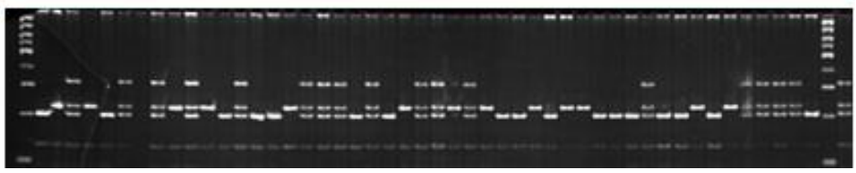
ANNUAL RESEARCH REVIEW WORKSHOP
2023-2024



BIOTECHNOLOGY DIVISION

BANGLADESH RICE RESEARCH INSTITUTE
GAZIPUR 1701

Contents

List of Personnel

Name and Designation	Working Man Months	Remarks
Dr. Md. Enamul Hoque Chief Scientific Officer	12	-
Dr. Shahanaz Sultana Principal Scientific Officer	12	-
Dr. Jannatul Ferdous Senior Scientific Officer	12	-
Dr. Nilufar Yasmin Shaikh Senior Scientific Officer	-	Deputed to TOC
Dr. S.M. Hisam Al Rabbi Senior Scientific Officer	12	-
Ripon Kumar Roy Senior Scientific Officer	12	-
Md. Arafat Hossain Scientific Officer	12	-
Shampa Das Joya Scientific Officer	11	-
Md. Sentu Rahman Scientific Officer	12	-
Md. Faruq Hossain Asst .Electrical Eng.	-	Deputed to the Building and construction Division
Md. Jahangir Alam Assistant Farm Manager	12	-
Esrat Jahan Computer operator	12	-
Md. Ibrahim Khalil Lab. Attended	12	-
Khuku Moni Lab. Attended	12	-

Summary

A total 28 experiments were conducted during the year 2023-24 for the development of aromatic, antioxidant enriched black rice, and high yielding Aus, Aman and Boro rice varieties. Thirty-four (34) lines from anther culture of BRRI dhan50/Bashful (Acc. No. 3954) cross were evaluated in Boro 2023-24 as OT along with check BRRI dhan50. Among them 14 lines were selected for further evaluation. During Boro 2022-23, six and eight lines for antioxidant enriched black rice were selected from PYT and OT respectively. Seven and six lines for antioxidant enriched black rice were also selected from PYT and OT respectively during T Aman 2022.Three hundred and twenty six somaclonal variants (SCV_3) of Kalijira were harvested from 126 SCV_2 lines for further evaluation. Forty seven and 89 homozygous antioxidant enriched black rice lines were selected during T Aman 2022 and Boro 2022-23 respectively from SC_5 generation. In a total, 219 backcross progeny plants (BC_2F_5) from wide hybridization were evaluated in Boro 2023-24. Among them 114 plants were selected for generation advancement. For developing high yielding aromatic rice variety one hundred and eighty two lines F_6 progenies derived from a cross between BRRI dhan87 and Kalijira were grown as OT during T Aman 2023. Among them forty six homozygous lines were selected. *AeMDHAR* salt tolerant gene (from mangrove plant) containing transgenic plant was crossed with BRRI dhan28 to introgress *AeMDHAR* salt tolerant gene. One hundred and twenty six BC_2F_4 plants were confirmed with gene specific primer. To deactivate the function of *BADH2* gene, a construct was prepared and twenty one days old calli of BRRI dhan90 were used to transform with *BADH2* gene through *Agrobacterium* mediated transformation. Putative transformed calli are now in selection stage. For fragrant rice development,168 M_3 Kilijira lines were transplanted in T Aman 2023 along with check and 273 plants were selected. Besides EMS treated seeds of local variety (Tulshimala) were used in this experiment. Thirty-One (31) plants (M_3) of Tulshimala obtained through mutation by EMS were evaluated during T. Aman 2023. Among them 47 plants (M_4) were selected for generation advancement Seed from 7 rice genotype treated with 350Gy and 450Gy Gamma radiation were transplanted in 2023. A total 50 and 41 M_3 plants from 350Gy and 450Gy were selected respectively, for further evaluation. Fifty-three M_3 plants of BRRI dhan87 were grown in the field and 117 M_4 plants were selected for further evaluation. During Aus 2023, 24 and 22 fixed lines of EMS treated variants of BRRI dhan48 were evaluated in two OT's with check variety. Among them ten lines were selected for further evaluation. During T. Aman 2023, 222 fixed mutant lines of BR11 lines were evaluated as OT with standard check and 20 lines were selected for further evaluation. Besides, during Boro 2023-24, four (4) fixed lines were evaluated as PYT and one (1) lines were selected for further evaluation. For C4 rice development, a total 7000 M4 lines of Kaoun (*Setaria italica*) were developed. So far, 1100 M4 lines have been screened in low concentration (20 ppm) CO2 chamber for 72 hours and 26 plants among them is seemed to have lost C4 properties. Photosynthetic properties of rice can be enhanced utilizing Uri dhan (*Oryza coarctata*) as it has been reported to be an intermediate towards C4 having Kranz anatomy. It has a larger bundle sheath and denser venation. But its chloroplasts in the bundle sheaths are rudimentary making it less efficient photosynthetically (Chowrasia et al., 2021). This can be improved by editing the hexokinase gene (*OsHXK1)* through CRISPR and making the Uri dhan, even more, closer to the C4 plant. Primers have been designed and synthesized and the vector has been cloned for genome editing

Introduction

Biotechnology division has been working for developing modern rice varieties as well as basic information using different biotechnological tools since its inception. Its major thrust includes the development of high yielding rice genotypes having different stress tolerance and nutritional quality. During the reporting period, this division done 28 experiments on rice anther culture, somaclonal variation, wide hybridization, genetic transformation, marker assisted selection (MAS), gene pyramiding and genetic engineering under eight (8) different projects.

PROJECT I: DEVELOPMENT OF DOUBLED HAPLOID RICE VARIETY THROUGH ANTHER CULTURE

General Objective: To develop high yielding rice varieties with desired traits.

Experiment 1.1: Development of premium quality rice variety through anther culture

General Objective: To develop high yielding premium quality rice lines

Activity 1.1.1: Observational yield trial (OT) of premium quality DH rice lines

Specific Objective: To evaluate initial yield potential of advanced breeding lines

Materials and methods: Thirty-four (34) DH lines from anther culture of BRRI dhan50/ Bashful (Acc. No. 3954) cross were evaluated in Boro 2023-24 as OT along with check BRRI dhan50. Each entry was grown in a 5.4m × 4 rows having single seedling/hill at 25 cm × 15 cm spacing. Fertilizer was applied at 137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic management practices were followed during cultivation period.

Result and Discussion: Thirty-four (34) lines from anther culture of BRRI dhan50/ Bashful (Acc. No. 3954) cross were evaluated in Boro 2023-24 as OT along with check BRRI dhan50. Among them 14 lines were selected for further evaluation (Table-1).

Table 1: Agronomic characteristics of selected lines derived from BRRI dhan50/Bashful (Acc. No. 3954) evaluated as OT in Boro 2023-24.

Sl. No.	Designation	PH (cm)	GD(Days)	Yield(t/ha)
1	BR(Bio)16417-AC2-3-5	76	142	6.26
2	BR(Bio)16417-AC2-1-6	93	150	6.38
3	BR(Bio)16417-AC3-1-3	85	141	5.96
4	BR(Bio)16417-AC3-7-4	83	141	6.24
5	BR(Bio)16417-AC4-3-2	81	141	6.15
6	BR(Bio)16417-AC4-1-1	86	141	6.04
7	BR(Bio)16417-AC6-4-1	101	144	6.33
8	BR(Bio)16417-AC6-5-3	84	144	6.00
9	BR(Bio)16417-AC7-1-3	80	143	6.14
10	BR(Bio)16417-AC7-5-4	84	143	6.12
11	BR(Bio)16417-AC8-1-1	86	145	6.26
12	BR(Bio)16417-AC8-3-3	88	142	6.02
13	BR(Bio)16417-AC9-2-1	96	144	6.14
14	BR(Bio)16417-AC9-6-5	88	144	6.05
15	BRRI dhan50 (CK)	84	153	6.15

Principal Investigator: Nilufar Yasmin Shaikh

Co-Investigators: Ripon Kumar Roy, S M Hisam Al Rabbi

Activity 1.1.2: Progeny Selection of premium quality DH rice lines

Specific Objective: To select the best plants with desirable traits.

Materials and methods: Thirty-three (33) and 08 double haploid plants of BRRI dhan90/Kataribhog (Dinajpur) and BRRI dhan38/Bashful (Acc. No. 3954), respectively were evaluated in T. Aman 2023. Besides, 160 doubled haploid plants from BRRI dhan50/Bashful (Acc. No. 3954) were evaluated in Boro 2023-24. Single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices were followed during cultivation time.

Result and Discussion: Thirty-three (33) doubled haploid plants of BRRI dhan90/Kataribhog (Dinajpur) were evaluated in T. Aman 2023. Among them 65 plants were selected. Eight (08) double haploid Plants from BRRI dhan38/Bashful (Acc. No. 3954) were evaluated in T. Aman 2023 and 48 plants were selected. Besides, 160 doubled

haploid Plants from BRRI dhan50/Bashful (Acc. No. 3954) were evaluated in Boro 2023-24 and 53 lines were selected.

Principal Investigator: Nilufar Yasmin Shaikh

Co-Investigators: Ripon Kumar Roy, S M Hisam Al Rabbi

Experiment 1.2: Regional yield trial (RYT) of intermediate amylose content (19-20%)) rice genotypes

Specific Objective: To evaluate advanced rice lines for specific and general adaptability at the regional level.

Material and methods: Three doubled haploid homozygous advanced breeding lines were evaluated in T. Aman/2023 as RYT. Each progeny were grown in a 5.4 m X 12 rows using single seedling/hill in three replications at different regional station of BRRI. RCBD was followed for this experiment. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.

Results and discussion: During T. Aman/2023 three advanced breeding lines were evaluated at nine regional stations. None was selected for ALART (Table 2).

