to release a variety.

Collection and evaluation of annatto (*Bixa Orellana* L.) for seed multifaction as a source of natural edible dye

S. Brahma, M. N. Yousuf, M. M. Kamal, N. Nath, M. M. Akand and M. M. Haque

The experiment was conducted at the research field of Regional Spices Research Centre, BARI, Gazipur during 2024-2025 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.

Characterization and evaluation of vanilla germplasm

A. H. F. Fahim, M. A. Islam, M. K. Hasan, M. A. Alam, M. A. Rahman and M. Z. H. Prodhan

The research was carried out at the experimental field of Spices Research Centre, Shibganj, Bogura during 2024-25 to develop a vanilla variety suitable for cultivation in Bangladesh. Two vanilla germplasm VP Bog 001 and VP Bog 002 were evaluated for the study. The experimental design was RCBD. Each flower was hand pollinated to produce vanilla beans. Three years old plants were selected for taking data on different morphological and yield contributing traits. A significant variation was observed among the different traits except leaf breadth (mm), vine diameter (mm), internode distance (cm), no. of leves per meter of vine and no. of flowers /inflorescences. The highest bean length

(15.54 cm), bean diameter (1.26 cm), single bean weight (15.61 g), number of beans/inflorescence (7.67) and number of beans /plant (222) was recorded from the vanilla germplasm VP Bog 002. On the other hand, VP 001 showed the lowest performance. The highest amount of green bean 3.46 kg/plant was recorded from vanilla germplasm VP Bog 002 and the lowest amount or green bean 1.98 kg/plant was recorded from VP Bog 001. Both the vanilla germplasm was well adapted to our climatic conditions and capable of producing fruits. Among them VP Bog 002 performed better in terms of bean producing ability. Further research will be continued for insuring the flavor content and bean quality during harvesting stage.

Screening of chilli genotypes for waterlogging stress tolerance

S. Brahma, M. N. Yousuf, M. M. Kamal, N. Nath and M. M. Haque

To mitigate the adverse effects of climate-induced waterlogging stress on chilli, a pot experiment was conducted with 15 genotypes during 2024-2025 at the Regional Spices Research Center. Waterlogging was imposed at 30 days after transplanting (DAT) by submerging pots in water 5 cm above the soil surface for 48 hours (Set I) and 72 hours (Set II). The experiment aimed to identify genotypes that demonstrate tolerance to waterlogging stress. Fifteen genotypes survived 48-hour waterlogging, while only one genotype (G16) survived the 72-hour treatment. Based on survival percentage, SPAD values, dry matter accumulation, and Stress Tolerance Index (STI), genotypes G7, G12, G16, G21, G22, G24, G13, G17, G23, G20, G3, G2, G11, G15, and G10 were identified as relatively tolerant to waterlogging.

Screening of chilli genotypes for their tolerance to drought stress

M. N. Yousuf, S. Brahma, M. M. Kamal, M. M. Haque, N. Nath and M. M. Akand

A field experiment was conducted during *rabi* seasons of 2024-2025 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) Three irrigations levels: I_1 = 100% Field Capacity (FC), I_2 = 30% depletion of Field capacity (FC) and I_3 = 50% depletion of Field capacity (FC) and Factor B: 8 Chilli genotypes (CO620, China Morich, CO630-1, CO613-1, BARI Morich-4, and 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 (443.05g).

Screening of chilli germplasm for salinity stress tolerance

S. Brahma, M. N. Yousuf, M. M. Kamal, I. M. Ahmed and M. M. Haque

Salinity is one of the most critical abiotic stresses limiting crop productivity worldwide. This study aimed to evaluate the performance of 16 chilli genotypes under varying salinity stress levels to identify tolerant genotypes for breeding and cultivation in saline-prone areas. A pot experiment was conducted under controlled conditions with four salinity levels (0, 4, 8, and 12 dS/m) using NaCl. Significant variation among genotypes and salinity levels was observed. Genotypes G9, G2, and G12 showed better tolerance, indicating their potential for saline environments.

Screening of chilli germplasm against thrips and mites

M. M. Kamal, M. M. Akand, M. N. Yousuf, M. M. Haque and Z. H. Prodhan

A field experiment was conducted to evaluate the resistance or tolerance of thirty-four chilli lines and varieties against thrips and mites in chilli under field conditions. Data on pest population were recorded at three different crop growth stages (50, 65, and 80 DAT). Significant variation was observed among the germplasm for both pests. The mean mite population ranged from 2.59 to 6.95 mites/leaf, with BM-2, CO 646, and CO 641 identified as the most tolerant entries. In the case of thrips, mean infestation ranged from 1.59 to 6.03 thrips/leaf, with VTNMCH, BM-6, CO 646, Chinese bona lanka, and BM-2 showing the lowest pest infestation. Based on visible symptom grading, five genotypes were categorized as field tolerant to thrips and three to mites, while 26 and 25 lines, respectively, were classified as susceptible.

Screening of chilli germplasms against chilli leaf curl virus disease

M. A. Wadud, M. S. Akter, M. A. Alam, N. Nath, M. M. Islam, and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Bogura during 2024-25 to identify resistant sources for chilli leaf curl disease. Fifty-two chilli genotypes were screened for responses to chilli leaf curl virus infection under natural conditions during 2024-25. A wide range of symptoms were observed on genotypes screened against ChLCV infection. Analysis of variance for incidence and severity indicated the presence of significant differences among 52 chilli genotypes. One genotype (BGCMA-17) was found to be resistant, AFMAG-001 showed the moderately susceptible reaction, six genotypes namely BGCMA-14, Co-626, AIS-11050, CKRMAF-1, 446 and RKMAF-1 were susceptible and 44 genotypes exhibited highly susceptible to ChLCV. The experiment will be repeated for further confirmation for their disease reaction.

Study of pollination approach on the true seed production of onion

Mst. Sadia Naznin, M. A. Alam and M. Z. H. Prodhan

The experiment was conducted at the Spices Research Centre, BARI, Shibganj, Bogura, during the 2024-25 *Rabi* season to study the effect of different pollination approaches on true seed production of onion (*Allium cepa L.*), variety BARI Piaz-6. The experiment was laid ot in RCBD with five treatments and three replications. The unit plot was 3.0 m x 1.2 m having plant spacing of 15 cm x 10 cm. The bulb of BARI Piaz-6 was sowing on 17 November 2024. Five treatments were implemented: T_1 involved natural pollination combined with regular hand pollination; T_2, T_3, and T_4 incorporated natural pollination with hand pollination at intervals of 1, 2, and 3 days, respectively; and T_5 served as the control with only natural pollination. Results revealed that T_1 (natural + daily hand pollination) and T_2 (natural + 1-day interval hand pollination) significantly enhanced key parameters such as 1000-seed weight (3.12 g and 2.88 g), seed yield (301.50 kg/ha and 284.21 kg/ha), seeds per umbel (325.50 and 299.40) and active florets per umbel (115.93 and 110.30), compared to the control (T_5) which recorded the lowest performance in all traits. The findings suggest that combining natural pollination with frequent hand pollination greatly improves true seed production of onion in Bangladesh.

Effects of seed priming on germination and seedling growth summer 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 25 February 2025 to evaluate the effects of different seed priming methods on germination and early growth of summer onion cultivar BARI Piaz-5. The experiment followed a Randomized Complete Block Design (RCBD) with three replications. Five treatments were consisted: T_1: Hydro-priming, T_2: Osmopriming, T_3: Hormonal priming, T_4: Biopriming, T_5: control, each replicated thrice. The highest germination (84.67 and 81.33%) were recorded in T_2 and T_3 respectively. The maximum seedling density (471.67 and 438.00 Seedlings/m^2) were observed in T_3 and T_4, respectively The maximum seedling vigor index (1028.68 and 1018.27) were noted in T_2 and T_3 respectively. The highest dry matter content (3.07%) and survival rate (88.67) were exhibited in T_3 treatment. Biopriming (T_4) produced the tallest plants (13.31cm) while the control treatment (T_5) consistently exhibited the lowest performance including germination (59.67%), vigor index (737.91) and survival rate (61.33%). The study concludes that seed priming particularly with GA_3 and KNO_3 significantly improves germination, seedling vigor and early growth of summer onion and can be recommended for enhancing productivity under field conditions.

Study of pollinator attractants on onion seed production

Mst. Sadia Naznin, M. A. Alam and M. Z. H. Prodhan

A field experiment at Spices Research Centre, BARI, Shibganj, Bogura (2024-2025) evaluated pollinator attractants on onion (cv. BARI Piaz-6) seed production. Five treatments:T_1 (Jaggery 10%), T_2 (Sugar 10%), T_3 (Honey 2.5%), T_4 (Rose water 3%) and T_5 (Control) were arranged in RCBD with three replications. Sprays were applied at 7-day intervals during 50-70% umbel opening. T_1 recorded

the highest afternoon pollinator visitation (10.87/ m^2), mainly syrphid flies, and showed superior floral traits: 126 active florets, 34.67 inactive florets, 290 seeds per umbel, 3.23 g 1000-seed weight, and 304.00 kg/ha seed yield. Jaggery and sugar sprays effectively enhanced pollination and seed yield.

Effect of sowing methods and varieties on bulb yield on charland

M. A. Hossain, M. N. Farid, A. A. Tithi and M. A. Sarker

A field trial was conducted during the *rabi* 2024-25 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 (S_1=Broadcast method, S_2=Line sowing method, S_3=Transplanting method) in RCBD with three replications. Among the varieties, BARI Piaz-4 showed the highest bulb breadth (3.42cm), bulb length (4.35 cm), and yield (23.17 t/ha). In terms of sowing methods, the line sowing method demonstrated the best performance in bulb breadth (3.40cm), bulb length (4.10 cm), and yield (24.16 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 (3.76cm), bulb length (5.03 cm), and yield (27.73 ton/ha), with a similar trend observed for BARI Piaz-4 with the line sowing method.

Response of gibberellic acid on quality seed production of winter onion in cumilla

M. Rahman

The field experiment was laid out in RCBD with three replications. Bulbs were planted on November 21, 2024. There were seven different treatments viz. T_1 = 25 ppm, T_2 = 50 ppm, T_3 = 75 ppm, T_4 = 100 ppm, T_5 = 125 ppm, T_6=150 ppm, T_7 = Control was sprayed at 45 and 60 days after planting. The seeds were harvested by cutting off the umbels when about 15-30% of the heads had black seeds exposed. After harvesting, the umbels were dried in scorching sun light for 4-5 days and then threshed manually. After threshing, seeds were cleaned and dried properly and kept in polyethylene bags, which were stored properly at room temperature. Data were recorded from randomly selected ten plants from each plot and their averages were taken for treating as per plant. In laboratory thousand seed weight, and germination of the seeds were measured. GA_3 influenced the seed yield and quality of onion. Higher doses were more effective and showed a linear relationship in plant growth and seed yield of onion. The highest seed yield (1023.30 kg/ha) was obtained with application of 125 ppm GA_3. The present study clearly shows that almost all the plants treated with GA_3 performed better than control. GA_3 application significantly varied the scape length, umbel diameter, seed yield per plant, thousand seed weight, and germination percentage. However, application of Gibberellic acid has positive impact on growth and seed yield of onion.

Effect of different cocodust combination on ginger production using bagging culture method

M. A. Islam and M. S. Naher

The experiment was conducted two years at Spices Research Centre, BARI, Shibganj, Bogura during April 2023 to February 2024 and April 2024 to February 2025 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. 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 and 1250 g/bag) April 2023 to February 2024 and April 2024 to February 2025 respectively was also obtained from T_2 (50% coco dust + 50% soil) treatment combinations and the lowest yield (473.70 and 139.0 g/bag) was found from T_5 treatment (100% soil)

Validation of ginger seedlings in the field

A. H. F. Fahim, M. M. Hasan, M. A. Alam, M. A. Rahman, M. S. Naher, M. A. Mottalib and M. Z. H. Prodhan

An observation trial was conducted at Spices Research Centre, BARI, Shibganj, Bogura, during *Kharif-1* season 2024 to validate the performance of ginger seedlings produced from the pro-tray

technique in field. BARI Ada-1 was used for raising the ginger seedlings. Coco dust was used as the media, and 5-10 g of weighted rhizome was used as seed rhizome for raising seedlings under the pro-tray technique. 45 day-old seedlings were transplanted in the main field. At the sometime 50g weighted seed rhizomes were planted in the field. Transplanting of seedlings and the traditional methods of planting rhizomes were considered as the treatments. The experimental design was RCBD with 10 replications. It was found that all the yield contributing characters were statistically significant among the different planting materials except the weight of secondary rhizome /hill (g), yield /hill (kg), and yield (t/ha). The highest plant height (97.20), number of tillers/hill (36.8), number of leaves/hill (565), number of primary rhizomes/hill (2.90), and wt. of primary rhizome (38.70 g) were recorded where planting material was used as seedlings. Wt. of secondary rhizome / hill (g), yield /hill (kg), and yield (t/ha) were found statistically non-significant, which indicates that ginger seedlings can perform near about similarly to the traditional practice of using planting material as seed rhizome. This was an observation trial; it will be repeated next year as an experiment for confirmation of the results.

Standardization of potting media for the propagation of black pepper (*Piper nigrum* CV. BARI Golmorich-1) as bush pepper

F. Ahmed, J. C. Sarker, and M. H. M. B. Bhuyan

An experiment was conducted at Spices Research Sub-Station under Citrus Research Station, BARI, Jaintapur, Sylhet (25.13562º N latitude, 92.13217º E longitude and aimed to find the ideal media for rooting and establishment of bush pepper cuttings. The experiment was conducted in CRBD with 11 media combinations and three replications. Significant differences were recorded among the treatments. Comparatively better growth parameters were observed in T_8=Soil+ Cocopeat+ Vermicompost (1:1:1) and T_7=Soil+ Cocopeat+ FYM (1:1:1). Maximum success was observed at treatment T7 (62.33 %), followed by T_8 (61.67 %), while the lowest was from the treatment T_1. In a similar way maximum number of plants survived was found from T_8 (49%) followed by T_7 (46 %). Therefore, it could be suggested that equal proportions of Soil, cocopeat, and vermicompost or Soil, cocopeat, and FYM could be ideal for the establishment of bush pepper cuttingsin the nursey.

Application of micronutrients (Fe and Zn) for onion biofortification

M. A. Rahman, M. N. A. Chaudury, M. S. Naher, M. A. Alam, A. H. F. Fahim and Z. H. Prodhan

Onion (*Allium cepa* L.) is a vital crop but often lacks essential micronutrients like iron (Fe) and zinc (Zn), which are crucial for human health. This study investigated the effect of micronutrient application on onion biofortification and its economic viability. Six treatments were tested: $T_1 = Fe_0Zn_0$, $T_2 = Fe_0Zn_{2.5}$, $T_3 = Fe_1Zn_0$, $T_4 = Fe_1Zn_{2.5}$, T5 = $Fe_{1.5}Zn_3$, and $T_6 = Fe_2Zn_3$, using the BARI Piaz-6 variety during the 2024-2025 *rabi* season at the SRC, BARI, Bogura. Results showed that T_5 ($Fe_{1.5}Zn_3$) significantly improved growth, yield, bulb biomass, and yielding 20.41 t/ha. It also had the highest BCR (2.09) level. Additionally, T_4 demonstrated the best storage characteristics, showing the lowest percentage of non-marketable bulbs after two months.

Using nano fertilization to improve yield and quality of onion

M. N. Yousuf, S. Brahma, M. M. Kamal, M. M. Akand and M. M. Haque

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 204-2025. The experiment was designed in Randomized Complete Block Design having four replications. The treatment composed T_1 = 100% Conventional fertilizers (N, P, K, S, Zn and B @100, 50, 100, 30, 3.5 and 1.5 kg ha^{-1}), T_2 = 100% Nano fertilizers (N, P, K, S, Zn and B @100, 50, 100, 30, 3.5 and 1.5 kg ha^{-1}), T_3 = 50% Conventional +50% Nano fertilizer and T_4= Control. The conventional and nano fertilizer had significant effect on yield, yield contributing parameters of onion. The highest bulb yield (31.13 t ha^{-1}) and marketable bulb yield (30.2 t ha^{-1}) were recorded when onion variety BARI Piaz-4 cultivated under 50% Conventional +50% nano fertilizer in the study area.

Effect of integrated use of azotobacter and nitrogen fertilizer on growth, yield and quality of onion (*Allium cepa* L.)

M. S. Naher, M. A. Rahman, M.a. Wadud, M. A. Alam and Z. H. Prodhan

A field experiment was conducted to investigate the effects of Azotobacter inoculation and varying nitrogen fertilizer levels on the growth, yield, quality, and economic returns of onion (*Allium cepa* L.). Seven treatments were compared including control, different nitrogen levels, and their combinations with Azotobacter. Results revealed that the integrated use of Azotobacter with 80% recommended nitrogen significantly improved growth parameters, yield (23.24 t/ha), quality traits, and economic benefits. This treatment also recorded the highest Azotobacter population (22.32×10^6 cfu g^{-1} soil), total soluble solids (16.55 °Brix), and market benefit-cost ratio (MBCR) of 24.48. The findings support integrated nutrient management as a sustainable practice for onion cultivation.

Impact of nitrogen regime and nitrogen application timing on yield and quality of onion

M. M. A. Khan, R. Sarker and M. M. Rahman

The experiment was conducted at the Spices Research Sub-Centre (SRSC), BARI Faridpur during winter season of 2024-2025 to find out the optimum time of nitrogen application for higher yield and quality of onion (var. BARI Piaz-4) through comparison of Spices Research Centre recommended doses and farmers applied doses. N application at 25 DAT and 65 DAT gave the heaviest bulb (67.78 g), while the lightest (54.86 g) bulb was found in treatment N_1T_1 (during transplanting+ 25 DAT+45 DAT). The highest bulb yield (28.00 t/ha) closely followed by N application timing at transplanting, 25 DAT and 65 DAT and the lowest yield was found in treatment N_1T_1 (during transplanting+ 25 DAT+45 DAT).

Effect of different doses of fertilizers on yield and storage quality of winter onion varieties in Lalmonirhat of AEZ-3

M. A. Hossain

Onion yield in Bangladesh is often limited by poor soil fertility and improper nutrient management. A 2024–25 field trial at BARI's Lalmonirhat sub-centre tested four fertilizer strategies on three onion varieties under AEZ-3. Soil test-based (STB) fertilization produced the highest yield (10.37 t/ha), with BARI Piaj-4 being the top-performing variety (9.20 t/ha). The best result (10.53 t/ha) came from the combination of BARI Piaj-4 and STB, highlighting it as the most effective approach for improving yield and storage quality.

Integrated nutrient management for onion - jute - T. aman cropping pattern

M. N. Yousuf, S. Brahma, M. M. Kamal, M. M. Akand, N. Nath and M. M. Haque

A field experiment was conducted at Regional Spices Research Centre, BARI, Gazipur, for recommendation of fertilizer dose on yield and yield contributing characters of onion, Jute and T. aman under Onion-Jute-T.aman cropping pattern during 2024-2025. The experiment was designed in RCBD having four replications. The treatment composed T_1 = 100% RDF + Cowdung @5 tha^{-1}, T_2 = 100% RDF + Poultry manure @3 tha^{-1}, T_3 = 100% RDF + Vermicompost @3 tha^{-1} and T_4 = Native fertility. The highest bulb yield (30.34 t ha^{-1}) and marketable bulb yield (29.56 t ha^{-1}) were recorded when onion variety BARI Piaz-4 cultivated under fertilized 100% RDF + Vermicompost @3 tha^{-1} on onion-jute-T. aman cropping pattern in the study area.

An evaluation of yield limiting nutrients in onion using compositional nutrient diagnosis (cnd) norms on bangladesh soils

M. N. Yousuf, S. Brahma, M. M. Akand, A. J. M. Sirajul Karim, M. E. Ali, M. H. Rashid and M. M. Haque

Generic models can assist Compositional Nutrient Diagnosis (CND) in providing a yield cutoff value between high-and low-yielding subpopulations for small databases. The present study aimed to determine minimum bulb yield target of high yielding subpopulations in farmers' field and nutritional difference between high and low yielding subpopulations. Popular high yielding onion cv. BARI piaz-4 was extensively grown all over Bangladesh. Data were collected at random using a survey database of 42 observations from 42 districts of Bangladesh including bulb yield and green portion or leaf nutrient concentrations. Nutrient composition was determined form leaf at 45-50 days after transplanting. Mean, median,

minimum, maximum, standard deviations, skewness of yield as well as nutrient concentration for N, P, S, K, Ca, Mg, Na, Zn, Cu, B, Fe and Mn were determined and a R, which comprises all nutrients not chemically analyzed and quantified in onion. Row centered log ratio and cumulative variance ratio function of each nutrient was calculated. The CND generic model gave 27.49 tha^{-1} as minimum cutoff yield of the high-yield subpopulation. Zinc was identified as the core yield limiting nutrient for onion in piedmont plain, floodplain and basin soils of Bangladesh. However, Ca, S, B, Cu, N, Fe and Mn also play a significant role for increasing bulb yield of onion. Onion in farmers' fields of Bangladesh may require higher Zn fertilizer dose for better bulb yield. From the studied piedmont plain, floodplain and basin soils of Bangladesh, the yield limiting nutrients were established the following series: Zn>Ca>S>B>Cu>N>Fe>Mn>Mg>K>P.

Impact of foliar application of mustard oil cake on supplying sulphur and minimizing garlic tip burn

M. A. Rahman, M. A. Islam, M. S. Naher, M. A. Alam, A. H. F. Fahim and Z. H. Prodhan

This study investigates the impact of foliar application of mustard oil cake (MOC) on supplying S and minimizing garlic tip burn during the *rabi* season of 2024-2025 at the SRC, BARI, Bogura, using the BARI Rasun-1. The treatments included varying concentrations of MOC (15g/L to 50g/L), with a farmer's practice (soil application treatment (S18)) as control. The results revealed that T_4 (30g MOC/L) consistently outperformed other treatments in terms of garlic growth, yield, and economic performance. It exhibited the highest plant height, leaf growth, bulb size, and yield (10.58 t/ha) and recorded the best benefit-cost ratio (3.28). T_4 also showed superior results in minimizing tip burn and improving bulb biomass and leaf biomass.

Response of garlic (*Allium sativum* L.) to different potassium fertilizers and foliar sprays

M. S. Naher, M. A. Islam, M. A. Rahman and M. Z. H. Prodhan

A field study was evaluated at SRC Bogura to findout the effects of potassium sources and foliar sprays on garlic (*Allium sativum* L.). Potassium sulfate (K_2SO_4) outperformed muriate of potash (KCl) in enhancing growth, yield, and bulb quality. Foliar application of Cycocel + micronutrients further boosted plant performance. The combined treatment of K_2SO_4 and Cycocel + micronutrients (S_2T_4) resulted in the highest yield (11.1 t/ha), bulb weight (19.73 g), and lowest storage loss (8.44%). This approach effectively improves garlic productivity and storability.

Response of garlic inoculated with arbuscular mychorhizal fungi to phosphorus fertilization at field condition

M. S. Naher, M. A. Islam, M.A. Wadud, M. A. Rahman and M. Z. H. Prodhan

A field study at the Spices Research Centre, BARI, Bogura (2024-25) was evaluated the impact of arbuscular mycorrhizal fungi (Neoroot) and varying phosphorus (P) levels on garlic growth and yield. Among six treatments, the combination of AMF with 80% of the recommended P dose significantly improved plant growth, bulb yield (9.01 t/ha), and phosphorus uptake, achieving a 16.56% yield increase over the control. This treatment also provided the highest net return (Tk. 653,870/ha) and MBCR (16.91), proving both economically and environmentally beneficial. The findings highlight that integrating AMF with reduced P fertilizer enhances garlic productivity and soil health sustainably.

Standardization of integrated nutrient management for BARI Morich-5 in AEZ-25

M. S. Naher, M. A. Rahman, M. N. A. Choudhury and M. Z. H. Prodhan

An experiment was conducted at SRC Bogura to determine the optimum integrated fertilizer doses for BARI Morich-5, a widely cultivated hot pepper variety in Bangladesh, within Agro-Ecological Zone 25 (AEZ-25). Different combinations of organic and inorganic fertilizers were tested to evaluate their effects on plant growth, yield, and economic return. Results revealed that the integration of 75% recommended chemical fertilizers with 25% trichocompost (2.27t/ha) produced the highest fruit yield (12.10 t/ha), significantly improved soil fertility status, and provided higher marginal benefit-cost ratio (10.87) compared to sole application of 100% chemical fertilizers and control. The study concludes that an integrated nutrient approach

enhances productivity and sustainability in BARI Morich-5 cultivation under AEZ-25.

Effect of chemical fertilizers on growth and yield of ginger (*Zingiber officinale*) rhizome in sack cultivation

M. S. Naher, M. A. Islam, M. A. Rahman and M. Z. H. Prodhan

From April 2024 to February 2025, six fertilizer treatments (0%, 100%, 125%, 150%, 175%, and 200% of recommended fertilizer doses) were tested on sack-grown ginger at SRC Bogura. Each sack received a base soil mix, compost, coco dust, ash, cow dung, and varying amounts of chemical nutrients (urea, TSP, MoP, gypsum, $ZnSO_4$, and borax), with split applications of nitrogen and potassium at 50, 80, and 110 days after planting. The 150% RDF treatment consistently outperformed others producing the highest yield (998 g per sack), delivering a top marginal benefit-cost ratio (14.23), and maintaining low disease levels. Treatments above 150% RDF showed reduced effectiveness and higher disease incidence. Applying 150% of the recommended fertilizer dose is the best agronomic and economic strategy for sack-cultivated ginger, especially for urban and space-limited growers.

Maximizing the yield and quality of black cumin by foliar application of s, b and zn

R. Sarker, M.A. Khan and M. M. Rahman

A field experiment was conducted at Spices Research Sub-Centre, Faridpur during *rabi* season, 2024-2025 to find out the effect of foliar application of S, B and Zn on quality and seed yield of black cumin. The experiment was laid out in RCBD with three replications. Result revealed that foliar application of different concentration of S, B and Zn had significant effect on seed yield and quality of black cumin. Highest seed yield (1199.6 kg/ha) was found from (S_1+B_1+Zn_1) treatment and the lowest yield was obtained from control treatment (778.66 t/ha).

Effect of organic fertilizers on leaf yield of mint cultivation

M. S. Naher, M. A. Rahman, M. N. A. Choudhury and M. Z. H. Prodhan

A field experiment was conducted from December 2024 to May 2025 at the Spices Research Centre, BARI, Bogura, to evaluate the effects of organic fertilizers on the leaf yield of mint (BARI Pudina-2). Treatments included cowdung (5 t/ha), vermicompost (3 t/ha), poultry manure (2.5 t/ha), trichocompost (2 t/ha), and an untreated control, arranged in RCBD with three replications. Organic fertilizers significantly improved plant height, number of branches, and fresh and dry leaf yield compared to the control. The highest fresh leaf yield (16.98 t/ha) was achieved with vermicompost with highest MBCR (10.90), while the lowest (7.15 t/ha) came from the control. The results highlight that using organic fertilizers enhances yield and supports sustainable soil health and environmental safety, promoting organic nutrient management as an effective alternative or supplement to chemical fertilizers in mint cultivation.

Development of fertilizer recommendation for mint

M. S. Naher, M. A. Rahman, M. N. A. Choudhury and M. Z. H. Prodhan

A field experiment was conducted at the Spices Research Centre, BARI, Bogura during the 2024-2025. Fourteen fertilizer treatments combining different levels of N, P, K, and S were tested on the mint variety BARI Pudina-2 using RCBD design. Data were analyzed using polynomial regression to identify optimal nutrient doses. Response of N was more pronounced in comparison to P and K. The maximum leaf yield (17.27t/ha) was recorded in T_{10} treatment which was identical to T_4, T_{11}, T_{13} and T_{14}. The highest marginal benefit cost ratio (10.76) was also obtained from the same treatment T_{10}. The application of $N_{100}P_{50}K_{40}S_{20}$ kg/ha along with a blanket dose of 2 kg B, 4 kg Zn and 2-ton cowdung/ha appear to be the best treatment for maximizing the seed yield of dill. The results aim to support region-specific fertilizer recommendations, boosting sustainable and profitable mint cultivation in Bangladesh.

Effect of honey bee and artificial pollination in enhancing seed yield of onion

M. M. Kamal, M. M. Akand, M. N. Yousuf, M. M. Haque and Z. H. Prodhan

A field trials was conducted to investingate the yield enhancement through bee pollination and artificial pollination in onion. Open hand pollination (T2) achieved the highest 1000-seed weight (4.28 g), seed yield (642.15 kg/ha), and germination rate

(90.36%), corresponding to increases of 83.69%, 637.10%, and 31.18% over the closed control (T5: 2.89 g, 87.13 kg/ha, 68.88%). Open pollination by honey bees (T1) and the treatment open control (T6) also enhanced seed parameters significantly. Artificial methods using clothes and brush showed moderate improvements but were less effective than natural or manual pollination. The closed control treatment (T5) consistently resulted in the lowest seed quality and quantity.

Effect of different microbial biopesticides against thrips (*Thrips Tabaci Lindeman*) in seed onion and their impact on seed yield

M. M. Kamal, M. M. Akand, M. N. Yousuf, M. M. Haque and Z. H. Prodhan

A field trials was conducted to to find out the suitable management option against thrips in seed onion. The efficacy of microbial biopesticides against Thrips tabaci and their effects on seed yield in onion were evaluated. Bio-spinosad reduced thrips population by 65.05% and increased umbels per plant (3.55), flowers per umbel (535.33), and effective flowers per umbel (512), showing increases of 269.19% and 564.93% over control. It also achieved the highest thousand seed weight (3.51 g) and seed yield (578.45 kg/ha), with 31.95% and 464.67% increases over control. Other biopesticides (Tido, Beauveria, Metarhizium) showed moderate improvements. Significant differences were observed among treatments ($p \leq 0.05$). The control treatment consistently showed the lowest production of onion.

Survey and monitoring of new pest arthropods infesting spice crops in bangladesh

M. Z. H. Prodhan

Survey and monitoring was conducted at different growing areas during 2024-25 to document new pest arthropods infesting spice crops. Four new pest arthropods was found to attack on four different Spice crops. The pests caused damage on different crops in Bangladesh but they are new in spice crops. The document helps to update the check list of pest arthropods infesting spice crops in Bangladesh.

Incidence of chilli fly, silba capsicarum mcalpine (diptera: lonchaeidae) on chilli in farmers' fields

M. Z. H. Prodhan

Chilli fly, *Silba capsicarum* Mcalpine has been recorded for the first time from Bangladesh on chilli during 2022-23. It is a destructive and invasive pest, damages the flower buds and immature fruits, 23% infestation observed during 2024-25. A detailed study needs to be conducted to access their infestation rates and sustainable management techniques.

Incidence of fall armyworm, *Spodoptera frugiperda* on ginger in ginger growing areas of bangladesh

M. Z. H. Prodhan

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 12% infestation observed during 2024-25. It is suspected that the infestation spread gradually to the ginger growing areas in Bangladesh.

Effect of fungicides for the management of leaf blight disease complex of summer onion for seed production

M. A. Wadud, M. N. Alam, M. Z. H. Prodhan, N. Nath and M. M. Islam

The experiment was conducted at Spices Research Centre, BARI, Bogura during 2024-2025 to find out the effect of fungicides for the management of leaf blight disease complex of summer onion for seeds production. BARI Piaj-5 was used as the test variety. The experiment was laid out in randomized complete block design with four replications and twelve different treatments. viz Rovral, Luna Sensation, Amister Top, Nativo, Discover, Filia, Nister, Cabriotop, Antracole, X-Tra care, Tared and Control. The lowest disease incidence and severity (19.45% and 15.94%) and the maximum disease reduction over control (79.84%) was recorded in Luna sensation and the highest disease incidence and severity (77.93% and 79.06%) was observed control plot. The maximum seeds yield (6.33 quintal/ha) was recorded in Luna sensation and the minimum was in control (1.19 quintal/ha) plot.

Survey and identification of summer onion diseases

N. Nath, M. A. Wadud, M. M. Kamal, M. N. Yousuf and S. N. Mozumder

Survey was conducted at different summer onion growing areas namely Gazipur, Faridpur, Rajbari and Bogura during 2024-25 to identify the diseases of summer onion with their causal organisms. Basal rot (*Fusarium oxysporum* f. sp. *cepae*) and purple blotch (*Alternaria porri*) were found predominantly in the surveyed area. Black mold (*Aspergillus niger)* was seen in post-harvest storage condition. Basal rot was observed at growth stage (30 to 45 days old seedlings). Purple Blotch was observed in small, water-soaked spots on leaves that enlarge into purplish-brown lesions with yellow halos at the mid growth stage of the bulb. In storage, black mold was also found as a black, sooty discoloration on the neck and outer scales of the bulb. These fungi were identified as *Fusarium oxysporum* f. sp. *cepae*, *Alternaria porri* and *Aspergillus niger* were isolated from diseased plant parts on PDA medium for identification.

Detection of viruses and their vectors of chilli in Bangladesh

N. Nath, M. S. Rahman, M. A. Wadud, M. M. Kamal

The study was undertaken with a view to determining the reduction of growth and yield contributing parameters due to the viruses in Chilli (*Capsicum annum* L.). Based on symptomatological study, virus infected samples were collected from naturally infected chilli field from Regional Spices Research Centre, BARI, Gazipur. The infected samples were tested in the laboratory of Plant Pathology by Double Antibody Sandwich Enzyme-Linked Immuno-Sorbent Assay (DAS-ELISA). In order to draw up the management practices for the control of virus diseases of chilli, reliable tests are required for its detection. DAS-ELISA was found as the suitable tests for the detection of viruses. In this experiment, eight infected chilli germplasm were used against the antiserum i.e. Chilli veinal mottle virus (ChVMV) to detect the virus separately. The most common sucking pests such as aphids, whitefly, thrips and tiny mites were observed in the infected plants. However, only one infected chilli sample (AVPP-1236-2) gave the positive result against the virus. The results suggested that Chilli veinal mottle virus (ChVMV) as the causal organism of that infected chilli germplasm.

Detection of pathogens from imported ginger rhizome

M. A. Wadud, N. Nath, Z. H. Prodhan and M. M. Islam

The study was conducted during 2024-25 to identify the new disease of imported spice crop especially ginger with their causal organisms. Eight samples were tested where the all samples of ginger rhizomes were collected from Raja Bajar and Shwapno Super Shop, Police Plaza, Bogura. All the ginger were imported from India and Bhutan. *Sclerotium rolfsii* were found after testing the all samples which may be a post-harvest/ transit disease of ginger. Pathogenicity test was done by Rhizome inoculation method. After pathogenicity test, it was confirmation that storage rot of ginger caused by *Sclerotium rolfsii* which was similar to previous pathogen.

Effect of different fungicides in controlling stem gall of coriander

M. R. Islam, M. A. Alam, M. I. Haque and M. A. Wadud

The experiment was conducted at Regional Spices Research Centre, BARI, Magura during 2024-2025 to find out the effect of different fungicides in controlling stem gall disease of coriander. BARI dhonia-2 was used as the test variety. The experiment was laid out in randomized complete block design with three replications and five different treatments. Significant differences regarding yield and yield attributes were observed among different treatments. The highest yield (3.24 t/ha) was found from treatment T_3: Amistar top (Azoxystrobin + Difenoconazole 1.5 ml/L) which was significantly higher than those of other treatments. The lowest yield (0.46 t/ha) was found from control plot T_5. The lowest disease incidence (0.95 %) and highest disease reduction over control (98.97%) was recorded from T_3: Amistar top (Azoxystrobin + Difenoconazole @1.5ml/L) treatment. The highest disease incidence (84.84%) was recorded from control plot. The highest BCR (2.22) was recorded from T_3: Amistar top (Azoxystrobin + Difenoconazole @1.5ml/L) treatment and lowest BCR (0.38) was recorded from control plot.

Identification of new diseases of vanilla in Bangladesh

M. A. Wadud, M. Z. H. Prodhan, N. Nath, A. H. F. Fahim and M. M. Islam

The experiment was conducted at Spices Research Centre, BARI, Bogura during 2024-25 to identify the new disease of vanilla with causal organisms. The pathogens were isolated from infected leaves, stem and bean by direct tissue transplanting technique on PDA media at 26 ± 1 ^{0}C. Result showed that leaf spot, stem rot and bean rot caused by *Fusarium oxysporum* which identified through morphological characterization based on colony, mycelium and conidial features. After pathogenicity similar symptoms were reproduced by artificial inoculation of detached method.

Potential use of remote sensing platforms for garlic yield prediction

M. A. Mottalib, M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Islam, M. M. Hasan, M. M. Alam, M. Z. Hasan, M. A. Hoque, M. A. Rahman, K. Hassan, and Z. H. Prodhan

This study evaluated the suitability of various vegetation indices from Sentinel-2 imagery for predicting garlic yield across different growth stages. The indices analyzed included NDVI, SAVI, GESAVI, GCVI, EVI2, NDRE, and MCARI. NDRE consistently showed the strongest correlation with yield, achieving the highest R^2 value (0.6798) on 09 March 2024 coinciding with garlic's bulb development and maturity stage. GCVI (R^2 = 0.5573) and GESAVI (R^2 = 0.5281) also performed well, while MCARI showed poor results throughout. NDRE's sensitivity to chlorophyll and canopy structure under high biomass makes it highly effective in dense garlic fields. GCVI provided the best model fit (R^2 = 0.6063), while NDRE had the lowest prediction error (RMSE = 194.80 kg/ha; MBE = 160.62 kg/ha). GESAVI, despite weaker statistical performance, aligned most closely with BBS yield estimates, highlighting the importance of ground validation. Yield mapping revealed that 68% of the area produced 9.3–10.1 t/ha, confirming NDRE as the most reliable index during late growth stages.

Land suitability assessment for spices crop production through remote sensing and GIS in southern saline region of Bangladesh

M. A. Mottalib, M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Islam, M. M. Hasan, M. M. Alam, M. Z. Hasan, M. A. Hoque, M. A. Rahman, K. Hassan, and Z. H. Prodhan

This study aimd to identify suitable land for spices crop production in the southern saline region of Bangladesh, considering topography, climate, and soil properties. The Analytical Hierarchy Process (AHP), a Multicriteria Decision-Making approach, was applied using GIS. Key criteria included soil texture, depth, salinity, land type, surface temperature, rainfall, slope, elevation, and drainage. Weights were assigned through expert judgment and pairwise comparison, while sub-parameter scores were based on field data and standards. Results showed 26.31% (8804.52 ha) as highly suitable, 45.32% moderately suitable, 13.56% marginally suitable, and 14.81% permanently unsuitable. Shallow soil, steep slope, and high salinity limited suitability. Further study will be conducted next year for improved validation and interpretation.

Development and fabrication of a two-wheel tractor coupled bund maker

This study aimd to locally manufacture and evaluate a two-wheel tractor-coupled bund maker to improve land preparation for spices and other cropping systems. The implement is designed to be low-cost, labour-saving, easy to maintain, and suitable for smallholder farmers. It was fabricated using locally available materials at the SRC, BARI, Bogura workshop during 2024–2025. Initial field testing and performance evaluation will be conducted during the 2025–2026 cropping season. Based on test data and observations, design improvements will be made. Field evaluation will follow ASABE standard testing protocols. As a first-year trial, further refinement and testing are planned to enhance efficiency and reliability.

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

Processing and preservation of ginger by suitable means is a major thrust area since a long time.

These techniques are mainly used for preservation and value addition of ginger. 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 ginger powder using dehydration technology with attractive organoleptic and nutritional properties. The ginger powder obtained from fresh ginger through processing process in which remains all active ingredients of the ginger can be added into other food for improving the mouth feeling of the food as the spice during eating. Now-a-days people do not have enough time to prepare ginger paste at home, so they depend on the ready to eat spice for curry making. The chemical compositions of the fresh and dehydrated ginger 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 ginger powder can be developed utilizing available low cost dehydration processes and thereby, post-harvest losses of ginger can be reduced to an acceptable level.

Studies on quality of developed ginger-garlic mix paste during storage

M. M. Alam, M. G. F. Chowdhury and M. Z. H. Prodhan

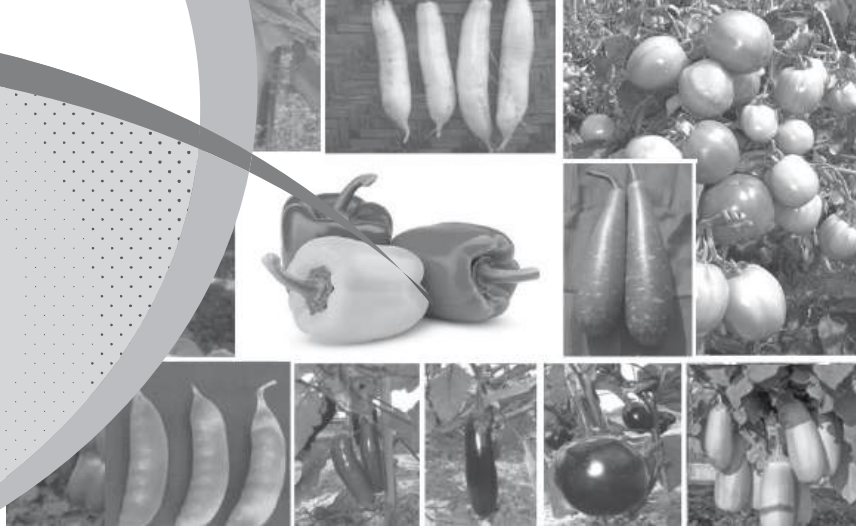
This experiment was carried out to investigate the effect of preservatives, storage conditions and time on the keeping quality of ginger-garlic (G-G) mix paste. The fresh peel ginger sliced and garlic cloves were crushed in blender. The mix paste was prepared using 50:50 of ginger sliced and garlic cloves. Among three treatments, samples of mix pastes were treated with T_1 - salt + sodium benjoate + citric acid, T_2- salt + KMS + citric acid, T_3-citric acid only. All the prepared samples (G-G mix paste) were stored in glass bottle (GB) and food grade plastic pot (PP) kept in room temperature (RT) and refrigerated temperature (RFT). The moisture, ash, pH and TSS of G-G paste of all the samples were observed at 30 days interval up to 270 days of storage. It was found that ash, pH and TSS of G-G paste in GB and PP were increased while moisture was decreased with the increase in storing time at all treatments. The colour, flavor, texture and overall acceptability of all the samples were observed at 15 days interval up to 270 days storage. It was observed that in room temperature the highest shelf life 270 days and 180 days were found of ginger-garlic mix paste in GB and PP by T_2(treated with NaCl + CA+ KMS) which was closely followed by T_1 (treated with NaCl + CA + sodium benjoate) with 150 and 120 days and T_3 (treated with CA) with 75 and 60 days for same storage condition. It is also observed that in refrigerated storage the highest shelf life of ginger-garlic mix paste 270 days was found in T_1 and T_2 for both glass bottle and plastic pot, but T_3 showed 150 and 120 days shelf life when it was packed in glass bottle and plastic pot.In order to determine the suitability of two samples of ginger-garlic paste (which were found better in RT and RFT) in a curry, it was decided to conduct organoleptic taste test of chicken and beef curry using above 2 samples ($T_1$and T_3) with fresh ginger-garlic paste. The results showed that all the samples were statistically almost identical in respect of colour, flavour, pungency, taste and overall acceptability though there was little bit difference in scoring among each attributes.

Adaptive trial of onion vareties in charland condition

M. A. Hossain, M. N. Farid, A. A. Tithi, M. A. Sarker

A field experiment was conducted during *rabi* 2024-25 in the char land area at the Spices Research Sub-Centre, BARI, Lalmonirhat to evaluate 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.

VEGETABLE CROPS



05

Eggplant/Bringal

Evaluation of eggplant genotypes

A. K. M. Quamruzzaman, S. Akter and L. Akter

A study was conducted at BARI, Gazipur during winter 2024-25 to evaluate 20 eggplant OP lines for yield and associated traits. Significant genetic variability was observed, with days to first harvest ranging from 101.33 (BD-616) to 108.67 days (BD-614). BD-616 showed early maturity and vigorous growth (126.40 cm height). Fruit characteristics varied widely, with BD-630 producing the longest fruits (28.60 cm) and BD-622 the widest (10.83 cm). BD-614 yielded maximum fruits/plant (32.53) while BD-632 produced the heaviest fruits (502.67 g) and highest yield (119.57 t/ha). Disease incidence ranged from 13.33% (BD-627) to 20.33% (BD-632). The genotypes BD-632, BD-622, and BD-619 emerged as most promising due to their high yield potential and desirable fruit traits. The findings provide valuable genetic resources for developing improved eggplant varieties with enhanced productivity and disease resistance.

Advanced yield trial of brinjal germplasm

M. M. Hossain, M. M. Ahmed M. B. Sarker and A. M. K. Islam

The experiment was conducted at Regional Agricultural Research Station, BARI, Burirhat, Rangpur during the *Rabi* season of 2024-25 with a view to developing high yielding and good quality brinjal variety. The experiment was laid out in a randomized complete block design with three replications. A total of seven collected brinjal germplasm viz. SMBur-001, SMBur-002, SMBur-004, SMBur-005, SMBur-006, SMBur-007 and SMBur-008 with BARIBegun-10 as check were evaluated in the study. Among the tested genotypes the highest marketable fruit yield (57.30 tha^{-1}) was obtained from the genotype SMBur-004, while the lowest (19.17 tha^{-1}) was found in SMBur-008.

Advanced yield trial of winter eggplant lines at Jamalpur region

H. Rahman, M. A. Goffar, M. J. Rahman, A. Akter and R. Sultana

The experiment was conducted to develop new high yielding OP variety at HRC research field, RARS, BARI, Jamalpur during the winter season of 2024-25. Eight eggplant lines viz. SM Jam-003, SM Jam-008, SM Jam-011, SM Jam-015, SM Jam-017, SM Jam-018, SM Jam-020 and BARI Begun-12 as check were included in the study. All the yield and yield contributing parameters of different eggplant lines/variety showed significant variation except percentage of little leaf infected plants. Days to 50% flowering varied from 79 to 87 days. Harvest duration varied from 89 to 99 days. The highest number of fruits per plant (39) was produced by the line SM Jam-008 whereas the lowest number of fruits (15) was from the check variety BARI Begun-12. Maximum individual fruit weight (361.33 g) was obtained from the check variety BARI Begun-12 and minimum (91.87 g) from the line SM Jam-008. Fruit length ranged from 10.43 cm to 18.01 cm. Fruit breadth was found maximum (11.76 cm) in the line SM Jam-020 and minimum (3.71 cm) in the line SM Jam-008. The maximum fruit yield (6.61 kg/plant) was produced by the line SM Jam-015 as against the minimum (3.47 kg/plant) in the line SM Jam-008. The line SM Jam-015 exhibited the highest fruit yield per hectare (54.23 t) followed by BARI Begun-12 (51.32 t), the lines SM Jam-020 (50.33 t) & SM Jam-003 (42.42 t) and SM Jam-003 had the lowest fruit yield (34.32 t). The percentage of virus infected plants was recorded from 13.33 to 23.33%. No little leaf disease was found in the lines SM Jam-003, SM Jam-008, SM Jam-011, SM Jam-015, SM Jam-017 and SM Jam-018. The percentage of little leaf infection was recorded from 3.33 to 6.67%. Infestation by Brinjal Shoot and Fruit

Borer ranged from 21.02 to 41.50% fruits per plant, where the maximum infestation was observed in the check variety BARI Begun-12 and the minimum infestation was observed in line SM Jam-003.

Regional yield trial of eggplant (OP)

A. K. M. Quamruzzaman, S. Akter and L. Akter

The study was conducted during the winter season of 2024–25 at BARI, Gazipur, to evaluate nine OP eggplant lines along with two check varieties for yield and associated traits. The accessions exhibited considerable variability in growth, fruit characteristics, and yield performance. SM-217A showed the highest yield (98.23 t/ha), followed by SM-275 (93.17 t/ha) and SM-236B (88.77 t/ha), all surpassing the check varieties. Notable variation was also observed in fruit number, size, and weight, with SM-18 producing the heaviest fruits (669 g). Disease incidence varied, with SM-470 showing the lowest infection (14%). The observed negative correlation between fruit size and number supports known brinjal growth behavior. High CV% values indicate broad genetic variability, highlighting strong potential for breeding improved and disease-tolerant brinjal varieties.

Hybridization of eggplant

S. Yesmin, M. Ratna, E. Mahmud, M. Islam, N. Akter and M. A. Rahman

An experiment was carried out at Regional Horticulture Research Station, Lebukhali, Patuakhali during October, 2024 to March, 2025 to develop hybrid variety of eggplant for round the year production. Six parental lines were used in this experiment. The parents were crossed by following 6×6 full diallel cross design. The parents were crossed in all possible combinations including reciprocals and a total of 30 cross combinations were made. A total of 221 crosses were done and 140 fruits were harvested. The seeds obtained from the harvested fruits will be used to raise F_1 plant. Heterosis as well as combining ability study will be done in next cropping season.

Heterosis study of eggplant hybrids

A. K. M. Quamruzzaman, S. Akter and L. Akter

A field experiment was conducted at BARI, Gazipur, during the winter season of 2024–25 to evaluate the standard heterosis of ten eggplant hybrids compared with two commercial checks, BHB-06 and Purple King. The study aimed to assess heterotic performance for yield, yield-contributing traits, fruit quality, and disease resistance. Significant variation was observed among the hybrids for all traits studied. Hybrids $F_1$12X21, $F_1$18X5, $F_1$5X1, and $F_1$1X18 exhibited superior heterosis for fruit yield, fruit breadth, early maturity, and resistance to bacterial wilt and fruit rot. $F_1$12X21 and $F_1$18X5 were particularly promising, outperforming both standard checks in multiple traits. These findings highlight the potential of heterosis breeding for developing high-yielding, disease-resistant eggplant varieties adapted to the agro-climatic conditions of Bangladesh. Further trials are recommended to confirm stability and adaptability.

Regional yield trial of eggplant hybrid

A. K. M. Quamruzzaman, S. Akter and L. Akter

A field experiment was conducted at the Bangladesh Agricultural Research Institute (BARI), Gazipur, during the winter 2024–25 to evaluate eight eggplant hybrids alongside two check varieties (BARI Hybrid Begun-04 and -06). The hybrids exhibited significant variation in yield and yield-related traits. Days to first harvest ranged from 101 to 107, with plant height varying between 89 and 131 cm. Fruit weight, number, and size differed widely, contributing to yield variability (67.32–101.2 t/ha). F1 253A × 21 produced the highest yield (101.2 t/ha) due to large fruit size (503g) and moderate fruit number, coupled with acceptable disease resistance. Overall, hybrids F1 253A × 21, F1 20 × 5, and F1 18X405 demonstrated strong potential for commercial cultivation in Bangladesh's diverse agro-ecologies.

Development of bacterial wilt resistant eggplant variety through backcross method

M. H. Islam, A. K. M. Quamruzzaman, M. Afroz, M. Z. A. Talukder, L. Akter, S. Akter

The study was designed to begin developing resistant eggplant varieties by combining high-yielding but susceptible types with a known resistant parent. Two susceptible varieties-BARI Begun-6 and BARI Begun-12-were crossed with BARI Begun-8, a variety known for its bacterial wilt resistance. The initial backcross population (Bc_1F_1) was grown during the 2024–25 winter season at

the Olericulture Division, HRC, BARI in Gazipur. Seeds were sown in September, and seedlings were transplanted in November. At this stage, the plants were grown without artificial disease pressure; resistance testing will be carried out in the next generation (BC_1F_2). Morphological data from the BC_1F_1 population showed encouraging traits such as good fruit shape, moderate plant height, and reduced infection compared to the susceptible parents. These results indicate successful transfer of desirable characteristics, laying the foundation for future selection of resistant, high-performing lines.

Maintenance and quality seed production of eggplant (OP varieties, Hybrids varieties and parental lines of concern hybrids)

L. Akter, A. K. M. Quamruzzaman and S. Akter

The study evaluated genetic purity maintenance and seed production parameters in eggplant varieties at BARI. Isolation techniques effectively preserved genetic purity, with all varieties maintaining 98-99% purity (off-types <2%), well below the 5% national standard, confirming the efficacy of 200-meter isolation distances. Seed yield varied significantly among varieties, with BARI Begun-12 producing exceptional yields (45 kg/20 decimals) due to superior fruit size and seed-setting capacity, outperforming hybrids (4-8 kg). Despite lower quantities, hybrid seeds met premium quality standards, exhibiting 97.6-99.2% germination rates with optimal physical purity and moisture content. Disease incidence remained minimal (0.5%) through stringent sanitation and controlled fermentation practices. The inverse yield-area relationship in BARI Begun-12 highlights genotype-specific efficiency differences. These findings establish BARI Begun-12 as ideal for commercial seed production while underscoring the need for optimized hybrid seed protocols to balance yield and quality. The study provides critical insights for enhancing eggplant seed production systems in Bangladesh.

Tomato

Evaluation of tomato genotypes

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

An experiment was conducted during the 2024–25 winter season at the Olericulture Division, HRC, BARI, Gazipur, to evaluate 13 tomato lines with two checks, including BARI Tomato-14. Significant variability was observed in yield and fruit traits, with uniform flowering at 98 days. BD 7756 was the highest yielder (135.91 t/ha), while BD 7758 produced the largest fruits (132g), revealing an inverse relationship between fruit number and size. Fruit quality traits varied moderately, with TSS (3.28–5.36%) and pericarp thickness (0.44–0.82 cm). Disease resistance screening identified BD 7751, BD 7752, and BD 8886 as completely resistant to TYLCV, bacterial wilt, and fruit borer. These findings highlight promising genetic resources for developing high-yielding, quality tomatoes with enhanced stress resistance, offering valuable material for future breeding programs.

Evaluation of tomato germplasm

M. H. Islam, M. A. Islam and M.R. Islam

The study was conducted with 15 tomato germplasm including one check variety at the research field of Olericulture Division, HRC, BARI, Gazipur during the winter season of 2024–25. The objective was to identify promising tomato lines in terms of yield potential, fruit quality, and other important horticultural traits for future breeding programs. Significant variation was observed among the tested lines across all traits. Notably, lines SL432 (3.73 kg/plant; 118.42 t/ha), SL703 (2.98 kg/plant; 94.50 t/ha), SL429 (2.76 kg/plant; 87.50 t/ha), and SL706 (2.64 kg/plant; 83.78 t/ha) exhibited outstanding performance compared to the check variety BARI Tomato-15 (1.34 kg/plant; 42.34 t/ha). These results suggest that several lines have strong potential for advancement to preliminary yield trials, and they may serve as valuable breeding materials for tomato improvement in Bangladesh.

Evaluation of newly collected exotic tomato lines

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25 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 (45.72), average 5 fruit weight (228.6 g), and yield (22.84 t/ha) 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 8. The maximum fruit size (38.15 mm ×36.23 mm) and thickness of pericarp (6.98 mm) were observed in SL Rai-051, followed by SL Rai-016.

Advanced yield trial of tomato

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

An experiment was conducted at the Olericulture Division, HRC, BARI, Gazipur, Bangladesh, during the 2024-25 winter season to evaluate 32 tomato genotypes alongside the check variety BARI Tomato-14. Significant variability was observed in growth, yield, and fruit quality traits. Plant height ranged from 78.6 cm (SLA 015-7) to 304 cm (SLA 011 and BARI Tomato-14), while fruit yield per plant varied between 1.88 kg (SLA 015-1) and 4.22 kg (SLA 035). High-yielding genotypes (SLA 026, SLA 035, SLA 15-2) produced 4.15–4.22 kg/plant (138.60–139.39 t/ha), with distinct yield strategies—fewer but heavier fruits (SLA 026, SLA 15-2) versus balanced fruit number and size (SLA 035). Fruit characteristics varied widely, with TSS ranging from 3.32% (SLA 15-6) to 7.6% (SLA 12). Disease and pest resistance screening revealed complete resistance (0% incidence) in SLA 015-7, SLA 15-6, and SLA 030 against TYLCV, bacterial wilt, fruit borer, and leaf-sucking pests, while SLA 024 and SLA 026 showed higher TYLCV susceptibility (10–20%). The study highlights promising genotypes for breeding high-yielding, stress-resistant tomato varieties with improved fruit quality.

Regional yield trial of cherry tomato lines

N. U. Ahmed, M. M. Hasan and M. Z. Rahman

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25 with three cherry tomato germplasms to find out the suitable cherry tomato lines to develop as a variety. The earliest flowering (53 DAT), earliest harvest (74 DAT), maximum number of fruits (222.8), yield per plant (3.5 kg), and estimated yield (27.44 t/ha) were observed in SL Rai-002, followed by SL Rai-007. Its average fruit weight was 15.73 g, TSS 5 % and red in color. This line was superior compared to other lines based on all the characters.

Regional yield trial of open pollinated tomato lines

L. Akter, A. K. M. Quamruzzaman and M. H. Islam

A field experiment was conducted across three locations at Olericulture Division, HRC, BARI, Gazipur, during the 2024-25 winter season to evaluate five tomato lines alongside BARI Tomato-15. Significant variations were observed in yield and morphological traits. Plant height ranged from 99 cm (AVTO 1717) to 133 cm (BARI Tomato-15), while fruit number varied between 19 (AVTO 1711) and 45 (BARI Tomato-15). AVTO 1711 produced the heaviest fruits (217 g), whereas AVTO 1717 achieved the highest yield (114.88 t/ha). Fruit quality parameters showed moderate variation, with TSS ranging from 3.7% to 4.5% (highest in AVTO 1717). Disease incidence was minimal, with only 5% TYLCV in AVTO 1008 and AVTO 1712. AVTO 1717 and AVTO 1712 demonstrated superior yield, quality, and stress tolerance, making them promising candidates for commercial cultivation and breeding programs.

Inbred development of tomato

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

The study was conducted at the experimental field of Olericulture Division HRC, BARI, Gazipur, Bangladesh during the winter season of the year 2024-25. This study evaluated 15 tomato lines, revealing significant genetic variability in yield and disease resistance. AVTO 1719 showed highest yield (160.53 t/ha) through large fruits (236g), while AVTO 1907 achieved 119.14 t/ha via high fruit numbers (48.8/plant), both outperforming BARI Tomato-14 (92.07 t/ha). Early-flowering lines (AVTO 1717/1711) maintained good yields (108-116 t/ha) with complete disease resistance. High-yielding lines exhibited a yield-quality tradeoff (TSS 2.7-4.8%). Three breeding strategies emerged: 1) large-fruited (AVTO 1719), 2) high-yielding (AVTO 1907), and 3) disease-resistant (AVTO 1717) types. The findings highlight opportunities to pyramid disease resistance into high-yielding backgrounds while optimizing fruit quality, providing valuable genetic resources for developing improved tomato varieties.

Study of heterosis in tomato

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

An experiment was conducted during the winter season of 2024–25 at the experimental field of the Olericulture Division, HRC, BARI, Gazipur, to assess standard heterosis in 19 tomato hybrids against the check variety BARI Hybrid Tomato-7 across 14 traits. Significant heterosis was observed, particularly in yield and fruit quality parameters. F_1 3301 showed outstanding yield heterosis (46.29%

per plant; 49.15% per hectare), driven by a balanced combination of fruit number and size. F_1 3203 excelled in fruit weight (65.78%) and TSS (18.05%) but had fewer fruits. F_1 4401 showed the opposite pattern, with high fruit number but reduced size. Positive heterosis for pericarp thickness was also notable. Three heterotic patterns—large fruit, high number, and balanced yield—were identified, offering breeders diverse selection pathways. Overall, the results demonstrate strong hybrid vigor and highlight the potential of these hybrids for commercial tomato production in Bangladesh.

Heterosis and combining ability analysis in tomato (*Solanum lycopersicum* L.)

M. R. Islam, M. M. R. Salim and A K M Quamruzzaman

The experiment was conducted at the research farm of Olericulture Division, Horticulture Research Centre, BARI, Gazipur to estimate heterosis and combining ability in tomato. A randomized complete block design (RCBD) with two replications was used to evaluate nine tomato parents, their hybrids, and standard checks for yield, earliness, and quality traits. Significant genotypic variation ($p < 0.05$) was observed for yield/plant, fruit traits, flowering time and TSS. Hybrid $P_3 \times P_7$ showed the highest heterosis for yield and strongest SCA, while $P_4 \times P_6$ combined yield heterosis with improved TSS. $P_1 \times P_2$ was the best for earliness, showing negative heterosis and favorable SCA. GCA analysis identified P_3 and P_4 as top yield donors, P_2 and P_4 for TSS, and P_1 and P_6 for earliness. These results highlight key parental combinations for targeted hybrid development, with $P_3 \times P_7$ and $P_4 \times P_6$ recommended for multi-location testing.

Performance yield trial of winter tomato hybrid

M. A. Islam, M. A. Goffar, M. H. Islam, B. Ahmed, M. R. Isalm and A. K. M. Quamruzzaman

A study was conducted to evaluate yield and yield contributing traits of six tomato crosses along with the check variety BARI Hybrid Tomato-9 at the experimental field of Olericulture Division, HRC, BARI, Gazipur Bangladesh during the winter season of the year 2024-25. Significant variations ($p < 0.05$) were observed among the crosses for all measured traits. Plant height ranged from 87.0 cm (check) to 186.5 cm (5×6 and 6×8), while the number of fruits per plant varied from 20.5 (5×7) to 33.5 (BARI Hybrid Tomato-9). Maximum single fruit weight (126.0 g) was recorded in 5×6 and 6×9. Fruit yield per plant and per hectare were highest in 6×9 (3.24 kg; 113.5 t/ha), followed by 6×8 (2.85 kg; 99.6 t/ha) and 5×6 (2.78 kg; 97.2 t/ha). Crosses also differed in fruit quality, with 6×8 showing the highest TSS (5.43%) and 5×6 the thickest pericarp (0.70 cm). Overall, 6×9, 6×8, and 5×6 are promising hybrids for high-yielding and quality tomato production in Bangladesh. So these three hybrids can be selected for the further evaluation.

Regional yield trial of tomato hybrids

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

An experiment was conducted during the winter season of 2024–25 at the Olericulture Division, HRC, BARI, Gazipur, and three diverse locations to evaluate the performance of four tomato hybrids against the standard check, BARI Hybrid Tomato-10. The hybrids showed significant variability in growth, yield, and fruit quality traits. F_1 3701 recorded the highest yield (181.14 t/ha) followed by F_1 4401 (166.19 t/ha), both surpassing the check. F_1 3701 produced the largest fruits (90g), while F_1 3101 had the highest TSS (4.4%). Both F_1 3701 and F_1 4401 showed good pericarp thickness and complete resistance to TYLCV, bacterial wilt, and fruit borer. These results highlight the strong potential of F_1 3701 and F_1 4401 for commercial cultivation in Bangladesh.

Evaluation of tomato hybrids in relation to disease

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

The study was conducted at the experimental field of Olericulture Division HRC, BARI, Gazipur, Bangladesh during the winter season of the year 2024-25. Evaluation of 17 tomato hybrids revealed significant yield variations, with F_1 4701 achieving highest yield (150.73 t/ha) through large fruits (120.2g) and F_1 6319 (131.99 t/ha) via high fruit numbers (66/plant). While F1 6319 demonstrated complete bacterial wilt resistance, all hybrids showed some TYLCV susceptibility (0-5%). Quality traits varied considerably, with TSS ranging 3.08-5.76%. The study identified three promising hybrid groups: large-fruited (F_1 4701), high-yielding (F_1 6319), and quality-focused (F1 6503) types, with

significant genetic variability (LSD p≤0.05) for trait recombination. These findings provide a foundation for developing improved tomato hybrids combining disease resistance, high yield, and superior fruit quality to enhance Bangladesh's tomato production.

Evaluation of tomato hybrids in relation to salinity

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

An experiment was conducted during the winter season of 2024–25 at BARI's Plant Physiology Laboratory and nethouse to evaluate the salinity tolerance of 14 tomato genotypes, including F_1 hybrids and advanced AVTO lines, under three salinity levels: 0, 8, and 12 dS/m. Salinity stress significantly reduced leaf area, chlorophyll content, yield, and plant biomass across all genotypes, with severity increasing at higher salinity. However, notable genotypic variation was observed. F_1 3701 consistently outperformed others in growth and yield traits, maintaining higher SPAD values, fruit number, and biomass under salinity. AVTO 1911 and AVTO 1705 also showed stable performance. These results highlight the potential of F_1 3701 and selected AVTO lines for cultivation in salinity-prone areas and their use in breeding programs to develop salt-tolerant tomato varieties for Bangladesh's coastal regions.

Nutritional analysis of OP and F_1 tomato

A. K. M. Quamruzzaman, L. Akter and M. H. Islam

A study was conducted during the winter season of 2024–25 at the Olericulture Division and BARI Central Laboratory to evaluate the nutrient composition of eight tomato genotypes (open-pollinated and F_1 lines): AVTO 1717, AVTO 1719, AVTO 1008, AVTO 1713, F_1 4601, F_1 5303, F_1 4701, and F_1 6503. Fully matured fruits were analyzed for vitamin C, lycopene, β-carotene, total soluble solids (TSS), and titratable acidity using standard laboratory methods. Significant genotypic variation was observed. AVTO 1713 had the highest vitamin C (26.4 mg/100g), F_1 5303 showed the highest lycopene (8.95 mg/100g), and F_1 4701 recorded the highest β-carotene (2.65 mg/100g). TSS ranged from 4.2 to 6.1 °Brix across genotypes. These findings highlight the genetic diversity in nutrient content and identify promising lines for breeding nutrient-rich tomato varieties. The results provide valuable insights for developing tomatoes with enhanced health benefits for both fresh consumption and processing in Bangladesh.

Maintenance and quality seed production of tomato

M. R. Islam, L. Akter, M. M. R. Salim and A. K. M. Qumruzzaman

This study was conducted to produce breeder seed of selected BARI tomato varieties while maintaining varietal purity through the application of genetic and agronomic principles. The experiment included BARI Hybrid Tomato-8, 4, 5, 7, 9, and C 51 (pollen parent), cultivated during the 2024–25 season. Seeds were sown on 26 October 2024, and 32-day-old seedlings were transplanted into beds of specified dimensions, following recommended fertilizer and intercultural management practices. Roughing was performed at vegetative, flowering, and fruiting stages, and emasculation with hand pollination was carried out during anthesis. Harvested fruits were processed for seed extraction, drying, and storage. Results showed that BARI Hybrid Tomato-8 yielded the highest seed output (17 kg), followed by BARI Hybrid Tomato-4 (3.5 kg), while smaller plots of BARI Hybrid Tomato-5, 7, and 9 produced 480 g, 450 g, and 250 g seed, respectively. The findings confirm that strict adherence to varietal purity protocols ensures quality breeder seed production, supporting large-scale multiplication and distribution to farmers.

Sweet Pepper

Regional yield trial of sweet pepper OP

L. Akter, A. K. M. Quamruzzaman, and M. R. Karim

An experiment was conducted with four sweet pepper lines with a check (BARI Mistimorich- 2) at the central Experimental farm of Olericulture Division, HRC, Gazipur; ARS, Pahartoli, Chattogram and RARS, Jamalpur, BARI, from October 2024 to April 2025. Significant variation was observed among sweet pepper genotypes for most traits, except days to harvest. Days to harvest ranged from 64.05 days in BARI Mistimorich-2 to 85.37 days in CA 0046. Fruit length was highest in CA 0043A (9.70 cm) and lowest in BARI Mistimorich-2 (7.12 cm), while fruit diameter ranged from 5.80 cm (CA 0031) to 6.76 cm (CA 0042A). The maximum number of fruits per

plant was recorded in CA 0046 (9.43). Average fruit weight was highest in CA 0046 (102.32 g). Yield per hectare ranged from 24.06 t (CA 0046) to 30.16 t (CA 0043A). CA 0043A exhibited superior yield stability, orange fruit colour, bell-shaped fruits, and minimal pest infestation under nylon net protection. 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 of sweet pepper

L. Akter, A. K. M. Quamruzzaman and S. Akter

The experiment was conducted at the experimental farm of Olericulture Division, HRC, BARI during, the winter season of 2024-25 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 sweet pepper hybrid

L. Akter, A. K. M. Quamruzzaman and S. Akter

Five selected F_1's of sweet pepper ($P_1 \times P_2$, $P_1 \times P_3$, $P_2 \times P_3$, $P_1 \times P_7$ and $P_3 \times P_4$) with a check (F_1 Syam) were evaluated at the farm of Olericulture Division, HRC, BARI, Gazipur during the winter season of 2024-25. 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 $P_2 \times P_3$. The heaviest fruits (176.67g) were obtained from $P_1 \times P_2$. Fruit weight per plant was found maximum (1.30kg) in $P_2 \times P_3$ followed by the $P_1 \times P_2$ (1.06kg) and $P_1 \times P_3$ (1.02kg). The highest yield was produced by $P_2 \times P_3$ (36.24 t/ha). The hybrids $P_2 \times P_3$, $P_1 \times P_3$ and $P_1 \times$ P7 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, A. K. M. Quamruzzaman and S. Akter

This study was conducted at the farm of Olericulture Division, HRC, BARI, Gazipur, RHRS, Lebukhali, Patuakhali and ARS Pahartoli, Chattogram during the winter season of 2024-25 with six sweet pepper hybrids and one check variety, revealing significant variation in yield and yield-contributing traits. Days to first harvest ranged from 67 in hybrid P6 × P8 to 77 days in the commercial check, F1 Super Beauty, indicating earlier maturity in hybrids. F1 Super Beauty produced the longest (8.97 cm) and widest fruits (5.02 cm), while hybrids had slightly smaller dimensions. Fruit number per plant was highest in F1 Super Beauty (6.0) and $P_2 \times P_6$ (5.9), and average fruit weight was greatest in $P_2 \times P_6$ (197 g) compared to F_1 Super Beauty (167 g). Correspondingly, fruit yield per plant peaked in $P_2 \times P_6$ (1.12 kg), followed by $P_8 \times P_{10}$ and $P_9 \times P_{10}$. Resistance to little leaf infestation varied, with $P_2 \times P_6$ and $P_9 \times P_{10}$ showing none, while P8 × P10 was highly susceptible. Overall, $P_2 \times P_6$ emerged as the most promising hybrid, combining early harvest, higher fruit weight, yield, and disease resistance.

Cauliflower

Evaluation of cauliflower genotypes

M. A. Islam, M. H. Islam and A. K. M. Quamruzzaman

The study was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur during

the winter season of 2024-25 to evaluate the growth, yield, and curd quality traits of sixteen cauliflower genotypes, including two checks (BARI Fulcopy-1 and BARI Fulcopy-2). Significant variation ($p < 0.001$) was observed for all traits. CL-02, CL-04. CL-01 and CL-07 were the earlier genotypes, maturing in 41, 43, 55 and 58 days, respectively, but CL-02 and CL-04 showed lower yields (14.1 t/ha and 15.2 t/ha). CL-01 and CL-07 performed moderately well with earliness and yield (25.3 t/ha and 34.2 t/ha). In contrast, CL-10 produced the highest yield (67.1 t/ha), followed by CL-15 (63.9 t/ha), CL-14 (61.6 t/ha), CL-05 (58.6 t/ha), and CL-08 (56.6 t/ha). Genotypes with broader leaves and larger curds (e.g., CL-10, CL-05, and CL-08) had higher productivity. Early-maturing lines like CL-02, CL-04, CL-01 and CL-07 offer advantages for early markets, while late but high-yielding genotypes are suited for commercial production. A clear trade-off between earliness and yield potential was observed.

Maintenance and quality seed production of cauliflower (BARI Fulkopi-1, BARI Fulkopi-2 and BARI Fulkopi- 3)

M. A. Islam and A K M Quamruzzaman

The study was been carried out at Olericulture division, Horticulture Research Center, BARI Gazipur during winter season 2024-25. A maintenance breeding program was conducted for three cauliflower varieties *i.e.* BARI Fulkopi-1, BARI Fulkopi-2, and BARI Fulkopi-3 to preserve genetic purity, varietal identity, and ensure breeder seed production. Phenological data showed stable maturity patterns with days to first curd initiation ranging from 55 to 72 days, consistent with varietal descriptors. Varietal uniformity ranged between 50% and 60%, with BARI Fulkopi-3 exhibiting the lowest uniformity, indicating a higher frequency of off-types. Morphological traits, including curd size, color, and plant height, remained within acceptable ranges, confirming varietal stability. Seed yield per plant varied significantly, with BARI Fulkopi-1 producing the highest yield (1.85 kg), while BARI Fulkopi-3 had the lowest (0.50 kg). Despite yield differences, seed quality attributes were maintained across all varieties. The findings emphasize the need for stringent selection to sustain varietal purity and high-quality seed production.

Broccoli

Evaluation of broccoli genotypes

M. A. Islam, M. H. Islam and A. K. M. Quamruzzaman

A field trial was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur during the winter season of 2024-25 to evaluate the growth, yield, and curd quality traits of four broccoli genotypes. Significant differences were observed among the genotypes for all studied parameters. BARI Broccoli-1 was the earliest maturing genotype, initiating curd at 39 days and harvesting at 54.67 days, but exhibited the lowest yield (12.13 t/ha). In contrast, BOI-04 showed the highest yield potential (20.00 t/ha) with superior marketable curd weight and plant biomass, although it matured later. The genotypes BOI-03 and BOI-01offered a balance between earliness (43 days to curd initiation) and higher yield (17.37 t/ha and 15.27 t/ha, respectively). In addition, BOI-01 demonstrated satisfactory seed production capability under the prevailing climatic conditions. Based on the findings, BOI-04 is recommended for high-yield cultivation and BOI-01 may serve as suitable genotypes combining earliness with reasonable yield potential with seed production capacity. These results support varietal improvement and commercial broccoli production in Bangladesh.

Maintenance and quality seed production of broccoli (BARI Broccoli-1)

M. A. Islam and A K M Quamruzzaman

A maintenance breeding program for BARI Broccoli-1 was conducted during the *rabi* season of 2024–25 at the Olericulture Division, Horticulture Research Center, BARI, Gazipur, to preserve genetic purity and varietal identity. Seedlings were raised in seedbeds using the double transplanting method and transplanted at the 4-leaf stage with a spacing of 50 × 50 cm. Out of 425 total plants, 320 were selected as true-to-type, achieving 75% varietal uniformity. The selected plants produced 4.13 kg of seed, with an average seed yield of 12.90 g per plant. The seed yield was 516 kg/ha without rouging and 387 kg/ha with rouging. Although rouging reduced total yield, it was essential to maintain genetic purity and uniformity. The study demonstrates that systematic selection, rouging, and controlled pollination are

critical for producing high-quality breeder seed of BARI Broccoli-1.

Radish

Evaluation of radish genotypes

M. A. Islam, S. Akter and A. K. M. Quamruzzaman

The study was conducted at the experimental field of Olericulture Division, Horticulture Research Center, Bangladesh Agricultural Research Institute, Gazipur during 2024-25 to evaluate the performance of eleven radish genotypes, including three released varieties (BARI Mula-1, BARI Mula-2, and BARI Mula-3), based on vegetative and yield-contributing traits. Significant genotypic variation ($p < 0.001$) was observed across all parameters. RS 03 showed the highest number of leaves (30) and leaf breadth (46.0 cm), while RS 06 produced the longest roots (35.8 cm) and the highest marketable root weight (631.7 g). Yield per hectare ranged from 17.8 t/ha (RS 02) to 43.0 t/ha (RS 06), with RS 06, RS 07, RS 04, and RS 05 outperforming the check varieties. BARI Mula-1 yielded best among the released varieties (38.6 t/ha). Overall, RS 06, RS 07, RS 04 and RS 05 were identified as promising genotypes for future variety development.

Maintenance and quality seed production of radish (BARI Mula-1 and BARI Mula-2)

M. A. Islam and A K M Quamruzzaman

A maintenance breeding program was conducted during the *rabi* season of 2024–25 at the Olericulture Division, Horticulture Research Center, BARI, Gazipur to preserve the genetic purity of two released radish varieties, BARI Mula-1 and BARI Mula-2. Seeds were sown in November, and true-to-type plants were selected and replanted for seed production. In BARI Mula-1, 405 plants were selected from 580, maintaining 70% varietal uniformity, and producing 13 kg of seed, equivalent to 830 kg/ha with rouging compared to 1188 kg/ha without rouging. In BARI Mula-2, 60 plants were selected from 90, ensuring 66% uniformity, and producing 0.8 kg of seed, corresponding to 325 kg/ha with rouging compared to 495 kg/ha without rouging. Although rouging reduced seed yield, it was essential for maintaining varietal identity, genetic purity, and quality breeder seed production.

Carrot

Evaluation of carrot genotypes

M. A. Islam, S. Akter and A. K. M. Quamruzzaman

A field trial was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur during the winter season of 2024-25 to evaluate the growth, yield, and root quality traits of four carrot genotypes. Significant variability was observed, indicating potential for genetic improvement. Genotype DC-03 exhibited the highest total plant weight (235.93 g) and marketable yield (20.22 t/ha) but its fibrous roots made it unsuitable for visual and textural selection. In contrast, DC-1 showed the best root quality, with the lowest core: flesh ratio (0.51), smooth texture, and acceptable yield (18.22 t/ha). DC-06 (18.53 t/ha) and DC-7 (18.96 t/ha) also demonstrated moderate yield and better root texture than DC-03, making them suitable alternatives. DC-7 had the thickest roots after DC-3 (4.57 cm), while DC-06 maintained favorable uniformity. High heritability and genetic gain in root traits suggest that DC-01, DC-06, and DC-07 are promising candidates for selection based on root quality for future trial, with DC-3 useful as a yield donor in breeding.

Cucurbits

Regional yield trial of bottle gourd (OP)

L. Akter, A. K. M. Quamruzzaman, R. Islam and H. 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, Rahmatpur,) of Bangladesh during the winter season of 2024-25 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, A. K. M. Quamruzzaman and H. Islam

The study was conducted at the experimental field of Olericulture Division, HRC, BARI, Gazipur during 2024-25 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. Goffar, M. J. Rahman, A. Akter and R. Sultana

A study was conducted to evaluate some bottle gourd (*Lagenaria siceraria*) S_1 lines in respect of yield and quality and selfing of respected lines in order to develop inbred lines at HRC research field, RARS, Jamalpur, during 2024-25. Sixteen Bottle gourd S_1 lines, viz., Diana (1), Diana (2), Diana (3), Moyna (1), Moyna (2), Mina, Nandini, Super Chamok, Hi Green, Jamuna (1), Jamuna (2), Arafa, White Man (1), White Man (2), Chiang Mai (1) and Chiang Mai (2), were evaluated to investigate the yield and yield contributing characters. The highest number of fruits per plant (19) was produced by Moyna (2), whereas the lowest number of fruits (7) was noted from Jamuna (2). The higher individual fruit weight (2.21 kg) was noted in White Man (1) and lower (1.50 kg) in Diana (3). The highest fruit yield per plant (37.50 kg) & per hectare (75.00 t) was produced by the Moyna (2) as against the least (16.61 kg per plant & 33.22 t per hectare) in Chiang Mai (2).

Regional yield trial of bottle gourd hybrids

A. K. M. Quamruzzaman, L. Akter, R. Islam 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 2024-25 to develop new high yielding bottle gourd hybrid varieties. In case of days to 1stharvest, 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.

Maintenance breeding and quality seed production of bottle gourd (BARI Lau-6)

L. Akter, A. K. M. Quamruzzaman and R. Islam

Bottle gourd is a widely consumed vegetable in Bangladesh. BARI Lau-6, a released variety by BARI, has gained popularity due to its high yield, quality, and consumer preference. To ensure the continuous supply of genetically pure and high-quality seeds, maintenance breeding and systematic seed production protocols are essential. This study, conducted at the Olericulture Division, HRC, BARI, Gazipur, outline a comprehensive approach for maintaining varietal purity and producing quality seeds of BARI Lau-6. Results showed successful maintenance of genetic purity with a high germination rate (98.2%) and a total seed production of 48 kg in 20 decimal area. The findings validate the effectiveness of the adopted breeding and seed production strategies for sustaining the quality and yield potential of BARI Lau-6.

Inbred development of pumpkin (S_6- S_7)

B. Ahmed and A. K. M. Qumruzzaman

Five pumpkin lines (CM01-1-2-3-5-6, CM01-1-2-(A)-3-6, BD10063-1-1-7-1, 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 2024 - 25 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 3.95 to 4.40 cm, 4.30 to 10.25 kg, 2.10 to 3.80, 14.50 to 22.50 kg and 27.55 to 42.75 ton, respectively. The TSS ranged from 10.7 to 11.5%. 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 S_7 progenies of pumpkin lines were stored for advancing S_8 progenies in the next year.

Regional yield trial of pumpkin hybrids

A. J. M. Obaidullah

The experiment was conducted at Regional Agricultural Research Station, Ishwardi, Pabna during *rabi* season of 2024-25 to observe yield and quality of the promising hybrids of pumpkin. Two hybrids of pumpkin namely B x D and B x E with check variety namely Sweety (LalTeer) were evaluated in the study. The experiment was laid out in RCB design with three replications. No significant differences were observed among the lines in most of the parameters. However, the highest marketable yield (19.42 t/ha) was recorded from Sweety and the lowest (14.58 t/ha) was recorded from B x E. The minimum fruit fly infestation (18.32%) was occurred in B x E and maximum (35.63%) in B x D.

Maintenance and quality seed production of BARI Hybrid Mistikumra-2

B. Ahmed and A. K. M. Qumruzzaman

A study was carried out at the experimental field of Olericulture Division, HRC, BARI during the winter season of 2024-25 to maintain the genetic purity of BARI developed one pumpkin hybrids (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.

Advanced yield trial of snake gourd lines

M. R. Islam and A. K. M. Qumruzzaman

This study evaluated five snake gourd genotypes at Olericulture Division, HRC, BARI, Gazipur, during the 2024-2025 *Kharif* season to identify high-yielding lines. The experiment followed a randomized complete block design with three replications, standard agronomic practices, and comprehensive trait assessments. The line TC 46 emerged as the superior genotype, exhibiting the earliest flowering (65.67 days), first harvest (76.67 days), highest fruit yield (8.86 kg/plant; 26.60 t/ha), maximum fruits per plant (32.33), and widest fruit diameter (4.47 cm). The line TC 01 produced the longest (50.00 cm) and heaviest fruits (315.33 g) but had moderate yield (22.38 t/ha) and the shortest harvest duration (58.67 days). The line BARI CHICHINGA-1 showed the earliest flowering initiation (64.33 days) and longest harvest duration (72.67 days) but low yielded (15.96 t/ha) with the narrowest fruits (3.90 cm). The line TC 58 recorded the lowest yield (3.95 kg/plant; 11.86 t/ha) and fewest fruits (20.33). The results demonstrate TC 46 has optimal balance of early maturity, high productivity and robust fruit traits, recommend it for breeding programs and further evaluation.

Regional yield trial of snake gourd hybrids

B. Ahmed and A. K. M. Quamruzzaman

A study on the performance of four snake gourd hybrids along with check (padma) was conducted at the experimental field of Olericulture Division, HRC, BARI Gazipur along with different RARS of Bangladesh during the *kharif* season of 2024 to develop high yielding hybrid snake gourd varieties. The hybrid 2 required minimum days for 1st female flower open (45.00 days) and the hybrid 5 showed the maximum fruit length (54.64cm) and the hybrid 2 showed the maximum fruit breadth (3.75cm). The hybrid 3 showed the highest average fruit weight (250.54 gm). The number of total fruits per plant was highest in hybrid 3 (83.80) and the lowest was in hybrid 2 (60.30). The highest yield per plant was observed from the hybrid 3 (21.11kg) and lowest yield per plant was observed from the check variety (12.85 kg). The downy mildew infection was less (2%) in hybrid 3 but it is more in other tested hybrids (5- 8 %). Fruit fly infestation was low due to the use of pheromone trap and

bit trap jointly. Considering the yield and yield contributing characters, the snake gourd hybrid 2 were found promising and may be released as a new snake gourd hybrid variety.

Maintenance and quality seed production of BARI Hybrid Dhundul-1

B. Ahmedand and A. K. M. Qumruzzaman

A study was carried out at the experimental field of Olericulture Division, HRC, BARI during the *kharif* season of 2024 to maintain the genetic purity of BARI developed onesponge gourd hybrids (BARI Hybrid Dhundol-1). 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.

Evaluation of local pointed gourd germplasm

M. M. Ahmed, M. N. Farid and M. K. 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.The result raveled that TD(R)-Bur-02 responded in better performance in respect of number of fruits/plant (78), weight of fruit (62.3 gm), fruit length (21.2 cm) and fruit yield (6.6 kg/plot) followed by TD(R)-Bur-01 with number of fruits/plant (75), weight of fruit (58.4 gm), fruit length (20.3 cm)band fruit yield (8.2 kg/plot). The lowest data were collected from TD(M)-Bur-04 in respect of number of fruits/plant ((38), weight of fruit (34 gm), fruit length (13.7 cm) and fruit yield (3.3 kg/plot).

Maintenance of BARI released OP and hybrid varieties of bitter gourd

M. R. Islam, M. M. R. Salim and A. K. M. Qumruzzaman

Breeder seed production was done in Olericulture Division, HRC, RARI, Gazipur in the 2024-25 season evaluated seed yield and genetic purity of two hybrids (BARI Hybrid Karola-2 and 3) and one open-pollinated variety (BARI Karola-2) of bitter gourd in Bangladesh. Seedlings were transplanted into 18 m × 1.2 m beds (18 plants per bed) under designated layouts: BARI Hybrid Karola-2 contains (12 female + 6 male beds), Karola-3 hybrid (8 female + 6 male beds), and Karola-2 OP (20 beds). Balanced fertilization and split nutrient applications were applied. Rigorous rouging at vegetative, flowering, and fruiting stages, together with field isolation and hand pollination at anthesis, maintained varietal integrity. The Karola-2 hybrid female line (20 beds, 360 plants) yielded 1.3 kg seed (65 g/bed; 3.6 g/plant), Karola-3 (14 beds, 252 plants) yielded 1.3 kg (93 g/bed; 5.2 g/plant), and open-pollinated Karola-2 (20 beds) produced 2.3 kg (115 g/bed; 6.4 g/plant). Yield differences reflect genetic background and pollination mode. These protocols support sustainable production of high-quality breeder seed in this cross-pollinated crop.

Evaluation of watermelon germplasm

L. Akter, A. K. M. Quamruzzaman, M. R. Islam and S. Akter

A study conducted at BARI during the summer season of 2024 to evaluate 10 watermelon germplasms/varieties for high-yielding, quality traits. Significant variations were observed in yield and horticultural characteristics. CL 009D (18.49 kg/plant), CL 009B (18.36 kg/plant), and CL 009C (18.10 kg/plant) outperformed checks, with CL 009B showing highest sweetness (13.6% TSS) and CL 009D having compact vines (4.0 m). BARI Tarmuj-1 had exceptional flesh thickness (31.0 cm). Fruit traits varied: weight (4.0–7.1 kg), length (25.5–45.8 cm), and yield (31.38–49.97 t/ha). Disease resistance was strong, with 0–20% fusarium wilt and 0–10% mite infestation. Biplot analysis highlighted CL 009B and CL 009D for yield and quality, while CL 009C and BARI Tarmuj-2 were wilt-resistant. Four lines (CL 005A, CL 009B, CL 009C, CL 009D) combined high yield, fruit size, sweetness, and disease resistance, making them ideal for advanced trials and breeding programs in Bangladesh.

Advanced yield trial of OP watermelon

L. Akter, A. K. M. Quamruzzaman, M. R. Islam and S. Akter

The study was conducted at the research field of Olericulture Division, Horticulture Research Center (HRC), BARI, Gazipur during the 2024 growing season. Four advanced watermelon lines (CL 05A, CL 006, CL 009A, and CL 009D) were evaluated alongside the check variety BARI Tarmuj-1. CL 009A yielded highest (27.97 kg/plant; 55.93 t/ha), while BARI Tarmuj-1 had superior fruit quality (31.0 cm flesh, 33.0 cm diameter). CL 005A showed peak sweetness (12.4% TSS), with BARI Tarmuj-1 close behind (12.9%). CL 009D was fully resistant to fusarium wilt and mites but had the thinnest rind (0.90 cm). Key findings highlight: CL 009A for yield, BARI Tarmuj-1 for quality, and CL 009D for disease resistance. These results guide targeted breeding—crossing high-yield (CL 009A), disease-resistant (CL 009D), and quality-enhanced (BARI Tarmuj-1) lines could develop superior cultivars. The study supports breeding adapted varieties for Bangladesh that balance productivity, quality, and stress tolerance to meet farmer and market needs.

Inbred development of watermelon [S_4-S_5]

A. K. M. 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, HRC, BARI, Gazipur during the summer season of 2024. 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.

Diallel crossing of watermelon inbreds

A. K. M. Quamruzzaman, L. Akter, M. R. Islam and S. Akter

The study was conducted at the research field of Olericulture Division, Horticulture Research Center (HRC), BARI, Gazipur during the 2024 growing season. Five advanced watermelon lines (CL 001, CL 005A, CL 006, CL 009A, and CL 009D) were used in a half-diallel crossing scheme. This study evaluated ten watermelon hybrid combinations, showing high crossing success (81.82-100%) and germination rates (79-94%). $P_1 \times P_5$ and $P_2 \times P_5$ achieved 100% crossing success, while P1×P3 showed optimal germination (94%), indicating excellent parental compatibility. Results demonstrate potential for developing superior F1 hybrids with improved yield and stress tolerance. $P_2 \times P_5$'s lower germination (79%) requires further study. The findings provide valuable insights for breeding programs to enhance hybrid seed production. Future field trials should validate these hybrids' performance to strengthen commercial watermelon production strategies.

Regional yield trial watermelon OP

L. Akter, A. K. M. Quamruzzaman, M. R. Islam and S. Akter

The study was conducted at BARI's HRC, Gazipur and RHRS, Patuakhali during 2024, evaluating four advanced watermelon lines (CL04A, CL005, CL008, CL021) alongside BARI Tarmuj-1 to identify superior genotypes for farmers cultivation. Significant variations were observed in yield components and fruit quality traits. Significant variations were observed in yield components and morphological characteristics. CL04A emerged as the highest yielder (20.01 kg/plant; 52.21 t/ha), while CL021 showed superior fruit quality with largest dimensions (39.9×27.7 cm), thickest flesh (25.7 cm), and highest TSS (12.5%). CL005 and CL008 demonstrated balanced productivity (5.8 and 5.6 fruits/plant respectively). Distinct fruit traits

were noted: CL04A/CL08 had light green rinds; CL05/CL21/BARI Tarmuj-1 showed deep green (striped in CL05); and flesh colors ranged from deep red (CL04A, high lycopene) to yellow (CL08, rich in beta-carotene). BARI Tarmuj-1 exhibited vigorous vines (5.4 m) but lowest yield (15.93 kg/plant). The findings identify CL04A as ideal for commercial production, CL021 for premium markets, and CL005/CL008 for stable yields, providing valuable genetic resources for breeding programs targeting improved watermelon varieties.

Maintenance and quality seed production of watermelon

L. Akter, A. K. M. Quamruzzaman and S. Akter

This study successfully demonstrated the effectiveness of rigorous maintenance breeding protocols for watermelon breeder seed production at HRC, BARI Gazipur and RHRS, Patuakhali during the 2024-25 season. Through strict isolation (1000m), controlled pollination, and systematic roguing, genetic purity exceeding 98% was maintained for both BARI Tarmuj-1 and Tarmuj-2 varieties. The produced seeds consistently met superior quality standards, with germination rates of 95-97%, physical purity >99%, and minimal pathogen contamination (<0.5%). Location-specific yield analysis revealed Patuakhali's superior performance for Tarmuj-1 (40% higher than Gazipur), indicating its better agro-climatic suitability. The combined seed production of 6.0kg (3.6kg Tarmuj-1 and 2.4kg Tarmuj-2) from both locations, coupled with the initiation of a second production cycle with 30% expanded acreage, establishes a sustainable framework for quality seed multiplication. These findings provide valuable insights for optimizing watermelon seed production systems in Bangladesh while maintaining genetic integrity and quality standards.

Advanced yield trial of netted melon

M. R. Islam and A. K. M. Qumruzzaman

This study evaluated nine advanced netted melon (*Cucumis melo* var. *reticulatus*) lines in Gazipur, Bangladesh, during the 2024-2025 *rabi* season using a randomized complete block design. CM-07 achieved the highest yield (12.44 t/ha and 1.87 kg/plant) due to maximal fruit count (4.67/plant), though with moderate fruit weight (400 g) and sweetness (7% TSS). CM-04 ranked second (11.01 t/ha) and produced the heaviest fruits (550 g), matching CM-01, which also exhibited superior fruit diameter 10.33 cm and flesh thickness 2.75 cm. CM-06 showed peak sweetness (12.33% TSS) but moderate yield (9.78 t/ha). Significant trade-offs were observed: high-yield/large-fruit lines (CM-07, CM-04 and CM-01) had reduced TSS (5.33–8%), while the sweetest genotype (CM-06) moderate yield. These results identify CM-07 and CM-04 for yield focused cultivation and CM-01 and CM-06 for trait-specific breeding, addressing Bangladesh's agro-climatic challenges.

Legumes

Advanced yield trial of French bean lines

N. U. Ahmed, M. M. Hasan and M. Z. Rahman

An experiment for evaluation yield trial on French bean lines was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25 to find out the suitable flat French bean lines in order to release as a variety. BARI Jharsheem-2 was used as a check variety. Among the two lines and control BARI Jharsheem-2, PV Rai-097 was found superior in terms of pod number (18.35), pod size (20.85 × 1.78 × 0.75 cm), individual pod weight (21.78 g), green seed yield 7.09 t/ha and green pod yield (31.53 t/ha) compared to control.

Regional yield trial of French bean

M. R. Islam and A. K. M. Qumruzzaman

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 advanced line of French bean. 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 and BARI Jharsheem-2 produced 13.9 t/ha and 8.2 t/ha respectively. The bean mosaic virus was minimum in JSRVU-002 (9.5%) while JSRVU-003 (13.3%).

Regional yield trial of hyacinth bean

M. R. Islam and A. K. M. Qumruzzaman

Regional yield trial of twelve hyacinth bean lines was conducted at the Olericulture Division, HRC, BARI, Gazipur during winter season of 2024-25 to find out superior lines. The experiment followed a Randomized Complete Block Design with three replications, using standard agronomic practices. Data on phenology, yield, pod characteristics, and pest/disease incidence were recorded and analyzed. Significant differences were observed among genotypes. DL Gaz-024 emerged as the highest yielder (7.83 kg/plant; 32.65 t/ha), exhibiting early flowering (47 days) and high pod count (706/plant), no mosaic virus and had moderate borer infestation (8.00%). LP Jam 008 combined high yield (6.88 kg/plant; 28.69 t/ha), very early maturity (flowering: 41 days; first harvest: 52 days), long pods (13.43 cm), and absence of mosaic virus, despite moderate borer infestation (6.33%). DL Gaz-032 produced the longest (13.67 cm) and widest (3.70 cm) pods with low borer infestation (4.66%) and no mosaic virus, but yielded moderately (5.26 kg/plant). Conversely, LP Pah-005 and LP Pah-006 were the lowest yielders and some lines (LP Pah-025, LP Pah-006) suffered high borer infestation and mosaic virus. DL Gaz-024 was the highest yielder and LP Jam 008 demonstrated the most promising combination of desirable traits for potential varietal release.

Regional yield trial of bold seeded hyacinth bean

M. R. Islam and A. K. M. Qumruzzaman

The experiment was conducted at the research farm of Olericulture Division, HRC, BARI, Gazipur during the *rabi* season of 2024-2025. The evaluation of three new bold-seeded hyacinth bean lines (LP Pah-13,15,19) against BARI Sheem-10. BARI Sheem-10 showed superior pod yield such as highest pods/plant (363.7), pod yield/plant (5 kg), and pod yield/ha (20.9 tons). It also led in seeds/plant (2,037.3) and seed yield/ha (11.17 tons). LP Pah-13 produced the highest 1000 seeds weight (1.65 kg), while LP Pah-15 had the largest seed diameter (1.42 cm). LP Pah-19 flowered earliest (50.7 days). Future work should assess nutritional profiles and stress resilience.

Hybridization (confirmation of F_4) of hyacinth bean

A. Akter, M. A. Goffar, M. J. Rahman, H. Rahman and R. Sultana

A hybridization program was conducted at the HRC field, Regional Agricultural Research Station, Jamalpur during 2024-2025 to observe the performance of yield and yield contributing characters of F_4 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 (654) was observed from BARI Sheem-6 x BARI Sheem-7(2) and minimum (248) from BARI Sheem-6 x BARI Sheem-1(1). BARI Sheem-6 x BARI Sheem-7(2) gained maximum individual pod weight (17.4 g), whereas; minimum (9 g) observed in BARI Sheem-6 x BARI Sheem-1(1). Maximum pod yield (11 Kg/plant, 45.52 kg/plot and 47.91 t/ha) gained from BARI Sheem-6 x BARI Sheem-7(2) and minimum pod yield (2 Kg/plant, 8.93 kg/plot and 9.40 t/ha)) obtained from BARI Sheem-6 x BARI Sheem-1 (1).

Maintenance of BARI released open pollinated varieties of hyacinth bean

M. R. Islam, M. M. R. Salim and A. K. M. Qumruzzaman

The breeder seed production trial was conducted during summer 2024–25 at the Olericulture Division, HRC, BARI, Gazipur, using three BARI-developed varieties: BARI Sheem-1, BARI Sheem-6, and BARI Sheem-7. Each variety was cultivated on an equal plot size of 276 m² following standard agronomic practices, including fertilization, staking, rouging, and hand pollination to ensure varietal purity. The results showed variation in seed yield among the varieties. BARI Sheem-1 recorded the highest yield (61.0 kg), followed by BARI Sheem-7 (40.0 kg) and BARI Sheem-6 (37.0 kg). The superior performance of BARI Sheem-1 indicates its potential as a leading variety for large-scale breeder seed production, while BARI Sheem-6 and Sheem-7 remain important for maintaining varietal diversity and meeting consumer preferences.

Okra

Evaluation of F_4 progeny rows of okra for yield and resistance to yellow vein mosaic virus

S. Sultana and M. S. Ali

An experiment was conducted to evaluate F_4 progeny rows of okra along with the check variety BD Dherosh-2 for yield and resistance to yellow vein mosaic virus (YVMV). Considerable variability was observed among progeny families for plant height, fruit number per plant, individual fruit weight, and yield. Plant height ranged from 80.6 to 183.8 cm, fruit number from 11to 17, and individual fruit weight from 11.33 to 14.69 g. Yield per hectare varied from 6.18 to 11.36 t/ha, while YVMV incidence ranged from 0 to 38.9%. Notably, progeny families ok-2.1.1.44, ok-1.1.1.23, and ok-1.1.1.11 outperformed the check, yielding 10.7–11.4 t/ha with no YVMV incidence. Within these families, elite plants with complete resistance were identified and selfed for advancement to the F_5 generation. The results highlight promising progeny families as sources of high yield and YVMV resistance for okra breeding programs.

Amaranth

Regional yield trial of stem amaranth lines

A. Akter, M. A. Goffar, M. J. Rahman, H. Rahman and R. Sultana

A study was undertaken to evaluate stem amaranth (*Amaranthus tricolor*) lines in respect of yield and quality at HRC field, RARS, Jamalpur during the summer season of 2025 with a view to release a new stem amaranth variety. Six stem amaranth lines viz. AM Jam-008, AM Jam-011, AM Jam-018, AM Joy-018, AM Joy-024, AM Joy-030 and BARI Data-1 as check were evaluated to investigate the yield and yield contributing characters. Days to first flowering (50 days) in the line AM Jam-008 (late) and (46 days) in the lines AM Joy-018 (early). The maximum individual stem weight (323 g) was noted in line AM Jam-011 and the minimum (153 g) in the line AM Joy-030. The highest yield per hectare (38.69 t) was produced by the line AM Jam-011 and the second highest yield per hectare (35.82 t) was produced by the line AM Jam-008 as against the least yield per hectare (18.37 t) was produced by the line AM Joy-030, respectively.

Soilless Culture

Development of coco-coir based soilless culture systems (SCS) for growing fruit vegetables

M. H. Islam, B. Ahmed, M. M. R. Salim and S. Akter

Soilless culture systems (SCS) are a promising approach for producing high-value vegetables where soil-related constraints limit productivity. This study aimed to develop a simplified coco-coir–based hydroponic system for winter-season production of sweet pepper (*Capsicum annuum* L.) var. BARI Mistimorich-2 and tomato (*Solanum lycopersicum* L.) var. BARI Tomato-21. Two nutrient treatments were compared: T_1 (standard Enshi-shoo solution) and T_2 (50% strength of a newly formulated commercial-grade hydroponic nutrient solution). Plants were grown in coco dust substrates under drip irrigation, arranged in a completely randomized design with six replications. Sweet pepper grown with T_1 produced higher fruit number (8.83/plant), fruit weight (148.08 g), and yield (1.31 kg/plant) compared to T_2 (7.83 fruits/plant, 139.58 g, 1.09 kg/plant). In tomato, T_1 yielded slightly more (1.62 kg/plant) than T_2 (1.54 kg/plant). The results suggest that a coco-coir–based SCS with a balanced nutrient solution is effective for winter-season production of fruit vegetables in resource-limited regions.

Development and standardization of hydroponic nutrient solution based on commercial grade chemical fertilizers available in Bangladesh

M. H. Islam, B. Ahmed, M. M. R. Salim and S. Akter

Hydroponic vegetable production offers an efficient and sustainable method for cultivating high-value crops, especially in land-scarce countries like Bangladesh. However, widespread adoption is often hindered by the high cost and limited availability of imported, analytical-grade nutrient solutions. This study was conducted to develop and standardize a hydroponic nutrient solution using locally available commercial-grade fertilizers and evaluate its effectiveness in growing high value vegetables such as sweet pepper (BARI Mistimorich-1) and tomato (BARI Tomato-19). Four treatments were tested: T_1 (Enshi shoo standard solution), T_2 (40% strength), T_3 (50% strength) and T_4 (60% strength) of a commercial-grade formulation. Key growth and yield parameters were measured. Results indicated that the 50% strength solution (T_3) performed

comparably to the standard solution in both crops, producing optimal yield and plant vigor. These findings suggest that the T_3 formulation is a cost-effective and locally applicable alternative to imported hydroponic nutrient solutions, promoting accessible and sustainable vegetable production.

Development of a nutrient film technique (NFT) system for growing leafy vegetables using simplified hydroponic approaches

M. H. Islam, B. Ahmed, M. M. R. Salim and S. Akter

Hydroponic systems offer sustainable alternatives to conventional soil-based agriculture, particularly in areas facing space and resource limitations. This study was conducted to develop a simplified nutrient film technique (NFT) hydroponic system using locally available materials for winter cultivation of leafy vegetables. BARI Lettuce-1 was selected as the test crop and evaluated under four nutrient regimes: T_1 (standard Enshi Shoo solution), T2 (60% formulation), T_3 (50%), and T_4 (40%), all prepared using locally sourced commercial-grade fertilizers. The experiment followed RCBD with four replications. Morphological parameters including plant height, leaf number, leaf dimensions, root length, and fresh weight were recorded after 4–8 weeks of growth. Results revealed that the full-strength nutrient solution (T_1) significantly improved plant vigor and yield (10.67 kg/3m²), followed by the 50% solution (T_3) which also demonstrated substantial growth potential. Treatments T_2 and T_4 exhibited stunted growth and lower biomass accumulation, indicating the critical role of adequate nutrient availability. This research highlights the feasibility of adopting low-cost NFT systems for efficient leafy vegetable production in peri-urban and resource-constrained environments.

Validation of hydroponic system models at Jashore and Rangpur

M. H. Islam, B. Ahmed, M. M. R. Salim and S. Akter

The validation of simplified hydroponic system models was carried out at the Regional Agricultural Research Station (RARS), Jashore and at Rangpur during 2024–25 in semi-controlled net house conditions. Three hydroponic culture techniques, namely soilless culture system (SCS), nutrient film technique (NFT), and deep water culture system (DWC) were evaluated for their suitability in producing both fruiting and leafy vegetables. At Jashore, tomato, cherry tomato and capsicum were cultivated under SCS, while lettuce and water spinach were grown under DWC, and spinach and lettuce were tested in NFT. At Rangpur, cucumber and tomato were tested in SCS, while leafy vegetables including BARI Palongshak-2 and BARI Lalshak-1 were evaluated in DWC and NFT systems. The systems were developed with locally available materials and supplied with standard hydroponic nutrient solutions. Results showed that SCS performed well for fruit-bearing crops, producing higher yields in tomato, cherry tomato, capsicum, and cucumber across locations. Leafy vegetables exhibited good adaptability in both NFT and DWC systems, with lettuce, spinach, palong shak and lal shak producing marketable yields within short crop cycles. The study highlights the potential of simplified hydroponic models in different agro-ecological zones of Bangladesh, demonstrating their effectiveness for safe and high-value vegetable production under protected cultivation.

Good Agricultural Practices (GAP)

Good agricultural practices (GAP) validation trial of eggplant

A. K. M. Quamruzzaman, M. Rabiul Islam, L. Akter, S. Akter

To validate Good Agricultural Practices (GAP), a field trial of eggplant (variety: Caity, Ispahani Seed Company) was conducted during summer 2024 at a farmer's field in Shibpur, Narsingdi, Bangladesh. The aim was to produce safe, high-quality eggplant by following the Bangladesh GAP protocol, officially adopted in 2023. Eggplant was planted on 13 March 2024 on 37 decimals of land owned by Md. Belayet Hossain. All cultivation practices strictly followed GAP guidelines. Harvesting spanned from 08 May to 26 July 2024, across 22 harvests. Yields per harvest ranged from 69.69 kg to 206.19 kg per plot, equivalent to 465.23–1,376.46 kg/ha. The total yield was 3.045 MT, with an estimated 20.331 MT/ha. These results highlight the potential of GAP in achieving superior yields. Economic analysis revealed a Benefit-Cost Ratio (BCR) of 1.31, confirming profitable production under GAP, with implications for both domestic consumption and export markets.

Good agricultural practices (GAP) validation trial of bottle gourd

M. R. Islam, L. Akter and A. K. M. Quamruzzama

A GAP validation trial for bottle gourd (BARI Lau-4) was conducted in Basna, Dhamrai during summer 2024 to assess its impact on yield and quality. Key practices included balanced fertilization, efficient irrigation, and disease control. Despite drought and pest challenges, the trial achieved 35 MT/ha yield well above the national average and a benefit-cost ratio of 1.93. Farmer training improved productivity and profitability. GAP-grown gourds met export standards, highlighting strong market potential. Future focus: drought resilience, farmer engagement, and support from DAM and Hortex for better market access.

Good agricultural practices (GAP) validation trial of pointed gourd

B. Ahmed

A trial was conducted at Borohybotpur village under Jashore district. Three progressive farmers who are trained earlier were involved in this activity with 85 decimal (0.34 hectare) of land. The initial soil and water samples were collected and analyzed in a certified laboratory. All the activities were done following the Bangladesh GAP protocol for pointed gourd and all the necessary information were recorded in a register book with the help of Sub-Assistant Agricultural Officer (SAAO), DAE. From 0.34 hectare of land 3.9MT pointed gourd fruit yield was obtained. The average individual fruit weight was 60g. This translated to fruit yield of 11.47MT/ha, which is significantly higher than the national average yield of 1.21 MT/ha. The total production cost was 150000 Taka, while the market price per kg pointed gourd was 60 Taka, generating total revenue of 234000 Taka. The Benefit-Cost Ratio (BCR) was calculated to be 1.56. Farmers expressed their satisfaction with the results.

Good agricultural practices (GAP) validation trial of yardlong bean

M. A. Goffar and B. Ahmed

A Good Agriculture Practices (GAP) validation trial on yard long bean was conducted in the farmer's field at Borkoit village of Chandina upizilla, Cumilla district during January to June 2024 aiming to validate and popularize GAP among the farmers and for producing quality and safe yard long bean. There were three farmers (Md. Rafiquil Islam, Md. Mobarok Hossain and Mahin Ahmed) involved in these activities with 70 decimal (0.28 hectare) of land. Full production cost was provided to purchase relevant inputs covering labour cost too. Prior to starting production activities, farmers were trained focusing Bangladesh GAP protocols. The soil and water were tested to assess soil nutrient status and detection of stress elements in irrigation water. Proper technical support was provided in every step of the production system following GAP protocols. Locally popular "Kagornatoky" variety of yard long bean was used in this trial. The yield performance of yard long bean under trial revealed that the obtained average yield (14.64 MT/ha) at farmers level was two times higher than that of national average yield (5.50 MT/ha) of the crop. The Benefit-Cost Ratio (BCR) was calculated to be 1.41. Farmers were satisfied enough performing GAP as they obtained higher yield with premium price due to the quality and safeness of the produces.

Technical report on good agricultural practices (GAP) validation: bitter gourd

M. M. R. Salim

A trial was conducted at Parertong, village Shreemangal upozilla, under Moulavibazar district. Three progressive farmers who are trained earlier were involved in this activity with 80 decimal (0.32hectare) of land. The initial soil and water samples were collected and analyzed in a certified laboratory. All the activities were done following the Bangladesh GAP protocol for bitter gourd and all the necessary information were recorded in a register book with the help of Sub-Assistant Agricultural Officer (SAAO), DAE. From 0.32 hectare of land 19.63 ton bitter gourd fruit yield was obtained. A total of bitter gourd production cost for 80 decimals land Tk): 221900/-, while the market price per kg bitter gourd was 50 Taka, generating total revenue of 316700/- Taka. The Benefit-Cost Ratio (BCR) was calculated to be 1.43. Farmers expressed their satisfaction with the results.

Research Carried out by different Sections of HRC

Plant Physiology Section

Enhancing seed yield and quality of sweet pepper by application of plant growth regulators

R. Khatoon, L. Akter, M. Moniruzzaman A. Q. M. Quamruzzaman and M. F. Ahmed

An experiment was conducted at the Plant Physiology Section research field of the Horticulture Research Centre, BARI, Joydebpur, Gazipur during 2024-25 to enhance seed yield of sweet pepper by application of growth regulators. Two growth regulators *viz*. NAA and GA_3 were applied as foliar spray in two sweet pepper (*Capsicum annuum* L.) varieties to enhance seed yield and quality. The experiment was laid out in RCBD (factorial) with three replications. Ten treatment combinations comprising five growth regulators viz. GA_3 25 ppm, GA_3 50 ppm, NAA 25 ppm, NAA 50 ppm and untreated control and two mistimorich varieties *viz.* BARI Mistimorich-1, CA0043A which was proposed as BARI Mistimorich-3 were used for this experiment. Foliar sprays were done at 30, 60 and 90 days after transplanting, among plant growth regulators, maximum growth and maximum germination after harvest was found from 50 ppm GA_3. But spraying of 50 ppm NAA resulted in higher number of fruits per plant, fruit yield per plant and seed yield per plant. While the control recorded lowest values for the same parameters. The seed yield obtained from 50 ppm NAA was 17.49% and 29.87% higher over the control in BARI Mistimorich-1 and CA0043A, respectively. There was gradual decline in seed germination after 3 months of storage. The highest germination percentage (97.78%) was recorded in 50 ppm NAA whereas the lowest was observed in case of control treatment (71.11%) after 3 months of storage. Similar trend was observed for seed vigour indices. Thus, it may be concluded that foliar spray of 50 ppm NAA played an important role in improving the fruit yield, seed yield attributing parameters. Foliar spray of 50 ppm GA_3 and 50 ppm NAA at 30, 60 and 90 DAT can be considered as a suitable technique for improving seed yield and quality of sweet pepper, as well as reducing loss in qualitative seed character during seed storage.

Effect of humic acid on flower retention, pod setting and yield of summer country bean

R. Khatoon, M. Moniruzzaman and M. F. Ahmed

A field experiment was carried out at the research field of Plant Physiology Section, Horticulture Research Centre, BARI during summer season of 2024 to reduce flower drop for maximizing the yield of summer country bean (var. BARI Sheem-7). Two methods of humic acid (HA) application: foliar spray and soil application were included in the experiment to flower retention and find out optimum dose of humic acid for maximum pod yield. The treatment consisted of three levels of humic acid soil application *viz*. 5 kg/ha, 10 kg/ha and 15 kg/ha and two levels of foliar spray *viz*.1000 ppm and 1500 ppm humic acid. The experiment was conducted using randomized complete block design with 3 replications. Humic acid application significantly affected pod setting percentage, pods/plant and pod yield. Foliar application humic acid @ 1500 ppm resulted in higher pod setting (26.88%), number of pods/plant (4.83), pod yield/plant (1582.83g), however it was statistically similar to the treatments where HA was soil applied @ 10 and 15 kg/ha. It may be concluded that humic acid @ 1500 ppm and soil application @ 10 kg 15 kg/ha significantly enhanced pod set percentages, pod yield and yield components of summer country bean.

Effect of boron on flower retention and pod yield of summer country bean

R. Khatoon, M. Moniruzzaman and M. F. Ahmed

A field experiment was carried out at the research field of Plant Physiology Section, Horticulture Research Centre, BARI during summer season of 2024 to reduce flower drop for maximizing the pod yield of summer country bean (var. BARI Sheem-7). The soil test values (boron) showed that the experimental soil was below the critical level of boron (0.15 mg/kg). The treatment consisted of five levels of boron (0.1%, 0.2%, 0.3%, 0.4% and soil application @ 2 kg/ha) and untreated control. The experiment was laid out in randomized complete block design with 4 replications. The micronutrient boron in the form of boric acid was applied as foliar spray and as soil application to determine the optimum rate of boron for maximizing the yield of

BARI Sheem-7. Foliar application was done before flowering stage, at flowering stage and at fruit setting stage. The results indicated that application of boron had significant influence on the number of pods/plant, individual pod weight and pod yield per plant. The highest number of pods (302.00) was produced by 0.2% foliar spray of boron and the highest pod yield per plant (1512.54 g) was also found from the spray with 0.2% boron. In 2023-24 and 204-25 the average pod yield per plant (1520.18 g) was also found from 0.2% boron treatment. It can be concluded that foliar application of 0.2% boron significantly increased the total number of pods/ plant by decreasing the number of flower drop and recorded the highest pod yield of summer country bean.

Effect of salicylic acid on growth, yield and physiological attributes of tomato under salinity stress

R. Khatoon, M. Moniruzzaman and M. F. Ahmed

Salicylic acid (SA) usage is a relatively inexpensive and quick method for promoting growth and yield of crops under saline conditions. A pot experiment was conducted in open air at the research field of Plant Physiology Section, Horticulture Research Centre, BARI during *rabi* season of 2024-25. The experiment was carried out RCBD (factorial) design with three replications to evaluate the effect of salicylic acid (SA) on tomato (BARI Tomato- 21) growth under salt stress condition. The first factor was three levels of irrigation water salinity (0, 8 dS/m and 12 dS/m) and the second factor was salicylic acid (SA) concentration (0, 50 ppm and 100 ppm) which was foliar sprayed. There was highly significant reduction in plant height, SPAD value, plant dry weights, RWC% and yield per plant with increasing salinity. However, yield of plants treated with 50 ppm SA was significantly higher than the other concentrations. The results revealed that growth characters and yield attributes were decreased due to the harmful effect of salt stress. Spray of salicylic acid (SA) @ 50 ppm improved growth characters, RWC%, SPAD value, yield attributes and fruit yield under salt stress. The study revealed that 50 ppm SA spray could be successfully used to obtain better growth and yield in tomato under moderate salt stress.

Study of physiological disorder of BARI released tomato varieties

R. Khatoon, M. Moniruzzaman and M. F. Ahmed

Tomato is one of the most popular protective foodstuffs because of its high lycopene content and widely grown vegetables in the world. A field experiment was carried out at the research field of Plant Physiology Section, Horticulture Research Centre, BARI during winter season of 2025 to study the physiological disorder of BARI released tomato varieties. Eleven BARI released tomato varieties, namely BARI Tomato-2, BARI Tomato-3, BARI Tomato-11, BARI Tomato-14, BARI Tomato-15, BARI Tomato-16, BARI Tomato-17, BARI Tomato-18, BARI Tomato-19, BARI Tomato-20, BARI Tomato-21 were used for the study. Tomato plants are susceptible to various kinds of physiological problems, which can reduce fruit quality and productivity. The purpose of this study was to know about the non-parasitic disorders which affect the tomato crop and the remedies which should be followed to control them. The major physiological disorders which are affecting the crop are blotchy ripening, fruit cracking (radial and concentric cracking), sunscald, and cat facing etc. Maximum disorder (13.77%) was found from BARI Tomato- 17. In BARI Tomato-16 and BARI Tomato-20, no physiological disorder was found. Choosing tomato cultivars that are less susceptible to physiological problems can improve crop resilience. By addressing these issues, growers can improve overall crop health, resulting in higher-quality yields and lower economic losses.

Plant Pathology Section

Screening of eggplant germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M. S. Ali

Twenty one eggplant varieties/accessions were evaluated for resistance to *Ralstonia solanacearum* grown under artificial epiphytotic conditions during 2024-2025 cropping seasons. Among the accessions, one variety and three lines such as BARI Begun-8, 21X11, SM-217-A and SM-402 showed resistant reaction. Two lines such as 18X405 and SM-405 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

Fourteen tomato varieties/accessions were screened to find out bacterial wilt resistant source grown under artificial epiphytotic field conditions during 2024-2025 cropping seasons. Among the varieties/accessions, only one variety and one line of tomato such as BARI Tomato-11 and F_1-2001 showed resistant reaction against bacterial wilt. Two lines such as SLA-006 and 1008 were grades as moderately resistant. Rest of the accessions of tomato showed moderately susceptible to highly susceptible reaction to *R. solanacearum.*

Screening of eggplant germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M. S. Ali

Twenty eggplant germplasm viz. SM-276-, SM-18, SM-275, SM-470, SM-262, SM-23CB, SM-405, SM-402, SM-217 A, 21 x 11, 253-B x333, 275x220, BARI Hybrid Begun – 6, BARI Hybrid Begun – 7, 5 x 216, 20 x 5, 12 x 11, 18 x 405, 5 x 405 and 262 x 220 were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2024-2025 cropping season. Among them SM-275, 275x220 showed resistant, nine germplasm such as SM-276, SM-262, SM-23CB, SM-402, 253-B x333, BARI Hybrid Begun – 7, 20 x 5, 262 x 220 and18 x 405 showed moderately resistant, two germplasm such as SM-405, 5 x 405 showed moderately susceptible and seven germplasm such as SM-18, SM-470, SM-217 A, 21 x 11, BARI Hybrid Begun – 6, 5 x 216 and 12 x 11 showed susceptible to root knot nematode.

Screening of tomato germplasm against root-knot nematode

L. Yasmin, M. Afroz, M. M. Rahman and M. S. Ali

Fourteen tomato germplasm were tested in a nematode infested sick bed for their resistance to root-knot nematode during 2024-2025 cropping season. Among them, four germplasm (F_1-380,1F_1-3201, F_1-7515 and BARI Tomato-11) showed resistant, six germplasm (SL A- 015, SL A-15-1-B, 15-6, F_1-7417, SL A-15-6 and 1008) showed moderately resistant, four accessions (1409, 1717, AV-1711 and AVTO-1718) showed susceptible reaction to root knot nematode.

Screening of okra germplasm resistance to okra yellow vein mosaic virus

L. Yasmin, M. M. Rahman, M. Afroz, and M. S. Ali

Twenty one okra germplasm were evaluated for resistance to Okra yellow vein mosaic virus (OYVMV) grown under natural conditions during 2025 cropping season. Among them, five germplasm of okra such as BD-12108, BD-1892, BD-1210, BD-12119 and BD-12114 showed tolerant reaction. Eight germplasm of okra such as BD-8622, BD-8623, BD-12109, BD-12120, BD-12121, BD-12116, BD-12115 and BD-12113 susceptible reaction. Eight germplasm such as BD-1907, BD-1904, BD-1900, BD-1897, BD-12128, BD-12122 and BD-12112 and BARI Derosh -1 highly susceptible reaction to Okra yellow vein mosaic virus (OYVMV).

Screening of tomato germplasm for resistance to tomato leaf curl virus under field condition

M. M. Rahman, L. Yasmin, M. Afroz and M. S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2024-2025 cropping season with promising germplasm and variety of tomato to find out resistant sources against Tomato Leaf Curl Virus (TLCV) disease. A total of 18 tomato variety/ accessions were evaluated including susceptible check in two sowing time like 11th November and 9th December. Among the germplasm, only one germplasm was showed resistant and four germplasm were found moderately resistant to disease and rest of the moderately susceptible and highly susceptible to the disease on 11th November sowing time. However, 30 days after transplanting ten germplasm were showed resistant and rests of the germplasm were found moderately resistant to the disease. The highest yield was recorded in AVTO-1911 (30.5 ton/ha) and lowest yield was obtained in SLA-15-1 (17.5 ton/ha), respectively.

Screening of country bean germplasm for resistance to yellow mosaic disease under field condition

M. M. Rahman, L. Yasmin, M. Afroz and M. S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during winter 2024-

25 cropping season with germplasm and variety of country bean to find out resistant sources against country bean yellow mosaic virus 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, the rests of the germplam were found moderately susceptible to susceptible to the disease. LP Jam -004 germplasm produced the highest yield (16.8 ton/ha), with 33.337% disease incidence followed by LP Pah-025 (14.4 ton/ha) whereas the lowest yield was obtained from BD10516 (7.8 ton/ha) respectively. Yield of BARI Sheem-1 was 15.00 t/ha with disease incidence 33.33%.

Screening of cucumber germplasm for resistance to cucumber mosaic virus under field condition

M. M. Rahman, L. Yasmin, M. Afroz, B. Ahmed and M. S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during summer 2024-2025 cropping season with promising germplasm of cucumber to find out resistant sources against cucumber mosaic virus (CMV) disease. A total of 14 cucumber germplasm were evaluated including two susceptible check (MynamatiF1 & AlviF1). Among the germplasm, three germplasm including one commercial variety were showed highly resistant and the rest of the germplasm were found moderate susceptible to susceptible to the disease. The highest yield was recorded in CS-79-3-2 (11.88 t/ha) followed by CS-008-12-3(10.68 ton/ha), CS-0017-10 (10.13 ton/ha), CS-0044-5-2 (10.12 ton/ha) and CS-05-9-6 (10.05 ton/ha)) with 66.67%, 25%, 25%, 0.00% and 100% disease incidence and the lowest yield was obtained in CS-0080-5 (5.7 t/ha) respectively with 0.00% disease incidence. Moreover, among the 14 screened germplasm, CS-18-3-1, CS-0044-5-2 and CS-008-12-3 displayed resistance to downy mildew and rest of the germplasm were showed moderate susceptible and susceptible to the disease. These germplasm can be more thoroughly used for resistant sources or hybrid development.

Evaluation of pumpkin genotypes to mosaic viral disaese under field condition

M. M. Rahman, L. Yasmin, M. Afroz and M. S. Ali

The experiment was conducted in Horticulture research field, BARI, Gazipur during 2024-25 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 four germplasm were found moderately resistant and rest of the germplasm were showed moderate susceptible and susceptible to the disease. The highest yield was recorded in BD-2157 (20.4 t/ha) followed by BD-00363 (20 t/ha), BD-232 (19.6 t/ha) and BD-279 (19.6 ton/ha) with 33.33% , 0.00%, 0.00% and 0.00% disease incidence whereas the lowest yield was obtained in BD-2214 (13.2 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, 2024-2025 cropping season in Panchagarh and Khagrachhari 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 40 wilt infected plant samples of eggplant were collected from Panchagarh district during July-June, 2024-2025. A total of 23 isolates *R. solanacearum* were isolated from eggplant. 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.

Survey on different diseases of watermelon

M. Afroz, L. Yasmin, M. M. Rahman and M. S. Ali

A comprehensive survey was conducted during May, 2025 cropping season in Gazipur district to record the incidence of different diseases of watermelon. Wilt incidence (%), stem end rot (%), powdery mildew (%) etc. were recorded at the time of survey.

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, 2024 to April, 2025 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 T_1= Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 2 t/ha (in pit) (ii), T_2=Stable Bleaching Powder @ 25 kg/ha + *Bacillus cereus* (Seed and root soaking), T_3= Burning of rice husk @ 2 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T_4= Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 2 t/ha (in pit) + *Bacillus cereus* (Seed and root soaking), T_5= Farmer's practice and T_6= Susceptible check (BARI Begun-5). Among the treatments, T_4 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, 2024 to April, 2025 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 $T_{1=}$ Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 5 t/ha (in pit) (ii), $T_{2=}$ Stable Bleaching Powder @ 25 kg/ha + *Bacillus subtilis* 38 (Seed and root soaking), $T_{3=}$ Burning of rice husk @ 5 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), $T_{4=}$ Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 5 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), $T_{5=}$ Farmer's practice and $T_{6=}$ Susceptible check (BARI Tomato-15). Among the treatments, T_4 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. M. Rahman, L. Yasmin, M. Afroz and M. S. Ali

This study was conducted to evaluate the efficacy of chemicals, botanicals and plant defense activators in managing Okra Yellow Vein Mosaic Virus (OYVMV) and Okra enation leaf curl disease (OELCuV), as well as their impact on crop yield. The experiment was conducted at Horticulture research field during 2024-25 growing season in summer. The experiment consisted of eight treatments such as: i) Basil leaves 5m/L, ii). Neem oil 5ml/L iii). Salicylic acid 0.1 mM, iv). Zinger 5ml/L, v) Turmeric 5ml/L vi). Aloe vera 5ml/L, vii) Imidacloprid 0.5ml/L viii) Untreated control. Through, no statistically significant differences were found in disease incidence or yield across treatments, certain botanicals demonstrated promising effects. Aloe vera treatment showed OYVMV disease incidence to 39.34% at 60 days after transplanting, compared to 44.21% in the control. Similarly, turmeric treatment was showed OELCuV incidence to 23.52% at 60 days after transplanting, relative to 48.38% in the control. The highest yield was obtained from ginger treatment (2.42 tons/ha) compare to control (1.86 tons/ha). These findings suggest that botanical extracts may offer potential for integrated disease management and yield enhancement in okra cultivation.

Soil and Water Management Section

Fertilizer management of cauliflower intercropping with garden pea system productivity, quality and nutrient uptake

M. A. Quddus, R. Ahmed, M. Ataur Rahman and Z.H. Fahad

Intercropping cauliflower (*Brassica oleracea* var. *botrytis* L.) with garden pea (*Pisum sativum* L.) is maximized system crop productivity, enhanced crop quality, and improved sustainable soil health. Consequently, a field experiment was executed during the 2024-2025 period at the research field of the Soil & Water Management Section, Horticulture Research Centre, BARI, Gazipur. The experiment utilized a Randomized Complete Block Design (RCBD) with three replications to evaluate eight distinct fertilizer and organic amendment treatments. The treatments were T_1: Control (No use of fertilizer), T_2: $N_{150}P_{40}K_{100}S_{10}Mg_{12}Zn_3B_2$ kg ha^{-1} for cauliflower, T_3: 3 t ha^{-1} vermicompost (VC)+100% of NPKSMgZnB, T_4: 5 t ha^{-1} CD +100% of NPKSMgZnB, T_5: 3 t ha^{-1} VC +125% of NPKSMgZnB, T_6: 5 t ha^{-1} CD +125% of NPKSMgZnB, T_7: 3 t ha^{-1} VC+150% of NPKSMgZnB and T_8: 5 t ha^{-1} CD +150% of NPKSMgZnB. Results indicated that treatment T_5 gave the highest cauliflower curd yield of 39.8 t ha^{-1}. The highest cauliflower equivalent yield (44.1 t ha^{-1}) was also achieved in T_5, which was attributed to better growth characteristics and heavier curds.

Furthermore, T_5 produced the highest vitamin C content (41.0 mg/100 g for Cauliflower and 40.5 mg/100g for garden pea). These findings suggest that a combination of 3 t ha^{-1} vermicompost and 125% of the recommended NPKSMgZnB fertilizer is an appropriate approach for successfully cultivating cauliflower intercropped with garden peas.

Foliar application of boron and boron nanoparticles on growth, yield, quality and nutrient use efficiency of cauliflower

M. A. Quddus, M. Ataur Rahman, R. Ahmed and M. S. Arfin

Cauliflower (*Brassica oleracea var. botrytis* L.*)* is responsive to boron fertilization. An experiment was conducted in winter season of 2023-24 and 2024-25 to evaluate the effect of boron and boron nanoparticles on growth, yield traits, yield and quality of cauliflower. The experiment was planned with 5 treatments 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 (50.2 t ha^{-1}) which was 88.7% higher than control. The treatment was responsible for higher individual curd weight (1761 g) and higher content of vitamin C (46.9 mg/100g). The same treatment achieved higher total B uptake (0.578 kg ha^{-1}) by cauliflower. The benefit cost ratio was maximum (6.69) in foliar application of 200 ppm boron nanoparticles. In contrast, the boron use efficiency was higher in foliar application of 100 ppm boron nanoparticles. Result suggests that foliar application of 200 ppm of B nanoparticles can be recommended for cauliflower cultivation.

Evaluation of yield potential of tomato genotypes under elevated fertilizer level

M. Ataur Rahman, M. A. Quddus and R. Ahmed

Tomatoes (*Solanum lycopersium* L.) are highly responsive to increased fertilizer application, leading to improved crop yield and quality. Hence, an experiment was conducted at the research field of Horticulture Research Centre (HRC), BARI during 2023-24 and 2024-25. Four levels of fertilizers viz. control, recommended dose of fertilizers ($N_{120}P_{30}K_{50}S_{20}$), 150% of recommended fertilizer, 150% of recommended fertilizer plus 10.0 t/ha cow-dung were applied in main plots and four tomato genotypes, namely BARI Tomato -14, BARI Hybrid Tomato -8, BARI Hybrid Tomato -10, and AvTo–1314 were planted in the subplots following a split plot design with three replications. The results indicated that yield response to applied fertilizer was varied among the genotypes. The genotype BARI Hybrid Tomato -8 was more responsive to fertilizer that gave maximum yield (78.5 t/ha) under 150% recommended fertilizer with 10 t/ha cow-dung. The advanced line AvTo-1314 gave significantly higher yield compare to control. Infestation of blight disease was more severe in AvTo - 1314 causing fewer yields compare to other genotypes. Based on the higher fruit yield and having maximum fruit number per cluster, the tomato variety BARI Hybrid Tomato-8 can be recommended as a promising variety under elevated fertilizer level.

Integrated nutrient management for gardenpea-bitter gourd-Indian spinach-red amaranth cropping pattern

M. A. Quddus, M. Ataur Rahman, R. Ahmed 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 amarangth cropping system and to determine the suitable combination of organic and inorganic fertilizers for sustaining crop productivity and soil fertility. The experimental seven treatments were T_1: Control (no use of fertilizer), T_2: 100% recommended dose of inorganic fertilizer (RDF), T_3: 25% vermicompost (VC) + 75% RDF based on IPNS, T_4: 25% VC+25%CD + 50% RDF based on IPNS, T_5: 25% PM+ 25% CD + 50% RDF based on IPNS, T_6: 25% VC+ 25% PM + 50% RDF based on IPNS and T_7: 25% CD+ 75% RDF based on IPNS following randomized complete block design (RCBD) with three replications. Results indicated that application of 25% vermicompost + 75% RDF on IPNS basis produced the highest garden pea equivalent yield (18.0 t ha^{-1}) which was 98.2% higher over control and vitamin C was also highest in T_3 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.

Foliar application of boron nanoparticles in improving yield, quality and nutrient uptake of summer tomato

M. A. Quddus, M. Ataur Rahman, R. Ahmed, M.R. Islam and Z. Hasan

Tomato (*Solanum lycopersicum* L.) is responsive to foliar application of boron nanoparticles when soil is deficit in boron nutrient. A field experiment was conducted in summer season of 2024 to evaluate the effect of boron nanoparticles on growth, yield traits, yields and quality of tomato. The study was scheduled with 5 treatment involving four levels of nano boron (0, 100, 200 and 300 ppm) including boric acid at 1 gL^{-1} following randomized complete block design with three replications. The result indicated that foliar application of 200 ppm nano B fertilizer produced the highest marketable fruit yield (41.8 t ha^{-1}) which was 58.3% higher than control treatment with higher individual fruit weight (53.6 g), maximum number of fruits per plant (44.3) and highest plant height (108 cm). The same treatment showed greater amount of TSS (4.22 ^{0}Brix) and maximum vitamin C (32.4 mg/100g) of tomato. The same T_2 treatment showed the highest benefit cost ratio (6.29). The result suggests that foliar application of 200 ppm nano B fertilizer can increase the fruit yield and quality improvement of summer tomato.

Post Harvest Technology Section

Determination of maturity indices and shelf life of sweet pepper var. BARI Mistimorich-2

Z. H. Fahad, M. A. Rahman and M. S. Arfin

Sweet pepper (*Capsicum annum* L.) has emerged as a high-value crop in Bangladesh due to rising culinary demand. BARI released two varieties, BARI Mistimorich-1 and BARI Mistimorich-2, which turn red and yellow during ripening, respectively. Optimizing postharvest storage and determining appropriate harvesting time are essential for maximizing shelf life and returns. This study was aimed to determine the optimal harvesting time for sweet pepper var. BARI Mistimorich-2 to maximize shelf life maintaining nutritional and marketable qualities. Six harvesting time based on days after anthesis (DAA) was employed, ranging from 45 to 60 DAA at three-day intervals. The experiment was laid out in a randomized complete block design (RCBD) with six treatments replicated thrice. Quality parameters including fruit weight, length, firmness, titratable acidity, ascorbic acid content, total soluble solids, and colour change were analyzed following standard methods. The average fruit weight and length increased with delayed harvest, while firmness decreased. Total soluble solids increased with ripening, and titratable acidity decreased as acid-to-sugar conversion approached maturity. Ascorbic acid content declined with delayed harvesting. Considering both pricing and storage life, fruits harvested at 51-54 DAA, when turned to yellow stage showed the shelf life about 13 days were deemed appropriate for the market.

