ANNUAL RESEARCH REVIEW WORKSHOP
2022-23

AREA-I:
VARIETAL DEVELOPMENT PROGRAMME (VDP)

COMPONENT – 1A
RICE BREEDING

PLANT BREEDING DIVISION
BANGLADESH RICE RESEARCH INSTITUTE
GAZIPUR -1701

CONTENTS

Personnel of the Plant Breeding Division, July 2022-June 2023

SN	Name and Designation	Working days
GOB		
1	Dr. ASM Masuduzzaman, PhD, Chief Scientific Officer,	365
2	Dr. Khandakar Md. Iftekharuddaula, PhD, Chief Scientific Officer and Head	365
3	** Dr. Partha Sarathi Biswas, PhD, Chief Scientific Officer	365
4	Dr. Md. Abdul Kader, PhD, Chief Scientific Officer	365
5	*** Mohammad Amir Hossain, PhD, Principal Scientific Officer	210
6	**Dr. Mohammad Akhlasur Rahman, PhD, Principal Scientific Officer	365
7	Dr. Mahmuda Khatun, PhD, Principal Scientific Officer	365
8	**Dr. Md. Ruhul Amin Sarker, PhD, Senior Scientific Officer	365
9	* Dr. Sharmistha Ghosal, PhD, Senior Scientific Officer	297
10	* Dr. Ratna Rani Majumder, MS, Senior Scientific Officer	322
11	Dr. Md. Anisuzzaman, MS, Senior Scientific Officer	365
12	* Dr. Hasina Khatun, PhD, Senior Scientific Officer	297
13	*Tapas Kumer Hore, MS, Senior Scientific Officer	365
14	Dr. Shiekh Maniruzzaman, PhD, Senior Scientific Officer	365
15	* M M Emam Ahmed, MS, Senior Scientific Officer	83
16	Sanjoy Kumer Debsharma, MS, Scientific Officer	365
17	Nusrat Jahan, MS, Scientific Officer	365
18	Urmi Rani Shaha, MS, Scientific Officer	365
19	Md. Ruhul Amin, Scientific Assistant	365
20	Md. Shariful Islam, Scientific Assistant	365
21	Md. Hasibul Hossain, Scientific Assistant	365
22	Prosenjit Das, Scientific Assistant	365
23	Md. Nazmul Haque, Scientific Assistant	0
24	Md. Abdul Malek, DMO	365
25	Md. Ranju Khan, LA	365
26	** Sharmin Akter Sweety, MLSS	34
Project		
27	Ribed Farzana Disha, MS, Scientific Officer (TRB)	365
28	Md. Yeakub Khan, MS, Scientific Officer (TRB)	365
29	Zabid Al Riyadh, MS, Scientific Officer (TRB)	365
30	Jannatul Ferdousy, MS, Scientific Officer (TRB)	365
31	Mahmuda Maliha Yasmin, MS, Scientific Officer (TRB)	365
32	**Afroza Awal Shoily, MS, Scientific Officer (TRB)	273
33	Md. Istiak Hossain Joy, MS, Scientific Officer (TRB)	303
34	Md. Mostafa Bin Afzal, MS, Scientific Officer (SDLTR)	61
35	****Muhtasim Billah Sajid, MS, Scientific Officer (TRB)	0
36	****Md Motalib Hossain, MS, Consultant, PARTNER	0
37	Md. Azizul haque, Scientific Assistant (TRB)	365
38	Sabuj Kumar Datta, Scientific Assistant (TRB)	365
39	S M Mizanur Rahman, Scientific Assistant (TRB)	365
40	Md. Syful Islam, Scientific Assistant (TRB)	365
41	Probir Chandra Sen, Scientific Assistant (TRB)	365
42	Md. Mosharuf Hossain Raju, Scientific Assistant (TRB)	365
43	Md. Muktar Hossain, Scientific Assistant (TRB)	365
44	Biswajit Tarafder, Accounts Officer (TRB)	365
45	Md. Mahfuj Alam, Accounts Officer (TRB)	365

*** Deputed for higher Study/Office of the Director (Research)**

**** Transferred to /from Regional Station, *** Resigned from BRRI; **** Newly join**

Summary

For the development of rice varieties under different ecosystems 695 crosses were made and 530 crosses were confirmed during 2022-23. A total of 5,31,077 individual plants were advanced from F_{2-6} generation following single seed decent (SSD) method under rapid generation advance (RGA) technique. From Line-Stage Testing (LST) trial, 6,430 genotypes were selected based on yield and other agronomic performances. A total of 1,639 genotypes from observational yield trial (OYT) and 1014 advanced breeding lines were selected from different yield trials (PYT, SYT, AYT, RYT, ALART and PVT). A total of 49 germplasm from different biotic and abiotic screening nurseries were selected during T. Aman and Boro season to use as parents in the breeding programme. National Seed Board (NSB) of Bangladesh has released two promising genotypes *viz* BR8862-29-1-5-1-3 and BRC266-5-1-1-1 as BRRI dhan104, BRRI dhan105, respectively, for cultivation throughout the country in Boro season and BR8781-16-1-3-P2 has been released as BRRI dhan106 for non-saline tidal submergence areas for Aus season. BRRI dhan104 is a premium quality aromatic Basmati type high yielding Boro rice variety. The size and shape is extra-long slender (7.5 mm) with white color grain of newly developed Basmati type variety. It is a strong aromatic rice variety (according to GCMS system the value of volatile aromatic compound is 2.12 ppm). Its grain contains 29.2% amylose and 8.9% protein. Weight of 1000 matured grain of the variety is around 21.5 grams. The average yield of BRRI dhan104 is 7.30 t/ha with 147 days growth duration, its potential yield can be obtained up to 8.71 t/ha under favorable environment and appropriate agronomic management. BRRI dhan105 is high yielding low GI Boro rice for cultivation throughout the country. The average yield of BRRI dhan105 is 7.6 t/ha with 148 days' growth duration, its potential yield can be attained up to 8.5 t/ha under favorable environment and appropriate agronomic management. As the GI value of this rice variety is 55, so it can be categorized as a low GI or diabetic rice. The amount of amylose and protein content of the BRRI dhan105 is 27.0% and 7.3%, respectively. BRRI dhan106 is a high yielding rice variety suitable for non-saline tidal submergence prone areas for T. Aus season. The average yield of BRRI dhan106 is 4.8 t/ha with growth duration 117 days. Lodging tolerance is the special feature of this variety. Amylose and protein content of BRRI dhan106 is 27.2% and 8.5% respectively. This variety can produce around 17% higher grain yield than BRRI dhan27.

Development of Upland Rice (B. Aus). Efforts were made to develop upland rice varieties with multiple traits such as quick seedling emergence, vigorous growth, shorter growth duration (90-100 days); tolerance to lodging and drought and pre-harvest sprouting tolerance; medium bold to medium slender grains and good eating and cooking quality. In 2022-23, eleven crosses were made using 17 parents. Out of seven crosses, six crosses were confirmed as true F_1 through hybridity test. Out of 2,262 lines, a total of 64 genotypes derived from14 crosses were selected from LST trial based on uniform flowering, grain type traits and phenotypic acceptability under field condition. In OYT trial, twenty-seven entries were selected out of 207 advanced breeding lines considering growth duration, yield, uniformity of morpho-agronomic traits and superiority in one or more traits over the standard checks. Eight genotypes such as BR12236-5R-6, BR12244-5R-24, BR12248-5R-18, BR12248-5R-22, BR12248-5R-37, BR12248-5R-65, BR12248-5R-122 and BR12263-5R-75 were selected from 15 tested entries on the basis of yield and short growth duration in PYT-1. In PYT-2, four genotypes were selected namely, BR12239-5R-136, BR12244-5R-190, BR12246-5R-97 and BR12248-5R-31 from fourteen advanced lines and in PYT-3 trial, seven genotypes were evaluated but none of the entry was selected. Four genotypes viz. BR11262-B-109-3-47, BR10756-2B-8-72, BR10409-15-2-8 and BR10417-15-2-11 were selected out of seven tested entries in SYT.

Development of Jhum Rice. Program was implemented aiming at high yielding rice variety along with drought tolerance, less fertilizer use efficiency, good eating quality acceptable to tribal people of Chattogram hill districts following their traditional cultivation practices (Dibbling method of planting associated with other crop species). Seventeen crosses were made using promising parental genotypes from local Jhum cultivars namely Chikon Chakma, Patri dhan, Gunda-1, Mojenshi, Kalo Binni, Sumodhan, Ranqui; exotic varieties (Japanese Black rice, DR-6, Abhaya,

Basmati); BRRI varieties (BR24, BRRI dhan55); promising advanced breeding lines (BR12239-5R-197, BR10418-54-4-96, BR10411-54-6-33, BR12239-5R-93, BR10756-28-8-12, BR12234-4R-209 and BR10756-28-8-72) having good performance in terms of yield in rainfed situation, drought tolerance capacity and other remarkable traits following respective product profile. Seven crosses were confirmed as true F_1. Six F_2 population were grown for generation advance through field RGA (Rapid generation advance). A total of 9,180 progenies obtained from 17 crosses of F_4 generation were advanced through field RGA. Twenty-three entries were selected from 48 tested genotypes in OYT were selected. In the reporting year, four preliminary yield trials (PYT) were executed. Among these, four genotypes were tracked better to promote from fourteen evaluated genotypes in PYT-1. No entries were selected in PYT-2 due to poor performance better than the check varieties. In PYT-3, only six genotypes out of 18 were better yielder performance over the checks. In PYT-4 trial, none of the entry was promoted for succeeding trial considering growth duration, yield and phenotypic acceptability. Seven genotypes out of 16 entries were selected in SYT. An advanced yield trial was conducted in six locations of three hilly districts (Khagrachari, Rangamati and Bandarban) of Bangladesh. Eight genotypes including BRRI dhan83 as standard check and one local check i.e., most popular cultivar specific to each location were evaluated. The other six common genotypes for each of the six trials were Chinese Rice, Japanese black rice, Mongthongno, IR1-DQ157-R6-D1, GSR IR1DQ121-Y6-D2 and BR(Bio)10376-AC4-1-3. Among all the entries, despite heterogeneity in climatic condition and topographic architecture, BRRI dhan83 was the top yielder in every trial.

Genetic Improvement of Partially Irrigated Rice (T. Aus). The project was aimed to develop short duration (105-110 days), high yield potential genotypes having tolerance to lodging and heat (high temperature) at the reproductive phase, pre-harvest sprouting and good grain quality. In total, 30 crosses were made using 40 parents and 4,127 F_1 seeds were obtained; 23 crosses were confirmed as true F_1; 24,300 progenies of 53 crosses in T. Aus season were advanced through modified field rapid generation advance (FRGA) technique. Out of 7,700 lines of 22 crosses, 792 uniform lines were identified from LST based on uniformity in heading, plant height, and acceptable grain type in the field condition. Finally, 697 fixed lines were selected from 792 lines on the basis of trait genotyping with 12-SNP indica panel. Forty genotypes were selected out of 318 entries in observational yield trial (OYT), twenty-four advanced lines were selected out of 195 from AYT#1 and AYT#2 for T. Aus growing areas of Bangladesh on the basis of homogeneity with respect to plant height, phenotypic acceptability at vegetative and maturity stages and physicochemical properties. Three genotypes were selected from RYT#1 and two genotypes were selected from RYT#2 for non-saline tidal ecosystem, along with the check BRRI dhan27, BRRI dhan48 and BRRI dhan98. The proposed line BR8781-16-1-3-P2 was evaluated along with the check variety BRRI dhan27 under PVT in six locations of non-saline tidal T. Aus growing areas of Bangladesh. Finally, proposed line was recommended to release as variety BRRI dhan106. Lodging tolerance is the special feature of this variety. Amylose content is 27.2% and protein content of this variety is 8.5%.

Evaluation of heat resilient varieties with reduced impact of combined high day and high night temperatures on rice productivity with added premium grain quality for improving livelihoods in South and Southeast Asia under AYT. The experiment was conducted at five locations namely Gazipur, Rajshahi, Kushtia, Lalpur and Dinajpur during late Boro2022-23. Sixteen entries including two checks BRRI dhan98 (local check) and N22 (tolerant check) were evaluated under Participatory Variety Selection (PVS) at four locations namely Rajshahi, Kushtia, Lalpur and Dinajpur. PVS preference analysis for each entry was done by the PVS evaluation team consisting of male and female farmers, researchers, DAE personals, scientific assistant (SA), sub assistant agricultural officer (SAAO), seed dealers, rice millers, seed producer, local leaders, local NGO's. Each participant was provided six paper ballots (three for positive entries and three for negative entries) and they were given necessary instructions on how to cast ballots for best and worst breeding lines. After casting the votes, these were counted by the scientists and displayed in front of the farmers using the flip chart board. Considering all the locations IRRI 154 (PVS-2), IR18C1005 (PVS-3), IR18C1010 (PVS-8), IR18C1002 (PVS-12), IR18C1004 (PVS-14) and

BRRI dhan98 (PVS-15) were selected under PVS program. Among the selected genotypes, IRRI154 (PVS-2) and IR18C1004 (PVS-14) were got the maximum time positive first and second ranked in the trial sites.

Improvement of rice for shallow flooded and deep-water environment. The major objectives of the project were to develop high yielding (4.0-5.0 t/ha) rice varieties for deep water (>1.0 m), shallow flooded area (up to 1.0 m depth), shallow deep-water area (30 cm water) and medium deep-water area (50-60 cm water) along with submergence, facultative elongation and hypoxia tolerance. In total, 23 crosses were made by using 20 parents and produced 2,500 F_1 Seeds. In total seven F_1s crosses were confirmed through QC SNP panel analysis. A total of 11,754 progenies from 73 crosses (3,064 progenies of 15 F_2 crosses, 3,295 progenies of 19 F_3 crosses, 3,541 progenies of 20 F_4 crosses, 1,881 progenies of 19 F_5 crosses) were advanced through RGA. In yield trials, 34 genotypes were selected out of 83 genotypes. In OYT trial, the genotype BR11186-5R-119 gave highest yield (3.5 t/ha) which is significantly higher than the check variety BRRI dhan91 (1.8 t/ha) whereas in AYT the genotype BR11186-5R-549 (3.5 t/h) gave highest yield which was significantly higher than the check variety BRRI dhan91 (1.7 t/ha). The heritability obtained for growth duration was ranging from 82% to 88% and grain yield was ranging from 61 % to 74% indicating acceptable level of precision in these experiments. Through maintenance breeding 15 shallow flood tolerant genotypes and landraces were grown and maintained for future breeding purpose.

Two lines namely BR10230-7-19-2B (3.1 t/ha) and BR9392-6-2-1B (3.0 t/ha) were selected out of six genotypes in the ALART under deep water (100-150 cm) condition. The ALART materials were suggested for evaluating as re-trial due to damage of crops by heavy flood in four locations. On the other hand, BR10260-5-15-21-6B was evaluated in PVT trial and this line produced 1.45 t/ha more yield than the check variety BRRI dhan91. However, the PVT material was suggested to evaluate as re-trial due to damage of crops in three locations. In T. Aman (stagnant water) 2022-23, RYT#Tall materials were evaluated with four breeding lines and check BRRI dhan91. The highest yield was observed in the advanced line BR10247-14-18-7-3B (4.94 t/ha) followed by the line BR10238-5-1-9-3B (4.82 t/ha) and BR9892-8-2-2B (4.70 t/ha).

Development of rainfed lowland rice (RLR): The project aims to develop genotypes superior to standard varieties and adaptable to rainfed lowland environment in T. Aman season. 5,329 F_1 seeds were obtained from 32 single crosses and 35 crosses were confirmed as true hybrids using 10-SNP *indica* QC panel. A total of 8,362 individual progenies of 27 crosses from F_3 and F_5 generations were harvested from T. Aman season through RGA method. The materials were advanced in Boro 2022-23 season and 20,000 progenies of 59 crosses from F_2 and F_4 generations were harvested in Boro season at Gazipur through RGA method. A total of 384 genotypes were selected out of 6,651 progenies of Line Stage Testing (LST) trial with 5.66% selection intensity. A total of 507 genotypes were evaluated in two Observational Yield Trials (OYTs) in Gazipur, Cumilla and Rangpur. Among the tested genotypes 104 genotypes were selected and forwarded in Advanced Yield Trial (AYT). In Advanced Yield Trial (AYT) 26 genotypes were evaluated in two trials in Gazipur, Cumilla and Rangpur and 16 genotypes were found as promising for advanced. None of the genotypes were found promising from IRLON (International Rainfed Lowland Observational Nursery) out of 28 fixed lines. Secondary Yield Trial (SYT) containing three tested genotypes, only one was advanced based on grain yield. Among the four tested genotypes of Regional Yield Trial (RYT) none was advanced for ALART due to not significant higher yield performance.

Development of rice varieties for favorable Boro environment: The aim of this project was to develop improved genotypes with high yield potential (≥8.0 t/ha), earliness (135-145 days) and accepted grain quality for favorable irrigated ecosystem in Bangladesh.

Thirty-four crosses were made using 29 promising lines/varieties as parents targeting to develop high yielding breeding lines enriched with favorable alleles of key target traits, viz. disease resistance (blast and BLB), insect resistance (BPH) and acceptable grain quality (amylose, chalkiness, palatability, zinc content etc.). Thirty-six crosses were confirmed as true F_1 through a hybridity test using QC SNP genotyping. In total 29,069 individual progenies from 118 cross combinations of F_2-F_5 generations were advanced in the RGA nurseries following single seed decent method of breeding. Out of 2,548 lines tested in LST, 259 fixed lines were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape. Finally, 219 lines were selected based on the presence of favorable alleles of high amylose specific Wx, blast resistance, BB resistance, BPH resistance and cold tolerant genes**.** The genotypic profiles showed that all the selected lines had favorable alleles for high amylose specific markers Wx(a), Wx-10, 9 lines had blast resistant gene Pi9. In contrast, 23 lines had favorable allele for BB resistance gene xa5 and 29 lines had Xa21 gene. However, 67 lines had seedling stage cold tolerant allele SCT1. Total 6 lines had reproductive stage cold tolerant gene *qPSST3*, 57 lines had *qPSST7* and 5 lines had heat tolerance gene *qPSST9*.

In OYT trial, thirty-nine genotypes were selected out of 694 fixed lines which was tested in four locations following sparse testing model of genomic selection. The selection was done based on genomic BLUP for yield. Genomic BLUP values were estimated using genome-wide genotyping data and phenotypic values for yield of training population tested at MLT sites. Thirty-six breeding lines were tested in advanced yield trial (AYT) at two locations under three categories, AYT-Early, AYT-ML. In AYT-Early, three genotypes out of 15 entries showing around 6.8 -7.5 t/ha grain yield potentiality with 149- 153 days growth duration. From AYT_ML, six genotypes showing 5.44 -6.76 t/ha grain yield potentiality with 153- 154 days growth duration.

31 advanced breeding lines were tested at nine research stations including HQ of regional yield trial (RYT) under short, medium, long maturity classes and extra-long slender. In RYT (SD) three breeding lines showed 150 days, 152 days and 144 days growth duration with 0.32 t/ha, 0.35 t/ha and 0.75 t/ha higher yield, respectively over BRRI dhan96 (yield 6.24 t/ha growth duration 144 days); three breeding lines showing 6.4-7.1 t/ha yield with 152 days growth duration while both the check varieties BRRI dhan81 and BRRI dhan89 yielded 5.0 t/ha and 7.1 t/ha in RYT (MD). In RYT (LD) the advanced lines BR11318-5R-148, BR11318-5R-84 and BR11894-5R-260 produced similar yield to the check variety BRRI dhan89 (7.4 t/ha). Among three varieties BR11318-5R-84 showed similar growth duration and yield was 0.58 t/ha higher yield than the check variety BRRI dhan89. Besides, four breeding lines BR7528-2R-19-16-RIL-52, BR7528-2R-19-16-RIL-55, BR7528-2R-19-16-RIL-59 and BR9945-5R-21 yielded more than 0.6-0.8 t/ha yield advantage over BRRI dhan50 with similar growth duration were selected for further advancement in extra-long slender category.

Development of salt tolerant rice (STR). The objective of this project is to develop high yielding salt tolerant rice cultivars based on product profile. Salinity is one of the major constraints for the rainfed lowland and Boro rice ecosystem in the southern coastal zone of Bangladesh. In T. Aman season, 29 crosses were made using 40 well characterized elite parents with higher genetic merit/breeding values and various alleles of interest. A total of 39 F_1s were confirmed as true hybrids through hybridity test via F_1 verification by quality check (QC) genotyping with purity SNP panel during T. Aman season. In T. Aman season, 41192 segregating progenies derived from 110 crosses were advanced in F_2-F_5 generations using FRGA technique. Yield trials were carried out in Gazipur, Debhata, Kaliganj and BRRI Farm, Satkhira in T. Aman season. In LST, out of 5085 breeding lines of 30 crosses, 452 lines were selected on the basis of strong culm with good plant ideotype, acceptable grain type and uniformity at heading in field condition.

Out of 772 genotypes, 237 genotypes were selected from OYT. Four PYTs (PYT-1 to PYT-4) were conducted using 179 breeding lines by following alpha lattice design. One hundred seven genotypes were selected from these trials depending on grain yield, salinity tolerance and phenotypic acceptability.

Forty-five genotypes, out of 105 genotypes were selected from AYT-1 and AYT-2. In ALART, three genotypes were evaluated and one genotype (BR11716-4R-102) was recommended for PVT. The mean grain yield of selected line (BR11716-4R-102) ranged from 3.30 t/ha to 6.52 t/ha in ten locations which were significantly higher than the check varieties.

In Boro Season, 35 crosses were made using 64 detailed characterized elite parents with higher breeding values. A total of 32 F_1s were confirmed as true hybrids through F_1 verification by quality check (QC) genotyping with purity SNP panel. In total 49,590 segregating progenies from 114 crosses (F_2-F_5 generation) were harvested from FRGA nursery and grown in the subsequent generation. In LST trial, 956 lines out of 6277 lines were selected on the basis of desirable plant type, grain quality and uniformity in flowering under field condition. A total of 146 genotypes were selected out of 312 from OYT based on growth duration, grain yield, and homogeneity in different morpho-agronomic traits. Out of 159 genotypes, 45 genotypes were selected from four PYTs. Thirty-one genotypes were selected from three AYT's.
Thirty-one genotypes were evaluated under four RYTs and two genotypes BR11712-4R-93 and BR11717-4R-12 were selected from RYT-1 to conduct ALART. These two genotypes produced higher yield than the check variety BRRI dhan89 and BRRI dhan99 at six locations and showed higher tolerance to salt stress during boro season 2022-23.

AGGRi Network Trials in Bangladesh for Salt-Stress Prone Environment. Two hundred (200) breeding lines from IRRI along with six international check varieties and four national check varieties were evaluated at two locations viz., Shyamnagar and Kaliganj Upazillas of Satkhira during Boro 2022 to select superior genotypes aiming to include directly in the variety release system or use as parents in the breeding program.
In Shyamnagar, grain yield was ranged from 0.34 t/ha (IR21LT1560) to 2.02 t/ha (A69-1, IR21LT1564) with growth duration 120 days (IR21LT1081) to 147 days (IR21LT1239), respectively. Among 200 entries, only 13 genotypes were selected based on SES score of salinity tolerance protocol at hotspot condition, grain type and grain yield. The genotype IR21LT1564 produced better yield (2.02 t/ha) than BRRI dhan99 (1.49 tha^{-1}) and Binadhan-10 (1.69 t/ha) and similar yield with A69-1. One genotype may be considered as potential to evaluate in the advanced yield trial in the next season as stage-2 and also could be recycled as a parent in the breeding program. On the contrary, none of the genotypes including checks were survived in Kaliganj, Satkhira.

It is important to note that when the trial plot was salinized using irrigation water with high salinity (EC ~7.0 dS/m), the irrigation water entered into the trial plot from one side and then this salt water ran off towards the other end of trial plot and salt accumulated in the distal (other part) part of the trial field. The salinity gradient in two opposite directions of the trial site was not equal. Thus, the genotypes of the distal part of the trial did not survive due to excessive accumulation of salt consequently the salt stress was higher as well. Although we were unable to collect data from both the replications in these unavoidable circumstances however, we had selected 13 genotypes based on phenotypic acceptability, yield under salt stress in hotspot salinity condition.

Evaluation of AFACI materials in Stage-1 trial. The experiment was conducted in two locations viz. Kaliganj and Debhata in the coastal area. Out of one hundred four tested entries only seven entries were survived in Kaliganj whereas, no entries were survived due to severe salinity in Debhata. Those genotypes showed poor performance in Kaliganj but survived under high level of salinity (5.35-26.30 ds/m), they were selected for conducting stage 2 trial. Almost all the entries were damaged and yield of seven entries were very low, for instance, highest yield was 0.22 t/ha for IR18T1137. The both checks BRRI dhan89 and BRRI dhan67 were completely damaged. The salinity graph of Kaliganj revealed that the genotypes faced the gradual increase of salinity stress from transplanting to maturity with its severity during the sensitive reproductive phase. The selected genotypes identified as potential sources of salinity tolerance and may be included in the variety release system and also can be utilized as donors in forward breeding of STR breeding program.

Development of cold tolerant rice. The major objective of the project was to develop high yielding and short duration (6.0-7.0 t/ha yield with 135-145 days growth duration for haor areas) and high yielding medium duration (6.5-7.5 t/ha yield with 145-150 days growth duration for Northern regions) rice varieties tolerant to cold stress at seedling and reproductive stage. Thirty-five crosses were made using 32 lines and varieties as parents targeting to develop high yielding breeding lines enriched with favourable alleles of key target traits, viz. disease resistance (blast and BLB), insect resistance (BPH) and acceptable grain quality (amylose, chalkiness, palatability, zinc content, etc.). Thirty crosses were confirmed as true F1 through a hybridity test using QC SNP genotyping. In segregating RGA nurseries, in total 5,712 individual plants were advanced from 27 cross combinations of F_2-F_5 generations following SSD method. Out of 2,513 lines tested in LST, 219 uniform lines in terms of plant height, days to flowering, grain size and shape were selected based on the presence of the favorable alleles of key target genes.

Thirty-seven genotypes out of 414 breeding lines and 9 genotypes out of 235 breeding lines tested under natural cold stress (at booting stage) and non-stress conditions at two locations in OYT-1 and OYT-QTL, respectively were selected based on significantly higher yield than the check varieties of similar growth duration under non-stress condition and minimum yield reduction under cold stress condition for further yield trial. A total of 22 breeding lines were selected from 130 lines tested at four locations in three AYT class trials under two simulated cold-stress (October seeding) and non-stress control environments. From RYT-CTR, three genotypes out of six breeding lines/varieties tested at 13 locations including 10 haor sites under Kishoreganj, Sunamganj, and Habiganj districts showed better performance in terms of yield and cold tolerance at reproductive stage. In this trial BR11894-R-R-R-R-169 yielded up to 5.97 t/ha under severe cold stress ($<20^0$C) condition for consecutive three weeks during PI to heading stage, while others including moderately tolerant BRRI dhan67 produced no grain yield.

Development of premium quality rice (PQR)

PQR T. Aman. Efforts were made to develop aromatic and non-aromatic fine quality rice with national (Kalizira/ Chinigura /Kataribhog /Radhunipagol) and international (Jasmine type) standards and photosensitive rice for domestic use and export. In T. Aman 2022-23, a total of 62 crosses (42 single crosses and 12 backcrosses for PQR and 9 single crosses for photosensitive rice) were made. Total 63 crosses (40 for PQR and 23 for photosensitive rice) were confirmed as true hybrids using quality control SNP panel analysis. A total of 14, 962 progenies from 76 crosses (7083 progenies of 14 F_2 crosses, 6131 progenies of 36 F_3 crosses, 876 progenies of 12 F_4 crosses and 872 progenies of 14 F_5 crosses) were advanced through RGA under PQR program. A total of 2,460 progenies from 23 crosses (1001 progenies of eight F_2 crosses, 594 progenies from five F_3 crosses, 638 progenies from five F_4 crosses and 227 progenies from five F_5 crosses) were advanced through RGA under photosensitive program. Under PQR, a total of 84 fixed lines were selected from 1,000 fixed lines of eight crosses and from photosensitive rice breeding program, 20 fixed lines out of 197 fixed lines were selected from LST. In Observational Yield Trial (OYT) 11 genotypes were selected out of 35 genotypes from PQR. In Preliminary Yield Trial (PYT), 11 genotypes were selected out of 24 genotypes under PQR program and 11genotypes were selected out of 25 genotypes under Photosensitive rice breeding program. A total of 11 genotypes were selected out of 24 genotypes under PQR program and nine genotypes were selected out of 22 genotypes under Photosensitive rice breeding program from Advanced Yield Trial (AYT). Two promising genotypes were evaluated under PQR-ALART but none of the genotypes were selected. In OYT, the genotype BR9053-16-3-4-1 produced highest yield (5.4 t/ha) which is non-aromatic having BRRI dhan90 type grain quality genotype that could be used as recipient parent. In PYT, the Katari type aromatic genotype BR9178-7-2-4-4-P1 produced highest yield of 5.5 t/ha with a growth duration of 120 days. In AYT, the genotype BR10824-5-6-4-1 having BRRI dhan34 type aromatic grain having stronger plant type produced 4.2 t/ha yield with similar growth duration of BRRI dhan34. Under photosensitive rice program in PYT, the genotype BR10212-4-3-1 produced significantly higher yield (6.6 t/ha) than the check varieties BR22 (4.6 t/ha) and BR23 (5.2 t/ha) followed by the genotype BR10212-17-3-2 (6.5 t/ha) having strong photosensitivity. The heritability obtained for growth duration was ranging from 86% to 92% and grain yield was ranging from 54 % to 82% indicating acceptable level of precision in these experiments. Through maintenance breeding, a total of 235 genotypes including 146 aromatic rice landraces were grown as panicle to row method to maintain as nucleus stock for future use.

PQR Boro: The project aims to develop of aromatic and non-aromatic fine quality rice with international (Basmati/Banglamati/SoruBalam type) standards in Boro season for domestic use and export quality purpose. Totally 1,802 F_1 seeds were obtained from 29 crosses. Twenty-six F_1 crosses were confirmed out of 26 crosses as true hybrid. In total 13,210 progenies of 29 crosses from F_2, F_4 and F_5 generations were advanced through RGA method. A total of 623 genotypes were selected from 6,546 progenies of LST trial. A total of 198 genotypes were evaluated in three Observation Yield Trials (OYTs) in Gazipur, Rajshahi and Rangpur. Among the tested genotypes 56 genotypes were selected and forwarded in Advanced Yield Trial (AYT). In PYT, none of the genotypes were selected out of seven tested genotypes. From two SYT's, a total of 27 genotypes were evaluated and 12 genotypes were advanced in RYT. In RYT and ALART none of the genotypes were selected to advance but the materials will be used for hybridization purpose. The proposed Variety Trial (PVT) of premium quality rice Lata Balam was conducted. The yield of Lata Balam was 8.188 t/ha whereas, the average yield of check variety BRRI dhan50 was 6.997. Considering yield from all 10 locations, the proposed variety (Lata Balam) gave 17.67% higher yield in ten locations than BRRI dhan50. Therefore, BRRI dhan107 was recommended to release as extra-long slender premium quality rice for commercial cultivation throughout Bangladesh in the 111th meeting of NSB held on 09 January 2024.