Table 2: Agronomic characteristics of selected anther culture derived materials. RYT, T. Aman 2023

Sl. no.	Designation	PH (cm)	GD (day)	YIELD (t/ha)										
				Kus	Cum	Gop	Ran	Bar	Gaz	Raj	Sat	Son	Sir	Avg
1	BR(Bio)10381-AC11-7-1	114	125	6.28	6.50	4.00	6.26	4.35	5.43	4.74	4.91	4.92	6.08	5.35
2	BR(Bio)10381-AC11-8-1	96	106	4.92	4.15	4.23	3.30	RD	2.85 *	2.11 *	4.11	4.94	1.96	3.62
3	BR(Bio)13031-AC1-2	113	113	4.39	6.01	3.23	3.74	3.30	3.41	5.22	3.35	4.70	3.42	4.08
4	BRRI dhan71(ck)	117	114	4.99	5.44	5.10	4.86	3.65	5.55	5.13	4.01	4.52	5.54	4.88
5	BRRI dhan87(ck)	121	124	6.22	6.26	6.00	5.79	4.32	4.90	5.78	4.71	5.12	5.99	5.51
	CV (%)			8.17	6.94	2.48	7.58	4.23	11.6	5.41	5.1	5.34	8.94	
	LSD (0.05)			0.82	0.74	0.21	0.68	0.25	0.94	0.45	0.41	NS	0.77	

*= lodging, RD= Rat damage, Locations: Cum=Cumilla, Raj=Rajshahi, Kus=Kushtia, Sat=Satkhira, Son=Sonagazi, Gop=Gopalgonj, Sir= Sirajgonj, Bar=Barishal, Ran=Rangpur, Gaz=Gazipur,

Principal Investigator: Jannatul Ferdous,

Co-Investigators: Shahanaz Sultana and Md. Enamul Hoque.

Experiment: 1.3 Antioxidant enriched black rice development through anther culture

General Objective: To develop high yielding Vitamin E enriched black rice.

Activity 1.3.1: Advanced Line Adaptive Research Trial (ALART)

During Boro 2023-24, three Vitamin E enriched black rice lines were developed using anther culture were evaluated as ALART by ARD. Among them one line was selected for PVT (Table 3). Details report will be presented by ARD.

Table 3: Agronomic characteristics and Antioxidant properties of selected antioxidant enriched black rice doubled haploid lines, ALART, Boro 2023-24

Sl no	Designation	PH (cm)	GD (day)	Yield (t/ha)	Vit E (α-Tocopherol) mg/kg	Cyanidin-3-Glucoside (C3G) mg/kg	Total Antioxidant Content (TAC) µM AAE per 100g
1	BR(Bio)13028-AC24-1-2	116	145	6.54	11.72	1.11	542.81
2	**BR(Bio)13028-AC24-2-3**	**101**	**145**	**6.00**	**14.98**	**29.12**	**536.61**
3	BR(Bio)13028-AC24-2-4	103	143	5.52	14.93	35.61	611.05

4	BRRI dhan86	95	142	6.05	5.67	Not Detected	235.61
5	BRRI dhan96	93	144	6.40	7.21	Not Detected	356.07

PH= Plant Height, GD= Growth Duration,

Activity 1.3.2: Regional yield trial (RYT) of antioxidant enriched black rice lines

Specific Objective: To evaluate advanced rice lines for specific and general adaptability at the regional level.

Material and methods: Six doubled haploid homozygous advanced breeding lines were evaluated in Boro 2023-24 as RYT. Each progeny were grown in a 5.4 m X 12 rows using single seedling/hill in three replications at different regional station of BRRI. RCBD was followed for this experiment. Fertilizer was applied at 137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed.

Results and discussion: During Boro 2023-24 two advanced breeding lines were evaluated at nine regional stations and among them three were selected based on the growth duration, grain color, root characteristics and yield performance with checks for ALART (Table 4).

Table 4: Agronomic characteristics of selected antioxidant enriched black rice doubled haploid lines, RYT, Boro 2023-24

Designation	PH (cm	GD (day	Yield (t/ha)									
			Gaz	kus	cum	gop	sir	sat	raj	bar	son	Avg.
BR(Bio)13028-AC1-2-2	110	143	4.7	5.44	4.26	6.24	3.91	5.12	6.68	5.57	5.95	5.32
BR(Bio)13028-AC1-2-3	115	143	5.71	6.42	5.16	7.17	6.68	5.86	5.99	5.12	5.42	5.95
BR(Bio)13028-AC1-2-4	**105**	**144**	**6.43**	**6.6**	**6.60**	**7.30**	**6.02**	**6.08**	**7.60**	**5.86**	**6.62**	**6.57**
BR(Bio)13028-AC1-2-7	**105**	**146**	**6.3**	**6.35**	**5.23**	**7.53**	**5.90**	**6.01**	**7.69**	**6.08**	**4.50**	**6.18**
BR(Bio)13029-AC6-2-6	103	146	6.1	6.22	5.5	6.57	5.72	5.57	7.28	6.01	5.74	6.08
BR(Bio)13030- AC13-2-2	100	145	6.56	6.58	5.53	6.83	6.06	5.18	7.67	5.18	6.55	6.24
BRRI dhan86	93	141	5.7	6.28	6.21	6.11	6.07	5.4	6.51	5.40	6.37	6.01
BRRI dhan96	87	143	5.5	6.68	6.54	6.97	5.88	5.6	6.79	5.60	6.85	6.27
CV (%)			14.59	6.17	6.31	6.93	7.04	4.31	3.01	4.314	7.64	
LSD (0.5)			ns	0.68	1.02	1.36	1.17	0.69	0.42	0.37	0.80	

Ph= Plant Height, GD= Growth Duration, Gaz=Gazipur, Cum=Cumilla, Bar=Barishal, Gop=gopalgonj, Son=Sonagaji, Sir=Sirajgonj, Raj=Rajshahi, Kus=Kushtia, Sat=Satkhira

Principal Investigator: Jannatul Ferdous,

Co-Investigators: Shahanaz Sultana and Md. Enamul Hoque.

Table 5: Root Characteristics of selected antioxidant enriched black doubled haploid lines, RYT, Boro 2023-24

SL. No.	Designation	Root Length (cm)	CRLUP30 (cm)	CRLB30 (cm)	Total CRL (cm)	Root weight (mg)	RSR (mg/g)
1	BR(Bio)13028-AC1-2-2	59.0	1159.3	233.3	1392.7	736.7	302.1
2	BR(Bio)13028-AC1-2-3	48.7	1390.0	167.7	1557.7	466.7	184.6
3	BR(Bio)13028-AC1-2-4	51.7	1485.3	364.0	1849.3	666.7	253.4
4	BR(Bio)13029-AC6-2-6	50.7	929.3	117.0	1046.3	540.0	368.9
5	BR(Bio)13028-AC1-2-7	54.7	810.3	146.3	956.3	456.7	179.1
6	BR(Bio)13030-AC13-2-2	48.7	547.0	114.7	661.7	416.7	215.1
7	BRRI dhan86	49.3	1248.3	278.7	1527.0	506.7	238.8
8	BRRI dhan96	48.0	1146.0	202.3	1348.3	720.0	504.2
9	Morich boti	61.0	1355.3	404.7	1760.0	816.67	282.2

Activity 1.3.3 Preliminary yield trial (PYT) of antioxidant enriched black rice lines

Specific Objective: To evaluate initial yield potential of advanced breeding lines develop through anther culture in replicated trials.

Materials and methods: During Boro 2023-24, a total of 10 double haploid lines were grown as PYT with standard checks. Each entry was grown in a 5.4m × 8 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at

137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed.

Results and discussion: During Boro 2022-23, a total of 10 double haploid lines were evaluated as PYT. Among them 8 lines were selected depending on the duration and yield performance and grain color with checks for further evaluation (Table 6).

Table 6: Agronomic characteristics of selected anther culture derived materials. PYT, Boro 2023-24

Sl. No.	Designation	PH (cm)	GD (days)	Yield(t/ha)
1	BR(Bio)13028-AC11-2-1-1	115	148	5.33
2	BR(Bio)13028-AC11-2-2-3	102	150	5.83
3	BR(Bio)13028-AC15-1-1-1	96	148	4.95
4	BR(Bio)13028-AC15-3-1-2	116	152	5.30
5	BR(Bio)13028-AC24-3-5-1	113	148	5.31
6	BR(Bio)13028-AC24-4-2-2	96	146	5.91
7	BR(Bio)13028-AC24-4-3-3	104	145	4.82
8	BR(Bio)13028-AC24-5-2-4	93	149	5.33
9	BR(Bio)13030-AC 1-2-3	95	146	5.12
10	BR(Bio)13030-AC 6-4-1	102	149	4.12
11	BRRI dhan86 (ck)	90	145	5.23
12	BRRI dhan96 (CK)	80	146	5.17
	CV (%)			11.98
	LSD (0.5)			ns

Principal Investigator: Jannatul Ferdous,
Co-Investigators: Shahanaz Sultana and Md. Enamul Hoque.

Activity 1.3.4: Preliminary yield trial (PYT) of antioxidant enriched black rice lines

Objective: To evaluate initial yield potential of advanced breeding lines develop through anther culture in replicated trials.

Specific Objective:

1. To evaluate specific and general adaptability of the colored doubled haploid line in different location of hilly area
2. To evaluate specific and general adaptability of the low amylose content doubled haploid lines in different location of hilly area

Materials and methods: During Boro 2023-24, eighteen antioxidant enriched black rice lines and low amylose content doubled haploid were evaluated at Khagrachori sadar as PYT with standard checks. Each entry was grown in a 5.4m × 8 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed. Fertilizer requirement of Khagrachori sadar soil were determine.

Results and discussion: During Boro 2023-24, a total of 18 doubled haploid lines were evaluated as PYT. Among them 8 lines were selected depending on the growth duration, yield performance, grain color and root characteristics with checks for further evaluation (Table 7).

Principal Investigator: Jannatul Ferdous,
Co-Investigators: Shahanaz Sultana, Md. Sentu Rahman and Md. Enamul Hoque.