Effect of harvesting time on the nutritional quality and shelf-life of sponge gourd

Z. H. Fahad, M. A. Rahman and M. S. Arfin

Sponge gourd (*Luffa cylindrica*) is a prevalent summer vegetable in Bangladesh, recognized for its nutritional value and numerous beneficial components. Although sponge gourds mature rapidly, optimizing maturity indices is essential to ensure both quality, postharvest management, storage and favourable market pricing. This experiment was conducted to investigate the effect of harvesting time on the nutritional quality and shelf-life of sponge gourd variety BARI Dhundol-1. A randomized complete block design was employed with six treatments based on days after anthesis (DAA), ranging from 07 to 12 DAA at one-day intervals. Physio-chemical properties including weight, length, firmness, titratable acidity, total soluble solids (TSS), and color change were determined following the standard methods weight and length increased steadily until 12 DAA, while TSS peaked at 11 DAA before declining. Firmness exhibited a two-phase pattern, and titratable acidity gradually decreased. Seed maturation and fiber formation were

closely linked, beginning at 11 DAA. The optimal harvest time for fresh vegetable consumption was identified as 8–10 DAA, when fruits reached their maximum size, high TSS, moderate firmness, and lacked fiber development. These findings provide a practical guide for determining harvest timing to balance market quality in sponge gourd cultivation.

Uniform and safe ripening of tomato using novel ethylene gas generator

M. A. Rahman and Z. H. Fahad

Tomato is a very important high-value commercial crop rich in different nutrients, which grown round the year in Bangladesh. Uneven ripening of tomato is a common problem in commercial marketing of this fruit. To address this problem, farmers and traders usually spray ethyphon solution on pre-matured tomatoes with unknown concentration for force ripening of fruits, which is not permitted due health hazard. This experiment was undertaken to find out a suitable doze of ethyphon to generate ethylene gas, and its effect on the ripening process of mature-green tomato var. BARI Tomato-18. To get ethylene gas, a novel ethylene gas generator (EG) was prepared with a small plastic jar containing 2 ml ethephon (48% SL ai) and 0.5g NaOH pellet. Matured-green tomatoes were harvested from the experimental field, brought to the laboratory and exposed to three different concentrations of ethyphon (2,4 and 6 mLm^{-3}) in ripening chambers for 24h at 18-20 °C and 70-75% RH. The experiment was laid out in a complete randomized design (CRD) with four treatments including controls replicated four. The EG was found highly effective in triggering the ripening process of tomato by day 4 of storage at 20±1°C and 65-70% RH. More than 90% of treated fruits were uniformly ripened on day 6, increased the number rapidly reaching 100% on day 7 of storage. In contrast, 60% tomato under control treatment found ripened on day 6, which increased up to 100% on day 8 of storage. All quality parameters including external colour, TSS, vitamin C contents of ripe tomato found better, and marketable to the local as well distant markets.



FRUIT CROPS

06

Project I: Varietal Development

Hybridization in jackfruit

M. A. Islam, M. Z. Rahman, M. J. Rahman and M. M. Khatun

Hybridization in jackfruit was carried out at the Fruit Research Farm of Horticulture Research Centre (HRC), BARI, Joydebpur, Gazipur to incorporate some important characters like colour, off-season and year-round with regular heavy bearing habit in the desired variety or cultivar. Cross combinations for hybridization were: BARI Kanthal-6×BARI Kanthal-3. Initial fruit set was found 4 in BARI Kanthal-6×BARI Kanthal-3 cross combination and finally 4 fruits were harvested and already seedlings were raised which would be planted in the main field.

Evaluation of local jackfruit germplasm in Chattogram region

S. R. Haque, H.Barua and M. Moniruzzaman

An experiment was conducted at Agricultural Research Station, Pahartali, Khulshi, Chattogram to evaluate 17 promising genotypes and to select desirable Jackfruit lines with higher yield and qualities. AH Pah 018 exhibited the highest yield (53.72 tha^{-1}) and number of fruits per plant (112). The heaviest fruits were produced by AH Pah 016 (8.72 kg) while the lightest was by AH Pah 006 (2.74 kg), bulb weight per fruit was also highest in AH Pah 016 (4.07 kg). The maximum number of bulbs per fruit was recorded in AH Pah 010 (217 bulbs). AH Pah 018 also showed the highest (53.72 tha^{-1}) yield. The highest TSS content was recorded in AH Pah 001 (27.48%). Flake texture was firm for AH Pah 001, AH Pah 002, AH Pah 007, AH Pah 008, AH Pah 015 and AH Pah 016. According to quantitative and qualitative traits the genotype AH Pah 001, AH Pah 002, AH Pah 004, AH Pah 006, AH Pah 015, AH Pah 016 and AH Pah 018 were found promising for further studies.

Hybridization in mango

M. S. Uddin and M. M. Rahman

Mango is an important commercial crop in Bangladesh. Good quality mangoes have huge demand in domestic and international market. To mitigate the growing demand of quality mangoes as well as to increase the number of export potential variety, a hybridization program was conducted following half-diallel fashion at the Fruit Research Farm, Horticulture Research Centre, BARI, Gazipur to develop superior hybrids with desirable characters. BARI Aam-4 × Ruby, BARI Aam-4 × Miyazaki, BARI Aam-4 × BARI Aam-3, BARI Aam-3 × Ruby, BARI Aam-3 × Miyazaki, BARI Aam-3 × Langra and BARI Aam-3 × Harivanga. A total of 788 flowers from 204 panicles were emasculated and 757 flowers pollinated. Fifteen hybrid fruits were obtained from five cross combinations. These fifteen hybrid fruits were harvested at mature stage and stones of the ripen fruits were sown in soil for germination in polybag under net house condition. Then will transfer to main field for evaluation.

Performance of mango hybrids at Joydebpur

M. S. Uddin and M. M. Rahman

An experiment was carried out at the fruit research farm, HRC, BARI, Gazipur to evaluate the performance of two promising mango hybrids for releasing as a variety. It was planted in the year 2018 and 2019 and the tree volume 33.63 m^3 and 13.14 m^3 were recorded in the hybrid MI JoyHy-001 and MI JoyHy-002 respectively. The average fruit weight of MI JoyHy-001 and MI JoyHy-002 were 265.0 g and 255.0 g; fruit yield (21.47 kg) and 13.52 kg; edible portion (79.24% and 80.0 %) and TSS (27.0 % and 26.5 %) were recorded respectively. There was no

disease and insect infestation. The shelf life was recorded 8-10 days for both hybrids.

Hybridization in mango

M. S. Islam, M. H. Waliullah and K. H. Alam

A total of 2033 flowers from 297 selected panicles from different cross combinations were emasculated where 1914 flowers were pollinated. Total 23 hybrid fruits were obtained from different cross combinations (six fruits from BARI Aam-4×King Chakapat, four fruits from Langra×Taiwane King and four fruits from BARI Aam-4× Taiwane king, four fruits from BARI Aam-4× Cartimon and five fruits from BARI Aam-3× Fazlee) and stones of the hybrids were planted in pot among them 17 stones were germinated, the hybrid lines will be transplanted in the field for characterization and evaluation.

Evaluation of mango germplasm collected through mango karmosuchi

M. S. Uddin and M. M. Rahman

An experiment was carried out at the fruit research farm, HRC, BARI, Gazipur to evaluate the performance of 24 mango germplasm collected from Mango Karmosuchi for releasing a variety. The plants were planted during the year 2019-2021. All the plants were in good vegetative stage and only six germplasm have borne fruits this year. The maximum TSS% (21) recorded from MI JoyMK-022 and the minimum (16%) from MI JoyMK-009. The highest yield (11.85 t/ha) recorded from MI JoyMK-005 and the lowest yield (2.0 t/ha) from MI JoyMK-009.

Evaluation of mango germplasm

M. H. Waliullah, M. S. Islam, 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. Thirteen mango germplasms namely MI Raj-004, MI Raj-005, MI Raj-006, MI Raj-008, MI Raj-010, MI Raj-011, MI Raj-012, MI Raj-015, MI Raj-018, MI Raj-020, MI Raj-021, MI Raj-022 and MI Raj-023 were identifiedin the previous year as good among them, earliest flowering and harvesting were observed in MI Raj-010 germplasm. The highest edible portion (79.4%) was achieved from MI Raj-015 while the lowest edible portion (59.6%) was achieved from MI Raj-006. Maximum total Soluble Solids (TSS) (232.3%) was observed in MI Raj-006 where minimum (16.5%) TSS was observed in MI Raj-018. The highest yield per tree (48 kg) was produced by MI Raj-004 but the lowest yield per tree (9 kg) was produced by MI Raj-021. MI Raj-015 might be considered as a promising line on the basis of fruit size, yield quality and harvesting time.

Inter-varietal hybridization of mango

A.S.M. Yousuf Ali, M. M. Rahman and M. M. Rahman

A hybridization programme was conducted at RHRS, Chapai Nawabganj. A total of 4027 flowers from 864 panicles were emasculated and pollinated. A total of eight hybrid fruits were collected this year. Among these, four hybrid fruits were obtained from the cross BARI Aam-2 × BARI Aam-4, two from the cross BARI Aam-3 × Langra and two from Fazli × BARI Aam-3. These mango hybrid fruits were harvested at mature stage and stones of the fruits sown in soil for germination in the hybrid seedling plot. After germination, one year hybrid seedlings will be transplanted in the main field after khasi and will be evaluated in the following seasons.

In-situ evaluation of late mango germplasm

A.S.M. Yousuf Ali, M. M. Rahman and M. M. Rahman

An experiment on *In-situ* evaluation of late mango germplasm was carried out at RHRS, Chapai Nawabgonj. The highest (110) number of fruits per plant were recorded from BARI Aam-12 and the minimum (73) from MI ChaL-02. The maximum average fruit weight (469g) was produced by MI ChaL-02 while the lowest (310g) was given by MI ChaL-01. The fruit yield varied from 31 to 41.91 kg/tree .The maximum fruit yield per tree (41.91kg/tree) was recorded from BARI Aam-12 & the minimum (31kg/tree) from MI ChaL-01. 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 (10 days) shelf life and the minimum (6 days) was recorded from BARI Aam-12. The maximum edible portion (81.36%) was found in BARI Aam-12 whereas minimum (76.45%) was obtained from MI ChaL-01.

Characterization and evaluation of collected exotic color mango germplasm

B. R. Barman, M. K. Kubra, M. Z. Masud, M. S. Hossain

The characterization and evaluation of exotic color mango (*Mangifera indica* L.) germplasm are essential for identifying superior genetic resources and ensuring their effective use in breeding and varietal development. In this study conducted at BSPC, BARI, collected exotic mango accessions were evaluated using the IPGRI (International Plant Genetic Resources Institute) descriptors for mango, covering both qualitative and quantitative traits of vegetative, morphology. floral, and fruit characteristics could not be evaluated as plants are in vegetative growth stage. Considerable variability was observed among the accessions in traits such as plant height, trunk circumference, crown diameter, shape, growth habit and leaf characteristics.

Inter-varietal hybridization of mango

M. A. Alam, M.R. Alam and S.M. M. Rahman

A hybridization programme on mango was undertaken at HRC, RARS, Jashore. A total of 425 flowers from 88 panicles were emasculated whereas 415 flowers were pollinated comprising two sets- set-I is for ripen 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.

Evaluation of mango genotypes at jamalpur region

H. Rahman, M. J. Rahman, A. Akter and R. Sultana

An experiment was conducted to identify suitable Mango genotypes (*Mangifera indica*) at HRC, Fruit Orchard, RARS, Jamalpur. The highest plant height was recorded from MI Jam-011 (5.06 m) and the lowest was in MI Jam-017 (2.90 m). The maximum base girth was obtained from MI Jam-001 (63.60 cm) and the minimum in MI Jam-036 (35.00 cm). The highest canopy spread was observed in MI Jam-002 (4.56 m x 4.53 m) and the lowest was in MI Jam-036 (2.90 m x 2.66 m). The maximum tree volume was obtained from MI Jam-002 (51.43 m^3) and the lowest was in MI Jam-017 (12.58 m^3). The highest number of branches (5) observed in MI Jam-016 and the lowest number of branches (2) observed in MI Jam-003. Among the collected genotypes fourteen were in bearing stage. The highest number of fruits (286) was obtained from MI Jam-011, and the lowest number of fruits (25) was obtained from MI Jam-012. The highest fruit yield (49.76 kg) recorded in MI Jam-011 followed by MI Jam-009 (35.44 kg) and the lowest fruit yield (4.88 kg) in MI Jam-012. Individual fruit weight varied from 59.20 g to 754 g. The biggest fruit (754 g) obtained from MI Jam-009 followed by MI Jam-001 (384 g), MI Jam-036 (378 g), MI Jam-016 (356 g) and smallest fruit (59.20 g) from MI Jam-017. Percentage of TSS of different mango genotypes varied from 14% to 22%. The highest TSS (22%) recorded in MI Jam-013 followed by MI Jam-002, MI Jam-003, MI Jam-007, MI Jam-011, MI Jam-014, MI Jam-036 (20%) and the lowest TSS (14%) found in MI Jam-001.

Evaluation of exotic mango germplasm

M. Ratna, M. Islam, E. Mahmud, N. Akter, S. Yesmin, M. A. Rahman

An experiment with thirty one germplasm of mango was conducted at Regional Horticulture Research Station, BARI, Lebukhali, Patuakhali to identify the superior genotype(s) of mango. Among the tested germplasm, MI PK-018, MI PK-021, MI PK-026, MI PK-032, MI PK-034 and MI PK-039 were red coloured skin and the rests were yellow skin. Fiber was present in the fruit pulp of four germplasm, namely MI PK-013, MI PK-017, MI PK-025 and MI PK-033. The highest weight of single fruit (2351g) was recorded in MI PK-042 whereas the lowest weight of single fruit (162 g) was recorded in MI PK-035. The highest edible portion (81.0%) was found in MI PK-026 followed by MI PK-040 (79.71%). The lowest edible portion (66.88%) was obtained from MI PK-017. The brix varied from 10% to 26%. The highest brix value (26%) was recorded in MI PK-022 followed by MI PK-029 (23%) whereas the lowest brix (10%) was observed in MI PK-013. Based on the appearance, harvesting period, fruit volume, edible portion, fruit pulp condition and storage period, all the germplasm were considered as better except MI PK-013 and MI PK-025. However, after completing the experiment, the final recommendation will be made regarding

superior genotype(s) of mango for the southern region of Bangladesh.

Hybridization in mango

M. Ratna, M. Islam, E. Mahmud, N. Akter, S. Yesmin, M. A. Rahman

An experiment on hybridization of mango was conducted at Regional Horticulture Research Station, BARI, Lebukhali, Patuakhali to develop new mango hybrid(s). A total of 780 flowers from 150 inflorescences were emasculated and pollinated. A total of 56 hybrid fruits were set initially and only one fruit remained from the cross BARI Aam-3 × Fazli. All other fruits dropped before getting maturity. The study will be continued until getting desirable hybrid(s) of mango.

Collection and evaluation of different mango germplasm in Chattogram region

H. Barua, S. R. Haque and M. Moniruzzaman

Thirty-two germplasm of local mango were evaluated at Agricultural Research Station, Khulshi, Chattogram. Among of them twenty-eight germplasm produced flowering this year. Earliest flowering (last week of January 2025) in MI Pah 024, MI Pah 029, MI Pah 030, MI Pah 040 and MI Pah 063, the latest flowering (Ist week of March 2024) in MI Pah 032 was observed. MI Pah 046 exhibited the heaviest fruits with the greatest size. Overall, MI Pah 032 and MI Pah 040 were notable for producing the highest fruit number (70) and yield per tree (18.16 kg), respectively, while MI Pah 029 excelled in edible portion and TSS (85.68% and 24.02%). In contrast, MI Pah 066 and MI Pah 082 recorded the lowest values for edible portion (60.02%) and yield (1.11 kg).

Hybridization in mango at Chattogram region

H. Barua, S. R. Haque and M. Moniruzzaman

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 x BARI Aam-11 and Kartimon x BARI Aam-11 . Out of 85 emasculated flowers, 42 fruits were set but all dropped off in 16 inflorescences of crossing between BARI Aam-3 and BARI Aam-11 and Kartimon x BARI Aam-11.

Evaluation of newly collected mango germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of mango germplasm in the hill valley was conducted at the fruit orchard of Hill Agricultural Research Station, Raikhali, Rangamati Hill District. Thirty-six promising exotic and local mango lines were studied to identify superior genotypes for the hilly region. The performance of the germplasm will be assessed after the harvest of the fruits.

Evaluation of banana (Sabri) germplasm

S. Yesmin, M. Islam, M. Ratna, E. Mahmud, N. Akter, and M. A. Rahman

An experiment was conducted at Regional Horticulture Research Station, BARI, Lebukhali, Patuakhali to evaluate the banana (Sabri) germplasm. Six banana germplasm viz., MS PK-004, MS PK-006, MS PK-007, MS PK-008, MS PK-009, and MS PK-012 were collected from farmers' orchards and household of the southern region of Bangladesh. The highest weight of finger bunch (16.7 kg) was found in MS PK-008 and the lowest weight (8.8 kg) was observed in MS PK-007. The highest edible portion (85%) was found in MS PK-006 and the lowest portion (76%) was obtained from MS PK-009. Similarly, MS PK-006 gave the highest brix (40%) and the lowest brix (18%) was recorded in MS PK-007. Among the tested germplasm, MS PK-006 and MS PK-008 were found promising in terms of fruit bunch weight, brix and organoleptic test.

Clonal selection of banana cv. Amritsagar

E. Mahmud, P. Chakraborti, M. T. Hossain and M. A. Sattar

Ten Amritsagar germplasm was collected from ten different locations of Narsingdi district and planted at the research field of Regional Horticulture Research Station of BARI, Shibpur, Narsingdi to evaluate and identify the suitable lines/variety of banana on 3rd August, 2025. The materials were planted at 2.5m x 3m spacing. Evaluation of the materials will be continued.

Hybridization in litchi

M. A. Islam, M. J. Rahman, M. M. Khatun and M. Z. Rahman

Hybridization in litchi was carried out at the Fruit Research Farm of Horticulture Research Centre

(HRC), BARI, Joydebpur, Gazipur during the flowering season of 2025 to incorporate some important characters like earliness, lateness, fruit colour, bearing habit in the desired variety or cultivar. Cross combination for hybridization was: Kanthali ×BARI Lichu-4. One fruit was harvested from Kanthali×BARI Lichu-4 cross combination. One seedling was raised from the seed.

Evaluation of local and exotic litchi germplasm

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, Gazipur. Local litchi germplasm was planted during 2007 (Set-1) and 2022 (Set-2). Exotic litchi germplasm was collected from China in 2018. Harvesting time of litchi germplasm was recorded from 2nd week of May to 2nd week of June, 2025. The average fruit weight was observed 20.00 g. Maximum fruit weight was recorded in LC Exo-07 (31.03 g) followed by LC Joy-17 (21.30 g) and LC Joy-23 (20.20 g) and LC Joy-24 (20.00 g). Minimum fruit weight was recorded in BARI Lichu-2 (17.03 g).

Evaluation of colour-fleshed guava germplasm

A. Alam, M. A. Haque and M. M. Rahman

Guava (*Psidium guajava L.*) is one of the important fruits 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. Five colour fleshed guava germplasm viz. PG Joy-001, PG Joy-002, PG Joy-003, PG Joy-004 and PG Joy-005 were evaluated on the Fruit Research Farm of HRC, BARI, Joydebpur, Gazipur. The heaviest fruit was produced by PG Joy-001 (342.00g) while PG Joy-004 produced the smallest fruit (225.13g). Maximum number of fruits per plant was recorded in PG Joy-002 (43.45). The highest mesocarp thickness was recorded in PG Joy-001 (3.5 cm) while the lowest of that was found in PG Joy-004 (1.58 cm). The highest TSS of mesocarp and endocarp was found in PG Joy-001 (12.20 % & 12.50%, respectively). The highest yield was recorded in PG Joy-005 (10.10 kg/plant) and lowest was recorded in PG Joy-001 (4.10 kg/plant).

Study on performance of guava hybrids

A. Alam and M. M. Rahman

In order to develop superior guava variety by incorporating characteristics of popular local cultivar (Sowrupkathi) in BARI Peyara-2 current investigation was carried out at the Fruit Research Farm of Pomology Division under HRC, BARI, Gazipur. The results revealed that the highest yield (10.6 kg/plant) and yield contributing characters viz. fruit weight 280 g, fruit length (7.4 cm) and mesocarp thickness (2.3 cm) were recorded in the F1 hybrid of plant number 01 of line number 09. The fruit of the F1 hybrid of plant number 01 of line number 09 had flavour like the parent Sowrupkathi.

Collection and evaluation of papaya germplasm

M. H. Waliullah, M. S. Islam, S. K. Biswash and K. H. Alam

Development of gynodioecious variety for obtaining 100% productive plants with a view to increasing farm income through papaya cultivation was performed under fruit research station, BARI, Binodpur, Rajshahi during the period from last week of February 2024 to till date. Two sets of germplasm, namely CP Raj-001, CP Raj-002 with BARI Papaya-1as a check variety were included in the study. Among the two sets of germplasm. Considering the number of fruits per plants, 18, 22 and 27 fruits were recorded in CP Raj-001, CP Raj-002 and BARI Papaya-1 respectively.

Purification of Shahi papaya

M. H. Waliullah, M. S. Islam, S. K. Biswash and K. H. Alam

An experiment was carried out at fruit research station, BARI, Binodpur, Rajshahi to purify the Shahi Papaya variety during 2024-25. Seedling of purified selfed seeds were transplanted in the main field on 10 March 2024 and 10 flowers in each plant were selfed (Sib mating) from June to August 2024. 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, M. A. Haque and M. M. Rahman

Three exotic ber germplasm were evaluated at the Fruit Research Farm of Horticulture Research Centre,

BARI, Gazipur. The maximum number of fruits was harvested from ZM Joy (KS)-003 (1350/plant) followed by ZM Joy (BS)-003 (1180/plant), and the minimum number of fruits was counted in ZM Joy (YR)-004 (117/plant). The highest individual fruit weight (69.5 g) was recorded in ZM Joy (YR)-004 followed by ZM Joy (BS)-003 (35.50g) while the lowest individual fruit weight manifested from ZM Joy (KS)-003 (29.35g). ZM Joy (YR)-004 produced fruits twice a year (harvested two times: March and August) while other two produced once a year (February. The highest TSS (%) was recorded in ZM Joy (KS)-003 (17.10) followed by ZM Joy (BS)-003 (14.30) while the lowest of that was recorded in ZM Joy (YR)-004 (12.50).

Evaluation of ber germplasm

A. S. M. H. Rashid, N.A. Jeany, M. F. Zaman and M. S. I. Khan

An experiment was conducted to identify suitable ber germplasm to release as BARI Kul variety at Regional Agricultural Research Station (RARS), Hathazari, Chattogram during 2024-2025. Two ber germplasms, namely ZM Hat 001 and ZM Hat 038 were selected for the study to observe their qualitative and quantitative parameters where BARI Kul-2 as check. The highest number of fruits per plant was observed in ZM Hat 038 (8819 nos.) followed by ZM Hat 001 (7061 nos.). The highest yield/plant was also observed in ZM Hat 038 (289 kg) followed by ZM Hat 001 (234) and lowest yield per plant recorded in BARI Kul 2 (169 kg) (check). The highest TSS% in ZM Hat 001 (15) followed by ZM Hat 038 (14) and lowest TSS% recorded in BARI Kul 2 (11) (check). BARI Kul-2 was harvested in the 1st week of February. On the other hand, ZM Hat 001 was harvested in 1st week of March and ZM 038 was harvested in 4th week of March. Both of them are late, among them ZM Hat 038 was too late. Therefore, these two lines are quite suitable for release as late season variety.

Evaluation of pineapple germplasm

M. A. Haque and A. Alam

A study was conducted to evaluate the vegetative growth and yield performance of four pineapple germplasm accessions (Ac Joy-001, Ac Joy-002, Ac Joy-003, and Ac Joy-004). Vegetative growth parameters were recorded at 12 months after planting, while yield and yield-contributing characters were assessed at harvest. Highly significant differences were observed among the accessions for most vegetative and yield traits. Accession Ac Joy-004 consistently exhibited superior vegetative growth, demonstrating the greatest plant height (85.20 cm), number of leaves (52.26), and length (68.80 cm) and width (5.18 cm) of the D leaf. This accession also produced the highest fruit weight (1950 kg with crown), fruit length (17.95 cm), and fruit width (12.73 cm), making it the most vigorous and highest-yielding accession in terms of total fruit mass. However, a trade-off was observed in other yield components. Ac Joy-002 was found to be the most efficient accession in terms of edible fruit, with a significantly higher edible portion percentage (70.61%) compared to all others. It also had the heaviest crown (276.66 g). No significant difference was found in TSS content among the accessions, with values ranging from 14.90% to 17.90%. The findings indicate that Ac Joy-004 is a promising accession for high fruit yield and vigorous growth, while Ac Joy-002 is highly suitable for uses where a high edible portion is desired. The results highlight the potential for selecting specific pineapple germplasm for different commercial and processing applications.

Evaluation of exotic pineapple germplasm

M. A. Haque and A. Alam

This study presents the growth and yield parameters of an exotic pineapple germplasm. At 12 months after planting, the plants had an average height of 60.45 cm and 40 leaves. The D leaf measured 49.50 cm in length and 4.69 cm in width. Fruit weight averaged 1650 g with the crown and 1368 g without. The fruit exhibited a high total soluble solids (TSS) content of 17.90% and a 73% edible portion. The taste was characterized as very sweet, with golden yellow, crispy flesh. Notably, the germplasm exhibited resistance to pests and diseases, with no recorded infections or infestations in the field. These findings suggest that this exotic pineapple germplasm possesses favorable agronomic and fruit quality traits, making it a promising candidate for further research and cultivation.

Collection and morphological evaluation of pineapple in Sylhet region

M. S. Alam, M.A. Sumi, M. A. Habib and M. I. Nazrul

The highest plant height (64 cm) was recorded in AC Akb-002 while AC Akb-007 showed the lowest plant height (34.667 cm). The maximum weight of single fruit was recorded at AC Akb -002 (0.972 kg), while AC Akb -004 showed the minimum weight (0.285 kg). The line AC Akb -003 had the highest TSS (15.867 %) but the AC Akb -005 recorded the lowest (7.633 %) TSS value. The maximum fruit yield was recorded at AC Akb -002 (28.67 t/ha) and the minimum fruit yield (4 t/ha) was recorded in AC Akb -007.

Collection and evaluation of pineapple germplasm in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate pineapple (*Ananas comosus* L.) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District, during 2024-25. Six promising exotic and local pineapple lines were studied to identify superior genotypes for the hilly region. The performance of the germplasm will be evaluated after the harvest of the fruits.

Evaluation of jamun germplasm

M. H. Waliullah, M. S. Islam, S. K. Biswash and K. H. Alam

An experiment was conducted at Fruit Research Station, BARI, Binodpur, Rajshahi to evaluate six jamun germplasm for superior traits during 2023-24 (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 form SC Raj-005 (50 kg) followed by SC Raj-001 (47 kg). Minimum yield per plant was recoded in SC Raj-006 and SC Raj-014 (20 kg).

Evaluation of para jam (*Antidesma acidum*) germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of para jam in Hill Valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. The highest fruit size, 100-fruit weight, ripen fruit TSS, and yield of the AA Rai-001 were 4.84 mm × 4.53 mm, 3.74 g, 20% and 8.6 kg/tree, respectively.

In-situ evaluation of local pummelo germplasm

M. S. Islam, M. H. Waliullah, and K. H. Alam

The study was conducted at the Fruit Research Station, BARI, Binodpur, Rajshahi during 2024-2025. One pummelo germplasm (CG Raj-004) was selected for the evaluation along with BARI Batabilebu-3 as check. Mainly flesh colour was very attractive 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 lime germplasm in Chattogram region

A. S. M. H. Rashid, N.A. Jeany, S. M. Foisal and M. S. I. Khan

Five Lime lines viz. CL Hat-001, CL Hat-002, CL Hat-003, CL Hat-005 and CL Hat-006 locally appeared as Kagozi lebu were evaluated at the Regional Horticulture Research Station, Hathazari, Chattogram during 2024-25. The highest number of fruits was observed in CL Hat-001 (500), CL Hat-002 (400), CL Hat 006 (350) and minimum fruit per plant recorded in CL Hat-005 (160). The highest number of lemon bunch was observed in CL Hat 001 (150 nos.) and each bunch contained on average 4 lime which is followed by CL Hat 006 (70 bunch). The highest fruit size was observed in CL Hat 006 (5.05 X 4.66 cm) and also the highest individual fruit weight in CL Hat 006 (90 g). Among 5 lines, CL Hat 006 contain very less number of seed (01) and high juice content with other desirable characteristics.

Evaluation of sweet orange line

A. S. M. H. Rashid, N.A. Jeany, S. M. Foisal and M. S. I. Khan

An experiment was conducted at the citrus orchard of RARS, Hathazari, Chattogram during July 2021 to 2025 in order to assess the yield potentialities of line CS Hat 001 (locally known as Katamalta). Differences were observed in all the quantitative parameters studied. The highest plant height was observed in CS Hat 001 (3.10 m) followed by BARI Malta 1 (2.72 m). The canopy size was higher in CS Hat 001 (3.81 m × 3.73 m) than BARI Malta-1 (3.42 m × 2.97 m) accordingly. Number of fruits per plant was higher in CS Hat 001 (142) than that of BARI Malta-1 (127). CS Hat 001 produced significantly heavier fruits (214 g) compared to BARI Malta-1 (146 g). Fruit length and diameter were also larger in CS Hat 001 (6.96 cm and 7.10 cm) than in BARI Malta-1 (5.51 cm and 5.52 cm). Juice content was greater in CS Hat 001 (74 ml) compared to BARI Malta-1 (56 ml). Total soluble solids (TSS) was also higher in CS Hat 001 (9.5%) compared to BARI Malta-1 (9.0%).

Collection and eveluation of pomegranate (*Punica granatum*) genotypes in Chattogram region

M. N. Uddin, T. A. Mujahidi, M. S. Jeny, A. S. M. H. Rashid, S. M. Faisal and M. S. I. Khan

Pomegranate (*Punica granatum* L.) is a minor yet promising fruit crop in Bangladesh, known for its high-value juice and potential nutraceutical applications. In view of its growing market demand and medicinal significance, an exploratory study was undertaken at the Regional Agricultural Research Station (RARS), Hathazari, Chattogram during 2024–2025. The objective was to enrich existing germplasm resources and establish grafted plants for future evaluation. A total of 12 genotypes were collected from 15 upazilas of Chattogram district and from commercial nurseries. The genotypes were screened, isolated for disease inspection, and subsequently established in the RARS orchard. All plants are currently in the early vegetative stage, and the experiment will continue to assess their growth, adaptability, and fruiting potential. This study lays the groundwork for future improvement and selection of superior pomegranate cultivars suited to the agro-climatic conditions of southeastern Bangladesh.

Hybridization for developing scion cultivars in citrus

F. Ahmed, J. C. Sarker and M. H. M. B. Bhuyan

A hybridization program was carried out among the available citrus genotypes during the flowering season of 2024-25 at the Citrus Research Station (CRS), BARI, Jaintapur, Sylhet for developing new hybrid citrus scion cultivars. Six selected genotypes of citrus variety were used for hybridization. Maximum numbers of successful crosses (14) were obtained from BARI Batabilebu-3(♂)×BARI Batabilebu-5(♀). The highest percentage of fruit setting (36%) was recorded from the cross combination BARI Komla-1(♂)× BARI Komla-3(♀), while the lowest (10%) was recorded for BARI Komla-3(♂)×BARI Malta-1(♀). Maximum number of fruit retention (7) was recorded from the crosses between BARI Batabilebu-3(♂)×BARI Batabilebu-5(♀) followed by BARI Komla-3(♂)×BARI Malta-1(♀) and BARI Batabilebu-5(♂)×BARI Batabilebu-3(♀), whereas, no fruit was retained in the rest of the cross combinations.

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 at Citrus Research Station, Bangladesh Agricultural Research Institute (BARI), Jaintapur, Sylhet to find out the best germplasm in Sylhet region. The tallest plant (272.67 cm) was found in BARI Komola-3 while the shortest plant (113.33 cm) was found in CR Jai-306. The plants of CR Jai-303 spread maximum (206.33 cm × 181.67 cm) whereas the plants of CR Jai-306 had the minimum canopy spreading (58.00 cm × 57.33 cm). Maximum stem diameter (4.07 cm) was recorded in BARI Komola-1 Contrary minimum stem diameter (2.10 cm) was recorded at CR Jai-301. The variety BARI Komola-1, BARI Komola-3 and the germplasm CR Jai-303 and CR Jai-304 were in fruit bearing stage and bore fruits but the other germplasm were in satisfactory vegetative growth stage.

Performance of exotic sweet orange germplasm

J. C. Sarker, M. H. M. B. Bhuyan, and F. Ahmed

A study was conducted with four exotic sweet orange germplasm to evaluate their performance at Citrus

Research Station, Jaintapur, Sylhet during 2024 to 2025. 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-1was light yellow.

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 from December 2022 to December 2023 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.Among the germplasm tested CG Jai-005-3 was found superior with tree height (5.0 m),while maximum number of fruits plant^{-1} (75) 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-054 (1.11%). Sugar acid ratio was lowest in CG Jai-54 (0.18).

Evaluation of lemon germplasm

J. C. Sarker, M. H. M. B. Bhuyan and F. Ahmed

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 during 2024 to 2025. 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 and F. Ahmed

A study was conducted with three lime germplasm to evaluate their performance at Citrus Research Station, Jaintapur, Sylhet during 2024 to 2025. 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%).

Evaluation of local pummelo germplasm

N. Akter, M. Islam, M. Ratna, E. Mahmud, S. Yesmin and M. A. Rahman

An experiment was conducted with five germplasm of pummelo viz., CG PK-001, CG PK-005, CG PK-006, CG PK-007 and CG PK-008 at Regional Horticulture Research Station, BARI, Lebukhali, Patuakhali to develop superior genotype(s). The collected germplasm were transplanted during 2022-2023. All the plants are in growth stage at this moment. After completion of the experiment superior genotype(s) will be identified for releasing as new variety of pummelo for the southern region of Bangladesh.

Evaluation of pummelo germplasm

P. Chakraborti, E. Mahmud, R. Akter, M. T. Hossain and M. A. Sattar

An experiment was conducted at the Regional Horticulture Research Station (RHRS), BARI, Shibpur, Narsingdi during 2024-2025 to select suitable lines of pummelo. All the germplasm showed significant variation in respect of plant height, base girth and canopy spreading attributes. The highest plant height recorded in CG Nar-003 (4.80 m) and the lowest plant height in CG Nar-006 (3.20 m) and CG Nar-008 (3.20 m). Maximum base girth (63.33 cm), biggest canopy size (5.50 m x 5.60 m) was also found from CG Nar-003. Minimum base girth (32.67 cm), smallest canopy size (3.20 x 3.60 m) was recorded in CG Nar-006.

Evaluation of kaghzi lime

A.K. Das., S. D. Setu, S. Hasna and M. S. I. Khan

The experiment was conducted at the RARS, Rahmatpur, Barishal during July 2024 to July 2025. 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 yield, yield contributing character and nutrition value CA Rah 02 was better than others germplasm.

Evaluation of pummelo in hilly region of Rangamati

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

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 during the period of 2024-25 for the evaluation of superior pummelo genotypes in hilly region. The performance of the germplasm can be concluded after the harvest of the fruits.

Evaluation of bullock's heart germplasm

M. A. Haque and A. Alam

A study was conducted to assess the genetic diversity of five bullock's heart germplasm accessions collected from local markets. The accessions, designated AR Joy-001 to AR Joy-005, were evaluated for a range of morphological and biochemical characteristics, including fruit weight, fruit dimensions, Total Soluble Solids (TSS), seed count, seed dimensions, total seed weight, skin weight, and edible portion percentage. The results showed variability across most traits. The mean fruit weight was 334.44 g, with a high coefficient of variation (CV) of 27.73%, while the edible portion had a mean of 80.01% with a low CV of 6.66%. Accession AR Joy-002 recorded the highest fruit weight (498.70 g) and edible portion (88.79%). In contrast, AR Joy-001 and AR Joy-003 exhibited the highest TSS content (26% Brix), a key indicator of sweetness. However, AR Joy-003 also had the highest number of seeds (85). The findings suggest a valuable genetic diversity within the local market germplasm, highlighting promising accessions like AR Joy-002 for breeding programs focused on increasing fruit size and yield, and AR Joy-001 and AR Joy-003 for improving fruit sweetness. These results provide a foundation for further selection and breeding efforts to develop superior bullock's heart varieties.

Evaluation of lotkon germplasm

M. S. Alam, M.A Habib, and M.I Nazrul

Twenty-two lotkon genotypes were evaluated at Regional Agricultural Research Station, Akbarpur, Moulvibazar during the year 2024-25. Maximum single fruit weight (16.67 g) was obtained from BS -Akb-047 followed by BS -Akb-006 (16.0g) and minimum was in BS -Akb-031 (9.60g). The highest skin weight was found from the line BS -Akb-037 (7.76g) and minimum was in BS -Akb-039 (3.97g). The highest TSS was obtained from BS -Akb-014 (14.50%) and the line was very good in taste. Highest fruit yield was found in BS Akb 014 (96.22 kg) followed by BS Akb 001 (83.79 kg) and lowest fruit yield was for BS Akb-025 (13.24 kg).

Evaluation of custard apple germplasms

M. H. Waliullah, K. H. Alam, S.K. Biswash and M. S. Islam

An experiment on collection and evaluation of some custard apple germplasm was conducted at Fruit Research Station, BARI, Binodpur, Rajshahi during the fruiting season of 2024-25. Five germplasms were collected from different nursery of Nator and Rajshahi district. Seedlings were planted into main

field between 2022 and 2023. The plants are still in vegetative stage.

***In-situ* evaluation of bael germplasm**

A.S.M. Yousuf ALI, M. M. Rahman, M. M. Hossain and M. M. Rahman

An experiment was conducted at Chapainawabganj Sadar and Shibganj Upazila during 2024-25. The study comprised one bael germplasm. 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.

Collection and eveluation of custard apple (*Annona squamosa*) genotypes in Chattogram region

T. A. Mujahidi, M. N. Uddin, M. S. Jeny, A. S. M. H. Rashid, S. M. Faisal and M. S. I. Khan

Custard apple (*Annona squamosa*), a minor yet highly valued fruit crop in Bangladesh, is renowned for its rich, creamy taste and nutritional benefits. Despite its popularity, there has been limited systematic collection and evaluation of its genetic resources in the country. With an aim to identifying and conserve superior genotypes for future cultivation and commercial exploitation, a preliminary investigation was initiated during 2024–2025 at the Regional Agricultural Research Station (RARS), Hathazari, Chattogram. A total of 22 custard apple genotypes were collected from 15 upazilas within Chattogram district. These genotypes were initially characterized for fruit traits, and seedlings were established in the RARS fruit orchard for further evaluation. As of now, all plants are in the early vegetative stage, and the trial will be continued for growth, phenological, and yield assessments in the upcoming seasons.

Collection and evaluation of bullock's heart genotypes

M. R. Alam and S. M. M. Rahman

A study was carried out at RARS, Jashore during the period from March to April, 2024 to find out the superior genotypes of bullock's heart (*Annona reticulata* L). Ten genotypes were identified of 6 to 12 years old plants from different locations of RARS, Jashore and nearby areas and fruits were collected. Data were taken in respect of fruit length, fruit breadth, fruit weight, pulp content, edible portion, TSS, number of fruits per plant and yield per plant. The heaviest fruit (576 g) was recorded in AR Jas-013 whereas the lightest fruit (296 g) was found in AR Jas-010. The highest edible portion (75.8%) was observed in AR Jas-007 while the lowest edible portion (64.1%) was found in AR Jas-011. The highest TSS (26.2%) was recorded in AR Jas-012 whereas the lowest TSS (18.3%) was found in AR Jas-010. Maximum number of fruits per plant (78) as well as the highest yield per plant (36.5 kg) was found in AR Jas-007.Eating quality as well as eye appeal of fruits were excellent in AR Jas-002, AR Jas-006, AR Jas-007 and AR Jas-012.

Evaluation of soursop in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Soursop (*Annona muricata*) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District, during 2024-25. Fifteen promising exotic and local Soursop lines were studied to identify superior genotypes for the hilly region. Among the fifteen germplasm, five germplasm have flowered and fruited this year. The maximum number of fruits (12), yield (4.16 kg/ha), % TSS (16) were observed in AM Rai-001, followed by AM Rai-011, and the highest individual fruit weight (405 g), fruit size (116.67 mm×104.55 mm× 98.35mm) were observed in AM Rai-007 compared to other lines.

Evaluation of eggfruit (*Pouteria campechiana*) in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Eggfruit (Tiesa) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District, during 2024-25. 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 (396), individual fruit weight (196 g), fruit size (87.65 mm × 69.91 mm), pulp thickness (16.16 mm), edible portion (80.33%), and yield (77.62 kg/plant), outperforming the other genotypes.

Evaluation of jabuticaba (*Plinia cauliflora*) in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of jabuticaba in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. 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 (4450), individual fruit weight (7.56 g), fruit size (25.13 mm × 24.68 mm), yield (33.64 kg/tree) and edible portion (76.45 %) was observed in PC Rai-001. It also had TSS 17% and was good in taste.

Evaluation of bael in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Bael (*Aegle marmelos*) was conducted at the Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25. Twenty-one promising Bael lines were studied to identify superior genotypes for the hilly region. The heaviest individual fruit weight (1790 g), fruit size (205.96 mm × 124.33 mm) was recorded in AM Rai-062, followed by AM Rai-060 (1450 g). The maximum number of fruits per plant (75), pulp thickness (132.25 mm), edible portion (79.93 %), TSS (38%), and yield (108.75 kg/plant) were observed in AM Rai-060, which outperformed the other genotypes.

Evaluation of star gooseberry (*Phyllanthus acidus* l.) germplasms

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of star apple in Hill Valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25. There were four genotypes under study. Among those four lines, PA Rai-002 had maximum 10-fruit weight (41.34 gm), flesh thickness (6.35 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 M. Z. Rahman

An experiment on the evaluation of star apple in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. There were three genotypes under study. Among those three lines, CC Rai-002 had maximum number of fruits per plant (220), individual fruit weight (193.5 g), fruit size (68.08 mm × 68.98 mm), pulp TSS (19%) and yield (42.57 kg/plant) compared to other two lines.

Evaluation of bullock's heart (*Annona reticulata* L) germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of bullock's heart in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. There were thirteen promising bullock's heart lines under study. Among those lines, the highest individual fruit weight (412 g), fruit size (118.7 mm ×90.76 mm), yield (16.74 kg/tree) and TSS % 28 were observed in AR Rai-010.

Evaluation of monkey jack germplasm

S. D. Setu, S. Hasna, A. K. Das and M. S. I. Khan

The experiment was conducted at the RARS, Rahmatpur, Barishal during 2024 to 2025. Five germplasm of monkey jack were collected from different areas of the southern part of country. Wide variations in growth characteristics among the germplasm were found. The consumers always prefer higher edible portion. 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 velvet apple germplasm

S. D. Setu, S. Hasna, A. K. Das and M. S. I. Khan

The experiment was conducted at the RARS, Rahmatpur during 2024 to 2025. 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 13 to 21 years. The

maximum age of the 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 different exotic fruit germplasm

A. Alam, M. A. Haque and M. M. Rahman

Eight exotic fruits germplasm were collected from different sources of Bangladesh. Saplings of grape, apple, mangosteen, persimmon. Durian, cherry, kiwi and pomegranate were planted in 2024 & 2025 in the Fruit Research Field of Pomology Division, HRC, BARI, Gazipur. All the planted saplings are now in initial phase of growth.

Evaluation of avocado lines

M. Z. Rahman, M. A. Haque and A. Anwari

A study was carried out at the Fruit Research Farm of Horticulture Research Center, BARI, Gazipur during 2024-25 to evaluate the avocado germplasm. Three germplasm were evaluated in this study where BARI Avocado-1 used as check. Vegetative, flowering and harvesting time, fruit characteristics and yield of avocado were recorded. All the studied germpasm produced flower but only BARI Avocado-1and PA Joy-003 produced fruits. BARI Avocado-1 produced average 27 fruits per plants having average fruit weight 450g, where PA Joy-003 produced only 03 fruits having an average weight of 300 g. The TSS and edible portion were 8.0% and 80% in BARI Avocado-1and 7.5% and 82% in PA Joy-001 respectively.

Characterization and evaluation of collected grapevine germplasm

B. R. Barman, M. K. Kubra, M. Z. Masud, M. S. Hossain

The characterization and evaluation of grapevine (*Vitis vinifera* L.) germplasm are essential for selection and supporting breeding programs aimed at developing improved varieties. This study was conducted at BSPC, BARI to characterize collected grapevine germplasm and evaluate its morphological and agronomic traits. 12 germplasm samples were collected from Rangpur region. Characterization was carried out following IPGRI descriptors, focusing on traits such as leaf and shoot morphology. Bunch and berry characteristics, yield potential could not be evaluated as plants are in vegetative growth stage. The study revealed considerable variability among accessions, with significant differences in shoot and leaf morphology.

Evaluation of coffee (Robusta) germplasm in the north-eastern hilly region of Bangladesh

J. C. Sarker, F. Ahmed, and M. H. M. B. Bhuyan

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. The biggest fruit was observed in CR Jai-001 whereas smallest in CR Jai-003.

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

Five cashew nut germplasm (AO Jai-001, AO Jai-002, AO Jai-003, AO Jai-004 and AO Jai-005) were evaluated in an experiment carried out in 2024–2025 at the Citrus Research Station, BARI, Jaintaapur, Sylhet. The experiment was conducted in a Randomized Complete Block Design with three

replications. Significant variations among germplasm were noted for all the attributes evaluated. Among five cashew nut germplasm AO Jai-001 exhibited superior vegetative growth with the tallest height, highest base girth and widest spreading. AO Jai-001 produces maximum nut yield per plant (3.52 kg), edible kernel weight per plant (1.09kg). However, based on overall growth and yield performance, AO Jai-001 and AO Jai-003 were identified as promising germplasm for cultivation in the north-eastern hilly region of Bangladesh.

Evaluation of yellow dragon fruit germplasm

Barua, S. R. Haque and M. Moniruzzaman

Four yellow dragon fruit lines viz. HM Pah-001, HM Pah-002, HM Pah-003 and HM Pah-004 were evaluated at the ARS, Khulshi, Chattagram during the year 2024-25. The lines were collected and planted in August 2022. Significant differences were observed in all the parameters during the studied period. First initial bud was recorded 8 May 2025 from HM Pah-001. Highest no. of flower (72) was found in HM Pah-001 followed by HM Pah-002 (52). The HM Pah-001 produced the highest no. of fruit (52) and maximum individual fruit weight was 422.11 g, giving a total yield of 21.53 kg per pillar, also the highest yield recorded. Minimum no. of fruit (24), individual fruit weight (302.44g) and the lowest yield (10.91 kg/pillar) was found im HM Pah 004. From the study highest edible portion percent recorded in HM Pah 001 (76%) followed by HM Pah 002 (66%). The highest TSS% was found in HM Pah 001 (15.3%) and lowest in HM Pah 004 (13.9%).

Evaluation of Cherimoya germplasm in Chattogram region

S. R. Haque, H. Barua and M. Moniruzzaman

An evaluation of Cherimoya germplasm was carried out in at Agricultural Research Station, Pahartali, Chattogram during the fruiting season of 2024-2025. The result indicated that the Cherimoya germplasm AC Pah 001 performed well in case of fruit weight (335.4), seed weight (6.60 g), TSS content (20%), Edible percentage (81%) and skin weight as well as other qualitative character. Further study is needed.

Evaluation of promising dragon fruit germplasm in Rangamati hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

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 during the period of 2024-25 for the evaluation of superior dragon fruit germplasm in hilly region. The experiment is ongoing, the yield contributing characters will be taken duly.

Project II: Propagation Technique

Propgation of BARI Komola-1 and BARI Malta-1 by shoot tip grafting

M. H. M. B. Bhuyan, J. C. Sarker, and F. Ahmed

The experiment was conducted at Citrus Research Station, BARI, Jaintapur, Sylhet from September 2024 to May 2025. 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. Only 6.66% of BARI Malta-1 grafts were successful. The grafts will be indexed for graft transmissible diseases further. The experiment will be continued in the following year to get more disease free saplings.

Effect of method of propagation on survivability and growth of Coffee Robusta

J. C. Sarker, M. H. M. B. Bhuyan, F. Ahmed, and S. M. L. Rahman

The experiment was conducted during 2023-24 at the Citrus Research Station, BARI, Jaintapur,

Sylhet, to identify an effective vegetative propagation technique for Coffee Robusta. Three grafting methods including softwood grafting, semi-hardwood grafting, and side grafting were evaluated. The study followed a Completely Randomized Design (CRD) with three replications, using 10 seedlings per treatment. Data were collected on plant survival percentage, growth of rootstock and scion, number of branches, and number of leaves per graft. The results revealed significant differences among the treatments. Softwood grafting exhibited superior performance, with the highest survival rate (68.23%), longest rootstock length (2.80 cm at 120 days after grafting), greatest number of branches per graft (2.16), and maximum number of leaves per graft (21.91). In contrast, side grafting consistently produced the lowest values across all parameters. The study concluded that softwood grafting offers better compatibility with the rootstock and is the most effective propagation method for Coffee robusta under the conditions of the northeastern hilly region of Bangladesh.

Standardization of grafting time and techniques in cashew nut under Bangladesh condition

J. C. Sarker, M. H. M. B. Bhuyan, F. Ahmed, and S. M. L. Rahman

An experiment was conducted during 2023-24 at the Citrus Research Station, BARI, Jaintapur, Sylhet, to determine the most effective vegetative propagation technique and optimal grafting time for cashew nut. Two grafting methods including cleft and veneer grafting were evaluated across 12 grafting dates at mid-month intervals throughout the year. The study followed a factorial arrangement in a Completely Randomized Design (CRD) with three replications, using 10 seedlings per treatment. Data were collected on days to bud break, graft success rate, graft survivability, number of leaves per graft, and number of shoots per graft. Results showed that the interaction between grafting time and technique significantly influenced bud break and shoot production. The shortest time to bud break (17.99 days) and highest shoot number (6.14) were recorded with cleft grafting on June 15, while the longest bud break (29.78 days) and lowest shoot count (2.44) occurred with veneer grafting on January 15. Although graft success, survivability, and leaf number were not significantly affected by the interaction, cleft grafting in June consistently yielded the best overall results. In contrast, veneer grafting in December and January performed poorly across most parameters. The study concluded that cleft grafting on June 15 was the most effective method for cashew propagation in the northeastern hilly region of Bangladesh, while veneer grafting in December and January showed poor results.

Effect of stem pruning on the growth and yield of dragon fruit

A. Akter, M. A. Hossain, M. A. Goffar, M. J. Rahman, H. Rahman and R. Sultana

The study was carried out at the HRC Fruit Orchard, RARS, Jamalpur during 2023-2024 to study the effect of stem pruning on the growth and yield of dragon fruit. Treatments were T_1: Only Mother stem allowed up to trellis; T_2: Two stems allowed up to trellis (with mother stem); T_3: Three stems allowed up to trellis (with mother stem); T_4: Four stems allowed up to trellis (with mother stem); T_5: Five stems allowed up to trellis (with mother stem) and T_6: Control (no pruning). The treatment only mother stem allowed up to trellis produced the heaviest fruits (435 g). Maximum fruit yield per plant (7.83 kg) was found in T_1 and minimum yield (1.38 kg) was found in T_6. Maximum edible portion (79.31 %) was found in T_1.

Project III: Cultural Management

Effect of shade on the yield and productivity of pineapple

M. S. Alam, F.I Siraj and M. I. Nazrul

The experiment was conducted at RARS Moulovi Bazar, Sylhet during 2024-25 to investigate the influence of shade on the yield of pineapple. The tallest plant (91.667 cm) was recorded in T_1 (100% sunlight) but T_4 (<40% sunlight) produced the shortest plant. T_2 (70-80% light level)) was recorded highest (860 g) individual fruit weight followed by T_1 (830 g) (full sunlight), while T_4 recorded the lowest individual fruit weight. The highest TSS, 19.3% was recorded in T_1 (full sunlight) but the lowest value was recorded in T_4 (12.7%). The highest fruit yield was recorded in T_2 (29.32 tha^{-1}), and the lowest yield was recorded in T_4 (7.35 tha^{-1}).

Effect of ultra high density plantation of mango at varying spacing on yield and return

M. M. Rahman, A. S. M. Y. Ali, M. S. Uddin, A. K. Saha and M. M. Rahman

The experiment was conducted at Regional Horticulture Research Station, BARI, Chapainawabganj during 2021-25 to find out the optimum spacing for ultra-high density plantation (UHDP) of mango. The treatments were T_1: Traditional spacing 8m × 8m, T_2: UHDP spacing 3m × 3m, T_3: UHDP spacing 3m × 2m, T_4: UHDP spacing 2.5m × 2.5m and T_5: UHDP spacing 2m × 2m. The highest yield (15.00 t/ha) was in the lowest spacing T_5 (2m×2m) and the lowest yield (1.48 t/ha) was found in the highest spacing (8m×8m). The result indicated that the spacings of 3m×3m and 3m×2m can give higher yield in early years of ultra high density mango orchard. 2m×2m will be over crowded as it already attained 95% canopy coverage.

Effect of length of heading back in ultra high density plantation on growth, stature and yield of mango

M. M. Rahman, A. S. M. Y. Ali, M. S. Uddin, A. K. Saha and M. M. Rahman

The experiment was conducted at Regional Horticulture Research Station, BARI, Chapainawabganj during 2021 - 25 to find out the suitable length of heading back in ultra-high density planting for short stature, balanced branching to cope with the space and higher yield of mango. The treatments comprising two times heading back were T_1: at 60 + 30 cm heights, T_2: at 60 + 45 cm heights, T_3: at 60 + 60 cm heights, T_4: at 60 + 75 cm heights, T_5: at 60 + 90 cm heights and T_6: No heading back. Second heading back at 30 cm and 45 cm (T_1 and T_2) produced reasonably lower canopy of around 65% at the end of 3rd year. It indicates if maintenance pruning done properly/ regularly it may need many years (may be 10-15 years) to spread full canopy and up to then successful yield and handsome return is possible.

Effect of paclobutrazol on mango tree raised from seed to promote early bearing

M. M. Rahman, A. S. M. Y. Ali, M. S. Uddin, A. K. Saha and M. M. Rahman

The experiment was conducted at Regional Horticulture Research Station, BARI, Chapainawabganj during 2024-25 to lessen the gestation period of mango tree raised from true seed. The treatments were P_1: No paclobutrazol P_2: paclobutrazol @ 2000 ppm/tree P_3: paclobutrazol @ 3000 ppm/tree P_4: paclobutrazol @ 4000 ppm/tree saplings and age of tree (A) were A_1: 2 year, A_2: 3 year, A_3: 4 year. During the last week of February, four years old saplings treated with paclobutrazol @ 3000 ppm/tree and paclobutrazol @ 4000 ppm/tree respectively showed normal bearing of flower and fruit set was observed in four years old saplings treated with paclobutrazol @ 3000 ppm/tree but all the fruits dropped at later stage. In contrast, three years old saplings treated with paclobutrazol @ 2000 ppm/tree, paclobutrazol @ 3000 ppm/tree and paclobutrazol @ 4000 ppm/tree respectively showed floral malformation. Other saplings remained healthy showing no abnormalities.

Pest status and population dynamics of mango thrips

G. M. M. Bari and M. M. Rahman

Thrips are persistent pests of mango and understanding the dynamics in relation to weather factors could be useful for effective IPM. These studies done for five years old trees (2024-25) on mango revealed that peak incidence of thrips was open flowering stage of plant (32.1 thrips/panicle), and preference found at new flushing stage (5.9 thrips/leaf bunch) also. Population density of thrips was significantly more abundant in the upper parts (9.6 number/leaf bunch) of tree. Mango thrips incidence had significant positive correlation with maximum average temperature ($p<0.01$), and negatively influenced with relative humidity (RH) and rainfall ($p<0.01$).This validated regression model might help IPM decision.

Combined management approach against thrips and hopper of mango

G. M. M. Bari and M. M. Rahman

Mango (*Mangifera indica* L.) is an important and exportable fruit crop grown in different parts of Bangladesh. Mango thrips as well as hopper, simultaneous pest is a major yield loser pest of mango. Six treatment combination such as- T_1= spraying of acephate (asataf 75SP) @ 1g/L of water at three times: 10 days before flowering, at flower initiation and also 25 days after flowering stage; T_2= spraying

of imidacloprid (Imitaf 20SL) @ 0.5 ml/L of water at three times: 10 days before flowering, at flower initiation and also 25 days after flowering stage; T_3= Spraying of Chlorfenapyr + Emamectin benzoate (Dimention 12 Sc) @ 1 ml/L of water at three times: 10 days before flowering, at flower initiation and also 25 days after flowering stage; T_4= Spraying of Acephate (asataf 75 SP) @ 1g+ imidacloprid (Imitaf 20SL) @ 0.5 ml together per litter of water at three times: 10 days before flowering, at flower initiation and also 25 days after flowering stage; T_5= Spraying of Chlorfenapyr + Emamectin Benzoate (Dimention 12 Sc) @ 1 ml + imidacloprid (Imitaf 20SL) @ 0.5 ml together per litter of water at three times: 10 days before flowering, at flower initiation and also 25 days after flowering stage and T_6= Untreated control were evaluated on mango at Regional Horticulture Research Station (RHRS), Bangladesh Agricultural Research Institute (BARI), Chapainawabganj during 2024-25 to develop a suitable management technique against mango thrips and hopper. Results indicated that treatment with Chlorfenapyr + Emamectin benzoate + Imidacloprid was the most effective technique for management of mango thrips (1.7 thrips/panicle) and mango hopper (6.3 hopper/panicle) which revealed 88.4 per cent thrips reduction and 80.3 per cent hopper reduction, 75.8% reduction of fruit infestation and 66.4% marketable fruit yield increase over control. Maximum MBCR was calculated 3.4 from T_3 (Chlorfenapyr + Emamectin benzoate) followed by T_1 (3.0) which was near to T_5 (2.2).

Survey of floral malformation of mango in Rajshahi region of Bangladesh

M. M. Hossain, A. K. Saha, 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 2025. Fifty locations were visited in five upazillas of Chapainawabganj districts and two upazillas of Rajshahi districts with the objective to confirm the status and update the existing statistics of mango floral malformation for the future planning and management. The disorder was found widely distributed in all over the survey area. The maximum severity (6.25%) was observed in Nachol upazilla followed by Gomostapur (5.78%). All the traditional cultivars were more or less affected by the disease. Among the varieties the highest severity (20.90 %) was recorded from Ashwina followed by BARI Aam-3 (16.23%). Ashwina and BARI Aam-3 are moderately susceptible (MS) while BARI Aam -1 is moderately resistant and others are tolerant variety to the malady.

Efficacy of chemicals in controlling floral malformation of mango

M. M. Hossain, A.K.Saha M. M. Rahman and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, BARI, Chapainawabganj during October 2024 to June 2025, to observe the efficacy of different chemicals to control floral malformation of mango caused by *Fusarium moniliformae*. The treatments were Goldazim 500 SC (Caebendazim 50%), Tilt 250 EC (Propiconazole 25%), Napthalene Acetic Acid (NAA), Goldazim 500 SC + NAA, Tilt 250 EC + NAA and Control. The treatments were applied in orchard of 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, A.K. Saha, M. M. Rahman and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, BARI, Chapainawabganj during February to July 2025, to test the efficacy of ten 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 Cabrio Top (Pyroclostrobin 5% + Metirum 55 %), Luna sensation 500 SC (Fluopyram 25% + Trifloxystrobin 25%), Zibal 77 WP (Copper hydroxide 77%), Stramin 75 WG (Tebuconazole 50%+ Trifloxistrobin 25%), Score 250 EC (Dificonazole 25%), Headline Tim 23 WP (Pyroclostrobin 12%+ Dimethomorph 10%), Novafix 42WDG (Copper 12% + Mancozeb 30%), Opponent 75 WG (Tebuconazole 50%+ Trifloxistrobin 25%), Deconil 500 SC (Chlotrothionil 50%), Amister top 325 SC (Azoxytrobin 18.2%+ Difenoconazole 11.4%) (standard check). 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 against anthracnose disease. In respect of incidence, severity, disease reduction and fruit retention, fungicidal treatments are arranged from higher to lower efficacy as Luna sensation 500 SC, Amister top 325 SC, Cabrio top, Deconil 500 SC, Stramin 75 WG, Headline Tim 23 WP, Opponent 75 WG Zibal 77WP, Score 250 EC, Novafix 42WDG.

Evaluation of new fungicides against anthracnose of mango

M. M. Hossain, A.K.Saha, A. S. M. Yousuf Ali and M. M. Rahman

A field trial was conducted at the Regional Horticulture Research Station, BARIe, Chapainawabganj in Bangladesh during February to July 2025, to check 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 1032 was the best fungicide to control postharvest anthracnose as this fungicide able to control 96.44 % of the disease followed by code no 1028 (89.29%), 1083 (83.93%) and 1042 (82.15%) respectively. Rest of the fungicides control less than 80 % of the disease.

Adaptive trial of BARI released banana varieties in Jashore region

S. M. M. Rahman and M. R. Islam

Five BARI released banana varieties, namely BARI Kola-1, BARI Kola-2, BARI Kola-3, BARI Kola-4 and BARI Kola-5 were trialed at Regional Horticulture Research Station, BARI, Khoertola, Jashore in 2024-2025. These plants were newly established in March, 2025. So, only growth data were recorded. The maximum pseudostem height ((172.00cm), base girth (36.00 cm) and top girth ((21.00 cm) were recorded from BARI Kola-2. Numbers of leaves were highest in BARI Kola-1 (12.67cm) and the lowest was BARI Kola-4 (9.00). Length of leaves, width of leaves, E-W and N-S spreading were also higher in BARI Kola-2 (95.00cm, 48.00cm, 200.00cm and 190.33 cm) respectively.

Holistic approaches to mitigate die-back disease of citrus

M. H. M. B. Bhuyan, J. C. Sarker, and F. Ahmed

The experiment was conducted at citrus research station, BARI, Jaintapur, Sylhet during November 2024 to March 2025 on a BARI Malta-1 orchard established 9 years back. All the plants in the orchard were infected by die-back disease. The experiment comprises-5 treatments with 8 replications. There were variations among the treatments regarding plant height, base girth, spreading, number of fruits per plant and the overall growth condition of the fruits. The results showed that T_3 was superior with maximum plant height (1.35 m), base girth (0.019 m), largest canopy (1.41×1.41 m) with maximum number of fruits per plant (56). T_3 also yielded the largest fruit (6.6×6.65 cm), with maximum individual fruit weight (1.65.2 g) and highest yield (9.3 Kg Tree^{-1}). Maximum TSS was also found in T_3 (8.2%) with maximum juice content (41.00%); while T_1 was inferior among the treatments.

Research Caried out by Different Sections of HRC

Plant Pathology Section

Survey and monitoring of diseases of cashew nut and coffee in bangladesh

M. S. Ali, L. Yasmin, M. Afroz, M. M. Rahman and M. A. Hossain

A comprehensive survey was conducted during May, 2025 in HARS, Khagrachari, 7 miles away from Khagrachari sadar, 8 miles away from Khagrachari sadar, Ramghar, 14 km away from Rangamati to record the incidence and severity of different diseases of coffee. *Fusarium sp.* and *Colletotrichum* sp were identified from leaves. *Colletotrichum* sp. was identified from stem.

Isolation and characterization of *Fusarium* spp isolates from guava

M. M. Rahman, L. Yasmin, S. Sultana, M. Afroz and M. S. Ali

Guava (*Psidium guajava* L.) is an important fruit crop cultivated throughout Bangladesh. However, wilt of guava plants is a serious disease in Bangladesh. Six isolates were collected from the root and

stem fragments of guava plants from cumilla and Gazipur districts of Bangladesh. Species identity was based on the colony character, morphology of microconidia, macroconidia and chlamydospores. Among the isolates, only two isolates showing *Fusarium oxysporum* sp associated with wilt disease in guava.

Post Harvest Technology Section

Uniform ripening of mango (Var. BARI Aam-3) managing quality and food safety using novel ethylene gas generator

M. A. Rahman and Z. H. Fahad

Uneven ripening commonly occurs during the natural ripening process, posing a significant problem, especially for commercial marketing of fresh fruits and vegetables. Artificial ripening is the process by which ripening is controlled to achieve desired characteristics intended for better consumer acceptance and improving sales. BARI Aam-3 is one of the important commercial varieties in Bangladesh. However, like other mangoes, fruits of BARI Aam-3 do not ripe uniformly, which makes problem in marketing the fruit properly. Fruit growers and traders on the other hand, usually spray ethyphon or calcium carbide for force ripening of fruits, which is not permitted because of health hazard. This experiment was undertaken to standardize the dozes of ethyphon along with standard protocol for uniform and safe ripening of mango var. BARI Aam-3 using low-cost novel ethylene gas generator (EG). To prepare the ripening chamber, one cubic meter (1m x 1m x 1m) bamboo structure was made along with a piece of high-density polyethylene film. Each EG was prepared with a small piece of cotton, 02 ml of ethephon (48% SL) and 0.5g NaOH. Matured-green mangoes were harvested from the HRC fruit orchard, brought to the laboratory and exposed to three different concentrations of ethyphon (2,4 and 6 mLm^{-3}) in ripening chambers for 24h at 18-20 °C and 70-75% RH. The experiment was laid out in a CRD with five treatments including two controls replicated four. All EGs containing 2, 4 or 6 mL ethyphon found highly effective in initiating the ripening process of fruits within 24h. About 100% of fruits treated even with the lowest concentration of ethyphon (2 mL) were uniformly ripened after 48h of treatment application at 20±1°C and 65-70% RH. Control fruits, on the other hand started to ripe after 48h, increased thereafter reaching 100% after 72h. All quality parameters including flesh colour, TSS, vitamin C contents of ripe mangoes found better and acceptable for marketing to the local as well distant markets. It is an environmentally safe, low-cost and affordable technology that can be used by all categories of farmers and fruit traders in Bangladesh.

Uniform ripening of mango (Var. BARI Aam-4) managing quality and food safety using novel ethylene gas generator

M. A. Rahman and Z. H. Fahad

Different fruits like mango, banana, jackfruit, papaya etc. should be ripened properly both for fresh consumption and minimal processing to get optimum aroma, sweetness, taste and eating quality. BARI Aam-4 is one of the mega commercial varieties in Bangladesh grown widely across the country. However, fruits of this variety took longer for ripening, especially when produced with pre-harvest fruit-bagging technique. Therefore, this experiment was undertaken to standardize the dozes of ethephon along with standard protocol for uniform and safe ripening of matured-green mango using low-cost novel ethylene gas generator (EG). To prepare the ripening chamber, one cubic meter (1m x 1m x 1m) bamboo structure was made along with a piece of high-density polyethylene film. Novel EG was prepared with a small piece of cotton, 02 ml of ethephon (48% SL) and 0.5g NaOH. Matured-green mangoes were harvested from the fruit orchard of HRC at maturity stage-2, brought to the laboratory and exposed them to three different concentrations of ethyphon (2,4 and 6 mLm^{-3}) in ripening chambers for 24h at 18-20 °C and 70-75% RH. The experiment was laid out in a CRD with five treatments including two controls. The ethylene gas (C_2H_4) generated from the ethephon-based EG inside the ripening chamber found highly effective in onset the ripening process of mango within 48h. Almost 100% of ethyphon-treated fruits were uniformly ripened after 60h of treatment application at 20±1°C and 65-70% RH. In contrast, the ripeness of absolute control and control fruits was initiated after 60h of storage

exhibiting 20.9 and 33.3% ripe fruits, respectively after 72h, increased thereafter reaching 100% after 96h after storage. All quality parameters including flesh colour, TSS, vitamin C contents of ripe mangoes found better and acceptable for marketing to the local as well distant markets.

Extending the green life of plantain banana by 1-methylcyclopropene

M. A. Rahman and Z. H. Fahad

Plantain (*Musa paradisiaca* L.) is an important commercial crop that grown across the world including Bangladesh. In Bangladesh, this banana is known as "cooking banana", which is generally used as curry at its green stage. But being perishable nature, the green life of this banana loss quickly after harvest, which is a barrier to marketing the crop in distant markets. To address this problem, an experiment was undertaken to evaluate the efficacy of aqueous 1-methylcyclopropene (1-MCP) on retaining the green life of plantain banana. Mature green fruits were harvested at stage-2, brought to the laboratory and immersed in 1-MCP solutions at 100, 200, or 300 µg L^{-1} for 10 min, air-dried, packed in 0.5% perforated low-density polyethylene film, and stored at 18-20 °C and 70-75% RH for 30 days. The experiment was laid out in a complete randomized design (CRD) with four treatments including control. All concentrations of 1-MCP showed greater effect in suppressing ethylene evolution compared to control treatment during the stipulated storage period. 1-MCP treatments even at lowest concentration (100 µgL^{-1}) retained the maximum tissue firmness of 13.5 N and green skin colour at the end of 30 days storage, and extended storage life by at least five days compared to control without compromising peel appearance, pulp texture and other quality parameters.



FLOWER CROPS

07

Collection, evaluation and maintenance of gladiolus

M. T. Rashid, F. N. Khan, N. Pervin, K. Ambia, M.M.R. Bhuyin and N. T. Hasan

A field experiment was conducted from October 2024 to April 2025 at the Floriculture Farm of the Horticulture Research Centre, BARI, Gazipur, to evaluate the agronomic and floral performance of ten gladiolus genotypes, including BARI Gladiolus-1 as a check. The genotypes were evaluated under a randomized complete block design (RCBD) with three replications. Significant variation was observed among genotypes in terms of spike length, floret number, rachis length, spike weight, and shelf life. Genotypes GL-025 and GL-002 recorded the highest floret number per spike (15), while GL-025 also produced the longest spike (95.0 cm), highest spike weight (60.0 g), and longest shelf life (9 days). GL-037 showed similar performance in terms of spike length (90.0 cm), floret number (14.5), and yield (230,000 spikes/ha). Early flowering was observed in GL-003 (47 days to 50% spike initiation). All genotypes exhibited moderate tolerance to leaf blight, with no significant insect infestation reported. Based on overall floral traits, earliness, and post-harvest shelf life, GL-002, GL-012, GL-025, and GL-037 were identified as promising lines for commercial cut flower production and potential variety release under Bangladesh agro-climatic conditions.

Evaluation, characterization and maintenance of tuberose

N. Pervin, F. N. Khan, M. R. R. Bhuyin, K. Ambia, M. T. Rashid and N.T. Hasan

A comprehensive evaluation was conducted at the Floriculture Research Field, HRC, BARI, Gazipur during 2024–2025 to characterize fourteen tuberoses (*Polianthes tuberosa* L.) germplasm introduced from India for their floral and bulb traits. The genotypes were assessed in a randomized complete block design with three replications. Significant morphological variation was observed across both qualitative and quantitative traits. Based on floral attributes, germplasm were classified into single (57.14%), double (35.71%), and semi-double (7.14%) flower types. TR-013, TR-020, and TR-022 exhibited heavy fragrance, while TR-021 was scentless. TR-010 produced the longest spike (101.5 cm), whereas TR-020 exhibited the longest rachis (40.0 cm), highest number of florets per spike (50), maximum spike weight (99.5 g), and longest vase life (8.14 days). TR-021 showed the longest floret (8.75 cm) and led in bulb-related parameters including bulb diameter (3.28 cm), number of bulbs/clump (14.8), and bulblets weight/clump (103.8 g). The findings revealed wide genetic variability, identifying TR-020 and TR-021 as superior for double cut flower use, and TR-010 and TR-017 as promising single-flowered lines for commercial cultivation. These genotypes offer potential for future varietal development and expansion of tuberose production in Bangladesh.

Collection and evaluation of tulip (*Tulipa sp*)

F.N. Khan, N. T. Hasan, M. M. R. Bhuyin, K. Ambia and Mt. Rashid

An observational study was carried out during the winter season of 2024 at the Floriculture Field, HRC, BARI, Gazipur to evaluate the phenotypic performance of eight tulip (*Tulipa* sp.) genotypes collected from different sources. The trial was conducted under shade net conditions to assess their adaptability, floral traits, and postharvest characteristics in the subtropical environment of Bangladesh. Significant variation was observed across genotypes for flowering time, plant height, flower diameter, vase life, and field longevity. Among the entries, T-001 (Laibela) was an early

bloomer (23 days to full bloom) and produced large, attractive red flowers with a vase life of 10 days. T-009 (Friendship) and T-008 (Clear Water) showed taller growth (up to 62.5 cm at full bloom), while T-011 (Sinfonie) exhibited the largest flower diameter (8.5 cm) and longest field life (43 days). Corm weight varied widely, with T-001 showing the heaviest corms (35.8 g). The results highlight considerable genetic variability among tulip lines and indicate the potential of certain genotypes, such as T-001, T-009, and T-011, for future tulip improvement and adaptation trials in Bangladesh's climatic context.

Collection, evaluation, characterization and maintenance of lilium

K. Ambia, F.N. Khan, N. Pervin, M. R. R. Bhuyin and N. T. Hassan

An evaluation study was conducted during the *rabi* season of 2024–25 at the Floriculture Research Field of HRC, BARI, Gazipur to characterize and conserve twenty-four Lilium (*Lilium* sp.) germplasm, including three BARI-developed lines. The trial was carried out under shade net and UV polyfilm structures to assess genetic diversity across morphological, floral, and postharvest traits. Significant variability was observed among the accessions for plant height, stalk and rachis length, number and size of florets, and vase life. Lil-029 recorded the tallest plants (88.2 cm), while BARI Lilium-1 exhibited the tallest stalks (81.5 cm) and the highest number of florets per stick (11.2). The longest vase life (11.1 days) was observed in BARI Lilium-2. Lil-036 produced the largest buds (13.6 cm) and the highest bulb weight (98.5 g), with a bulb diameter of 7.0 cm. Contrasting performance was noted in Lil-040, Lil-033, and Lil-026, which showed lower values in key traits. The findings indicate substantial genetic variation among the evaluated lines, with Lil-029, Lil-027, BARI Lilium-2, and Lil-036 identified as superior for use in future cut flower breeding and selection programs adapted to Bangladesh's growing conditions.

Collection and evaluation of chrysanthemum

K. Ambia, F.N. Khan, N. Pervin, M. R. R. Bhuyin, and N. T. Hasan

An evaluation study was conducted during the *rabi* season of 2024–25 at the Floriculture Research Field, HRC, BARI, Gazipur, to assess the performance of eleven Chrysanthemum (*Chrysanthemum* sp.) germplasms alongside two BARI-released check varieties. The trial was laid out in a completely randomized design using pot culture to characterize variation in morphological, floral, and postharvest traits. Significant differences were observed across genotypes in plant height, number of flowers per plant, flower diameter, stalk length, branching, and vase life. CM-001 emerged as the most promising line, producing the highest number of flowers per plant (165.0), the longest flower stalk (43.1 cm), and maximum tertiary branches (160.4), indicating superior ornamental potential. CM-005 showed the tallest plants (64.0 cm) and longest vase life (13 days), while CM-010 and CM-001 recorded the largest flower diameters (9.3 cm). Notable variation in flower colour, from deep pink and white to bicoloured forms, further underscored the genetic diversity within the germplasm set. The findings suggest strong potential for varietal improvement, with CM-001 identified as superior lines for cut flower under Bangladesh conditions.

Collection and maintenance of cactus and succulents

K. Ambia, N. T. Hasan, M. M. R. Bhuyin, M. T. Rashid and F.N. Khan

A morphological evaluation of thirty cactus and twenty-three succulent germplasms was conducted during 2024–25 at the Floriculture Research Field of HRC, BARI, Gazipur, with the objective of documenting vegetative variation and maintaining unique accessions for ornamental and research purposes. Germplasms were collected from multiple nursery sources and grown under standard cultural practices. Substantial variability was observed in plant habit, body coloration, spine structure, and vegetative architecture across both cactus and succulent accessions. Among the cactus entries, Gymnocalycium, Echinopsis, and Mammillaria species displayed distinct forms ranging from globular and columnar to flattened morphotypes, with wide variation in rib numbers, spine length, and clustering patterns. Noteworthy accessions such as Cac-026 (Brain Cactus), Cac-029 (Easter Cactus), and Cac-030 (Rat-tail Cactus) exhibited highly ornamental growth habits suitable for bonsai, hanging baskets, or pot culture. Succulent

germplasms also exhibited considerable diversity across genera such as Kalanchoe, Cryptanthes, Echeveria, and Euphorbia, with notable differences in leaf texture, color variegation, growth habit, and flowering potential. Accessions like S-008 (Kalanchoe), S-013/S-021/S-022 (Cryptanthes), and S-023 (Sweet Heart Hoya) were identified as highly suitable for indoor and landscape decoration. The wide phenotypic diversity observed in this study highlights the potential for future ornamental use, conservation efforts, and extended characterization involving floral traits, stress adaptation, and propagation strategies under subtropical conditions.

Evaluation, characterization and maintenance of gerbera

N. Pervin, F.N. Khan, M. R. R. Bhuyin, K. Ambia, M.T. Rashid and N. T. Hasan

Nine germplasm of *Gerbera jamesonii* were evaluated during the *rabi* season of 2024–2025 at the Floriculture Research Field, HRC, BARI, Gazipur to identify promising lines for cut flower production and future breeding. Substantial variation was recorded in both vegetative and floral traits among the evaluated accessions. Flower colour ranged from light pink to yellow, with GJ-002, GJ-007, and GJ-008 showing high ornamental value. The tallest plant (38.8 cm) was recorded in GJ-007, while GJ-008 produced the highest number of leaves (26) and flowers per plant (10.8). The largest flower diameter (11.3 cm) was observed in GJ-002, and the longest flower stick (60.8 cm) in GJ-007. Notably, GJ-007 exhibited the longest vase life (12.8 days), followed by GJ-002 (12.4 days). Significant differences were also observed in plant spread, flower stick diameter, and fresh flower weight. Based on flower colour, yield potential, size, and vase life, the germplasm GJ-001, GJ-002, GJ-007, and GJ-008 were identified as promising for commercial cut flower cultivation under subtropical conditions in Bangladesh.

Evaluation, characterization and maintenance of heliconia

N. N. Pervin, F.N. Khan, M. R. R. Bhuyin, K. Ambia, M.T. Rashid and N. T. Hasan

Seven Heliconia germplasms were evaluated during the 2024–2025 summer season at the Floriculture Research Field, HRC, BARI, Gazipur, to assess their morphological performance and identify promising lines for cut flower use. Significant variation was recorded among accessions in both vegetative and floral traits. Flower types included both erect and drooping forms, with colour ranging from orange, yellow, red, and reddish-orange to pinkish shades. The tallest plant (70.6 cm) was observed in H-002, which also recorded the highest number of bracts per stick (10.8), longest bract (16.8 cm), flower stalk (67.4 cm), and flowers per shoot (32.8). The maximum number of shoots per plant (12.7) and longest vase life (12.6 days) were recorded in H-004, while H-007 showed the largest flowering area (23.7 cm) and erect flower type with moderate floral traits. Based on flower orientation, colour, shoot production, and vase life, H-004 and H-007 were identified as superior germplasms with high ornamental potential. These accessions may serve as suitable candidates for further evaluation and breeding under subtropical conditions.

Evaluation, characterization and maintenance of foliage and ornamental plants

F. N. Khan, M. M. R. Bhuyin, N. Pervin, K. Ambia, M. T. Rashid and N. Tabassum

A germplasm evaluation study was conducted during 2024–2025 at the Floriculture Field of HRC, BARI, Gazipur, to characterize and maintain over 100 accessions of foliage and ornamental plants. The collected germplasms—comprising shrubs, climbers, palms, conifers, ferns, succulents, and various houseplants—were maintained under shade-house conditions and assessed for growth habit, propagation mode, and ornamental traits. Considerable variation was observed in propagation methods (e.g., stem cutting, seed, division), leaf morphology (e.g., variegation, size, shape), and adaptability to indoor environments. Notable species such as Aglaonema, Calathea, Philodendron, and Monstera exhibited high aesthetic value and indoor adaptability, making them ideal candidates for urban interior landscaping and dish gardens. The study also compiled practical propagation protocols based on plant type, contributing valuable resources for commercial floriculture. This characterization effort supports germplasm conservation and paves the way for future breeding and commercial utilization of ornamental foliage plants in Bangladesh.

Evaluation, characterization and maintenance of amaryllis

N. Pervin, F. N. Khan, K. Ambia, M. T. Rashid, M. M. R. Bhuyin and N. T. Hasan

A comprehensive evaluation of forty-six Amaryllis (*Hippeastrum sp.*) germplasms was conducted at the Floriculture Research Field, HRC, BARI, Gazipur during the 2024–2025 *rabi* season to assess their morphological diversity and flowering performance under pot culture. The study revealed substantial variability across vegetative and reproductive traits. The number of leaves per plant ranged from 2.6 to 6.9, with H-041 exhibiting the highest leaf count, while the longest leaf (65.4 cm) was recorded in H-040. Flowering initiation occurred earliest in H-010 (23.7 days), and bud bloom was fastest in H-026 (33.8 days). Floral traits varied widely: H-013 produced the largest flowers (19.2 cm), while H-027 recorded the highest flower count per plant (5). Notably, H-037 produced the highest number of sticks per pot (6.5), and H-018 showed prolonged blooming (8.5 days). The variability observed in flowering duration, stalk length, and bud development timing highlights the genetic potential for ornamental selection. Based on floral performance, plant vigor, and postharvest traits, the germplasms H-010, H-013, H-018, H-025, H-026, H-027, H-037, H-040, and H-041 were identified as promising candidates for future breeding and commercial cut flower use in Bangladesh.

Collection, evaluation and maintenance of water lily

N. T. Hasan, F.N. Khan, N. Pervin, K. Ambia, M. M. R. Bhuyin and M.T. Rashid

A study was conducted during August 2025 to June 2026 at the Floriculture Research Field, HRC, BARI, Gazipur, to evaluate the morphological diversity and flowering performance of twenty native and hybrid Nymphaea (water lily) germplasms. The experiment revealed significant variations in flower diameter, durability, and number of flowers per plant. Larger flowers (>10 cm) were recorded in native accessions N-001 and N-002 and in hybrid lines N-010, N-014, N-019, N-022, and N-023. The highest flower count per plant was observed in N-021 (15.0), while N-012 (12.25), N-005 (11.0), and N-014 (10.2) also showed superior blooming potential. Most genotypes maintained floral durability for 3 days, but N-016 exhibited extended vase life up to 4 days. In contrast, N-018, N-020, and N-021 showed shorter floral persistence (2 days). High coefficient of variation (CV%) in flower count (56.56%) and durability (19.66%) suggests substantial genetic diversity within the evaluated germplasm. The findings highlight promising candidates such as N-005, N-012, N-014, and N-021 for breeding, ornamental cultivation, and future conservation programs. Continued collection and evaluation of additional germplasm are recommended to enrich the water lily gene pool in Bangladesh.

Hybridization in gladiolus flower

F.N. Khan, N. T. Hasan, K. Ambia, N. Pervin, M.M.R. Bhyyin and Mt. Rashid

A long-term hybridization program was carried out at the Floriculture Research Field, HRC, BARI, Gazipur from November 2016 to June 2025 to develop new hybrid gladiolus lines with improved ornamental traits. A total of twenty controlled crosses were performed among visually attractive gladiolus genotypes. All crosses successfully produced pods, which matured within 30–45 days. Seeds from each cross generated a large number of cormels, which were planted and maintained annually to develop flowering-sized corms. Successive evaluations revealed significant variation among the F_1 hybrids in vegetative and floral characteristics. Among the twenty hybrids, GL hybrid 5 recorded the highest spike length (105.5 cm), while GL hybrid 13 produced the maximum number of florets per spike (15.5). Notably, GL hybrid 35 exhibited the heaviest flower stick weight (130 g), and GL hybrid 3 produced the largest single corm weight (85.8 g). Considerable genetic variation was confirmed by high coefficients of variation in traits such as flower stick weight (34.60%), corm weight (27.79%), and floret diameter (8.78%). Based on floral morphology, spike characteristics, and corm production, several hybrids including GL hybrid 5, GL hybrid 13, and GL hybrid 35 were identified as promising lines for future varietal development and commercialization.

Collection, evaluation and maintenance of rose

N. T. Hasan, F.N. Khan, N. Pervin, M. M. R. Bhuyin, K. Ambia and M.T. Rashid

A field experiment was conducted during May 2025 at the Floriculture Research Field, HRC, BARI, Gazipur, to evaluate five rose (*Rosa* spp.) genotypes (RS-001 to RS-005) for their morphological and qualitative traits under local agro-climatic conditions. The trial followed RCBD with three

replications. Significant variation was observed among genotypes in terms of plant height, number of branches, leaf area, petal number, prickle density, and fragrance. RS-002 exhibited superior plant height (78 cm), largest leaf area (12 cm²), highest petal count (20), and was completely thornless—making it a strong candidate for landscape and cut flower purposes. RS-001 showed the highest number of branches (7) and the strongest fragrance, though with the maximum number of prickles (33). Genotypes RS-003 and RS-004 displayed moderate fragrance with reduced prickle numbers (30 and 14, respectively), while RS-005 had the fewest prickles (11) but lacked fragrance. The observed genetic variability provides valuable insights for future rose breeding programs in Bangladesh, particularly toward developing thornless, fragrant, and aesthetically desirable cultivars suited for local markets.

Regional yield trial of heliconia

N. Pervin, F. N. Khan, M. M. R. Bhuyin, K. Ambia, N. T. Hasan and M. T. Rashid

A regional yield trial was initiated during the *Kharif* season of 2024–2025 at the Floriculture Field, HRC, BARI, Gazipur, to evaluate the performance of three promising Heliconia lines (H-004, H-005, and H-007) under local agro-ecological conditions. The objective was to identify suitable genotypes for cut flower production based on agronomic and floral traits. The experiment followed a randomized complete block design with three replications. Each pit (30 × 30 cm) received four plantlets per line, planted on 25 May 2025. Standard agronomic practices including fertilization and irrigation were applied uniformly. Data on plant height, shoots per plant, bracts per stick, bract and stalk length, flowers per shoot, flowering area, and vase life will be recorded at the flowering stage. Preliminary observations confirm healthy vegetative growth across all lines. The final evaluation will aid in selecting elite Heliconia lines for commercial floriculture and regional adaptability in Bangladesh.

Evaluation, characterization and maintenance of cactus at Jamalpur region

R. Sultana, M. Goffar, M. J. Rahman, H. Rahman, A Kter and H. E. M. K. Mazed

Nineteen cactus (Cactaceae) germplasm were collected from various nurseries and evaluated at the Regional Agricultural Research Station (RARS), Jamalpur, during 2024–2025. The germplasm were potted in a standardized growing medium (75% cocodust and 25% coarse sand) and maintained under uniform conditions. Significant variation was observed in vegetative and floral characteristics, including body shape, rib structure, spine morphology, and flowering behavior. Among the collected lines, Cac Jam-005 (Echinopsis calochlora), Cac Jam-012 (Opuntia), and Cac Jam-017 (Rat-tail Cactus) showed superior vigor, morphological uniqueness, and ornamental potential. These lines are recommended for further multi-location evaluation to assess adaptability and commercial viability under the agro-climatic conditions of Bangladesh.

Evaluation, characterization and maintenance of succulent at Jamalpur region

R. Sultana, M. Goffar, M. J. Rahman, H. Rahman, A Kter and H. E. M. K. Mazed

A total of 18 succulent germplasms were collected from different sources and evaluated during 2024–2025 at the Regional Agricultural Research Station (RARS), Jamalpur to assess their morphological diversity, adaptability, and ornamental value. The accessions showed substantial variation in leaf shape, size, coloration, growth habit, and floral characteristics. Standardized potting media (75% coco dust and 25% coarse sand) and uniform cultural practices were followed for all genotypes. Among the entries, S Jam-002 (Sansevieria) and S Jam-003 (Haworthia) exhibited vigorous vegetative growth and superior ornamental appeal. These genotypes demonstrated adaptability to local conditions and potential for commercialization in the ornamental plant sector. Further evaluation across seasons and locations is recommended to confirm their performance and stability under varying environmental conditions.

Evaluation, characterization and maintenance of climbing plant at Jamalpur region

R. Sultana, M. Goffar, M. J. Rahman, H. Rahman, A. Akter and H.E.M Khairul Mazed

A study was conducted at the Regional Agricultural Research Station (RARS), Jamalpur during 2024–2025 to evaluate, characterize, and conserve nine climbing plant germplasms collected from nurseries and natural sources. The accessions included Morning Glory (*Ipomoea purpurea*), Butterfly Pea

(*Clitoria ternatea*), Blue Petrea (*Petrea volubilis*), Bleeding Heart Vine (*Clerodendrum thomsoniae*), Allamanda (*Allamanda cathartica*), Star Jasmine (*Jasminum multiflorum*), Bougainvillea (*Bougainvillea* spp.), Madhobi Lota (*Hiptage benghalensis*), and Garlic Vine (*Mansoa alliacea*). These were grown in containers under uniform cultural conditions. Morphological evaluation revealed wide diversity in vegetative growth habit, floral traits, and ornamental potential. Notable variation was observed in leaf shape, flower color, scent, growth vigor, and blooming period. This preliminary characterization highlights the rich ornamental diversity of climbing plants and emphasizes the importance of expanding the germplasm base for future research, breeding, and landscape use in Bangladesh.

Evaluation, characterization and maintenance of orchid at Jamalpur region

R. Sultana, M. Goffar, M. J. Rahman, H. Rahman, A Kter and H. E. M. K. Mazed

A study was conducted at the Regional Agricultural Research Station, Jamalpur during 2024–2025 to evaluate the performance of eight Dendrobium orchid germplasms under shade net house conditions. The evaluated accessions were Dendrobium Alba (V1), Dendrobium Red (V2), Dendrobium Sonia (V3), Dendrobium Asian Beauty (V4), Dendrobium Paradise (V5), Dendrobium Piyaraddi (V6), Dendrobium Aggrigatum (V7), and Dendrobium Oncidium (V8). Significant variation was observed in vegetative and floral traits among the genotypes. Distinct differences in flower color and leaf pigmentation were recorded. These findings indicate the potential of certain germplasms for further selection and use in commercial orchid production in Bangladesh.

Cultural management

Standardization of potting media for better growth and yield of *dendrobium* orchid

N. T. Hasan , F.N. Khan, N. Pervin, K. Ambia, M. M. R. Bhuyin and M.T. Rashid

The study was conducted at the Floriculture Field of the Horticulture Research Centre, Bangladesh Agricultural Research Institute during 2025–2026 to evaluate the effect of different potting media on the growth and flowering of *Dendrobium* orchid. The experiment was laid out in a Completely Randomized Design with six treatments replicated three times using two-month-old seedlings. Treatments comprised T_1: Charcoal + Coconut Husk (50:50), T_2: Coconut Husk + Brick (50:50), T_3: Charcoal + Brick (50:50), T_4: Charcoal (100%), T_5: Coconut Husk (100%), and T_6: Brick (100%). Data on vegetative (plant height, number of leaves, leaf area) and reproductive (spike length, number of flowers, number of inflorescences) traits were recorded and analyzed statistically. Significant differences were observed among potting media for all measured parameters. The mixture of Charcoal and Coconut Husk (50:50) (T_1) produced the highest plant height (16.0 cm), number of leaves (9.6), leaf area (40.0 cm^2), spike length (20.0 cm), number of flowers per plant (12.7), and number of inflorescences (2.0), whereas Coconut Husk alone (T_5) recorded the lowest values for most parameters. The findings indicate that a potting medium comprising Charcoal and Coconut Husk in equal proportion provides optimal conditions for the growth and flowering of *Dendrobium* orchid under shade-net house conditions.

Foliar application of flora on growth and flowering of chrysanthemum

N. T. Hasan , F.N. Khan, N. Pervin, K. Ambia, M. M. R. Bhuyin and M.T. Rashid

A field experiment was conducted at the Floriculture Research Field of Horticulture Research Centre (HRC), BARI, Gazipur during 2025 to evaluate the effects of foliar application of Flora Hormone on the growth and flowering performance of Chrysanthemum morifolium (CM-011). The study followed a factorial Randomized Complete Block Design (RCBD) with three replications, incorporating four hormone concentrations (0, 1, 2, and 3 mL/L) and two application intervals (15 and 25 days). Significant variation was observed in both vegetative and floral traits across treatments. The application of 2 mL/L Flora Hormone (A_3), particularly at 15-day intervals (B_1), resulted in the best vegetative growth, producing the tallest plants (31.0 cm), largest leaf area (6.0 cm^2), and highest number of branches (4.9). This treatment also led to the earliest bud initiation (60 days), earliest flowering (75 days), largest flower diameter (4.9 cm), and highest flower count per plant (9.5). Statistical analysis confirmed significant effects of both hormone concentration and spray interval, as well as their interaction, on all parameters. These findings suggest that foliar application of Flora Hormone at 2 mL/L every 15 days optimizes vegetative growth

and enhances flowering traits in chrysanthemum cultivation under Bangladeshi conditions.

Performance of commercial cultivars of gerbera collected from various sources under protected condition

N. Pervin, F. N. Khan, N. T. Hasan, K. Ambia, M. M. R. Bhuyin and M.T. Rashid

An experiment was conducted during 2024–2025 at the Floriculture Division, Horticulture Research Centre (HRC), BARI, to evaluate the performance of commercial Gerbera (*Gerbera jamesonii*) cultivars collected from different sources under protected cultivation. Three seedling sources—KF Bio Plants (S1), Apex Agri-Science (S_2), and RRF (S_3)—were tested across six Gerbera color variants: Light Pink (V_1), White (V_2), Orange (V_3), Red (V_4), Magenta (V_5), and Yellow (V_6), following a two-factor RCBD. Significant variation was observed across all key growth and flowering parameters, including plant height, flower diameter, stalk length, flower weight, and vase life. The combination of Apex Agri-Science and Light Pink cultivar (S_2V_1) produced the tallest plants (39.33 cm) and longest flower stalks (68.66 cm), while the largest flower diameters (11.00–11.04 cm) were also recorded in S_2V_1 and S_3V_1. The highest single flower weight (41.00 g) was observed in Magenta Gerbera from Apex Agri-Science (S_2V_5), and the maximum flower production per plant (11.33) was noted in Red Gerbera from KF Bio Plants (S_1V_4). The longest vase life (11.66 days) was recorded in Magenta Gerbera from KF Bio Plants (S_1V_5). broadly, White, Orange, Red, and Magenta cultivars from KF Bio Plants (S_1V_2–S_1V_5), Light Pink and Magenta cultivars from Apex Agri-Science (S_2V_1, S_2V_5), and Light Pink from RRF (S_3V_1) were identified as the most promising combinations for commercial cultivation under protected environments in Bangladesh.

Research Caried out by Different Sections of HRC

Agricultural Economics and Statistics Section

Sustainable practices and adoption challenges in rose and gladiolus flower farming in Bangladesh

R. Islam

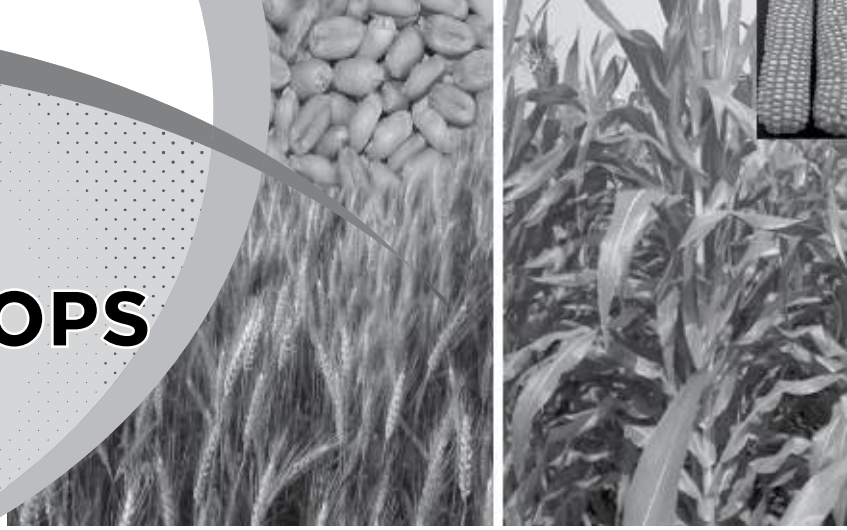
This study examined the sustainability and adoption challenges of rose and gladiolus cultivation in major flower-producing districts of Bangladesh—Rangpur, Jashore, and Cox's Bazar. Findings showed that floriculture, especially rose farming, was a profitable enterprise with favorable benefit–cost ratios (BCRs exceeding 1.00 across districts). However, profitability is largely achieved through heavy reliance on chemical fertilizers, pesticides, and costly planting materials, which threatens long-term soil health and environmental sustainability. Adoption of sustainable practices such as integrated pest management (IPM), organic fertilizers, efficient irrigation, and improved post-harvest handling remains moderate to low. Farmers generally recognized the benefits of soil health and profitability from sustainability but are less convinced of IPM's effectiveness and cost-reducing potential. Barriers to adoption included high input costs, lack of quality seedlings and bulbs, limited access to credit, weak extension and training services, and climate-induced risks, particularly in coastal areas. Regional differences are evident: Jashore shows higher productivity and profitability due to better market linkages and training, while Cox's Bazar faces major constraints in institutional support and climate-related vulnerabilities.

Plant Patholog Section

Efficacy of fungicides on botrytis blight of lilium

L. Yasmin, M. Afroz and M. M. Rahman, M. S. Ali and F. N. Khan

The experiment was conducted at Floriculture research field of Horticulture Research Centre, BARI, Gazipur during December 2024 to March 2025 to find out effective fungicides to manage the botrytis blight disease of lilium. Among the treatments, the lowest plant mortality (14.47%), incidence (60.0%) and PDI (18.0%) was found in T_2 treatment (Rovral 2gm/l) followed by T_1 treatment (Amistar top 1 ml/l), T_3 treatment(Autostin 2 gm/1) and T_4 (Luna sensation 2 ml/1) where plant mortality, disease incidence and PDI were18.41%, 21.0%, 23.27%; 65.0%d, 70.0%c, 75.0% and18.0%, 20.0%, 25.0%, respectively. The highest rachis length 42.27cm obtained from T_2 followed by T_3 (37.27cm), T_4 (37.0cm) and T_1 (36.0cm). The lowest rachis length 35.0cm and highest plant mortality (25.0%), incidence (90.0%) and PDI (50.0%) recorded in control treatment.



CEREAL CROPS

08

Introgression of recessive *nud* gene by combination of marker assisted breeding for hulless barley

Z. A. Talukder, A. Tabassum, M. M. Billah and R. Sultana

The hulless trait of barley was reported to be controlled by a17-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 in *rabi* season 2023-24 at BARI, Gazipur and produced 490 F_1 seed. In 2024-25, total 464 true F_1 plant was identified with *nud* gene specific marker. True F_1 plant crossed with two recurrent parents and produced 790 BC_1F_1 seed.

Hybridization of barley

Z. A. Talukder, A. Tabassum, M. M. Billah and R. Sultana

The experiment was conducted at the research field of Plant Breeding Division, Bangladesh Agricultural Research Institute, Gazipur during *rabi* 2024-25 to obtain new recombinant for developing high nutrient content and high yielding drought tolerant hull-less barley variety. Seven parental genotypes (BARI released variety and ICARDA lines) were crossed following 7×7 half diallel fashion. All the crosses successfully produced seeds which have been preserved and will be grown for confirmation trial in the next year.

Growing of F_1 generation of barley

S. Begum, M. M. Billah, Z. A. Talukder, A. H. Akhi, A. Tabassum and R. Sultana

The experiment was conducted to confirm F_1 population and identify the better cross combinations obtained from a 6×6 half diallel mating design at BARI, Gazipur. Six Parents and their 15 F_1s progenies were grown in single row in family block during *rabi* 2024-2025. Variation was observed among the genotypes for most of the traits studied. On basis of earliness, plant height, tillers per plant, 1000 grain weight and yield/plant the hybrids $P_1 \times P_2$, $P_1 \times P_3$, $P_1 \times P_5$, $P_1 \times P_6$, $P_2 \times P_3$, $P_2 \times P_4$, $P_4 \times P_5$, $P_5 \times P_6$ were selected for next year experiments.

Growing of f_2 generation of barley

Z. A. Talukder, M. K. Alam, M. M. Billah, A. H. Akhi and R. Sultana

Seventeen F_2 populations were evaluated for selecting desirable segregates. Based on earliness, tillering and yield/plant (26-71 g), 30 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 f_3 generation of barley

Z. A. Talukder, A. Tabassum, S. Begum, M. S. Akter and R. Sultana

Thirty-seven F_3 population were evaluated for selecting individual plants with desirable traits. Based on earliness, tillering and yield (15-62 g), 45 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 f_4 generation of barley

Z. A. Talukder, M. M. Billah and R. Sultana

Seeds of 70 genotypes were grown for selecting desirable plants. Based on earliness, tillering and

yield, 45 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 F_5 generation of barley

Z. A. Talukder, A. Tabassum, S. Begum, M. S. Akter, A. H. Akhi and R. Sultana

Seeds of 30 F_4 families were grown for selecting desirable plants. Based on earliness, tillering and yield, 23 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 F_6 generation of barley

Z. A. Talukder, A. Tabassum, S. Begum, M. S. Akter, M. K. Alam and R. Sultana

Seeds of one hundred and fifty F_6 family were grown for selecting desirable plants. Based on earliness, tillering and yield (19.5-51.5), 124 families were selected. The seeds of the plants were harvested, and threshing was done manually. The seeds were preserved for next year advancing.

Preliminary yield trial of barley

M. M. Billah, Z. A. Talukder, M. K. Alam, M. S. Akter and R. Sultana

Ten genotypes included two check varieties (BB-7 and BB-9) of barley were assessed to select the best barley lines at BARI Gazipur during *rabi* 2024-25. Considering earliness, yield and yield contributing characters 3 barley lines (E1, E3 and E7) were selected for next year advance yield trial.

Advanced yield trial of barley (Set-I)

Z. A. Talukder, S. Mondal, H. M. K. Bashar, K. Isalm and R. Sultana

Seven barley lines including two checks were evaluated at saline area (Satkhira, Khulna and Patuakhali) and non-saline area (Gazipur). The superior and stable genotypes were identified with GGE biplot and AMMI (Additive main effects and multiplicative interaction) models. Significant variation was observed among the lines and locations for all the traits. Based on results, grain yield was significantly dependent on environments (E), genotypes (G), and GEI. Significant yield reduction was recorded in almost all genotypes in saline environment compared to non-saline condition; however, some salttolerant genotypes showed minimal reduction in yield. BHL-33 produced highest yield in saline (2.6 t/ha) and non-saline condition (3.0t/ha) followed by BARI Barley -10 (Non-saline:2.7 t/ha; Saline:2.4 t/ha.) AMMI and GGE biplot analysis revealed that the BHL-33 and BB-10 genotype were selected under saline and non-saline condition. Among the lines, BHL-33 exhibited high K+/Na+ ratio and antioxidant enzymatic activity. Considering yield, K+/Na+ ratio and antioxidant enzymatic activity, BHL-33 were selected r as candidate variety.

Advanced yield trial of barley (Set-II)

Z. A. Talukder, S. Mondal, H. M. K. Bashar and R. Sultana

Twenty barley lines including one check were evaluated at saline area (Satkhira, Patuakhali) and non-saline area (Gazipur). The superior and stable genotypes were identified with GGE biplot and AMMI (Additive main effects and multiplicative interaction) models. Significant variation was observed among the lines and locations for all the traits. Based on results, grain yield was significantly dependent on environments (E), genotypes (G), and GEI. Significant yield reduction was recorded in almost all genotypes in saline environment compared to non-saline condition; however, some salttolerant genotypes showed minimal reduction in yield. Genotypes G4-4, G4-5, G4-6, G4-14, G4-16, G4-18, G4-37, G4-28, G4-32, G4-34 showed the higher K^+/Na^+ ratio and antioxidant enzymatic activity under saline condition. Considering yield, the K^+/Na^+ ratio and antioxidant enzymatic activity G4-4, G4-5, G4-6, G4-14, G4-16, G4-18, G4-27, G4-28, G4-32, G4-34 were selected for next year trial.

Advanced yield trial of barley (Set-III)

S. Begum, Z. A. Talukder, D. Halder, M. B. Sarker, M. H. Khan and R. Sultana

The experiment was conducted using seven barley advanced lines including two check varieties, BARI Barley 9 and BARI Barley 10 across four locations (Gazipur, Barisal, Jashore and Rangpur) of Bangladesh during 2024-25. 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-3 and F6/23E-4 were the most stable high yielding genotypes across the environments.

International barley yield trial for arid and semi-arid regions (IBYT-ASA-25)

A. Tabassum, Z. A. Talukder, M. M. Billah, M. S. Akter and R. Sultana

Twenty-three barley entries received from ICARDA and one standard check BARI Barley-9 was evaluated at BARI, Gazipur, during *rabi* 2024-2025 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 entries for next year trial.

International barley observation nursery (IBON-25)

A. Tabassum, Z. A. Talukder, S. Begum, M. K. Alam, M. S. Akter 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.

Growing of M_3 and M_2 generation of foxtail millet

M. M. Billah, Z. A. Talukder, M. M. Alam, M. S. Akter and R. Sultana

In several crops 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 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 seeds per plant. M_2 and M_3 generations have sown and selection was done at maturing stage. Seeds of different treatments were harvested and kept separately for future breeding program.

Observation trial of foxtail millet

M I Raid, Z A Talukder and M. M. Kadir

The experiment was conducted at RARS, Jamalpur, during *rabi* season 2024-2025 to find out the suitable foxtail millet genotypes for next year trial. Analysis was carried out for the characters such as days to heading, days to maturity, plant height, tiller number/plant, panicle length, weight of individual panicle, seed yield/plant, seed yield/plot, 1000 seed weight and yield. This experiment was carried out with fifteen foxtail millet genotypes including three checks. Among fifteen genotypes, six genotypes was produced more than 1.86 t/ha yield. Significant difference was found for all of the characters. Considering yield and yield contributing characters six lines i.e., BD-972, BD-1120, BD-1108, BD-1083, BD-954 and BD-1011 were selected for next year trial.

Advanced yield trial of foxtail millet germplasm

M. M. Hossain, M. B. Sarker and M. K. Islam

The experiment was conducted at Regional Agricultural Research Station, BARI Burirhat, Rangpur during the *rabi* season of 2024-25 with a view to developing high yielding foxtail millet variety considering earliness, yield and yield contributing characters. The experiment was laid out in a randomized complete block design with three replications. A total of eight foxtail millet genotypes including one check were evaluated in the study. Among the tested germplasm the highest grain yield per hectare (3.67t/ha & 3.62 t/ha) was obtained from the genotype BD-1154 and BD-1138. The lowest grain yield (2.80 t/ha) was obtained from the check variety.

Advanced yield trial of proso millet

M. M. Billah, M. Z. A. Talukder, M. K. Alam, M. S. Akter 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.

Regional yield trial of proso millet germplasm

M. M. Billah, M. Z. A. Talukder, M. K. Alam, M. S. Akter and R. Sultana

During *rabi* 2024-2025 a combined analysis was carried out for grain yield, days to heading and days to maturity, plant height, tillers/plant, spike length, weight of individual panicle and thousand grain weight of four proso millets germplasm including two checks viz. BC_1 and BC_2 across three different locations viz. Gazipur, Jamalpur and Jessore to find out the suitable genotypes across environments. Analysis of variance for different characters showed the presence of genetic variabilities among the lines. Considering overall mean grain yield across the locations BD1446 produced the highest yield (2.4 t/ha) followed by BD1402 (2.38 t/ha) and then checks BC1 (2.33 t/ha) and BC_2 (2.35 t/ha). These two genotypes out yielded than the check. So, based on overall mean yield and other desirable characters two proso millets genotypes i.e., BD1446 and BD1402 both are selected for large plot yield trial in the next year.

Preliminary yield trial of selected sorghum genotypes

Z. A. Talukder, S. Hossain, A. Tabassum, M. M. H. Khan and R. Sultana

The experiment was conducted to investigate the performance of the selected colored grain sorghum genotypes as preliminary yield trial and identify high yielding dwarf colored grain sorghum genotypes. A total of ten sorghum genotypes were used for a field trial conducted in three different environments such as Gazipur, Barishal and Hathazari using a randomized complete block design. Significant variation for genotypes (G), environment (E) and GEI was observed for the character studied. The environment of Gazipur and Barisal were poor for sorghum production whereas Hathazari was good. Among the sorghum genotypes entry-1 and entry-8 produced the highest yield (6.21 t/ha) followed by entry-2 (5.91 t/ha). Based on AMMI and GGE methods, Entry-1 and entry-8 exhibited higher yielder as well as stable over all environments. Considering the yield potentiality and stability parameter, varieties entry-1, entry-2, entry-8, and entry-9 were selected for next year trial.

Preliminary yield trial of sorghum genotypes for waterlogging tolerant at the field condition

Z. A. Talukder, M. M. Billah, A. Tabassum, M. S. Akter, M. K. Alam and R. Sultana

Waterlogging is one of the most important constraints for sorghum production and productivity in *kharif*-2 season in Bangladesh. A total 10 sorghum genotypes were evaluated at Gazipur during May 2025 with the aim to select excess soil moisture tolerant sorghum genotypes. Water was imposed at pre-flowering stage (75 days after flowering) of the genotypes. Water was released from the field after ten days of continuous waterlogged condition. Data on survival percentage of plant were taken seven days after the water were removed. The result showed that most of the plants across all genotypes survived in waterlogged condition. The experiment is still in the field. Data recording of yield and yield contributing characters are going on.

Estimation of antioxidant activity and phenolic compounds in sorghum [*Sorghum bicolor* (L.) Moench] grains

Z. A. Talukder, A. Tabassum, M. M. Billah and R. Sultana

Among cereals, sorghum, a gluten-free cereal is a rich source of bioactive polyphenols and dietary antioxidants. Antioxidant activities namely, Total phenolic content (TPC), Total flavonoids content (TFC) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) of ten sorghum genotypes with distinctive grain color (white, yellow, brown and red) were estimated. The result showed that significantly higher phenolic, flavonoid, and DPPH activity were observed in color sorghum grain compared with white color sorghum grain. The highest levels of TPC and TFC were found in Entry-5 and Entry-1, respectively, while Entry-2 showed the highest levels of DPPH activity. The lowest antioxidant activity such as TPC, TFC and DPPH activity was observed in white color sorghum entry-10 (BARI Sorghum-1). Therefore,

the genotypes of Orangish-red pericarp (entry-1), Red pericarp (entry-2), and Reddish-brown pericarp (entry-5) were identified to be promising for nutritionally rich sorghum.

Evaluation of m_5 mutants of oat created by gamma and chemical mutagen

A. H. Akhi and R. Sultana

A total of 50 M_5 mutant lines, generated through gamma irradiation and chemical mutagenesis, were evaluated for key yield and adaptive traits. Among these, 21 lines exhibited high grain yield potential, 9 lines showed early maturity, and 20 lines demonstrated short plant stature. High-yielding genotypes such as T11(2) recorded the highest thousand grain weight (39.1 g), maximum grain number per plant (363.7), and the highest plot yield (375 g) followed by T23. Among the early maturing mutant BOL5 (2), IO-5, and T4 being the earliest. Plant height ranged from 105–145 cm, with the shortest lines observed in T4 (1) (105 cm) and T2 (1) (120 cm). These findings highlight the potential of induced mutations in generating genetic variability and identifying promising lines with improved yield, early maturity, and short plant height, which may serve as valuable resources for future breeding programs.

Observation trial of exotic oat genotypes for high yield

A. H. Akhi, Z. A. Talukder and R. Sultana

An observation trial was conducted to evaluate 57 exotic oat genotypes for high yield potential and associated agronomic traits. Among the 57 genotypes only 34 produced seed. The genotypes showed considerable variation in days to heading (103–128), maturity (124–157 days), plant height (100–156 cm), number of tillers (5–8), fertile tillers (3–8), panicle length (19–36 cm), and 1000 grain weight (9.5–42.5 g). Plot yield ranged from 0.23 g to 3.82 g, with the highest yield recorded in BLACK OAT**,** followed by BARRA**,** HUSKEY, and MAYELLAN each producing over 3 g per plot. The observed diversity among genotypes highlights the potential for selecting promising lines for further testing and use in breeding programs aimed at improving oat productivity.

Advanced trial of oat genotypes for earlyness and high yield

A. H. Akhi, R. Sultana, M. I. Riad, M. H. Khan and B. Sarkar

Four genotypes of oat and one check variety (BARI Oat 1) were assessed for genotype environment interaction (GEI) and stability for the selection of promising one(s) in four agro-ecological zones 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 attributes. Regarding genotypes (G), significant variation was found for days to 50% flowering and thousand grain weight. Considering maturity BOL 5 showed earliness among the genotypes. The environment Rangpur was poor; but Gazipur, Barisal and Jamalpur were good for oat production. Considering bi~1 and (regression co-efficient), S^2di~0 (deviation from regression) genotype BOL 1 and BOL3 showed the higher yield as well as stable across locations.

Varietal identification and fingerprinting of bari released barley (*Hordeum vulgare* L.) Varieties using morphological descriptors and ssr markers

Z. A. Talukder, A. Tabassum, S. Begum and R. Sultana

Ten BARI released barley varieties were selected for identification DNA finger printing using morphological descriptors and SSR marker. Morphological characters of BARI released barley varieties were 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 hulless (BARI Barley-3, BARI Barley-6, BARI Barley-7, BARI Barley-8, BARI Barley-9 and BARI Barley-10). BARI Barley-9 produced the highest yield (2.70 t/ha) and BARI Barley-5 was early mature (95 days) variety. In this year 2025, 14 simple sequence repeat (SSR) primers were used for identification DNA finger printing of ten varieties. Out of these, 12 primers produced polymorphic profiles, while 2 were monomorphic. Cluster analysis based on SSR data clearly distinguished the varieties into two distinct groups: comprising hulless (group A) and hulled (group B).

Screening of barley genotypes (*Hordeum vulgare* L.) for drought tolerance at seedling stage on the basis of morphology using peg

S. Begum, M. M. Billah, Z. A. Talukder, A. H. Akhi, A. Tabassum, R. Sultana

Drought stress plays a pivotal role in plant growth. In order to evaluate PEG 6000-mediated water stress in barley (*Hordeum vulgare*) lines, a germination experiment was conducted. The seeds of 28 barley F_5 generation lines were subjected to PEG 6000 osmoticum and created five levels of osmotic stresses: T_1: Control (distilled water), T_2: 5% PEG 6000 (-0.05 MPa), T_3: 10% PEG 6000 (-0.15 MPa), T_4: 15% PEG 6000 (-0.30 MPa), and T_5: 20% PEG 6000 (-0.49 MPa). On the 7th day of treatment, data was taken on various germination parameters. The PEG stress treatments significantly changed the germination percent, root number, root length, plumule length, relative germination ratio (RGR), relative water content (RWC), and seedling vigor index (SVI). Of all the studied lines, based on their performance, it is concluded that barley lines such as P32, P42, P46, and P50 are found to be potential against drought stress over PEG treatments.

Development of gynoecious lines in cucumber (*Cucumis sativus*)

Z. A. Talukder, A. Tabassum, M. M. Billah and R. Sultana

The present experiment was carried out during *rabi* season 2024-25 at the Experimental Research field, PGRC, BARI to develop and maintenance of gynoecious line (Marufa, Paragon, Pusa cucumber and Keron super) by using chemicals to induce staminate flower for genetically selfing. The experiment was laid out in RCBD with three replications. The treatments consist of two chemicals viz., Gibberellic acid (300 and 500 ppm) and silver nitrate (300 and 500 ppm) along with control (distilled water) were sprayed at 2-3 true leaf stage at seven days interval till 10-15 leaf stage. Amongst the various treatments, chemical silver nitrate (300 ppm) induced maximum number of male flowers followed by silver nitrate (500 ppm) and gibberellic acid (500 ppm) whereas no male flower has been recorded in control treatment (Distilled water) in gynoecious cucumber lines. The selected gynoecious lines were selfed by hand pollination. The seeds from selected fruits were dried properly and kept them separately for advancing from S_1 to S_2 generation in the next season.

Collection and evaluation of papaya germplasm for yield and sex types (Set-I)

R. Sultana, Z. A. Talukder, A. Tabassum, M. M. Billah, M. S. Akter, M. K. Alam and I. Ahmed

Eleven 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.

Collection and evaluation of papaya germplasm for yield and sex types (Set-II)

R. Sultana, Z. A. Talukder, A. Tabassum, M. M. Billah, M. K. Alam and I. Ahmed

Performance of ten papaya genotypes collected from local market was studied at the Bangladesh Agricultural Research institute, Gazipur, during 2024-2025. Wide range of variability was found among the ten genotypes in all the studied traits. Among the genotypes, SK3 produced the highest fruit yield per plant followed by Babu. Rangpur-1 had the maximum average fruit weight (1463.3 kg) followed by SK3 (1370kg). The highest TSS (%) was recorded in Babu and shahi (11%). Considering yield potentiality, dwarfness and sweetness, Babu, Rangpur-4, Top lady, Red lady and SK3were selected for further breeding program.

Validation of specific-molecular marker for sex determination among papaya cultivars grown in Bangladesh

Z. A. Talukder, A. Tabassum, M. M. Billah and R. Sultana

Papaya (*Carica papaya* L.) is the one of important economical fruit plants in Bangladesh. Its sex-type determination in an early seedling stage is extremely significant for commercial production because it sufficiently accelerates the productive

hermaphrodite plants in orchard. The aim of this research was to validate the use of specific-molecular marker for sex determination among eight different papaya cultivars (Red Heart, Top lady, Red lady, Honey Queen, Babu, Bagan papaya, BRAC and Hajari) grown in Bangladesh. The result revealed that the SCAR-W11-F and SCAR-W11-R markers were very useful for detecting male and hermaphrodite of eight studied papaya cultivars, by giving the accurate PCR product approximately 830bp length in male and hermaphrodite but not in female. Furthermore, the new designed markers (PH2-F and PH1-R), were successfully useful to determine only in hermaphrodite of all validated papaya cultivars, by generating the PCR product (approximately 101bp length). These indicated that both molecular markers were greatly beneficial and valuable to identify the sex types of papaya plants at an early seedling stage.

Evaluation of papaya hybrids for short stature and high yielding

R. Sultana, Z. A. Talukder, A. Tabassum, M. M. Billah, M. K. Alam and A. N. S. Karim

Eight papaya hybrids, *viz*., Rangpur-1 × Deshi papaya, Babu × Rangpur-1, Babu × Rangpur-4, SK3 × shahi, Red lady × Rangpur-1, Deshi papaya × SK3, Papaya-3 × Babu, and SK3 × Top lady, along with their respective parents, were evaluated for fruit yield and quality. 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. Z. A. Talukder, M. M. H. Khan, M. J Alam, M.s Kabir. Mmh Khan. M.R. Islam, M.S Huda, M.B. Sarkar and R. Sultana

To disseminate and popularize as well as to increase pure seed stock of released barley varieties total 2465kg of barley seed viz. BARI Barley-6, BARI Barley-7, BARI Barley-8 BARI Barley-9 and BARI Barley-10 were produced at Eight different locations (Gazipur, Jamalpur, Burirhut, Rahmatpur, Ishurdi, Dinazpur, Debigonj and Takurgon).

Breeder seed production of foxtail millet, proso millet, sorghum, and oat varieties

M. K. Alam, M. M. Billah, M. Z. A. Talukder, M.M. H. Khan, M.S. Huda, M.B. Sarkar, M. I. Riad, M.S. Kabir, D. Halder, A. Tabassum, S. Hossain, M. J Alam, M. S. Akter and R. Sultana

The breeder seed is the first stage seed in the generation system of seed production. Total 2833 kg breeder seed of Foxtail Millet (Kaon), Proso millet (Cheena), Sorghum (Joar), and Oat (Joi) were produced at Gazipur, Jessore, Rahmatpur, Debigonj, Dinajpur, Hathazari, Jamalpur and Burirhut during *rabi* season 2024-2025.

Breeder seed production of finger millet, buck wheat, quinoa and chia varieties

M. K. Alam, Mm Billah, Z. A. Talukder, M. S. Huda, S. Hossain, M. B. Sarker, M. M. Hossain, M. S. Akter and R. Sultana

Seed production focuses on developing and producing high quality seeds of specific crop-varieties. Total 100 kg breeder seed of Finger millet, Buck wheat, Quinoa and Chia were produced in Gazipur, Rahmatpur, Hathazari, Dinajpur and Burirhat during *rabi* season 2024-25.

Maintenance and seed increase of barley lines

M. K. Alam, M. Z. A. Talukder, M. S. Akter and R. Sultana

Thirty barley lines were grown at BARI Gazipur for maintenance and seed increase during *rabi* 2024-25. A total of 7.618 kg seeds were obtained from 30 lines and stored to use in the breeding program for next year.

Maintenance and seed increase of foxtail millet germplasm

M. M. Billah, M. Z. A. Talukder, M. K. Alam, M. S. Akter and R. Sultana

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 40 kg seeds were preserved for future breeding program.

Technology transfer activities

M. M. Billah, Z. A. Talukder, M. K. Alam, M. S. Akter 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 emphasised 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 2024 - 25 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 Khulna and Rangpur. Demonstration trials were set at Rangpur, Bogura, Gaibandha, Munshigonj, Satkhira, Khulna. Besides, one seminar workshop was held at BARI, Gazipur and 2 field days were arranged at Hathazari, Chattagram and Sadar, Manikganj. Thirteen varieties were transferred throughout the countries. One leaflet (BARI Chia-1) and one annual report were published from the division.



AGRONOMY

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Crop Management

Effect of boron fertilization on yield and quality of BARI sarisha-18

J.A. Chowdhury, S. S. Kakon, 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 2024-2025 to find out the appropriate amount of boron fertilizer for optimum yield of BARI Sarisha-18. The experiment was comprised of 6 treatments viz. T_1= Control (no boron applied); T_2=1.5 kg/ha boron; T_3=1.75 kg/ha boron; T_4=2.0 kg/ha boron; T_5=2.25 kg/ha boron and T_6=. 2.5 kg/ha boron. The soil of the research area belongs to the Chhihata series under AEZ-28. Soils of the experimental plots were collected and analyzed. The soil was clay loam with pH 5.90 (slightly acidic), OC 1.44% (very low), total N 0.124% (very low), exchangeable K 0.0121 meq/100g soil (very low), available P 59.27 µg/mg (optimum), available S 31.16 µg/g (optimum), available Zn 0.474 µg/g (low) and available B 0.249 µg/g (very low). Organic carbon and Zn were under critical level in the soil. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 4.2 m × 3 m. The soil of experimental plots were fertilized at the rate of 120-36-90-27-3 kg/ha N P K S Zn (FRG,2018) as urea, triple super phosphate (TSP), muriate of potash (MoP), gypsum and zinc sulphate. Boron fertilizer was applied as boric acid according to experimental treatment set up. Half of N and all other fertilizer was applied as basal during final land preparation and rest N was applied as top dress at the time of flower initiation stage (25 days after sowing). Seeds were sown on 14 November, 2024 at the rate of 7 kg/ha seed and crop was harvested at 23 February 2024. Intercultural operations such as weeding, thinning, irrigation, spraying of insecticides and weedicides were done uniformly. For recording dry matter five plants from each replication were sampled at 30, 45, 60, 75, 90 DAS and at harvest. Different plant parts of the collected samples were separated and then oven dried at 80^0C for 72 hours. At harvesting stage, randomly 10 sample plants were uprooted from each unit plot to collect data on different yield contributing characters. Yield data was recorded by harvesting whole plot area excluding border line. Collected data were analyzed and the means were adjudged by using LSD at 5% level of significance. Cost and return analysis was also done considering local market price of harvested crop. 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 seeds/siliqua, seed yield, 1000-seed weight and harvest index (%). The highest number of siliqua/plant (130.13), number of seeds/siliqua (25.90), and 1000-seed weight (3.83 g) were obtained from the treatment T_6 (2.5 kg/ha boron). The highest seed yield (2666.67 kg/ha) was also found in the treatment T_6 (2.5 kg/ha boron) but all those parameters produced the statistically identical data in T_5 (2.25 kg/ha boron) Treatment. 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 siliqua 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.

Enhancement of zinc and iron micronutrients in potato through agronomic biofortification

M. A. H. Khan, S. S. Kakon, J. A. Chowdhury, M. R Karim, M.A. K. Mian and M. Z. Ali

Various approaches such as bio-fortification, nutrient supplementation, fortification and diet diversification have been implemented in order to

overcome micronutrient malnutrition. However, bio-fortification is considered as a long term and efficient method over the others due to the lack of socio-economic infrastructure. Agronomic bio-fortification refers to the use of mineral fertilizers to improve concentration of nutrients in edible crops and also positively effects the crop yield. The field experiment was conducted at the agronomy research field of Bangladesh Agricultural Research Institute, (BARI), Gazipur during *Rabi* season of 2024-2025 to assess the influence of foliar application of Zn and Fe on yield and nutrient concentration of potato. The experiment was laid out in a randomized compete block design with three replications. Soil sample were collected from the research field and soil analysis was determined in the Soil Science Division Laboratory, BARI, Gazipur. The treatment of the experiment were: T_1= RDF (control), T_2= RDF + Chelated Zn 4g/L foliar spray at 25 and 50 DAP, T_3= RDF + $ZnSO_4$ 15 kg/ha at basal dose T_4= RDF + $FeSO_4$ 5g/L foliar spray at 50 DAP, T_5= RDF + $FeSO_4$ 5g/L foliar spray at 50 DAP + Chelated Zn 4g/L foliar spray at 25 and 50 DAP,T_6= RDF + $FeSO_4$ 5g/L foliar spray at 50 DAP + $ZnSO_4$ 15 kg/ha at basal dose. Chelated Zn and $FeSO_4$ was dissolved in respected amount of water for foliar application. The unit plot size was 3.6 m × 3.0 m. The crop was fertilized with 135-30-135-15-4-1 kg/ha of NPKS Zn and B and cow-dung 5 t/ha, respectively (FRG,2018). All of organic manure, P, S, Zn and B and half of N and K should be applied as basal during final land preparation. Remaining half N and K should be applied at side dressing at 30 DAP during earthing up operation. Potato tubers were sown on 13 December 2024 with spacing of 60 cm × 25 cm and harvested on 16 March 2025. At harvest the number of tubers/plant, the weight of tubers/plant and the tuber weight were evaluated as yield components and tuber sample were collected for micro-nutrient determination. Ten tubers were collected as representative samples from selected tubers of each treatment and replicated for the analysis of micronutrients and dry matter. During processing the fresh weight of potato was recorded and at the end of drying the exact weight of the dry samples was collected to calculate the dry matter content. Data on yield and yield contributing characters were taken and statistically analyzed following Statistix-10 software package. Means were adjusted by LSD test at 5% level of significance. The higher tuber yield and higher concentration of Zn and Fe was found in T_3 (RDF + $ZnSO_4$ 15 kg/ha at basal dose), T_2 (RDF + Chelated Zn 4g/L foliar spray at 25 and 50 DAP), T_6 (RDF + $FeSO_4$ 5g/L foliar spray at 50 DAP + $ZnSO_4$ 15 kg/ha at basal dose) and T_5 (RDF + $FeSO_4$ 5g/L foliar spray at 50 DAP + Chelated Zn 4g/L foliar spray at 25 and 50 DAP). The result revealed that, the higher tuber yield, the higher Zn and Fe concentration of potato tuber was achieved in treatment T_5 (RFD + $FeSO_4$ 5g/L foliar spray at 50 DAP + Chelated Zn 4g/L foliar spray at 25 and 50 DAP). The result of this study might be used to further biofortification efforts and decrease nutritional deficiencies.

Effect of agroclimatic factors on BARI Begun-12

M. R. Karim, J. A. Chowdhury, S. S. Kakon, S. T. Zannat and M. A. K. Mian

A field experiment was conducted at the Agronomy Division, Bangladesh Agricultural Research Institute (BARI), Gazipur during the *Rabi* season of 2024–25 to evaluate how variations in sowing time and agroclimatic conditions influence the growth and yield of BARI Begun-12, and to develop a predictive model for yield forecasting under changing climates. The experiment consisted of four sowing dates-10 October (D_1), 20 October (D_2), 30 October (D_3), and 10 November (D_4) laid out in a Randomized Complete Block Design with three replications. Standard agronomic practices were followed and detailed phenological events and yield data were collected. Climatic data (temperature, rainfall, humidity, and sunshine hours were collected from the BARI Agro-meteorological Station, Gazipur). Results revealed that sowing date significantly affected the phenology and productivity of BARI Begun-12. Early sowing (10–20 October) led to shorter duration to flowering and fruiting set but produced the highest fruit yield (746.62 and 723.47 g/plant, respectively), as these plantings coincided with favorable maximum temperatures (28–30°C), higher sunshine duration (7–8 h/day) and greater thermal time accumulation (Growing Degree Days, GDD). In contrast, delayed sowing (30 October–10 November) was exposed to cooler temperatures at early stage, higher relative humidity (>80%) and occasional rainfall (>40 mm), leading to delayed flowering, reduced fruit set and lower yields (566–568 g/plant), largely due to increased pest

and disease pressure. Correlation and regression analyses demonstrated that yield was strongly and positively correlated with maximum temperature (r=0.84), sunshine hours (r=0.77), and GDD (r=0.72), while rainfall (r=0.62) had a significant negative impact. The regression model developed from this study predicted that yield increased by approximately 503 g/plant for every 1°C rise in maximum temperature (within the favorable range), but decreased by 21 g/plant with each additional millimeter of rainfall. These findings highlight the critical importance of sowing date adjustment to synchronize crop growth with favorable weather conditions. The study concludes that, sowing within 10–20th October ensures optimal climatic alignment for maximum productivity of BARI Begun-12 in central Bangladesh. Moreover, the developed weather-based yield prediction model provides a useful decision-support tool for planning climate-resilient brinjal production, enabling farmers and policymakers to optimize sowing schedules and mitigate risks associated with climatic variability.

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 2024 to March 2025 to find out yield performance of garlic under different integrated nutrient management at AEZ-9. The treatments were T_1= Recommended fertilizer dose (95-35-75-25-3-3 kg/ha N-P-K-S-Zn-B), T_2= IPNS+ poultry manure (1.5 t/ha), T_3= IPNS+ poultry manure (3.0 t/ha), T_4= IPNS+ vermicompost (1.5 t/ha), T_5= IPNS+ vermicompost (3.0 t/ha), T_6= IPNS+ FYM (1.5 t/ha), T_7= IPNS+ FYM (3.0 t/ha). The treatments were tested in randomized complete block design with 3 dispersed replications. The unit plot size was 3.0 m × 3.0 m and spacing was 15 cm × 10 cm. BARI Rosun-2 was used as test material. Rosun was sown on 26 November 2024 and harvested on 27 March 2025. Fertilizer was used as per treatment. Fifty percent N was applied as basal at the time of planting and remaining 50% N was applied in two equal splits during 30 and 45 days after sowing; full dose of P and K were applied at the time of planting and full dose of S was given fifty days before planting per treatments. Weeding, irrigation and other intercultural operations were done as and when necessary. The yield of garlic was calculated in t/ha considering the whole plot as harvest area. Ten plants of garlic from each plot were selected randomly to collect data on yield components. Collected data were analyzed statistically with the help of a computer package program STAR and the means were adjusted by Least Significance Difference (LSD) test at 5% level of significance. . The result indicated that garlic yield was increased due to integrated nutrient management. The highest garlic yield (11.57 t/ha) was found from IPNS+ poultry manure (3.0 t/ha) and the lowest yield (5.77 t/ha) was found from recommended fertilizer dose (95-35-25-3-3 kg/ha N-P-K-S-Zn-B) treatment. So it is concluded that integrated plant nutrient system (IPNS with manure (3.0 t/ha) is the best fertilizer combination for garlic production under AEZ-9.

Effect of priming with gibberellic acid on growth and yield of black cumin

M.S Huda, M.M Khanum and A.A. Tithi

The experiment was conducted at the research field of ARS, BARI, Rajbari, Dinajpur during *rabi* season of 2022-23 and 2024-25 to determine appropriate concentration of GA_3 and time of shrinking for treating black cumin to promote vigor/rapid seed germination and plant growth to improve its productivity. Treatments were T_1=30 m 00 ppm, T_2=30 m 50 ppm, T_3=30 m 100 ppm, T_4=30 m 150 ppm, T_5=60m 00 ppm, T_6=60m 50 ppm, T_7=60m 100 ppm and T_8=60m 150 ppm. GA3 were dissolved at 70% alcohol and different concentration of GA3 were prepared by adding water. Seeds were soaked in GA3 solution after 20 hr. soaking in water. For fertilization 40-16-30-10-1.0-0.7 kg/ha of N-P-K-S-Zn-B were used (FRG,2018). All of P-K-S-Zn and B were applied as basal during final land preparation. N was applied in two equal splits as top dressed at 30 and 55 DAS. Data were collected on Germination%, number of branches per plant, length of plant, yield contributing characters and yield (length of capsule, capsule diameter. number of seeds per capsule, number of capsules per plant, fresh seed yield per plant, dry seed yield per plant, 1000 seed weight: seed yield) and Cost and return. The collected data were analyzed statistically and means were adjudged by LSD test at 5% level of probability using R software package. The results indicated that the minimum

time for germination was recorded from 150 ppm GA_3 + 60minute soaking time, which is statistically similar with 100 ppm GA_3 + 60minute soaking time. The maximum yield (1.36 t/ha) was recorded from 150 ppm GA_3 + 30 minute soaking time which is statistically similar with 100ppm GA_3+ 30minute soaking time (1.30 t/ha). The soaking of black cumin seeds for 30 minutes in 100-150 ppm GA_3 is suitable for evenly germination and suitable yield.