Development of Insect Resistant Rice: The main thrust of the project was to develop varieties resistant to gall midge (GM), brown plant hopper (BPH) and white backed plant hopper (WBPH). The experiments were conducted in both T. Aman and Boro seasons. In the T. Aman season, 19 crosses for forward breeding, three BC_1F_1 and four BC_2F_1 crosses for line augmentation, and three BC_1F_2 crosses for QTL deployment were made, and 15 crosses were confirmed as true hybrids using quality check (QC) genotyping with purity SNP panel. In total 57,132 segregating progenies from 82 crosses of F_2-F_5 generations were advanced through Field Rapid Generation Advanced (FRGA) technique. Out of 2803 $F_{5:6}$ LST lines derived from 16 different crosses, 229 genotypes were selected based on strong plant architecture, grain type and uniformity in heading under field condition as well as the presence of the favorable alleles of key target genes for BPH (*bph9, bph17_1, bph17_2, bph17_3 and bph32*), Gm (*Gm4_3* and *Gm4_4*) and grain quality *(Wx-A and Wx-10*). The yield trials (OYT, PYT and AYT) were conducted at three locations of BRRI Gazipur, Cumilla and Rangpur. Forty-nine genotypes were selected from 228 breeding lines in OYT. Two selected OYT genotypes had both *bph17* and *bph32,* one genotype had both *bph17 with Gm4, and* one had *bph17, bph32* with *Gm4* SNP favorable alleles. Twenty-four genotypes were selected from 100 genotypes in PYT. Ten genotypes were selected from 28 lines in AYT. In Boro season, 20 crosses for forward breeding, three crosses for pre-breeding, three F_1 and three BC_2F_1 crosses for line augmentation were made, and 16 crosses were confirmed as true hybrids through F_1 verification using quality check (QC) genotyping with purity SNP panel. A total of 46,901 individual plants were advanced from 79 crosses in F_2-F_5 generations by FRGA technique. In LST, 794 lines having strong plant architecture, grain quality, uniformity in heading under field condition and the presence of the favorable alleles of key target genes for BPH (*bph9, bph17_1, bph17_2, bph17_3 and bph32*), Gm (*Gm4_3* and *Gm4_4*) and grain quality *(Wx-A and Wx-10*) were selected from 5889 $F_{5:6}$ breeding lines that are the descendants of 23 crosses. Eighty-four genotypes out of 360 were selected from OYT that tested in three locations. Thirty lines were selected from 82 lines in PYT. Out of 30 genotypes, 14 were selected from AYT for further evaluation. Total 65 parental lines were maintained in insect resistant maintenance breeding program.

Development of submergence and water stagnation tolerant rice varieties. The project aims for the development of high yielding rice varieties tolerant to submergence (flash flooding) and medium stagnant water (MSW) stresses. Totally 43 single crosses were made and 4500 F_1 seeds were produced. Thirty-four single crosses were confirmed and selected through QC SNP panel analysis. A total of 25395 progenies from 80 crosses (4,930 from 12 F_2 crosses, 12,220 from 22 F_3, 4,680 from 27 F_4 progenies, 810 from nine F_5 progenies, and 2,755 from ten F_6 progenies) were harvested at the time of maturity, processed with proper labels and preserved. The ranges of mortality percentage of different RGA generations were around 7%. From LST population, 3,006 lines from

12 crosses were genotyped with trait markers using custom SNP panel among which 162 lines were selected based on uniformity and traits markers like *Sub1, Wx-A group, Wx-A_NB*, *xa13*, *Xa21* etc. In yield trial, a total of 368 genotypes were tested out of which 150 genotypes were selected based on phenotypic acceptance, growth duration, survivability and higher yield performance. From OYT, 76 genotypes out of 271 genotypes, from AYT_Early, 44 genotypes out of 118 genotypes, from AYT_Late, 17 genotypes out of 58 genotypes, from PVS one genotype out of ten genotypes were selected. Two lines were evaluated in ALART from which one line was recommended to evaluate in PVT, one line was evaluated in PVT and the line performed better over the check. In OYT, the genotype BR12154-5R-65-2 with 88% survivability produced highest yield of 6.7 t/ha under stress condition and in average yielded 6.5 t/ha followed by the genotype BR12487-5R-75 produced 6.7 t/ha under controlled stress and in average 6.2 t/ha with 92% survivability. In INGER, the early genotype SV1582 produced highest yield (5.6 t/ha) under rainfed condition where two checks BRRI dhan87 and BRRI dhan52 yielded only 4.8 t/ha and 4.6 t/ha respectively. In AYT_Early genotype BR12162-5R-350-3 and IR15F1886 produced highest yield of 7.0 t/ha followed by BR11692-5R-345 (6.7 t/ha) and SV1179 (6.6 t/ha) under controlled stress condition. In AYT_Late, the genotype IR13F582 gave highest yield of 7.2 t/ha with 89% survivability in control stress condition followed by the genotype IR93339129-B-7-7-B-B-B-16 (7.1 t/ha) with 84% survivability. In ALART (ALART_Tidal submergence), the genotype BR9158-19-9-6-50-2-HR1 produced significantly higher yield (4.89 t/ha) over both check BRRI dhan52 (4.49 t/ha) and BRRI dhan44 (4.31 t/ha) with similar growth duration. This line was recommended to evaluate in PVT in T. Aman 2023-24. In PVT, the genotype IR16F1148 yielded 5.28 t/ha which was 18% higher than the check variety BINA dhan11 (4.48 t/ha) but national technical committee (NTC) recommended for re-PVT in next T-Aman season as there was less flood in the farmer field condition. The heritability obtained for grain yield under stress of all trials conducted was ranging from 44 % to 95%, whereas that for non-stress trials was ranging from 38 % to 83%, indicating acceptable level of precision in these experiments. Through maintenance breeding, a total of 280 genotypes including submergence tolerance land races landraces were grown as panicle to row method to be maintained as nucleus stock for future use.

Development of water saving and aerobic rice varieties. The objective of the project was to develop short duration water-use-efficient rice genotypes with 10% more yield than the check varieties under transplanted alternate wetting and drying (AWD) and aerobic conditions. A total of 35 crosses were made using 35 parents and 2,350 F_1 seeds were obtained, and 14 single crosses were selected and confirmed through QC SNP panel analysis. A total of 8,037 individual panicles were selected from 30 crosses (4,430 of 13 crosses from F_2, 3315 of 13 crosses from F_3 and 292 of four crosses from F_5) were harvested from RGA.
From yield trial, a total of 37 genotypes were selected out of 143 genotypes. In OYT, 12 genotypes were selected from 63 genotypes. From PYT, 25 genotypes were selected from 80 genotypes. In OYT, among all selected genotypes, the line IR 126999-B-32-2-1-3 gave highest yield (7.0 t/ha) followed by two similar yielder genotypes IR16F1147 (7.0 t/ha) and IR 126999-B-32-2-1-3 (7.0 t/ha). In PYT#1, two genotypes IR18R1119 and IR18R1121 produced highest yield (6.3 t/ha) having aroma whereas, the check variety BRRI dhan88produced 5.6 t/ha yield. In PYT#2, the genotype IR93339129-B-7-7-B-B-B-16 produced the highest yield (7.5 t/ha) followed by the genotype BR12493-5R-151 (7.3 t/ha). In RYT, both the tested entry BR11206-5B-351 and BR11204-5B-224 produced similar average yield (6.6 t/ha) with the check variety BRRI dhan58 (6.8 t/ha). However, the growth duration of the genotype BR11204-5B-224 was one week earlier than the check variety BRRI dhan58. The heritability obtained for growth duration and grain yield of all trials conducted was ranging from 85 % to 95%, and 44 % to 85%, respectively indicating acceptable level of precision in these experiments.

International network for genetic evaluation of rice (INGER). This project focused on sharing and use of germplasm and breeding lines through international platform for the acceleration of genetic improvement of rice varieties. Totally 49 genotypes were selected out of 195 genotypes of nine INGER nursery sets of which four genotypes were selected out of 32 genotypes of one INGER nursery sets of Aus, 31 genotypes out of 109 genotypes from six INGER nursery sets of T. Aman 2022-23 and 14 genotypes out of 54 genotypes from two INGER nursery sets of Boro 2022-23 seasons were selected to be used in different breeding programs for direct use in the breeding pipeline.

Development of drought tolerant rice (DTR). The project aims to develop of high yielding drought tolerant rice varieties for northern and western region of Bangladesh in the T. Aman season. In T. Aman 2022-23, a total of 4,147 F_1 seeds were obtained from 25 crosses using 15 parents and 14 crosses were confirmed as true hybrids using 10-SNP *indica* QC panel. A total of 4,523 individual progenies from of 19 crosses from F_3 generation were harvested through RGA. The materials were advanced in the Boro 2022-23 season and 9,570 progenies of 33 crosses from F_2 and F_4 generations through RGA method. From Line Stage Testing (LST), 293 lines were selected from 2,058 progenies of 17 crosses with 14.5% selection intensity. A total of 619 genotypes were evaluated in two OYTs in Gazipur, Rajshahi and Rangpur. Among the tested genotypes 67 genotypes were selected and forwarded in Advanced Yield Trial (AYT). In AYT, 26 genotypes were evaluated in two trials in Gazipur, Rajshahi and Rangpur and seven genotypes were found promising and advanced. During flowering stage drought stress was observed in almost all three locations of OYT and AYT. Especially in Rajshahi and Rangpur, severe drought stress and in Gazipur moderate stress were recorded. Although having multiple genes/QTLs, none of the genotypes was selected based on grain yield in comparison to check varieties from Preliminary Yield Trial (PYT). No genotype was recommended by ARD due to similar grain yield performance compared to check varieties in Advanced Line Adaptive Research Trial (ALART).

Development of Zinc Enriched Rice (ZER): The project aims to develop high yielding rice varieties with improved nutritional quality with high zinc (Zn≥24 mg/kg) in polished grain. The project also prioritizes development of stress tolerant zinc enriched rice varieties in a combination of submergence + zinc, drought + zinc, salinity + zinc and cold + zinc enriched rice with improved grain yield. The experiments were conducted in both T. Aman and Boro seasons. In T. Aman season, 20 single crosses were made that produced 2955 seeds. A total of 45 crosses were selected and confirmed as true F1s. In RGA method, 23,376 segregating progenies were harvested from F2 to F5 generations of 114 crosses. Initially 239 uniform lines out of 2856 LST lines were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape. From the Observational Trial (OT), 15 genotypes were selected from 70 genotypes. A total of 08 genotypes were selected out of 56 genotypes from two PYT's based on yield performances. Only four promising genotypes were selected out of 11 genotypes from the SYT. None of the entries were recommended for promoting from RYT.

In Boro season, 15 single crosses were made that produced 1639 seeds. A total of 11 crosses were confirmed as true F1s. A total of 56,080 progenies were advanced from F_2 to F_5 generation at the time of maturity and preserved and processed with proper labels through RGA method. Initially 484 uniform lines were selected from 7065 LST lines based on visual observation on homogeneity in flowering, plant height and grain size and shape. A total of 17 genotypes were selected out of 61 genotypes from PYT based on yield performances. Five promising genotypes were selected out of fifteen genotypes from SYT. One genotype out of three genotypes were selected for re-RYT from the RYT.

Deployment and validation of high beta-carotene rice and high iron & zinc rice varieties (Healthier Rice): The main objective of the project was to develop high yielding transgenic rice varieties with enhanced provitamin-A, iron and zinc content in polished rice grain. A total of 1,420 BC2F1 seeds were obtained from three backcrosses. However, in three backcrosses (BR11723-4R-27, BRRI dhan81 and BRRI dhan87) none of the hemizygous plant (H type) was found in T. Aman 2022-23 season with a view to developing high iron and zinc enriched rice (HIZR). With a view to developing provitamin-A enriched rice, 567 homozygous plant (B type) were selected from 1047 plant of BC3F3 generation through Marker Assisted Selection (MAS) method. A total of Twelve promising lines i.e., BR13263-GR2E:24-1-1, BR13263-GR2E:36-1-1, BR13263-GR2E:12-1-1-3, BR13263-GR2E:17-1-1-3, BR13263-GR2E:64-1-1-3, BR13263-GR2E:66-1-1-3, BR13263-GR2E:85-1-1-3, BR13265-GR2E:10-1-1, BR13265-GR2E:32-1-1-3, BR13265-GR2E:68-1-1-3, BR13265-GR2E:87-1-1-3 and BR13265-GR2E:107-1-1-3 were selected from Contained Trial (CT) based on their grain yield, carotenoid content and other yield contributing for further evaluation.

In Boro 2022-23 season, 980 F1 seeds were obtained from three crosses and a total of 260 BC3F1 seeds were obtained from three backcrosses to develop high iron and zinc enriched rice.

Development of Antioxidant Enriched Rice Variety, T. Aman and Boro

The main objective of the project was to develop anthocyanin enriched value-added rice genotypes with high yield potential for rainfed and irrigated ecosystems in Bangladesh. In T Aman 2022-23, a total of 15 crosses were made using 13 parents and 2,273 F_1 seeds were obtained, and 25 single crosses were selected and confirmed through QC SNP panel analysis. Panicles of 10,698 progenies from 21 crosses (6,962 progenies of eight F_2 crosses, 2144 progenies of four F_3 crosses, 1025 progenies of four F_4 crosses and 567 progenies of five F_5 crosses) were advanced through RGA. A total of 163 fixed lines from 1,682 fixed lines were selected from 11 crosses of LST. In OYT1 and OYT2, 51 genotypes were selected out of 245 (two trials) aromatic and non-aromatic genotypes. A total of 54 genotypes were selected out of 176 (PYT1, PYT2, PYT3 and PYT4) aromatic and non-aromatic genotypes. From advanced yield trial (AYT), 11 genotypes were selected out of 30 genotypes. In OYT, the genotype BR12839-4R-8 produced highest yield (6.8 t/ha). In PYT, the short duration genotype BR12839-4R-137 produced highest yield which is 6.1 t/ha with growth duration 123 days while the medium duration genotype BR12839-4R-106 produced highest yield which is 6.2 t/ha having growth duration 129 days. Also, an aromatic genotype BR12836-4R-312 with strong plant type produced 5.5 t/ha yield in PYT. In AYT, the highest yielder genotype was BR12839-4R-157-2 producing 6.3 t/ha yield followed by the genotype BR12839-4R-5-2 which produced 6.0 t/ha with the growth duration of 132 and 130 days respectively.

In Boro 2022-23, a total of 26 crosses were made using 25 parents and 5,997 F_1 seeds were obtained, and six single crosses were confirmed and selected through QC SNP panel analysis. Panicles of 17, 400 progenies from 41 crosses (4,000 progenies of six F_2 crosses, 10100 progenies of 23 F_3 crosses, 2500 progenies of eight F_4 crosses and 800 progenies of four F_5 crosses) were advanced through RGA. A total of 15 fixed lines were visually selected from 162 fixed lines of four crosses of LST. In OYT, 32 genotypes out of 110 genotypes were selected. In PYT, seven genotypes out of 24 genotypes were selected. From advanced yield trial (AYT), eight aromatic and 11 non-aromatic genotypes out of 42 genotypes were selected from two trials. From two RYT trials (short and medium duration), one short duration (out of three genotypes) and two medium duration genotypes (out of three genotypes) having higher C3G content were selected. In AYT, the genotype BR12839-4R-106 produced highest yield which is 7.5 t/ha with growth duration 152 days followed by the genotype BR12839-4R-34-1 producing yield of 6.9 t/ha having growth duration 149 days. These two genotypes also possess very high antioxidant (C3G) which is 479 and 459 mg/kg, respectively. In AYT (aromatic), the aromatic genotypes BR12839-4R-124-2 produced highest yield (6.84 t/ha) followed by the genotype BR12836-4R-312 (6.8 t/ha). C3G content of these genotypes is 242 and 305 mg/kg, respectively. In RYT (medium duration), the highest yielder genotype was BR12839-4R-157-2 producing 7.12 t/ha yield followed by the genotype BR12839-4R-5-2 which produced 6.8 t/ha yield in Gazipur. Both of the selected genotypes have higher C3G content i.e. 268 and 209 mg/kg, respectively. The growth durations of these genotypes are 142 and 140 days, respectively.

TRANSFERABLE TECHNOLOGY

National Seed Board (NSB) of Bangladesh has released four promising genotypes such as BR8862-29-1-5-1-3, BRC266-5-1-1-1, Lata Balam and BRH11-9-11-4-5B as BRRI dhan104 (2 March, 2023), BRRI dhan105 (26 December, 2023), BRRI dhan107 and BRRI dhan108 (9 January, 2024), respectively, for cultivation throughout the country in Boro season. On the other hand, promising genotype BR8781-16-1-3-P2 was released as BRRI dhan106 for non-saline tidal ecosystem in T. Aus season in the NSB meeting dated on 26 December 2023.

BRRI dhan104: BRRI dhan104 (BR8862-29-1-5-1-3) is a strong aromatic, Basmati type high yielding rice variety with excellent physicochemical properties for Boro season **(Fig. 1)**. BRRI dhan104 produced 11.33% higher yield in all the locations with 17.94% higher yield in top six locations than BRRI dhan50 in the PVT (**Table 1**) with 147 days' growth duration. BRRI dhan104 was recommended to release for commercial cultivation throughout the country as a premium quality aromatic Basmati type rice in the 108th meeting of National Seed Board of Bangladesh (NSB) held on 2 March 2023.

Fig. 1. Field view and grain picture of BRRI dhan104

Table 1. Salient feature of BRRI dhan104 (BR8862-29-1-5-1-3)

Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Grain Characteristics (Boro 2019-20)										
				Milling outturn (%)	Head rice recovery (%)	Milled Rice length (mm)	L-B ratio	Size and shape	Elongation ratio	Imbibition ratio	Protein (%)	Amylose (%)	1000 grain weight (g)	Aroma
BRRI dhan104	95	147	7.29	69.0	57.2	7.5	4.5	LS	1.3	3.4	8.9	29.2	21.5	Strong
BRRI dhan50 (Ck)	86	147	6.61	70.5	59.7	6.6	4.2	LS	1.2	3.3	8.4	26.8	18.0	Light

BRRI dhan105: BRRI dhan105 (BRC266-5-1-1-1) is a high yielding rice variety for Boro season with low glycemic index (GI) value (55.0) **(Fig. 2)**. BRRI dhan105 is called a diabetic rice due to its low glycemic index properties. BRRI dhan105 produced 7.61 t/ha grain yield whereas, check variety BRRI dhan58 produced 7.65 t/ha. In the PVT, BRRI dhan105 showed 8.39% higher yield in top five locations of Bangladesh than BRRI dhan58 **(Table 2)**. The growth duration of BRRI dhan105 is 148 days. BRRI dhan105 was recommended to release as a low GI diabetic rice for commercial cultivation throughout Bangladesh in the 109th meeting of NSB held on 02 March 2023.

Fig. 2. Field view and grain picture of BRRI dhan105

Table 2. Salient feature of BRRI dhan105 (BRC266-5-1-1-1)

Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Grain Characteristics									
				Milling outturn (%)	Head rice recovery (%)	L-B ratio	Size and shape	Elongation ratio	Imbibition ratio	Protein (%)	Amylose (%)	GI value	1000 Grain wt.
BRC266-5-1-1-1	100	148	7.61	70.9	66.5	3.1	MS	1.4	3.5	7.3	27.0	55.04	19.4
BR16 (Ck)	87	-	-	71.8	62.0	3.0	MS	1.4	3.5	7.9	27.3	51.94	27.2
BRRI dhan58 (Ck)	100	147	7.65	69.0	85.0	3.0	MS	1.4	3.0	8.9	26.0	75.74	24.0
BRRI dhan28 (Ck)	90	143	6.76	71.0	59.0	3.2	MS	1.5	4.3	8.1	27.7	70.96	23.1

BRRI dhan106: The proposed line BR8781-16-1-3-P2 was evaluated along with the check variety BRRI dhan27 under PVT in six locations of non-saline tidal T. Aus growing areas of Bangladesh and proposed line was recommended to release as variety BRRI dhan106 (**Table 3**) in 110th NSB meeting (26 December, 2023). The average yield of BRRI dhan106 is 4.8 t/ha with 117 days growth duration. Lodging tolerance is the special feature of this variety. Amylose content is 27.2% and protein content of this variety is 8.5% (**Fig. 3a & 3b**).

Table 3: Performance of BRRI dhan106 in Proposed Variety Trial, T. Aus 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Mean Yield (t/ha)	Amylose (%)	Protein (%)	Milling outturn (%)	Head rice yield (%)	ER (%)	Size & shape
1	BR8781-16-1-3-P2 (BRRI dhan106)	125	117	4.8	27.2	8.5	72.4	59.1	1.5	MB
2	BRRI dhan27 (Ck)	141	114	4.1	27.5	7.6	68.8	65.4	1.4	MB

Fig. 3a. Pictorial view of BRRI dhan106

Paddy **Unparboiled rice** **Parboiled rice**

Fig. 3b. Grain picture of BRRI dhan106

BRRI dhan107: BRRI dhan107 (Lata Balam) is a premium quality extra-long slender rice with good physicochemical properties for Boro season **(Fig. 4)**. The yield of Lata Balam is 8.188 t/ha whereas, the yield of check variety BRRI dhan50 was 6.997 t/ha with 143 days growth duration **(Table 4)**. BRRI dhan107 gave 17.67% higher yield than BRRI dhan50 in ten locations of Bangladesh. Therefore, BRRI dhan107 was recommended to release as extra-long slender premium quality rice variety for commercial cultivation throughout Bangladesh in the 111th meeting of NSB held on 9 January 2024.

Fig. 4. Field view and grain picture of BRRI dhan107

Table 4. Performance of Lata Balam in Proposed Variety Trial, Boro 2022-23

Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Grain Characteristics								
				Milling outturn (%)	Head rice recovery (%)	L-B ratio	Size and shape	Elongation ratio	Imbibi tion ratio	Protein (%)	Amy lose (%)	1000 gr wt.
Lata Balam	103	143	8.188	70.8	60.1	4.2	1.8	1.4	4.2	9.8	29.1	26.1
BRRI dhan50 (Ck)	87	144	6.997	70.5	59.9	4.0	1.6	1.2	3.9	8.2	26.8	19.0

BRRI dhan108: An advanced breeding line BRH11-9-11-4-5B has been approved and released as a new rice variety BRRI dhan108 for cultivating favorable Boro areas throughout the country by National Seed Board (NSB). BRRI dhan108 has high yield and fine grain. The yield average of BRRI dhan108 is 8.7 t/ha, which is 1.0-1.3 t/ha more than BRRI dhan100. It has lodging tolerance with 149-151 days growth duration. The main characteristics of this variety are more densely grains. number of grains is 250-270 per panicle. The grain type of this variety is medium slender, white color almost as like Jira dhan. 1000 grain weight is 16.3 g. The content of amylose and protein is 24.5% and 8.8%, respectively. Its cooked rice is non-sticky. This variety has been developed for better market price for the farmers and branding.

Fig. 5. Field view of BRRI dhan108

Table 1. Performance of BRRI dhan108 in Proposed Variety Trial (PVT), Boro 2022-23

Proposed line with std. check	Plant height (cm)	Growth Duration (days)	Grain Yield (t/ha)	Grain characteristics						
				Head rice yield (%)	L/B Ratio	shape	length (mm)	Bread th (mm)	Protein (%)	Amylose (%)
BRH11-9-11-4-5B	102	149	8.7	65	3.2	MS	5.5	1.7	8.8	24.5
BRRI dhan100 (Ck)	101	147	7.5	65	2.8	MB	5.4	1.9	10.2	26.4
BRRI dhan63 (Ck)	92	148	7.3	64	4.3	LS	6.8	1.6	7.0	26.3

PROJECT 1: DEVELOPMENT OF UPLAND/DIRECT SEEDED RICE (B. AUS)

General Objectives: Development of varieties in combination with multiple traits such as quick seedling emergence and vigorous growth, short growth duration (90-95 days), tolerance to lodging, drought, pre-harvest sprouting, medium bold to medium slender grain along with good Cooking and eating quality.

Project Leader: M. Amir Hossain

Experiment 1.1: Hybridization

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: To incorporate genes for earliness (90-95 days), drought and lodging tolerance into the high yielding genetic background with yield target of 4.0-4.5 t/ha

Materials and Methods: The parental materials were grown in three different sets at seven days interval to synchronize flowering. Croosing was done in T, Aman season to get good seed set of F_1s. Seeding was started from 15th July and three weeks old seedlings were transplanted per set in the hybridization block at BRRI, Gazipur. Fertilizers @ 80:60:40:20 kg N, P_2O_5, K_2O, S/ha were used with split application of N at 15, 30, 50 days after transplanting (DAT) in T. Aman. All amounts of P, K, S and Zn were applied at the time of final land preparation and N was applied at three equal splits at 10, 25-30 and 40-45 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly.

Results: Eleven crosses were made using seventeen parents (**Table 1.1**).

Table.1.1: List of crosses made, Development of Upland Rice (B. Aus), 2022-23

Sl. #	Cross combination	Trait	F_1 seeds
1	BR12244-5R-210/ BR11864-5R-12	High yield, high amylose, drought tolerance	11
2	Balirdia/BR12248-5R-22	High yield, high amylose, drought tolerance	62
3	BR10418-32-1-58/BR12239-5R-146	High yield, high amylose, drought tolerance	25
4	BR12248-5R-22/BR11864-5R-12	High yield, drought tolerance, short duration	12
5	BR11863-5R-50/BR12244-5R-14	High yield, high amylose, drought tolerance,	10
6	BR12248-5R-18/BRRI dhan65	High yield, high amylose, Kataktara type grain, drought tolerance, short duration	18
7	BR12263-4R-31/Patri dhan	High yield, drought tolerance, short duration	15
8	BR12239-5R-146/BR12248-5R-22	High yield, high amylose, Kataktara type grain, drought tolerance, short duration	21
9	BR11864-5R-80/BR12244-5R-210	High yield, drought tolerance, fine grain	29
10	BR12263-5R-31/Basmati	High yield, drought tolerance, fine grain	37
11	BR12244-5R-14/BR12248-5R-4	High yield, high amylose, drought tolerance, fine grain	29

Experiment 1.2: F1 Confirmation

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: Confirmation of crosses as true F_1.

Materials and Methods: The F_1 seeds along with their respective parents were germinated in the petri-dish and were seeded in earthen pots at BRRI, Gazipur. Twenty-one days old seedlings were transplanted with single seedling per hill at a spacing of 20 cm × 15 cm in the net house along with respective parents. Fertilizers at the rate of 60 (130 kg Urea): 10 (50 kg TSP): 40 (80 kg MP): 18 (100 kg Gypsum): 3.6 (10 kg Zn SO4) kg NPKSZn/ha were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and N was applied at three equal splits at 10, 25-30 and 40-45 days after transplanting (DAT).

Results and discussion: Six crosses were confirmed (Table 1.2) by careful observation of plant phenotypic and agronomic characters. After confirmation, the F_2 seeds were collected and preserved. These confirmed F_1s were registered into BRRI cross list with BR number.

Table.1.2: List of Confirmed F1s, for Development of Upland Rice (B. Aus), 2022-23

Sl. #	Cross combination	BR No.	Trait
1	BR11864-5R-32/ BR10418-32-1-58	15484	High yield, high amylose, drought tolerance
2	BR10409-15-2-8/ BR11863-5R-271	15485	High yield, high amylose, drought tolerance
3	BR11863-5R-271/Dharial	15486	High yield & amylose, drought tolerance,
4	BR11864-5R-92/ Hashikalmi	15487	High yield & amylose, DTR, short duration
5	BR11864-5R-32/BRRI dhan83	15488	High yield& amylose, Kataktara type, DTR
6	BR26/ BR11864-5R-12	15489	High yield, high amylose, DTR, fine grain

Experiment 1.3: Growing of F_2 population

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Growing F_2 population to advance generation through RGA

Materials and Methods: Eight F_2 populations were grown which were previously confirmed F_1 plants from each cross were grown in Field RGA (Rapid generation Advance) nursery at BRRI, Gazipur. Thirty days old seedlings were transplanted at a spacing of 5 cm x 5 cm. Fertilizer management was done using the half doses of all fertilizers used in Experiment 1.2. Weeding was done during the period of early seedling to maximum tillering stages. Thinning of tillers was practiced in maximum tillering stage and so on. At maturity, single mature tiller was harvested from each plant under field condition (**Table 1.3**).

Results and discussion: In total, 12,000 plants were maintained in F_2 generation originated from eight crosses. Total number of harvested plants used on modified single seed descent method were 10,070. **(Table 1.3)**.

Table 1.3: List of F_2 progenies maintained through Field RGA, Development of Upland Rice (B. Aus), 2022-23

Sl	BR No.	Cross combination	Traits	TP	HP
1	14439	BR10757-2B-9-23/ BRRI dhan65	High yield, high amylose, drought tolerance, fine grain	1500	1150
2	14440	BR10757-2B-9-23/Dharial	High yield, high amylose, drought tolerance, good taste	1500	1310
3	14441	BR10757-2B-9-23/ Kataktara	High yield, high amylose, drought tolerance, good grain quality	1500	1180
4	14442	BR10757-2B-9-23/ Panbira	High yield, high amylose, drought tolerance, fine grain	1500	1310
5	14443	BR10757-2B-9-26/Hashikalmi	High yield, high amylose, drought tolerance, short duration	1500	1220
6	14444	BR10757-2B-9-26/LalDular	High yield, high amylose, drought tolerance, reddish hull	1500	1300

7	14445	BR10757-2B-9-42/BRRI dhan65	High yield, high amylose, drought tolerance, fine grain	1500	1230
8	14446	BR10757-2B-9-42/BRRI dhan83	High yield, high amylose, Kataktara type grain, drought tol.	1500	1370

Experiment 1.4: Identification of superior fixed lines from Line Stage Testing (LST)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: Isolation of homozygous breeding lines with emphasis on earliness, high yield potential, semi dwarf to intermediate plant type and tolerance to drought at seedling stage in field condition.

Materials and Methods: A total of 2,262 genotypes comprising 14 F_6 populations were grown for evaluation. Seeds of each progeny were grown in a 5.0 m long row by keeping 25 cm distance from row to row at BRRI, Gazipur. Fertilizer doses were followed as Experiment 1.2. Weeding was done three times during the period of early seedling to maximum tillering stages.

Results and discussion: Out of 2,830 lines, a total of 64 lines comprising 14 crosses were selected from LST trial during T. Aman, 2022 based on identical flowering, grain type and phenotypic acceptability under field condition (Table 1.4).

Table 1.4: List of materials for Line Stage Testing (LST), Development of Upland Rice (B. Aus), 2022-23

Sl. No.	BR No.	Parentage	Genotypes	
			Tested	Selected
1	11820	BRRI dhan65/ Vandana	208	16
2	13292	BRRI dhan56*3/Kachalath	106	0
3	13293	BRRI dhan48*2/Chengri	208	2
4	13294	BRRI dhan65*2/Apchasa	208	4
5	13295	BRRI dhan49*2/Kataktara	208	7
6	13296	Rata Boro/ BRRI dhan65	208	5
7	13297	BR7528-2B-19-HR10*2/ DhalaSaitta	122	1
8	13298	BRRI dhan83*2/Binnatoa	98	6
9	13299	BRRI dhan82/Kaisapanja	199	7
10	13300	N22*2/DhalaSaitta	138	10
11	13301	BRRI dhan65/Dhala Saitta	138	4
12	13302	GRS-3/ BRRI dhan43	128	2
13	11826	BRRI dhan48/Dular	153	0
14	13303	BRRI dhan48*2	140	0
Total			**2,262**	**64**

Experiment 1.5: Observational Yield Trial (OYT)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: To select genetically fixed breeding lines for morpho-agronomic characters having early seedling emergence, good seedling vigor, short growth duration, tolerance to lodging and high yield.

Materials and Methods: Two hundred and seven genotypes were seeded directly in augmented design with unit plot size of 5 m × 4 rows with spacing of 25 cm between two rows by following

RCB design with sufficient moisture in the field at BRRI, Gazipur. Fertilizer application and crop management was followed as in Experiment 1.2. BRRI dhan43, BRRI dhan65 and BRRI dhan83 were standard checks and Hasikalmi was local check.