Table 7: Agronomic characteristics of selected colored and low amylose content doubled haploid lines, PYT, Boro 2023-24 at Khagrachori Sadar

SL NO	Line	PH (cm)	GD (day)	Yield (t/h)	Size and Shape	Color of grain
1	**BR(Bio)13028-AC24-1-2**	**114**	**139**	**6.45**	**LS**	**Black**
2	BR(Bio)13028-AC24-2-3	107	137	4.78	MS	
3	BR(Bio)13028-AC24-2-4	101	135	5.50	LS	
4	BR(Bio)13028-AC24-3-3	109	144	5.71	LS	
5	BR(Bio)13029- AC2-2-2	122	144	3.06	MB	
6	**BR(Bio)13029-AC6-2-6**	**104**	**137**	**6.42**	**LB**	

7	BR(Bio)13029-AC6-3-2	130	142	5.90	LB	
8	BR(Bio)13028-AC1-2-2	126	135	5.59	MS	
9	**BR(Bio)13028-AC1-2-3**	**111**	**139**	**6.19**	**MS**	
10	**BR(Bio)13028-AC1-2-4**	**107**	**137**	**6.80**	**MB**	
11	**BR(Bio)13028-AC1-2-7**	**111**	**137**	**6.36**	**MB**	
12	**BR(Bio)13028-AC2-2-2-3**	**120**	**137**	**6.15**	**MS**	
13	BR(Bio)13030-AC5-2-1	124	136	5.84	MS	
14	**BR(Bio)13030-AC13-2-2**	**100**	**137**	**6.25**	**LS**	
15	BR(Bio)10368-AC6-1-1	117	147	4.66	LS	White
16	BR(Bio)10368-AC17-2-2	116	148	4.72	LS	
17	BR(Bio)10368-AC22-2-2	111	150	5.49	LS	
18	**BR(Bio)10368-AC30-2-3**	**123**	**151**	**6.08**	**LS**	
19	BRRI dhan86	102	136	6.85	LS	
20	BRRI dhan96	96	137	7.00	MB	
	Morichboti					

Bold selected

Experiment 1.4: Development of high yielding Aus rice variety through anther culture

General Objective: To develop transplanted Aus Rice variety

Activity: 1.4.1 Hybridization

Specific Objective: To generate F_1 seeds for anther culture.

Materials and methods: In the Aus 2023-24 season, two crosses (Table 8) were made using four parents.

Result and discussion: 377 F_1 seeds from the cross BRRI dhan48/BR(Bio)9786-BC2-65-1-1 and 156 seeds from BRRI dhan98/BR(Bio) 9787-BC2-16-3-1 were produced.

Table 8. List of cross combinations.

Sl. No.	Cross Combination	No of seeds
1	BRRI dhan48/BR(Bio)9786-BC2-65-1-1	221
2	BRRI dhan98/BR(Bio)9787-BC2-16-3-1(HR-1)	156
Total		**377**

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.4.2: Rice Anther Culture

Specific Objective: To generate doubled haploid rice lines.

Materials and methods: In the Aus 2023-24 season, anthers were cultured from 2 crosses. F_1s populations were grown in the net house under optimum management. Boots with appropriate stage were collected from F_1 plants and boots were then incubated in a refrigerator at 8ºC for 8 days. The panicles were taken from the boots and cut into small pieces. They were then surface sterilized by 70% ethanol for 2-3 minutes and then placed onto the sterile filter paper in Petri dishes to remove excess alcohol. For callus induction, anthers were incubated into N6 medium and kept in an incubator under dark condition at 25ºC until cullus initiation. Calli were then transferred into regeneration medium for regeneration. Data were taken on number of anther plated, number of calli produced, number of green and albino plant regenerated. Regenerated plantlets were transferred into earthen pot and kept there until maturity.

Result and discussion: Thirty-three calli were generated from the cross BRRI dhan48/BR(Bio)9786-BC2-65-1-1 and 32 green plants and 15 albino plants were regenerated from 42 calli (Table 9).

Table 9. List of cross combinations and anther culture status.

Sl. No.	Cross Combination	Number of Calli generated	Number of Green Plant	Number of Albino Plant
1	BRRI dhan48/BR(Bio)9786-BC2-65-1-1	42	32	15

Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.4.3: Preliminary yield trial (PYT) of the advanced lines
Specific Objective: To evaluate the agronomic performance of the advanced lines.
Materials and methods: In the Aus 2023-24 season**,** 15 anther culture derived lines were grown in a PYT with standard checks with 2 replications. Each entry was grown in 5.4 m × 8 rows with 20 cm × 20 cm spacing. A single seedling was transplanted for each hill. Standard agronomic management practices followed in the cultivation period.
Results and discussion: Five doubled haploid lines were selected for the secondary yield trial (SYT) based on phenotypic acceptance, growth duration, and yield. (Table 10).
Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya, Sentu Rahman, MA Monsur, MN Islam, MM Rana, T Halder, TK Roy

Table 10. Agronomic characteristics of selected anther culture-derived lines. PYT, T. Aus 2023

SL No.	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	BR(Bio)15085-AC2-9	112	104	5.41
2	BR(Bio)15086-AC11-5	108	100	5.52
3	BR(Bio)15086-AC11-7	108	100	5.54
4	BR(Bio)15086-AC51-7	107	101	5.18
5	BR(Bio)15086-AC51-6	103	101	5.12
6	BRRI dhan48 (CK)	100	107	4.72
7	BRRI dhan98 (CK)	104	111	5.60
CV		1.11	0.75	3.28
LSD		2.5	2.25	0.38

Experiment 1.5: Photosensitive rice variety development using anther culture
General Objective: i. To develop photosensitive rice

Activity 1.5.1: Hybridization
Specific Objective: To generate F_1 seeds for anther culture.
Materials and methods: In the Aman 2023-24 season, 4 crosses (Table 11) were made using 5 parents.
Result and discussion: 276 F_1 seeds were produced in the 4 crosses by using 5 parents (Table 11).
Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Table 11. List of cross combinations.

Sl. No.	Cross Combination	No of seeds
1	BR22/Barsha dhan	74

2	BR23/Barsha dhan	62
3	Dishari (Local rice at Barishal Region)/Barsha dhan	85
4	Mothamota (Local rice at Barishal Region)/ BR23	55
Total		276

Activity 1.5.2: Progeny Selection

Specific Objective: To select the best plants having taller seedling capabilities

Materials and methods: Seventy-four (74) advanced lines having taller seedling capabilities were grown in Aman 2023. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices were followed in cultivation time.

Result and Discussion: Thirty (30) plants were selected for further evaluation.

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.5.3: Preliminary yield trial (PYT) of photosensitive advanced lines

Specific Objective: To evaluate the yield potential of advanced lines.

Materials and methods: Six (6) advanced lines were grown in 2 replications with the standard checks. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in cultivation time.

Result and Discussion: Four (4) lines were selected (Table 12) for further evaluation.

Table 12. Agronomic characteristics of selected anther culture derived lines in PYT-1, Aman/2023

Designation	**PH**	**DFH**	**GD**	**Yield (t/ha)**	**TW (g)**
BR (Bio)8033-AC5-1-1-HR1	119	24.10.23	143	5.79	27.51
BR (Bio)8033-AC5-1-1-HR2	118	23.10.23	142	5.51	29.91
BR (Bio)8033-AC5-1-2-HR1	119	23.10.23	142	5.60	28.72
BR (Bio)8033-AC7-1-1-HR2	118	23.10.23	142	5.43	29.14
Gainja (CK)	158	27.10.23	146	4.48	24.63
CV	3.13		2.78	4.21	
LSD	2.56		1.97	0.41	

Principal Investigator: Ripon Kumar Roy

Co-investigator: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya, Sentu Rahman, MA Monsur, MN Islam, MM Rana, T Halder, TK Roy

Experiment 1.6: Development of Aman Rice for the favorable ecosystem through anther culture

Activity 1.6.1: Hybridization

Specific Objective: To generate F_1 seeds for anther culture.

Materials and methods: In the Aman 2023-24 season, 2 crosses (Table 13) were made using 5 parents.

Result and discussion: 156 F_1 seeds were produced in the 2 crosses by using 4 parents (Table 14).

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Table 13. List of cross combinations.

Sl. No.	**Cross Combination**	**No of seeds**
1	BRRI dhan92/BRRI dhan103	81

2	BR(Bio)9786-BC2-65-1-1/BRRI dhan101	75
Total		**156**

Activity 1.6.2: Rice Anther Culture

Specific Objective: To generate doubled haploid rice lines.

Materials and methods: In the Aman 2023-24 season, anther was cultured from 2 crosses

Result and discussion: Twenty calli were generated from the cross BRRI dhan89/BRRI dhan103 and 13 green plants were regenerated from 21 calli. Thirteen calli were generated from the cross Swarna5 /BR((Bio)9787-BC2-16-3-1(HR-1). Twenty-two albino plants were regenerated from 13 calli (Table 14).

Table 14. List of cross combinations and anther culture status.

Sl. No.	Cross Combination	Number of Calli generated	Number of Green Plant	No. of Albino Plant
1	BRRI dhan89/BRRI dhan103	20	13	-
2	Swarna5 /BR((Bio)9787-BC2-16-3-1(HR-1)	13	-	22

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.6.3: Preliminary yield trial (PYT) of the advanced lines for T Aman

Specific Objective: To evaluate the yield potential of advanced lines having the standard seedling capability.

Materials and methods: Twelve (12) advanced lines were grown in a preliminary yield trial (PYT) in Aman 2023 with 2 replications. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.

Result and Discussion: Three (3) promising advanced lines were selected (Table 15) for further evaluation based on phenotypic acceptance, growth duration, and yield.

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Table 15. Agronomic characteristics of selected advanced lines in PYT-1, Aman/2023

SL No.	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	BR(Bio)15086-AC114-8-1	113	117	6.38
3	BR(Bio)15086-AC119-16	112	118	6.36
4	BR(Bio)15086-AC120-18	114	121	6.59
5	BBRI dhan75 (C)	112	113	5.46
6	BRRI dhan95 (C)	120	134	4.98
7	BRRI dhan71 (C)	113	118	5.35
CV		2.61	0.98	4.18
LSD		2.5	1.69	0.33

Experiment 1.7: Development of high-yielding Boro rice variety using anther culture

General Objective: Developing high-yielding Boro rice

Activity 1.7.1 Hybridization for the favorable ecosystem of Boro Rice using anther culture techniques

Specific Objective: To generate F_1 seeds for anther culture

Materials and methods: In the Boro 2023-24, five crosses were made using eight parents.