Growth and yield of oat as influenced by different fertilizer levels

S. S. Kakon, M.Z.Ali, S.S.Nasreen and M. A. K. Mian

A field experiment was conducted at Agronomy Research Field, Gazipur of Bangladesh Agricultural Research Institute during *rabi* season of 2024-25 to assess the growth and yield of oat crop under nutrient management.Treatment included in the experiment were: T_1= 90-25-20 kg/ha of NPK (BARI),T_2 = T_1 + 25% NPK (112-31.25-25 kg/ha of NPK) ,T_3 = T_1 + 50% NPK (135-37.5-30 kg/ha of NPK) ,T_4 = T_1 -25% NPK (68-18.5-15 kg/ha of NPK) ,T_5 = T_1 -50% NPK (45-7.5-10 kg/ha of NPK) and T_6 = Control (Native fertility). The soil of the research area belongs to the Chhihata series under AEZ-28. The meteorological data of the experimental site revealed that the highest temperature prevails in March-April and the lowest in December to January. Maximum rainfall was received during the months of April .The crop received 105 mm rain showers from November to April in 2024-25 years. The average maximum (32.08 °C) was found in the month of March during the crop growing season and minimum (12.77 °C) temperature in the month of January during the crop growing season. Soils of the experimental plots were collected and analyzed. The physical and chemical properties of initial soil of the experimental plot has been taken. The soil was clay loam with pH 6.42, OC 1.09% (very low), total N 0.094% (very low), exchangeable K 0.097meq/100g soil (very low), available P 17.31 µg/mg (optimum), available S 17.57 µg/g (optimum), available Zn 0.629 µg/g (low) and available B 0.166 µg/g (very low). Organic carbon, N, K and B were under critical level in the soil. The experiment was laid out in a randomized complete block design with three replications and the unit plot size was 3m × 3m. Oat line was used in the experiment. Seeds were sown on 25 November, 2024 and harvested on 25 April, 2025.Fertilizers were applied as per treatment. Half N and all other fertilizer was applied as basal during final land preparation and rest N was applied at 25DAS. Data on growth parameters like leaf area and dry matter accumulation were measured at different dates with 15 days interval. For recording dry matter weight and leaf area, five plants from each replication were sampled at 30, 45, 60, 75, 90 DAS and at harvest. Different plant parts of the collected samples were separated and then oven dried at 80^0C for 72 hours. Leaf area was measured by an automatic leaf area meter (L13100 c, L1COR, USA).At harvest, the yield data was recorded plot wise. The collected data were analyzed statistically and means were adjudged by LSD test at 5% level of significance using Statistics 10 package. Different fertilizers level differed in leaf area index (LAI), total dry matter production (TDM), yield and yield components of oat. Results revealed that, fertilizer levels showed great influence on leaf area index (LAI), dry matter production and yield of oat. The highest LAI was recorded inT_3 ($N_{135}P_{370}K_{30}$kg/ha) treatment. Significantly the highest oat yield (1.15 t/ha) was observed inT_1 (90-25-20 kg/ha of NPK) treatment. Cost and return analysis revealed that the highest gross return (Tk.69000/ha) wasfoundinT_1 (90-25-20 kg/ha of NPK) treatment. But the highest benefit cost ratio (BCR) of 2.19-2.21 was obtained from $T_{1\ and}$ T_4 treatment. The results revealed that among the different fertility levels,T_1 ($N_{90}P_{25}K_{20}$ kg/ha) and T_4 (68-18.5-15 kg/ha of NPK)were found better in respect of yield due to economic returns which saving 10% NPKS for oat cultivation. $N_{68}P_{18}K_{15}$kg/ha and$N_{90}P_{25}K_{20}$ kg/ha were found the most suitable dose for obtaining higher yield and economic benefit in oat cultivation.

Productivity and quality of fodder oat as influenced by seed rate and cutting time

S. S. Kakon, J.A. Chowdhury, M. Z. Ali, S.T.Zannat, M.A H. Khan and M.A.K.Mian

The experiment was conducted during November 2023 to March 2024 at Grey Terrace Soils of Bangladesh Agricultural Research Institute farm, Gazipur. The objective of the study was to determine the optimum seed rate and cutting time for oat to produce maximum fodder yield and its effect on the quality of the fodder. The soil of the

experimental field was silty clay loam in texture with pH 5.8 belonging to Chhiata series under AEZ 28. There were two cutting time viz. C_1= 60 days after sowing (DAS) and C_2=70 days after sowing (DAS) and five seed rate viz. S_1= 70 kg/ha, S_2= 80 kg/ha, S_3=90 kg/ha, S_4=100 kg/ha, S_5= 120 kg/ha included the experiment. The experiment was laid out in randomized complete block design with three replications. The unit plot size was 3.6 m × 3 m. Fertilizers were applied @ 90-25-20-27-2-2 kg/ha N-P-K-S-Zn-B (Rahman *et al.*, 2021). Half N and full dose of other fertilizer should be applied as basal dose during land preparation. Remaining N fertilizer will be top dressed at 55-60 DAS (days after sowing) after irrigation in two equal splits and mixed thoroughly with the soil as soon as possible for better utilization. Seed of fodder oat were sown on 28 November 2024 with 20 cm x continuous sowing. Cutting of green fodder was done as per treatment leaving 6 cm at the bottom. The fodder was harvested as per cutting treatment and fodder yield was taken from whole plot. Five plant samples were collected from each plot, partitioned into different components and oven dried for calculating dry matter followed by chemical component analysis. Chemical component estimation for fodder quality was done at Bangladesh Livestock Research Institute (BLRI) Laboratory. Data on green fodder yields were analyzed statistically with the help of Statistics 10 Programme and the means were adjudged by using LSD at 5% level of significance. Economic analysis was also done. Fodder yield of oat was significantly affected by different seeding rate and cutting time. Fodder yield increased with increasing cutting time. Fodder yield and production efficiency were significantly influenced by cutting time and seed rate. It was found that 120 kg/ha produced the highest fodder yield (38.78 t/ha) when cutting was done at 70 DAS. Though the highest gross return (Tk. 154880 /ha) was obtained from T_{10} (120 kg seed rate /ha and cutting at 70 DAS) treatment but the highest benefit cost ratio (3.24) was found in T_9 (100 kg seed rate /ha and cutting at 70 DAS) treatment. The result revealed that the concentration (g/100g dry matter) of organic matter (OM) and ash% increased significantly with the decrease in crude protein (CP) content through advancing the cutting time. The result also revealed that cutting at 70 DAS and 120 kg seed rate /ha recorded significantly higher green fodder yield but cut at 60 DAS proved significantly better in terms of green (564.27kg/ ha/day) fodder production efficiency as well as quality parameters viz. crude protein (12.3%) and ADF content. From the result it might be concluded that higher fodder yield of oat could be obtained by using 100-120 kg seeds/ha when cutting was done 60 DAS with better profitability at Gazipur region (AEZ 28).

Growth and yield of barley as influenced by fertilizer and weed management

M. Z. Ali, J. A. Chowdhury, A. A. Begum, M. I. Hossain and M. A. K. Mian

The experiment was conducted at the research field of Agronomy Division BARI, Gazipur during *rabi* season of 2024-25. The soil of the research area belongs to AEZ-28. The soil was clay loam with pH 6.3. Six treatments viz., T_1 = 85-25-43-10-3-1.5 kg/ha N-P-K-S-Zn-B (100% use by Breeding Division) + herbicide spray (Pendimethalin 33% EC @ 1 L/ha) at 5 days before sowing (DBS) of barley seed + spading at 25 DAS, T_2 = 68-20-34-8-2.4-1.2 kg/ha N-P-K-S-Zn-B (80% of T_1) + herbicide spray (Pendimethalin 33% EC @ 1 L/ha) at 5 DBS of barley seed + spading at 25 DAS, T_3 = 51-15-26-6-1.8-0.9 kg/ha N-P-K-S-Zn-B (60% of T_1) + herbicide spray (Pendimethalin 33% EC @ 1 L/ha) at 5 DBS sowing of barley seed + spading at 25 DAS, T_4 = 34-10-17-4-1.2-0.6 kg/ha N-P-K-S-Zn-B (40% of T_1) + herbicide spray (Pendimethalin 33% EC @ 1 L/ha) at 5 DBS sowing of barley seed + spading at 25 DAS, T_5 = 34-10-17-4-1.2-0.6 kg/ha N-P-K-S-Zn-B (40% of T_1) + herbicide spray (Pendimethalin 33% EC @ 1 L/ha) at 5 DBS sowing of barley seed and T_6 = 43-13 kg/ha N-P (Farmer practice + No weeding) were used in the study as treatment variable. The experiment was laid out in a randomized complete block design with three replications. The unit plot size was 4 m × 5 m. Seeds of BARI Barley-9 were sown on 02 December 2024 with line to line spacing 25 cm in continuous line. The chemical fertilizers were used in the form of urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate and boric acid. All of organic manure half N-P-K-S-Zn and B were applied as basal dose during final land preparation and mixed thoroughly with the soil. Remaining half N fertilizer was top dressed at 25-50 DAS (days after sowing) after irrigation in two equal splits and mixed thoroughly with the soil as soon as possible for better utilization. A

light irrigation was given after sowing of seeds for uniform germination. In addition 5 t/ha of cow dung were applied before land preparation. Intercultural operation was done as and when required. Leaf area was measured by an automatic leaf Area Meter (L 13200, LICOR, USA). For dry matter estimation, 5 plants were sampled started from 15 DAE at 15 days interval up to harvest. Dry weight of the samples was taken after drying at 80^0C in an oven for 72 hours. Weed samples were collected using 50 cm × 50 cm quadrate, from randomly selected four places from each plot at 25 and 50 days after sowing (DAS). Weed dry weight was recorded carefully. Weed control efficiency (WCE) was calculated according to following formulas:

WCE (%) = $\left(\frac{A-B}{A}\right)\times 100$; where, A = Dry weight of weeds in no weeding plots and B = Dry weight of weeds in treated plots.

BARI Barley-9 was harvested on 07 March 2025. The yield component data was taken from 5 randomly selected plants prior to harvest from each plot. At harvest, yield and yield contributing characters were recorded and data analyzed statistically and mean separations were done by LSD test at 5% level of significance. Economic analysis was also done considering local market price of harvested crops. Among the treatments the lowest weed /m^2 (94) was found in T_1 treatment followed by T_2 (99) at 25 DAE and at 50 DAE the lowest weed was obtained from T_1 treatment (62) followed by T_3 (73). The highest weeds /m^2 (222 at 25 DAE and 263 at 50 DAE) was recorded in T_6 (Farmer practice). The number of weeds/m^2 was decreased in all the plots at 50 DAE than 25DAE. The maximum weed dry weight of 50.12 g/m^2 and 61.24 g/m^2 was recorded in treatment T_6 treatment (Farmer practice) at 25 DAE and 50 DAE, respectively. The minimum weed dry weight 7.21 g/m^2 and 5.75 g/m^2 were obtained from treatment T_2 at 25 DAE and at 50 DAE respectively. Higher number of weeds/m^2 and dry weight decrease the seed yield of barley. The variation in weed control efficiency (WCE) was observed among the different treatments. The highest weed control efficiency (WCE) 85.61at 25 DAE and 89.99% at 50 DAE was found in treatment T_2 respectively followed by T_1, T_3 and T_4 treatments. Among the treatments, highest LAI (4.12) was recorded in T_1 treatment followed by T_2, T_3, T_4 and T_5 treatments, respectively. The lowest LAI (2.81) was recorded in T_6 treatment.

Total dry matter (TDM) increases gradually with the advancement of plant growth. Total dry matter g/m^2 of barley influenced by the different dose of fertilizer and weed management method. TDM was increased gradually with the different level of applied fertilizer and weed management method. TDM increased slowly up to 60 DAE thereafter dry matter accumulation increased rapidly up to harvest. The highest TDM (2103.45 g/m^2) accumulation was obtained from T_1 treatment at harvest and it was higher than other treatments throughout the growing period and T_5 treatment (Farmer practice) produced the minimum TDM (1568.31g/m^2). The highest number of spikelet/spike (43.96), number of grains/spike (40.48), 1000-grain weight (37.44 g) and grain yield (2.97 t/ha) of barley were recorded in T_1 treatment and it was statistically identical with T_2 treatment (2.77 t/ha) followed by T_3 and T_4 treatments. The lowest grain yield (1.77 t/ha) was obtained from T_6 treatment (Farmers practice). Higher fertilizer dose and Pendimethalin spray @ 3 L/ha at 5 days before sowing (DBS) + hand weeding at 25 DAS gave the highest grain yield due to proper utilized the fertilizer and effective control of weeds by reduction in the dry matter of weeds and weed density which resulted in more spikes/m^2, grains/spike and finally grain yield. From the cost-benefit analysis it was found that the maximum gross return (Tk.148333/ha) and gross margin (Tk.82982/ha) was obtained from T_1 treatment but the highest benefit cost ratio 2.29 (BCR) was obtained from T_2 treatment due to lower cost of production and it was very close to T_1 and T_3, treatments. The lowest BCR (1.91) was obtained from T_5 (Farmer practice + no weeding) treatment. It might be conclude that fertilizer dose @ 68-20-34-8-2.4-1.2kg/ha N-P-K-S-Zn-B (80% of T_1) + Pendimethalin spray @ 3 L/ha at 5 days before sowing (DBS) and spading at 25 days after sowing of barley seed would be effective for higher economic return and weed control method for barley cultivation.

Effect of nutrient management on growth, yield and nutrient uptake in sorghum

S.S. Nasreen, A. A. Begum, M. A. H. Khan, J.A. Chowdhury, M. Z. Ali and M. A. K. Mian

A two-year field study was conducted at Agronomy Research Field, BARI, Gazipur, during *rabi* season of 2023-24 and 2024-25 to evaluate the impact

of different nutrient management levels on the growth, yield and nutrient uptake of sorghum. The experiment was conducted in RCBD with 3 replications consisting five treatments viz., T_1: 150-75-62.5-33.75-2.8-1.4 kg/ha of N-P-K-S-Zn-B; T_2: 120-60-50-27-2.8-1.4 kg/ha of N-P-K-S-Zn-B; T_3: 90-45-37.5-20.25-2.8-1.4 kg/ha of N-P-K-S-Zn-B; T_4: 60-30-25-13.5-2.8-1.4 kg/ha of N-P-K-S-Zn-B; T_5: Control (Native fertility). The unit plot size was 3m × 3m. BARI sorghum-1 seeds were sown on 29 November 2023 and 01 December 2024, respectively maintaining 60 cm line spacing and 10 cm plant to plant distance. One third N and all other fertilizer were applied as basal during final land preparation and rest N will be applied at 25 and 50 DAS in equal split. Data for growth analysis were taken at 35 DAS, 55 DAS, 75 DAS, 95 DAS, and 115 DAS in the year 2023-24. Chlorophyll content was measured using a SPAD meter (Model SPAD-502, Minolta crop, Ramsey, NJ). The yield component data was taken from 10 randomly selected plants prior to harvest from each plot. At harvest, the yield data was recorded plot wise. The collected data were analyzed statistically and means were adjudged by LSD test at 5% level of significance using Statistics 10.The highest SPAD value was observed at 60 DAS which declined progressively reaching the lowest at 90 DAS in all treatments. The highest values (from 28.1 at 35 DAS to -45.8 at 115 DAS) were observed in T_1 treatment all through the growing season. The TDM accumulation rate was slower up to 55 DAS then increased rapidly up to 95 DAS and then increased slowly up to harvest. TDM accumulation was less with native fertility and higher in higher dose of fertilizer (T_1) applied (1316 g/m2) at harvest. Grain yield was significantly influenced by nutrient levels. A general decline in seed weight and yield was observed across all treatments in 2024–25, possibly due to environmental factors. Thousand seed weight showed a clear nutrient response, with the highest values in T_1 and T_2 in both years. Thousand seed weight declined sharply in lower nutrient levels, particularly in T_5. Among the treatments, T_1(150-75-62.5-33.75-2.8-1.4 kg/ha of N-P-K-S-Zn-B) treatment produced the tallest plant (137 cm) and the highest yield (4.5 t/ha in 2023–24 and 3.6 t/ha in 2024–25) and T_2 (120-60-50-27-2.8-1.4 kg/ha of N-P-K-S-Zn-B) treatment also performed well, particularly in plant height (138 cm) and seed weight (39.5 g in 2023–24), although its yield was slightly lower than T_1 treatment. On the other hand T_3, T_4 and T_5 treatments showed a gradual decline across all parameters. Treatment T_5(Control) recording the lowest values in plant height, seed weight and yield in both years. Nutrient uptake (N-P-K and S) over two cropping years highlighted a positive correlation with sorghum grain yield. Sorghum's response to nutrient management varied significantly across years, with 2023-24 outperforming 2024-25 in yield and TSW. In conclusion, balanced and adequate nutrient application significantly enhanced sorghum growth and yield.

Growth and yield of sorghum as affected by row spacing

S. Akther, 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, Joydebpur, Gazipur during *Rabi* season of 2023-2024 and 2024-2025 to find out suitable planting geometry for getting higher yield of sorghum. Six treatments viz. T_1= 50 cm × 10 cm (20 plants/m^2), T_2= 50 cm × 15 cm (13 plants/m^2), T_3= 60 cm × 10 cm (16 plants/m^2), T_4= 60 cm × 15 cm (11 plants/m^2), T_5= 70 cm × 10 cm (14 plants/m^2) and T_6= 70 cm× 15 cm (9 plants/m^2) were used in the study. The trial was set up in randomized complete block design with three replications. Unit plot size was 3m × 3m. The crop was fertilized with 120-48-75-30-3-1.5 kg/ha N-P-K-S-Zn-B and 5 t/ha cowdung (BARI). One third of N and all other fertilizers were applied as basal. Rest N was applied at 25 and 45 DAS in two equal splits. A light irrigation was given after sowing of seeds for uniform germination. Three irrigations were done at 30 and 50 DAS and grain development stage. Thinning was done at 20 DAS and weeding at 25 and 45 DAS. Data on growth parameters like leaf area and dry matter accumulation were measured at different dates with 25 days interval. For recording dry matter weight and leaf area, three plants from each replication were sampled at 30, 45, 60, 75, 90 DAS and at harvest. Different plant parts of the collected samples were separated and then oven dried at 80^0C for 72 hours. Leaf area was measured by an automatic leaf area meter (L13100 c, L1COR, USA). Light interception (LI) by the crop was recorded at five times (30, 45, 60, 75, 90 DAS and at harvest) at around 11:30 am to 13:00 pm

by Sunfleck Ceptometer (Model Decagon, Pulman, Washington, USA). Four readings each of PARinc and PARt were recorded at different spots of each plot. The proportion of intercepted PAR (PARint) was calculated using the following equation and expressed in percentage (Ahmed *et al.,* 2010):

$$\text{Light interception } \{\text{PARint } (\%)\} = \frac{\text{PARinc} - \text{PARt}}{\text{PARinc}} \times 100$$

where, PARinc= Incident PAR, PARt= Transmitted PAR, PARint= Intercepted PAR

BARI Sorghum-1 was used in the experiment. Seeds were sown on 27 November, 2022 in 1st year and 28 November, 2023 in 2nd year and harvested on 17 April, 2023 in 1st year and 17 April, 2024 in 2nd year. At harvest 10 plants were randomly selected for collecting data on yield components. Grain yields were calculated on whole plot basis and adjusted at 14% moisture content. The collected data were analyzed statistically with the help of Statistics 10 program and mean separation was done by LSD at 5% level of significance. 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, T_1 (50 cm ×10 cm) gave the highest TDM. Significantly the maximum grain yield (4.56 t/ha at 2023-24 and 4.65 t/ha at 2024-25) was recorded from T_3 (60 cm × 10 cm: 16 plants/ m^2) treatment due to higher plant population. From the two years (2023-2024 and 2024-2025) study it may be concluded that plant spacing 60 cm × 10 cm (16 plants/m^2) is suitable for sorghum cultivation.

Effect of different types and rates of compost on yield and economic return of winter vegetables in Barishal region

M. M. Rahman and M. A. Rahman

An experiment was carried out at RARS, BARI, Rahmatpur, Barishal during 2024-25 to determine the effect of different types and rates of compost on yield and economic return of winter vegetables in Barishal region. The location represents the Ganges Tidal Floodplain (AEZ-13), characterized with a subtropical monsoon climate and a humid environment. The soil type is clayey loam. The land of the experiment is medium low that has been raised up as the sorjan system. The soil shows a neutral reaction in nature, low organic matter content, and overall low fertility level The experiment consisted of two factor with nine treatments viz., Factor A. Compost type: 3 (three), C_1 =Decomposed floating bed, C_3 = Cowdung and C_3 = Vermi-compost; Factor B. Compost rate: 3 (three) includes T_1 = RDF+ 1 t/ha, T_2 = RDF + 3 t/ha and T_3 = RDF + 5 t/ha and they produce nine treatment combinations. The experiment was laid out in randomized complete block factorial design (RCBD) having three replications. The unit plot size was 1.8×1.8 m^2. The cauliflower seeds were sown in seed bed during 18 October 2023, then after hardening of seedlings for 2 days, they were transplanted in to the main field in 15 November when they were 25 days old. The crop received N-P-K-S-Zn, and B nutrients at rates of 120, 60, 100, 24, 3.6, and 2.1 kg/ha, respectively, in the form of urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate, and boric acid (FRG, 2018) along with different types and rate of composts as per treatment specification. All the fertilizers except N and K were given during final land preparation and N and K were applied in three equal splits at 15, 30 and 50 days after transplanting using ring method followed by irrigation. Irrigation, mulching, weeding, plant protection and other intercultural operations were done as and when necessary as per the recommended production technologies of the crops (BARI, 2020). Ecofriendly pheromone traps and sticky traps were used to minimize the infestation of insect pests in the crops. Harvesting of all vegetables was done at their respective harvestable stages. Data were collection on yield parameters and yields of the crops. The plot yields were converted into ton/hectare. Data were analyzed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT). The number of days required for curd initiation ranged from 42 to 47 days, with the longest duration observed in plants treated with 5 t/ha of decomposed floating bed residue and the shortest in plants treated with 1 t/ha of vermicompost. The time taken for curd maturity was highest in treatment C_1T_3 (72.00 days) and lowest in treatment C_3T_1 (69.33 days). The heaviest individual curd was produced by plants treated with C_1T_3 (1.75 kg), while the lightest curd was obtained from plants treated with C_2T_1 (0.99 kg). The highest curd yield (48.54 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 t/ha of cow dung (27.78 t/ha). The highest gross return (970800 tk), net return (642650 tk) and BCR (2.96) were obtained from the treatment C_1T_3 which denotes as application of decomposed floating bed residue at the rate of 5 t/ha.

Effect of irrigation on yield of sunflower in Barishal region

M. M. Rahman and M. A. Rahman

The field trial was conducted at RARS, BARI, Rahmatpur, Barishal during 2024-25 to make an effective irrigation regime for getting maximum yield of sunflower. The location represents the Ganges Tidal Floodplain (AEZ-13), characterized with a subtropical monsoon climate and a humid environment. The soil type is clayey loam. The land of the experiment is medium low land. The treatments included various irrigation schedules: I_0 = No irrigation, I_1 = Irrigation at 35days after emergence (before flowering), I_2 = Irrigation at 55 days after emergence (during heading), I_3 = Irrigation at 75days after emergence (during grain filling), I_4 = Irrigation at 35 DAE + 55 DAE, I_5 = Irrigation at 35 DAE + 75 DAE, I_6 = Irrigation at 55 DAE + 75 DAE, I_7 = Irrigation at 35 DAE + 55 DAE + 75 DAE. The experiment was laid out in RCB design with three replications. The unit plot size was 6m×5m.The seeds are sown in line sowing method with row to row distance 50 cm and plant to plant distance 25 cm. The crop received N-P-K-S-Mg-Zn-B @ 105-36-84-24-6-2-1.6+2 kg/ha. Half of urea and full amount of other fertilizers will be broadcasted during final land preparation. The rest amount of urea was top dressed at 20-25 and 40-45 days after emergence of seedling. Weeding, plant protection and other intercultural operations were done as and when necessary as per the recommended production technologies of the crops. Data were collected and analysed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT).

Irrigation scheduling had significant impact on the growth characteristics of sunflower. The longest plant was obtained from treatment T_3 (110.96 cm) which was irrigated at 75 DAE and statistically similar with treatment T_6, T_4, T_5 and T_2 at 65 DAE. The shortest plant was found from T_0 (70.6 cm) with no additional irrigation. At harvest stage, the largest plant was obtained from treatment T_7 (120.36 cm), which was irrigated at 35, 55 and 75 DAE due to sufficient irrigation and statistically similar with treatment T_6 (115.74 cm), T_3 (111.05 cm) and T_5 (110.77 cm) and the shortest plant was found from T_0 (80.91 cm), which was controlled. The highest leaf area (8033.52 cm^2 at 65 DAE and 9275.88 cm^2 at 75 DAE) was obtained from T_7 treatment and the lowest (4729.74 cm^2 at 65 DAE and 5635.50 cm^2 at 75 DAE, respectively) was observed from T_0 treatment. Highest (40.57 g at 65 DAE and 48.87 g at 75 DAE, respectively) dry weight per plant was found from treatment T_7(irrigation at 35 DAE + 55 DAE + 75 DAE) treatment The lowest dry weight was found from treatment T_0 (26.25 g at 65 DAE and 28.52 g at 75 DAE). Irrigation interval significantly influenced thousand seed weight and yield. The increase in irrigation intervals affected sunflower yield. The highest yield (1967 kg /ha) was obtained from T_7 (irrigation at 35 DAE + 55 DAE + 75 DAE) treatment which was statistically similar to treatments T_6 and T_5 while the lowest seed yield was obtained from treatment T_0 (848 kg). The highest gross return (Tk. 165860/ ha), gross margin (Tk. 81260/ha) and benefit cost ratio (1.96) was found from T_7 (irrigation at 35 DAE + 55 DAE + 75 DAE) treatment which was followed by T_6 and T_5 treatments. Application of irrigation water at 35 DAE + 55 DAE + 75 DAE might be optimum for getting higher yield of sunflower in Barishal.

Effect of seasonal variation on growth and yield of foxtail millet (*Kaon*)

S.S. Nasreen, S. S. Kakon, J.A. Chowdhury, A. A. Begum, M. Z. Ali, M. A. H. Khan and M. A. K. Mian

A two-year field experiment was conducted during the *rabi* and *kharif*-1 seasons of 2023–24 and 2024–25 at the Agronomy Research Field, BARI, Gazipur, to evaluate the optimum sowing time for foxtail millet in the region. It was consisted 8 treatments (sowing dates): T_1: November 15, T_2: November 30, T_3: December 15, T_4: December 30, T_5: February 15, T_6: February 29 /March 01, T_7: March 15, T_8: March 30. It was done in randomized complete block design with 3 replications. The unit plot size was 3.0 m × 3.0 m. BARI Kaon-2 seeds were sown as respective dates as treatments. Fertilizer doses

for foxtail millet was followed by FRG, 2018 (50-20-35-8-1.5 kg/ha N-P-K-S-Zn respectively). Half of N and all other fertilizers were applied as basal during final land preparation of each sowing date and remaining N was top-dressed in two equal splits at 25 DAS (Days after sowing) and 60 DAS. The yield component data was taken from 10 randomly selected plants prior to harvest from each plot. At harvest, the yield data was recorded plot wise. The collected data were analyzed statistically using Statistics 10. March 30 (T_8) sowing was unsuccessful due to poor germination. Early sowing dates like T_1 (November 15) and T_2 (November 30) resulted in relatively good yields, particularly in 2024. In contrast, late sowing, especially T_7 (March 15), led to significantly lower yields, highlighting the negative impact of delayed planting. While some treatments showed strong performance in individual traits, T_6 demonstrated the most balanced and stable results across all measured parameters. In 2023-24, plant height varied widely, with the tallest plants observed in T_6 (93.2 cm) and T_4 (89.4 cm), while the shortest were in T_1 and T_2 (both around 51 cm). Panicle length followed a similar trend, being highest in T_4 and T_6 and shortest in T_1 and T_7. Seed weight was highest in early sowings (T_1, T_2, T_6), whereas the lowest seed weight was recorded in T_3. Yield was significantly higher in T_1, T_2, and T_6, and lowest in T_7 (0.50 t/ha), suggesting poor productivity with delayed sowing. In 2024-25, although plant height differences were not statistically significant, T_5, T_3, and T_6 maintained taller plant stature. Panicle length remained highest in T_3 and T_6, and shortest in T_4. Seed weight was again highest in T_4 and T_6, and lowest in T_5 and T_3. Yield followed a similar pattern as the previous year, with T_1 and T_6 showing the highest values, while T_3 and T_7 had the lowest. Early sowing dates (T_1: November 15 and T_2: November 30) in the *rabi* season, and February sowing ($T_{5 \text{ and}}$ T_6) in the *kharif* season, are suitable for maximizing the yield of foxtail millet in Gazipur. March sowing ($T_{7 \text{ and}}$ T_8) should be avoided due to low productivity and risk of crop failure.

Weed Management

Effect of integrated weed management on yield of mungbean

A. A. Begum, M. S. Alam, M. Z. Ali, S. T. Zannat and M. A. K. Mian

The field experiment was conducted at Agronomy Research Field of BARI, Gazipur and PRC, Ishwardi, Pabna during *Kharif*-1, 2025 to find out suitable weed management practice for controlling weeds in mungbean for getting higher seed yield and economic return. The soil of the research area belongs to the Chhihata series under AEZ-28 in Gazipur and an Aeric Haplaquept series under AEZ-11 in Ishwardi. The treatments in both locations were as follows: T_1 = Two HW at 15 and 30 DAS, T_2 = Bentazone 48 SL @ 2 L/ha at 15 DAS, T_3 = Pendametheline 33% EC @ 2 L/ha at 3 DAS, T_4 = Pendametheline 33% EC @ 2 L/ha at 3 DAS + 1 HW at 30 DAS, T_5 = Pendametheline 33% EC @ 2 L/ha at 3 DAS + Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 30 DAS, T_6 = Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 15 DAS, T_7 = Quizalofop-p-ethyl 10% EC @ 0.8 L/ha at 15 DAS + 1 HW at 30 DAS, T_8= BARI weeder at 15 and 30 DAS, T_9 = Spading at 15 and 30 DAS, T_{10} = No weeding (control). The experiment was set up in randomized complete block design with three replications. The unit plot size was 3.0 m × 3.0 m. Seeds of mungbean (BARI Mung-6) were sown @ 35 kg/ ha on 23 February 2024 in Gazipur and 18 March 2025 in Ishwardi maintained 30 cm row to row distance. Crop in both locations Fertilized with @ N_{18} P_{18} K_{24} S_{12} Zn_2 $B_{1.2}$ kg/ha as urea, triple super phosphate, Muriate of potash, gypsum, zinc sulphate and boric acid (FRG, 2018). All fertilizers were applied as basal during final land preparation. Two irrigations were applied, one at immediately after seed sowing and another at flowering stage (35 DAS) of crop in both locations. Thinning was done at 15 DAS maintaining plant to plant distance 8 cm. Intercultural operations such as mulching, applying insecticides were done as and when necessary same as both locations. Weed samples were taken at 25 and 45 DAS from 1 m^2 area in each plot using quadrate and weed population and dry weight were recorded in both locations. Weed control efficiency (WCE %) and intensity of weed infestation was calculated following Kundu *et al.* (2009) as:

$$\text{WCE (\%)} = \left(\frac{A - B}{A}\right) 100$$

Where, A = Dry weight of weeds in control plots and B = Dry weight of weeds in treated plots.

$$\text{Intensity of weed infestation (II)} = \frac{\text{Absolute density of weed spp./ unit area (m2)}}{\text{Absolute density of the crop plant/unit area(m2)}}$$

Mungbean harvested twice on 30 April and 10 May 2025 in Gazipur and on 19 May up to 15 June 2025 in Ishwardi. At harvest, yield and yield contributing characters were recorded and analyzed statistically following Statistix-10 software package. Mean was adjudged by LSD test at 5% level of significance in both locations. Economic analysis was also done considering local market price of harvested crop. Weed management practice showed great influence on weed population, weed dry matter, weed control efficiency (WCE), intensity of weed infestation, yield components and yield of mungbean in both locations. The common and dominant weeds during the period of experimentation in both locations were grasses like, Shyama (*Echinochloa crusgalli),* Khude Shyama (*Echinochloa colonum),* Chapra (*Eleusine indica),* Durba *(Cynodon dactylon),* Gitla ghas *(Paspalum distichum) and* Anguli *(Digitaria Spp.),* sedges like Mutha (*Cyperus rotundus) and* broad-leaved weeds like Bone palong (Rumex maritimus), Helencha (*Enhydra fluctuans),* Malancho *(Alternanthera philoxeroides),* Nunia *(Portulaca oleracea),* Hatishur *(Helitropium indicum)* kanai nala *(Cyanoties axillaries*) and shaknote *(Amaranthus viridis).*In Gazipur, the highest number of weeds/m^2 (290 at 25 DAS and 363 at 45 DAS) was recorded in T_{10} (No weeding) treatment and the lowest number of weeds/m^2 (65 at 25 DAS and 50 at 45 DAS) was found in T_1. The maximum weed dry weight of 78.00 and 130.00 g/m^2 were obtained in T_{10} (control treatment) at 25 and 45 DAS, respectively, followed by T_2 (28.23 g/m^2 at 25 DAS, 63.36 g/m^2 at 45 DAS) whereas, the minimum weed dry weight of 13.33 g/m^2 at 25 DAS and 23.33 g/m^2 at 45 DAS were found in T_1 treatment. In Ishwardi, the highest number of weeds/m^2 (305 at 25 DAS and 465 at 45 DAS) was also recorded in T_{10} (No weeding) treatment. The lowest number of weeds/m^2 (62 at 25 DAS and 58 at 45 DAS) was found in T_1 followed by T_4 (68/m^2 at 25 DAS and 65/m^2 at 45 DAS). The maximum weed dry weight of 93.50 and 125.19 g/m^2 were obtained in T_{10} (control treatment) at 25 and 45 DAS, respectively, followed by T_9 (40.55 g/m^2 at 25 DAS, 50.16 g/m^2 at 45 DAS) whereas, the minimum weed dry weight of 9.33 g/m^2 at 25 DAS and 12.33 g/m^2 at 45 DAS were found in T_1 treatment. The highest WCE (83% and 82% in Gazipur; 90% and 90% in Ishwardi) and the lowest intensity of weed infestation (1.5 and 1.3 in Gazipur; 1.3 and 1.3 in Ishwardi.) were found in T_1 treatment at 25 and 45 DAS, respectively. The highest seed yield (1295 kg/ha in Gazipur and 1545 kg/ha in Ishwardi.), gross return (Tk. 103595/ha and Tk. 123600/ha in Gazipur and Ishwardi, respectively) were observed in T_1 followed by T_4. But the highest BCR (2.39 and 1.90 in Gazipur and Ishwardi, respectively) was observed in T_4 treatment. The result revealed that treatment T_4 (Pendimethalin @ 2 L/ha at 3 days after sowing + one hand weeding at 30 days after sowing would be most economic and effective weed management practice with higher seed yield of mungbean during *Kharif* -1 season in both locations of Gazipur (AEZ 28) and Ishwardi (AEZ 11).

Effect of herbicides for controlling weeds in onion field

A. A. Begum, M.R. Islam, S. Akther and M. A. K. Mian

The experiment was conducted at Agronomy Research Field, Gazipur and the Regional Agricultural Research Station, Ishurdi, Pabna of BARI during 2024-2025 to find out the appropriate herbicide for controlling weed in onion field. Six treatments were included viz; T_1=Beenash (Oxidiazon 38%) @ 700 ml/ha, T_2 = Bounce30 WP (Bensulfuron methyl 12% + Bispyribac sodium 18%) @ 75g/ha, T_3 =Agristar 25 EC (Oxidiazon 25%) @ 1 L/ha, T_4= Dictate 46 SL (Bentazone Sodium 40%+MCPA potassium salt 6%) @ 2 L/ha, T_5 = Two hand weeding (HW) at 25 and 45 days after transplant (DAT), T_6= Control (No weeding). The experiment was laid out in a Randomized Complete Block design with three replications. The unit plot size was 3 m × 3 m. The crop was planted on 31 December 2024 and harvested on 28 March 2025 in both locations. Fertilizer was applied @ 105-45-90-30-3-1.4 kg/ ha of N-P-K-S-Zn-B (FRG, 2018), respectively. All amount of P, S, Zn, B and ½ of N and K were applied as basal during final land preparation. Remaining N and K were applied in two equal splits at 25 and 50 DAT. No weeding was done in case of herbicide applied plots. All herbicide were spraying at 2-3 leaf stage of weed. The data were analyzed by partitioning the total variance with the help of a computer using the R software program in Ishurdi and statistix-10 in Gazipur. The mean values were adjudged by LSD at 0.05 levels of probability in both locations. The highest WCE (81 and 82% in Gazipur; 81and 81% in Ishurdi) were

found in T_5 treatment at 30 and 50 DAT, respectively. The highest bulb yield (14.71 t/ha in Gazipur and 14.92 t/ha in Ishurdi), gross return (Tk. 588400/ha and Tk. 596800/ha in Gazipur and Ishurdi, respectively) and cost of cultivation (Tk. 286900/ha in both locations) were observed in T_5 followed by T_1. But the highest BCR (2.90 and 2.64 in Gazipur and Ishurdi, respectively) was observed in T_1 treatment followed by T_3 (2.65 and 2.59 in Gazipur and Ishurdi, respectively). The result revealed that two hand weeding at 25 and 45 days after transplant was found suitable weed management practice for controlling weeds in onion to get higher bulb yield. But post emergence herbicide Beenash (Oxidiazon 38%) @ 700 ml/ha and Agristar 25 EC (Oxidiazon 25%) @1 L/ha would be remunerative and effective herbicide for controlling weeds with higher bulb yield of onion during *rabi season* in Gazipur (AEZ 28) and Ishurdi (AEZ 11) regions.

Efficacy of different herbicides for controling weeds in onion field

M. Z. Ali, Sabikunnahar, A. A. Begum, S. S. Kakon and M. A. K. Mian

A field experiment was conducted at Agronomy research field of Bangladesh Agricultural Research Institute, Gazipur and Regional Agricultural Research Station, Cumilla, during the period from December 2024 to March 2025. Seven treatments viz., T_1 = Fair 33 EC (Pendimethalin 33%) @ 800 ml/ha spraying at 2-4 leaf stage of weeds, T_2 =Victor 33 EC (Pendimethalin 33%)@ 1000 ml/ha spraying on soil 1-2 days before transplanting, T_3= Super Clean 23.5 EC (Oxyfluorfen 23.5% EC) @750 ml/ha spraying at 3-4 days before onion seedling transplanting, T_4=Two hand weeding at 25 & 50 DAT and T_5 = Control (No weeding and no herbicide). The trial was set up in randomized complete block design with three replications. The unit plot size was 3 m × 3 m. The crop was fertilized with cowdung 10 t/ha and 140-60-120-40-4.5-2.1 kg/ha of N-P-K-S-Zn-B (FRG 2024) respectively. Cowdung was applied at the time of land preparation. All of P, S, Zn, B and ½ of N and K were applied as basal during final land preparation. Remaining N and K were applied in two equal splits at 25 and 50 days after transplanting followed by irrigation and mixed thoroughly with soil as soon as possible for better utilization followed by irrigation. Seedlings of onion variety (BARI Piaj-4) were transplanted at Gazipur on 23 December 2024 and 26 December 2024 at Cumilla maintaining the spacing of 15 cm × 5 cm. A light irrigation was given after transplanting. Weed samples were collected using 50 cm × 50 cm quadrate, from randomly selected four places from each plot as per treatment. Number and dry weight of weeds were recorded carefully. The weed control Efficiency (WEC) was calculated by the following formula.

$$\text{WCE (\%)} = \left(\frac{A - B}{A}\right) \times 100$$

Where, A = Dry weight of weeds in no weeding plots and B = Dry weight of weeds in treated plots. The crop was harvested on 12 April 2025 at Gazipur 19 April, 2025 at Cumilla. Yield and yield contributing characters were recorded and analyzed statistically and mean separations were done by LSD test at 5% level of significance. The maximum weed dry weight at 25 DAT (15.41 g/m^2 at Gazipur and 16.13/m^2 at Cumilla) and at 50 DAT (32.31 g/m^2 at Gazipur and 30.15 g/m^2 at Cumilla) was obtained in T_5 treatment (control plot), whereas, the minimum weed dry weight at 25 DAT (2.49 g/m^2 at Gazipur and 2.34 g/m^2 at Cumilla) and at 50 DAT (5.12 g/m^2 at Gazipur and 4.75 g/m^2 at Cumilla) was found in T_2 treatment followed by T_1, T_4 and T_3 treatments (Table 2). The variation in WCE was observed among different herbicides in both locations. The highest WCE at Gazipur (83.84% and 84.15%) was found at 25 and 50 DAT in T_2 treatment followed by T_4, T_1 and T_3 treatments (Table 2). Similar trend also observed in case of Cumilla. The highest WCE at Cumilla (85.49% at 25 DAT and 84.25% at 50 DAT) was found in the same treatment (T_2) followed by T_4, T_1 and T_3 treatments (Table 2). The target weeds of all herbicides were controlled 81-87% at 25-50 DAT in both the locations. The height of pseudo stem, single bulb weight and yield of onion were significantly influenced at both locations by applying different type of herbicides (Table 3). The tallest pseudo stem (56.61 cm at Gazipur and 53.86 cm at Cumilla), the highest single bulb weight (70.26 g at Gazipur and 69.22 g at Cumilla) and bulb yield (18.64 t/ha at Gazipur and 18.71 t/ha at Cumilla) were observed in T_4 treatment (Two hand weeding at 25 and 50 DAT). Among the herbicides treated plots the tallest pseudo stem (55.77 cm at Gazipur and 53.86 cm at Cumilla), the highest single bulb weight (65.02 g at Gazipur and 63.98g at Cumilla) and bulb yield (17.50 t/ha

at Gazipur and 18.02 t/ha at Cumilla) were obtained from T_2 treatment which was statistically similar with T_1 treatment in the both locations. Significantly the smallest pseudo stem (31.30 cm at Gazipur and 28.55 cm at Cumilla), the lowest single bulb weight (20.87 g at Gazipur and 19.84 g at Cumilla) and bulb yield (10.33 t/ha at Gazipur and 10 .45t/ha at Cumilla) were obtained from T_5 treatment in control treatment (No weeding and no herbicide). This may be due to low chlorophyll content and photosynthetic rates due to unchecked weed growth there by reducing availability of moisture, light and nutrients to the crop and resulted in loss of onion bulb yield in control plot. In both the location the maximum cost of cultivation Tk.286978/ha and the highest gross return (Tk.559200/ha at Gazipur and 561300 at Cumilla) were obtained from treatment T_4 (Two hand weeding at 25 & 50 DAT) but the highest gross margin (Tk. 327153/ha at Gazipur and Tk.342753/ha at Cumilla) and the highest benefit cost ratio (BCR) (2.65 and 2.73) were found in T_2 treatments at Gazipur and Cumilla respectively followed by $T_{1 \text{ and}}$ T_3 treatments due to lower cost of cultivation. The lowest gross return Tk.309900/ha and Tk.313500/ha and gross margin Tk.198851/ha and Tk.162515/ha was recorded in T_5 treatment (control, No weeding and no herbicide) in both the location at Gazipur and Cumilla respectively. The lowest BCR (1.95 at Gazipur and 1.96 at Cumilla) was obtained from T_4 treatment. Although T_4 treatment produced the highest bulb yield (18.64 t/ha at Gazipur and 18.71t/ha at Cumilla respectively) did not show the highest BCR due to the higher the cost of production. The results revealed that Fair 33 EC (Pendimethalin 33%) @ 800 ml/ha spraying at 7-8 days after transplanting (2-4 leaf stage of weeds) and Victor 33 EC (Pendimethalin 33%) @ 1000 ml/ha spraying on soil 1-2 days before onion seedling transplanting were found effective for controlling weeds in onion field and economically profitable for onion cultivation at Gazipur (AEZ-28) and Cumilla (AEZ-16) region.

Weed control in brinjal through intercropping

A. A. Begum, J.A. Chowdhury, S. S. Kakon, M. Z. Ali, S. Shanjida and M. A. K. Mian

A field experiment was undertaken at Agronomy Research Field of BARI during *rabi* season of 2024-2025 to find out the suitable intercrop with brinjal for weed control and higher productivity with monetary advantage. Treatments included in the experiment were: T_1= Brinjal (80 cm × 60 cm) + Spinach intercrop, T_2= Brinjal (80 cm × 60 cm) + Red amaranth intercrop, T_3= Brinjal (80 cm × 60 cm) + Coriander intercrop, T_4= Brinjal (80 cm × 60 cm) + Grasspea intercrop (twig used as leafy vegetables), T_5= Brinjal (80 cm × 60 cm) + Garden pea intercrop, T_6= Sole brinjal (80 cm × 60 cm) + 3 hand weeding at 20, 40 and 60 days after transplant (DAT) and T_7= Sole brinjal (80 cm × 60 cm) + No weeding/no intercrop (Control).The experiment was laid out in randomized complete block design with four replications and the unit plot size was 4m × 3m. The variety of brinjal was BARI Begun-8 and that of spinach was BARI Palongshak-1, red amaranth was BARI Lalshak-1, coriander was BARI Dhonia-1, grass pea was BARI Kheshari-6 and garden pea was BARI Motorshuti-3 were used in the experiment. Brinjal (35 days old seedlings) was transplanted on 1 December, 2024 and seeds of all vegetables were sown (broadcast) on 12 December, 2024 after establishment of brinjal seedlings. Three vegetables (spinach, red amaranth and coriander) were sown two times. Seeds of spinach and red amaranth were second time sown on 20 January, 2025 (after harvest of first time). Second time coriander seeds were sown on 22 February 2025 (after harvest of first time). The seeds of all vegetables were treated with provex at the rate of 3 g per one kg of seed. Fertilizers were applied at the rate of 140-48-140-20-3-1.5-4000 kg/ha of N- P- K-S- Zn- B, OF (FRG, 2018) as urea, triple super phosphate (TSP), muriate of potash (MoP), gypsum, zinc sulphate and boric acid for both sole brinjal and intercrop. Half of organic fertilizer and all of P, S, Zn and B were applied as basal during final land preparation. Remaining organic fertilizer were applied in pits before planting of seedlings. N and K were applied in three equal splits at 20, 40 and 60 DAT as ring method under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization. Besides this, 20 kg/ha of urea was top dressed in second time sowing of spinach, red amaranth and coriander at 15 DAS and at 30 DAS of gardenpea. Weed samples were taken at 40 and 70 DAT of brinjal from 1 m^2 area in each plot using quadrate and weed population and dry weight were recorded. Weed control efficiency

(WCE %) was calculated following Kundu *et al.* (2009) as:

WCE (%) = $\left(\frac{A-B}{A}\right)100$ where, A = Dry weight of weeds in control plots and B = Dry weight of weeds in treated plots. Data on yield contributing characters of brinjal were taken from randomly selected 5 plants from each plot. Yield of all crops were taken from whole plot area. Brinjal was harvested 4 times on 3 March, 10 March, 17 March and 6 April 2025. On the other hand, spinach and red amaranth were harvested 2 times on 17 January and 25 February 2025 (Every time 35 DAS of vegetable). Coriander and grass pea (twig as leafy vegetable) were harvested 2 times on 22 January and 5 March 2025 (Every time 40 DAS of vegetable). Garden pea was harvested on 17 February (65 DAS). Brinjal equivalent yield was computed by converting yield of intercrops on the basis of prevailing market price of individual crop following the formula of Bandyopadhyay (1984) as given below:

Brinjal equivalent yield = Yib + (Yix × Px)/ Pb

Where, Yib = Yield of intercrop brinjal, Yix = Yield of intercrop vegetable (spinach/red amaranth/ coriander/grass pea/garden pea), Pb = Market price of brinjal and Px = Market price of vegetable (spinach/red amaranth/coriander/grass pea/garden pea).

Collected data of all the crops were analyzed statistically with Statistix 10 and the means were adjudged by LSD test at 5% level of significance. Economic analysis was also done considering local market price of harvested crops. Weed management practice through intercropping with vegetables showed influence on weed population, weed dry matter, weed control efficiency (WCE), yield components and yield of brinjal. The highest weed population 95 and 146/m^2 were recorded in control plot at 40 and 70 DAT, respectively. The lowest weed population 11 and 12/m^2 were recorded in T_2 treatment at 30 and 70 DAT, respectively. Similar trend was observed in weed dry matter. Intercropping treatments showed 82-90% WCE and the highest WCE (90% both at 30 and 70 DAT) was recorded in T_2 treatment. All intercropping treatments showed better performance than sole brinjal (with and without weeding). Intercropping treatments showed 28.98-39.64 t/ha brinjal equivalent yield (BEY) which were 15-57% higher than sole brinjal (T_6). The highest BEY (39.64 t/ ha), gross return (Tk. 1189288/ ha), gross margin (Tk. 899558/ ha) and benefit cost ratio (4.10) were observed in Brinjal (80 cm × 60 cm) + Red amaranth intercrop. The results revealed that weed control in brinjal through intercropping might be higher productive and economically viable for brinjal production. Moreover, spinach and red amaranth intercrop with brinjal might be agronomically more feasible and economically more profitable at Gazipur region (AEZ- 28).

Effect of integrated weed management on yield of sesame

S.S. Nasreen, J.A. Chowdhury, A. A. Begum, S. S. Kakon, M. A. H. Khan and M. A. K. Mian

A field experiment was conducted at Agronomy Research Field of BARI, Gazipur during *Kharif*-1, 2025 to find out suitable weed management practice for controlling weeds in sesame for getting higher yield and economic return. The treatments were as follows: T_1= Pendimethalin 33% EC @ 2.5 L/ ha as pre-emergence, T_2= Pendimethalin 33% EC @ 2.5 L/ha as pre-emergence + one hand weeding at 25 DAS, T_3= Quizalofo-p-ethyl 5% EC @ 1 L/ ha as post- emergence (2-3 leaf stage of weed), T_4= Intercropping black gram (broadcast sowing) with sesame simultaneously, T_5= Two hand weeding at 25 DAS and at 45 DAS, T_6= No weeding (control). The experiment was set up in randomized complete block design with three replications. The unit plot size was 3.6 m × 3.6 m. Seeds of sesame (BARI Til-4) were sown @ 25 kg/ ha on 10March 2025maintained30 cm row to row distance. Fertilizers were applied at the rate of 75-30-60-21-2.6-2 of N-P-K-S-Zn-B Kg/ha as urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate and boric acid (FRG, 2018). Half of N and all other fertilizer was applied as basal during final land preparation and rest N was applied at 25 –35 DAS. Two irrigations were applied, one at immediately after seed sowing and another at flowering stage (35 DAS) of crop. Intercultural operations such as thinning, applying insecticides were done as and when necessary. Weed samples were taken at 25 and 45 DAS from 1 m^2 area in each plot using quadrate and weed population and dry weight were recorded. Weed control efficiency measures the efficiency of any weed control treatment in reducing the weed biomass production in comparison to weedy

treatment (Mani 1968). Mathematically, it could be expressed as below.

WCE (%) = $\left(\frac{A-B}{A}\right)100$ where, A = Dry weight of weeds in control plots and B = Dry weight of weeds in treated plots.

Sesame was harvested on 01June 2025.Atharvest yield and yield contributing characters were recorded and analyzed statistically following Statistix-10 software package. Mean was adjudged by LSD test at 5% level of significance. Economic analysis was also done considering local market price of harvested crop.

Weed management practice showed influence on weed population, weed dry matter, weed control efficiency (WCE) and yield of sesame. Number of weeds, weed dry weight, WCE and intensity of weed infestation have been affected by different weed control method. The common and dominant weeds during the period of experimentation were grasses like, Shyama (*Echinochloa crusgalli),* Chapra (*Eleusine indica) and* Anguli *(Digitaria Spp.),* sedges like Mutha (*Cyperus rotundus) and* broad-leaved weeds like Helencha (*Enhydra fluctuans),* Malancho *(Alternanthera philoxeroides),* Kanai banshi *(Commelina benghalensis),* kanainala *(Cyanoties axillaries) and* Shaknote *(Amaranthus viridis).* The highest WCE (94% at 45 DAS) and the lowest intensity of weed infestation (18. at 45 DAS) were found in T_2(Pendimethalin 33% EC @ 2.5 L/ha as pre-emergence + one hand weeding at 25 DAS) treatment. The highest seed yield (0.98 t/ha), gross return (Tk.98000/ha) and cost of cultivation (Tk.56500/ha) was observed in T_5 followed by T_2. But the highest BCR (1.90) was observed in T_2(Pendimethalin 33% EC @ 2.5 L/ha as pre-emergence + one hand weeding at 25 DAS) treatment followed by T_1 (1.88). From the result it may be concluded that among all treatments T_2 (Pendimethalin + one hand weeding) treatment provided the best combination of weed suppression and yield enhancement. Highest weed control efficiency was recorded in T_2 treatment which was followed by T_1 correlating with improved yield.T_4 and T_6 exhibited poor weed suppression, especially T_6 with no control measures.T_5 also achieved good WCE, validating the efficacy of manual weeding. Highest yield was observed in T_5 (0.98 t/ha) followed closely by T_2(0.97 t/ha), demonstrating the effectiveness of two hand weeding and integration of chemical + manual control. Lowest yield occurred in T_6 (0.62 t/ha) where no weed management was implemented. Despite higher plant height in T_6 and T_3, yield was compromised due to increased weed competition, especially with higher dry matter accumulation in weeds.

Effect of different weed control method of chia

M. A. H. Khan, J. A. Chowdhury, S. S. Kakon, M. Z. Ali, S. Akhter, M. R. Karim 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 2024-2025 to find out the effective and economic weed control method for chia cultivation. Treatments included in the experiment were: T_1 = One hand weeding at 30 DAS, T_2= Two hand weeding at 30 and 45 DAS, T_3= One weeding by BARI dry land weeder at 30 DAS, T_4= Herbicide Pendimethaline @ 1.5 L/ha spraying as pre-sowing, T_5= Herbicide Quizalofop-p-ethyl @ 1 L/ha spraying as pre-sowing, T_6= Oxyfluorfen 24% @ 700 g/ha as pre-sowing, T_7= No weeding. The experiment was laid out in a RCB design with three replications. The unit plot size was 3.0 m × 3.0 m. The crop was fertilized with 60-40-50 -8 N-P-K-S kg /ha, respectively (Mary *et al*., 2018). One third N and all other fertilizer were applied as basal during final land preparation and rest N was applied at 25 and 50 DAS in equal split following irrigation. The seed were sown on 8 December and 29 November 2024 and harvested on 20 March and 15 March 2025 at Gazipur and Cumilla, respectively. Weed samples were collected from randomly selected four places by using 50 cm × 50 cm quadrate from each plot at 25 and 45 DAS. Number and dry weight of weeds were recorded carefully. Weed control efficiency (WCE) was calculated according to following formula of Mian *et al.* (1973): WCE (%) = $\left(\frac{A-B}{A}\right)\times100$ where, A = Dry weight of weeds in no weeding plot and B =Dry weight of weeds in treated plot. Data on yield and yield contributing characters were taken and statistically analyzed following Statistiz-10 software package. Means were adjusted by LSD test at 5% level of significance.

Result showed that weed dry weight (g/m^2) and weed control efficiency (WCE) and yield of chia

was significantly influenced by weed management. The maximum dry weight of 24.30 g/m^2 at 25 DAS, 29.41 g/m^2 at 45 DAS and 9.43 g/m^2 at 25 DAS, 59.62 g/m^2 at 45 DAS were obtained in T_7 (control) at Gazipur and Cumilla, respectively, whereas the minimum dry weight of 3.99 g/m^2 at 25 DAS in $T_{5\ and}$ 7.34 at 45 DAS in T_4 was found in Gazipur and 1.49 g/m^2 at 25 DAS in $T_{2\ and}$ 7.41 g/m^2 at 45 DAS in T_1 was observed in Cumilla. The highest weed control efficiency (WCE) was found 83.40% at 25 DAS in T_5 and 74.56% at 45 DAS in T_2 at Gazipur and 79.90% at 25 DAS in T_2 and 84.52% at 45 DAS in T_4 was observed in Cumilla. The highest seed yield (1517 kg/ha and 1747 kg/ha) was found in T_6 (Quizalofop-p-ethyl @ 2 L/ha spraying as pre-sowing) treatment at Gazipur and Cumilla, respectively. The lowest seed yield (1038kg/ha at Gazipur and 1747 kg/ha at cumilla) was recorded in control (T_7) treatment. . The result of the experiment revealed that, herbicide Pendimethaline @ 1.5 L/ha spraying as pre- sowing, Quizalofop-p-ethyl @ 1 L/ha spraying as pre-sowing and Oxyfluorfen 24% @ 700 g/ha as pre- sowing were the most effective and economic weed control method for chia crop cultivation. From the result it may be concluded that, Pendimethaline @ 1.5 L/ha spraying as pre- sowing, Quizalofop-p-ethyl @ 1 L/ha spraying as pre-sowing and Oxyfluorfen 24% @ 700 g/ha as pre- sowing might be effective and economic weed control method for chia crop cultivation.

Effect of integrated weed management of soybean

S. T. Zannat, M. A. Rahman, A. A. Begum, S. Akhter and M.A.K Mian

A field experiment was conducted at Agronomy Research Field of Bangladesh Agricultural Research Institute, Gazipur and RARS, Barishal during *rabi* season 2024-25 to find out the performance of different weed management practices in soybean field. The soil of Gazipur and RARS, Barishal were silty clay loam and clay loam in texture with pH 6.3 and 6.5 belonging to Agro Ecological Zone (AEZ) 28 and 13, respectively. The treatments were: T_1 = Pendamethylene @ 1.5 L/ha spraying as post sowing + one hand weeding at 45 DAS, T_2 = Pendamethylene @1.5 L/ha spraying as post sowing, T_3 = Glufosinate Ammonium @ 1.5 L/ha spraying as post sowing + one hand weeding at 45 DAS, T_4 = Quizalofop-p-ethyle @ 2-3 L/ha spraying as post sowing + one hand weeding at 45 DAS, T_5 = Mulching with straw (5-6 cm) after sowing, T_6 = Two Hand weeding at 25 and 45 DAT and T_7 = Control (No weeding). The trial was set up in randomized complete block design with three replications. Sowing was done on 14 January, 2025 at Gazipur whereas at RARS, Barishal sowing was done on 19 December 2024 due prevailing weather and temperature. The unit plot size was 3 m × 3 m. Test crop was BARI hybrid soybean-7. The crop was fertilized with cow dung (3 t/ha), 32-40-80-20-3.0-1.5 kg/ha of N-P-K-S-Zn-B respectively (FRG' 18) in the form of urea-TSP-MoP-gypsum-zinc sulphate and boric acid. All Fertilizers should be applied as basal dose during final land preparation and mixed thoroughly with soil as soon as possible for better utilization. A light irrigation was given after sowing for uniform emergence of seeds. Weed samples were collected from randomly selected four places from each plot at 25 and 45 days after planting. Harvesting was done on 6 May, 2025 at Gazipur and on 7 April, 2015 at Barishal. Yield and yield contributing characters were recorded and analyzed statistically using "STAR" software package and means were separated by LSD at 5% level of significance. Economic analysis was performed considering the prevailing market price of applied inputs and output of soybean. Results showed that the highest number of weeds/m^2 (94/m^{2}at 25 DAS and 174/m^2 at 45 DAS in Gazipur and 67/m^2 at 25 DAS and 168/m^2 at 45 DAS in Barishal) recorded in T_7 (No Weeding) treatment. Maximum Weed dry weight (144.51 g/m^2 at 25 DAS and 284.98 g/m^2 at 45 DAS in Gazipur and 40.18 g/m^2 at 25 DAS and 231.75 g/m^2 at 45 DAS in Barishal) found in controlled plots. Whereas, highest weed control efficiency (88.05% at 25 DAS and 89.10% at 45 DAS at Gazipur and 90.06% at 25 DAS and 93.44% at 45 DAS in Barishal) found in T_1 (Pendamethylene @ 1.5 L/ha spraying as post sowing + one hand weeding at 45 DAS) treatment. Significantly, the highest yield (2.09 at Gazipur and 2.14 t/ha at Barishal) was observed in T_1 (Pendamethylene @ 1.5 L/ha spraying as post sowing + one hand weeding at 45 DAS) treatment. The highest gross margin (34728 Tk/ha at Gazipur and 38280 Tk/ha at Barishal) and BCR (1.71 at Gazipur and 1.81 at Barishal) showed in T_1 (Pendamethylene @ 1.5 L/ha spraying as post

sowing + one hand weeding at 45 DAS) treatment. From the result it may be concluded that, spraying Pendamethylene @ 1.5 L/ha as post emergence followed by one hand weeding at 45 DAS would be cost effective and economically profitable and effective for controlling weed in soybean field.

Multiple Cropping

Improvement of cropping pattern through chilli-vegetable intercropping system

J.A. Chowdhury, S.S.Kakon, M. Z. Ali 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 2024-25 to find out suitable inter crop based cropping pattern for higher productivity. Six treatments of cropping sequence were: CP_1=Chilli (100%) + gardenpea (40%) – T. *aman* – T. *aman,* CP_2=Chilli (100%) + bushbean (40%) - T. *aus* – T. *aman*, CP_3=Chilli (100%) +red amaranth (66%) –T. *aus* –T. *aman* CP_4=Chilli (100%) + spinach (66%) – T. *Aus* - T. *aman*, CP_5= Chilli– T. *aus* - T. *aman,* CP_6= Potato- T. *aus* (15 cm×15 cm)- T. *aman* (25cm×20 cm) (Farmers' practice). The experiment was laid out in a RCB design with 3 replications. The unit plot size was 4 m × 4.8 m. Different dates of operation and durations followed are described. A pre-sowing irrigation was given for proper emergence of the crops. Vegetable yield was taken from whole plot Chilli was transplanted with 2 seedlings per hill and later maintained one seedling per hill. The inter row spacing was 60 cm and intra row spacing was 50 cm. Intercrops were sown between the rows. Five tons of cowdung/ ha was applied to the crop before transplanting. Before chilli seedling transplanting, the land was fertilized with 96-45-75-15-1.5-1.4 kg/ha N-P-K-S-Zn-B (FRG, 2018). Half of N and full amount of all other fertilizers were applied as basal during final land preparation. Remaining N was applied in three equal splits at 25, 50 and 70 days after transplanting (DAT).Transplanted *aus* (var. BRRI dhan 82) rice was transplanted (twenty five days aged seedling) with 15cm × 15 cm spacing. One third urea and full amount of TSP and MoP @ 135-55-85 kg/ ha, respectively, were applied as basal during final land preparation. Rest of the urea was applied in two equal splits at 15 and 45 DAT. Intercultural operations were done when necessary. Grain yield was taken from whole plot. Transplanted *aman* (var. BRRI dhan 56) rice (twenty five days aged seedling) was transplanted during *kharif* II season. One third urea and full amount of TSP, MoP and gypsum @ 150-55-85-60 kg/ha, respectively, were applied as basal during final land preparation. Rest of the urea was applied in two equal splits at 15 and 40 days after transplanting (DAT). Intercultural operations were done when necessary. Grain yield was taken from whole plot. The higher rice equivalent yield (16.88 t/ ha), highest gross return (Tk. 590800/ha) and highest benefit cost ratio (2.95) were found in CP_4 cropping pattern. Productivity and economic returns were lower in farmers' existing pattern. In terms of rice equivalent yield was increased by 43.42% in CP_4 followed by 37.13 % in CP_1, 28.72 % in CP_2 and 7.05 % in CP_3 cropping pattern compared to farmers' practice (FP). In case of gross margin, the income was increased by 125.63 % in CP_4 followed by 108.39 % in CP_1, 88.44 % in CP_2 and 39.46 % in CP_3 cropping pattern compared to Farmers' practice (FP). Considering crop productivity, CP_4 (Chilli (100%) +spinach (66%) – T. *aus* -T. *aman*) was found the most suitable pattern for sustainable crop production.

Intercropping carrot with brinjal under different planting system

M. R. Islam

A field experiment was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna during 2024-2025 to find out the suitable intercrop combination of carrot with brinjal. Seven treatments combination viz; T_1= 100% Brinjal (80 cm × 60 cm) + carrot 80%, T_2= 100% Brinjal (80 cm × 60 cm) + carrot 60%, T_3= 100% Brinjal (80 cm × 60 cm) + carrot 40%, T_4= 100% Brinjal (80 cm × 60 cm) + carrot 20%, T_5= 100% Brinjal (80 cm × 60 cm) + carrot broadcast, T_6= Sole Brinjal (80 cm × 60 cm) , T_7= Sole crop of carrot were evaluated in this study. The experiment was laid out in a RCB design with three (3) replications. The fertilizers were applied @ 135-36-105-15-2.0-1.0 kg/ha of N-P-K-S-Zn-B (FRG, 2018) in the form of urea, triple super phosphate, gypsum, zinc sulphate and boric acid, respectively for sole crop of brinjal and intercrops treatments. Full amount of cowdung and P, S, B, Zn were applied during final land preparation. N and K

were applied in three equal splits at 20, 40 and 80 days after transplanting of brinjal. The sole crop of carrot was fertilized @ 120-39-90-18-2.0 kg/ha of N-P-K-S-Zn (FRG, 2018). One third ($^1/_3$) N and full amount of cowdung, P, K, S, Zn were applied during final land preparation. Remaining N were applied in two equal splits at 20 and 40 days after sowing of carrot. Two weeding were done at 45 and 75 DAP of brinjal. Five irrigation were done at 20, 60, 110, 120 and 140 DAP of brinjal. Brinjal and carrot were planting/sown on 12 November 2024. Brinjal harvest starting on 20 February 2024 and continued to 5 May 2025. Carrot was harvested on 5 February 2025. Data on growth, yield and yield contributing traits were recorded, and analyzed statistically with the help of 'R' program. Mean separation was done by LSD at 5% level of significance. The results revealed that the treatment combinations of brinjal 100% + carrot broadcast (T_5) and brinjal 100% + carrot 80% (T_1) were more productive and profitable, with the highest BEY (60.71 t/ha and 58.97 t/ha), gross margin (Tk 634,209 and Tk 615759), and BCR (3.29), respectively.

Feasibility study of different component crops intercropping with chickpea

M. R. Islam

A field experiment was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna during 2024-2025 to find out the suitable intercrop combination with chickpea for higher productivity and economic return. Nine treatments combination viz; T_1=One row of chia in between two rows of chickpea; T_2= One row of coriander in between two rows of chickpea; T_3 = One row of black cumin in between two rows of chickpea; T_4 = Two row black cumin in between two rows of chickpea; T_5 = One row of linseed in between two rows of chickpea; T_6 = One row of barley in between two rows of chickpea; T_7= One row of wheat in between two rows of chickpea; T_8= One row of foxtail millet in between two rows of chickpea and T_9 = Sole chickpea were evaluated in this study. The main crop (chickpea) and component crops were sown simultaneously maintaining 40cm line with continuous sowing at 20 November 2024. The experiment was conducted in a randomized block design with three replications. The unit plot size was 4m × 4m. Chickpea var. BARI chola-9, Chia var. BARI Chia-1, Coriander var. BARI Dhania-1, Black cumin var. BARI Kalogira-1, Linseed var. Nila, Barley var. BARI Barley-8, Wheat var. BARI Gom-33, Foxtail Millet var. BARI Kaon-2 were used as a test variety in the experiment. The sole crop of chickpea and intercrops were fertilized with 27-18-24-12-2-1.2 kg /ha of N-P-K-S-Zn-B in the form of urea, triple super phosphate, murate of potash, gypsum, zinc sulphate and boric acid, respectively (FRG, 2018). The entire dose of N-P-K- S- Zn and B were applied at the time of final land preparation. The field were kept weed free for whole growing period. A post sowing irrigation was applied for proper germination and seedling establishment. Subsequently, irrigation was applied at 60 DAS. Other intercultural operations were done as and when required. Chickpea, chia, coriander, black cumin, linseed, barley, wheat and foxtail millet were harvested on 130 DAS, 112 DAS, 115 DAS, 125 DAS, 115 DAS, 110 DAS, 110 DAS and 121 DAS, respectively. Data were analyzed statistically with the help of 'R' program and mean separation was done by LSD at 5% level of significance. The result revealed that the highest chickpea equivalent yield (2.39 t/ha) was obtained from T_6 (One row of barley in between two rows of chickpea). The highest gross return (Tk.227043.95/ha), gross margin (Tk.152113.95/ha) and benefit cost ratio (3.03) were obtained from same treatment and the lowest (1.01 t/ha) chickpea equivalent yield (CEY), gross margin (96016.80 kg/ha) and BCR (1.37) were recorded in T_8 (One row of foxtail millet in between two rows of chickpea) treatment. Considering the produce higher chickpea yield barley and wheat intercropping with chickpea might be better combination.

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

An experiment was conducted at Agronomy research field of Bangladesh Agricultural Research Institute, Gazipur during *Rabi* season 2023-24 and 2024-25 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 (GP) viz., T_1= Sole sweet gourd (2m × 2m), T_2 = Four row garden pea (50 cm × continuous sowing) in between two rows of sweet gourd (29% GP), T_3 = Five row garden

pea (40 cm × continuous sowing) in between two rows of sweet gourd (36 % GP) and T_4 = Six row garden pea (30 cm × continuous sowing) in between two rows of sweet gourd (43%), were tested. The experiment was laid out in a RCB design with 3 replications. The unit plot size was 4m × 4m. BARI Hybrid Misti kumra-2 and BARI Motorshuti -3 were used in this experiment. Seeds of garden pea sown on 21 December. Twenty seven days old seedlings of sweet gourd were transplanted on 25 November 2024 and garden pea was sown in line according to the treatments. Fertilizers @ 63-26-38-16-2-1.1 kg/ha N-P-K-S-Zn-B + OF: 10 t/ha were applied in sweet gourd. All of OFPSZnB were applied in pit 5-7 days before planting and mixed thoroughly with the soil. N and K were applied around the plant by ring method at 15, 35, 55 and 75 DAT under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization (FRG' 18). Garden pea was fertilized at the rate of 38-21-26-11-1.1 kg/ha of N, P, K, S and Zn. All of P, S, Zn and one –third N fertilizers will be applied as basal during final land preparation. Remaining N and K were side dressed at 20 and 35 DAT under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization (FRG' 18). Intercultural operations like watering, weeding and pest control were done as and when required. Sweet gourd harvested 4 times and started from 15 February 2025 and continued up to 25 March 2025. Garden pea was harvested on 22 March, 2025. Yield components of sweet gourd were taken from randomly selected 5 plants from each plot. Yields of both the crops were taken from whole plot. Collected data of both the crops were analyzed statistically and the means were adjudged using LSD test at 5% level of probability using "STAR" software package. Economic analysis was also done considering local market price of harvested crops. The highest mean sweet gourd yield (40.30 t/ha) recorded in sole sweet gourd (T_1). The highest mean garden pea yield (3.73 t/ha) also recorded in 100% sweet gourd + Five rows garden pea (36%) with 50 cm apart lines. Maximum Sweet gourd Equivalent Yield (46.41 t/ha), highest gross return (Tk.324870/ha and BCR 2.27) were recorded in 100% sweet gourd + Five rows garden pea (36%) with 50 cm apart lines. Result revealed that, garden pea planted in between two rows of sweet gourd 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

A field experiment was conducted at Agronomy research field, Bangladesh Agricultural Research Institute, Gazipur during *Rabi* season of 2023-2024 and 2024-25 to find out suitable intercrop combination for higher productivity and monetary advantage. Treatments included in the experiment were: T_1 = Sole sorghum (60 cm × 20 cm), T_2 = Red amaranth broadcast (75%) in between two rows of sorghum, T_3 = Red amaranth broadcast (100%) in between two rows of sorghum T_4 = Radish broadcast (75%) in between two rows of sorghum, T_5 = Radish broadcast (100%) in between two rows of sorghum, T_6 = Spinach broadcast (75%) in between two rows of sorghum and T_7 = Spinach broadcast (100%) in between two rows of sorghum. The experiment was laid out in a randomized complete block design with three replications and the unit plot size was 4.2m × 4m. BARI Sorghum-1, BARI Lalshak-1, BARI Mula-1 and BARI Palongshak-1 were used in the experiment. The seed rate of sorghum, red amaranth, radish and spinach were 10, 3, 5, 25 kg/ha, respectively. Sorghum seed was sown on 03 November 2023 and leafy vegetables seeds were broadcasted on 19 February 2024. Fertilizers were applied at the rate of 120-60-50-27-2.8-1.4 kg/ha of N, P, K, S, Zn, B as urea, triple super phosphate (TSP), muriate of potash (MoP), gypsum, zinc sulphate and boric acid for sole sorghum and intercrop (FRG, 2018). One third of N, whole amount of TSP, MoP, gypsum, zinc sulphate and boric acid were applied as basal. Remaining 2/3 N was top dressed at 25 and 45 days after sowing (DAS) of sorghum. In intercrop, extra N (46 kg/ ha) was top dressed only on leafy vegetables at their early vegetative stage at 15 days after sowing. Data on yield contributing characters of sorghum were taken from randomly selected 5 plants from each plot. Yields of both the crops were taken from whole plot area. Sorghum was harvested on 29April, 2025. Spinach, red amaranth and radish were harvested on 13 March of 2025. Collected data of two years of both crops were pooled and analyzed statistically and the means were adjusted using LSD test at 5% level of probability using "STAR" software package. Economic analysis was also done

considering local market price of harvested crops. The maximum grain yield (3.07 t/ha) of sorghum was observed in sole crop and sorghum yield was decreased by around 7-43%, in other intercrop treatments. The result revealed that the highest sorghum equivalent yield (SEY) (10.06 t/ha), gross margin (Tk. 175810/ha) and benefit cost ratio (3.32) were observed in T_7 {Spinach broadcast (100%) in between 2 rows of sorghum} treatment. From the result it might be concluded that all leafy vegetables intercropped with sorghum might be agronomically feasible and economically profitable.

Enhancement productivity and economic return of pigionpea through inclusion of turmeric

M. R. Islam and J. Hossain

A field experiment was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna, BARI, during 2024-2025 to find out the suitable planting geometry of turmeric with pigeonpea in relation to higher system productivity and economic returns. Six treatments combination viz; T_1= Four rows of turmeric in between two rows of pigeon pea; T_2=Three rows of turmeric in between two rows of pigeon pea; T_3=Two rows of turmeric in between two rows of pigeon pea; T_4= One row of turmeric in between two rows of pigeon pea; T_5=Sole turmeric; T_6=Sole pigeon pea were evaluated in the experiment. The design of the experiment was RCB and replicated thrice. The crops (Pigeonpea and turmeric) were sown/planted maintaining 2m × 2m and 60cm × 25m plant spacing. The pigionpea var. BARI Arhar-1 and turmeric var. BARI Holud-5 were used as a test. The sole crop of pigionpea and intercrops were fertilized with 20-60-40-20 kg ha^{-1} of N-P-K-S in the form of urea, triple super phosphate, murate of potash and gypsum, respectively (Ray et al., 2015; Jadhav, 2020). Half of the nitrogenous fertilizer and entire dose of P, K and S were applied at the time of land preparation and the rest half of nitrogen were top dressed at 50 days after sowing (DAS). Furthermore, additional 10 kg N was applied at 80 days after sowing/planting of component crops. For sole crop of turmeric, 140-40-120-20-5-2 kg ha^{-1} of N-P-K-S-Zn-B was applied (FRG, 2018). Half K and full amount of P, S and Zn were incorporated as basal. Half N was top dressed at 50 days after planting (DAP). Rest ½ N and K were applied in two equal installments, at 80 and 110 DAP of turmeric. Plots were kept weed free for whole growing period. Irrigation and other intercultural operation were done as and when required. Pigeonpea seed were sown in line keeping seed rate of 15 kg/ ha on 21 April 2024 maintaining 2 m× 2 m plant spacing, and harvested on 24 February 2025. Turmeric was planted on same date maintaining plant densities/ according to the treatments. Earthing up was done at 80 days after planting of turmeric. Turmeric was harvested at 8 January 2025. Collected data were analyzed statistically with the help of 'R' program and mean separation was done by LSD at 5% level of significance. Significantly the highest pigeonpea yield (3.22 t/ha) was obtained from their respective sole crops. While considerably turmeric yield (21.49 t/ha) was obtained where four rows of turmeric intercrop in between two rows of pigeon pea (T_1). Pigeonpea yield was reduced (2-18%) due to intercropping which was compensated by the turmeric yield. Results reveled that T_1 (Four rows of turmeric in between two rows of pigeon pea) and T_2 (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 (T_1) was found as the best intercrop combination in terms of higher gross margin (Tk. 566450/ha) along with pigeon pea equivalent yield (17.69 t/ ha) fallowed by three rows of turmeric in between two rows of pigeon pea (T_2). However, the highest benefit cost ratio (2. 89 and 2.78, respectively) was observed when three rows / four rows of turmeric intercrop in between two rows of pigeon pea (T_2 and T_1). Farmers could be benefited by adoption this technology.

Intercropping of Indian spinach with chilli under different plant population

S.S.Kakon, A.A.Begum, S.Akter, S.S.Nasreen and M.A.K, Mian

A field experiment was undertaken at the Agronomy Research Field, BARI, Joydebpur, Gazipur during *Kharif-1* season of 2025 to find out suitable combination of chilli and Indian spinach intercropping system for higher productivity. Treatments included in the experiment were: T_1 = Chilli (100%) + One row of indian spinach (30cm × 25cm) in between two rows of chilli (42%) ,T_2 = Chilli (100%) + Two row indian spinach (25cm × 25cm) in between two rows of chilli (85%) ,T_3 = Chilli

(100%) + Two rows indian spinach (25cm ×40 cm) in between two rows of chilli (53%) ,T_4 = Sole chilli (60 cm×50cm) and T_5 = Sole indian spinach(30cm × 25 cm). The experiment was laid out in randomized complete block design with three replications and the unit plot size was 4.2 m × 4.0m. The variety of chilli was BARI morich-2 and Indian spinach was BARI Indian Spinach-2.The fertilizer dose was 96-45-75-15-1.5-1.4 kg/ha N P K S Zn B (FRG, 2018). Half of N and all other fertilizers was applied as basal during final land preparation. Remaining N was applied in three equal splits at 25, 50 and 70 DAP (Days after planting). Cowdung @ 10 t/ha was applied as a blanket dose during final land preparation. In intercrop, extra N (40 kg/ ha) was applied in 2 splits at 20 and 40 DAT as ring method to Indian spinach. Sole Indian spinach was fertilized at the rate of 70-15-45-15 kg/ ha (FRG, 2018) of N, P, K, S. 1/3 N and all other fertilizers were applied as basal. Rest N was applied in 2 splits at 20 and 40 DAT as ring method. Weeding, irrigation and crop protection measures were taken as and when necessary. Indian spinach was harvested 5 times on 16 April, 27 April, 08 May, 26 May and 1 June 2025.First harvest of green chilli was done at 109 days after planting (DAP) and continued up to 118 DAP. Yield was calculated for green chili and intercrops in ton per hectare considering the whole plot as harvest area. Collected data were analyzed statistically with the help of Statistics 10 program and mean separation was done as per Least Significant Difference (LSD) test at 5% level of significance. Benefit cost analysis was performed considering the prevailing price of green chili and Indian spinach at the harvesting period in the local market. All intercropping treatments showed better performance than sole chilli crop. The highest gross return (Tk. 199352.27/ha) and BCR (2.85) were obtained from the T_2 {Chilli (100%) + Two row indian spinach (25cm × 25cm) in between two rows of chilli (85%)} treatment. The results revealed that two rows indian spinach (85%) intercropped with chilli (100%) might be suitable intercrop combination for higher productivity and economic return.

Sunflower- legume strip cropping for resource conservation

A. A. Begum, M. Z. Ali, J.A. Chowdhury, S. Akther, 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 2024-25 to find out the effect of strip cropping on maintaining soil health and sustainable productivity. Four treatments viz., T_1= Sunflower four rows alternate with eight rows lentil, T_2= Sunflower four rows alternate with eight rows garden pea, T_3= Sunflower 100% Brinjal (80 cm × 60 cm) rows alternate with five rows grass pea, T_4= Sole sunflower 16 rows were tested. The experiment was laid out in a RCB design with three replications. The unit plot size was 8.0 m × 15.0 m. Seeds of sunflower (var. BARI Surjomukhi-3), lentil (var. BARI Masur-8), garden pea (var. BARI Motorshuti-3) and grass pea (var. BARI Kheshari-3) were sown on 18 November 2024 maintaining with each spacing. All crops were fertilized with recommended dose of fertilizer (FRG, 2018). For sunflower, one third of N and all of other fertilizers were applied during final land preparation and rest N was applied in two equal splits at 30 and 50 days after sowing. Other three crops were fertilized with all fertilizers during final land preparation. All intercultural operation and plant protection were done as and when required. Sunflower was harvested on 5 March 2025, lentil on 11 March 2025, garden pea on 22 and 28 January 2025 and grass pea on 6 March 2025. Sunflower equivalent yield (SEY) was computed by converting yield of intercrops on the basis of prevailing market price of individual crop following the formula of Bandyopadhyay (1984) as given below:

Sunflower equivalent yield (SEY) = Yis + (Yil × Pl)/ Ps

Where, Yis = Yield of intercrop sunflower, Yil = Yield of intercrop legume crop (Lentil/garden pea/ grass pea), Ps = Market price of sunflower and Pl = Market price of legume crop (Lentil/garden pea/ grass pea),

At harvest the yield data was recorded whole plot wise. Collected data of all crops were analyzed statistically following Statistix-10 software package and the means were adjudged using $LSD_{(0.05)}$ test. Economic analysis was also done considering local market price of harvested crops. Strip cropping increased the accumulation of all investigated nutrient in sunflower grain and in soil. The inclusion of garden pea as strip crop (T_2 treatment) resulted in higher content of all investigated nutrients among the legume crops. All sunflower legume strip cropping showed higher productivity than sole sunflower. But

the highest sunflower equivalent yield (SEY) of 3.68 t/ha, gross return (Tk. 147200/ha), gross margin (Tk. 81700/ha) and benefit cost ratio (BCR) of 2.25 was obtained from T_2 treatment (Sunflower 4 rows alternate with 8 rows garden pea strip cropping). The result revealed that all sunflower legume strip cropping showed higher productivity than sole sunflower. Soil health also might be improved by strip cropping. Among three strip cropping 'sunflower alternate with garden pea' strip cropping was the most productive and financially more profitable. The farmers can be benefited by adopting this technology.

Sorghum- legume strip cropping for higher productivity and improve soil health

M. Z. Ali, J.A. Chowdhury, A. A. Begum, S. S. Kakon, and M. A. K. Mian

The experiment was conducted at the research field of Agronomy Division BARI, Gazipur during *rabi* season of 2024-25. 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., T_1= Sorghum four rows alternate with eight rows garden pea, T_2= Sorghum 4 rows alternate with 8 rows lentil, T_3= Sorghum 4 rows alternate with 6 rows chickpea, T_4= Sole Sorghum 8 rows. The experiment was laid out in a RCB design with three replications. The unit plot size was 4.8 m × 16.0 m. Seeds of sorghum (var. BARI Sorghum-1), garden pea (var. BARI Motorsuti-3) lentil (var. BARI Masur-8), and chickpea (var. BARI Chola-9) were sown on 27 November 2024 with maintaining spacing sorghum 60 cm × 5 cm, garden pea 30 cm × 5 cm, lentil 30 cm × 5 cm and chickpea 40 cm × 5 cm. Recommended dose of fertilizer was applied to all crops (for sorghum: 120-48-75-30-3-1 kg/ha N- P- K- S- Zn- B; for garden pea 45-24-30-12-1.4 kg/ha N- P- K- S- Zn, lentil: 21-18-21-9-2-1.2 kg/ha N- P- K- S- Zn- B and for chickpea: 27-18-32-12-2.0-1.5 kg/ha N- P- K- S- Zn- B (FRG, 2018) in the form of urea, TSP ,MOP, Gypsum, Zinc sulphate and Boric acid. One third of N, whole amount of TSP, MoP, gypsum, zinc sulphate and boric acid were applied as basal. Remaining 2/3 N was top dressed at 25 and 45 days after sowing (DAS) of sorghum under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization. For other three crops all fertilizer were applied during final land preparation. Five t/ha of cowdung was applied to the crop before sowing. The seeds of all crops were treated with provex @ 3g/ kg of seed. A light irrigation was given after sowing of all seeds for proper germination. All intercultural operation and plant protection were done as and when required. At harvest the yield data was recorded whole plot wise. Sorghum was harvested on 21 April 2025, garden pea 28 January 2025, lentil 21 March 2025 and chickpea 27 March 2025. Sorghum equivalent yield (SEY) was calculated by converting yield of intercrops on the basis of prevailing market price of individual crop following the formula of Islam *et al*., (2012) as given below:

$$SEY = Yis + \frac{Yicp \times Pcp}{Ps}$$

Where, Yis = Yield of intercropped sorghum, Yicp = Yield of component crops (garden pea, lentil and chickpea), Pcp = Market price of component crop (garden pea, lentil and chick pea) and Ps = Market price of sorghum. Collected data of all crops were analyzed statistically and the means were adjudged using $LSD_{(0.05)}$ test. Economic analysis was also done considering local market price of harvested crops.

Economic analysis was also done considering local market price of harvested crops. Yield of sorghum varied from 2.07t/ha to 3.45t/ha due to influence exerted by different treatments. The highest grain yield 3.45 t/ha of sorghum was obtained from T_4 treatment (Sole sorghum). Among the strip cropping, the maximum grain yield 2.45 t/ha of sorghum was recorded in T_1 treatment (Sorghum 4 rows alternate with 8 rows garden pea) which was statistically identical with T_2 (2.26 t/ha) Sorghum 4 rows alternate with 8 rows lentil) and T_3 (2.07 t/ha) Sorghum 4 rows alternate with 6 rows chickpea) treatments. In case of legume crops garden pea produced the highest pod yield (3.67 t/ha) in T_1 treatment **(**Sorghum 4 rows alternate with 8 rows garden pea) followed by lentil seed yield (1.07 t/ha) in T_2 treatment (Sorghum 4 rows alternate with 8 rows lentil) and the lowest seed yield (0.99 t/ha) was obtained from T3 treatment **(**Sorghum 4 rows alternate with 6 rows chickpea)**.**). In strip cropping combination the highest sorghum equivalent yield (6.85 t/ha) was recorded in T_1 treatment (Sorghum 4 rows alternate with 8 rows garden pea) followed by T_2 treatment (5.46 t/ha; Sorghum 4 rows alternate

with 8 rows lentil) and T_3 treatment (4.83 t/ha; Sorghum 4 rows alternate with 6 rows chickpea). The lowest sorghum equivalent yield was recorded in T_4 treatment (3.45 t/ha; sole sorghum 8 rows). The equivalent yield of sorghum in all strips cropping was higher (40.08-98.45%) as compared to sole cropping of sorghum. The highest gross return (Tk.171167/ha), gross margin (Tk.99667/ha) and benefit cost ratio (2.39) was recorded in T1 treatment due to lower cost of production. The lowest gross return (Tk. 86250/ha), gross margin (Tk. 21250/ha) and BCR (1.33) was obtained from T_4 treatment (Sole sorghum). The results revealed that all strip cropping combination showed better productive and profitability than growing sole sorghum and farmers can be benefited by cultivating any one sorghum legume strip cropping with higher productivity. But among the three strip cropping's sorghum four rows alternate with eight rows lentil strip cropping combination was found economically profitable and agronomically feasible.

Barley- legume strip cropping for higher productivity and soil health

J.A. Chowdhury, M. Z. Ali, S. S. Kakon, M.A.H.Khan, M. R. Karim and M. A. K. Mian

A field experiment was conducted during *rabi* season, 2024-2025 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., T_1= Barley (12 row) alternate with garden pea (8 row), T_2= Barley (12 row) alternate with lentil (8 row), T_3= Barley (12 row) alternate with grass pea (6 row) and T_4= Sole Barley (48 row). Experiment was laid out in a RCB design with three replications and each gross plot was 9.6 m×8 m. Barley (BARI Barley-9), gardenpea (BARI Motorsuti-3), lentil (BARI Masur-6) and grasspea (BARI Khasari-1) were used as test crop. All crops were sown on 21 November 2024 and harvested from 20 January to 12 March 2025 (gardenpea: 20 January; lentil: 3 March; grasspea: 12 March and barley: 2 March). 5 t/ha of cowdung and recommended dose of fertilizer was applied to all crops (for barley: 225-60-120-45-4-1.6kg/ha N- P- K- S- Zn- B; for lentil: 21-18-21-9-2-1.2 kg/ha N- P- K- S- Zn- B; for pea 45-24-30-12-1.4 kg/ha N- P- K- S- Zn and for grass pea 15-15-18-9 kg/ha N- P- K- S) (FRG, 2018) in the form of urea, triple super phosphate (TSP), muriate of potash (MoP), gypsum, zinc sulphate and boric acid. For barley half of N and all other fertilizer was applied during final land preparation and rest N was applied in two equal splits at 30 days after sowing and 55 days after sowing. For other three crops all fertilizer was applied during final land preparation. Cultural and plant protection measures were taken up as and when required. Observations were made on the 10 randomly selected plants in each plot in respect to plant height and yield contributing characters. Yield data was taken whole plot basis. For economic analysis, gross return, total operational cost, gross margin and BCR were used. Strip cropping increased the accumulation of all investigated macronutrient in soil. The inclusion of pea as strip crop (T_1 treatment) resulted in higher content of all investigated nutrients among the legume crops. The grain yield of barley (2.42 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 (3.99 t/ha), gross return (Tk. 199500/ha), gross margin (Tk.132500/ha) and BCR (2.98) were observed in T_1 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.

Performance of flower based cropping patterns for northern region of Bangladesh

M.M. Sheikh, M.A.I. Sarker and M. K. Islam

A field study was conducted at Agronomy experimental field, Regional Agricultural Research Station, BARI, Burirhat, Rangpur during cropping seasons 2023-24. The study area is located at 26º75´ N latitude and 89º08´E longitude with 45 m above mean sea level (https://bd.geoview.info/burir_hat,8022271) to the traditional Potato–*Boro*–T. *Aman* pattern in the northern region of Bangladesh. The objective was to assess crop scheduling efficiency, yield performance, and economic viability of diversified cropping systems. There were four cropping patterns e.g. CP_1: Potato-*Boro* rice-T-*aman* (Check), CP_2: Gladiolus-Sesame-T. *aman* (early), CP_3: Gladiolus-Sesame-T. *aman* (optimum),

CP_4: Gladiolus-T. *Aus*-T. *aman* (late). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Uniform agronomic practices were applied to all four patterns. Unit plot size was 4 m × 4 m with the recommended plant spacing of the respective crops. Fertilizer used for potato: 90-20-90-10-5-2-1 N-P-K-S-Mg-Zn-B (kg/ha)-3 OF(t/ha), Gladioluus: 120-44-90-16-2-1 N-P-K-S-Zn-B (kg/ha)- 5 OF(t/ha), Sesame: 50-30-60-21-2-2 N-P-K-S-Zn-B (g/ha) and Rice: 60-10-50-8-1NPKSZn (Kg/ha) Source: FRG, BARC-2018. For Gladiolus, all OF (Organic fertilizer) and chemical fertilizers except N was applied as basal during final land preparation. In case of potato, all OF (Organic fertilizer), P-K-S- Zn, B and half of N & K was applied as basal during final land preparation and remaining half N & K was applied at 30-35 DAP during earthing up operation. For sesame, half of the N and all of P- K-S- Zn and B were applied as basal during final land preparation. Remaining half N was top dress at 25-30 DAS. In case of Rice, all OF (Organic fertilizer) and chemical fertilizers except N was applied as basal during final land preparation. The rest N was applied in two equal splits at early tillering stage and 5-7 days before panicle initiation stage. The experiment was initiated (corm sown) in the field on 07 October in both the year targeting production for the happy New Year festival. The second planting was done on 15 November fulfilling the market demand of the Valentine (14 February) and the International Mother Language Day (21 February). Finally third planting was done on 15 January targeting 26 March (The Independent Day and National Day). Irrigation was provided three times. Weeding was done twice 30 days after sowing (DAS) and 55 DAS. After maturing randomly 10 plants were harvested to record the yield and yield contributing characters. Mean data was analyzed statistically and was carried out to analysis of variance (ANOVA) using the R studio. Further statistical validity of the differences among treatment means was estimated using the least significant difference (LSD) comparison method. Results revealed that Gladiolus-based patterns could be effectively incorporated within a one-year cycle with manageable Turn Around Time (TAT), enhancing land use efficiency. Among the tested patterns, the optimum Gladiolus–Sesame–T. *aman* sequence exhibited favorable crop scheduling with a total cycle of 361 days and shorter idle periods. Yield analysis showed consistent Gladiolus performance across all flower-based patterns, with plant heights ranging from 97.48 cm to 102.50 cm, spike numbers from 288 to 304 per plot, and spike lengths between 128.34 cm and 135.25 cm. Flower and seed yields were comparable, ranging from 1,80,000 to 1,90,000 spikes or corms per hectare. Economic evaluation highlighted the superiority of Gladiolus-based systems, where the optimum Gladiolus–Sesame–T. *aman* sequence achieved the highest gross return (Tk.20,85,000/ha), net return (Tk.8,55,000/ha), and MBCR (1.70), significantly outperforming the traditional cropping system. The findings suggest that integrating high-value flower crops like Gladiolus into conventional cropping patterns can improve profitability, promote crop diversification, and enhance sustainability.

Performance of different agro-forestry crops as intercrop with arecanut (*Areca Catechu*)

M.M. Sheikh, A.I. Sarker and K.Islam

The experiment was conducted at farmer's field in Bhurungamari, Kurigram during cropping season 2024-25 with the objectives to introduce and determine 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 viz. T_1: Arecanut (sole), T_2: Arecanut + Zinger (in Gunny bags), T_3: Arecanut + Bottle Gourd and T_4: Arecanut + Blackgram. The experimental site (Arecanut orchard) is of ten years old. 200 m^2 area was selected from Acecanut orchard (purposively selected) for each inter-cropping system. The seeds/saplings of each intercrop was sown in the Arecaut orchard. The experiment was initiated of 27 May, 2024. Spacing followed for arecanut and bottle gourd was 3 × 3 m, zinger in gunny bags line sowing method. Black gram was broadcasted in between the arecanut rows. The varieties used in this experiment were: Arecanut (Local), BARI Lau-4, BARI Ada-1 and BARI Mash-3. Fertilizer dose for each crop was Arecanut: 275-255-280-48-NPKS (g/tree/year)-7 OF (kg/tree/year), Zinger: 20-20-15-10-5-5 NPKSZnB (g/plant)-5 OF (kg/bag), Bottle gourd: 40-20-30-12-1.0-0.7 NPKSZnB (kg/ha) 3 OF (t/ha), Blackgram:10-08-10-05 NPKS (kg/ha). All OF (Organic fertilizer), P, K, S, Zn, B and half of N should be applied as basal during final

land preparation except Banana. The yield, cost of production and B: C ratio of different intercrops were estimated following simple statistical programmes taking into consideration of the prevailing market price. Among the four treatments, the second pattern T_2 (Arecanut + Zinger) had a gross expenditure of Tk. 3,80,000 and a gross return of Tk. 15,00,000, yielded the highest net return of Tk. 11,20,000 with the most favorable benefit-cost (B:C) ratio of 2.95, indicated best economic performance. The third and fourth treatments also performed well, with net returns of Tk. 8,11,500 and Tk. 9,23,550 and B:C ratios of 2.49 and 2.42, respectively, showing better profitability. The sole Arecanut provided a B:C ratio of 2.00, had the lowest gross and net returns. The Arecanut + Zinger in Gunny bags intercropping found most profitable.

Intercropping of garden pea with brinjal under different plant population

M. Rahman and M. A. Siddiky

An experiment was conducted at the research field of Regional Agricultural Research Station (RARS), Bangladesh Agricultural Research Institute (BARI), Cumilla during *rabi* season 2024-2025 to find out the suitable crop combination for increasing total productivity, return and maximize land utilization under climatic conditions of Cumilla. The experiment was set up in a randomized complete block design with three replications and four treatments (T_1 = Sole brinjal (100%), T_2 = 100% brinjal + two rows of garden pea (46%), T_3 = 100% brinjal + three rows of garden pea (70%), T_4 = 100% brinjal + garden pea broadcast (80%). The experiment was set up in a randomized complete block design with three replications. The sole crop of brinjal and intercropped treatments were fertilized with cow-dung at the rate of 5 t/ ha and 180-50-140-20-3-2 kg/ha of N-P-K-S-Zn-B, respectively. One third of N, half of K and full amount of cowdung, P, S, B, Zn were applied during final land preparation. Remaining N and K were applied in three equal installments at 20, 40 and 60 days after transplants (DAT) as ring method around the brinjal plant. Brinjal (var. BARI Begun-10) as base crop and garden pea (var. BARI motorshuti-3) were used as intercrops in this study. The unit plot size was 3.2 m × 3.6. The sole crop of brinjal was planted at a spacing of 80 cm x 60 cm. In intercropping systems, 46%, 70%, and 80% garden pea were intercropped in between brinjal rows maintaining 25 cm x 15 cm plant spacing. Seedling of brinjal (thirty-five days old) and seeds of garden pea were planted/sown on 23 and 24 November 2024 respectively. Harvesting of brinjal was started from 20 February 2025 and it was continued up to 28 April 2025. Five irrigations were applied in the experimental field and the first was applied at just after transplanting (brinjal) and sowing of the crops. Second to fourth irrigation was applied at 30, 60, 90 and 120 days after transplanting/sowing (DAT/ DAS) of brinjal and garden pea, respectively. Weeding was done as per requirement. The yield component data of brinjal and garden pea was taken from 10 randomly selected plants prior to harvest from each plot. Data on yield and yield contributing characters were taken and analyzed statistically using statistix 10 package and means were adjudged by LSD at 5%level of probability. Among treatment T_2= 100% brinjal + two rows of garden pea (46%) was the most feasible intercropping system in respect of brinjal equivalent yield (38.73 t ha^{-1}), gross return (Tk. 5,80,950), gross margin (Tk. 3,83,550) and benefit cost ratio (2.94).

Intercropping of leafy vegetables with radish under different plant population

S. Nahar, M. M. H. Bhuiyan and M. H. Hossain

The experiment was conducted at the Regional Agricultural Research Station, BARI, Cumilla during *rabi* season of 2024-25 to evaluate the effects of intercropping on growth and yield of radish intercropped with leafy vegetable and to calculate crop equivalent yield and the benefit cost ratio. Treatments were T_1: Radish as sole crop, T_2: 100% radish + 100% red-amaranth, T_3: 100% radish + 75% red-amaranth, T_4: 100% radish + 100% spinach, T_5: 100% radish + 75 % spinach, T_6: 100% radish + 100% coriander, T_7: 100% radish + 75 % coriander. The experiment was laid out in a randomized complete block design (RCBD) with three replications. BARI Mula-3 (as main crop) and BARI Lalshak-1, BARI Palongshak-1, BARI Dhonia-2 (as companion crop) were used as variety in this experiment. The unit plot size was 2m × 1.5m. Main crop (radish) was line sown maintaining spacing 30× 10cm. Companion crops (red amaranth, spinach and coriander) were broadcasted. Fertilizers were applied @5000-350-225-225-100-15 kg/ha of cowdung-Urea-TSP-

MoP-Gypsum-Borax according to the standard recommendation for radish. The entire amount of cowdung, TSP, Gypsum, Borax and 1/3rd of K were applied during preparation as basal. The rest of K was applied in two equal installments at 20 and 35 days after sowing (DAS) of radish. N was applied in two equal installments at 20 and 35 DAS. Standard agronomic practices were followed as and when necessary. Radish seeds were sown on October 31, 2024. After 21 DAS of radish, seeds of companion crops were broadcasted as per treatments. Weeding, irrigation and other intercultural operations were done as per necessity. For leafy vegetables urea fertilization was done at 04-12-24 on 14 days old seedlings. The experimental plots were frequently observed but there was no attack of pests and disease incidence on the crop. Data on the different crop parameters and yield contributing characters were recorded, calculated, tabulated and analyzed using Statistix10 software; the means were separated using LSD. Equivalent yield and economic analysis was calculated to evaluate the intercropping system. Treatments were radish as sole crop and 100% radish was combined with 100% red-amaranth, 100% spinach, 100% coriander, 75% red amaranth, 75% spinach and 75% coriander respectively. Results showed the effects of intercropping on plant weight, root weight, root length and yield of radish. Radish as sole crop was dominating over other combinations. Radish intercropped with 75% red-amaranth produced the highest plant weight (465.3 g), highest tuberous length (25.7 cm) and tuberous root weight (316.3 g). The highest yield (48.44 t/ha) and the highest BCR (4.6) was obtained from T_1 where radish was cultivated as sole crop followed by radish intercropped with 75% red-amaranth yield (48.11 t/ha) and BCR (4.2).

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 2024-25 determining increase the yield and economic return under existing mango orchard. The location represents the Ganges Tidal Floodplain (AEZ-13), characterized with a subtropical monsoon climate and a humid environment. The soil type is clayey loam. The land of the experiment is medium low that has been raised up as the sorjan system. The soil shows a neutral reaction in nature, low organic matter content, and overall low fertility level. The experiment consisted four treatments viz., T_1 = BARI Sharisha-11, T_2 = BARI Sharisha-14, T_3 = BARI Sharisha-18 and T_4 = BARI Sharisha-19. The experiment was laid out in randomized complete block design (RCBD) having three replications. The unit plot size was 10× 2.2 m^2. The crop received Urea-TSP-MP-Gypsum-Zinc Sulphate-Boric acid @ 250-170-85-150-5-10 kg/ha, respectively + 3 t/ha cowdung. Fifty percent urea and full amount of other fertilizers will be broadcasted during final land preparation. The rest amount of urea will be top dressed at 20-25 days after emergence of seedling (i.e. during flowering). Adequate soil moisture is necessary during top dressing (FRG, 2018). Irrigation, weeding, plant protection and other intercultural operations were done as and when necessary as per the recommended production technologies of the crops (BARI, 2020). Harvesting of all crops was done at their respective harvestable stages. Data were collection on yield parameters and yields of the crops. The plot yields were converted into ton/hectare. Data were analyzed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT). The treatment T_3, which involved BARI Sharisha-18, had the highest plant population per square meter (92.93), statistically similar to treatment T_4 with BARI Sharisha-19 (88.83). Conversely, the lowest plant population was recorded in treatment T_1 with BARI Sharisha-11 (60.81). The tallest plant was observed in treatment T_1 (131.20 cm), statistically similar to treatment T_3 (117.43 cm), while the shortest plant was found in treatment T_2 (73.28 cm). The highest number of branches was recorded in BARI Sharisha-11 (3.93), whereas the lowest number of branches was in BARI Sharisha-19 (3.35), statistically similar to other varieties. Treatment T_4 yielded the highest number of siliqua per plant (131.76), while treatment T_1 had the lowest (61.91). The number of seeds per siliqua was highest in treatment T_3 (18.90) with BARI Sharisha-18 and lowest in treatment T_4 (11.20), statistically similar to other treatments. Thousand seeds weight did not show significant differences among the varieties. The highest seed yield per plot was obtained from treatment T_3 (3.44 kg), while the lowest was from treatment T_2 (1.79 kg). Treatment

T_3 also had the greatest seed yield per hectare (1603.9 kg), with the lowest in treatment T_2 (883.4 kg). Straw yield was highest in treatment T_3 (3660 kg), statistically similar to treatment T_4 (3584 kg), and lowest in treatment T_2 (1067 kg).

Un favourable ecosystem

High temperature

Estimation of temperature co-efficient of lentil for adjusting proper sowing time

M. Z. Ali, M. R. Islam, J. A. Chowdhury A. A. Begum and M. A. K. Mian

The experiment was conducted at the research field, Gazipur, BARI during *rabi* of 2024 – 2025. The soil was silty clay in texture at experimental sight (AEZ-28). The treatments were four sowing date: D_1 = 15 November, D_2 =25 November, D_3=05 December and D_4=15 December. The experiment was laid out in a RCB design with three replications and the unit plot size was 4.5 m × 5 m. Lentil seeds (var. BARI Mosur-8) were sown as per treatment in line with maintaining 30 cm row to row distance with continuous sowing. Fertilizers were applied @ 25-22-25-11-2.5-1.5 kg/ ha of N-P-K-S-Zn-B respectively (FRG, 2018), in the form of urea, TSP, MoP, gypsum, zinc sulphate and boric acid. All fertilizers were applied as basal during the final land preparation. A light irrigation was given after sowing of seeds for uniform germination. In addition, 5 t/ha of cow dung were applied before land preparation. Intercultural operation was done as and when required. Data on growth parameters like dry matter accumulation were measured at different dates with 15 days interval. To record dry matter weight, one linear meter was sampled at 15, 30, 45, 60, 75 DAE and at harvest. Collected samples were separated in to different plant parts like leaf, stem and grain and then oven dried at 80˚C for 72 hours. Daily air temperatures were recorded for computing the growing degree days (GDD). The GDD was calculated using the following formula:

$$GDD = \sum \frac{Tmax + Tmin}{2} - T_{base}$$

Where, T_{max} and T_{min} were daily maximum and minimum air temperatures, respectively. T_{base} indicated base temperature of lentil (5°C). The GDD can be summed over days to indicate the amount of heat for growth that the crop has received over the period of the growing season (Kumar *et al*., 2023). For estimation of physiological maturity and grain growth study fifteen lentil plant were harvested from each plot at fifteen days interval. It was continued up to 33 to 48 days after anthesis (DAA). The harvested grain was oven dried at 70°C for 72 hours. Fifteen grains were separated from the middle of each plant and then weight was taken. The crop was harvested at physiological maturity 01 March, 19 March, 20 March and 20 March, 2025 respectively. The yield component data was taken from one linear meter prior to harvest from each plot. At harvest, the yield data was recorded plot wise excluding border. Yield and yield contributing characters were recorded and data analyzed statistically and mean separations were done by LSD test at 5% level of significance. TDM of 25 November sowing was higher which was more or less similar with 15 November. Low temperatures might favor the growth of early sowing (15 November and 25 November) that caused higher TDM production. Among the different sowing dates, 25 November sowing exhibited higher grain growth in all over the grain filling period. It might be due to prevailing optimum air temperature on 25 November sowing. 25 November sowing took the maximum duration 115 days and minimum mean air temperature (20.80˚C) to reach physiological maturity with maximum GDD (1896) followed by 15 November (GDD: 1747) and 05 December sowing (GDD: 1634). 15 December sowing took the minimum duration 94 days to reach physiological maturity with minimum GDD (1538) and it might be due to comparatively higher temperature prevailed at the earlier and later sowing than 25 November to 05 December sowing. The longest duration 115 days due to prevailing lowest temperature (20.80˚C) with highest GDD (1896) produced the highest grain yield and the shortest duration (94 days) due to prevailing highest mean air temperature (22.11˚C) with lowest GDD (1538) produced the lowest grain yield of lentil. The higher number of pods/plant (65.00), number of seeds/pod (1.87) and 1000-seed weight (22.00 g) was obtained from 25 November sowing and it was higher than all sowing time of lentil. 15 November sowing time of lentil gave the number of pods/plant (61.33), number of seeds/pod (1.67) and 1000-seed weight (19.33 g) followed by 05 December, number of pods/plant (54.33),

number of seeds/pod (1.37) and 1000-seed weight (18.00 g). The lowest number of pods/plant (51.33), number of seeds/pod (1.10) and 1000-seed weight (16.00g) was recorded in 15 December sowing. The highest seed yield (2.49 t/ha) was obtained from 25 November sowing which was statistically identical with with 15 November sowing (2.28 t/ha) due to cumulative effect of better yield components and the lowest seed yield (1.65 t/ha) was observed in 15 December sowing followed by 05 December sowing (1.74 t/ha) due to cumulative effect of poor yield components. It was observed that 25 November sowing received lower temperature during growing period that caused longer crop growth duration and ultimately produced higher TDM and translocation of higher TDM to grain. It might be 25 November sowing probably received favorable environment mainly optimum temperature resulting better vegetative growth of the plants which ultimately led to the better anthesis, grain filling and finally increased seed yield and the lowest seed yield might be received high temperature at early growth stage which shorten the vegetative and reproductive stage as a result that forced maturity and reduced TDM production and translocation of less dry matter to the reproductive organ (grain). Yield decreases over 25 November sowing (early or late sown) caused about 8.57-33.73% yield reduction over 25 November sowing. The result of the present study was also supported by Bhandari *et. al.,* (2016). There was a negative linear correlation between grain yield (t/ha) of lentil and mean air temperature has been shown in Fig. 5. The regression line (Y= -0.4034x + 10.727, R^2= 0.7646) that means the correlation of coefficient (x) was -0.4034 stated that seed yield decreases at the rate of 0.4034 t/ha for per unit change (1˚C) of air temperature at harvest. The contribution of regression (R^2= 0.7646) value indicated that 76% seed yield of lentil was attributed due to mean air temperature. Thus result showed that increasing air temperature decreasing the seed yield of lentil. The results revealed that physiological maturity period as well as crop duration of lentil was reduced as influenced by higher temperature. The 25 November sowing would be the optimum sowing date for lentil in relation to mean air temperature and early or late sown caused about 8.57-33.73% yield reduction over 25 November sowing. The temperature co-efficient of lentil was estimated at -0.4034 t/ha indicated that grain yield would reduce @ 0.4034 t/ha per unit (1°C) change of air temperature that means increasing air temperature decreasing the seed yield of lentil and the effect of temperature on grain yield of wheat was estimated at 76%.

Salinity

Effect of sowing date on yield of sorghum in saline soil

M. A. H. Khan, J. A. Chowdhury, S. S. Kakon, M. R. Karim, M. S. U. Khan and S. Mondal

An experiment was conducted at the Agricultural Research Station, Benerpota, Satkhira during *rabi* season of 2024–2025 to find out the optimum sowing time for sorghum in saline area. The treatments of the experiment were five sowing date: T_1 =1 December, T_2 =10 December, T_3 = 20 December, T_4= 30 December and T_5= 10 January. The experiment was laid out in a RCB design with three replications and the unit plot size was 4.8m × 4m. Sorghum seeds (var. BARI Sorghum-1) were sown as per treatment with maintaining 60 cm row to row and10 cm plant to plant distance. Fertilizers were applied @ 120-60-50-27-2.8-1.4 kg/ha of N-P-K-S-Zn and B in the form of urea, TSP, MoP, gypsum, zinc sulphate and boric acid. One third urea and all other fertilizers were applied as basal during final land preparation and rest N was applied at 25 and 50 DAS in equal split following irrigation. Salinity level was taken at different time. Weeding was done at 25 and 50 DAS. Irrigation and other intercultural operation were done properly. Yield contributing characters were recorded from randomly selected 10 plants from each plot at the time of harvest. Yield data was recorded by harvesting nine square meter area excluding border. Collected data was analyzed statistically following statistix-10 software package and means were compared using LSD test at 5% level of significance. The result indicated that, the highest hill/m^2 (19), and the highest panicle length (19.3 cm) was observed in T_3 (20 December) and the highest grains/panicle (1013), and 1000 grain weight (26.24) and the highest grain yield (1675 kg/ha) was found in T_4 (30 December) sowing date which were identical to (1595) T_3 (20 December). So, the optimum date of sowing in saline area for sorghum might be 20 December to 30 December for getting higher yield and avoiding salinity.

Charland

Performance of different chilli varieties at charland of Jamalpur

M. R. Ali, J. Rahman , M. R. Karim, Ma Hossain, M A K Mian and M. M. Kadir

The experiment was conducted at Nawvanger char, sadar, Jamalpur, Bangladesh 24°57′ north latitudes and 89°55′ east longitudes. The experimental site was of medium high land belonging to the agro-ecological zone Old Brahmaputra Floodplain under Agro-Ecological Zone 9. The experiment was conducted during the *rabi* 2024-2025 to find out the suitable productivity for chilli variety, economic and nutritional development of charland farmers. The experiment was laid out in randomized complete block design with three replications. Treatments included in the experiment were: T_1= BARI Morich-4, T_2=Balejuri and T_3= Local. Higher yield (7.85-8.23 t/ha) was observed in BARI Morich-4and Beljuri Seedlings were transplanted on 07 December and harvested on 05 May, 2025. Fertilizer was applied in accordance with the fertilizer recommendation guide BARC, 2018. Intercultural operations like watering, weeding and spraying insecticides were followed as and when necessary. Collected data were analyzed statistically with the help of STAR software and mean separation was done as per LSD test at 5% level of significance. .From the above findings, it might be concluded that, Balejuri and BARI Morich-4 would be suitable for cultivation in charland area instead of local variety for getting higher yield and income in Jamalpur region.

Effect of integrated nutrient management on yield of murikata Peaj at charland of Jamalpur under AEZ-9

M. R. Ali, J. Rahman and M. M. Kadir

An experiment was carried out at the farmer's field at Naovanga char under Jamalpur district during November 2024 to March 2025 to find out the effect of integrated nutrient management on yield of murikata peaj at charland of Jamalpur under AEZ-9. The treatments were T_1= Recommended fertilizer dose (FRG' 2023) 115-55-75-20-20-1.5 kg/ha N-P-K-S-Zn-B, T_2= 125% recommended fertilizer dose, T_3= IPNS with vermicompost (3 t/ha), T_4= IPNS with 3t/ha FYM, T_5= Farmers' practice. BARI Peaj-4 was used in the study. The treatments were tested in randomized complete block design with 3 dispersed replications. The unit plot size was 3.0 m × 2.0 m and spacing was 15 cm × 10 cm. BARI Peaj-4 was used as test material. Murikata piaj was sown on 12 December 2024 and harvested on 6 February 2025. Fertilizer was used as per treatment. Fifty percent N was applied as basal at the time of planting and remaining 50% N was applied in two equal splits during 30 and 45 days after sowing; full dose of P and K were applied at the time of planting and full dose of S was given fifty days before planting per treatments. Weeding, irrigation and other intercultural operations were done as and when necessary. The yield of murikata piaj was calculated in tons per hectare considering the whole plot as harvest area. Ten plants of onion from each plot were selected randomly to collect data on yield components. Collected data were analyzed statistically with the help of a computer package program STAR and the means were adjusted by Least Significance Difference (LSD) test at 5% level of significance. The result indicated that onion yield was increased due to integrated nutrient management. The highest onion yield (19.73 t/ha) was found from IPNS+ vermicompost (3.0 t/ha) and the lowest yield (11.31 t/ha) was found from recommended fertilizer dose (95-35-25-3-3 kg/ha N-P-K-S-Zn-B) treatment.

Performance of sweet gourd varieties at charland area of rangpur region

M.M. Sheikh, A.I. Sarker and K. Islam

The experiment was carried out in charland of Mohipur, Gangachara, Rangpur during *rabi* season 2024-25 to find out suitable sweet gourd varieties for the charland areas of Rangpur region. The location of the experimental site was at AEZ-3, the Tista Meander Floodplain (25.86884°N latitude and 89.25521°E longitudes).The soil was sandy heavy 5.6 P^H and 0.5% organic matter. In this research work five varieties were used, namely BARI Misti kumra-2, BARI Hybrid Misti kumra-2, company hybrid Sweety (Laltir), Block Stone (Indian) and a local one. The seeds of local, Indian varieties was collected from the farmers of the area, BARI Misti kumra-2 from RARS office, BARI, Burirhat, Rangpur BARI Hybrid Misti kumra-2 from Vegetable division, HRC, Bangladesh Agricultural Research Institute, Gazipur and the company (Laltir)

hybrid sweety from the market of Rangpur. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 3 replications. Pits of 60 x 60 x 60 cm were drug and dried in the sun and decomposed cowdung was mixed with the soil. A basal dose of urea, triple super phosphate (TSP), muriate of potash (MP) and molybdenum were used as the source of nitrogen, phosphorus, potassium and molybdenum applied at the rate of @ 250, 210, 120, 100 and 1kg/ha, respectively. Urea was applied as top dressing in 2 equal splits at 30 and 50 days after sowing. The entire amount of cowdung, TSP, MOP and molybdenum were applied at the time of final land preparation. Seeds were treated by autostin @ 2 g/kg seed. Treated seeds were sown in the pits on 20 November 2024. Mulching was done to keep the soil moist. Irrigation was given at regular intervals during the growing season was applied through the plastic pipe. The parameters such as number of leaves/vine, number of vines/plant, number of fruit/plant, individual fruit weight (g), fruit yield (t/ha) were measured to interpret the results. BARI Misti kumra-2 exhibited attractive golden yellow skin and deep orange flesh. It also showed superior performance in yield-related traits, producing the highest number of vines (11.30), fruits per plant (10.8), and yield (41.89 t/ha). The Sweety hybrid (Laltir) also demonstrated good performance, whereas Black Stone (Indian) produced the heaviest fruits but had a lower overall yield. The local variety showed the poorest performance across all parameters. BARI Hybrid Misti kumra-2 emerged as the most promising variety for commercial cultivation in charland areas. Farmers are interested with BARI Hybrid Misti kumra-2 as it had attractive shape, skin and pulp color and produced highest yield than other varieties. Therefore, efforts should be directed towards increased seed production and distribution of these promising varieties to enhance production and profitability in the region.

Performance of mustard varieties at charland area in rangpur

M.M. Sheikh, A.I. Sarker and K. Islam

A filed experiment was conducted at Mohipur charland of Tista River under Gangachara Upazila of Rangpur district during r*abi* season 2024-25 to find out suitable mustard varieties for cultivation in that area. Four varieties of mustard viz. BARI Sarisha-14, BARI Sarisha-11, BARI Sarisha-18, BARI Sarisha-20 were tested with the local Tori-7 variety as check variety. The experiment was laid out in RCB design with three replications. The unit plot size was 3 × 3m. Seeds were sown on 20 December, 2024 with 25 cm continuous line sowing method. Fertilizers were given at recommended dose and other cultural operations were done as and when required. Data were taken on different growth parameters like plant height, plant/m^2, pods/plant seeds/pods, 1000-grain weight, days to maturity and yield. Gathered data were compiled and analyzed with MSTAT-C software. It was revealed that all the BARI released mustard varieties gave higher yield than the farmers used local variety. BARI Sarisha-18 produced the highest seed yield (1.97 t/ha), followed by BARI Sarisha-11 (1.74 t/ha) and BARI Sarisha-20 (1.53 t/ha). BARI Sarisha-14 noticed as the early maturing variety among the farmers in charland area of Rangpur region. Farmers are interested to cultivate BARI varieties e.g. BARI Sarisha-18, Sarisha-20 and BARI Sarisha-11 if seeds are available. They preferred those varieties because of their high yield potentials and economic benefits. Therefore, efforts should be directed towards increased seed production and distribution of these promising varieties to enhance mustard production and profitability in the region.

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 Shibnagar village under Meghna upazila in Cumilla district during *kharif* season of 2024-25 to compare the yield performance of BARI released sesame varieties with the aim to replace it by the best one. The experiment was conducted with four treatments such as T_1= BARI Til-4 T_2=BARI Til-5 and T_3=BARI Til-6 and $T_{4=}$ local variety was used in the study. The experiment was laid out in randomized complete block design with three replications. Seed was sown on 18 February 2025 and harvested on 28 May 2025. The unit plot size was 5.0 m × 5.0 m having plant spacing of 30 cm × 10 cm. The fertilizer was applied in the form of urea, triple super phosphate, muriate of potash, gypsum @ N_{50}, P_{60}, K_{30}, S_{28} Kg/ ha. Half nitrogen and full amount of other fertilizers was applied at basal. Rest

amount of nitrogen was applied at flowering stage. Irrigation and other intercultural operation was applied at when necessary. Fungicide was sprayed alternately at 15 days' interval starting from 60 days after planting. Data on plant height (cm), number of branches per plant, number of capsules per plant, capsule length (cm), 1000 seed wt.(g), yield(kg/ha) were collected. The recorded data were statically analyzed by using statistix10 software. Significantly the highest number of capsules/plant (59.73), seed/ casule (63.63), 1000-seed weight (3.25g) and yield (1351.70 kg/ ha) were recorded in BARI Til -6. Therefore, BARI Til -6 performed better than three varieties in charland area. Farmers are also interested to grow BARI released variety of sesame. Farmers of Shibnagar village of Meghna upazilla in Cumilla district preferred BARI Til 6 because of black coated seed color and higher yielder.

Chalanbeel

Performance of potato varieties at chalan beel area

S. S. Kakon, A. A. Begum, J.A. Chowdhury, S.Akther and M.A.K.Mian

The experiment was conducted at the farmers' field of Chalanbeel of Sirajgonj district during the *rabi* season of 2024-2025. It belongs to the Lower Atrai Basin (AEZ-5). The treatments were four potato varieties viz., BARI Alu-53, BARI Alu-41, BARI Alu-25, BARI Alu-8 and against deshalalu (Local). The experiment was laid out in RCB design with three replications. The unit plot size was 12 m × 10 m. The spacing was maintained 60 cm × 25 cm in BARI released varieties and 50 cm × 10 cm in local cultivar. Fertilizers were applied 180-40-180-20-6-1.2 kg/ha N-P-K-S-Zn-B for sole potato (FRG, 2018).Half of the area and all other fertilizers and manure were applied at the time of final land preparation. The rest half of the urea was top-dressed at 30-35DAP. The crop was irrigated two to three times at 25 and 35 DAP. Weeding and earthing up were done once at 30-35 DAP. The crop was planted on 25 November 2025 and HYV were harvested on 2 March 2025 and deshal alu was harvested on 19 February 2025. The yield component data was collected from randomly selected ten plants prior to harvest from each plot. At harvest, yield of potato was recorded plot wise. Data were analyzed statistically and means were compared using LSD test at 5% level of significance. Economic evaluation was also done. The results revealed that higher tuber yield was observed in BARI released varieties than local cultivar. Potato cultivation is water saving as compared to *boro* rice cultivation in upper land of chalan beel area. Farmers were interested to grow BARI released potato varieties for getting higher tuber yield in chalanbeel area if the seed is available.

Sorjan

Improvement of sorjan based cropping systems for increasing crop productivity in southern Bangladesh

M.A.Rahman

The sorjan based cropping systems research were conducted at farmers' field of Atghar, Nesarabad, Pirojpur all the year round (2023-2024) under sorjan system to develop location specific sorjan based cropping systems for increasing crop productivity and profitability in southern region of Bangladesh.. The experimental site belongs to the agro-ecological zone Ganges Tidal Floodplain (AEZ-13). The soil type is medium low land and soil texture is loamy. As treatment, cropping patterns on different types of non-creeper vegetables (five patterns viz., Chili - Brinjal + Chili - Brinjal, Chili – Brinjal - Chili+ Knolkhol, Chili - Chili + Coriander leaf + Cauliflower, Chili - Chili - Brinjal, Stem amaranth-Chili-KnolKhol) and creeper vegetables (five patterns viz., Bottle gourd-Bottle gourd-Sweet gourd, Bottle gourd-Ash gourd-Sweet gourd, Bitter gourd-Sponge gourd-Sweet gourd, Ridge gourd-Bottle gourd- Sweet gourd, and Ridge gourd-Ash gourd-Bottle gourd) were cultivated on sorjan bed and trellis, respectively. The seedlings of creeper/ vine vegetables were transplanted on the edge of the sorjan beds but their growth and development were taken place on the trellis that was made above the sorjan canals. The experiment was laid out in randomized complete block design with three replications. The unit plot size was 8.0 m x 4.0 m. The vegetable and spice crops cultivated by season on sorjan bed and trellis following the recommended production technologies of the crops (BARI, 2020). Fertilizers were applied as per recommended dose of the respective crops (FRG, 2018). Trellis were made with bamboo, sesbania (*dhaincha*), nylon net and

rope above the canal of the respective sorjan edge. Irrigation, mulching, weeding, plant protection and other intercultural operations were done as and when necessary as per the recommended production technologies of the cultivated crops (BARI, 2020). Data were collected on different parameters of the cultivated vegetable and spice crops. The plot yields were converted into ton/hectare. The chili or bottle gourd equivalent yield was calculated to compare system performance by converting the yield of other crops into equivalent chili or bottle gourd yield (CEY) on a price basis, using the formula: CEY = Yx (Px/Pr), where Yx is the yield of crops (other than chili or bottle gourd) (kg/ha), Px is the price of crops (other than chili or bottle gourd) (Tk/kg), and Pr is the price of chili or bottle gourd (Lal *et al*., 2017). Crops sown/planted in the existing *rabi* season on sorjan bed and trellis were harvested at harvestable stage. Data were recorded on relevant parameters of the experiment. Data were analysed both statisically and economically for better intrepretation of the results. It can be noted that the crops grown sorjan bed and trellis during *kharif-2* season of 2024 were slightly damaged and delayed by heavy rainfall and tidal flooding. Statistically significant variation was observed among the studied cropping patterns on sorjan bed (CPSB) in terms of Chili Equivalent Yield (CEY). Of the cropping patterns on sorjan bed, treatment CPSB-1 (Chili - Brinjal + Chili - Brinjal) gave the highest CEY (35.36 t/ha) followed by CPSB-4 (Chili - Chili - Brinjal) (30.80 t/ha). Treatment CPSB-3 (Chili - Chili - Chili + Coriander leaf + Cauliflower) and CPSB-2 (Chili – Brinjal - Chili + Knolkhol) gave the CEY of 28.69 and 24.39 t/ha, respectively. The lowest CEY (11.51 t/ha) was obtained from CPSB-5 (Knolkhol - Stem amaranth - Chili). Among the cropping patterns on sorjan trellis, treatment CPST-5 (Ridge gourd - Ash gourd - Bottle gourd) produced the highest BEY (126.57 t/ha), where the second highest yield was obtained from CPST-2 (Bottle gourd - Bottle gourd - Sweet gourd) (119.40 t/ha) which was statistically at par to that of CPST-1 (Bottle gourd - Ash gourd -Sweet gourd) 118.49 t/ha, followed by CPST-4 (Ridge gourd - Bottle gourd - Sweet gourd) exhibited the BEY of 112.41 t/ha, respectively. Treatment CPST-3 (Bitter gourd - Sponge gourd -Sweet gourd) gave the lowest BEY (87.76 t/ha). Farmers showed their interest to cultivate different creeper vegetables crops on sorjan bed for increasing the total yield and net incom

Intercropping of vegetables with newly established guava orchard (BARI Peyara-2) under sorjan system in Barishal region

M.A.Rahman

The research programme was conducted at Gava village under Banaripara upazila of Barishal district (Farmer's name: Md. Rashedul Islam) for all the year round to develop suitable intercropping system(s) of vegetables with newly established guava orchard (BARI Peyara-2) for sorjan agriculture system in Barishal region. The experimental site is situated in the latitudes and longitudes of N 22°45′52.57796″ and E 90°10′36.06172″, respectively. The experimental site belongs to the agro-ecological zone Ganges Tidal Floodplain (AEZ-13). The soil type is medium low land and soil texture is loamy. The guava seedlings were produced through grafting method where BARI developed guava variety (BARI Peyara-2) was used as scion and local Swarupkati variety was taken as root stock. Guava seedlings were planted on 22 February 2022 through zigzag method on sorjan bed maintaining recommended plant spacing with row to row distance 3m and plant to plant distance 2m. Staking was also given to protect the plant from lodging. Pruning of branch was done to encourage new shoots on guava plant. The following different types of non-creeper (four cropping patterns viz., Cabbage - Red amaranth – Fallow, Knolkhol - Indian spinach –Fallow, Radish - Red amaran - Red amaranth – Fallow, and Radish - Red amaranth - Fallow) and creeper vegetable (five cropping patterns viz., Bottle gourd - Ash gourd, Bottle gourd - Ridge gourd, Bottle gourd - Bitter gourd, Sweet gourd - Ridge gourd, and Sweet gourd - Bitter gourd) crops were cultivated in various seasons as intercrops with guava on sorjan bed and trellis, respectively (Table 1). The non-creeper vegetable crops were planted in between two rows of guava plants. The seedlings of creeper vegetables were transplanted as intercrops on the edge of the sorjan beds but their growth and development were taken place on the trellis that was made above the respective sorjan canals. The experiment was laid out in randomized complete block design with three replications. The unit plot size was 7.0 m x 4.5m.

Fertilizers were applied as per recommended dose of the respective crops (FRG, 2018). Trellis were made with bamboo, sesbania (*dhaincha*), nylon net and rope above the canal of the respective sorjan edge.

Irrigation, mulching, weeding, plant protection and other intercultural operations were done as and when necessary as per the recommended production technologies of the cultivated crops (BARI, 2020). Data were collected on different parameters regarding yield components and yield of the crops. The plot yields were converted into ton/hectare. The Guava Equivalent Yield (GEY) was calculated to compare system performance by converting the yield of other crops into equivalent guava on a price basis, using the formula: GEY = Yx (Px/Pr), where Yx is the yield of crops (other than guava) (kg/ha), Px is the price of crops (other than guava) (Tk/kg), and Pr is the price of guava (Lal *et al*., 2017). It can be noted that the intercrops grown on sorjan trellis in *kharif* season (2024) were damaged partially by inundation with rainfall and tidal flooding, as a result yields were found slightly lower than their potential yield. Guava fruit bagging are being done using small transparent polythene bag for protecting the fruits from the infestation and insect-pest and diseases. The guava plants existing at fruit bearing stage at this moment (December, 2024). Data regarding yield components and yield of guava were collected after attaining the fruit at ripening stage. Data were analyzed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT). Experimental results showed statistically significant difference among the Guava based intercropping on sorjan trellis (GICST), treatment GICST-2 (Guava + Ridge gourd- Bottle gourd) gave the highest GEY (54.33 t/ha) followed by GICST-3 (Guava + Bitter gourd-Bottle gourd) (48.04 t/ha). On the other hand, GEY obtained from GICST-1 (Guava + Ash gourd-Ridtle gourd) and GICST-4 (Guava + Bitter gourd - Sweet gourd-) were 46.90 and 44.84 t/ha, respectively. Treatment GICST-5 (Guava + Sweet gourd-Bitter gourd) showed the lowest GEY (40.51 t/ha).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, bitter gourd, sweet gourd, ridge gourd etc.) can be practiced on sorjan trellis with newly established dwarf type of guava orchard (like BARI Peyara-2 variety) for increasing the total yield and economic return of the sorjan system. However, non-creeper vegetable crops can be cultivated on sorjan bed only in the first year of orchard establishment and thereafter it cannot be done due to shading effect of plant leaf canopy. Farmers showed their interest to cultivate creeper vegetable crops (like bottle gourd, bitter gourd, sweet gourd, ridge gourd etc.) on sorjan trellis as intercrop with newly established dwarf type guava orchard (like BARI Peyara-2) under sorjan system.

Intercropping of pineapple with existing fruit orchard on sorjan system

M.A.Rahman

The intercropping initiative has been implemented in Gava village, located within the Banaripara upazila of the Barishal district, under the supervision of farmer Sajal Mondal and Atghar, nesarabad upazilal of the Pirojpur district, under the supervision of farmer Md.Nazrul Chowdhuri. This program aims to assess the productivity and profitability of the indigenous Swarupkati variety of guava cultivated within a sorjan system in the Barishal region. The experimental site is positioned at the coordinates N 22°45'29.912" and E 90°10'18.818" and N 22°44'13.93742" E 90°10'49.47348". In this setup, pineapple plants (Giant Kew) were interspersed between two rows of guava trees, with four rows of pineapple established between the guava lines, utilizing a Randomized Complete Block Design (RCBD). There were four treatments, viz. i. Sole guava ii. Guava+ pineapple intercropping, iii. Sole golden apple iv. Golden apple+ pineapple intercropping. The treatments were applied to a nine-year-old guava orchard of the local Swarupkati variety and a twelve year old local golden apple orchard. The experimental plot consisted of four guava trees, with a unit plot size of 24 m^2 and incase of golden apple trees, experimental plot consisted of two trees, with unit plot size of 36 m^2, while the pineapple plot actually calculated as 18m^2. Each guava tree received an annual application of 12 kg of cow dung, 500 g of urea, 416 g of TSP, 416 g of MoP, 14 g of zinc sulfate, and 60 g of gypsum (FRG, 2018). Fertilizers were administered in two equal splits: the first application occurred in October post-harvest, and the second in April, just prior to the onset of flowering. The fertilizers were distributed around the tree within a canopy spread of 1.0-1.5 meters from the base and were incorporated into the soil through gentle ploughing

with a hand spade, followed by irrigation. During the dry season, irrigation was conducted as needed (BARI, 2020). Weeds were meticulously removed from the base of the trees, and the soil around the tree base was regularly tilled to achieve a fine tilth. Pruning of diseased, dead, and unwanted branches was performed in October. Instances of anthracnose disease were noted, prompting the application of Tilt 250 EC (Propiconazole) at a rate of 1.5 ml per liter, administered twice at fifteen-day intervals, commencing when the guava fruits reached marble size. Harvesting occurred when the fruits attained physiological maturity, indicated by a color transition from green to yellow. The total soluble solids (TSS) percentage was determined using a Digital Refractometer (Atago Pocket Refractometer, Model: PAL-1, Japan), and fresh samples were subsequently dried using a drying. The fruit yields from the sole and intercropped systems in guava cultivation were recorded at 28.13 t/ha and 24.29 t/ha, respectively. The sole cropping system yielded fruits that were both larger and heavier, with an average weight of 98.55 grams, compared to the intercropped system, which had an average weight of 96.25 grams for golden apples. Furthermore, the total fruit weight per tree in the golden apple orchard was noted to be 33.80 kg for sole cultivation and 27.62 kg for the intercropped system. The fruit yields for the sole and intercropped systems in golden apple cultivation were 18.78 t/ha and 15.34 t/ha, respectively, translating to guava equivalent yields of 28.17 and 23.01 t/ha. Pineapple production was measured at 19.60 t/ha in the guava intercropping system and 19.76 t/ha in the golden apple intercropping system, leading to guava equivalent yields of 49.00 and 49.40 t/ha, respectively. In summary, the guava equivalent yield was higher in the intercropped plots, with measurements of 73.29 t/ha in one system and 72.41 t/ha in the other, while the sole cropped plots yielded guava equivalent yields of 28.13 and 28.17 t/ha. This indicates that farmers can achieve nearly three times the yield and income through the intercropping system, leading to a strong interest in its adoption among farmers. Farmers showed their high interest to cultivate pineapple as an intercrop in their existing Swarupkati guava and local golden apple orchard on sorjan bed for getting higher yield and economic return.