Results and discussion: Twenty-seven entries were selected out of 176 breeding lines considering growth duration, grain yield, uniform flowering, phenotypic acceptance and superiority in one or more traits over the standard checks **(Table 1.5).**

Table 1.5: List of selected materials from Observational yield trial (OYT), Development of Upland Rice (B. Aus), 2022-23

Sl.#	Genotype	Days to maturity	Plant height (cm)	Yield (t/ha)
1	BR12852-5R-4	106	108	1.05
2	BR12852-5R-5	109	116	0.82
3	BR12852-5R-19	116	95	0.52
4	BR12852-5R-28	104	95	0.66
5	BR12852-5R-29	107	94	1.03
6	BR12852-5R-32	110	103	0.60
7	BR12852-5R-46	107	104	0.42
8	BR12852-5R-48	106	121	0.62
9	BR12853-5R-1	117	120	0.16
10	BR12853-5R-53	103	98	1.05
11	BR12853-5R-66	105	106	0.62
12	BR12853-5R-92	104	131	1.24
13	BR12854-5R-31	109	108	1.05
14	BR12854-5R-61	106	97	0.83
15	BR12854-5R-63	106	99	1.23
16	BR12854-5R-89	107	103	0.83
17	BR12854-5R-102	105	111	0.62
18	BR12854-5R-104	108	101	0.82
19	BR12854-5R-110	105	115	1.73
20	BR12854-5R-121	105	107	1.83
21	BR12855-5R-25	107	97	1.22
22	BR12855-5R-41	107	105	1.03
23	BR12855-5R-47	100	127	1.03
24	BR12855-5R-99	107	105	1.24
25	BR12856-5R-1	102	106	0.84
26	BR12856-5R-3	106	112	0.83
27	BR12856-5R-23	109	99	0.42
28	BR12856-5R-41	106	120	1.25
29	BR12856-5R-45	104	107	1.03
30	BR12856-5R-67	104	119	1.46
31	BR12857-5R-1	116	102	0.52
32	BR12857-5R-30	116	92	0.58
33	BR12857-5R-32	118	99	0.95
34	BR12857-5R-50	109	111	2.03
35	**BR12857-5R-55**	**105**	**94**	**3.00**
36	BR12857-5R-56	119	100	1.25
37	BR12857-5R-63	108	94	1.94
38	BR12857-5R-68	105	98	2.48
39	BR12857-5R-72	109	96	2.48
40	**BR12857-5R-85**	**107**	**95**	**2.72**
41	BR12857-5R-111	118	107	1.65
42	**BR12857-5R-112**	**106**	**99**	**2.79**
43	BR12857-5R-119	120	91	0.63
44	BR12857-5R-123	109	97	1.66
45	BR12857-5R-124	123	92	0.46
46	BR12857-5R-126	120	96	0.52
47	BR12858-5R-3	106	112	1.85
48	BR12858-5R-7	106	111	2.02
49	BR12858-5R-21	120	110	1.05
50	BR12858-5R-22	120	121	1.12

Sl.#	Genotype	Days to maturity	Plant height (cm)	Yield (t/ha)
51	BR12858-5R-35	125	116	0.62
52	BR12858-5R-39	125	119	0.37
53	BR12858-5R-45	105	112	2.11
54	BR12858-5R-61	115	105	1.50
55	BR12858-5R-64	106	108	1.87
56	BR12858-5R-102	106	108	1.94
57	BR12858-5R-112	116	102	1.45
58	**BR12858-5R-116**	**106**	**103**	**2.51**
59	BR12858-5R-125	108	106	2.25
60	**BR12859-5R-31**	**108**	**107**	**3.47**
61	**BR12859-5R-32**	**105**	**101**	**3.18**
62	BR12859-5R-81	105	120	1.88
63	BR12859-5R-93	105	118	1.04
64	BR12860-5R-10	113	112	0.74
65	BR12860-5R-18	109	103	2.06
66	BR12860-5R-21	109	114	2.04
67	BR12860-5R-34	117	110	0.83
68	BR12860-5R-50	109	113	1.55
69	**BR12860-5R-79**	**102**	**106**	**2.51**
70	BR12860-5R-84	113	127	0.83
71	BR12860-5R-111	115	148	0.46
72	**BR12862-5R-3**	**106**	**121**	**3.15**
73	BR12862-5R-13	119	145	1.23
74	BR12862-5R-27	106	104	1.05
75	BR12862-5R-42	107	123	1.03
76	BR12862-5R-62	102	120	1.24
77	BR12862-5R-64	103	124	1.85
78	BR12862-5R-65	105	122	1.66
79	BR12862-5R-88	109	121	1.07
80	BR12862-5R-89	103	105	0.92
81	BR12862-5R-99	108	104	1.22
82	BR12862-5R-103	108	111	1.43
83	BR12862-5R-112	103	121	2.25
84	BR12862-5R-128	109	120	1.03
85	BR12863-5R-1	103	114	1.64
86	BR12863-5R-16	105	122	2.30
87	BR12867-5R-1	107	107	0.84
88	BR12867-5R-2	108	102	1.26
89	BR12867-5R-16	102	106	1.67
90	BR12867-5R-17	104	111	1.82
91	BR12867-5R-33	106	111	1.47
92	BR12867-5R-40	105	109	1.64
93	BR12867-5R-79	103	116	1.46
94	BR12867-5R-85	105	113	1.45
95	BR12867-5R-91	117	118	0.54
96	BR12867-5R-107	104	120	1.90
97	BR12867-5R-109	116	112	1.66
98	BR12867-5R-114	106	105	2.01
99	**BR12867-5R-125**	**106**	**114**	**3.24**
100	**BR12867-5R-129**	**104**	**116**	**2.90**
101	BR12867-5R-134	104	111	2.02
102	BR12867-5R-137	104	114	1.88
103	BR12867-5R-145	104	117	2.09
104	BR12867-5R-149	104	103	1.94
105	BR12868-5R-21	106	124	2.19
106	BR12868-5R-28	106	113	1.03
107	BR12868-5R-29	115	135	0.42
108	BR12868-5R-34	114	133	0.84
109	BR12868-5R-59	102	113	1.14
110	BR12868-5R-64	120	130	0.99
111	BR12868-5R-82	106	107	2.26

Sl.#	Genotype	Days to maturity	Plant height (cm)	Yield (t/ha)
112	BR12868-5R-90	107	139	2.22
113	BR12868-5R-100	107	117	0.94
114	BR12868-5R-106	106	95	0.63
115	BR12868-5R-124	105	126	1.46
116	BR12868-5R-133	104	106	2.37
117	BR12871-5R-63	109	131	0.84
118	BR12871-5R-92	109	128	0.95
119	BR12871-5R-114	109	106	1.65
120	BR12871-5R-133	107	110	1.66
121	BR12871-5R-143	107	114	2.30
122	BR12871-5R-192	108	95	1.88
123	BR12873-5R-8	102	106	2.48
124	**BR12873-5R-46**	**106**	**99**	**3.32**
125	**BR12873-5R-48**	**106**	**83**	**3.48**
126	**BR12873-5R-60**	**106**	**98**	**3.06**
127	BR12873-5R-63	107	91	2.07
128	**BR12873-5R-65**	**105**	**99**	**3.44**
129	**BR12873-5R-73**	**106**	**108**	**2.71**
130	BR12873-5R-74	108	81	1.64
131	**BR12873-5R-97**	**106**	**91**	**3.32**
132	BR1873-5R-102	104	84	2.30
133	**BR12873-5R-104**	**103**	**106**	**2.51**
134	BR12874-5R-13	109	113	1.23
135	BR12874-5R-18	103	107	0.83
136	**BR12874-5R-33**	**108**	**106**	**2.88**
137	BR12874-5R-48	108	100	1.52
138	BR12874-5R-50	103	108	2.07
139	BR12874-5R-63	115	106	0.62
140	BR12874-5R-64	115	107	1.04
141	BR12874-5R-67	109	111	2.30
142	BR12874-5R-72	109	104	1.56
143	BR12874-5R-75	100	87	1.44
144	BR12874-5R-92	109	109	1.43
145	BR12874-5R-101	106	101	0.70
146	BR129874-5R-112	115	108	2.25
147	**BR12874-5R-116**	**117**	**117**	**2.53**
148	BR12874-5R-141	106	106	1.71
149	BR12874-5R-154	98	108	2.46
150	BR12874-5R-157	105	105	0.80
151	BR12876-5R-1	107	107	2.27
152	**BR12876-5R-3**	**105**	**105**	**2.66**
153	BR12876-5R-7	109	109	2.04
154	BR12876-5R-14	117	117	1.63
155	BR12876-5R-28	104	104	2.37
156	**BR12876-5R-37**	**104**	**104**	**2.51**
157	BR12876-5R-38	113	113	1.26
158	**BR12876-5R-40**	**106**	**106**	**3.07**
159	BR12876-5R-56	108	98	2.10
160	BR12876-5R-71	109	113	0.69
161	BR12876-5R-75	103	94	1.97
162	BR12876-5R-77	106	118	0.49
163	BR12876-5R-80	106	111	0.49
164	BR12876-5R-104	100	94	1.45
165	BR12876-5R-111	109	115	0.94
166	BR12876-5R-126	105	108	1.88
167	BR12876-5R-131	106	99	2.40
168	BR12877-5R-30	109	104	1.31
169	BR12877-5R-70	108	73	1.65
170	BR12877-5R-77	113	84	2.09
171	BR12877-5R-85	117	81	0.42
172	BR12877-5R-100	107	85	2.49

Sl.#	Genotype	Days to maturity	Plant height (cm)	Yield (t/ha)
173	BR12877-5R-104	115	91	0.81
174	**BR12877-5R-121**	**106**	**86**	**2.69**
175	BR12877-5R-134	107	83	0.70
176	BR12877-5R-137	109	101	0.41
179	BR12878-5R-13	114	116	0.67
180	BR12878-5R-42	112	103	1.37
181	BR12878-5R-52	115	104	0.46
182	BR12879-5R-8	115	109	0.63
183	BR12879-5R-13	118	112	0.83
185	BR12879-5R-18	120	111	0.63
186	BR12879-5R-24	117	117	0.42
187	BR12879-5R-36	125	117	0.62
188	BR12879-5R-38	109	105	0.88
189	BR12879-5R-54	123	116	0.78
190	BR12879-5R-58	109	117	0.52
191	BR12879-5R-68	123	120	0.80
192	BR12879-5R-93	118	126	0.63
193	BR12879-5R-94	116	119	0.64
194	BR12880-5R-91	120	117	0.41
195	BR12880-5R-99	109	109	0.41
196	BR12880-5R-106	109	98	1.15
197	BR12880-5R-190	109	125	2.27
198	BR12880-5R-218	109	120	1.90
199	BR12880-5R-237	109	103	2.38
200	BR12880-5R-259	109	111	2.37
201	**BR12880-5R-266**	**100**	**97**	**3.13**
202	BR12880-5R-276	109	107	2.09
203	**BR12880-5R-291**	**105**	**103**	**2.51**
204	**BR12880-5R-302**	**105**	**105**	**2.69**
205	BR12880-5R-307	105	108	2.30
206	**BR12880-5R-308**	**103**	**115**	**3.34**
207	BR12880-5R-317	105	88	1.40
	BRRI dhan43 (Ck)	106	112	1.80
	BRRI dhan65 (Ck)	86	104	1.60
	BRRI dhan83 (Ck)	109	107	2.40
	Hashikalmi (L. Ck)	95	99	0.80
	LSD < 0.05	**3.6**	**5.5**	**0.5**
	H2b	**0.58**	**0.73**	**0.93**

Experiment 1.6: Preliminary Yield Trial (PYT)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Initial yield evaluation and other agronomic characteristics of advanced breeding lines compared to standard checks in replicated trial.

Materials and Methods: Fifteen entries were evaluated under PYT-1 and 14 entries were evaluated under PYT-2 against BRRI dhan43, BRRI dhan65 and BRRI dhan83 as standard check and Hasikalmi as local check in 5m × 10 rows plot with a spacing of 25 cm between two rows with sufficient moisture in the field at BRRI, Gazipur. Seeding was done in 7 April, 2022. The experiment was laid out in RCB design with two replications. Fertilizer application and other crop management was followed as Experiment 1.2.

Results and discussion: In PYT-1, eight genotypes such as BR12236-5R-6, BR12244-5R-24, BR12248-5R-18, BR12248-5R-22, BR12248-5R-37, BR12248-5R-65, BR12248-5R-122 and BR12263-5R-75 were selected on the basis of yield and growth duration (earliness) compared to check varieties **(Table 1.6.a).**

In PYT-2, four genotypes such as BR12239-5R-136, BR12244-5R-190, BR12246-5R-97 and BR12248-5R-31 were selected on the basis of yield and growth duration (earliness) compared to check varieties **(Table 1.6.b).**

Table 1.6.a: Performance of the genotypes in Preliminary Yield Trial-1 (PYT-1), Development of Upland Rice (B. Aus), 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	BR12235-5R-10	99	107	2.8	LS	21.1	23.6
2	BR12235-5R-353	101	107	2.2	LS	23.0	21.8
3	**BR12236-5R-6**	**103**	**104**	**3.0**	**LS**	**21.9**	**26.8**
4	BR12239-5R-146	100	108	1.6	LB	23.2	25.3
5	BR12244-5R-14	99	106	2.9	LB	27.4	18.7
6	**BR12244-5R-24**	**99**	**105**	**3.0**	**LS**	**24.7**	**20.7**
7	BR12244-5R-210	89	105	2.9	LB	25.4	20.0
8	BR12248-5R-4	94	103	2.9	LB	25.0	25.8
9	**BR12248-5R-18**	**93**	**104**	**3.6**	**LB**	**28.9**	**26.5**
10	**BR12248-5R-22**	**96**	**105**	**3.7**	**LB**	**22.9**	**25.2**
11	**BR12248-5R-37**	**109**	**106**	**3.1**	**LS**	**22.7**	**24.4**
12	**BR12248-5R-65**	**104**	**107**	**3.5**	**LB**	**23.6**	**25.4**
13	**BR12248-5R-122**	**100**	**105**	**4.1**	**LB**	**23.0**	**25.0**
14	BR12263-5R-31	104	107	2.7	MB	22.8	25.5
15	**BR12263-5R-75**	**112**	**105**	**3.4**	**MB**	**26.1**	**24.3**
	BRRI dhan43 (Ck)	104	112	1.6			
	BRRI dhan65 (Ck)	81	104	3.0			
	BRRI dhan83 (Ck)	105	106	2.6			
	Hashikalmi (L. Ck)	106	101	1.9			
	LSD < 0.05	6.2	1.9	0.9			
	H2b	0.9	0.91	0.77			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Table 1.6.b: Performance of the genotypes in Preliminary Yield Trial-2 (PYT-2), Development of Upland Rice (B. Aus), 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC %
1	BR12235-5R-176	97	107	1.1	LS	24.0	20.3
2	BR12235-5R-202	98	108	1.8	LB	24.2	25.1
3	BR12235-5R-355	97	109	1.1	LB	24.3	20.9
4	BR12236-5R-130	101	105	1.6	MB	20.4	25.9
5	**BR12239-5R-136**	**104**	**106**	**1.9**	**LB**	**23.9**	**25.0**
6	BR12244-5R-23	99	106	1.6	LS	24.4	24.9
7	BR12244-5R-26	110	102	1.8	LB	23.0	19.4
8	BR12244-5R-31	97	105	1.8	LB	25.5	18.5
9	**BR12244-5R-190**	**98**	**105**	**2.0**	**LS**	**24.5**	**23.8**
10	**BR12246-5R-97**	**95**	**105**	**2.1**	**LB**	**24.3**	**24.8**
11	**BR12248-5R-31**	**104**	**102**	**2.3**	**LB**	**27.3**	**26.3**
12	BR12261-5R-46	97	104	1.8	LS	20.2	25.6
13	BR12266-5R-22	91	106	1.4	LS	23.0	26.6
14	BR12266-5R-72	98	104	1.8	LS	22.2	24.3
	BRRI dhan43 (Ck)	101	103	1.1			
	BRRI dhan65 (Ck)	88	103	2.3			
	BRRI dhan83 (Ck)	105	104	1.9			
	Hashikalmi (L. Ck)	104	99	1.3			
	LSD < 0.05	8.50	3.78	0.72			
	H^2b	0.63	0.76	0.45			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Experiment 1.7: Secondary Yield Trial (SYT)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Confirmation of yield potential of the selected materials

Materials and Methods: Seven genotypes were evaluated under SYT against BRRI dhan43, BRRI dhan65 and BRRI dhan83 as standard checks and Hashikalmi as local check in 5m × 10 rows plot with a spacing of 25 cm between two rows with sufficient moisture in the field at BRRI, Gazipur. Seeding was done on 7 April, 2022. The experiment was laid out in RCB design with two replications. Fertilizer application and other crop management was followed as Experiment 1.2.

Results and discussion: Four genotypes such as BR11262-B-109-3-47, BR10756-2B-8-72, BR10409-15-2-8 and BR10417-15-2-11 were selected on the basis of yield and growth duration (earliness) for further trial but three genotypes that were comparatively better and selected for re-trial in the next season **(Table 1.7)**.

Table 1.7: Performance of the genotypes in Secondary Yield Trial (SYT), Development of Upland Rice (B. Aus), 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	**BR11262-B-109-3-47**	**118**	**108**	**2.9**	**LB**	**21.9**	**24.7**
2	BR11274-B-11-1-16	110	105	2.3	LS	20.8	25.0
3	BR11274-B-35-1-36	101	107	2.4	LB	21.0	26.0
4	**BR10756-2B-8-72**	**105**	**105**	**3.1**	**LB**	**20.0**	**26.1**
5	BR10757-2B-9-26	110	112	1.9	LS	20.5	27.3
6	**BR10409-15-2-8**	**102**	**106**	**2.5**	**LS**	**21.1**	**24.6**
7	**BR10417-15-2-11**	**108**	**106**	**2.6**	**LB**	**24.8**	**24.3**
	BRRI dhan43 (Ck)	106	113	0.9	MB	22.2	23.4
	BRRI dhan65 (Ck)	86	105	2.6	LS	23.7	27.2
	BRRI dhan83 (Ck)	110	108	3.2	LB	23.8	26.4
	Hasikalmi (L Ck)	106	101	1.6	MB	23.4	26.2
	LSD < 0.05	5.2	2.0	1.2			
	H^2b	0.76	0.95	0.61			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

PROJECT 1A: DEVELOPMENT OF *JHUM* RICE

General Objectives: Development of high yielding rice variety with low (10-19%) to high (>25%) amylose content and drought tolerance along with good cooking and eating quality suitable for Jhum cultivation and acceptable to the tribals people of Chattogram hill tracks.

Project Leader: M. Amir Hossain

Experiment 1A.1: Hybridization

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: To incorporate genes for drought tolerance along with good eating quality suitable for Jhum cultivation into high yielding genetic background.

Materials and Methods: The parent materials were grown in three different sets at 7 days' interval to synchronize flowering at BRRI, Gazipur. Seeding was done starting from 15th July and three weeks old seedlings were transplanted per set in the hybridization block. Fertilizers at the rate of 60 (130 kg Urea): 10 (50 kg TSP): 40 (80 kg MP): 18 (100 kg Gypsum): 3.6 (10 kg Zn SO_4) kg NPKSZn/ha were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and N was applied at three equal splits at 10, 25-30 and 40-45 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly. Promising parental genotypes from local Jhum cultivars (Chikon Chakma, Patri dhan, Gunda-1, Mojenshi, Kalo Binni, Sumodhan, Ranqui); exotic varieties (Japanese Black rice, DR-6, Abhaya, Basmati); BRRI varieties (BR24, BRRI dhan55); promising advanced breeding lines (BR12239-5R-197, BR10418-54-4-96, BR10411-54-6-33, BR12239-5R-93, BR10756-28-8-12, BR12234-4R-209 and BR10756-28-8-72) having good performance in terms of yield in rainfed condition, drought tolerance capacity and other remarkable traits by following respective product profile.

Results: Seventeen crosses were made using twenty-five parents **(Table 1A.1).**

Table 1A.1: List of crosses made, Development of Jhum Rice, 2022-23

SL No.	Designation	F_1 Seeds
1	Patri Dhan/Abhaya	52
2	Japanese Black rice / Basmati	48
3	BR12234-4R-209/IR8348-B-11-B	24
4	GSR-IR1-DQ130-Y5-Y1/BR12239-5R-197	50
5	Ranqui/BR10418-54-4-96	12
6	BR10756-28-8-72/BRRI dhan55	3
7	Mosenshi/DR-6	66
8	Ranqui/BR12448-5R-18	5
9	Mojenshi/DR-6	71
10	Chikon Chakma/BRRI dhan55	17
11	Mojenshi/Patri dhan	62
12	Kalo Binni/Chikon Chakma	16
13	Sumodhan/BR24	88
14	BR10418-54-4-96/Chikon chakma	8
15	Gunda-1/Abhaya	47
16	BR10411-54-6-33/BR10756-28-8-12	11
17	BR12239-5R-93/GSR IR1-DQ130-Y5-Y1	56

Experiment 1A.2: F_1 Confirmation

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: Confirmation of crosses as true F_1s.

Materials and Methods: The F_1 seeds along with their respective parents were germinated in the petri-dish and were seeded in earthen pots at BRRI, Gazipur. Twenty-one-day-old seedlings were transplanted at the rate of single seedling in a spacing of 20 cm × 15 cm in the net house along with respective parents. Fertilizer application and crop management procedure were followed as Experiment 1.2.

Results and discussion: Seven crosses were confirmed (**Table 1A.2**) by careful observation of plant characters. After confirmation, the F_2 seeds were collected and preserved. These confirmed F_1s were registered into BRRI cross list with BR registration number.

Table 1A.2: List of confirmed F_1s, Development of Jhum Rice, 2022-23

Sl.	Cross combination	BR No.	Trait
1	BR26/ Binni (Red) (9)	13955	High yield, intermediate amylose, good grain quality, acceptable to ethnic population

2	Chubu 125/ BR10411-59-5-33	13956	High yield, low amylose, short duration, acceptable to ethnic population
3	BR10411-59-5-5/ Monqui	13957	High yield, low amylose, acceptable to ethnic population
4	Japanese black rice/ BR11864-5R-32	13958	High yield, low amylose, good grain quality, light aroma, acceptable to ethnic population
5	Japanese black rice/Gunda-1	13959	High yield, low amylose, good grain quality, light aroma, acceptable to ethnic population
6	Japanese black rice/Gunda-2	13960	High yield, low amylose, good grain quality, light aroma, acceptable to ethnic population
7	Japanese black rice/Monqui	13961	High yield, low amylose, good grain quality, light aroma, acceptable to ethnic population

Experiment 1A.3: Growing of F_2 population

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Growing of F_2 population from F_1 progenies.

Materials and Methods: Six F_2 populations were grown which were previously confirmed F_1 plants from each cross were grown in Field RGA (Rapid generation Advance) nursery at BRRI, Gazipur. Thirty days old seedlings were transplanted at a spacing of 5 cm x 5 cm. Fertilizer management was done using the half doses of all fertilizers used in Experiment 1.2. Weeding was done during the period of early seedling to maximum tillering stages. Thinning of tillers was practiced in maximum tillering stage and so on. At maturity, single mature tiller was harvested from each plant under field condition (**Table 1.3**).

Results: In total, 9,000 plants were maintained from F_1 plants originated from 6 crosses. Total number of harvested plants were 7,500. **(Table 1.3)**.

Table 1A.3: List of F_2 progenies maintained through Field RGA, Development of Jhum Rice, 2022-23

Sl.	BR No.	Cross combination	Traits	No. of plants	
				TP	HP
1	14447	Mongthongno/BRRI dhan82	High yield, drought tolerance, intermediate amylose, acceptable to ethnic group	1500	1200
2	14448	Kopro/BRRI dhan62	High yield, intermediate amylose, good grain quality, short duration, acceptable to ethnic population	1500	1310
3	14449	Kopro/BRRI dhan82	High yield, drought tolerance, acceptable to ethnic group	1500	1180
4	14450	Bekui/ BRRI dhan82	High yield, drought tolerance, acceptable to ethnic group	1500	1320
5	14451	Company/ BRRI dhan82	High yield, drought tolerance, acceptable to ethnic group	1500	1210
6	14452	Galong/BRRI dhan83	High yield, Kataktara type grain, acceptable to ethnic group	1500	1280

Experiment 1A.4: Advancement of segregating generation

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Advancement of segregating generation through field RGA

Materials and Methods: Seventeen crosses of F_4 generation were grown in Field RGA (Rapid generation Advance) nursery at BRRI, Gazipur. Thirty days old seedlings were transplanted at a spacing of 5 cm × 5 cm. Fertilizer management was done using the half doses of all fertilizers used in Experiment 1.2. Weeding was done during the period of early seedling to maximum tillering stages. Thinning of tillers was practiced in maximum tillering stage and so on. At maturity, single mature tiller was harvested from each plant under field condition (**Table 1A.4**).

Results and discussion: A total of 9,180 progenies obtained from 17 crosses of F_4 generation were advanced through Field RGA.

Table 1A.4: List of F_4 progenies maintained through Field RGA, Development of Jhum Rice, 2022-23

Sl. #	BR No.	Parentage	No. of progenies
1	13855	Chinese rice/BR24	280
2	13856	Chinese rice /BRRI dhan62	550
3	13857	Kanbui/BR26	600
4	13858	Kanbui/BRRI dhan55	620
5	13859	Kanbui/BRRI dhan60	560
6	13860	Ranqui/BRRI dhan55	610
7	13861	BR10466-2B-15/ Ranqui	750
8	13862	Bish Number/BR24	680
9	13863	Bish Number /BR26	720
10	13864	Bish Number/BRRI dhan62	420
11	13865	Takanari/BRRI dhan55	410
12	13866	Takanari/BRRI dhan60	400
13	13867	Takanari/BRRI dhan62	520
14	13868	Takanari/ Bish Number	400
15	13869	BRRI dhan55/ Hokuriku193	480
16	13870	BRRI dhan60/ Hokuriku193	620
17	13871	BRRI dhan62/ Hokuriku193	560
Total=			**9,180**

Experiment 1A.5: Observational Yield Trial

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objectives: Selection of homozygous breeding lines with drought tolerance, suitable for Jhum cultivation with high yield, good cooking and eating quality and acceptable to tribals of Chattogram hill districts.

Materials and Methods: Thirty-one exotic advanced lines were evaluated in OYT. The genotypes were seeded directly in unit plot size of 5 m × 4 rows with a spacing of 25 cm between two rows with sufficient moisture in the field at BRRI, Gazipur. The experiments were laid out in augmented RCB design with three blocks. Fertilizer application and crop management was followed as in Experiment 1.2. BRRI dhan43, BRRI dhan65 and BRRI dhan83 were used as standard checks.

Results and discussion: Twenty-three entries were selected out of thirty-one entries, considering uniformity of morpho-agronomic traits, growth duration and yield (**Table 1A.5**)

Table 1A.5: Performance of selected entries in Observational yield trial (OYT), Development of Jhum Rice, 2022-23

Sl	Genotype	Days to maturity	Plant height (cm)	Yield (tha^{-1})
1	**IR18R1137 ***	**120**	**112**	**3.55**
2	**IR18R1181 ***	**111**	**108**	**3.54**
3	**IR18R1089**	**120**	**116**	**3.52**
4	**IR18R1111 ***	**120**	**110**	**4.00**
5	**IR18R1162 ***	**120**	**109**	**3.48**
6	**IR18R1145 ***	**119**	**117**	**3.27**
7	**IR18R1164**	**119**	**110**	**3.27**
8	**IR18R1073 ***	**120**	**109**	**3.24**
9	**IR18R1160 ***	**120**	**114**	**3.19**
10	**IR19L1007**	**120**	**109**	**3.03**
11	**IR18R1156 ***	**121**	**124**	**3.00**
12	**TL Aus-Gaz10-2-40-4-3***	**123**	**124**	**2.97**
13	**IR18R1068 ***	**120**	**114**	**2.97**
14	**BR10062-9-1-3**	**123**	**125**	**2.73**
15	**BR10068-22-1-3-1-P2**	**123**	**113**	**2.73**
16	**IR18R1066 ***	**119**	**114**	**2.54**
17	**TL Aus-Gaz8-45-4-3***	**122**	**110**	**2.48**
18	**IR18R1154 ***	**119**	**110**	**2.48**
19	**IR18R1153 ***	**120**	**103**	**2.43**
20	IR18R1119 *	119	105	2.41
21	**IR18R1117 ***	**119**	**115**	**2.30**
22	Sahbhagi Dhan	107	105	2.20
23	**BR9178-7-2-4-4 (short-early) ***	**117**	**114**	**2.02**
24	TL Aus-Gaz8-45-4-12	113	116	1.91
25	BR10066-26-3-2-2 (early)	118	108	1.91
26	IR18R1123 *	110	113	1.72
27	BRRI dhan83 (Ck)	99	109	1.71
28	Vandana	108	105	1.65
29	IR18R1148 *	119	111	1.63
30	IR18R1103 *	119	107	1.46
31	**TL Aus-Gaz10-40-5-19***	**112**	**117**	**1.23**
	BRRI dhan43 (Ck)	106	102	0.90
	BRRI dhan65 (Ck)	86	104	1.10
	BRRI dhan83 (Ck)	105	107	1.70
	LSD < 0.05	3.7	2	0.4
	H^2b	0.72	0.98	0.9

Experiment 1A.6: Preliminary Yield Trial (PYT)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Preliminary yield evaluation and other agronomic characteristics of advanced breeding lines compared to standard checks in replicated trial.

Materials and Methods: Four preliminary yield trials (PYT) were executed. Fourteen, eight, eighteen and eight entries were evaluated under PYT-1, PYT-2, PYT-3 and PYT-4, respectively against five standard checks namely BRRI dhan43, BRRI dhan55, BRRI dhan65, BRRI dhan69 and BRRI dhan83 in 5m × 10 rows plot with a spacing of 25 cm between two rows with sufficient moisture in the field at BRRI, Gazipur. Seeding was done in April. The experiment was laid out in RCB design with two replications. Fertilizer application and other crop management was followed as experiment 1.2.

Results and discussion: Four genotypes were tracked better to promote from fourteen evaluated genotypes in PYT-1. No selection was done in PYT-2 as none of the tested entries perfom better than the check varieties. In PYT-3, only six genotypes had better yield performance over the checks and selected from eighteen tested genotypes. In PYT-4 trial, eight genotypes were evaluated but none of the entry was promoted for succeeding trial considering growth duration, yield and phenotypic acceptibility (**Table 1A.6.a; 1A.6.b; 1A.6.c** and **1A.6.d).**

Table 1A.6.a: Performance of the genotypes in Preliminary Yield Trial-1 (PYT-1), Development of Jhum Rice, 2022-23

SL	Genotype	Plant Height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	IR2-9-R1-SU3-Y2	99	107	1.2	LB	21.8	21.6
2	IR1-5-S14-S2-Y1	82	113	1.5	LS	25.1	20.4
3	IR1-DQ157-R6-D1	101	115	1.1	LS	22.8	25.7
4	**IR83140-B-11-B**	**102**	**111**	**2.2**	**LB**	**25.8**	**20.5**
5	**GSR IR 1-DQ121-Y6-D2**	**102**	**110**	**3.1**	**LS**	**21.9**	**18.8**
6	GSR IR 1-DQ62-D7-D1	100	107	1.3	LB	20.7	21.4
7	GSR IR 1-DQ130-Y5-Y1	95	113	1.9	LB	20.1	19.1
8	**GSR IR 1-DQ60-D2-D1**	**101**	**110**	**2.4**	**LB**	**21.0**	**17.8**
9	GSR IR 1-DQ146-L18-Y1	101	107	1.7	LB	22.0	22.3
10	GSR IR 1-DQ112-Y1-D2	92	111	0.9	LB	20.5	23.0
11	GSR IR2-8-Y5-SU1-L2	100	119	0.6	LS	21.6	21.8
12	**BR(Bio)10376-AC4-1-3**	**99**	**109**	**2.5**	**LS**	**22.8**	**19.7**
13	BR(Bio)10376-AC9-1-3	95	108	1.6	MB	21.3	18.6
14	BR(Bio)10376-AC11-1-3	94	107	1.9	LS	23.6	20.1
	BRRI dhan43 (Ck)	99	104	1.2			
	BRRI dhan55 (Ck)	101	104	1.2			
	BRRI dhan65 (Ck)	87	103	1.6			
	BRRI dhan69 (Ck)	92	124	1.0			
	BRRI dhan83 (Ck)	103	103	2.6			
	LSD < 0.05	2.3	4.28	1.3			
	H^2b	0.99	0.86	0.43			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Table 1A.6.b: Performance of the genotypes in Preliminary Yield Trial-2 (PYT-2), Development of Jhum Rice, 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	Japanese black rice	108	131	0.3	LB	25.0	9.5
2	Takanari	81	125	0.7	MB	21.7	17.1
3	Black rice (Indonesia)	92	130	1.2	LB	23.4	10.2
4	Gunda-2	103	123	0.8	MB	21.3	23.5
5	Qropokdhan	125	118	1.2	MB	23.3	23.7
6	Tokte	101	116	0.4	MB	27.3	21.0
7	Kobroq	115	119	0.6	LB	20.9	22.5
8	Mongqui	126	126	0.9	LB	22.0	26.0
	BRRI dhan43 (Ck)	101	105	0.8			
	BRRI dhan55 (Ck)	98	107	2.0			
	BRRI dhan65 (Ck)	85	105	2.3			

	BRRI dhan69 (Ck)	95	129	1.1			
	BRRI dhan83 (Ck)	101	103	2.0			
	LSD < 0.05	7.1	1.1	0.3			
	H^2b	0.89	0.99	0.86			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Table 1A.6.c: Performance of the genotypes in Preliminary Yield Trial-3 (PYT-3), Development of Jhum Rice, 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	**BR12236-5R-8**	**100**	**108**	**3.1**	**LS**	**23.1**	**26.7**
2	**BR12236-5R-17**	**118**	**107**	**2.5**	**LB**	**23.7**	**25.5**
3	**BR12239-5R-5**	**108**	**115**	**2.5**	**LB**	**24.6**	**23.0**
4	BR12239-5R-12	107	116	0.9	MB	22.7	24.5
5	**BR12239-5R-25**	**114**	**115**	**2.6**	**LB**	**22.8**	**25.0**
6	BR12239-5R-27	115	108	2.1	LB	26	23.0
7	BR12239-5R-31	96	114	0.8	LB	26.3	25.6
8	BR12239-5R-113	117	107	1.7	LB	24.8	25.7
9	BR12239-5R-174	110	113	1.4	MB	22.1	24.0
10	**BR12239-5R-183**	**111**	**105**	**2.3**	**MB**	**24**	**23.0**
11	BR12239-5R-186	106	114	2.1	LB	27	25.0
12	BR12239-5R-195	105	113	1.2	LB	23	28.0
13	BR12239-5R-197	109	108	1.8	MB	21	22.0
14	BR12239-5R-198	94	111	1.9	MB	23	23.0
15	**BR12239-5R-201**	**100**	**107**	**2.5**	**LB**	**26**	**22.0**
16	BR12239-5R-202	100	114	2.0	MB	26	23.0
17	BR12239-5R-209	96	111	2.2	LB	24	23.0
18	BR12248-5R-107	95	111	2.2	LB	24	27.0
	BRRI dhan43 (Ck)	88	113	1.8			
	BRRI dhan55 (Ck)	105	105	2.1			
	BRRI dhan65 (Ck)	72	106	1.9			
	BRRI dhan69 (Ck)	89	103	1.4			
	BRRI dhan83 (Ck)	99	107	2.2			
	LSD < 0.05	3	0.9	0.8			
	H^2b	1	1	0.7			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Table 1A.6.d: Performance of the genotypes in Preliminary Yield Trial-4 (PYT-4), Development of Jhum Rice, 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC%
1	SVIN271	90	115	1.8	LB	24.4	24.1
2	SVIN646	83	119	0.6	LS	27.6	21.8
3	SVIN647	96	126	0.7	LS	23.6	26.5
4	SVIN703	94	129	1.3	LS	23.6	23.4
5	SVIN474	105	119	0.7	LB	25.2	22.4
6	SVIN649	91	118	1.1	LB	21.6	22.6
7	SVIN693	102	128	0.5	MB	26.2	23.3
8	SVIN306	94	117	1.6	LB	21.7	25.8
	BRRI dhan43 (Ck)	93	101	1.6			
	BRRI dhan55 (Ck)	98	108	3.5			
	BRRI dhan65 (Ck)	86	102	3.2			
	BRRI dhan69 (Ck)	92	130	3.8			
	BRRI dhan83 (Ck)	103	112	4.0			
	LSD < 0.05	3.1	3.3	1.5			
	H^2b	0.99	0.98	0.8			

*TGW= Thousand grain weight and AAC%= Apparent amylose content

Experiment 1A.7: Secondary Yield Trial (SYT)

Principal Investigator: M. A. Hossain

Co-investigator: Nusrat Jahan

Specific Objective: Confirmation of yield potential of the selected materials

Materials and Methods: Eight genotypes were evaluated under SYT against BRRI dhan43, BRRI dhan65 and BRRI dhan83 as standard checks and Hashikalmi as local check in 5m × 10 rows plot with a spacing of 25 cm between two rows with sufficient moisture in the field at BRRI, Gazipur. Seeding was done on 8 April, 2021. The experiment was laid out in RCB design with two replications. Fertilizer application and other crop management was followed as experiment 1.2.