Result and Discussion: A total of 458 F_1 seeds were produced from the five crosses (Table 16)

Table 16. List of cross combinations.

SL NO.	Cross Combination	No of seeds
1	BRRI dhan89/Fatema	105
2	BRRI dhan96/Fatema	111
3	BR(Bio)9786-BC2-80-1-1/BR(Bio)9787-BC2-203-1-3	97
4	BR(Bio)9786-BC2-49-1-2/BRRI dhan50	90
5	BRRI dhan89/Amey dhan (Pahari dhan)	55
Total		458

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.7.2: Rice Anther Culture for the development of high yielding Boro rice

Specific Objective: To generate doubled haploid rice lines.

Materials and methods: Three F_1s were used for this study. Boots were collected at the appropriate stage from test materials. For callus induction, anthers were plated in N6 medium. After callus initiation, calli were transferred into regeneration medium (MS medium containing 1.0 mg/l NAA + 1.0 mg/l Kn). Regenerated plantlets were then transferred into small pot containing soil for hardening. Data on callus induction (%), regeneration (%), no. of green plant, no. of albino plant were collected. Seven crosses were done for future anther culture program. (Table 18).

Result and discussion: Twenty-four calli were generated from the cross BR(Bio)9786-BC2-65-1-1/BR(Bio)15861-AC300-1-2 and 9 green plants were regenerated. Fifteen calli were regenerated from Fatema dhan/BRRI dhan89, and 11 calli were regenerated from BRRI dhan96/Fatema dhan. Twenty-five and 23 albino plants were regenerated respectively from these two crosses (Table 17).

. **Principal Investigator**: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Table 17. List of cross combinations and anther culture status.

Sl. No.	Cross Combination	Number of Calli generated	Number of Green Plant	Number of Albino Plant
1	BR(Bio)9786-BC2-65-1-1/BR(Bio)15861-AC300-1-2	24	9	5
2	Fatema dhan/BRRI dhan89	15	-	25
3	BRRI dhan96/Fatema dhan	11	-	23

Activity 1.7.3: Progeny selection

Specific objective: To select the desired plants

Materials and methods: 578 Anther cultured derived lines from different cross combinations were grown. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.

Result and Discussion: Four hundred and eighty five (485) plants and 30 homozygous lines were selected for further evaluation.

Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

Activity 1.7.4: Preliminary yield trial (PYT) of the advanced lines
Specific Objective: To evaluate the yield potential of advanced lines.
Materials and methods: Seventeen (17) advanced lines were evaluated in an observational yield trial (PYT-1) in Boro 2023-24 with 2 replications. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.
Result and Discussion: Ten (10) lines were selected from PYT-1 (Table 18) for further evaluation based on phenotypic acceptance, growth duration, and yield.

Table 18: Agronomic characteristics of selected anther culture derived lines in PYT-1, Boro/2023-24

Sl No	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	BR(Bio)15086-AC67-1	100	151	7.81
2	BR(Bio)15086-AC67-3-1	117	149	7.99
3	BR(Bio)15086-AC67-3-2	104	149	7.88
4	BR(Bio)15086-AC68-4	107	151	7.91
5	BR(Bio)15086-AC69-1	114	149	7.95
6	BR(Bio)15086-AC69-2	97	148	7.78
7	BR(Bio)15086-AC70-1	101	153	7.89
8	BR(Bio)15086-AC73-1	112	149	7.85
9	BR(Bio)15086-AC74-1	103	152	7.96
10	BR(Bio)15086-AC74-2	108	149	7.77
11	BRRI dhan89 (CK)	107	156	7.68
	CV	2.09	0.73	3.12
	LSD	4.69	2.3	0.49

Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya, Sentu Rahman, MA Monsur, MN Islam, MM Rana, T Halder, TK Roy

Activity 1.7.5: Secondary yield trial (SYT1) of the advanced lines
Specific Objective: i. To evaluate the yield potential of medium-duration advanced lines.
Materials and methods: Eleven (11) advanced lines were evaluated in a secondary yield trial (SYT-1) in Boro 2023-24 with 2 replications. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.
Result and Discussion: Nine (9) lines were selected from SYT-1 (Table 19) for further evaluation based on phenotypic acceptance, growth duration, and yield.

Principal Investigator: Ripon Kumar Roy
Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya, Sentu Rahman, MA Monsur, MN Islam, MM Rana, T Halder, TK Roy

Table 19: Agronomic characteristics of selected anther culture derived lines in SYT-1, Boro/2023-24

SL	Designation	PH(cm)	GD (day)	Yield (ton/ha)
1	BR(Bio)15086-AC11-1	105	150	7.78

2	BR(Bio)15086-AC12-1	107	150	7.68
3	BR(Bio)15086-AC13-2	108	150	7.71
4	BR(Bio)15086-AC14-6	102	149	7.79
5	BR(Bio)15086-AC16-4	109	150	7.75
6	BR(Bio)15085-AC27-2	102	151	7.84
7	BR(Bio)15085-AC28-2	103	151	7.74
8	BR(Bio)15085-AC38-1	103	148	7.85
9	BR(Bio)15085-AC62-1	107	150	7.73
10	BRRI dhan58(CK)	101	153	7.23
11	BRRI dhan89(CK)	104	157	7.73
	CV	1.0	0.68	5.53
	LSD	2.26	2.23	0.25

Activity 1.7.6: Secondary yield trial (SYT-2) of the advanced lines

Specific Objective: i. To evaluate the yield potential of long-duration advanced lines.

Materials and methods: Ten (10) advanced lines were evaluated in a secondary yield trial (SYT-2) in Boro 2023-24 with 2 replications. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.

Result and Discussion: Eight (8) lines were selected from SYT-2 (Table 20) for further evaluation based on phenotypic acceptance, growth duration, and yield.

Table 20: Agronomic characteristics of selected anther culture derived lines in SYT-2, Boro/2023-24

SL	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	BR(Bio)15085-AC1-4	113	163	7.82
2	BR(Bio)15086-AC13-6	110	161	7.93
3	BR(Bio)15086-AC16-1	111	163	7.86
4	BR(Bio)15085-AC29-5	108	161	7.98
5	BR(Bio)15086-AC58-1	110	159	7.89
6	BR(Bio)15086-AC58-3	107	159	7.89
7	BR(Bio)15086-AC59-6	113	159	7.95
8	BR(Bio)15086-AC59-8	110	164	7.93
9	BRRI dhan89 (CK)	108	159	7.60
10	BRRI dhan92 (CK)	110	163	7.66
	CV	0.39	0.20	5.19
	LSD	0.96	0.70	0.20

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya, Sentu Rahman, MA Monsur, MN Islam, MM Rana, T Halder, TK Roy

PROJECT II: DEVELOPMENT OF RICE VARIETY THROUGH SOMACLONAL VARIATION

Experiment 2.1: Development of antioxidant enriched black rice

Activity: 2.1.1 Observational yield trial (OT) of antioxidant enriched black rice lines

Specific Objective: To evaluate the yield potential of advanced lines.

Materials and methods: In the Aman 2023 season**,** 46 anther culture derived lines were grown as OT with standard checks. Each entry was grown in 5.4 m × 4 rows with 20 cm × 20 cm spacing. A single seedling was transplanted for each hill. Standard agronomic management practices followed in the cultivation period.

Results and discussion: Two doubled haploid lines were selected depending on the duration and yield performance and grain color with checks for further evaluation (Table 21).

Table 21: Agronomic characteristics of selected anther culture derived materials. OT-1, T. Aman/2023

SL. No.	Designation	PH	GD	Yield
1	Selasih-SC7-6-3-1-1	110	108	4.66
2	Selasih-SC7-6-3-1-2	108	108	4.35
3	BRRI dhan87	125	122	7.16

Principal Investigator: Jannatul Ferdous
Co-Investigator: Shahanaz Sultana, and Md. Enamul Hoque

Experiment 2.2: Development of premium quality (Kalijira type) variety through somaclonal variation

Specific Objective: To create somaclonal variation towards development of high yielding premium quality (Kalijira type) rice varieties

Activity 2.2.1: Progeny Selection of premium quality SCV

Specific Objective: To select the best plants with desirable traits.

Materials and methods: During T Aman 2023, Three hundred and twenty six (326) somaclonal variants (SCV_3) of Kalijira were grown using single seedling/hill at 20 cm × 15 cm spacing. Standard checks were planted after every 10^{th} row. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively in T. Aman season. Standard agronomic practices were followed.

Results and discussion Four hundred and forty one (441) somaclonal variants (SCV_4) of Kalijira rice were selected for further evaluation.

Principal Investigator: Shahanaz Sultana,
Co-Investigator: Jannatul Ferdous and Md. Enamul Hoque

Experiment 2.3: Development of premium quality rice variety through somaclonal variation

Specific Objective: To create somaclonal variation and select rice lines with high yield with desirable traits.

Activity 2.3.1: Progeny Selection of premium quality SCV

Specific Objective: To select the best plants with desirable traits.

Materials and methods: Seeds of Kataribhog, Tulshimala, Radhunipagol & Shakkhorkhana (Local varieties) were used in this experiment. Seed culture was done to create somaclonal variations. Thirty one (31) SC_1 plants derived from seed culture was field evaluated during the T. Aman 2023. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period.

Results and discussion: Thirty one (31) SC_1 plants derived from seed culture was field evaluated during the T. Aman 2023. In a total, 42 plants (SC_2) were selected from Kataribhog (13), Tulshimala (02), Radhunipagal (16) and Sakkarkhana (11) for generation advancement.

Principal Investigator: Nilufar Yasmin Shaikh
Co-Investigator: Ripon Kumar Roy, S M Hisam Al Rabbi

PROJECT III: DEVELOPMENT OF RICE VARIETY THROUGH WIDE HYBRIDIZATION

General Objective: To develop high-yielding Rice lines

Experiment 3.1: Development of rice variety through wide hybridization followed by embryo rescue

Activity 3.1.1: Progeny selection

Specific Objective: To develop high yielding and short duration rice lines through wide hybridization**.**

Material and methods: In a total, 38 backcross progeny plants (BC_2F_4) from different wide crosses were evaluated in T. Aman 2023. Among them 219 (BC_2F_5) plant were selected and evaluated in Boro 2023-24. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices were followed during cultivation period.