Influences of management practices on yield and quality of local Swarupkati guava on sorjan bed

M.A.Rahman

An experiment was conducted during 2023-24 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 site was selected because it comprises the favorable growing condition for guava, has an appropriate agro-ecology and farmers needed solution against decreasing yield. The experimental site is located in Bangladesh between 22°45'29.91308''N latitude and 90°10'19.38407''E longitude, 6 meters above from sea level. The experimental treatments were six viz., T_1 = Earthing up (farmers' practice), T_2 = Earthing up + Recommended dose of fertilizer (RDF), T_3 = RDF + Spraying of pesticides against insect and diseases, T_4 = Earthing up + RDF + Spraying, T_5 = Earthing up + Pruning + Spraying, T_6 = Earthing up + RDF +Pruning + Spraying. The experiment was set up in an established eight years old local guava orchard (var. Swarupkati). Randomized complete block design (RCBD) was used as the experimental design with three replications. The treatments were imposed on existing local variety of guava orchard (var. Swarupkati) of nine year old. The experimental plot was composed of four trees and the unit plot size was 24 m^2. The single tree received 12 kg cow dung, 500 g urea, 416 g TSP, 416 g MoP, 14 g zinc sulphate, 60 g gypsum/year (FRG, 2018). Fertilizers were applied in two equal split, first one in October after harvesting of fruits and other one was applied in April just before starting of flowering. Fertilizer was placed around the tree up to canopy spread 1.0-1.5 meters from the tree base and incorporated with the soil by gently ploughing with hand spade followed by irrigation. During dry season irrigation was done frequently as when necessary (BARI, 2020). Weeds were kept free from tree base and soil in the base of tree was frequently break down to fine tilth regularly. Pruning of diseased, dead and undesired branch were done in October. Some anthracnose disease was occurred and spraying of Tilt 250 EC (Propiconazole) @ 1.5 ml per liter of was sprayed two times in fifteen days interval starting when the guava fruit size became marble size. The fruits were harvested during they became physiological maturity

and their skin color was started to turning green to yellow. Total soluble solid (TSS) percentage was measured with the help of Digital Refractometer (Atago Pocket Refractometer, Model: PAL-1, Japan). The fresh samples were dried using drying Oven (Memmert, Model: UN110, Germany). Data were analyzed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT). Management practices had statistically significant effects on the number of fruit/tree, single fruit weight, fruit weight/tree and fruit yield. Treatment T_6 produced the highest weight of fruit/tree (22.37 kg). The lowest weight of fruit/tree was recorded from treatment T_1 (11.05 kg). Fruit yield became the highest (37.30 t/ha) in treatment T_6. Management practices of T_5, T_4, T_3 and T_2 contributed reduced amount of fruit yields (30.16, 29.75, 26.91, 25.02 and 18.42 t/ha, respectively). Percentage of Total soluble solid (TSS) exhibited the highest value (15.10%) in T_6 treatment. The longest shelf life (8.66 days) was observed in treatment T_6, which was statistically identical to that of T_5 (8.33 days) and the shortest shelf life (5.80 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. Farmers also showed their interest to cultivate guava with incorporating improved management practices.

Yield and quality of golden apple as influenced by agronomic practices on sorjan bed

M. A. Rahman

The field experiment was conducted at Gava village in Banaripara, Barishal during 2023-24 all the year round to find out the optimum agronomic practices for getting higher yield and quality of golden apple on sorjan bed in Barishal region. The experimental site was located at a latitude of 22°45'55.59397''N, a longitude of 90°10'46.57429''E, and an elevation of 6 meters above sea level. The location represents the Ganges Tidal Floodplain (AEZ-13), characterized with a subtropical monsoon climate and a humid environment. The soil type is clayey loam. The land of the experiment is medium low that has been raised up as the *sorjan* system. The soil shows a neutral reaction in nature, low organic matter content, and overall low fertility level. The experiment consisted of five agronomic practices viz., T_1= Control (Earthing up), T_2= Earthing up + Spraying pesticides against insect-pest, T_3 = Earthing up + RDF (Recommended dose of fertilizer), T_4 = Spraying + RDF, and T_5 = Earthing up + Spraying + RDF. The treatments were imposed on existing golden apple orchard (variety: local) of 12 years old. As per treatment specifications, each tree received 15 kg of cowdung annually, alongside 190 g urea, 350 g TSP, 300 g MoP, 190 g gypsum, and 15 g boric acid (FRG, 2018). The fertilizers were given in two equal installments, one split in the month of November (after harvesting of fruits) and the other split in April (just before flowering started). The fertilizers were applied 1.0-1.5 meters from the tree base around the tree. The tree base was regularly kept weed free. Spraying of Score 250 EC (Difenoconazole) @ 0.5 ml/liter of water for twice with a seven-day interval for controlling the incidence of anthracnose disease. No other disease incidence was recorded in the experimental area was kept free from the attack of Golden apple leaf beetle, cleaning the orchard regularly and spraying the orchard with Rogor 40 EC (Dimethoate) @ 2 ml/liter of water. The fruits were harvested when they reached full physiological maturity and had a green skin color. Data were analyzed statistically using windows based computer software of Statistix 10 version and then the mean differences were adjudged with Duncan's Multiple Range Test (DMRT). Experimental results showed that treatment T_5 resulted the highest yield of fruit (23.97 t/ha). Treatments T_2, T_3 and T_4 gave the fruit yields of 19.53, 19.37 and 18.75 t/ha, respectively. On the other hand, farmers' practice (control treatment) (T_1) gave the lowest yield (16.72 t/ha). Treatment T_5 increased the yield of 43.36% over the control. The same treatment (T_5) also contributed the highest amount of marketable yield (22.93 t/ha) and exhibited the highest shelf life (9.25 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 as compared to that of farmers' practice. Farmers have shown their interest to cultivate golden apple by applying improved agronomic practices.

Pilot production programme of grafted BARI Peyara-2 replacing local Swarupkati guava variety on sorjan bed

M. A. Rahman

The pilot production programme has been conducting at Gava village under Banaripara upazila of Barishal district (Farmer's name: Md. Rashedul Islam) for all the year round to examine the performance of grafted BARI Peyara-2 over the existing local Swarupkati variety under sorjan system in Barishal region. The experimental site is situated in the latitudes and longitudes of N 22°45′52.57796″ and E 90°10′36.06172″, respectively. BARI developed guava variety (BARI Peyara-2) was used as grafted planting material. The whole plot size was 0.26 ha (64 decimal). Previously, scion of BARI Peyara-2 was placed on the root stock of Swarupkati variety for seedlings production. Seedlings were planted on sorjan bed with row to row distance 3m and plant to plant distance 2m through zigzag method on 22 February 2022. Recommended doses and application method of fertilizers were applied for new guava orchard (BARI Peyara-2). Before planting of guava seedling, pits of about 60 cm x 60 cm x 45 cm were dug in zigzag system. The pits were exposed for 15 days before it is filled with soil, manure and fertilizer. The pits were filled with 15 kg well rotten cowdung or compost, 250 g TSP, 250 g MP, 100 g gypsum and 25 g zinc sulphate (FRG, 2018). At the planting time a small hole was made at the centre of the refilled pit and the seedlings were planted. Water was applied immediately after planting. Staking was also given to protect the plant from lodging. Pruning of branch was done to encourage new shoots. Spraying of fungicide (Tilt 250 EC @ 0.5 ml/L) was applied prior to bagging for controlling anthracnose. Mulching was done using water hyacinth for conserving soil moisture and suppressing weed growth. Fruit bagging are being done using small transparent polythene bag for protecting the fruit from the infestation and insect-pest and diseases (BARI, 2020). Guava was harvested when attain full physiological maturity. Data regarding yield components and yield was collected after attaining the fruit at ripening stage. Number of fruit/plant were 114 and 239 in BARI Peyara-2 and Swarupkati variety, respectively. Single fruit weight of BARI Peyara-2 was 271.15 g, while it was 83.50 g in Swarupkati variety. Fruit weight of a single tree was 30.91 kg in BARI Peyara-2 and 19.96 kg in Swarupkati variety. Fruit yields obtained from BARI Peyara-2 and Swarupkati variety were 36.26 and 28.59 t/ha, respectively. It can be noted that age of BARI Peyara-2 was lower as compared to that of existing local Swarupkati variety (3 and 9 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 12 to 13 days and shelf life for Swarupkati variety was range from 5 to 7 days. Brix value *BARI* Peyara-2 and Swarupkati guava were 8.50% and 10.18%, 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 findings from the pilot production suggest that the grafted BARI Peyara-2 is potentially well-suited for cultivation on sorjan beds in the tidal flood-prone areas of the Barishal region. Furthermore, the yield performance and economic returns of BARI Peyara-2 are expected to surpass those of the current Swarupkati variety progressively over time. Farmers showed their high interest to cultivate grafted BARI peyara-2 with replacing their existing Swarupkati variety on sorjan bed for getting higher yield and economic return. Farmers showed their high interest to cultivate grafted BARI peyara-2 with replacing their existing Swarupkati variety on sorjan bed for getting higher yield and economic return.

Survey

Survey on crops and cropping in drought prone areas of bangladesh

M. A. K. Mian, J. A. Chowdhury, A. A. Begum, S. S. Kakon, M. Z. Ali, S.S. Nareen, M. A. H. Khan and M. R. Karim

Drought is a serious crop production constraint in Bangladesh. Every year 3-4 million ha of land are affected by drought with different magnitude in Bangladesh. A survey by BARC shows 4.2 million hectares of land are prone to droughts with

different intensities. High Barind Tract (HBT) is a typical drought prone area. High Barind Tract (AEZ 26) comprises parts of Rajshahi, Nawabganj and Naogoan districts, characterized by grey terrace soil, low organic matter, low rainfall and high temperature. The main constraint to crop production is drought due to erratic and low rainfall from October. The long term mean annual rainfall is 1200 ± 300 mm. The maximum temperature reaches as high as 45^0C in May and the minimum falls as low as to 6^0C in January. More than 90% of the rainfall occurs from June to September. Moisture depletion starts from October and in December, no residual moisture is normally available for crop emergence, a situation that continues up to April (Idris and Huq, 1987). There is a very short period after harvest of rice, then low soil moisture conditions are conducive for sowing of *rabi* crops. Moisture holding capacity of HBT soil is poor due to critical organic matter content and low infiltration water (Ali, 2000). The study was conducted at selected locations of Naogaon, Natore, Rajshahi, Nawabganj, Bogra and Joypurhat region during 2022-2025. Data collection was done by face to face interviewing with FGD at farmers' field using a pretested interview schedule. About 3-7 numbers farmers were involved in each FGD group. Total 150 original farmers were interviewed at different locations. Some relevant data were collected from local DAE office and BMDC office. Data on major crops and cropping, and other relevant information were recoded and analyzed in MS Excel. About 16 major crops are grown in the drought prone areas. Among them, Wheat, *Boro* rice, Mustard, *Aus* rice, T.*aman*, Mango and Vegetables are dominant at Naogaon region but Wheat, Maize, *Boro* rice, Potato, Mustard, *Aus* rice, Onion, Garlic, Sugarcane, Mango, Litchi and Jute are found dominant at Natore, Rajshahi and Nawabganj regions. On the other hand, *Boro* rice, Potato, Mustard, Maize, Wheat, *Aus* rice, Banana, Chilli, Aroids are major crops observed at farmers' field of Bogra and Joypurhat region. There are three most dominant cropping practiced by the farmers. They are Wheat-T.*aman, Boro* rice-T.*aman and* Potato-*Boro* rice - T.*aman.* Besides these cropping patterns, there are 18 major cropping patterns at three study region practiced by the farmers. Farmers of this area already general crop cultivation shifted to mango cultivation. Mango is grown as intercropping with blackgram, wheat, rice and other crops in early stages of mango. Early tomato cultivation practiced in Barind area. Deep Tube well is used for irrigation. Major cropping patterns cover more than 60-80% area of the study locations. The patterns are changing from year to year due to market demand/ farmers' choice or govt. policy. Minor cropping patterns are not listed in the report. Aroid Latiraj exported to different countries of Europe including Kuwait, Malaysia, Singapore, Saudi Arabia and other countries.



IRRIGATION AND WATER MANAGEMENT

10

Background

Irrigation and Water Management Division (IWM) is one of the16 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 2024-25 are provided below.

Changes in crop water requirements and future irrigation water demand with climate change in the southwest coastal area

R. P. Rannu, K. K. Sarker, S. K. Biswas, M. A. Hossain

Fresh water is limited for agricultural purposes in Bangladesh, especially in coastal areas. For the judicial use of this limited water, this study intended to estimate the irrigation water requirements through crop water requirements. The CROPWAT model was employed to estimate reference crop evapotranspiration, crop water need and irrigation requirement for the Boro rice in Khulna district. Results revealed that there is almost no increasing or decreasing trend annually for the long-term historical data period. Monthly variation of net irrigation requirement was also observed, and that could be due to ETo or rainfall variability. However, this is a partial study with one crop and for a historical period. The conclusion will be done once the full study is completed.

Response of proso millet to different levels of irrigation

C. R. Paul, T. H. Munmun, K. K. Sarker, S. H. Anik

Proso millet is a short-duration, drought-tolerant cereal with potential for cultivation in water-limited environments of Bangladesh. A field study was conducted during 2024–2025 at the IWM Division, BARI, Gazipur, and RARS, BARI, Jamalpur to evaluate the effect of irrigation at different growth stages on growth, yield, and water productivity of proso millet. Six irrigation treatments at different growth stages were considered with three replications. The results showed that irrigation during the vegetative and flowering stages, treatment T_2, produced the highest yields, at 2.72 t/ha and 2.92 t/ha in Gazipur and Jamalpur, respectively. In contrast, no irrigation (T_0) resulted in the lowest yields at both locations. Yield and plant growth traits followed similar trends, with higher performance at Jamalpur compared to Gazipur, likely due to reduced stress conditions (biotic and abiotic). Although treatment T_5, three irrigations at vegetative, flowering and grain filling stages, enhanced vegetative growth, it did not result in higher grain yield, indicating that excessive irrigation promotes biomass production but lower grain yield. This study will be continued in the next year at both locations for the validation of these results.

Effect of irrigation on yield and water productivity of foxtail millet

T. H. Munmun, C. R. Paul, K. K. Sarker, S. H. Anik

Foxtail millet is an important crop for both cereal production and animal feed, but its water requirements have not yet been thoroughly studied. Therefore, this study aimed to examine the effect of irrigation at different growth stages on the yield and water productivity of foxtail millet. The research was conducted at the research field of the IWM Division,

BARI, Gazipur, and RARS, BARI, Jamalpur. Six irrigation treatments with three replications were considered. The results showed that irrigation during the vegetative and flowering stages produced the highest yields, at 2.81 t/ha and 2.71 t/ha in Gazipur and Jamalpur, respectively. Conversely, a single irrigation at the vegetative stage resulted in the highest water productivity, at 2.28 kg/m³ and 1.88 kg/m³ in the two locations. Although maximum irrigation improved both growth and yield attributes, the overall findings indicated that the vegetative and flowering stages are the most critical for irrigation. However, for water-scarce areas, a single irrigation at the vegetative stage is preferable.

Yield and water productivity of chia to different levels of irrigation

F. Akter, S. K. Biswas, M. A. Hossain, K. K. Sarker, R. P. Rannu

This study investigated the impact of different irrigation treatments on BARI chia-1 for the year 2023-24 and 2024-25. Five treatments: T_1= irrigation at vegetative stage, T_2=irrigation at vegetative + flowering stage, T_3= irrigation at vegetative + grain filling stage, T_4= irrigation at flowering + grain filling stage, and T_5= irrigation at vegetative + flowering + grain filling stage. The study indicated that irrigation during the flowering stage and grain filling stage led to the highest seed yield and water productivity, followed by irrigation at the vegetative and grain filling stage. Overall results as well as water use of the treatments indicated that irrigation at the flowering stage and grain filling stage is the critical stage for irrigation.

Temperature forecasting using bayesian optimization tuned machine learning algorithms

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 two meteorological stations (Dhaka, and Ishurdi). The study developed and compared 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 showed that prediction accuracy was influenced not only by the choice of algorithm but also by the characteristics of the training and testing datasets. In Dhaka, ELM consistently outperformed all models across all forecast horizons. In Ishurdi, SVR demonstrated superior performance for one-day-ahead and ELM for two, and three-day-ahead average temperature predictions (RMSE = 0.0495 °C and 0.0697 °C, respectively), as indicated by Shannon's Entropy-based decision theory. Therefore, ELM emerged as the most effective method in nearly all cases, except for the one-day-ahead prediction at Ishurdi, highlighting both its robustness and the importance of dataset-specific characteristics in predictive modelling.

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 (ETc) plays a vital role in making informed decisions for both real-time and future irrigation scheduling of major crops. Therefore, accurately predicting ETc is essential in the field of water resources management. This study investigates the effectiveness of a fuzzy tree (FT) approach, optimized using various algorithms, for predicting ETc during the initial, development, mid-season, and late-season growth stages of onion and potato crops in Gazipur. A total of 16 FT models were developed, and model performance was ranked using Shannon's Entropy (SE) method. For onion, the results showed that the FIS, GA-PSO, PSO-PSO, and FIS performed best during the initial, development, mid-season, and late-season stages, respectively. In contrast, for potato, the FIS model consistently outperformed other models across all growth stages. However, since the FT models were developed by optimizing tunable parameters, they are expected to outperform standalone FIS models when applied to unseen data. Overall, the study concluded that the FT model is highly effective for predicting seasonal ETc values for both onion and potato crops.

Projection of medium-term weather parameters using deep learning models

D. K. Roy, M. P. Haque, C. R. Paul, M. A. Hossain

Accurate forecasting of weather parameters and reference evapotranspiration (ET_0) is vital for effective irrigation planning and climate-resilient agriculture. This study evaluated the performance of three deep learning models—LSTM, Bi-LSTM, and Pro-LSTM—for projecting daily weather variables and ET_0 up to 730 days ahead at three stations in Bangladesh. Bi-LSTM showed the best performance on short-term predictions ($R \approx 0.999–1.000$; low NRMSE), but its accuracy declined over extended forecasts, likely due to its bidirectional structure. Pro-LSTM, by contrast, outperformed others in long-range projections, aided by its projected-layer design. Results highlight Pro-LSTM's robustness for medium-term forecasting, supporting data-driven agricultural water management.

Automation of drip irrigation using advanced soil sensors in tomato (BARI Tomato-21) cultivation

D. K. Roy, M. P. Haque, C. R. Paul, M. A. Hossain

Efficient irrigation management is critical for optimizing water use and maximizing crop yield, particularly for water-sensitive crops like tomato. This study evaluated the performance of different soil sensor-based automation systems for drip irrigation in the cultivation of BARI Tomato-21. The experiment was laid out in a Randomized Complete Block Design (RCBD) with six treatments and three replications, comparing control and timer-based systems with four advanced sensor-based methods. Results showed that automation using multi-parameter and multi-layer soil moisture sensors effectively monitored soil conditions and controlled solenoid valves to initiate or terminate irrigation as required. Among the treatments, T_3 demonstrated the highest yield (82.69 t/ha) and superior fruit characteristics, while T_2 achieved the highest water productivity (21.89 kg/m³) with the lowest seasonal water use. The findings confirm that sensor-based irrigation systems can enhance tomato yield and resource efficiency by enabling real-time, data-driven irrigation scheduling. This underscores the potential of precision irrigation technologies to support sustainable water management in tomato production.

Advancing water lifting facilities and implementing water-saving micro-irrigation practices for sustainable hilltop agriculture in the hilly regions of Bandarban

D. K. Roy, M. F. Hossain, M. Salim, M. P. Haque, C. R. Paul, M. A. Hossain

In the hilly terrains of Bandarban, Bangladesh, limited water access and inefficient irrigation practices pose significant challenges to sustainable agriculture. This research aims to enhance water availability and crop productivity through advanced water lifting systems and water-saving micro-irrigation techniques. During the first two years of the project, two major objectives were successfully achieved: (1) the design and development of water lifting facilities, and (2) the implementation of micro-irrigation systems. A solar-operated 3 HP submersible pump was installed, lifting water from a depth of 550 ft, powered by eight 585 W solar panels (total 4680 W). Micro-irrigation systems were established for papaya and ber cultivation. The upcoming research year will focus on evaluating the socio-economic impacts of these interventions and developing sustainable adoption guidelines. Another 550 ft deep water lifting system (from the point of first lifting: double lifting) will also be installed. The findings aim to contribute to sustainable hill agriculture, improving livelihoods and climate resilience in the region.

Evaluation of bed and furrow irrigation for yield and water productivity of potato

K. K. Sarker, M. A. Hossain, S. K. Biswas, M. A. H. Khan, T.H. Munmun, C. R. Paul

Potato is traditionally grown with every furrow irrigation method, which increases irrigation water use and reduces water productivity (WP). Therefore, an experiment was conducted in the research field to investigate yield, water use, WP, and the quality of potato tubers. The two-factor experiment included twelve combinations of four-ridge beds and furrow irrigation with three irrigation levels and two variable spacing. Double row ridge bed (70 cm) and furrow irrigation, row spacing 50 cm (DREFI50) significantly increase yields, reduce water use, and increase water productivity in potatoes. This system saved around 19% irrigation water compared to double row ridge bed (90 cm) and furrow irrigation with 60 cm (DRBFI60). Irrigation levels affect the

quality of potato tubers. The results indicate that DREFI50 can be used for potato production in water-scarce areas.

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). Due to seasonal rainfall variability, sowing date performed differently, consequently, in 2023-24, mid-December sowing gave the significantly highest seed yield and in the following year, 1st week of December 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 demand of 17.12 crore people by focusing on limited water resources. Therefore, it can be difficult to conclude in case of sowing date because of rainfall variability. However, the dwarf sunflower can be irrigated at 50% of full irrigation at three growth stages to get higher IWP with 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

Optimize irrigation use of dwarf sunflower at various time 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 time of sowing using four irrigations with full and 50% of full irrigation at 3 crop growth stages. We have made good progress in parametrising 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.

Design and development of a low-cost sprinkler system

M. P. Haque, D. K. Roy, K. K. Sarker, M. A. Hossain

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 peak at 360 cm from the sprinkler. The sprinkler system, equipped with a submersible 0.75 Hp DC solar pump, was also tested, and the coefficient of uniformity (CU) was relatively low (approximately 60%). This high uniformity and efficient water distribution with domestic water supply 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 (850 Tk.) 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, M. A. Hossain

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, 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 R^2 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 estimated irrigation water requirement was highest for Boro rice (927 mm) and lowest for bean (10 mm). The study should be carried out in the next year.

Smart irrigation based on pan evaporation using iot-enabled ultrasonic sensor for brinjal production

K. K. Sarker, M. A. Hossain, M. P. Haque, M. S. Kabir, M. G. M. Amin

Sensor-based smart irrigation (SI) is not in general practice, and its potential is yet to be investigated. Therefore, the objective of this study was to (i) develop and test the SI based on pan evaporation using IoT-enabled ultrasonic sensor for eggplant production. IoT-based smart irrigation practice (T_1) system was developed and tested in the lab and evaluated at field conditions. A mobile app was used to operate it. T_1 was partially evaluated by comparing it with BARI recommended practices (T_2), drip irrigation (T_3), and traditional practice (T_4). The results indicated that the water saved by T_1 was more than that of T_4. The treatments affected the fruit yield of eggplant. T_1 and T_3 produced a better yield than the others. IoT-enabled ultrasonic sensor-based pan evaporation method irrigation needs further validation.

Parameterisation, calibration, and validation of apsim-sunflower for various surface drainage depths in southern bangladesh

A. J. Mila, D. S. Gaydon, R. W. Bell, A. K. Chaki, P. L. C. Paul

In 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 field study was conducted during 2022-23 and 2023-24 to simulate the APSIM-Sunflower for surface drainage depths (0 cm; no drain, 15, and 30 cm) at Dacope soil in Khulna district using the sunflower and long-term yield variability for changing climate. The model performed satisfactory in simulating observed crop, soil and salinity parameters with a high coefficient of determination (0.79-0.99) and acceptable RMSE values for both calibration and validation datasets. From the long-term yield prediction for seasonal total rainfall, 30 cm surface drainage showed more resilient than those for 15 cm and no drain treatments.

Parameterisation, calibration, and validation of apsim-potato for various surface drainage depths in southern Bangladesh

A. J. Mila, D. S. Gaydon, R. W. Bell, M. A. Hossain, S. K. Biswas

In 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 field study was conducted during 2022-23 and 2023-24 to simulate the APSIM-Potato for surface drainage depths (0 cm; no drain, 10, and 20 cm) at Dacope soil in Khulna district using the potato and long-term yield variability for changing climate. The model setup and calibration completed for the three surface drainage depth treatments. Model simulated crop (phenology, yield, and biomass), soil water content and soil salinity as chloride content. At this stages of model setup, yield and biomass match perfectly with R^2 values varied from 0.89-0.99. However, the validation is not completed yet but field data collection from the field experiment has been completed. After completion of validation, the model can perform long-term yield prediction for the climate change variabilities.

Projection of groundwater level fluctuations using long short term memory networks in a drought prone region of northwestern Bangladesh

D. K. Roy, M. P. Haque, C. R. Paul, M. A. Hossain

This study investigates the capability of Long Short-Term Memory (LSTM) networks to forecast groundwater level (GWL) fluctuations in northwestern Bangladesh, a region particularly

susceptible to drought. The performance of LSTM was benchmarked against traditional time series models, dynamic system response models and their hybrid forms. A total of eight models were evaluated using historical GWL data from 19 observation wells: LSTM, ARMA, three state-space models (n4sid, SSEST, SSREGEST), and three corresponding hybrid ARMA-state-space models. Model performance was assessed using key statistical indicators. Across most locations, the LSTM model consistently outperformed the others, achieving correlation values between 0.53 and 0.92. To identify the top-performing models, an integrated Entropy-EDAS decision-making framework was applied, further validating the dominance of LSTM. The best-performing models provided accurate GWL projections for five years beyond the available data, offering a practical tool for informed and sustainable groundwater management in drought-affected areas.

Investigation of groundwater level fluctuations in relation to rainfall at Kushtia district

M. M. Morshed, R. P. Rannu, M. A. Hossain

This study examines 30 years of rainfall and groundwater data from Kushtia District, Bangladesh, to evaluate rainfall–groundwater interactions. A moderate negative correlation ($r = –0.28$) was found between rainfall and groundwater depth, with the strongest effect at a two-month lag ($r = –0.65$), showing delayed recharge. High annual rainfall variability ($CV > 1.0$) was linked to deeper groundwater, indicating reduced recharge efficiency under irregular rainfall. Regression analysis revealed that 61% of fluctuations were explained by current and lagged rainfall. These findings underscore the role of consistent rainfall in aquifer replenishment and emphasize the need for adaptive irrigation and sustainable groundwater use.

Monitoring of ground water level at different BARI stations

M. A. Hossain, D. K. Roy, S. K. Biswas, M. S. Hossain, M. Morshed, M. A. Rahman, M. M. Rahman, M. S. Hossain, Rokkonuzaman, M. A. Mottalib

This study has been conducted at the research fields of Irrigation and water Management Division (IWM), RARS, Rahmatpur, Barisal, and RARS Ishurdi, Pabna, SRC, Bogura, BSPC, Debigonj, RARS, Jamalpur and RARS, Jessore of Bangladesh Agricultural Research Institute (BARI) from 2019-20. The maximum depletion of groundwater level was found (156.11ft) at IWM Field of BARI, Gazipur in 7th September, 2025 followed by RARS, BARI, Ishurdi (32 ft) in 26th April 2025. The lowest depletion of groundwater level was observed 14.9 ft at BSPC, Debigonj. Variation of maximum depletion of date at different locations may be caused by variations in rainfal, soil type, soil characteristics and other factors.

Impact of a small municipal solid waste dumpsite on groundwater quality: A case study in Gazipur city

D. K. Roy, M. P. Haque, M. A. Hossain

This study evaluates the impact of a small municipal solid waste dumpsite on groundwater quality in Konabari, Gazipur, Bangladesh. Specifically, it assesses the travel time and direction of particle movement from the dumpsite to a pumping well and quantifies leachate migration into the subsurface system. The study employs finite difference-based numerical models: MODFLOW-MODPATH and MODFLOW-MT3DMS. Two pumping wells used for beneficial purposes were considered—one located near the dumpsite and the other farther away. The results show that MODFLOW-MODPATH effectively delineates the flow direction of water particles from the dumpsite to the pumping well, as well as the associated travel time. The average flow length and travel time to the nearest well were 429.41 meters and 5,163.57 days, respectively. Likewise, MODFLOW-MT3DMS-based contaminant transport modeling successfully simulates leachate migration from the dumpsite toward the well as a result of pumping.

Adaptive trials on water-saving irrigation technologies in water-scarce regions of Bangladesh

D. K. Roy, M. A. Hossain, K. K. Sarker, A. J. Mila, M. P. Haque, C. R. Paul

This study evaluates the performance of various water-saving irrigation technologies through adaptive field trials conducted in farmers' fields across water-scarce regions of Bangladesh during the 2024–2025 growing season. A total of 71 demonstrations were implemented across multiple

sites, comprising 22 trials of alternate furrow irrigation, 8 trials of conjunctive use of fresh and saline water, 16 trials of deficit irrigation, 7 trials of drip irrigation, 5 trials of solar-powered drip irrigation, 7 trials of sprinkler irrigation, and 6 trials of solar-powered sprinkler irrigation. These technologies were applied to diverse crops and soil types representative of the region. Key performance indicators included water use efficiency, crop yield, and water productivity. Results showed that alternate furrow irrigation reduced water use by up to 33% (e.g., potato: 0.30 m to 0.20 m, water productivity 9.79 kg/m³; cauliflower: 0.26 m to 0.17 m, water productivity 11.83 kg/m³) without compromising yield. Deficit irrigation saved 15–20% water while improving water productivity (e.g., mustard: 0.15 m to 0.12 m, water productivity 1.21 kg/m³; maize: 0.33 m to 0.26 m, water productivity 3.85 kg/m³). Conjunctive use maintained stable yields (e.g., maize 10.00 t/ha, potato 19.10 t/ha) but showed no significant water savings. Drip irrigation achieved high yields for high-value crops such as tomato (80.00 t/ha) and brinjal (50.00 t/ha), while solar-powered systems reduced operational costs and improved energy sustainability. Sprinkler irrigation performed well for moderate water-requirement crops like onion (18.00 t/ha) and garlic (8.00 t/ha). Farmers perceived these technologies as effective strategies for addressing water scarcity, enhancing yields, and lowering operational costs, with strong interest in continued adoption. The study will extend for the next three years, evaluating these irrigation methods under varying agro-ecological conditions to further validate their long-term benefits.

Water-efficient irrigation management for enhancing crop production in char areas of northern Bangladesh

M. A. Hossain, D. K. Roy, M. P. Haque

This study investigated the performance and economic viability of modern, water-efficient irrigation technologies in the water-scarce char regions of northern Bangladesh. Field trials of drip fertigation, sprinkler irrigation, and solar-powered alternate furrow irrigation (AFI) were conducted across four char locations to improve crop productivity and resource use efficiency. Results showed that these technologies significantly reduced water (30–50%), fertilizer (20–40%), and energy use while increasing crop yields (20–35%). The solar-powered AFI system had the shortest payback period (0.7–0.8 years), demonstrating strong potential for rapid adoption. Overall, the study highlights the effectiveness of integrating climate-smart irrigation practices with renewable energy for sustainable agricultural intensification in marginal ecosystems.

Validating sprinkler and subsurface drip irrigation systems for sustainable crop production in char areas of Bangladesh

M. A. Hossain, D. K. Roy, K. K. Sarker

In Bangladesh, where agricultural land is dwindling due to population pressure, innovative irrigation techniques are critical for maximizing crop production on underutilized char lands. This study validates and refines sprinkler and subsurface drip irrigation (SDI) systems for growing high-value crops under the challenging conditions of sandy loam soils in the char areas of Rajbari, Dhaka, and Tangail districts. Field and tank experiments were conducted from October 2024 to April 2025 using crops such as brinjal, pumpkin, onion, and ground nut. The sprinkler system showed enhanced yields for shallow-rooted crops, while SDI demonstrated substantial water and fertilizer savings. Preliminary results indicate increased water productivity and techno-economic feasibility, suggesting these irrigation technologies can play a significant role in ensuring sustainable agriculture in vulnerable char ecosystems.

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, M. A. Hossain

Dissemination of solar-powered drip irrigation system for watermelon cultivation in saline prone areas of Bangladesh (Patuakhali, Noakhali, and Barguna)

Traditionally, watermelon farmers irrigate by manually carrying water from small ponds, a process that is both labor-intensive and time-consuming. To address this challenge and improve resource efficiency, field demonstrations were conducted using a solar-powered drip irrigation system. The study included two treatments with three replications: solar-powered drip irrigation (T_1)

and the farmers' conventional practice as the control (T_2). Trials were carried out during the 2024–25 growing season at Holdebariya and Omitpur in Kalapara, Patuakhali; Char Jabbar in Subarnochar, Noakhali; and Patakata in Amtoli, Barguna. Results indicated that T_1 consistently produced higher yields and significantly improved water productivity compared to T_2. The adoption of solar-powered drip irrigation not only reduced the labor burden of water application but also saved water and energy, making it an attractive and sustainable option for farmers.

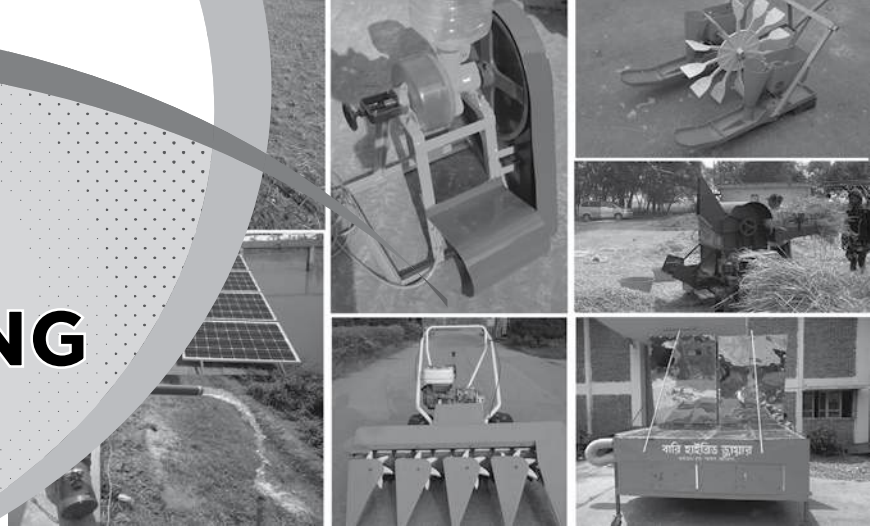
Dissemination of solar-powered drip irrigation system for pumpkin cultivation in saline prone areas of Bangladesh (Patuakhali and Noakhali)

Pumpkin fields are typically irrigated by farmers using manual techniques, drawing water from nearby sources, which often leads to excessive water use. To address this issue, field trials utilizing a solar-powered drip irrigation system were carried out to reduce water wastage and improve energy efficiency. These trials took place during the 2024-25 growing season in several locations across southern Bangladesh, including Monoharpur and Kalapara in Patuakhali, as well as Char Hasan, Char Jabbar, and Subarnochar in Noakhali. The experiment consisted of two irrigation treatments, each replicated three times: (i) a solar-powered drip irrigation system (T_1) and (ii) conventional farmer practices (T_2) serving as the control. Findings showed that T_1 outperformed T_2 in both yield and water productivity. The technology also garnered positive interest from farmers due to its potential for saving both water and energy.

Dissemination of solar-powered drip irrigation system for brinjal cultivation in saline prone areas of Bangladesh (Patuakhali)

In many coastal areas, brinjal growers still rely on manually transporting water from nearby ponds, a method that demands considerable labor and time. To overcome these limitations and enhance the efficient use of resources, field demonstrations were implemented featuring a solar-powered drip irrigation system. The experimental setup consisted of two treatments with three replications: solar-powered drip irrigation (T_1) and the traditional farmer's method (T_2) as the control. A field demonstration was conducted during the 2024–25 growing season at Khajura in Kalapara, Patuakhali. Results revealed that, T_1 consistently delivered greater yields and markedly higher water productivity than T_2. Moreover, the solar-powered drip system reduced the physical effort required for irrigation while conserving both water and energy, making it a promising and sustainable technology for local farming communities.

FMP ENGINEERING



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Development and evaluation of four-wheel tractor operated seeder

M. A. Hoque and M. N. Amin

Four-wheel tractor (4WT) is getting popularity in recent days in farming works. They are also a suitable option to use as sitting type seeder. Therefore, this research has been under taken to develop four-wheel tractor operated seeder (4WTOS). The seeder was evaluated for planting maize in Gazipur and Rajshahi during 2024-25. The experiment was conducted with four treatments replicated thrice with RCB design. The treatments were: T_1= 4WT operated strip tillage seeder, T_2= 4WT operated seeder, T_3= 2WT operated BARI seeder and T_4= conventional or full tillage method. Yield and yield contributing characters of maize planted by different methods were not varied in Gazipur but the significantly highest wheat yield was found in 4WT operated seeder in both the strip till and full tilled land. The four-wheel tractor operated seeder may be recommended for CA and full tillage methods.

Energy analysis of rice-based cropping patterns (Mustard-rice) for different tillage and residue options

M. A. Hoque and M. N. Amin

System-based evaluation of the conservation tillage in terms of energy and economic is important. Therefore, this experiment was undertaken for Rice-Mustard-Cover crop 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 2024-25 with eight treatments. Treatments were conventional tillage (CT) T. Aman-CT Mustard, CT machine transplanted T. Aman-CT Mustard, CT T. Aman-Strip tillage (ST) Mustard, CT T. Aman-Zero tillage (ZT) Mustard, STMT T. Aman-ST Mustard, Strip till followed by manual transplanting (STMT) T. Aman-ZT Mustard, Unpuddled tillage (UPT) T. Aman-ST Mustard and UPT T. Aman-ZT Mustard. The higher energy ratio was found in strip tillage (ST) based cropping systems which were also similar with that found in zero tillage-based cropping systems.

Development and validation of four-wheel tractor operated ca planter for commercial farming

M. A. Hoque, M. A. Rahman and M. N. Amin

Conservation agriculture (CA) is a concept of crop production that aims to achieve high and sustained production levels with conserving the natural resources and environment. There are some existing mechanical seeders for CA practices driven by two-wheel tractors. The demands of four-wheel tractor (4WT) is increasing in recent years in farming works in Bangladesh. Therefore, a study was undertaken to develop a four-wheel tractor CA planter for large plot and commercial farming. A CA planter was designed and fabricated during 2024-25 to place seed and fertilizer together in strip tillage. Initial performance evaluation revealed that the field efficiency of the CA planter was 76.80%.

Development of a four-wheel tractor operated garlic planter

M. A. Hoque, M. A. Mottalib and M. N. Amin

Four-wheel tractors are becoming popular in farming works in recent days since they have suitable alternative use option. Therefore, this research work has been taken to design, develop and evaluate a suitable four-wheel tractor operated onion and garlic planter. A four-wheel tractor operated garlic planter was redesigned and fabricated accordingly in FMP Engineering Division, BARI, Gazipur during 2024-25. Maximum 12 lines of seed can be sown with BARI 4WT garlic planter and the tilling width was 180 cm.

Improvement and validation of two-wheel tractor operated planter for small holders

M. A. Hoque, M. A. Rahman, M. R. Hasan and M. N. Amin

Increasing seasonal labor scarcity due to rural out-migration has urged in small-scale agricultural machinery appropriate for the small and fragmented land. Major goals of conservation agriculture are sustainable intensification, improvement of land productivity, and efficient use of water and nutrients. The uses of two-wheel tractor (2WT) are playing remarkable role in recent years in farming works in Bangladesh. Therefore, this research has been under taken to develop two-wheel tractor operated seeder (2WTOS) for sowing upland crops quickly and efficiently during 2024-25. With this seeder, tilling, seeding and fertilization could be done in a single pass. The fabrication of two model prototype was completed but could not be tested due to lacking of time.

Development and validation of ca dibbler

M. A. Rahman, M. A. Hoque and M. N. Amin

The CA (Conservation Agriculture) dibbler is a tool or machine used to place seeds directly into the soil with minimal disturbance. It plays a crucial role in implementing CA practices because it only disturbs tiny areas of soil, most of the soil surface remains covered with crop residues or mulch. The CA dibbler was designed and fabricated at Farm Machinery and Postharvest Process Engineering (FMPE) Division of Bangladesh Agricultural Research Institute during 2024-25. The fabricated dibbler was tested primarily. Some technical problem was observed i.e. when the dibbler was pushed into the soil for seeding, the dibbling tine was not opened properly. This was caused due to the dibbling tine opener pressure spring could not create enough pressure. Primary performance (field efficiency for BARI Hybrid Maize-17, BARI Soybean-5 and BARI Mung-17 were found as 85.7, 77.8 and 77.2 % respectively) of the CA dibbler was found. Overall dimension was observed 100×50×787 mm. The dibbler consisted of dibbling tines, seed hopper, seed metering plate etc. On the basis of primarily tested result it was undertaken for further modification.

Effect of tillage, residue levels and fertilizer doses for ca practices in maize-cover crop-rice cropping pattern

M. A. Hoque 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 at BARI, Gazipur. The rice-maize-cover crop pattern were cultivated with four tillage methods such as conventional, strip tillage, zero tillage and bed planting with three replications during 2024-25. Three residue levels (0, 25 cm and 100%) and three fertilizer doses (80, 100 and 120% of recommended dose). The SREY was varied for individual effect of tillage, residue and fertilizer dose. The highest SREY was found for interaction effect of bed planting and full residue incorporation.

Suitable residue retentions and tillage methods in mustard-mungbean-t. Aman pattern

M. A. Hoque, M. A. Rahman, M. R. Hasan, T. Jahan and M. N. Amin

The long-term conservation agriculture trials were conducted at CA park at FMPE Division research field in BARI, Gazipur. The experiment with varying tillage methods and residue levels was conducted. The tillage methods were CT= Conventional, ST= Strip tillage, ZT= Zero tillage and BP= Bed planting. The residue levels were L_1= No residue, L_2= Residue (25cm). The highest system rice equivalent yield (SREY) in mustard-mungbean-rice pattern was found in CA tillage systems (ST, ZT and BD) compared to conventional tillage system. The similar SREY was found among the residue treatments in the cropping pattern.

Development and fabrication of a two-wheel tractor coupled bund maker

M. A. Mottalib, M. A. Hoque, M. M. Alam, M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. M. Hasan and Z. H. Prodhan

This study aims to locally manufacture and evaluate a two-wheel tractor-coupled bund maker to improve land preparation for spices and other cropping systems. The implement is designed to be low-cost, labour-saving, easy to maintain, and suitable for smallholder farmers. It was fabricated using locally

available materials at the SRC, BARI, Bogura workshop during 2024–2025. Initial field testing and performance evaluation will be conducted during the 2025–2026 cropping season. Based on test data and observations, design improvements will be made. Field evaluation will follow ASABE standard testing protocols. As a first-year trial, further refinement and testing are planned to enhance efficiency and reliability.

Performance evaluation of onion production using conservation tillage practices in the jamalpur region

M. S. Hossain, M. A. Hoque, M. N. Amin, M. Yasmin and M. M. Kadir

An experiment was conducted to evaluate the performance of different tillage practices in onion cultivation in the Jamalpur region. Three different tillage practices, namely, minimum tillage (T_1), tractor tillage (T_2), conventional or farmer's tillage (T_3) and zero tillage (T_4) were introduced to evaluate bulb productivity with four replications. Tillage practices showed positive effects on yield parameter characteristics and bulb yields. The results reveal that the highest fresh bulb yield of 11.36 t ha^{-1} of BARI onion-4 was produced under minimum tillage practice for year 2024-25 on the other hand tractor, conventional tillage and zero tillage practices also produced different bulb yields (9.76, 11.25 & 10.22 t ha^{-1}) than minimum tillage practices. Timely sowing of onion crops will be possible with BARI Seeder in Charland ecosystem.

Evaluation of tillage practices of groundnut in charland ecosystem of jamalpur region

M. S. Hossain, M. A. Haque, M. N. Amin and M. M. Kadir

An experiment was conducted to evaluate the performance of different tillage practices in groundnut cultivation under Charland ecosystem in Jamalpur region. Four different tillage practices, namely, minimum tillage (T_1), strip tillage (T_2), conventional or farmers tillage (T_3), and dibbling tillage (T_4), were introduced for this with three replications. Tillage practices showed positive effects on yield parameter characteristics and nut yields. The results revealed that the highest pod yield (1.94 t ha^{-1}) of BARI groundnut-9 was produced under minimum tillage practice. Strip and dibbling tillage practices also produced statistically similar pod yields (1.92 & 1.9 t ha^{-1}) to that of minimum tillage practices.

Development of a power operated handheld weeder for hilly region

M. A. Rahman, T. N. Barna, N. Jahan, M.A. Gulandaz, M. Z. Hossain, M. A. Hoque and M. N. Amin

Horticultural fruit orchards replace the traditional Jhum cultivation in hill agriculture. The hill farmers demanded a light weight portable bush cutter to cut soft grasses and bushes. A handheld weeder was evaluated with four types of blades at the research field. The different sized and shaped cutting blades (plastic blade, stainless steel blade and disc blades) were used to cut soft grasses and bushes. The backup time of a rechargeable 24 V, 13 Ah lithium-ion battery and angular speed at no load were measured around 2 h and 8000 rpm, respectively. The operators needed 2-minutes resting time after every 15 minutes of continuous operation to avoid hand muscle pain. The cutting and field efficiency (99 % and 62 % for plastic blade, 98 % and 37 % for stainless steel blade and 94 % and 21 % for disc blade of diameter 15 cm and 96 % and 27 % for disc blade of diameter 10 cm) were found satisfactory.

Design and development of a plastic mulch machine

M. Hossain, S. Akther, M. A. Hoque, M. S. Miah, M.A. R. Gazi and M. N. Amin

Mulching is process of covering the soil round the plant root area with a view to insulate the plant and its roots from the consequences of utmost temperature fluctuation. Mulches can be classified into organic and inorganic. The power tiller operated machine will be beneficial for farmers to reduce the time consumption in laying the mulch sheet and punching the mulch sheet will ultimately reduce the human effort and cost of laying the mulch. The objectives of the research are i. To design and fabricate a plastic mulch machine and ii. To test and performance evaluation of plastic mulch machine. 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. It is also one of the best methods to

cover the soil and maintain required atmosphere around the crop. The working and parameters of mulch paper laying machine for minimizing the human efforts and increasing productivity of crops. We have designed a mulching machine application in agriculture field which is going to lay mulch film reducing the human efforts and increase efficiency which results in less expenditure on labour. Also it reduces the cost required for employee for laying mulch paper on bed. The theoretical field capacity was found to 0.22 ha/h at an average speed of 2.5 km/h with field efficiency of 72 percent. It was observed that the actual field capacity of developed mulching machine 0.16ha/h.

Improvment and evaluation of a new tunnel shed design for summer tomato production

M. R. Hasan, M. A. Hoque and M. N. Amin

This study evaluates a new, scientific tunnel shed design for cultivating summer tomatoes to overcome challenges like heat stress, heavy rainfall, and poor ventilation. It compared three new gable-roof shed designs with ridge vents (T_1, T_2, and T_3) against a traditional farmers' practice (T_4). The sheds were constructed using GI pipes, hollow square bars, and polythene, with internal temperature and humidity monitored by sensors. The results demonstrated that the new designs created a more favourable microclimate, characterized by a slight decrease in temperature and an increase in relative humidity, which led to healthier, taller plants. The new designs significantly outperformed the traditional method in terms of yield. Treatment 1 (T_1) produced 10.8 tons/ha, nearly double the 5.25 tons/ha from the traditional method (T_4). Treatment 2 and Treatment 3 yielded 7.05 tons/ha and 4.10 tons/ha, respectively. The average fruit weight was similar across all treatments, but the new sheds enhanced overall fruit production. In conclusion, the study finds that these innovative shed designs, particularly T1, offer a practical and effective solution for enhancing tomato cultivation in challenging summer conditions by improving the microclimate and increasing overall yield.

Development of a variable rate multi-nozzle sprayer

S. Akter, M. A. Hoque, M. A. Gulandaz and M. N. Amin

The sprayer is a type of agricultural equipment used to apply insecticide and spray liquid on agricultural crops. The general spraying technique uses hand-operated and power sprayers that are backpack-style, which cover a very small area during application. Evenness of flow characteristics of liquid from a sprayer nozzle is one of the requirements of accurate pesticide application. In pesticide application, accuracy and uniformity of application are most important to avoid adverse effects of pesticides on the environment and crop injury and reduce pest management. For this reason, controlling the spraying time and nozzle pressure is very important to incorporate in the sprayer machine. The three types of hollow cone nozzles were tested at three different spraying height such as 30 cm, 45 cm and 60 cm respectively and at a 4.5 psi pressure. For spraying test, a battery-operated pump was used preliminary. Average droplet number, droplet diameter and uniformity of these nozzles were calculated using python programming. In the next year, a sprayer, spraying through 4 to 5 nozzles at a time will be developed and laboratory and field test will be done.

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

A motorized climbing-type coconut sprayer was developed and modified by the FMPE Division, BARI during 2024–2025 to overcome the challenges of pesticide application on tall coconut trees. The system is equipped with a 373 W climbing motor powered by a 48 V rechargeable battery, integrating four 12 V DC motors for climbing support and spray operation. The sprayer accommodates two remotely wired controlled rotating arm bound with nozzles to ensure flexibility in field use. Laboratory performance evaluation demonstrated spray lengths of 6.0 m with a single nozzle and 5.8 m with dual nozzles, corresponding to discharge rates of 113 L/h and 90 L/h, respectively. Field trials confirmed its practical efficiency, with climbing times ranging between 44 and 70 seconds and a slippage rate of 10–12%, which remained within acceptable limits for operational stability. In comparison to conventional ground-based sprayers, which are restricted to an effective spray height of approximately 10.4 m, the motorized climbing sprayer provided significantly improved vertical coverage, ensuring more uniform pesticide

distribution across tall canopies. Additionally, the system enhanced safety by minimizing the need for manual climbing, while also improving labor efficiency and reducing pesticide wastage. The developed climbing sprayer therefore represents a practical, safe, and efficient solution for coconut growers, addressing limitations of existing methods and supporting better crop protection practices.

Development of input and farm product transportation system for hilly region

M. A. Hoque, M. A. Rahman and M. N. Amin

Carrying down the harvested fruits from high hills is as laborious and costly. Lack of insufficient manpower and higher labour cost for fruits harvesting and transporting down from hill retards fruits production. An experiment was conducted to develop a cable car as transportation system of agricultural commodity in hilly region. A reversible cable car with 10-degree slope was design and fabricated at FMP Engineering divisional workshop during 2024-25. The speed of the load bearing carrier was varied with the loads. The initial testing showed that the system can carry load in inclined cable. The system will be further evaluated in the hilly environment in the coming years.

Improvement and validation of barley thresher

M. Hossain, M. A. Rahman, M. A. Haque and M.N. Amin

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 modified by attaching two types of rasp bars on the threshing cylinder and adding a perforated MS sheet on the concave. Barley is a minor crop in Bangladesh which is grown mainly in some pockets of northern region. In BARI has released 9 barley cultivars, and 54 accessions of barley germplasm are also conserved at the PGRC. However, there is no commercial machine available in the country for threshing of barley. Barley genotypes have been classified in two based on presence of hull around the kernels i.e. hull-less and hulled. The relation between drum speed and threshing capacity in barley crop at drum speed of 800 rpm, 1000 rpm, and 1200 rpm and feed rates of 700, 800 and 900 kg/h. The maximum threshing capacity was observed to be 420 kg/h at drum speed of 1000 rpm and feed rate of 900 kg/h and minimum threshing capacity was 316 kg/h at drum speed of 800 rpm and feed rate of 700 kg/h for barley crop respectively. As the feed rate increased from 700 to 900 kg/h, the threshing capacity increased from 316 to 397 kg at 800 rpm drum speed for barley respectively. Similarly for the same range of feed rate the threshing capacity increased from 324 to 420 kg and 320 to 361 kg; at drum speed of 1000 rpm and 1200 rpm, for barley respectively. The thresher perform satisfactorily as threshing recovery 420 kg/h, threshing efficiency 99.78%. However, percentage of breakage grain was found to be 0.87%.

Development of a power operated coconut tree climber

M. Hasan, M. N. Amin, M. A. Hoque, M. S. Miah, M. Z. Hossain and N. Jahan

Coconut tree climbing is a labor-intensive task with significant risks due to the tree's height, slippery trunk, and sharp leaves. To address these challenges, a power-operated coconut tree climber was developed at the FMPE Division, BARI, Gazipur. This innovative device includes a stainless-steel frame, gear box, chain-sprocket, and specialized wheels to ensure secure traction. Powered by a 52cc petrol engine with a 4.5 HP output, Performance tests revealed that the highest ascent speed is 0.61 m/s, while the lowest is 0.55 m/s. Similarly, the highest descent speed is 0.74 m/s, and the lowest is 0.45 m/s. This invention enhances productivity and reduces the risks associated with manual climbing, meeting the growing demand for safer, more efficient coconut tree harvesting.

Design and development of tractor-operated potato harvester

M. R. Hasan, M. A. Hoque and M. N. Amin

A four-wheel tractor-driven potato harvester was designed and fabricated with locally available materials to facilitate the farmers to harvest their potatoes at low cost. The machine, a semi-automatic digging device, was created to help farmers reduce the high costs, labor, and time associated with manual potato harvesting. It features a digging blade, a conveyor flat chain, a shaker, and a collector to simultaneously dig, separate, and bag potatoes.

Performance tests showed that the harvester has a field capacity of 0.10 ha/h and operates at a forward speed of 1.25 km/h. While the machine successfully digs and separates the potatoes, the study identified significant issues. The harvesting missing rate was 5.92%, and the damage rate was 5.52%. A major problem was that some potatoes were damaged by the tractor wheels pressing on them, an issue that proved to be a critical flaw and would prevent farmers from adopting the machine. The report concludes that although the harvester shows potential for improving efficiency, the current design is not viable due to the high rate of potato damage caused by the tractor wheels.

Testing and evaluation of combine harvester for harvesting mungbean and soybean in coastal areas

M. Hossain, M. S. Miah, M. A. Hoque, M. N. Amin and M. A. Hossain

The soybean mungbean and black gram is a good source of plant protein. Most of the cases these two crops are collected traditional way. But, mechanized agriculture can play a crucial role in the complete socio-economic progress in terms of food security, value addition, employment, poverty mitigation and export earnings. Due to the migration of agricultural labor in non-farm sectors and increasing climate vulnerability, it is a great challenge to keep pace of food production for the exponential growth of population, especially in Bangladesh.Soybean ,mungbean and black gram are currently harvested manually.Harvesting requires a lot of time, labour, and money for both. To solve this problem a combine harvester was tested and its performance was evaluated. The aim of the research to evaluate the performance of the combine harvester for harvesting mungbean,soybean and black gram as well as to modify and improve combine harvester. The machine was tested at undar chor, Noakhali sodor for combine harvesting of soybean and at Amkhola, Golacipa, Patuakhali for combine harbesting of mungbean during the year. The average forward speed and field capacity of combine harvester for soyabean, mungbean and black gram were 2.03 km/h, 0.34 ha/h, 2.21km/h, 0.39 ha/h and 1.99km/h,0.33 ha/h respectively. It was found that the percentage of unthreshed grain pad in soyabean, mungbean and black gram were 39.20%, 35.67% and 37.85% respectively.

Development of an oat dehulling machine

N. Jahan, M. N. Amin, M. M. Hossain, S. Akter and A. H. Akhi

An oat dehulling machine removes the outer hull, enhancing the quality and palatability of oats for consumer use. This research explores the design and performance evaluation of an oat dehulling machine aimed at improving the processing efficiency and quality of oats by removing their outer hulls. The machine was tested using different pulley sizes to determine optimal operational parameters, with materials including whole oats and various machine configurations. Key performance indicators such as broken groats, unhulled grains, and dehulling efficiency were measured in this study. A larger 15.24 cm pulley proved ineffective, generating insufficient force and resulting in a low dehulling efficiency of only 59.67% with 30.38% of grains unhulled. Conversely, a smaller 10.16 cm pulley applied excessive force, achieving a high efficiency of 83.55% but causing significant damage with 25-30% broken grains.The optimal performance was achieved using a 12.7 cm pulley, which struck a balance between effectiveness and grain preservation. This configuration provided a high dehulling efficiency of 93.33% while minimizing damage, with broken grain and unhulled grain rates of 13.69% and 10.34%, respectively. When compared to imported machines, the developed prototype demonstrated better performance by effectively balancing high efficiency with acceptable levels of grain breakage and unhulled grains.

Development and evaluation of a power operated chia thresher

T. N. Barna, M. N. Amin, M. A. Rahman and M. A. Hoque

Chia cultivation is gaining popularity in Bangladesh due to its high nutritional and economic value. However, manual threshing methods like stick beating or hand rubbing, remain labor-intensive, time-consuming, and inefficient, with a throughput of only 0.18 kg/h. To address this, a study was conducted to evaluate mechanized threshing options using specially designed attachments for existing BARI power threshers. Developed by the Farm Machinery and Postharvest Process Engineering Division of BARI, two attachments Model-1 (sieve drawer with blower off) and Model-2 (combined

threshing and winnowing with blower on) were tested. Results showed high threshing efficiency**:** 96.7% for Model-1**,** 96.6% for Model-2**,** and only 87.3% for manual methods. In terms of capacity, Model-2 achieved 20.81 kg/h, Model-1 reached 19.33 kg/h. Winnowing efficiency was highest with the BARI Winnower 98%, while Model-2 achieved 72–77%, and Model-1 lagged behind at 33–43%**.** Moisture content had minimal impact on winnowing performance. Model-2 demonstrated the best balance of efficiency and convenience, supporting the need for a single, integrated attachment suitable for chia and other small-seeded crops. In conclusion, mechanized threshing, particularly using Model-2 greatly enhances productivity and reduces labor. A new unified attachment is under development to simplify operations further and promote scalable chia processing for smallholder farmers in Bangladesh.

Development of a power operated cotton harvester

M. R. Hasan, M. A. Hoque and M. N. Amin

This report describes the development and evaluation of a new, power-operated cotton harvester designed for small-scale farms in Bangladesh, aiming to address the high costs and low efficiency of traditional manual harvesting. The machine features a lightweight aluminium frame, a 24 V lithium-ion battery, a 350 W brushless DC motor, and a stripper-comb picking head. Its ergonomic design includes a shoulder strap and safety features to reduce operator strain. Performance tests showed the harvester significantly outperformed manual methods. The machine achieved a picking efficiency of 90%, surpassing the 80% of manual harvesting. Its field capacity was 7.5–8 kg/h, nearly double the 4.0–4.5 kg/h of manual picking, demonstrating a clear time-saving advantage. Although the battery run time was limited to 25–30 minutes, its quick-swapping design allows for continuous operation. The study also noted a significant reduction in farmer drudgery and physical strain, with less bending and finger fatigue reported compared to manual work. In conclusion, this innovative harvester proves to be a valuable tool for modernizing cotton farming. Its increased efficiency and reduced labor requirements make it a viable solution for improving the productivity and profitability of cotton cultivation in Bangladesh.

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, half recovery, broken percentage and shelling efficiency of BARI four blades auto cashew nut sheller was found to be 81, 12, 7 and 76 respectively.

Development of a suitable fruit bagging tool

M. Hasan, M. N. Amin, M. A. Haque and M Hossain

Fruit bagging is a common technique in fruit crops to improve skin color and protect against pests, diseases, sunburn, and mechanical damage. Traditionally done manually, bagging becomes difficult at higher tree levels. To address this, a fruit bagging tool was developed and tested for mango at the BARI Engineering Complex. The tool includes a plastic cylinder, an elastic rubber band circle, and a rope mechanism for holding bags. Initially, brown fruit bags were used, but the elastic band lacked sufficient tightness. A modified version using a thread with a special knot improved performance. Average bagging time was 42.4 seconds with the first tool and 44.5 seconds with the modified one. Fabrication costs were Tk.1000 and Tk.500, respectively.

Development of a vapor heat treatment plant for extending shelf life of mangoes and controlling pests

M. A. Gulandaz, M. A. Hoque, M. Z. Hossain and M. N. Amin

Mango (*Mangifera indica L.*) is one of the most important tropical fruits in Bangladesh, but it is highly perishable and faces considerable postharvest losses, estimated at 20–30%. These losses are

mainly due to physiological weight loss, rapid decay, color degradation, and fungal infections such as anthracnose, which severely reduce marketability and export potential. To address these challenges, this study developed and evaluated a sensor-based Smart Vapor Heat Treatment (SVHT) system for postharvest management of the high-yielding 'BARI-4' mango variety. The SVHT system was designed using SOLIDWORKS and fabricated at the FMPE Division, BARI. It consisted of a coal-fired boiler supplying steam to a stainless-steel treatment chamber with a capacity of 150 kg per batch (arranged in 3×50 kg rows). An IoT-enabled control unit, based on a Raspberry Pi 4 microcomputer, regulated temperature and humidity through DHT22 sensors using closed-loop logic. Data were logged at 1 Hz, stored in CSV format, and remotely accessible, ensuring precise and automated operation. Seven treatments were tested: T_1 (53 °C for 22 min), T_2 (47 °C for 27 min), T_3 (42 °C for 30 min), T_4 (37 °C for 35 min), T_5 (hot water treatment [HWT] at 55 °C for 7 min), T_6 (HWT at 60 °C for 5 min), and T_7 (control, no treatment). Results demonstrated that the higher temperature SVHT treatments, particularly T_1 and T_2, significantly reduced physiological weight loss (final weight retention of 9.09 kg for T_1 and 8.43 kg for T_2) and delayed decay progression (50% decay by day 15 for T_1 and day 13 for T_2). Moreover, these treatments maintained superior fruit color, enhanced sweetness (higher TSS values), and completely eliminated anthracnose infection. In comparison, hot water treatments and untreated controls showed faster deterioration, lower sweetness, and higher disease incidence. Overall, optimized SVHT, especially at higher temperatures, proved superior to conventional treatments. It represents a practical, eco-friendly, and technologically advanced solution for prolonging mango shelf life, ensuring quality retention, and improving marketability both locally and internationally.

Design and development of onion detopper

M. A. Hoque and M. A. Mottalib

Onion is important spice crops in Bangladesh. After harvesting of onion, the edible bulb is separated from the stem by cutting or detopping. This cutting is usually done manually. The detopper was improved at the FMPE Division of BARI, Gazipur during 2024–25. Output capacity of the detopper was varied from 170 to 200 kg/h. The net profit of the detopper is 53067 Taka and the BCR is 1.24. The detopper may be recommended for the farmers.

Real-time whitefly detection and control through precision sprayer for vegetable crop

M. A. Gulandaz, M. A. Hoque, S. Akter, M. A. Rahman and M. N. Amin

Whiteflies (*Bemisia tabaci*) are among the most damaging insect pests in vegetable cultivation, particularly in crops like tomato, due to their role as vectors of viral and fungal diseases that significantly reduce yield. Conventional pest control methods, which rely heavily on pesticide spraying, often result in excessive chemical use, environmental contamination, and poor pest-targeting efficiency. To address these limitations, this study aimed to develop and evaluate a real-time machine vision system for whitefly detection, serving as a foundational step toward an autonomous precision spraying solution. The experimental setup integrated a Raspberry Pi 4B microcontroller with an HD webcam for real-time image acquisition. A dataset of 1,500 annotated images was collected, consisting of 900 images for training, 300 for validation, and 300 for testing. Images were taken under diverse conditions, with particular attention to the undersides of leaves where whiteflies predominantly occur. Two state-of-the-art deep learning architectures, Mask R-CNN and YOLOv8, were implemented and assessed under both image-based analysis and real-time detection scenarios. Results demonstrated that both models achieved high detection accuracy, highlighting the feasibility of automated pest recognition. For real-time detection, YOLOv8 consistently outperformed Mask R-CNN, achieving an accuracy of 96.14% compared to 94.99% for Mask R-CNN. In image-based evaluations, performance levels were slightly higher, but YOLOv8 again demonstrated marginal superiority. These findings confirm that YOLOv8 provides robust and reliable results, particularly in real-time environments where faster inference speed and adaptability are critical. Overall, the study establishes the effectiveness of machine vision for insect detection, providing a strong foundation for future integration into autonomous precision sprayers. The ability to accurately identify pests in real time will enable targeted spraying, reducing chemical input, minimizing environmental impact, and supporting sustainable vegetable production.

Development of an IOT-based seed storage for high-value spices and vegetable seeds

M. Z. Hossain, T. N. Barna, M. A. Hoque, M. M. Kamal and M. N. Amin

A seed storage unit (1030 × 810 × 1150 mm) for high-value vegetables and spices was developed at the FMPE Division, BARI, Gazipur during 2024–2025 to improve storage conditions and maintain seed quality for smallholder farmers. The performance of the FMPE Seed Storage system was evaluated in comparison with the SRC Cool Room and traditional steel drum storage over a three-month period. The FMPE and traditional systems were installed in Faridpur (onion true seed grower Ms Shahida Begum's home), while the SRC Cool Room was tested in Gazipur. Environmental monitoring revealed that the FMPE unit consistently maintained an average of 11°C and 39% relative humidity, while the SRC system sustained 12°C and 45%. In contrast, the traditional steel drum reached 29°C with 86% humidity, creating unfavorable storage conditions. Initial germination tests indicated retention rates of 82% in FMPE storage, 86% in SRC, and 87% in traditional storage. However, fungal contamination was lowest in the FMPE unit (39%), compared with 42% in both SRC and traditional storage. The final germination and contamination data will be taken in October 2025, before the seeds are sold. The FMPE system was also equipped with integrated IoT-based sensors linked to an Android mobile application using Firebase, allowing real-time monitoring of storage temperature and humidity. Unlike conventional systems, the FMPE design combines portability, cost-effectiveness, and digital monitoring features, making it highly suitable for small-scale farmers handling high-value seeds. Overall, the FMPE storage unit demonstrated stable environmental control, reduced fungal incidence, and user-friendly monitoring, offering a practical and sustainable solution for enhancing seed preservation in resource-limited farming communities.

Development of an automated squirrel repellent

M. Z. Hossain, M. N. Amin, M. S. Alam and A. T. M. Hasanuzzaman

Squirrels are a major cause of damage to stored seeds and high-value crops, necessitating effective and sustainable control technologies. During 2024–2025, two automated squirrel repellent systems (Model 1 and 2) were developed at the Farm Machinery and Postharvest Process Engineering (FMPE) Division, BARI, and their performance was compared with a commercially available Chinese repellent. All systems were powered by solar energy to ensure eco-friendly operation. Model 1 was designed as an AI-based system with rapid image recognition, enabling accurate squirrel detection under diverse environmental conditions. It demonstrated low false trigger rates and consistent all-weather performance, though it required moderate levels of maintenance to sustain reliability. Model 2 utilized a passive infrared (PIR) sensor and showed 90–100% detection accuracy within a 5 m range. It achieved a medium response time but required minimal maintenance, making it more user-friendly for farmers in field conditions. In contrast, the Chinese repellent was inexpensive and widely available but exhibited a limited sensing range and frequent false alarms, which reduced its effectiveness for long-term crop protection. Comparative evaluation indicated that Model 2 offered the most practical field solution, balancing accuracy, reliability, and ease of use. Meanwhile, Model 1 was identified as the most suitable choice for precision environments where advanced monitoring and higher control are essential, despite higher maintenance needs. Overall, both BARI-developed systems demonstrated superior performance over the commercial option, offering sustainable, solar-powered solutions to reduce postharvest losses and safeguard high-value agricultural commodities from squirrel damage.

Development of a fruit grader

M. Z. Hossain, M. S. Miah, M. A. Haque, S. Akter and M. N. Amin

A load cell–based fruit grader was developed at the FMPE Division, BARI, during 2024–2025 and evaluated against an earlier version designed in 2023–2024 to improve postharvest processing efficiency. The newly developed Model-2 integrates load cell technology with image analysis, enabling simultaneous evaluation of fruit weight, color, and surface defects. In contrast, Model-1 relied solely on weight-based grading, limiting its accuracy in capturing visual quality traits. Both systems were tested using BARI Aam-4 mangoes and calibrated against a digital weighing scale. Calibration results showed a strong correlation with a coefficient of determination (R^2) of 0.99, confirming

high measurement precision for both models. Performance assessment revealed that grading efficiency increased from 71% in Model-1 to 82% in Model-2, underscoring the advantages of combining machine vision with weight measurement. The integration of image analysis allowed more consistent identification of defects and improved classification accuracy, reducing reliance on manual inspection. While Model-2 requires slightly more system complexity, its enhanced performance demonstrates the potential of intelligent grading technologies for commercial-scale fruit handling. Machine performance evaluation and optimization are ongoing, with future improvements expected to further enhance throughput and reliability. Overall, this study highlights the practical value of integrating load cell and image processing technologies for automated fruit grading. The improved system offers greater reliability, efficiency, and labor savings, supporting better quality management and market competitiveness for high-value fruits such as mango.

Development and evaluation of two-wheel power tiller-operated automated seeder for precise seeding

N. Jahan, M. S. Mia, M. M. Hassan

A precision seeder was developed for two-wheel power tillers to plant seeds automatically and more accurately for smallholder farmers. Traditional and semi-mechanized seeding methods, still prevalent among over 60% of Bangladeshi farmers, often result in inconsistent seed spacing and missed placements, contributing to an estimated 10-15% annual yield reduction .The design of the precision seeder includes six seed meters, each controlled by a stepper motor and monitored in real-time by an infrared (IR) sensor to detect missing seeds. Its intelligence is centralized in an Arduino Mega controller, which synchronizes the seed meter's operation with the wheel speed of the power tiller, measured by a rotary encoder. This adaptive control allows the system to maintain performance despite speed variations. Field tests demonstrated effective synchronization; as the tiller's speed increased from 35 to 70 rpm, the seed meter speed correspondingly rose from 5 to over 8 rpm. Furthermore, the system's programming delay significantly decreased from over 14,000 to around 8,400 microseconds as speed increased, ensuring precise timing. The seeder showed high accuracy during operation, with actual seed drops of 45, 48, and 52 in one test and 44 and 45 in another, closely matching the target of 48 seeds over 10 meters of driving distance. In conclusion, the automated seeder proves to be a reliable and effective solution for precise seeding.

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.

Development of a remote controlled power tiller

M. A. Hoque, Md. Anwar Hossain, M. A. Rahman and M. N. Amin

Availability of agricultural labour is decreasing day by day since they are migrating to alternate job with comparatively less drudgery. Importance of autonomous agricultural machines has been increasing worldwide. Remote-controlled tillers can reduce the physical labor associated with traditional tilling, offering farmers more efficient and safer operation, particularly in challenging terrains or for specific tasks like puddling. Thus, am experiment was conducted to develop a remote-controlled tiller. A remote-control tiller was designed and fabricated during 2024-25. The experiment will be continued in the next year to test the performance in different field conditions.

Introduction of solar energy for operation of winnower

N. Jahan, M. A. Hoque, M. S. Miah, M. Z. Hossain and M. A. Rahman

A winnowing machine separates grain from debris, enhancing processing efficiency for farmers. The

BARI winnower was modified by replacing AC motor with a 500W, 48V DC motor to create a solar-powered system. When winnowing machine powered directly by solar panels, the motor failed to function if the supplied voltage was too high (e.g., 92.7V, 93.5V) or became suboptimal at lower voltages. Optimal solar performance was achieved when the panel's voltage matched near to the motor's rating. In contrast, when the winnower was operated using batteries charged by solar panels, performance was highly stable and efficient. The system functioned excellently within a narrow voltage range of 50.1V to 51.3V. Within this range, the machine maintained varying motor speeds (510-550 rpm), achieved high cleaning capacities (530-536 kg/h), and delivered consistently high cleaning efficiencies between 95.6% and 97%. The fill factor of the solar panels, an indicator of their efficiency, was also identified as a key factor influencing overall system performance by ensuring sufficient power conversion. The study concludes that while solar power is viable for operating agricultural machinery like winnowers, it necessitates intense voltage regulation. Future work will involve testing the system with inverters.

Development of a handy solar weeder

N. Jahan, R. Ahmed and M. N. Amin

Weeding significantly hampers crop production in Bangladesh due to favorable conditions for weed growth. The solar weeder was developed at the BARI and tested in field conditions using an oat crop with four different weeding treatments at varying soil depths (2.54 cm, 3.30 cm, 4.40 cm, and a manual control). The solar weeder is powered by three 36V lead-acid batteries charged by solar panels, ensuring an eco-friendly alternative to traditional diesel-powered weeders. The performance evaluation revealed that at a depth of 4.40 cm (T3), the solar weeder achieved the highest weeding index of approximately 95% and a field capacity of 4.6 decimal/hour. However, energy consumption increased with depth, peaking at 10.36A, indicating higher power requirements. At a depth of 2.54 cm (T4), the machine showed good efficiency (92.5%) but with lower energy draw and field capacity. The study concludes that the solar weeder effectively balances efficiency and power consumption, providing a sustainable solution for smallholder farmers.

Adaptive trial of BARI tomato seed separator cum pulper

T. N. Barna, S. Parvin, M. Islam, N. Jahan, M. N. Amin and M. A. Hoque

Tomato seed extraction in Bangladesh is largely manual, resulting in labor-intensive work and reduced seed quality. To address this, BARI developed the BARI tomato seed separator cum pulper machine. It aims to enhance seed recovery and utilize the leftover pulp. In 2024–2025, six adaptive field trials were conducted in different upazilas, alongside a demonstration at HRC, BARI. The machine's field performance was compared with lab results using Welch's t-test, while farmer feedback was gathered through surveys.The machine processed 91 kg/h in the field (vs. 107 kg/h in-lab), with seed loss 3.9% and germination at 96%**.** No seed injury occurred. Statistical analysis showed no significant performance difference between lab and field. User perceptions were mostly positive to highly positive, based on Likert-scale scoring of operational, pulping, and seed separation features. Using Multi-Criteria Decision-Making (MCDM) methods like AHP, TOPSIS, and VIKOR, BARI's machine outperformed the HRC machine, Millet Wet separator and traditional methods. Economic analysis revealed a Benefit-Cost Ratio (BCR) of 1.97 with a payback period under one year for farmers, while a local service provider model showed a BCR of 1.43 and payback in 1.6 years. Processed tomato pulp from the machine was preserved and found acceptable in taste, color, and texture after 4 months ambient storage. In conclusion, the BARI seed separator demonstrated strong technical and economic performance, with high user acceptance indicating high potential for wider adoption with scaling support.

Adaptive trial of BARI tractor operated vegetable seedling transplanter

T. N. Barna, M. R. Hasan, M. N. Amin and M. A. Hoque

A tractor-operated semi-automatic vegetable seedling transplanter was developed and field-tested by BARI to address the labor shortage and inefficiencies of manual transplanting for high-value crops like cabbage. The adaptive trial, conducted with 80 farmers across various locations in Gazipur, evaluated the machine's performance using BARI

Badhakopi-3. The transplanter demonstrated a forward speed of 0.8 km/h, effective field capacity of 0.75 ha/h, and 62% field efficiency. The average yield was 58.6 ton/ha, which was statistically lower than the on-station yield of 68.5 ton/ha. This reduction was primarily due to higher seedling missing rates caused by an unskilled operator. Economic analysis showed that while the machine's planting cost per seedling (1.13 Tk) is higher than manual planting (0.65 Tk), it saves one full working day and six laborers during peak season. The machine proved economically viable, with a Benefit-Cost Ratio (BCR) of 1.12, a break-even point of 21.74 hectares per year, and a payback period of 4.73 years. Regression analysis revealed a strong inverse relationship between missing rate and yield (R^2 = 0.9443), highlighting the critical role of operator skill. Over 68% of participating farmers expressed satisfaction regarding ease of operation and transplanting quality. The machine offers a scalable, labor-saving solution for vegetable production. With future integration of bed preparation and mulching, its usability and impact on productivity are expected to improve significantly, making it a practical tool for mechanized vegetable farming in Bangladesh.

Adaptation of BARI developed farm machinery in the selected areas of bangladesh

M. N. Amin, M. A. Hoque, M. Hasan, 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 the Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute (BARI), Gazipur during 2024–25. BARI-developed eighteen types of agricultural machinery were disseminated to farmers and local service providers (LSPs) through adaptive trials and training with the assistance of OFRD, BARI, and the Department of Agricultural Extension (DAE). During this year, 212 batches of farmer training were conducted and 648 adaptive trials were carried out in the project areas. Farmers expressed that these machines reduced laborious work and production costs significantly, while also often leading to higher yields compared to manual sowing. A total of 122 Local Service Providers (LSPs) were developed in the working areas. Two manufacturer in-house trainings were conducted in Kishoreganj and Jashore.

Adaptability testing of BARI-developed agricultural machinery for high-value crop production in coastal area

M. Z. Hossain, P. C. Sarker and M. N. Amin

Under the Smallholder Agricultural Competitiveness Project (SACP), the Farm Machinery Division of BARI implemented mechanisation activities in Noakhali, Patuakhali, and Bhola during 2024–2025 to promote labor-saving technologies and improve farm productivity. Seven BARI-developed machines—Seeder, Weeder, Axial Flow Pump, Compost Separator, Maize Sheller, Groundnut Sheller, and Slicer—were introduced and evaluated through 15 adaptive trials, each involving 40 participants, of whom 40% were women. These participatory trials enabled farmers to test and validate the machines under local conditions. Following demonstrations, ten local service providers adopted the technologies and expanded their use from an initial 2 ha in trial plots to 100 ha in subsequent applications, indicating strong potential for scaling. In Subarnochar, Noakhali, ten farmers used the BARI Seeder for maize and soybean cultivation, providing clear evidence of economic benefits compared to traditional practices. The BARI Seeder increased farmer profits by 26.5% in maize production and 67% in soybean, with corresponding benefit-cost ratios (BCRs) of 2.2 and 1.1, respectively. These results highlight the Seeder's potential in reducing labor costs, improving crop establishment, and enhancing profitability. Overall, the introduction of multiple BARI machines under SACP demonstrated positive impacts on smallholder farming systems, particularly by improving efficiency, creating opportunities for women's participation, and establishing service provider networks for sustained use. The findings suggest that scaling mechanisation innovations beyond trial sites can substantially improve farm profitability, reduce drudgery, and enhance the competitiveness of smallholder farmers in coastal districts of Bangladesh.

Development of a four-wheel tractor operated bed planter

S. Akter, O. Ullah, Roknuzzaman and M. N. Amin

A tractor-operated bed planter 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. 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 bed planter. Based on the design, a set of parts were fabricated i.e. seed box, fertilizer box, bed shaper and bed 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. Field trial is done and modifications according to the needs were done. The field trial till now were performed with two sets of bed shaper making two rows of beds with each bed width of 120 cm at bottom and 90 cm at upper respectively and a height of 22-25 cm. In field trial, it was found that the depth of seed placement was around 5-7 cm, line to line distance was 60 cm and seed to seed distance was around 22-23 cm.

Development of a multiple-capacity insect killer

M.Z. Hossain, M.Y. Mollah, M. Hossain, N. Amin and A.K.M.R.H. Ferdous

A multiple-capacity insect killer was developed at the FMPE Division, BARI, and its performance was evaluated in collaboration with the Entomology Division, BARI, Gazipur during 2024–2025. The study compared the BARI Multi-Capacity Insect Killer with two existing devices: the BRRI Solar Light Trap and the BARI Pheromone Trap, tested in an eggplant field over nine consecutive days. Results indicated that the BRRI Solar Light Trap captured the highest average number of insects (41,485), but this included a large proportion of beneficial species, raising concerns about ecological balance. The BARI Multi-Capacity Insect Killer recorded a total of 12,124 insects, demonstrating a more selective capture efficiency. The BARI Pheromone Trap attracted comparatively fewer insects overall but proved highly specific, with a 100% moth capture rate. In terms of shoot borer (*Leucinodes orbonalis*) captures, averages were 19.2 in the BARI Multi-Capacity, 3.1 in the BRRI Solar Trap, and 5.8 in the Pheromone Trap. Species analysis further highlighted that the BRRI Solar Trap primarily targeted diverse pest groups, including termites (37%) and beetles (15%), whereas the Pheromone Trap exclusively targeted moth species. The findings suggest that the BRRI Solar Light Trap may be more suitable for broad-spectrum pest control, albeit with risks to beneficial insect populations. In contrast, the BARI Multi-Capacity Insect Killer offers a balanced approach, with higher selectivity and effectiveness against shoot borers, while the BARI Pheromone Trap remains ideal for targeted monitoring of moth pests. Together, these tools provide complementary options for integrated pest management in vegetable production.

Development of a digital portable android app based soil testing device

M. A. Rahman, T N Barna 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. So, a digital portable android app-based soil testing device (Matir Pran) was developed during 2024-25 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 (35 ± 3) % whereas the standard method showed the moisture content of (33 ± 4) %. 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.

Modification and development of a semi automated BARI banana fiber stripper machine

T. N. Barna, M. A. Hoque, M. N. Amin and N. Jahan

Banana is a widely grown fruit in Bangladesh, generating substantial biomass waste after harvest, especially from pseudo stems. Manual extraction of fiber from these stems is labor-intensive and costly.

To address this, a small-scale banana fiber extraction machine was developed and improved under the FMD project's Talent Hunting Program at BARI. The goal was to enhance automation, fiber yield, cleanliness, and overall usability while ensuring economic viability.The machine was upgraded with features like a 2-hp motor, 17 beaters, a conveyor belt, and improved fiber separation mechanisms. Four modified models were developed and tested against the original. Among them, Model 4 achieved the highest total fiber yield (7.03 kg/h), while Model 2 provided the best balance between yield and fiber cleanliness (97%), making it suitable for applications needing both quality and volume.Response ratio analysis confirmed significant improvements across all models. Post-extraction waste was composted using vermicompost and banana-based compost, showing no significant difference, indicating sustainable waste utilization.Economically, the optimized system is promising. It ensures a daily net profit of 3,213 BDT, BCR of 1.168, and a payback period of just 0.21 years, supporting its scalability. In conclusion, the improved machine models, especially Model 4 demonstrated high efficiency, sustainability, and profitability, making them suitable for field-level adoption in banana fiber processing across Bangladesh.

Automatic mushroom spawn making machine

N. Jahan, M. A. Hoque and M. A. Rahman

Mushroom cultivation has gained popularity due to the rising demand for these nutritious and versatile foods. This study presents the development and evaluation of an automatic mushroom spawn making machine designed to improve the efficiency, consistency and scalability of spawn bag preparation compared to traditional manual methods. The machine was developed with adjustable key and limit distances to control substrate volume and bag dimensions and tested using poly-small and poly-large bags under varying moisture conditions. Performance comparisons revealed that machine operation significantly increased output (up to 180 bags/hour compared to 25 manually), ensured more uniform bag weight, height and bulk density. The machine has the potential to reduce labor dependency, enhance spawn quality and support commercial mushroom production. The automatic spawn-making machine provides a practical and cost-effective solution for mushroom growers, particularly in regions like Bangladesh, where labor-intensive methods limit scalability. Its adoption could contribute to increased productivity, better spawn uniformity, and broader access to sustainable mushroom cultivation technologies.

Development of a forced air smart onion storage system

M. A. Gulandaz, T. T. Rakin, M. A. Hoque and M. N. Amin

Postharvest loss of onion (*Allium cepa L.*) remains a serious challenge in Bangladesh, where traditional storage practices are often unable to maintain quality over extended periods. In conventional onion storage systems, inadequate ventilation, uncontrolled temperature, and high relative humidity frequently lead to excessive sprouting, rotting, and physiological weight loss. These factors collectively result in significant economic losses for farmers and traders. To address this problem, the present study was undertaken to design, develop, and evaluate a solar-powered forced-air smart onion storage system (SOSS) and compare its performance with Traditional Onion Storage Systems (TOSS). The SOSS was powered by a 200 W solar panel and incorporated DC axial fans for forced air circulation, temperature and humidity sensors for continuous monitoring, and an IoT-enabled microcontroller for automated control and real-time data access. The system was tested under a randomized complete block design with two treatments (SOSS and TOSS) and three replications. During the storage period, the smart system successfully maintained relatively stable humidity levels ranging between 45% and 56%, whereas traditional storage exhibited wide fluctuations, often dropping below safe thresholds. Onion quality indicators demonstrated clear differences between the two storage approaches. Physiological weight loss in the SOSS ranged from only 2.22% to 6.22%, compared to 13.33% to 13.33–15.56% in TOSS. Similarly, decay percentages were substantially lower in the SOSS (4–6%) than in the traditional system (17–20%). Color retention was also superior in the smart storage, with bulbs showing less discoloration and better firmness. Statistical analysis confirmed that these differences were significant at both $p<0.05$ and $p<0.01$ levels. The results highlight that the solar-powered smart

storage system is highly effective in minimizing postharvest losses while preserving bulb quality. This system demonstrates strong potential as a sustainable, cost-effective, and scalable technology for improving onion storage management and reducing economic losses in Bangladesh.

Development of pesticide spraying drone for precision agriculture

M. A. Hoque, Sabuj Miah, M. A. Rahman and M. N. Amin

Unmanned Air Vehicle is one of the most important technologies for smart farming and precision agriculture. Drones can maintain precise and uniform distribution of agrochemicals. A study was conducted to develop and evaluate a pesticide spraying drone. A drone was fabricated at FMP engineering division during 2024-25 under the talent hunt program. Drone sprayer performance was evaluated in different flying conditions. Spay width of the pesticide spraying drone was varied with the flying height. The detail performance and flying protocol will be developed in the coming years.

Development of a smart universal seed cleaning and disinfection machine

M. Z. Hossain, M. Hossain, M. H. M. M. Rahman and M N Amin

A seed disinfection machine was developed by the Farm Machinery and Postharvest Process Engineering (FMPE) Division of BARI and evaluated during 2024–2025 at Gazipur to provide an effective, chemical-free method for reducing seed-borne pathogens. The system employs a vibrating conveyor mechanism that rotates seeds 360° under UVC lamps, ensuring uniform exposure to radiation. Machine functions, including conveyor speed, blower fan, and sieve shaker intensity, are controlled through the "Xavier Air" unit, allowing adjustments for different seed types. Initial experiments using short light and vibration treatments showed no significant reduction in fungal contamination, with infection levels ranging between 8–14%. However, extending treatment duration from 2 to 4 minutes led to a marked improvement, reducing fungal infection from 32–48% in untreated controls to 3–12% in treated seeds. Further laboratory analysis demonstrated that UV-C exposure time strongly influenced effectiveness: a 20-minute treatment reduced fungal colony counts to approximately 8, compared to 32 at 10 and 15 minutes. Importantly, germination performance was not adversely affected, confirming the machine's suitability for preserving seed viability. Constructed primarily from locally available materials, the unit achieved a throughput of 20–30 kg/h, offering portability, affordability, and scalability for smallholder applications. Overall, the FMPE-developed disinfection machine achieved over 90% reduction in seed-borne pathogens without reliance on chemical fungicides, making it a safe, eco-friendly, and practical solution for on-farm seed treatment and sustainable crop production

Real-time intelligent and tracking system for farm machineries

M. Z. Hossain, M. R. Al. Mamun, T. N. Borna and M. N. Amin

A real-time intelligent tracking system was developed to improve monitoring, coordination, and service efficiency of farm machinery operations. The system integrates hardware, software, and mobile applications to streamline hiring and utilization processes. The hardware unit was designed using the Lilygo TTGO T-SIM7600 ESP32 microcontroller with built-in GNSS and LTE/GPRS connectivity. Power was supplied by a 3.7 V, 7800 mAh lithium-ion battery supported by dual 6 V, 3 W solar panels for off-grid sustainability. The device, enclosed in a waterproof acrylic housing, continuously transmitted machine coordinates and operational status to a Firebase cloud database. A Flutter-based mobile application was developed to enable users to discover available machines, book services, track locations in real time, receive automated notifications, and process payments digitally. Field evaluation results demonstrated GPS accuracy of ±2.5 m and 95% data availability, even under low-connectivity conditions. The solar-charging system achieved full recharge within four hours of daylight and provided 15–16 hours of uninterrupted operational capacity. Comparative analysis revealed that the intelligent system reduced machinery hiring and coordination time by up to 99.5% relative to traditional phone-based methods. This significant improvement highlights the potential of integrating IoT-based tracking with mobile applications to enhance service delivery, reduce downtime, and improve access to mechanisation for smallholder

farmers. Overall, the developed system offers a cost-effective, scalable, and sustainable digital solution for managing farm machinery services, ensuring higher efficiency, better transparency, and greater farmer satisfaction.

Development and performance evaluation of BARI bee pollen dryer

T. N. Barna, M. N. Amin, N. Jahan and M. A. Hoque

Bee pollen is a nutritionally rich and commercially valuable apicultural product, but its usage in Bangladesh remains limited due to lack of affordable drying technologies. To address this, a low-cost, microcontroller-based pollen dryer was developed and improved under the FMD project at BARI. Since real pollen was unavailable off-season, soaked rice was used as a substitute for drying trials. The improved dryer includes features such as glass wool insulation, thermistor-based temperature sensing, microcontroller-controlled heating, and improved airflow systems. It has a 2500-gram capacity, a significant upgrade from the original 500-gram model. The system automatically maintains a drying temperature of 35-40°C, as per adjustable settings. with airflow speeds ranging from 2.37 to 5.76 m/s, ensuring uniform drying. In a 4-hour drying trial, final moisture contents across five trays ranged from 4.0% to 20.5%, with optimal levels (4–10%) achieved in three trays. Drying behavior was modeled using Newton, Page, Henderson and Pabis, and Logarithmic models. The Page model showed the best fit overall ($R^2 > 0.97$ in most trays), though tray-specific variations were observed due to airflow and temperature distribution differences. These results demonstrate the technical feasibility of the dryer design, but real pollen trials during the harvesting season are needed for validation. The system shows promise for scalable, affordable pollen drying, enabling better preservation, extended shelf life, and enhanced commercial potential in the apiculture sector of Bangladesh.

Development and performance evaluation of BARI groundnut thresher

T. N. Barna, M. N. Amin and M. A. Hoque

This study evaluated the performance and economic viability of the BARI Groundnut Thresher under real field conditions using a Completely Randomized Design (CRD)**.** The machine was optimized for 275 RPM cylinder speed and 264 kg/h feed rate, achieving a threshing capacity of (29.2-35) kg/h**,** 91.02% efficiency**,** 3.2% grain breakage**,** and 2.02% unthreshed loss in silty clay loam soil at 25% crop moisture. Economic analysis compared two rental models. In the first model (Tk. 3,800/day rental), the machine had a BCR of 1.17, a 5.18-year payback period, and a break-even point of 602 hours/year. The alternative model (Tk. 2,400/day rental + transport by user) showed the same BCR but with a longer 8.16-year payback and higher break-even point of 948 hours/year. Despite lower investment, this model suits cost-sharing or self-labor systems better. Compared to manual threshing (Tk. 2,400/day, 6 laborers), the machine reduced labor demand to 3 operators, saving 28 hours and 5 labor-days for threshing 240 kg of groundnut per day. The fodder-to-pod ratio observed was 8.16:1, lower than high-yielding varieties, indicating room for agronomic improvement. In conclusion, the BARI Groundnut Thresher is efficient, labor-saving, and economically sustainable. It enhances groundnut post-harvest operations and becomes more profitable when used seasonally or for multiple crops, offering practical benefits for smallholder farmers and local service providers in Bangladesh.

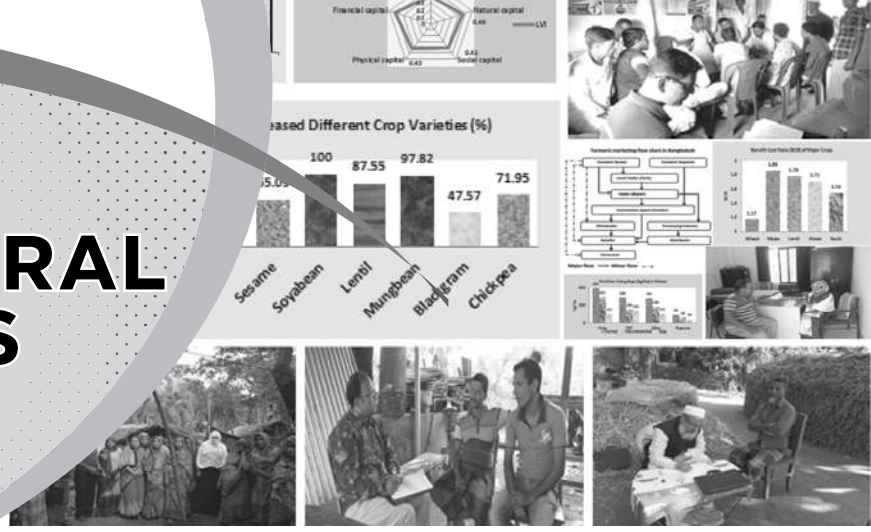
Improvement and performance evaluation of a heavy-duty groundnut sheller

M. Hasan, M. N. Ali, N. Jahan and M. N. Amin

Groundnut (*Arachis hypogaea L.)* is an important oilseed crop, and efficient shelling is crucial for post-harvest processing. This study evaluated a heavy-duty groundnut sheller developed under the FMDP Project, FMPE Division, BARI, Gazipur. The machine, powered by a 3 HP motor and equipped with a shelling drum, concave, and vibrating sieve, achieved a throughput of 160 kg/hr. Operational challenges included improper discharge of kernels and straw due to incorrect inclination, unsuita+ ble sieve hole size, and insufficient blower fan speed, which resulted in incomplete cleaning. Optimizing the machine's inclination and fan speed is expected to improve shelling efficiency, kernel quality, and overall performance.

AGRICULTURAL ECONOMICS

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Cost and return analysis of selected varieties of lentil in selected districts of Bangladesh

M. A. Rashid and M. Khatun

The study was conducted to estimate the financial and economic returns and competitiveness of lentil varieties in Bangladesh. A total of 300 lentil growers were randomly selected from Natore, Jashore and Faridpur district for the study. Cost and return analysis was done on both variable and total cost basis. Domestic resource cost (DRC) was also estimated for evaluating the comparative advantage of lentil crop. The study revealed that the gross margins of producing BARI Masur-6, BARI Masur-4, BARI Masur-3 and BINA Masur-5 varieties were found positive. BCR of producing BARI Masur-6, BARI Masur-4, BARI Masur-3 and BINA Masur-5 were 1.65, 1.61, 1.57 and 1.51, respectively. The estimates of DRC showed that Bangladesh had comparative advantage in lentil production as these estimates were less than one (0.47) implied that the production of lentil would be highly efficient for import substitution. Responded farmers mentioned that low market price at harvesting time and market syndicate were the major constraints for lentil production. The constraints were also fertilizer, not working properly might be due to adulterations, crisis of labour at harvesting time and high wage rate in the study areas. 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 minimizing the labour crisis.

Farm level adoption and market status of BARI released major fruits varieties in Bangladesh: A socio-economic study

M. A. Rashid, Moniruzzaman, M. S. Hoq, M. Khatun, M. S. Rahman, N. Nahar, R. Hasan, F. Rahman and S. M. A. Shiblee

The study was conducted to identify the adoption status and marketing performance of selected fruits in major growing areas of Bangladesh. A total of 2565 respondents were interviewed to collect primary data for the study. Purposive random sampling technique was used to select the respondent farmers and traders. Four important fruits such as mango, dragon, banana, malta and guava were selected for the study. This study investigated varietal adoption, willingness, marketing channels, costs, margins, and efficiency of selected fruits production and marketing in Bangladesh, with emphasis on both BARI-released and local cultivars. Adoption analysis revealed that BARI varieties and other improved varieties were increasingly preferred due to higher yields (76% of responses), profitability (82%), and fair price opportunities (71%). However, adoption was constrained by lack of own land (75%), insufficient cash (56%), and market-related challenges. Despite these constraints, a considerable proportion of farmers are willing to expand mango cultivation, highlighting the profitability and demand potential of improved varieties. The adoption of BARI banana varieties analysis showed that BARI-4 (Champa) is the most widely cultivated improved variety, covering 26.32% of the total banana area, with particularly high adoption in Chittagong and Barisal. In contrast, local and traditional varieties such as Sobri and Chapa Sobi remain dominant in Dhaka, Khulna, Rangpur, and Mymensingh, indicating farmers' continued reliance on familiar cultivars. The adoption analysis of dragon fruits shows that BARI Dragon-1 occupies 100% of the cultivated area, while in Khulna it accounts for 72.4%, with the remaining 27.6% under BARI Dragon-2. At the national level, BARI Dragon-1 covers 97.5% of the total 389.7 hectares, while BARI Dragon-2 represents only 2.46%. Marketing analysis identified four major channels of mango, with product flows of 35%, 30%, 20%, and 15%, respectively. On the other hand, Dragon and Banana marketing involved three major channels contributing 40%, 26%, 36%

and 45%, 25%, 20% of product flow, respectively. Among the intermediaries Bepari incurred highest cost for all the selected fruits. Faria, Bepari, Arathdar, Paiker, and retailers played crucial roles in assembling, financing, and distributing mangoes from farm to consumer. Cost and margin assessment showed that marketing costs were highest in longer chains due to transportation, labor, commission, and wastage, while retailers obtained the highest margins. The shorter chain was the most efficient for all selected fruits. Overall, the findings suggest that promoting adoption of improved varieties along with shorter and more efficient marketing chains can substantially increase farmer profitability, ensure fair consumer prices, and strengthen the sustainability of the selected fruits marketing chain in Bangladesh.

Production, handling and consumption of selected fruits in Bangladesh: A concern of good agricultural practices adoption

M. Khatun, M. S. Hoq, M. A. Rashid, and S. M. A. Shiblee

The study assessed the knowledge, attitude and practices (KAP) of different stakeholders toward production, handling and consumption of fruits and the problems associated with not adopting Good Agricultural Practices (GAP). The study analyzed 355 stakeholders data collected from guava and mango growers (175), traders (42) and consumers (138) from two guava growing districts, namely Rajshahi and Chuadanga; and two mango growing districts namely Chapainawabganj, and Satkhira. Descriptive statistics was used for analyzing the data. Farmers had a high degree of knowledge regarding GAP standards was held by 53% of guava farmers, followed by a medium level by 47% and a low level by 1%. Conversely, 58% of mango farmers had a high degree of understanding regarding GAP standards. Regarding the farmers' attitudes, 55% of the guava and 52% of mango farmers had a highly positive attitude toward the GAP standards adoption. Farmers' degree of experience showed that the majority of respondents cultivating guava (57%) and 76% mango farmers came into the category of intermediate-level practitioners. There were no farmers found in having high level experiences in this aspect. 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. Mango traders have a slightly higher proportion of highly knowledgeable traders (44%), while guava traders were more towards the medium knowledge category (58%). Traders overall had a positive mindset about GAP-based fruit handling, with mango traders showing stronger enthusiasm (72% high attitude) compared to guava traders, who are split equally between medium and high. For mango, a relatively large proportion (39%) is still in the low practice group. Guava traders perform somewhat better, but still, most remain in the medium group rather than reaching high compliance. The most frequently cited cause of not adopting GAP standards were high cost involvement (48%), safe handling may not be possible when supply is excessive (33%), and lack of awareness about health (32%). Approximately, 83% consumers were agree with paying more money. On average, the market price for mango was 60 Tk./kg and for guava it was Tk. 55, but consumers are willing to pay more 82 Tk./kg on mango and Tk. 78 for on guava. For adopting GAP standards in fruits production, the first and foremost crucial way is motivating farmers ethically and creating the market linkage of safe fruits for ensuring better price which will encourage the farmers. Improving monitoring systems, reducing implementation costs, and raising health awareness among traders could encourage better adoption of GAP-compliant handling.

Investigating the dynamics and determinants of price volatility in the potato and onion markets of Bangladesh

M. S. Rahman

Potato and onion are among the most essential crops in Bangladesh, playing a crucial role in household consumption, market dynamics, and farm-level income generation. Despite their significance, the production, marketing, and pricing mechanisms of these crops are subject to volatility, policy neglect, and structural inefficiencies, which adversely affect farmers' livelihoods and food security. This study investigates the long-term production trends of potato and onion in Bangladesh, analyzes stakeholders' perspectives on demand and supply, assesses the sensitivity of farm-level returns to cost, price, and yield fluctuations, and explores the mechanisms of farmgate price determination. To address these objectives, both primary and secondary data sources were utilized. Primary data were collected through a

structured questionnaire survey administered to 320 potato farmers and 320 onion farmers, alongside 80 market actors in the potato value chain and 60 in the onion value chain. The survey was conducted in major production hubs: Bagura, Nilphamari, Rangpur, Panchagarh, and Munshiganj for potato, and Rangpur, Lalmonirhat, Pabna, and Faridpur for onion. Multistage stratified random sampling was employed, with support from the respective upazila agricultural extension offices. Data collection was conducted by the researcher, assisted by three scientific assistants, and was complemented with secondary data sourced from the Bangladesh Bureau of Statistics (BBS). The findings reveal that potato production has shown steady long-term growth, supported by improved technologies and storage facilities, whereas onion production remains stagnant and highly vulnerable to climatic, input, and market uncertainties. Farmers' profitability in both crops is highly sensitive to fluctuations in farmgate prices, input costs, and yield variations, with onion farmers in particular facing greater risks due to inadequate storage facilities and exploitative pricing structures. The analysis of the onion's farmgate pricing mechanism highlights a complex system involving post-harvest drying, storage, and market intermediaries. Farmers sell their produce either in local markets (hatbar) or directly to traders, but their bargaining power is limited due to asymmetric access to market information, dependency on immediate cash needs, and syndicate-like control exerted by terminal market aratdars. Evidence suggests that farmers often receive lower-than-fair prices, with local traders measuring one mon as 45 kg instead of the standard 40 kg, further reducing their returns. Overall, the study highlights the need for institutional reforms, enhanced storage and market information systems, and strengthened regulatory oversight to ensure fair pricing mechanisms and sustainable returns for farmers. The insights provide critical implications for policymakers, development agencies, and researchers concerned with agricultural marketing, rural livelihoods, and food security in Bangladesh.

Price volatility of summer green chilli in Bangladesh: an economic analysis

M. R. Hasan

This study examined the price volatility patterns of summer green chili in Bangladesh over the period 2010-2024, employing advanced econometric techniques including multiple regression analysis and ARCH-GARCH models. Green chili is a crucial spice crop in Bangladesh, significantly impacting both producer incomes and consumer expenditure patterns. The research revealed high price volatility characterized by seasonal patterns, supply-demand imbalances and external shocks. Using daily wholesale price data from major markets, the study identified key determinants of price volatility and provides policy recommendations for market stabilization. The findings indicate that weather variability, seasonal production cycles and market integration significantly influenced price dynamics, with GARCH (1,1) model effectively capturing volatility clustering in green chili prices.

Adoption status of BARI mustard varieties in selected areas of cumilla district

M. J. Uddin

The study was carried out to understand the adoption status of BARI mustard varieties in selected areas of Cumilla district during 2024-25. Mainly three upazilas were selected (i.e. Barura, Chandina and Debidwar) purposively covering 155 mustard growers. Out of thise 122 BARI mustard adopters and 33 non-adopters were selected randomly for the study. Mean, percentage, standard deviation and Probity regression model was used. Analysis revealed that the rate of adoption of BARI Sarisha-14 (73.82%), BARI Sarisha-15 (2.0%), BARI Sarisha-17 (14.3%), BARI Sarisha-18 (4.45%) and Local (Tori-7), 2.78% irrespective of all locations. The adoption of different management techniques was found to be low compared to the recommended practiced by BARI. Probit model showed that education of the farmer, farm size, availability of seed and contact of SAAO enhanced the adoption of BARI mustard improved varieties. Results revealed that farmers showed positive attitude towards adoption of improved mustard varieties since about 61.18% for the adopters wanted to increase area under improve mustard cultivation in next growing season considering the high yielding ability, low cultivation cost, high profit, less labour requirements and market demand. Ability of improved mustard seed was also important factors for adoption it at farm level.

Adoption and impact of BARI potato varieties and zero tillage potato cultivation practice in saline coastal area

M. E. A. Begum, S.M.A. Shiblee, M. M. H. Molla, A. T. M. T. Islam and M. M. Rahman

This study aimed to identify the adoption and impact of potato varieties and zero tillage potato cultivation (ZTPC) practice and determinants of the adoption of ZTPC practices and their impacts on potato farming in saline coastal area. To achieve the study objectives, the researchers employed Poisson regression, Propensity Score Matching techniques and the Adoption and Diffusion Outcome Prediction Tool (ADOPT). A total of 120 potato farmers were surveyed in 2025. The results showed that the average yields of BARI Alu-72, BARI Alu-73, BARI Alu-78, and BARI Alu-79 under zero tillage with rice straw mulch were 21.59 t/ha, 19.41 t/ha, 26.76 t/ha, and 24.13 t/ha which provided 218 %, 229%, 301% and 203% higher yields than that of conventional tillage (9.88 t/ha, 8.46 t/ha, 8.89 t/ha and11.85 t/ha respectively. The results indicated their decision regarding whether to adopt ZTPC practice was significantly influenced by training and visit to demonstration field. The impact on productivity with the adoption of the ZTPC practices investigated in this study was from 5995.72 kg to 6017.33 kg greater for adopters than non-adopters. Socioeconomic studies into adoption and scaling approaches are necessary for a proper technological transfer. For that, investment in training facilities is warranted to adopt and sustain ZTPC and increase potato farmers' income.

Adoption and profitability of BARI developed potato varieties in Bangladesh

M. S. Akter, M. A. Rashid, M. M. H. Molla and M. M. Rahman

This study aimed to assess the adoption, input use, profitability, and marketing challenges associated with BARI developed potato varieties in Bangladesh. The study was conducted across three major potato growing districts, namely Bogura and Joypurhat (in 2024), and Cumilla (in 2025). Data were collected from 150 households through random sampling between February and June of 2024 and 2025. The results revealed widespread adoption of BARI varieties, particularly BARI Alu-7 (Diamont) and BARI Alu-25 (Asterix), with BARI varieties occupying 88.42% of the total potato cultivation area in 2024-25. BARI Alu-90 and BARI Alu-72 had low adoption, mainly due to seed unavailability and limited awareness. Region-wise Rangpur**,** Dinajpur, and Bogura contributed over 60% of total potato production. In 2024, BARI Alu-90 in Bogura-Joypurhat achieved the highest BCR (2.08) and yield (34.48 mt/ha).BARI Alu-54, Alu-29, and Alu-25 also performed well. However, in Cumilla (2025**)**, BARI Alu-90's BCR dropped to 1.15 indicating a decline in profitability compared to the previous year, due to higher input costs and lower farmgate prices. Local varieties like Pakri and Sakila, though grown on small scales, achieved higher market prices but had lower yields. BADC-1 (Sunshine) covered 2.36% of the area and performed moderately (26.53 t/ha). Farmers faced multiple challenges including high seed costs (96%), low-quality seeds (94%), and poor market access, especially in terms of unstable prices and limited storage. The declining BCR trend highlighted the need for better input management, stable pricing and enhanced extension services to sustain profitability

Factors affecting adoption of BARI sunflower in selected southern areas of Bangladesh

Md. Nymul Islam

Sunflower is widely recognized as an important oilseed crop in Bangladesh. It is a high-temparature and and drought-tolerant crop, capable of growing in saline prone regions, particularly suitable for coastal areas in Bangladesh. The Southern coastal region is highly suitable for sunflower for saline soil conditions, the crop can tolerate about 8 ds/m. As a result, sunflower can be cultivated in areas of the coastal belt where others crops fail due to rising soil salinity. This study was conducted in Sathkhira, Khulna and Bagerhat regions of Bangladesh to identify the factors affecting the adoption of BARI sunflower. The probit estimates were carried out to quantify factors contributing to adoption of BARI Sunflower. Data was gathered from 132 respondents whereas, 37.12% respondents cultivated BARI sunflower varieties, whereas the remaining 62.88% cultivate other improved sunflower varieties. Training on oilseeds, Influences from neighboring farmers and SAAO, Oilseed project had a significant positive effect on the likelihood of adoption, indicating that those factors increases the probability of Adopting BARI Sunflower variety. Other factors like Age, Education, Occupation,

Total working members, Family members, Farm Size, availability of improved seed, cosmopolites, farmers involvement in social organizations, Extension contact etc. of the respondents had not significant effect on the likelihood of adoption of BARI Sunflower. There were several constraints to adopt sunflower production like Agro-ecological, Input related, Extension gap, Economic and market, structural constraints. To overcome those constraints Government should Ensure timely supply of BARI-certified sunflower seeds, ensure Subsidies on quantity seeds and inputs, Increasing farm-level demonstrations and focusing improved sunflower cultivation technique, Establish mini oil mills to process and purchase sunflower directly from the farmer, strengthening public-private partnership collaboration between BARI, DAE, BRAC and NGOs for field trial and variety adoption, Develop Community–based irrigation systems and Transportation facilities and BARI should focus on climate –resilient variety development.

Comparative study of mustard in adoption inclusion and existing pattern

M. Rasheduzzaman, M. I. Nazrul, M. A. Rashid

Increase of cropping intensity in rice based cropping system is becoming important for food security and poverty alleviation. Therefore, this study evaluates the impacts of incorporating mustard into the fallow land in Sylhet region of Bangladesh for improving cropping intensity. The current cropping pattern, Fallow–T. Aus–T. Aman, limits productivity, while introducing mustard during the fallow period may optimize land use. Data from the farmers revealed that the improved Mustard–T. Aus–T. Aman pattern significantly enhanced land use efficiency (79.73% vs. 61.37%), production efficiency (42.38 vs. 35.50 kg ha^{-1} day^{-1}), and rice equivalent yield (12.33 vs. 7.95 t ha^{-1}). Economically, the mustard-inclusive system yielded higher gross returns and benefit-cost ratio (1.90). Furthermore, the dichotomous logistic regression showed that age, education, farm size, training received, extension contact, and incentive received were significant determinants of adoption and incorporating mustard production in existing cropping pattern. Results suggest that adopting mustard cultivation in fallow periods can improve productivity, profitability, and sustainable intensification of rice-based farming in Sylhet, benefiting local farmers and food security efforts.

Adoption and profitability of different BARI developed groundnut varieties in Rangpur region of Bangladesh

M.S. Afroj

The study analyzed the socio-economic characteristics of 160 groundnut growers in Rangpur region, focusing on forecasting of area, yield and production of groundnut production in Bangladesh and adoption status of groundnut varieties using a purposive random sampling technique. Auto-Regressive Integrated Moving Average (ARIMA) model was used to forecast area, yield and production of groundnut in Bangladesh by using data from FAOSTAT (1961-2024).The forecasted value of area, yield and production will be 45886 ha, 1152.8 kg/ha and 90674 tons, respectively by the year 2050. Among the varieties BARI developed variety was prominent it was about 70%.

PLANT GENETIC RESOURCES

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Exploration and collection of plant genetic resources

M M Ali, N Jahan, S Rahman, F B Hossain, M G Hossain, I Ahmed, M F Khatun and Q M Ahmed

An exploration and collection program on different crops were implemented in sixty-three (63) upazilas of twenty districts in Bangladesh. One thousand and one hundred forty-six (1146) germplasm from seventy crops were collected. Among the germplasm five entries of cereals, four fruits, seven oilseeds, ten pulses, eleven spices, thirty-one vegetables and two other crops were collected. Germplasm were collected from farmers' field, farm store, threshing floors, homestead gardens, markets, hilly areas etc. During collection, passport information was recorded. The samples were conserved in active collection chamber providing a collector's number.

Multiplication of newly collected germplasm

I Ahmed

In 2024–25, a seed multiplication trial was conducted at PGRC, BARI using recently collected germplasm that was initially in very small quantities. Thirty-two crop accessions were multiplied in this trial, and a substantial amount of fresh seed was conserved for future use.

Characterization of tomato germplasm

S Rahman, N Jahan and M M Ali

The study aimed to characterize tomato to support breeding and varietal improvement. Conducted during winter 2024-25 at BARI's PGRC field, 100 accessions were evaluated across 59 agro-morphological traits. Standardized field management practices-including recommended fertilization, pest control, and mulching-were applied. Qualitative observations revealed wide phenotypic variability: 28% dwarf, 34% determinant, and 38% indeterminate growth types; diverse leaf forms (potato, peruvianum, hirsutum); and fruit traits varying in shape, size, color, peel ability, and firmness. Quantitatively, fruit weight ranged from 8.6 to 130 g (mean 21.5 g), and yield per plant ranged from 393 to 3,380 g (mean 742 g), with high coefficients of variation in yield components. Stable traits like days to flowering and total soluble solids (mean 4.9 ° Brix) contrasted with high variability in yield-related traits. The integration of qualitative and quantitative data underscores a rich genetic resource, informing the selection of promising germplasm for crop improvement programme.

Characterization of bottle gourd germplasm

N Jahan and M F Khatun

The experiment was conducted with 70 germplasm of bottle gourd (*Lagenaria siceraria* L.) in the experimental field of PGRC, BARI, Gazipur, during *rabi* 2024-25. Qualitative characters showed distinct variation among the germplasm except plant growth habit, stem pubescence, stem shape, tendril, tendril types, leaf shape, leaf size, leaf pubescence nature, leaf pubescence density, sex type, flower color and fruit pubescence density. The maximum variation was found in fruit shape followed by fruit skin color, early plant vigor, seed size and seed cluster. The highest coefficient of variation was observed in fruit breadth (CV-92.22%) followed by number of fruits per plant (CV-44.01%), fruit weight (CV-42.35%) and number of female flower/plant (CV-34.90%).Based on days to edible fruit harvest such as RAI-69, SS-123, SNR-43, SNQ-48, IRM-41, IRM-241, NSR-143, AR-217 and based on number of fruit /plant such as SS-96, SS-97, SS-107, SNR-56, IRM-41, IRM-297, AHI-40 and AHI-40(1) found promising germplasm for future breeding.

Characterization of cucumber germplasm

I Ahmed

Twenty-one accessions of cucumber (Cucumis sativus L.) were characterized at Plant Genetic Resources Centre (PGRC), BARI, Gazipur during summer, 2025. Variability showed in different fruit characters at edible stage i.e stem end fruit shape, blossom end fruit shape. Fruit shape was oblong, oval, ellipsoid and ovate and blossom end was flat among the accessions. Light green, green, dark green and yellowish green fruit skin colour were at edible stage. Whereas brown and yellow fruit skin colour at mature stage was found in all accessions. In quantitative characters. Days to staminate and pistillate flower ranged from 36 to 45 days after sowing and 43 to 54 days after sowing, respectively. Average fruit length was 14.66 and fruit width was 6.48 cm. Number of fruit per plant was ranged from 2.5 to 7.5 with an average 5.15. Maximum number fruit per plant was obtained from TRMR-137 and minimum number of fruits per plant was recorded from NT-52. The highest coefficient of variation was found in fruit length (19.85 %) followed by number of fruits per plant (18.71%) and lowest in days to harvest (3.62%).

Characterization of chilli germplasm

M F Khatun and N Jahan

This study was conducted at the Plant Genetic Resources Centre (PGRC), Bangladesh Agricultural Research Institute (BARI), Gazipur, during the *rabi* season 2024–25, to characterize 111 chilli germplasm accessions using qualitative and quantitative descriptors. Wide variability was observed in traits such as nodal anthocyanin, plant growth habit, branching habits, leaf morphology, flower position, corolla colour, fruit colour, fruit shape, and fruit surface. Leaf colour ranged from light green to variegated, while nodal anthocyanin varied from green to dark purple. Growth and branching habits were mostly intermediate, and lanceolate leaves predominated. The corolla colour was primarily white, and most of the fruits exhibited acute pedicel attachment, green colour at the immature stage, red colour at maturity, and semi-wrinkled surfaces. Quantitative analysis revealed wide variation in plant height, flowering and fruiting time, fruit size, and fruit number, with the highest variability in fruit number per plant (CV 86.8%). These findings highlight the rich genetic diversity in chilli germplasm, offering valuable traits for future crop improvement and conservation programs. Chilli germplasm showed wide variability, presenting useful traits for genetic improvement and preservation.

Characterization of local foxtail millet germplasm

K U Ahamed and M M Anwar

The study was conducted at Regional Plant Genetic Resources Center, Regional Agricultural Research Station, Ishurdi, Pabna during *Rabi* season of 2024-2025 to characterize the germplasm. The experiment involved 14 local foxtail millet germplasm. Remarkable variations were observed in respect of qualitative and quantitative traits among the germplasm. Among the germplasm in qualitative characteristics maximum variations were observed in plant growth habit, inflorescence shape, panicle growth habit, leaf senescence, plant pigmentation and seed shape. The early maturity was found in SIISD-034 accession (86 days) and BARI Caun-2 (98 days). Inflorescence shape was highest 57.14% observed in oblong shape followed by ovate for 21.43%, elliptic for 7.14% and obovate for 14.29%. Seed shape observed three types and highest 71.43% observed as oval shape, ovate shape found 21.43% and round shape observed for 7.14%. Seed colour showed two categories, among them, highest 85.71% showed yellow and 14.29% showed brown seed colour. The maximum 1000- seed weight (15.40 g) was recorded in accession SIISD-013 (54.21 g) and the highest grain yield per plant (18.99 g) was found in accession SIISD-019 followed by SIISD-013 (16.74 g), SIISD-028 (11.25 g), SIISD-033 (10.04), SIISD-016 (9.97 g), BAR Caun-2 (9.25 g) and SIISD-020 (8.53 g) and the lowest grain yield per plant was observed in accession SIISD-002 (2.34 g). Biotic stress susceptibility found as very low or no visible sign of susceptibility for 71.43%, low for 7.14%, high for 7.14% and 14.29% showed very high susceptibility.

Characterization of yam germplasm

K U Ahamed and M M Anwar

The present study was conducted at Regional Plant Genetic Resources Center, RARS, Ishurdi, Pabna during *rabi* season of 2024-2025 to develop high

yielding and to ensure long and or medium term conservation of the genetic diversity represented yam germplasm characterization. The experiment involved 35 yam germplasm. Remarkable variations were observed in respect of qualitative and quantitative traits among the germplasm. The first female flower initiation was earlier in DAISD-033 (94 days) than the other germplasm. Early maturity was observed within 255-280 days among 35 accessions. Stem colour showed green 17.14%, purplish green 28.57%, brownish green colour 11.43% and rest accessions were in purple colour 42.86%. Leaf colour showed three types as yellowish was 22.86%, pale green 25.57% and dark green 51.43%. Aerial tuber shape was round 17.14%, irregular 8.57% and rest accessions showed elongate 74.79%. Underground tuber shape was oval 2.86%, oval-oblong 37.14%) cylindrical 2.86%, flattened 28.57% and rest were irregular 28.57%. DBISD-005 produced significant maximum number of aerial tuber per plant (50.50). The highest aerial tuber yield per plant (2007.00 g) was recorded from entry DBISD-003 accession., Tuber yield per plant varied from 283.33 g to 5533.33 g per plant, where DAISD-004, DAISD-008, DAISD-010, DAISD-021, DAISD-026, DAISD-027 and DAISD-029 were high yielding (3433-5533.33 g per plant). The highest tuber yield per plant (5533.33 g per plant) was recorded from DAISD-026 yam accession and the lowest yield (316.67 g per plant) from DBISD-034 yam accession. The highest total tuber weight per germplasm (16.600 kg per germplasm) was recorded from DAISD-026 yam accession and the lowest total tuber weight per germplasm (316.67 kg per germplasm) from DBISD-034 yam accession. Biotic stress susceptibility showed four types as very low or no visible sign of susceptibility 65.71%, low 20.00%, intermediate 5.71% and high 8.57%.

Characterization of bitter gourd germplasm

N Jahan

The experiment was carried out with twenty-six germplasm of bitter gourd (*Momordica charantia* L.). at Plant Genetic Resources Centre, BARI Gazipur during *kharif* season, 2025 to characterize and estimate the variability among germplasm. Twenty agro morphological characters were recorded, fourteen were visually assessed and six were measured. In case of qualitative characters, four categories of fruit shape were noticed that was highest in terms of variation. Maximum coefficient of variation (56.55%) was estimated in individual fruit weight followed by fruit length (43.92%).

Evaluation of hyacinth bean germplasm for seasonal variation

Q M Ahmed and I Ahmed

Among 89 hyacinth bean (*Lablab purpureus*) genotypes, most exhibited stem pigmentation; green veins and absence of anthocyanin were predominant. Leaves varied in size, flowers were largely white, and fresh pods were generally green in color, with pod shape ranging mostly flat or curved. Fresh seeds were typically light green and oval; dry seeds were mainly brown or black. Flowering initiation varied widely from 45 to 112 days post-transplanting, while edible pods emerged between 74 to 145 days (mean 113), and full maturity occurred at about 143 days. Pod size and weight were highly variable (length: 4.8-11 cm; width: 1.4-4.3 cm; weight: 5.2-19.78 g), with pod weight showing the greatest variability (about 26% CV) and days to maturity the least (about 14% CV).

Characterization and development of core collection of brinjal germplasm

M G Hossain, I Ahmed, N Jahan, M F Khatun and M M. Ali

Brinjal (*Solanum melongena L.*) is an important economic vegetable crop grown all over Bangladesh. Morphological characterization was done to investigate the diversity within a germplasm collection of 306 brinjal accessions at PGRC research field during *rabi* 2024-25 season. The most variable morphological characters were associated with fruit and leaf. Regarding qualitative characters only the fruitposition has no variation. In case of quantitative characters considerable variations were observed in fruit length and width, number of fruits per plant and individual fruit weight among the tested accessions. Principal Component Analysis (PCA) further confirmed the high genetic diversity within the panel, which is amenable for breeding applications.

Molecular characterization of halda chilli for gi registration

I Ahmed and M M Ali

A total of 40 SSR (Simple Sequence Repeat) primers were evaluated in this study. From this

set, six primers were selected based on their superior performance. These criteria included: high polymorphism, clear, reproducible amplification, high discrimination power and minimal missing or ambiguous data. These six primers (Cl-08, Cl-10, Cl-12, Cl-28, Cl-11, Cl-20) form a robust core set that can be used for DNA fingerprinting to uniquely identify Halda chilli.

Conservation of germplasm in active and base collection

S. Rahman, N. Jahan and M. M. Ali

The Plant Genetic Resources Centre (PGRC) of BARI has been conserving germplasm since 1987 through *ex situ* methods, including seed and field gene banks. Currently, PGRC conserves 13,165 accessions of 154 crops, comprising cereals, pulses, oilseeds, spices, vegetables, fruits, cash crops, medicinal, and other minor crops. Of these, 12,998 accessions are maintained in the seed gene bank and 167 in the field gene bank. In 2024-25, an additional 152 new accessions-consisting of oilseeds (52), spices (10), vegetables (82), and fruits (8) were collected, assigned BD codes, and preserved in both active and base collections. These conservation efforts ensure the availability of diverse genetic resources for future crop improvement, food security, and adaptation to environmental changes.

Monitoring of germplasm in active collection

S. Rahman, N. Jahan and M. M. Ali

A total of 3402 accessions of 20 crops viz. ash gourd, black gram, bottle gourd, coriander, halim shak, hinta, indian spinach, mallow, niger, okra, onion, pea, pigeon pea, ridge gourd, roselle, sesame, sorghum, sulfa, sword bean, and velvet bean, were monitored from the active collection during 2024-25 through germination testing. Out of these, 1172 accessions (34.4%) recorded poor germination (0-40%), 1016 accessions (29.8%) exhibited medium germination (41-80%), and 1214 accessions (35.7%) maintained high viability (81-100%). The crops okra, sorghum, pea, pigeon pea, and ridge gourd showed considerable deterioration, while bottle gourd, sesame, and pea demonstrated better performance in the desirable category (81-100%). The accessions having germination below 80% and/or limited seed quantity will be prioritized for regeneration in the upcoming year to restore their viability and ensure long-term conservation.

Conservation of germplasm at the field genebank

I. Ahmed and M. M. Ali

Plant Genetic Resources Centre (PGRC) of Bangladesh Agricultural Research Institute, Gzaipur maintaining a total of 330 accessions of 68 crops both indigenous and exotic germplasm in its field genebank. In 2023-24, new 35 germplasm of 7 crops were collected from different district 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 germplsm 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.

Regeneration of proso millet germplasm

S. Rahman

Proso millet (*Panicum miliaceum*) is a climate-resilient, nutrient-rich cereal and a mandate crop of BARI in Bangladesh. To enhance conservation and utilization, 100 accessions were regenerated at PGRC, Gazipur, during *Kharif* 2024. Results revealed significant phenotypic diversity in plant height (154-306 cm), seed yield (218-360 g/plot), and flag leaf traits, indicating valuable genetic variability. A total of 28.13 kg of seed was conserved, ensuring seed integrity and availability.

Regeneration of black cumin, fenugreek, celery, safflower and sunflower germplasm

F. B. Hossain and N. Jahan

The experiment was conducted at the experimental field of Plant Genetic Resources Centre, BARI, Gazipur during 2024-025 including some crops namely as 20 accessions of black cumin, 3 accessions of fenugreek, 3 accessions of celery, 6 accessions of safflower and 31 accessions of sunflower. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. Observations on different qualitative and one quantitative characters were recorded. After completing all the post-harvest operations, the harvested seeds were conserved properly for future study.

Regeneration of yard long bean germplasm

N. Jahan

The experiment was conducted with one hundred and fifteen accessions of yard long bean at PGRC, BARI, Gazipur during *kharif* season of 2025. Germplasm regeneration leads to get the sufficient seed quantity with increase viability for future use. Six observations on five qualitative and one quantitative characters were recorded. After completing all the post-harvest operations, the 11.42 kg seeds were conserved properly for future study.

Regeneration of barley and french bean germplasm

M. F. Khatun

The experiment was conducted at the experimental field of the Plant Genetic Resources Centre (PGRC), Bangladesh Agricultural Research Institute (BARI), Gazipur, during the *rabi* season of 2024–25. The study involved the cultivation of different accessions: Barley (26) and French bean (9). These crops were successfully grown to produce sufficient seeds for the regeneration and conservation program. Both qualitative and quantitative character data were recorded to assess the variations among the accessions. In barley, variations were observed in early plant vigour and plant growth habit, while in French bean, differences were found in flower colour and seed colour. After completing all post-harvest operations, the seeds were properly conserved for future use.

Regeneration of buckwheat, batishak and kangkong germplasm

M. F. Khatun

The regeneration experiment was conducted at the Plant Genetic Resources Centre, BARI, Gazipur, during the *rabi* season 2024-25 to preserve genetic integrity and produce enough seed for conservation. The crops were buckwheat (3), batishak (1) and Kangkong (4). Some important qualitative and quantitative data were recorded to know the variations among the accessions. Maximum variations were noted in plant growth habit, leaf colour, leaf shape, seed shape and seed colour. After completing the post-harvest operations, all seeds were conserved properly for future use.

Regeneration of muskmelon germplasm

N. Jahan

The regeneration of thirty-eight muskmelon (*Cucumis melo*) germplasm was conducted in the experimental field at Plant Genetic Resources Centre (PGRC) of BARI, Gazipur, during summer season of 2025. The most important qualitative and quantitative characters were recorded to know the variations among the germplasm. After completing all the post-harvest operations, the 369 g seeds from 38 accessions were conserved properly for future use.

Regenaration of snake gourd germplasm

M. G. Hossain

The experiment was conducted with forty-three (43) snake gourd accessions at the research field of PGRC, BARI, Gazipur during *kharif* season of 2025 to regenerate these selected accessions. Germplasm regeneration leads to ensure sufficient seed quantity with increased viability for future use. Six (6) observations viz. qualitative (3) and quantitative (3) characters were recorded where each of them showed remarkable variations. After completing all the post-harvest operations, a total of 3.07 kg seeds were conserved properly for future activities.

Regeneration of lentil germplasm

D. Halder and S. Paul

The experiment was conducted at Plant Genetic Resource Centre, RARS, BARI, Jashore during the *Rabi* season of 2024-2025 to regenerate the conserved germplasm. The experiment was involved 100 lentil accessions. Variations among lentil accessions were observed in qualitative characteristics like seedling pigmentation, leaf pubescence, leaflet size, tendril length, lodging susceptibility, flower ground color, pod pigmentation, pod shedding, pod dehiscence, ground color of testa, pattern of testa, color of pattern on testa and cotyledon color. The highest standard deviation (167.20) was observed in the seed yield per plot (g) and the lowest standard deviation (0.35) was observed in 1000 seed weight (g). The highest co-efficient of variation (54.24%) was observed for seed yield per plot (g) followed by biological yield (g/m^2) (35.17%) whereas the lowest (1.69%) was found in time to maturity.

Regeneration of lentil germplasm

M. I. Riad and M. M. Kadir

Lentil is the third most important pulse crop as a source of dietary protein. The regeneration of 100 germplasm of lentil (*Lens culinaris* Medikus subsp. *culinaris*) was carried out at the Plant Genetic Resources Centre (PGRC), RARS, Jamalpur during 2024-2025.Variations were found in both qualitative and quantitative characters among the germplasm. Some of the qualitative and quantitative data were recorded and adequate amount of seeds were harvested for conservation and future use.

Regeneration of grasspea germplasm

K U Ahamed and M M Anwar

The study was conducted at Regional Plant Genetic Resources Center, Regional Agricultural Research Station, Ishurdi, Pabna during *Rabi* season of 2024-2025 to regenerate seeds for conservation in the gene bank. Regeneration is one of the important activities of PGR which to replenish seed viability and maximize seed quantity. The experiment involved 102 grasspea accessions. Remarkable variations were observed in respect of qualitative and quantitative traits among the germplasm. The early maturity was found in BD-3197 accession (101 days). Three types of uniformity among the accessions showed as poor type 19.61%, medium 34.31% and rest was good type for 46.08%. Variations were found in flower colour as white blue for 5.88%, blue for 89.22%, violet blue for 4.90%. Immature pod colour found as two types light green 2.94% and green-purple 97.06%. Seven types of seed coat colour found as grey, brown, yellow-white, pink, red-purple, green mottled and greyed-white, highest 70.59% showed in brown colour. The early maturity was found in BD-3197 accession (101 days). The maximum number of pods per plant (160.00) was found in BD-3280 accession. The highest seed yield per plant (36.03 g) gave from BD-3224 accession followed by BD-3206 (26.20 g), BD-3275 (24.88 g), BD-3200 (24.71 g), BD-3254 (21.76 g), BD-3253 (21.91 g) and the lowest (3.30 g) was found in BD-3261 accession. The highest total seeds weight per germplasm (1953 g) was recorded from BD-3185 accession followed by BD-3241 (1592 g), BARI Khesari-2 (1495 g), BARI Khesari-3 (1483 g), BD-3223 (1480 g), BD-3249 (1470 g), BD-3255 (1410 g) and BD-3214 (1407 g) and the lowest total seeds weight per germplasm (607 g) found from BD-3192 accession. Eight accessions showed low susceptibility to diseases and pests reaction. Adequate amount of seeds have been harvested for conservation and future utilization.

Distribution of germplasm

N. Jahan, S. Rahman and M. M. Ali

Germplasm distribution is one of the important activities of PGRC. In 2024-25, the centre distributed 698 accessions of 15 crops among the researchers, MS and PhD students, plant breeder, horticulturist and teachers of different Universities and Institutes for conducting research. Among the germplasm, 30 accessions of cereal crops (foxtail millet), 63 oil seeds (Sunflower and mustard), 375 pulses (Grass pea, mung bean, field pea and black gram), 51 spices (chilli), 158 vegetables (Pumpkin, okra, brinjal, hyacinth bean, yard long bean and cucumber) and 21 fruits (musk melon) were distributed

Documentation of germplasm

M. G. Hossain, N. Jahan, I. Ahmed, M. F. Khatun 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 with efficient and effective updates enhancing its accessibility, usability, and analytical capabilities. PGRC database highlights recent updates made during 2024-25, aiming to improve data quality, accessibility, and utilization. A total of 11607 data were updated, of which 6522 were from passport data, 3928 conservation and monitoring data and 1157 were germplasm characterization and regeneration data.