Results and discussion: Seven out of 16 entries were selected in SYT on the basis of yield and growth duration (earliness) to be recycled as parental genotypes in respective breeding program **(Table 1A.7).**

Table 1A.7: Performance of the genotypes in Secondary Yield Trial (SYT), Development of Jhum Rice, 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	Yield (tha^{-1})	Size & Shape	TGW	AAC %
1	**Shili**	**115**	**107**	**2.2**	**LS**	**21**	**22.2**
2	SonaJhuri	120	115	1.4	SR	14.3	25.8
3	**Bodakusum**	**151**	**114**	**1.7**	**LB**	**25.5**	**25.8**
4	**Chuli**	**100**	**115**	**1.8**	**MB**	**19.2**	**23**
5	**Gellong-2**	**106**	**115**	**1.8**	**MB**	**21.4**	**26.8**
6	Kala Binni (2)	110	62	0.6	MB	24.9	26.6
7	**Binni (Red) (8)**	**120**	**115**	**1.7**	**SR**	**15.5**	**26.4**
9	Binni Dhan (Reddish)	91	63	0.5	MB	23.8	26.3
10	Patri Dhan	127	115	1.1	MB	18.9	26.0
11	KutkuttaBinni	115	106	1.3	MB	26.2	26.8
12	Bak Binni	128	113	1.6	MB	19.9	26.6
13	Mongthongno	107	103	1	LB	21.9	25.2
14	Kanbui	104	110	1.1	MB	17	26.4
15	Ranqui	100	118	0.7	LS	22.2	27.7
16	Gunda	104	115	0.9	MB	22	26.5
17	Sanki	95	105	1.2	LS	21.8	24.5
18	Bish Number	102	116	0.6	MB	24.4	26.8
19	**Chinese rice**	**100**	**111**	**1.9**	**LS**	**19.4**	**27.4**
20	**YAAS-V5**	**101**	**105**	**2.3**	**MB**	**21.7**	**27.2**
	BRRI dhan43 (Ck)	96	105	1.0			
	BRRI dhan55 (Ck)	103	104	1.5			
	BRRI dhan65 (Ck)	88	103	1.4			
	BRRI dhan69 (Ck)	105	132	1.8			
	BRRI dhan83 (Ck)	104	107	2.1			
	LSD < 0.05	37.9	3.8	0.8			
	H^2b	0.08	0.95	0.72			

Experiment 1A.8: Advanced Yield Trial (AYT)

Principal Investigator: M. A. Hossain

Co-Investigator: Nusrat Jahan and K. M. Iftekharuddaula

Specific Objective: Advanced evaluation of promising entries in replicated trial under targeted hill condition of Chattogram hill tracts.

Materials and Methods: Eight genotypes including BRRI dhan83 as standard check and one local check i.e., most popular cultivar specific to each location were evaluated. The other six common genotypes for each of the six trials were Chinese Rice, Japanese black rice, Mongthongno, IR1-DQ157-R6-D1, GSR IR1DQ121-Y6-D2 and BR(Bio)10376-AC4-1-3, were grown in replicated trial under targeted hill condition of Chattogram hill districts. The method of planting was dibbling as practiced by tribal Jhum farmers. The experiment was laid out in randomized complete block (RCB) design. Unit plot size was 20m^2 (5m x 4m). The crop was fertilized by Urea, TSP, MoP, Gypsum and Zinc sulphate @ 20, 8, 12, 8 and 1 kg/bigha, respectively. All the fertilizers and one third of urea was applied at the time of planting in the dibbled hole. Rest two third of urea was top dressed in two equal splits at different stages of crop growth.

Unit plot size= 5m x 4m = 20 square meter
Design: Randomized complete block (RCB) Design
No. of entries including checks: 8
No. of replication: 3
Unit plot area = 5m x 4m = 20 square meter
Total plot area (each AYT) =30m x20m = 600 square meter
Locations: Khagrachori (Sadar and Matiranga), Rangamati (Sadar and Kaptai) and Bandarban (Sadar and Rowangchori)

Results: Among all the entries, despite heterogeneity in climatic condition and topographic architecture, BRRI dhan83 was the top yielder entry in every trial.

Table. 1A.8.a: Performance of genotypes in AYT, Development of Jhum Rice, 2022-23

SL	Genotype	Plant height (cm)	Days to maturity	L1	L2	L3	L4	L5	L6	Yield (tha^{-1})
1	Chinese Rice	104	118	1.3	1.4	2.8	2.1	0.9	2.2	1.8
2	Japanese black rice	110	135	0.9	0.8	0.5	1.2	0.5	1.9	1.0
3	Mongthongno	121	105	1.5	1.5	2.6	1.5	1.4	2.9	1.9
4	IR1-DQ157-R6-D1	107	126	1.4	1.4	2.1	1.7	1.1	2.3	1.7
5	GSR IR1DQ121-Y6-D2	97	118	1.1	1.7	2.4	1.7	1.9	2.2	1.8
6	BR(Bio)10376-AC4-1-3	94	117	1.1	1.2	2.8	1.7	1.5	2.2	1.8
7	BRRI dhan83	112	110	2.0	1.9	2.9	2.0	2.1	3.9	2.5
	LSD < 0.05	10.8	6.9	0.3	0.3	0.5	0.6	0.3	0.5	0.4
	H^2b	0.84	0.94	0.93	0.92	0.93	0.69	0.95	0.93	0.91

L1=Rowangchori, Bandarban; L2=Sadar, Bandarban; L3=Matiranga, Khagrachori; L4=Sadar, Khagrachori; L5=Kaptai, Rangamati; L6=Sadar, Rangamati.

PROJECT 2: GENETIC IMPROVEMENT OF PARTIALLY IRRIGATED RICE (T. AUS), 2022-2023

General objectives: To develop short duration high yield potential genotypes having tolerance to lodging, high temperature at reproductive phase and pre-harvest sprouting tolerance including good grain quality.

Project Leader: M Khatun

Experiment 2.1: Hybridization

Principal Investigator: M Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objectives: Introgression of earliness, pre-harvest sprouting tolerance and quality grains into high yielding genotypes.

Materials and Methods: The crossing program for the development of T. Aus was started from 01 July in T. Aman and 15 November in Boro for good seed setting. The experiment was conducted at BRRI Headquarter, Gazipur. Seeding was done in the hybridization block at three dates with an interval of 7 days to synchronize flowering times between desired male and female parents. Twenty-five-day-old seedlings for T. Aman & thirty-five-day-old-seedlings for Boro season were transplanted in a 5.4 m × 2 rows plot with a spacing of 25 × 20 cm. Single seedling was used for transplanting. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg $ZnSO_4$) kg NPKSZn/ha in T. Aman and @ 120 (261 kg Urea): 19 (95 kg TSP): 60 (120 kg MP): 20 (111 kg Gypsum): 4 (11 kg ZnSO4) kg/ha NPKSZn were applied in Boro season. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen was applied at three equal splits at 10, 25-30 and 40-45 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly.

Results: Nineteen crosses were made using 16 parents for development of partially irrigated rice (T. Aus) from 2022-23 and 2269 F_1 seeds were collected (**Table 2.1**).

Table 2.1. List of the crosses, Development of Partially Irrigated Rice (T. Aus), 2022-23

SN	Parentage	No of F1 seed	Introgression of target genes
1	BR9006-40-2-3-1*3/BR11607-4R-72	286	*Xa4, Xa21, xa5, xa13*
2	BR9830-53-3-5-2*2/BR11607-4R-72	35	*Xa4, Xa21, xa5, xa13*
3	BR9006-40-2-3-1*3/BR11868-5R-23	99	*Xa4, Xa21, xa5*
4	BR9829-78-1-2-1*3/BR11607-4R-192	274	*Xa4, Xa21, xa5, xa13*
5	BR9829-78-1-3-2*2/BR11868-5R-23	278	*Xa4, Xa21, xa5*
6	BR9829-78-1-2-1*3/IR127152-3-22-2-1-B	269	*Xa4, Xa21, xa5, xa13*
7	7 FBR-222/BR11603-4R-49	27	*Xa4, Xa21, xa5*
8	BR11723-4R-12/BR12442-4R-49	122	*Xa4, Xa21, xa5*
9	BR8781-16-1-3-P2/BR12442-4R-49	113	*Xa4, Xa21, xa5*
10	BRRI dhan43/BR11102-4R-247	55	*Xa4, Xa21, xa5*
11	BR11723-4R-172/IR64-EMF_3	24	-
12	BR11723-4R-12/N22	15	*qHTSF4.1*
13	BR11867-4R-371*2/IR64-EMF_3	61	*Xa4, Xa21*
14	BR11723-4R-12/IR12N177	94	*qHTSF4.1*
15	7 FBR-376/IR64-EMF_3	5	-
16	7 FBR-222/BR11603-4R-49	27	*Xa4, Xa21, xa5*
17	BR12442-4R-49/IR64-EMF_3	108	*Xa4, Xa21, xa5*
18	BR12121-4R-53/IR12N177	269	*qHTSF4.1*
19	BR11723-4R-12/N22//BR11867-4R-371/IR64-EMF_3	108	*Xa4, Xa21, xa5, qHTSF4.1*
	Total	**2269**	

Experiment 2.2: Confirmation of F_1

Principal Investigator: Mahmuda Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objective: Confirmation of F_1s as true crosses through hybridity test.

Materials and Methods: Sixteen crosses were grown (**Table 2.2**). F_1 seeds of each cross and their respective parents were germinated in petri dishes and then sown in earthen pots. Twenty-five-day-old seedlings were transplanted using single seedling per hill with a spacing of 25 × 15 cm in the net house. Respective parental seedlings were transplanted on both sides of each F_1 population. The cross confirmation was done by careful observation of plant characters. After confirmation promising F_1s were selected and used for double and multiple crosses. Complex crosses were mainly done for the F_1s which using local cultivars or low yielding genotypes with valuable traits. The F_2 and multiple F1 crosses were preserved carefully after proper drying in a cool place. Crop management was done as described in Experiment 2.1.

Results: All F1s were confirmed successfully during T. Aus 2022-23.

Table 2.2. F_1 confirmation, T. Aus, 2022-23

SN	BR No.	Cross combination	Trait/ Genes of interest
1	BR14994	BR9006-40-2-3-1*2/ BR11607-4R-72	*Xa21, xa13*, xa5, Pita, TSV1
2	BR14995	BR9830-53-3-5-2*2/ BR11607-4R-72	*Xa21, xa13*
3	BR14679	BR11723-4R-172/IR64-EMF3	*qHTSF4.1*
4	BR14681	BR11723-4R-12/N22	*qHTSF4.1*
5	BR14996	BR11867-4R-371*2/IR64-EMF3	*Xa21*
6	BR14997	BR9006-40-2-3-1*3/BR11868-5R-23	*Xa21, xa5*
7	BR14998	BR9829-78-1-2-1*3/BR11607-4R-192	*Xa21, xa13*, xa5
8	BR15008	BR12121-4R-53/BR9138-4-4-5-5-P3-HR3-HR5	*xa5, Xa21, qHTSF4.1*
9	BR15009	BR11723-4R-12/IR12N177	*xa5, Pita, qHTSF4.1*
10	BR15010	7 FBR-222/ BR11603-4R-49	*xa5, Xa21, BADH2.1*
11	BR15011	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49	*Xa21, xa5*
12	BR15012	BR11723-4R-12/BR12442-4R-49	Xa21, qHTSF4.1, *BADH2.1*
13	BR15013	BR12442-4R-49/IR64-EMF3	*Xa21, qHTSF4.1, BADH2.1*
15	BR15015	BR11723-4R-12/N22//BR11867-4R-371/IR64-EMF3	*Xa21, xa13, xa5, Pita, qHTSF4.1*
16	BR15016	BR8781-16-1-3-P2/BR12442-4R-49	*Xa21, qHTSF4.1, BADH2.1*

Experiment 2.3: Field RGA nursery (F_2-F_4 Generation)

Principal Investigator: Mahmuda Khatun

Co-investigator: S K Debsharma & J Ferdousy

Specific objectives: To maintain high yield potential progenies with good grain type, short growth duration and disease and insect pest resistance under field condition.

Materials and methods: A total of 27,500 progenies from 58 crosses were grown (**Table 2.3 & 2.4).** Each progeny was grown in a 1.2 m single row plot. Three weeks old seedlings were transplanted @ single seedling with a spacing of 5 × 5 cm. Fertilizers were applied as per needed. Weeding, tiller cutting and other cultural operations were done in time.

Results: In partially irrigated rice (T. Aus) program, a total of 27,500 progenies of 58 crosses in T. Aus season were advanced trough modified RGA in greenhouse and FRGA.

Table 2.3. List of F_2 population to be grown in Greenhouse-RGA, T. Aus, 2022-23

SN	BR No.	Cross combination	No of Plants	Progenies
F_2				
1	BR14304	BR9006-40-2-3-1 / HHZ12-Y4-Y1-DT1	2,3,5,6,8	500
2	BR14305	BR9006-40-2-3-1 / BR11600-4R-230	2,3,8	500
3	BR14307	BR8781-16-1-3-P2/ HHZ12-Y4-DT1-Y3	1,2,4,6	500
4	BR14311	BR11868-5R-23/N22	4,5,7,8	500

5	BR14312	BR9029-37-2-1-3-P1/ HHZ15-DT7-SAL4-SAL1	1,3,4,6,7,8	500
6	BR14313	7 FBR-400/ IR99853-B-B-B-460	2,3,5,6,8	500
7	BR14315	BR11600-4R-230/ BRRI dhan43	1,3,4,6,7	500
8	BR14319	7 FBR-416/ BR9651-15-2-1-4	1,2,3,7,8	500
9	BR14321	BRRI dhan92/ IR99853-B-B-B-460	1,2,3,5,6	500
10	BR14327	BRRI dhan98/ BR11102-4R-247	1,2,5,6	500
11	BR14329	BRRI dhan99/ BR11102-4R-247	1,2,3,5	500
12	BR14332	BRRI dhan43/ BR11102-4R-247	2,3,4,6	500
13	BR14336	BR11723-4R-172/ USPi9	4,5,6,7,8	500
14	BR14306	BR9006-40-2-3-1/ BR11868-5R-23	1,2,3,6,8,9,10,11,14	500
15	BR14308	BR9829-78-1-2-1/ BR11607-4R-192	5,6	500
16	BR14309	BR9829-78-1-3-2/ BR11868-5R-23	3,4,11,12	500
17	BR14310	BR11600-4R-230/N22	3,5,8	500
18	BR14314	BR9830-53-3-5-2/ BR11600-4R-43	1,2,3	500
19	BR14316	BRRI dhan98/ BR11600-4R-230	4	500
20	BR14317	7 FBR-416/ BR11868-5R-59	2,3,4,5,6,7	500
21	BR14318	7 FBR-400/ BR11868-5R-89	2,3,5	500
22	BR14320	BR11600-4R-230/ BR11607-4R-153	1,3,4,5,6,7	500
23	BR14322	BRRI dhan89/ BR11607-4R-192	1,4,11,14,28	500
24	BR14323	BR11600-4R-140/ BR11607-4R-153	1,2,3,5,6	500
25	BR14324	BR11604-4R-84/ BR11600-4R-230	1-7	500
26	BR14325	BR11723-4R-12/ BR11868-5R-89	4,5,6,7,8	500
27	BR14326	BR11723-4R-172/ BR11607-4R-192	1,2,6,8	500
28	BR14328	BRRI dhan99/ BR11103-4R-97	1,2,3	500
29	BR14331	7 FBR-400/ BR11103-4R-97	2,3,4	500
30	BR14333	BRRI dhan98/ IR64-Pi9	2,3,4,5,6,8	500
31	BR14343	BRRI dhan71*2/ IR127152-3-22-2-1-B	2,6,8,9,10	500
			Total	**15500**

Table 2.4. List of F_{3-5} population to be grown in FRGA, T. Aus, 2022-23

SN	BR No.	Designation	Imp. features	Progenies
F_3, T Aus				**Trans**
1	BR13957-R	BR9829-78-1-2-1/IR127152-3-22-2-1-B	BB resistance	500
2	BR13958-R	BR9829-30-3-2-1*2/BR9651-15-4-3-2	"	500
3	BR13959-R	HHZ15-DT7-SAL4-SAL1/BR9942-1-2-1-1-B2	"	500
4	BR13960-R	BRRI dhan89/BR10397-3-2-1-1	"	500
5	BR13961-R	GSR-IR 1-DQ-142-Y1-Y1/BR9636-8-6-10-2-3	"	500
6	BR13962-R	BRRI dhan99/IR127152-3-22-2-1-B	"	500
7	BR13963-R	BR9011-25-4-1-3/IR64-EMF$_3$	EMF	500
8	BR13964-R	BRRI dahn89/IR99853-B-B-B-460 (HNT)	HNT	500
9	BR13965-R	BR9006-40-2-3-1/IR127152-3-22-2-1-B	BB resistance	500
10	BR13966-R	7 FBR-400/ IR99853-B-B-B-460 (HNT)	HNT	500
11	BR13967-R	BR9006-40-2-3-1/ BR10397-3-2-1-1-8	BB resistance	500
12	BR13968-R	BR9011-62-2-1-2*2/ IR12N177	HTR	500
	Total			**6000**
SN	**BR No**	**Designation**	**Imp. features**	**Progenies**
F_4, T Aus				**Trans**
1	BR13618-2R	7 FBR-222/BRRI dhan89	Lodging tol	400

2	BR13619-2R	BRRI dhan27/HHZ12-Y4-DT1-Y3	Earliness	400
3	BR13620-2R	BRRI dhan27/ 7 FBR-189	"	400
4	BR13622-2R	7 FBR-400/BRRI dhan89	"	400
5	BR13623-2R	GSR-IR 1-DQ-142-Y1-Y1/BR9011-62-2-1-2	"	400
6	BR13624-2R	BR9011-62-2-1-2/ IR12N177	"	400
7	BR13625-2R	BR9830-44-1-8-2/ BRRI dhan89	"	400
8	BR13626-2R	BRRI dhan89/IR05N412	"	400
9	BR13627-2R	BR8784-4-1-2/BR9942-1-2-1-1-B2	"	400
10	BR13628-2R	BR9829-30-3-2-1/ BR9651-15-4-3-2	"	400
11	BR13629-2R	BRRI dhan89/IR12N177	"	400
		Total		**4400**

SN	BR No	Designation	Imp. features	Progenies
F_5, T Aus				**Trans**
1	BR13614-3R	BRRI dhan89 /IR12N177	lodging tol	400
2	BR13615-3R	BR9011-62-2-1-2/Nania	short duration	400
3	BR13616-3R	BR9830-5-2-2-3/BRRI dahn87	short duration	400
4	BR13617-3R	BR9830-5-2-2-3/Nania	Short duration	400
		Total		**1600**

Experiment 2.4: Line Stage Testing (LST)

Principal Investigator: M Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objective: Isolation of homogeneous breeding lines with improved plant type, disease free and short duration.

Materials and Methods: Line Stage Testing consisting of 7700 genotypes (**Table 2.5**) was evaluated in T Aus 2022-23. The unit plot size was 2.4 m × 1 row (12 hills). The spacing for transplanting was 20 cm × 20 cm and twenty-five-day-old seedlings were transplanted @ single seedling per hill. Application of Fertilizers were applied @ 195: 50: 75: 40: 5 kg Urea, TSP, MP, Gypsum, Zinc sulphate/ha respectively. The fertilizers other than urea were applied as basal during final land preparation. Urea was applied in three splits at final land preparation, 4-5 tillering stage (10 DAT) and 5-7 Days before PI stages (30 DAT).

Results: Out of 7700 lines of 22 crosses, 722 uniform lines were identified from LST based on uniformity in heading, plant height and acceptable grain type in the field condition with 9% selection intenaity (**Fig. 1**). Final selection was made based on trait marker profiles for BB, Blast, BPH resistance and different grain quality traits. The genotyping profiles showed that majority lines obtained favorable alleles of high amylose (*WxA was* 90%), BB resistance (*Xa21* was 12%, *xa5* was 9% and *xa13* was 5%), Blast resistance (*Pb1* was 46%, *Pi-ta* was 47%), rice tungro virus resistance (*TSV1* was 9%) and high temperature tolerance (*qHTSF4.1* was 20%) **(Fig. 2)**

Table 2.5. List of materials for Line Stage Testing (LST), Development of Partially Irrigated Rice, T. Aus, 2022-23

F_6 T. Aus, 2022-23				
SN	**BR No.**	**Parentages**	**Important features**	**No. of lines**
1	BR13156-4R	BR9006-54-1-3-2/BR9943-35-2-1-2-B2	Lodging tol., BB res.	350
2	BR13157-4R	BR8781-16-10-3B /BR9943-35-2-1-2-B2	Earliness, BB res.	350
3	BR13158-4R	BR9013-28-2-3/ BR9942-1-2-1-2-B2	"	350
4	BR13159-4R	BR8781-16-10-3B /BRRI dhan88	"	350
5	BR13160-4R	BR9011-12-2-1/BRRI dhan89	"	350

6	BR13161-4R	BR9006-62-2-2-2/BR9942-1-2-1-2-B2	"	350
7	BR13162-4R	BR9011-62-2-1-2/ 7 FBR-355	Earliness, Blast res.	350
8	BR13164-4R	BRRI dhan48/ 7 FBR-350	"	350
9	BR13165-4R	BR9006-62-2-2-2/HHZ5-DT20-DT2-DT1	"	350
10	BR13166-4R	BR9006-62-2-2-2 / BR9830-44-1-8-1	"	350
11	BR13167-4R	BRRI dhan27/ 7 FBR-189	"	350
12	BR13168-4R	BRRI dhan27/BR9943-35-2-1-2-B2	Tidal stress tol, BB res.	350
13	BR13169-4R	BRRI dhan82/BR9943-35-2-1-2-B2	Earliness, BB res.	350
14	BR13170-4R	BRRI dhan65/BR9830-44-1-8-1	"	350
15	BR13171-4R	BR9011-67-4-1/Parija//HHZ23-DT16-DT1-DT1	Earliness	350
16	BR13173-4R	BR9006-54-1-3-2/BR9011-34-3-2	"	350
17	BR12883-5R	BRRI dhan65/BR8781-16-1-3	Lodging tol.	350
18	BR12889-5R	BRRI dhan48/ BRRI dhan43	Zn enriched	350
19	BR12890-5R	BR9006-62-2-2-2/SA15	Non-saline tidal stress tol.	350
20	BR12891-5R	BR9006-62-2-2-2/BRRI dhan27	"	350
21	BR12893-5R	BRRI dhan27/ Habataki	Lodging tol.	350
22	BR12894-5R	BRRI dhan82/HHZ5-DT20-DT20-DT1	Earliness	350
		Total		**7700**

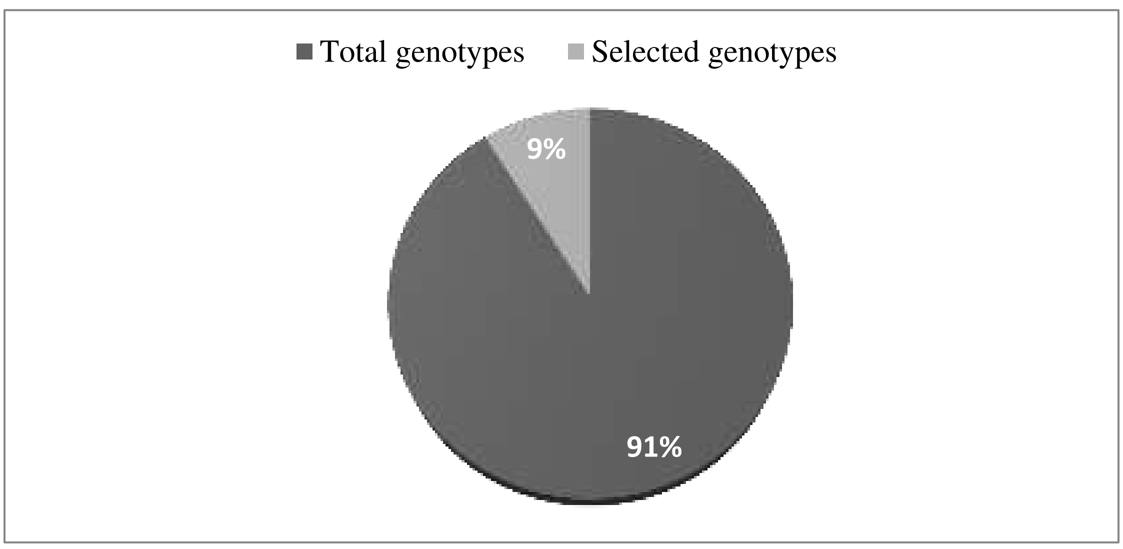


Fig.1. Pie chart showing the selected genotypes under LST, T. Aus 2022-23

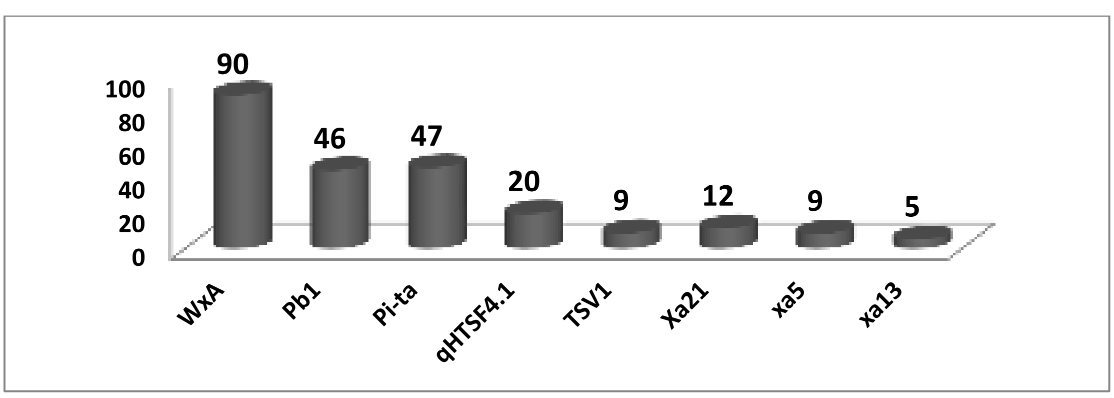


Fig. 2. Bar graph showing the different traits of LST genotypes identified by 10 SNP based trait genotyping.

Experiment 2.5: Observational Yield Trial (OYT)

Principal Investigator: Mahmuda Khatun

Co-investigator: S K Debsharma, J Ferdousy (Plant Breeding)**,** N Jahan, M Salahuddin & M R Islam (Cumilla), Anisar Rahman & M R Hasan (Rangpur), S Abedin, M R Islam & M F Islam (Rajshahi)

Specific objectives: To select materials with higher yield potentials and shorter growth duration than the standard checks to initiate preliminary yield trial.

Location: BRRI, Gazipur, Cumilla, Rangpur and Rajshahi

Materials and Methods: A total of 318 advanced lines in OYT#1 and 123 advanced lines in OYT#2 along with the check BRRI dhan48, BRRI dhan82, BRRI dhan98 and N22 were evaluated in a non-replicated trial at four locations (**Table 2.6 & 2.7**). The field layout was augmented RCBD. Three weeks old seedlings were transplanted with single seedling per hill at a spacing of 20 × 15 cm in a 5.4 m × 4 rows plot. Importantly, checks were repeated every 15-20 lines. Fertilizers were applied @ 195:50:75: 40:5 kg Urea, TSP, MP, Gypsum, Zinc sulphate/ha respectively. The fertilizers other than urea were applied as basal during final land preparation. Urea was applied in three splits at final land preparation, 4-5 tillering stage (10 DAT) and 5-7 Days before PI stages (30 DAT). Insect pest control measure and other cultural management were done as and when needed.

Results and discussion: The breeding lines showed a wide range of variation in growth duration (100-130 days), plant height (82-142 cm) and yield (1.7-5.94 t/ha) (**Fig.3**). The selected breeding lines showed 4.49 -5.94 t/ha grain yield with 108-114 days' growth duration. Highest yield (5.94 t/ha) was observed in the line BR11851-4R-37 which was about 29% higher yield than the check variety BRRI dhan48 with similar growth duration and about 17% yield advantage compared to the check variety BRRI dhan98 (**Table 2.6**). Therefore, the line BR11851-4R-37 and BR12603-4R-170 might be proceeded to evaluate in next trial.