Results and discussion: In a total, 38 backcross progeny plants (BC_2F_4) from different wide crosses were evaluated in T. Aman 2023. Among them 219 (BC_2F_5) plant were selected and evaluated in Boro 2023-24. Among them 114 plants were selected for generation advancement (Table 22).

P**rincipal Investigator**: Nilufar Yasmin Shaikh

Co-Investigators: Ripon Kumar Roy, S M Hisam Al Rabbi

Table 22. Pedigree Selection from wide hybridization in Boro 2023-24

Designation (Generation: BC_2F_5)	Cross number	No. of plant evaluated	No. of Plant Selected
BRRIdhan28/ *O. glaberrima* IRGC105190	BR(Bio)13037	104	70
BRRIdhan87/ *O. glaberrima* IRGC105190	BR(Bio)13040	41	26
BRRIdhan48/ *O. glaberrima* IRGC105190	BR(Bio)13036	74	18
Total		**219**	**114**

Activity 3.1.2: Secondary Yield Trial (SYT) of lines derived from BRRI dhan28/*O. nivara* (IRGC103821) in Boro 2023-24

Specific Objective: To evaluate yield potential of advanced breeding lines in replicated trials

Materials and methods: Three (03) lines from BRRI dhan28/*O. nivara* (IRGC 103821) along with check BRRI dhan96 were field evaluated as SYT during Boro 2023-24. Each entry was grown in a 5.4 m × 8 rows having 25 cm × 15 cm spacing using single seedling/hill with three replications. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed.

Results and discussion: Three lines from BRRI dhan28/*O. nivara* (IRGC 103821) along with check BRRI dhan96 were field evaluated as SYT during Boro 2023-24 and none of the line was selected for further evaluation. These lines will be sent to Pathology division for screening of BB, Sheath Blight, Blast and Tungro resistant traits and GQN division for physicochemical properties.

Table 23. Agronomic characteristics of lines derived from wide cross of BRRI dhan28/*O. nivara* (IRGC103821) evaluated as SYT in Boro 2023-24.

Sl. No.	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	BR(Bio)13035-ERBC1-6-1 -1	101	142	6.91
2	BR(Bio)13035-ERBC1-6-1 -2	98	142	6.78
3	BR(Bio)13035-ERBC1-6-1 -6	98	144	6.90
4	BRRI dhan96 (Ck)	90	145	6.68
5	CV	0.80	0.40	3.37
6	LSD	0.55	1.14	0.29

Principal Investigator: Nilufar Yasmin Shaikh

Co-Investigators: Ripon Kumar Roy, S M Hisam Al Rabbi

Activity 3.1.3: Progeny Selection

Specific Objective: To select desired plant

Materials and methods: Five embryos rescued BC_2F_2 populations were grown in T.Aman 2023. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period

Result and Discussion: A total of 1111 plants (Table 24) were selected from five populations.

Table 24: List of cross combinations

SL	Designation	Generation	No. of selected plants
1	BR(Bio) 15863 BRRI dhan33*2/O. rufipogon(103404)	ERBC$_2$F$_3$	491
2	BR(Bio) 15864 BRRI dhan11*2/O. rufipogon(103404)	ERBC$_2$F$_3$	157
3	BR(Bio) 15865 BRRI dhan52*2/O. rufipogon(103404)	ERBC$_2$F$_3$	117
4	BR(Bio) 15866 BRRI dhan66*2/O. rufipogon(103404)	ERBC$_2$F$_3$	96
5	BR(Bio) 15867 BRRI dhan39*2/O. rufipogon(103404)	ERBC$_2$F$_3$	250
Total			**1111**

Principal Investigator: Ripon Kumar Roy

Co-Investigators: S.M. Hisam Al Rabbi, Nilufar Yasmin Shaikh, Md. Arafat Hossain, Shampa Das Joya

PROJECT IV: MOLECULAR MARKER ASSISTED SELECTION

General Objective: Development of rice variety through molecular marker assisted selection

Project Leader: EH

Experiment 4.1: Marker assisted selection for fragrance in F$_6$ Population of BRRI dhan87 and Kalijira.

Specific Objective: To develop high yielding aromatic rice

Activity 4.1.1: Progeny Selection

Specific Objective: To select desired plant

Material and Methods: 154 pedigree lines developed from a cross between BRRI dhan87 and Kalijira were grown in the field during T. Aman 2023. Each pedigree line was grown in a 5.4 m single row using single seedling/hill at 20 cm × 20 cm spacing. Standard checks were planted after every 10th row. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.

Results and discussion: One hundred and fifty four (154) pedigree lines developed from a cross between BRRI dhan87 and Kalijira were evaluated as pedigree. Among them 46 plants were selected on the basis of aroma, growth duration and plant height. All tested aromatic lines were confirmed by using functional marker of fragrance gene *BADH2*. The primers combination of ESP and IFAP amplified the fragrance specific allele at 257 bp. On the other hand, the primers combination of INSP and EAP amplified the expected non-fragrance-specific allele (355 bp).

Principal Investigator: Jannatul Ferdous,

Co-Investigators: S M Hisam Al-Rabbi and Md. Enamul Hoque

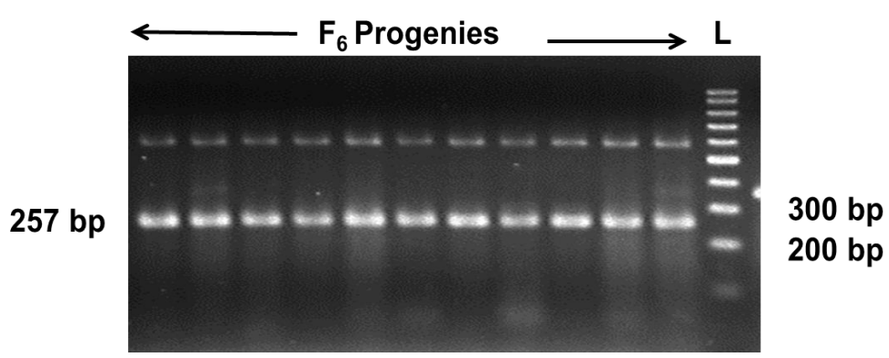


Fig 1: Marker assisted selection with functional marker of *BADH2* gene in F$_6$ Population of BRRI dhan87 and Kalijira

Experiment 4. 2: Marker assisted selection for aromatic and submergence tolerance rice genotype
Objective: To develop submergence tolerant aromatic genotypes

4.2.1 Activity: Marker assisted selection for aromatic and submergence tolerant gene
Specific Objective: To select desired plant using PCR
Materials and methods: F_1 plants were grown in net house and leaves were collected for DNA extraction followed by PCR.
Results and discussion: A three way cross, two doubled crosses and six crosses were made. Aromatic progenies were identified with functional marker of *BADH2* gene (Fig 2). Based on PCR thirty eight lines of different crosses were selected and seed were harvested from F_2 generation.

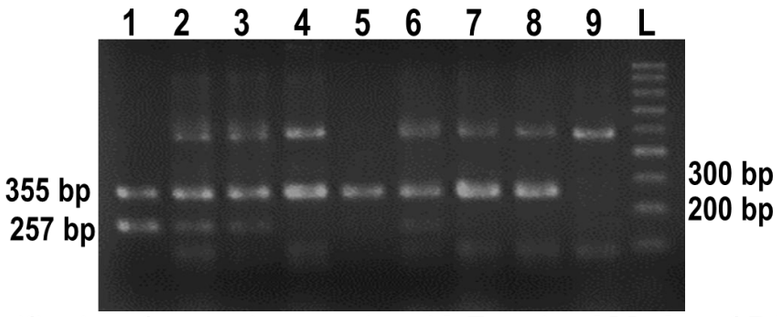


Fig 2. Identification of aromatic progenies with Functional Marker of *BADH2* gene
1-3=BRRI Dhan90/Kalijira// BRRI Dhan52/Kalijira
4-9= BRRI Dhan90//BRRI Dhan52/Kalijira

Principal Investigator: Jannatul Ferdous,
Co-Investigators: Shahanaz Sultana and Md. Enamul Hoque.

Experiment 4.3: Development of multiple disease resistant (blast and bacterial blight) rice varieties using marker assisted selection
Specific Objective: To introgress bacterial blight (BB) and blast resistant genes in high yielding rice variety

4.3.1 Activity: Marker assisted selection for blast and bacterial blight resistant gene
Specific Objective: To select desired plant using PCR
Materials and methods: F_3 plants were grown in net house and leaves were collected for DNA extraction followed by PCR.
Results and discussion: To develop multiple disease resistant (blast and bacterial blight) rice varieties F_3 plants of four crosses such as BR(Bio)11447-1-28-14-3/IR64Pi9 (L), BR(Bio)11447-1-28-14-3/IR64Pi9 (E), BR(Bio)11447-3-10-7-1/IR64Pi9 (L), BR(Bio)11447-3-10-7-1/IR64Pi9 (E) were screened with *Xa21*, *xa13* and NMSM primer and F_4 seeds were harvested from confirmed plants (Fig 3 & 4).