ON-FARM STUDIES

14

Project: On-Farm Soil Fertility Management

Nutrient management of onion in Faridpur

M. M. Rahman and N. Sultana

A trial was conducted at the FSRD Site, Sholakundu, Faridpur during the *rabi*, 2023-24 & 2024-25 to find out a suitable fertilizer dose as well as to increase sustainable yield and economic return of onion under farmers' fields condition. The experiment was laid out in RCBD 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 ha^{-1} NPKSZnBMg. On the basis of result, the application of vermicompost with soil test based fertilizer dose to the crop yield found to be good nutrient management practice where it recorded highest average bulb yield (19.29 t ha^{-1}). On the basis of gross return (Tk 825725 ha^{-1}), gross margin (Tk 575017 ha^{-1}) and benefit cost ratio 3.34, respectively. The soil test based fertilizer plus 2 ton Vermicompost ha^{-1} was found to be profitable in Faridpur region.

Development of fertilizer management package on potato-groundnut-fallow cropping pattern in Nikli, Kishoreganj

Y. H. Rayhan, M. Mohiuddin and M. M. Zaman

An experiment was executed at the MLT site Nikli during 2024-2025 to assess the fertilizer management package on potato-groundnut-fallow cropping pattern in Nikli, Kishoreganj. The experiment was designed in RCBD with three dispersed replication in 30 m^2 plots with spacing of 30 cm × 15 cm for groundnut and 60 cm × 25 cm for potato. BARI Chinabadam-9 and BARI Alu-79 were used as planting material in this experiment. The highest gross margin (566645 Tk ha^{-1}) and BCR (2.25) was calculated from Lime (1 t ha^{-1}) with 120% Soil test based recommended fertilizer dose (Potato:169-9-186-17-3-1,Groundnut:54-11-62-58-2-1 (N-P-K-S-Zn-B kg ha^{-1}), the lowest gross margin (Tk 295415 ha^{-1}) and BCR (1.62) were from farmers practice (Potato:128-141-210-41-2-1.5, Groundnut: 45-49.4-0-0-0-0 (N-P-K-S-Zn-B kg ha^{-1}).

Effect of different fertilizer doses and application methods for potato production under zero tillage condition in coastal area

H. M. K. Bashar, M. M. Islam, K. N. Islam and N. Sultana

The experiment was conducted using the potato variety BARI Alu-72 during the *Rabi* season of 2024–25 at the Multi Location Testing site in Kalapara, Patuakhali. RCBD with three replications and six treatments was employed. A uniform spacing of 25 cm between plants and 60 cm between rows was maintained across all treatments, resulting in a plot size of 5 × 4 meters per treatment. The study evaluated three fertilizer application methods—broadcasting, ring placement, and side placement—in combination with two fertilizer levels: 125-50-100-30-2-1.5 kg h^{-1} NPKSZnB and 120-40-80-20-2-1.5 kg h^{-1} NPKSZnB. Significant differences were observed among the fertilizer application methods for key parameters such as the number of tubers per plant, tuber weight per plant (g), and tuber yield per hectare (t ha^{-1}). The analysis of variance also revealed significant interaction effects for all traits studied. Similarly, fertilizer levels showed highly significant effects on these parameters. The highest performance was recorded with side placement, which resulted in an average of 5.49 tubers per plant, 522 g of tuber weight per plant, and a tuber yield of 21.69 tons per hectare. The best interaction outcome was achieved

when 120-50-100-30-2-1.5 kg h^{-1} NPKSZnB was applied through side placement. These findings suggested that side placement is the most effective and economical method of fertilizer application for potato under zero tillage conditions at Kalapara, Patuakhali. Furthermore, the 120-50-100-30-2-1.5 kg h^{-1} NPKSZnB fertilizer rate appears to be the most promising for maximizing yield and productivity in this context.

Response of vermicompost on growth, yield and fruit quality of watermelon in coastal saline soil

H. M. K. Bashar, M. M. Islam, K. N. Islam and N. Sultana

An experiment was conducted at the Multi Location Testing (MLT) site in Kuakata, Patuakhali, during the *rabi* season of 2024–25 to evaluate the impact of varying vermicompost application rates on the yield and fruit quality of watermelon under farmers' field conditions. The study incorporated different doses of vermicompost alongside the recommended levels of inorganic fertilizers as per the Fertilizer Recommendation Guide (FRG' 2018). The treatment combinations were 1 ton Vermicompost ha^{-1} + $N_{150}P_{50}K_{125}S_{40}Zn_5B_4$ T_1, 2 ton Vermicompost ha^{-1} + $N_{150}P_{50}K_{125}S_{40}Zn_5B_4$ T_2, 3 ton Vermicompost ha^{-1} + $N_{150}P_{50}K_{125}S_{40}Zn_5B_4$ T_3 and Farmers practice ($N_{175}P_{70}K_{120}S_{30}Zn_{10}B_5$) T_4. Sprouted seeds of the popular hybrid watermelon variety 'Big Family' were sown in plots assigned to each treatment. The combined application of vermicompost and inorganic fertilizers significantly influenced yield and yield contributing parameters in watermelon cultivation in the coastal region. The highest yield (31.69 t ha^{-1}) was achieved with the application of 3 t vermicompost ha^{-1} in combination with inorganic fertilizers. The maximum amount of Total Soluble Solid (TSS) indicated improved fruit quality with higher doses of vermicompost application. Conversely, the lowest TSS was observed in T_4, where no vermicompost was applied. Economic analysis revealed that T_3 resulted in the highest gross return (Tk 633800 ha^{-1}), gross margin (Tk 444900 ha^{-1}), and benefit cost ratio (BCR) of 3.36. In contrast, the control plot i.e. the farmers practice yielded the lowest economic return (Tk 535800 ha^{-1}) and a BCR of 3.18. These findings suggested that integrating 3 ton vermicompost ha^{-1} plus recommended inorganic fertilizers can enhance both the yield and quality of watermelon, offering a viable strategy for sustainable and profitable watermelon production in the coastal regions of Bangladesh.

Development of fertilizer recommendation for potato production

N. Sultana, N. Akther, S. Sultana, S. Akhter and M. A. H. Khan

A fertilizer trial on potato was conducted at Mymensingh region under close supervision of OFRD, BARI, Mymensingh during *rabi* season in the year 2024-2025 to evaluate the performance of different fertilizers dose and to develop a fertilizer recommendation for potato production in farmer(s) field. The trial was consisted of six fertilizer doses viz. T_1: Farmers practice (P from DAP and N from Urea), T_2: Farmers practice (P from DAP and N from Urea and rest N from DAP), T_3: Farmers practice (P from TSP and N from Urea), T_4: Upper limit of low fertility level, FRG' 2018, T_5: P from DAP and rest N from Urea and T_6: Control. The yield performance of those treatments on potato appeared to be promising. It was found that maximum number of tubers (15.60) $hill^{-1}$was recorded from T_1 treatment and weight of tuber per hill (636.30 g)) was recorded in the plot which received fertilizer through T_3 i.e. Nitrogen from urea and Phosphorus from TSP. In case of T_5 i.e. proposed fertilizer dose recorded highest yield of potato (26.34 t ha^{-1}) which was statistically at par with T_1, T_2, T_3 and T_4. From the study the highest gross return (Tk 577000 ha^{-1}) and gross margin (Tk. 334791ha^{-1}) were estimated from the treatment T_5. The lowest gross return (Tk 309800ha^{-1}) and gross margin (Tk 80891 ha^{-1}) were recorded from T_6 when lowest amount of fertilizers were applied. The result led to conclusion that the most effective and economic fertilizer application in potato is 150-45-135-15-10-4-1.6 kg ha^{-1} NPKSMgZnB along with 5 ton ha^{-1} cow dung fertilizer are the promising level for excellent results in potato crop under plain land conditions at Gouripur, Mymensingh.

Integrated nutrient management for the yield of sweet gourd

N. Sultana, N. Akther, S. Sultana, S. Akhter and M. A. H. Khan

The investigation was carried out at farmers' field of Gouripur upazila under Mymensingh district of Bangladesh. The experiment was conducted in RCBD with six replications using the variety BARI Hybrid Mistikumra-2 with the treatments of soil test

based (STB) fertilizer, reduced doses of chemical fertilizers (IPNS with cow dung), 25% increased NPK plus STB, 50% 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. It recorded maximum number of fruits (3.63), fruit weight (2.14 kg), fruit circumference (64.73 cm) and yield per hectare (19.41 t ha^{-1}). According to the economic point of view, the treatment T_5 also recorded the highest gross return (Tk. 291150 ha^{-1}) and gross margin (Tk 192204 ha^{-1}) where the total variable cost was (Tk 98946 ha^{-1}).

Effect of rhizobium inoculum on the yield of BARI motorshuti-3 in the farmers field

S. Sultana, S. Akhter, N. Akther, N. Sultana, and M. A. H. Khan

An experiment was conducted in the farmers' field of Muktagacha upazila under Mymensingh district under the close supervision of OFRD, BARI, Mymensingh, during winter 2024-2025 to observe the effect of rhizobium on the yield of BARI Motorshuti-3. The crop was fertilized according to the treatment combinations: T_1: Rhizobium inoculation (BARI RPS-501, 1.5 kg ha^{-1}) + recommended 24 and 30 kg P & K ha^{-1}, T_2: Rhizobium inoculation (1.5 kg ha^{-1}) & vermicompost (5 t ha^{-1}) + recommended 24 and 30 kg P & K ha^{-1}, T_3: Control un-inoculated ie. recommended fertilizers (48-24-30 kg ha^{-1} NPK). Rhizobium and combined application of vermicompost gave the highest pod yield of 5.40 t ha^{-1} followed by control treatment (4.56 t ha^{-1}). On the other hand, Rhizobium treatment produced the lowest pod yield of 4.44 t ha^{-1}. The maximum gross return was recorded from rhizobium + vermicompost application (Tk 405000 ha^{-1}) followed by un-inoculated and rhizobium application (Tk 342000 ha^{-1} and Tk 333000 ha^{-1}).

Effect of tricocompost on the yield of cabbage in farmers field

S. Sultana, S. Akhter, N. Akther, N. Sultana, and M. A. H. Khan

An experiment was conducted in the farmer's field of Muktagacha upazila under Mymensingh district with the close supervision of OFRD, BARI, Mymensingh, during winter 2024-2025 to observe the effect of biofertilizer on the yield of cabbage variety. Seedlings of Atlas-70 were planted on 20 November, 2024 in 60 cm × 45 cm spacing in each plot of 6m × 4.5 m. The crop was fertilized according to the treatment combinations: T_1: Tricho-compost (3 t ha^{-1}) + 12-47-14-3 kg ha^{-1} PKSZn (recommended fertilizers dose), T_2: Vermicompost (5 t ha^{-1}) + 12-47-14-3 kg ha^{-1} PKSZn (RFD), T_3: Tricho-compost and Vermicompost + 12-47-14-3 kg ha^{-1} PKSZn (RFD), T_4: 129-12-47-14-3 kg ha^{-1} NPKSZn (control). Tricho-compost and combined application of vermicompost gives the highest card yield of 86.6 t ha^{-1} followed by vermicompost treatment (82.5 t ha^{-1}). On the other hand, control treatment gives the lowest card yield of 75.68 t ha^{-1}. The maximum gross return was recorded from tricho-compost + vermicompost application (Tk 433000 ha^{-1}) followed by sole vermicompost treatment (Tk 412500 ha^{-1}).

Effect of different fertilizer doses on the yield of groundnut in the charland of AEZ-8

M. R. Amin, M. A. Rahaman, G. Paul, K. Roy, T. Tasmima, S. Roy and N. Sultana

The experiment was conducted at Daulatpur upazila of Manikganj and Bhuapur, Tangail (AEZ-8) during *Kharif-I and rabi* of 2024-25 to determine the optimum fertilizer dose for groundnut production farmers' field condition. The treatments were T_1: Soil test based=39.8-20.75-23.47-11.46-2.65 kg NPKSZn ha^{-1}), T_2:STB+10% extra of NPKS= 43.82-22.82-26.13-12.60-2.91 kg NPKSZn ha^{-1} T_3: STB+20% extra NPKS (48.20-25.10-28.74-13.86-3.20 kg NPKSZnB ha^{-1}, T_4: STB+30% extra NPKS=53.02-27.61-31.61-15.25-3.52 kg NPKSZn ha^{-1} and T_5: farmers practice=113.82-49.40-61.75-19.76-0 kg NPKS ha^{-1} . Soil test based fertilizer dose performed better which produced the highest nut yield (1.96 and 1.87 t ha^{-1} respectively) in Manikganj and Tangail. Varying in nut price of both the location, the economic point of view soil test based fertilizer combination provided the highest gross return and gross margin. These results indicated that soil test based fertilizer management practice is the most effective for maximizing the groundnut yield and profitability in char land areas of AEZ-8.

Effect of potassium fertilizer on groundnut in charland

M. U. S. Khatun, M. Z. Ferdous, M. K. Islam, U. K. Laily, M. A. H. Talukder and N. Sultana

A field trial was conducted in the farmer's field under stable Char land of Chilmari, Kurigram during *rabi* season of 2022-23, 2023-24 and 2024-25 to identify the suitable dose of potassium fertilizer under water deficit condition of char environments. Four potassium fertilizer T_1: recommended chemical fertilizer (RDCF), T_2: RDCF+125% of recommended MoP, T_3: RDCF+150% of recommended MoP and T_4: Farmer's practices were tested on BARI Chinabadam-9 in the farmer's field. On an average of three consecutive years, among the tested entries, T_3 (2.26 t ha^{-1}) gave maximum pod yield followed by T_2 (2.08 t ha^{-1}). Farmers practice gave the minimum yield (1.60 t ha^{-1}). The maximum gross margin (Tk 130868 ha^{-1}) was obtained from RDCF with extra 150% of recommended MoP fertilizer.

Effect of gypsum fertilizer on groundnut in charland

M. U. S. Khatun, M. Z. Ferdous, M. K. Islam, U. K. Laily, M. A. H. Talukder and N. Sultana

A field trial was conducted in the farmer's field under stable Char land of Chilmari, Kurigramduring *rabi* 2024-25 to identify the suitable dose of gypsum as a source of calcium and sulphur fertilizer under water deficit condition of stable Char land. Four gypsum fertilizer T_1: Recommended dose of chemical fertilizer (RDCF)=37-34-27-26-1-2 kg NPKSBZn ha^{-1}, T_2: T_1+125% of recommended gypsum, T_3: T_1+150% of recommended gypsum and T_4:Farmer's practice were tested in the farmer's field. Among the tested entries, T_3 gave the maximum nut yield (2.47 t ha^{-1}) and followed by T_2 (2.36 t ha^{-1}). Farmers practice gave the minimum yield (1.84 t ha^{-1}). The maximum gross return (Tk 296400 ha^{-1}) and gross margin (Tk 107204 ha^{-1}) was obtained from the same treatment T_3.

Effect of application method of gypsum on groundnut production in char land of rangpur region

M. U. S. Khatun, M. Z. Ferdous, M. K. Islam, U. K. Laily, M. A. H. Talukder

Application of gypsum as source of calcium and sulphur for groundnut cultivation is common practice and mainly applied during peg initiation stage of groundnut. However, its effect is mainly influenced by the type of soil and dissolution of gypsum, which facilitates the yield and quality of groundnut. Hence, field experiments were conducted to know the effect of split application of gypsum on yield and quality of groundnut. A field trial was conducted in the farmer's field under stable Char land of Bongram, Chilmari, Kurigram during *Rabi* 2024-25. Four gypsum fertilizer treatments viz., T_1=Farmer's practice, T_2=400 kg gypsum as basal, T_3=400 kg gypsum (50% basal+50% top dress during 30-45 days under irrigated condition) and T_4=400 kg gypsum as top dress (during 30-45 days under irrigated condition)were tested in the farmer's field. The variety was BARI Chinabadam-9. Split application of gypsum fertilizer was tested for yield and yield components like plant height, no. of pods plant^{-1}, weight of pods plant^{-1}, no. of kernels plant^{-1}, weight of kernels plant$^{-1,}$ 100 kernels weight, pod yield and shelling etc. with the close supervision of OFRD, BARI, Rangpur. Among the tested entries, T_3 (2.50 t ha^{-1}) gave maximum pod yield and T_1gave minimum yield (1.80t ha^{-1}). The maximum gross return (300000 Tk. ha^{-1}) and gross margin (111430 Tk. ha^{-1}) was obtained from T_3.

Development of nutrient management package of BARI begun-12

U. K. Laily, M. Z. Ferdous, M. K. Islam, M. U. S. Khatun, M. A. H. Talukder and N. Sultana

The field experiment was conducted during the *Rabi* season of 2024-25 on station OFRD, BARI, Rangpur to observe the effect of organic fertilizer on 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 t ha^{-1} and T_4: STB + Cow dung 10 t ha^{-1} and T_5: Farmers practice (Contro). Among the treatments, the highest number of fruits plant^{-1} (9.13) and fruit yield (51.04 t ha^{-1}) was obtained from STB + Vermicompost 3 t ha^{-1}) fertilizer treatment. The lowest number of fruits plant^{-1} (6.72) and fruit yield (40.67 t ha^{-1}) was obtained from control treatment. The highest gross return (Tk 1122880 ha^{-1}) and gross margin (Tk 689326 ha^{-1}) was also recorded from the same combination of in organic and organic fertilizer. The lowest gross return (Tk 894740 ha^{-1}) and gross margin (Tk 466636 ha^{-1}) was recorded from control plot, respectively.

Effect of split application of urea and MOP on potato production in Rangpur region

U. K. Laily, M. Z. Ferdous, M. K. Islam, M. U. S. Khatun, M. Akhter-Ul-Alam, M. A. H. Talukder

In Bangladesh, the use of chemical fertilizers is not balanced. In order to maintain agricultural production and increase potato yield while reducing adverse effects on soil fertility, proper nutrient management is crucial. The aim of the study was to observe the effect of spilt application of N and K on potato production. A field experiment was conducted at OFRD, BARI, Rangpur in the *rabi* season of 2024–25. Three treatments viz. T_1: Farmers practices (Basal: 1/3rd Urea and 1/3rd MoP, 1/3rd Urea and 1/3rd MoP at 28 days after planting (DAP), 1/3rd Urea and 1/3rd MoP at 42 DAP), T_2: Two splits of RFD (Basal: 1/3rd Urea and 1/3rd MoP, 1/3rd Urea and 1/3rd MoP at 28 DAP) and T_3: Three splits of RFD (Basal: 1/3rd Urea and1/3rd MoP, 1/3rd Urea and 1/3rd MoP at 28 DAP, 1/3rd Urea and 1/3rd MoP at 42 DAP) were evaluated for this purpose. Results revealed that the highest number of tuber hill^{-1} (16.92), tuber weight hill^{-1} (0.644 kg) and tuber yield (34.58 t ha^{-1}) were found from three splits of RFD (Basal : 1/3rd Urea and 1/3rd MoP, 1/3rd Urea and 1/3rd MoP at 28 DAP, 1/3rd Urea and 1/3rd MoP at 42 DAP) treatment. Amongst the three treatments adopted in the experiment, the highest gross return (Tk 518400 ha^{-1}) and gross margin (Tk 275317 ha^{-1}) were also obtained from the T_3 treatment. The lowest tuber yield was obtained from T_1 (Farmers' practices) treatment.

Effect of nutrient management on the productivity of mustard (canola) in north-west Bangladesh

M. S. Hossain, M. T. Hasan, M. E. Haque, M. A. H. Talukder and M. M. Hasan

The cultivation area of rapeseed mustard in Bangladesh is expanding rapidly, driven by the development of high yielding varieties and the rising market price of edible oil. However, imbalanced fertilization remains a key constraint limiting seed yield. To determine the optimum and economical fertilizer dose for canola type mustard (BARI Sarisha-18) a field experiment was conducted during the *rabi* seasons of 2023-24 and 2024-25 under the supervision of the OFRD, BAR). The trials were carried out across three locations representing different agro-ecological zones (AEZs): the Barind tract of Godagari in Rajshahi (AEZ-26), the char land of Bogura Sadar (AEZ-3), and the BARI research station in Rangpur (AEZ-3). The experimental treatments included four nutrient management packages applied across all sites: 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. An additional treatment T_5: Khamari App-based Nutrient Package was evaluated only at the Rangpur site. The experimental layout followed a RCBD with three replications. In Rajshahi, T_3 recorded the highest seed yield (2.17 and 2.13 t ha^{-1} in 2023–24 and 2024–25, respectively) and economic performance as highest gross return Tk 188125 ha^{-1}, gross margin Tk 159967 ha^{-1}, and a benefit cost ratio (BCR) 3.24. In Bogura, T_3 likewise produced the highest seed yield (2.12 t ha^{-1}), gross return (Tk 168120 ha^{-1}), and gross margin (Tk 116980 ha^{-1}). However, T_2 was the most economically favorable providing a yield of 1.75 t ha^{-1}, gross return Tk 148495 ha^{-1}, and gross margin of Tk 94930 ha^{-1} in Rangpur region.

Effect of nitrogen levels on crop productivity and profitability of different rice-based cropping systems

M. A. Islam, M. Maniruzzaman, M. Z. Hasan, M. S. H. Molla and M. S. Hossain

A field experiment was conducted during 2021-22, 2022-23, and 2023-24 at the Agricultural Research Station, Pabna, Bangladesh, to evaluate crop productivity and system performance under diversified rice-based cropping systems. Three cropping patterns were examined: cereal-based system (CBS), oilseed-based system (OBS), and legume-based system (LBS), along with four nitrogen fertilizer levels: 0% of the recommended nitrogen dose (RND) – control (N0), 50% of RND (N50), 100% of RND (N100), and 150% of RND (N150). The experiment followed a split-plot design with three replications. In the 2023–24 season, LBS consistently outperformed CBS and OBS across all crops and nitrogen levels. For Crop 7 (rice), LBS recorded the highest yield (3.2 t/ha), with the maximum yield observed under the LBSN100 combination (4.3 t/ha). In Crop 8, LBS achieved the highest rice equivalent yield (REY) of 5.1 t/ha, with the LBSN50 treatment yielding the maximum at 6.4 t/ha. A similar pattern was observed in Crop 9, where LBS produced the highest REY (4.4 t/ha),

and LBSN50 reached the peak yield of 5.1 t/ha. Overall, system REY was highest in LBS (12.8 t/ha), followed by CBS (8.8 t/ha) and OBS (8.3 t/ha). Nitrogen application significantly enhanced system productivity, with N100 and N150 treatments producing REYs of 12.5–12.7 t/ha, while the control (N0) recorded only 5.7 t/ha. The highest system REY (14.6 t/ha) was obtained under LBSN100, whereas the lowest (3.3 t/ha) was observed in CBSN0. Although a slight decline in system productivity was noted compared to the previous year, the legume-based LBS system remained the most productive. These findings underscore the importance of integrated cropping system diversification and optimal nitrogen management for sustainable agricultural intensification in rice-based systems.

Effect of phosphorus levels and planting techniques on the performance of mustard-maize-t. Aman rice cropping pattern

M. Maniruzzaman, M. Z. Hasan, M. A. Islam, M. S. H. Molla and M. S. Hossain

The impacts of conservation agriculture (CA) practices combined with varying phosphorus (P) input levels on soil P availability and P fertilizer management are not yet fully understood, particularly in short- to medium-term rice-based cropping systems. To address this knowledge gap, a field experiment was conducted during the 2022–23 and 2023–24 cropping seasons to evaluate the combined effects of tillage practices and P fertilization on system productivity. The experiment assessed two tillage methods—strip planting (SP) and conventional tillage (CT)—along with three P fertilizer application rates: low dose (LD = 75% of the recommended dose, RD), recommended dose (RD = 100% P as per FRG-2018), and high dose (HD = 125% of RD). The results revealed that SP improved system rice equivalent yield by 3–10% compared to CT, primarily due to increased yields of the component crops. Furthermore, both RD and HD of phosphorus application produced comparable system yields, significantly outperforming the LD treatment. These findings suggest that the mustard–maize–T. aman rice cropping system, when managed under strip planting with the recommended phosphorus rate, holds considerable promise for enhancing crop yield and system productivity.

Effects of boron on growth and yield of proso millet at char areas of Brahmaputra-Ganges floodplains

M. S. H. Molla, M. Maniruzzaman, M. A. Isalm, M. Z. Hasan and A. A. Mahmud

This study evaluated the effects of varying boron fertilizer doses on the growth and yield of Proso millet (BARI Cheena-1) under the Char land conditions of Pabna, Bangladesh. Five boron fertilizer rates: 0.0, 1.0, 1.25, 1.50, and 1.75 kg B ha^{-1} were assessed using a RCBD with three replications. The results revealed that boron application significantly influenced key yield components, including the number of panicles per plant, panicle length, number of grains per panicle, grain yield, and straw yield. The highest grain yield (2.82 t ha^{-1}) was recorded at 1.75 kg ha^{-1} B, which was statistically similar to 1.50 kg ha^{-1} B (2.81 t ha^{-1}), and both were significantly superior to the control (0 kg ha^{-1} B) which produced a yield of 1.78 t ha^{-1}. These findings highlight the critical role of boron fertilization in enhancing Proso millet productivity under the nutrient deficient and stress prone conditions of Char land ecosystems. Application of 1.50–1.75 kg B ha^{-1} is recommended for optimizing yield performance in this environment.

Development of fertilizer recommendation for onion (bulb + leaf)-onion (bulb)-t. Aus-t. Aman rice cropping pattern

M. J. Islam, M. N. A. Siddquie, M. M. I. Chowdhury and M. S. Hossain

An experiment was conducted during the 2024–2025 cropping cycle on station research field of Agricultural Research Station, Shyampur, Rajshahi, to develop a suitable fertilizer recommendation for onion based four crop pattern comprising leaf + bulb onion – bulb onion – T. Aus-T. Aman rice. Four fertilizer treatments were evaluated: T_1 – Soil Test Based (STB) dose following the Fertilizer Recommendation Guide (FRG, 2018); T_2–T_1 plus 20% additional NPKS through Integrated Plant Nutrient System (IPNS); T_3–T_1 plus 40% additional NPKS via IPNS; and T_4– conventional farmer practice. The cropping system included BARI Piaz-1 (onion), BRRI dhan98 (T. Aus), and BRRI dhan75 (T. Aman). Among the treatments, T_3 recorded the highest total Rice Equivalent Yield (REY) of 32.4 t ha^{-1} and the maximum gross margin of Tk 1899288

ha^{-1}. In contrast, the conventional practice (T_4) yielded the lowest REY (27.2 t ha^{-1}) and economic return. These findings indicated that applying 40% additional NPKS through IPNS over the STB dose (T_3) is the most effective strategy for enhancing productivity, profitability, and sustainability in onion based cropping systems under similar agro ecological conditions.

Yield assessment of potato-boro-t. Aman rice cropping pattern using different fertilizer recommendations

M. J. Islam, M. N. A. Siddquie, M. M. I. Chowdhury and M. S. Hossain

A field experiment was conducted during the 2023–2024 growing season to evaluate the effect of different fertilizer management strategies on the productivity and profitability of the Potato–Boro–T. Aman rice cropping pattern. Five fertilizer treatments were assessed: T_1– Recommended Fertilizer Dose (RFD) as per FRG, 2018, T_2– Soil Test Based (STB) dose, T_3– SRDI recommendation, T_4– BRRI/ BARI recommendation, and T_5–farmer's practice. The results demonstrated that T_4 (BRRI/BARI recommendation) consistently produced the highest potato yield (32.7 t ha^{-1}), followed by T_3 (31.8 t ha^{-1}) and T_5 (31.5 t ha^{-1}). Both in Boro rice and T.Aman rice, the highest grain yield was observed under T_2 (5.68 t ha^{-1}, 4.86 t ha^{-1}). The economic analysis revealed that T_4 provided the highest gross margin (Tk 419915 ha^{-1}) closely followed by T_3. These results highlight the effectiveness of site specific nutrient management approaches. In particular, the BRRI/BARI and SRDI recommendations significantly enhanced system productivity and economic returns compared to the conventional farmer practice. Therefore, the promotion of BRRI/ BARI and SRDI based nutrient management is recommended for sustainable intensification and improved resource use efficiency in similar agro-ecological zones.

Development of fertilizer recommendation for foxtail millet at charland of bogura

M. R. A. Mollah, M. M. Hasan, M. S. Alam, M. T. Hasan and M. S. Hossain

A field experiment was conducted during the *Rabi* seasons of 2023–2024 and 2024–2025 at farmers' fields in Gozaria Char, Sariakandi, Bogura, to determine a judicial fertilizer dose for foxtail millet. The treatments included: T_1: Recommended dose based on FRG, 2018 (28-20-37-0.5-0.5 kg ha^{-1} NPKZnB), T_2: T_1 + 25% NPKZn, T_3: T_1 + 50% NK, T_4: T_1 + 1 kg ha^{-1} B, and T_5: Farmers' practice (46-15-20-14-1.5-1 kg NPKSZnB ha^{-1}). Fertilizer doses were calculated based on treatment specifications, including soil test based (STB) estimations, and applied accordingly following a RCB design. In the 2023–2024 year, the highest seed yield (2.18 t ha^{-1}) was recorded from T_4, which was statistically similar to T_5, while the lowest yield (1.92 t ha^{-1}) was observed in T_1. Similarly, in the 2024–2025 year, T_4 again produced the highest seed yield (2.27 t ha^{-1}), statistically similar to T_5, with T_1 yielding the lowest (2.00 t ha^{-1}). Economic analysis revealed that T_4 resulted in the highest gross return of Tk 152600 ha^{-1} and Tk 158900 ha^{-1} in 2023–2024 and 2024–2025, respectively, against a constant cultivation cost of Tk 35265 ha^{-1}. This resulted in the highest gross margins of Tk 117335 ha^{-1} and Tk 123635 ha^{-1}, respectively. In contrast, the lowest gross returns (Tk 134400 ha^{-1} in 2023–2024 and Tk 140000 ha^{-1} in 2024–2025) and gross margins (Tk 99135 ha^{-1} and Tk 105105 ha^{-1}) were obtained from T_1. These results suggest that the addition of 1 kg B ha^{-1} with FRG' 2018 significantly improves both yield and profitability of foxtail millet under char land conditions.

Project: Improvement of Cropping Systems

Development of blackgram-*boro*-T. *Aus* rice cropping pattern against fallow-*boro*-T. *Aus* rice in barind area

M. E. A. Pramanik and M. S. Hossain

An experiment was conducted at the MLT site, Niamatpur, Naogaon during 2023–24 to evaluate the productivity, production efficiency, land use efficiency, and economic returns of different cropping patterns in High Barind Tract. The study compared two cropping patterns: i.e., improved pattern Blackgram-*Boro*-T. *Aus* rice with the existing Fallow-*Boro*-T. *Aus* rice pattern. The experiment was laid out in RCBD with three dispersed replications. Results showed that higher rice equivalent yield (REY) of 18.00 t ha^{-1} was achieved from Blackgram-*Boro*-T. *Aus* rice cropping pattern which was 65.59 % higher compared to existing Fallow-*Boro*-T.

Aus rice cropping pattern. Although this improved cropping system incurred higher variable costs, it also generated the highest gross return, gross margin, and marginal benefit-cost ratio (MBCR) among the patterns tested.

Development of alternate cropping pattern (T. *Aman* -mustard-tomato-) against existing cropping pattern (T. *Aman* - fallow – tomato-) in Dinajpur

M. S. Huda

A field experiment was carried out at Agricultural Research Station, Rajbari, Dinajpur during 2024-25 to develop improved cropping pattern and to compare its productivity and profitability against farmers existing cropping pattern. The experiment was laid out in a RCBD with six dispersed replications. Two cropping patterns viz., alternate cropping pattern (T. *Aman* -Mustard-Tomato-) and farmers' existing cropping pattern (T. *Aman* -Fallow- Tomato). In whole pattern, rice equivalent yield in alternate cropping pattern was 57.3 t ha^{-1} while 52.8 t ha^{-1} in existing pattern. The higher gross return and gross margin were substantially higher in the alternate pattern than the farmer's existing pattern. The mean marginal benefit cost ratio (MBCR) also showed that inclusion of high yielding mustard and tomato might be profitable to the farmers' over the farmer existing pattern.

Development of T. *Aman*- mustard-sesame cropping pattern against T. *Aman* - *boro*-fallow in active Brahmaputra Jamuna floodplain of Gaibandha

M. J. Alam M. Akhtaruzzaman and A. A. Mahmud

The experiment was conducted at Kamolpur, Saghata, Gaibandha during 2024-25 to increase the cropping intensity and productivity in rice-based cropping patterns. The experiment was laid out in a randomized complete block design with six dispersed replications. Two cropping patterns viz., alternate cropping pattern (Mustard-Sesame-T. *Aman* rice) and farmers' existing cropping pattern (*Boro*- Fallow-T. *Aman*) were the treatment variables. The result revealed alternate cropping pattern was agronomically and economically more profitable than the existing pattern. Mean rice equivalent yield, productivity and profitability was higher than farmers' existing cropping pattern. Rice equivalent yield of the farmers' existing cropping pattern was 11.28 t ha^{-1} whereas in the improved cropping pattern it was12.45 t ha^{-1}. Inclusion of new crops in the existing cropping pattern and replacing old and traditional varieties by modern improved varieties enhanced productivity and profitability. As such improved cropping pattern could be established successfully with inclusion short duration mustard var. BARI Sarisha-14 and sesame var. BARI Til-6

Development of alternate cropping pattern mustard - danta- T. *Aus* - T. *Aman* rice against *boro* - fallow - T. *Aman* rice

M. M. Alam, M. Ahmed and M. H. Rahman

The experiment was conducted at OFRD, BARI, Shibpur, Narsingdi during 2023-24 to develop improved cropping pattern Mustard -Danta-T. *Aus* -T. *Aman* rice and to compare its productivity and profitability against farmers existing cropping pattern *Boro*-Fallow-T. *Aman* rice. The experiment was laid out in a RCBD with six dispersed replications. Two cropping patterns viz., alternate cropping pattern (Mustard-Danta-T. *Aus*-T. *Aman* rice) and farmers' existing cropping pattern (*Boro*-Fallow-T. *Aman* rice) were the treatment variables. The result revealed that improved cropping pattern could be established successfully with inclusion short duration mustard var. BARI Sarisha-14. Rice equivalent yield, productivity and profitability was higher than farmers' existing cropping pattern. Rice equivalent yield of the farmers' existing cropping pattern was 9.40 t ha^{-1} whereas in the improved cropping pattern was 15.94 t ha^{-1}. Alternate cropping pattern (Mustard- Danta - T. *Aus* - T. *Aman*) gave higher gross margin (Tk. 182380 ha^{-1}) against the existing pattern *Boro* - Fallow-T. *Aman* (Tk. 97070 ha^{-1}). Inclusion of new crops in the existing cropping pattern and replacing old and traditional varieties by modern improved varieties enhanced productivity and profitability.

Development of alternate cropping pattern potato-jute-T. *Aman* rice against wheat-jute - T. *Aman* rice

M. M. Alam, M. Ahmed and M. H. Rahman

The experiment was conducted at OFRD, BARI, Shibpur, Narsingdi during 2021-22, 2022-23 and 2023-24 to improve the existing cropping pattern by inclusion of potato and to increase cropping intensity, productivity and farmers income. The improved cropping pattern Potato (var. BARI Alu-

40) - Jute (var. Deshi Pat-5)-T. *Aman* (var. BRRI dhan71) was evaluated against existing cropping pattern Wheat (var. BARI Gom-21)-Jute (var. CVL-1)- T. *Aman* (var. BRRI dhan87). The experiment was laid out in RCBD design with six dispersed replications. The unit plot size was 800 m^2. Alternate cropping pattern agronomically and economically more profitable than existing cropping pattern. Rice equivalent yield of the farmers' pattern was 14.26 t ha^{-1} whereas alternate cropping pattern, it was 30.57 t ha^{-1}. Alternate pattern gave higher gross margin (Tk.485574 ha^{-1}) which was 224% higher than farmers existing pattern (Tk. 149842 ha^{-1}).

Development of alternative cropping pattern mustard - *boro*- T. *Aman* rice against fallow- *boro*- T. *Aman* cropping pattern in Rajshahi region

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

A field trial was conducted at the farmers' fields of Mypara, Puthia, Rajshahi during 2023–2024 to develop alternate cropping pattern (Mustard-*Boro*-T. *Aman* rice) against Fallow- *Boro*-T. *Aman* rice. There were two treatments, *viz.*, Existing Cropping Pattern Fallow-*Boro* (Jirasail)-T. *Aman* (Swarna) and alternate Cropping Pattern Mustard (var. BARI Sarisha-14)-*Boro* (var. Binadhan-17)-T. *Aman* (var. BRRI dhan87). In the alternate cropping pattern the yields of mustard, *Boro*, and T. *Aman* rice were 1.47, 6.35, and 5.1 t ha^{-1} respectively, while in the existing pattern, the yields of *Boro* and T. *Aman* rice were 6.51 and 5.2 t ha^{-1} respectively. Alternate cropping patterns gave a higher rice equivalent yield (14.99 t ha^{-1}) against the existing cropping pattern (11.81 t ha^{-1}). Total gross return and gross margin of the improved cropping patterns were Tk. 519095 and 279765 ha^{-1}, whereas in the existing cropping pattern it was Tk. 419255 and 207655 ha^{-1}, respectively.

Development of alternae cropping pattern mustard- maize- T. *Aman* rice against fallow- *boro*- T. *Aman* cropping pattern in Rajshahi region

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

A field trial was conducted at the farmers' field of Paba, Rajshahi, during 2023–2024 to develop a Mustard-Maize-T. Aman rice cropping pattern. There were two treatments, i.e., existing cropping Pattern: Boro (BRRI dhan28)-Fallow-T. Aman (Sharna) and alternate cropping Pattern: Mustard (var. BARI Sarisha-18)-Maize (NK-6848)-T. Aman (var. BRRI dhan87). In alternate cropping pattern, yields of Mustard, Maize, and T. Aman rice were 1.65, 6.91, and 5.87 t ha^{-1} while in existing pattern, yields of Boro and T. Aman rice were 5.85 and 5.20 t ha^{-1}, respectively. Alternate cropping patterns gave rice equivalent yields (15.12 t ha^{-1}) which was 35.73 % higher than existing cropping patterns (11.14 t ha^{-1}). The higher gross return (Tk. 502820 ha^{-1}) and gross margin (Tk. 264720 ha^{-1}) was recorded in alternate cropping pattern than existing cropping pattern (Tk.393900 ha^{-1} and Tk. 226770 ha^{-1}). After inclusion of the alternate cropping pattern, MBCR was 1.53.

Improvement of existing cropping pattern potato-*boro*-t. *Aman* through inclusion of new varieties

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

An experiment was conducted at Berabari, Mohonpur, Rajshahi during the 2023–24 cropping season to evaluate the improvement of the existing Potato–*Boro*–T. *Aman* cropping pattern through the introduction of improved varieties. The improved cropping pattern (IP) comprised potato var. BARI Alu-62, rice var. BRRI dhan102, and BRRI dhan87, while the Farmers' existing pattern (FP) included potato var. BARI Alu-7, rice var. Jirasail and Swarna. The results revealed that the improved cropping pattern performed better than the existing one in terms of productivity and profitability. Tuber /grain yields of potato, *Boro*, and T. *Aman* in the IP were 37.85, 6.20, and 5.62 t ha^{-1}, respectively, compared to 36.24, 5.8, and 5.27 t ha^{-1} in FP. The improved cropping pattern achieved 5.245 %, 5.04 and 5.14 % higher rice equivalent yield (42.10 t ha^{-1}), gross return (Tk 1,052,500 ha^{-1}), and gross margin (Tk 558,990 ha^{-1}), respectively. Marginal benefit cost ratio (MBCR) was 2.42. These findings revealed that the inclusion of improved varieties could enhance yield and economic return.

Development of alternate cropping pattern hybrid maize -panikachu against farmers existing cropping pattern hybrid maize-jute-fallow at Manikganj

M. R. Amin

The experiment was conducted at Dautia village under Sadar upazila of Manikganj district during *rabi* season of 2024-25 to test the new cropping

pattern hybrid maize-panikachu against farmer's existing hybrid maize-Jute-fallow cropping pattern in farmers' field. The objectives of the study was to introduce stolon producing aroid in the pattern and compare the agro-economic performance of the new pattern with farmers existing cropping pattern for increasing cropping intensity and productivity. The variety of hybrid maize was Bayer-135 *and* the variety of panikachu was BARI Panikachu-1. The experiment was laid out in RCB design with four dispersed replications. The highest maize equivalent yield (34.17 t ha^{-1} $year^{-1}$), gross return (Tk. 956900 ha^{-1}) and gross margin (Tk. 443580 ha^{-1}) was obtained from improved cropping pattern. The MBCR of improved pattern (2.03) indicated higher profitability and acceptability over farmers existing cropping pattern.

Improvement of existing cropping pattern potato-*boro*-t. *Aman* through inclusion of new varieties

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

An experiment was conducted at Berabari, Mohonpur, Rajshahi during the 2024–2025 cropping season to evaluate the improvement of the existing Potato–Boro–T. Aman cropping pattern through the introduction of improved varieties. The improved cropping pattern (IP) comprised potato var. BARI Alu-62, rice var. BRRI dhan102, and BRRI dhan87, while the Farmers' existing pattern (FP) included potato var. BARI Alu-7, rice var. Jirasail and Swarna. The results revealed that the improved cropping pattern performed better than the existing one in terms of productivity and profitability. Tuber /grain yields of potato, Boro, and T. Aman in the IP were 37.85, 6.20, and 5.62 t ha^{-1}, respectively, compared to 36.24, 5.8, and 5.27 t ha^{-1} in FP. The improved cropping pattern achieved higher rice equivalent yield (REY) of 42.1 t ha^{-1} gross return of Tk 1,052,500 ha^{-1}, gross margin of Tk 558,990 ha^{-1} and marginal benefit cost ratio (MBCR) of 3.61. These findings revealed that the inclusion of improved varieties could enhance yield and economic return.

Upscalling of the improved cropping pattern: mustard-sesame-b. Aman rice in Cummilla

M. J. Uddin

A field experiment was conducted during 2023–24 at a farmer's field in Kesobpur, Titas, Cumilla under AEZ-19 to incorporate sesame into the existing cropping pattern with the aim of increasing cropping intensity and enhancing farmers' income. Two treatments were evaluated: T_1 (existing pattern) – Mustard (*Tori-7*)–Fallow–B. Aman (*Local*), and T_2 (improved pattern) – Mustard (*BARI Sarisha-18*)–Sesame (*BARI Til-6*)–B. Aman (*BRRI dhan-91*). The results showed that the improved cropping pattern produced a significantly higher Rice Equivalent Yield (13.43 t ha^{-1}) compared to the existing pattern (5.86 t ha^{-1}), owing to the addition of sesame during the fallow period. Moreover, the improved pattern yielded higher gross return (Tk. 243,988 ha^{-1}), gross margin (Tk. 133,085 ha^{-1}), and a superior marginal benefit-cost ratio (2.71). These outcomes were primarily attributed to the additional yield of sesame and the better performance of the modern varieties BARI Sarisha-14 and BRRI dhan-91.

Development of improved cropping pattern potato/sweet gourd - T. Aus - T. Aman rice against potato – fallow- T. Aman in cumilla

M. J. Uddin

A field experiment was conducted during 2023–24 at a farmer's field in Kachisair, Debidwar, Cumilla under AEZ 19 to utilize fallow land between two crops in the existing cropping pattern and enhance cropping intensity. Two treatments were tested: T1 – existing pattern: Potato (BARI Alu-7)/Sweet gourd (Hybrid SG Asha)–Fallow–T. Aman (BRRI dhan-48), and T_2 – improved pattern: Potato (BARI Alu-62)/Sweet gourd (BARI Misty Kumra-2)–T. Aus (BRRI dhan-98)–T. Aman (BINA dhan-17). The improved pattern recorded higher yields of potato (29.79 t ha^{-1}) and sweet gourd (18.08 t ha^{-1}) compared to the existing pattern. Rice Equivalent Yield (REY) was 47.48 t ha^{-1} in the improved pattern, with a gross margin of Tk. 460,795 ha^{-1} and an MBCR of 2.59, indicating strong economic and technical feasibility.

Development of an improved cropping pattern tomato-T. Aus-T. Aman against tomato-fallow-T. Aman in Cumilla

M. J. Uddin

A field experiment was conducted during 2023–24 at a farmer's field in Barera, Debidwar, Cumilla under AEZ 19 to utilize fallow land in the existing cropping pattern and enhance cropping intensity.

Two treatments were tested: T_1 – existing pattern: Tomato (Mongol Raza)–Fallow–T. Aman (BRRI dhan32); and T_2 – improved pattern: Tomato (BARI Tomato-17)–T. Aus (BRRI dhan98)–T. Aman (BINA dhan17). In the improved pattern, average yields of tomato, T. Aus, and T. Aman were 44.42, 4.07, and 3.70 t ha^{-1}, respectively, compared to 42.00 and 4.20 t ha^{-1} for tomato and T. Aman in the existing pattern. The improved pattern recorded a Rice Equivalent Yield (REY) of 33.53 t ha^{-1}, a gross margin of Tk. 659,249 ha^{-1}, and an MBCR of 1.84, confirming its economic viability and potential for adoption.

Development of improved cropping pattern roundshaped cucumber (Khira)-sesame-b.aman rice against (Khira)-fallow-B. Aman rice in Meghna, Cumilla (EPOC)

M. J. Uddin

The trial was conducted at the farmers' field at Shibnagor, Meghna in Cumilla during 2023–24 under AEZ-19. The experiment followed a randomized complete block design with three dispersed replications. Two cropping patterns were evaluated: T1 (existing) – Round-shaped Cucumber (Khira, Hybrid Bogura)–Fallow–B. Aman (Fortune), and T2 (improved) – Round-shaped Cucumber (Khira, Hybrid Naugga)–Sesame (BARI Til-6)–B. Aman (BRRI dhan91). In the improved cropping pattern (T2), average yields of cucumber, sesame, and B. Aman were 32.58, 1.13, and 2.50 t ha^{-1}, respectively. In contrast, the existing pattern (T1) yielded 32.05 t ha^{-1} for cucumber and 2.13 t ha^{-1} for B. Aman. The improved pattern achieved higher REY (43.72 t ha^{-1}), gross margin (Tk. 622,385), and MBCR (2.96), indicating its economic superiority and viability for adoption.

Devlopment of improvement cropping pattern mustard-T. Aus-T. Aman rice against mustard-fallow-t.aman in brahmanbaria(epoc)

M. J. Uddin

The trial was conducted at the farmers' field in Kharera, Kasba, Brahmanbaria during 2023–24 under AEZ-19, using a randomized complete block design with three dispersed replications. Two treatments were compared: T_1 – the existing cropping pattern (Mustard [Tori-7]–Fallow–T. Aman [Pajam]) and T_2 – the improved cropping pattern (Mustard [BARI Sarisha-14]–T. Aus [BRRI dhan98]–T. Aman [BRRI dhan71]). The average yields in the improved pattern were 1.40 t ha^{-1} for mustard, 4.45 t ha^{-1} for T. Aus, and 4.31 t ha^{-1} for T. Aman, compared to 0.960 t ha^{-1} for mustard and 3.60 t ha^{-1} for T. Aman in the existing pattern. The improved pattern recorded higher Rice Equivalent Yield (REY) of 11.76 t ha^{-1}, gross margin of Tk. 209,525 ha^{-1}, and a Marginal Benefit-Cost Ratio (MBCR) of 2.78, indicating that the improved cropping pattern is economically viable and profitable.

Development of alternate potato / maize - jute -T. *Aman* rice cropping pattern against potato / sweet gourd -T. *Aman* cropping pattern

T. Tasmima, M. A. Rahaman, K. Roy and G. Paul

A field experiment was conducted at the MLT site Madhupur, Tangail during 2023-24 under AEZ-9 to improve the productivity of existing cropping pattern by introducing new crops and 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 / Sweet gourd-T. Aman. The improved cropping pattern gave the higher gross return (Tk 963900 ha^{-1}) and gross margin (Tk 543479 ha^{-1}) compared to existing pattern (Tk.729550 and 407469 ha^{-1}) respectively. The marginal benefit cost ratio of the improved pattern over the existing pattern was 2.38, which indicates that improved pattern is a profitable venture.

Improvement of potato / sweet gourd/ brinjal/ bottle gourd cropping pattern against existing cropping pattern potato/sweet gourd- T. Aman rice

T. Tasmima, M. A. Rahaman, K. Roy and G. Paul

A field experiment was conducted at the MLT site Madhupur, Tangail during 2023-24 under AEZ- 9 to improve the productivity of existing cropping pattern by introducing new crops and varieties as well as higher yield and economic return of the farmers. The experiment was laid out in RCB design with six dispersed replications. Improved cropping pattern potato/sweet gourd/ brinjal/ creeper vegetables was tested against the existing pattern Potato / Cucurbit-T. Aman. The improved cropping pattern gave the higher gross margin (Tk 14,92,934 ha^{-1}) compared to existing pattern (Tk

5,13,442 ha^{-1}). The marginal benefit cost ratio of the improved pattern over the existing pattern was 9.88, which indicates four crops based pattern is a profitable venture.

Development of mustard-T.Aus- T. Aman and mustard-boro-t. Aman against fallow-boro-T. Aman cropping pattern in tangail

T. Tasmima, M. A. Rahaman, K. Roy and G. Paul

On-farm trial has been conducted at MLT site Madhupur and Dhanbari to increase cropping intensity and productivity through inclusion of mustard in fallow period at farmers existing practice of Fallow-Boro-T. Aman and in improve pattern Mustard- T. Aus/ Boro -T. Aman rice. Mustard var. BARI Sarisha-14/ BARI Sarisha-18, rice var. BRRI dhan89/BRRI dhan98 and BRRI dhan75 were used. The result showed that three crops patterns produced the higher rice equivalent yield (REY) 10.57 and 12.30 t ha^{-1} respectively which was 42.41 and 64.80 % higher than farmers practice. Cost-benefit analysis over the locations in Tangail district showed that improved pattern resulted in 45.37 and 63.75 % higher gross return (Tk. 411665 ha^{-1}) and gross margin (Tk. 199380 ha^{-1}) respectively compared to that of existing pattern with only 31.51 % extra cost. The marginal benefit cost ratio of the two cropping patterns over the existing pattern was 2.49 which indicates that the three crops is a profitable venture.

Development of existing cropping pattern by introducing oilseed and pulse crops in different AEZS of Bangladesh

The experiment was conducted at 06 locations under On-Farm Research Division during 2023-24 and 2024-25 to determine the feasibility of 06 different alternate cropping patterns against farmers existing cropping patterns The results revealed that the alternate cropping patterns could be established successfully with short duration varieties. Alternate cropping patterns was agronomically and economically more profitable than the existing patterns. Rice equivalent yield, productivity and profitability was higher than the farmers' existing cropping patterns. Rice equivalent yield (REY) of the farmers' existing cropping pattern varies from 4.76 to 16.14 t ha^{-1} whereas in the alternate cropping patterns it ranges from 6.68 to 20.71 t ha^{-1}. Inclusion of new crops in the existing cropping patterns and replacing old and traditional varieties by modern improved varieties enhanced productivity and profitability.

Development of four crops based cropping pattern mustard-mungbean-T. Aus-T. Aman against mustard-d. Aus-T. Aman rice cropping pattern in Bhola

G. N. Hasan, R. H. Anik & M. Islam

On-farm trial was conducted at MLT site Daulatkhan and Bhola sadar under AEZ-18 during 2024-2025 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 dhan87, respectively. It was observed that four crop patterns produced the highest rice equivalent yield (REY) (17.12 t ha^{-1}) than farmer's practice (11.97 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 (3.29) indicated that four crops pattern is a profitable venture.

Improvement of existing cropping pattern groundnut-d. Aus-T. Aman by replacing crop varieties

G. N. Hasan, R. H. Anik and M. Islam

The experiment was conducted at On-Farm Research Division, Bangladesh Agricultural Research Institute, Daulatkhan, Bhola during 2024-25 to develop improved cropping pattern Groundnut (var. BARI Chinabadam-9)-T. Aus (var. BRRIdhan82)-T. Aman (var. BRRI dhan87) and to compare its productivity and profitability against farmers' existing cropping pattern Groundnut (var. Dhaka-1)-D. Aus (var. BRRI dhan48)-T. Aman (Sarna). The experimental was laid out in a randomized complete block design with three dispersed replications. Two cropping patterns *viz*., improved cropping pattern and farmers' existing cropping pattern were the treatment variables of the experiment. The unit plot size was 1000-1200 sq.m. The result revealed that improved cropping pattern could be established successfully with inclusion of new crop varieties. The improved cropping pattern gave higher Rice equivalent yield (17.30 t ha^{-1}) which was 17.92 % higher than farmers' existing cropping pattern

(14.67 t ha^{-1}). Inclusion of new crop varieties in the existing cropping pattern and replacing traditional varieties by modern varieties enhanced productivity and profitability.

Improvement of existing cropping pattern soybean- D. Aus-T. Aman by replacing crop varieties in Bhola

G. N. Hasan, R. H. Anik and M. Islam

The experiment was conducted at OFRD, BARI, Daulatkhan, Bhola during 2024-25 to develop improved cropping pattern Soybean (var. BARI Soybean-6)-T. Aus (BRRI dhan82)-T. Aman (BRRI dhan87) and to compare its productivity and profitability against farmers' existing cropping pattern Soybean (Local)-D. Aus (BRRI dhan48)-T. Aman (var. BRRI dhan52). The experimental was laid out in a randomized complete block design with three dispersed replications. Two cropping patterns *viz*., improved cropping pattern and farmers' existing cropping pattern were the treatment variables. The unit plot size was 1000-1200 sq.m. The result revealed that improved cropping pattern could be established successfully with inclusion of new crop varieties. The improved cropping pattern gave higher Rice equivalent yield (11.14 t ha^{-1}) which was 14.49 % higher than farmers' existing cropping pattern (9.73 t ha^{-1}). Inclusion of new crop varieties in the existing cropping pattern and replacing traditional varieties by modern varieties enhanced productivity and profitability. The MBCR (3.26) also indicates the superiority of the improve pattern.

Increase cropping intensity and productivity by adoption of short duration mustard variety in rice based cropping system

S. Akhtar, N. Akther,S. Sultana, N. Sultana, M. A. H. Khan, M. M. Rahman, A. K. M. Z. U. Noor and M. F. Islam

The experiment was conducted at the farmers' field of multi-location testing (MLT) site, Challisha, Netrakona; Trishal, Mymensingh; Shapmari, Sherpur and Boushi, Sarishabari, Jamalpur under OFRD, Mymensingh and Sherpur during 2024-25. The study was carried out to evaluate the performances of existing cropping pattern (T. Aman-Fallow-Boro) and alternate cropping pattern (T. aman-Mustard-Boro) by inclusion of short duration high yielding mustard var. BARI Sarisha-14 after harvesting of high yielding short duration T. Aman varieties i.e. BRRI dhan71 or BRAC-20 or Swarna-5 . During Boro season, high yielding Boro rice varieties i.e.,BRRI dhan88/89, Ispahani-9 and BRRI dhan92 has used instead of BRRI dhan29. Economically, the gross return of the alternate cropping pattern (Tk. 499500 ha^{-1}) was 47.34% higher than the existing pattern (Tk. 3,39,000 ha^{-1}) in Netrakona. In Mymensingh, the gross return of the alternate pattern (Tk. 4,43,400 ha^{-1}) was 28.44% higher than the existing pattern (Tk. 3,45,200 ha^{-1}). The gross return of the alternate cropping pattern (Tk. 4,8,2272 ha^{-1}) was 37.32% higher than the existing pattern (Tk. 3,51,200 ha^{-1}) in Sherpur. In Jamalpur, the gross return of the alternate pattern (Tk. 5,17,250 ha^{-1}) was 50.01% higher than the existing pattern (Tk.3,44,800 ha^{-1}). The gross margin was significantly higher in the alternate pattern for all locations. The mean marginal benefit-cost ratio (MBCR) was 2.70 in Netrakona, 1.65 in Mymensingh, 1.66 in Sherpur and 2.18 in Jamalpur indicating the superiority of the alternate cropping pattern over the existing cropping pattern

Studies on intercropping of leafy vegetables with sweet gourd

S. Sultana and M. A. M. Khan

An experiment was conducted in the farmers' field of Muktagacha upazila under Mymensingh district with the supervision of OFRD, BARI, Mymensingh, during winter 2024-2025 to observe performance intercropping of leafy vegetables with sweet gourd at medium high land. Sweet gourd var. BARI Hybrid Mistikumra-3 was used as main planting material with red amaranth, coriander and spinach as intercrop.The highest sweet gourd equivalent yield 46.42 t/ha) was found from Sweet gourd + Coriander (leaf) (T_2) and the lowest yield (35.92 t/ha) from Sweet gourd + Spinach treatment. The highest gross return (Tk. 4,64,200 ha^{-1}), gross margin (Tk. 3,16,300 ha^{-1}) was found from Sweet gourd + Coriander (leaf) and the lowest gross return (Tk. 405100ha^{-1}), gross margin (Tk. 264600 ha^{-1}) was found from sole sweet gourd (T_4).

Intercropping short duration vegetables with BARI begun-12 in Cumilla region

M. J. Uddin

On-farm trial was conducted during the *rabi* season of 2024–25 at MLT sites in Barura, Chandina, Debidwar of Cumilla, Kasba in Brahmanbaria, and Shahrasti in Chandpur districts to evaluate suitable

and profitable intercropping systems of Brinjal (var. BARI Begun-12) with short-duration vegetables, namely red amaranth (var. BARI Lalshak-1), coriander (var. BARI Dhonia-2), and spinach (Hybrid). Sole brinjal yielded 48.05 t/ha, intercrop combinations recorded lower brinjal yields due to competition; however, the reduction was offset by intercrop yields. The brinjal equivalent yield (BEY) was highest in the brinjal + spinach system (55.0 t/ha), followed by brinjal + coriander (52.2 t/ha) and brinjal + red amaranth (49.08 t/ha). Brinjal + spinach produced the highest gross margin (Tk. 7,50,495/ha) and benefit-cost ratio (3.34), whereas the lowest gross margin (Tk. 5,71,290/ha) was from sole brinjal. The results showed that intercropping spinach and red amaranth with brinjal is a productive and profitable approach for maximizing land use and farm income in the Cumilla region.

Intercropping of hybrid maize with short duration vegetables in Cumilla

M. J. Uddin

The experiment was conducted at a farmer's field in Atipara, Daudkandi, Cumilla during the *rabi* season of 2024–25 to identify suitable and profitable intercropping systems involving hybrid maize (var. BARI Hybrid Maize-16) and short-duration vegetables:Jharseem (var. BARI Jharseem-2), red amaranth (var. BARI Lalshak-1), coriander (var. BARI Dhonia-2), and garden pea (var. BARI Motorshuti-3). Sole maize produced grain yield of 10.65 t/ha, which was reduced under intercropping systems. However, maize equivalent yield (MEY) increased under intercropping, with the highest MEY recorded in maize + garden pea (14.45 t/ha), followed by maize + coriander (13.51 t/ha) and maize + Jharseem (11.97 t/ha). Maize + red amaranth resulted in the lowest MEY (11.02 t/ha). The highest gross margin (Tk. 238,283/ha) and benefit-cost ratio (2.62) were also observed in the maize + garden pea system. The results showed that intercropping maize with garden pea or coriander is more profitable and compatible for the Cumilla region.

Determination of seed rate of linseed with groundnut intercropping system

M. F. Islam, M. M. Rahman and A. K. M. Z. U. Noor

The experiment was carried out at Islampur, Jamapur during the *rabi* season of 2024-25 to find out the optimum plant density of linseed for intercropping with groundnut for higher productivity and economic return. There are five treatments viz., T_1=Sole Groundnut (100%), T_2=Sole Linseed (100%), T_3=Groundnut + 20% Linseed, T_4=Groundnut + 40% Linseed and T_5=Groundnut + 60% Linseed. The highest groundnut equivalent yield (2.26 t ha^{-1}), gross return (Tk. 4,52,000 ha^{-1}) and gross margin (Tk. 3,62,950 ha^{-1}) were recorded from T_5 treatment (Groundnut + 60% Linseed). The lowest groundnut equivalent yield (1.08 t ha^{-1}), gross return (Tk. 2,16,000 ha^{-1}) and gross margin (Tk. 1,46,110 ha^{-1}) was obtained from T_2 treatment (Sole Linseed (100%). The results revealed that intercropping treatments produced higher groundnut equivalent yield (GEY) than sole cropping.

Intercropping sunflower with soybean in the coastal area

M. Islam and M. Bashir

A field experiment was conducted in the coastal region of Noakhali during the late *rabi* season of 2024-25 to evaluate the performance of intercropping sunflower with soybean. The experiment comprised of five treatments: T_1: Sole soybean (30 cm × continuous) T_2: one row sunflower (plant to plant 25 cm) after two rows of soybean T_3: one row sunflower (plant to plant 50 cm) after two rows of soybean T_4: one row sunflower (plant to plant 25 cm) after three rows of soybean T_5: one row sunflower (plant to plant 50 cm) after three rows of soybean. Significant variation was observed in yield and yield-contributing characters of both soybean and sunflower. Sole soybean (T_1) recorded the highest soybean seed yield (2.17 t ha^{-1}), while sunflower intercropped in the treatment T_2 (one row sunflower plant to plant 25 cm after two rows of soybean) gave the highest sunflower yield (1.42 t ha^{-1}). Treatment T_2 produced the highest soybean equivalent yield (t ha^{-1}), gross margin (Tk. 157800 ha^{-1}), gross return (Tk. 91675 ha^{-1}) and also the highest marginal benefit cost ratio (2.97).

Inter-mixed cropping of leafy vegetables with maize in char areas of Gaibandha

M. J. Alam, M. Akhtaruzzaman and A. A. Mahmud

A two-year field experiment (2023–2025) was conducted at Haldia char, Saghata, Gaibandha to evaluate the productivity and economic efficiency of mixed cropping of maize with leafy vegetables. The experiment was designed in a RCBD with four dispersed replications. The tested crops were maize

(var. Major), red amaranth (var. BARI Lalshak-1), Radish leaf (var. BARI Mula-1) and coriander leaf (var. BARI Dhonia-1). Four treatments *viz*.: T_1: Sole Maize, T_2: Maize +20% Red amaranth, T_3: Maize + 20% Radish leaf and T_4: Maize + 30% Coriander leaf were evaluated. The average maximum MEY was recorded in T_2 (19.0 t ha^{-1}), followed by T_4 (17.2 t ha^{-1}) and T_3 (16.8 t ha^{-1}), indicating substantial yield advantages due to the added leafy vegetable component. The yield reduction in maize under mixed cropping was compensated by the economic value of the companion leafy vegetables. These findings demonstrate that mixed cropping, especially maize with Red amaranth could be an efficient and profitable cropping system for the resource-constrained and flood-prone char lands of Gaibandha, enhancing land-use efficiency, income diversification, and food security.

Performance of yield of chilli and radish mixed cropping at char land

M. K. Islam

The field experiment was conducted at the Char Bongram, Chilmari, Kurigram during *rabi* season 2024-25 to verify the agro economic performance of mixed cropping of chilli with radish at char land. The experiment was laid out in a RCBD with six replications. The unit plot size was 5 m x 8 m. Seeds were sown on 03-05 December, 2024 as broadcasting method. Four treatment *viz*., T_1 = Sole Chilli, T_2 = Sole Radish, T_3 = 75% Chili + 25% Radish, T_4 = 50% Chili + 50% Radish were evaluated. The highest chilli equivalent yield (CEY) (15.67 t ha^{-1}), gross margin (5,68,650 Tk. ha^{-1}) was obtained from 75% Chilli + 25% Radish treatment with satisfactory BCR (2.53).

Mixed cropping of black cumin with onion in charland

M. F. Islam, M. M. Rahman and A. K. M. Z. U. Noor

The experiment was carried out at Islampur, Jamapur during the *rabi* season of 2024-25 to find out the suitable combination of onion and black cumin as mixed cropping. There are five treatments *viz*., T_1= Onion 90% + Black cumin 10%, T_2= Onion 80% + Black cumin 20%, T_3= Onion 90% + Black cumin 30%, T_4= Sole Onion 100% and T_5= Sole Black cumin 100%.The highest onion equivalent yield (19.07 t ha^{-1}), gross return (Tk. 7,62,800 ha^{-1}) and gross margin (Tk. 4,99,240 ha^{-1}) were recorded from Onion 90% + Black cumin 10% followed by sole onion. The lowest onion equivalent yield (8.14 t ha^{-1}), gross return (Tk. 3,25,600 ha^{-1}) and gross margin (Tk. 2,96,250 ha^{-1}) were obtained from sole black cumin.

Mixed cropping of mustard and grasspea with lentil

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

Mixed cropping is a sustainable agricultural strategy that enables efficient use of natural resources and ensures yield stability by cultivating multiple crops on the same field. This study was conducted at Shyampur, Rajshahi during the *rabi* season of 2024–25 to evaluate the productivity and economic feasibility of mixed cropping systems involving lentil, mustard, and grasspea. Twelve different crop combinations (T_1–T_{12}) were tested to assess their performance in terms of lentil equivalent Yield (LEY), gross return (GR), gross margin (GM), and benefit-cost ratio (BCR). Results showed significant differences among treatments. Treatment T_4 (100% lentil + 10% grasspea + 5% mustard) recorded the maximum LEY (2.45), GR (Tk 195,736 ha^{-1}), GM (Tk 127,758 ha^{-1}), and BCR (2.88), followed by T_5 and T_6. The findings underscore the benefits of crop diversification and intercropping in improving resource efficiency, profitability, and sustainability, especially in rainfed and resource-constrained areas.

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 and M.R. Alam

The field experiment was carried out at MLT site, Atghoria during *rabi* season of 2024-25 to verify the performance of mustard and linseed as mixed cropping with lentil. The treatment combinations were, T_1= Lentil (80%) + Linseed (20%), T_2= Lentil (80%) + Mustard (20%), T_3= Lentil (75%) + Mustard (15%) + Linseed (10%), T_4= Lentil (100%), T_5= Mustard (100%) and T_6= 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) (1.64 t ha^{-1}) was obtained from sole lentil which is identical to sole mustard,

Lentil (80%) + Linseed (20%) and Lentil (80%) + Mustard (20%). LEY was minimum (1.37 t ha^{-1}) in Lentil (75%) + Mustard (15%) + Linseed (10%) which was statistically similar to sole linseed.

Performance of different mixed cropping systems with barley, mustard and coriander

M. Maniruzzaman, M. S. H. Molla, M. A. Isalm, M. Z. Hasan and M. R. Alam

The field experiment was carried out at MLT site, Atghoria during *rabi* season of 2024-25 to verify the performance of barley and coriander as mixed cropping with lentil. The treatment compositions used for the experiment were T_1= Mustard (50%) + Barley (50%), T_2= Mustard (50%) + coriander (50%), T_3= Mustard (40%) + Barley (30%) + coriander (30%) , T_4= Mustard (40%) + Barley (20%) + coriander (40%), T_5= Mustard (100%), T_6= Barley (100%), and T_7= Coriander (100%). Sole mustard provided maximum (1720 kg ha^{-1}) mustard equivalent yield (MEY) which is followed by sole coriander and mixed cropping of Mustard (50%) + Barley (50%). Minimum mustard equivalent yield (MEY) (846 kg ha^{-1}) was obtained from Mustard (40%) + Barley (20%) + coriander (40%) which is identical to Mustard (40%) + Barley (30%) + coriander (30%). Sole mustard produced the higher economic return which is followed by sole coriander, sole mustard and Mustard (50%) + Barley (50%).

Inter-mixed cropping of lentil with groundnut varying different plant population at the charland of Tangail

M. A. Rahaman, T. Tasmima, K. Roy and G. Paul

The experiment was conducted in the farmers' field at the MLT site, Bhuapur, Tangail during *rabi* 2024-25 under AEZ- 8 to verify the performance of lentil as a mixed crop with groundnut in char lands and to increase production and farmers' income. The treatment combinations used for the experiment were T_1: Sole groundnut (100%), T_2: Groundnut (100%) + lentil (20%), T_3: Groundnut (100%) + lentil (30 %) and T_4: 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 (2.06 t ha^{-1}) was found in the treatment combination of 100% groundnut + 40% lentil. Cost and return analysis revealed that the combination of 100% groundnut + 40% lentil (T_4) gave the highest gross return (Tk.1,85,400 ha^{-1}) and gross margin (Tk. 79,689 ha^{-1}) where sole groundnut (T_1) gave the lowest gross return and gross margin (Tk 1,72,800 and 76,505 ha^{-1}).

Effect of plant density and variety on sunflower yield in southern Bangladesh

M. M. Howlader and D. Halder

The experiment was conducted at Najirpur, Pirojpur during *rabi* season in 2024-`25 with the objective of the study was to identify the yield potentiality of different sunflower varieties under different plant density. The experiment was laid out in two factors RCBD design allocating three spacing, S_1= (40 cm × 25 cm), S_2= (50 cm × 25 cm), S_3= (75 cm × 25 cm) and two varieties, V_1= BARI Surjamukhi-3 and V_2= Hysun33 comprising six treatments with three dispersed replications. The seed yield was significantly influenced by the interaction of different spacing and variety, the seed yield ranged was from 1.43 to 2.06 t ha^{-1}. The maximum seed yield 2.06 t ha^{-1} was found S_1V_2 treatment which followed by S_2V_2 treatment with yield 2.03 ha^{-1}. The lowest seed yield 1.43 t ha^{-1} was found in S_1V_2 treatment.

Effect of plant density on sunflower yield and productivity in southern Bangladesh

R. Uddin and M. S. I. Khan

Plant density significantly influences the population, growth, and yield of sunflower. Since sunflower varieties differ in canopy size, optimal plant spacing is crucial for maximizing productivity. This study investigated at three locations: RARS, Barishal; Ponabalia, Jhalokathi; and Babuganj, Barishal with three sunflower varieties: BARI Surjomukhi-2, BARI Surjomukhi-3, and Hysun-36 and four planting densities:40 cm × 25 cm, 50 cm × 25 cm, 60 cm × 25 cm, and 70 cm × 25 cm—under late-sown conditions Results revealed that the maximum seed yield (2.0 t/ha) was obtained from Hysun-36 at 70 cm × 25 cm spacing followed by BARI Surjomukhi-2 at 60 cm × 25 cm spacing (1.91 t/ha). The lowest yield was recorded for BARI Surjomukhi-3 at 40 cm × 25 cm spacing. Despite the higher yield of Hysun-36, the cost-benefit ratio

indicated that BARI Surjomukhi-2 was found more profitable overall.

Effect of seed priming with gibberellic acid on growth & yield of soybean at AEZ-18

G. N. Hasan, R. H. Anik & M. Islam

An experiment was conducted at the farmer's field, Bhola sadar, Bhola in the *rabi* season of 2024-25 to find out appropriate concentration that improves seed germination, enhance growth and yield of soybean and to determine appropriate dose of Gibberellic acid that enhances growth and yield of soybean. The treatments were of 4 doses of Gibberellic acid viz., control (T_0), Gibberellic acid 50 mg/l(T_1), Gibberellic acid 75 mg/l(T_2), Gibberellic acid 100 mg/l(T_3), was outlined in a RCBD with 3 replications. Results revealed that 75 mg/l Gibberellic acid gave the highest seed yield (1.83tha^{-1}) and maximum plant height (53.46 plant height cm) at harvest, T_2 (Gibberellic acid 75 mg/l) gave the maximum plant population (18.67 m^{-2}) whereas the minimum number of plant population (14.34 m^{-2}) was obtain from without GA_3. Maximum number of branches plant $^{-1}$ (4.46) was observed from 100mg/l GA_3. Result also revealed that 75 mg/l GA_3 gave maximum number of filled pod plant^{-1} (63.43 plant^{-1}) which was statistically similar to 100 mg/l (63.00 plant^{-1}). So, the application of 75mg/l GA3 showed the highest seed yield and other yield attributes as compared to those of other GA_3 dose.

Late planting potentiality of onion varieties for bulb production in Noakhali region

M. S. Islam and M. M. Bashir

The experiment was conducted in the farmer's field of Sadar, Noakhali during *Rabi* season of 2024-25 to select suitable transplanting date(s) and onion variety(s) for bulb onion production. There was no significant variation in bulb yield due to varietal difference (BARI Peaj-2 and BARI Peaj-4). First transplanting (07 January) produced higher bulb yield than later transplanting. Transplanting at 07 January, onion var. BARI Peaj-4 produced the highest bulb yield (12.08 t ha^{-1}) which was statistically identical to that of BARI Peaj-2 transplanting in the same date. A delay in transplanting dates resulted in a reduction in bulb yield. BARI Peaj-2 gave the lowest bulb yield (10.17 t ha^{-1}) at 27 January transplanting.

Effect of sowing date on the productivity of mustard (canola) in north-west Bangladesh

M. S. Hossain and M. E. A. Pramanik

A field trial was conducted at the FSRD site, Godagari, Rajshahi during the *rabi* seasons in 2023–24 and 2024–25 to evaluate the effect of sowing date on yield attributes and yield of mustard (Canola). Mustrad var. BARI Sarisha-18 was used as the test crop. The experiment included five sowing dates: 25 October, 05 November, 15 November, 25 November, and 05 December. It was arranged in a RCBD with three dispersed replications. The crop required 37–44 days to reach first flowering and 90–104 days to attain physiological maturity, depending on the sowing date. It was observed that delayed sowing resulted in shorter growth duration. In both years, the highest seed yield was obtained from the 05 November sowing, after which the yield gradually declined with later planting dates.

Development of nutrition enrich cropping pattern in high barind tract

M. S. Hossain and M. E. A. Pramanik

A farmers' participatory research trial was conducted during the 2023–24 cropping season at Soyghati and Bautia villages under the FSRD site in Basantapur, Rajshahi, to evaluate diversified, intensified, and climate-resilient cropping pattern options in comparison with the traditional farmers' practice. Four cropping patterns were assessed, including the conventional Rice–Mustard (var. BARI Sharisha-18)–Fallow (R–Mu–F) system as the control. Three improved patterns were: Rice–Lentil–Sweet Corn (R–L–Sc); Rice–Maize (intercropped) with Red Amaranth followed by Sole Sorghum (fodder) (R–M+Ra–S); and Rice–Mustard (BARI Sharisha-14) followed by Sorghum intercropped with Cowpea (fodder) (R–Mu–S+C). The experiment was followed a RCBD with six dispersed replications at each site. Results indicated that all improved cropping patterns produced significantly higher rice equivalent yields (REY) compared to the traditional R–Mu–F system. Among them, the R–L–Sc pattern outperformed the others, achieving 260–340% higher REY relative to the control. Additionally, the R–L–Sc system recorded the highest gross margin due to the high market value of sweet corn, contributing substantially to its profitability. While the R–L–Sc pattern offered the

greatest economic benefit, the R–M+Ra–S system showed greater resilience under adverse weather conditions, indicating its potential as a sustainable option for local farmers.

Effect of tillage systems on the management of agronomic factors at mustard crop production in north-western Bangladesh

M. E. A. Pramanik and M. S. Hossain

An experiment was conducted in the farmers field at FSRD site Basantapur, Godagari, Rajshahi during 2024-25 to analyze agronomic management in the production of mustard crops in different tillage systems. The treatment combinations used for this experiment were three Tillages (Strip Tillage, Bed Planting, Conventional Tillage) with three sulphur doses (0 kgha^{-1}, 20 kgha^{-1} and 40 kgha^{-1}). Among the treatment combinations the maximum seed yield (1.78 t ha^{-1}) was found in bed planting with 40 kg S ha^{-1} and followed by Conventional Tillage x 40 kg combinations (1.72 t ha^{-1}). But the maximum gross margin (88,825 Tk. ha^{-1}) was found in bed planting and 40 kg S ha^{-1} combinations and followed by Conventional Tillage x 40 kg S combinations (81,775 Tk. ha^{-1}).

Determination suitable seed rate of proso millet in the char land

M. R. A. Mollah, M. M. Hasan, M. S. Alam and M. T. Hasan

The experiment was conducted at the farmer's field of Khatiamaria, Sonatola, Bogura during *rabi*, in 2023-2024 and 2024-2025 to find out the suitable seed rate of proso millet and to disseminate BARI released Cheena varieties to the farmers field of Char land areas. The experiment was laid out in RCB Design with three dispersed replications. The treatments were T_1=25 kgha^{-1}, T_2=50 kgha^{-1}, T_3=75 kgha^{-1} and T_4= 100 kgha^{-1}(Farmer's practice). Maximum seed yield (1.54 tha^{-1}) was recorded from T_3 treatment that was statistically different from all other treatments in 2023-2024. Similarly, the highest seed yield was 1.71 tha^{-1} recorded from T_3 treatment in 2024-2025.The highest gross return (Tk. 107100 ha^{-1}) in 2023-2024 and (Tk. 119700 ha^{-1}) in 2024-2025 was amounted from T_3 treatment against the cultivation cost of Tk. 30524 ha^{-1} that together led to the higher gross margin (Tk. 77176 ha^{-1} Tk. 89176 ha^{-1}). Lower gross return (Tk. 88900 ha^{-1} and Tk.100100 ha^{-1}) as well as gross margin (Tk. 58576 ha^{-1}and Tk. 69176 ha^{-1}) was obtained from the T_4 (Farmer's practice) treatment in both the year. Therefore, the optimum seed rate of proso millet 75 kgha^{-1} at Charland of Sonatola, Bogura.

Effect of tillage and mulch on the yield performance of potato in AEZ-11

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

A two-year field experiment (2023–24 and 2024–25) was conducted both on-station and on-farm to evaluate the effects of different tillage practices on potato growth, yield, quality, and profitability. The treatments included conventional tillage, strip tillage with straw mulch (strip + straw), and strip tillage with polyethylene mulch (strip+poly). The results revealed that conservation tillage practices significantly improved plant height, tuber number, tuber weight per plant, and tuber yield compared to conventional tillage, particularly on-station. Strip tillage combined with straw and polyethylene mulches resulted in higher tuber yield (up to 42.6 t ha^{-1}) and better dry matter content. Potato grade distribution was not significantly influenced by tillage methods; however, larger tuber sizes tended to be more prevalent under conservation practices. Economic analysis indicated that conservation tillage practices led to higher net returns and benefit-cost ratios (up to 2.57 on-station and 2.51 on-farm), demonstrating their economic viability. These findings suggest that strip tillage combined with organic or plastic mulching is a promising strategy for enhancing potato productivity and profitability in sustainable farming systems.

Effect of spacing on the yield and yield attributes of dwarf sunflower in northeastern part of Bangladesh

M. Zulfiqar, M. Asaduzzaman, M. I. Nazrul

An experiment was conducted at Sylhet sadar, MLT site of Golapgonj under Sylhet district in the *rabi* season of 2024-25 to accommodate the optimum number of plants in a unit area for maximum yield. The experiment was laid out in RCBD with three dispersed replications. Five treatment was considered as S_1= 50cm x 15cm, S_2 = 50cm x 20cm, S_3 = 50cm x 25cm, S_4 = 50cm x 30cm and S_5 = 50cm x 35cm. Maximum head was derived from S_2 = 50cm x 20cm

spacing (13.95 cm) which is identically similar with spacing S_3 = 50cm x 25cm (13.59 cm) while smallest head from recommended spacing S_1= 50cm x 15cm (12.99 cm). The higher number of seed per head was obtained from spacing S_2 = 50cm x 20cm (503.66 no.) while lower number from S_5= 50cm x 35 cm (455.). The highest seed yield was obtained from S_2 = 50cm x 25 cm spacing (2.89 t ha^{-1}) where the lowest from S_1 = 50cm x 15 cm spacing (2.55 t ha^{-1}). The highest number of 1000 -seed weight was from S_2 = 50cm x 25 cm spacing (57.33 gm) where the lowest from S_1 = 50cm x 15 cm spacing (55.00 gm). The higher stover yield was from S_2 = 50cm x 25 cm spacing (2.94 t ha^{-1}) where the lowest from S_1 = 50cm x 15 cm spacing (2.50 t ha^{-1}). The gross return showed the highest (Tk. 2,65,980/ha) in S_2 =50cm x 20cm while the lowest gross return (Tk. 234500 /ha) in S_1= 50cm x 15cm. The gross margin became the highest (Tk. 169805 /ha) in S_2 = 50cm x 20cm. The lowest gross margin (Tk. 142582 /ha) was found in S_1= 50cm x 15cm.

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* 2024-25 to find out the optimum transplanting time for brinjal var. BARI Begun-12 cultivation. 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. Transplanting time had a significant influence on the fruit yield of BARI Begun-12. Transplanting on 15 October (T_1) produced significantly the highest yield (29.93 t ha^{-1}) while 30 November planting gave the lowest yield (3.36 t ha^{-1}). Considering transplanting dates, the highest gross margin (1110030 Tk ha^{-1}) was obtained from earliest planted (15 October) and no economic benefit was gained from 15 November and 30 November plantation.

Surface seeding of blackgram in haor areas of Kishoregnaj

Y. H. Rayhan, M. Mohiuddin and M. M. Zaman

A field trial was conducted in the farmer's field at Balikhola haor Karimganj, Kishoreganj during *rabi* 2023-24 and 2024-25 cropping season to assess the performance of blackgram without disturbing the soil and disseminate the BARI released blackgram variety among the farmers in the haor area. The average yield was found (1.46 t/ha) from blachgram var. BARI Mash-3. Maximum gross return (Tk. 1,61,875/ha), gross margin (Tk. 1,16,517/ha) as well as BCR 3.57 were calculated from BARI Mash-3.

Effects of seedling age and seedling raised for sunflower cultivation in coastal region

H. M. K. Bashar, M. M. Islam and K. N. Islam

The success of sunflower (*Helianthus annuus* L.) cultivation is significantly influenced by seedling establishment and early growth vigor. An experiment was conducted at the MLT site, Kuakata, Patuakhali, during the *Rabi* season of 2024–2025 to establish seedling transplanting practices for sunflower cultivation in fallow saline coastal areas following Aman rice harvest. This study aimed to evaluate the effects of seedling age on the growth, yield, and overall production performance of sunflower. Five treatments were tested: 10-day-old tray seedlings, 15-day-old tray seedlings, 10-day-old seedlings, 15-day-old seedlings, and direct seeding. A RCBD with threedispersed replications was employed. The results revealed that 15-day-old tray seedlings exhibited superior growth and yield performance compared to the other treatments, showing significant increases in head perimeter, 1000-seed weight, and seed yield. Direct seeding, although simpler, resulted in lower stand establishment and yield. The 10-day-old seedlings performed moderately but were less vigorous than the 15-day-old seedlings. The findings suggest that transplanting 15-day-old tray seedlings can be a viable strategy for enhancing sunflower productivity under optimal management practices.

Effect of different sowing dates on the yield of mungbean in coastal area

H. M. K. Bashar, M. M. Islam and K. N. Islam

The experiment was carried out during the late *rabi* season of 2024–25 at Badarpur, Patuakhali sadar, Patuakhali, to identify the optimal sowing date for maximizing mungbean yield in coastal regions. The mungbean var. BARI Mung-6 was sown at 10-day intervals on three different dates: 20 January, 30 January, and 10 February. Sowing date had a significant influence on yield and yield-contributing

traits. The 30 January sowing produced the highest number of pods per plant (19.76), the higher number of seeds per pod (11.34), and the longest pods (10.75 cm), resulting in the highest seed yield of 1.94 t/ha. In contrast, delaying sowing to 10 February led to a 23.25% reduction in seed yield due to declines in these yield components. Among the tested dates, 30 January (T_2) was the most effective in terms of productivity and profitability. This treatment recorded the highest gross return (Tk. 1,74,600/ ha), gross margin (Tk. 1,15,100/ha), and benefit-cost ratio (BCR) of 2.94. The lowest economic performance was observed with the 10 February sowing (T_3) which yielded a gross return of Tk. 1,56,600/ha and BCR of 2.74.

Effect of variety and sowing dates on sunflower varieties in southern region

H. M. K. Bashar, M. M. Islam, Kn Islam, M. M. Howlader and D. Halder

This study aimed to determine the optimum sowing time for three sunflower varieties: BARI Surjomukhi-2, BARI Surjomukhi-3, and the widely cultivated hybrid Hysun-33 in the coastal regions of Patuakhali and Barguna, Pirojpur and Gopalganj during the 2024–2025 growing season. The experiment was conducted in farmers' fields using a two factorial RCBD with six dispersed replications. Three sowing dates in Patuakhali and four sowing dates (15 December, 30 December, 15 January and 30 January) were tested in Pirojpur, Gopalganj to evaluate their effect on sunflower growth and yield. The highest plant height (132.54 cm and 135.90 cm), head perimeter (74.23 cm and 76.98 cm), number of seeds per head (450.54 and 470.98), and seed yield (1.75 and 1.87 t/ha) were recorded for the 15 December sowing date at both experimental locations. The interaction between sowing date and variety showed that the highest values for days to maturity (117 and 117.5), plant height (135.98 cm and 139.89 cm), head perimeter (71.94 cm and 73.83 cm), number of seeds per head (443.15 and 468.37), thousand-seed weight (87.50 g and 88.00 g), and seed yield (1.82 and 1.90 t/ha) were achieved by BARI Surjomukhi-2 and Hysun-33 when sown on 15 December in Kuakata, Patuakhali, and Barguna Sadar, Barguna, respectively. Soil salinity levels during the study ranged from 0.47 to 9.79 dS/m in Kuakata and from 0.67 to 7.65 dS/m in Amtoli. The seed yield was significantly influenced by the interaction of sowing date and variety, the seed yield ranged was from 0.71 to 2.21 t ha^{-1}at Pirojpur and Gopalgan. The highest seed yield 2.21t ha^{-1} was found from 15 December with Hysan-33 and it was followed by 30 December with Hysan-33 (2.10 ha^{-1}). The lowest seed yield 0.71 t ha^{-1} was found from 30 January with Hysan-33 variety.

Effect of different application times of ethephon on off-season pineapple production in Bandarban

M. Salim, M. T. Islam and M. I. Hossain

An experiment was carried out at Farukpara of Bandarban Sadar during 2024-25 to find out the response of pineapple plants (cv. Giant Kew) to ethephon in early, uniform flowering and off-season production of fruits. Ethephon had a significant effect on flower induction and fruit development in pineapple. The treatments were: T_1= September forcing, T_2= October forcing, T_3= November, and T_0=Control. The experiment was carried out in a randomized complete block design with three dispersed replications. Plant hormone (ethephon) treated in September showed maximum flowering (71.33%) followed by in October (67.45%) and the lowest flowering percentage was observed in November treated plants (62.65%). The appearance of 1st inflorescence took 38 to 42 days to initiate after forcing. The yield of off-season pineapple was varied according to the treatments. The highest yield was obtained in T_1 (31.02 t/ha) and minimum in T_2 (24 t/ ha). Seasonal yield from T_1, T_2, T_3 and T_0 were 9.45 t/ ha, 14.65 t/ha, 15.43 t/ha and 36.38 t/ha, respectively. From cost-return analysis, the highest net return was found from T_1 (Tk. 6,82,250/ha) with BCR of 3.81 followed by T_2 (Tk. 6,58,000/ha and 3.71) and the lowest from T_o (Tk. 3,34,700/ha and 2.55).

Effect of spacing and different variety on groundnut production in the coastal region of Bangladesh

A field experiment was conducted in Patuakhali sadar, Patuakhali, Bangladesh during the 2025 cropping season to evaluate the effect of different plant spacing and groundnut varieties on growth and yield performance in the coastal agro-ecological zone. The trial was followed a factorial arrangement with three spacing levels (30 cm × 15 cm, 30 cm × 20 cm, and 30 cm × 25 cm) and four groundnut varieties (BARI Chinabadam-9, BARI Chinabadam-10,

BARI Chinabadam-11, and Dhaka-1). Results revealed significant differences in plant height, number of pods per plant, 100-seed weight, and yield among treatments. Wider spacing increased plant height and number of pods per plant, while narrower spacing higher plant population density and overall yield. The maximum yield (2.52 t ha^{-1}) was recorded from BARI Chinabadam-9 at 30 cm × 15 cm spacing, followed by BARI Chinabadam-10 (2.19 t ha^{-1}) under the same spacing. In contrast, the lowest yield (1.45 t ha^{-1}) was observed in Dhaka-1 at 30 cm × 25 cm spacing. Among the varieties, BARI Chinabadam-9 performed best in terms of both yield and agronomic traits. The study concludes that closer spacing (30 cm × 15 cm) combined with BARI Chinabadam-9 is the most suitable option for maximizing groundnut production in the coastal region of Bangladesh.

Effect of sowing date on the productivity of mustard (canola) in north-west Bangladesh

M. E. Haque, M. Z. Ferdous, M. A. U. Alam and M. A. H. STalukder

The experiment was conducted during the *rabi* season of 2024–2025 at the farmers' field in Fatehpur, Vurarghat, Sadar upazila of Rangpur, under the supervision of the OFRD, BARI, Rangpur. However, the productivity of mustard is strongly influenced by sowing time, which determines its exposure to climatic extremes, particularly terminal heat stress during the reproductive stage. The study employed a randomized complete block design with three dispersed replications. The treatment comprised five sowing dates at 10-day intervals: October 25, November 5, November 15, November 25, and December 5. The selected variety mudtard was BARI Sharisha-18, a long-duration canola-type for its higher yield potential and oil quality. Early sowing on October 25 and November 5, showed significantly higher yields (up to 1866.7 kg ha^{1}) and better seed quality compared to later sowings, which suffered from shortened growth duration and high-temperature-induced stress.

Effect of different mulching materials on yield of egg plant

U. K. Laily, M. K. Islam, M. U. S. Khatun and M. A. H. Talukder

In order to determine the various mulching materials on eggplant production, a field trial was carried out at the OFRD, BARI, Rangpur in the *rabi* season of 2023-24 and 2024–25. 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. On an average of two consecutive years, T_1 produced the highest fruit yield (52.19 t ha^{-1}), whereas T_3 treatment had the lowest fruit yield (32.63 t ha^{-1}). The maximum gross margin (679310 $Tk.ha^{-1}$) was obtained from treatment T_1.

Effect of drip irrigation on growth and yield of BARI Coffee-1 in Chittagong hill tracts

M. Salim, M. T. Islam, M. I. Hossain, N. U. Ahmed, F. Arshad and M. A. Hossain

An experiment was conducted to evaluate the effect of drip irrigation on growth and yield of BARI Coffee-1 during 2024-25 in Bandarban sadar, Bandarban and Raikhali, Rangamati. The experiment was carried out in RCBD with four treatments and five dispersed replications. The treatments were: T_1= 75% of the recommended dose of water; T_2= 50% of the recommended dose of water; T_3= 25% of the recommended dose of water; and T_4= Control (No water). Significant variations were found within the treatments in both of the locations. Increment in plant height, canopy and plant volume along with the values of yield contributing characters were found to be the highest in treatment T_1 and the lowest in treatment T_4.

Dissemination of a low cost two-wheel tractor operated potato harvester in farmers field of Tangail

M. A. Rahaman, K. Roy, T. Tasmima, S. Roy and G. Paul

A field trial of the two-wheel tractor driven potato harvester was conducted at MLT site, Mirzapur, Tangail during *rabi* 2024-25 to introduce and disseminate the machine among the farmers. The field capacity of the potato harvester was found to be 0.088 ha hr^{-1}. The potato harvester reduced 65% labourers, picking time and cost compared to those of the manual method of harvesting. It also saved 3% tuber damage compared to that of manual harvesting and left no tuber under the soil. Besides,

it saved around 41% of the operational costs and 65% of picking cost compared to those of manual harvesting.

Effect of alternate furrow irrigation strategies on potato yield and water productivity

J. A. Mahmud, M. M. Morshed and M. M. Hossain

An experiment was conducted at MLT site, Bheramara, Kushtia during the *rabi* season of 2024-25. The experiment compared three different irrigation strategies for potato cultivation namely: Alternate Furrow Irrigation (AFI), Fixed Furrow Irrigation (FFI), and Every Furrow Irrigation (EFI). Alternate furrow irrigation resulted in a substantial decrease in water consumption and a notable gain in water productivity. AFI achieved a 35% reduction in water usage and a 50% increase in water productivity compared to EFI. This approach minimizes water consumption without reducing production.

Survey, monitoring and documentation of major insect pests of betel leaf in Rajshahi region

M. E. A. Pramanik and M. S. Hossain

The current study was conducted in a betel leaf garden in the Rajshahi district of Bangladesh 2024-25 to identify the pests that exist in the research locations. During the research period, twelve insect pests were identified. Various insect pests were observed in betel leaf orchard e.g. blackfly, whitefly, semi looper, common cutworm, scale insects, mealy bug, snail, trips, red spider mite, betel vine bug, and betel vine termite. The betel vine blackfly, semi looper, scale insects, whitefly, and red spider mite were discovered to be the most harmful pests. Blackflies and red spider mites, two dangerous insect pests that damage betel vines, peak in infestation between May and October and cause significant economic losses. Pests cause serious losses by affecting the crop's roots and leaves. Documenting the pests is essential for creating efficient management strategies.

Survey and documentation of insect pests attacking mango in north-west region of Bangladesh

M. E. A. Pramanik, M. Z. H. Pradhan and M. S. Hossain

Mango, scientifically known as *Mangifera indica* Linn. is a widely consumed fruit globally and is commonly recognized as the "King of Fruits." The fruit that may be farmed in tropical and subtropical regions with the highest profitability. The entire area has been affected by both insect pests and non-insect pests. It is a widely grown fruit crop in Bangladesh. A field survey was conducted at north-west region of Bangladesh during 2024-25 to record new pest of mango fruit crops. Six new pests were found to attack e.g., scale insect of mango, spirallying mango white fly, June beetle of mango and Mango bag warm. Among these pests, spirallying mango white fly and scale insect of mango infestation were more severe at Godagari, Rajshahi, Amnura, Chapainawabganj and Sapahar, Naogaon district.

Development of biorational pest management packages against sucking pest of summer tomato in high barind tract

M. E. A. Pramanik and M. S. Hossain

A field trial was conducted at Basantapur, Godagari, Rajshahi on summer tomato to develop suitable method using bio-rational based management approaches for managing the sucking pest, of summer tomato and causes economic losses during 2024-25. During the research period, five sucking pests were identified, e.g. aphids, jassids, whitefly, thrips and mites. To control these pests attack on tomato (*Solanum lycopersicum*) plants, biorational based pesticides namely, T_1: Installing yellow sticky trap + Seed treatment with cyantraniliprole (Fortenza 60 FS) @ 2.5ml/kg seed + two Spraying with Fizimite (10% Sodium Lauryl ether Sulphate) @ 1 ml/L of water, T_2: Spraying of Tundra 50SP (Acetamiprid) @ 1 g/L of water, T_3: Alternate spraying of Actara 25WG (Thiamethoxam) @ 0.5 g/L of water + Soap water+ Bio-clean (D-Limonene 5% SL) @ 1ml/L of water, T_4=Flometoquin (Gladius 10SC) @1 ml/L of water with blue and yellow sticky traps, T_5: YST+3 sprays of Kalomegh leaf extract @ 5g/L of water, T_6: Farmers practice (3 sprays with Abamectin (Vertimec 1.8 EC) @ 1.2 ml/L of water and 5 sprays with Cypermethrin (Ripcord 10 EC @ 1ml/L of water) and T_7: Control (Only water spray) respectively. The biorational pesticides' effectiveness was contrasted with the untreated control treatment. The findings indicated that, in comparison to the control, the biorational treatments greatly decreased the incidence of sucking pests and exerted a lower degree of infestation. The lowest

percent infestation (by no. and wt.) was 1.23% and 1.76%, respectively and the highest yield (45.08 tha^{-1}) was found in Flometoquin (Gladius 10SC) @1 ml/L of water with blue and yellow sticky traps. The control group had the lowest yield at 30.68tha^{-1}. The weather parameters were strongly significantly correlated with aphids, jassids, whitefly, thrips and mites' population except maximum temperature(^{0}C) was negatively correlated with aphids' population. The highest gross return was observed in (T_4) Flometoquin (Gladius 10SC) @1 ml/L of water with blue and yellow sticky traps (22,57,500 Tk. ha^{-1}).

Integrated management approach of thrips, white fly, jassid and fruit borer complex in chilli at Bogura region

M. T. Hasan, M. R. A. Mollah, M. M. Hasan and M. S. Alam

The effectiveness of integrated management practices against thrips, white flies, and the jassid complex in chilli under char land conditions was examined in an experiment carried out at the MLT site, Sariakandi, Bogura during 2023–2025. RCBD design with three treatments: T_1=Blue, Yellow and White sticky trap + Use of pheromone mask trap + Success 2.5 EC, T_2= Cover crops with 60 mesh net and T_3= Farmers practice with insecticide was used. In 2023-24, the lowest percent of infested fruit (1.32) and the highest fresh yield (14.83 tha^{-1}) was obtained from the treatment T_2 compared to integrated approach and farmer's practice. The highest gross return (Tk. 10,38,100/ha) and gross margin (Tk. 9,95,775/ha) was also recorded from the treatment T_2. On the other hand, in 2024-25, the lowest percent of infested fruit (1.18), highest yield (14.94 tha^{-1}) was obtained from the treatment T_2 compared to integrated approach and farmer's practice. The highest gross return (Tk. 7,47,000/ ha) and gross margin (Tk. 7,02,770/ha) was also recorded from the treatment T_2. Thus, the percentage of insect infestation is lower than that of the other treatments.

Integrated management of bacterial curd rot disease of cauliflower in Kushtia

J. A. Mahmud, M. M. Morshed, M. M. Hossain

An experiment was carried out at RARS, Meherpur during the 2024–2025 *rabi* season to see how various treatments responded to the bacterial card rot disease of cauliflower. The following treatments were used: T_1 = Foliar spray with Bactroban 20WP @ 2g/L of water; T_2 = Soil amendment with stable blessing powder @ 25kg/ha + folair spray with Bactroban 20WP @ 2g/L of water; T_3 = Soil amendment with Bacillus sp. (EMOs) granule @ 500 kg/ha + folair spray with EMOs powder @ 1g/L of water; and T_4 = Farmer's practice. In the experiment cauliflower var. BARI Fulcopy-2 was employed. Farmer's practice, or therapy T_4, had the highest illness score, whereas treatment T_2 had the lowest.

Management of gummosis disease of citrus at Shibpur in Narsingdi

M. M. Alam, M. Ahmed and M. H. Rahman

The experiment was carried out in the first week of March, 2023, using Colombo lebu at Datergaon and Joymongal, Shibpur, Norsingdi. A randomized full block design with three replications was used for the experiment. For the experiment, 20 disease-infected plants between the ages of five and eight were chosen, and five trees were regarded as one replication. One of the treatments was Ridomil gold pest. Alkatra (iv) control (ii) Bourdo mixture (iii). After cleaning the injured area, apply redomil pesticide and spray it four times at a distance of 15 days, each time using 5gm L-1. After three applications, the lesion's length and diameter were assessed, and a notable reduction was seen. The diameter and length decreased by almost 72.07% and 61.85%, respectively, after being treated with Ridomil gold. However, it decreased roughly 51.20 and 63.42% in the therapy with Bordeaux combination and 52.34 and 73.30% in the treatment with Alkatra.

Development of management package for controlling onion maggot (*Delia antiqua*) for true seed production

M. E. Haque, M. Z. H. Pradhan, M. H. Rashid, M. A. Alam, M. Z. Ferdous and M. A. H. Talukder

The success of true seed production in Bangladesh is seriously threatened by the onion maggot (*Delia antiqua*), a dangerous pest of onions. The purpose of the study was to determine how well different insecticidal treatments worked to control onion

maggot infestation and increase onion seed yield (*Allium cepa* L., cv. BARI Piaj-4) at the OFRD, BARI, Rangpur during the 2024–25 *rabi* season. In a RCBD with three replications, the investigation included seven treatments with varying application timings and combinations of Cadusafos (Ragbi) and Coragen. The findings showed that three foliar sprays of Coragen provided the maximum seed output (972.59 kg ha^{-1}) and greatly decreased infestation levels. Integrated applications came in second and third, respectively. The lowest yield and greatest insect infestation were seen in the control plot. For efficient onion maggot management in seed production areas, the study suggests carefully planning when to apply insecticides, especially Coragen treatments after infection.

Clubroot disease of mustard

M. J. Islam, M. N. A. Siddquie and M. M. I. Chowdhury

The screening of fungicides trial was conducted at On-station, Shyampur, Rajshahi druing *rabi* season of 2024-2025 to find out the efficacy of fungicides against clubroot disease of mustard. The trial consists of eight treatments. There was no Clubroot disease observed in this location. Though statistically similarly the highest yield (1.86 t/ha) was observed in T_5 = Amistar Top (Azoxystrobin+ Difenoconazole) @ 2ml/L followed by T_2= Ridomil Gold (Metalaxyl) @ 2ml/L (1.78 t/ha), T_6= Nativo 75 wg (Tebuconazole + Trifloxystrobin) @ 2ml/L (1.77 t/ha), T_4=Luna sensation (Fluopyrum + Trifloxystrobin) @ 2ml/L (1.73 t/ha), T_3= Dolochune @ (1.69 t/ha), T_7= Blitox (Copper fungicide) @2g /L (1.68 t/ha), T_8= Control (1.58 t/ha) and lowest yield (1.51 t/ha was obtained T_1= Secure 600 WG (Fenamidone+ Mancozeb) @ 2ml/L.

Screening of fungicides in controlling clubroot disease of mustard

M. S. Hossain, M. Monirul Islam and M. E. A. Pramanik

A field trial was conducted during the *rabi* season of 2024–25 at the farmers' field under the FSRD site, Basantopur, Godagari, Rajshahi, to evaluate the efficacy of various fungicides for the management of clubroot disease in mustard. The mustard variety used in the study was BARI Sarisha-14. The trial included eight treatments, consisting of seven fungicide applications and one untreated control, as follows: T_1 = Secure 600 WG (Fenamidone + Mancozeb) @ 2 mL/L, T_2 = Ridomil Gold (Metalaxyl) @ 2 mL/L, T_3 = Dolochune @ 5 t/ha, T_4 = Luna Sensation (Fluopyram + Trifloxystrobin) @ 2 mL/L, T_5 = Amistar Top (Azoxystrobin + Difenoconazole) @ 2 mL/L, T_6 = Nativo 75 WG (Tebuconazole + Trifloxystrobin) @ 2 mL/L, T_7 = Blitox (Copper-based fungicide) @ 2 g/L, and T_8 = Untreated control. A total of three fungicidal sprays were applied at seven-day intervals, with the first application initiated at the initial appearance of disease symptoms. Notably, no incidence of club root was observed during the trial period across all treatments, including the control. However, plots treated with fungicides consistently produced higher seed yields compared to the untreated control, suggesting a potential yield-enhancing effect of fungicide application under field conditions, possibly due to the control of other latent or subclinical fungal pathogens.

Screening of mustard varieties and lines against clubroot in high barind tract

M. S. Hossain, M. Monirul Islam and M. E. A. Pramanik

A field trial was conducted during the *rabi* season of 2024–25 at the farmers' field under the FSRD site, Basantopur, Godagari, Rajshahi, with the objective of identifying suitable mustard genotypes for potential resistance to clubroot disease. There were 61-genotype in the trial viz., E1BS-6, E2BS-7, E3BS-8, E4BS-9, E5BS-10, E6BS-11, E7BS-12, E8BS-13, E9BS-14, E10BS-15, E11BS-16, E12BS-17, E13BS-18, E14BS-19, E15BS-20, E16Din-2, E17Tori-7, E18Kallynia, E19Jumka, E20SS-75, E21Daulat, E22Rai-5, E23BD-9344, E24BD-9345, E25BD-9346, E26BD-9347, E27BD-9348, E28BD-9349, E29BD-9350, E30BD-9351, E31BD-9352, E32BD-9333, E33BD-9334, E34BD-9335, E35BD-9336, E36BD-9337, E37BD9353, E38BD-9340, E39BD-9341, E40BD-9342, E41BD-9343, E42BD-9318, E43BD-9319, E44BD-9320, E45BD9321, E46BD-9322, E47BD-9326, E48BD-9327, E49BD-9328, E50BD-9331, E51BD-9332, E52BD-9954, E53BD-9955, E54BD-9956, E55BD-9957, E56BD-9864, E57BD-9866, E58BD-9867, E59BD-9868, E60BD-10105 and E61BD-10106. A total of 61 mustard

genotypes were evaluated under field conditions. Although no incidence of clubroot disease was observed during the trial period, significant variation in seed yield was recorded among the tested genotypes. Among them, E31BD-9352 produced the highest seed yield, reaching 2.81 t ha^{-1}, indicating its potential for high productivity under the prevailing agroecological conditions.

Development of management package for controlling onion maggot (*Delia antiqua*) for true seed production

M. E. Haque, M. Z. H. Pradhan, M. H. Rashid, M. A. Alam, M. Z. Ferdous and M. A. H. Talukder

Onion maggot (*Delia antiqua*), a serious pest of onion, poses a significant threat to the success of true seed production in Bangladesh. The study was conducted at the On-Farm Research Division (OFRD), BARI, Rangpur during the 2024–25 *rabi* season to evaluate the effectiveness of various insecticidal treatments in managing onion maggot infestation and enhancing seed yield in onion (*Allium cepa* L., cv. BARI Piaj-4). The experiment consisted of seven treatments involving different application timings and combinations of Cadusafos (Ragbi) and Coragen, laid out in a randomized complete block design with three replications. Results revealed that three foliar sprays of Coragen (T_5) significantly reduced infestation levels and produced the highest seed yield (972.59 kg ha^{-1}), followed closely by integrated applications (T_4 and T_6). The control plot (T_7) exhibited the highest pest infestation and lowest yield. The study recommends strategic insecticide scheduling, particularly Coragen applications post-infestation, for effective onion maggot control in seed production fields.

Performance of different blackgram varieties within betelnut orchard in Bhola

G. N. Hasan, R. H. Anik & M Islam

The experiment was conducted at Bhola sadar and Doulatkhan under Bhola districts during *rabi* season of 2024-25 in farmer's field to select suitable variety of blackgram which can be produced in betelnut orchard as well as to increase cropping intensity and productivity. Blackgram varieties i.e. BARI Mash-3, BARI Mash-4 and local were tested. Among the varieties, BARI Mash-3 gave the average maximum seed yield (1.12t ha^{-1}) followed by BARI Mash-4(1.07 t ha^{-1}), whereas local gave average lowest yield (0.95t ha^{-1}). The highest betelnut equivalent yield (1.147 t ha^{-1}) was found in Betelnut + BARI Mash-3 combination whereas Betelnut + local combination gave the lowest betelnut equivalent yield (1.123 t ha^{-1}). The gross return and gross margin of Betelnut + BARI Mash-3 was 5,73,000 and 4,72, 675 Tk. ha^{-1} respectively, the gross return and gross margin of Betelnut + BARI Mash-4 was 5,70,000 and 4,69,125 Tk. ha^{-1} respectively.

Performance of mixed vegetables in newly established mango orchard in Cumilla

M. J. Uddin

The experiment was conducted at the 1-3 years old mango orchard of the farmers' field of Uzanijora in Debidwar, Cumilla and Monkhasir in Kasba, Brahmanbaria in during 2024-25. There was some gaps between the tree canopy in the garden, where direct sunlight may reach to the under storey crops. Vegetables (cabbage, Cauliflower, Sweetgourd, Tomato and Gardenpea) were used as under storey crop in this experiment. The treatments were designed as Mango + Cabbage (T_1), Mango + Cauliflower (T_2); Mango + Sweet gourd (T_3), Mango + Tomato (T_4) and Mango+Gardenpea (T_5). The maximum fruit yield (60.0 t ha^{-1}) was found from tomato followed by cabbage (52.6 t ha^{-1}) and minimum yield (1.71 t ha^{-1}) from Garden pea under agroforestry system. Gross margin and BCR (2.12) were found higher in cabbage followed by tomato.

Project: On-Farm Trials with Advanced Lines and Technologies

On-farm trail of BARI hybrid brinjal varieties

M. R. Amin, M. M. Howlader and D. Halder

The on-farm trials were conducted at Gopalganj Sadar, Muksudpur and Tungipara under Gopalganj; Noyadingi and Dhankura village under Saturia upazila of Manikganj district during *rabi* season of 2024-25 to evaluate the performance of BARI released hybrid brinjal varieties at farmers' field. The trial was laid out in RCB design with six dispersed replications. Four hybrid brinjal varieties viz. BARI Hybrid Begun-4, BARI Hybrid Begun-5, BARI

Hybrid Begun-6 and Local hybrid as check were tested in Gopalganj whereas BARI Hybrid Begun-5, BARI Hybrid Begun-6 and a commercial Purple King hybrid as check were evaluated in Manikganj. In Gopalganj, BARI Hybrid Begun-6 gave the highest yield of 56.76 t ha^{-1} and the lowest yield (31.7 t ha^{-1}) was recorded from the local hybrid variety. In Manikganj, BARI Hybrid Begun-6 produced the highest yield (42.35 t ha^{-1}) followed by BARI Hybrid Begun-5 (38.35 t ha^{-1}) and the lowest yield was recorded from Purple King hybrid (35.80 t ha^{-1}) variety. BARI Hybrid Begun-6 provided higher gross margin with higher BCR at both the tested locations. Farmers in both districts farmers choose BARI Hybrid Begun-6 for its high yield potentiality and better market value, especially due to its attractive violet color and uniform fruit size.

Adaptive trial of BARI brinjal varieties

N. Akther, M. A. H. Khan, K. Roy, T. Tasmima, M. A. Rahaman, S. Roy and G. Paul

The trials were conducted at Trishal upazila of Mymensingh and Bhuapur under Tangail district during *Rabi* season of 2024-25 to evaluate the performance of BARI released brinjal varieties at farmers' field. There were three brinjal varieties *viz*. BARI Begun-8, BARI Begun-10, BARI Begun-11, and a local variety (Amjury) were tested in Trishal; while BARI Begun-12 was evaluated against a local variety in Tangail. The trial was laid out in RCB design with six dispersed replications. In Mymensingh, the highest yield (54.44 tha^{-1}) was observed in BARI Begun-11 and the lowest yield (25.10 tha^{-1}) in local variety (Amjury). The highest gross margin (Tk. 110050 ha^{-1}) was also found in BARI Begun-11 and the lowest gross margin (Tk. 664500 ha^{-1}) from local variety (Amjury). In Tangail, BARI Begun-12 gave the maximum yield of 31.9 t ha^{-1} with the highest gross return (Tk. 1281040 ha^{-1}) and gross margin (Tk.1096065 ha^{-1}) and local one gave the lowest gross return (Tk. 416060 ha^{-1}) and gross margin (Tk. 231085 ha^{-1}).

On-farm trial of Bt brinjal variety in Cox's Bazar

M. Ahmed and M. S. Bhuiyan

The field trial was conducted at Cox'sbazar during *Rabi* season of 2024-2025 to observe the performance of transgenic Bt brinjal variety at the farmers' field. The trial was laid out in RCB design with five dispersed replications. BARI Bt Begun-4 performed better with fruit yield 37.72 t ha^{-1}, reduced brinjal shoot and fruit borer infestation, produced maximum healthy fruit and gave higher gross margin (Tk. 440500 ha^{-1}).

On-farm trial of BARI tomato varieties during winter season

M. J. Uddin, J. A. Mahmud, M. M. Morshed, M. M. Hossain, S. Akhtar, M. A. H. Khan, M. T. Hasan, M. Rahmat A Mollah, M. M. Hasan, M. S. Alam, K. Roy, M. A. Rahaman, M. S. Islam, M. M. Bashir and M. R. Amin

The experiment was conducted at Barura, Chandina and Debidwar of Cumilla and Saharasti under Chandpur district; Kushtia sadar and Chuadanga; Trishal of Mymensingh; Gabtoli of Bogura, Delduar of Tangail and South Shullukia of Sadar Noakhali, Daulatpur and Saturia of Manikganj district during *Rabi* season of 2024-25 to evaluate the performance of BARI released winter tomato varieties in the farmers' field. The trial was laid out in RCB design with five dispersed replications. BARI winter tomato varieties viz. BARI Tomato-8, BARI Tomato-15, BARI tomato-16, BARI Tomato-17, BARI Tomato-18, BARI Tomato-19, BARI Tomato-21, BARI Tomato-22, and BARI Tomato-23 and BARI Tomato-2 (Ratan) and local variety, namely Red Boll, Roma VF and Bahuboli hybrid were evaluated. BARI Tomato-15 (38.90-85.63 t ha^{-1}), BARI Tomato18 (49.3-78.35 t ha^{-1}), BARI Tomato-21 (50.70-84.43 t ha^{-1}) and BARI Tomato-23 (89.10 t ha^{-1}) performed better compared to other evaluated varieties.

On-farm trial of BARI developed hybrid tomato varieties during winter season

M. M. Howlader, D. Halder, M. M. Alam and M. H. Rahman

The experiment was conducted at MLT site, Tungipara, Gopalganj and Shibpur, Narsingdi during *rabi* season 2024-2025 to evaluate the performance of BARI released winter hybrid tomato varieties in the farmers' field. The trial was laid out in RCB design with six dispersed replications. BARI winter hybrid tomato varieties viz. BARI hybrid tomato-5, BARI hybrid tomato-7, BARI hybrid Ttmato-9,

BARI hybrid tomato-11 along with commercial hybrids were evaluated. At Gopalganj, BARI Hybrid Tomato-9 produced the highest yield (84.76 t ha^{-1} which higher gross return (Tk. 1695200 ha^{-1}) and BCR (2.27) followed by local hybrid tomato with 82.13 t ha^{-1} yield, gross return (Tk. 1642600 ha^{-1}) and BCR (2.20). The lowest fruit yield (72.07 t ha^{-1}), gross return (Tk. 1441400 ha^{-1}) and BCR (1.93) were found from BARI Hybrid Tomato-11. At Narsingdi, BARI Hybrid Tomato-5 produced the maximum fruit yield (96.70 t ha^{-1}) which was 33.09 % higher than the Local hybrid.

On-farm trial of winter type country bean varieties in Gopalganj

M. M. Howlader and D. Halder

A field trial with four country bean varieties was conducted at Gopalganj during the *Rabi* season of 2024-25 to evaluate their yield and economic viability. BARI Sheem-6, BARI Sheem-8, BARI Hybrid Sheem-9 and local variety as check were evaluated under this trial. The experiment was laid out in RCB design with four dispersed replications. BARI Sheem-8 demonstrated the highest yield (19.12 t ha^{-1}) followed by BARI Sheem-6 (15.99 t ha^{-1}) and BARI Sheem-9 (11.38 t ha^{-1}). The lowest yield (11.44 t ha^{-1}) was obtained from the local variety. BARI Sheem-8 gave the highest gross margin (Tk. 326600 ha^{-1}) with a BCR of 2.32.

On-farm trial of BARI bitter gourd varieties in Manikganj

M. R. Amin

The experiment was conducted at Purba Bandhail village under Singair upazila of Manikganj district during *Kharif-I* season of 2025 to evaluate the performance of BARI released bitter gourd varieties among the farmers. The experiment was laid out in RCB design with three dispersed replications. BARI bitter gourd varieties viz. BARI Korola-1 and BARI Korola-2 were evaluated with a commercial variety (Tia hybrid) as check. Tia hybrid gave the higher fruit yield (23.75 t ha^{-1}) compared to BARI Korola-1 (18.15 t ha^{-1}) and BARI Korola-2 (15.10 t ha-1). Higher gross margin (Tk. 466663 ha^{-1}) was also obtained from BARI Korola-1 compared to Tia hybrid (Tk. 431663 ha^{-1}) and BARI Korola-2 (Tk. 359913 ha^{-1}).

On-farm trial of BARI developed sponge gourd variety in Tangail

M. A. Rahaman, T. Tasmima, K. Roy, G. Paul and P. Sutradhar

A field trial was conducted at MLT site Modhupur, Tangail during *Kharif* season of 2024 to evaluate the performance of BARI Dhundol-1 and BARI Dhundol-2 with a local cultivar. The experiment was laid out in RCB design with six dispersed replications. BARI Dhundol-1 gave higher yield (32.51 t ha^{-1}) compared to BARI Dhundol-2 (26.11t ha^{-1}) and local variety (29.38 t ha^{-1}).

On farm trial of BARI developed stem amaranth varieties

M. F. Islam, M. M. Rahman, A. K. M. Z. U. Noor, M. A. Rahaman, T. Tasmima, K. Roy, G. Paul and P Sutradhar

On-farm trials were carried out in farmers' fields at Ghatail, Tangail during *Kharif* season of 2024 and *Rabi* season of 2024–25 in Sherpur district to evaluate the performance of BARI-released stem amaranth varieties. In Tangail, BARI Danta-1 was compared with a local variety. The experiment was laid out in RCB design with six dispersed replications. In Sherpur, BARI Danta-3 and BARI Danta-4 were tested against a local variety as check. BARI Danta-3 produced the highest stem yield (44.06 t ha^{-1}) at Sherpur, followed by BARI Danta-4 (39.27 t ha^{-1}). At Tangail, BARI Danta-1 outperformed the local variety with a stem yield of 33.84 t ha^{-1}. The local variety consistently produced the lowest yield across both locations (32.55 - 34.17 t ha^{-1}). In terms of economic performance of Sherpur, BARI Danta-3 recorded the highest gross return (Tk. 793080 ha^{-1}) and gross margin (Tk. 663205 ha^{-1}) followed by BARI Danta-4, whereas the lowest gross return and gross margin were obtained from the local variety.

On-farm trial of watermelon varieties in different locations of Bangladesh

K. Roy, M. A. Rahaman, T. Tasmima, S. Roy, and G. Paul

An experiment was conducted at the FSRD site, Atia, Delduar, Tangail and of Cox's Bazar district during 2024–2025 to evaluate the performance of BARI released watermelon varieties and assess their potential and economic return at the farm level. Two

varieties BARI Tormuj-1, BARI Tormuj-2 and local were tested in RCB design with three replications. The findings of Tangail revealed that BARI Tormuj-1 produced the highest fruit yield (24.9 t ha^{-1}**),** gross return **(**Tk. 995200 ha^{-1}**),** and gross margin **(**Tk. 808180 ha^{-1}**),** outperforming BARI Tormuj-2 in all key parameters. At Coxs' Bazar, the highest yield (25 t ha^{-1}) and gross margin (217700 Tk. ha^{-1}) was found from BARI Watermelon-1. BARI Tormuj-1 was found suitable for both the agro-climatic conditions and have potentials for wider adoption to increase yield and farmers' income.

Adaptive trial of coffee at Bandarban hill district and hilly area of Sherpur and Mymensingh

M. Salim, M. T. Islam, F. Arshad, M. I. Hossain, M. A. Hossain, A. K. M. Z. U. Noor, M. M. Rahman and M. F. Islam

This five-year adaptive trial (2021–2025) evaluated the growth, adaptability and yield of *Coffea robusta and Coffea arabica* across seven upazilas in Bandarban Hill District, Gandhigaon, Jinaighati (Sherpur) and Haluaghat (Mymensingh) hilly area. In Jinaighati, *Coffea robusta* recorded the highest plant height (135.3 cm), leaf length (16.8 cm), and leaf breadth (10.2 cm), while *Coffea arabica* showed better performance in yield (7.5 t ha^{-1}), number of branches (21.9), base girth (7.5 cm), and canopy spread (98.5 × 86.5 cm^2). Similarly, in Haluaghat, *Coffea arabica* exhibited higher yield (6.3 t ha^{-1}), plant height (131.6 cm), number of branches (90.4), and canopy size (105.4 × 92.4 cm^2), whereas *Coffea robusta* had longer leaves (19.4 cm) but lower yield (2.3 t ha^{-1}). The adaptive trial in Bandarban, conducted on 26 farmer fields covering 18.14 acres under homogenous cultural practices with RCB design. Results revealed that Robusta exhibited huge vegetative growth reaching up to 170.9 cm in Alikadam and maximum yield of 1807.33 g plant^{-1} in Bandarban Sadar. Arabica, whereas slightly shorter (126.3 cm), showed consistent growth and the maximum yield of 1234.67 g plant^{-1}. Tree volume increased by 424% in Robusta and 554% in Arabica under favorable conditions indicated wider adaptability. These findings revealed the yield potentiality and ecological suitability of *Coffea arabica* in northern hill valleys and the broader adaptability of *Coffea robusta* in southeastern hill regions, offering strategic direction for sustainable coffee expansion in Bangladesh.

On farm trial of BARI gladiolus varieties in Sherpur region

M. M. Rahman, M. F. Islam and A. K. M. U. Noor

The experiment was conducted in the farmers' field at Nalitabari, Sherpur region during *rabi* season of 2024-25 to evaluate the performance of BARI released gladiolus varieties. The trial consisted of three gladiolus varieties viz. BARI Gladiolus-3, BARI Gladiolus-4 and BARI Gladiolus-5. The experiment was laid out in RCB design with three replications. The highest spike yield was obtained from BARI Gladiolus-4 (211250 spike ha^{-1}) followed by BARI Gladiolus-5 (202500 spike ha^{-1}) and the lowest spike yield was recorded in BARI Gladiolus-3 (192500 spike ha^{-1}).The maximum gross return (Tk. 2112500 ha^{-1}) and gross margin (Tk. 1204220 ha^{-1}) were estimated from BARI Gladiolus-4 and the lowest gross return (Tk. 1925000 ha^{-1}) and gross margin (Tk.1016720 ha^{-1})was obtained from BARI Gladiolus-3.

Farmers were happy to get higher yield from BARI Gladiolus-4, BARI Gladiolus-5 and BARI Gladiolus-3.

Adaptive trial with high yielding potato varieties in different locations

M. J. Alam, M. Akhtaruzzaman, A. A. Mahmud, M. J. Uddin, M. I. Nazrul, M. Asaduzzaman, M. Julfiqar, M. R. Amin, M. Salim, M.T. Islam, M.I. Hossain, M. A. Rahaman, T. Tasmima, K. Roy, G. Paul, P. Sutradhar, A. K. M. Z. U. Noor, M. M. Rahman, M. F. Islam, M. Mohiuddin, M. Y. H. Rayhan, M.M Zaman, M. Z. Ferdous, M. E. Haque, M. A. U. Alam, and M. A. H. Talukder

Four set of trials were carried out at farmers' fields in 9 (Nine) locations under four different ecosystems, *viz*. low land/haor, drought/char, plain land and hill ecosystem during the *rabi* season of 2024–2025 to assess the performance of high-yielding potato varieties and learn about farmers' preferences regarding the varieties. Considering the low land ecosystem, the tuber yield ranged from 18.3 to 46.0 t ha^{-1} across the locations. Sylhet was identified as the most favorable environment for potato production, with an average yield of 37.6 t ha^{-1}, followed by Brahmanbaria with 30.4 t ha^{-1}. On the other hand, the environmental conditions in Kishoreganj were less conducive to potato cultivation, resulting in

an average yield of 28.0 t ha^{-1}. In the plain land ecosystem, the potato yield ranged between 20.0 to 44.5 t ha^{-1} across different locations. The Manikganj region was identified as the most favorable environment for potato production, with an average yield of 36.6 t ha^{-1}. In contrast Sherpur was found to be less productive with an average yield of 30.4 t ha^{-1}. In the char land ecosystem, the tuber yield of potato varied from 10.95 to 38.0 t ha^{-1} across different locations. The char area of Kurigram has been founded as the most favorable environment for potato production, where the average yield was 30.8 t ha^{-1}. Conversely, the char area of Tangail was found to be less productive with an average yield of 16.5 t ha^{-1}. Within the hill ecosystem, the potato yield ranged from 21.00 to 33.6 t ha^{-1} in Bandarban. Farmers chose different potato varieties based on market price, plant growth, yield potential, tuber size and shape, and skin color. This difference was noted in various places. However, in lowland and haor ecosystems, BARI Alu-47, BARI Alu-62, BARI Alu-77, BARI Alu-87 and BARI Alu-90 were found to be the best-performing potato varieties. For plain land ecosystems, BARI Alu-40, BARI Alu-41, BARI Alu-47, and BARI Alu-49 were the top performers. For char land ecosystems, BARI Alu-7, BARI Alu-62, BARI Alu-72, BARI Alu-73 and BARI Alu-78 were the top performers. For hill ecosystems, BARI Alu-47, BARI Alu-62, BARI Alu-63 and BARI Alu-87 were the top performers. Considering all ecosystems, the corresponding potato varieties were determined to be appropriate for growing in the particular ecosystems and might be suggested for future cultivation.

On farm validation of selected potato varieties in different locations

M. J. Alam, M. Akhtaruzzaman, A. A. Mahmud, M. K. Islam, M. Rahman, T. S. Munmun and M. Ahmed

Three set of validation trials were carried out at farmers' fields in 3 (three) locations *viz*. Gaibandha, Khulna and Cox`s Bazar during the *rabi* season of 2024–2025 to assess the performance of high-yielding potato varieties and learn about farmers' preferences regarding the varieties. Trials were set up in Gaibandha with 3 potato varieties, namely BARI Alu-37, BARI Alu-47 and BARI Alu-62; in Khulna with 5 potato varieties namely BARI Alu-35, BARI Alu-36, BARI Alu-47, BARI Alu-49 and BARI Alu-50 and in Cox`s Bazar with 6 potato varieties namely BARI Alu-25, BARI Alu-37, BARI Alu-38, BARI Alu-40, BARI Alu-41 and BARI Alu-50. Among all the tested potato varieties, BARI Alu-62 and BARI Alu-47 performed well in Gaibandha; BARI Alu-49 and BARI Alu-50 performed well in Khulna; BARI Alu-50 performed well in Cox`s Bazar.

On farm trial of sweet potato varieties in different locations

M. J. Alam, M. Akhtaruzzaman, M. M. Howlader, D. Halder, H. M. K. Bashar, M. M. Islam, K. N. Islam, M. M. Rahman, A. K. M. Z. U. Noor, M. F. Islam and A. A. Mahmud

An on-farm trial was conducted during the 2024–2025 *rabi* season across three agro-ecologically diverse locations Gopalganj, Barguna, and Sherpur to evaluate the performance of different sweet potato varieties and identify farmer-preferred cultivars. The trials included five varieties in Gopalganj, four in Barguna, and five in Sherpur. Results revealed that BARI Mistialu-14 and BARI Mistialu-16 performed best in Gopalganj; BARI Mistialu-12 in Barguna, and BARI Mistialu-15 and BARI Mistialu-17 in Sherpur. Farmers expressed a strong preference for these varieties due to their higher yield, attractive root characteristics, and better financial returns. The findings underscore the importance of location-specific varietal selection to enhance sweet potato productivity and farmer adoption.

On farm trial of BARI released varieties of panikachu in different locations

M. J. Alam, M. Akhtaruzzaman, S. Akhter, N. Akhter, S. Sultana, M.A.H Khan, M. M. Alam, M. Ahmed, M. H. Rahman, M. M. Rahman, A. K. M. Z. U. Noor, M. F. Islam and M. J. Uddin

The experiment was carried out in four distinct places during the *kharif* season of 2023-2024 to assess the performance of Panikachu varieties. In Mymensingh, the stolon yields ranged from 4.6-26.2 t ha^{-1} and rhizome yield ranged from 22.0-43.4 t ha^{-1}. The highest stolon yield was obtained from BARI Panikachu-2 (26.2 t ha^{-1}) and rhizome from BARI Panikachu-5 (43.4 t ha^{-1}). In Narsingdi, the stolon yields ranged from 4.6-17.9 t ha^{-1} and rhizome yield ranged from 7.9-35.0 t ha^{-1}. The highest stolon and

rhizome yield was obtained from BARI Panikachu-1 (17.9 t ha^{-1}) and BARI Panikachu-6 (35.0 t ha^{-1}). In Sherpur, the stolon yields ranged from 7.5-23.1 t ha^{-1} and rhizome yield ranged from 21.7-37.1 t ha^{-1}. The highest stolon and rhizome yield was obtained from BARI Panikachu-1 (23.1 t ha^{-1}) and BARI Panikachu-4 (37.1 t ha^{-1}). In Cumilla, the stolon yields ranged from 23.1-29.7 t ha^{-1}. The highest stolon yield was obtained from BARI Panikachu-9 (29.7 t ha^{-1}), followed by BARI Panikachu-1 (29.4 t ha^{-1}).

Adaptive trial of mukhikachu varieties at Sherpur

M. J. Alam, M. Akhtaruzzaman, M. M. Rahman, A. K. M. Z. U. Noor and M. F. Islam

Two BARI released variety of Mukhikachu (*C. esculenta*) were evaluated at the farmer's field of Khunua, Sherpur during March to September 2024. Two BARI released variety BARI Mukhikachu-1 (Bilashi) and BARI Mukhikachu-2 (Meherchandi) were used as planting materials. BARI Mukhikachu-1 produced highest corm yield (28.7 t/ha) and lowest by BARI Mukhikachu-2 (24.6 t/ha). Highest gross return and gross margin per hectare were found Tk 12,03,000/- and Tk. 9,72,420/- from BARI Mukhikachu -1.

On-farm evaluation of BARI-released mustard varieties in different agro-ecological zones of BANGLADESH

M. S. Hossain, M. E. A. Pramanik, S. Akhtar, N. Akther, S. Sultana, N. Sultana, M. A. H. Khan, M. F. Islam, M. M. Rahman, A. K. M. Z. U. Noor, M. T. Hasan, M. R. A. Mollah, M. M. Hasan, M. S. Alam, G. N. Hasan, R. H. Anik and M Islam

The experiments were conducted during the *rabi* season of 2024–25 across diverse agroecological zones of Bangladesh, including Rajshahi, Mymensingh, Sherpur, Bogura, Cox's Bazar, and Bhola, to evaluate the growth, yield performance, and economic returns of promising mustard varieties. The trials were laid out in RCBD with three to six dispersed replications. The tested varieties exhibited significant variation in phenological traits, yield-contributing characters, and economic profitability across locations. BARI Sarisha-18 consistently demonstrated superior performance, producing the highest seed and straw yields in most locations, along with excellent reproductive traits such as siliquae $plant^{-1}$, seeds $siliqua^{-1}$, and 1000-seed weight. BARI Sarisha-20 also performed well, particularly in coastal and drought-prone regions due to its early maturity and higher seed yield. BARI Sarisha-17 showed notable performance in some locations like Bhola and Sherpur. Economic analysis revealed that BARI Sarisha-18 recorded the highest gross margin and benefit-cost ratio in most environments, making it a robust and profitable choice for farmers. These results indicate that variety selection should be location-specific, and BARI Sarisha-18 and BARI Sarisha-20 hold potential for widespread adoption under diverse agro-climatic conditions of Bangladesh.

Yield performance of advanced lines of *brassica rapa* under on-farm conditions in Bangladesh

M. Z. Hasan, M. A. Islam, M. M. A. Niruzzaman, M. S. H. Molla, S. Akhtar, N. Akther, S. Sultana, N. Sultana, Mah Khan, M. M. Rahman, M. F. Islam and A. K. M. Z. U. Noor

The experiments was conducted during *Rabi* season of 2024–2025 at farmers' fields across three locations Gangarampur (Pabna), Trishal (Mymensingh), and Sherpur to evaluate the yield performance and agronomic traits of advanced *Brassica rapa* lines compared to the check variety BARI Sarisha-20. A total of 4–6 advanced lines, including BC-0835, BC-100614(4)2(Y), BC-14031(Y), BC-15015, and BC-15022 were tested in RCBD with three to four dispersed replications. Significant variations were observed in yield-contributing characters such as days to flowering, days to maturity, plant height, branches $plant^{-1}$, siliqua $plant^{-1}$ and 1000-seed weight. Across locations, the highest seed yield (1720 kg ha^{-1}) was obtained from BC-100614(4)2(Y) which exceeded the yield of BARI Sarisha-20 by 12.4%. BC-14031(Y) and BC-0835 also demonstrated greater performance with yields of 1690 and 1575 kg ha^{-1}, respectively. BARI Sarisha-20 and BC-15015 achieved the highest gross returns (Tk. 105127 ha^{-1} and Tk. 105000 ha^{-1}). Shorter days to maturity (74-80 days) and better adaptability of the advanced lines indicated their suitability for Mustard–Boro–T. Aman rice cropping pattern. Farmers expressed satisfaction with BC-15015 and BC-0835 due to their high yield and profitability. Further trial is nedded in the upcoming seasons to confirm the results.

Adaptive yield trial of *brassica napus*

M. Z. Hasan, M. A. Islam, M. Maniruzzaman and M. S. H. Molla

An adaptive trial was conducted in the farmer's field at FSRD site, Gangarampur, Pabna during *rabi* seasin of 2024-25 to evaluate the performance of advanced lines of *Brassica napus*. The experiment was laid out in RCBD with three replications. Five advanced lines viz. NAP-15029, T_2 = NAP-15037, T_3 = NAP-0717-2, T_4 = NAP-0733-1, T_5= NAP-20009 and BARI Sharisha-8 was used as check variety. No significant difference was found in seed yield and yield contributing characters except 1000-seed weight. The highest 1000-seed weight (3.73 g) was found the highest (3.73 g) in BARI Sarisha-8 and the lowest (3.10 g) in NAP-0733-1. The shorter plant height (103.9 cm) and maturity duration (92 days) were found in NAP-15029 which were beneficial for the farmers boro rice based cropping pattern.

Adaptive trial of long duration mustard varieties

M. M. Howlader, D. Halder, M. Salim, M. T. Islam, and M. I. Hossain

Two adaptive trials were conducted in contrasting environments such as low-lying southern region (Gopalganj) and hill valleys (Bandarban) during the *Rabi* season of 2024–25 to evaluate the performance of long-duration mustard varieties. The varieties were BARI Sarisha-11, BARI Sarisha-16, BARI Sarisha-18 and BARI Sarisha-19. The trials aimed to identify suitable varieties for late sowing in water-receding low lands and moisture-retentive hill valleys of Banderban. In Gopalganj, BARI Sarisha-19 gave the highest yield (1.72 t ha^{-1}) followed by BARI Sarisha-16 (1.60 t ha^{-1}). In Bandarban, BARI Sarisha-18 outperformed others in terms of plant height, siliqua $plant^{-1}$, seed yield (1.53 t ha^{-1}) and economic return (BCR 2.88). Farmers at both locations preferred high yialding, long duration varieties particularly BARI Sarisha-18 and BARI Sarisha-19 due to higher grain and stover yield. These varieties are recommended for non-traditional, resource-constrained areas to boost oilseed productivity and farmer income.