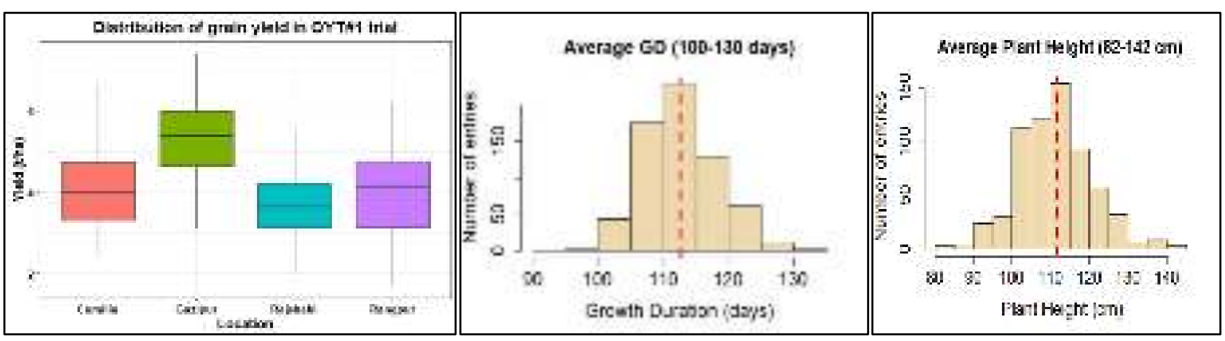


Fig. 3. Box plot showing the yield performance and histogram showing growth duration and plant height of 318 entries in OYT at four locations during T. Aus 2022-23.

Table 2.6. Agronomic Performance of the selected top yielder materials from observational yield trial (OYT#1), T. Aus 2022-23

SN	Designation	PH (cm)	DM (days)	Yield (t/ha)				
				Gazipur	Rajshahi	Rangpur	Cumilla	Pooled
1	BR11991-6R-61	101	108	7.29	4.27	4.02	3.20	4.69
2	BR12616-4R-104	114	112	7.21	2.46	5.70	3.16	4.63
3	BR12109-4R-10	102	111	7.14	3.32	4.25	5.71	5.11
4	BR12603-4R-161	118	111	7.13	3.29	3.75	5.61	4.95
5	BR12616-4R-112	118	111	7.04	3.59	5.08	4.51	5.06
6	BR12589-4R-27	112	108	6.91	4.89	5.29	3.01	5.02
7	**BR12603-4R-170**	113	108	6.88	5.54	5.78	4.66	**5.71**
8	BR12603-4R-189	132	112	6.88	3.62	4.87	4.19	4.89
9	BR12598-4R-189	101	109	6.83	3.87	5.13	2.70	4.63
10	BR11863-5R-25	103	112	6.82	4.29	3.60	4.01	4.68
11	BR12597-4R-219	114	106	6.69	4.32	2.35	4.60	4.49
12	BR12593-4R-23	109	110	6.65	4.34	4.98	4.23	5.05
13	**BR11851-4R-37**	127	115	6.52	5.88	5.97	5.39	**5.94**
14	BR12088-5R-41	119	114	6.50	3.50	4.06	4.59	4.66
15	BR12599-4R-105	105	108	6.44	4.79	3.91	3.56	4.67
16	BR12590-4R-81	103	105	6.43	4.42	5.61	2.86	4.83

BRRI dhan82 (Ck)	105	106	5.38	4.78	4.56	4.60	4.83
BRRI dhan48 (Ck)	103	108	5.30	4.30	3.90	4.91	4.60
BRRI dhan98 (Ck)	105	110	5.44	4.53	4.86	5.53	5.09
LSD <0.05	20.89	10.76	1.51	0.63	1.90	0.92	1.46
H2b	0.31	0.30	0.47	0.89	0.25	0.84	0.15
Range (N-318)	82-142	100-130	2.2-7.4	1.4-5.7	1.7-5.9	2.3-6.8	1.7-5.94

In heat tolerant T. Aus program, 123 entries were evaluated at three locations (Gazipur, Rajshahi, Rangpur) under observational yield trial (OYT#2). The selected breeding lines showed a wide range of variation in growth duration (101-131 days), plant height (86-131 cm), yield (1.1 -6.2 t/ha) and spikelet fertility (22.8-76.7) (**Table 2.7**). Highest yield (6.20 t/ha) was observed in the line BR11845-4R-178 which yield was higher than the check variety BRRI dhan48, BRRI dhan98 & N22 with similar growth duration (**Table 2.7**). Highest rainfall was found in Rangpur region & lowest in Gazipur amongst these three locations during February-June 2022-23 **(Fig. 4).** Maximum temperature of these three locations varied from 21-38˚C during February-June 2022-23. Maximum temperature found in Rajshahi region & minimum temperature found in Rangpur region in that period **(Fig.5 & 6).** The promising lines produced >5.0 t/ha yield, those lines were advanced for next trial.

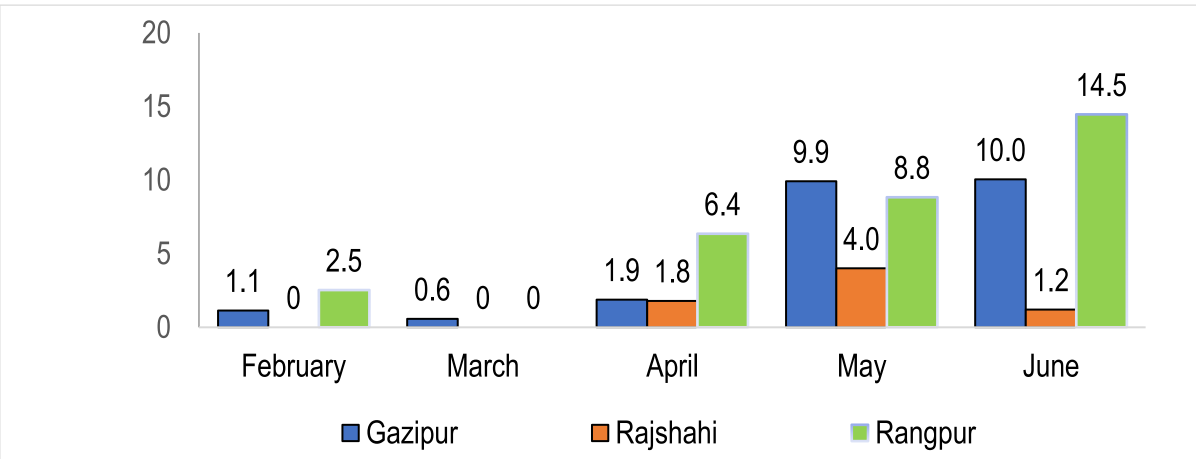


Fig. 4: Bar graph showing average rainfall in three locations during February-June 2022-23.

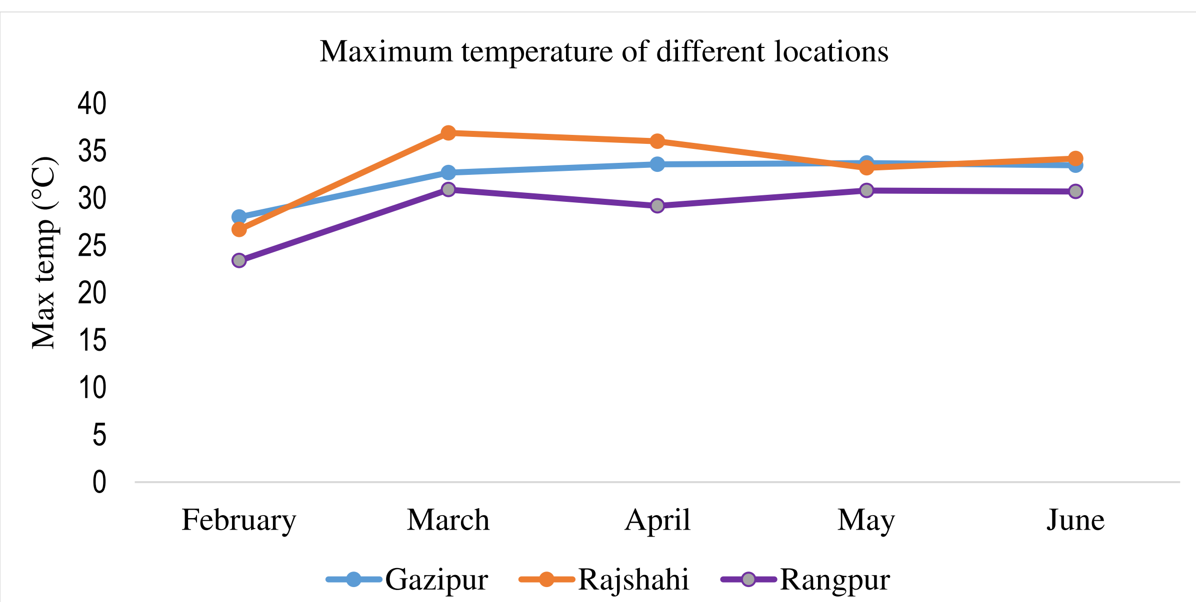


Fig. 5: Line graph showing maximum temperature in three locations during February-June2022-23.

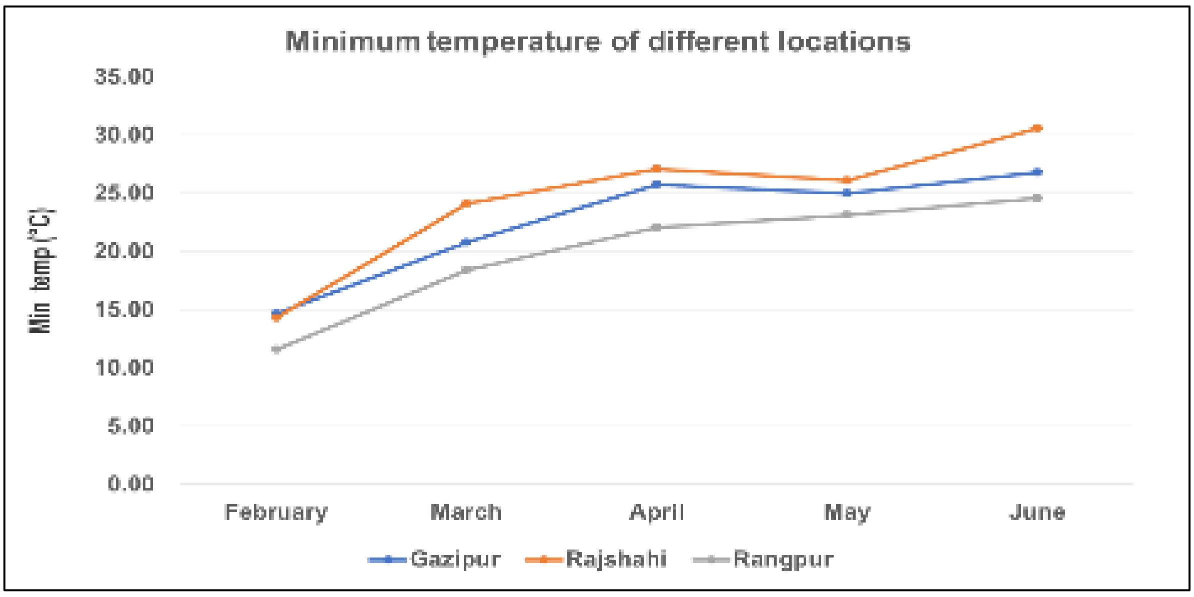


Fig. 6: Line graph showing minimum temperature in three locations during February-June2022-23.

Table 2.7. Agronomic performance of the selected top yielder materials from observational yield trial (OYT#2), Heat Tolerant Rice (HTR), T. Aus 2022-23

SN	Designation	GD (days)	PH (cm)	Yield (t/ha)				Spikelet fertility%
				Gazipur	Rajshahi	Rangpur	Pooled	
1	**BR11845-4R-178**	101	107.0	6.3	6.7	5.6	**6.2**	61.3
2	BR11845-4R-1	102	99.4	6.1	6.1	5.6	5.9	61.8
3	BR11845-4R-130	105	91.8	5.9	5.4	6.2	5.8	62.7
4	BR12605-4R-298	104	106.3	4.0	5.7	6.8	5.5	60.7
5	BR12605-4R-109	109	105.7	5.9	5.1	5.3	5.5	62.4
6	BR12605-4R-240	104	111.3	3.3	5.2	7.2	5.3	70.9
7	BR12605-4R-72	115	101.1	5.7	4.3	5.1	5.0	68.1
8	BR12605-4R-275	108	113.8	4.2	4.4	6.5	5.0	75.1
9	BR12432-5R-4	108	118.9	5.3	5.5	4.2	5.0	62.2
10	BR11845-4R-69	104	93.2	3.5	5.2	6.0	4.9	59.3
11	BR12605-4R-121	106	108.1	3.1	5.7	5.7	4.8	62.7
12	BR11845-4R-50	102	94.0	3.1	5.5	5.8	4.8	58.1
13	BR11845-4R-90	104	93.9	3.1	6.1	5.2	4.8	62.1
	BRRI dhan48 (Ck)	106	97.6	2.2	5.4	4.2	4.0	44.5
	BRRI dhan82 (Ck)	106	101.4	3.6	4.8	4.5	4.3	58.8
	BRRI dhan98 (Ck)	107	98.6	4.5	5.0	4.2	4.5	60.7
	N22 (Tol. Ck)	105	105.8	1.5	3.5	1.9	2.3	64.1
	LSD (0.05)	4.96	17.34	2.84	0.27	1.68	1.97	19.26
	H2b	0.81	0.38	0.88	0.87	0.60	0.13	0.10
	Range	101-131	86.3-131	0.9-6.8	1.0-6.7	1.7-7.2	1.1-6.2	22.8-76.7

Experiment 2.6: Advanced Yield Trial (AYT)

Principal Investigator: Mahmuda Khatun

Co-investigator: S K Debsharma, J Ferdousy (Plant Breeding), N Jahan, M Salahuddin & M A Islam (Cumilla), Anisar Rahman, M R Hasan & M A Badshah (Rangpur), S Abedin, F Akter & M F Islam (Rajshahi)

Specific objective: Initial yield evaluation and selection of desirable lines compared to standard checks.

Location: BRRI, Gazipur, Cumilla & Rajshahi.

Materials and methods: Advanced yield trial consisting a total of thirty-seven genotypes for AYT#1, AYT#2 & AYT#3 along with the check BRRI dhan48, BRRI dhan82 and BRRI dhan98. Three weeks old seedlings were transplanted with single seedling per hill at a spacing of 20 × 15 cm in a 5.4 m × 10 rows plot by following Latinized Row Column design with three replications. Fertilizers were applied @ 195:50:75: 40:5 kg Urea, TSP, MP, Gypsum, Zinc sulphate/ha respectively. The fertilizers other than urea were applied as basal during final land preparation. Urea was applied in three splits at final land preparation, 4-5 tillering stage (10 DAT) and 5-7 Days before PI stages (30 DAT). Insect pest control measure and other cultural management were done as and when needed.

Results and discussion: Fifteen advanced lines from AYT#1, 10 from AYT#2 & 12 from AYT#3 were selected on the basis of homogeneity with respect to plant height, phenotypic acceptability at vegetative and maturity stages and physicochemical properties (**Table 2.8, Table 2.9 and Table 2.10**). The selected breeding lines showed 4.06-5.27 t/ha with 103-120 days' growth duration and good appearance under AYT#1 **(Fig.7 and Fig.8)**, 4.02-5.35 t/ha with 104-131 days growth duration and good appearance under AYT#2 **(Fig.9 and Fig.10)** and 2.92-5.18 t/ha with 108-120 days growth duration which were evaluated under AYT#3. The highest yield (5.35 t/ha) was observed in the line BR11867-5R-442 that was 17% higher yield than the check variety BRRI dhan48 with similar growth duration (**Table 2.9**). In non-saline tidal ecosystem, BR11868-5R-2 produced higher yield among four genotypes compared to the standard check varieties BRRI dhan27, BRRI dhan48 and BRRI dhan98 (**Table 2.11**). Amylose & protein content of these promising lines was high with good appearance (**Table 2.12**). However, the genotypes were performed better than the check varieties, those genotypes were evaluated in next stage trial.

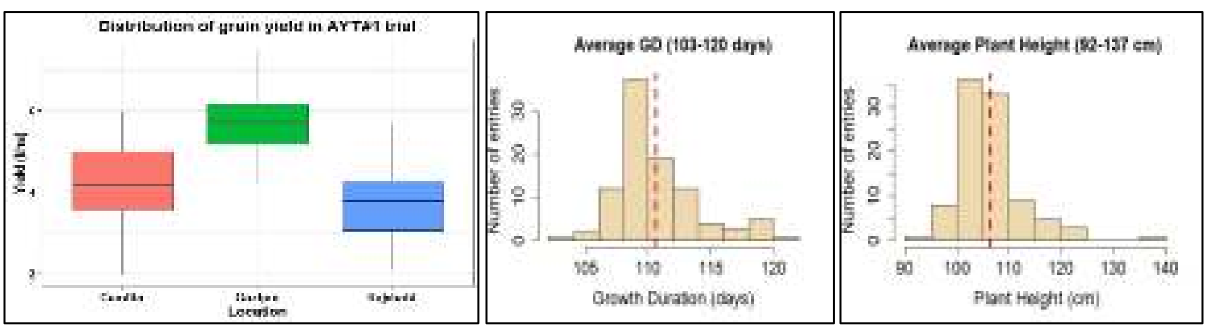


Fig. 7: Histogram showing plant height, growth duration and box plot showing the yield performance of 93 entries in AYT#1 at three locations during T. Aus 2022-23

Table 2.8. Agronomic performance of the selected materials from Advanced Yield Trial (AYT#1), T. Aus 2022-23

SN	DESIGNATION	PH (cm)	DM (days)	Yield (t/ha)			
				Gazi	Raj	Cumi	Pooled
1	BR12102-4R-38	98.99	107	6.71	4.45	2.32	4.51
2	BR12091-4R-35	105.00	112	6.63	5.01	3.22	4.93
3	BR12087-5R-31	107.49	110	6.60	3.52	5.27	5.13
4	BR12090-5R-255	104.64	113	6.56	4.77	3.33	4.95
5	BR10969-B-3R-23	123.32	113	6.53	3.34	5.18	5.01
6	BR12087-5R-55	108.37	110	6.46	4.19	4.20	4.95
7	BR12089-5R-86	107.27	113	6.43	3.92	4.07	4.81
8	BR10969-B-3R-29	112.14	113	6.39	3.21	4.93	4.84
9	BR12101-5R-76	104.17	109	6.38	5.23	4.16	**5.27**
10	BR12101-5R-184	108.53	112	6.35	4.97	3.17	4.83
11	BR12088-5R-275	109.17	112	6.31	3.07	4.03	4.47
12	BR12091-4R-169	104.32	110	6.30	4.28	5.01	5.20
13	BR12087-5R-155	100.98	107	6.29	3.33	2.56	4.06
14	BR12102-4R-58	112.83	111	6.29	4.33	4.60	5.07
15	BR12090-5R-233	103.82	112	6.24	3.25	5.17	4.89

	BRRI dhan82 (Ck)	137.59	106	5.49	4.80	4.53	4.94
	BRRI dhan48 (Ck)	103.14	110	6.00	4.12	4.40	4.84
	BRRI dhan98 (Ck)	106.26	112	6.32	5.43	5.07	5.61
	LSD <0.05	10.18	4.89	1.02	0.59	0.50	1.44
	H2b	0.26	0.53	0.38	0.79	0.89	0.15
	Range (N-96)	92-137	103-120	2.9-7.5	2.1-5.7	1.9-6.0	3.03-5.27

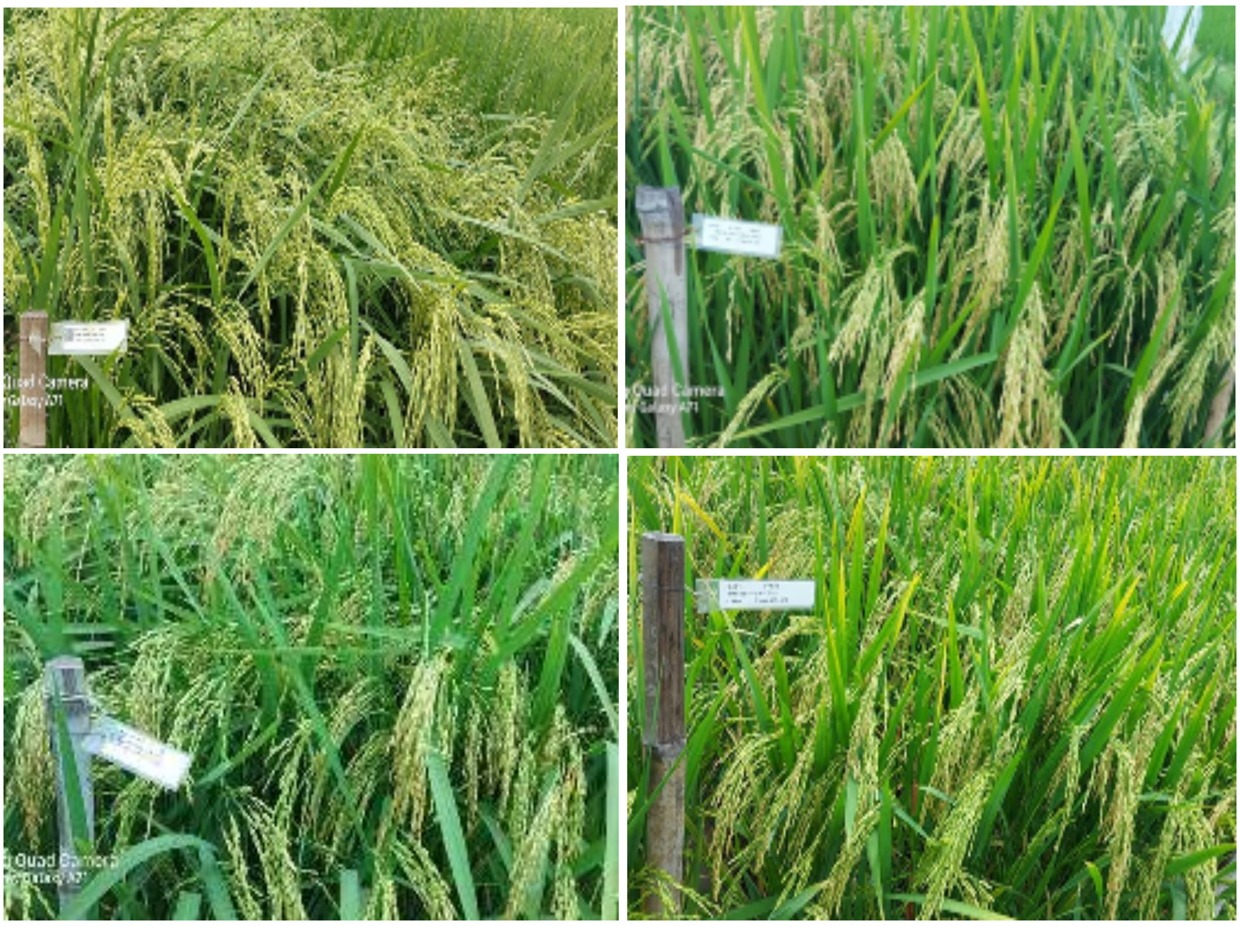


Fig.8. Pictorial view of the advanced lines under AYT#1, T. Aus2022-23

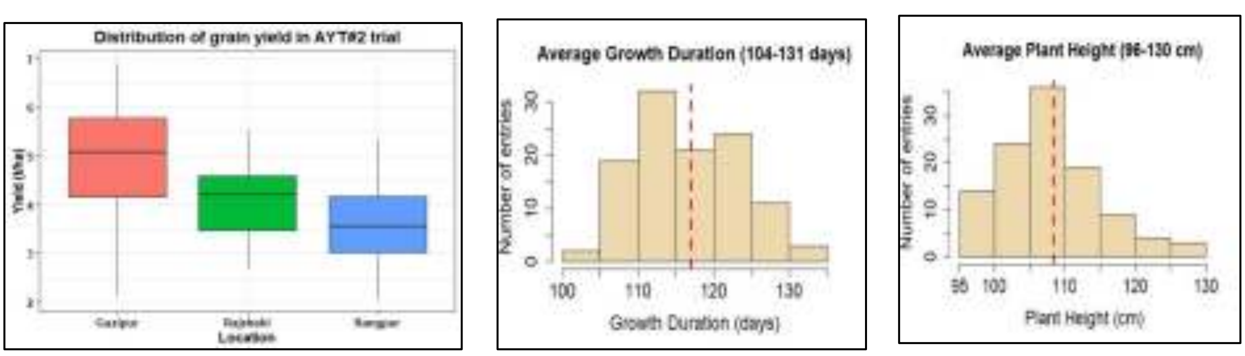


Fig. 9: Histogram showing plant height, growth duration, and box plot showing the yield performance of 114 entries in AYT#2 at three locations during T. Aus 2022-23

Table 2.9. Agronomic Performance of the selected materials from Advanced yield trial (AYT#2), T. Aus 2022-23

SN	DESIGNATION	PH (cm)	DM (days)	Yield (t/ha) Gazipur	Rajshahi	Rangpur	Pooled
1	**BR11867-5R-442**	111	109	6.36	4.84	4.86	**5.35**
2	BR11866-5R-68	107	110	6.91	4.41	4.42	5.25
3	BR11866-5R-109	102	114	6.03	4.43	4.85	5.11
4	BR11867-5R-356	110	118	6.33	4.98	3.72	5.02
5	BR11867-5R-292	104	106	4.74	5.04	5.25	5.01
6	BR11866-5R-351	101	106	4.85	4.58	5.31	4.92
7	7 FBR-364	106	110	5.13	4.87	4.57	4.86

8	BR11866-5R-215	101	109	5.60	5.00	3.84	4.81
9	BR11867-5R-103	109	108	4.09	5.52	4.36	4.66
10	BR11867-5R-188	98	108	5.26	3.65	5.01	4.64
	BRRI dhan48 (Ck)	100	105	4.21	4.54	5.02	4.59
	BRRI dhan82 (Ck)	105	104	5.20	3.05	4.41	4.22
	BRRI dhan98 (Ck)	99	108	5.78	4.64	4.93	5.11
	LSD <0.05	11.78	9.32	1.32	1.00	1.02	1.44
	H2b	0.86	0.44	0.55	0.37	0.51	0.06
	Range (N-67)	96-130	104-131	2.1-6.9	3.0-5-5	2.5-5.3	3.1-5.35

Fig.10. Pictorial view of the advanced lines under AYT#2, T. Aus2022-23

Table 2.10. List of materials under Advanced Yield Trial (AYT#3), Materials from AGGRiNET, FBR & Salinity tol. rice (Boro), T. Aus 2022-23

SN	Designation	GD (days)	PH (cm)	Yield (t/ha)				Remarks
				Gazipur	Cumilla	Rajshahi	Pooled	
1	BR11630-5R-39	108	124	2.57	3.27	2.92	2.92	FBR
2	BR11640-5R-70	113	102	4.88	5.12	4.65	4.88	FBR
3	BR11658-5R-10	109	105	2.40	4.86	3.13	3.47	FBR
4	BR11896-5R-285	112	90	2.94	3.46	3.60	3.33	FBR
5	BR11896-5R-88	111	114	3.61	4.31	3.64	3.86	FBR
6	BR11898-5R-241	112	110	4.43	5.35	5.83	5.20	FBR
7	IR17A1731	111	107	5.01	4.70	5.30	5.00	AGGRiNET
8	BR11712-4R-218	119	106	4.52	5.25	Not ger.	4.89	Salinity tol.
9	BR11715-4R-186	117	107	5.21	5.15	Not ger.	5.18	Salinity tol.
10	BR11716-4R-105	120	117	3.25	3.20	Not ger.	3.23	Salinity tol.
11	BR11723-4R-12	116	105	6.15	3.69	Not ger.	4.92	Salinity tol.
12	BR11723-4R-172	116	101	4.65	5.07	Not ger.	4.86	Salinity tol.
	BRRI dhan48 (Ck)	109	97	3.86	4.76	3.19*	3.94	
	BRRI dhan82 (Ck)	108	105	5.10	4.70	4.75	4.85	
	BRRI dhan98 (Ck)	110	102	5.14	5.05	2.72*	4.30	
	LSD<0.05	9.18	18.7	0.96	0.80	0.85	0.78	
	H2b	NA	NA	0.00	0.98	0.60	0.71	

Table 2.11. List of the materials for AYT (Non-saline tidal ecosystem), T. Aus, 2022-23

SN	Designation	GD (days)	Seedling height (cm)	PH (cm)	Yield (t/ha)			
					Gazi	Bari	Sona	Pooled
1	BR9829-78-1-2-1	112	29.4	129.7	5.72	3.44	6.21	5.13
2	BR9830-5-2-2-3	110	37.5	127.0	5.27	3.76	5.35	4.79

3	BR8773-2-2-2-2	110	44.0	121.8	6.09	3.43	5.80	5.10
4	BR11868-5R-2	112	31.2	129.2	5.99	3.57	6.18	**5.24**
	BRRI dhan27 (Ck.)	109	44.3	138.2	2.63	3.89	5.19	3.90
	BRRI dhan48 (Ck.)	106	36.3	101.4	5.27	5.18	5.28	5.25
	BRRI dhan98 (Ck.)	107	34.6	99.4	5.92	4.45	4.88	5.08
	LSD<0.05	5.79		7.20	0.46	0.27	0.52	1.12
	H2b	0.38		0.89	0.94	0.87	0.64	0.89

Table 2.12. Physico-chemical properties of the promising line, T. Aus, 2022-23

SN	Designation	Amy (%)	Protein (%)	Milling outturn (%)	Head rice (%)	Milled rice Length (mm)	Milled rice Brt (mm)	L/B ratio	Size & Shape	Chalk iness
1	BR9829-78-1-2-1	27.0	9.0	71.0	61.6	6.9	2.6	2.7	LB	Tr
2	BR9830-5-2-2-3	27.7	8.9	71.9	62.2	5.6	2.7	2.1	MB	Tr
3	BR8773-2-2-2-2	25.7	8.3	69.7	60.7	5.3	2.4	2.2	MB	Wb1
4	BR11868-5R-2	25.6	7.9	70.0	61.9	6.2	2.3	2.7	LB	Tr
	BRRI dhan27 (Ck.)	26.8	8.0	71.1	62.5	5.9	2.2	2.7	MB	Tr
	BRRI dhan48 (Ck.)	27.5	7.6	68.8	65.4	5.6	2.1	2.7	MB	Wb5
	BRRI dhan98 (Ck.)	27.9	9.5	66.0	51.6	6.5	2.0	3.2	LS	Wb1

Experiment 2.7: Regional Yield Trial (RYT)

Principal Investigator: M Khatun

Co-Investigator: S K Debsharma, J Ferdousy & Scientists of different regional station

Specific objective: To evaluate specific and general adaptability of the advance breeding lines as compared with standard checks in on-station condition.

Materials and methods: Regional yield trial (RYT) consisting of 12 genotypes along with the standard check BRRI dhan48 and BRRI dhan98 were evaluated for high yield performance in T Aus growing areas (Gazipur, Cumilla, Kushtia, Rajshsahi and Sonagazi) (**Table 2.13**). Three weeks old seedlings were transplanted with single seedling per hill at a spacing of 20 × 15 cm in a 5.4m × 10 rows plot by following RCB design with three replications. Fertilizers were applied @ 195:50:75: 40:5 kg Urea, TSP, MP, Gypsum, Zinc sulphate/ha respectively. The fertilizers other than urea were applied as basal during final land preparation. Urea was applied in three splits at final land preparation, 4-5 tillering stage (10 DAT) and 5-7 days before PI stages (30 DAT). Insect pest control measure and other cultural management were done as and when necessary.

Results: The genotype BR11863-5R-82 and BR11864-5R-31 were selected from RYT on the basis of grain yield, growth duration and grain qualities compared to the check varieties in T. Aus2022-23. **(Table 2.13).**

Table 2.13. Agronomic Performance of the selected materials from Regional Yield Trial (RYT), T. Aus 2022-23

SN	Designation	PH (cm)	DM (days)	Yield (t/ha)					
				Cumi	Gazi	Kush	Raj	Sona	Pooled
1	**BR11863-5R-82**	94.8	107	5.22	5.64	5.81	4.37	5.97	**5.40**
2	BR11863-5R-256	105.3	109	3.98	4.62	5.92	4.78	6.46	5.16
3	**BR11864-5R-31**	95.0	108	5.40	4.76	6.03	5.02	5.60	**5.36**
4	BR11864-5R-38	95.7	107	4.32	3.01	5.24	4.01	5.56	4.43
5	BR11864-5R-75	98.7	108	4.65	4.33	5.29	4.57	5.11	4.79
6	BR11869-5R-98	97.2	107	4.79	3.45	4.81	4.19	5.31	4.51
7	BR11604-4R-133	121.3	120	3.85	3.75	4.84		5.56	4.50

8	BR11607-4R-6	107.3	121	3.46	2.13	4.29	2.02	5.58	3.50
9	BR11607-4R-72	101.2	114	3.75	3.71	4.68	2.91	6.02	4.21
10	BR9651-15-2-1-3	93.5	111	3.41	3.03	4.77	4.31	4.72	4.05
11	7 FBR-400	102.0	114	4.67	3.76	4.88	3.94	5.59	4.57
12	7 FBR-416	101.5	109	4.70	5.63	5.05	3.36	6.56	5.06
13	BRRI dhan48 (Ck)	90.0	112	4.90	4.82	5.44	4.89	5.79	5.17
14	BRRI dhan98 (Ck)	99.5	107	5.39	5.05	5.81	4.96	5.74	5.39
	LSD<0.05	9.23	4.36	0.54	7.26	0.61	0.26	0.54	1.27
	H2b	0.57	0.61	0.92	0.99	0.72	0.91	0.65	0.34

Experiment 2.8: Proposed Variety Trial (PVT)

Principal Investigator: M Khatun

Co-Investigator: S K Debsharma, J Ferdousy & Scientists of different regional stationx.