Principal Investigator: Jannatul Ferdous,
Co-Investigators: Shahanaz Sultana, Ashik Ikbal Khan and Md. Enamul Hoque

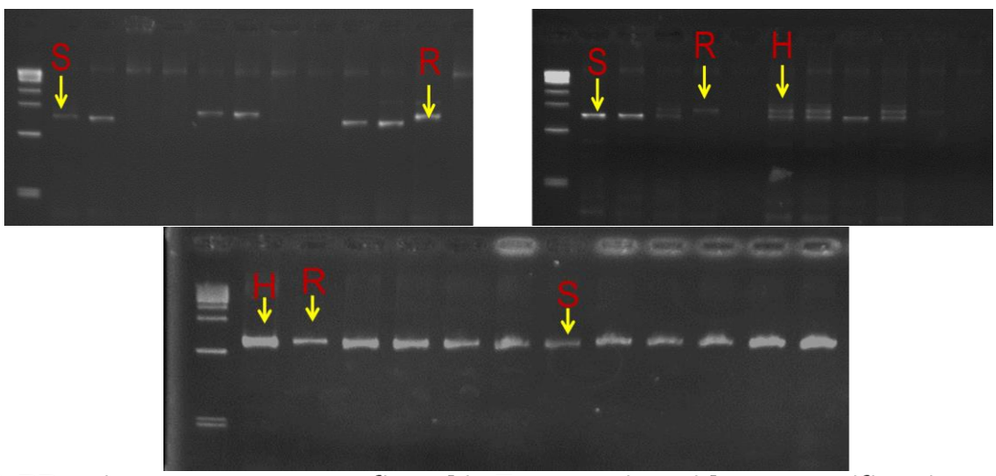


Fig 3. BB resistance gene were confirmed in F_3 generation with gene specific primer Xa21, xa13

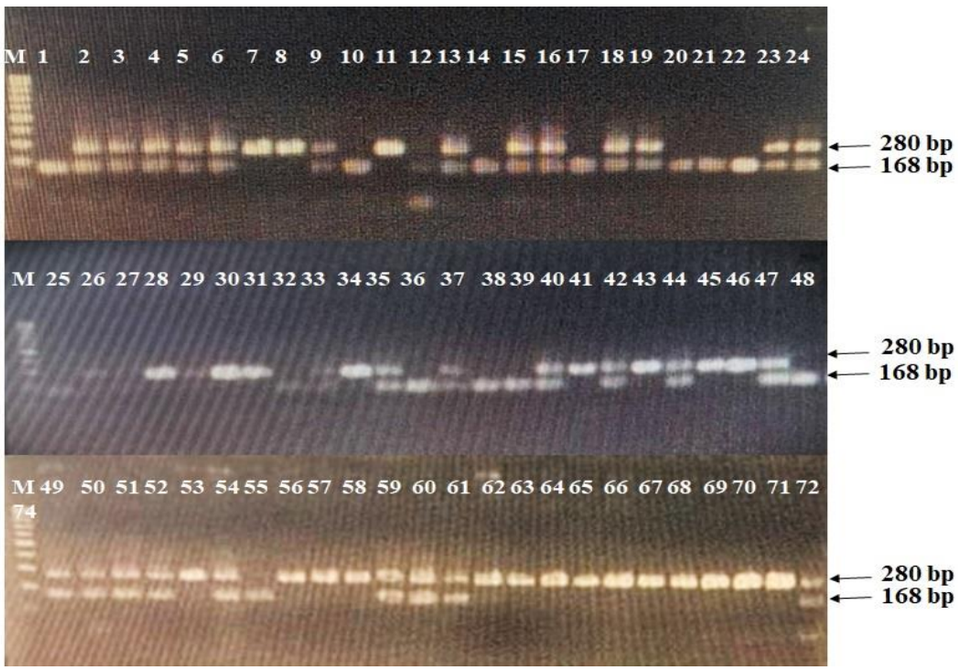


Fig 4. Blast resistance gene were confirmed in F_3 generation with primer NMSM

Experiment 4.4: Association mapping for rice Photosensitivity
Specific Objective: To identify genomic locations controlling photosensitivity

Activity 4.4.1: Phenotyping
Objective: to collect flowering data
Materials and methods: An association mapping panel of 158 accessions comprised of varieties, landraces, and advanced breeding lines of the T Aman season was used for the study. Heading data were taken in the short-day conditions for two years and long-day conditions for two years. They were raised in the shading facility under the plant physiology division of BRRI in the current year and data taking is being continued on the heading date for measuring rice photosensitivity.
Results and discussion: Heading dates are taken in the shaded condition. Heading data of unshaded rice germplasm is being continued for comparison with shaded rice data and measuring rice photosensitivity.
Principal Investigator: S.M. Hisam Al Rabbi,
Co-Investigators: Md. Arafat Hossain, Ripon Kumar Roy, Md. Sentu Rahman, and Munnujan Khanam

Experiment 4.5: Development of BB Resistance BRRI dhan87 through Marker assisted selection
Specific Objective: To develop BB resistant BRRI dhan87

Activity 4.5.1: Hybridization
Objective: To generate F_1 seeds
Materials and methods: In the Aman 2023 season, F_1 plants were produced by crossing two BB-resistant lines (BR(Bio)11447-3-10-7-1, BR(Bio)11447-1-28-14-3) with BRRI dhan87, and these F_1 plants were grown with BRRI dhan87 during the 2023-2024 Boro season for backcrossing.
Results and discussion: During the T. Aman 2023 season, 45 F_1 seeds were harvested from the cross between BR(Bio)11447-3-10-7-1 and BRRI dhan87, alongside 18 F_1 seeds from the cross between BR(Bio)11447-1-28-14-3 and BRRI dhan87. In the subsequent

Boro 2024 season, a total of 80 BC_1F_1 seeds were obtained from the backcrosses. The crossing details are outlined below in Table 25.

Table 25: List of cross combinations.

Sl No.	List of crosses	No. of seed harvested
1	BR(Bio)11447-3-10-7-1/ BRRI dhan87	45
2	BR(Bio)11447-1-28-14-3/ BRRI dhan87	18
3	BR(Bio)11447-3-10-7-1/ BRRI dhan87// BRRI dhan87	59
4	BR(Bio)11447-1-28-14-3/ BRRI dhan87// BRRI dhan87	21

Principal Investigator: Sentu Rahman
Co-Investigator: Jannatul Ferdous, Shahanaz Sultana, Md. Enamul Hoque

Experiment 4.6 Development of protein and vitamin E enriched high yielding rice
Objective: To develop protein and vitamin E enriched high yielding rice
Activity 4.6.1: Hybridization
Objective: To generate F_1 seeds
Materials and methods: In T. Aman 2023-24, three crosses were made using five parents.
Result and Discussion: Three crosses were made and total of 381 F_1 seeds were harvested (Table 26)

Table 26: List of cross combinations.

Sl. No.	Designation	No of F_1 seeds harvested
1	BRRI Dhan96/BRRI Dhan86	185
2	BRRI Dhan96/Pukki	93
3	BRRI Dhan90/Selasih-14-12-2	103
	Total	381

Principal Investigator: Jannatul Ferdous,
Co-Investigators: Shahanaz Sultana and Md. Enamul Hoque

Project V: RICE GENETIC ENGINEERING
General Objective: Development of stress tolerant transgenic rice variety.
Experiment 5.1: Introgression of salt tolerant mangrove gene
Specific Objective: To develop salt tolerant transgenic rice lines
Material and methods: Transgenic plant containing mangrove salt tolerant gene, *AeMDHAR* was crossed with BRRI dhan28 for the introgression of salt tolerant gene *AeMDHAR.*
Results and discussion: *AeMDHAR* salt tolerant gene (from mangrove plant) containing transgenic plant was crossed with BRRI dhan28 to introgress *AeMDHAR* salt tolerant gene. One hundred and twenty six BC_2F_4 plants were confirmed with gene specific primer (Fig 5) and seeds were harvested for further evaluation.

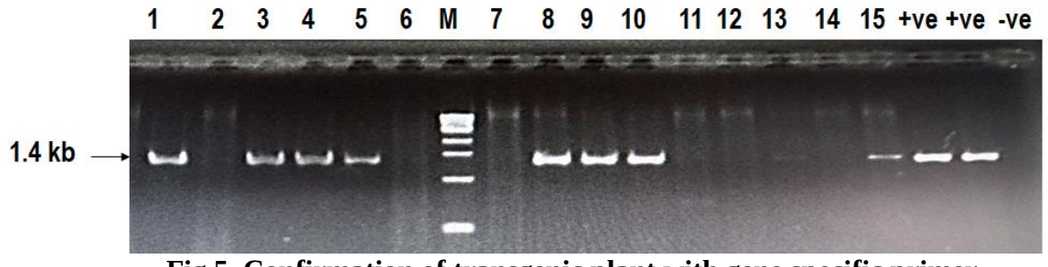


Fig 5. Confirmation of transgenic plant with gene specific primer

Principal Investigator: Shahanaz Sultana,
Co-Investigator: Shampa Das Joya, Jannatul Ferdous and Md. Enamul Hoque.

Experiment 5.2: Development of high yielding aromatic rice lines through genome editing

Specific Objective: To develop high yielding aromatic rice lines using CRISPR-Cas9 technology.

Materials and methods: To deactivate the function of *BADH2* gene, two primers were designed for construct preparation. Vector pRGEB31 was used in this experiment.

Results and discussion: To deactivate the function of *BADH2* gene, a construct was prepared and twenty one days old calli of BRRI dhan90 were used to transform with *BADH2* gene through *Agrobacterium* mediated transformation. Putative transformed calli are now in selection stage.

Principal Investigator: Shahanaz Sultana,

Co-Investigator: Jannatul Ferdous, S.M Hisam Al Rabbi, Shampa Das Joya, Md. Enamul Hoque, Hirendro Nath Barman

PROJECT VI: C4 RICE DEVELOPMENT

General Objective: To develop a C4 rice line

Experiment 6.1: Identification of major regulators for C4 rice

Specific Objective: To develop a C4 rice line

Materials and methods: This study is a background work for identifying major genes controlling C4 photosynthetic properties. *Setaria italica* (Kaoun), being a C4 crop was chosen for this study since this is a C4 crop having a comparatively smaller size and short life span. Therefore, we can handle more plants in small areas. Also, more generations can be carried out in a shorter time. Generation advancement was done for the plants with loss of C4 functions.

Results and discussion: Some 7000 M_4 lines of Kaoun (*Setaria italica*) have been developed for further study. These lines are gradually raised and subjected to CO_2 stress in low concentration (20 ppm) CO_2 chamber for 72 hours and high-throughput screening for loss of C4 functions was made. High throughput screening of 1100 mutant lines detected 26 lines losing C4 properties which are being maintained for future studies.