On-farm trial of BARI sesame varieties in Manikganj and Gopalganj region

M. R. Amin, M. M. Howlader, and D. Halder

On-farm trials were conducted during the 2024–25 *Kharif*-I and *rabi* seasons at Chargobindapur, Daulatpur upazila of Manikganj and in selected sites of Gopalganj and Pirojpur districts to evaluate the performance of BARI developed sesame varieties. The experiment was laid out in RCBD with three dispersed replications. At Manikganj, three BARI sesame varieties viz. BARI Til-4, BARI Til-5 and BARI Til-6 and at Gopalganj five sesame varieties viz. BARI Til-3, BARI Til-4, BARI Til-5, BARI Til-6 and a local variety were evaluated. In Manikganj, BARI Til-4 recorded the highest yield (1.44 t ha^{-1}) whereas BARI Til-5 provided the highest gross margin (Tk. 87178 ha^{-1}) due to higher market price. In Gopalganj and Pirojpur, BARI Til-5 also showed superior performance with the highest yield (1.67 t ha^{-1}). Farmers at both locations ptreferred BARI Til-5 for its high productivity and higher market price. These findings indicate the high adaptability and economic viability of BARI sesame varieties under diverse field conditions.

Regional yield trial of sesame in coastal region of Bangladesh

The field experiment was conducted under varying saline conditions (2.65–12.98 dS/m) in the coastal saline region. The study aimed to identify suitable sesame varieties capable of withstanding salinity while maintaining satisfactory growth and yield. The experiment was laid out in RCBD with three dispered replications. The six sesame varieties/lines viz. Ses05115, Ses65, Ses05178, Ses031, Ses79 and BARI Til-6 were included in the study. BARI Til-6 exhibited better performance with the highest plant height (97.67 cm), number of seeds $capsule^{-1}$ (112.98) and yield (1.22 t ha^{-1}) followed by Ses65 (1.21 t ha^{-1}). Conversely, Ses79 gave the lowest yield (1.06 t ha^{-1}). Despite moderate variation in plant growth traits, yield stability under salinity stress highlighted the potential of BARI Til-6 and Ses65 for saline-prone regions. The findings suggest that these varieties are promising candidates for sesame cultivation in saline environments contributing to crop diversification and food security in vulnerable coastal areas.

Mustard cultivation in association with mango fruit tree

M. S. Huda

This study investigates the effects of different varieties of mustard in a mango-based agroforestry system in Dinajpur, Bangladesh. The agroforestry

setup with mango trees aged two to five years, presents a favorable microenvironment for mustard cultivation, offering partial shade and enhanced soil moisture retention. Four different varieties viz. BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-19, BARI Sarisha-20 and BARI Sarisha-18 were used. The field experiment was set up in a RCBD with three compact replications. BARI Sarisha-18 gave the highest yield (1.86 t ha^{-1}) showed significant improvements in thousand seed weight and yield attributes. In contrast, the BARI Sarisha-14 produced the lowest yield (1.08 t ha^{-1}). The findings emphasize the benefits of BARI Sarisha-18 to enhance mustard production sustainably by maximizing yield and enhancing sustainable production practices in mango-based agroforestry systems.

On-farm trial of groundnut varieties in Bangladesh (Charland, Gopalganj and Bhola regions)

M. U. S. Khatun, M. Z. Ferdous, M. K. Islam, U. K. Laily, M. A. H. Talukder, M. M. Howlader, D. Halder, G. N. Hasan, R. H. Anik and M. Islam

On-farm trials were conducted at three major locations in Bangladesh such as Charland of Bongram, Chilmari (Kurigram), Gopalganj-Pirojpur and Bhola during the *rabi* seasons of 2022-23, 2023-24 and 2024-25 to evaluate the performance of improved groundnut varieties for yield, yield attributes and economic return under farmer field condition. The experiment was laid out in RCBD with four to six dispered replications. Four BARI released groundnut varieties viz. BARI Chinabadam-8, BARI Chinabadam-9, BARI Chinabadam-10, BARI Chinabadam-11 and one local variety Dhaka-1 as check were evaluated. Irrespective of locations and years, BARI Chinabadam-9 consistently produced the highest pod yield (2.19–2.52 t ha^{-1}) and gross margins (Tk. 151200 ha^{-1}). BARI Chinabadam-8, BARI Chinabadam-10 and BARI Chinabadam-11 also gave promising yield and economic return. The local variety Dhaka-1 produced the lowest yield (1.43–1.63 t ha^{-1}) and return. Farmer preferred BARI Chinabadam-9 for its higher yield and profitability. Based on the results, BARI Chinabadam-9 is recommended for wider cultivation in these agro-ecological zones.

Regional yield trial of soybean at Noakhali

M. S. Islam and M. M. Bashir

A regional yield trial was conducted at Noakhali during the late *rabi* season of 2024–25 to evaluate the performance of ten soybean genotypes including both advanced lines and released varieties viz. ST-1, MTD-453, RICHMOND, USDA-3, USDA-4, USDA-72, USDA-107, KADSING, BARI Soybean-6 and BARI Soybean-7. The experiment was laid out in RCBD with three replications. Significant variation was observed in plant height, number of branches $plant^{-1}$, pods $plant^{-1}$, 100-seed weight and seed yield. Among the genotypes, MTD-453 produced the highest seed yield (2.45 t ha^{-1}) which was statistically similar to all other entries except BARI Soybean-7 and USDA-107. The lowest yield was recorded in USDA-107 (1.90 t ha^{-1}).

On-farm evaluation of soybean varieties in the coastal saline region

M.S. Islam and M.M. Bashir

The experiment was conducted in the farmers' fields in the charlands of Noakhali during *Rabi* seasons of 2023–24 and 2024–25 to identify suitable soybean varieties for cultivation under saline and rainfed conditions. The experiment was laid out in RCB with six dispersed replications. Twelve soybean varieties from various institutions were tested *viz*. BINA soybean-2, BINA soybean-3, BINA soybean-5, BINA soybean-6, BINA soybean-7, BU Soybean-1, BU Soybean-2; BARI Soybean-5, BARI Soybean-6, BARI Soybean-7, BD-4 and Shohag. Among the tested varieties, the highest seed yields (3.07 t ha^{-1}) were recorded both in Binasoybean-2 and BARI Soybean-6 during 2024–25 which was statistically similar to all other varieties except BU Soybean-1 (2.44 t ha^{-1}) , BARI Soybean-5 (2.43 t ha^{-1}) and BARI Soybean-7 (2.3 t ha^{-1}) that yielded the least. BARI Soybean-6 consistently produced the highest yield both the experimentation years.

On-farm and adaptive trials of sunflower varieties in different regions of Bangladesh

M. F. Islam, M. M. Rahman, A. K. M. Z. U. Noor, H. M. K. Bashar, M. M. Islam, K. N. Islam, M. M. Howlader and D. Halder

A series of on-farm and adaptive trials were conducted in three diverse agro-ecological regions –Sherpur

(charland), Kalapara (coastal saline), and Pirojpur (Gopalganj region) during *Rabi* season of 2024–25 to evaluate the performance of sunflower varieties and popularize their cultivation. The experiment was laid out in RCB with six dispersed replications. The tested varieties viz. BARI Surjomukhi-2, BARI Surjomukhi-3, Hysun-33, Syn-3 and an advanced breeding line were included in the study. Hysun-33 produced the highest yields irrespective of all locations followed by Advanced Line Syn-3 at Gopalganj region. In Sherpur, Hysun-33 yielded 3.90 t ha^{-1} whereas in saline Kalapara and Gopalganj it yielded 1.76 t ha^{-1} and 2.25 t ha^{-1}, respectively. The highest gross return and BCR was obtained from Hysun-33 and the new advanced line.

Adaptive trial of advanced lines of rapeseed

K. Roy, M. A. Rahaman, T. Tasmima, S. Roy, and G. Paul

A field trial was conducted at the FSRD site, Atia, Tangail during the *rabi* season of 2024–25 to evaluate the performance of four advanced lines of rapeseed *viz*. BS-15-YF-01*,* BC-100614(3)-1*,* BC-100614(8)-4 *and* BC-100614(4)-7 in comparison with the check variety BARI Sarisha-20*.* The experimemnt was laid out in RCBD with three replications. Among the tested entries, the advanced line BC-100614(4)-7 exhibited highest seed yield (1.28 t ha^{-1}) under the prevailing agro-ecological conditions followed by BARI Sarisha-20 (1.14 t ha^{-1}). The the lowest yield was observed in BC-100614(8)-4 (1.00 t ha^{-1}). The highest gross return (Tk. 108800 ha^{-1}) and gross margin (Tk. 41630 ha^{-1}) was also obtained from BC-100614(4)-7.

Evaluation of BARI, SAU, BSMRAU and BAU developed rapeseed-mustard varieties at saline prone areas

M. Rahman, M. K. Islam and T. S. Munmun**,** M. S. Islam and M. M. Bashir

Two field experiments were conducted during the *rabi* season of 2024–25 to evaluate the yield performance of rapeseed-mustard varieties under saline-prone areas of Khulna and Noakhali regions. The experiment was laid out in RCBD with three replications. Sixteen mustard varieties *viz*. BARI Sarisha-11, BARI Sarisha-14, BARI Sarisha-16, BARI Sarisha-18, BARI Sarisha-19; BAU Sarisha-1, BAU Sarisha-2, BAU Sarisha-3, BAU Sarisha-4, BAU Sarisha-5, BAU Sarisha-6, BAU Sarisha-7, BAU Sarisha-8, BAU Sarisha-9; BU Sarisha-1 and BHS01 were evaluated in Khulna whereas eighteen varieties viz. BARI Sarisha-11, BARI Sarisha-14, BARI Sarisha-16, BARI Sarisha-17, BARI Sarisha-18, BARI Sarisha-19, BARI Sarisha-20; BAU Sarisha-1, BAU Sarisha-2, BAU Sarisha-3, BAU Sarisha-4, BAU Sarisha-5, BAU Sarisha-6, BAU Sarisha-7, BAU Sarisha-8, BAU Sarisha-9; BU Sarisha-1 and BHS01 were evaluated in Noakhali. In Khulna, BAU Sarisha-5 produced the highest grain yield (2.45 t ha^{-1}) followed by BAU Sarisha-6 (2.31 t ha^{-1}), BU Sarisha-1 (2.29 t ha^{-1}) and BHS01 (2.29 t ha^{-1}) whereas BARI Sarisha-16 gave the lowest yield (1.51 t ha^{-1}). In Noakhali, where soil salinity ranged from 2.05–6.72 dS m^{-1} BARI Sarisha-19 yielded the highest (0.92 t ha^{-1}) followed by BAU Sarisha-3 (0.84 t ha^{-1}) and BAU Sarisha-4 (0.80 t ha^{-1}) whereas BARI Sarisha-17 gave the lowest yield (0.32 t ha^{-1}). The studies revealed that BAU Sarisha-5, BAU Sarisha-6, BHS01, BU Sarisha-1 and BARI Sarisha-18 were promising for saline soils in Khulna whereas BARI Sarisha-19 and BAU Sarisha-3 performed well under moderate salinity in Noakhali.

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, Basantopur, Godagari, Rajshahi during *rabi* 2024-25 to select suitable chickpea genotype through regional yield trial (RYT) under drought prone area. The experiment was laid out RCB design with three replications. Four genotypes of chickpea viz. BCX-17007-6, BCX-17007-2, BCX-17009-1, BCX-17009-3 and two varieties namely BARI Chola-5 and BARI Chola-10 as a check were evaluated. Among the tested genotypes BCX-17009-1 gave the maximum seed yield (1.72 t ha^{-1}) followed by BCX-17007-6 (1.65 t ha^{-1}). BARI Chola-10 (1.56 t ha^{-1}) and BCX-17007-2 (1.50 t ha^{-1}) gave statistically similar yield. The minimum seed yield obtained from BARI Chola-5 (1.37 t ha^{-1}).

On farm trial of promising chickpea genotypes 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, Basantopur, Godagari, Rajshahi during

rabi season 2024-25 to select suitable chickpea variety under drought prone area. The experiment was laid out RCB design with three replications. Three genotypes of chickpea *viz*. E_2=BCX-16006, E_3=BCX-16010-2, E_4=BCX-16006-4 and two varieties BARI Chola-5 and BARI Chola-10 as check were evaluated. Among the genotypes, E_4=BCX-16006-4 showed the maximum pods plant^{-1} (92.67) followed by BARI Chola-5 (83.33) while minimum pods plant^{-1} (64.66) from E_2=BCX-16006. The genotype E_4=BCX-16006-4 gave the maximum seed yield (1.86 t ha^{-1}) followed by BARI Chola-5 (1.60 t ha^{-1}) and the minimum from E_2=BCX-16006 (1.46 t ha^{-1}).

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, Basantopur, Godagari, Rajshahi during *Rabi* 2024-25 to select suitable chickpea genotype through regional yield trial (RYT) under drought prone area. The experiment was laid out RCB design with three replications. Four genotypes of chickpea *viz*. BCX-17007-6, BCX-17007-2, BCX-17009-1, BCX-17009-3 and two varieties namely BARI Chola-5 and BARI Chola-10 as a check were evaluated. Among the tested genotypes BCX-17009-1 gave the maximum seed yield (1.72 t ha^{-1}) followed by BCX-17007-6 (1.65 t ha^{-1}). BARI Chola-10 (1.56 t ha^{-1}) and BCX-17007-2 (1.50 t ha^{-1}) gave statistically similar yield. The minimum seed yield obtained from BARI Chola-5 (1.37 t ha^{-1}).

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, Basantopur, Godagari, Rajshahi during *rabi* season 2024-25 to select suitable field pea variety through regional yield trial (RYT) under drought prone area. The experiment was laid out RCB design with three replications. Three genotypes of field pea viz. BFPX-16003, BFPX-16005, BFPX-16008 and one variety BARI Motor-3 as check were tested. Among the tested genotypes and variety, BFPX-16005 gave the maximum seed yield (1.34 t ha^{-1}) followed by BARI Motor-3 (1.27 t ha^{-1}) and the minimum seed yield was obtained from BFPX-16008 (1.07 t ha^{-1}).

Preliminary yield trial of grass pea in high Barind tract

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 2024-25 to identify drought tolerant grass pea genotypes considering yield. The experiment was laid out RCB design with three replications. Ten genotypes *viz*. E_1= IGYT-110, E_2= IGYT-123, E_3= IGYT-124, E_4=IGYT-125, E_5=BGP-13009, E_6=144995, E_7=66054, E_8=116755, E_9=BARI Khesari-3, E_{10}=BARI Khessari-5 were evaluated. The highest yield was obtained from E_1= IGYT-110 (1.60 t ha^{-1}) followed by E_8=116755 (0.64 t ha^{-1}) and the lowest from E_6=144995 (0.60 t ha^{-1}).

Preliminary 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, Basantopur, Godagari, Rajshahi during *rabi* season 2024-25 to select suitable field pea variety through regional yield trial (RYT) under drought prone area. The experiment was laid out in RCB design with 3 replications. Eleven genotypes of field pea *viz*. BFPX-17002-12, 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 and two BARI released varieties BARI Motor-3 and BARI Motor-4 as check were tested. Among the tested genotypes, BFPX-17002-13 gave the maximum seed yield (1.47 t ha^{-1}) followed by BARI Motor-4 (1.37 t ha^{-1}) and the minimum seed yield was obtained from BFPX-17002-12 (0.92 t ha^{-1}).

Adaptive yield trial of grasspea in charland of Saghata

M. J. Alam, M. Akhtaruzzaman and A. A. Mahmud

The expereiment was conducted in the charland of Saghata, Gaibnadha during *rabi* seson of 2024-25. Two promising grasspea lines viz. IGYT-110), IGYT-123 were evaluated with BARI Khesari-5 used as check. The trial was laid out in RCB design with three replications. The maximum yield (1.63 t ha^{-1}) was obtained from BARI Khesari-5 similar to those of genotypes IGYT-110 (1.56 t ha^{-1}) and

IGYT-123 (1.50 t ha^{-1}). However, the yield of these two advanced lines is comparable to that of BARI Khesari-5 and may be considered for further trial for confirmation.

On farm trial of grasspea in charland of saghata

M. J. Alam, M. Akhtaruzzaman and A. A. Mahmud

The trial was conducted with three promising grasspea lines *viz*. IGYT-124, 116690 and 116755, with two checks i.e., BARI Khesari-3 and BARI Khesari-5 in charland of Saghata, Gaibandha during 2024-25. The experiment was laid out in RCB design with three replications. The highest seed yield (1.50 t ha^{-1}) was obtained from E5 (BARI Khesari-5) which was statistically similar to E1 (BARI Khesari-3) (1.45 t ha^{-1}). Lower but statistically similar yields viz. 1.08, 1.13 and 1.01 t ha^{-1} was recorded in E2 (IGYT-124), E3 (116690) and E4 (116755), respectively.

On-farm trial of blackgram varieties in Faridpur

M. M. Rahman

The experiment was conducted at the farmers' field of Moukuri Char, Sadar, Rajbari under "Strengthening regional pulse research station, Madaripur and increase production of pulse crops at greater Barisal, Faridpur region" Project, RPRS, Madaripur during of 2024-25 to evaluate the performance and adaptability in char area. The experiment was laid out in RCB design with 3 replications. Four blackgram varieties viz. T_1= BARI Mash-3, T_2= BARI Mash-4, T_3= Binamash-2 and T_4= Local variety were used in the experiment. The highest seed yield (1.83 t ha^{-1}) was obtained from BARI Mash-4 followed by BARI Mash-3 (1.73 t ha^{-1}), Binamash-2 (1.70 t ha^{-1}) and the lowest from local variety (1.35 t ha^{-1}). Highest gross margin (Tk. 192951 ha^{-1}) was also obtained from BARI Mash-4.

On-farm trial of relay grasspea varieties in Faridpur

M. M. Rahman

An adaptive trial of grasspea varieties was conducted at the farmers' field of Mojumderkandi, Rajoir, Madaripr under "Strengthening regional pulse research station, Madaripur and increase production of pulse crops at greater Barisal, Faridpur region" Project, RPRS, Madaripur during *rabi* season of 2024-25. The experiment was laid out in RCB design with 4 replications. Five treatments *viz*. T_1= BARI Khesari-2, T_2= BARI Khesari-3, T_3=BARI Khesari-5, T_4=BARI Khesari-6 and T_5= Local variety were used in the experiment. The highest seed yield (1.72 t ha^{-1}) was obtained from BARI Khesari-2 followed by BARI Khesari-6 (1.66 t ha^{-1}) and BARI Khesari-5 (1.65 t ha^{-1}) and the lowest was from local variety (1.42 t ha^{-1}). The highest gross margin (Tk. 88260 ha^{-1}) and BCR (3.29) was found BARI Khesari-2.

Adaptive trial of cowpea varieties in hill valleys of Bandarban

M. Salim, M. T. Islam, M.I. Hossain

The experiment was carried out at the farmers' field of Bandarban during *Rabi* season of 2024-25 to investigate the performance of different cowpea varieties. Three cowpea varieties viz. BARI Felon-1, Bhola Local and Local variety were selected. The experiment was laid out in RCB design with three replications. The highest seed yield (1.34 t ha^{-1}) was obtained from BARI Felon-1 (1.34 t ha^{-1}) followed by Bhola Local (1.31 t ha^{-1}) whereas the lowest was found in local variety (1.15 t ha^{-1}). The highest gross return (Tk. 107200 ha^{-1}) and gross margin (Tk. 69700 ha^{-1}) was found from BARI Felon-1 with BCR 2.86 and the lowest gross margin from local variety (Tk. 54500 ha^{-1}) with BCR 2.45.

Performance of mungbean varieties at hill valleys of Bandarban

M. Salim, M.T. Islam, M.I. Hossaain

The study was conducted at farmers' field of Swarna Mondir of Bandarban sadar during March to June 2025 to evaluate the suitability of mungbean in Bandarban. Three Mungbean varieties *viz*. BARI Mung-6, BARI Mung-8 and BINA Mung-8 were used to this study. The experiment was laid out in RCBD with three replications. The highest seed yield (1.48 t ha^{-1}) was obtained from BARI Mung-8 followed by BINA Mung-8 (1.42 t ha^{-1}). The lowest yield (1.29 t ha^{-1}) was found in BARI Mung-6. The highest gross return (Tk. 125800 ha^{-1}) and gross margin (Tk.80300 ha^{-1}) was found from BARI Mung-8 with BCR 2.76.

On farm trial of onion varieties in charland

N. Akther, S. Akhter, S. Sultana, N. Sultana and M. A. H. Khan, M. M. Rahman, M. F. Islam and A. K. M. Z. U. Noor

The experiment was conducted at Mymensingh and Sherpur during *rabi* season of 2024-25 to evaluate

the performance of onion variety under farmers' field conditions. Six varieties were used for the trial *viz*., BARI Piaz-1, BARI Piaz-4, BARI Piaz-5, BARI Piaz-6, Local (Faridpuri) and Local (Taherpuri). Results obtained from the study indicated that, in Mymensingh, the highest bulb length, bulb diameter and single bulb weight (6 cm, 4.5 cm and 62 g respectively) was recorded from BARI Piaz-6 and the lowest (4.8 cm, 3.8 cm and 42 g respectively) was recorded from local variety. The highest bulb yield (18.50 tha^{-1}) was recorded from BARI Piaz-6 and the lowest bulb yield (13.90 t ha^{-1}) was found in local variety. The highest gross margin (Tk. 405685 ha^{-1}) was found in BARI Piaz-6 and the lowest gross margin (Tk. 270685 ha^{-1}) was found in local variety (Faridpuri). In Sherpur, the highest bulb yield (13.22 t/ha) was produced from BARI Piaz-4 in Sherpur due to higher individual bulb weight and local variety produced lower bulb yield (10.04 t/ha) due to lower individual bulb weight. BARI Piaz-4 gave the highest gross return (Tk. 370160 ha^{-1}) and gross margin (Tk. 198792 ha^{-1}) due to highest production. Local variety gave the lowest gross return (Tk. 351400 ha^{-1}) and gross margin (Tk. 180032 ha^{-1}) in Sherpur because it produced lower yield.

On farm trial of turmeric varieties

M. M. Alam, M. Ahmed, M. H. Rahman, M. F. Islam, M. M. Rahman and A. K. M. Z. U. Noor

On farm trial of turmeric varieties were conducted at the farmers' field of Sherpur and Narsingdi district during 2024-25. Six turmeric varieties are evaluated under this experiment *viz*. BARI Halud-1, BARI Halud-2, BARI Halud-3, BARI Halud-4, BARI Halud-5 and local (Rangila) variety. The significantly highest yield was found from BARI Halud-1 (37.30 tha^{-1}) in Sherpur and Narsingdi was found in BARI Halud- 4 (28.04 tha^{-1}). The lowest yield was found from BARI Halud-2 (24.55 tha^{-1}) in Sherpur and Narsingdi was found in local variety (11.34 tha^{-1}).

On-farm trial of coriander varieties in Tangail

M. A. Rahaman, T. Tasmima, K. Roy, G. Paul and P. Sutradhar

The experiment was conducted at MLT site Mirzapur, Tangail during the *rabi* season of 2024-25 to popularize the coriander varieties at farmers' fields. The coriander varieties BARI Dhania-1, BARI Dhania-2, and local were used in this trial. The experiment was laid out in a randomized complete block design with three replications. Out of three coriander varieties, BARI Dhania-2 showed the highest yield (2.10 t ha^{-1}) and local one showed the lowest yield (1.60 t ha^{-1}) in Mirzapur, Tangail.

Adaptive trials with barley varieties and lines in high barind tract and costal regien of Bangladesh

M. U. S. Khatun, U. K. Laily, M. E. A. Pramanik, M. S. Hossain, H. M. K. Bashar, M. M. Islam, K. N. Islam, M. Rahman, M. K. Islam and T.S. Munmun

A set of experiment were conducted to assess the performance and popularize of BARI barley varieties (BARI Barley-6, BARI Barley-7, BARI Barley-8 and BARI Barley-9) in drought-prone areas Godagari, Rajshahi and coastal regions of Kuakata,, Patuakhali and Seven barley lines viz BHL-15, BHL-27, BHL-31, BHL-32, BHL-33, Check BB-7 and Check BB-10 were used in coastal area Koyra, Khulna districts, during 2024-25. Among the tested barley varieties BARI Barley-9 (1.97 tha^{-1}) performed better in drought prone areas of Rajshahi and BARI Barley-8 had the lowest grain yield, producing 1.61 t ha^{-1}. However, BARI Barley-7 produced the highest yield (2.45 t ha^{-1}), while the lowest yield (1.97 t ha^{-1}) was recorded form BARI Barley-9 under coastal saline environment Kuakata, patuakhali. Among the advanced barley lines there was significant variation in yield which ranges 1.18 to 2.35 t ha^{-1}. The highest yield produced from BHL-33 (2.35 t ha^{-1}) and the lowest was BHL-15 (1.18 t ha^{-1}) in coastal area of Koyra, Khulna.

Project: Integrated Farming

Integrated farming research and development for livelihood improvement in the plainland ecosystem

M. S. H. Molla, M. A. H. Talukder, Z. Ferdous, M. M. Rahman, M. A. Rahman and A. K. M. Z. Nur

The process of improving one's standard of living is complex and necessitates acquiring the necessities to satisfy one's basic needs. Continuing from the previous year, the program was carried out in 2024-25 in a participatory manner with the goals of improving family income and livelihood, developing integrated farming technologies, integrating component technologies with efficient use of farm

resources, and refining innovations created by NARS institutes. Atia, Delduar (Tangail), Tarakandi (Sherpur), Sholakundu (Faridpur), Gangarampur (Pabna), and Ajoddhapur (Rangpur) were the five Farming Systems Research and Development (FSRD) sites where it was carried out. Members of the group included marginal, small, and medium-sized farmers who partially or fully considered the off-farm, cattle, fisheries, field crops, and homestead fruits and vegetables as components of farming systems. The used components were brought under improved technological intervention. The average homestead size at the FSRD sites in Pabna, Rangpur, Sherpur, Faridpur, and Tangail were 0.14, 0.05, 0.07, 0.09, and 0.13 hectares, respectively. The average amount of vegetables produced per homestead at the site was 699 kg following intervention (AI), compared to just 170 kg before intervention (BI). Compared to BI, the average amount of vegetables consumed during AI was 279% higher, at 247 g head-1day-1. Fruit production per household averaged 585 kg, compared to 302 kg during BI. During AI, there was also an increase in average fruit consumption (averaging 118%). Through increased consumption of fruits and vegetables from the homestead garden, family members' daily nutritional needs were significantly supplied, particularly with carotene and vitamin C. Animal products from fish, chicken, duck and cattle also could help to minimize the protein deficiency. A total of 643 fruit trees were brought under pest management, and 1061 fruit saplings were distributed across several FSRD locations. Fruit tree management had a positive effect on farm households. The involvement of women (20-80%) in various agricultural pursuits rose significantly, which had some beneficial effects on gender parity within the household. Drip and sprinkler irrigation for homestead vegetable production is a cost-effective technology, especially for elite farmers who have a water pump system for residential use, as it can increase water use efficiency and crop productivity. Crop land sizes in the Pabna, Rangpur, Sherpur, Faridpur, and Tangail areas were, respectively, 0.84, 0.43, 0.54, 0.64, and 0.61 ha. By incorporating improved crops and varieties, improved cropping patterns were implemented at the field level. In the improved cropping pattern Mustard-Boro-T. Aman and Lentil-Sesame-T. Aman, the REY rose by 28.09% and 11.86%, respectively. In the livestock component, the prevalence of major cow diseases was lowered to less than 5% following deworming and vaccination. The minimal cost required for goat rearing made it seem like a potential endeavor. Pigeon rearing and the Sonali breed were maintained in some homesteads and areas, which had a positive effect on farm people as a good source of revenue and sustenance for their children. After immunization, the mortality rate for chickens decreased and was between 3 and 5%. Additionally, the production of vermicompost (300 kg/homestead) and farmyard manure (3550 kg/homestead) and their use, as well as the production of green fodder (60 t/ha) in specific homestead areas, had a positive effect on the farm families. Over all locations, the average pond size was between 0.04 and 0.06 hectares. Some farmers maintained their own projects after it was discovered that seasonal fish culture using carp polyculture in seasonal ponds showed promise. The average fish yield from carp polyculture was 3360 kg per hectare, which was good. Farmers also earned some extra money from various off-farm activities (average gross margin Tk. 11625 per household). Among the various production components, the field crop sector had the highest gross margin, while the gross margin improved the most in the homestead vegetable production sector, where overall gross margin increased by 100-947% per farm. Local Service Provider (LSP) operations (seed and seedling collection, production and distribution or sell, immunization, spraying, and other activities) were found to be promising for home gardening at the FSRD site in Gangarampur, Pabna. It was discovered that partially integrating farm components was a cost-effective approach.

Integrated farming for improving livelihood of resource poor farm households in drought and rainfed ecosystem

M. S. Hossain, M. Asaduzzaman, M. I. Nazrul, M. E. A. Pramanik and M. Zulfiqar

Agricultural production in drought-prone and rainfed ecosystems faces mounting challenges due to prolonged drought, elevated temperatures, irregular rainfall patterns driven by climate change, soil acidity, and declining fertility. These environmental constraints are further exacerbated by socio-economic pressures, including the shrinking availability of cultivable land, especially for resource-poor households.

To address these multifaceted challenges, an integrated and resource-efficient farming systems approach was implemented during 2024–2025 at the Farming Systems Research and Development (FSRD) sites in Basantapur, Godagari, Rajshahi, and Kamalbazar, Sylhet. The primary objectives were to optimize on-farm resource use, enhance homestead land utilization, improve year-round vegetable availability, and empower women and children through active participation in homestead-based agriculture. The research focused on two core components: (i) Homestead Production Systems and (ii) Crops and Cropping Systems. Technological interventions introduced high-yielding varieties and improved cropping patterns, such as Tomato–Boro–T. Aus, which proved to be both productive and economically viable. The integration of fruits, vegetables, and cereal crops significantly increased yields and income. On-farm validation of improved crop varieties—including BARI Alu-41, BRRI dhan48, Bina dhan7, and BARI Sarisha-14 resulted in higher economic returns compared to traditional practices. Notably, homestead vegetable production increased by 5.45 times following intervention, with average household outputs reaching 632 kg of vegetables and 526 kg of fruits. Corresponding gross margins were Tk. 8,015 and Tk. 12,640, respectively. Vegetable and fruit consumption rose by 230% and 133%, respectively, contributing to improved dietary diversity and nutritional intake. Enhanced farmyard manure uses improved soil health and sustainability. Active involvement of women and children in homestead gardening maximized resource use and contributed to food security and income generation. Overall, the integrated farming systems approach demonstrated substantial potential to enhance the resilience, productivity, and livelihoods of resource-constrained households in the High Barind Tract and northeastern regions of Bangladesh. These findings underscore the value of coordinated, site-specific, and inclusive interventions in transforming smallholder agriculture.

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. K. Uddin

The activities under integrated farming were carried out at two FSRD site, Jamla, Dumki, Patuakhali and North Wapda, Sadar, Noakhali during 2024-2025 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 136%, 403%, 118% of marginal, small and medium farmers, respectively in Patuakhali after project intervention, where intake of vegetables was markedly increased (33-114%) as compared to before intervention. Contrary, in Noakhali, it was increased about 81%, 45% and 76% of marginal, small and medium farmers, respectively and intake of vegetables was increased 67-85%. Average intake of fruits per year will be increased next years as the existing fruit trees are managed properly. A total of 144 saplings were distributed to enrich agroforestry system with 4 types of fruit trees in Noakhali, whereas 4 types of fruit trees a total of 96 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

Adoption status of BARI mustard varieties in selected areas of Cumilla district

M. J. Uddin

Mustard is an important oilseed crop valued for its edible oil, high protein content, and diverse uses in food, medicine, and industry. Therefore, an attempt was made to assess the adoption status of BARI improved mustard varieties and their management practices at farm level. The study was conducted in three upazilas namely Barura, Chandina and Debidwar in Cumilla district covering 155 mustard growers. Among them 122 BARI mustard adopters and 33 non-adoters were selected randomly for the study. Mean, percentage, standard deviation and Probit regression model was used. Analysis revealed that the rate of adotion of BARI Sarisha-14 (73.82%), BARI Sarisha-15 (2.0%), BARI Sarisha-17 (14.3%), BARI Sarisha-18 (4.45%) and Local (Tori-7), 2.78% irrespective of all locations. The adotion of different management techniques is found to be low compared to the recommended practiced by BARI. Probit model showed that education of the farmer, farm size, availability of seed and contact of SAAO enhanced the adoption of BARI mustard improved varieties. Results revealed that farmers showed positive attitude towards adoption of improved mustard varieties since about 61.18% for the adopters wanted to increase area under improve mustard cultivation in next growing season considering the high yielding ability, low cultivation cost, high profit, less labour requirements and market demand. Availability of improved mustard seeds were also important factors for adoption it at farm level.

Adoption and profitability of mandarin in Sylhet district

M. Akhtar Hossain, M. Asaduzzaman, M. I. Nazrul and K. U. Ahmad

This study explores the adoption, production practices, cost structure, and profitability of Mandarin cultivation in the Sylhet district with a specific focus on the Golapganj Union of Sylhet Sadar Upazila as a Mandarin growing area. Data were collected from 40 purposively and randomly selected Mandarin farmers through structured interviews conducted in February-March 2025. Results reveal that Mandarin cultivation in Sylhet is predominantly a secondary farming activity practiced with limited formal education and average landholdings of 1.32 hectares. The majority (80-90%) have adopted the improved BARI Multa-1 variety, though cultivation practices remain semi-traditional and low-input. Initial investment and input use are highest during the establishment year, with profitability emerging only after the fifth year of cultivation. Mature orchards (5-10 years) yield 15,825 kg/ha and generate a net return of Tk. 395,566/ha, indicating long-term economic viability. BCR was found 1.99 in 5-10 year period while gross return was found zero during 1-4 year period. Key challenges include climate variability, pest and disease infestations, inadequate access to quality inputs, lack of modern farming knowledge, and water scarcity. The study recommends enhanced extension services, improved access to certified planting materials, adoption of improved agronomic practices, and better market linkages to support sustainable Mandarin production and improve farmer livelihoods in the Sylhet region.

Project: Transfer of Technology

Pilot production program of mustard varieties in different locations

The production program was conducted at Kushtia, Pabna, Faridpur, Manikganj, Sherpur, Bhola, Noakhali, Khulna, Sylhet, Cox's Bazar, and Gopalganj district during the *rabi* season of 2024-25 to observe the performance of BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-18, BARI Sarisha-19, BARI Sarisha-20 and BARI Sarisha-21 at the farmer's field. All the varieties of Mustard in different locations gave better seed yield than that of the national average (1.15 t ha^{-1}). However, among the short duration tested mustard varieties (BARI Sarisha-14 and 17) the highest seed yield (1.75 t ha^{-1}) was found in BARI Sarisha-17 at Kushtia district. BARI Sarisha-18 gave the highest seed yield in Sherpur (2.35t ha^{-1}) through the variety took more duration for its maturity. The highest gross return

(188000 Tk ha^{-1}), gross margin (109075 Tk ha^{-1}) from Sherpur were calculated from BARI Sarisha-18 and the lowest gross return (107920 Tk ha^{-1}) were calculated from BARI Sarisha-14 at Cox'sbazar. The lowest gross margin (43250 Tk ha^{-1}) from BARI Sarisha-14 at Bhola. Farmers are interested in cultivating BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-19, the reason being impressed to have the higher yield of BARI Sarisha-14, BARI Sarisha-17 within a short period (75-85 days) and these varieties can be easily developed three or four crop based cropping pattern without hampering Boro cultivation.

Pilot production program of sunflower variety

The production program was conducted at farmer's field of Kushtia, Faridpur, Bhola and Cox's Bazar during *rabi* season of 2024-25. Seeds of BARI Surjomukhi-3 were sown 07 December to 17 January, 2025, after germination test of seeds and harvesting was done on 28 March to 20 April, 2025. Total area was 400 decimals maintaining a line to line spacing of 50 cm and plant to plant spacing of 25 cmThe days required to be mature the crop was 95-100 days. The average seed yield of BARI Surjomukhi-3 was 1705 kg ha^{-1}. Higher seed yield (1820 kg ha^{-1}) was obtained from Faridpur and lower (1500 kg ha^{-1}) at Cox's Bazar. The gross return (Tk. 163800 ha^{-1}) and gross margin (Tk. 72991 ha^{-1}) were higher at Faridpur. Farmers of Faridpur and Kushtia are happy in growing BARI Surjomukhi-3 due to its higher yield and an extra income generation. They also opined that it has an aesthetic value while flowers blooming. They are interested in cultivating for the next year if the seeds are available. In all location farmers are highly appreciated to get a new variety and they pleased to observe the dwarf type and yield performance of BARI Surjomukhi-3. Farmers are facing problem to sell their produce. In Kushtia farmers were very much impressed of BARI Surjamukhi-3 due to its short height, uniform big head and higher seed yield. They preserved their seeds and will go for cultivation in the next year. They sold BARI Surjamukhi-3 seeds among the neighboring farmers and they were also happy and interested to cultivate in the next year.

Production program of BARI groundnut varieties

The Production program of BARI Chinabadam-8, BARI Chinabadam-9 and BARI Chinabadam-10 was carried out at different Agro Ecological Zones of Bangladesh during *rabi* season of 2024-2025 to popularize and increase oil seed productivity as well farmers' income. BARI high yielding groundnut variety such as BARI Chinabadam-8, BARI Chinabadam-9 and BARI Chinabadam-10 was distributed among the 12 farmers at different districts where the total land area was 7.16 hectare. The seeds of BARI Chinabadam-8, BARI Chinabadam-9 and BARI Chinabadam-10 were sown on 5 November 2024 to 18 February, 2025 in different location with a seed rate of 100 kg ha^{-1}. The crop was harvested from 25 April to 22 June, 2025. The seed yield of BARI released groundnut varieties were ranged from 2.08-2.35 t ha^{-1} where the highest seed yield was obtained from BARI Chinabadam-8 (2.35 t ha^{-1}) in Kushtia. The lowest seed yield from BARI Chinabadan-10 (2.08) in Gopalganj. The highest gross return (249600) from Gopalganj.

Production program of sesame variety at Gopalganj

Sesame (*Sesamum indicum*) is grown in Bangladesh during both the *kharif* and autumn seasons, with about two-thirds of the crop produced during *kharif*. The ideal time to sow seeds is February to March, and the crop can be harvested after 120 to 140 days. Sesame is a crop that prefers hot, dry climates with temperatures between 25–30°C, and it can't tolerate waterlogging. Well-drained, loamy soil is also best for sesame cultivation, Average sesame yield in Bangladesh is about 957 kg ha^{-1}. Currently, about 38,923 ha of land are under sesame cultivation and annual production is about 37,260 m tons. BARI Til-4 is a high yielding variety of sesame. It should be disseminated and popularize to farmers. With this point of view, production program of BARI Til-4 was done at farmer's field of Tungipara, Gopalganj and Nazirpur, Pirojpur. The sowing date of crop was on 06 to 15 March 2025. The crop was harvested in 15 to 26 June 2025. The average yield and gross return of BARI Til-4 were 1.38 t ha^{-1} and Tk. 124200 ha^{-1}, respectively.

Pilot production program of soybean varieties

The production program was conducted at Noakhali, Bhola and Chandpur district during the *rabi* season of 2024-25 to observe the performance of BARI Soybean-5 and BARI Soybean-7 at the farmer's field. Quality seeds of the different BARI released

Soybean varieties were distributed. The seeds were broadcasted 70.0 kg ha^{-1}. Half of N and all other fertilizers were applied during final land preparation. The rest of N was top-dressed at 23 days after sowing (DAS) followed by irrigation. All the varieties of Soybean in different locations gave comparatively better seed yield except Noakhali However, among the short duration tested Soybean varieties (BARI Soybean-7) the maximum seed yield (2.30 t ha^{-1}) was found in Hanarchar, Chandpur. Farmers are interested to cultivate BARI Soybean-7, the reason being impressed to have the higher yield of BARI Soybean-7 within a shorter period (average of 85 days) and these variety can easily be fitted in this location.

Production program of bottle gourd at Gopalganj

The production of bottle gourd is lower in Bangladesh due to various reasons. Selection of good variety is very important. Bangladesh Agricultural Research Institute (BARI) has developed a new high yielding variety BARI Lau-4, which can be cultivated year-round. It should be disseminated and popularize to farmers. With this point of view, production program of BARI Lau-4 was done at farmer's field of MLT site, Muksedpur and MLT site Tungipara, Gopalganj. Seedlings were transplanted at 6 October and 20 November 2024. The land was fertilized with N-P-K-S-Zn-B at the rate of 150-175-150-100-12-10 kg ha^{-1}, respectively. The crop harvesting date at different locations was 05 January 2024 to 16 March 2025. The yield and gross return of BARI Lau-4 were 50.62t ha^{-1}, 749300 Tk. ha^{-1} and 3.47, respectively. Farmers and their neighbors of MLT site, Muksedpur and MLT site, Tungipara showed their interest to cultivate BARI Lau-4 for its better yield and profitability.

Production program of BARI mukhikachu at Narsingdi

A demonstration was carried out at Shibpur, Narsingdi during 2024-25 to observe the yield performance of BARI Mukhikachu-1 at farmer's field condition. One hundred two farmers were participated, cultivating a total area of 25.66 bigha. The planting dates were 05-10 April 2024. The crop was harvested 15-20 October, 2024. The price of Mukhikachu-1 was Tk. 30 per kg. The yield of BARI Mukhikachu-1 was 21.90 t ha^{-1}. Farmers expressed their satisfaction to show the preference of BARI Mukhikachu-1 due to its higher yield and profitability. They noted that the variety's robust growth and disease resistance contributed to its superior performance. The economic benefits of cultivating BARI Mukhikachu-1 were particularly appreciated, with farmers highlighting the increased income potential.

Pilot production of onion varieties in different locations

Among the main spice crops, onion *(Allium cepa)* is one of the most important and essential in Bangladesh. Onion is mainly grown in *rabi* season and harvested in spring or early summer. A production program of BARI Piaz-4 and BARI Piaz-5 under farmer's field condition at Kushtia and Gopalganj district during the *rabi* season of 2024-25. Seedling of BARI Piaz-5 were transplanted on 30 October to 05 November 2024 and harvested 25 January to 30 January 2025. The Seedling of BARI Piaz-4 were transplanted 10 January to 15 January 2025 and harvested 26 March, 2025. The yield of BARI Piaz-4 of Kushtia was recorded 20.94 t ha^{-1}. The yield of BARI Piaz-5 of Muhsedpur, Gopalganj was 19.66 t ha^{-1} which can be attributed to favorable agro-climatic conditions and effective management practices. The gross margin of BARI Piaz-4 at Kushtia was (Tk 478200 ha^{-1}) and gross margin of BARI Piaz-5 at Muhsedpur, Gopalganj was (Tk 407600 ha^{-1}) respectively (Table 1). The farmers involved in this study expressed satisfaction with the performance of BARI Piaz-4, and BARI piaz-5, particularly in terms of yield and disease resistance.

Pilot production programme of potato varieties at different locations

The production program was conducted at various locations in Bangladesh, including Kushtia, Kishoregonj, Gopalganj, Cumilla, Bhola and Cox'sbazar during *rabi* season of 2024-25. BARI potato varieties *viz*. BARI Alu-7, BARI Alu-46, BARI Alu-63, BARI Alu-72, BARI Alu-73, BARI Alu-78 and BARI Alu-87 were piloted in the farmer's field. Forty-two farmers were involved in this production program covering total land area of 68.32 hectares. Before planting, the seed tubers were soaked in 3% boric acid to control scab disease and sown on 26 November to 05 December 2024 maintaining the spacing 60 cm X 25 cm. The crop was harvested on 11 February to 7 March 2025. It

was observed that the highest tuber yield (39.74 t ha^{-1}) was obtained from the variety of BARI Alu-87 at Gopalganj. The variety BARI Alu-87 showed lower yield in farmer's field condition than expected performance. The yield of BARI Alu-73 in Cox'sbazar was the lowest at 22.50 t ha^{-1}, which may be due to the less favorable coastal climatic conditions and potential salinity issues in the soil.

Pilot production program of BARI brinjal variety at different locations

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 three districts-Manikganj, Faridpur and Gopalganj covering the land area 0.81 hectares. The multi-location trial assessed regional variations in yield, pest and disease resistance, and economic benefits. Transplanting dates varied across locations, ranging from late September to November 2024. Harvesting commenced in late December 2024 and continued until mid-April 2025. Results indicated an average yield of 44.67 t ha^{-1}, with the highest in Gopalganj (61.40 t ha^{-1}) and the lowest in Faridpur (31.78 t ha^{-1}). The highest gross return was (Tk. 1535000 ha^{-1}) in Gopalganj and lowest in Faridpur (Tk. 794500 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.

Production program of BARI Bt Begun-4 at Kushtia

The experiment was conducted at Kushtia sadar upazila during *rabi* season 2024-2025. Unit plot size was 280 m^2 with spacing of 1m row to row (bed 70 cm + 30 cm drain) and 0.8 m plant to plant. Thirty days old seedlings were transplanted on 26-28 November 2024. Stable bleaching powder was applied 20 days before transplanting @ 21 kg ha^{-1} for preventive measure against bacterial wilt. The fruits harvesting started at 15 February and continued up to 20 April 2025. Fruit yield and gross margin of BARI Bt. Begun-4 at Kushtia sadar was 22.25 t ha^{-1} and Tk. 595000 ha^{-1}, respectively. Sporadic infestation of other non-target sucking pests, like white fly, thrips, jassid, aphid, flea beetle, mite etc and diseases (bacterial wilt, fusarium wilt, phomopsis blight etc.) was observed in some fields.

Production program of BARI lentil variety at Kushtia

The production program was conducted at Kushtia sadar and MLT site: Bheramara during *rabi* season 2024-2025. OFRD, BARI, Kushtia has supplied all inputs like seed of BARI Masur-8, chemical fertilizers and pesticides to the farmers. Total land area was 1.00 ha under the production program. Seed rate was 37.5 kg ha^{-1}. Seeds were sown on 09-12 November, 2024 in different location. The crop was harvested on 06-10 March, 2025. Yield and other data were recorded. The gross economic return was calculated on the basis of prevailing market price of the commodities. Three famers were involved in the production program. The seed yield of BARI Masur-8 in Kushtia sadar and MLT site: Bheramara were 2.05 t ha^{-1} and 1.90 t ha^{-1} respectively. Gross margin of BARI Masur-8, in Kushtia sadar and MLT site: Bheramara were Tk. 118975 ha^{-1} and Tk. 106975 ha^{-1} respectively.

Production program of garden pea

The variety BARI Motorsuti-3 was used as planting material in the production program. Seeds were sown on 05 November, 2024. The crop was harvested from 08 to 12 January 2025. An average green pod yield (10.8 t ha^{-1}) was obtained from BARI Motorsuti-3. The crop duration was 68.0 days. The yield performance of garden pea variety BARI Motorsuti-3 appeared to be promising in the tested location. Gross return was found Tk. 4,86,000 ha^{-1} and gross margin was Tk. 3,75,500 ha^{-1} respectively (Table 1). Farmers are interested to cultivate BARI Motorsuti-3 due to market price is high and it can be easily fitted in Motorshuti-Boro-T. Aman cropping pattern without impede Boro cultivation.

Production program of BARI blackgram variety in different location

The pilot production program of BARI Blackgram variety (BARI Mash-3) was conducted at farmers'

field in Kushtia sadar upazila and Chargobindapur village under Daulatpur upazila of Manikganj district during *rabi* season of 2024-25. BARI Mash-3 was grown under rainfed condition. Total land area was 28.05 bigha. Seeds of BARI Mash-3 at Kushtia was sown 25 July 2024 and Manikganj 14 to 15 October, 2024 as broadcast @ 35 kg ha^{-1}. Hairy caterpillar was observed in some plots. Grass hopper was also observed in some plots. The pests were controlled spraying with Karate @ 2 ml L^{-1} and Nitro @ 2 ml L^{-1} water in the field. OThe crop was harvested at Kushtia 05 October, 2024 and Manikganj 25 to 28 December, 2024. An average seed yield of BARI Mash-3 at Kushtia was 1.10 t ha^{-1} and Manikganj 0.96 t ha^{-1}. The maximum gross margin was found Tk. 58000 ha^{-1}at Kushtia and lowest Tk. 51905 ha^{-1} at Manikganj. Previously farmers of this area used to cultivate local variety. They were happy to see the new variety and interested to grow BARI Mash-3 for its higher yield.

Production program of BARI black cumin at farmer's field

The pilot production program of BARI Black Cumin variety (BARI Kalozira-1) was conducted in the farmers' field at Chargobindapur village under Daulatpur upazila of Manikganj district during *rabi* season of 2024-25. BARI Kalozira-1 was grown under irrigated conditions in 3 farmer's field in 07 bighas of land. Seeds of BARI Kalozira-1 was sown as broadcast @ 10 kg ha^{-1} on 15 to 20 November, 2024. Plant protection measures were taken as and when required. The crop was harvested on 05 to 10 April, 2025. Root rot disease was observed in some plots and was controlled by spraying with Carbendazim @ 2 g L^{-1} water. The average seed yield of BARI Kalozira-1 was (0.895 t ha^{-1}) and gross margin (Tk. 170630 ha^{-1}) respectively

Production program of grass pea

The pilot production program of BARI Grasspea variety (BARI Kheshari-3) was conducted in the farmers' field at Chargobindapur village under Daulatpur upazila of Manikganj district during *rabi* season of 2024-25. BARI Kheshari-3 was grown under rainfed condition in 3 farmer's field in 6 bighas of land. The seed of BARI Khesari-3 was collected from Pulses Research Centre of BARI, Ishwardi. Seeds of BARI Kheshari-3 was sown as broadcast @ 55 kg ha^{-1} on 14 to 15 November, 2024. Hairy caterpillar was observed in some plots. The crop was harvested on 15 to 17 March, 2025.Data on yield was recorded plot wise and converted in to kg per hectare. The average seed yield of BARI Kheshari-3 was (1.45 t ha^{-1}) and gross margin (Tk. 71520 ha^{-1}) respectively.

Production program of BARI linseed at Noakhali

The production program was conducted in four farmers' field at Companiganj and Sadar upazila in Noakhali district during *rabi* season of 2024-25 to increase crop productivity through fallow land utilization. BARI Tisi-1 was used to address Fallow-Fallow-T.Aman cropping pattern. Soils of the field was silty-clay loam under the saline area of AEZ 18 with low organic matter content. Six hectare was covered at Companiganj by three farmers and 0.8 hectare by one farmer at Sadar upazila. Seeds were sown from one to 18 November 2024 at Companiganj and 25 November 2024 at Sadar upazila. Seed rate was 7 kg ha^{-1}. Seeds were sown with two ploughing. No weeding or irrigation was done. Harvesting was done from 15-22 March 2025. Yield of BARI Tishi-1was higher at Companiganj (820 kg ha^{-1}) whereas it was 780 kg ha^{-1} at Sadar upazila. Average yield was 815 kg ha^{-1}. Total variable cost (TVC) was Tk. 33600 ha^{-1} and it was lower than other winter crops as there was less fertilizer use and no pest or disease infestation and no weeding. Both gross return (GR) and gross margin (GM) was satisfactory though yield was low. GR at Companiganj and Sadar was Tk. 82000 and Tk. 78000 ha^{-1}, respectively. As TVC was same for both the locations GM followed the seed yield. GM at Companiganj and Sadar was Tk. 48400 and Tk. 44400 ha^{-1}, respectively.

Production program of BARI Barly-9 at Faridpur

A production program of BARI Barley-9 was conducted at the FSRD Site, Sholakundhu of Faridpur during the *rabi* 2024-25 to introduce and observe the performance of BARI Barley- 9 among the local farmers. The program was conducted in about 250 decimals of land and six farmers were selected. Seeds were sown on 08-15 December, 2024. The crop was harvested from 03-06 April, 2025. The seed yield obtained from BARI Barley-9 was 2.48 t ha^{-1} which was 60 % higher than that of local variety (1.55 t ha^{-1}). BARI Barley-9 showed higher gross return (111600 Tk. ha^{-1}) over the local cultivar (62000 Tk. ha^{-1}).

Production program of BARI released elephant foot yam varieties

The experiment was conducted in Kishoregonj during the year 2024-25 to observe the performance of BARI released Ol kachu varieties. BARI Ol kachu-1, BARI Olkachu-2 were used in this experiment. The unit plot sizes were 9 m × 4.5 m^2. Spacing was followed by 60 cm x 45 cm. Ol kachu were sown 15 April 2024. The recommended fertilizer doses were applied as N_{132} P_{34} K_{180} S_{20} $Zn_{4.3}$ $B_{1.7}$ kg^{-1} respectively. Harvesting of rhizome started from 21 October 2024 and ended at 21 November 2024. Data on yield and yield contributing characters were recorded and analyzed for report writing. The highest rhizome yield was obtained from BARI Olkachu-1 (39.84 t/ha) and the lowest from BARI Olkachu-2 (35.20 t/ha). The highest gross return (398400Tk/ha) and gross margin (224860 Tk/ha) were calculated from BARI Olkachu-1and the lowest from BARI Olkachu-2 (352000 Tk/ha, 178460 Tk/ha and 2.02) respectively.

Production program of BARI pani kachu varieties in Kishoreganj

The experiment was conducted at MLT site Hossainpur, Kishoregonj during the year 2024-25 to observe the performance of BARI released Panikachu varieties in that area. The design was RCBD with three disperse replication. Each farmer treated as each replication. Varieties were BARI Panikachu-1 (Latiraj) and BARI Panikachu-6. The unit plot sizes were 9 m × 4.5 m^2. Spacing was followed by 60 cm x 45 cm. Panikachu suckers were sown on 17 January 2024. Harvesting of stolon started from 20 June 2024 and ended at 30 August 2024. The Rhizome was harvested from August to September 2024. Data on yield and yield contributing characters were recorded and analyze for report writing. The highest stolon yield was obtained from BARI Panikachu-1 (26.25 t/ha) and the lowest from BARI Panikachu-6 (9.15 t/ha). In case of Rhizome, the highest Rhizome yield was obtained by BARI Panikachu-6 (39.33 t/ha) and the lowest from BARI Panikachu-1 (18.20 t/ha). The highest gross return (575750 Tk/ha), gross margin (318000 Tk/ha) and BCR (2.23) were calculated from BARI Panikachu-1 and the lowest from BARI Panikachu-6 (530550 Tk/ha, 272800Tk/ha and 2.05 respectively.

Pilot production of BARI Panikachu-2 at Mymensingh

The production program was carried out at Rampur and Bagan, Trishal under Mymensingh district during *Kharif* season of 2024. BARI Panikachu-2 was practiced in tested locations. The land was ploughing and cross ploughing was done with power tiller followed by laddering. The seedlings were planted on 02-30 January, 2024 with maintaining line to line distance 60 cm and plant distance 45 cm. The stolon was harvested from 6 May 2024 to 8 September2024 and rhizome was harvested from 12 to 25 September, 2024. The stolon and rhizome yield of BARI Panikachu-2 was 18.5 t $ha^{-1}$and 18.8 t ha^{-1}, respectively. Stolon harvesting was started from 6 May, 2024 and ended 8 September, 2024. The total gross return and gross margin from stolon and rhizome was prevailing as Tk. 832500.00 ha^{-1} and 282000.00 ha^{-1} where the farmer expends only Tk. 319375.00 ha^{-1}.

Pilot production program of zero tilage garlic at Pabna

The production program was conducted at MLT site, Atghoria, Pabna during the *rabi* season of 2022-23, 2023-24 and 2024-25. Farmers cultivated local garlic variety under zero tillage mulch condition. Immediately after receding of water from the field during the winter, the bulbs of garlic were planted on November 1-15, 2022; 25 November to 25 December 2023 and November 7-15, 2024 in the muddy soil maintaining spacing of 15 cm x 10 cm. The variety of BARI Rasun-1 was used in 2022-23, 2023-24 and BARI Rasun-5 was used in 2024-25. Dried rice straw mulch was uniformly placed in each plot immediately after planting of bulbs. In total 100 bighas of land in 2022-23 involving 60 farmers, 150 bighas of land involving 70 farmers in 2023-24 and 150 bighas of land involving 100 farmers in 2024-25 were included in this program. The crop was harvested on 25-30 March, 2023, 25 March to 15 April, 2024 and 18 March to 7 April, 2025. Bulb yield of zero tillage garlic (10.9 t/ha, 11.5 t/ha and 11.2 t/ha in 2022-23, 2023-24 and 2024-25) was higher as compared to conventional tillage system in 2022-23, 2023-24 and 2024-25, respectively.

Production of lentil as relay crop with T. Aman rice at Pabna

The production program was conducted at MLT site, Baoikhola, Atghoria, Pabna during *rabi* season in 2023-24 and 2024-25. BARI developed improved variety BARI Masur-8 was demonstrated through block approach at MLT site, Baoikhola, Atghoria, Pabna during *rabi* season, 2023-24 and 2024-25. The total size of the demonstration plot was about one hectare of six farmers in 2023-24 and four hectares of twenty farmers in 2024-25 were involved. The cooperative farmers were selected after a joint group discussion organized by OFRD, ARS, Pabna. Different inputs (Seed, fertilizers and fungicides) were supplied from OFRD, Pabna. The selected farmers received one day training on management of relay lentil production. The seeds of relay crops were sown on 5-15 November, 2023 and 1-10 November, 2024, 10-12 days prior to T. Aman harvest. Seeds were soaked overnight in fresh water for seed priming. The seed rate of lentil was 45 kg ha^{-1}. The crop was harvested on 17-22 March, 2024 and 15-22 March, 2025. The mean yield obtained from BARI Masur-8 was 1778 kg ha^{-1} which ranged from 1751-1828 kg ha^{-1} in 2023-24 and 1921 kg ha^{-1} which ranged from 1801-2125 kg ha^{-1} in 2024-25.

Production program of country bean on the support of chilli plant in Faridpur

A production program of country bean on dead chili plant used as trellis was conducted at the farmer's field FSRD site, under OFRD, BARI, Faridpur during *ra*bi, 2024-25 to demonstrate the performance of BARI Sheem-8 & local variety and to popularize BARI variety among the farmers. Seven (07) farmers were selected for this program with a total of 265 decimals of land. The treated seeds with Provax (Thiram 37.5% + Carboxin 37.5%) were sown on 05-15 September 2024. The yield obtained from BARI Sheem-8 was 15.75 tha^{-1} which was 14.32% higher than that of local variety (13.78 t ha^{-1}). BARI Sheem-8 showed higher gross return (315000 Tk ha^{-1}) over the local cultivar (220480 ha^{-1}). Gross margin BARI Sheem-8 (153212 t ha^{-1}) and local cultivar (68542tha^{-1}) respectively. The BCR of BARI Sheem-8 and Local were found 1.95 & 1.45, respectively. Farmers were happy with BARI Sheem-8 as it exhibited higher yield and gross margin for highest market price than local varieties.

Upscaling of IPM package of mungbean flower thrips and pod borer in Barishal

The upscaling program has been conducted over four locations of Barishal district (Babuganj, Bakerganj, Rajapur and Kathalia) during Late *rabi* 2024-25. Application of bio-pesticides, chemical and blue sticky traps were considered as treatment of the up-scaling program. IPM package of Blue sticky trap (3 numbers/decimal) + chlorfenapyr (benapore) 1ml/L at 35-40 DAS + 2 times spray of spinosad (Success 2.5 EC)/coragen which was compared with farmers practice (voliam flexi) two-time spray at 30-35 DAS and 45-50 DAS. Flower thrips population data were collected before every spray application and after 24 hrs of each spraying. Thrips population was assessed from 20 opened flower randomly collected from the field. The infested (bored) and total number of pods were counted and the percent pod infestation was determined using the following formula: % Pod infestation = (Number of infested pod/ Total number of pod) x 100. The grain yield was obtained from each plot converted into per hectare. The compiled data were analyzed by statistical software R and mean differences has been recorded at 5% level of significance. The effectiveness of IPM packages on thrips population and bod borer infestation was represented in Table 1. Flower thrips reduced drastically from number 10.50 to number 1 and 90.12 % reduction happened after 24 hrs of spray. Whereas from the farmers practice, it can be observed from % reduction for thrips population was 43.21%. From four different locations, mean pod infestation by pod borer from IPM package was 3.12 % and from farmers practice 10.60 %. Percent reduction over treatment was 74.8%. The highest yield can be observed from, IPM packages 1290 Kg/ha and yield increased over control was 27.72%. Farmers were reluctant to use bio pesticides at first, but after seeing the impact of insect reduction at their field they become eager to use the IPM technology. They also opined that, biopesticides are not easily available at local market.

Pilot production of mustard varieties in Cumilla region

M. J. Uddin

The pilot production programs were carried out in Cumilla region (Cumilla, Chandpur and

Brahmanbaria) during the *rabi* season of 2024-25. BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-18 and BARI Sarisha-20 were used in different locations in the pilot production program. Quality seeds of the different BARI released Mustard varieties were distributed. The seeds were broadcasted @ 8.0 kg ha^{-1}. All the varieties of Mustard in different locations gave comparatively better seed yield than that of the national average (650 kg ha^{-1}). However, among the short duration tested Mustard varieties (BARI Sarisha-14) the maximum seed yield (1.50 t ha^{-1}) was found in Debidwar. However, another short-duration variety BARI Sarisha-18 also performed comparatively better all over the locations and yield 1.83 t ha^{-1}. BARI Sharisha-17 and BARI Sarisha-18 gave the maximum seed yield 1.83 t ha^{-1} BARI Sarisha-20 seed yield 1.78t/ha respectfully at Debidwar, Cumilla. Farmers are interested to cultivate BARI Sarisha-14, BARI Sarisha-17 and BARI Sarisha-20 the reason being impressed to have the higher yield of BARI Sarisha-14, BARI Sarisha- 17 and BARI Sarisha-20 within a shorter period (average of 85 days) and these variety can easily be fitted in the Muastard-Sesame-B.Aman and Mustard-T.Aus-T. Aman cropping pattern without hampering the *rice* cultivation. Farmers in Cumilla impressed on seed yield BARI Sarisha-18, and it took more days to attain maturity which can be fitted in Mustard-Sesame-B. aman cropping pattern.

Pilot production program of sunflower variety in Cumilla

M. J. Uddin

The pilot production program of BARI Surjjomukhi-3 was conducted at farmers field in new areas of Voshna (Debidwar) in Cumilla during the *rabi* season of 2024-25 in-order to popularize the variety and raising farmers income. This pilot programme was conducted. The sunflower variety was used in different locations in the pilot production program covering (50 decimal) of land involving three farmers irrepective of all locations. Quality seed of the BARI Surjjomukhi-3 and all input support were supplied with free of cost. Recommended fertilizer dose were applied and crop management were done properly. The average seed yield (1.6 t ha^{-1}). Farmers are interested to cultivate BARI Surjjomukhi-3 due to its higher seed yield and oil content. Farmers opined that, the BARI Surjjomukhi-3 are suitable for that areas and it has less pest/disease infestation. Farmers are agreed to cultivate this variety if oil extraction facilities are provided in locally.

Production programme of potato variety in Cumilla region

M. J. Uddin

The pilot production programs were carried out in Cumilla region Chowdhurykhala, Sadar dakkhin, Cumilla and Gobindpur, Chandina in Cumilla during the *Rabi* season of 2024-25. BARI Alu-78 was used in different locations in the pilot production program. Quality seeds of the different BARI released Potato varieties were distributed. The Potato were broadcasted @ 500 kg ha^{-1}. Among the short duration tested Potato varieties (BARI Alu-78) the maximum seed yield (45.0 t ha^{-1}) was found in Gobindrapur Cumilla. However, BARI Alu-78 also performed comparatively better all over the locations and yield 39.5t ha^{-1}(Table 1). Farmers are interested to cultivate BARI Alu-78, the reason being impressed to have the higher yield of BARI Alu-78 within a shorter period (average of 85-90 days) and these variety can easily be fitted in this location.

Production program of sesame variety in Cumilla

M. J. Uddin

The production program of BARI Til-4 was conducted at farmers field in new areas of Hatila, Haziganj in Chandpur during the *rabi* season of 2024-25 in-order to popularize the variety and raising farmers income. The Sesame variety was used in different locations in the production program covering (33 decimal) of land involving three farmers irrepective of all locations. Quality seed of the BARI Til-4 and all input support were supplied with free of cost. Recommended fertilizer dose were applied and crop management were done properly. BARI Til-4 was harvested at 80-90 DAS. The average seed yield (1.31 t ha^{-1}). Farmers are interested to cultivate BARI Til-4 due to its higher seed yield and oil content. Farmers opined that, the BARI Til-4 are suitable for that areas and it has less pest/disease infestation. Farmers are agreed to cultivate this variety if oil extraction facilities are provided in locally.

Pilot production program of aroid varieties in Cumilla

M. J. Uddin

The production program of BARI Panikachu-1 was conducted at farmers field in new areas of Purbo Shilmuri, Barura in Cumilla during the *Kharif-II* season of 2024-25 in-order to popularize the variety and raising farmers income. This Production programme was conducted. The Panikachu variety was used in different locations in the production program covering 50 decimal of land involving two farmers in the location. Quality seed of the BARI Panikachu-1 seedllings and all input support were supplied with free of cost. Panikachu variety was harvested at 70 DAS continue 05 (Five) month. BARI Panikachu-1 was harvested at 90-100 DAS. Irrespective of all locations, the BARI Panikachu-1 gave comparatively better yield. The stolon yield (32.66 t ha^{-1}) was obtained from Barura MLT site. Farmers are happy to see the performance of BARI Panikachu-1 due to its higher yield of stolon and its high market demand. Farmers opined that, the BARI Panikachu-1 are suitable for that areas and it has less pest/disease infestation. A good amount of stolon has been preserved by the farmers for growing in the next year. It has an enough export potentiality.

Production programme of BARI begun-10 in Cumilla region

M. J. Uddin

A production program BARI Begun-10 was conducted at farmer's field of the MLT site areas in Monipur Sadar Dakkhin, Cumilla, Gobindopur, Chandina, Cumilla, Mohammadpur Sadar, Brahmanbaria district during the *rabi* season of 2024-25 to popularize BARI Begun-10 and to observe the local neighboring farmers, DAE personnel and NGO workers. The program was conducted in about 70 decimal (2.09 bigha) of land and Three (03) numbers of farmers were involved. Among the short duration tested Brinjal varieties (BARI Begun-10) the yield (38.12t ha^{-1}) was found in Gobindrapur, Chandina, Cumilla. However, BARI Begun-10 performed comparatively better all over the locations and yield 27.93t ha^{-1}. Farmers are interested to cultivate BARI Begun-10. The reason being impressed to have the higher yielding variety within a shorter period (average of 90-120 days) and these variety can easily be fitted in this location.

Production programme of BARI Begun-12 in Cumilla region

M. J. Uddin

A production program of BARI Begun-12 was conducted at farmer's field of the MLT site, Gonigor, Debidwar, Alumora, Chnadpur Sadar, Chandpur, Gobindrapur, Chandina, Cumilla district during the *rabi* season of 2024-25 to popularize BARI Begun-12 and to observe the local neighboring farmers, DAE personnel and NGO workers. The program was conducted in about 164 decimal (1.95 bigha) of land and Three (03) numbers of farmers were involved. Among the short duration tested Brinjal varieties (BARI Begun-12) the yield (53.81t ha^{-1}) was found in Gonigor, Debidwar. However, BARI Begun-12 performed comparatively better all over the locations and yield 44.30t ha^{-1}. Farmers are interested to cultivate BARI Begun-12. The reason being impressed to have the higher yielding variety within a shorter peiod (average of 90-120 days) and these variety can easily be fitted in this location.

Production programme of sweet gourd variety in Cumilla region

M. J. Uddin

A production program of BARI Misty Kumra-2 was conducted at farmer's field of the MLT site areas in Raniara, Kuti, Kasba and Purbo Hatila, Hazigong during the *rabi* season of 2024-25 to popularize BARI Misty kumra-2 and to observe the local neighboring farmers, DAE personnel and NGO workers. The program was conducted in about 35 decimal (1.1 bigha) of land and Two (02) numbers of farmers were involved. Among the short duration tested Sweet gourd varieties (BARI Misty kumra-2) the yield (25.0t ha^{-1}) was found in Purbo Hatila, Hazigong. However, BARI Misty Kumra-2 performed comparatively better all over the locations and yield 20.75t ha^{-1}. Farmers are interested to cultivate BARI Misty Kumra-2. The reason being impressed to have the higher yielding variety within a shorter period (average of 100-120 days) and these variety can easily be fitted in this location.

Production programme of bottle gourd variety in Cumilla region

M. J. Uddin

A production program of BARI Lau-4 was conducted at farmer's field of the MLT site areas

in Vosna, Debidwar, Sonargoar, Kharara, Kasba, B.Baria, Gobindrapur, Chandina district during the *rabi* season of 2024-25 to popularize BARI Lau-4 and to observe the local neighboring farmers, DAE personnel and NGO workers. The program was conducted in about 60 decimal (2 bigha) of land and Three (03) numbers of farmers were involved. Among the short duration tested Bottle gourd varieties (BARI Lau-4) the yield (62.96t ha^{-1}) was found in Vosna, Debidwar, Cumilla. However, BARI Alu-4 performed comparatively better all over the locations and yield 54.53t ha^{-1}. Farmers are interested to cultivate BARI Lau-4. The reason being impressed to have the higher yielding variety within a shorter period (average of 90-120 days) and these variety can easily be fitted in this location.

Production programme of tomato variety in Cumilla region

M. J. Uddin

A production program BARI Tomato-17 was conducted at farmer's field of the MLT site areas in Gobindrapur, Chandina Monohara, Barura and Mirpokurpar, Kasba, B.Baria during the *rabi* season of 2024-25 to popularize Tomato varieties (BARI Tomato-17 and BARI Tomato-19) and to observe the local neighboring farmers, DAE personnel and NGO workers. The program was conducted in about 33 decimal (1 bigha) of land and Four (04) numbers of farmers were involved. Among the short duration tested Tomato varieties (BARI Tomato-17 and BARI Tomato-19) the maximum yield BARI Tomato-17 (65.66t ha^{-1}) was found in Gobindrapur, Chandina. However, BARI Tomato-17 and BARI Tomato-19 also performed comparatively better all over the locations and yield 58.34t ha^{-1}. Farmers are interested to cultivate BARI Tomato-17 and BARI Tomato-19 the reason being impressed to have the higher yielding variety within a shorter period (average of 90-120 days) and these varieties can easily be fitted in this location.

Production programme of danta variety in Cumilla region

M. J. Uddin

The production programs of BARI Danta-3 was carried out in Cumilla region Sayedpur, Cumilla Sadar, Gobindra, Chandina in Cumilla and Monkashir, Kasba, B.Baria during the *Rabi* season of 2024-25. BARI Danta-3 was used in different locations in the pilot production program. Quality seeds of the different BARI released Danta varieties were distributed. The Danta were broadcasted @ 2 kg ha^{-1}. Among the short duration tested Danta varieties (BARI Danta-3) the maximum seed yield (27 t ha^{-1}) was found in Sayedpur, Cumilla. However, another short-duration variety BARI Danta-3 also performed comparatively better all over the locations and yield 25.25t ha^{-1}. Farmers are interested to cultivate BARI Danta-3, the reason being impressed to have the higher yield of BARI Danta-3 within a shorter period (average of 82 days) and these variety can easily be fitted in this location.

Production programme of country bean variety in Cumilla region

M. J. Uddin

The production programs of BARI Seem-1was carried out in Cumilla region Vinglabari, Debidwar, Dhairkhar, Kasba, B.Baria, Syedpur, Cumilla and Gobindpur, Chandina in Cumilla during the *rabi* season of 2024-25. BARI Seem-1 was used in different locations in the production program. Quality seeds of the different BARI released Country Bean varieties were distributed. The Country bean were broadcasted @ 5-7 kg ha^{-1}. Among the short duration tested Country bean varieties (BARI Seem-1) the maximum yield (19.29t ha^{-1}) was found in Vinglabari. However, BARI Seem-1 also performed comparatively better all over the locations and yield 14.02t ha^{-1}. Farmers are interested to cultivate BARI Seem-1, the reason being impressed to have the higher yield of BARI Seem-1 within a shorter period (average of 85-90 days) and these variety can easily be fitted in this location.

Pilot production of soybean varieties in Cumilla region

M. J. Uddin

The pilot production programs were carried out in Cumilla region Bakharpur, Hanarchar Chandpur during the *rabi* season of 2024-25. BARI Soybean-7 was used in different locations in the pilot production program. Quality seeds of the different BARI released Soybean varieties were distributed. The seeds were broadcasted @ 70.0 kg ha^{-1}. The varieties of Soybean in different locations gave comparatively better seed yield. However, among the short duration

tested Soybean varieties (BARI Soybean-7) the maximum seed yield (2.30 t ha^{-1}) was found in Hanarchar, Chandpur. However, another short-duration variety BARI Soybean-7 also performed comparatively better all over the locations and yield 2.3t ha^{-1}. Farmers are interested to cultivate BARI Soybean-7, the reason being impressed to have the higher yield of BARI Soybean-7 within a shorter period (average of 85 days) and these variety can easily be fitted in this location.

Production programme of BARI pointed gourd variety in Cumilla

M. J. Uddin

A production program of BARI Patol-1 was conducted at farmer's field at Monohara, Barura and On-station, Shasongacha, Cumilla during the *rabi* & *Kharif* season of 2024-25 to popularize BARI Patol-1 and to observe the local neighboring farmers, DAE personnel and NGO workers as well as raising farmers income. The program was experimented in only 5 decimal of land for one farmers in Barura was involved. The seedllings of BARI Patol-1 was collected from HRC, BARI, Gazipur. The seedllings was planted with maintaining spacing 2.25mX2.25 m. The seedllings was planted 24 November, 2024 with maintaining male:female ratio:10:1. Before planting the seedlling, the pit (50 cmx50 cm x50 cm) was prepared in bed systems. In total, five times was harvested with yield obtained 98 kg in total (19.6 kg/harvest) from 26 plants of BARI Patol-1. The details result will be shown after full harvest ofcrop in October, 2025. Farmers are interested to cultivate BARI Patol-1. The reason being impressed due to its higher yield, soft seed, tasty and high market deamnd.

Production programme of tomato varieties at Cumilla

M. J. Uddin

The production program was conducted at MLT site areas in Gobindrapur, Chandina Monohara, Barura and Mirpokurpar Kasba, B.Baria during the *rabi* season of 2024-25 to observe the performance of BARI Tomato-17 and BARI Tomato-19 at the farmer's field. Four number of farmers were involved in this production program covering the total land area 50 decimal. The maximum yield of BARI Tomato-17 (65.66t ha^{-1}) was found in Gobindrapur, Chandina. However, BARI Tomato-17 and BARI Tomato-19 also performed comparatively better all over the locations, and the yield of BARI Tomato-19 was 58.34 t ha^{-1}. Farmers are interested to cultivate BARI Tomato-17 and BARI Tomato-19, the reason being impressed to have the higher yield and economic return.

Production program of BARI seem-1 at Cumilla

M. J. Uddin

The production programs of BARI Seem-1was conducted at Cumilla during the *rabi* season of 2024-25. BARI Seem-1 was used in different locations in the production program. Quality seeds of the BARI released Country Bean variety were distributed. The Country bean was broadcasted @ 5-7 kg ha^{-1}. BARI Seem-1 in different locations gave comparatively better green pod yield. The average green pod yield of Country bean variety (BARI Seem-1) was (14.02 t ha^{-1}). Farmers are interested to cultivate BARI Seem-1, the reason being impressed to have the higher yield of BARI Seem-1 within a shorter period (average of 85-90 days) and its high bearing capacity, good taste and high price in market.



PLANT PATHOLOGY

15

Executive Summary

Diseases are the main concern in crop production. Plant Pathology Division (PPD) mainly focus on basic and applied research of plant pathogens, disease diagnosis, monitoring and management of BARI mandated crops caused by different biotic (fungi, virus, bacteria and nematode) and abiotic factors. The division also work on seed pathology, crop loss assessment, pre-registration trial of new fungicides, clinical services to the growers, post-harvest losses etc. A total of 107 experiments were reported during the cropping season 2023-2024 including division centers, RARS, ARS and OFRD. All the research works were prioritized on the basis of rapporteurs reports of different reviews and the opinion of expert's panel on current issue and importance of plant pathogens (Fungus, Bacteria, Virus and Nematode). This cropping season we had conducted research programs on 30 different crops under Tuber crops, Pulse crops, Oilseed crops, Spice crops, Vegetable crops, Fruit crops, Flower crops and others.

Tuber crops

Fifteen experiments were conducted on tuber crops (Potato and Sweet potato) mainly focus on resistant screening, varietal evaluation, disease management and survey against fungal, bacterial and viral diseases. Also study the hybrid clones against viral disease. Several potato and sweet potato lines were found resistant against late blight and viral diseases. BARI alu-90 was selected late blight resistant where BARI alu-77 and 46 were moderately resistant. In case of fungicidal management, Cypa 52.5 WG (Cymoxalin 30% + Famoxadone 22.5%) @ 2mg/L was found better against late blight disease. According to disease survey, late blight was found more prevalent and PLRV, PVY, PVX etc. were found low to medium incidence range.

Pulse crops

Nine research works were executed on three pulse crops like lentil, chickpea and field pea regarding pathogen characterization, resistant screening and bio-chemical management of foot and root rot, fusarium wilt, stemphylium blight and rust disease. Root rot disease mainly caused by *Fusarium spp. Rhizoctonia spp Sclerotium spp*. Seed treatment with Provax 200 WP (Carboxin + Thiram) @ 0.3% also Bioderma (*Trichoderma harzianum*) @ 3% presented better performance to control foot and root rot disease. Fungicides Luna sensation (1ml/L), Navara (1ml/L), and Stromin (2g/L) successfully reduced the stemphylium blight disease. Seed treatment + Spraying with Tricomax and Soil amendment with tricho-compost + spraying with tricho-leachate in the rhizosphere performed better against foot and root rot disease of lentil. On the other hand, seed treatment with Provax 200 WP @ 3 g/kg showed better performance + Spraying with Goldazim 500 SC @ 0.1% at 25 DAS and Dynamic WP (*Bacillus amyloliquefaciens*) @ 5 g/kg seed to control Fusarium wilt disease of Chickpea. Under screening of field pea against rust disease, 121germplasm were showed resistant and 3 were Moderately resistant. Nativo 75 WP as well as Azonil 56 EC @ 1 ml/L was found effective against rust disease of field pea.

Oilseed crops

Under Oilseed crops nine research programs were reported on mustard, groundnut and sunflower to find out resistant lines and manage of different fungal diseases. Five mustard lines (NAP-20002, NAP-16036, BJ-2014-Y-04, BJ-10-10104(Y), and BJ-1110(12)-1 were reported moderately resistant against Alternaria blight disease. Rovral, Amister top and Navara were found better for managing Alternaria blight and Rovral and Amistar Top for

white mold disease. No groundnut germplasm or variety were found resistance against Tikka/leaf spot disease. Clubroot disease caused by *Plasmodiophora brassicae* was found newly emerging disease of oilseed crops in many areas.

Spice crops

Eleven research works were reported on spice crops including onion, black cumin, chilli and turmeric mainly focus on varietal screening, fungicidal, bio-fungicidal and integrated disease management of fungi and viruses. Four onion lines viz. AC-GAZ-384, AC-GAZ-380, AC-Bog423-AF5 and AB4(379) were preliminarily selected as promising against purple blotch disease. Bio-fungicide Lycomax was found effective against purple blotch disease of onion. Fungicide Luna sensation and Amistar top were found effective against purple blotch and Alternaria of onion. Black mould and soft rot diseases of onion were found predominant in the storage. Eleven different diseases were recorded from 8 different spice crops (Onion, chilli, black cumin, celery, ginger, plum, chaba, and vanilla). Thirty different isolates of *Fusarium* spp. were identified as a causal agent of wilt of black cumin. The rhizome rot (wilt) of turmeric by *Ralstonia solanacearum* was found predominant at different areas in Bangladesh. Plants treated with *Trichoderma harzianum* showed induced systemic resistant against CMV of chilli.

Vegetable crops

Thirty different experiments were executed on different vegetable crops like Tomato, Cucumber, Brinjal, Pumpkin, Bottle gourd, Okra and Country bean. The research works focus on resistant screening of different vegetable germplasm, fungicidal, bio-rational and integrated management of Fungal, Bacterial, Nematode and Viral diseases. Luna sensation 50 SC, Nativo 75 WG, Amistar Top 325 SC @, Indofil M 45 @ and Rovral 50 WP were effectively reduced stem rot & leaf blight of tomato. Most of the cases integrated approach was found better in controlling early and late blight disease of vegetables. BARI Tomato-11, AV-135, AV-1616, 1008, AVTO-1315, AV-1306, AVTO-1921 and 1903 showed resistant reaction bacterial wilt of tomato. Stable Bleaching Powder @ 25kg/ha+ Burning of rice husk @ 4.18 t/ha (in pit) + Bacillus based bio-fungicide was found effective against bacterial wilt of vegetables. One spray of Imidacloprid 0.1% at 5 Days before transplanting + Sticky yellow trap in the plot + 3 sprays of Imidacloprid /Phytomax at 15 days' interval was reported effective against ToLCV of tomato. AVTO-1315, BARI Tomato-11, AVTO-1010, AV-1907, AVTO-1921and AV-195 were found resistant against root-knot nematode. Different composts and bio-chars were effective for reducing root-knot nematode of vegetables. Tricho-compost and Rugby 10G were found effective for reducing root-knot disease of cucurbits. Country bean germplasm DLST 0032 was performed the best to the multiple viral disease complex of country bean.

Fruit crops

Eighteen research works were executed on seven fruit crops like mango, guava, banana, citrus, strawberry, watermelon and papaya. Most of the experiments focus on management of fungal, bacterial and viral diseases. Goldazim 500 SC and NAA was found better for reducing mango floral malformation.

Fungicide Arba 50 WP, Goldazim 500 SC, Knowing 50WP, Amister top and Cabrio top were selected as best for controlling Anthracnose of mango. Rovral and 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 were found effective in controlling leaf spot, root rot and anthracnose disease of strawberry. Autostin 50WDG @ 2 g/L effectively controlled the Fusarium wilt of watermelon. The endophytes Iso-16 and Iso-37 were found effective in controlling wilt disease of guava. Bacillus velezensis GL6 and B. tropicus K3 and their EMOs, BHAT-03 WP showed consistent disease suppression to fungal wilt in BARI Kala 1.*B. subtilis* GBO3, *Bacillus oryzicola* YC7007, *Bacillus velezensis* were selected as a strong endophytic for controlling bacterial black spot of mango. EMOs, BHAT-02 WP made by strains YC7007 and YC7012 showed the good grafting projection and showed significantly consistent disease suppression to greening disease of citrus. The RB genotype of CTV in sweet orange was identified in Bangladesh by using molecular tools. Spraying of Imidacloprid (0.1%) 4 times at 15 days interval + sticky yellow trap or spraying of Phytomax (0.2%) 4 times at 15 days interval + sticky yellow trap was found effective against PRSV of papaya.

Flower crops

Five experiments were reported on flower crops including Marigold, Gerbera, Lilium and Aloe Vera mainly focus on fungal disease diseases management. Fungicides Novera 28SC showed good performance controlling botrytis blight disease of marigold and in case of white mold disease neem oil cake @ 800 kg/ha + three times foliar spray with Amistar Top 325 SC @ 1ml/l performed better. Luna sensation 50WP, foliar spray with Tricomax and Neem leaf extract performed better against Alternaria leaf spot of gerbera. application of Calcium carbonate @ 6.25% at an interval of 10 days starting from the first appearance of the disease symptoms effectively controlled the leaf spot disease of Aloe vera.

Others

Under this section ten research activity were reported on characterization of pathogens and disease survey. Two entomopathogenic fungi were isolated and characterized like *Cordyceps javanica* and Beauveria sp. Morpho-physiological study was conducted on different isolate of *S. sclerotiorum*. Molecular identification was done for root-knot nematode Meloidogyne incognita of bottle gourd, okra, red amaranth and spinach in Bangladesh. Thirty-two endophytic colonizing bacterial strains were isolated from two solanaceous vegetable crops, brinjal and chilli. Two isolates were found antagonistic to *Ralstonia Solanacearum*. Different crops diseases were monitoring under various survey reports.

Activities: Tuber crops: Potato

Evaluation of new fungicides against late blight of potato

Md. Iqbal Faruk and Md. Haider Hossain

Twenty five different new fungicides were tested against late blight disease of potato and their influence on the crop was compared with a control (water spray). The experimental was conducted in the field of RARS of BARI, Cumilla during *Rabi* season of 2024-25. In this cropping season and locations, incidence of late blight disease was not appeared in the experimental field. However, fungicidal spray influenced the tuber yield to some extent. Among the 25 fungicides evaluated in the present experiment, only 3 caused significant increase in tuber yield over control. The highest tuber yield was obtained with fungicide having code no. 1391 (45.46 t ha^{-1}) followed by Melody Duo (46.11 t ha^{-1}) and Code no. 1363 (45.46 t ha^{-1}). Tuber yield in the rest 22 fungicide were statistically similar to that of control, where code no. 1371 showed the lowest yield (31.15 t ha^{-1}), which was followed by the fungicides code nos. 1371 (31.28 t ha^{-1}), 1370 (31.97 t ha^{-1}), 1374 (32.22 t ha^{-1}), 1443 (32.62 t ha^{-1}) and1387 (35.97 t ha^{-1}).

Efficacy of new fungicides in controlling late blight of potato

H. Rahman and M. M. Rahman

An experiment was conducted to evaluate 25 new chemical fungicides with a view to find out appropriate ones to control the late blight disease of potato. The experiment was conducted at the Regional Agricultural Research Station of BARI, Jamalpur during *Rabi* season of 2024-25 under natural inoculum pressure. The fungicides were supplied by the Pesticide Technical Advisory Committee (PTAC). A standard fungicide (Ridomil Gold 68 WG) and a control (water) were included in the experiment. Efficacy of new fungicides ranged from 9.74 to 98.82% where fungicide encoded 1615 demonstrated the lowest efficacy as highest in the fungicide encoded 1669 followed by 1660 (97.37%), 1666 (96.06%), 1718 (92.51%) and 1656 (90.82%), respectively. More than 95% disease suppression was observed due to the spray with 1660, 1666, 1669 encoded fungicide. On the other hand, 1656 & 1718 encoded fungicide suppressed the disease 90.82% and 92.51%, respectively. There was over 80% disease suppression because of the 1684, 1686.1687, and 1711 encoded fungicide application. Fungicides No. 1626-1669, 1687, 1699, 1708, 1714, 1718, 1740, 1757 and 1762 yielded significantly larger tuber compared to control. Except 1531, 1615, 1622, 1740 and 1743, other 20 fungicides significantly increased tuber yield per hectare over control

Efficacy of fungicides in controlling late blight of potato

M.Z. Masud, M.I. Hossain, M.M. Begum and M. S. Hossain

A total of 9 different new fungicides were tested against late blight disease of potato at the BSPC,

Debiganj, Panchagarh during the Robi season 2024-25. Results reveal that most of the tested fungicides reduced the disease significantly over control. Among the 9 fungicides, Zampro and Acrobet MZ showed excellent performance in controlling late blight disease and yielding potato tuber (32.22 t/ha and 31.99 t/ha respectively). Disease severity was reduced over control by 67-97% due to apllication of fungicides. The lowest tuber yield (12.63 t ha^{-1}) was observed under control. Significant increase in tuber yield was obtained with all fungicide compared to control. Under different fungicides, the yield varied from 27.76 to 32.22 t h^{-1} but the variations were not significant (Table 1).

Survey on potato diseases in northern part of Bangladesh

M.Z. Masud, M.I. Hossain, M.M. Begum and M. S. Hossain

A survey was conducted to observe the incidence of potato diseases in northern part of Bangladesh. Late blight disease incidence was medium in Rangpur, Kurigram, Dinajpur, Thakurgaon and Panchagarh and lower in Nilphamary and Lalmonirhat districts. Bacterial wilt and black leg incidences were medium in early season of potato cultivation. Incidence of common scab, mosaic, stem rot, early blight, stem canker and black scurf, PVY were low.

Screening of potato genotypes against bacterial wilt (*Ralstonia solanacearum*) *under* pot condition

M. Nazneen, F. Elahi, R. Islam, M. M. Islam, M. H. Rashid and M. H.Hossain

An experiment was conducted to evaluate 36 BARI released potato varieties for resistance to bacterial wilt caused by *Ralstonia solanacearum* under pot conditions in the net house of the Plant Pathology Division, BARI, Gazipur, during the 2024-2025 cropping season. The varieties grown in pots and were artificially inoculated with virulent isolates *R. solanacearum* (10^8 cfu/mL) following stem inoculation and soil drenching (20 mL) methods through root injuries. Percent disease incidence (PDI) was recorded using a disease rating a scale standard. Unfortunately, no disease incidence was observed due to unknown reason.

Screening of antagonistic bacteria from potato plants and rhizosphere for their efficacy to control bacterial wilt

M. Nazneen, F. Elahi, R. Islam, M. M. Islam, M. H. Rashid and M. H.Hossain

An experiment was conducted in the laboratory of plant pathology division, BARI during 2024-2025 potato growing season to isolate bio-antagonistic bacteria from potato plant and rhizosphere to investigate their antagonistic effects on *R. solanacearum*, the causal agent of bacterial wilt in potato. Apparently healthy plant samples parts such as the tuber, root, stem, leaf, and rhizospheric soil were collected and isolation of bio-antagonistic bacteria was carried out following dilution plate technique on different selective media. The purified bacterial isolates were tested for antagonism against *R. solanacearum* through duel culture plate technique and streaking method. A total of 26 different probable antagonistic bacterial strains were isolated. Among these, 11 isolates were found to possess antagonistic effects on *R. solanacearum*, showing inhibition zone ranging from 1.8 to 19.62 mm in diameter and suppressing the pathogen population in agar disc diffusion assays.

Incidence of common scab on BARI released potato varieties

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

Twelve BARI released potato varieties viz. BARI Alu-7, BARI Alu-37, BARI Alu-40, BARI Alu-46, BARI Alu-47, BARI Alu-48, BARI Alu-49, BARI Alu-62, BARI Alu-73, BARI Alu-78, BARI Alu-87 and BARI Alu-88 were evaluated for their response to common scab disease. The experiment was conducted at Tuber Crops Research Centre, BARI, Joydebpur, Gazipur during 2024-25 cropping year under the field condition in *Rabi* season. Varieties BARI Alu-37, BARI Alu-47, BARI Alu-88, BARI Alu-87 and BARI Alu-62 showed lower scab incidence (less than 5.0%) compared to other varieties, the germination ranged from 73.33 to 95.00% and the yield ranged from 16.00 to 24.12 t\ ha among the verities.

Evaluation of the exotic potato lines for their resistance to PLRV and PVY under the infection pressure

M. M. Begum

Three exotic potato lines were evaluated against PLRV and PVY to find out the resistant source (s). The experiment was conducted at Joydebpur, Gazipur during 2024-25 potato growing season. Based on field observation and according to ELISA test, all lines were found to be infected with PLRV, PVY and other viruses.

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

M. M. Begum

Six potato lines (4th progeny) were evaluated against PLRV and PVY to find out resistant source (s) at Joydebpur, Gazipur. 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 (fourth progeny) for PLRV and PVY resistance under the infection pressure

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

Fourteen potato lines along with a check, Diamant were evaluated against PLRV and PVY to find out resistant source(s) at Joydebpur, Gazipur. All lines including Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2024-25 at Joydebpur. Though, potato line Chenoa was found free from virus infection, but potato line 18.19 and 18.43 performed better considering all the parameters and found less susceptible to viruses.

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

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

Three exotic potato lines along with a check, Diamant were evaluated against PLRV and PVY to find out resistant source (s). All lines including the check were exposed to the infection pressure of PLRV and PVY. All the exotic lines were found more susceptible to potato viruses than that of the Check Diamant. Germination, vigour and yield of all exotic lines reduced gradually in parallel with higher progeny.

Evaluation of potato lines (second progeny) against PLRV and PVY under infection pressure

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

Sixteen potato lines along with a check Diamant were evaluated against PLRV and PVY to find out resistant source (s). All lines including a check variety Diamant were exposed to the infection pressure of PLRV and PVY in the cropping season of 2024-25 at Joydebpur. The hybrid clones 19.340, 19.870 and 19.113 were found free from all viruses and showed higher vigour and yield compared to other lines.

Evaluation of potato hybrid clones (Generation-1) and exotic lines against PLRV and PVY resistance

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

A total of twenty eight first generation potato lines and variety Diamant (as a control) were evaluated against PLRV and PVY at Joydebpur, Gazipur during 2024-25 to find out the resistant source(s). All tested lines and the check variety Diamant were completely free from virus infection.

Detection viruses in potato plantlet samples supplied by different companies using das-elisa

M. M. Begum

A total of 475 plantlet samples from different government and non-government organizations were tested using specific DAS-ELISA detection technique for the presence of viruses. Separate kits for PLRV, PVY, PVX, PVS and PVM used according to manufacturer's instructions (Bioreba AG, Switzerland). Among the tested samples, 85% was virus free and 15% were found to be infected with different viruses, alone or mixed. Mixed virus infection was as high as 21% for PLRV followed by 15% had PVY, 15% had PVS and 3% had PVX.

Incidence of post-harvest diseases of different BARI released potato varieties

M. M. Begum

Fourteen BARI released potato varieties namely 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 for their postharvest diseases and shelf life under natural storage conditions in a pacca store house of TCRC of BARI, Gazipur during 2024-25. Considering all parameter, BARI Alu-89, BARI Alu-100, BARI Alu-7, BARI Alu-87, BARI Alu-90, BARI Alu-104, BARI Alu-102, BARI Alu-77 and BARI Alu-73 were found to be better for normal storage showing comparatively longer shelf life compared to other tested varieties.

Heterologous expression of recombinant truncated coat protein of three potato infecting viruses (PVY, PLRV and PVX) in *escherichia coli*

MS Akhter, MS Rahman, KE Jahan, M M Islam, MI Faruk and Matiar Rahman

Cocktail of polyclonal antibodies (PAb) will help to 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 we 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* are in progress.

Observational trial of sweet potato varieties/ germplasm against virus diseases

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

An experiment was conducted to screen sweet potato lines against different virus diseases during 2024-25 cropping season at Tuber Crop Research Centre, Bangladesh Agricultural Research Institute, Gazipur. Six sweet potato lines along with a check BARISP-17 were evaluated against virus diseases where Sweet potato feathery mottle virus and Sweetpotato Chlorotic Stunt virus were observed in the field. Among the tested lines, H16ej/10 and H9.48/11 were performed as the best lines for showing free of virus infection.

Activities: Pulse Crops

Lentil

Identification and characterization of root rot pathogens of lentil of ishurdi

D. Sarkar, M. Z. Rahman, M. A. A. Momin, M. Akhterruzzaman, M. Hossain, J. Hossan, 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 2024 to March 2025 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 resistance.

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 2024-25. Forty-seven lentil 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 to be 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 A. K. M. 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 A. K. M. M. Alam

The experiment was conducted at the Pulses Research Sub-center, BARI, Gazipur, and the Pulses Research Centre, Ishurdi, Pabna, during 2024-25 to identify effective fungicides and biological agents for controlling foot and root rot disease of lentil. Eight fungicides were tested for their efficacy against the disease, with the susceptible variety BARI Masur-1 used as a control treatment. The lowest foot and root rot (5.56 % & 7.06 %) was obtained from seed treatment with Provax 200 WP (Carboxin + Thiram) and Companion (Mancozeb + Carbendazim) @ 3 g/kg, and the highest incidence (19.98 % & 40.40 %) was obtained from the untreated control. The highest yield (1760 & 1758 Kg/ha) was obtained from seed treatment with Provax 200 WP and Companion @ 3 g/kg, respectively, and the lowest yield was obtained from untreated control plots (1152 & 1263 Kg/ha).

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

M. Z. Rahman, D. Sarkar, Raziuddin and A. K. M. M. Alam

The experiment was conducted at Pulses Research Sub-Center, BARI, Gazipur, and Pulses Research Centre, Ishurdi, Pabna during 2024-2025 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, Cabritop, 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 the biological control approach.

Bio-agent based management practice against foot and root rot of lentil

MB Anwar and MA Hossain

This experiment was conducted at Regional Agricultural Research Station, Jashore during *rabi* 2024-25 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 over control (70.62%) was found from T_7 (Provax) treated plots. In case of bio-control agents, the highest percent reduction of seedling mortality over control (68.18%) was found from T_6 (Tricho-compost) treated plots which was statistically similar to T_5 (Tricomax) treated plots and the lowest percent reduction of seedling mortality 37.06%) was found from T_4 (Lycomax) treated plots. The highest yield (1526 kg/ha) was found in T_7 (Provax) treated plot followed by T_6 (Tricho-compost) and T_5 (Tricomax) treated plot and the lowest (980 kg/ha) was found in T_8 (Control) plot.

Effects of tillage and p management under conservation agriculture (ca) on root rot disease management

D. Sarkar, Z. Rahman, A. Rahman and M. Anwar

The root rot disease is one of the major threats to the production of lentil in Bangladesh. A Conservation Agriculture (CA) experiment was conducted to identify suitable tillage systems for lentil production, as well as for managing root rot disease. Soil moisture is essential for the development of Root Rot disease (RRD). This season's root rot disease was relatively lower than last year's, since there was no rainfall following the sowing. Among the tillage systems, all tillage were provided good results for the management of root rot disease, but at the later stage, Stemphylium Blight disease was observed, and there is a significant difference among the tillage practices. The highest nodules per plant (9) at 60 DAS was observed in NT practice whereas lowest was found at ST practice STB disease was lower at NT with RD P fertilizer (30%) and ST with HD P fertilizer showed highest (60%) STB Disease. In grain yield, HD of P fertilizer showed higher yield (1369 kg/ha) compare to RD and LD. In the future, an in-depth study will be needed to further identify soil microorganisms under different tillage systems.

Chickpea

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 2024-25 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 (6.79 %) was obtained from the seed treatment with seed treatment with Autostin 50WDG (Carbendazim) @ 0.2%+ Spraying with Goldazim 500 SC (Carbendazim) @ 0.1% at 25 DAS and the highest incidence (23.31%) was obtained from untreated control. The highest seed yield (1321 Kg/ha) was recorded in seed treatment with Autostin 50WDG (Carbendazim) @ 0.2%+ Spraying with Goldazim 500 SC @ 0.1%, and the lowest yield was obtained from the untreated control plot (1047 Kg/ha).

Field Pea

Effect of fungicides on powdery mildew and rust diseases in

M. Z. Rahman, D. Sarkar, Raziuddin and A. K. M. M. Alam

The experiment was conducted at PRSC, BARI, Gazipur during 2024-25 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 Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 1 ml/L and the highest incidence (60.00%) was obtained from untreated control. The highest seed yield (2276 Kg/ha) was recorded in Amistar Top 325 SC treated plots, and the lowest yield was obtained from the untreated control plots (1587 Kg/ha).

Activities: Oilseed Crops

Screening of rapeseed-mustard varieties/lines against alternaria blight disease of mustard

N. A. Sultana and K. Jahan

The experiment was conducted during 2024-2025 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 was used as a 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 six (06) lines (NAP-20002, NAP-16036, NAP-21070, BJ-10-10104(Y), BJ-1110(12)-1 and BJ-11536(12)-6 were showed moderately resistant reaction to the disease.

Efficacy of different groups of chemical fungicides and botanicals against alternaria blight of mustard

N.A. Sultana and K. Jahan

An experiment was conducted to evaluate the efficacy of chemical and botanical fungicides in managing Alternaria blight and improving the growth and yield of mustard (Brassica spp.). Seven fungicidal treatments, including Rovral 50 WP (0.2%), Amister Top (0.1%), Folicur(0.1%), Navara 0.1%, Nativo(0.2%), Autostin(0.2%), Luna sansation (0.1%), and two botanicals, including

Neem leaf extract and Garlic clove extract, were sprayed three times at 10-day intervals. The results demonstrated that chemical fungicides significantly outperformed both untreated controls and botanical alternatives in terms of disease suppression and yield enhancement. Among all treatments, Rovral (T_1) showed the highest effectiveness in improving plant height, siliqua development, and seed yield, followed by Amister Top (T_2) and Nativo (T_5). Although botanical treatments offer environmentally sustainable options, their efficacy was comparatively lower. Based on the findings, Rovral, Amister Top, and Nativo are recommended for effective management of Alternaria blight and for maximizing mustard yield.

Survey on clubroot disease of mustard in Bangladesh

H. Rahman, M. M. Rahman and M M Islam

The survey was conducted to determine the present status of Clubroot disease of Mustard at Jamalpur district during the *Rabi* season of 2024-2025. A total of 25 farmers' fields in 2 (two) Upazilas viz., Islampur and Dewangonj in Jamalpur district were surveyed for Clubroot disease occurrences of Mustard. Some varieties, viz., BARI Sharisha-14, BARI Sharisha-17, Tori-7, BINA Sarisha-9 and local cultivars were cultivated in fields. Disease incidence varied from 0 to 15% in the surveyed areas. Disease status ranged from 0 to 2. A few small clubs were noticed in 19 farmers' fields and moderate clubbing was observed in 4 farmers' fields. Two (2) farmers' fields were no clubbing.

Screening of fungicides in controlling clubroot disease of mustard

H. Rahman, M. M. Rahman and M M Islam

The experiment was conducted to find out the efficacy of fungicides against clubroot disease and for yield and yield contributing characters of Mustard at the research field of Plant Pathology Division, RARS Jamalpur, during the *Rabi* season of 2024-2025. The experiment was conducted under natural field conditions. The study consists of 8 (eight) treatments viz., T_1= Acrobat MZ (Dimethomorph+ Mancozeb) @ 2 g/L, T_2= Ridomil Gold (Metalaxyl) @ 2 g/L, T_3= Dolochune @ 5 t/ha, T_4=Luna sensation (Fluopyrum + Trifloxystrobin) @ 2 ml/L, T_5 = Amistar Top (Azoxystrobin + Difenoconazole) @ 2 ml/L, T_6= Nativo 75 WG (Tebuconazole + Trifloxystrobin) @ 2 ml/L, T_7= Blitox (Copper fungicide) @ 2 g/L and T_8= Control. BARI Sarisha-14 was used in this study as variety. Only 0.59% of infected plants were found in the control treatment (T8) where disease severity is 1 and disease status was a few small clubs in the infected plants. Other treatments had no infection (no clubbing). These findings indicate that fungicides application for controlling clubroot disease of BARI Sarisha-14 is not effective because very few percentage infections were found in control treatment under natural field conditions. Artificial inoculation of clubroot inoculum in the plants afterwards application of fungicides would be effective. The highest seed yield per hectare (1768.52 kg) noted in the T_7 treatment followed by the T_8 treatment (1720.37 kg), T_1 and T_2 treatments (1703.70 kg). These findings indicate that although seed yield performance exhibits significant variations among the treatments but only one treatment showed better performances compared to control. On the other hand, two treatments showed at par seed yield performance with the control and four treatments showed inferior performance to control that might be due to the uneven population and land heterogeneity.

Screening of mustard varieties and lines against clubroot disease

H. Rahman, M. M. Rahman and M M Islam

The experiment was conducted to find out the resistant varieties/lines against clubroot disease of mustard at the Plant Pathology Division, RARS Jamalpur, during the *Rabi* season of 2024-2025 with sixty-two (62) varieties and lines of Mustard collected from ORC and PGRC, Gazipur. To screen for clubroot disease and to evaluate yield and yield-contributing characteristics, sixty-two mustard varieties and lines have been studied. Twenty-one varieties and lines among them exhibited 1.05 to 12.48% infected plants. Based on the disease severity scale, out of 62 varieties and lines, 41 had no clubbing, 10 had a few minor clubs, 9 had moderate clubbing, and 2 had severe clubbing. According to these results, the defense mechanisms of sixty-two mustard varieties and lines against clubroot disease vary in severity. Seed yield per hectare ranged from 455.60 kg to 2972 kg. The highest seed yield per hectare (2972 kg) was noted in Mustard BD-9955,

followed by Mustard BD-9352 (2733 kg), Daulat (2670 kg), Mustard BD-9345 (2328 kg), Mustard BD-9340 (2106 kg), and the lowest in Mustard BD-9956 (455.60 kg). Additionally, a screening for Mustard Alternaria leaf spot was performed. Alternaria leaf spot disease severity ranged from 0.00 to 6.67% among 62 mustard varieties and lines.

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 and white mold of mustard. No entry was observed either immune or resistant against Alternaria blight and white mold disease. Under natural conditions, out of 107 entries, 29 showed tolerance to Alternaria and 13 to white mold. Notably, only 6 entries exhibited the lowest disease incidence for both diseases. The remaining entries were found to be susceptible to highly susceptible.

Surveillance, isolation and preservation of *sclerotinia sclerotiorum* from different hosts including mustard

M.M.E. Rahman, S. Ghosh 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 the 34 samples were collected from different host including mustard, some isolates were purified and preserved for further studies.

Efficacy of fungicides against white mold of mustard

M.M.E Rahman, S. Ghosh, A.K. Saha and M. K. Islam

A total of eight 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 62.83 to 88.28% and 69.97 to 91.99% diseases suppression occurred in Alternaria blight and white mold disease, respectively. Among the fungicides, Luna sensation (Flupyrum + Trifloxystrobin) was found to control Alternaria blight (88.28%) and white mold (91.99%) disease significantly. Moreover, Amistar Top (Azoxystrobin + Difenoconazole) and Rovral (Iprodione) was also found to control the disease effectively considering both the diseases.

Screening of mustard varieties/lines against clubroot diseases

M.M.E. Rahman, S. Ghosh, M. K. Islam and A.K. Saha

Clubroot disease, caused by *Plasmodiophora brassicae*, poses a significant threat to mustard cultivation in Bangladesh. This study aimed to screen mustard germplasm for resistance to clubroot under natural field conditions. A total of 110 mustard lines and varieties were collected from the Oilseed Research Centre, Gazipur, and evaluated using an augmented design in a disease-prone field. Disease severity was assessed using a 0–3 scale, and the Disease Severity Index (DSI) was calculated. Results revealed a wide range of responses among the entries: 23 lines showed resistance, 35 showed moderate resistance, while 33 and 19 entries were categorized as susceptible and highly susceptible, respectively. No entry exhibited complete resistance during field evaluation. These findings highlight the presence of partial resistance in the evaluated germplasm and underscore the need for further breeding efforts to develop clubroot-resistant mustard varieties.

Surveillance of *plasmodiophora brassicae* causing clubroot of mustard

M.M.E. Rahman, S. Ghosh and M. K. Islam

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 for last two years. During the survey, clubroot disease was observed in mustard fields in various places, exhibiting increasing levels of disease intensity and severity. The disease was found to be prevailed in all the ten surveyed districts with a range from 1 to 50% disease incidence with very 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.

Management of seed borne mycoflora on mustard, soybean and field pea seed and their pathogenic potential

R. Momotazm. Arifunahar, S.T.Nira, F.Elahi, M. Monir, M. H. Rashid and M.H.Hosain

The experiment was conducted during the 2024–2025 cropping season in the laboratory and pot house of the Plant Pathology Division, Bangladesh Agricultural Research Institute (BARI), Gazipur, to evaluate effective seed treatment for managing seed-borne fungal pathogens of mustard (*Brassica campestris* L.), soybean (*Glycine max*), and field peas (*Pisum sativum*). Six treatments were tested: T1—Detergent (0.1%), T2—Kerosene/paraffin (0.1%), T3—Bleaching powder (5000 mg/ml), T4—Provax 200 (2500 mg/ml), T5—Soft drinks (0.1%), and T6—Untreated control. Laboratory results in three seed crops revealed that the detergent treatment (T1) consistently achieved the highest seed germination rates, seedling vigor, and the most effective reduction in seed-borne fungal infections across all crops, followed by T3 and T4. In contrast, untreated seeds (T6) showed the highest levels of infection and lowest germination. In the pot house trial with mustard, detergent treatment also resulted in the highest vigor index (1864.25), lowest infection rate (9.59%), and highest plant survival (98.08%). Fungal pathogens isolated from seeds and seedlings included *Fusarium* spp., *Aspergillus* spp., *Penicillium* spp., *Alternaria* spp., *Rhizoctonia solani*, and *Sclerotium rolfsii*, each characterized by distinct colony morphology and associated symptoms.

Groundnut

Evaluation of different group of commercial fungicides against tikka (leaf spot) and rust disease of groundnut (*Arachis hypogaea*)

K. Jahan & N. Sultana

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 2024-25 growing season. Nine treatments namely, Score, Nativo, Folicure, Tilt, Autostin, Rovral, Amister top, Navara, Ridomil were sprayed three times according to disease prevailing conditions. For Tikka disease, Amister Top showed minimum disease incidence (24.09%) which was 63.62% disease reduction over untreated control treatment. For Rust disease, Navara showed minimum disease incidence (23.25%) which was 60.75% disease reduction over untreated control treatment.

Screening of groundnut varieties/lines against tikka rust and other soil borne diseases

K. Jahan & N. Sultana

An experiment was conducted at Oilseed Research Centre, BARI, Gazipur during *Rabi* 2024-25 cropping season under natural epiphytotic condition to evaluate groundnut entries against Tikka (leaf spot) and Rust diseases. Disease data were recorded at 141 days of plant age using '0-5' scale for Tikka and "1-9" scale for Rust. Among the 35 tested varieties/lines, 27 entries showed Moderately Susceptible and 8 entries showed susceptible reaction against Tikka. Percent disease severity for Tikka ranges between 32.22 to 63%. The lowest disease severity 32.22% obtained from T_{14} = ICGV-95090, followed by T_{11} = ICGV 0207, T_{8} = ICGV 91176, T_{13} = ICGV 35-1 and T_{5} = ISD-94323. For Rust disease percent disease severity ranges between 29.85 to 59.49%. The lowest disease severity 29.85% obtained from T_{18} = ISD-502-4-3-1, followed by T_{25}= ISD-2914, T_{6} = ISD-94062, T_{5} = ISD-94323, and T_{24} = 14-403. No entry was observed either Resistant or Moderately Resistant against Cercospora leaf spot and Rust (*Puccinia arachidis*) disease of groundnut.

ELISA based detection of aflatoxin from groundnut

M. S. Rahman, M.M and M. S. Akhter

Groundnut (*Arachis hypogaea*) is an important legume and oilseed crop. Its use to make different foods or directly eaten by human being. Aflatoxins are a group of naturally occurring toxic secondary metabolites produced, by two species of fungus Aspergillus (*A. flavus* and *A. parasiticus*) when they grow under favorable conditions for toxin formation. The experiment was conducted during the year 2024-2025 to detect total aflatoxin of groundnut from different location of Bangladesh. Fifteen groundnut samples from five districts were tested to determine total aflatoxin by ELISA methods. The amount of total aflatoxin concentration in tested groundnut samples were ranged from 1.46 ppb to 22.04 ppb.

Among the fifteen samples only one sample (G2-22.04 ppb) was found above the acceptable range i.e. >20 ppb. Other samples were found below the acceptable range i.e. < 20 ppb.

Sunflower

Evaluation of some fungicides against leaf blight of sunflower

N. A. Sultana and K. Jahan

A field experiment was conducted at the Oilseed Research Centre (ORC), Gazipur, during the 2024–2025 cropping season to evaluate the efficacy of seven fungicides in managing Alternaria leaf blight of sunflower (Helianthus annuus L.) and their impact on yield and yield-contributing traits. The study followed a Randomised Complete Block Design with eight treatments, including a control. Fungicides were applied at disease onset and repeated at 10-day intervals. Results revealed that Rovral (0.2%) was the most effective, significantly reducing disease incidence by 65.49% over the control and achieving the highest seed yield (1722.3 kg/ha), representing a 34% yield increase. Amistar Top (0.1%), was the second highest, significantly reducing disease incidence by 58.89% over the control and achieving the seed yield (1673 kg/ha), representing a 32% yield increase. Score (0.1%), and Folicure (0.1%) also provided moderate disease control and yield enhancement. In contrast, Mancer, Tilt, and Mancozeb were less effective. The untreated control exhibited the highest disease severity and the lowest yield. These findings suggest that Rovral, followed by Amistar Top and score, can be effectively integrated into disease management strategies to control Alternaria blight and improve sunflower productivity. Considering the benefit cost ratio, the fungicide Amistar Top (0.1%), was found to be highly economic (BCR 3.8).

Effect of sowing date on the *Alternaria* blight diseases severity and yield contributing characters of sunflower

K. Jahan and N. Sultana

A field experiment was carried out during winter season, 2024-25 at Oilseed Research Centre, BARI, Gazipur to find out Alternaria leaf blight incidence and severity in sunflower varieties sown at early, mid and late sowing dates in November, December and January. *Alternaria* leaf blight caused by *Alternaria helianthi* is considered as most dangerous that reduce productivity. A survey has revealed that losses due to this in seed yield ranging from 27-80%, oil yield from 17-33%.The experiment was conducted in randomized block design with three replications. Two varieties BARI Sunflower-3 and Hysun-33 and nine sowing dates were used in this field trial. Disease severity, under natural conditions in the field, was evaluated at four growth stages of the crop, with reference to "0-5" scale of this disease. Marked plants were harvested individually according to their maturity for evaluation of yield and yield contributing characters. The results showed significant effects of sowing dates and varieties on yield and yield components of sunflower. BARI Sunflower-3 always showed higher disease severity e.g. 41.8% at vegetative stage at 30 January compared to Hysun-33 where severity was 21.8%. Lowest percent diseased leaf area (10%) was observed in December sowings, whereas higher percent diseased leaf area (40-45%) in late January sowings. November sowings also show moderately high percentage of leaf area covered by the disease (30-35%). Hysun-33 gave the highest seed yield at 10 November followed by 20 November with 272 gm and 230.33gm/5plants seed weight, respectively. Whereas, BARI Sunflower-3 showed higher seed yield (151.33 gm/5plants seed) at 20 November. The higher plant height, stem diameter, head diameter, 500-seed weight and no. of mature seed/head were also observed in mid-November to early-December sowings. Delayed sowing also shortened the crop duration of sunflower in the field. For BARI Sunflower-3 and Hysun-33, crop duration reduces by about 34 and 26 days when sowing is delayed from early November to late January, respectively. The study recommended mid-November to early-December as optimal sunflower planting dates For BARI Sunflower-3 and Hysun-33.

Integrated management for controlling white mold disease of sunflower

MB Anwar and MA Hossain

This experiment was conducted at Regional Agricultural Research Station, Jashore during *rabi* 2024-25 to find out appropriate management practice against white mold disease of sunflower. Seven treatments including control were evaluated in this

study. The lowest disease severity (15.00%) was obtained from T_4 treated plot which was statistically similar to T_4 treated plot. On the other hand, the highest disease severity (60.00%) was found in T_7 (control) plot. Maximum percent reduction (75.00%) of disease severity over control was found T4 treated plot and minimum percent reduction (33.33%) of disease severity over control was found from T1 treated plot. The highest yield (1415 kg/ha) was recorded from T_4 treated plot which was statistically similar to T_3 treated plots and the lowest yield (555 kg/ha) was recorded from T_7 (control) plot.

Efficacy of fungicides in controlling white mold disease of sunflower

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

An experiment was conducted at the Regional Agricultural Research Station, Ishurdi, Pabna during the *Rabi* season of 2024–2025 to evaluate the efficacy of various fungicides in managing white mold (Sclerotinia rot) disease of sunflower (*Helianthus annuus* L.). Six fungicides: Tilt 250 EC (Propiconazole) @ 0.5 ml/l, Folicur 250 EC (Tebuconazole) @ 1 ml/l, Indofil M-45 (Mancozeb) @ 2 g/l, Contaf 5 EC (Hexaconazole) @ 1 ml/l, Rovral 50 WP (Iprodione) @ 2 g/l, and Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 1 ml/l, along with an untreated control were tested. The lowest disease incidence (8.87 %) was recorded in plots treated with Tilt 250 EC, which was statistically at par with Indofil M-45 (9.46) and Folicur 250 EC (10.48). In contrast, the highest disease incidence (40.74%) was observed in control plots. The highest seed yield (2203 kg/ha) was obtained from Tilt 250 EC treated plots, followed closely by other fungicide treatments, whereas the lowest yield (1480 kg/ha) was recorded in the control. The maximum net income (Tk. 59,520/ha) was achieved with Tilt 250 EC, followed by Tk. 55,830/ha from Indofil M-45 and Tk. 50,160/ha from Folicur 250 EC. The results suggest that Tilt 250 EC, Indofil M-45, and Folicur 250 EC are effective options for managing white mold in sunflower while ensuring higher economic returns.

Soybean

Screening of soybean genotypes against soybean yellow mosaic virus

N. A. Sultana and K. Jahan

The experiment was conducted during 2024-2025 at Joydebpur to find out the resistant lines of soybean yellow mosaic virus. A total of twenty-six lines/ varieties of soybean were tested. A susceptible variety, BARI soybean-6, was used as a standard check. Foliar disease was recorded at the pod development stage using a 0-9 scale. Among the 26 test lines, only one line (VIETKHAI) showed a highly resistant reaction. Four lines (Richmond, MTD 453, ST-1, and KADSING) showed resistant reaction, and six lines (Shohag, Bangladesh Soybean-4, BARI Soybean-5, Australia-1, BINA Soybean-2, and BINA Soybean-6) showed moderately resistant reaction against soybean yellow mosaic virus disease. These promising lines may be considered for further evaluation in the following season.

Activities: Spices Crops

Onion

Effect of fungicides for the management of leaf blight disease complex of summer onion for seeds production

M. A. Wadud, M. N. Alam, M. Z. H. Prodhan, N. Nath and M. M. Islam

The experiment was conducted at Spices Research Centre, BARI, Bogura during 2024-2025 to test efficacy of 11 new fungicides for the management of leaf blight disease complex of summer onion for seeds production. BARI Piaj-5 was used as planting materials. The experiment was laid out in a randomized complete block design with four replications. The tested fungicides were Rovral, Luna Sensation, Amister Top, Nativo, Discover, Filia, Nister, Cabriotop, Antracole, X-Tra care and Tared. The lowest disease incidence and severity (19.45% and 15.94%) and the maximum disease reduction over control (79.84%) were recorded in Luna sensation and the highest disease incidence and severity (77.93% and 79.06%) was observed under control plot. The maximum seeds yield (6.33 quintal/ ha) was recorded under Luna sensation and the minimum was under control (1.19 quintal/ha) plot.

Survey and Identification of summer Onion diseases

N. Nath, M. A. Wadud, M.M.Kamal, M. N. Yousuf and S. N. Mozumder

A survey was conducted at different summer onion growing areas of Gazipur, Faridpur, Rajbari and Bogura during 2024-25 to identify the diseases of summer onion and their causal organisms. Basal rot (*Fusarium oxysporum* f. sp. *cepae*) and purple blotch (*Alternaria porri*) were found predominantly in the surveyed areas. Black mold (*Aspergillus niger)* was seen in post-harvest storage condition. Basal rot was observed at growth stage (30 to 45 days old seedlings). Purple blotch was observed as small, water-soaked spots on leaves that enlarge into purplish-brown lesions with yellow halos at the mid growth stage of the bulb. In storage, black mold was also found as a black, sooty discoloration on the neck and outer scales of the bulb. The causal fungi were identified as *Fusarium oxysporum* f. sp. *cepae*, *Alternaria porri and Aspergillus niger*.

Chilli

Integrated management of collar rot disease of chilli with seed and soil treatments

Y. H. Rayhan, M. Mohiuddin and M. M. Zaman

An integrated disease management approach was developed for the management of collar rot of chili using fungicide, biocontrol agents and an organic amendment. The results of the experiments from the 1st year data and cost-benefit ratio indicated that seed treatment with Provax 3 gm/kg + seedling treatment with Autostin 2 gm/l+ soil treatment wity *Trichoderma* at 2.5 tha^{-1} significantly reduced the collar rot disease incidence (5.26 %). The green fruit yield of chili was 13.35 t/ha, showing 30.86% yield increase over control. The integrated management of chili collar rot using fungicide, biocontrol agents and an organic amendment is safe and ecologically sound and appears to be a healthy approach to the disease management.

Detection of viruses of Chili and their vectors

N. Nath, M. S. Rahman, M. A. Wadud, M. M. Kamal

An investigation was conducted to detect causal viruses of virus diseases infecting chili plant. Virus infected samples of chili plant were collected from naturally infected chili field and Double Antibody Sandwich Enzyme-Linked Immuno-Sorbent Assay (DAS-ELISADAS-ELISA was performed for the detection of causal viruses. In this experiment, eight infected chilli germplasm were collected from 8 genotypes. An antiserum of *Chilli veinal mottle virus* (ChVMV) was used to detect the virus separately. Only one infected chili sample (AVPP-1236-2) gave the positive result against the virus. The results suggested that *Chilli veinal mottle virus* (ChVMV) was the causal agent of the virus disease in chilli germplasm.

Evaluation of different new fungicides in controlling anthracnose of chili

R. Momotaz, M. M. Islam, M.N. Islam, M. Arifunnahar, M.Nazneen, M.H.Rashid and M.H.Hosain

An experiment was conducted to find out the appropriate chemical fungicide to control the anthracnose of chili under natural epiphytotic condition. Ten new fungicides viz. Sadno 50 WP, Hydrox 77 WP, Metaxo 25 SP, Caroline -50 DF SC, Extra-Zole 40 SC, Carben 80 WP, Jalkar 30 EC, Galary Plus 32.5 SC and Bimole Plus 75 WP were tedted in the experiment. Result revealed that among the fungicides, Sadno 50 WP showed most effective for controlling anthracnose diseases of chili and produced higher yield 4034 kg/ha. More than 85% disease suppression over control was observed due to the spray with Sadno 50 WP. More than 70% disease suppression was observed due to the spray with Metaxo -25, Extra-Zole 40 SC, Carben 80 WP and Galary Plus 32.5 SC fungicides respectively.

Screening of chili germplasms against chili leaf curl virus disease

M. A. Wadud, M. S. Akter, M. A. Alam, N. Nath, M. M. Islam, and M. Z. H. Prodhan

An experiment was conducted to screen chili germplasm with a view to identify resistant sources of chili against chili leaf curl disease. Fifty-two chili genotypes were screened under natural conditions during 2024-25. A wide range of symptoms were observed on genotypes screened against ChLCV infection. Analysis of variance for incidence and severity indicated the presence of significant differences among 52 chili genotypes. One genotype (BGCMA-17) was found to be resistant, AFMAG-001 showed the moderately susceptible

reaction, six genotypes (BGCMA-14, Co-626, AIS-11050, CKRMAF-1, 446 and RKMAF-1) were susceptible and the rest 44 genotypes exhibited highly susceptible reation to ChLCV.

Ginger

Fungal pathogens associated with imported ginger rhizome

M. A. Wadud, N. Nath, Z. H. Prodhan and M. M. Islam

A study was conducted to identify the fungal pathogens associated with imported rhizomes of ginger. Eight samples of ginger rhizomes were collected from Raja Bajar and Shwapno Super Shop, Police Plaza, Bogura. All the ginger were imported from India and Bhutan. *Sclerotium rolfsii* was found to associate with the samples. Pathogenicity test was done by Rhizome inoculation method. After pathogenicity test it was confirmed that storage rot of ginger was caused by *Sclerotium rolfsii*.

Betel Vine

Identification of causal pathogen of stem rot of betelvine

M. H. Rahman and R. Momotaz

An investigation was carried out to identify the causal pathogen of betlevine stem rot in the On-farm Research Division, BARI, Shibpur, Narsingdi during December 2024 to May 2025. Bitelvine vine samples infected with stem rot disease were collected from Monohardi areas. Fungal pathogen associated with the diseased specimens were isolated. Based on morphological character, the pathogens were identified as *Collitotrichum* sp., and *Pestalotia* sp. Findings of the investigation indicate that these pathogens are detrimental to bitelvine cultivation under prevailing environmental conditions in betel vine growing areas of Monohardi.

Vanilla

Identification of new diseases of vanilla in Bangladesh

M. A. Wadud, M. Z. H. Prodhan, N. Nath, A. H. F. Fahim and M. M. Islam

The experiment was conducted at Spices Research Centre, BARI, Bogura during 2024-25 to identify the new disease of vanilla with causal organisms. The pathogens were isolated from infected leaves, stem and bean by direct tissue transplanting technique on PDA media at 26 ± 1 ^{0}C. Result showed that leaf spot, stem rot and bean rot caused by *Fusarium oxysporum* which identified through morphological characterization based on colony, mycelium and conidial features. After pathogenicity similar symptoms were reproduced by artificial inoculation of detached method.

Activities: Vegetable crops

Tomato

Efficacy of new fungicides to control fusarium wilt of tomato

M. Nazneen, S.T. Nira, F. Elahi, R. Islam, M. M. Islam, M. H. Rashid and M. H.Hossain

An experiment was conducted to evaluate nine different groups of new chemical fungicides in controlling fusarium wilt disease of tomato. All the fungicides significantly reduced the disease as compared to control. The lowest disease incidence (33.33%) was recorded in T_1 followed by T_2, T_4, T_3, T_6. On the contrary, the untreated control T_{10} showed the highest disease incidence (91.67%) which was statistically similar to T9 treated plot. The lowest disease severity (23.23%) was observed in T_1 treated plot which was statistically lower than T_2, T_4, T_3, T_6. On the other hand, the highest severity 47.53% was found in control (T_{10}) plot. Maximum percent reduction of disease severity over control was found in T_1 (51.12%) and the lowest was found in T_9 treated plot followed by T_5. The highest yield was (46.64 t/ha) recorded from T_1. The second highest yield was obtained from T_2 (42.75 t/ha). In contrast, the control plot recorded the lowest yield (17.60 t/ha) followed by T_9 and T_5.

Integrated management of early blight of tomato

MB Anwar and MA Hossain

An experiment was conducted at Regional Agricultural Research Station, Jashore during *rabi* 2024-25 to find out suitable integrated management practice for controlling early blight disease of tomato. Seven treatments including a control were evaluated in this study. The lowest disease severity (10.00%) was obtained from T_3 (Seed treatment

with Provax + foliar spray with Luna Sensation 50SP) treated plot which was statistically similar to T_4 (Seed treatment with Provax + foliar spray with Amistar Top 32.5SC) and T_1 (Seed treatment with Provax + foliar spray with Rovral 50WP). On the other hand, the highest disease severity (50.00%) was found in T_7 (control) plot. Maximum reduction (80.00%) of disease severity over control was found in T_3 treated plot and the lowest (39.33 %) was found in T_5 treated plot. The highest yield was recorded (47.72 t/ha) from T_3 treated plot followed by T_4 and T1 (Seed treatment with Provax + foliar spray with Rovral 50WP) and the lowest (23.42 t/ha) from T_7 (control) plot.

Efficacy of new fungicides to control early blight of tomato

T H Tabassum and S T Nira

An experiment was conducted to screen ten fungicides with a view to find out appropriate chemical fungicide to control early blight of tomato. The fungides were coded as 369, 609, 1134, 1146, 1162, 1200, 1225, 1243, 1247 and 1046. The fungicides were applied as foliar spray for four times at 10 itervel. Spraying five fungicides of coded as 1247, 369, 1146, 1225 and 1243 were effective in disease management of early blight of tomato under field condition.

Screening of fungicides to control stem rot/blight disease of tomato

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

Anexperiment was conducted to identify effective fungicides against stem rot/blight disease of tomato. Six different fungicides tested were: Tilt 250 EC (Propiconazole) @ 0.5 ml/l, Rovral 50 WP (Iprodione) @ 2 g/l, Luna Sensation 50 SC (Fluopyram + Trifloxystrobin) @ 1 ml/l, Score 250 EC (Difenoconazole) @ 1 ml/l, Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 1 ml/l, and Nativo 75 WG (Tebuconazole + Trifloxystrobin) @ 0.5 g/l, along with a control. The lowest Percent Disease Index (PDI) of 7.95 was observed in plots treated with Luna Sensation 50 SC @ 1 ml/L, which was statistically similar to the PDI of 8.85 recorded in plots treated with Score 250 EC @ 1 ml/L. In contrast, the highest PDI (75.67) was recorded in the untreated control plots. The maximum yield of 49.33 t/ha was obtained from plots treated with Luna Sensation 50 SC @ 1 ml/l followed by 48.13 t/ha in plots treated with Score 250 EC @ 1 ml/l. The highest net income (Tk. 577,750/ha) was calculated from Luna Sensation 50 SC treated plots, followed by Tk. 566,500/ha from Score 250 EC treated plots.

Screening of tomato germplasm for resistance to bacterial wilt

M. Afroz, L. Yasmin, M. M. Rahman and M. S. Ali

Fourteen tomato varieties/accessions were screened to find out bacterial wilt (*R. solanacearum*) resistant source grown under artificial epiphytotic field conditions during 2024-2025 cropping seasons. Among these only one variety (BARI Tomato-11) and one line (F_1-2001) showed resistant reaction against bacterial wilt. Two lines such as SLA-006 and 1008 were graded as moderately resistant. Rest of the accessions of tomato showed moderately susceptible to highly susceptible reaction to *R. solanacearum.*

Integrated disease management of bacterial wilt in tomato

M. Afroz, L. Yasmin, M. M. Rahman and M. S. Ali

An experiment was conducted to find out the effective control tactics in integrated approach against bacterial wilt and to enhance yield of tomato. The experiment was conducted in the research field of Horticulture Research Centre, BARI, Joydebpur, Gazipur during November, 2024 to April, 2025. There were seven treatments viz. $T_{1=}$ Stable Bleaching Powder @ 25 kg/ha + Burning of rice husk @ 5 t/ha (in pit) (ii), $T_{2=}$ Stable Bleaching Powder @ 25 kg/ha + *Bacillus subtilis* 38 (Seed and root soaking), $T_{3=}$ Burning of rice husk @ 5 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), $T_{4=}$ Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 5 t/ha (in pit) + *Bacillus subtilis* 38 (Seed and root soaking), $T_{5=}$ Farmer's practice and $T_{6=}$ Susceptible check (BARI Tomato-15). Among the treatments, T_4 (Stable Bleaching Powder @ 25 kg/ha+ Burning of rice husk @ 5 t/ha (in pit) + *Bacillus subtilis* 38) showed the lowest incidence of the disease and provided the highest yield.

Survey on bacterial wilt of solanaceous vegetable

M. Afroz, L. Yasmin, M. M. Rahman and M. S. Ali

A comprehensive survey was conducted during July-June, 2024-2025 cropping season in Panchagarh

and Khagrachhari districts to record the incidence of bacterial wilt of eggplant. Data on area surveyed, wilt incidence, etc. were recorded. A total of 40 wilt infected plant samples of eggplant were collected from Panchagarh district during July-June, 2024-2025, from which 23 isolates of *R. solanacearum* were isolated. 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 test results were found positive, which confirmed identification of these isolates.

Integrated management of tomato leaf curl virus (ToLCV) of tomato

M. S. Rahman, M. S. Akhter

An experiment was conducted to find out the effective management option against *Tomato leaf curl virus* (ToLCV) of Tomato. BARI tomato 15 was planted in the research field of Plant Pathology Division, BARI Gazipur on December 2024. The experiment was comprised of seven treatments including a control with three replications using RCBD. Significant variation of disease incidence, severity and yield was found in different treatment packages. Disease incidence and severity ranged from 11.00 to 31.00 % and 1.00 to 3.00, respectively in different management packages. The lowest disease incidence and severity was found in treatment package T_5 (4 sprays with 0.2 % Bio-Viron at 12 days interval + Sticky yellow trap.). The highest yield (70.83 t/ha) was recorded from T_5 where the highest reduction of disease incidence (64.52 %) and maximum increase of yield (50.45 %) were found in the same treatment package.

Management of leaf curl disease of tomato using beneficial microbs and vector control

MB Anwar, MS Akhtar and MA Hossain

An experiment was conducted to find out beneficial microbs for controlling leaf curl virus of tomato. Seven different treatments including control were evaluated in this study. The lowest disease incidence (22.41%) was found in T_3 treated plot followed by T_1, T_4, and T_6 treated plots, respectively whereas the highest disease incidence (50.81%) was found in T_7 (Control) plot. Maximum percent reduction of disease incidence (55.89%) over control was found from T_3 treated plot and minimum (27.94%) from T_5 treated plot over control.The highest yield was recorded (45.32 t/ha) in T_3 treated plot followed by T_1 and T_4 treated plot and the lowest (21.54 t/ha) in T_7 (control) plot.

Cucumber

Efficacy of polythene mulch and fungicides and bio-fungicides against downy mildew of cucumber

Md. Iqbal Faruk

An experiment was conducted to test the efficacy of different group of fungicides and bio-fungicides aganisnt downy mildew diseases of cucumber caused by *Pseudoperonospora cubensis* under natural field condition. Results of the experiment revealed that application of bio-pesticides reduced 42.60% to 50.53% and 43.78% to 50.88% of downy mildew disease incidence and disease severity of cucumber, respectively compared to control. Use of polyethene mulch along with application of chemical fungicides Xivana (Fluoxapiprolin 20%) or Ridomil Gold 72 WP reduced 81.93% and 74.78% disease incidence, 66.68% and 62.72% disease severity, and increased yield by 45.46% and 42.41% respectively compared to control.