Specific objective: To evaluate specific and general adaptability of the advanced breeding lines as compared with standard checks in on-farm condition.

Materials and methods: The experiment was conducted in different locations in Bangladesh. In Aus season, the genotype BR8781-16-1-3-P2 was evaluated with one standard check BRRI dhan27 in six locations. Thirty-five to forty-day-old seedlings were transplanted @ 2-3 seedlings at a spacing of 25 cm × 15 cm in different locations. The plot size was 5.4 m × 3 m. Fertilizer doses and application were same as experiment no. 2.1. Crop management such as weeding, irrigation etc. was done in time. Insects and other pests were controlled properly.

Results: The tested genotype BR8781-16-1-3-P2 produced 4.79 t/h yield that was higher than the check BRRI dhan27. Highest yield (5.49 t/h) was observed in BRRI Regional Station, Sonagazi, Feni. Therefore, the tested genotype was released as variety BRRI dhan106 by National Seed Board (NSB) (**Table 2.14**). Lodging tolerance is the special feature of this variety showing lodging rate 3.3%, short internode (9.9 cm) and less bending moment (1321.7 g. cm) with good appearance **(Table 2.15, 2.16, 2.17 & Fig.11).** Milling outturn (72.4%), head rice recovery (59.1%), amylose content (27.2%) and protein content of this variety is 8.5% **(Table 2.18 and Table 2.19).**

Table 2.14. Yield and agronomic performance of the advanced line BR8781-16-1-3-P2 under Proposed Variety Trial (PVT), T. Aus 2022-23

SN	Region	Trial location	Growth duration (Days)		Grain Yield (t/ha)		
			BR8781-16-1-3-P2	BRRI dhan27	BR8781-16-1-3-P2	BRRI dhan27	Difference (%)
1	Chattogram	BRRI Station, Feni	126	114	**5.49**	4.52	21.46
2		Lakshmipur, Noakhali	119	106	5.07	4.14	22.46
3	Barishal	BRRI Station, Barishal	117	109	4.90	4.25	15.29
4		Amtoli, Barguna	114	108	4.47	3.82	17.01
5		Badarpur, Patuakhali	111	104	4.01	3.66	10.00
		Mean	117	108	4.79	4.08	17.40

Table 2.15. Visual lodging rate of proposed T. Aus rice genotypes with check

SN	Name of genotype	Lodging rate (%)
1	BR8781-16-1-3-P2 (BRRI dhan106)	**3.33**
2	BRRI dhan27 (ck)	91.66
	LSD <0.05	11.55

Table 2.16. Characters concerned for canopy architecture and plant stature of proposed T. Aus rice genotypes with check

Name of genotype	Plant height (cm)	Flag leaf angle (°)	Panicle length (cm)	Panicle weight (g)	Length of different internodes (cm)			
					1st	2nd	3rd	4th
BR8781-16-1-3-P2 (BRRI dhan106)	126.8	22.7	25.5	3.33	40.6	26.8	19.3	**9.9**
BRRI dhan27 (ck)	141.5	41.7	25.2	3.22	41.7	31.0	21.9	16.1
LSD (0.05)	5.64	4.87	0.42	0.49	2.65	2.17	2.50	2.37

Table 2.17. Culm stiffness of proposed T. Aus rice genotypes with check

Name of genotype	Culm diam. (mm)	Culm wall thickness (mm)	Bending moment (g . cm)	Total wrapping score	Stem density (mg/cm)
BR8781-16-1-3-P2 (BRRI dhan106)	6.5	0.42	**1321.7**	30.5	63.54
BRRI dhan27 (ck)	6.1	0.38	1416.7	24.4	52.26
LSD (0.05)	0.46	0.05	23.27	1.24	2.27

Table 2.18. Physical properties of the advanced line BR8781-16-1-3-P2, T. Aus 2022-23

SN	Designation	Milling outturn (%)	Head rice (%)	Milled rice Length (mm)	Milled rice Breadth (mm)	L/B ratio	Size & Shape	1000 grn wt (g)	Appearance	Chalkiness
1	BR8781-16-1-3-P2 (BRRI dhan106)	72.4	59.1	5.3	2.4	2.2	MB	24.6	Good	Wb1
2	BRRI dhan27 (Ck.)	68.8	65.4	5.6	2.1	2.7	MB	26.8	Good	Wb9

Table 2.19. Chemical and cooking properties of the advanced line BR8781-16-1-3-P2, T. Aus 2022-23

SN	Designation	Amy (%)	Protein (%)	Cooking time (min)	Alkali spreading value (ASV)	Elongation ratio (ER)	Imbibition ratio (%)
1	BR8781-16-1-3-P2 (BRRI dhan106)	27.2	8.5	19.3	4.3	1.5	2.9
2	BRRI dhan27 (Ck.)	27.5	7.6	23.0	3.0	1.4	3.3

Paddy **Unparboiled Rice** **Parboiled Rice**

Fig. 11. Grain picture of non-saline tidal submergence T. Aus variety BRRI dhan106

PROJECT 3: IMPROVEMENT OF RICE FOR SHALLOW FLOODED AND DEEP-WATER ENVIRONMENT

General objective: Development of high yielding (4.0-5.0 t/ha) rice varieties for shallow flooded area (up to 1.0 m depth), shallow deep area (30 cm water) and medium deep area (50-60 cm water) along with submergence, facultative elongation and hypoxia tolerance.

Project Leader: Khandakar Md. Iftekharuddaula

Experiment 3.1: Hybridization

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, A S M Masuduzzaman and K M Iftekharuddaula

Specific objective: Introgression of submergence tolerant and facultative elongation genes into modern genetic background with short/long growth duration, weakly/strongly photoperiod sensitivity and acceptable grain quality etc.

Materials and Methods: In total 22 parents (**Table 3.1a**) were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Around 30 days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 25 × 15 cm. Single seedling was used for transplanting. Fertilizers were applied at the rate of 200 kg urea, 70 kg TSP, 100 kg MoP, 70 kg gypsum and 6 kg zinc sulphate. Total amount of TSP, gypsum and two-third MoP were applied at the time of final land preparation. Total amount of zinc sulphate was applied at first top dressing. Urea was applied in equal three splits at 10, 25 and 40 days after transplanting. Rest of the one-third MoP was applied during second top-dressing of urea. Other cultural and pest management practices were done as and when necessary. Leaf sample was collected from previously labeled four healthy plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique profiles of each parent were used to make crosses. At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glycine bag. Pollination was performed with just anthesised panicles of the male parent by dusting pollens on the emasculated panicle of the female parent.

Results: Totally 2,500 F_1 seeds were obtained from 23 crosses (**Table 3.1b**). These were recorded and labeled properly. The F_1 seeds were sun-dried and stored in a cool and dry place.

Table 3.1a: List of parents for hybridization, Improvement of rice for shallow flooded Environment, T. Aman 2022-23

SL.	Parental genotypes	SL.	Parental genotypes
1	BR9789-2-2-1	12	Vobani
2	IR16F1097-P1	13	BR10260-7-19-2B
3	IR15F1709	14	BR11186-5R-1
4	IR15F1764	15	IRRI 154
5	IR16F1243	16	IRRI 176
6	IR13F450-4	17	Fatema dhan
7	IR16F1083-P1	18	IRRI 132
8	IR108042-B-B-B-4-B-B-1	19	IR16T1356
9	BR7730-1-1-2B	20	IR14L545
10	BR7919-1-1-3B	21	IR 126998-B-10-5-1-3
11	Khoiya motor	22	BRRI dhan92

Table 3.1b: List of single crosses made, Improvement of rice for shallow flooded Environment, T. Aman 2022-23

SN	BR Number	Parentages	Number of F_1 Seeds	Average (BLUP-t/ha)
1	BR15275	BR9789-2-2-1/BR7730-1-1-2B	82	4.5
2	BR15276	BRRI dhan92/Vobani	80	4.7

3	BR15277	IR16F1097-P1/BR7730-1-1-2B	80	4.4
4	BR15278	IR15F1709/BR7919-1-1-3B	70	4.0
5	BR15279	IR16F1243/Vobani	60	4.0
6	BR15280	IR13F450-4/Khoiya motor	85	3.9
7	BR15281	IR108042-B-B-B-4-B-B-1/Khoiya motor	10	4.1
8	BR15282	IR16F1097-P1/Vobani	100	4.3
9	BR15283	IR15F1709/BR7730-1-1-2B	90	4.4
10	BR15284	BR9789-2-2-1/BR7919-1-1-3B	500	4.2
11	BR15285	IR16F1097-P1/Khoiya motor	180	4.3
12	BR15286	IR15F1709/Vobani	120	4.1
13	BR15287	BR9789-2-2-1/Khoiya motor	130	4.2
14	BR15288	IR13F450-4/BR7919-1-1-3B	85	4.1
15	BR15289	IRRI 154/BR10260-7-19-2B	78	4.6
16	BR15290	IRRI 176/BR10260-7-19-2B	20	4.5
17	BR15291	Fatema dhan/BR11186-5R-1	15	4.2
18	BR15292	IR16T1356/BR10260-7-19-2B	140	4.6
19	BR15293	IR14L545/BR10260-7-19-2B	80	4.4
20	BR15294	IR 126998-B-10-5-1-3/Khoiya motor	180	4.5
21	BR15295	BRRI dhan92/BR11186-5R-1	125	4.8
22	BR15296	Fatema dhan/BR11186-5R-1IRRI 154	130	5.2
23	BR15297	BR11186-5R-1/IRRI 154	60	4.6
		Total F_1 seeds	**2,500**	

Experiment 3.2: **Confirmation of F_1**

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, A S M Masuduzzaman and K M Iftekharuddaula

Specific objective: Confirmation of F_1s as true crosses and selection of promising ones.

Materials and Methods: Seven crosses were grown to be confirmed as true crosses. F_1 seeds of each cross and their respective parents were germinated in Petri dishes and then sown in earthen pots. Twenty-five days old seedlings were transplanted @ single seedling at a spacing of 20 × 15 cm in the net house. Respective parental seedlings were transplanted on both sides of each F_1 population, leaf samples were collected from each of the plants from F_1 and parents for QC genotyping to determine true F_1. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F_1s were selected.

Results: Based on QC profile of the test F_1s, all seven crosses were confirmed as true F_1. The F_1 plants were selfed to produce F_2 seeds. At maturity, F_2 seeds of all confirmed plants were harvested individually, dried, cleaned and preserved in cold room (**Table 3.2**).

Table 3.2. List of F_1s confirmed as true crosses, Shallow Flooded Rice, T. Aman 2022-23

SL.	BR Number	Single Cross	Plant No. confirmed as true F_1s
1	BR14486	IRRI 119/Khoiya motor	1,2,5,6,7,9,10,11,12
2	BR14487	BR11186-5R-1/Vobani	1,3,4,5,6,7,8,9,10
3	BR14488	BR11186-5R-549/BR7730-1-1-2B	1,2,4,5,7,8,9,10,11
4	BR14489	BRRI dhan91/Khoiya motor	2,4,5,9,8,11,12,1,6
5	BR14490	BRRI dhan91/Vobani	1,3,4,5
6	BR14491	BRRI dhan91/CN6	9,10,11,12,3,7
7	BR14492	BRRI dhan91/ BR7919-1-1-3B	1,2,3,9,10,11,12,4,5,6,7,8

Experiment 3.3: **Rapid Generation Advance (RGA)**

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, M Maniruzzaman, A S M Masuduzzaman and K M Iftekharuddaula

Specific objective: Rapid advancement of segregating population for shortening breeding cycle.

Materials and Methods: A total seventy-two crosses comprising of 15 F_2, 19 F_3, 20 F_4 and 18 F_5 populations were grown in T. Aman season**.** Single seed progenies from single panicle of one plant were grown in the RGA nursery. Part of the panicle was sown directly on the soil. No thinning or pruning was done. Fertilizers were applied @80 kg urea, 60 kg TSP, 70 kg MoP, 50 kg gypsum and 5 kg zinc sulphate/ha. All fertilizers were applied during final land preparation. During harvesting at maturity, one panicle was collected from each plant of all the crosses in different times and the plant was uprooted. Harvested seeds remaining in the panicles were dried and subjected for dormancy breakage to initiate next cycle of RGA immediately. For dormancy breaking, at first, sun-drying was done for three days followed by oven drying with 50°C temperature for 72 hours.

Results: In Total 6,431 progenies comprising 1,652 F_2, 1,512 F_3, 1,726 F_4 and 1,541 progenies were harvested and advanced through field RGA. The average recovery percentage of the RGA generations was 63% (**Table 3.3**).

Table 3.3: List of population advanced through RGA, Shallow flooded DWR rice, T. Aman 2022-23

SL#	BR No	Crosses	Progenies Grown	Progenies harvested	Recovery %
F_2 Population					
1	BR13908	BR11186-5R-377/LalMohon	160	134	84
2	BR13909	BR11186-5R-377/Dud Laki	200	154	77
3	BR13911	BR11186-5R-377/Bashiraj	120	97	81
4	BR13915	BR11186-5R-672/ Dud Laki	280	218	78
5	BR13917	BR11186-5R-1/LalMohon	120	110	92
6	BR13918	BR11186-5R-1/Dud Laki	100	83	83
7	BR13922	BRRI dhan87/BRRI dhan91	60	57	95
8	BR13923	BRRI dhan77/BRRI dhan91	150	117	78
9	BR13924	BRRI dhan87/BR10260-7-19-2B	120	105	88
10	BR13926	BRRI dhan76/LalMohon	120	80	67
11	BR13929	BRRI dhan77/LalMohon	150	107	71
12	BR13932	BRRI dhan87/LalMohon	100	69	69
13	BR13933	BRRI dhan87/Dud Laki	150	98	65
14	BR13934	BRRI dhan87/Jalkumari	120	78	65
15	BR13921	BRRI dhan94/BRRI dhan91	200	145	73
		Sub Total	**2,150**	**1,652**	**77**
F_3 Population					
1	BR13379	BR7932-17-2-1-2-1-1-1-12/Laxmi Digha	82	26	32
2	BR13380	BR9175-9-1-3-20-3 /Laxmi Digha	146	84	58
3	BR13381	BR9175-9-2-1-12-5 /Jal Kumari	100	90	90
4	BR13382	BRRI dhan77/BR10230-15-27-7B	235	187	80
5	BR13383	BRRI dhan76/BR10230-15-27-7B	115	68	59
6	BR13384	BRRI dhan76/BR10260-7-19-2B	185	166	90
7	BR13385	BRRI dhan77/BR10260-7-19-2B	168	132	79
8	BR13386	BR9175-9-1-3-20-3/BR10230-15-27-7B	122	64	52
9	BR13388	BR9175-9-2-1-12-5 /Laxmi Digha	145	48	33
10	BR13389	IR13F441/Jal Kumari	193	59	31
11	BR13390	BRRI dhan 76/ Dud Laki	195	64	33
12	BR13391	BRRI dhan 77/Dud Laki	140	48	34
13	BR13392	BR7932-17-2-1-2-1-1-1-12/Dud Laki	73	20	27
14	BR13393	BR8146-5-2-2-1-1-1-2/Dud Laki	96	36	38
15	BR13394	Bashiraj/BR10260-7-19-2B	125	104	83
16	BR13395	IR13F441/Dud Laki	150	80	53
17	BR13396	IR13F441/Hizal Digha	153	88	58
18	BR13397	BRRI dhan 76/Jal Kumari	111	84	76

19	BR13398	BRRI dhan 77/Jal Kumari	174	64	37
Sub Total			**2,708**	**1,512**	**56**
F_4 Population					
1	BR12968	BR8157-50-1-6-2-1-27/ Fulkari	147	80	54
2	BR12969	BR8157-50-1-6-2-1-27/ Laxmi Dhigha	87	29	33
3	BR12970	BR8157-50-1-6-2-1-27/ Bajail 65	165	60	36
4	BR12971	IR90082-SUB-35-3-2-2/ Lal Khama	206	203	99
5	BR12972	IR90082-SUB-35-3-2-2/ Hbj. A. II	188	133	71
6	BR12973	IR90082-SUB-35-3-2-2/ Lal Dhigha	100	64	64
7	BR12974	IR90082-SUB-35-3-2-2/ Gour Kajol	154	53	34
8	BR12975	BR9163-1-30-1-25/ Lal Khama	112	16	14
9	BR12976	BR9163-1-30-1-25/ IR13F582	235	92	39
10	BR12977	BR9163-1-30-1-25/ Til Bajal	135	54	40
11	BR12978	BR9163-1-30-1-25/ Bajail 65	40	31	78
12	BR12979	IR92689-SUB-SUB-92-1-B/ Fulkari	212	90	42
13	BR12980	IR92689-SUB-SUB-92-1-B/ Bajail 65	170	123	72
14	BR12981	IR85261-18-158-Gaz-3B-62/ Lal Khama	82	26	32
15	BR12982	IR85261-18-158-Gaz-3B-62/ Gour Kajol	180	74	41
16	BR12983	IR85261-18-158-Gaz-3B-62/ Til Bajal	170	40	24
17	BR12984	IR13F458/ Til Bajal	210	97	46
18	BR12985	BRRI dhan52/ Lal Dhigha	215	20	9
19	BR12986	BRRI dhan79/ Dud Laki	217	113	52
20	BR12987	BRRI dhan79/ Hbj. A. IV	340	328	96
Sub Total			**3,365**	**1,726**	**53**
F_5 Population					
	Single Cross				
1	BR12930	PCR89350-B-R-3-1-2-1/Tilbajal	40	34	85
2	BR12931	BRRI dhan67/Barsha dhan	40	35	88
3	BR12932	BR8157-50-1-6-2-1-27/Gour kajol	65	60	92
4	BR12933	PCR89350-B-R-3-1-2-1/BR8159-20-8-5-8-2	120	120	100
5	BR12934	Hbj Aman-IV/Binadhan-12	50	50	100
6	BR12935	Barsha dhan/IR13F582	60	53	88
7	BR12936	IR92689-SUB-SUB-92-1-B/BR8159-20-8-5-8-2	149	140	94
	Multiple crosses				
1	BR12937	BR8159-20-8-5-8-2/ Hbj aman IV//BRRI dhan51	133	120	90
2	BR12938	Barsha dhan/BR9158-19-9-6-7-50//BR9163-1-30-1-25	200	150	75
3	BR12939	BRRI dhan52/ Hbj AmanII//BR9163-1-30-1-25	212	120	57
4	BR12940	Bajail65/Til Bajal///IR85261-18-158-Gaz-3B-62	100	75	75
5	BR12941	IR09F236(Sub)/Gour Kajol//BRRI dhan79	70	65	93
6	BR12942	BRRI dhan52/ Hbj AmanII//BRRI dhan79	150	120	80
7	BR12943	Bajail65/Til Bajal//IR13F582	130	60	46
8	BR12944	IR09F236/Gour Kajol//BR8157-50-1-6-2-1-27	100	75	75
9	BR12945	BR9159-8-5-40-13-52/Lal Khama//BRRI dhan79	120	90	75
10	BR12946	BRRI dhan44/ Lal Khama//BRRI dhan79	110	54	49
11	BR12947	BR8159-20-8-5-8-2/ Hbj aman IV// IR90082-SUB-35-3-2-2	140	120	86
Sub Total			**1,939**	**1,541**	**79**
Total Progenies			**10,162**	**6,431**	**63**

Experiment 3.4: Observational Yield Trial (OYT)

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman, A S M Masuduzzaman and K M Iftekharuddaula

Specific objective: Advanced evaluation of promising breeding lines in replicated trial under shallow flooded and rainfed conditions.

Materials and methods: In total, 64 entries with two check varieties were evaluated following RCB design with two replications. Around 30 days old seedlings were transplanted at a spacing of 20 x 20 cm with single seedling per hill. The unit plot size was 5.4 m x 6 rows. Fertilizers were applied @ 100kg urea, 60kg TSP, 50kg MoP, 50kg gypsum and 5kg zinc sulphate/ha. Urea was applied in equal three splits at 10 and 30 days after transplanting. The fertilizers other than urea were applied as basal during final land preparation. Other cultural and pest management practices were done as and when necessary.

Results and discussion: Among all tested entries 20 lines were selected based on agronomic performance and phenotypic acceptability. The genotype BR11186-5R-119 significantly produced highest yield (3.5 t/ha) followed by IR19A1050 (3.2 t/ha) and BR12494-5R-69 (3.2 t/ha) (**Table 3.4**). All selected entries performed better over check variety BRRI dhan91 (1.8 t/ha). The tested entries were lodged due heavy storm during flowering stage, which causes poor grain yield. The heritability obtained from plant height, growth duration and grain yield were 67%, 82%, and 62% respectively, indicating high level of precision of experiment (**Table 3.4**).

Table 3.4: Performance of the selected genotypes in Observational Yield Trial (OYT), Shallow Flooded Rice, T. Aman 2022-23

SL	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Traits of interest
1	BR11686-5R-1	166	13	5	139	2.7	*Sub1,WxA,Xa7,Pita2,Chalk5,Gn1a*
2	BR9789-3-1-1	180	8	5	138	2.9	*Wx-A, Wx-10, DTH8, Chalk5, Gn1a*
3	BR11186-5R-119	147	9	1	136	3.5	*Sub1, Wx-A, Xa7,Pita2, Chalk5, Gn1a*
4	BR10212-12-1-2-6	140	7	5	138	2.4	*Wx-A,Wx10,Xa4,DTH8,Chalk5,Gn1a*
5	BR10212-12-1-2-2	138	6	5	139	2.9	*Wx-A, Wx-GBSS-ex16, Xa4, Chalk5*
6	IR19A1050	137	10	5	133	3.2	*Wx-A, Chalk5, GS3, Gn1a*
7	BR12487-5R-95-2	144	10	3	134	2.9	*Sub1, Wx-A, Gn1a, Xa4*
8	BR12487-5R-123	140	8	3	138	2.5	*Wx-A, Gn1a, Xa4*
9	BR12489-5R-40	126	11	3	132	3.1	*Wx-A, Gn1a, Xa4*
10	BR12489-5R-115	128	9	7	136	2.6	*Wx-A, Gn1a, Xa4*
11	BR12489-5R-159	135	7	5	139	2.3	*Wx-A, Gn1a, Xa4*
12	BR12490-5R-1	155	9	5	133	2.0	*Sub1, Wx-A, Wx-10*
13	BR12490-5R-134	135	10	5	141	2.7	*Wx-A, Gn1a, Xa4*
14	BR12490-5R-175	137	11	5	139	2.2	*Sub1, Wx-A, Wx-NB, Gn1a*
15	BR12494-5R-69	185	7	1	132	3.2	*Sub1, Wx-A, Wx-NB, Gn1a, Xa4*
16	BR12501-5R-81	175	9	5	136	2.6	*Wx-A, Wx-10, Gn1a*
17	BR12501-5R-111	155	9	5	140	2.6	*Wx-A, Wx-10, Gn1a*
18	BR12501-5R-204	182	8	5	133	2.2	*Wx-A, Wx-10, Gn1a*
19	BR12501-5R-205	179	7	5	139	2.1	*Wx-A, Wx-10, Gn1a, Xa4*
20	BR12506-5R-235	163	8	5	138	1.9	*Wx-A, Gn1a*
21	BRRI dhan44 (Ck)	128	11	5	133	2.6	*Wx-A, Wx-10, Xa4*
22	BRRI dhan91 (Ck)	139	8	7	140	1.8	*Wx-A, Wx-10, Xa4*
	P Value	***	ns	*	***	*	
	LSD (0.05)	6.5		1.3	4.1	0.7	
	H^2b	0.67		0.61	0.82	0.62	

Experiment 3.4: Advanced Yield Trial (AYT)

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman, A S M Masuduzzaman and K M Iftekharuddaula

Specific objective: Advanced evaluation of promising breeding lines in replicated trial under shallow flooded and rainfed conditions.

Materials and methods: In total, 21 entries with three checks were evaluated following RCB design with two replications. Around 30 days old seedlings were transplanted at a spacing of 20 x 20 cm with single seedling per hill. The unit plot size was 5.4 m x 6 rows. Fertilizers were applied @ 100kg urea, 60kg TSP, 50kg MoP, 50kg gypsum and 5kg zinc sulphate/ha. Urea was applied in equal three splits at 10 and 30 days after transplanting. The fertilizers other than urea were applied as basal during final land preparation. Other cultural and pest management practices were done as and when necessary.

Results: Among all tested entries 14 lines were selected based on agronomic performance and phenotypic acceptability. The genotype BR11186-5R-549 gave highest yield (3.5 t/ha) followed by BR10260-7-19-2B (3.3 t/ha) and BR11186-5R-1 (3.1 t/ha), whereas check variety BRRI dhan91 yielded only 1.8 t/ha. The heritability obtained from plant height, growth duration and grain yield were 68%, 88% and 74% respectively, indicating high level of precision in this experiment (**Table 3.4**).

Table 3.4: Performance of the selected genotypes in Advanced Yield Trial (AYT), Shallow Flooded Rice, T. Aman 2022-23

SL	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Traits Marker
1	BR11186-5R-549	160	9	5	134	3.5	*Sub1, Wx-A, Pita2*
2	BR10260-7-19-2B	144	11	7	124	3.3	*Wx-A, Wx-10*
3	BR11186-5R-1	155	10	5	136	3.1	*Wx-A, Wx-10, Xa4*
4	BR8159-20-8-5-8-2	138	10	5	135	3.1	*Wx-A, Wx-10*
5	BR11186-5R-672	165	9	5	133	2.7	*Sub1, Wx-A, Xa4*
6	BR8361-5R-7	160	9	5	133	2.6	*Wx-A, Wx-NB, Chalk5, Gn1a, Xa7, Xa4*
7	BR10211-22-9-2_PS4	150	10	5	136	2.6	*Wx-A, Wx-10, Xa4*
8	BR8796-5R-2	165	12	5	133	2.6	*Wx-A, Wx-NB, Chalk5, Gn1a, Xa7, Xa4*
9	BR11186-5R-377	166	8	5	136	2.5	*Sub1, Wx-A, Pita2*
10	BR10212-12-1-2 (PS9)	142	9	5	123	2.2	*Wx-A, Wx-10, Xa4*
11	BR9192-5R-15	155	10	5	133	2.1	*Wx-A, Wx-NB, Chalk5, Gn1a, Xa7, Xa4*
12	BR10212-12-1-2 (PS2)	174	7	5	134	1.9	*Wx-A, Wx-10, Xa4*
13	BR8361-5R-11	158	11	5	135	1.9	*Wx-A, Wx-NB, Chalk5, Gn1a, Xa4*
14	BR10211-30-2-1-P2	145	10	5	135	1.8	*Wx-A, Wx-NB,Pita2, Xa4, Xa7*
15	BRRI dhan44 (Ck)	135	10	5	127	2.3	*Wx-A, Wx-10, Xa4*
16	BRRI dhan91 (Ck)	155	11	7	135	1.8	*Wx-A, Wx-10, Xa4*
	P Value	*	*	*	***	*	
	LSD $_{(0.05)}$	10.5	1.5	1.1	4.9	0.9	
	H2b	0.68	0.75	0.71	0.88	0.74	

PROJECT 4: DEVELOPMENT OF RAINFED LOWLAND RICE

General objective: Development of genotypes superior to standard varieties and adaptable to rainfed lowland environment in T. Aman season.

Project Leader: Md Abdul Kader

Experiment 4.1: Hybridization

Principal investigator: M A Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Introgression of genes from diverged genetic background into rice varieties/lines for the improvement of standard T. Aman varieties.

Materials and Method: Forty varieties/lines (**Table 4.1a**) were grown in the hybridization block of plant breeding division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Twenty-five to thirty days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 20 cm × 15 cm. Single seedling were used for transplanting. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg Zn SO_4) kg NPKSZn/ha were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen were applied at three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly. For parental purification, leaf samples were collected from all plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique genomic profiles of each parent were used to make crosses. To make the desired cross combination, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glassine paper bags. Pollination was performed with just anthesized panicles of the male parent by dusting pollens on the emasculated panicles of the female parent.

Results and discussion: Thirty-two crosses were made with 22 true parents (**Table 4.1a**) and 5,329 seeds were made. **Table 4.1b** shows the list of crosses made in the season. Mature F_1 seeds were harvested, sun dried and stored separately in paper bags with proper labeling and packaging.

Table 4.1a: List of the parents used in hybridization, Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Designation	Characteristics
1	BR10458-20-2-3-1-3	PH: 147 cm, GD: 130 days, GY: 6.51 t/ha, High yield
2	BR10475-1-2-3-5-5	PH: 135 cm, GD: 121 days, GY: 6.42 t/ha, High yield
3	BR10482-1-2-3-1-3	PH: 141 cm, GD: 132 days, GY: 5.69 t/ha, High yield
4	BR10795-6R-46	PH: 131 cm, GD: 128 days, GY: 7.32 t/ha,
5	BR10799-6R-151	PH: 141 cm, GD: 134 days, GY: 6.38 t/ha, *Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
6	BR10800-6R-1	PH: 131 cm, GD: 121 days, GY: 6.66 t/ha, *Wx-A+* $DTY_{1.1}$*_1+* $qDTY_{1.1}$*_4+* $qDTY_{2.2}$*_1+* $qDTY_{3.1}$*+* $qDTY_{3.2}$*+* $qDTY_{4.1}$*-2*
7	BR10800-6R-54	PH: 137cm, GD: 112days, GY: 6.46t/ha, *Wx-A+ xa5+* $qDTY_{1.1}$*_1+* $qDTY_{1.1}$*_4+* $qDTY_{2.1}$*+* $qDTY_{2.1}$*+* $qDTY_{3.1}$*+* $qDTY_{4.1}$*-2*
8	BR10802-6R-66	PH: 144 cm, GD: 134 days, GY: 6.35 t/ha, *Wx-A+* $DTY_{1.1}$*_4+* $DTY_{2.2}$*_1+* $qDTY_{3.1}$*+* $qDTY_{3.2}$*+* $qDTY_{4.1}$*-2+ BPH32*
9	BR11222-6R-64	PH: 167 cm, GD: 138 days, GY: 6.38 t/ha, *Wx-A+* $qDTY_{2.1}$*+* $qDTY_{3.1}$*+* $qDTY_{3.2}$*+ BPH32*
10	BR11333-6R-73	GD: 121 days, GY: 6.42 t/ha, *Wx-A+ xa5+* $qDTY_{2.1}$*+* $qDTY_{3.1}$
11	BR11334-6R-35	*PH: 125 cm, GD: 123 days, GY: 6.82 t/ha, fgr-1+ Wx-A+ xa5+* $qDTY_{2.1}$*+* $qDTY_{2.1}$*+* $qDTY_{3.1}$*+* $qDTY_{3.2}$*+ BPH32*
12	BR11716-4R-102	PH: 107 cm, GD: 119 days, GY: 7.75 t/ha, High yield
13	BR11910-4R-127	PH: 115 cm, GD: 128 days, GY: 6.31 t/ha, Moderate Photoperiod Sensitive (Basic veg phase: 26+-2.51 days, photoperiod sensitive days: 55+- 5.49 days; Relative photo sensitivity 38%)
14	BR12007-6R-61	PH: 126 cm, GD: 109 days, GY: 6.37 t/ha, *Pita+Wx-10+ Wx-A+* $qDTY_{2.1}$*+* $DTY_{2.2}$*_1+* $qDTY_{3.1}$*+* $qDTY_{3.2}$
15	BR23	Photosesitive
16	BRRIdhan46	Photosesitive
17	BRRIdhan87	PH: 122 cm, GD: 127 days, GY: 6.5 t/ha, High yield
18	Bangabandhu dhan100	PH: 101cm, GD: 148days, GY: 7.7t/ha, Zinc 25.7 mg/kg
19	BRRIdhan101	PH: 110 cm, GD: 142 days, GY: 7.72 t/ha, High yield, BB resistant
20	BRRIdhan102	PH: 103 cm, GD: 150 days, GY: 8.1 t/ha, Zinc 25.5 mg/kg

SN	Designation	Characteristics
21	SVIN297	PH: 131 cm, GD: 120 days, GY: 5.15 t/ha, High yield
22	Beroi	PH: 110 cm, GD: 135-140days, GY: 2.0t/ha, Beroi type grain in the background of BRRI dhan87

Table 4.1b: List of the crosses made under Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Cross combinations	Characteristics	No of seeds	Average_BLUP yield (t/ha)
1	Bangabandhu dhan100/ BR10799-6R-151	Medium GD (≤135 days) with High Zn and yield	150	7.04
2	Bangabandhu dhan100/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield and Zn	20	7.18
3	Bangabandhu dhan100/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn	20	7.08
4	Bangabandhu dhan100/ BR10802-6R-242	Medium GD (≤135 days) with High Zn and yield	172	7.06
5	Bangabandhu dhan100/ BR10802-6R-66	Medium GD (≤135 days) with High Zn and yield	60	7.03
6	Bangabandhu dhan100/ BR11222-6R-64	Medium GD (≤135 days) with High Zn and yield	27	7.04
7	Bangabandhu dhan100/ BR11333-6R-73	Short duration (≤120 days) with acceptable yield and Zn	8	7.06
8	Bangabandhu dhan100/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield, Zn and aroma	110	7.26
9	Bangabandhu dhan100/ BR11910-4R-127	Moderate photo sensitive	12	7.01
10	Bangabandhu dhan100/ BR12007-6R-61	Short duration (≤120 days) with acceptable yield and Zn	106	7.04
11	BR10458-20-2-3-1-3/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield	310	6.92
12	BR10475-1-2-3-5-5/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield	130	6.87
13	BR10475-1-2-3-5-5/ BR10800-6R-1	Medium GD (≤135 days) with high yield	208	6.54
14	BR10475-1-2-3-5-5/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and aroma	380	6.62
15	BR10482-1-2-3-1-3/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield	234	6.51
16	BR11716-4R-102/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield	480	7.54
17	BR11716-4R-102/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield	220	7.21
18	BR11716-4R-102/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield	36	7.11
19	BR11716-4R-102/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield	305	7.29
20	BRRI dhan101/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield and BB resistant	110	7.19

21	BRRI dhan101/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and BB resistant	300	7.27
22	BRRI dhan102/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield and Zn	210	7.71
23	BRRI dhan102/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield and Zn	105	7.38
24	BRRI dhan102/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn	64	7.28
25	BRRI dhan102/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and Zn	158	7.46
26	BRRI dhan87/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn	65	6.66
27	BRRI dhan87/ BR10802-6R-66	High yield	300	6.51
28	BRRI dhan87/ BR12007-6R-61	High yield	167	6.58
29	SVIN297/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield	180	6.73
30	BRRI dhan87/ Beroi	Beroi type grain with yield, photo sensitive	150	-
31	BR23/BRRI dhan46	Photo sensitive	220	-
32	BRRIdhan46/BR23	Photo sensitive	312	-
		Total	**5,329**	

Experiment 4.2: Hybridity test and confirmation of F_1

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: To confirm the crosses as true F_1s and use of the selected F_1s to produce F_2 seeds.