Principal Investigator: S. M. Hisam Al Rabbi,

Co-Investigator: Ripon Kumar Roy, Munnujan Khanam, Sazzadur Rahman

Experiment 6.2: Redesigning photosynthesis to enhance sustain rice yield potential under climate change

Specific Objective: To enhance photosynthesis

Materials and methods: Photosynthetic properties of rice can be enhanced by utilizing Uri dhan (*Oryza coarctata*) as it has been reported to be an intermediate towards C4 having Kranz anatomy. It has a larger bundle sheath and denser venation. But its chloroplasts in the bundle sheaths are rudimentary making it less efficient photosynthetically (Chowrasia et al., 2021). This can be improved by editing the hexokinase gene *(OsHXK1)* through CRISPR and making the Uri dhan, even more, closer to the C4 plant.

Results and Discussion: Primers have been designed (Table 27) and synthesized and two construct targeting two sites have been made for genome editing using pRGEB31 vector and sent for sequencing to check if the cloning was made accurately.

Principal Investigator: S. M. Hisam Al Rabbi,

Co-Investigator: Ripon Kumar Roy, Munnujan Khanam and Hirendra Nath Barman

Table 27: Primer list for OsHXK1

Primer name	**Primer sequence (5′→3′)**
HXT1-F:	GGCACCATGGTGATCAACACCGAG
HXT1-R:	AAACCTCGGTGTTGATCACCATGG

HXT2-F:	GGCAGCGCTCATCAACGACACCGT
HXT2-R:	AAACACGGTGTCGTTGATGAGCGC
HXSeq-F:	CTTGGGTTCACCTTCTCCTT
HXSeq-R:	TGCGTTCCAGCTTCTCG
HPT-F:	TGCTCCATACAAGCCAACC
HPT-R:	TGTCCTGCGGGTAAATAGC
PRGEB-F	ATTGAAAAGGCTAATCTGGGGACCT
PRGEB-R	CGTAGTGGGCCATGAAGCC

Experiment 6.3: Application of GAMMA-RAY radiation to develop mutants through radiation.

Specific Objective: To develop Kaoun genotypes losing C4 properties

Materials and methods: We have irradiated 20,000 Kaoun seeds with gamma rays having 10 different treatments (100 Gy, 200 Gy, 300 Gy, 400 Gy, 500 Gy, 600 Gy, 700 Gy, 800 Gy, 900 Gy, and 1000 Gy) to get at least 6000 mutant lines. We planted 100, 300, 700, and 100Gy gamma ray-treated seeds in the plots.

Results and Discussion: We got 222, 134, 18, and 0 seedlings comprising a total of 374 potentially mutant plants. Due to mutation, plants are showing huge variation in terms of plant height, flowering time, panicle size, etc. showing the effectiveness of the mutagenic agent. Selection is being carried out to get potentially mutant plants. So far 338 panicles have been selected.

Principal Investigator: S. M. Hisam Al Rabbi,

Co-Investigator: Ripon Kumar Roy, Munnujan Khanam, Sazzadur Rahman

PROJECT VII: DEVELOPMENT OF RICE VARIETY THROUGH MUTATION

General Objective: To develop high yielding and premium quality rice

Experiment 7.1: High yielding Aus rice varieties

Objective: to develop Aus rice variety

Activity 7.1.1: Observational yield trial (OT) of mutant BRRI dhan48 in Aus season

Specific Objective: To evaluate initial yield potential of advanced breeding lines

Materials and methods: During Aus 2023, 24 and 22 fixed lines of EMS treated variants of BRRI dhan48 were evaluated in two OT's with two check variety. Each entry was grown in a 5.4m × 4 rows having single seedling/hill at 20 cm × 15 cm spacing. Fertilizer was applied at 60:40:40:10:4 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.

Results and discussion: During Aus 2023, 24 and 20 fixed lines of EMS treated variants of BRRI dhan48 were evaluated as OT-1 and OT-2 with two check variety BRRI dhan48 and BRRI dhan98. Among them 3 and 7 lines were selected from OT-1 and OT-2, respectively for further evaluation (Table 28 and 29).

Table 28. Agronomic characteristics of mutant of BRRI dhan48. OT-1, Aus 2023

SL	Designation	PH(cm)	GD(days)	Yield(t/ha)
1	**T6-BR48-M-2-1**	**97**	**109**	**5.14**
2	T6-BR-48-8-1	103	109	4.28
3	T6-BR-48-8-2	109	109	3.26
4	T6-BR-48-8-3	108	109	4.59
5	**T6-BR-48-17-1**	**82**	**108**	**5.54**
6	T6-BR-48-22-4	83	108	3.20
7	T6-BR-48-25-2	118	121	2.78
8	T6-BR-48-25-3	100	107	4.24
9	T6-BR-48-28-1	99	108	4.32
10	T6-BR-48-28-2	97	108	4.87
11	T6-BR48-1-1	98	108	4.88
12	T6-BR48-1-2	104	108	4.98

13	T6-BR48-1-3	105	109	4.85
14	T4-BR48-83-1	101	109	4.34
15	T4-BR48-83-2	103	108	4.69
16	T4-BR48-83-3	106	109	4.63
17	T4-BR48-84-1	106	109	4.58
18	T4-BR48-84-2	97	109	4.54
19	T4-BR48-84-3	102	110	4.64
20	T6-BR48-26-1	93	103	2.16
21	T6-BR48-26-2	98	104	4.37
22	T6-BR48-26-3	91	105	2.93
23	**T6-BR48-26-4**	**99**	**110**	**5.05**
24	T6-BR48-26-5	99	110	4.56
25	BRRI dhan48 (Ck)	100	109	4.73
26	BRRI dhan98 (Ck)	98	111	5.29

Table 29: Agronomic characteristics of selected lines as OT-2, Aus 2023

SL	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	**T6-BR48-4-2-1**	**108**	**111**	**5.15**
2	T6-BR48-4-3-1	102	111	4.43
3	**T6-BR48-7-1-1**	**107**	**111**	**5.10**
4	T6-BR48-9-1-1	102	111	3.78
5	T6-BR48-9-2-1	105	111	4.29
6	T6-BR48-9-3-1	97	110	4.26
7	T6-BR48-11-1-1	109	107	3.99
8	T6-BR48-11-2-1	101	107	4.23
9	**T6-BR48-11-3-1**	**103**	**110**	**4.94**
10	T6-BR48-12-1-1	105	110	4.09
11	**T6-BR48-12-3-1**	**104**	**110**	**5.52**
12	T6-BR48-13-3-1	102	103	4.53
13	T6-BR48-13-4-1	103	106	3.79
14	**T6-BR48-13-5-1**	**119**	**110**	**5.11**
15	T6-BR48-14-3-1	104	110	3.65
16	T6-BR48-14-4-1	106	110	4.34
17	**T6-BR48-81-1-1**	**111**	**110**	**5.07**
18	T6-BR48-82-1-1	99	110	3.75
19	**T4-BR48-81-2-1**	**96**	**110**	**4.90**
20	T4-BR48-85-1-1	102	110	4.10
21	BRRI dhan48 (Ck)	100	109	5.4
22	BRRI dhan98 (Ck)	99	111	5.78

Principal Investigator: Shahanaz Sultana
Co-Investigators: Jannatul Ferdous, Shampa Das Joya, Md. Arafat Hossain, Md. Enamul Hoque

Experiment 7.2: Development of High yielding Aman rice varieties
Objective: to develop T Aman rice variety

Activity 7.2.1: Observational yield trial (OT) of mutant BR11 in T Aman season
Specific Objective: To evaluate initial yield potential of advanced breeding lines
Materials and methods: During T Aman 23, 222 fixed mutant of BR11 were evaluated as OT with check variety BR11, BRRI dhan71, BRRI dhan87, and BRRI dhan103. Each entry was grown in a 5.4m × 4 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.

Results and discussion: During T Aman 23, 222 fixed mutant of BR11 were evaluated as OT with check variety and twenty (20) lines were selected for further evaluation (Fig. 6 and Table 30)

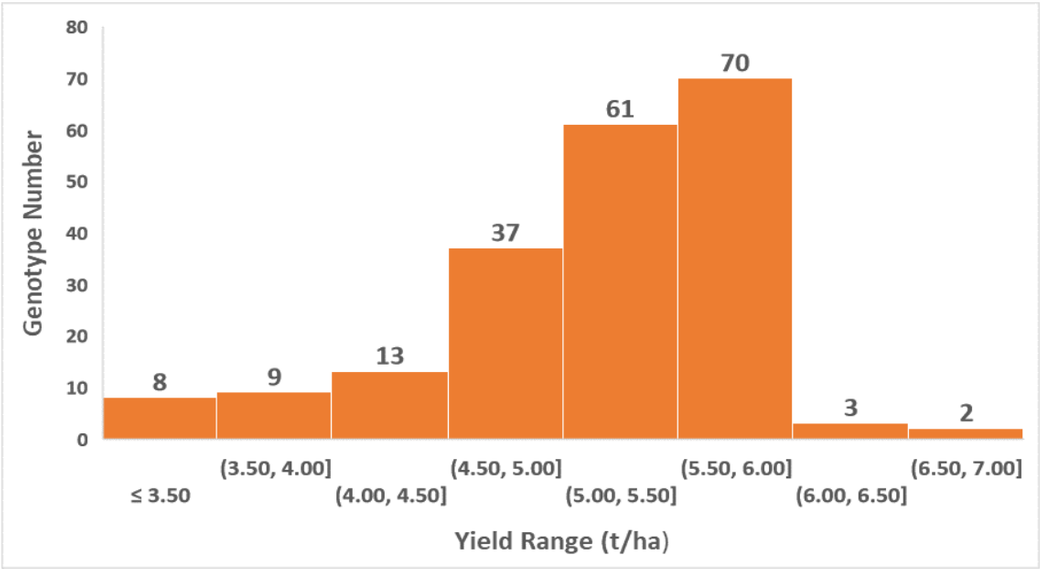


Figure 6. Yield of 222 fixed mutant lines of BR11 T. Aman 2023

Table 30: Agronomic characteristics of selected mutant line of BR11. OT, T. Aman 2023