Brinjal

Validation trial of biolife bhat-01 wp for controlling bacterial wilt of a bari released brinjalvariety

M. T. Hossain and M S. I. Khan

An experiment was carried out to control the bacterial wilt in the susceptible BARI Begun 12 using the bacterial formulated products at the Regional Agricultural Research Station, Hathazari and Chattagram. Bacterial wilt, a major threat to our economy, was causing their yields to decline. There is currently no successful remedy for bacterial wilt in solanaceous crops worldwide. However, probiotic microbial species and their formulated products had been used in agricultural fields around the world since last decade. But, in our nation, it has become still primitive. We have used both *in vitro* and *in vivo* trials using reasonable chemical pesticides comparing effective microbial organisms called BioLife BHAT-01 WP which were formulated by *Bacillus oryzicola* YC7007, *Bacillus velezensis*

GL6 with some standard carrier materials against bacterial wilt during 2024-25. Formulated powder BioLife BHAT-01 WP were conducted by three-time sprayings to the rhizosphere till to droplet. The *in vitro* antagonistic activities by formulated product of BioLife BHAT-01 WP and their active inocula levels 2.0×10^{10} CFU/gm had been scrutinized against the bacterial pathogen *Ralstonia solanacearum* for controlling bacterial wilt. There were no diseases at 2-MAT (Months after transplanting) in the treated plot. BioLife BHAT-01 WP powder, a formulated bacterial product (1×10^{10} CFU/g) revealed significantly (Student's t-test, $P<0.05$) lower disease severity indices by 1.3±0.3 and 2.3 ± 0.3 than the control by 2.6 ± 0.3 and 3.3 ± 0.8 in the BARI Begun 12 respectively at 5-MAT and 6 MAT. We came to the conclusion that BioLife BHAT-01 are essential biological products to control *Ralstonia solanacearum*.

Determination of tolerance level of bari bt-brinjal varieties against bacterial wilt (*ralstonia solanacearum*) under field condition

R.Islam, M.S. Akhter, K. Jahan, M. Naznin, M. M. Islam and M. H. Hossain

An experiment was conducted to determine the tolerance level of BARI released Bt and Non Bt brinjal varieties against bacterial wilt (*Ralstonia solanacearum*) under field conditions. The Bt varieties were BARI BARI Bt-brinjal-2, BARI Bt-brinjal-3, BARI Bt-brinjal-4 and BARI Bt-brinjal-5, and non-Bt varieties were BARI brinjal-1, BARI brinjal-4, BARI hybrid brinjal-6. Disease incidence was recorded at 30, 60, 90 and 120 days after transplanting (DAT). At 30 DAT, average disease incidence was 2.78% in BARI Bt brinjal-4 and BARI Bt brinjal-5, which were graded as resistant. Other varities were free from visible symptoms of wilt and graded as highly resistant. At 60 DAT, BARI Bt-brinjal-2 was resistant, and BARI Hybrid Brinjal-6 and BARI Brinjal-1were moderately resistant. Other varieties showed susceptible to highly susceptible reactions. At 90 DAT, four varieties showed moderately suscptile reaction, two susceptible and one highly susceptible reactions. At 120 DAT, disease incidence varied from 52.78% to 100.00% in 7 varieties and these were graded as highly susceptible irrespective of Bt and non Bt.

Pumpkin

Efficacy of fungicides to controlpowdery mildew of pumpkin

R. Momotaz, M. M. Islam, M.N. Islam, M. Arifunnahar, M.H.Rashid and M.H.Hosain

An experiment was conducted to find out the appropriate chemical fungicide to control the powdery mildew diseases of pumpkin. Twelve new fungicides viz. Trizole Super 75 WP, Cinatima 10 CS, S-Zim 75WP, Five star 32.5 SC, CP Vit 80WDG, Rover 80WG AP No-1510, Greenazole 32.5 SC, Aram Plus60WDG, Anabi Top 32.5SC, Maxtop 32.5SC, Zeba 50WP, and ZIMZIM 80 WP were teste in the experiment. Result revealed that, among the fungicides, Trizole Super 75 WP fungicide were most effective for controlling powdery mildew diseases of pumpkin and produced highest yield of 39.24 t/ha. Where, more than 87% disease suppression was observed due to the spray with Trizole Super 75 WP fungicide. More than 70% disease suppression was observed due to the spray with Zeba 50WP, Anabi Top 32.5SC, CP Vit 80WDG, Rover 80WG AP No-1510 fungicides.

Efficacy of new fungicides to controlpowdery mildew of sweet gourd

H. Rahman and M. M. Rahman

This experiment was conducted at Regional Agricultural Research Station (RARS), Jamalpur during 2025 to find out the effective new fungicides against powdery mildew disease of Sweet gourd. Twenty (20) new fungicides along with standard control and control were evaluated in this study. BARI Mistikumra-2 was used as a variety. Among the fungicides, the lowest disease incidence (7.69%) was observed in 1572 encoded fungicide whereas the highest disease incidence (52.50%) was recorded in the control treated plot. Among the fungicides, the lowest disease severity (1.08%) was recorded in 1520 encoded fungicide followed by 1572 (1.25%), 1477, 1518, 1584 (1.50%), standard control (Thiovit 80 WG) (1.83%) and 1527 (1.92%) encoded fungicides, respectively. On the other hand, the highest disease severity (15.63%) was found in the control plot. The highest efficacy of new fungicides (93.35%) of disease severity over control was found in 1520 encoded fungicide followed by 1572 (92.00%), 1477 (90.68%), 1518 (90.66%) and 1584 (90.33%) encoded fungicides treated plot, respectively and the lowest (75.34%) in 1466 encoded fungicide treated

plot. The highest yield (36.00 t/ha) was recorded in 1572 encoded fungicide treated plot followed by 1538 (31.98 t/ha) and 1557 (31.36 t/ha) encoded fungicide treated plot, respectively and the lowest (9.13 t/ha) in the control plot.

Efficacy of bio-fungicide and chemical fungicides to control powdery mildew of pumpkin on floating bed

M. G. Kibria, H. B. Harun, and M. M. R. Talukder

An experiment was conducted to find out efficacy of a bio-fungicide (Bioderma (3%)) and two chemical fungicides (Tilt 250 EC @ 0.05%, Thiovit 80WG@ 0.2%) to control powdery mildew of pumpkin grown on floating beds at RARS, Rahmatpur, Barishal during 2024-25. Both the bio-fungicide and chemical fungicides were found to be effective to control powdery mildew disease on floating beds. It was found that spraying with Thiovit 80 WG @ 0.2% and Bio-derma (0.3%) effectively controlled the powdery mildew and increased fruit yield of pumpkin,.

Evaluation of pumpkin genotypes to mosaic disaese under field condition

M. M. Rahman, L. Yasmin, M. Afroz and M. S. Ali

An experiment was conducted to screen pumpkin genotypes with a view to find out resistant sources against mosaic viral diseases. A total of 20 pumpkin germplasm were evaluated including susceptible check (variety sweety). Among the germplasms, ten showed resistant and four showed moderately resistant reaction to the disease. The rest genotypes showed moderate susceptible to susceptible reaction to the disease. The highest yield was recorded fromn BD-2157 (20.4 t/ha) followed by BD-00363 (20 t/ha), BD-232 (19.6 t/ha) and BD-279 (19.6 ton/ha) with 33.33, 0.00, 0.00 and 0.00% disease incidence. The lowest yield was obtained from BD-2214 (13.2 ton/ha) with 0.00% disease incidence.

Bottle Gourd

Development of bio-rational disease management package against root knot nematode of bottle gourd

Md. Iqbal Faruk

An experiments were conducted to develop an eco-friendly integrated management technology against root knot disease bottle gourd caused by *Meloidogyne incognita*. Root knot nematode infested pit soils were treated with different treatments viz. *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. It was revealed that all the treatments gave appreciable reduction of root knot 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 of poultry refuse with Rugby 10G or Trichoderma based bio-fungicides Tricho-composts with Rugby 10G or mustard oil cake with Rugby 10G were the mosteffective treatments in reducing root-knot nematode disease as well as increasing plant growth and yield of bottle gourd.

Efficacy of different fungicides and cultural control practices against gummy stem blight disease of bottle gourd

T H Tabassum and S T Nira

A piece of research was conducted to test the efficacy of fungicides and cultural practices to control gummy stem blight of bottle gourd. The disease incidence and severity of gummy stem blight disease were reduced due to all treatments compared to control. Fruit yield was increased to some extent over control under different treatments.

Study on soilless media (water hyacinth, tema) for production of damping off or foot rot disease free seedlings and increased yield of bottle gourd under floating bed

R.Momotaz, Y.H.Rayhan, M. Arifunnahar, M.M.Islam, T.Tabassum and M.H.Hosain

A study was conducted to evaluate the effectiveness of *tema*—a soilless growing medium composed of water hyacinth (*Eichhornia crassipes*) and *Topapana* (*Pistia stratiotes*)—amended with various organic and chemical substrates, in controlling damping-off and foot rot diseases and enhancing seedling growth and yield of bottle gourd (*Lagenaria siceraria*) under floating bed cultivation. Nine treatments were tested which were neem oil cake, cow dung, biochar, horn meal, coco dust, bone meal, Tricho-compost, Autostin 50 WP, and control. Among them, cow dung showed superior performance, recording the

highest seedling survival rate (96.16%), greatest shoot (51.38 cm) and root growth (45.12 cm), and maximum biomass accumulation (3.44 g) along with the lowest disease incidence (7.04%). Neem oil cake and Tricho-compost also showed effective disease suppression and improved plant vigor. Conversely, the control exhibited the highest disease incidence (16.85%) and the weakest seedling growth. These findings highlight the potential of cow dung-amended with *tema*-based soilless media as a sustainable, eco-friendly solution for producing healthy seedlings and improving yield in floating cultivation of bottle gourd.

Integrated management of gummy stem blight disease of bottle gourd

Md. Iqbal Faruk, Sabikun Nahar and Md. Haider Hossain

A series of experiments was conducted season to develop eco-friendly integrated management technology against gummy stem blight disease (*Didymella bryoniae*) of bottle gourd. Four different treatment viz. stem painting with bordeaux paste, stem painting with copper fungicide, stem painting with bordeaux paste + foliar spray with copper fungicide (Copper blue 50 WG) and stem painting with copper fungicide + foliar spray with copper fungicide were tested against the disease. It was revealed that all the treatments gave appreciable reduction of gummy stem blight disease and increased yield of bottle gourd. Among the treatments, integration of stem painting with bordeaux paste + foliar spray with copper fungicide (Copper blue 50 WG) and stem painting with copper fungicide + Foliar spray with copper fungicide were the best treatments for disease management and increasing yield of bottle gourd.

Okra

Efficacy of chemicals, botanicals and plant defense activators in managing okra yellow vein mosaic virus

M. M. Rahman, L. Yasmin, M. Afroz **and** M. S. Ali

The present study was conducted to evaluate the efficacy of chemicals, botanicals and plant defense activators in managing Okra Yellow Vein Mosaic Virus (OYVMV) and Okra enation leaf curl disease (OELCuV), as well as their impact on crop yield. The experiment was consisted of eight treatments such as: i) Basil leaves 5m/L, ii). Neem oil 5ml/L iii). Salicylic acid 0.1 mM, iv). Zinger 5ml/L, v) Turmeric 5ml/L vi). Aloe vera 5ml/L, vii) Imidacloprid 0.5ml/L viii) Untreated control. Athough, significant differences were not found in disease incidence or yield across treatments, certain botanicals demonstrated promising effects. Aloe vera treatment showed OYVMV disease incidence to 39.34% at 60 days after transplanting compared to 44.21% in the control. Similarly, turmeric treatment was showed OELCuV incidence to 23.52% at 60 days after transplanting, relative to 48.38% in the control. The highest yield was obtained from ginger treatment (2.42 tons/ha) compare to control (1.86 tons/ha). The findings suggest that botanical extracts may offer potential for integrated disease management and yield enhancement in okra cultivation.

Country Bean

Identification of viruses infecting country bean and their suspected weed hosts

M.S. Akhter, M.S.Rahman, Mi Faruk, M.M.Karim and Matiar Rahman

Yellowing disease is the severe constrain of country bean production in Bangladesh. Serological and molecular test results revealed that two species of potyvirus and several geminivirus species are 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* which are frequently infected by viruses. The identified viruses are mostly whitefly transmitted geminivirus species as identified by symptomatology and PCR.

Cauliflower

Integrated management of bacterial card rot of cauliflower in kushtia

J. A. Mahmud, M. M. Morshed, M. M. Hossain

An experiment was conducted to observe the response of different treatments against bacterial card rot disease of cauliflower. The treatments were.

T_1= Foliar spray with Bactroban 20WP @ 2g/L of water, T_2= Soil amendment with stable blessing powder @ 25kg/ha + folair spray with Bactroban 20WP @ 2g/L of water, T_3= Soil amendment with Bacillus sp. (EMOs) granule @ 500 kg/ha + folair spray with EMOs powder @ 1g/L of water and T_4= Farmer's practice were appilied. BARI Fulcopy-2 was used as experimental variety. The lowest disease score was recorded in treatment $T_{2\ and}$ the highest disease score was observed in T_4 (Farmer's practice)

Survey

Survey on major diseases of commercially grown vegetables in cumilla region

T H Tabassum, R Momotaz, M Nazneen, S T Nira

A comprehensive survey was conducted to observe disease prevalence of commercially grown vegetables in Cumilla region during 2024-25 cropping season. Disease plant as well as fruit samples were collected and cultured for identification of the pathogen in Plant Pathology laboratory, BARI, Gazipur following standard survey method. Through the survey, 6 diseases of different major vegetables with their incidence and severity were recorded. Among the diseases we observed late blight of potato, late blight of tomato, bean anthracnose, BMV, Chili leaf curl virus and bacterial wilt of brinjal. The highest leaf infection in Chilli leaf curl virus was observed in Chandina. Late blight disease of potato, late blight disease of tomato, bean anthracnose appeared with minimum infection in crop field in Chandina and RARS, Cumilla. Bacterial wilt in BARI Begun-12 appeared with an incidence of 20% as the major hindrance of brinjal production in Cumilla region.

Activities: Fruit Crops

Mango

Efficacy of chemicals in controlling floral malformation of mango

M. M. Hossain, A.K.Saha 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 2024 to June 2025, to observe the efficacy of different chemicals to control floral malformation of mango caused by *Fusarium moniliformae*. The treatments were Goldazim 500 SC (Caebendazim 50%), Tilt 250 EC (Propiconazole 25%), Napthalene Acetic Acid (NAA), Goldazim 500 SC + NAA, Tilt 250 EC + NAA and Control. The treatments were applied in orchard of 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, A.K. Saha, 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 2025, to test the efficacy of ten 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 Cabrio top (Pyroclostrobin 5% + Metirum 55 %), Luna sensation 500 SC (Fluopyram 25% + Trifloxystrobin 25%), Zibal 77 WP (Copper hydroxide 77%), Stramin 75 WG (Tebuconazole 50%+ Trifloxistrobin 25%), Score 250 EC (Dificonazole 25%), Headline Tim 23 WP (Pyroclostrobin 12 %+ Dimethomorph 10%), Novafix 42WDG (Copper 12% + Mancozeb 30%), Opponent 75 WG (Tebuconazole 50%+ Trifloxistrobin 25%), Deconil 500 SC (Chlotrothionil 50%), Amister top 325 SC (Azoxytrobin 18.2%+ Difenoconazole 11.4%) (Standard check). 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 against anthracnose disease. In respect of incidence, severity, disease reduction and fruit retention, fungicidal treatments are arranged from higher to lower efficacy as Luna sensation 500 SC, Amister top 325 SC, Cabrio top, Deconil 500 SC, Stramin 75 WG, Headline Tim 23 WP, Opponent 75 WG Zibal 77WP, Score 250 EC, Novafix 42WDG.

Evaluation of new fungicides against anthracnose of mango

M. M. Hossain, A.K.Saha, 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 2025, to check 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 1032 was the best fungicide to control postharvest anthracnose as this fungicide able to control 96.44 % of the disease followed by code no 1028 (89.29%), 1083 (83.93%) and 1042 (82.15%) respectively. Rest of the fungicides control less than 80 % of the disease.

Induction mechanisms for controlling bacterial black spot in mango

M. T. Hossain and M S. I. Khan

An experiment was conducted at the Regional Agricultural Research Station, Hathazari, Chattagram in order to ascertain the induction in the plant employing the bacterial formulated products at the farmer's field during 2024-25. *Bacillus* species have been employed for last decade in agricultural settings to promote plant growth, increase yields, and combat a variety of plant diseases. But in our country, it has become still infantile. However, we have used both *in vitro* and *in vivo* trials using reasonable chemical pesticides comparing effective microbial organisms called BioLife BHAT-04 WP which were formulated by *Bacillus oryzicola* YC7007, *Bacillus velezensis* GL6, and *B. subtilis* GBO3 with some standard carrier materials against mango bacterial black spot, MBBS disease of exotic banana mango. 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 *16sRNA* sequencing. Formulated BioLife HAT-04 revealed significantly (Student's t, $P<0.05$) lower disease severity by 1.0 ± 0.6, than the control by 2.8 ± 0.4 in the exotic banana mangoes out of 0-4 disease rating scales. It also revealed significantly induction of *PR1* gene compared to control. BioLife BHAT-04 also revealed significantly (Student's t, $P<0.05$) higher yield (total no. of fruit/plant) compared to control by 35.3 ± 3.0 no/plant than the control by 25.0 ± 3.0. Formulated products showed significantly consistent disease suppression 2.8 times to MBBS compared to control. We concluded that BioLife BHAT-04 is a necessary biological product for controlling MBBS disease.

Screening of different group of fungicides against anthracnose of mango in hilly area

M. M. Hasan and N. U. Ahmed

The experiment was conducted with BARI Aam-4 at Hill Agricultural Research Station, Raikhali, Rangamati during February to July 2025 to find out effective management options against the disease. The experiment was laid out in randomized complete block design with three replications. Eight years aged, 21 BARI Aam-4 plants were selected for the experiment and one plant was considered one replication. Seven treatments were explored in the experiments. Significant variation of disease incidence, severity was found in different treatments. The fungicides are Tilt 250 EC, Cupravit 50 WP, Amister Top 350 SC, Companion, Secure, Autostin. 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. Amister Top (Azoxystrobin + Difenoconazole) exhibited the highest effectiveness, reducing disease incidence to 15.42% and severity to 8.50 PDI, with a 76.45% reduction in disease incidence over the untreated control. Tilt (Propiconazole) also performed well, showing a 67.17% reduction in incidence. In contrast, Carbendazim (Autostin) showed the least effectiveness among treated plots.

Survey of floral malformation of mango in rajshahi region of Bangladesh

M. M. Hossain, A. K. Saha, 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 2025. Fifty locations were visited in five upazillas of Chapainawabganj districts and two upazillas of Rajshahi districts with the objectives to confirm the status and update the existing statistics of mango floral malformation for the future planning and management. The disorder was found widely distributed in all over the survey area. The maximum severity (6.25%) was observed in Nachol upazilla

followed by Gomostapur (5.78%). All the traditional cultivars were more or less affected by the disease. Among the varieties the highest severity (20.90 %) was recorded from Ashwina followed by BARI Aam-3 (16.23%). Ashwina and BARI Aam-3 are moderately susceptible (MS) while BARI Aam -1 is moderately resistant and others are tolerant variety to the malady.

Citrus

Search for resistance sources of citrus sp. Against *candidatus liberibacter asiaticus* (CLAS) causing greening disease of citrus

R.Islam, M.S. Akhter, K. Jahan, M. Naznin, M. M. Islam and M. H. Hossain

Citrus, particularly sweet orange (*Citrus sinensis*) and mandarin (*Citrus reticulata*), is an important fruit crop in Bangladesh, but its production is increasingly threatened by huanglongbing (HLB), a destructive disease caused by *Candidatus Liberibacter asiaticus* (CLas) and transmitted by psyllid vectors. The disease leads to severe yield loss, fruit quality reduction, and tree decline, yet little is known about the interaction of CLas with commonly used citrus rootstocks in Bangladesh. In this study, four CLas isolates were collected from symptomatic sweet orange trees in Rajshahi, Chapainawabganj, Rangpur, and Moulvibazar. Molecular detection using polymerase chain reaction (PCR) confirmed the presence of CLas in all isolates. These isolates were subsequently graft-inoculated onto seedlings of three citrus species: Pummelo (*Citrus grandis*), Rangpur lime (*Citrus limonia*), and Trifoliate orange (*Poncirus trifoliata*). Symptom development was monitored and validated by PCR. Results of biological indexing revealed clear differences in host responses: Pummelo showed the highest level of tolerance, with minimal symptom expression and complete resistance to one isolate (CSCN03); Rangpur lime exhibited moderate and isolate-dependent susceptibility; and Trifoliate orange was highly susceptible, with up to 100% infection. These findings demonstrate significant variability in host–pathogen interactions and highlight Pummelo as a potential source of tolerance for future rootstock improvement. The study provides a foundation for resistance-based management strategies aimed at mitigating the threat of HLB to citrus cultivation in Bangladesh.

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, M.Islam, R. Momotaz, M.S.Akhter, M. M. Islam, M.H.Rashid and M.H. Hossain

Strawberry (*Fragaria×ananassa* Duch.) is an important fruit of the family Rosaceae. It is infected by number of diseases caused by fungi, bacteria, viruses and other pathogens. Amongst fungal diseases, leaf spots caused by Pestalotia are important diseases which cause huge losses in the crop. A field experiment was conducted in the reasrch field of Horticulture Research Centre (HRC), BARI, Gazipur during 2024-25 cropping season. The treatments $T_{1=}$ Companion (Mancozeb 63% + Carbendazim21%) @ 2 gm/L water, T_2= Autostin (Carbendazim) @ 2gm/L water, T_3= Sunfonate 70 wp (Thiophanate- methyl) @ 1 gm/L water, T_4= Score (Difenoconazole) @ 0.5ml/L water, T_5 = Ridomil gold MZ 68 WG (Mancozeb 64% + Metalaxyl 4%) @ 2 gm/L water, T_6 = Sunvit 50 wp (Copper oxychloride 50%) @ 1.5gm/ L water, T_7= Rovral (Iprodione) @ 2 gm/Lwater, T_8= Champion (Copper hydroxide 77%) @ 2 gm/L water, T_9= Contaf (Hexaconazole) 2 ml/L water, T_{10}= Control were used in the experiment. BARI Strawberry 1 was used as a variety. The experiment was laid in Randomized Block Design (RBD) with three replications. The disease incidence was ranged from 37.37 % to

85.89%. The maximum good fruits were obtained from Treatment T_7 and lowest was from Control. In case of damaged fruits and PDI minimum result was found in Rovral treated plot and maximum in Control treatment. Per The maximum yield was found in T_7 treatment and minimum in Control treatment. Disease reduction over control was maximum in T_7 treatment as compared to other treatment

Watermelon

Cultural, chemical and biological control of fusarium wilt in watermelon

M. G. Kibria, H. B. Harun, and M. M. R. Talukder

The experiment was conducted at RARS, Rahmatpur, Barishal during 2024-2025. Management of Fusarium wilt disease on watermelon was conducted by spraying with Spraying with TRICOST 1% WP (Trichoderma sp.) @ 5 g/L; Dynamic WP (Bacillus amyloliquefaciens) @ 5 g/L; Trooper 75 WP (Tricyclazole) @ 3 g/L; Amistar top 325 SC (Azoxystrobin +Difenoconazole) @ 1 ml/L; Dithane M-45 (Mancozeb) @ 4 g/L; Autostin 50WDG (Carbendazim) @ 2 g/L. From this experiment, it was found treatment with Autostin 50WDG @ 2 g/L can effectively control the Fusarium wilt on watermelon.

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 reveled that all the tested samples are positively reacted with the WBNV.

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, OFRD, 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 Orthotospovirs a Watermelon *bud necrosis virus and Groundnut bud necrosis virus*. *Watermelon bud necrosis virus* (WBNV), *Ground nut bud necrosis virus* (GBNV) which are the member of Orthotospovirs and are the major threats to watermelon production in Bangladesh. Among the fungal diseases Fusarium wilt, gummy stem blight and Alternaria leaf blight disease were observed.

Papaya

Ecofriendly management of *papaya ring spot virus* (PRSV).

M. S. Rahman and M. S. Akhter

Papaya (*Carica papaya L*) is an important commercial vegetable and fruit crop. *Papaya ringspot virus* (PRSV) is considered as the most serious virus disease of papaya and causes severe yield loss. The research work was undertaken to develop echo-friendly disease management option against PRSV of papaya. The experiment was conducted in the research field of Bangladesh Agricultural Research Institute, Gazipur during *rabi* season 2024-25. Four 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 28.56 % to 57.74 % over control. Treatments T_2 (Spray Imidacloprid 0.1 % 4 times at 15 days interval + sticky yellow trap) was found better on the basis of disease reduction.

Survey and monitoring of diseases of cashew nut and coffee in Bangladesh

M. S. Ali, L. Yasmin, M. Afroz, M. M. Rahman and M. A. Hossain

A comprehensive survey was conducted during May, 2025 in HARS, Khagrachari, 7mile Khagrachari sadar, 8 mile Khagrachari sadar, Ramghar, 14 km Rangamati to record the incidence and severity of different diseases of coffee. *Fusarium sp.* and *Colletotrichum* sp were identified from leaves. *Colletotrichum* sp. was identified from stem.

Activities: Flower Crops

Lilium

Efficacy of fungicides on botrytis blight of lilium

L. Yasmin, M. Afroz and M. M. Rahman, M. S. Ali and F. N. Khan

The experiment was conducted at Floriculture research field of Horticulture Research Centre, BARI, Gazipur during December 2024 to March 2025 to find out effective fungicides to manage the botrytis blight disease of lilium. Among the treatments, the lowest plant mortality (14.47%), incidence (60.0%) and PDI (18.0%) was found in T_2 treatment (Rovral 2gm/l) followed by T_1 treatment (Amistar top 1 ml/l), T_3 treatment (Autostin 2 gm/1) and T_4 (Luna sensation 2 ml/1) where plant mortality, disease incidence and PDI were18.41%, 21.0%, 23.27%; 65.0%d, 70.0%c, 75.0% and18.0%, 20.0%, 25.0%, respectively. The highest rachis length 42.27cm obtained from T_2 followed by T_3 (37.27cm), T_4 (37.0cm) and T_1 (36.0cm). The lowest rachis length 35.0cm and highest plant mortality (25.0%), incidence (90.0%) and PDI (50.0%) recorded in control treatment.

Others

Isolation and characterization of entomopathogenic fungi

M. S. Rahman, M. Arifunnahar, M. M. Islam and M.H. Hossain

Entomopathogenic fungi (EPFs) play an important role for regulating insect pest populations, as they exist in many different ecosystems. Within these fungi, Beauveria, Metarhizium spp. Cordyceps spp. etc. genera include species that are the most commercially important. The aim of this study was to isolate and characterization of entomopathogenic fungi. Two entomopathogenic fungi were isolated and characterized. One is *Cordyceps javanica* from dead insect and another is *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.

Survey on disease status of various crops of fragile ecosystem in Bangladesh

R. Momotazm. Arifunahar, M.M.Islam, M.S.Rahman, I. Ahmed, R.Islam, M.S.Akhter, M. Monir, M. H. Rashid and M.H.Hosain

A field survey was conducted during the 2024–25 cropping season across Khulna (Dumuria), Satkhira(Tala), Rajshahi (Poba), and Chapainawabganj (Islampur), recorded 24 diseases affecting vegetables, spices, tubers, fruits, oilseeds, and pulses. Rajshahi showed the highest disease pressure in vegetables, especially cabbage (21%), brinjal (16%), and chili (15%), while Chapainawabganj had the lowest overall incidence. Khulna recorded the highest curd rot in cauliflower (21%), and Satkhira exhibited a broader range of vegetable diseases, including beetroot (11%) and broccoli (8%). In oilseeds and pulses, Rajshahi had the highest incidence of mustard club root (24%) and lentil Stemphylium blight (17%), in contrast to Chapainawabganj's lower levels. Among spices, Rajshahi reported the highest tip burn in garlic (14%) and purple blotch in onion (12%). Early blight of potato was most severe in Khulna (16%), and yam leaf spot occurred only in Khulna. Fruit crops in Rajshahi again showed high disease burdens—mango (24%), papaya (18%), and banana (20%)—while Khulna was the only district with citrus greening (12%). Satkhira showed milder fruit disease incidence. Botrytis blight of Gladiolus was highest in Khulna (11%) and absent in Chapainawabganj. The study highlights regional differences in disease prevalence and provides critical data for crop protection strategies.

Survey on major diseases of commonly grown fruits in cumilla region

T H Tabassum, R Momotaz, M Nazneen, S T Neera

A survey was conducted to observe disease prevalence of commonly grown fruits in Cumilla region during 2024-25 cropping season. Through the survey, 8 diseases of different major fruits with their incidence and incidence 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). Guava wilting, among all the diseases 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 of mango (20%) infection on orchard plants. In Borura, an established citrus orchard located where bacterial disease canker (25%) harmed the most.

Characterization of PGPR based rhizo-bacterial species

M. T. Hossain and M S. I. Khan

An experiment was carried out at the Regional Agricultural Research Station, Hathazari, and Chattagram to determine whether rhizobium endophytic bacterial species are ecologically suitable for causing nodule development during 2024-25. Nodule formatting bacteria have been utilized as integrated management tools for root architecture, plant growth promotion, and environmental sustainability in agriculture. The gram-negative bacteria were isolated using morphological, biochemical and Gram staining techniques. NRB BHat-1 and NRB BHat-2 are isolates of gram-negative bacteria with robust nodule formatting that had not yet been thoroughly documented in relation to their distinct unique novel species. In comparison to control, NRB BHat-2 revealed significantly higher PGP by root length cm (28.33 ± 2.1), fresh weight gm (7.22 ± 2.1), and number of nodules (27.67 ± 1.4) by root length cm (18.33 ± 3.1), fresh weight gm (1.6 ± 0.3), and number of nodules (14.0 ± 4.5). Regarding nodulation and root architecture, only the considerable plant growth promoting activities (PGPA) of the recently discovered bacterial species had been evaluated. Currently, they are being prepared for *16sRNA* and sequencing in order to create new, novel species. According to our findings, strain NRB BHAT-02 is an essential biological supplement for root architecture, plant growth promotion.

Collection and isolation of endophytic bacteria to suppress bacterial wilt pathogens

R.Islam, M.S. Akhter, K.Jahan, M. Naznin, Md.M.Islam and Md. H.Hossain

Biological control of bacterial wilt pathogen (*Ralstonia Solanacearum*) using endophytic bacteria is one of the alternative control methods to support sustainable agriculture. An experiment was conducted in the laboratory of plant pathology division in 2024-2025 cropping season at BARI, Gazipur, The objective of this study was to isolate endophytic bacteria from different healthy vegetable plants and to determine their antimicrobial properties. In this study, 24 different probable endophytic colonizing bacterial strains were isolated from three solanaceous vegetable crop species biz,Tomato, brinjal and chilli. Among 81 isolates successfully isolated, 4 isolates which antagonistic effect on Ralstonia *Solanacearum* by producing inhibition zone from 1 to 2 mm diameter or ability to suppress population in ager disc diffusion assays. The endophytic bacterial communities of healthy roots, stems and leaves of these plants were assessed on Nutrient agar medium Kings B medium.

Survey of major diseases of selected fruits, vegetables and spices in northern region

M.M.E Rahman, M.S. Akhter, M.S. Huda, M. Afroz and A.K.Saha

Diseases of commercially grown fruit, vegetables and spices were considered as an important bottle neck for the production these crops in the country. During 2021 to 2025, a total of 24 different fruits, vegetables and spices including malta, dragon, mango, litchi, custard apple, coconut, date palm, fig, papaya, watermelon, melon, banana, capsicum, summer tomato, ginger, onion etc. were surveyed in the Northern region to know their disease status. Depending on the disease's nature and crop type, disease incidences and severity ranged from 1 to 50% with low to high, respectively. Some new diseases were recorded in some selected commercially important fruits, vegetables and spices. Several symptoms like citrus yellowing, virus in brinjal, extensive inflorescence and fruit rot of mango and litchi were observed. Some minor diseases of some crops were observed to become severe threats in some areas of Northern region.

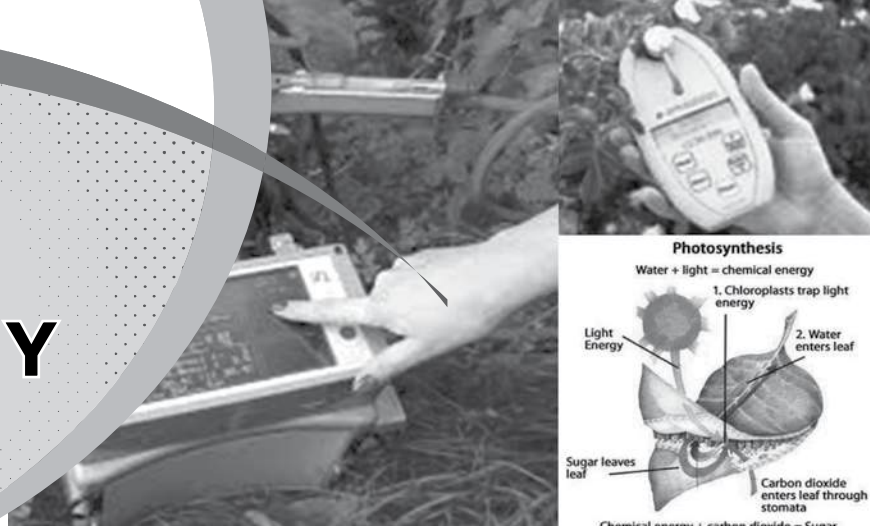
Morpho-physiological characterization of selected new isolates of *sclerotinia sclerotiorum*

M.M.E Rahman, S.Ghosh 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 was observed in collected isolates of *S. sclerotiorum.*

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Effect of seaweed extract on morpho-physiological response and seed yield of soybean under drought stress

M. S. A. Khan, A. H. M. M. R. Talukder, M. Ahmed and F. Ahmed

A field experiment was conducted during *rabi* 2024-25 at the research field of Plant Physiology Division, BARI to investigate the influence of seaweed extract on morpho-physiological traits and seed yield of soybean under drought stress. BARI Soybean-6 was grown in field under water stress (50 – 60% FC) with foliar application (five levels: 0, 2.5, 5.0, 7.5 and 10 ml/l of water) of seaweed extract at second trifoliate leaf to R6 stage. Seaweed extract showed significant effect on soybean growth characters and seed yield. Relative water content and chlorophyll fluorescence were also varied due to different levels of seaweed extract. Proline accumulation and reactive chemical compounds like H_2O_2 and malondealdehyde contents were observed maximum in water stress plant and the contents were decreased with increasing levels of seaweed extract. Antioxidant enzymes activities like GSTs, POD, CAT and APXs were observed maximum in water stress along with seaweed extract @ 10 ml/l of water. The lowest seed yield (774 kg/ha) was observed in water stress treatment which was 51% lower as compared to well-watered treatment. However, water stress along with seaweed extract @ 7.5 and 10 ml/l of water treatments produced 86.13% (1304 kg/ha) and 87.52% (1325 kg/ha) seed yield as compared to well-watered treatment, respectively. Results revealed that foliar application of BARI Seaweed-1 extract @ 7.5 to 10 ml/L significantly improved drought tolerance in soybean by enhancing physiological traits, reducing oxidative stress, and increasing antioxidant enzyme activities. These treatments resulted in substantial yield recovery under water-limited conditions, suggesting that seaweed extract is a promising biostimulant for sustainable soybean production in drought-prone areas.

Morpho-physiological and biochemical responses of selected sesame genotypes to waterlogging stress

S. N. Mahfuza, A. F. M. S. Ahsan, A. H. M. R. Talukder, A. A. M. M. Mustakim and N. Mokarroma

A pot-culture experiment was conducted at the pot-house of the Plant Physiology Division, BARI, Gazipur, from March 2025 to June 2025. The objective of this study was to examine and identify the comparatively waterlogging tolerant sesame genotypes. Five sesame genotypes including BARI Til-6 as G5 were subjected to waterlogging stress for 48 and 72 hours and data were measured. The experiment followed a randomized complete block design (RCB) with three replications. Ten seeds of each genotype were sown in each pot on March, 2025. 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 stress was imposed at 55 days after sowing (DAS) by placing the pots in a cement-concrete tank and submerging them to maintain waterlogged conditions. The water level was kept 2–3 cm above the soil surface to ensure complete saturation. The treatment was maintained for the desired stress period, with the water level monitored and replenished daily to prevent fluctuation. The present study showed that waterlogging stress caused severe damage to different attributes of the sesame genotypes compared with their control. The treated genotypes showed an increasing trend in lipid peroxidation as well as in hydrogen peroxide (H_2O_2) and Lipoxygenase (LOX) contents that corresponded to increased stress duration. The results also showed that the plants exposed to water stress presented a significant decline in CMSI content, yield and yield contributing characters, but the reduction rate was significantly lower in G4, which was identical with G5 (BARI Til- 6).

Morpho-physiological evaluation of brinjal genotypes at elevated temperature

S. N. Mahfuza, A. H. M. M. Rahman, N. Mokarroma, F. Ahmed, M. Moniruzzaman, L. Akter and A. K. M. Quamruzzaman

A study was conducted to evaluate the impact of elevated temperature stress on the physiological traits and yield attributes of ten hybrid brinjal (*Solanum melongena* L.) genotypes, including two varieties (BARI Hybrid Begun-4 and BARI Hybrid Begun-6). This study was a collaboration program with vegetable Division, HRC, BARI. The experiment involved two temperature conditions: normal (24°C in an open field) and elevated, where the temperature was raised by 5±1°C. High-temperature stress (ambient ± 5~6°C) was imposed at 20 days after transplanting (DAT) using a polythene chamber. Daily air temperature inside and outside the chamber was measured using maximum–minimum thermometers, while humidity was monitored with a hygrometer to assess atmospheric water vapor. The experiment followed a randomized complete block design with three replications. Fertilizers @ 150-50-125-40-2 kg ha^{-1} N-P-K- Zn-B and Organic Manure 10 Kg pit^{-1} were applied. At 45 days after transplanting (DAT) samples were taken from both control and stressed plants to assess several physiological parameters, such as photosynthetic parameter, Cell membrane stability Index (CMSI), Proline content in leaves and pollen viability (%) of flowers. At designated time intervals, plants were harvested to record plant height, total dry matter, fruit number $plant^{-1}$, and fruit yield $plant^{-1}$. Results indicated that heat stress significantly reduced all measured physiological and yield parameters across all genotypes, reflecting damage to photosynthetic apparatus, membrane integrity, osmotic adjustment, and reproductive function. Notably, genotypes G4, G5, and G6 exhibited a comparatively lower reduction in these traits, performing statistically similar to the tolerant check variety BARI Hybrid Begun-6 (G10). Their ability to maintain higher CMSI, accumulate proline, and sustain pollen viability underscores their inherent thermo-tolerance. These genotypes were thus identified as promising, heat-tolerant candidates for future breeding programs aimed at developing climate-resilient brinjal varieties.

Exogenous application of plant growth regulators for mitigating heat stress and improvement of yield in bottle gourd

S. N. Mahfuza, A. A. M. M. Mustakim, A. H. M. M. Rahman, F. Ahmed, M. Moniruzzaman, L. Akter and A. K. M. Quamruzzaman

The present investigation was carried out with three plant growth regulators, namely Ethrel, Malic Hydrazide and GA_3, respectively were sprayed at 15 days after transplanting subsequently applied at 15-day intervals for a total of four sprays on bottle gourd plants to find out their response on bottle gourd compared to their control (water spray) under heat stress (ambient ± 5~6°C). The study was conducted at the vinyl house of Plant Physiology Division, BARI Gazipur during November, 2024-March, 2025. High temperature was raised by using a polythene chamber (ambient ± 5~6°C). Pit size was top dia: 50 cm, depth: 50 cm and bottom dia: 50 cm and 25 days old seedling were transplanted 10 December, 2024. Fertilizers @ 80-40-100-30-2-2 g pit^{-1} of N P K S Zn B Mn and Organic Manure (OM) 10 kg pit^{-1} were applied. Half OM, N and half of K along with full amount of other fertilizers were applied as basal. Remaining OM, N and K were top dressed in 4 equal splits. The experiment followed a randomized complete block design with three replications. The results clearly indicated that the spraying of Ethrel @ 200 ppm significantly increased fruit length and diameter, average fruit weight, sex ratio and fruit yield $plant^{-1}$ over control treatment and notably, Malic Hydrazide @ 200 ppm was the lower performer. Simultaneously, toxic by product of plants (MDA and LOX) was also significantly reduced by spraying of Ethrel @ 200 ppm under heat stress. Based on these observations, it could be suggested that spraying of Ethrel @ 200 ppm at 15 days after transplanting subsequently applied at 15-day intervals for a total of four sprays can significantly reduce MDA and LOX percentage and increase yield contributing characters and yield of bottle gourd under heat stress.

Evaluation of sweet potato genotypes for salinity tolerance in coastal Bangladesh

A.F.M. Shamim Ahsan, A. A. M. M. Mustakim, A. H. M. M. Rahman, S. N. Mahfuza, N. Mokarroma and M. S. U. Khan

An experiment was conducted at the farmer's field in Shyamnagar, Satkhira during the *rabi* season of 2024–

2025 to identify salt-tolerant genotypes. Three sweet potato genotypes (V_1 = H16.EJ/10, V_2 = H9.7/12, and V_3 = BARI Sweet Potato-12) were evaluated under naturally saline field conditions, where soil salinity ranged from 1.75 to 38.65 dS/m. The experiment followed a randomized complete block design with three replications, using 3 m × 3 m plots at 60 cm × 30 cm spacing. Recommended fertilizer doses (260-150-250-75-12-10 kg/ha of Urea, TSP, MOP, Gypsum, Zinc sulphate, Boric acid + 10 t/ha cow dung) were applied. Data were collected on morphological, physiological, and yield traits. Significant genotypic variation was observed for salinity tolerance. Genotype V_1 outperformed others, producing the highest yield (14.79 t/ha), with superior vine length (162.53 cm), maximum land coverage (95.33%), greater total biomass (20.28 g/plant), and highest marketable root weight (215.24 g). In contrast, V_3 was most sensitive, recording the lowest yield (7.65 t/ha) with reduced vegetative growth and root development. Correlation analysis indicated that root yield was positively associated with vine length, biomass, and marketable root weight, while root diameter remained stable across genotypes. These results identify V_1 (H16.EJ/10) as a promising salt-tolerant genotype, suitable for cultivation in the salinity-affected coastal regions of Bangladesh.

Phenology, growth and yield response of rapeseed-mustard to variable sowing environment

A.H.M. Motiur Rahman Talukder, and F. Ahmed

A field study was conducted during the 2024-2025 *rabi* season at the Plant Physiology Division, BARI, Gazipur to observe the phenology, growth and yield of rapeseed-mustard varieties as influenced by sowing times. Two rapeseed-mustard varieties, namely BARI Sarisha-14 and BARI Sarisha-18 were sown in three different time scheduling 10-days intervals viz. 14 November, 24 November and 04 December, respectively. The trial was laid out in a Randomized Complete Block Design (RCBD) with three replications. Seeds were sown at a rate of 7.0 kg ha^{-1} with the spacing of 30 cm × 10 cm, in unit plots of 3.0 m × 4.0 m. To ensure healthy establishment, seeds were treated with Provax 200-EC (2.5 g kg^{-1} seed). Crop management included manual weeding, light irrigation, thinning, bird scaring, and pest control through Malathion (2 ml L^{-1}) and Rovral (0.2%). Fertilizers were applied at the rate of 100-30-80-20-3-1 kg ha^{-1} N-P-K-S-Zn-B in the form of urea, tripple super phosphate (TSP), muriate of potash (MOP), zypsum, zinc sulphate and boric acid, respectively. Half of the urea along with the full doses of tripple super phosphate, muriate of potash, zypsum, zinc sulphate and boric acid was applied as basal, while the remaining urea was top-dressed at 20 days after sowing (DAS). Observations were recorded on phenological traits (emergence, two-leaf stages, flowering, pod initiation, seed setting, and maturity), growth parameters (plant height, leaf area index, and biomass accumulation) and yield-contributing characters (pods $plant^{-1}$, pod length, seeds pod^{-1}, 100-seed weight), and final grain yield. Weather data were also analyzed to interpret crop-environment interactions. Results revealed that sowing time had a significant effect on all growth and yield attributes. Early sowing (14 November) promoted rapid emergence, prolonged vegetative growth, and timely flowering, which ultimately enhanced yield performance, particularly in BARI Sarisha-18 (1.56 t ha^{-1}). In contrast, late sowing (04 December) curtailed the growth duration, reduced leaf area development and led to yield reduction, with BARI Sarisha-14 recording the lowest yield (0.55 t ha^{-1}). Distinct varietal differences were observed, where BARI Sarisha-14 exhibited rapid early phenological development and larger seed size, whereas BARI Sarisha-18 demonstrated greater canopy expansion, higher pod production, and enhanced biomass accumulation, which collectively contributed to its superior yield potential. In conclusion, mid-November sowing, combined with appropriate nutrient management, is optimal for maximizing the productivity of rapeseed-mustard in Bangladesh. The varietal performance data generated from this study provide a robust foundation for parameterization of crop simulation models such as DSSAT and APSIM, thereby supporting improved agro-climatic decision-making for rapeseed-mustard cultivation.

Screening for drought tolerance in foxtail millet genotypes

A. H. M. Motiur Rahman Talukder, F. Ahmed, M. Motiar Rohman, M. M. Billah

A pot experiment with genetically diverse foxtail millet genotypes was carried out in the vinyl house of the Plant Physiology Division, BARI, from November 2024 to March 2025. The aim of this study was to evaluate and screen foxtail millet genotypes for their relative drought tolerance. A total of thirty genotypes were assessed as experimental materials

under a collaborative program with the Plant Breeding Division, BARI. For smooth execution of the study, a trial was established in the vinyl house using a pot culture system with 30 genotypes. In this setup, 300 plastic pots (26 cm top diameter, 20 cm base diameter, and 25 cm height) were organized, with 10 pots arranged per block across 15 replications inside the vinyl house. The experiment commenced on 06 December 2024, laid out in a RCBD with ten replications. Fertilizers @ 40-16-28-6-1 kg ha^{-1} N-P-K-S-Zn were applied. 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 300 pots were divided into two sets and each set contained 150 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. 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. Genotypes such as BD BD-1116, BK-2, BK-4, BD-157, BD-1283, BD-1281, BD-11646 and BD-162 exhibited superior drought tolerance as evidenced by their relatively higher yields under stress, favorable stress tolerance indices (STI, GMP, YSI), and lower yield reductions. These results can provide a foundation for breeding programs aimed at improving drought resilience and enhancing sustainable millet production in drought-prone regions of Bangladesh.

Evaluation of barley genotypes under drought and salinity stresses in coastal region of Bangladesh

A. H. M. Motiur Rahman Talukder, F. Ahmed and S. Mondal

A field experiment was carried out at the Agricultural Research Station (ARS), Benarpota, Satkhira during the *Rabi* season of 2024-2025 to evaluate the performance of selected barley varieties/genotypes under combined drought and salinity stresses in coastal Bangladesh. The study was designed using a Randomized Complete Block Design (RCBD) with three replications. Four genotypes/varieties viz. BARI Barley-8, BARI Barley-9, BARI Barley-10, and the genotype T-16 were tested under two stress conditions: (i) salinity with irrigation and (ii) salinity combined with drought stress (imposed by withholding irrigation at reproductive stage). Each plot measured 1.5 m × 2.0 m, with a total of 24 plots in the trial. Fertilizers were applied following the Fertilizer Recommendation Guide at the rate of 60-24-30-10-1.0-0.5 kg ha^{-1} N-P-K-S-Zn-B in the form of urea, tripple super phosphate, muriate of potash, zypsum, zinc sulphate and boron respectively. All tripple super phosphate, muriate of potash, zypsum, zinc sulphate and Boron were applied at final land preparation, while urea was top-dressed in two equal splits at 30 and 60 days after planting. Data were recorded on phenological, morphological, and agronomic parameters, including days to 50% heading, days to maturity, plant height, effective tillers hill^{-1}, panicle length, number of grains spike^{-1}, 100-seed weight, grain yield plant^{-1}, and total plot yield. The results revealed significant genotypic variation under stress conditions. T-16 exhibited the highest sensitivity, showing delayed phenology and sharp reductions in plant height, tiller number, panicle length, and yield attributes under combined drought and salinity. In contrast, BARI Barley-9 and BARI Barley-10 demonstrated superior adaptability, maintaining relatively stable phenology, higher panicle length, and greater yield stability. BARI Barley-10 produced the highest plot yield (728.0 g; under irrigation + salinity and 536.6 g; under drought + salinity), followed closely by BARI Barley-9, which maintained the highest 100-seed weight and improved resilience in grain number and plant yield. In conclusion, the study identified BARI Barley-9 and BARI Barley-10 as promising candidates for cultivation in drought- and salinity-prone coastal regions, whereas genotype T-16 proved highly susceptible. These findings highlight the potential of improved barley varieties for enhancing productivity and stability in stress-prone environments of Bangladesh.

Bolting as influenced by maleic hydrazide in onion bulb production

A. A. M. M. Mustakim, A. F. M. Shamim Ahsan, A. H. M. M. Rahman, S. N. Mahfuza, N. Mokarroma and M. A. A. Khan

A field experiment was conducted at the Plant Physiology Division, BARI, Gazipur, during the 2024–2025 *rabi* season. To investigate the effect of Maleic Hydrazide (MH) on bolting suppression

and bulb yield Two sowing dates (November 30 and December 15) were combined with four MH concentrations (0, 1000, 1500, and 2000 ppm) in a randomized complete block design with three replications. Growth, yield, and bolting parameters were recorded at harvest. Results indicated that MH application significantly reduced bolting across sowing dates. The highest bolting percentage occurred in untreated control plots (13–15%), whereas 1500 ppm MH almost completely inhibited bolting (0.5–3.7%). Yield performance was also enhanced by MH, with Nov. 30 producing the maximum bulb weight (30.1 g), total weight (42.7 g), and yield (11.3 t/ha for early sowing and 10.5 t/ha for late sowing). Correlation analysis revealed that bolting percentage was negatively associated with bulb weight (r = –0.58) and yield (r = –0.48), while bulb weight, bulb diameter, and bulb length were strongly correlated with yield (r = 0.81 to 0.96). These findings confirm that MH at 1500 ppm is optimal for minimizing bolting while improving bulb yield in onion.

Screening of chilli genotypes for salinity stress tolerance

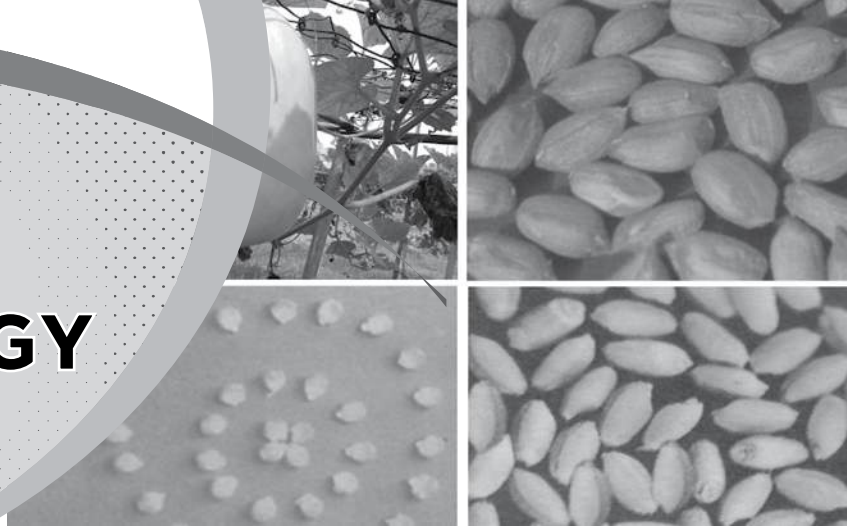
A. A. M. M. Mustakim, A.F.M. Shamim Ahsan, A. H. M. M. Rahman, S. N. Mahfuza, N. Mokarroma, M.A.A. Khan and F. Ahmed

A pot experiment was conducted at the Plant Physiology Division, BARI, Gazipur, during the 2024–2025 *rabi* season to evaluate the response of six chilli genotypes under graded salinity stress (0, 8, 10, and 12 dS m^{-1}). Morpho-physiological and biochemical traits including plant height, branch and flower number, fruits, leaf area, chlorophyll content, relative water content, root traits, and total carotenoids were recorded. Results revealed significant reductions in growth and physiological parameters under increasing salinity, with severe suppression at 12 dS m^{-1}. Genotypes CO-634 and CO-446 maintained higher SPAD values (73.7–77.8), root length (44–68 cm), and chlorophyll content, which contributed to superior fruit set (46–69) and node number compared to other genotypes. Conversely, BARI Morich-6 and CO-525 showed sharp declines in photosynthetic pigments (total chlorophyll 0.47–0.76) and fruit set, indicating susceptibility. Correlation analysis demonstrated strong positive associations among SPAD, root volume, and fruit set (r = 0.35 to 0.58), whereas total chlorophyll was negatively correlated with reproductive performance (r = –0.24 to –0.33). Based on tolerance indices, CO-634 and CO-446 were identified as promising genotypes for salinity-affected areas, while BARI morich-6 and CO-525 were salt-sensitive.

Screening of groundnut genotypes against heat stress

A. A. M. M. Mustakim, A.F.M. Ahsan, A. H. M. M. Rahman, S. N. Mahfuza, N. Mokarroma, M.K. Matin

An experiment was conducted at the Pot House of the Plant Physiology Division, BARI, Gazipur, during the 2024–2025 *rabi* season. To evaluate tolerance mechanisms, Five groundnut genotypes (G1–G5) were sown on December 24, 2024, and exposed to three temperature regimes: open field (control), heat stress from flowering to maturity, and heat stress from pegging to maturity. Heat stress was imposed using a polythene chamber (4 m × 3 m), which increased minimum and maximum temperatures by 1–3°C and 4–6°C, respectively, relative to the open field. The experiment followed a randomized complete block design with five replications, and recommended fertilizer doses (90-45-120-30-3-1.4 kg/ha of N-P-K-S-Zn-B) were applied. Data on physiological and yield traits were recorded at harvest. Results revealed that heat stress reduced chlorophyll content and biomass accumulation; however, significant genotypic variation was observed. Genotypes ICGV-94361, ICGV-93382, and BARI Badam-8 exhibited the highest tolerance, maintaining superior relative water content, membrane stability index, root volume, and dry matter partitioning under elevated temperatures. ICGV-94361 under flowering stress recorded the highest CMSI (97.12) and strong biomass performance, while BARI Badam-8 under pegging stress produced the largest leaf area and high dry matter accumulation. ICGV-93382 performed consistently across all treatments, combining stability with good physiological efficiency. Overall, ICGV-94361 emerged as the most heat-tolerant genotype, with ICGV-93382 and BARI Badam-8 was also recommended for cultivation in heat-prone environments of Bangladesh.



SEED TECHNOLOGY

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Effect of gibberellic acid seed priming on soybean germination and quality seed production

S. A. Bagum, P.C. Sarker and M. H. Rahman

The experiment was carried out at the Seed Technology Division's research field in BARI, Gazipur, from November 2023 to April 2024 and November 2024 to April 2025, to determine the effect of seed priming with various doses of GA3 on soybean emergence and quality seed production. A field and laboratory investigation evaluated four GA_3 concentrations (0, 100, 150, 200 ppm) applied to three soybean varieties (BARI Soybean-5, -6, -7). The experiment featured a two-factor randomized complete block design with three replications. Seed priming with gibberellic acid (GA_3) significantly improves germination performance, seedling vigor, and yield attributes in soybean. Priming at 100 ppm GA_3 maximized germination percentage (up to 95%), vigor index (up to 14,984), plant height (94.5 cm), number of pods per plant (up to 192.7), and seed yield (up to 37.9 g/plant). Higher concentrations (150–200 ppm) produced variable results, indicating an optimal GA_3 dose exists. These findings support the use of 100 ppm GA_3 seed priming for enhanced soybean seed production and field establishment.

Effect of foliar application of growth regulators on yield and seed quality of garden pea

A. Hannan, M. N. Islam, M. A. Hossain, M. S. Rahman, P.C. Sarker and M. H. Rahman

The experiment was carried out at the research field of Seed Technology Division, BARI, Joydebpur, Gazipur during *rabi* season 2024-2025 to find out the effective growth regulator on yield and seed quality of garden pea. The experiment was laid out in a 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}, seedspod^{-1}, 100-seed weight, seed yield, germination per cent, shoot length and Seed Vigor Index (SVI) was recorded from the treatment of α-tocopherol when applied with 100 ppm at flowering + pod filling stages.

Influence of sulphur level on yield and seed quality of soybean

A Hannan, M S Rahman, M Isam, M M Masud ,P C Sarker and Mh Rahman

The experiment was carried out at the research field of Seed Technology Division, BARI, Gazipur during *rabi* season 2024-20245to find out the optimum dose of sulphur on yield and seed quality of soybean. The experiment was laid out in a RCBD design with three replications. BARI Soybean-7was used as a test crop. Sulphur level was S_0= Control, S_1= 10 kg, S_2=20 kg, S_3= 30 kg and $S_{4=}$ 40 kg "S" ha^{-1} The results indicated that there was much variation among the different doses of sulphur on yield contributing parameters and seed quality parameters of soybean. Among the sulphur doses, S_2 (20kg ''S'') gave the highest yield attributes and seed yield of soybean. Considering the seed quality parameter, S_2 (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 seed priming on seed yield and seed quality of groundnut

A.N.M.A Karim and Md. Habibor Rahman

The experiment was carried out at the research field and laboratory of Seed Technology Division, BARI, Gazipur during 2024-2025 to find out

effect of seed priming on seed yield and seed quality of groundnut. The experiment was laid out in Randomized Completely Block Design with three replications involving different chemicals viz., (untreated seeds) as control (T_1), soaking in water for 6 hr (T_2), soaking 1% KH_2PO_4 for 6 hr (T_3), soaking 1% $CaCl_2$ for 6 hr (T_4), soaking 1% Boron for 6 hr (T_5)and soaking with 1%$H_4SiO_4$for 6 hr. (T_6).The seed priming treatments were given before sowing of seeds after the priming seeds were dried for 6 hr than used for sowing. The field observations were recorded on seed yield and yield contributing characters. The study reveals that, the seed priming significantly influence the seed yield and seed quality of groundnut. The maximum yield (40 g/Plant) wed due to seed priming with observed soaking 1% Boron for 6 hr (T_5).The seed priming with Boron 1% recorded the highest field emergence (85%), days to 50 % flowering (37days), plant height (50.66cm), number of pods per plant (24.33), 100 seed weight (49g). Seed quality parameter viz., germination (95.33 %), Root length (19cm) .shoot length (9cm) ,seedling dry weight (0.5633g) vigor index I (570.69) and vigor index II (43) improve by seed priming with 1% Boron for 6 h.So, the treatment soaking 1% Boron for 6 hr (T_5) was found suitable seed priming method for better seed yield and seed quality of groundnut.

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, P. C. Sarker and M. H. Rahman

This experiment is conducted at Seed Technology Division BARI, Gazipur research field during *Rabi* season 2024-25 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. T_1= Control (Native nutrient), T_2= Organic fertilizer only (STB) – Biologically Active Organic Fertilizer (BIOFER) + BARI IMO-1 + BARI IMO-2, T_3= Inorganic fertilizer only (STB), T_4= Both organic and inorganic fertilizer – IPNS (25% organic + 75% inorganic) and T_5= Recommended fertilizer. Plant ht, No branch/plant, Seed yield, Germination (%), seedling dry wt and speed of germination were significantly influenced by different treatments.

Enhancement of growth, seed yield and quality as influenced by seaweed extract, and agronomic bio-fortification of zinc and selenium in field pea

R. Chakma, M. Islam, Md. N. Islam, M. S. Rahman, P. C. Sarker and M. H. Rahman

This experiment is conducted at Seed Technology Division BARI, Gazipur research field during *Rabi* season 2024-25 to find out the effect of Zn, Se and seaweed extract on the growth, yield, quality and concentration in seeds of field pea. The experiment design was carried out in a RCB design with three replications. The experiment comprises five treatments viz. T_1= Control (RDF BARI), T_2= 16 kg/ha. $ZnSO_4$ (Soil) + 2.5 ml/L (foliar), T_3 = 100g/ha Na_2SeO_4 (Foliar) T_4=2.5 ml/L Seaweed and T_5= T_2+T_3+T_4. Combined application of ZnSO4, Na_2SeO_4 and seaweed increased the grain yield by 34.62%, compared to the control. Application of Se, Seaweed and Zn increased the field pea grain yield by 33.33%, 25% and 10.26%, respectively, compared to the control. However, the combined application of Zn, Se, and seaweed, as well as the sole Se application, resulted in greater grain yield increases compared to the other treatments.

Effect of iron, zinc and selenium on growth, yield attributes, seed yield and nutrient bio-fortification of bushbean

R. Chakma, M. Islam, M. N. Islam, M. S. Rahman, P. C. Sarker and M. Habibur Rahman

This experiment is conducted at Seed Technology Division BARI, Gazipur research field during *Rabi* season 2024-25 to assess the influence of the foliar application of Fe, Zn and Se on growth, yield, quality and micronutrients concentration in seeds. The experiment design was carried out in a RCB design with three replications. The experiment comprises five treatments viz. T_1= Control, T_2=$FeSO_4.7H_2O$ foliar spray, T_3= $ZnSO_4.7H_2O$ foliar spray, T_4=100g/ha Na_2SeO_4 foliar spray. Application of FeSO4, ZnSO4 and Na2SeO4 increased the grain yield by 9.48%, 11.22% and 10.65%, respectively, compared to the control. Overall, Fe, Zn and Se fertilization is beneficial in increasing bush bean seed yield and quality.

Effect of planting time and plant spacing on seed yield and quality of onion

M. A. Hossain and M. H. Rahman

The experiment was carried out at the research field and laboratory of Seed Technology Division, BARI, Gazipur during *rabi* season of 2024-25 to investigate

the effect of planting time and plant spacing on seed yield and quality of onion seed. The experiment consists of three different planting dates, i.e. 1 November (P_1), 15 November (P_2) and 30 November (P_3) with four spacing, viz. 20 cm x 20 cm (S_1), 25 cm x 20 cm (S_2), 25 cm x 25 cm (S_3) and 25 cm x 30 cm (S_4). The experimental results revealed that the date of planting and plant spacing had significant influence on yield and quality characters of onion. The planting on 15 November (P_2) showed significant higher, plant height (98.85 cm), stalk height (93.73 cm), number of umbel per plant (4.09), umbel diameter (54.47 mm), seed yield/plant (9.49 g) and seed yield (1271.1 kg/ha), thousand seed weight (3.472 g), germination (%) (95.00), seedling dry weight (2.0 mg) and vigour index (192.78) than 1 November and 30 November planting. The plant spacing 25×20 cm (S_2) showed higher plant height (96.36 cm), stalk height (93.82 cm), stalk diameter (11.85 mm), number of umbel per plant (4.31), umbel diameter (55.82 mm), seed yield/plant (9.83 g) and seed yield (1113.0 kg/ha), thousand seed weight (3.553 g), germination (%) (96.44), seedling dry weight (2.1 mg) and vigour index (204.34) than closer spacing.

Effect of fruit retention on seed quality of brinjal

M. A. Hossain, M. S. Rahman, M.N Islam, A. Hannan, R. Chakma, M. Islam, P.C. Sarker and M. H. Rahman

The experiment was conducted in the field and laboratory of seed technology division, BARI, Gazipur, Bangladesh during *Rabi* season of 2023-2024 and 2024-25 to investigate the impact of fruit retention levels (T_1:3, T_2:5, T_3:7 fruits /plant and T_4: all fruit retention) on yield attributes and seed quality of brinjal (BARI Begun-12), conducted in a Randomized Complete Block Design (RCBD) with three replications**.** The results demonstrate a clear relation between fruit/seed size and total yield per plant driven by fruit retention level. Retaining three to five fruits/plant maximizes seed physiological quality, yielding vigorous seedlings with robust root-shoot development, confirming T_1 and T_2's consistency in optimizing resource allocation for seed development 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 Sarkar

The experiment was conducted to the field and laboratory of seed technology division, BARI, Gazipur during *Rabi* season of 2023-2024 and 2024-25 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 (T_1:35 days after pollination (DAP), T_2:45 days after pollination (DAP), T_3:55 days after pollination (DAP), T_4:65 days after pollination (DAP) and T_5:75 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 to 65 days after pollination (DAP).

Emergence and biomass allocation of brinjal seedling as affected by potting substrate

M. S. Rahman, P. C. Sarker, M. S. Hossain and M. H. Rahman

A study was conducted at Seed Technology Division, BARI, Gazipur, Bangladesh during 2024–2025 to evaluate the efficacy of seven substrate mixtures, comprising varying ratios of vermicompost (VC), trichocompost (TC), cocodust (CD), and soil - on seedling survival and qualitative transplant parameters (adhesiveness, intactness, and smoothness of cake) of BARI Bt Begun-1 (brinjal), using RCB design, with three replications. Among the treatments T_3 (VC:TC:CD = 2:1:1) outperformed than other substrates, achieving the highest survival and qualitative transplant parameters, demonstrates that T_3 substrate optimizes brinjal seedling vigor and transplant readiness, attributed to balanced physical properties, enhancing root development and structural integrity. This mixture may be recommended for nursery production to improve field establishment.

Effect of macro and micro nutrients on seed yield and quality of BARI begun-12

M. Islam, M. S. Rahman, P. C. Sarker and M. H. Rahman

An experiment was conducted in the experimental field and laboratory of Seed Technology Division, BARI, Gazipur, Bangladesh during 2024-25 to know the effect of macro and micro nutrients on seed yield and seed quality of brinjal (var. BARI Begun-12). The experiment was done following RCBD with

three replications. The treatments were, T_1 - 100% RDCF, T_2 - 125% RDCF, T_3 - 100 % RDCF + Compost @ 3t/ha, T_4 - 125% RDCF + Compost @ 3t/ha, T_5 -100 % RDCF + Vermi compost @ 3t/ha, T_6 - 125 % RDCF + Vermi compost @ 3t/ha. The maximum seed yield (551.31kg/ha) was found when 125% RDCF + compost @ 3t/ha was applied and 534kg/ha seed was obtained when 125% RDCF + vermi-compost @ 3t/ha was applied. This is due to higher number of fruit per plant (4.25), fruit weight (1.177kg), fruit length (25.08cm) and diameter (36.48cm), number of seed (2367) per fruit obtained from T_4 and second higher value found in T_6. Where, minimum was recorded in T_2 Treatment. On the other hand, the maximum seed germination (%), length of seedling and vigor index of seedling was found in both T_4 & T_6 treatments than the others.

Determination of optimum harvesting time of chia for getting quality seed

M. Islam, M. A. Hossain, 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 2024-2025for the determination of optimum harvesting time of chia for getting quality seed. Chia crop was harvested at six different time at 5days interval from 85 DAS to 110 DAS. Plant height at harvest, number of inflorescences per plant, main inflorescence length, seed yield, thousand seed weight, seedling dry weight and vigorindex were found maximum from chia harvested at 95 DAS. Although average inflorescence length and number of seeds per floret found maximum from chia harvested at 100 DAS except the seed germination. The percentage of sterile florets was found lower from harvest at95 DAS. Although100% germination was found from the seed harvested at any time from 85 to 110 DAS. So, chia should be harvested at 95 DAS to 100 DAS for getting higher seed yield and better quality in respect of thousand seed weight, germination and good quality seedlings.

Effect of seed priming with gibberellic acid on growth & yield of soybean at aez-18

G. N. Hasan, R. H. Anik & M. Islam

An experiment was conducted at the farmer's field, Daulatkhan, Bhola in the *rabi* season of 2024-25 to find out appropriate dose of gibberellic acid that enhance growth and yield of soybean. The experimental area was located at 22.638763" N and 90.662973" E longitude at an elevation of 10 m above from the sea level under agro-ecological zone (AEZ-18). The treatments were of 4 doses of Gibberellic acid viz., control (T_0), Gibberellic acid 50 mg/l (T_1), Gibberellic acid 75 mg/l (T_2), Gibberellic acid 100 mg/l (T_3), was outlined in a Randomized Complete Block Design (RCBD) with 3 replications. Results revealed that 75 mg/l Gibberellic acid gave the highest seed yield ($1.83 tha^{-1}$) and maximum plant height (53.46 plant height cm) at harvest, T_2 (Gibberellic acid 75 mg/l) gave the maximum pant population ($18.67\ m^{-2}$) whereas the minimum number of plant population ($14.34\ m^{-2}$) was obtained from T_0 treatment. Maximum number of branches plant $^{-1}$ (4.46) was observed from 100mg/l GA_3. Result also revealed that 75 mg/l GA_3 gave highest number of filled pod $plant^{-1}$ ($63.43\ plant^{-1}$) which was statistically similar to 100 mg/l ($63.00\ plant^{-1}$). So, the application of 75mg/l GA_3 showed the highest seed yield and other yield attributes as compared to those of other GA_3 dose.

Study of pollination approach on the true seed production of onion

M. S. Naznin, M. A. Alam and M. Z. H. Prodhan

The experiment was conducted at the Spices Research Centre, Bangladesh Agricltural Research Institute (BARI), Shibganj, Bogura, during the 2024-25 *Rabi* season to study the effect of different pollination approaches on true seed production of onion (*Allium cepa L.*), variety BARI Piaz-6. The experiment was laid out in a randomized Complete Block Design (RCBD) with five treatments and three replications. The unit plot was 3.0 m x 1.2 m having plant spacing of 15 cm x 10 cm. The bulb of BARI Piaz-6 was sowing on 17 November 2024. Five treatments were implemented: T_1 involved natural pollination combined with regular hand pollination; T_2, T_3, and T_4 incorporated natural pollination with hand pollination at intervals of 1, 2, and 3 days respectively; and T_5 served as the control with only natural pollination. Results revealed that T_1 (natural + daily hand pollination) and T_2 (natural + 1-day interval hand pollination) significantly enhanced key parameters such as 1000-seed weight (3.12 g and 2.88 g), seed yield (301.50 kg/ha and 284.21 kg/ha), seeds per umbel (325.50 and 299.40) and active florets per umbel (115.93 and 110.30), compared

to the control (T_5) which recorded the lowest performance in all traits. The findings suggest that combining natural pollination with frequent hand pollination greatly improves true seed production of onion in Bangladesh.

Effects of seed priming on germination and seedling growth summer onion

Mst. Sadia Naznin, M. N. A. Chowdhury and M. Z. H. Prodhan

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogura, on 25 February 2025 to evaluate the effects of different seed priming methods on germination and early growth of summer onion cultivar BARI Piaz-5. The experiment followed a Randomized Complete Block Design (RCBD) with five treatments:T_1: Hydro-priming, T_2: Osmopriming, T_3: Hormonal priming, T_4: Biopriming, T_5: control, each replicated thrice. The highest germination (84.67 and 81.33%) were recorded in T_2 and T_3 respectively. The maximum seedling density (471.67 and 438.00 No. of Seedlings/m^2) were observed in T_3 and T_4 respectively The maximum seedling vigor index (1028.68 and 1018.27) were noted in T_2 and T_3 respectively. The highest dry matter content (3.07%) and survival rate (88.67) were exhibited in T_3 treatment. Biopriming (T_4) produced the tallest plants (13.31cm) while the control treatment (T_5) consistently exhibited the lowest performance including germination (59.67%), vigor index (737.91) and survival rate (61.33%). The study concludes that seed priming particularly with GA_3 and KNO_3 significantly improves germination, seedling vigor and early growth of summer onion and can be recommended for enhancing productivity under field conditions.

Study of pollinator attractants on onion seed production

Mst. Sadia Naznin, M. A. Alam and M. Z. H. Prodhan

A field experiment at Spices Research Centre, BARI, Shibganj, Bogura (2024-2025) evaluated pollinator attractants on onion (cv. BARI Piaz-6) seed production. Five treatments:T_1 (Jaggery 10%), T_2 (Sugar 10%), T_3 (Honey 2.5%), T_4 (Rose water 3%) and T_5 (Control) were arranged in RCBD with three replications. Sprays were applied at 7-day intervals during 50-70% umbel opening. T_1 recorded the highest afternoon pollinator visitation (10.87/m^2), mainly syrphid flies, and showed superior floral traits: 126 active florets, 34.67 inactive florets, 290 seeds per umbel, 3.23 g 1000-seed weight, and 304.00 kg/ha seed yield. Jaggery and sugar sprays effectively enhanced pollination and seed yield.

Comparative study of different seed priming techniques on soybean

Sabikunnahar, M. M. H. Bhuiyan and M. H. Hossain

A field experiment was conducted during the *Rabi* season of 2025 at RARS, BARI, Cumilla to evaluate the effects of different seed priming treatments on soybean (*Glycine max* L.) growth and yield. Seven treatments were tested: hydropriming for 1 hour (T_1), hydropriming for 2 hours (T_2), osmopriming with 0.5% KNO_3 for 1 hour (T_3), osmopriming with 1% KNO_3 for 2 hours (T_4), osmopriming with 0.5% humic acid for 1 hour (T_5), osmopriming with 0.5% salicylic acid for 1 hour (T_6), and an untreated control (T_7). Significant differences were observed for all parameters. T_1 produced the highest seed yield (2.79 t ha^{-1}), seed yield per plant (11.14 g), 100-seed weight (10.6 g), harvest index (47%), early emergence (4.0 days), and pod number (39.4 pods $plant^{-1}$). The control had the lowest values across most traits. The superior performance of T_1 is attributed to enhanced germination, improved stand establishment and efficient assimilate partitioning. Given its simplicity, no chemical cost and positive impact on yield, hydropriming for 1 hour is recommended as a low-cost, eco-friendly pre-sowing treatment for soybean. As the experiment was conducted for only one season, further trials will be undertaken next year to validate these results.

Prediction of the field emergence of brinjal seed

M. Rasel, M. S. Rahman and I. Ahmed

An experiment measuring the viability, vigor and germination of brinjal (BARI Bt Begun-1) seed lots with tetrazolium test, Electrical conductivity (EC) test and standard germination method respectively was conducted to predict the field emergence (FE) of seed lots. A robust beta regression model with quadratic predictors was selected for predicting FE, considering the data's non-linearity, outliers, and heteroscedasticity. Comparing the relationships between FE with EC, viability ratio (VR), and germination ratio (GR) it can be predicted that EC

value over 40 is not preferable for sowing of BARI Bt Begun-1 in field.

Effect of different storing methods on seed quality of groundnut under ambiant condition

A.N.M.A Karim, M. H. Rahman and P.C. Sarker

The experiment was carried out at the laboratory of Seed Technology Division BARI, Gazipur 2024-25 to find the effect of storing methods on seed quality of groundnut. The experiment was laid out in CRD with BARI Chinabadam-9 and three storing methods *viz*. 1. Seed storing in normal polythene bag 2. seed air tight polythene bag 3. seed storing in normal polythene bag with anhydrous calcium chloride. Among the storing method seed storing in at normal polythene bag with anhydrous calcium chloride showed significantly better seed quality parameters such as moisture content (10.31 %), germination percent (87%), seedling root length (11.82 cm), seedling shoots length (9.07 cm) and vigor index (498.33) after 9 months of storage.

Effect of storage material on seed quality of green gram

M. Islam, M. S. Rahman, R. Chakma, P. C. Sarker and M.H Rahman

The present investigation was carried out in laboratory of Seed Technology Division, Bangladesh Agricultural Research Institute, Gazipur from August, 2024 to February, 2025, wherein freshly harvested quality seed of mungbean cv. BARI Mug 6 having high germination percentage and low moisture content (5.83%) was stored in different packages in ambient storage condition. There were five packaging materials i.e. i) Plastic container with air-tight lid, ii) PET bottle, iii) Gunny bag inside laminated with polybag, iv) Plastic bag inside laminated with polybag and v) Tin container used for storage of mug bean seed. The experiment was carried out using completely randomized design (CRD) with four replications. Observations were recorded at bimonthly interval on seed moisture content (%), germination (%), root length (cm), shoot length (cm), seedling dry weight (g) and seedling vigor index. The results indicated that all the treatments exhibited significant difference for all the traits studied after two, four and six months of storage. Maximum germination (87 %), seedling length, seedling dry weight, vigor index and low moisture content (5.93%) was found in seed stored in air tight PET bottle after six months of storage. Therefore, mung bean would be stored up to six months in air tight PET bottle or plastic container maintaining low moisture content and good seed quality.

Seed quality of chia stored in different environmental conditions and packages

M. Islam, R. Chakma, M. S. Rahman, P.C. Sarker and M. H. Rahman

An experiment was conducted in laboratory of Seed Technology Division, BARI, Gazipur, during 2024-2025 to find out the suitable storage condition and storage medium for packaging of chia for maintaining seed quality during storage. There were two storage environments as ambient condition and cool room (17-20 ^{0}C temp and 50 % RH) and five storage materials such as 1) glass bottle, 2) Plastic container, 3) Poly bag (0.06mm thikness), 4) Alluminium foil and 5) PET bottle. Data on seed moisture, germination, EC, seedling dry weight, vigor index etc. were taken initially, 3 months and 6 months of storage. Seed stored in cool room showed higher germination (above 95%), seedling dry weight, vigor index in air tight glass bottle, PET bottle or plastic container and ambient storage showed lower germination (0%) and other seed quality.

Survey on storage technology of groundnut in selected areas of Bangladesh

A.N.M.A Karim, M. Habibur Rahman and P.C. Sarker

The study was conducted in four major groundnut areas of Bangladesh to assess and analyze existing groundnut storage technologies and practices in the study. The result revealed that most of the farmers (40.5 %) in the study areas were cultivating BARI Chinabadam-8 variety of groundnut. The majority of groundnut farmers (53.5%) farmers save seeds for next year cultivation. Sun drying was found to be the mostly practiced traditional seed drying system according to (51.5%) of the respondent. A number of storage materials were used in the survey areas of plastic drums (45.25 %) was found to be the mostly adopted storage materials. Majority of respondents (52.25%) in all area believed that groundnut seeds must be properly dried and brought to a safe moisture level before storage in order to preserve their quality.

VERTEBRATE PEST

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Effect of bait station design on bait uptake and control efficacy of rodent in wet crop field

A T M Hasanuzzaman and M S Alam

The experiment was conducted in outdoor rat enclosure at vertebrate pest division, BARI, Joydebpur, Gazipur during 2024-25 to increase the consumption of poison bait by rat through providing bait with suitable bait station and to increase the control efficacy of Zn_3P_2 poison bait in wet crop field. Plain bait was offered to rats with six newly designed bait stations and their consumption was recorded. The different bait stations were bamboo pipe bait station type 1 (BPB1), bamboo pipe bait station type 2 (BPB2), banana leaf sheath bait stations (BLB), cork sheet bait stations (CSB), plastic bottle bait station (PBB) and Polythene sheet bait station (PSB. Rat consumed significantly higher amount of plain bait from BLB bait station which was statistically similar with BPB2 and BPB1 bait station whereas CSB bait station was least preferred by rat which was statistically similar with PSB and PBB bait station. Similarly, in poison bait consumption, BLB (0.56 g/rat/day) bait station was highly preferred by rat that was followed by BPB1 (0.43g/rat/day) bait station which was statistically similar with BPB2 (0.37g/rat/day) bait station. On the other hand, Highest success in rodent control was observed in BLB bait station (59.76%) that was followed by BPB2 (44.05%) and BPB1 (41.67%) bait station. The lowest success was observed in PBB bait station (26.67%).

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 Joypurhat and Natore districts during 2024-25. 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 presc/ribed 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 both Joypurhar and Natore. Most affected fruits were ber, mango, litchi, coconut, guava and pumelo. Farmers reported that they lost 11.62% guava, 9.54% mango, 10.62% ber, 8.97% litchi and 20.14% pumelo due to squirrel in last year. Farmer lost 876.59 taka per guava tree per year due to squirrel attack while it was 1561.30 taka for mango tree, 876.84 taka for ber, 1834.52 taka for litchi and 854.12 taka for pumelo tree. Farmers were unknown about breeding habit of squirrel.

Efficacy of different repellant techniques against pest birds in Foxtail Millet

M. S. Alam and A. T. M. Hasanuzzaman

The experiment was conducted at BARI central research field, Gazipur and during *rabi* season in 2024-25 to find out the efficacy of different combinations of repellent on foxtail millet against pest birds. five treatments viz. reflecting ribbon as parallel direction, and reflecting ribbon as vertical direction, only top nylon netting, whole plot netting, and Untreated control (without repellent) were used in this experiment. In control plots maximum 75% plant damage and 21.8% panicle damage were happened by the birds whereas the lowest damage was recorded in treatment where whole plot covered by net, only top nylon netting and reflecting ribbon as parallel direction (0% plant and 0% panicle damage) treated plots followed by reflecting ribbon

as vertical direction treated plot (50.0% plant and 13.75% panicle damage). Highest Marginal Benefit cost ratio was found in reflecting ribbon as parallel direction (0.16) and all other treatments show negative Marginal Benefit cost ratio (MBCR).

Evaluation of rodenticidal properties of some plant extract against rat in laboratory

M. S. Alam and A. T. M. 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, Mint, 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 4 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. Three treatments viz. Cumin, Clove and Black pepper treated bait of 10% and 20% concentration showed higher feeding deterrent with the increase of concentration except Calendula, coriander, akanda and mint powder. These four treatments 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, Coriander, Mint and Akanda leaves have some attraction power to rodent for feeding activity. This results may be useful in preparation of rodenticides baits used in rodent control.

Field evaluation of rodenticide for controlling rats

M. S. Alam and A. T. M. Hasanuzzaman

The experiment was conducted at Vertebrate Pest Division, BARI, Gazipur and ARS, Rajbari, Dinajpur to study the effectiveness of Bromadiolone 0.005% (Rat killer BPI and Rat killer PAS) supplied from company. The average poison bait consumption was 4.99 to 5.3 g/rat/day in choice feeding test of all the tested bait in laboratory. In field trial test two rodenticide showed more than 80% rodent control success was recorded.



POSTHARVEST TECHNOLOGY

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Effect of edible wax coating and storage temperature for improving quality and enhancing shelf life of Mango fruit

M.G.F. Chowdhury, M. M. Rahman, M.M. Molla

This study evaluated the effects of edible surface coating (Endura Fresh™ 9000) and storage temperature (9±1°C) on postharvest quality and shelf life of mango (BARI Aam-3). BARI Aam-3 was collected from farmers' orchard of Chapainawabganj and then washed with 1000 ppm thiabendazole, 0.1% calcinated calcium and treated with hot water at 55°C for 5 mins and wax coating (Endura fresh ™9000) were applied and then stored at 9±1°C and 80±5% RH. For uniform surface coating a hand sprayer was used to apply wax @500 fruit/L on the fruit peel. The study revealed significant variations in colorimetric parameters, β-carotene content, and total soluble solids (TSS) of BARI Aam-3 mangoes during 05 weeks storage (9±1°C) under different treatments. At the initial stage, fruits exhibited moderate lightness (45.48), high chroma (112.75), hue angle (85.91), and a low β-carotene content (13.77 mg/100 g), with TSS recorded at 7.27° Brix. During 05 weeks storage, the control fruits exhibited a rapid decline in L* and h° values, accompanied by a sharp increase in β-carotene (114.58 mg/100 g at 14 DAS), indicating fast ripening and color changes. However, fruits treated with hot water treatment (HWT) and edible surface coating retained higher lightness and hue angle values throughout storage, reflecting delayed ripening and better color preservation compared to control. Chroma values were significantly reduced in treated samples, particularly in treatment HWT and treatment HWT and edible surface coating, suggesting a slower degradation of green pigments. Beta carotene increased progressively in all treatments, with the highest accumulation in HWT and treatment HWT and edible surface coating at later storage periods (30.92 mg/100 g and 30.81 mg/100 g after 04 weeks storage, respectively). TSS also increased gradually across treatments, reaching 21.64 °Brix in treatment HWT and edible surface coating after 02 weeks storage indicating enhanced sweetness with storage period. HWT and edible coating effectively maintained peel color and controlled ripening, while untreated fruits exhibited rapid senescence. It can be concluded that hot water and edible surface wax coating may extend storage life upto 5 weeks at 9±1°C with 80±5% RH and maintain the physico-chemical quality of mangoes.

Development of fermented Soysauce using BARI Soyabean

M.G.F. Chowdhury, R. Islam, S. Parven, M.M. Molla

This study was conducted to develop soy sauce using suitable soybean–wheat formulations and assessed its physicochemical properties during 2 months of storage. Soybeans (1 kg), brown wheat (1 kg), and koji malt *Aspergillus oryzae* (10 g) were used and then sodium chloride (921 g) and distilled water (2.2 L) were applied for brine solution. Soybeans were sorted, washed, soaked overnight, and drained before steaming under pressure until softened. Cooked beans were cooled below 40°C. Brown wheat was sorted, roasted, and lightly crushed to about 30% powder. Equal dry weight ratios of steamed soybeans and crushed wheat were mixed and inoculated with 10 g of koji malt. The mixture was spread in trays at ~30 °C, covered with cloth or paper to prevent drying, and incubated in a controlled room. Mixing was performed after 17-18 h and 25-26 h, maintaining the temperature below 40 °C. Completed koji (44-46 h, ~30% moisture) was obtained and fermentation was initiated by

mixing koji (2 kg) with brine (2.2 L water and 921 g salt). The mash was stirred daily during the 1st week, weekly thereafter, and fermented for ~10 months to produce final product. The fermented mixture was pressed, and the extract was pasteurized at 80°C for 30 mins. After settling (2-3 days), the clear soy sauce was decanted, reheated at 55°C, clarified, and bottled. Among the samples, soybean: wheat (75:25) exhibited the highest initial lightness (43.76), followed by soybean: wheat (25:75) (39.75) and treatment soybean: wheat (50:50) (25.11). During storage, lightness of soybean: wheat (75:25) increased progressively (48.38 at two months), whereas soybean: wheat (50:50) declined sharply to 13.65. Commercial sauces demonstrated markedly low values after 02 months (7.76 in Pran soya sauce and 3.56 in sajeeb soya sauce). For chroma, initial values ranged from 24.06 in soybean: wheat (75:25) to 27.91 in soybean: wheat (50:50). Both soybean: wheat (50:50) and soybean: wheat (75:25) increased gradually (30.18 and 28.29 at 02 months), whereas commercial samples dropped to near zero (0.49 in Pran soya sauce; 2.17 in sajeeb soya sauce. Hue angle was highest in soybean: wheat (75:25) (71.17), with slight increases during storage (71.52), while soybean: wheat (50:50) treatment remained relatively stable (63.11). In contrast, Pran soya sauce decreased drastically (42.85), whereas sajeeb soya sauce maintained higher hue angle (71.46). After 02 months storage, the water activity was lower in soybean**:** wheat (50**:**50) (0.73 ± 0.01), followed by soybean: wheat (25**:**75) (0.85 ± 0.01) and treatment soybean: wheat (75**:**25) (0.85 ± 0.01). That means it is less prone to microbial growth and is likely the best for shelf stability. Formulated sauces maintained stable pH (≈5.1-5.5), moderate fat content (2.5-2.7%), and higher protein (6.89-6.93%) compared to commercial sauces. These results indicate that soybean–wheat formulations, particularly with higher soybean ratios, provide superior color stability and nutritional quality than commercial soy sauces. To sum up treatment (50:50) were better in terms of water activity and potential shelf life. Formulated soya sauce retained more favorable color attributes compared to commercial products and maintained consistent pH stability, higher protein, and fat contents, making them nutritionally superior to the commercial counterparts during storage.

Physicochemical and storage stability of vacuum fried Mango chips

M.G.F. Chowdhury, M. H. H. Khan, M.M. Molla, S. Pervin

This study evaluated the effect of vacuum fried mango chips processing using BARI developed vacuum fryer at 110ºC for 30 mins and then de-oiled at 1400 rpm for 2 mins during 05 months storage at ambient condition (26±2ºC & 75±5% RH). Matured green mangoes were peeled and thinly sliced (2-3 mm) and treated with 06 treatments such as 20% maltodextrin (MD), 20% MD with 10% salt, 20% MD with 10% salt and then freezing, 20% MD with direct frying, preserved 10% salted mango and without treated assumed as control. Raw chips were packed in a HDPE packet (~60 micron) and stored in a refrigerator (-14ºC) for 12-24 hrs. After that stored chips were fried at 110ºC for 30 mins using BARI vacuum frying and de-oiling machine. After de-oiled of chips, metalex foil packet were used for evaluating quality during 6 months of storage at one month interval. The study revealed significant variations in the physicochemical and bioactive properties of mango exposed to different treatments during 06 months of storage at ambient conditions. Moisture content of the control treatment was found 3.94% initially, while treatment 20% MD and treatment 20% MD with 10% salt maintained comparatively lower values. Treatment 20% MD, 10% salt and freezing and treatment 20% MD and direct frying exhibited gradually increased, whereas treatment preserved 10% salted mango demonstrated higher moisture stability with minimal variations. Titratable acidity remained relatively stable in control treatment and treatment 20% MD but declined in treatment 20% MD with 10% salt and 20% MD, 10% salt and freezing treatment during 06 months storage, while 20% MD and direct frying treatment and preserved 10% salted mango treatment exhibited pronounced reductions after three months. Ascorbic acid content was initially high in all treatments except 20% MD treatment and preserved 10% salted mango treatment (>70 mg/100 g) but declined during storage, with 20% MD and 10% salt treatment demonstrated rapid losses and preserved 10% salted mango treatment maintaining the lowest values (<22 mg/100 g initially). Antioxidant activity decreased significantly in all treatments, with the highest initial values in control

treatment (66.58%) and 20% MD and 10% salt and freezing treatment (64.59%), but became sharply after 04 months, particularly in control treatment 20% MD with 10% salt treatment, 20% MD and direct frying treatment, and preserved 10% salted mango treatment. Texture analysis indicated that control treatment hardened considerably (82.41 N) after that crispiness drastically reduced and was not marketable. The highest firmness was found in 20% MD treatment retained firmness (79.63 N) but remaining treatments reduced firmness (8.29 - 9.35 N) after 06 months of storage. Energy retention was the highest in 20% MD and direct frying treatment (919-730 kcal/100 g) during 6 months storage, while 20% MD, 10% salt and freezing treatment initial losses but later stabilization (951-706.49 kcal/100 g). It can be concluded that MD-based treatments, particularly mangoes treated with 20% MD and 20% MD, 10% salt and then freezing exhibited better preservation of nutritional and functional quality during 06 months of storage at ambient condition (26±2°C & 75±5% RH). Matured mango slices treated with 20% MD, 10% salt and then freezing also contributed to better retention of bioactive compounds.

Physicochemical and nutritional quality of freeze-dried Mango chips

M.G.F. Chowdhury, M.M. Molla, P.Sen

This study aimed to standardize the processing protocol for freeze-dried green mango chips using starch, citric acid, and maltodextrin (MD). Fresh mango slices (2–3 mm thick) were treated with 2.5% starch, 0.3% citric acid, and varying MD levels (10%, 15%, 20%), then packed in high-density polyethylene packets (~60 µm) and frozen at-18ºC for 24-36 hours. The frozen slices were freeze-dried at –55ºC for 24 hours followed by -45ºC for 48 hr. and packaged in foil packets (~50 µm). Freeze-drying was performed using a laboratory-scale freeze dryer under controlled vacuum pressure (0.001 mBar). The drying process was carried out at -55ºC for 24 hours followed by-45ºC for 24 hours to achieve optimal dehydration. After drying, the chips were packed in laminated aluminum foil packets (~50 µm) and stored at room temperature (26±2ºC, 75±5% RH). Results revealed that the lightness values of control treatment, 2.5% starch, 0.3% citric acid and 10% MD treatment, and 2.5% starch, 0.3% citric acid and 15% maltodextrin (MD) treatment were statistically similar, ranging from 58.07 to 58.74, signifying that the application of starch and citric acid coatings with 10-15% MD effectively preserved brightness comparable to untreated samples. However, treatments 2.5% starch, 0.3% citric acid and 20% MD exhibited a significantly lower lightness value (48.27±0.01), indicating a darker appearance at higher MD concentrations. Chroma value indicates color intensity, was highest in the control (41.60±0.01), and followed by treatments (39.87±0.06). In contrast, 2.5% starch, 0.3% citric acid and 10% MD treatment and 2.5% starch, 0.3% citric acid and 20% MD treatment revealed relatively lower values (34.05±0.06 and 31.06±0.06), indicating that excessive MD reduced the vividness of chip color, while moderate levels-maintained intensity close to the control. Hue angle values (79-81) reflected a typical yellowish-orange tone of mango. Treatment 2.5% starch, 0.3% citric acid and 10% MD treatment (81.08±0.01) and treatment 2.5% starch, 0.3% citric acid and 20% MD (80.12±0.07) exhibited slightly higher hue angles, shifting toward a lighter yellow, whereas 2.5% starch, 0.3% citric acid and 15% MD treatment (79.78±0.01) indicated a deeper orange tone. Moisture content was highest in the control (10.06±0.87%) and the lowest in 2.5% starch, 0.3% citric acid and 15% MD treatment (6.42±0.02%), highlighting the role of MD in reducing moisture retention. Titratable acidity was maximum in control treatment (2.41±0.05%) and the lowest in 2.5% starch, 0.3% citric acid and 20% MD treatment (1.47±0.05%). Phenolic content increased with coating, the highest in 2.5% starch, 0.3% citric acid and 20% MD (8.32±0.03 mg GAE/g), while antioxidant activity peaked in 2.5% starch, 0.3% citric acid and 10% MD treatment (29.09±0.57%), confirming improved nutritional and functional quality. Freeze-dried mango chips treated with moderate MD levels (10–15%) preserved brightness and intensity, while excessive MD (20%) led to reduced lightness and chroma, negatively influencing visual quality. On the other hand, mango chips treated with 2.5% starch, 0.3% citric acid and 10% MD and 2.5% starch, 0.3% citric acid and 20% MD enhanced phenolic content and antioxidant properties while maintaining lower acidity and moisture levels.

Study on the heat stress and edible surface coating for improving quality and shelf life of Mango fruit

M.G.F. Chowdhury, M. M. Rahman, M. A. Hossain, M.S.Uddin

A study was conducted on mango fruits treated with hot water and wax coating for evaluating postharvest changes in physical, biochemical quality and shelf life during 20 days of storage (18±2°C and 86±5% RH). Mangoes (BARI Aam-3) were treated with hot water (55°C for 5 mins) without surface coating (Endura Fresh™9000), without hot water with surface coating, hot water treatment (HWT) with surface coating and another was assumed as control treatment (26±2°C and 75±5% RH). Fruits were observed at 4-day intervals up to 20 days for peel color, total soluble solids (TSS) and β-carotene, firmness, and physiological weight loss. The results exhibited that mango fruits had high lightness (50.92), moderate chroma (25.19), and the highest hue angle (105.70) initially (Table 1). This indicated a characteristic fresh greenish appearance. The initial β-carotene content was 13.77 mg/100 g. TSS (°Brix) values of mango fruits were the lowest (7.27 °Brix) and generally, all treatments shown a gradually increase in TSS up to 8–16 days of storage, followed by a decline during later storage while texture firmness was maximum at 43.52 N, reflecting fresh and mature-hard fruit quality. On four days after storage, a significant shift in peel color was observed, with lightness and chroma values generally increasing under treatments, indicating initiation of ripening. Hue angle decreased (92.01-98.32), reflecting yellowish color development. Beta carotene accumulation increased considerably, particularly under treatment edible surface coating (52.95 mg/100 g) and treatment HWT with surface coating (27.18 mg/100g), presenting accelerated carotenoid biosynthesis. Firmness gradually declined, with control treatment fruits becoming noticeably softer (21.98 N) compared to treatment HWT (41.48 N). Physiological weight loss (%) increased gradually with storage duration, ranging from 0.84% to 4.08%. For eight days storage, further ripening was apparent, with control treatment exhibiting the highest chroma (38.63) and the lowest hue angle (78.37), signifying advanced yellow coloration. Beta carotene peaked in edible surface coating treatment (56.51 mg/100 g), while control treatment, TSS increased rapidly to a maximum of 20.60 °Brix. Firmness dropped markedly, especially in control treatment (4.05 N), indicating loss of texture. In contrast, HWT maintained moderate firmness (11.91 N) and color stability. Physiological weight loss increased, ranging 1.85–8.31% that indicate faster moisture loss and metabolic activity. Similar trends were almost observed at 12 days of storage. By the end of storage (20 DAS), control treatment and edible surface coating treatments fruits were fully rotten. HWT treatment and HWT with surface coating exhibited residual lightness (52.07 and 50.37), while hue angle decreased further (76.74–73.29), reflecting senescence-related discoloration. Edible coating alone reduced brightness after 8 days of storage and firmness consistently decreased with complete softening after 16 and 20 days of storage. Among them, hot water treatment and edible coating exhibited delayed senescence and higher carotenoid accumulation suggesting better storability and nutritional quality retention.

Effects of postharvest treatments on quality and shelf life of fried green Jackfruit slices (Jhuri bhaja)

M.G.F. Chowdhury, S. Parven, M.M. Molla, P.Sen

The study was conducted on the effect of postharvest treatment on quality and storage life of fried green jackfruit slices (Jhuri bhaja). Local variety green jackfruits (5-7 weeks) were collected from the market, washed, peeled, and sliced to 1–2 mm thickness. The slices were subjected to four pre-treatments such as blanching; 500 ppm KMS; 2% starch and 0.02% calcinated calcium were applied and kept in Metalex foil packet. After pre-treatments, slices were deep-fried for 30 minutes and initially packed in metalex foil packets at room temperature (26 ± 2°C and 75 ± 5% RH). Color characteristics varied markedly among treatments. Initially, blanching control treatment and starch based treatment produced lower lightness (34.42-35.60), resulting in a darker color, whereas potassium meta-bisulfite (500 ppm KMS) yielded the highest lightness (39.11). Chroma values (18.43-22.39) and hue angles (58.17-61.36) indicated a typical yellow color of fried jackfruit products. After three months, treatment 500 ppm KMS retained the highest brightness (39.69) with stable hue (60.18), while 0.02% calcinated

calcium maintained similar brightness (39.64) and yellow hue (60.49). Conversely, 2% starch-treated samples exhibited reduced brightness (34.49) and lower chroma (16.25), resulting in a duller appearance. Proximate composition was also affected by treatments. Initially, control treatment exhibited the highest moisture (7.98%), while treatment 500 ppm KMS and treatment 2% starch observed lower levels (1.53% and 2.45%). During storage, moisture increased across all samples, with 2% starch (6.57%) and 500 ppm KMS (6.17%) presenting greater absorption, whereas treatment 0.02% calcinated calcium remained relatively stable (4.33%). Protein content ranged from 5.27% (control treatment) to 6.94% (0.02% calcinated calcium), with control treatment declining further to 4.67% after storage, likely due to blanching losses. In contrast, treatment 500 ppm KMS, treatment 2% starch and 0.02% calcinated calcium maintained higher protein stability. Fat content was the lowest in blanched treatment (9.95%) but the highest in 2% starch (28.45%) and 0.02% calcinated calcium (30.22%) with slight increased after storage. KMS and calcinated calcium treatments effectively preserved the bright yellow appearance of jackfruit Jhuri bhaja, while 2% starch and 0.02% calcinated calcium maintained higher protein and fat stability, besides blanched treatment resulted in lower nutritional quality.

Development and validation of low-cost semi-commercial ripening chamber at entrepreneurs' level for uniform ripening of fruits

M.G.F. Chowdhury, M.H.H.Khan, M. M. Rahman

Low-cost semi-commercial ripening chamber was established and validated in entrepreneurs' level at Godagari, Rajshahi and Monohardi, Narsingdi for uniform ripening of mango, tomato and banana. The fruits were exposed to different doses of concentrated liquid ethylene such as 0, 50, 100, 150 and 200 ppm for overnight at PHTD Low-cost Ripening Chamber (3.5m L×2m W×2m H), BARI, Gazipur. After that, the fruits were kept at 20±2°C with 80±5% RH and at ambient temperature for 12 days for the shelf life and physico-chemical quality. For validation similar type of ripening chamber was fabricated and trial experiment was conducted. In Noadia, Monohardi, Narsingdi, bananas (BARI Kola-1) were ripened using approximately 100-150 ppm of ethylene gas overnight. The results were highly satisfactory, with bananas ripening uniformly within 72 hrs. After 48 hrs fruits were partially ripen and 72 hrs, bananas were marketable and fully edible, exhibiting consistent color, texture, and taste. This process not only accelerated ripening but also improved the quality and appearance of the bananas, making them more appealing to consumers and suitable for sale. In Sona Dighi, Godagari, Rajshahi, tomatoes were placed in the ripening chamber to ensure uniform ripening. The results were equally promising, with color development starting after 24 hrs of exposure to the controlled conditions in the chamber. Green matured tomatoes (local variety) developed attractive red color and fully ripen within 08 days but within 06 days tomatoes were marketable as per the observation trial and farmers comment. This accelerated process ensured that the tomatoes reached the desired ripeness while maintaining high quality, with the right color, firmness, and taste to meet consumer expectations. Those demonstration findings exhibit the effectiveness of the ripening chambers in providing controlled, uniform ripening conditions for both bananas and tomatoes. The results indicate that exogenous ethylene treatments, particularly at higher concentrations of ethylene gas (100-150 ppm), significantly enhance the ripening process in bananas by increasing TSS and reducing weight loss. The findings also highlight that 100-150 ppm ethylene treated mangoes may provide an optimal balance, enhancing sweetness and preserving nutrients while minimizing weight loss, making it suitable for managing postharvest quality. This ripening chamber is convenient for semi-commercial purpose to ripen matured fruits safe and maintaining uniformity for large amount at a time. At least 290 tons of fruits need to ripe to return back money within 16 months.

Up-scaling and entrepreneurs preference of selected fresh-cut vacuum fried chips at different locations in Bangladesh

M.G.F. Chowdhury, M. M. Rahman, M. H. H. Khan, M.M. Molla

The assessment was conducted to evaluate entrepreneurs' acceptance and marketability of selected vacuum fried chips at selected locations. Banana, jackfruit, potato and mango chips were prepared by the trained entrepreneurs and marketed

those products at different project locations and received their feedback. It was observed that the trained entrepreneurs sold about 57 lakhs taka and most of them were banana chips (36 lakhs taka) and jackfruit chips (11 lakhs Taka). The BCR of jackfruit chips was 3.51 and the payback period will be about 15 months. BCR of remaining chips were analyzed but not presented here. Banana, jackfruit and potato chips were accepted by the entrepreneurs. Mango chips need improvement for crispiness, seasoning and shelf life. The trained entrepreneurs sold mostly banana chips (36 lakhs Taka) and jackfruit chips (11 lakhs Taka) where BCR and payback period of jackfruit chips were 3.51 and 15 months.

Shelf-life study of Foxtail Millet fortified Sourdough bread at different storage temperatures

P. Sen, M. H. H. Khan, M. M. Rahman, M.G.F. Chowdhury, M.M. Molla, S. Pervin And B.C. Dey

This study evaluated the shelf-life stability of foxtail millet fortified sourdough bread stored under different temperature conditions: ambient, freezing (-5±2°C), refrigeration (4±2°C), (26±2°C) winter-considering, and (37±2°C) summer-considering. Foxtail millet sourdough bread was prepared and packaged in parchment paper to prevent direct moisture exchange with the environment. It was observed that the acidity of foxtail millet sourdough bread increased during storage, while pH declined. At ambient conditions, pH dropped from 5.44 ± 0.03 on Day 0 to 4.65 ± 0.03 on Day 4. Similarly, at summer-simulated conditions (37 ± 2 °C), pH decreased from 5.37 ± 0.04 to 4.70 ± 0.06. Freezing (−5±2°C) and refrigeration (4±2°C) slowed acidification, maintaining higher pH values. The outcome aligns with studies on sourdough fermentation, which indicate that higher temperatures generally favor faster microbial growth, resulting in higher acidification. The moisture content also increased at both ambient and winter temperatures, with a notable increase from 23.72±0.191 to 27.13±0.347 at ambient temperature on day 4. Conversely, there was a decrease in the moisture content in the freezing (-5±2°C) and refrigerated (4±2°C) conditions. This suggests that both higher temperatures accelerated moisture retention as well as low temperatures acted to facilitate water loss due to the inactive status of microbes and enzymes at low temperatures. The texture also increased significantly from 92.89 at Day 0 to 127.70 at Day 4 (-5±2°C). Freezing may form ice crystals, causing physical changes and firmer bread. Storage temperature exerted a significant influence on the physicochemical stability of foxtail millet fortified sourdough bread. Ambient and summer conditions promoted rapid acidification, pH decline, softening of texture, and color deterioration. Refrigeration provided partial preservation, whereas freezing at -5±2°C most effectively maintained acidity, pH, texture, and color stability. Therefore, freezing represents the optimal storage condition for extending the shelf life of foxtail millet sourdough bread.

Effect of coatings on the physicochemical properties of air fried Jackfruit chips

P. Sen, M. H. H. Khan, M. M. Rahman, M.G.F. Chowdhury, M.M. Molla, S. Pervin, B.C. Dey

This study investigated the impact of different coatings: rice flour, corn flour, maltodextrin, and sugar flour; on various physicochemical properties of air fried jackfruit chips. In this study, physiologically matured khaja-type jackfruits (BARI Kathal-2) were procured, peeled, decored, and sliced into 5 mm strips, then frozen at -18°C for 24-48 h. The slices were coated by dipping in 10% solutions of rice flour, corn flour, maltodextrin, and sugar flour for 30 min, followed by blanching and then drying to reduce initial moisture. Moisture content was observed to be higher in the coated treatments compared to the raw jackfruit. The raw jackfruit had a moisture content of 2.99%, while the maltodextrin-coated jackfruit exhibited the highest moisture retention at 6.77%. Air frying is known to remove less moisture than traditional frying, thereby better preserving moisture and reducing oil absorption-this combination keeps chips less dry and potentially softer in texture. Coating with corn flour yielded higher TSS (4.4°Brix), most likely due to the concentration of soluble solids in the retained moisture fraction. maltodextrin was lowest (2.13°Brix), possibly because maltodextrin itself does not contribute appreciable soluble sugars and may dilute extractable fruit solids. Air-fried jackfruit chips showed significantly reduced fat content with sugar flour (5.48%), followed by corn flour coating (7.70%), compared to the control (9.54%). This indicates that flour-based coatings, can effectively

lower oil absorption during air frying. The greatest breaking force (24.55 N) for the most complex structure (rice flour) may result from a crusted and structured uniform crust of gelatinized paste during hot air frying. Corn flour provided for a softer (11.75 N). Air frying-with high-velocity hot air-encourages rapid crust formation, and coatings like corn flour can enhance crispness. Corn flour's higher starch content leads to decreased moisture retention within the chip's coating, which results in a crispier texture after frying. The control appears as the lightest sample (highest L*), which is to be expected since the sample of non-coated jackfruit was used. The rice flour and corn flour coatings cause a moderate lightness reduction, probably due to the pacification (rice starch-based) or the color of the corn flour. Matter of corn flour coatings is beneficial in retention of these constituents, primarily because of the protective matrix and pigment sources in the corn. Maltodextrin alone as a coating may lower the extraction and retention values, unless combined with other substances, such as gum arabic, for improved encapsulation. Rice and sugar flour-coatings have lower retention caused by their surface characteristics and composition

The edible coatings significantly changed the physicochemical and nutritional characteristics of air-fried jackfruit chips. Corn flour was the most effective, providing crisp texture and better retention of bioactive compounds, while maltodextrin enhanced moisture retention and crispy texture but lowered antioxidant extractability. In contrast, rice flour and sugar flour coatings resulted in inferior texture and lower nutrient retention and higher fat reduction.

Standardizations of mixed foxtail millet-Jackfruit sourdough bread

P. Sen, M. H. H. Khan, M. M. Rahman, M.G.F. Chowdhury, M.M. Molla, S. Pervin, B.C. Dey

This study evaluated the impact of incorporating jackfruit and foxtail millet flour on the physicochemical, functional, and nutritional qualities of sourdough bread.

BARI Kaun-4 was collected and de-husked to prepare flour. BARI Kathal-2 jackfruits were peeled, decored, and dried at 65°C to make flour. Six treatments were prepared: T_0: Wheat flour (100); T_1: Millet Flour : Jackfruit Flour (0:100); T_2: Millet Flour : Jackfruit Flour (25:75); T_3: Millet Flour : Jackfruit Flour (50:50); T_4: Millet Flour : Jackfruit Flour (75:25); T_5: Millet Flour : Jackfruit Flour (100:0). Moisture content of the prepared bread samples ranged from 18.45% to 27.31%, with the highest value observed in the jackfruit-based formulation (T_1) and the lowest in the 100% wheat bread (T_0). Similarly, total soluble solids (TSS) were highest in jackfruit formulations. The higher MC and TSS in jackfruit-rich breads can be attributed to their soluble fibre and sugar content, which increases water retention. In contrast, millet-rich blends showed lower MC due to the lower solubility of millet proteins. The pH values remained stable across treatments (5.41–5.49), confirming a slightly acidic nature, while titratable acidity was higher in millet-rich blends (T_4, T5). The acidic nature of millet can be attributed to the phenolic acids and fermentable carbohydrates naturally present in the grain. Texture analysis showed hardness ranging from 84.93 N (T_0) to 133.79 N (T_3). Composite flour blends (T_1– T_3) showed firmer textures than the control, likely due to gluten dilution and restricted gas retention for jackfruit flour. Moreover, higher levels of millet flour (T_4 and T_5) reduced hardness slightly compared to T_2 and T_3, likely due to improvements in water retention and the softening of the crumb resulting from the increased fibre and soluble sugars. Colour analysis indicated that lightness decreased in millet-rich blends (T_3 = 74.39 vs. T_0 = 87.52), while jackfruit contributed to higher yellowness due to carotenoids and slightly elevated redness. Specific volume ranged 1110 to 1200 cm^3 and inversely tracked loaf density (8.29 to 11.86 g/in^3). The lowest volume and highest density were observed with 100% jackfruit within the blend (T_1), indicating weaker gas retention due to gluten dilution and interference with the gluten network by fibre and pectin. By contrast, 100% millet within the blend (T_5) restored volume to the control level (1200 cm^3) and yielded a low density (8.39 g in^{-3}), suggesting better gas cell stabilization than jackfruit and a less disruptive interaction with the gluten matrix. Higher jackfruit ratios resulted in the lowest baking loss, at 8.85%. Millet-rich loaves (T_4– T_5) exhibited greater baking loss (~20–21%) along with higher specific volume, as grater expansion is accompanied by higher moisture loss during baking. This study showed that millet flour contributed more favorably to the physical and functional quality of

composite breads compared to jackfruit flour. Millet-rich formulations exhibited higher specific volume, lower loaf density, and improved phenolic content, enhancing both texture and bioactive properties. In contrast, jackfruit flour increased carotenoid levels but compromised loaf structure due to gluten dilution and reduced gas retention. Overall, millet flour proved to be a more effective ingredient for improving bread quality.

Effects of different drying methods on physicochemical and functional properties of BARI Mistialu-17

B.C. Dey, M.M. Molla, M. H. H. Khan, M. A. Hossain, S. Pervin, P. Sen, M. S. Alam

The study was to investigate the effects of various drying techniques on the physicochemical and functional characteristics of BARI Mistialu-17. Three distinct techniques of drying (sun drying, cabinet drying, and freeze drying) were used. Results showed that the moisture content of BARI mistialu-17 flour varied from 4.89 % to 7.78 %. The present study reveals that the anthocyanin content of freeze-dried sweet potatoes (0.63 mg/100 g) was significantly higher than sun and cabinet drying samples (0.38 & 0.47 mg/100 g, respectively). Results also showed that the β-carotene and ascorbic acid content of freeze-dried sweet potatoes were significantly higher than those of sun-drying 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 that of the sun and cabinet-dried samples (2.18, and 2.42 mg/100 g, respectively). The color attributes for sun drying, cabinet, and freeze drying were significant, and the findings were covenant. 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. WAC and OAC are useful in structure interaction in food, especially in flavor retention, palatability improvement, and shelf-life extension, particularly in bakery products. The mineral contents of the flours noticeably changed in distinctive drying methods. The physicochemical characteristics of BARI Mistialu-17 flour varied considerably. The losses of nutritional quality and mineral contents throughout the freeze-drying process were minimal. Freeze-dried samples were found to be desirable in terms of color retention, nutritional, and bioactive qualities. It can be suggested that BARI Mistialu-17 flour may be utilized as a raw material for further commercial uses in the food processing industry for product development.

Development of bakery products from sweet potato flour and evaluation of its quality

B.C. Dey, M.M. Molla, M. H. H. Khan, M. A. Hossain, S. Pervin, P. Sen, M. S. Alam

This study sought to investigate the effects of adding BARI Mistialu-17 flour (MF) at different substitution levels (10 %, 20 %, 30 %, 40 % and 50 %) to develop nutritious biscuits and eventually examine their quality attributes and sensory profile. Freshly harvested BARI Mistialu-17 was collected and sorted. The weight of the control and developed biscuits ranged from 11.28 to 11.85 g, with a maximum value in 50% wheat flour and 50% sweet potato flour. The diameter of the biscuit sample (80% wheat flour and 20% sweet potato flour) was slightly higher, and the other samples were lower than that of the 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. Results revealed that the incorporation of BARI Mistailau-17 flour increased the hardness of the biscuits. Control biscuits had a hardness value of 21.97 N, which increased to 23.71 N in 90% wheat flour and 10% sweet potato flour, 24.68 N in 80% wheat flour and 20% sweet potato flour, 26.17 N in 70% wheat flour and 30% sweet potato flour, 27.09 N in 60% wheat flour and 40% sweet potato flour, and 34.25 N in 50% wheat flour and 50% sweet potato flour. The energy content of the 50% wheat flour and 50% sweet potato flour biscuits was significantly higher than that of the other treatments. Results revealed that the color and bioactive contents of the formulated biscuits were significant. The trend of diminishing the color of biscuits with higher incorporation. This study demonstrates the potential of BARI Mistialu-17 flour as a functional ingredient for improving the nutritional quality and antioxidant properties of the formulated biscuits. The flour's richness in phenolic compounds, anthocyanins, and

carotenoids contributed to significant enhancements in antioxidant and bioactive potential in the fortified biscuits. It can be concluded that BARI Mistialu-17 flour incorporation of up to 50% showed good overall acceptability with a distinctive color, desirable texture, and provided higher amounts of energy than other formulations.

Effect of blanching on the quality and shelf life of green chili

S. PERVIN, M.M. Molla. M. A. Hossain, M.G.F. Chowdhury, M. M. Rahman

This study investigated the effects of blanching (0, 20, 40, and 60 seconds) and low-temperature preservation on the quality and shelf life of Jamalpur and BARI Morich-4 varieties. Those chilies were then blanched in hot water for 60^0C, according to different treatments and immediately cooled. After blanching and cooling, the chilies were packed in high-density polyethylene (HDPE) bags and stored at refrigerator for a duration of 8 months. Six treatment groups, T_1 = No blanching of Jamalpur Chili; T_2 = No blanching of BARI Morich-4; T_3 = Blanching @ 20 S of Jamalpur Chili; T_4 = Blanching @ 20 S of BARI Morich-4; T_5 = Blanching @ 40 S of Jamalpur Chili; T_6 = Blanching @ 40 S of BARI Morich-4; T_7 = Blanching @ 60 S of Jamalpur Chili; and T_8 = Blanching @ 60 S of BARI Morich-4 were conducted. Vitamin C content declined steadily in all treatments during storage. Fresh Jamalpur and BARI Morich-4 initially contained 83.0 and 90.0 mg/100g, but decreased to 12.5 and 13.0 mg/100g after 8 months. Blanching for 20 seconds was most effective, with BARI Morich-4 retaining 16.0 mg/100g. Longer blanching times (40–60 s) caused greater losses, though still better than unblanched samples. Overall, short-time blanching combined with low-temperature storage minimized nutrient degradation. The decline in vitamin C is linked to oxidation, enzymatic activity, and thermal damage, with brief blanching reducing enzymatic losses while excessive heating accelerates degradation. Total phenol content declined during storage across all treatments. Unblanched Jamalpur BARI Morich-4 decreased from 9.8 to 4.0 and 8.4 to 3.6 mg GAE/100g, respectively. Blanching for 20 seconds showed better retention, with Jamalpur Chili maintaining 5.1 mg/100g after 8 months, compared to 3.4 mg/100g in BARI Morich-4 blanched for 60 seconds. Lycopene content decreased over storage but was better preserved with blanching. Unblanched Jamalpur and BARI Morich-4 declined from 67 to 18 and 84 to 32 µg/100g, respectively. Blanching for 20 seconds gave the best retention, with BARI Morich-4 maintaining 41 µg/100g after 8 months. Declines result from oxidation and isomerization, while blanching reduces enzyme-driven degradation. On the other hand, β-carotene declined in all treatments during storage. Fresh BARI Morich-4 dropped from 88.93 to 31.20 µg/100g unblanched, while 20-second blanching best preserved content (28.87 µg/100g). Longer blanching caused greater losses but remained superior to unblanched samples. Investigated enzyme inactivation time of chili (blanching temperature 60±1°C and time 60 sec) with six months storage was found suitable. Therefore, chili can be stored at home refrigerator using the above blanching condition for six months.

Drying kinetics and rehydration behavior of BARI Tomato-14

S. Pervin, M. A. Hossain, M.M. Molla. M.G.F. Chowdhury, M. M. Rahman, B.C. Dey

This study evaluated the drying kinetics and rehydration behavior of BARI Tomato-14 using a cabinet dryer at three temperatures such as 55°C, 65°C, and 75°C. Moisture ratio (MR) decreased with time at all temperatures, with higher temperatures accelerating drying rates. Fresh BARI tomato-14 were collected and then blanched in hot water at 80^0C for 2 min. After blanching, the tomatoes were sliced and ground into fine powder and packed in high-density polyethylene bags and stored at ambient temperature for a duration of 6 months. The experiment involved three treatment groups: T_1=blanched tomato dried at 55°C, T_2=blanched tomato dried at 65°C, and T_3=blanched tomato dried at 75°C. The tomatoes were dried in a Mummert dryer at three different temperatures (55°C, 65°C and 75°C) with single layer of material. It was observed that the moisture ratio (MR) decreased with time and the time to dry at a specific moisture ratio decreased with increasing temperature. At very high temperature and low humidity drying rate may initially increase, but the resulting case hardening would reduce the drying rate significantly and the product quality would be degraded by boiling instead of drying. The tomato dried very quickly at

a temperature of 75°C. It was observed that for dried BARI tomato-14 (5 g samples), rehydration after 30 min varied slightly with temperature treatments. Blanched tomato reached 20.45 g (rehydration ratio, RR = 4.00), T_2 gave 19.87 g (RR = 3.97), and T_3 yielded 19.59 g (RR = 3.92). Corresponding dehydration ratios (DR) were 0.36, 0.35, and 0.34, yielding coefficients of reconstitution (RR/DR) of 11.11, 11.34, and 11.53, respectively. Drying temperature strongly affected BARI Tomato-14. Higher temperatures (75°C) reduced drying time but slightly lowered rehydration due to structural damage.

Processing and preservation of fermented miso soup

S. Pervin, M.M. Molla , A. Shimizu, M. Afroz, P. Sen

The study aimed to prepare fermented miso soup using different cereal–legume combinations. The BARI Barley-9 and BARI Soyabean-6 rice were collected and rice, mash dal and Mung dal were purchased. Six treatments such as T_1 (50% Barley+50% Soybean); T_2 (50% Barley+50% Mash dal); T_3 (50% Barley+50% Mug dal); T_4 (50% Rice+50% Soybean); T_5 (50% Rice+50% Mash dal); and T_6 (50% Rice+50% Mug dal). In preparing the miso paste (fermented base), soybeans, Mung dal, and mash dal (black gram) were soaked overnight, while barley was soaked for 6–8 hours. The soybeans were then boiled until soft (about 2–3 hours), and the Mung dal, mash dal, and barley were lightly boiled until tender but not mushy. The cooked barley was mixed with *Aspergillus oryzae* spores (koji mold) and incubated for up to 48 hours at 30 °C until fragrant. Afterwards, the boiled soybeans and cooked Mung dal were mashed and combined with the koji barley. Salt (12–15%) was added, and the mixture was packed tightly into sterilized containers, pressed to remove air, and covered. Fermentation was carried out at room temperature for 3–6 months, with longer fermentation resulting in deeper flavor. pH of fermented miso soup declined during six months of storage. At the start, pH ranged from 6.33 (T_4) to 6.57 (T_3). By the sixth month, it dropped to 5.08–5.46. Barley–soybean (T_1) showed the sharpest decline, while rice–mug dal (T_6) retained slightly higher pH values. Overall, soybean-based treatments exhibited faster acidification compared to dal-based ones. Variations depend on raw material composition, as soybeans promote stronger acid formation than dals, and barley enhances fermentation more than rice. Moisture content increased progressively throughout storage. Initially, values ranged from 63.67% (T_4) to 74.66% (T_3). By six months, they rose to 67.76%–78.35%. Barley-based treatments (T_2, T_3) maintained higher moisture compared to rice-based ones, while soybean mixtures had lower moisture levels than dal mixtures. Moisture rise occurs due to enzymatic breakdown of starches and proteins, releasing bound water. Water activity (a_w) increased steadily over storage. At start of the experiment, water activity values ranged between 0.45 (T_6) and 0.50 (T_1). By the sixth month, they reached 0.68–0.73. Barley–soybean (T_1) showed the highest a_w, while rice–Mung dal (T_6) remained the lowest. Barley-based treatments consistently maintained higher a_w compared to rice-based ones. Variations among treatments are due to raw material differences; barley and soy promote higher solubilization, while rice and dal mixtures release relatively less free water. Fermented miso soup showed decreasing pH and increasing moisture and a_w during storage, influenced by ingredient composition. Barley–soybean combinations promoted greater acidification and higher water activity, suggesting better fermentation activity, while rice-based mixtures maintained relatively higher stability.

The nutritional and bioactive compounds analysis of different melon cultivars available in Bangladesh

M.M. Molla, B.C. Dey, M. A. Hossain, S. Pervin, A.Y. Akhond

The physicochemical and nutritional composition of nine melon cultivars were collected and incorporated to analyze their physicochemical and nutritional properties. Nine cultivars of melon was collected and were pooled together to make three analytes (Analytes-I, Analytes-II, and Analytes-III). Then the pooled samples were shifted for analysis of physicochemical, nutritional, minerals and bioactive compounds. The lowest moisture was recorded in exotic cultivars (M-5 and M-6) whereas the highest moisture content was recorded in cultivar M-3 and M-4. The highest pH and lowest acidity were recorded in cultivar M-4 indicates that there was

an inverse relation between pH and acidity. The analysis of variance for ash contents showed that the differences were highly significant. Lowest ash content was found in cultivar M-3 and M-4 whereas the highest was in cultivar M-5 and M-6. In the case of total sugar, cultivar M-3 and M-4 were found to have lower total sugar whereas it was found to be higher as 8.00 % and 8.50 % in cultivar M-5 and M-6. TSS of the cultivar ranged from 2.43-8.36°B. The lower TSS (°B) was calculated in cultivar M-3 and M-4, while the highest was found in exotic cultivar M-5 and M-6 (7.13°B and 8.36°B). The highest overall acceptability score gained by the cultivar M-1 and M-2. The indication of good cultivar characteristics arenaceous properties were found in cultivar M-1 and M-2. BARI Tormuz-1 (M-7) and BARI Tormuz-2 (M-8) were found to be promising due to retain higher level of vitamin C whereas the lowest was recorded by the M-5 and M-6. The highest overall acceptability score was gained by the M-1, M-2, M-7, M-8 and M-9. The arenaceous or sandy characteristics were found by the cultivar M-1 and M-2. In opposite, more sweetness was recorded by the BARI Tormuz-1 due to their highest TSS (8.36 and7.13) and total sugar (37.00 and 30.33 %) than other cultivars.

Byproduct utilization of watermelon to develop watermelon rind based tutti-frutti in terms of storage and packaging technique

M.M. Molla, S. Pervin, M.G.F. Chowdhury, B.C. Dey, M. A. Hossain

The study was formulated to develop watermelon rind based tutti-frutti in terms of textural properties and storage studies with maintaining proper moisture level. Fully matured watermelon was collected and were cut and peel was separated by knife manually. The flesh was used for processing into watermelon juice and the peel was preserved with 10 % and 20 % salt solution for 30 days. After 30 days, the treated peels were explored and cut into tutti-frutti size using automatic peeler machine. The pieces were treated with 45 % brix solution by mild heating and allow for 12 hrs. Then the pieces were drained out and rinsing with water and finally drained out it. The prepared tutti-frutti was dried using cabinet dryer at 55°C for 42 hrs. The treatments were: T1= Tutti-frutti from fresh watermelon rind; T2= Tutti-frutti from 10 % salted watermelon rind; and T3= Tutti-frutti from 20 % salted watermelon rind. The result shows that rind based tutti-frutti is a better source of physicochemical, nutritional and bioactive compounds. Tutti-frutti from fresh watermelon rind possessed a highest vitamin C, β-carotene and total phenol than treated with salted based rind tutti-frutti (T2 and T3). The highest total and non-reducing sugar was recorded by the treatment T1 (fresh rind based tutti-frutti) as compared to T2 (10 % salt preserved tutti-frutti) and T3 (20 % salt preserved tutti-frutti). Results revealed that tutti-frutti treated with brine solution retained more softness after processing. The control sample (T1) gained more hardness than brine preserved tutti-frutti (T2 and T3). The reason might be due to removal of more water by brine preserved tutti-frutti and hence the brine treated tutti-frutti took less drying time than control one. The size and shape of the brine treated tutti-frutti (T2 and T3) were retained excellent texture than control (T1). The rind preserved with 20 % salt solution retained soft texture and was acceptable than others.

Development of papaya tutti-frutti in terms of storage and packaging technique

M.M. Molla, B.C. Dey, M. H. H. Khan, S. Pervin, P.Sen, A. Khatun

The purpose of the study was to find out the proper texture and color of the papaya tutti-frutti in terms of moisture and storage periods. Green papaya was collected and was prepared from fresh and preserved (using salt solution) papaya as per treatments such as T_1= Tutti-frutti from fresh papaya; T_2= Tutti-frutti from 10 % salted papaya; and T_3= Tutti-frutti from 20 % salted papaya. The texture depends on hardness, softness, and the amount of moisture content present in tutti-frutti. The rupture force (FR) was used to measure the hardness and softness of the tutti-frutti. The maximum force was recorded by the treatment T_1 (5.73 N) whereas the lowest was in T_2 (2.19 N) and T_3 (0.34 N) sample. The lowest peak obtained by the T_3 sample might be due to using more salt concentration at short time storage that helps to remove moisture from cell membranes of the tutti-frutti. The color of the tutti-frutti was affected by the treatments and varied after 2 months of storage. But the color of the tutti-frutti changed by the treatment and drying time. The highest color difference was observed for the treatment T_3 whereas the lowest was recorded in the treatment T_1, indicate that the

redness and yellowness was found higher by the T_3 sample. Indeed, lightness significantly changed by the treatment whereas the more transparent was observed by the treatment of T_3. The increased lightness in the sample T_1 is probably due to the observed crystallization whereas the decreased lightness was observed by the T_2 and T_3 samples, indicates that the sample seemed to be natural and suitable as commercial product. The tutti-frutti prepared using 20% salted papaya found acceptable texture with lowest FR 0.34 N and performed better color. The tutti-frutti could be preserved 2 months more without any quality deterioration.

Development of watermelon rind flour-based bakery products: A novel approach

M.M. Molla, B.C. Dey, G.F. Chowdhury, S. Pervin, M. A. Hossain

This study explores the potential of incorporating watermelon rind flour (WRF) into muffin formulations as a sustainable alternative to wheat flour (WF). Five formulations were developed: T_1 (100% WF, control), T_2 (25% WRF+75% WF), T_3 (50% WRF+50% WF), T_4 (75% WRF + 25% WF), and T_5 (100% WRF). Watermelon was collected and peeled the rind using stainless steel knife. Then the rind was dried using mechanical dryer and made fine powder by sieving 60 mesh sieves. The moisture content of the rind muffin was recorded as 22.35-27.09 %. The highest moisture was recorded by the treatment T_5 (100% rind flour) whereas the lowest was recorded for the T_1 (100% WF). More concentration of the products indicates more TSS in the sample. The highest TSS was found in T_5 sample (3.25°B). The highest TSS in T_5 might be due to use of 100% rind flour that might be increased solidification of treatment T_5. The maximum total sugars were found in T_5 (51.96 %) and minimum in T_1 (49.24 %). The maximum sugars in T_5 sample might be due to utilization of cent percent of rind that contained more sugar than wheat flour. The pH of the muffin ranged from 8.68-10.50 whereas the highest pH was found in control sample than treated samples. Lower pH in T_5 sample might be influenced to grow microorganisms after 30 days of storage. The taste and storage of the processed products depend on the acidity level. All treated and control samples were statistically insignificant. In this study, the highest crude protein, crude fat and crude fiber of the rind flour-based muffin ranged from 11.18-11.75%, 2.31-2.40% and 2.81-4.80%. The cake formulation with 25-75% pomace flour were found superior both appearance and nutritional aspect instead of 100% pomace flour.

Effect of thermal and non-thermal treatments for preservation of watermelon juice with its nutritional and microbial properties

M.M. Molla, M. H. H. Khan, B.C. Dey, S. Pervin, M. M. Rahman, M. A. Hossain

The study explores to preserve the watermelon for its acceptance to the consumer without deterioration of its red color and good aroma. Physiologically matured watermelon was collected and sliced and the mixer grinder was used to prepare juice according to the following treatments. Three treatments viz. control (T_1), pasteurization (T_2) and UV treatment (T_3) were applied and 14% pulp, 21% sugar, 0.03% CMC, 0.1% xanthane gum, 0.1% guar gum, 0.1% KS, 0.1% KMS, 64.4 % water and 0.3 %permitted food color and flavor were used for preparation of the juice. Watermelon pulp had a high moisture content (93.62%). The pH (6.95) was nearly neutral, which supported microbial growth. The TSS (6.55 ºBrix) and total sugar (8.70%) indicates moderate sweetness, while the low acidity (0.74%) suggests a short shelf life of the product. The watermelon pulp was rich sources of vitamin C (7.90 mg/100 g), β-carotene (21.60 mg/100 g), total carotenoid (44.33 mg/100 g), total phenol (2.57 mg/100 g) and high energy value (5.4 Kcal). Results showed that the β-carotene was decreased by the UV treatment (T_3), might be due to the light intensity of UV treated juice. The total carotenoid, total phenol and lycopene were richer in UV treated juice (T_3) than others. This study successfully explored the nutritional benefit of watermelon and preservation of watermelon juice using both thermal and non-thermal treatments. The findings indicate that UV treatment is a superior preservation method compared to pasteurization, as it retains higher levels of vitamin C, and natural color while effectively reducing microbial contamination.

Processing and preservation of Lemon juice by application of hurdle technology

M.M. Molla, M. H. H. Khan, B.C. Dey, M.G.F. Chowdhury, M. A. Hossain, P.C. Sarker

The study explored to develop lemon juice by application of hurdle technology using numerous

artificial food additives and preservatives. Five treatments namely T_1= 14 % fresh lemon juice +0.1 % KMS+ 85.90 % water,T_2= 14 % fresh lemon juice +0.1 % KMS+ 0.1 % KS+ 85.87 % water, T_3= 14 % fresh lemon juice +0.1 % KMS+ 0.1 % KS + 0.3 % CMC+ 85.87 % water, T_4= 14 % fresh lemon juice +0.1 % KMS+ 0.1 % KS + 0.3 % CMC+ 0.1 % xanthan gum + 85.77 % water,T_5= 14 % fresh lemon juice +0.1 % KMS+ 0.1 % KS + 0.3 % CMC+ 0.1 % xanthan gum + o.1 % guar gum + 85.67 % water was conducted. Fresh lemon was collected and juice was extracted. Results show that the hurdle technology applied juice (T_2-T_5) contained a highest amount of physicochemical, nutritional and bioactive compounds than control (T_1). There were insignificant differences among the treated juice. But the maximum score obtained by the application of hurdle technology (T_2.T_5) than control (T_1). The findings showed that lemon juice treated with hurdle treatments T_4 and T_5 did not contain any microorganisms after 160 days of storage whereas the treated juice T_1, T_2 and T_3 were abundant source of *Aspergillus, Shigella* and *E. coli*. The lemon juice was shelf stable up to 4 months without microbes free after application of hurdle technology.

Development of Mungbean chips using hot extrusion technology

M.M. Molla, B.C. Dey, S. Pervin, M.G.F. Chowdhury, and M. A. Hossain

This study sought to explore the development of Mungbean chips (BARI Mungbean-6) using hot extrusion technology (HET) to find out the effect of moisture, extrusion temperature, conditioning time, and storage life. The chips were prepared using a single screw extruder and hot extrusion technology with little modification. The barrel temperature (below 145ºC), feed moisture, and product burn were optimized with different water ratios, viz. 1.0 %, 2.0 %, 3.0 %, 4.0 %, 5.0 % and conditioning for 3 hrs for better producing of chips. Ingredients ratio, feed moisture, material ratio and barrel temperature significantly influence the quality of Mungbean chips. The incorporation of whole Mungbean in the mixture of other ingredients with moisture 1-2%, feeding time 0.25-0.30 hrs., extrusion temperature 115-135°C and conditioning 2-3 hrs led to produce high quality and yield of chips with high swelling capacity and better crispiness without any quality deterioration. The study emphasizes to produce high quality Mungbean chips by fixing the proper feed moisture 1-2%, feed rate 0.25 to 0.30 hrs extrusion temperature 115-135°C and conditioning time 2-3 hrs.