Materials and Methods: A total of thirty-five crosses were grown along with their parents in the crossing blocks at BRRI Gazipur using single seedling/hill at 20 cm × 20 cm spacing in 12-hill three/four row plots. Fertilizer and crop management was done following the protocol described in Experiment 4.1. Leaf samples were collected from each of the plants of F_1 and parents for QC genotyping to determine true F_1s. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. All genotyping results were analyzed using Flapjack.

Results and discussion: The plants with heterozygous alleles at two or more SNP loci were declared as true F_1. All the 35 crosses were identified as true F1. Seeds of these F1 plants were selfed to produce F_2 seeds. At maturity stage, F_2 seeds of all selected plants were harvested individually. Then they were dried, cleaned and preserved in cold room for proper storage (**Table 4.2**).

Table 4.2: The list of F_1s confirmed, Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	BR#	Cross combinations	Characteristics
1	BR14935	SVIN139/ IR98377-B-B-B-B-24	High yield
2	BR14936	SVIN139/ SVIN297	High yield
3	BR14937	SVIN139/ SVIN405	High yield
4	BR14938	SVIN297/ SVMET302	High yield
5	BR14939	BR9574-9-5-3-1-1/ BRRI dhan100	High yield, high zinc
6	BR14940	Bangabandhu dhan100/ BR9574-9-5-3-1-1	High yield, high zinc

7	BR14941	Bangabandhu dhan100/ SVIN352	High yield, high zinc
8	BR14942	Bangabandhu dhan100/ SVIN405	High yield, high zinc
9	BR14943	Bangabandhu dhan100/ SVMET302	High yield, high zinc
10	BR14944	Bangabandhu dhan100/ SVMET306	High yield, high zinc
11	BR14945	IR98377-B-B-B-B-24/ Bangabandhu dhan100	High yield, high zinc
12	BR14946	SVIN297/ Bangabandhu dhan100	High yield, high zinc
13	BR14947	SVMET302/ Bangabandhu dhan100	High yield, high zinc
14	BR14948	SVMET306/ Bangabandhu dhan100	High yield, high zinc
15	BR14949	Bangabandhu dhan100/ IR83484-3-B-7-1-1-1	High yield, salinity tol., long slender grain
16	BR14950	BR9571-13-1-9-1-1/ BR8548-8-22-5-15	High yield, BB resistance, long slender grain
17	BR14951	BR9571-13-1-9-1-1/ BR9140-5-22-5-1	High yield, BB resistance, long slender grain
18	BR14952	SVIN139/ BR9140-5-22-5-1	High yield, BB resistance, long slender grain
19	BR14953	SVIN139/ BR9840-52-1-2-1	High yield, BB resistance, long slender grain
20	BR14954	BRH14-9-13-16B/ IR101791-10-1-4-3-24	High yield, high amylose, long slender grain
21	BR14955	SVIN139/ BRH14-9-13-16B	High yield, high amylose, long slender grain
22	BR14956	SVIN139/ BRH15-24-7-B	High yield, high amylose, long slender grain
23	BR14957	SVIN139/ BR10490-1-2-3-8-7	High yield, high amylose, high zinc
24	BR14958	BR11604-4R-84/ Bangabandhu dhan100	High amylose, BB and blast resistance, high zinc
25	BR14959	Bangabandhu dhan100/BR11604-4R-84	High amylose, BB and blast resistance, high zinc
26	BR14961	BR9571-13-1-9-1-1/ Gainja	High yield, photosensitive
27	BR14962	BR9571-13-1-9-1-1/ Malshira	High yield, photosensitive
28	BR14963	BR9574-9-5-3-1-1/ Gainja	High yield, photosensitive
29	BR14964	BR9574-9-5-3-1-1/ Malshira	High yield, photosensitive
30	BR14965	BR9840-52-1-2-1/Mele (Aus)_1671	High yield, high protein
31	BR14966	BR8492-9-5-3-2-HR1/Mele (Aus)_1671	High yield, high protein
32	BR14967	BR9574-9-5-3-1-1/Mele (Aus)_1671	High yield, high protein
33	BR14968	BR9840-52-1-2-1/ Duksail (TA)_2022	High yield, high protein
34	BR14969	BR9571-13-1-9-1-1/ Duksail (TA)_2022	High yield, high protein
35	BR14970	BR9574-9-5-3-1-1/ Duksail (TA)_2022	High yield, high protein

Experiment 4.3: Advancing segregating progenies in RGA/FRGA nurseries

Principal investigator: M A Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Rapid advancement of segregating population for shortening the breeding cycle.

Materials and Method: A total of 31,126 individual segregating progenies were grown during the reporting period. Among these, 8,666 progenies of 27 crosses of F_3 and F_5 generations were grown in T. Aman and 22,460 progenies of 59 crosses from F_2 and F_4 generations were grown in Boro season at Gazipur under greenhouse and field RGA condition. In case of field RGA, panicles were directly seeded on the raised bed at 5 cm × 5 cm spacing. A wooden frame was used to make single-row plots on the beds. Fertilizer and crop management was done using the half doses of all fertilizers used in Experiment **4.1**. At maturity stage, single panicle was harvested from each bunch of hills. Harvested panicles were dried and subjected to keep in the oven at 50ºC for breaking dormancy and repeat the same method to initiate next cycle of RGA immediately.

Results and discussion: A total of 28,362 individual segregating progenies were harvested during the reporting period. Among these, 8,362 progenies of 27 crosses of F_3 and F_5 generations were harvested in T. Aman and 20,000 progenies of 59 crosses from F_2 and F_4 generations were harvested in Boro season at Gazipur under greenhouse and field RGA condition (**Table 4.3a** and **Table 4.3b**).

Table 4.3a: List of segregating progenies harvested from greenhouse and field RGA nurseries under Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	BR Reg. No.	Cross combinations	No of progenies harvested
F_3 generation			
1	BR14348	SVIN197/ IR17A1080	420
2	BR14349	SVIN197/ IR17A1211	300
3	BR14350	SVIN096/ BR8442-12-1-3-1-B5	240
4	BR14351	SVIN085/ IR17A1779	400
5	BR14352	SVIN096/ IR66946-3R-116-1-1	244
6	BR14353	IR83484-3-B-7-1-1-1/ BR10001-94-2-B	260
7	BR14354	IR83484-3-B-7-1-1-1/ BR8442-12-1-3-1-B5	160
8	BR14355	IR83484-3-B-7-1-1-1/ HHZ5-DT20-DT2-DT1	292
9	BR14356	IR83484-3-B-7-1-1-1/ HHZ12-SAL2-Y3-Y2	160
10	BR14357	HHZ5-DT20-DT2-DT1/ IR17A1080	360
11	BR14358	HHZ5-DT20-DT2-DT1/ IR17A1211	500
12	BR14359	HHZ5-DT20-DT2-DT1/ BR9574-9-5-3-1-1	450
13	BR14360	SVIN085/ HHZ5-DT20-DT2-DT1	450
14	BR14361	HHZ5-DT20-DT2-DT1/ BR8548-8-22-5-15	350
15	BR14362	SVIN197/ BR8548-8-22-5-15	500
16	BR14363	SVIN085/ BR8548-8-22-5-15	450
17	BR14364	SVIN096/ BR9140-5-22-5-1	500
18	BR14365	HHZ5-DT20-DT2-DT1/ Malshira	500
19	BR14366	HHZ12-SAL2-Y3-Y2/ Nizersail	500
20	BR14367	IR83484-3-B-7-1-1-1/ Rosulbhog	100
21	BR14368	SVIN197/ Malshira	150
22	BR14369	SVIN085/ Rosulbhog	140
23	BR14370	SVIN096/ Gainza	330
		Sub Total	**7,756**
F_5 generation			
1	BR13872	BR23/BRRI dhan89	160
2	BR13873	BRRI dhan46/BRRI dhan87	96
3	BR13874	BR23/BR8526-38-3-2-1-HR2	120
4	BR13875	BRRI dhan46/BR8526-L8	230
		Sub Total	**606**
		Grand Total	**8,362**

Table 4.3b: List of segregating progenies harvested from greenhouse and field RGA nurseries, Development of Rainfed Lowland Rice, Boro 2022-23

SN	BR Reg. No.	Cross combinations	No of progenies harvested
F_2 generation			
1	BR14935	SVIN139/ IR98377-B-B-B-B-24	370
2	BR14936	SVIN139/ SVIN297	375
3	BR14937	SVIN139/ SVIN405	360
4	BR14938	SVIN297/ BR8492-9-5-3-2-HR1	380
5	BR14939	SVIN297/ SVMET302	385
6	BR14940	BR9574-9-5-3-1-1/ Bangabandhudhan100	390
7	BR14941	Bangabandhudhan100/ BR9574-9-5-3-1-1	380
8	BR14942	Bangabandhudhan100/ SVIN352	385
9	BR14943	Bangabandhudhan100/ SVIN405	385
10	BR14944	Bangabandhudhan100/ SVMET302	390
11	BR14945	Bangabandhudhan100/ SVMET306	380
12	BR14946	IR98377-B-B-B-B-24/ Bangabandhudhan100	390
13	BR14947	SVIN297/ Bangabandhudhan100	350
14	BR14948	SVMET302/ Bangabandhudhan100	385
15	BR14949	SVMET306/ Bangabandhudhan100	375
16	BR14950	Bangabandhudhan100/ IR83484-3-B-7-1-1-1	390
17	BR14951	BR9571-13-1-9-1-1/ BR8548-8-22-5-15	385
18	BR14952	BR9571-13-1-9-1-1/ BR9140-5-22-5-1	385
19	BR14953	SVIN139/ BR9140-5-22-5-1	350
20	BR14954	SVIN139/ BR9840-52-1-2-1	350
21	BR14955	BRH14-9-13-16B/ IR101791-10-1-4-3-24	300
22	BR14956	SVIN139/ BRH14-9-13-16B	395
23	BR14957	SVIN139/ BRH15-24-7-B	400
24	BR14958	SVIN139/ BR10490-1-2-3-8-7	400
25	BR14959	BR11604-4R-84/ Bangabandhudhan100	390
26	BR14960	Bangabandhudhan100/ BR11604-4R-84	380
27	BR14961	BR9571-13-1-9-1-1/ Gainja	390
28	BR14962	BR9571-13-1-9-1-1/ Malshira	100
29	BR14963	BR9574-9-5-3-1-1/ Gainja	60
30	BR14964	BR9574-9-5-3-1-1/ Malshira	120
31	BR14965	BR9840-52-1-2-1/ Mele (Aus)_1671	380
32	BR14966	BR8492-9-5-3-2-HR1/ Mele (Aus)_1671	375
33	BR14967	BR9574-9-5-3-1-1/ Mele (Aus)_1671	385
34	BR14968	BR9840-52-1-2-1/ Duksail (TA)_2022	390
35	BR14969	BR9571-13-1-9-1-1/ Duksail (TA)_2022	385
36	BR14970	BR9574-9-5-3-1-1/ Duksail (TA)_2022	120
		Sub Total	**12,51**0
F_4 generation			
1	BR14348	SVIN197/ IR17A1080	400
2	BR14349	SVIN197/ IR17A1211	300
3	BR14350	SVIN096/ BR8442-12-1-3-1-B5	240
4	BR14351	SVIN085/ IR17A1779	380
5	BR14352	SVIN096/ IR66946-3R-116-1-1	240
6	BR14353	IR83484-3-B-7-1-1-1/ BR10001-94-2-B	250
7	BR14354	IR83484-3-B-7-1-1-1/ BR8442-12-1-3-1-B5	160
8	BR14355	IR83484-3-B-7-1-1-1/ HHZ5-DT20-DT2-DT1	280
9	BR14356	IR83484-3-B-7-1-1-1/ HHZ12-SAL2-Y3-Y2	250
10	BR14357	HHZ5-DT20-DT2-DT1/ IR17A1080	350
11	BR14358	HHZ5-DT20-DT2-DT1/ IR17A1211	480
12	BR14359	HHZ5-DT20-DT2-DT1/ BR9574-9-5-3-1-1	450
13	BR14360	SVIN085/ HHZ5-DT20-DT2-DT1	420
14	BR14361	HHZ5-DT20-DT2-DT1/ BR8548-8-22-5-15	320
15	BR14362	SVIN197/ BR8548-8-22-5-15	480
16	BR14363	SVIN085/ BR8548-8-22-5-15	420
17	BR14364	SVIN096/ BR9140-5-22-5-1	450
18	BR14365	HHZ5-DT20-DT2-DT1/ Malshira	460
19	BR14366	HHZ12-SAL2-Y3-Y2/ Nizersail	480

SN	BR Reg. No.	Cross combinations	No of progenies harvested
20	BR14367	IR83484-3-B-7-1-1-1/ Rosulbhog	100
21	BR14368	SVIN197/ Malshira	150
22	BR14369	SVIN085/ Rosulbhog	130
23	BR14370	SVIN096/ Gainja	300
		Sub Total	**7,490**
		Grand Total	**20,000**

Experiment 4.4: Line Stage Testing (LST)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: To select uniform genotypes in terms of plant height and days to flowering with key target traits.

Materials and Method: Total 6,651 progenies from 28 crosses were grown in T. Aman season in in a 2.6 m single-row plot with a spacing of 20 cm × 20 cm in the field using systematic arrangement design. Thirty-day-old single seedling was transplanted at 20 cm × 20 cm in the plots. Fertilizer and crop management was done following the protocol described in experiment **4.1**. Leaf samples were collected from single plant of selected entries for genotyping with trait markers using trait-based SNP markers. Selection was done considering uniformity in plant height, days to flowering, grain size and shape, lodging tolerance and tolerance to major disease and insect over check varieties under field condition and presence of target key traits. Additionally, five plants were harvested from selected LST lines to compare the grain weight among selected progenies of same cross combination.

Results and discussion: Among the lines 384 LST lines of 26 crosses were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape **(Table 4.4a).** The initially selected lines showed a wide range of variation in plant height ranged from 96-182 cm and days to flowering starting from 97-135 days and the selection intensity was found 5.66% (**Fig. 4.1a**). The genotypic profiles showed that majority lines had favorable alleles for high amylose specific marker *Wx-A,* W*x-10.* Among blast resistant genes *Pita* gene was present in 94 lines. Thity three lines have bacterial blight resistant gene *xa5* only (**Fig. 4.1b**). Fifty-five lines have brown plant hopper resistant gene *BPH32* and a very few lines have gall midge resistant genes. The genotypic profiles also showed that the lines had reproductive stage drought tolerant QTLs i.e., $qDTY_{1.1}$, $qDTY_{2.1}$, $qDTY_{2.2}$, $qDTY_{3.1}$, $qDTY_{3.2}$, $qDTY_{4.1}$ and $qDTY_{12.1}$. Lines with these QTLs have an immense effect to drought tolerance. Among all the lines 209 lines have $qDTY_{12.1}$ QTL which is responsible maximum drought tolerance. All the RGA derived fixed lines of 25 cross families were selected for initial yield evaluation.

Table 4.4a: List of selected genotypes Line Stage Testing (LST) Trial, Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	BR No.	Parentage	Progenies transplanted	Selected lines
F_6 generation (Source: TA 2021-22)				
1	BR13519	BRRI dhan39/BRH11-9-11-4-5B (CN-6)// BRRI dhan49/IRRI 154/// BRRI dhan70/IR64-Pi9 NILs// BRRI dhan71/ HHZ23-DT16-DT1-DT1//// BRRI dhan72/BR9571-2-2-5-2-1// BRRI dhan73/IR70213-10-CPA-4-2-2-2/// BRRI dhan75/ BR7831-59-1-1-4-5-1-9-P1// BRRI dhan79/ BR8938-19-4-3-1-1	1180	65
2	BR12988	IR99091-B-B-B-253-1/ BR8938-19-4-3-1-1	299	24

3	BR12989	BR9840-52-1-1-2/ BR7528-2R-HR16-24-1	233	22
4	BR12990	IR70213-10-CPA-4-2-2-2/ BR8410-16-4-17-9-1	321	17
5	BR12991	IR105857-8-80-3-1/ IR64-pi9 NILS	481	28
6	BR12992	IR99091-B-B-B-253-1/ BR9840-52-1-1-2	197	29
7	BR12993	IR70213-10-CPA-4-2-2-2/ IR64-pi9 NILS	414	24
8	BR12994	BR9573-31-2-1-3-1/ BR8938-19-4-3-1-1	182	06
9	BR12995	BR7528-2R-HR16-24-1/ BR8410-16-4-17-9-1	221	05
10	BR12996	IR70213-10-CPA-4-2-2-2/ BR8938-19-4-3-1-1	354	20
11	BR12997	IR99091-B-B-B-253-1/ IR105857-8-80-3-1	232	15
12	BR12998	BR8938-19-4-3-1-1/ IR64-pi9 NILS	239	19
13	BR12999	BRRI dhan87/ IR99091-B-B-B-253-1	315	15
14	BR13046	BRRI dhan39/BRH11-9-11-4-5B (CN-6)// BRRI dhan49/IRRI 154/// BRRI dhan70/IR64-Pi9 NILs// BRRI dhan71/ HHZ23-DT16-DT1-DT1	195	09
15	BR13047	BRRI dhan39/BRH11-9-11-4-5B (CN-6)// BRRI dhan49/IRRI 154/// 1 BRRI dhan72/BR9571-2-2-5-2-1// BRRI dhan73/IR70213-10-CPA-4-2-2-2	270	09
16	BR13048	BRRI dhan39/BRH11-9-11-4-5B (CN-6)// BRRI dhan49/IRRI 154/// BRRI dhan75/BR7831-59-1-1-4-5-1-9-P1// BRRI dhan79/ BR8938-19-4-3-1-1	230	07
17	BR13049	BRRI dhan70/IR64-Pi9 NILs// BRRI dhan71/ HHZ23-DT16-DT1-DT1/// BRRI dhan72/BR9571-2-2-5-2-1// BRRI dhan73/IR70213-10-CPA-4-2-2-2	360	20
18	BR13050	BRRI dhan72/BR9571-2-2-5-2-1// BRRI dhan73/IR70213-10-CPA-4-2-2-2/// BRRI dhan75/BR7831-59-1-1-4-5-1-9-P1//BRRI dhan79/ BR8938-19-4-3-1-1	227	07
		Sub Total	**5,818**	**348**
F_6 generation (Source: Boro 2021-22)				
1	BR13520	BRRI dhan87/BR8841-38-1-2-2	128	11
2	BR13521	BRRI dhan87/BR8526-L8	98	04
3	BR13522	IRLON-2018-SVIN-173/BRRI dhan89	120	07
4	BR13523	BRRI dhan89/BR8526-38-3-2-1-HR2	12	00
5	BR13524	BR8521-30-3-1/BRRI dhan71	188	05
6	BR13525	IRLON-2018-SVIN-172/BRRI dhan71	53	09
7	BR13526	BR8526-38-3-2-1-HR2/IRLON-2018-SVIN-196	30	01
8	BR13527	BR8526-L8/IRLON-2018-SVIN-173	36	-
9	BR13528	IRLON-2018-SVIN-131/BR8521-30-3-1	128	05
10	BR13529	IRLON-2018-SVIN-169/BR8841-38-1-2-2	40	01
		Sub Total	**833**	**43**
		Grand total	**6,651**	**384**

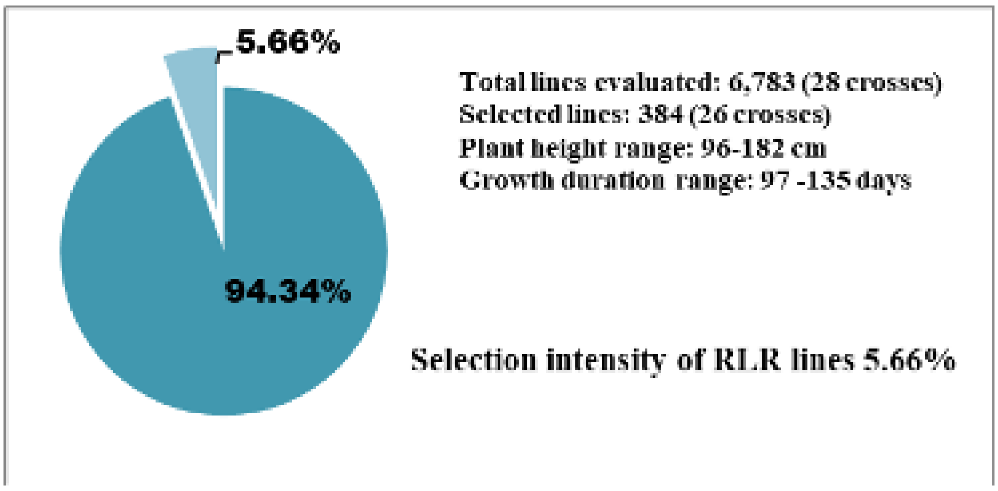


Fig. 4.4a: Selection intensity genotypes of LST, RLR, T. Aman 2022-23

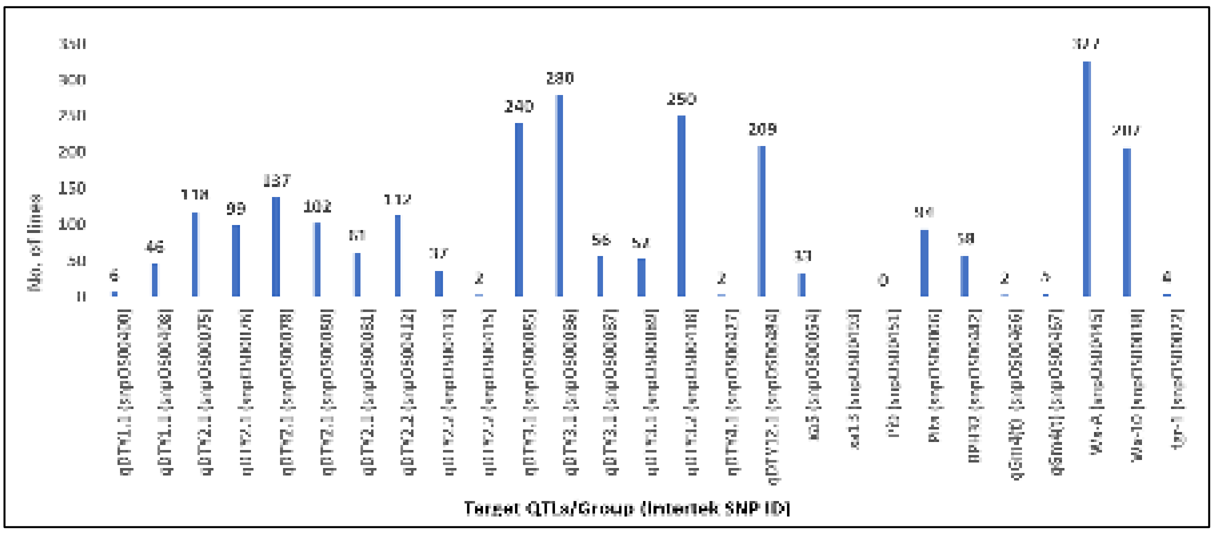


Fig. 4.4b: Trait marker profile of genotypes of LST, RLR, T. Aman 2022-23

Table 4.4b: List of LST lines with enriched traits/genes originated different cross families, Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Cross family	Enriched trait/gene	No. of selected lines
1	BR12988	*qDTY1.1_2+qDTY2.2-1+qDTY3.2+qDTY12.1+Waxy_A*	1
		qDTY1.1_2+qDTY2.2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	2
		qDTY12.1+Waxy_A	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+xa5+Pita	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ xa5+Pita+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+ Pita	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY2.2-1+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_2+Waxy_A	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1	2
		Waxy_A	1
2	BR12989	*qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1*	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A	2
		qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY12.1+Waxy_A	1
		qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	3
		qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2+Waxy_A	10
		qDTY3.1_2+Waxy_A+Waxy_10	1
		Waxy_A+Waxy_10	1
3	BR12990	*qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Waxy_A*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_2+qDTY3.2+qDTY12.1+ Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Pita+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	2
		qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	2
		qDTY3.1_2+Waxy_A	4
		qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.2+Waxy_A	1
4	BR12991	*qDTY1.1_2+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A*	1
		qDTY1.1_2+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	3
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	2
		qDTY1.1_2+qDTY3.2+qDTY12.1+Waxy_A	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	5
		qDTY2.1_3+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	5

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.1_3+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	4
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY12.1+Waxy_A	1
5	BR12992	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY12.1+BPH32+Waxy_A	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+ Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.2+qDTY12.1+xa5+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+BPH32+Waxy_A+Waxy_10	5
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+BPH32+Waxy_A+ Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Pita+BPH32+Waxy_A+Waxy_10	2
		qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Pita+BPH32+Waxy_A	1
		qDTY2.1_3+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+BPH32+Waxy_A	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+BPH32+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
6	BR12993	*qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+ Waxy_10	3
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+BPH32+Waxy_A+Waxy_10	6
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2	1
		qDTY3.1_3+qDTY3.1_4+xa5+Waxy_A	1
7	BR12994	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+ qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	1
		qDTY3.2+Waxy_A	1
		DTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
8	BR12996	*qDTY1.1_2+qDTY12.1+Waxy_A*	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_2+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ Waxy_A+Waxy_10	3
		qDTY2.1_1+qDTY3.2+Pita	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A	1
		qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+qGm4(t)_2+Waxy_A+Waxy_10	1
9	BR12997	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+ qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+ qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.2+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2	1
		qDTY3.1_1+qDTY3.1_2+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+xa5	1
		qDTY3.1_1+qDTY3.1_2+xa5+Waxy_A	1
10	BR12998	*BPH32+Waxy_A*	1
		qDTY2.2-1	2
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2	13
		qDTY3.1_1+qDTY3.1_2	1
		qDTY3.1_1+qDTY3.1_2+xa5+BPH32+Waxy_A+Waxy_10	2
11	BR12999	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_2+qDTY3.2+qDTY12.1+ Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	5
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+ Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_2+qDTY12.1+Waxy_A+ Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
12	BR13046	*qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10*	1
		qDTY2.2-1+qDTY3.1_1+Waxy_A	1
		qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.1_4+qDTY12.1+Waxy_A	1
13	BR13047	*qDTY1.1_2+qDTY3.2*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+ Waxy_10	1
		qDTY2.1_1+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.2-2+qDTY2.2-3+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+fgr-1	1
		qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita	1
		qDTY2.2-2+qDTY3.1_3+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10+fgr-1	1
14	BR13048	*qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	2
		qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY3.2+Waxy_A	1
15	BR13049	*qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+ Pita+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY2.2-1+qDTY2.2-2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	2

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ qDTY12.1+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	3
		qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.2+xa5+Waxy_A	1
16	BR13050	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+ Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.2+xa5+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ xa5+Pita+Waxy_A	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.2+Pita+Waxy_A	1
17	BR13519	*qDTY1.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ Pita	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ xa5+Pita+	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ xa5+Pita+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_2+qDTY3.2+qDTY12.1+ Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+ Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+ xa5+Pita+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+ Pita+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+ Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+ Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita	1
		qDTY2.1_1+qDTY2.1_2+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_4+qDTY3.2+qDTY12.1+Pita+	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A	1
		qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.1_2+qDTY3.2+Pita+	1
		qDTY2.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A	1
		qDTY2.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	1
		qDTY2.1_1+qDTY3.2+qDTY12.1+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.2+qDTY12.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	2
		qDTY2.1_3+qDTY2.2-1+qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A+fgr-1	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.2+Pita+Waxy_A+Waxy_10+fgr-1	1
		qDTY2.2-3+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+BPH32+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A	1
		qDTY3.1_2	1
		qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY3.1_2+Waxy_A	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	3
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	2
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A	1
		qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.2+Waxy_A+Waxy_10	2
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+ Pita+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1 _1+qDTY3.1_2+qDTY3.2+ qDTY12.1+Pita+Waxy_A+Waxy_10	1
18	BR13520	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+ Waxy_A+Waxy_10*	9
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
19	BR13521	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Pita+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
20	BR13522	*qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+xa5+Waxy_A+Waxy_1 0*	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+xa5+BPH32+qGm4(t)_2+Waxy_ A+Waxy_10	1
		qDTY2.2-2+qDTY3.1_1+qDTY3.1_2+xa13+Pita+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_3+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_3+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
21	BR13524	*qDTY1.1_2+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A*	1
		qDTY1.1_2+qDTY2.1_5+qDTY2.2-1+qDTY3.2+Waxy_A	1
		qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+Waxy_A	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Waxy_A	1
		DTY1.1_1+qDTY1.1_2+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	1
22	BR13525	*qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+Pita+Waxy_A*	2
		qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Pita+Waxy_A	1
		qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	2
		qDTY2.2-1+qDTY2.2-2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+Waxy_A	1

SN	Cross family	Enriched trait/gene	No. of selected lines
		qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1+Pita+BPH32+Waxy_A	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+BPH32+Waxy_A	1
23	BR13526	*qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A*	1
24	BR13528	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ Pita+BPH32+Waxy_A*	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+ Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+BPH32+Waxy_A	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+Waxy_A+Waxy_10	1
		qDTY3.1_2+Waxy_A	1
25	BR13529	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+qGm4(t)_2+ Waxy_A+ Waxy_10*	1

Experiment 4.5: Observational Yield Trial (OYT)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha, K Fatema, A Rahman, M R Hasan

Specific objective: Selection of homogeneous breeding lines with fine grain properties having high yield with good plant type.