Sl No	Designation	PH (cm)	GD (Days)	Yield (t/ha)
1	T4-BR11-26-1-1	138	132	7.00
2	T4-BR11-104-23-8-1	125	128	6.99
3	BR11 -M-1	120	132	6.24
4	T4-BR11-13-1-1	120	136	6.18
5	T4-BR11-112-1-1	133	133	6.02
6	T4-BR11-103-1-3	137	134	5.99
7	T4-BR11-49-1-2	135	129	5.98
8	T4-BR11-58-1-1	132	129	5.97
9	T4-BR11-12-1-1	118	132	5.95
10	BR11-M-3	123	132	5.93
11	T4-BR11-4-1-1	131	135	5.91
12	T4-BR11-16-1-1	113	136	5.91
13	T4-BR11-33-1-3	121	133	5.90
14	T4-BR11-35-1-2	121	132	5.87
15	T4-BR11-24-1-1	133	132	5.87
16	T4-BR11-18-1-1	120	132	5.86
17	T4-BR11-91-120-4-1	130	134	5.85
18	T4-BR11-38-1-2	127	132	5.84
19	T4-BR11-59-1-2	130	133	5.83

20	T4-BR11-52-1-1	136	135	5.83
21	BRRI dhan103 (Ck)	128	132	5.65
22	BRRI dhan71 (Ck)	125	116	5.00
23	BRRI dhan87 (Ck)	130	127	4.34

Principal Investigator: Shahanaz Sultana

Co-Investigators: Jannatul Ferdous, Shampa Das Joya, Md. Arafat Hossain, Md. Enamul Hoque

Experiment 7.3: Development of High yielding Boro rice varieties

Objective: to develop Boro rice variety

Activity 7.3.1: Preliminary yield trial (PYT) of mutant BR11 in Boro season

Specific Objective: To evaluate initial yield potential of advanced breeding lines

Materials and methods: During Boro 2023-24, four fixed mutant of BR11 were evaluated as PYT with check variety BRRI dhan74 and BRRI dhan96. Each entry was grown in a 5.4m × 8 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed.

Results and discussion: During Boro 2023-24, four fixed mutant of BR11 were evaluated as PYT with check variety and one line was selected for further evaluation (Table 31).

Principal Investigator: Shahanaz Sultana

Co-Investigators: Jannatul Ferdous, Shampa Das Joya, Md. Arafat Hossain, Md. Enamul Hoque

Table 31: Agronomic characteristics of selected mutant line of BR11. PYT, Boro **2023-24**

SL	Designation	PH (cm)	GD (days)	Yield (t/ha)
1	T4-BR11-17-1-3	103	151	5.90
2	T4-BR11-53-1-1	113	160	4.93
3	T4-BR11-53-1-2	117	154	5.99
4	**T4-BR11-104-23-8-4**	**115**	**149**	**7.28**
5	BRRI dhan74(ck)	97	142	6.46
6	BRRI dhan96(ck)	87	140	6.31
	CV (%)			11.42
	LSD (0.5)			1.28

Activity 7.3.2: Observational yield trial (OT) of mutant BR11 in Boro season

Specific Objective: To evaluate initial yield potential of advanced breeding lines

Materials and methods: During Boro 23-24, 60 fixed mutant of BR11 were evaluated as OT with check variety BRRI dhan74, BRRI dhan89, BRRI dhan92 and BRRI dhan96. Each entry was grown in a 5.4m × 4 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 137:17.5:62:10:2.25 of N, P, K, S and Zn kg/ha, respectively. Standard agronomic practices were followed.

Results and discussion: During Boro 23-24, 60 fixed mutant of BR11 were evaluated as OT with four check variety and six (6) lines were selected for further evaluation (Table 32).

Table 32: Agronomic characteristics of selected mutant line of BR11. OT, Boro **2023-24**

Sl	Designation	PH(cm)	GD(days)	Yield(t/ha)
1	T4-BR11-80-1-1	104	150	7.12
2	T4-BR11-97-1-3	107	154	6.88
3	T4-BR11-98-1-1	111	154	6.92
4	T4-BR11-104-23-8-1	114	155	6.76
5	T4-BR11-104-23-8-3	115	146	6.60
6	T4-BR11-104-23-8-4	116	145	7.41
7	BRRI dhan74	96	143	6.31
8	BRRI dhan89	114	155	7.35
9	BRRI dhan92	121	158	6.88
10	BRRI dhan96	88	140	6.50

Principal Investigator: Shahanaz Sultana
Co-Investigators: Jannatul Ferdous, Shampa Das Joya, Md. Arafat Hossain, Md. Enamul Hoque

Experiment 7.4: Development of Kilijira type rice variety through mutation
Specific Objectives: To develop high yielding short stature aromatic Kilijira type rice varieties
7.4.1 Activity- Pedigree Selection
Specific Objective: To select desired plant
Materials and methods: Seed from 91 M_3 Kilijira lines were transplanted in T Aman 2023. Each entry was grown in a 5.4m × 1 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.
Results and discussion: One hundred and sixty eight (168) M_3 Kilijira lines were transplanted in T Aman 2023 along with check and 271 plants were selected based on aroma and plant height for further evaluation
Principal Investigator: Shahanaz Sultana,
Co-Investigator: Jannatul Ferdous, S.M Hisham Al Rabbi, Shampa Das Joya and Md. Enamul Hoque.

Experiment 7.5: Development of Premium Quality Rice through Mutation by EMS
Specific Objectives: To develop high yielding, short duration, short stature plant type aromatic rice lines
7.5.1 Activity- Pedigree Selection
Specific Objective: To select desired plant
Materials and Methods: EMS treated seeds of local variety (Tulshimala) were used in this experiment. Thirty-One (31) plants (M_3) of Tulshimala obtained through mutation by EMS were field evaluated during T. Aman 2023. A single seedling was transplanted for each hill with 20 cm × 20 cm spacing. Standard agronomic management practices followed in the cultivation period. Pedigree selections were done with desirable traits.
Results and Discussion: Thirty-One (31) plants (M_3) of Tulshimala obtained through mutation by EMS were field evaluated during T. Aman 2023. Among them 47 plants (M_4) were selected from them for generation advancement.
Principal Investigator: Nilufar Yasmin Shaikh
Co- Investigator: Ripon Kumar Roy, S M Hisam Al Rabbi and Md Arafat Hossain

Experiment 7.6: Development of High Yielding Sheath Blight Resistant Rice Variety

Objective: To develop Sheath Blight Resistant Rice Variety

7.6.1 Activity- Pedigree Selection

Specific Objective: To select desired plant

Specific Objectives: Sheath Blight resistant lines through mutation by EMS

Materials and methods: During T. Aman 2023, 60 M_3 mutant population of BRRI dhan87 were grown for evaluation.

Results and discussion: In T. Aman 2023, based on phenotypic acceptance, growth duration and disease reaction, 117 plants from M_4 generation were selected for further evaluation.

Principal Investigator: Md. Arafat Hossain,

Co-Investigator: S.M Hisam Al Rabbi, Ripon Kumar Roy, Md. Sentu Rahman and Shamima Akter

Experiment 7.7: Development of rice variety through mutation by Gamma Ray

Specific Objectives: To develop high yielding short stature rice varieties

7.5.1 Activity- Pedigree Selection

Specific Objective: To select desired plant

Materials and methods: M_2 generation of Gamma radiation treated (350Gy and 450Gy) seeds of 7 rice genotypes were transplanted in T Aman 2023**.** Each entry was grown in a 5.4m × 1 rows having single seedling/hill at 20 cm × 20 cm spacing. Fertilizer was applied at 92:12:41:10:1.8 of N, P, K, S, Zn kg/ha respectively. Standard agronomic practices were followed.

Results and discussion: A total 50 and 41 M_3 plants from 350Gy and 450Gy were harvested respectively for further evaluation (Table 33).

Principal Investigator: Shahanaz Sultana,

Co-Investigator: Jannatul Ferdous, Md. Sentu Rahman and Md. Enamul Hoque

Table 33: List of selected materials during T Aman 2023

Sl no	Genotype	Selected lines	
		Treatment	
		350Gy	450Gy
1	BRRI dhan34	1	19
2	BRRI dhan87	25	11
3	BRRI dhan103	5	1
4	Kalijira	10	2
5	Gainja	2	-
6	Selasih	7	1
7	Elai	-	7
Total		**50**	**41**

PROJECT VIII: BASIC RESEARCH

Experiment 8.1: Studies on Kernel Elongation of Rice

General Objective: Development of long slender rice variety with high kernel elongation (>1.7)

Activity 8.1.1 Screening of rice genotypes with high kernel Elongation

Specific Objective: to identify the rice variety with high kernel elongation (>1.7)

Materials and methods: Sixty four selected genotypes were grown in T Aman, 2023 and seed were harvested from single plant. Seeds from 10 genotypes were used for physico-chemical properties analysis.

Results and discussion: Sixty four selected genotypes were grown in T Aman, 2023 and seed were harvested from single plant. Seeds from 10 genotypes were used for physico-chemical properties analysis. Kernel length varied from 3.6 to 7.1 mm (Table 34). Highest kernel elongation was observed in GulTepi (1.6) followed by Bashmati 385(AC-4905)(1.59) and lowest in Bashmati 370 (AC-4904) (1.5). Highest amylose content was found in Bashmati PARDNR442 (IRGC-27792) (AC-4497) (22.22%) and lowest in Bashmati (IRGC-3647) (AC-4488) (7.5%)

Table 34: Physicochemical properties of selected genotypes.

Sl no	Name of genotypes	Kernel Length of milled rice (mm)	Kernel elongation	Amylose content (%)
1	Bashmati39(IRGC-6448) (AC-4491)	6.8	1.53	18.76
2	Bashmati 370(AC-4904)	6.84	1.5	20.80
3	Bashmati 385(AC-4905)	5.98	1.59	20.56
4	Bashmati370(IRGC-9026) (AC-4492)	6.3	1.58	19.84
5	BashmatiPARDNR442 (IRGC-27792) (AC-4497)	6.64	1.57	22.22
6	Bashmati (IRGC-3647) (AC-4488)	6.66	1.5	7.25
7	BASHMATI-134(IRGC-27809) (AC-4502)	6.7	1.53	20.74
8	Bashmati 372B(IRGC-27825)(AC-4504)	6.24	1.55	19.93
9	Bashmati 377(IRGC-27820) (AC-4507)	7.1	1.52	20.09
10	GulTepi (131891)	3.56	1.6	21.85

Principal Investigator: Shahanaz Sultana,

Co-Investigator: Jannatul Ferdous, Shampa Das Joya, Md. Enamul Hoque, Habibul Bari Sojib