Effect of fruit maturity and packaging technique on shelf life and quality of BARI Tomato-14

M. A. Hossain, M.M. Molla, M. H. H. Khan, S. Pervin, B.C. Dey

The aim of the study was to find out the effect of fruit maturity and packaging technique on shelf-life extension of tomato (BARI Tomato-14). There were two factors namely factor A: maturity indices (A_1= matured green, A_2= breaker stage (5-10 %), A_3=50% skin turns red or orange-red color (half ripe/pink), A_4= 75% skin turns red or orange-red color (3\4 pink color), A_5=100% skin turns to red or orange-red color (full ripe stage).) and factor B: packaging (B_0= without packaging, B_1= non-perforated polyethylene bag, B_2= perforated polyethylene bag). Maximum weight loss (13.42 % and 12.10 %) was found in tomato harvested with 100% ripen (full color) and kept in without packaging ($A_5B_{0;}$ 13.42%) and non-perforated polyethylene bag ($A_5B_{1;}$ 12.10%) while the minimum weight loss was found tomato harvested at matured green and packed in non-perforated ($A_1B_{2;}$5.12%) and perforated polyethylene bag (A_1B_2; 5.010%) under the constant temperature and relative humidity chamber. In non-perforated polyethylene bag, there was no adequate ventilation and therefore, higher PLW occurred as compared to perforated polyethylene bag. Maximum disease incidence was found in tomato harvested at 75 to 100% maturity without packaging (A_4B_0; 19.11% and $A_5B_{0;}$ 20.10%) both in ambient, constant temperature and relative humidity chamber. Percent diseases were identified Anthracnose (*Colletotrichum spp*.), Alterianaria rot (*Alternaria altenaria*), Fusarium rot (*Fusarium spp*.) and Sour rot (*Geotrichum candidum*). Maximum shelf life of tomato was observed by the tomato harvested at matured green stage and kept in non-perforated (A_1B_1; 30.00 days) and perforated polyethylene bag (A_1B_2; 34.00 days) under the constant temperature and relative humidity chamber. The lowest shelf life (8-9 days) was recorded tomato harvested at 75-100% ripen stage both storage conditions. The shelf life of tomato harvested at mature green and packed

in perforated polyethylene bag could be extended up to 34 days at 13±1°C temperature and 85-90 % relative humidity.

Storability of watermelon pulp for retaining bioactive compounds during ambient storage

M. M. Rahman, M.G.F. Chowdhury, M.M. Molla, M. A. Hossain, M. H. H. Khan

The objective of this study was to evaluate the storage stability of watermelon pulp, rich in lycopene and β-carotene, for its potential diversified applications. Red flesh watermelon (*Citrullus lanatus*) was purchased and peeled off by stainless steel knife. Seed-free watermelon slices were blended to obtain fresh pulp and treatments were: 10% sugar, 15% sugar, 20% sugar, 25% sugar, 30% sugar and 35% sugar. The pulp was slowly heated at 80–90 °C and concentrated to approximately 15°Brix. Xanthan gum powder, pre-mixed with an equal quantity of sugar, was added gradually and homogenized. The pulp was heated to reach 23–27 °Brix. Color measurements of the pulp showed no significant variation among treatments or compared to the fresh pulp, suggesting that color was stable during storage. The pH of the fresh watermelon pulp was 6.95, reflecting its low acidity. The addition of citric acid (0.5%) successfully reduced the pH to around 4.5, ensuring a moderately acidic environment that is more suitable for preservation. The pH values remained relatively stable across treatments with only minor variations throughout the storage period. Similarly, the total soluble solids remained consistent between treatments, with no marked differences observed between 10% sugar supplementation and 20% sugar supplementation. This indicates that no significant sugar conversion occurred during storage. In contrast, the phytochemical compounds lycopene and β-carotene showed a gradual decline compared to the fresh pulp. However, among the treatments, 10% sugar supplementation exhibited the best retention of both lycopene and β-carotene, suggesting that lower sugar concentration favored the preservation of these bioactive compounds. Watermelon pulp supplemented with 10% sugar, along with the required stabilizing ingredients, can be safely preserved under ambient conditions (29–38 °C, 75–92% RH) for up to six months.

Efficacy of clove essential oil and carnauba wax in extending shelf life of Mango

M. M. Rahman, M.G.F. Chowdhury, M. A. Hossain, M.H. H. Khan

The study evaluated the effectiveness of clove essential oil and carnauba wax coating in controlling stem-end rot and anthracnose of mango, caused by *Botryodiplodia theobromae* and *Colletotrichum gloeosporioides*, respectively, with the aim of extending fruit shelf life. Mango cv. BARI Aam-3 (Amrapali) was collected. Clove essential oil (EO) was extracted using a steam distillation apparatus. Ethanol (Absolute GR, Merck), Triton X-100, Thiabendazole fungicide, and calcinated calcium (EcoWash™) were obtained. Surface-sterilized fruits were placed in a rotating wax-coating machine. Clove EO (1 mL L^{-1}), premixed with ethanol (1 mL L^{-1}) as a stabilizer and Triton X-100 (40 mg L^{-1}) as a surfactant, was applied by hand spraying. Immediately after, carnauba wax coating was sprayed onto the fruits. Treated mangoes were placed in plastic foam cup liners, dried under a fan for 1–1.5 hours, and then transferred to a constant temperature and humidity chamber. Clove essential oil (EO) extracted by steam distillation yielded approximately 5% oil. Mangoes treated with the combination of clove EO and carnauba wax showed the highest shelf life, with no rotting observed after 30 days of storage at 10 ± 2 °C and 85–95% RH. In comparison, control fruits exhibited 83.7% rotting, while fungicide-treated fruits had 53.3% rotting. Firmness of EO + carnauba-treated mangoes remained significantly higher (51.29 N) at 30 days, compared to control (22.73 N) and fungicide-treated fruits (25.87 N), indicating better textural retention. Total soluble solids in EO-treated fruits were lower (18.35 °Brix) than in control and fungicide-treated fruits, suggesting slower sugar conversion and delayed ripening. Bioactive compounds were also better retained in EO + carnauba-treated mangoes. β-Carotene content remained higher (93.20 µg/100 g) compared to control (120.68 µg/100 g) and fungicide-treated fruits (30.54 µg/100 g), while antioxidant activity (38.09 µg/100 g) was maintained more effectively than in controls (34.63 µg/100 g). In the sensory triangle test, only 7 of 35 panelists correctly identified treated fruits, below the 16 required for significance ($p = 0.05$), indicating that EO and wax coating did not adversely affect taste.

These findings suggest that clove EO combined with carnauba wax is effective in extending shelf life, maintaining quality, and preserving bioactive compounds in mangoes during cold storage. Clove EO in combination with carnauba wax coating effectively reduced postharvest fungal infestation and extended the shelf life of mangoes for 30 days at 10±2 °C, followed by 7 days of acclimatization at 25±3°C for marketing. The *in vitro* pathogenicity test of the stem end rot and anthracnose will be evaluated next year.

Shelf-life extension of fresh Guava fruits through postharvest treatments

M. M. Rahman, M. A. Hossain, M. H. H. Khan

The study evaluated the effects of gibberellic acid (GA_3) and cling wrap packaging on the quality and shelf life of guava. Commercially mature guava (*Psidium guajava* L.) 'BARI Peyara-2' commonly known as "Thai Peyara" was obtained and were dipped in gibberellic acid (GA_3) solutions at 400, 600, and 800 ppm for 10 minutes. After dipping, fruits were air-dried for 30 minutes and then wrapped with cling film (cellophane). All fruits were placed in plastic foam cup liners and stored at 6±2°C and 80-90% relative humidity. Treatment with gibberellic acid (GA_3) combined with cling wrap significantly slowed firmness loss. After 21 days, firmness of treated fruits ranged 103.0–108.1 N, whereas control fruits reached 64.5 N by 14 days. No significant differences were observed among GA_3 concentrations, indicating effective softening inhibition across tested doses. TSS, ascorbic acid, and β-carotene were better maintained in treated fruits. TSS remained 9-9.5% compared to 11.4% in controls, indicating slower sugar accumulation. Vitamin C retention ranged 101-106 mg/100 g vs 89.7 mg/100 g in controls, while total carotenoids were 6.59-7.14 µg/100 g compared to 5.34 µg/100 g, demonstrating preservation of nutritional quality. Overall, GA_3 combined with cling wrap effectively extends guava shelf life while preserving firmness, nutritional content, and overall quality, providing a practical postharvest strategy for this climacteric fruit. Gibberellic acid treatment combined with cling wrap effectively extended the shelf life of guava at 6±2°C and 80-90% relative humidity for 21 days with maintaining firmness, nutritional quality, and bioactive compounds.



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Standardization of *in vitro* propagation protocol for gerbera

M. M. Khatun and N. Bilkish

The study was undertaken to standardize the *in vitro* propagation protocol for gerbera. Capitulum was used as the explant source, and the studied cultivars were purple pink, magenta, and red. The maximum survival of explants (53% in magenta and 66% in purple pink) was achieved when explants were sterilized with 60% Clorox solution for 20 minutes in GM_3 and GM_4 media, respectively. The highest number of roots (3.89) was obtained from MS medium supplemented with IBA in the T_3 treatment. For *ex vitro* establishment, well-developed plantlets were transferred to the greenhouse using different potting media. The highest survival rate (100%) was observed in a soil and cocopeat mixture at a ratio of 1:2. During the reporting year, a total of 2,625 gerbera plantlets were produced in the laboratory.

Standardization of micropropagation protocol of lilium *(Lilium longiflorum)*

M. M. Khatun, S. C. Halder and M. Zannat

To standardize a micropropagation protocol for lilium, stem node and bulb scale explants of the bicolor pink variety were used for continuous *in vitro* multiplication. MS medium supplemented with eight different concentrations and combinations of BAP, NAA, IAA, and IBA was used for bulblet and plantlet formation. Shoot initiation occurred 17 to 24 days after inoculation in the culture medium. The maximum fresh weight, leaf number, root number, and bulblets per explant were obtained from T_6 treatment after one and two months of culture. After three months, T_5 treatment produced the maximum number of leaves, roots, the highest shoot length, and bulblets per explant.

Multification of banana varieties through tissue culture

S. C. Halder, M. K. Hasan, M. M. Khatun and M. A. Y. Akhond

Sword suckers were collected from the mother orchard of the Biotechnology Division. Shoot tips were excised from the suckers and cultured on different shooting and rooting media for *in vitro* plantlet production. A total of 784 plantlets were produced during the last year.

Development of an efficient *in vitro* regeneration protocol for BARI mungbean varieties

S. Ahmed, M. K. Hasan, M. Zannat, M. M. Khatun, and M. A. Y. Akhond

A study was undertaken to develop an efficient regeneration protocol for BARI mungbean varieties. Single cotyledonary nodes, shoot tips, hypocotyls, and leaves of BARI Mung-6 were used as explant sources. Five different treatments consisting of different concentrations of BAP, kinetin, TDZ, $AgNO_3$, and Ads were tested for shoot regeneration. Among the explants, only cotyledonary nodes-initiated shoot buds, 7–15 days after inoculation. The highest percentage of responsive explants (93.75%) and the maximum number of shoots (2.03) were obtained in the T_5 treatment.

***In vitro* regeneration of country bean (*Lablab purpureus* L. Sweet)**

N. Bilkish, M. K. Hasan, M. M. Khatun and M. A. Y. Akhond

Embryonal axis, epicotyl, and leaf explants of BARI Sheem-1 and BARI Sheem-3 were cultured on MS media and B_5 vitamins (MSB5) supplemented with various concentrations and combinations of growth regulators. Early shoot bud initiation was observed 6–7 days after inoculation when embryonal axis explants

were used. In epicotyl explants, callus formation started around 21 days after inoculation. Among the different treatments, T_9 showed the highest response for shoot formation, with 95% in BARI Sheem-1 and 100% in BARI Sheem-3. The lowest percentage of shoot bud formation (65%) was recorded in T_8. In the case of leaf explants, no further response was observed.

Rescue of amritsagar banana from extinction through biotechnological approaches

S. Islam, S. C. Halder and M. A. Y. Akhond

Several clones of Amritsagar banana were collected from different locations of the country, and a mother orchard was established at the research field of the Biotechnology Division, BARI, Gazipur. Amritsagar banana collected from Gafargaon and Kapashia were found to be superior to other clones and were compared with each other using the standard Descriptor for Banana (*Musa* spp.). Amritsagar Gaforgaon showed better in relation to taste, colour, shape, size and aroma.

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 embryonal axes were used as the explant source. Six different treatments and one control, consisting of modified MS medium with varying concentrations of BAP and NAA, were tested for callus induction. Explants treated with T_3 produced the maximum callus induction (98%). For shoot regeneration, five treatments were evaluated. Among them, T_3 showed the highest regeneration frequency (49%) and maximum number of shoots (11.2), whereas the greatest shoot length (3.5 cm) was observed in T4. For root induction, individual shoots were cultured in five treatments and one control. The highest percentage of rooting (55%) and the maximum number of roots (10.7) were obtained from T_3.

Varietal improvement of oyster mushroom (*Pleurotus sp.*) through induced variation

S. Yesmin, K. Nahar and M. M. Khatun

The study examined the effects of gamma radiation on dikaryotic and monokaryotic mycelia, as well as spore suspension, of oyster mushroom (*Pleurotus ostreatus*, PO2). In all cases, the treatments produced thick white cottony mycelia. In dikaryotic cultures, the control condition showed the highest growth (2.54 cm) after 7 days, whereas irradiated treatments (100–1000 Gy) resulted in reduced growth (1.35–0.34 cm). Mycelial growth decreased progressively with increasing radiation dose, with complete mycelial coverage achieved within 9–11 days at 100–1000 Gy. No growth was observed at higher doses (1500–3000 Gy), even after 11 days. Similar trends were observed in monokaryotic mycelia, where the control exhibited the highest growth (4.61 cm) after 7 days, while treatment at 100 Gy also supported considerable growth (4.18 cm). Growth was progressively reduced (3.64–2.33 cm) at doses of 200–1000 Gy. In spore suspension experiments, germination was observed only at 200 Gy, while other treatments were contaminated when spread on PDA medium; therefore, the experiment needs to be repeated for confirmation. Overall, the findings suggest that lower gamma doses (100–1000 Gy) permit limited growth, whereas higher doses (1500–3000 Gy) completely inhibit the mycelial development of *Pleurotus ostreatus* (PO2).

***In vitro* conservation of mycelia of oyster mushroom (*Pleurotus sp.*)**

S. Yesmin, M. K. Hasan and M. M. Khatun

This study evaluated the effectiveness of three preservation methods-periodical subculture (PS), sterile distilled water (SDW), and sterile paraffin oil (PO)-on the long-term viability of three oyster mushroom (*Pleurotus* sp.) species OS, POP, WS respectively. Mycelial growth was measured on potato dextrose agar (PDA) plates after 3, 6, 12, 15, 18, and 24 months of storage. Results showed that the WS variety preserved in SDW exhibited the highest regrowth (~4.0 cm), followed by WS and OS preserved by PS and PO, which maintained moderate growth (~2.5–3.5 cm). In contrast, POP culture lost viability rapidly under all preservation conditions, showing negligible regrowth beyond 6 months. These findings highlight varietal differences in preservation response and suggest that SDW is a highly effective method for the long-term maintenance of WS, while alternative strategies are needed for POP.

Morpho-molecular characterization of blackgram germplasm

K. Nahar, Kamrun Nahar (Ph.D Student), M. N. Amin, M. A. Y. Akhond

Characterization of crop diversity panels enables the identification of genetic variation and markers linked to target traits relevant for breeding. Bangladesh harbors a wide range of blackgram (*Vigna mungo* L.) germplasm, much of which remains uncharacterized at the molecular level. In this study, DArTseq technology was employed to evaluate the genetic diversity of 92 blackgram accessions collected from diverse regions of Bangladesh. The objectives were to screen germplasm for drought tolerance at the seedling stage under PEG-induced stress and to identify genetic markers associated with drought tolerance through genome-wide association study (GWAS). Population structure analysis revealed five major groups, consistent with the clustering pattern obtained from dendrogram analysis. DArTseq genotyping identified 278,618 single nucleotide polymorphisms (SNPs) aligned to the blackgram reference genome. These SNPs were utilized in GWAS, which detected 25 novel SNP markers significantly associated with 4 drought-related traits. The findings contribute to the growing pool of phenotypic and genotypic data on blackgram, providing a valuable foundation for conservation, management, and genetic improvement strategies, as well as for the development of efficient breeding programs aimed at expanding crop cultivation.

Study on relative bacterial wilt tolerance of Bt egg plant varieties and their non-Bt parent lines

A. Saha, K. Nahar, M. K. Hasan and M. A. Y. Akhond

Ten wilt-affected brinjal (*Solanum melongena* L.) samples were collected from five different locations across Bangladesh during 2024-25. The presence of *Ralstonia solanacearum* was confirmed using immunostrip assays and polymerase chain reaction (PCR). Pathogenicity assays conducted through artificial inoculation of the stored isolates revealed differential host responses among Bt brinjal genotypes. BARI Bt Begun-1 exhibited moderate resistance, whereas BARI Bt Begun-2 and BARI Bt Begun-3 were susceptible. BARI Bt Begun-4 demonstrated resistance, although a disease index of 30% was recorded.

Comprehensive genome-wide analysis, identification and functional study of NAC transcription factors in pea (*Pisum sativum* L.) and their expression analysis under heat and drought stress

S. Islam, M. M. Khatun, M. A. Y. Akhond

A total of 91 non-redundant putative NAC genes were identified from the pea genome using BLAST searches in TBtools-II, of which 88 full-length protein sequences were subjected to further characterization. Motif analysis identified three conserved motifs, with their sequences, widths, and best matches. Domain pattern analysis using TBtools-II with the NCBI-CDD database confirmed the uniform presence of the NAC domain across all identified proteins. Furthermore, a phylogenetic tree constructed using the Maximum Likelihood method grouped the NAC proteins into 13 major classes, providing insights into their evolutionary relationships.

Transformation of tomato for broad spectrum resistance against leaf curl viruses

M. A. Y. Akhond, K. Nahar and S. Ahmed

The experiment was conducted to transform genetically 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 two tomato introns 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 resulted in plant regeneration. Seeds from PCR confirmed positive transformants were collected and stored for further research work.

Exploring the development of gametophyte – mediated genetic transformation systems in crop plants

M. A. Y. Akhond, K. Nahar, N. Bilkish and Roland Schafleitner

Genetic transformation is a powerful tool for plant improvement programmes. Most of the transformation methods developed are based on *Agrobacterium*-mediated transformation and biolistic bombardment which are time- and labour-intensive. Therefore, it is desirable to develop alternate simple and rapid transformation protocols for development of transgenic plants without a prolonged tissue culture and regeneration process. Although it has been shown that plant gametophytes could be a potential target for transformation as an alternative to produce transgenic plants, a reproducible method is still lacking in most of the crop plants. To fulfill the objectives of the experiment, stages of flower buds of eggplant and mustard harbouring male gametophytes at mid uninucleate stage have been identified. Four pollen-specific promoters have also been cloned. Results obtained in this experiment could lead the way for an optimized system for gametphyte-mediated transformation for crop plants in future. As a part of the whole experiment, in the current year, the regeneration and transformation protocols of tobacco were optimized. Direct shoot regeneration was observed in 100% explants with 12 shoots per explant after four weeks.

Development of an *agrobacterium*-mediated transformation and gene editing protocol for an elite BARI lentil variety

K. Nahar, Pankaj Bhowmik, Andrew 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 vitamin and different growth regulators. Total 325 explants of BARI Masur-4 (BM-4) and 340 explants of BARI Masur-8 (BM-8) were cultured and 270 calli of BM-4 and 276 calli of BM-8 were produced. Many shoots were produced by BM-4 and BM-8. Clusters of shoots of BM-4 and BM-8 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 (length 1.5-2.0 cm) of BARI Masur-4 and BARI Masur-8 placed in different media compositions supplemented with various concentrations of hormones. In BARI Masur-4, few roots regeneration 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. Similarly shoots of BM-8 were cultured in different media compositions supplemented with various concentrations of hormones. No root was developed in shoots cultured in different root induction medium. Grafting was done successfully in 50 plants using shoot of BM-4 as scion and 33 scions were survived. Grafted plants were healthy and produced higher number of pods and seeds i.e. 4-6 pods per plant. Grafting was done in 67 plants using shoots of BM-8 as scion and 48 scions were survived. Grafted plants produced pods and seeds.

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 by Sequencing. Two copies of PDS genes were detected in tobacco and brassica by sequencing. Guide RNA was designed for all the PDS genes.

Cloning and characterization of genes related to abiotic stress tolerance from arabidopsis through molecular techniques

K. Nahar, M. Jannat, N. Bilkish and M. A. Y. Akhond

Salinity is one of the major constraints for crop production. Development of stress tolerant crop is the most suitable solution for this problem. For development of stress tolerant variety *AVP1* 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 sequencing. The plasmid vector was introduced

into *Agrobacterium tumefaciens* and presence of the plasmid vector into *Agrobacterium* was confirmed by PCR. This vector will be used in future for salt tolerant transgenic crop development.

Development of second generation biotech potato variety using *agrobacterium* mediated genetic transformation system in Bangladesh

S. Yesmin, N. Bilkish, S.C. Halder, M. M. Khatun, M. A. Y. Akhond and D. Douches

The study aimed to develop an efficient *Agrobacterium* mediated transformation protocol for BARI Alu25(Asterix). Internodes explant from 4-5 week old *in vitro* grown plantlets were co-cultivated with *Agrobacterium rhizogenes* strain ArPORT1 and transferred to selection and rooting media. Out of 514 co-cultivated explants, 140 regenerated shoots, 80 elongated, and 55 rooted transformed plantlets were obtained. The observed transformation efficiency was 10.7%. Molecular analysis confirmed 13 transformed events using NPTII and RpiAmr3 gene specific primers. These findings demonstrate the reproducibility of the protocol and its potential for developing second generation Biotech potato varieties in Bangladesh. The established protocol provides a reliable method for developing improved Biotech potato varieties in Bangladesh.

Validation trial of tissue cultured plantlets of BARI strawberry-2 under field condition

M. M. Khatun and S. C. Halder

The experiment was conducted at the research field of the Biotechnology Division, BARI, Gazipur, from November 2024 to April 2025. Tissue-cultured plantlets of BARI Strawberry-2 were used as planting material. For morphological traits, plant height and leaf number were recorded at different days after planting (DAP). At 30 DAPS, mean plant height was 9.5 cm, which gradually increased to 17.78 cm at 80 DAP. The average number of leaves was 13.5 at 30 DAP and 30.56 at 80 DAP. Regarding yield-contributing traits, higher values were recorded for fruits per plant (36), single fruit weight (16.86 g), and fruit yield per plant (596.23 g) compared to those reported for BARI Strawberry-2 at the time of its release. This improvement is likely due to the use of clean, healthy, and disease-free tissue-cultured plantlets. The results suggest that tissue-cultured plantlets can enhance yield potential and may serve as a reliable planting material for commercial strawberry cultivation.

Validation trial of tissue cultured gerbera plantlets under field condition at RARS, Jashore

M. M. Khatun, S.C. Halder and D. Halder

The experiment was conducted at the Regional Agricultural Research Station, BARI, Jashore during 2024-25 to evaluate the field performance of tissue-cultured gerbera plantlets. Tissue-cultured plantlets of a red gerbera cultivar, differing in age, were used as experimental material. Morphological traits including plant height, leaf number, leaf length, leaf width, and days to first flower bud initiation were assessed, with data recorded at different days after planting (DAP). Across all observation periods, the highest plant height and leaf number were obtained from T_4 (11-month-old plantlets). The maximum leaf length was recorded in T_3 (9-month-old plantlets) at all DAP, whereas the highest leaf width was observed in T_1 (5-month-old plantlets) at all DAP except 30 DAP. Early flower bud initiation (19 days) was observed in T_3 (9-month-old plantlets), while delayed initiation was recorded in T_1 (5-month-old plantlets).

Validation trial of tissue cultured gerbera plantlets under field condition at biotechnology division's research field, Gazipur

M. M. Khatun and S. C. Halder

The experiment was conducted at the research field of the Biotechnology Division, BARI, Gazipur, during 2024–2025 to evaluate the field performance of tissue-cultured gerbera plantlets. Tissue-cultured plantlets of a red gerbera cultivar, differing in age, were used in this study. Morphological parameters including plant height, leaf number, leaf length, leaf width, and floral traits were evaluated. Data were recorded at 90 days after planting (DAP). Among the treatments, the highest plant height (39.40 cm), leaf number (24.40), and leaf length (23.80 cm) were obtained from T4 (8-month-old plantlets), while the highest leaf width was recorded in T3 (7-month-old plantlets). Regarding floral traits, the maximum flower stalk length (52.00 cm), stalk diameter (2.32 cm), and flower diameter (9.00 cm) were also recorded in T4 (8-month-old plantlets).

Sustaining of Bt eggplant in Bangladesh by implementing effective stewardship practices

M. K. Hasan, A. Saha, A. K. M. Quamruzzaman, M. M. Khatun and M. A. Y. Akhond

To sustain the first genetically engineered (GE) crop, Bt brinjal, several activities were undertaken, including maintenance and purification of Bt brinjal varieties, seed production, Bt trait assessment, quantification of Bt protein in shoots and fruits, and field evaluations. For maintenance, seeds were harvested from phenotypically desirable plants of BARI Bt Begun-3 and BARI Bt Begun-4. A total of 270 kg of seeds from BARI Bt Begun varieties were produced during the reporting year. ELISA analysis confirmed 100% presence of the Bt protien in seed samples obtained from both BADC and BARI. The Bt protein content ranged from 19.90 to 32.68 ppm in shoots and 17.24 to 33.14 ppm in fruits, irrespective of location and variety. In addition, desirable transgenic lines, BARI Begun-10 and BARI Begun-11, were selected at Mahyco, India, for future agronomic trials in Bangladesh.

Susceptibility of *Leucinodes orbonalis* Guenee populations to the cry1 ac protein

M. Z. H. Prodhan, M. K. Hasan and N. Z. Bristy

Studies were carried out to determine the susceptibility of the brinjal fruit and shoot borer, *Leucinodes orbonalis* (Guenée) to Cry1Ac protein of *Bacillus thuringiensis* by a diet incorporation method for the populations collected from ten different brinjal growing areas of Bangladesh during 2024. *Leucinodes orbonalis* larvae were reared to adults on a semi-synthetic diet and were allowed to mate using standardized rearing techniques in the laboratory at Agricultural Research Station, BARI, Pabna, Bangladesh. Eggs were collected from the mating cages were allowed to hatch and neonates emerged from these eggs were used for bioassay. The bioassay was performed with different concentration as of the Cry1Ac protein along with an untreated control to determine their susceptibility level. Median lethal concentrations (LC_{50}) ranged between 0.02 and 0.09 ppm and Moult inhibitory concentration (MIC_{50}) values for *L. orbonalis* ranged from 0.01 to 0.03 ppm. Variation in susceptibility amongst field populations was 4.5-fold for LC_{50} and 3.00 -fold for MIC_{50}. These values can be used for resistance monitoring.

Multilocation confined field trial of 3r-gene late blight resistant biotech potato

M. M. Khatun, N. Amin, S. Yesmin, N. Bilkish, and M. A. Y. Akhond

Two transgenic events DIA-MSU-UB015, DIA-MSU-UB255 along with the check variety BARI Alu-7 (Diamant) were planted in the greenhouse at the Biotechnology Division, BARI, Gazipur. A total of 1064 tubers of DIA-MSU-UB015, 1052 of DIA-MSU-UB255 and 940 tubers of check variety BARI Alu-7 (Diamant) were planted. The check variety BARI Alu-7 (Diamant) produced a total of 2700 tubers while 3950 and 3800 tubers were harvested from DIA-MSU-UB015 and DIA-MSU-UB255 respectively. All tubers were graded according to their size and stored in 4^0C freezer to be maintained for further confined field trials. The identity check of the two transgenic events were also documented by PCR method.



SOIL MANAGEMENT

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Project: Soil Chemistry

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 ($ZnSO_4.7H_2O$) 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 $ZnSO_4$, $7H_2O$. 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 $ZnSO_4$, $7H_2O$. 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 (T_6). The highest gross margin (2,14,336 Tk ha^{-1}) and highest BCR (2.3) were also found in T_6. T_6 also resulted in the highest nutrient content and nutrient uptake by pea plant. Post-harvest soil analysis indicated that T_6 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 (H_3BO_3) 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 T_3 (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 ($ZnSO_4.H_2O$) were applied at flowering stage. The treatment combinations were T_1: control, T_2: 50 mg L^{-1}, T_3: 100 mg L^{-1}, T_4: 150 mg L^{-1}, T_5: 200 mg L^{-1} as foliar spray and T_6: Soil application @ RDF. The highest seed yield (1110.0 kg ha-^{1}) was observed in T_5 (200 mgL^{-1}Zn) and which was produced equal yield with T_4 (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 T_{12} (Zn_4B_2) 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 T_6 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 T_6 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.

Project: Soil Fertility and Fertilizer Management

Nutrient management 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 field study (2000–2024) in AEZ-11, RARS Jashore, assessed fertilizer strategies for the Wheat-Mungbean-T. Aman pattern. Six treatments were tested using a randomized complete block design. The highest yields and gross margin (Tk 77071 ha^{-1} yr^{-1}) were consistently recorded with 125% recommended dose (RD), followed by 100% RD, both statistically similar. The lowest yield (7.09 t ha^{-1} yr^{-1}) came from the native nutrient treatment. With the highest total rice system yield (13.42 t ha^{-1} yr^{-1}), the 125% RD treatment is recommended for sustaining productivity, preserving soil health, and ensuring better economic returns in this cropping system.

Nutrient management for sustaining soil fertility and yield of mustard-mungbean-t. Aman croppingpattern at Jessore

N. U. Mahmud, N. Salahin, M M Masud and H. M. Naser

A long-term (2000–2024) field trial in AEZ-11, Jashore, evaluated fertilizer management for the Mustard-Mungbean-T. Aman 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 (T_5), gave the highest mustard yield (1.56 t ha^{-1}), along with maximum mungbean and T. Aman yields through residual effects. T_5 also showed the highest system yield (14.97 t ha^{-1} yr^{-1}), gross margin (Tk 75283 ha^{-1} yr^{-1}), and BCR (1.34). Over 24-cycles, N and K removal exceeded inputs, while mungbean biomass ploughed into soil added 136, 78, and 8 kg ha^{-1} of P, S, and Zn, respectively. T_5 is optimal for sustainability and profitability.

Nutrient management for sustaining soil fertility and yield of wheat-mungbean-t. Aman cropping pattern at Ishurdi

M A Rahman, M M Masud and H M Naser

A field experiment was conducted in the High Ganges River Floodplain Soils during 2024-25 to evaluate nutrient omission effects on crop performance and soil fertility under the Wheat-Mungbean-T. Aman cropping pattern. Six treatments were tested: one recommended dose, four omission treatments (N, P, K, S), and one native fertility, each replicated thrice. The recommended dose (NPKSZn @ 120, 35, 75, 20, 5 $kgha^{-1}$ for wheat and 160, 36, 70, 40, 3 $kgha^{-1}$ for T. Aman) produced the highest yield and system productivity, while native fertility recorded the lowest. Nutrient omission reduced yield and total system productivity compared to the recommended dose.

Nutrient management for sustaining soil fertility and yield of mustard-mungbean-t. Aman cropping pattern at Ishwardi

M A Rahman, M M Masud and H M Naser

A field trial was conducted at the Regional Agricultural Research Station, Ishwardi, Pabna, during 2024–2025 on High Ganges River Floodplain Soils (AEZ-11) to determine sustainable fertilizer doses for the Mustard–Mungbean–T. Aman cropping pattern and to assess the effects of nutrient omission on soil health and productivity. Six treatments were tested, including a recommended dose (T_1: NPKSZnB @ 160, 54, 105, 40, 3, and 1 $kgha^{-1}$ for mustard; NPKSZn @ 160, 36, 70, 40, and 3 $kgha^{-1}$ for T. Aman), four omission treatments, and a control. The recommended dose consistently produced the highest yield and system productivity, while the control had the lowest. Nutrient omission caused a notable reduction in yield and total system productivity. Rice equivalent yield and system yield were also highest in the recommended dose and lowest in the control.

Long-term integrated nutrient management for sustaining soil fertility and yield of maize-mungbean-T. Aman cropping pattern

M. M. Masud, M. M. Sultana and H. M. Naser

A long-term field experiment (2008-2025) 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 T_5 (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. T_1 (native fertility) produced the lowest yields and negative nutrient balances. Poultry manure incorporation improved soil pH and organic matter. T_5 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 and H. M. Naser

A field experiment conducted during the 2024-25 *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 n k nano fertilizers and the yield of cabbage

M. M. Masud, M. M. Sultana and H. M. Naser

Second year field experiments were carried out during 2024-2025 at the Central Research Field of the Soil Science Division, BARI, Gazipur. The objective was to assess the impact of Nano N and Nano K fertilizers on cabbage growth and yield and to maintain soil fertility. The experiment followed a randomized complete block design with six treatments replicated thrice. The findings revealed that the treatment involving 75% RD K along with two foliar sprays of Nano N and Nano K significantly registered the highest agronomic parameters and marketable yield (65.69 t ha^{-1}) compared to 100% recommended doses of chemical fertilizer, with statistically identical results. The control plot gave the lowest yield. The 75% RD K treatment with foliar sprays of Nano N and Nano K also showed the highest marginal benefit-cost ratio 1.15), while the 100% RDCF treatment showed 3.07 during cabbage cultivation. Despite these promising results, further research on nano fertilizer in Bangladesh is needed to fully understand its potential impact on crop production.

Evaluation of phosphorus availability for organic and inorganic fertilizer

M. M. Masud, M. M. Sultana and H. M. Naser

This study evaluated the effects of organic and inorganic fertilizers on phosphorus availability, growth, and yield of cabbage and broccoli in Gazipur during the *Rabi* season of 2024–25. Six treatments combining TSP and poultry manure were tested in RCBD. Results showed that T4 (60% RD P from TSP + 40% from poultry manure) recorded the highest cabbage head yield (82.46 t ha^{-1}) and broccoli curd yield (12.61 t ha^{-1}), with improved plant growth and P uptake. Conversely, control (T6) produced the lowest yields. Findings highlight that balanced integration of organic and inorganic fertilizers enhances phosphorus availability, crop productivity, and soil fertility.

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 evaluates unmanned aerial vehicle (UAV) multispectral imagery for predicting soil macronutrients and micronutrients. High-resolution imagery was acquired from bare soil plots over two seasons. Twenty-four spectral indices were calculated and used to cluster plot data, which was then integrated with laboratory-measured nutrient contents to train eleven machine learning models. Results showed significant variability for

most nutrients except OM, N, S, and B. The best-performing models (e.g., KNN for pH, LGBM for OM) were selected based on root mean squared error (RMSE) and used for prediction on validation data. Field-level predictions for 10 parameters showed no significant difference in 73% of cases, demonstrating that UAV-based multispectral sensing can accurately estimate key soil nutrients, offering a viable tool for rapid soil assessment.

Integrated nutrient management and proper plant density for the popular trellis growing pointed gourd at jashore region

N Salahin, N.U. Mahmud and K. U. Ahammad

A field study was conducted at RARS, Jashore during 2022–2023 and 2023–2024 cropping seasons to identify the best nutrient package and plant spacing for pointed gourd grown on trellises. The trial tested five fertilizer treatments (F_1-F_5) and two plant densities (1.0 m ×1.0 m and 1.5 m ×1.5 m). The F_4, which combined 100% recommended chemical fertilizers (RDCF) with 3 t ha^{-1} vermicompost, produced the highest fruit number and size, comparable to farmers' practice (F_5). The closer spacing of 1.0 m ×1.0 m produced significantly more fruit yield than the wider 1.5 m ×1.5 m spacing. The study concluded that combining F_4 nutrient treatment with 1.0×1.0 m spacing produced both yield and fruit size.

Integrated nutrient management for pineapple in barishal region

M.R. Islam and M. S. I. Khan

A field experiment was conducted at RARS, Rahmatpur, Barishal, in October 2024 to determine the proper nutrient dose for pineapple (cv. Rumai). Eight fertilizer treatments were evaluated under RCBD with three replications. Results showed significant effects on plant growth, fruit traits, and yield. The tallest plants (73.16 cm) were in T5, while the longest (33.88 cm) and broadest (33.96 cm) fruits were in T3. Individual fruit weight ranged from 753 g (T0) to 973 g (T3). Maximum yield (46.05 t ha^{-1}) was also recorded in T3, 30.08% higher than control. Total soluble solids ranged between 16.53–19.63%. Integrated fertilizer management markedly improved growth, yield, and quality of pineapple compared to native 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

Excessive use of synthetic fertilizers degrades soil and increases nitrate accumulation in vegetables like broccoli, posing health risks. This study, conducted at SSD, BARI, Gazipur, evaluated microbial-amended organic fertilizers on broccoli (var. Hybrid EARLY YOU). Six nutrient packages were tested: 100% chemical fertilizer, 80% chemical fertilizer, 80% fertilizer + vermicompost (3 t ha^{-1}), 80% fertilizer + cow dung (3 t ha^{-1}), 80% fertilizer + poultry litter (3 t ha^{-1}), and control. Growth, yield, and quality traits were assessed. Poultry litter with reduced fertilizer (T5) gave the highest yield (28.39 t ha^{-1}) and vitamin C (83.37 mg 100 g^{-1}), along with improved sulfur content. Vermicompost and cow dung showed moderate effects. Results suggest poultry litter with reduced chemical fertilizer as a sustainable option for improving broccoli yield and nutritional quality.

Effect of integrated nutrient management and plant growth regulator on yield ot tomato

Marufa Sultana, M. M. Masud and H. M. Naser

A field experiment was conducted in 2024–2025 at BARI, Gazipur, to evaluate integrated plant nutrient system (IPNS) practices and gibberellic acid (GA_3) on tomato (BARI Tomato 18). The study used a two-factorial RCBD with three replications. IPNS included 100% soil test-based (STB) fertilizer, 75% STB + vermicompost (2.5 t ha^{-1}), and 50% STB + vermicompost (5 t ha^{-1}). GA_3 concentrations were 100, 150, and 200 ppm. Results showed that reduced chemical fertilizers with higher vermicompost and GA_3 improved plant growth, yield, and soil fertility. The best performance was recorded with 50% STB + vermicompost (5 t ha^{-1}) and GA_3 at 150 ppm, highlighting a sustainable strategy for tomato cultivation in Bangladesh.

Effect of varing ratios of vermicompost with biochar on soil properties and crop yield

Marufa Sultana, M. M. Masud and H. M. Naser

Sustainable crop production requires nutrient management strategies that maintain soil fertility while minimizing dependence on chemical fertilizers. This study evaluated the combined effects of vermicompost and biochar on soil

properties, nutrient use efficiency, and crop yield. A field experiment was conducted in a randomized complete block design with three replications using potato (BARI Alu 25), data shak (BARI Data-1), and T. Aman rice (BRRI dhan-57). Five treatments were applied: 100% recommended fertilizer dose (RDF), 75% vermicompost + 25% chemical fertilizer + 5% biochar, 50% vermicompost + 50% chemical fertilizer + 5% biochar, 25% vermicompost + 75% chemical fertilizer + 5% biochar, and 100% vermicompost + 5% biochar. Key parameters including growth, yield, and soil fertility were assessed. The study is expected to identify an optimal vermicompost–biochar ratio that enhances productivity, improves soil health, and reduces reliance on chemical fertilizers, contributing to sustainable agricultural practices.

Development of fertilizer recommendations for onion-linseed intercropping

M. R. Khatun, M. M. Masud, M. M. Sultana and H. M. Naser

The experiment conducted at Gazipur (AEZ-28) aimed to develop a fertilizer recommendation for onion-linseed intercropping. Six treatments (T_1: 100% RDCF of Onion, T_2: T_1 + 20% RDCF of Linseed, T_3: T_1 + 30% RDCF of Linseed, T_4: T_1 + 40% RDCF of Linseed, T_5: T_1 + 50% RDCF of Linseed, T_6: T_1+ 60% RDCF of Linseed) were tested in a RCB design with three replications. Onion (var. BARI Piaz-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: 15.71 t ha^{-1} and linseed: 1.09 t ha^{-1} in 2024-25) were obtained in T_6 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, T_6 had the highest gross margin (357670/-) and highest B CR (3.37). T_6 showed better performance in case of nutrient content in post-harvest soil and nutrient uptake by the crops.

Effect of different levels of sulphur and boron on yield and nutrient uptake of sesame

M. R. Khatun, M. M. Masud, M. M. Sultana and H. M. Naser

The experiment conducted at Gazipur (AEZ-28) focused on investigating the effect of different levels of sulphur and boron on the yield and nutrient uptake of sesame during the 2023-2025. Two sulphur levels (i.e. 15 & 30 kg ha^{-1}) and four boron levels (i.e. 0.5, 1.0, 1.5, & 2 kg ha^{-1}) were tested in a randomized complete block design with ten treatments. The sesame variety used was BARI Till 4. Results indicated that yield-contributing characters and seed yield were significantly influenced by the fertilizer treatments. The highest seed yield was obtained in T_8 treatment (30 kg ha^{-1} sulphur and 2.0 kg ha^{-1} boron), which also exhibited the highest nutrient uptake by the sesame crop. Cost and return analysis revealed that the T_8 treatment had the highest gross return, gross margin and BCR.

Project: Soil Biology

Effect of different biofertilizer on yield of onion

M. E. Ali, A. Barman, M. Rahman, M.B. Banu and H.M Naser

The experiment was carried out during *Rabi* season of 2024-2025 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 piaj-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. T_1 : 100% NPKSZn of RD (Recommended Dose), T_2 : 80% N + *Azotobacter inoculum,* T_3 : 80% P + *PSB inoculum,* T_4 : 50% P + *AM inoculum,* T_5 : 80% NP +*Azotobacter* + *PSB,* T_6 : 80% N+ 50% P +*Azot.*+ *AM,* T_7 : 50% P + *AM*+*PSB,* T_8 : 80% N+ 50% P + Azot. +*AM*+*PSB and* T_9: Control. Results of the experiment revealed that the highest bulb yield of onion (17.44 t ha^{-1}) was found in T_7 (50% P + *AM*+*PSB*) treatments which was statistically identical with T_3, T_4, T_5 and T_8 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 onion

M. M. E. Ali, A. Barman, M. Rahman, M.B. Banu and H.M Naser

A field experiment was conducted at Central Farm, Soil Science Division, Bangladesh Agricultural Research Institute, Gazipur during *Rabi* season of 2024-2025 with the objectives to study the effect of combined use of arbuscular mycorrhizal fungi and phosphorus on growth and yield of onion, and to reduce to the use of P-fertilizer under field condition. The experiment was designed in factorial RCBD with eight treatments and four replications. The onion variety was BARI Piaj-4 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 onionseedlings. The treatment combinations were: T_1P_1U: 0% P × without AM, T_2P_2U: 50% P × without AM, T_3P_3U: 100% P × without AM, T_4P_1AM: 0% P × with AM, T_5P_2AM: 50% P × with AM and T_6P_3AM: 100% P × with AM. Mycorrhizal inoculation significantly increased plant height (cm), bulb height (cm) and bulb yield (t ha^{-1}). Root length (cm), and curd circumferences (cm) were non-significant. The plant that received AM in nursery bed produced higher bulb yield than without AM in all phosphorus levels of onion. The highest onion bulb yield 14.84 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 gardenpea

M. E. Ali, A. Barman, M. Rahman, M.B. Banu 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 2024-2025 with the objectives to evaluate the effect of *Rhizobium* biofertilizer, vermicompost and chemical fertilizers on cowpea. The crop variety was Gardenpea (BARI Motorshuti-2) and *Rhizobium* strain was BARI RPs-504. There were nine treatments viz. T_1: Control, T_2: Vermicompost (VC) @ 2.5 t ha^{-1}, T_3: VC @ 5 t ha^{-1}, T_4: VC @ 2.5 t ha^{-1} + Integrated Plant Nutrient System (IPNS) based NPKSZnB, T_5: VC @ 5 t ha^{-1} + IPNS based NPKSZnB, T_6: VC @ 2.5 t ha^{-1} + *Rhizobium* + IPNS based PKSZnB, T_7: VC @ 5 t ha^{-1} + Rhizobium + IPNS based PKSZnB, T_8: 100% NPKSZnB, T_9: *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 gardenpea 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 pod yield (13.26 t ha^{-1}, 97.91% 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 gardenpea 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, M. B. Banu and H.M. Naser

This study explored the impact of microbial inoculants on microbial community, biomass carbon, and nutrient uptake by chickpea in red-brown terrace soil during the 2024-2025 season. A randomized complete block design with seven treatments (T_1: 100% RDF; T_2: *Rhizobium* + PSB + AMF; T_3: 75% RDF + *Rhizobium*; T_4: 75% PSB; T_5: 75% RDF + AMF; T_6: 75% RDF + *Rhizobium* + PSB + AMF and T_7: Absolute control) was applied, combining various levels of chemical fertilizers and microbial inoculants (Rhizobium, PSB, AMF). The results showed that the treatment of 75% RDF combined with Rhizobium, PSB, and AMF (T6) significantly enhanced chickpea growth, with the highest number of nodules per plant (47), seed yield (2.12 t/ha), and stover yield (3.31 t/ha). This treatment also recorded the highest nutrient uptake, including nitrogen (114.12 kg/ha) and potassium (69.73 kg/ha). Additionally, microbial inoculants improved microbial biomass carbon (MBC) and nitrogen (MBN) content in the soil, with T6 showing the highest values (MBC: 97.32 mg/kg, MBN: 38 mg/kg). The study concluded that combining microbial inoculants with reduced fertilizer inputs enhances chickpea yield and soil fertility.

Role of microbes for nutrient availability and uptake by soybean

M.F.A. Anik, M. E. Ali, M. Rahman, A. Barman, M. B. Banu and H.M. Naser

This study, conducted at the Central Research Field of Soil Science Division at BARI, Gazipur during 2024-2025, explored the impact of microbial inoculants on nutrient availability and uptake in soybean. Using a randomized complete block design, six treatments (T_1: *Bradyrhizobium* + PSB; T_2: 75% RDF + *Bradyrhizobium*; T_3: 75% RDF + PSB; T_4: 75% RDF + PSB; T_5: 75% RDF + *Bradyrhizobium* + PSB; T_6: Absolute control) were tested, including combinations of Bradyrhizobium and Phosphate Solubilizing Bacteria (PSB) with 75% recommended dose of fertilizers (RDF). The findings indicated that soybean growth was significantly improved by the application of 75% RDF combined with Bradyrhizobium and PSB, showing results similar to full RDF application. The highest number of nodules (21.00 per plant), seed yield (2.10 t/ha), and stover yield (3.45 t/ha) were observed in the 75% RDF + Bradyrhizobium + PSB treatment. Nutrient uptake, including nitrogen (189.39 kg/ha), phosphorus (14.14 kg/ha), and potassium (99.67 kg/ha), was also highest in this treatment. Additionally, microbial biomass carbon (MBC) and nitrogen (MBN) content were significantly enhanced, with dual inoculation showing the greatest increase. The results highlight the potential of microbial inoculants to improve both soybean yield and soil health.

Mono culture production of arbuscular mycorrhizal fungi

M. Rahman, A. Barman, M. B. Banu, M. E. Ali, and H. M. Naser

This study developed contamination-free monocultures of arbuscular mycorrhizal fungi (AMF) for biofertilizer production. Sterilized soil, sand, and cow dung were used with disinfected seeds and pots in a completely randomized design. In 2024, 20.57 kg of inoculum containing 64.33 spores/100 g of soil was produced; in 2025, the same mass contained 70.50 spores/100 g of soil. This inoculum, referred to as a 'mother culture' because it is used to produce subsequent generations of inoculum, will serve as a starting point for further multiplication.

Suitability study of host and substrates for producing arbuscular mycorrhizal fungi inoculum

M. Rahman, A. Barman, M. B. Banu, M. E. Ali, and H. M. Naser

This study evaluated suitable host plants and substrates for producing arbuscular mycorrhizal fungi (AMF) inoculum using a randomized complete block design (RCBD) with three replications. Three hosts—onion (*Allium species*), sorghum (*Sorghum bicolor*), and maize (*Zea mays*)—were tested under six substrate treatments: potting mixture (PM), PM+tea residue (TR), PM+TR+nutrient solution (NS), PM+NS, PM+rose bengal agar medium (RBAM), and PM+RBAM+NS. Sterilized soil, sand, and cow dung were used, and seeds/pots were disinfected. The highest spore populations (85.67 for sorghum, 105.67 for maize per 100 g soil) and root colonization (53.33% for sorghum, 43.33% for maize) occurred in PM+RBAM+NS (T6). Sorghum was identified as the most effective host, and RBAM with NS as the best substrate combination.

Effect of mycorrhiza inoculated compost on phosphorus availability and yield of broccoli

A. Barman, M. Rahman, M.B. Banu, M. E. Ali and H.M. Naser

The present study investigates the effect of mycorrhiza-inoculated compost on phosphorus availability and the yield of broccoli. Five treatments (T_1: 100% recommended chemical fertilizer, T_2: 80% RDCF from compost + 20% RDCF, T_3: 60% RDCF from compost + 40% RDCF, T_4: 40% RDCF from compost + 60% RDCF and T_5: Native fertility) were applied, with varying levels of mycorrhiza inoculation, and the resulting effects on plant growth, yield, and phosphorus availability were assessed. Treatments T_1, T_2, and T_3, which received higher levels of mycorrhiza inoculation, showed significantly improved plant height, number of leaves, marketable head weight, curd height, circumference, and curd yield, compared to the control (T_5). The highest curd yield was recorded in T_3 (16.79 t/ha), while T_5 produced the lowest (6.62 t/ha). Additionally, mycorrhiza inoculation enhanced microbial biomass carbon (MBC) and nitrogen (MBN) levels, as well as available phosphorus (AP) in the soil, which contributed to better plant growth. The biological cost ratio (BCR) was also

higher in the inoculated treatments, indicating better economic viability. These results suggest that mycorrhiza-inoculated compost can significantly improve phosphorus availability and enhance the growth and yield of broccoli, offering a sustainable agricultural practice for increased productivity.

Influence of rhizobium and phosphate solubilizing bacteria on growth, yield and quality of mungbean

A. Barman, M. Rahman, M.B. Banu, M. E. Ali and H.M. Naser

This study evaluated the effects of Rhizobium and Phosphate Solubilizing Bacteria (PSB) on mungbean growth, yield, and quality. Sixteen treatments with varying levels of Rhizobium and PSB were compared, including a control (T1). Key parameters such as root length, plant height, number of pods per plant, number of grains per pod, 1000-seed weight, yield (ton/ha), and microbial populations (PSB, Rhizobium, and fungi) were measured. Results showed that Rhizobium and PSB significantly enhanced mungbean growth and yield. The highest yield (1.22 tons/ha) and 1000-seed weight (42.70 g) were observed in treatment T11 (R2P2). Additionally, treatments with higher microbial populations, such as T3 (R0P2), showed better root length, plant height, and pod numbers. Microbial populations were positively correlated with increased plant growth, suggesting that microbial inoculants improve nutrient cycling and availability. Overall, the combination of Rhizobium and PSB enhanced mungbean productivity, offering a sustainable approach for boosting crop yield, particularly in nutrient-poor soils.

Validation of biofertilizer on lentil

J. A. Mahmud, M. E. Ali, M. M. Morshed, M. M. Hossain

An experiment was conducted at Kushtia sadar during the *rabi* season of 2024-25 to observe the effect of rhizobium biofertilizer on 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., T_1 (without Rhizobium inoculant+ P_{22} K_{42} S_{20} Zn_5 kg ha^{-1}), T_2 (with Rhizobium inoculant+ P_{22} K_{42} S_{20} Zn_5 kg ha^{-1}) and T_3 ($N_{50}P_{22}$ K_{42} S_{20} Zn_5 kg ha^{-1}) were considered in this regard. The higher seed yield was obtained (1.79 t ha^{-1}) where Rhizobium inoculant along with P_{22} K_{42} S_{20} Zn_5 kg ha^{-1} was used (T_2). The gross margin was also higher in T_2 treatment (Tk 107775 ha^{-1}) over those of other two treatments. The effect of rhizobium biofertilizer to the performance of lentil was found positive.

Validation of biofertilizer on mungbean

J. A. Mahmud, M. E. Ali, M. M. Morshed, M. M. Hossain

An experiment was conducted at Meherpur, sadar during 2024-25 to observe the effect of rhizobium biofertilizer on Mungbean. The mungbean variety BARI Mung- 6 and peat based rhizobium strain (BARI RVr-403) were used for the experiment. Unit plot size was 10 m × 15 m. Three treatment combinations viz., T_1 (without Rhizobium inoculant+ P_{22} K_{42} S_{20} Zn_5 kg ha^{-1}), T_2 (with Rhizobium inoculant+ P_{22} K_{42} S_{20} Zn_5 kg ha^{-1}) and T_3 ($N_{50}P_{22}$ K_{42} S_{20} Zn_5 kg ha^{-1}) were considered in this regard. TThe effect of rhizobium biofertilizer to the performance of Mungbean was found positive. The maximum seed yield (1.29 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 (1.16 t ha^{-1}). According to top gross margin (Tk. 75600 ha^{-1}), treatment T_2 found to be profitable for mungbean cultivation.

Response of rhizobium and trichoderma on yield of blackgram at Madaripur

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

A field experiment was conducted at Regional Pulses Research Station, Madaripur during the *Kharif*-II season of 2024–25 to assess the impact of *Rhizobium* and *Trichoderma* inoculants on the growth and productivity of blackgram (BARI Mash-3). The experiment was followed a Randomized Complete Block Design (RCB) with six treatments. Treatments included applications of Lycomax and Bioderma (a *Trichoderma*-based product), Rhizobium (BARI RVm-301) and their combinations, alongside a control. Although none of the parameters showed statistical significance,

numerical differences suggested that Rhizobium combined with Bioderma resulted in the highest seed yield (1132kg/ha) and superior growth characteristics.

Response of rhizobium and trichoderma on yield of lentil at madaripur

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

An experiment was conducted at Regional Pulses Research Station, Madaripur during the *Rabi* season of 2024–25 to evaluate the impact of *Rhizobium* and *Trichoderma* inoculants on the growth and productivity of lentil. The study was laid out in a Randomized Complete Block Design (RCB) with six treatments and replicated accordingly. The treatments included individual and combined applications of Rhizobium (BARI RLC-107), Lycomax and Bioderma (a Trichoderma-based product) and control. Significant differences were observed in yield, the combination of Rhizobium + Bioderma recorded the highest seed yield (1692 kg/ha) and lowest the control (1205 kg/ha) while other traits such as plant height, pods per plant, and seed weight did not show statistical significance.

Effect of rhizobium bio-fertilizer on productivity and nutritional quality of grasspea varieties

S. Aktar, M. E. Ali and H.M. Naser

The experiment was conducted at BARI, Gazipur during *Rabi* season of 2023-2024 and 2024-2025 to evaluate the effect of rhizobium bio-fertilizer on productivity and nutritional quality of grasspea varieties. The selected varieties were BARI Khesari-2, BARI Khesari-3, BARI Khesari-5 and BARI Khesari-6 and these varieties were tested with *Rhizobium* strain BARI RLs-10. This two-factor experiment consisted of eight treatment combinations laid out in RCBD with three replications. BARI Khesari-3 performed best in respect of different parameters viz. nodule number, root and shoot dry weight and seeds pod^{-1}, N uptake by seeds and stover, N and protein content in seed. *Rhizohium* inoculation significantly increased seed yield and stover yield. N content in seeds and stover, N uptake by seeds and stover, protein content in seed was increased significantly compared to non-inoculation treatment.

Effect of different fertilizer combination on groundnut in barishal region

M.R. Islam, M. E. Ali, S. I. Khan and H.M. Naser

A field experiment was carried out at RARS, Rahmatpur, Barishal during December 2024 to April 2025 to find out the response of fertilizer on groundnut production in Barishal region. The crop variety was BARI Chinabadam-9. There were eight treatments viz.T_1: Native fertility, T_2:$N_{30}P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}kgha^{-1}$ (FRG2018),T_3:$N_{30}P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}$ $kgha^{-1}$+ Vermicompost $3tha^{-1}$ T_4:$P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}$+Vermicompost 3t/ha+ Rhizobium (BARI Rhi-803),T_5: $P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}$ $kgha^{-1}$ + Rhizobium, T_6: $N_{30}P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}$ $kgha^{-1}$+ CD 5t/ha,T_7: $P_{20}K_{30}S_{20}Zn_{1.0}B_{1.0}$ $kgha^{-1}$ + CD 5t/ha+ Rhizobium which were replicated for four times. Different fertilizer combination had influence on yield and yield attributes of BARI Chinabadam-9. The highest seed yield ($1.54tha^{-1}$) was obtained from T_4 treatment, where we used chemical fertilizer, vermicompost and rhizobium fertilizer and it was statistically similar with other treatments treatments except control (T_1) treatment. The highest number of nodule (160, 179 and 190) $plant^{-1}$ was found in those treatments where we used rhizobium fertilizer and yield was higher.

Project: Land Management

Effects of tillage and maize stalks-based compost on soil organic carbon and aggregate stability under pea-okra-t. Aman cropping systems

M.S. Islam, S. Brahma, R.S. Smriti, and H.M. Naser

A study was conducted at the Soil Science Division, BARI, comparing two tillage methods (conventional (T_1) and strip tillage (T_2)) and four nutrient management strategies: F_1 - Recommended chemical fertilizers, F_2 - 80% RDCF from compost + 20% RDCF, F_3 - 60% RDCF from compost + 40% RDCF, and F_4 - 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. The combination, 60% compost with 40% RDCF under strip tillage (T_2F_3) improved SOC in the small fraction of aggregates (0.25-2.0 mm), MBN, MBC (15%), total glomalin (97%), and MWD (12%) over sole chemical fertilizers. After

a cycle completion, the large macro and small macro aggregates improved 2-6% by reducing micro fractions. This increase was reflected in enhanced water-stable aggregate stability by 23% and promoted rice equivalent yield (14%) over sole chemical fertilizers. Thus, the study suggests that T_2F_3 or T_2F_4 is more feasible, may enhance carbon sequestration, aggregate stability, soil fertility, and crop production in grey terrace soils.

Strategic tillage options and integrated nutrient inputs on soil enzyme activity and nutrient bioavailability in field pea-okra-t. Aman cropping systems

M.S. Islam, S. Brahma, R.S. Smriti, and H.M. Naser

Conventional tillage practices and prolonged reliance on chemical fertilizers often disrupt microbial communities, enzymatic activity, and nutrient bioavailability, which can hinder soil health and crop productivity. While conservation tillage combined with integrated nutrient management has shown potential in addressing these challenges globally, its application in the grey terrace soils of Bangladesh remains largely underexplored. This study investigates the effects of two tillage methods conventional and conservation and four Integrated Plant Nutrition System (IPNS) treatments: (i) 100% chemical fertilizers, (ii) 20% RDCF + 80% compost, (iii) 40% RDCF + 60% compost, and (iv) 60% RDCF + 40% compost, on microbial indices, enzymatic activity, nutrient bioavailability, and the productivity of a pea-okra T. aman cropping sequence. A split-plot design was used to evaluate these variables. The results revealed significant improvements in microbial indices, with 11% higher dehydrogenase activity (DH), 4% greater organic carbon, and 15% more total nitrogen in strip tillage compared to conventional tillage, contributing to a higher field pea yield by 9.18%, 16.4%, and 16.9% in the F_2, F_3, and F_4 nutrient inputs, respectively, compared to those receiving only chemical fertilizers. Off the treatment, strip tillage with F_4 showed superior result at par to F_3 over chemical fertilizer. However, after the fourth cropping, the higher soil density in strip tillage resulted in a 14% reduction in okra yield, highlighting the need for careful management of soil compaction over time. The findings suggest that conservation tillage, combined with appropriate nutrient management, is essential for sustainable soil health and crop yield.

Role of organic amendment on improvement of nitrogen use efficiency in grey terrace soil in spinach

R.S. Smriti, S. Bramah, A.T.M.A.I. Mondol, M.S. Islam and H.M. NASER

A pot experiment was conducted at the net house of SSD, BARI, Gazipur, under AEZ-28 during the *rabi* seasons of 2023-24 & 2024-25 to observe the impact of organic amendments on soil physico-chemical properties and nitrogen (N) use efficiency in spinach cultivation. Six treatments were applied: T_1-80% Recommended Dose of Chemical Fertilizer (RDCF) +20% RDCF from cowdung (CD); T_2- 60% RDCF + 40% RDCF from CD; T_3- 40% RDCF + 60% RDCF from CD; T_4- 20% RDCF + 80% RDCF from CD; T_5- 100% CD; and T_6- 100% RDCF as control, with three replications in a CRD. Results showed that organic amendments substantially improved soil properties and crop performance. Among the treatments, T_2 consistently produced the highest yield (19.53 t ha^{-1}) and nitrogen use efficiency (45.6%). Conversely, T_5 (100% cowdung) improved soil properties but recorded the lowest yield (7.39 t ha^{-1}). These findings suggest that combination of organic and inorganic fertilizers, particularly at a 60:40 ratio, enhances soil fertility, crop yield, and nitrogen efficiency in spinach cultivation.

Effect of tillage and organic mulch on soil physico-chemical properties and potato yield

R.S. Smriti, S. Bramah, A.T.M.A.I. Mondol, M.S. Islam and H.M. NASER

A field experiment was conducted during the *rabi*seasons of 2023 to 2025 SSD, BARI, Gazipur (AEZ-28) to evaluate effects of tillage and mulching practices on soil physico-chemical properties and potato yield. The study followed a split-plot design with two tillage practices, strip tillage (T_1) and conventional tillage (T_2) and four mulching treatments: water hyacinth mulch (WHM, M_1), rice straw mulch (RSM, M_2), jute gunny bag mulch (JBM, M_3), and no mulch (M_0). Results revealed that tillage significantly influenced soil organic matter, nitrogen, phosphorus, and moisture content, though yield differences were not statistically significant. In contrast, mulching demonstrated strong positive effects on both soil properties and yield. Strip tillage produced a slightly higher yield (5.3% greater than conventional tillage), while WHM

increased yield by 24.1% compared to no mulch. However, the interaction between tillage and mulch did not significantly influence crop performance. These findings suggest that strip tillage combined with water hyacinth mulch is a promising practice for enhancing soil quality and boosting potato productivity in terrace soils.

Assessment of leaching loss of nutrients and determination of crop coefficient (kc) values of tomato through lysimeter

A.T.M.A.I. Mondol, S. Brahma, M.S. Islam, M. J. Alam, R.S. SMRITI and H.M. NASER

During robi season of 2024, a study was conducted to determine the Kc value of tomato and estimation of nutrients leaching loss using a Lysimeter for the Gazipur region (AEZ-28). Four irrigation water regimes viz; T_1: Irrigation up to drainage at 5-day intervals (13 irrigations), T_2: Irrigation up to drainage at 10-day intervals (7 irrigations), T_3: Irrigation up to drainage at 15-day intervals (5 irrigations), and T_4: Irrigation up to drainage at 20-day intervals (3 irrigations) following the RCB design with three replications. The irrigation scheduling significantly influenced the yield of tomato. The highest yield of this season (73.4t ha^{-1}) was obtained in T_2 treatment. Similarly, the same treatment has been provided the estimated Kc values of 1.00, 0.98, 1.23, and 0.98 for initial, crop development, mid-season, and late-season stages, respectively. Plant nutrients (NO_3-N, P, K and S) were lost through leaching.

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, S. Brahma, M. Islam, 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 & 2024-2025 to determine the changes in soil moisture content &soil temperatureand to observe the yield performance of onion (AEZ-28). There were 3 types of tillage such as strip tillage (T_1), bed panting (T_2), andconventional tillage (T_3). In addition, mulch such as rice straw mulch (M_1), and no mulch (M_0) in a split plot design with 6 treatments and 3replications. The different tillage and mulch significantly affected the crop performance. Strip tillage provided higher yield (39.5%) over conventional tillage whereas rice straw mulch gave higher yield (20.8%) over no mulch. Both strip tillage and rice straw mulch improved soil physico-chemical properties & soil moisture and soil temperature than traditional cultivation sytem.

Requirement of potassium fertilizer under conservation agriculture practice in wheat-mungbean-T. Aman cropping system

N Salahin, Nu Mahmud and Ku Ahammad

A four-year field experiment, spanning from 2021-2022 to 2024-2025, at RARS, Jashore, evaluated potassium (K) fertilizer rates under two crop establishment methods: T_1 (conventional tillage, residue removal) and T_2 (conservation agriculture with minimal tillage and residue retention). Four K rates (75%, 100%, 125%, 150% of the recommended dose) were tested. Conventional tillage yielded more rice (5.99 t ha^{-1}), while CA improved wheat yield (4.90 t ha^{-1}) and moisture retention. Applying 150% K increased yields to 6.32 t ha^{-1} for T. Aman rice and 5.23 t ha^{-1} for wheat, raising system productivity to 17.8 t $ha^{-1}year^{-1}$. After four years, CA improved soil organic matter, total nitrogen, and available K.

Effect of long-term fertilization on crop productivity, soil properties and nutrient use efficiency under conservation agriculture practice with mustard-boro-t. Aman cropping pattern

N Salahin, Nu Mahmud and Ku Ahammad

A four-year study (from 2021-2022 to 2024-2025) assessed chemical fertilizer impacts on crop yield, soil health, and nutrient use efficiency under conservation agriculture (CA) in a Mustard-Boro-T. Aman rotation. Two methods were compared: T_1 (conventional) and T_2 (CA), with four fertilizer levels (N_1: 75%, N_2: 100%, N_3: 125% of recommended dose, and N_4: control). Conventional methods produced more rice, while CA enhanced mustard yield due to better soil moisture retention. Applying 125% fertilizer (N_3) significantly increased mustard yield, rice equivalent yield, and nutrient use efficiency. After four years, CA plots showed improved soil organic matter, total nitrogen, and potassium over conventional plots.

ENTOMOLOGY



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Integrated Pest Management

Biorational based management of diamondback moth attacking late winter cabbage

N. K. Dutta, K. Begum, M. K. Uddin, A. K. M. R. H. Ferdous, A. Saha and A. T. M. Hasanuzzaman

The experiment was carried out at the research field of Entomology Division, BARI, Gazipur during 2024-25 to develop biorational based management package against Diamondback moth (DBM) attacking late winter cabbage. The cabbage seedlings (Variety: Atlas 70) were transplanted on 02 February 2025. The experiment was designed in RCB with six treatments including untreated control and three replications. The treatments were assigned as follows: T_1 = Spraying *Celastrus angulatus* (Bio Chamak 1.0% EW) @ 2.0 ml/L of water; T_2 = Spraying of Spinosad (Success 2.5 SC) @ 1.2 ml/L of water; T_3 = Spraying of spinetoram (Delegate 11.7 SC) @ 1 ml/l of water; T_4= Alternate spraying of *Celastrus angulatus* (Bio Chamak 1.0% EW) @ 2.0 ml/L of water and spinosad (Success 2.5 SC) @ 1.2 ml/L of water; T_5= Farmers' practice: Spraying of chlorpyrifos + cypermethrin (Nitro 505 EC) @ 1.0 ml/L of water; T_6= Untreated control.

The results indicated that T_3 i.e. spraying of Spinetoram (Delegate 11.7 SC) @ 1 ml/l of water offered significantly the highest reduction (86.35 %) of larval population of DBM over control and this was followed by T_1 i.e. spraying *Celastrus angulatus* (Bio Chamak 1.0% EW) @ 2.0 ml/L of water (78.25%). The highest marketable yield (54.72 t/ha) was also obtained from spraying of spinetoram followed by spraying *Celastrus angulatus* (51.24 t/ ha).

Development of bio-rational based management package against rugose spiralling whitefly infesting coconut

N. K. Dutta, K. Begum, M. K. Uddin, A. K. M. R. H. Ferdous and A. K. M. Z. Rahman

The field experiment was conducted to develop biorational based management package against Rugose Spiralling Whitefly (RSW) infesting coconut during 2024- 25 at BARI, Gazipur. The experiment was laid out in RCB design with 07 treatments and 03 replications. The treatments were assigned as follows: T_1= Sanitation + Rotation spraying of Bioclean 5 SL (d-limonene) @ 1.0 ml/L of water & Imunit 15 SC (teflubenzuron+alpha-cypermethrin)@ 1.0 ml/L of water; T_2= Sanitation + Rotation spraying of Fizimite (10% sodium lauryl ether sulphate) @ 1.0 ml/L of water & Gladius 10 SC (Flometoquin) @ 1.0 ml/L of water; T_3= Sanitation + Rotation spraying of Fizimite @ 1.0 ml/L of water & Imunit 15 SC @ 1.0 ml/L of water; T_4= Sanitation + Rotation spraying of Bioclean 5 SL @ 1.0 ml/L of water & Gladius 10 SC @ 1.0 ml/L of water; T_5= Sanitation + Rotation spraying of microbial pesticide, *Isaria fumosorosea* @ 2.0 g/L of water & Imunit 15 SC @ 1.0 ml/L of water; T_6= Sanitation + Rotation spraying of microbial pesticide, *Isaria fumosorosea* @ 2.0 g/L of water & Gladius 10 SC @ 1.0 ml/L of water ; T_7=Untreated control.

Results revealed that at 7 days after spraying chemical insecticide (DASCI), the lowest mean nymph population /leaflet (3.85) was noticed in T_4 (Sanitation + Bioclean +Gladius) treated plants which was statistically at par with T_2 (sanitation + Fizimite +Gladius) treated plants. On the other hand at 7 days after spraying chemical insecticide (DASCI), significantly the lowest mean adult whitefly population/leaflet (3.52) was noticed in T_4 (Sanitation + Bioclean + Gladius) treated plants which was followed by T_2 treated (sanitation +

Fizimite + Gladius) plants (3.85). The management packages comprising of sanitation along with rotation spraying of Bioclean and Gladius, and sanitation along with rotation spraying of Fizimite and Gladius, were found promising in view of RSW nymph and adult population reduction (74-77%) over pretreatment population.

Survey on the abundance of natural enemies of rugose spiralling whitefly, *aleurodicus rugioperculatus* attacking coconut in Bangladesh

K. Begum, N. K. Dutta, A. K. M. R. H. Ferdous, M. K. Uddin, M. A. Sarkar and F. Yasmin

Field surveys were conducted in Manikganj, Kishoreganj, Pabna, Khulna, Sylhet, Cumilla and Chapainawabganj districts to identify and assess the abundance of natural enemies of rugose spiralling whitefly attacking coconut crop during June 2024 to April 2025. 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 leaflets 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, five species of parasitoids of the rugose spiralling whitefly viz. *Encarsia guadeloupae*, *Encarsia dispersa*, *Comperiella bifasciata* and two unidentified species were documented. Among them, *Comperiella bifasciata* is a new record in Bangladesh. Additionally, four predatory beetle species (*Nephaspis oculata*, *Scymnus interruptus*, *Nephus quadrimaculatus*, *Jauravia pallidula*) were also documented. Among them *Scymnus interruptus*, *Nephus quadrimaculatus*, *Jauravia pallidula* are newly recorded in Bangladesh. One species of predatory mite (unidentified) was also documented from the survey work.

It revealed that, parasitization (%) and adult emergence (%) of nymphal parasitoids of rugose spiraling whitefly varied significantly among different locations. Natural parasitism by these parasitoids ranged 11.43 to 18.17% across different locations with highest parasitism recorded in Kishoreganj and lowest in Chapainawabganj, while parasitoid adult emergence ranged 8.05 to 11.65 %, with highest emergence recorded in Pabna and lowest in Chapainawabganj.

Pesticide Residue Analysis

Monitoring of multiple pesticide residues in fruits and vegetables collected from different regions of Bangladesh

M.D.H. Prodhan, M. Afroze, A. Begum, S. Jahan and N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2024-25. Pesticide standard stock solutions of cypermethrin, chlorpyrifos, chlorfenapyr, fenpropathrin, acetamiprid and lufenuron 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 present study was conducted to analyze multiple pesticide residues in eggplant, bitter gourd, yard long bean, apple and date fruits collected from Dhaka, Jashore and Gazipur district of Bangladesh.

A total of 210 samples were analyzed. Out of 210 samples, 40 (19.0 % of the total number of samples) contained detectable residues and 170 samples (81.0 % of the total number of samples) contained no detectable residues of the sought pesticides. Out of 20 apple samples, 1 had chlorpyrifos residue with a level above the EU-MRL. In case of 20 dates fruit samples, 1 had acetamiprid residue with

a level above the EU-MRL. Out of 50 eggplant samples, 3 had residues of chlorpyrifos with a level above the EU-MRL. In case of 60 yard long bean samples, 17 had residues with a level above the EU-MRL. In case of 60 bitter gourd samples, 7 had residues of chlorpyrifos with a level above the EU-MRL.

Determination of pre harvest interval for acetamiprid in summer tomato under supervised field trial

M. D. H. Prodhan, A. Begum, M. Afroze, S. Jahan and N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at BARI during 2024-25. 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 µm). Nitrogen was used as carrier and make up gas for GC-ECD. The supervised field trials were conducted and the selected neonicotinoid insecticide (acetamiprid) was sprayed with the recommended dose (1g/L). Samples were collected at 0,1,3,5,7,9,11,13,15 and 17 days after spray (DAS).

The residue level of acetamiprid was 0.837mg/kg at 0 DAS and gradually the levels of residues were decreased and at 15 DAS (0.048 mg/kg), it was below the EU-MRLs (0.06 mg/kg), at 17 DAS the level of residue was not detected and the level of residue was above MRL up to 13 DAS. Therefore, the PHI of acetamiprid was determined at 15 DAS for summer tomato.

Detection and quantification of different pesticide residues in dry fish and their associated health risk assessment

A. Begum, M. D. H. Prodhan, M. Afroze, S. Jahan and N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at BARI during 2024-25. 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. The method validation was done properly according to the standard document no. SANTE/11312/2021. In this study, sampling was performed by random collection from different market of 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.

A total of 60 dried fish samples were collected and subjected to residue analysis. Chlorpyrifos was detected in six samples, comprising four samples of Loitta, one sample of Churi, and one sample of Chapa. The concentrations of chlorpyrifos in the positive samples ranged from 0.043 to 3.591 mg/kg. Overall, 10% (6/60) of the analyzed samples were contaminated with chlorpyrifos, whereas 90% (54/60) of the samples were free from detectable residues. However, the contaminated samples were not hazardous for human consumption according to the health risk assessment data.

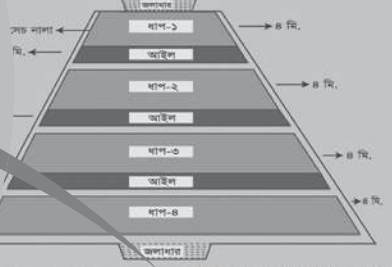
Monitoring of multiple pesticide residues in betel leaf collected from different regions of Bangladesh

M. D. H. Prodhan, M. Afroze, A. Begum, S. Jahan and N. K. Dutta

The study was carried out in Pesticide Analytical Laboratory (PAL) at Bangladesh Agricultural Research Institute during 2024-25. 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. The modified QuEChERS extraction technique was used for the extraction and clean-up of samples. This study was conducted to analyze selected pesticide residues in the samples of betel leaf collected from Dhaka, Gazipur and Barishal district of Bangladesh.

A total of 25 samples were analyzed. Out of 25 samples, 3 (12% of the total number of samples) contained detectable residues and 23 samples (88% of the total number of samples) contained no detectable residues of the sought pesticides. Among the 3 contaminated samples, two samples were contaminated with chlorpyrifos residue (0.115-180 mg/kg) with a level above the EU-MRLs; one sample was contaminated with lambda-cyhalothrin residue (0.161 mg/kg) with a level being below the EU-MRLs.



HILL AGRICULTURE





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Evaluation of promising coffee germplasm in the hilly region of Bangladesh

M. A. A. Malek, A. Paul, M. S. Hossain and M. A. Sattar

Coffee (*Coffea arabica* L.) is a potential high-value crop for the hilly tracts of Bangladesh due to favorable climatic and edaphic conditions. The present study was conducted at the Hill Agricultural Research Station (HARS) Khagrachari to evaluate the morphological and fruit characteristics of selected promising coffee germplasm lines and compare them with the released variety BARI Coffee-2 (check). Eight germplasm accessions (CA Kha-001, CA Kha-004, CA Kha-018, CA Kha-020, CA Kha-021, CA Kha-042, CA Kha-050, and CA Kha-052) were assessed. Results revealed considerable variability in plant height, leaf traits, fruit size and yield performance. CA Kha-001 produced the highest 100-fruit weight (134.09 g) while CA Kha-004 recorded the highest yield (3.91 kg). The check variety BARI Coffee-2 exhibited superior leaf size and fruit length, performing comparably with some accessions. The findings indicate that CA Kha-001, CA Kha-004 and CA Kha-020 are promising germplasm lines for future breeding and cultivation in the hilly region.

Evaluation of indigenous ber germplasm at Khagrachari

M. A. A. Malek, M. R. Ahmad, M. A. Hossain and M. A. Sattar

A study was conducted at Hill Agricultural Research Station in Khagrachari hill district with thirtyone local Ber genotypes during 2020 to March 2025. Average individual fruit weight ranged from 5.27g to 13.10 g. The genotype ZM Kha 013 produced the highest individual fruit weight (13.10g) and lowest in ZM Kha 017(5.27g). Fruit weight (12 fruits) of different ber genotypes ranged from 63-157g. The genotype ZM Kha 013 produced the highest fruit weight (152g) and lowest (63g). Edible portion (%) ranged 65.08g (ZM Kha 017) to 72.29% (ZM Kha 030). % TSS of ber genotypes varied from 10.2% (ZM Kha 021) to 24.4.0% (ZM Kha 017).

Evaluation of sweet orange germplasm in the hilly region

M. A. A. Malek, M. R. Ahmad, M. A. Hossain and M. A. Sattar

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 (221) in BARI Malta-1 while the lowest (140) 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.

Production Programme of Chilli + Bushbean Intercropping at Hilly River Bank Area of Khagrachari

M.A. A Malek , J.A. Chowdhury and M.A.K.Mian

A field experiment was conducted during the *Rabi* season of 2024–25 at a river bank site in Khagrachari

to evaluate the productivity and profitability of chilli + bushbean intercropping compared to sole chilli cultivation. The trial was arranged in a randomized complete block design (RCBD) with three treatments: sole chilli (T_1), chilli (100%) + one row bushbean (50%) between chilli rows (T_2) and chilli (100%) + two rows bushbean (100%) between chilli rows (T_3), each replicated three times. The chilli variety was local and bushbean variety was BARI Jharsheem-2. Results revealed that intercropping significantly influenced yield and economic returns. T_2 recorded the highest chilli equivalent yield (15.90 t/ha) and BCR (2.73), followed by T_3. Farmers reported better land use efficiency, higher income and soil quality improvement with intercropping. The study concludes that chilli + bushbean intercropping, particularly T_2, is a profitable and sustainable practice for hilly river bank areas.

Intercropping legumes/vegetables with maize at hilly region

M A A Malek, J A Chowdury and M. A. Hossain

An experiment was conducted during November 2024 to May 2025 in the hilly region of Khagrachari, to evaluate the productivity, economic return and nutritional advantage of intercropping short-duration legumes and vegetables with hybrid maize. The treatments included maize alone (control) and intercropping with bush bean, garden pea and Batishak. The experiment followed a Randomized Complete Block (RCB) design with 3 replications. Results revealed that intercropping bush bean with maize (T_1) produced the highest maize equivalent yield (15.88 t ha^{-1}), net return (Tk 272,000 ha^{-1}) and BCR (3.18). Intercropping Batishak (T_3) provided the highest vegetable yield (5.00 t ha^{-1}), while maize monoculture (T_4) had the lowest return and productivity. Farmers expressed satisfaction due to early returns and nutritional diversity from vegetables. The study concludes that maize intercropped with bush bean is the most beneficial option in terms of productivity, economic gain and nutritional value in hilly areas.

Intercropping of cabbage with sweet gourd under different planting systems in the hill district of Khagrachari

An on-farm experiment was conducted in Khagrachari hill district to evaluate the productivity and profitability of intercropping cabbage with sweet gourd under different planting systems. The trial was laid out in a Randomized Complete Block Design (RCBD) with three treatments Results revealed that sweet gourd yield alone was highest in T_3 (31.50 t/ha) compared to T_1 (29.56 t/ha) and T_2 (29.63 t/ha). Cabbage yield varied significantly with the highest yield (38.12 t/ha) under T_3. In terms of sweet gourd equivalent yield, T_3 outperformed all treatments (50.56 t/ha) followed by T_2 (41.09 t/ha) and T_1 (29.56 t/ha). Economic analysis showed that T_3 achieved the highest gross return (Tk. 15,16,800), gross margin (Tk. 10,66,800) and benefit-cost ratio (3.37). Farmers expressed positive feedback, highlighting better land use efficiency, higher income and improved soil fertility. Therefore, intercropping cabbage with sweet gourd (T_3) can be recommended for sustainable intensification in the hill district of Bangladesh.

Piloting of BARI mustard varieties in the eastern part of Bangladesh

J.A. Chowdhury, M. R. Karim and M.A.A. Malek

A field trial was conducted at Khagrachari in the eastern region of Bangladesh to evaluate the performance of two mustard varieties **BARI Sarisha-14** and **BARI Sarisha-20** under local agro-ecological conditions. The primary objective was to increase mustard productivity and identify the most suitable variety for expansion in hilly regions. The experiment was carried out on 1.0 ha land during November 2024 with proper fertilizer application, irrigation and spacing. Data on yield and agronomic traits were collected and statistically analyzed. Results showed that BARI Sarisha-14 had a significantly higher seed yield (1411.6 kg/ha) compared to BARI Sarisha-20 (1363.7 kg/ha), with better seed weight and earlier maturity. Farmer opinions also favored BARI Sarisha-14 due to its earlier harvest and higher economic return. The findings suggest BARI Sarisha-14 is more suitable for mustard expansion in the region.

Research report & program on vegetables, fruits, coffee, and cashew nut

Hill Agricultural Research Station, Raikhali

Advanced yield trial of french bean lines

N. U. Ahmed, M. M. Hasan and M. Z. Rahman

An experiment for evaluation yield trial on French bean lines was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25 to find out the suitable flat French bean lines in order to release as a variety. BARI Jharsheem-2 was used as a check variety. Among the two lines and control BARI Jhar sheem-2, PV Rai-097 was found superior in terms of pod number (18.35), pod size (20.85 × 1.78 × 0.75 cm), individual pod weight (21.78 g), green seed yield 7.09 t/ha and green pod yield (31.53 t/ha) compared to control.

Regional yield trial (RYT) of velvet bean lines

N. U. Ahmed, M. M. Hasan, S. M. Faisal, and M. Z. Rahman

An experiment for the evaluation of regional yield trial on velvet bean lines was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25 to find out the suitable velvet bean lines in order to release as a variety. BARI Sheem-1 & BARI Sheem-8 were used as a check variety. Among the velvet bean line, control BARI Sheem-1 & BARI Sheem-8, MP Ram-001was found superior in terms of single pod weight (37.05 g), Wt. of pods/plot (6.12 kg), pod yield (6.79 t/ha.

Regional yield trial of cherry tomato lines

N. U. Ahmed, M. M. Hasan and M. Z. Rahman

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25 with three cherry tomato germplasms to find out the suitable cherry tomato lines to develop as a variety. The earliest flowering (53 DAT), earliest harvest (74 DAT), maximum number of fruits (222.8), yield per plant (3.5 kg), and estimated yield (27.44 t/ha) were observed in SL Rai-002, followed by SL Rai-007. Its average fruit weight was 15.73 g, TSS 5 % and red in color. This line was superior compared to other lines based on all the characters.

Evaluation of newly collected exotic tomato lines

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

The experiment was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25 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 (45.72), average 5 fruit weight (228.6g), and yield (22.84 t/ha) 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 8. The maximum fruit size (38.15mm ×36.23mm) and thickness of pericarp (6.98 mm) were observed in SL Rai-051, followed by SL Rai-016.

Collection and evaluation of pineapple germplasm in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate pineapple (*Ananas comosus* L.) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District, during 2024-25. Six promising exotic and local pineapple lines were studied to identify superior genotypes for the hilly region. The performance of the germplasm will be assessed after the harvest of the fruits.

Evaluation of soursop in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Soursop (Annona muricata) was conducted at the Hill Agricultural Research Station in Raikhali, Rangamati Hill District, during 2024-25. Fifteen promising exotic and local Soursop lines were studied to identify superior genotypes for the hilly region. Among the fifteen germplasm, five germplasm have flowered and fruited this year. The maximum number of fruits (12), yield (4.16 kg/ha), % TSS (16) were observed in AM Rai-001, followed by AM Rai-011, and the highest individual fruit weight (405 g), fruit size (116.67 mm×104.55 mm× 98.35mm) were observed in AM Rai-007 compared to other lines.

Evaluation of eggfruit (*Pouteria campechiana*) in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Eggfruit (tiesa) was conducted at the Hill Agricultural Research Station

in Raikhali, Rangamati Hill District, during 2024-25. 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 (396), individual fruit weight (196 g), fruit size (87.65 mm × 69.91 mm), pulp thickness (16.16 mm), edible portion (80.33%), and yield (77.62 kg/plant), outperforming the other genotypes.

Evaluation of jabuticaba (*Plinia cauliflora*) in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of jabuticaba in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. 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 (4450), individual fruit weight (7.56 g), fruit size (25.13 mm × 24.68 mm), yield (33.64 kg/tree) and edible portion (76.45 %) was observed in PC Rai-001. It also had TSS 17% and was good in taste.

Evaluation of bael in hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment to evaluate Bael (*Aegle marmelos*) was conducted at the Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25. Twenty-one promising Bael lines were studied to identify superior genotypes for the hilly region. The heaviest individual fruit weight (1790 g), fruit size (205.96 mm × 124.33 mm) was recorded in AM Rai-062, followed by AM Rai-060 (1450 g). The maximum number of fruits per plant (75), pulp thickness (132.25 mm), edible portion (79.93 %), TSS (38%), and yield (108.75 kg/plant) were observed in AM Rai-060, which outperformed the other genotypes.

Evaluation of star gooseberry (*Phyllanthus acidus* L.) Germplasms

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of star apple in Hill Valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25. There were four genotypes under study. Among those four lines, PA Rai-002 had maximum 10-fruit weight (41.34 gm), flesh thickness (6.35 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 M. Z. Rahman

An experiment on the evaluation of star apple in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. There were three genotypes under study. Among those three lines, CC Rai-002 had maximum number of fruits per plant (220), individual fruit weight (193.5 g), fruit size (68.08 mm × 68.98 mm), pulp TSS (19%) and yield (42.57 kg/plant) compared to other two lines.

Evaluation of bullock's heart (*Annona reticulata* L) germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of Bullock's heart in hill valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. There were thirteen promising bullock's heart lines under study. Among those lines, the highest individual fruit weight (412 g), fruit size (118.7 mm ×90.76 mm), yield (16.74 kg/tree) and TSS % 28 were observed in AR Rai-010.

Evaluation of para jam (*Antidesma acidum*) germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of para jam in Hill Valley was conducted at Hill Agricultural Research Station, Raikhali, Rangamati Hill District during 2024-25. The highest fruit size, 100-fruit weight, ripen fruit TSS, and yield of the AA Rai-001 were 4.84 mm × 4.53 mm, 3.74 g, 20% and 8.6 kg/tree, respectively.

Evaluation of newly collected mango germplasm

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

An experiment on the evaluation of mango germplasm in the hill valley was conducted at the fruit orchard of Hill Agricultural Research Station, Raikhali, Rangamati Hill District, during 2024-25. Thirty-six promising exotic and local mango lines were studied to identify superior genotypes for the

hilly region. The performance of the germplasm will be assessed after the harvest of the fruits.

Evaluation of pummelo in hilly region of Rangamati

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

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 during the period of 2024-25 for the evaluation of superior pummelo genotypes in hilly region.The performance of the germplasm can be concluded after the harvest of the fruits.

Evaluation of promising dragon fruit germplasm in Rangamati hilly area

N. U. Ahmed, M. M. Hasan, and M. Z. Rahman

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 during the period of 2024-25 for the evaluation of superior dragon fruit germplasm in hilly region. The experiment is ongoing, the yield contributing characters will be taken duly.

Collection and evaluation of coffee germplasm

M. M. Hasan, N. U. Ahmed, M. Z Rahman, 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, during 2024-25. In the case of *Coffea arabica* germplasm, The maximum berry size (15.02mm × 13.99mm × 11.52mm), 100-fresh berry weight (163.9 g), seed size (12.93mm × 12.33mm × 10.18mm), 100-dried filled seed weight (37.7 g), fresh berry yield (6.56 t/ha) and dried seed yield (1.56 t/ha) of *C. arabica* were obtained in CA Rai-041 which had 85% filled seed and early-November to early -January harvest time. On the other hand, in *Coffea canephora* germplasm, The highest berry size (14.82 mm × 12.8 mm × 11.65 mm), 100-fresh berry weight (130.75 g), seed size (11.18 mm × 11.8 mm × 8.97 mm), 100-dried filled seed weight (18.18 g), fresh berry yield (6.05 t/ha), seed size (11.38 mm× 11.9mm × 8.99mm) and dried seed yield (1.24 t/ha) of *C. canephora* were found in CC Rai-063 which had 95% filled seed and late-December to mid-February harvest time.

Ollection and evaluation of cashew germplasm

M. M. Hasan, N. U. Ahmed, M. Z. Rahman, 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 during 2024-25. 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.

OFRD, Bandarban

Adaptive trial of cowpea varieties in hill valleys of Bandarban

M. Salim, M. T. Islam, M.I. Hossain

An On-Farm trial was carried out at the farmers' field of Bandarban during *Rabi* season of 2024-25 to investigate the performance of different cowpea varieties. Three cowpea varieties i.e. BARI Felon-1, Bhola Local and Local were selected. The experiment was laid out in a randomized complete block design with three replications. There was significant variation among the treatments. The highest plant height (74.43 cm), pod/plant (13.60), pod length (16.87 cm), seeds/pod (16.30), 1000 seeds weight (127.33g) and yield (1.34 t/ha) were found in BARI Felon-1 followed by Bhola Local whereas the lowest was found in local variety (65.96 cm, 9.50, 12.95 cm, 12.17g, 117g and 1.15 t/ha respectively). From cost return analysis, the highest gross return was found from BARI Felon-1 (Tk. 107200 ha-1) with BCR 2.86 and the lowest was found from local (Tk. 92000 ha-1 and 2.45).

Performance of mungbean varieties at hill valleys of Bandarban

M. Salim, M.T. Islam, M.I. Hossain

The study was conducted at farmers' field of SwarnaMondir of Bandarbansadar during March to

June 2025 to evaluate the suitability of Mungbean in Bandarban. Three Mungbean varieties viz., BARI Mung-6, BARI Mung-8, BINA Mung-8 were used to this study. The experiment was laid out in randomized complete block design (RCBD) with three replications. There was significant variation among the treatments. The highest plant height (81.23 cm), pod/plant (20.10), seeds/pod (13.13) and yield (1.48 t/ha) were found in BARI Mung-8 followed by BINA Mung-8 whereas the lowest was found in BARI Mung-6 variety (75.67 cm, 16.77, 10.53 and 1.29 t/ha respectively). In terms of cost return, the highest gross return was found from BARI Mung-8 (Tk. 125800 ha-1) with BCR 2.76 and the lowest was found from BARI Mung-6 (Tk. 109650 ha-1 and 2.41).

Effect of different application times of ethephon on off-season pine apple production in Bandarban

M. Salim, M.T. Islam and M. I. Hossain

An experiment was carried out at Farukpara of BandarbanSadar during 2024-25 to find out the response of pineapple plants (cv. Giant Kew) to ethephon in early, uniform flowering and off-season production of fruits. Ethephon had a significant effect on flower induction and fruit development in pineapple. The treatments were: T_1= September forcing, T_2= October forcing, T_3= November, and T_0=Control. The experiment was carried out in a randomized complete block design with three replications. Plant hormone (ethephon) treated plot in September showed maximum flowering (71.33%) followed by in October (67.45%) and the lowest flowering percentage was observed in November treated plants (62.65%). The appearance of 1st inflorescence took 38 to 42 days to initiate after forcing. The yield of off-season pineapple was varied according to the treatments. The highest yield was obtained in T_1 (31.02 t/ha) and minimum was in T_2 (24 t/ha). Seasonal yield from T_1, T_2, T_3 and T_0 were 9.45t/ha, 14.65 t/ha, 15.43 t/ha and 36.38 t/ha respectively. From cost-return analysis, the highest net return was found from T_1 (Tk. 682250 ha^{-1}) with BCR of 3.81 followed by T_2 (Tk.658000 ha^{-1} and 3.71) and the lowest from T_o (Tk.334700 ha^{-1} and 2.55).

Effect of drip irrigation on growth and yield of BARI coffee-1 in Chittagong hill tracts

M. I. Hossain,M. Salim, M. T. Islam, N. U. Ahmed, F. Arshad and M. A. Hossain

Field experiments were conducted at BandarbanSadar and Hill Agricultural Research Station, Raikhali, Rangamati during January 2024 to on-going to evaluate the influence of drip irrigation on the growth and yield of coffee robusta. Four treatments viz. T_1= 75% of the recommended dose of water; T_2= 50% of the recommended dose of water; T_3= 25% of the recommended dose of water; and T_0= 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,Significant variation was found among the treatments. The maximum plant height increment (19.40 %), canopy increment (70.01%), tree volume increment (143.51%), no. of fruiting branch/plant (37.8),no. of cluster/branch (8.60) and no. of fruit/branch (17.36), 100 fruit weight (180g) and yield/plant (2700g) were found in the T_1 treatment. On other hand, the minimum plant height increment (10.59 %), canopy increment (26.45%), tree volume increment (54.33%), no. of fruiting branch/plant (21.60),no. of cluster/branch (5.08) and no. of fruit/branch (8.88), 100 fruit weight (152g) and yield/plant (1060g) were found in the T_0 treatment.In BandarbanSadar, significant variation was found among the treatments. The maximum plant height increment (25.79 %), canopy increment (39.01%), tree volume increment (143.69%) and no. of fruiting branch/plant (37.80), no. of cluster/branch (7.8), no. of fruit/branch (14.1), 100 fruit weight (171g) and yield/plant (1890g) were found in the T_1 treatment. On other hand, the minimum plant height increment (12.47 %), canopy increment (24.04%), tree volume increment (73.12%) and no. of flowering branch/plant (21.60), no. of cluster/branch (4.8), no. of fruit/branch (8.1), 100 fruit weight (149g) and yield/plant (970g) were found in the T_0 treatment.

Adaptive trial of latest potato varieties in hill valleys of Bandarban

M. Salim, M. T. Islam, M.I. Hossain

A varietal trial of potato was conducted at farmer's field of Shikdarpara, Gun guru and SharnaMondir of Bandarbansadar, during *rabi* season of 2024-25 to

evaluate the performance of BARI Potato varieties. A total of ten varieties viz. BARI Alu-7,BARI Alu-25,BARI Alu-41,BARI Alu-47,BARI Alu-48,BARI Alu-62,BARI Alu-63,BARI Alu-78,BARI Alu-87 and BARI Alu-88were tested in the farmer's field. The experiment was carried out in a randomized complete block design with three replications. Significant differences were found among the potato varieties. In terms of plant height, the tallest (63.60 cm) was found from BARI Alu-41followed by BARI Alu-7 (61.70 cm) and the smallest (44.80 cm) from BARI Alu-47. The maximum emergence (93%) at 30 DAP, yield/hill (0.58 kg) and yield (33.64 t/ha) were found in BARI Alu-62 followed by BARI Alu-87 (92%, 0.54 kg and 31.68 t/ha respectively) whereas minimum was found in BARI Alu-7 (83%, 0.35 kg and 21 t/ha respectively).

Production program of BARI piyaj-5 at farmers field of Bandarban

M. Salim, M. T. Islam and M.I. Hossain

An On-Farm trial was conducted at Reicha and Sharnamondir of Bandarban during the *Rabi* season of 2024-25 with the aim to evaluate the performance of BARI Piyaj-5. Three farmers field was selected to conduct the trial. Results revealed that average plant height, leaf number, leaf length, bulb length, bulb diameter, individual bulb weight and bulb yield from BARI Piyaj-5 were 75.6 cm, 17.5, 52.5 cm, 6.32 cm, 6.75 cm, 155.6 g and 19.56 t/ha respectively.

Performance of BARI released mustard varieties at hilly areas in Bangladesh

M. Salim, M. T. Islam and M.I. Hossain

A field trial was conducted after the harvest of T.aman rice at Sultanpur and SwarnaMandir of Bandarbansadar during the *rabi* season, 2024-25, to evaluate the performance of mustard varieties in the hill valley areas, especially long-duration mustard varieties. The experiment was laid out in a randomized complete block design with three replications. Four varieties of mustard (BARI Sarisha-11, BARI Sarasha-16, BARI Sarisha-18, and BARI Sarisha-19) were tested. Among the varieties, BARI Sarisha-18 showed maximum plant height (122.07 cm), branch/plant (5.17), maximum silique/plant (126), and the highest yield (1.53 t/ha). The lowest yield was found from BARI Sarisha-11(1.32 t ha^{-1}). The highest Gross return (Tk. 122400 ha^{-1}), net return (Tk. 79900 ha^{-1}) and BCR (2.88) were found from BARI Sarisha-18 whereas the lowest was found in BARI Sarisha-11 (Tk. 105600 ha^{-1}, Tk. 63100 ha^{-1} and 2.48 respectively). So, it may be concluded that, BARI Sarisha-18 may be recommended for cultivation in the hill valley areas of Bandarban.

Pilot production program of BARI sarisha-14 in hill valleys of Bandarban

M. Salim, M. T. Islam and M.I. Hossain

Pilot production programs of BARI Sarisha-14 was conducted at Reicha and Sultanpur of Bandarbansadar in the hill valleys of Bandarban during the *rabi* season of 2024-25 to evaluate the yield potentiality and popularize this variety in hilly areas. Cultivation of mustard is not an old practice except some scattered production of local cultivar. But in recent times, high yielding BARI released mustard varieties are being cultivated in hill valleys of Bandarban. In hilly areas, Aman rice harvest becomes late and most of the land has water scarcity where *Rabi* crops cannot thrive. Targeting this areas, short duration BARI Sarisha-14 was introduced which can be sown slightly late. Average Plant height, Number of branches $plant^{-1}$, number of capsules $plant^{-1}$, capsule length, seeds $capsule^{-1}$ and seed yield of BARI Sarisha-14 was 137.6 cm, 5.7, 127.6, 5.87 cm, 35.3 and 1.37 t ha^{-1}. Gross return from BARI Sarisha-14 was 109600 Tk. ha^{-1} where net return was 67100 Tk. ha^{-1} with BCR of 2.58. Farmers were very happy to have an excellent variety like BARI Sarisha-14.

Introduction of T. Aman-mustard-boro rice cropping pattern in Bandarban region

M. Salim, M.T. Islam and M. I. Hossain

A field trial was conducted at the farmers' field of Shikdarpara and Sultanpur, Bandarbansadar during the year of 2024-2025 to develop T. Aman-Mustard-Boro cropping pattern. There were two treatments i.e., T_1: T. Aman (BRRI dhan 46) - Mustard (BARI Sarisha-14) - Boro (Shakti-2) and T_2:Boro (ACI Hybrid-1)-Fallow-T. Aman (BRRI dhan 46). In T_1cropping pattern, yield of mustard, Boro and T. Aman rice were 1.28 and 6.41 t ha^{-1} and 4.96 t ha^{-1}respectively while in T_2 pattern, yield of Boro and T. Aman rice were 6.16 t ha^{-1} and 4.96 t ha^{-1}, respectively. T_1 cropping pattern gave higher rice

equivalent yield (14.78 t ha^{-1}) against T_2 cropping pattern (11.12 t ha^{-1}). Total gross return T_1 cropping pattern was Tk. 467160 ha^{-1} whereas in T_2 cropping pattern was Tk. 352260 ha^{-1}. MBCR of T_1 on T_2 was 2.74.

Intercropping of bushbean with maize by bed planting method in hill valleys of Bandarban

M. Salim, M. T. Islam, M. I. Hossain, A. K. Chaki and M. M. Anowar

A field trial was conducted at ChemiDolupara of BandarbanSadar during the 'rabi' season in 2024-25 to evaluate the performance of Bushbean and maize by a power tiller-operated Bed Planter (BARI Bed Planter) in an intercropping system. Result revealed that plant height, Pod length, pod breadth, number of pod/plant and seed yield of Bushbean were 73.78 cm, 15.32 cm, 1.26 cm, 15.35 and 3.25 t/ha respectively. In case of maize, plant height, cob length, cob breadth, cob weight, grains/cob 1000 grain weight and grain yield were 274.5 cm, 33.46 cm, 6.12, 378 g, 587, 288 g and 8.35 t/ha respectively. In intercropping system, maize equivalent yield (t/ha), gross return (tk./ha), net return (Tk./ha) and BCR were 17.02 t/ha, 510600 Tk./ha, 400600 Tk./ha and 4.64 respectively.

Adaptive trial of coffee robusta and coffee arabica at seven upazilas of Bandarban hill district

F. Arshad, M. I. Hossain, M. Salim, M. T. Islam, and M. A. Hossain

This five-year adaptive trial (2021–2025) evaluated the growth, adaptability, and yield of Coffee Robusta and Arabica across seven upazilas in Bandarban Hill District, Bangladesh. Conducted on 26 farmer fields totaling 18.14 acres, the study applied standardized cultural practices and a randomized complete block design. Robusta exhibited superior vegetative growth, reaching up to 170.9 cm in height (Alikadam) and achieving yields as high as 1807.33 g per plant (BandarbanSadar). Arabica showed consistent growth, with a peak height of 126.3 cm (Alikadam) and maximum yield of 1234.67 g per plant (BandarbanSadar). Tree volume increments averaged 424% for Robusta and 554% for Arabica in favorable locations, reflecting strong adaptation. These results demonstrate Robusta's broader adaptability and higher yield potential, while Arabica thrives in specific microclimates, offering strategic insights for expanding coffee cultivation sustainably in Bangladesh's hill regions. Continued monitoring will refine varietal recommendations to enhance farmer livelihoods and support national agricultural diversification.

AGRICULTURAL STATISTICS AND ICT



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Detection of differences in vegetation and chlorophyll content in agricultural field using unmanned aerial vehicles

M. Mukhlesur Rahman, Nur Mohammad, Istiak Ahmed, Md. Monirul Islam

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 three 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 suggest from our study that NDRE and NDCI may be most useful index chlorophyll deficiency detection. Nutrient application will be implemented exclusively where chlorophyll deficiency is present.

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 were established using the classical linear regression model where the model was developed using the first two years' data and was validated using the data of the last study period. These equations were validated by using data from 2023 to 2025 seasons and found that an average error of estimation is about 8 to 12% for the three study region. It can be concluded that NDVI derived from remote sensing can be an effective tool for early estimation of mustard yield. The study developed a remotely sensed yield prediction model using high-resolution satellite imagery to predict mustard yields 15 days before harvest.

Crop-type mapping acreage and yield estimation of major crop in dry seasons using remote sensing and machine learning algorithms

Nur Mohammad, Mohammad Mukhlesur Rahman, Istiak Ahmed, Mohammad Rasel, and Kaushik Kumar Saha

Crop acreage analysis and yield estimation are prime importance in field-level agricultural monitoring and management. This enables prudent decision making during any crop failure event and for ensuing crop insurance. The free availability of the high-resolution Sentinel-2 satellite datasets has created new possibilities for mapping and monitoring agricultural lands in this regard. The present study conducted on the Tatibandha and Vaina unions/ blocks at Sujanagar upazila in Pabna district, Bangladesh during 2024-2025. The heterogeneous crop area was mapped according to the respective crop type, using Sentinel-2 multi-spectral images and two machine learning algorithms- Suport Vector Machine (SVM) and Random Forest (RF). Plot-level field information was collected from different cropland types to frame the training and testing datasets (comprising 70% and 30% of the total dataset, respectively) for cropland classification and accuracy assessment. The major dryseason (winter) crop acreage was identified based on three major crops like Boro rice, onion and mustard in the study area through this classification. The extracted maps had an overall accuracy of 74.24% and 77.27% respectively, in the SVM and RF classifications, with respective Kappa index values of 64.22% and 67.83%, along with F1-score 74% and 77% and showed that RF method proved to be more accurate. The methods used in this paper can be readily applied elsewhere for accurately enumerating the respective crop acreages. Effective estimation of crop yields at a regional scale holds significant importance in facilitating decision-making within the agricultural sector, thereby ensuring grain security. However, traditional ground-based measurement techniques suffer from inefficiencies, and there exists a need for a reliable, precise, and effective method for estimating onion yields. In this study, we employed five machine-learning algorithms: partial least squares regression (PLS), support vector machine (SVM), random forest (RF), and extreme graidient boosting (XGBoost) and decision tress (DT). We combined these methods with multi-temporal indicies like NDVI, GNDVI, EVI, CGVI and NDRE data for onion yield estimation. Following an accuracy evaluation, the RF model emerged as the most accurate for onion yield estimation, achieving an R^2 of 0.26, an RMSE of 3.57, and followed by the XGBoost (R^2=0.15, and RMSE=4.13). We concluded that the efficacy of combining multi-temporal remote sensing data with machine-learning techniques for accurate onion yield estimation, thereby aiding agricultural authorities and production enterprises in the timely formulation and refinement of cropping strategies and management policies for the ongoing season.

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. This study used remote sensing (RS) techniques for forecasting pre-harvest onion yield to improve the management system 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. The Normalized Difference Vegetation Index (NDVI) calculated from remotely sensed data has been widely used to predict crop yield. The study used Landsat 8/9 (~ 30 m) high resolution data for 2022-2023 and 2023-2024 to predict onion yield based on the year 2024-2025 at Sujanagar, Pabna; Baliakandi, Rajbari and Durgapur, Rajshahi district respectively. The single cloud free image acquisition date based on maximum NDVI for Landsat 8/9 satellite image was used for each onion growing period to develop the yield prediction model. A regression model was performed between NDVI values and 35 farmers field-level onion yields based on model accuracy criterion like R^2, RMSE, MAPE and NRMSE for selected locations. The mean yield gap of onion was found 5.97%, 4.83% and 5.30% for the study area. It can be concluded that NDVI data extracted from Landsat 8/9 high resolution satellite images can be successfully used to predict the onion

yield with appreciable accuracy. This research recommends the implementation of satellite multispectral imagery for accurate onion yield forecasting to enhance agricultural planning and resource management.

Calibration and performance evaluation of IOT-based sensors for precision monitoring of horticultural crops

Kowshik Kumar Saha, Istiak Ahmed, Dilip Kumar Roy, Md. Abdur Rab Gazi, Md. Ashrafuzzaman Gulandaz

Soil moisture sensor performance is strongly influenced by the type of growing media. This study evaluated Teros 12 and Rod sensors in 100% garden soil, 100% cocodust, and a 50:50 garden soil and cocodust mix. Teros 12 showed high accuracy in garden soil, while the Rod sensor was highly sensitive but overestimated at low moisture levels. In cocodust, only the Rod sensor responded significantly, though nonlinearly. Findings underscore the need for substrate-specific calibration to ensure reliable moisture monitoring across different media.

Genome-wide identification, characterization, and bioinformatics analysis of the major functional regulatory elements of the Rnai genes in *Bnassica napus* L.

Zobaer Akond, Sheikh Hasna Habib, Md. Shakil Hossain, Nurul Haque Mollah

Dicer-like (DCL), Argonaute (AGO), and RNA-dependent RNA polymerase (RDR) are known as RNAi genes in eukaryotes, which control gene expression at the transcriptional or post-transcriptional level and are often involved in maintaining plant growth and development. These genes also control expression in response to various biotic and abiotic stressors. This molecular mechanism is, however, maintained by the 19-24 nucleotide non-coding small RNA molecules (miRNA/siRNA). The identification and analysis of the motif structure, chromosomal mapping, major functional regulatory components, synonymous and non-synonymous substitution ratios (Ka/Ks), duplication and divergence periods of the genes, and expression at various organs/tissues have not yet been studied in detail for these gene groups. This study finally identified 8 *DCL*, 27 A*GO*, and 17 *RDR* RNAi-related genes in *Brassica napus*. The motif analysis revealed that most of the proteins conserved a similar motif sequence to those of the RNAi genes in *Arabidopsis*. Furthermore, sequence logo and relative frequency analysis showed that Alanine (A), Glutamic acid (E), Lysine (K), Serine (S), Valin e(V), Glycine (G), Leucine (L), Proline (P), Arginine (R), Aspartic acid (D) were the leading amino acids in the predicted motifs. Genomic distribution showed that 52 genes were distributed among the 19 chromosomes. Segmental distribution of the genes was observed in high, and some tandem duplication was observed in the BnAGO and BnRDR genes. The trans-regulatory analysis revealed that the top six TF families were Dof, ERF, C2H2, bZIP, TCP, and HD-ZIP. The BnRNAi genes-TFs network analysis also showed that three (Dof, ERF and C2H2) TF families of the BnDCL group were highly connected to the identified RNAi genes, whereas 5 (Dof, C2H2, ERF, bZIP and TCP) TF families of the BnAGO group were largely linked to the identified genes, and four (bZIP, ERF, TCP and HD-ZIP) TFs were highly connected to the BnRDRs. The findings of this work would be valuable for further in-depth investigation of their molecular mechanisms to utilize the RNAi pathway technique to improve a sustainable climate-smart-ready rapeseed-mustard variety from the *B. napus* species at BARI.

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 evaluates unmanned aerial vehicle (UAV) multispectral imagery for predicting soil macronutrients and micronutrients. High-resolution imagery was acquired from bare soil plots over two seasons. Twenty-four spectral indices were calculated and used to cluster plot data, which was then integrated with laboratory-measured nutrient contents to train eleven machine learning models. Results showed significant variability for most nutrients except OM, N, S, and B. The best-performing models (e.g., KNN for pH, LGBM for OM) were selected based on root mean squared error (RMSE) and used for prediction on validation data. Field-level predictions for 10 parameters showed no significant difference in 73% of cases, demonstrating

that UAV-based multispectral sensing can accurately estimate key soil nutrients, offering a viable tool for rapid soil assessment.

Foreseeing the field emergence of bt brinjal seed lots unifying with the vigor test

M. Rasel, M. S. Rahman and I. Ahmed

An experiment measuring the viability, vigor and germination of BARI Bt Begun-1 (brinjal) seed lots with tetrazolium test, Electrical conductivity (EC) test and standard germination method respectively was conducted to predict the field emergence (FE) of seed lots. A robust beta regression model with quadratic predictors was selected for predicting FE, considering the data's non-linearity, outliers, and heteroscedasticity. Comparing the relationships between FE with EC, viability ratio (VR), and germination ratio (GR) it can be predicted that EC value over 40 is not preferable for sowing of BARI Bt Begun-1 in field.

Efficiency of agricultural practices for food security in Barind region of Bangladesh: an exploratory survey

M. Rasel, K. S. Rahman and S. M. A. Shiblee

This exploratory study investigates the efficiency of agricultural practices and their impact on food security in the Barind region of Bangladesh, one of the country's most climate-vulnerable and agriculturally significant areas. Data were collected from 100 farming households across five blocks in Raninagar Upazila of Naogaon district using structured questionnaires and field observations. Key areas examined included crop cultivation, irrigation, input use, post-harvest management, and socio-economic conditions. Findings reveal that while most households achieve basic food self-sufficiency for 8–10 months per year, the efficiency of their practices is hampered by groundwater-dependent irrigation, overuse of chemical inputs, limited mechanization, and poor access to markets and storage facilities. Statistical analysis using Exploratory Descriptive Statistics (EDS) in R-Studio shows a strong association between farm size, education, training access, and food security outcomes. Households with institutional support performed better in terms of yield and resource use efficiency. Despite moderate staple crop sufficiency, nutritional security remains inadequate due to low dietary diversity. The study underscores the need for integrated interventions—such as sustainable water use, capacity building, improved extension services, and inclusive market access—to enhance the resilience and productivity of agriculture in the Barind region, thereby contributing to long-term food and nutrition security

A statistical investigation of climate parameters on the mango yield of Rajshahi district

Jamila Khatun Prioty, Istiak Ahmed and Mohammad Rasel

This study investigates the statistical relationship between climate parameters and mango production in Rajshahi District, Bangladesh, using annual data from 1993 to 2023. Climate variables considered include maximum, minimum, and average temperature, total precipitation, and solar radiation. Two time-series approaches were applied: **ARIMAX** with external regressors (climate variables and cultivated area) and **Prophet (models)** with climate regressors. The baseline ARIMA(0,1,0)+drift model produced RMSE ≈ 42,087 and MAPE ≈ 21.14%. Incorporating cultivated area provided the greatest improvement (RMSE ≈ 39,512; MAPE ≈ 14.46%). Among climate-only regressors, precipitation and solar radiation modestly improved accuracy (RMSE ≈ 41,511–41,523; MAPE ≈ 20.7–21.5%), while temperature regressors had limited effect. Prophet models performed best when minimum temperature was included, supporting short-term forecasts. Overall, cultivated area dominates yield variation, with precipitation, solar radiation, and minimum temperature emerging as consistent climatic drivers.

Efficiency of agricultural practices for food security in Charland region of Bangladesh: an exploratory survey

J. K. Prioty, K. S. Rahman and S. M. A. Shiblee

This study investigates the efficiency of agricultural practices and their contribution to food security in the charland areas of Chilmari Upazila, Kurigram District, Bangladesh. An exploratory survey was conducted among farming households to assess socio-economic conditions, farming practices, challenges, and coping strategies. Findings reveal that most farmers rely on agriculture as their primary livelihood but face constraints such as low education, small landholdings, high input costs, and recurring

floods. While traditional methods dominate, selective adoption of modern technologies is evident. Survey results indicate that 45% of respondents agreed agriculture enhances economic safety, 42% noted improvements in nutrition supply, and 41% acknowledged better land use. However, major challenges include soil degradation, inadequate irrigation, limited extension services, and lack of credit facilities. Despite these constraints, charland farmers exhibit resilience by diversifying crops and optimizing available resources. Strengthening agricultural extension, improving input accessibility, and providing infrastructural support are crucial to enhancing efficiency and ensuring sustainable food security in charlands.

Bioinformatics analysis of the dicer-like (DCL), argonaute (AGO), and RNA-dependent RNA polymerase (RDR) gene families in *Lens culinaris* L.

M. S. Hossain, Z. Akond and M. Z. A. Talukder

RNA silencing is mediated through RNA interference (RNAi) pathway gene families, i.e., Dicer-Like (DCL), Argonaute (AGO), and RNA-dependent RNA polymerase (RDR) and their cis-acting regulatory elements. The RNAi pathway is also directly connected with the post-transcriptional gene silencing mechanism, and the pathway controls eukaryotic gene regulation during growth, development, and stress response. Nevertheless, genome-wide identification of RNAi pathway gene families such as DCL, AGO, and RDR and their regulatory network analyses related to transcription factors have not been studied in many pulse crop species, including lentil (*Lens Culinaris*). In this study, we studied In-silico genome-wide identification and characterization of DCL, AGO, and RDR genes in lentil thoroughly via integrated bioinformatics approaches. A genome-wide analysis identified 4 LcDCL, 12 LcAGO, and 5 LcRDR candidate genes based on multiple sequence alignment and phylogenetic tree related to the RNAi pathway in lentil genomes. These genes correspond to the Arabidopsis thaliana RNAi silencing genes. The analysis of the conserved domain, motif, and gene structure (exon-intron numbers) for LcDCL, LcAGO, and LcRDR genes showed higher homogeneity within each group of their Arabidopsis counterpart. These genome wide analyses of these RNAi gene families provide valuable information related to RNA silencing, which can be useful to lentil breeding programs as well as those in closely related species such as pea, grass pea or faba bean, providing more data to increase the knowledge of this interesting gene family.

Potential use of remote sensing platforms for garlic yield prediction

M. A. Mottalib, M. A. Alam, A. H. F. Fahim, M. A. Rahman, M. A. Islam, M. M. Hasan, M. M. Alam, M. Z. Hasan, M. A. Hoque, M. A. Rahman, K. Hassan, and Z. H. Prodhan

This study evaluated the suitability of various vegetation indices from Sentinel-2 imagery for predicting garlic yield across different growth stages. The indices analyzed included NDVI, SAVI, GESAVI, GCVI, EVI2, NDRE, and MCARI. NDRE consistently showed the strongest correlation with yield, achieving the highest R^2 value (0.6798) on 09 March 2024 coinciding with garlic's bulb development and maturity stage. GCVI (R^2 = 0.5573) and GESAVI (R^2 = 0.5281) also performed well, while MCARI showed poor results throughout. NDRE's sensitivity to chlorophyll and canopy structure under high biomass makes it highly effective in dense garlic fields. GCVI provided the best model fit (R^2 = 0.6063), while NDRE had the lowest prediction error (RMSE = 194.80 kg/ha; MBE = 160.62 kg/ha). GESAVI, despite weaker statistical performance, aligned most closely with BBS yield estimates, highlighting the importance of ground validation. Yield mapping revealed that 68% of the area produced 9.3–10.1 t/ha, confirming NDRE as the most reliable index during late growth stages.

Land suitability assessment for spices crop production through remote sensing and GIS in southern saline region of Bangladesh

M. A. Mottalib, KK Saha, M. A. Rahman, M. A. Alam, A. H. F. Fahim, M. Z. Hasan, M. A. Hoque, M. M. Hasan, and Z. H. Prodhan

This study aims to identify suitable land for spices crop production in the southern saline region of Bangladesh, considering topography, climate, and soil properties. The Analytical Hierarchy Process (AHP), a Multicriteria Decision-Making approach, was applied using GIS. Key criteria included

soil texture, depth, salinity, land type, surface temperature, rainfall, slope, elevation, and drainage. Weights were assigned through expert judgment and pairwise comparison, while sub-parameter scores were based on field data and standards. Results showed 26.31% (8804.52 ha) as highly suitable, 45.32% moderately suitable, 13.56% marginally suitable, and 14.81% permanently unsuitable. Shallow soil, steep slope, and high salinity limited suitability. Further study will be conducted next year for improved validation and interpretation.

Information on Right to Information: RTI of BARI

Designated Officer

Officer's name : Dr. Md. Khalid Jamil
: ড. মো. খালিদ জামিল
Designation : Chief Scientific Officer
Phone : 49270129
Mobile : 01721630801
Eamil : 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 : Dr. Nur Mohammad
: ড. নূর মোহাম্মদ
Designation : Senior Scientific Officer
Phone : 4970041-8
Mobile : 01717354341
Eamil : 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
Eamil : 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 2024-2025

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 (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	BARI, Gazipur	02	02	01	-	-	-	-	-



Training & Communication Wing



25

Training & Communication

During 2024-25, twenty eight scientists were sent abroad for higher study (MS/PhD) and four hundred and forty four scientists/officers were sent for training/workshop/study tour/seminar/conference/ symposium etc. In case of the country, thirty seven scientists were admitted in the different universities for higher study (PhD). On the other hand total 342 scientists, officers and staffs have been sent in 99 different training courses, 145 scientists attended 33 workshops and 05 scientists attended 01 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 04 (four) seminars and 06 (six) workshops were organized at BARI during the year 2024-25 on different aspect of agricultural Knowledge share to achieve the goal of Annual Performance Agreement (APA). A total of 560 participants of BARI and other national research organization were actively participated in these seminars and workshops.

MoU singed

During the period 2024-25, BARI signed 01 (one) MoU with 01 (one) organization. The organization under MoU with BARI was voluntary organization. The purpose of the MoU was 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 scientist's 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 87,053 collections are existed till 2024-2025 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: 87,053

Items	No. of collection 2024-25	Quantity
Books, Reports, Proceedings, etc.	98	47,122
Archival collection	0	2,670
Thesis	25	986
Periodicals (bound in book form)	0	4,247
Journal	40	24,693
Newsletter	44	745
Bulletin	03	170
Pamphlets & Booklets	03	985
Reprint	0	518
Leaflets	0	4,917

Table 1a. List of Books, Reports, Proceedings etc. and Thesis: 138

Items	Purchased	Exchanged	Gift / Complimentary	Total
Books	55	01	42	98
Research reports, project reports & proceedings	-	-	15	15
Thesis (MS & Ph.D)	-	-	M.S-05 + Ph.D-20=25	25

Table 1b. List of Journal, newsletters and bulleting published :90

Items	Purchase	Exchange	Gift / Complimentary	Total
Journals	-	13	27	40
Newsletters	-	-	44	44
Bulletins	-	-	03	03
Booklet	-	-	03	03

Table 2. List of documentation service processed.

SI No.	Procured material processed	No.
01	Document Accessioned	178
02	Catalogued & Classified and pasted with call numbers, book pockets and due slips	98
Total		**276**

Table 3. Services provided to users.

Sl No.	Services provided to the Scientists	Number
1.	Documents Charged/ Discharges	53
2.	Users Referenced	536
3.	Photocopies	0
4.	Publication Distributed (Journal, Newsletter & Report) in Exchange & Complimentary)	26
5.	Correspondence made	62
Total		**677**

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 2024-2025.

Sl. No.	Icons	Document uploaded (no.)
1.	BARI Publications	263
2.	Bengali Books	1962
3.	Reference	7328
4.	Booklet	64
5.	Fiction	12
6.	Center's Publication	275
7.	Divisional Publications	161
8.	Newsletter	45
9.	Report	131
10.	Journal	1809
11.	Thesis – MS	338
12.	Thesis –Ph.D	456
13.	Leaflet	304
14	Personal Publications	167
	Total	**13,315**

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 5.

Table 5. 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



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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 (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) (IMED-04).
- Preparation of financial and physical progress report of the project and send to the Ministry of Agriculture
- 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.
- 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.
- Participate in Budget Working Group Meeting in Ministry of Agriculture.
- 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 ongoing projects chaired by DG, BARI.

Table 1: Post and Position of Planning & Evaluation Wing

Designation	Organogram	Existing
Officer		
Director	1	1
Chief Scientific Officer	1	1
Principal Scientific Officer	3	2
Senior Scientific Officer	2	2
Scientific Officer	3	2
Sub total	**10**	**8**
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**	**13**

Table 2: Progress report of development projects during FY 2024-25 (In lakh Tk.)

Sl. no.	Name of the Projects (Implementation period)	Project Cost	Allocation of 2024-25	Expenditure during 2024-25		Cumulative Progress upto June 2025 Financial (% Progress)
				Financial	Physical (%)	
1.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part) (2nd Revised) (July 2018 to June 2026)	1725.14	216.00	212.20	99%	1423.67 (82.52%)
2.	Farm Machinery Technology Development for Profitable Crop Production (1st Revised) (July 2020- June 2025)	5600.00	1296.00	1288.14	100%	5324.44 (95.07%)
3.	Enhance Production of Oil Crops Project (BARI Part) (1st Revised) (July 2020- June 2025)	2044.17	547.00	535.80	100%	1434.29 (70.16%)
4.	Research, Development & Extension of Cashew nut and Coffee (BARI Part) (January 2021- December 2025)	5330.75	364.00	328.00	92%	3803.60 (71.35%)
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	1115.00	521.34	50%	11655.65 (69.05%)
6.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship and Resilience in Bangladesh (PARTNER) (BARI Part) (July 2023- June 2028)	61286.55	7498.00	5613.18	77%	10083.94 (16.45%)
7.	Establishment of Regional Agricultural Research Station, BARI, Meherpur Sadar and Strengthening of Eco-Friendly Research activities in Mid-western region of the country (November 2023 - October 2028)	20996.00	803.00	259.00	34%	259.00 (1.23%)
Total:		**113862.61**	**11839.00**	**8757.66**	**-**	**33984.59**

Table 3: List of Completed Projects during FY 2024-25 (In lakh Tk.)

Sl.no.	Name of the Projects (Implementation period)	Project Cost	Cumalative Progress
1.	Farm Machinery Technology Development for Profitable Crop Production (1st Revised) (July 2020 to June 2025)	5600.00	5324.44 (95%)

Table 4: List of ongoing projects during FY 2025-26 (In lakh Tk.)

Sl.no.	Name of the Projects (Implementation period)	Project Cost	ADP Allocation 2025-26	Status
1.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part) (2nd Revised) (July 2018 to June 2026)	1725.14	267.00	7th year
2.	Enhance Production of Oil Crops Project (BARI Part) (1st Revised) (July 2020- June 2026)	2083.19	50.00	5th year
3.	Research, Development & Extension of Cashewnut and Coffee (BARI Part) (January 2021- June 2026)	5330.75	1295.00	4th year
4.	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	2203.00	4th year
5.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship and Resilience in Bangladesh (PARTNER) (BARI Part) (July 2023- June 2028)	61286.55	14921.00	2nd year
6.	Establishment of Regional Agricultural Research Station, BARI, Meherpur Sadar and Strengthening of Eco-Friendly Research activities in Mid-Western Region of the Country (November 2023 - October 2028)	20996.00	1463.00	2nd year
7.	Tuber Crops Research Strengthening Project (July 2025- June 2030)	10000.00	-	Approved
Total		**108301.63**	**20199.00**	

Table 5: List of new projects in formulation stage

Sl. No.	Name of the Projects (Implementation period)	Project Cost (In Lakh Tk.)
1.	Strengthening Research Activities of Bangladesh Agricultural Research Institute (July 2024- June 2029)	64000.00
2.	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

Table 6: List of Kormosuchi (Scheme) Completed in FY 2024-25 (In lakh Tk.)

Sl.no.	Title and Duration	Estimated Cost	Cumalative progress upto June 2025 (%)
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	247.49 (99.20%)
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	172.50 (99%)
Total		**425.00**	**419.99**

Table 7: List of Proposed Projects Aligned with SDG (2021-2030), Delta Plan-2100 & Five Year Plan

SL. No	Name of the Projects	Estimated Cost (In lakh Tk.)
1.	Southern Agricultural Improvement Project (SAIP) (BARI part)	87062.00
2.	Climate Resilient Agricultural Devlopment Project (CRADP) (BARI part)	30000.00
3.	High Value Crop Commercialization and Productivity Improvement Project (HV-CCPIP)	1342.00
4.	Research, Extension and Popularization of Vegetables and Spices Cultivation on Floating Bed (2nd Phase)	5000.00
5.	Farm Machinery Technology Development for Profitable Crop Production (2nd Phase)	8000.00

Table 8: List of on going projects under Climate Change Trust Fund (CCTF)

Sl.no.	Name of the Projects	Implementation period	Project Cost (In lakh Tk.)
1.	Increasing quality seed production capacity to address onion seed crisis in a changing climate	July 2025 - June 2028	1150.00
2.	Increasing crop production through low carbon emission agricultural technology in climate vulnerable areas	July 2025 - June 2028	600.00

Table 9: List of proposed projects under Climate Change Trust Fund (CCTF)

Sl.no.	Name of the Projects	Implementation period	Project Cost (In lakh Tk.)
1.	Enhancing Carbon sequstration and reducing greenhouse gas emissions through sustainable crop management	October 2025 - September 2028	1200.00
2.	Climate-Resilient Agricultural Adaptation in the Coastal Saline Environment of the South-Western Region	September 2025 - August 2028	1267.11

BUDGET

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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	
44362.12	4566.62	33324.50	37891.12	6471.00	9001.10	31365.73	40366.83

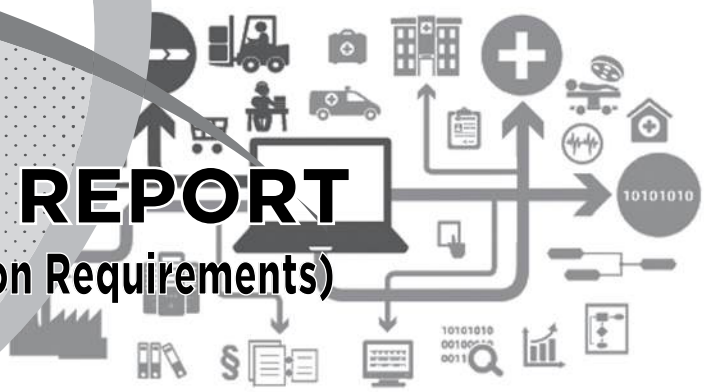
Table-2: Development Budget (Annual Development Programs) of BARI for 2023-2024 (in lakh Tk.)

No.	Name of Projects & Programs	Total	GOB		PA/ RPA	Expenditure		Total
	A. Development Projects		Revenue	Capital		Revenue	Capital	
1.	Smallholder Agricultural Competitiveness Project (SACP) (BARI Part)	212.20	69.20	0	143.00	212.20	0	212.20
2.	Farm Machinery Technology Development for Profitable Crop Production	1288.76	822.50	466.26	0	822.50	466.26	1288.76
3.	Enhance Production of Oil Crops Project (BARI Part)	535.80	535.80	0	0	535.80	0	535.80
4.	Research, Development & Extension of Cashew nut and Coffee(BARI Part)	362.40	362.40	0	0	356.37	0	356.37
5.	Strengthening Regional Pulse Research Station, Madaripur and increase production of pulse crops at greater Barishal, Faridpur Region.	521.34	521.34	0	0	493.64	0	493.64

No.	Name of Projects & Programs	Total	GOB		PA/ RPA	Expenditure		Total
	A. Development Projects		**Revenue**	**Capital**		**Revenue**	**Capital**	
6.	Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship, and Resilience (PARTNER) (BARI Part)	7490.00	1057.00	105.00	6328.00	4781.00	815.83	5596.83
7.	Establishment of Regional Agricultural Research Station, BARI, Meherpur Sadar and Strengthening of Eco-Friendly Research activities in Mid-western region of the country	368.62	293.44	75.18	0	250.86	8.14	259.00
Sub-Total -A Development Projects:		**10779.12**	**3661.68**	**646.44**	**6471.00**	**7452.37**	**1290.23**	**8742.60**

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
	B. Programs		**Revenue**	**Capital**		**Revenue**	**Capital**	
1.	Year round bulb production, reduction of post-harvest losses and storage technologies development of summer onion and its dissemination.	179.00	135.00	44.00	0	135.00	44.00	179.00
2.	Production of micro-propagated sapling of BARI Kola-1, BARI Kola-5 and G-9 banana varieties through tissue culture technique & its dissemination.	79.50	55.00	24.50	0	55.00	24.50	79.50
Sub-Total -B Programs:		**258.50**	**190.00**	**68.50**	**0**	**190.00**	**68.50**	**258.50**
Grand Total (A+B):		**11037.62**	**3851.68**	**714.94**	**6471.00**	**7642.37**	**1358.73**	**9001.10**



INFORMATION REPORT

(As per Information Commission Requirements)

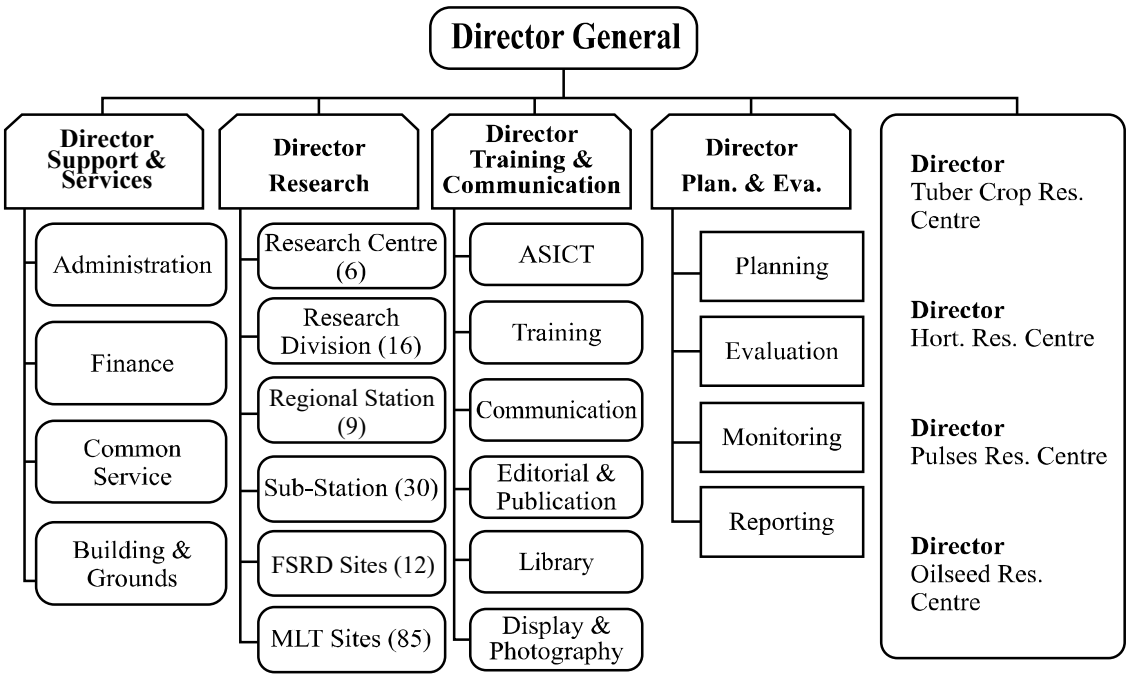
28

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 aboard 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 মমাহাম্মদ
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. মমাহাম্মদ এমদাদ উল্লাহ শময়ান
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	N0. 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. 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

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