Materials and Methods: Five hundred seven genotypes along with standard checks were evaluated in two OYTs. In OYT#1, 217 lines (GD: 94-120 days) along with BRRI dhan57, BRRI dhan62, BRRI dhan71 and BRRI dhan87 and in OYT#2, 290 lines (GD: 121-140 days) along with BRRI dhan49, BRRI dhan71 and BRRI dhan87 were evaluated. Thirty days old seedlings were transplanted in a 5.4 m × 3 rows at spacing of 20 cm × 15 cm in the field in Augmented RCB design. Single seedling was used for transplanting. Fertilizers doses and crop management was done as experiment no. **4.1**.

Location: BRRI, Gazipur; Cumilla and Rangpur.

Results: From the trial OYT#1, 50 lines and from OYT#2, 54 lines were selected based on grain yield and phenotypic performance (**Table 4.5**). Grain yield was ranged from 5.4 -8.4 t/ha in OYT#1 and 6.1-8.2 t/ha in OYT#2.

Table 4.5: Performance of selected materials of Observational Yield Trial (OYT) under Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
OYT#1							
1	BR11730-5R-32	116	136	5.14	6.61	5.88	*Wx-10+ qDTY2.1 (1)+ qDTY3.1 (1)+ qDTY1.1_4+qDTY3.2_1+qDTY4.1_2 + Wx-A+ qDTY12.1_2*
2	BR11730-5R-90	119	131	5.47	5.68	5.57	
3	BR12293-5R-47	117	117	6.26	7.31	6.78	*Wx-10+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY3.2_1+Wx-A+ qDTY12.1_2*
4	BR12294-5R-187	141	116	6.43	7.05	6.74	*qDTY3.1 (1)+ qDTY12.1_2*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
5	BR12296-5R-100	106	118	5.29	8.28	6.79	*fgr-1+Wx-10+qDTY2.1(4)+qDTY2.1 (5)+ qDTY3.1 (2)+ BPH32+ Wx-A+ qDTY12.1_2*
6	BR12296-5R-120	104	106	5.79	-	5.79	*Pi-ta+ fgr-1+ Wx-10+ qDTY2.1 (1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY3.2_1+Wx-A+ qDTY12.1_2*
7	BR12296-5R-131	102	110	6.29	5.84	6.06	*fgr-1+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
8	BR12298-5R-60	105	109	5	6.12	5.56	*fgr-1+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1(1)+ qDTY3.1 (2)+ BPH32+ Wx-A+ qDTY12.1_2*
9	BR12300-5R-109	101	116	5.79	-	5.79	*qDTY2.1 (1)+qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+ Gm4_3+ Gm4_4+ qDTY12.1_2*
10	BR12300-5R-325	100	108	5.78	7.07	6.42	*qDTY3.1(3)+qDTY3.1(4)+qDTY2.2_1+ Gm4_3+ Gm4_4+ qDTY12.1_2*
11	BR12300-5R-377	114	110	6.45	4.59	5.52	*Wx-10+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1(4)+qDTY1.1_4+qDTY2.2_1+ Wx-A+ qDTY12.1_2*
12	BR12300-5R-83	105	109	6.11	5.53	5.82	*Wx-10+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY3.1(4)+qDTY1.1_4+ qDTY2.2_1+ qDTY4.1_2+ Wx-A+ Gm4_3+ Gm4_4+ qDTY12.1_2*
13	BR12301-5R-190	123	109	5.65	5.4	5.52	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ Wx-A*
14	BR12301-5R-281	102	113	6.72	4.56	5.64	*fgr-1+Wx-10+qDTY2.1(1)+qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY2.2_1+Wx-A+qDTY12.1_2*
15	BR12301-5R-307	107	110	6.68	5.24	5.96	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ Wx-A+ qDTY12.1_2*
16	BR12301-5R-342	114	109	5.78	-	5.78	*fgr-1+Wx-10+qDTY2.1(1)+qDTY2.1 (2)+qDTY2.1 (3)+qDTY2.1(4)+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY2.2_1+Wx-A+qDTY12.1_2*
17	BR12302-5R-99	122	116	5.61	6.25	5.93	*Wx-10+ qDTY2.1 (1) + qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
18	BR12303-5R-13	107	117	6.43	5.58	6	*fgr-1+Wx-10+ qDTY2.1(1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
							(4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2
19	BR12303-5R-151	102	110	5.75	5.46	5.6	*fgr-1+Wx-10+qDTY2.1(1)+qDTY2.1 (2)+qDTY2.1(3)+qDTY2.1(4)+ qDTY3.1(1)+qDTY3.1(2)+Wx-A+ qDTY12.1_2*
20	BR12303-5R-218	114	119	6.26	4.75	5.51	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
21	BR12303-5R-22	103	118	5.76	6.95	6.36	*fgr-1+ Wx-10+ qDTY2.1 (1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
22	BR12303-5R-222	122	112	5.78	5.46	5.62	*fgr-1+ Wx-10+ qDTY2.1 (1)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ Wx-A+ qDTY12.1_2*
23	BR12303-5R-341	105	109	5.31	6.34	5.83	*fgr-1+ Wx-10+ qDTY2.1 (1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ Wx-A+ qDTY12.1_2*
24	BR12303-5R-49	112	116	6.57	5.13	5.85	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ Wx-A+ qDTY12.1_2*
25	BR12303-5R-95	101	111	6.09	5.45	5.77	*fgr-1+ Wx-10+ qDTY2.1 (1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
26	BR12628-5R-184	103	104	5.17	7.79	6.48	*Pi-ta+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ BPH32+ Wx-A+ qDTY12.1_2*
27	BR12628-5R-195	125	128	5.15	6.07	5.61	*Pi-ta+ Wx-10+ qDTY2.1 (5)+ qDTY3.1(1)+qDTY3.1(2)+qDTY3.2_1+BPH32+Wx-A+ qDTY12.1_2*
28	BR12629-5R-41	107	123	6.89	4.91	5.9	*Wx-10+ xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
29	BR12630-5R-140	131	121	6.1	5.37	5.74	*Pi-ta+ fgr-1+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1*
30	BR12631-5R-11	125	110	5.93	-	5.93	*Pi-ta+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY1.1_4+qDTY2.2_1+ Wx-A+ qDTY12.1_2*
31	BR12631-5R-146	129	115	6.76	5.61	6.18	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
							qDTY2.2_1+ qDTY3.2_1+ Wx-A+ qDTY12.1_2
32	BR12631-5R-151	115	114	6.11	4.9	5.51	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1(1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ qDTY4.1_2+ Wx-A*
33	BR12631-5R-26	120	110	6.59	4.85	5.72	*Wx-10+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY3.1(4)+qDTY1.1_4+qDTY2.2_1+qDTY3.2_1+qDTY4.1_2+ Wx-A+ qDTY12.1_2*
34	BR12631-5R-28	119	104	6.68	5.8	6.24	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+qDTY3.2_1+qDTY4.1_2 + Wx-A*
35	BR12631-5R-30	114	111	5.75	6.45	6.1	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY3.1(4)+qDTY1.1_4+qDTY2.2_1+ qDTY3.2_1+ qDTY4.1_2+ Wx-A*
36	BR12631-5R-35	113	122	6.57	4.68	5.63	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY3.1(4)+qDTY1.1_4+qDTY2.2_1+qDTY3.2_1+qDTY4.1_2+ Wx-A*
37	BR12631-5R-37	133	121	6.1	5.2	5.65	*Pi-ta+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY1.1_4+qDTY2.2_1+qDTY4.1_2 + Wx-A+ qDTY12.1_2*
38	BR12631-5R-41	100	112	7.06	6.35	6.71	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+ qDTY4.1_2+ Wx-A*
39	BR12631-5R-49	102	114	6.43	4.78	5.61	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1(4)+qDTY1.1_4+qDTY3.2_1+ qDTY4.1_2+ Wx-A*
40	BR12631-5R-51	132	115	7.05	9.69	8.37	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+qDTY3.2_1+qDTY4.1_2 + Wx-A*
41	BR12631-5R-60	121	115	4.99	6.07	5.53	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY3.1(4)+qDTY1.1_4+ Wx-A+ qDTY12.1_2*
42	BR12631-5R-69	118	115	6.71	5.19	5.95	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1(4)+ qDTY1.1_4+ qDTY2.2_1+qDTY3.2_1+qDTY4.1_2 + Wx-A*
43	BR12631-5R-83	119	114	5.44	7.3	6.37	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY3.2_1+ qDTY4.1_2+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
44	BR12634-5R-123	118	109	5.43	5.87	5.65	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
45	BR12634-5R-14	102	106	6.1	-	6.1	*fgr-1+Wx-10+qDTY2.1(1)+qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1(1)+qDTY3.1(2)+qDTY3.2_1+ Wx-A+ qDTY12.1_2*
46	BR12662-4R-11	125	115	5.77	5.28	5.53	*qDTY2.1(5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY2.2_2+ qDTY3.2_1+ Wx-A+ qDTY12.1_2*
47	BR12662-4R-163	142	118	6.75	5.33	6.04	*Pi-ta+ qDTY3.1(1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A+ qDTY12.1_2*
48	BR12665-4R-207	96	119	5.48	5.74	5.61	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+Wx-A+ Gm4_3+ Gm4_4*
49	BR12303-5R-130	112	121	6.7	5.12	5.91	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ Wx-A+ qDTY12.1_2*
50	BRRI dhan57 (Ck)	98	108	4.93	3.85	4.39	
51	BRRI dhan62 (Ck)	101	103	4.98	2.17	3.58	
52	BRRI dhan71 (Ck)	112	113	5.95	4.72	5.34	
53	BRRI dhan87 (Ck)	123	125	5.85	4.96	5.41	
	LSD <0.05	13.763	5.325	0.61	0.683	0.87	
	H2b	0.73	0.76	0.66	0.65	0.49	
OYT#2							
1	BR11728 -5R-170	134	136	7.57	6.25	6.91	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
2	BR11728 -5R-94	113	130	6.42	6.69	6.55	*Pb1_1*
3	BR11729-5R-127	108	124	5.68	6.75	6.22	*qDTY2.1(1)+qDTY1.1_4+qDTY3.2_1+ qDTY4.1_2+ Wx-A*
4	BR11729-5R-175	110	132	6.38	6.78	6.58	*qDTY1.1_4+ qDTY3.2_1+ Wx-A*
5	BR11731-5R-135	127	133	6.67	6.72	6.69	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_4+ Wx-A+ Gm4_4*
6	BR11731-5R-183	121	135	6.07	6.74	6.4	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_4+ Wx-A+ Gm4_4*
7	BR11732-5R-107	113	132	7.51	4.97	6.24	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_4+ qDTY4.1_2+ Wx-A+ qDTY12.1_2*
8	BR11736-5R-64	118	112	9.16	3.66	6.41	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY2.2_1+BPH17_3 + Wx-A*
9	BR11738-5R-6	125	133	5.99	6.68	6.34	*qDTY2.1(3)+qDTY1.1_4+qDTY2.2_1+ qDTY3.2_1+ BPH32+ Wx-A*
10	BR11739-5R-33	138	134	6.1	6.69	6.39	*qDTY2.1(1)+ qDTY3.1 (1)+ qDTY3.1 (2)+qDTY1.1_4+qDTY3.2_1+BPH17_3+BPH32+ Wx-A+ Gm4_3+ Gm4_4*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
11	BR11739-5R-53	131	129	7.08	6.3	6.69	*qDTY2.1(3)+ qDTY2.1 (4)+ qDTY3.1 (2)+qDTY1.1_4+qDTY2.2_2+qDTY 3.2_1+ BPH17_3+ Wx-A*
12	BR11743-5R-76	139	129	5.92	6.93	6.43	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ BPH32+ Wx-A*
13	BR11743-5R-87	133	131	8.19	6.31	7.25	*Wx-10+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY3.1(4)+qDTY1.1_4+qDTY2.2_1 + BPH17_3+ BPH32+ Wx-A*
14	BR11743-5R-98	130	127	6.02	6.41	6.22	*qDTY1.1_4+ BPH32+ Pb1_1*
15	BR11744-5R-173	106	102	-	6.29	6.29	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1*
16	BR11744-5R-2	118	132		6.45	6.45	
17	BR11745-5R-49	151	121	5.5	6.8	6.15	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
18	BR11745-5R-60	143	128	5.9	6.78	6.34	
19	BR11745-5R-76	138	139	9.63	6.77	8.2	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1(2)+qDTY3.1(4)+qDTY1.1_ 4+ qDTY3.2_1+ Wx-A*
20	BR11747-5R-10	116	130	6.13	6.7	6.41	*qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY4.1_2+ Wx-A*
21	BR11747-5R-122	114	130	6.17	6.18	6.18	*qDTY3.1 (1)+ Wx-A*
22	BR11747-5R-6	106	130	7.12	6.75	6.93	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_ 4+ Wx-A*
23	BR11747-5R-67	123	132	5.99	6.24	6.12	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_ 4+ Wx-A+*
24	BR11747-5R-69	109	134	7.89	6.79	7.34	*qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
25	BR11747-5R-97	122	136	5.71	6.75	6.23	*qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
26	BR11748-5R-16	124	134	7.42	6.76	7.09	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_ 4+ Wx-A*
27	BR11748-5R-2	114	129	9.62	6.68	8.15	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
28	BR11748-5R-30	121	136	7.71	6.66	7.19	*qDTY3.1 (1)+ qDTY1.1_4+ Wx-A*
29	BR11748-5R-50	114	132	5.72	6.75	6.24	*qDTY3.1(1)+qDTY3.1(2)+qDTY1.1_ 4+ Wx-A+ Gm4_4*
30	BR11749-5R-51	124	126	6.01	6.45	6.23	*xa5+ qDTY2.1(1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1(4)+ qDTY2.1 (5)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
31	BR11750-5R-42	136	133	6.08	6.78	6.43	*xa5+ qDTY3.1(2)+ qDTY3.2_1+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
32	BR11752-5R-105	125	129	7.96	6.78	7.37	*qDTY2.1(1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY1.1_4+ qDTY2.2_1+ Wx-A*
33	BR11752-5R-22	114	124	5.85	6.72	6.29	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ BPH32+ Wx-A*
34	BR11753-5R-157	108	128	6.37	6.68	6.53	*xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ BPH32+ Wx-A+ qDTY12.1_2*
35	BR11753-5R-173	124	133	5.84	6.66	6.25	*fgr-1+ xa5+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (4)+ qDTY3.2_1+ BPH32+ Wx-A*
36	BR11754-5R-17	116	126	5.7	6.78	6.24	*xa5+ qDTY2.1 (1)+ qDTY2.1 (3)+ qDTY3.2_1+ Wx-A*
37	BR11754-5R-34	112	128	6.61	6.27	6.44	*xa5+ qDTY2.1(1)+ qDTY2.1(3)+ qDTY2.1(4)+qDTY3.1(2)+qDTY3.2_1+ Wx-A*
38	BR11754-5R-41	112	131	6.95	6.7	6.82	*xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1(3)+qDTY2.1(4)+qDTY2.1(5)+qDTY3.1(2)+qDTY3.2_1+ Wx-A*
39	BR11754-5R-97	120	128	5.84	6.75	6.29	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
40	BR11755--40	143	127	5.75	6.79	6.27	
41	BR11755--5	112	136	5.65	6.81	6.23	
42	BR11756-5R-149	111	124	5.59	6.66	6.12	*Pi-ta+ xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
43	BR11757-5R-121	112	130	5.47	6.79	6.13	*xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
44	BR11757-5R-80	109	129	5.43	6.78	6.1	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
45	BR11758-5R-82	112	128	5.49	6.75	6.12	*qDTY2.1(1)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A+ qDTY12.1_2*
46	BR11761-5R-35	118	131	6.52	6.24	6.38	*xa5+ qDTY2.1(1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
47	BR11761-5R-73	109	126	5.49	6.75	6.12	*xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			Trait Markers
				Gaz	Rang	Mean	
48	BR11763-5R-25	134	105	5.84	6.76	6.3	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A+ Gm4_3+ Gm4_4*
49	BR11763-5R-26	163	131	5.55	6.68	6.11	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A+ Gm4_3+ Gm4_4*
50	BR12304-5R-83	109	128	6.87	6.75	6.81	*xa5+ qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1(3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.2_1+ Wx-A*
51	BR12305-5R-107	130	130	7.74	6.23	6.99	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1(5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ qDTY4.1_2+ BPH17_3+ Wx-A+ qDTY12.1_2*
52	BR12305-5R-65	98	121	6.87	6.25	6.56	*Wx-10+ xa5+ qDTY2.1 (1)+ qDTY2.1(2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ Wx-A+ qDTY12.1_2*
53	BR12631-5R-183	118	116	-	6.75	6.75	*qDTY2.1(1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ Wx-A*
54	BR12635-5R-131	120	129	5.66	6.76	6.21	*Wx-10+ xa5+ qDTY3.1(1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
55	BRRI dhan49 (Ck)	106	133	4.83	6.06	5.45	
56	BRRI dhan71 (Ck)	118	118	3.53	6.28	4.91	
57	BRRI dhan87 (Ck)	128	124	4.14	6.26	5.2	
	LSD (0.05)	15.763	7.825	0.721	0.683	0.892	
	Heritability	0.63	0.73	0.58	0.59	0.42	

Gaz: D/S- 26.06.22 D/T- 26.07.22, Rang: D/S- 8.07.2022; D/T- 31.07.2022, Cumilla site was damaged by rat and tungro disease

Experiment 4.6: Advanced Yield Trial (AYT)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objective: Selection of homogeneous breeding lines with fine grain properties having high yield with good plant type.

Materials and Methods: Twenty-six genotypes with BRRI dhan49, BRRI dhan71, BRRI dhan87 and BRRI dhan90 as standard checks in AYT#1 (GD: 101-120 days) and 27 genotypes in AYT#2 (GD: 120-140 days) along with BRRI dhan49, BRRI dhan71 and BRRI dhan87 as standard checks were evaluated in the trial (Table 4.6). Thirty days old seedlings were transplanted in a 5.4 m × 3 rows at spacing of 20 cm × 15 cm in the field in Alpha Lattice design.

Single seedling was used for transplanting. Fertilizers doses and crop management was done as experiment no. **4.1**.

Location: BRRI, Gazipur; Cumilla and Rangpur.

Results: From the trial AYT#1, six lines and from AYT#2 and ten lines were selected based on grain yield and phenotypic performance (**Table 4.6**). Grain yield was ranged from 5.6 -6.2 t/ha in AYT#1 and 5.6-6.3 t/ha in AYT#2.

Table 4.6: Performence of selected materials of Advanced Yield Trial (AYT) under Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Designation	PH (cm)	GD (days)	Grain yield (t/ha)				Trait of interest
				Gaz	Cum	Rang	Mean	
AYT#1								
1	BR10795-6R-3	105	122	4.48	-	5.25	4.86	-
2	BR10796-6R-13	118	116	4.9	-	5.31	5.11	*WxA+qDTY1.1_1+DTY1.1_4+ qDTY2.1qDTY2.1+ qDTY3.1+ qDTY3.2+qDTY4.1-2+ qDTY12.1+ BPH32*
3	BR10796-6R-39	118	122	6.57	-	4.36	5.46	*Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY3.1+ qDTY3.2+ BPH32*
4	BR10799-6R-70*	119	125	5.62	-	5.58	5.6	*Wx-A+qDTY1.1_1+DTY1.1_4 +qDTY2.1qDTY2.1+DTY2.2_1+ qDTY3.1+ qDTY3.2+qDTY4.1-2*
5	BR10800-6R-54	116	116	6.5	-	4.12	5.31	*Wx-A+xa5+DTY1.1_1+ DTY1.1_4+qDTY2.1+qDTY2.1+ qDTY3.1+ qDTY4.1-2*
6	BR11333-6R-84*	113	120	6.59	-	5.33	5.96	*Wx-A+ xa5+ qDTY2.1qDTY2.1+ DTY2.2_1+DTY2.2_2+qDTY3.1+ qDTY3.2Gm4_3+ Gm4_4*
7	BR11999-6R-1	118	116	4.82	-	5.54	5.18	-
8	BR11999-6R-128	107	119	4.89	-	4.9	4.89	-
9	BR11999-6R-147	112	117	5.06	-	5.56	5.31	-
10	BR12000-6R-13	108	117	5.54	-	5.36	5.45	-
11	BR12000-6R-183	112	118	5.22	-	4.87	5.05	-
12	BR12000-6R-184	110	117	5.44	-	4.08	4.76	-
13	BR12000-6R-36	108	121	4.62	-	5.51	5.06	-
14	BR12001-6R-205*	123	115	6.25	-	6.12	6.19	*Pita+ Wx-A+ qDTY2.1+ DTY2.2_2+DTY2.2_4+qDTY3.1+ qDTY3.2+ qDTY12.1+ BPH32*
15	BR12002-6R-117	113	116	5.77	-	5.02	5.39	*Pita+Wx-A+qDTY2.1+DTY2.2_2 + qDTY3.1+ qDTY12.1+ BPH32*
16	BR12002-6R-138	120	129	4.74	-	5.62	5.18	*qDTY3.2+ Wx-A+ Chalk5+ qDTY12.1*
17	BR12002-6R-26	112	120	5.14	-	5.36	5.25	*fgr-1+ Wx-10+ Wx-A+ qDTY2.1+ DTY2.2_2+ qDTY3.1+ qDTY3.2+ qDTY12.1*
18	BR12003-6R-76	114	115	5.54	-	5.21	5.38	*Pita+ Wx-10+ Wx-A+ qDTY2.1+ qDTY3.1+ qDTY3.2*
19	BR12005-6R-14*	115	117	6.6	-	4.63	5.62	*Wx-A+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY12.1+ BPH32*

SN	Designation	PH (cm)	GD (days)	Grain yield (t/ha) Gaz	Cum	Rang	Mean	Trait of interest
20	BR12005-6R-200	122	119	5.86	-	4.91	5.39	*Wx-A+ qDTY2.1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2+ qDTY12.1+ BPH32*
21	BR12006-6R-40	114	123	4.9	-	4	4.45	*Wx-A+ DTY1.1_1+ DTY1.1_4+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
22	BR12006-6R-5	117	118	5.46	-	5.27	5.37	*Pita+ qDTY2.1+qDTY2.1+ qDTY3.1+ qDTY12.1+ Gm4_3+ Gm4_4*
23	BR12007-6R-61*	121	119	5.75	-	6.05	5.9	*Pita+Wx-10+ Wx-A+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2*
24	BR12007-6R-92	119	114	5.49	-	5.05	5.27	*Pita+Wx-10+ Wx-A+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY12.1*
25	BR12011-6R-178*	114	121	5.79	-	5.84	5.82	
26	BR12011-6R-80	118	121	4.42	-	5.09	4.76	*Wx-A+ DTY1.1_1+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
27	BRRI dhan49 (C	111	131	5.85	-	5.11	5.48	
28	BRRI dhan71 (Ck)	120	113	6.31	-	5.48	5.9	
29	BRRI dhan87 (Ck)	115	131	6.12	-	4.23	5.17	
30	BRRI dhan90 (Ck)	108	119	4.74	-	4.35	4.55	
	LSD <0.05	12.376	7.325	0.72	-	0.683	0.896	
	H2b	0.61	0.69	0.67	-	0.61	0.48	
AYT#2								
1	BR 10795-6R-46	128	128	4.87	5.48	5.26	5.2	*wx(b)-IR34/Wx(a)-Swarna/Wx(a)-NB*
2	BR10795-6R-130	126	116	4.73	6.46	4.73	5.31	-
3	BR10795-6R-133*	124	116	4.76	6.44	5.62	5.6	*qDTY2.1+ qDTY3.1+ BPH17*
4	BR10795-6R-53	111	118	4.57	5.5	4.18	4.75	*Wx-A+ qDTY2.1+ qDTY3.1+ BPH17+ BPH32*
5	BR10796-6R-133	135	118	4.14	4.73	7.27	5.38	
6	BR10797-6R-140*	111	118	5.44	6.64	6.77	6.28	*Wx-10+ Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY3.1+ qDTY3.2*
7	BR10797-6R-24*	124	123	4.62	6.51	6.26	5.8	*PitaWx-10+ Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2*
8	BR10799-6R-104*	108	118	5.68	6.52	5.74	5.98	*Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ BPH32*
9	BR10799-6R-151	138	126	4.06	5.42	5.75	5.08	*Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
10	BR10799-6R-31*	125	120	6.75	5.34	5.2	5.97	*Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
11	BR10800-6R-1	142	115	5.08	5.28	5.95	5.43	*Wx-A+ DTY1.1_1+ DTY1.1_4+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2*
12	BR10802-6R-1	129	128	4.02	5.29	4.96	4.76	*Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY3.2BPH17+ BPH32*

SN	Designation	PH (cm)	GD (days)	Grain yield (t/ha)				Trait of interest
				Gaz	Cum	Rang	Mean	
13	BR10802-6R-242	117	129	4.55	5.17	4.97	4.89	*Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2+ qDTY12.1+ BPH32*
14	BR10802-6R-66*	121	135	5.03	5.41	7.55	6. 0	*Wx-A+ DTY1.1_4+ DTY2.2_1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2+ BPH32*
15	BR10804-6R-105	132	116	3.89	5.54	4.45	4.63	*Wx-10+ Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ Gm4_4*
16	BR11222-6R-92	115	119	4.22	5.33	4.59	4.71	*Wx-A+ DTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY3.1+ qDTY3.2*
17	BR11227-6R-98*	138	130	5.26	6.46	7.02	6.25	*Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ qDTY4.1-2+BPH32*
18	BR11333-6R-4*	127	119	5.25	5.74	6.25	5.75	*Wx-A+ xa5+ DTY1.1_4+ qDTY2.1qDTY2.1+ DTY2.2_1+ DTY2.2_2+ qDTY3.1+ BPH17+ BPH32+ Gm4_3+ Gm4_4*
19	BR11333-6R-73	146	122	4.55	6.3	4.58	5.14	*Wx-A+ xa5+ qDTY2.1+ qDTY3.1*
20	BR11334-6R-35	115	120	4.22	4.63	3.86	4.24	*fgr-1+ Wx-A+ xa5+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2+ BPH32*
21	BR11336-6R-10*	113	135	6.26	5.05	5.53	5.62	*qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2*
22	BR11336-6R-96	113	135	5.81	5.6	4.21	5.21	*Wx-A+ xa5+ qDTY2.1+ qDTY3.1+ qDTY3.2*
23	BR11342-6R-186	132	126	4.85	5.81	5.31	5.33	*Wx-A+ xa5+ qDTY2.1+ qDTY3.1+ qDTY3.2*
24	BR11343-6R-51*	129	125	5.5	5.37	6.95	5.94	*Wx-A+ qDTY1.1_1+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2*
25	BR11343-6R-64	102	122	4.46	6.36	4.5	5.11	*Wx-10+ Wx-A+ DTY1.1_1+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2*
26	BR11343-6R-78	96	123	5.62	5.67	3.99	5.09	*Wx-A+ DTY1.1_4+ qDTY2.1+ qDTY2.1+ qDTY3.1+ qDTY3.2*
27	BR12004-6R-56	162	127	4.63	5.26	4.75	4.88	*Wx-A+ qDTY2.1+ DTY2.2_1+ qDTY3.1+ qDTY4.1-2+BPH32*
28	BRRI dhan49 (Ck)	119	134	5.06	5.68	4.86	5.2	
29	BRRI dhan71 (Ck)	135	114	5.15	5.38	5.68	5.4	
30	BRRI dhan87 (Ck)	98	124	5.32	5.77	4.44	5.18	
	LSD (0.05)	14.327	6.921	0.79	0.59	0.783	0.903	
	Heritability	0.71	0.79	0.58	0.69	0.61	0.52	

Gaz: D/S- 12.06.22 D/T- 8.07.22 Cum: D/S- 15.07.22; D/T- 10.08.22 Rang: D/S- 8.07.22 D/T-01.08.22

* Selected for further trial, Cumilla site was severely affected by rice tungro disease in AYT#1

Experiment 4.7: International Rainfed Lowland Rice Observational Nursery (IRLON)

Principal investigator: M A Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Selection of homogeneous breeding lines with acceptable grain quality having high yield with good plant type.

Materials and Methods: A total of 28 fixed lines along with four check varieties were evaluated in RCB design at BRRI Gazipur. Twenty-five to thirty days old seedlings were transplanted at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 3 rows. Single seedling was used for transplanting. Fertilizer doses and crop management were done the same as Experiment no. **4.1**.

Results and discussion: None of the genotypes were selected due to lower grain yield performances from the check varieties (**Table 4.7).**

Table 4.7: Performance of genotypes in International Rainfed Lowland Rice Observational Nursery (IRLON), Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	GY BLUP
1	WS22_IRLON_S18_SV0470	113	114	2.87	3.37
2	WS22_IRLON_S18_SV0473	125	115	2.89	3.38
3	WS22_IRLON_S18_SV0475	122	117	2.59	3.29
4	WS22_IRLON_S18_SV0476	124	120	3.08	3.43
5	WS22_IRLON_S18_SV0478	116	115	3.55	3.57
6	WS22_IRLON_S18_SV0480	125	117	4.33	3.79
7	WS22_IRLON_S18_SV0481	121	118	1.82	3.07
8	WS22_IRLON_S18_SV0482	120	120	4.27	3.78
9	WS22_IRLON_S18_SV0056	112	117	2.75	3.45
10	WS22_IRLON_S18_SV0057	115	115	4.92	3.97
11	WS22_IRLON_S18_SV0058	116	113	4.92	3.96
12	WS22_IRLON_S18_SV0061	120	120	4.20	3.76
14	IRBB 62	107	112	2.83	3.36
15	WS22_IRLON_S18_SV0181	120	128	3.23	3.48
16	IRRI 123	112	116	3.90	3.67
17	IRRI 132	114	121	-	-
18	IRRI 133	118	104	3.08	3.43
20	WS22_IRLON_S18_SV0755	111	121	2.41	3.24
21	WS22_IRLON_S18_SV0190	115	119	3.21	3.47
22	WS22_IRLON_S18_SV0941	112	135	4.45	3.83
23	WS22_IRLON_S18_SV0194	119	113	2.82	3.36
24	WS22_IRLON_S18_SV0769	119	119	3.91	3.67
25	IRRI 180	118	135	2.48	3.26
26	IRRI 186	113	123	4.93	3.97
27	IRRI 188	121	114	2.42	3.40
28	WS22_IRLON_S18_SV0202	114	116	5.16	3.83
29	BRRI dhan71 (Ck)	111	114	5.29	3.85
30	BRRI dhan87 (Ck)	125	127	5.14	4.03
31	BRRI dhan32 (Ck)	124	132	3.88	3.66
32	BRRI dhan33 (Ck)	106	118	3.05	3.43
	LSD<0.05	13.3	14.8	2.283	
	H2b	0.22	0.41	0.26	

D/S: 13.07.2022 D/T: 10.08.2022

Experiment 4.8: Secondary Yield Trial (SYT)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Confirmatory yield evaluation of advanced lines compared to standard checks.

Materials and Methods: Three genotypes along with four checks were evaluated at BBRI Gazipur. Twenty-five to thirty days old seedlings were transplanted at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 10 rows. The design was RCB with two replications. Fertilizers doses and crop management was done as experiment no. **4.1**.

Results: From SYT, only one genotype was selected based on grain yield in comparison to check varieties (**Table 4.8**).

Table 4.8: Performance of genotypes in Secondary Yield Trial (SYT), Development of Rainfed Lowland Rice T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Amylose %	Grain type	PAcp V	PAcp M
1	SVIN139	123	117	4.08	24.1	LS	5	4
2	SVIN297*	121	113	4.54	15.1	LS	5	4
3	Khejurjhupi (Kushtia)	162	143	4.14	26.3	MB	5	6
4	BRRI dhan49 (Ck)	127	135	4.04	25.5	MB	5	3
5	BRRI dhan71 (Ck)	130	113	4.03	21.6	MB	5	3
6	BRRI dhan87 (Ck)	131	130	4.08	27.1	LS	5	3
	LSD (0.05)	8.856	4.573	0.352				
	Heritability	0.78	0.88	0.69				

*Selected genotype D/S: 23.06.2022 D/T: 21.07.2022

Experiment 4.9: Regional Yield Trial (RYT)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: To evaluate specific and general adaptability of the advanced breeding lines as compared with standard checks in on-station condition.

Materials and Methods: Four genotypes along with four standard checks were evaluated at seven locations of Bangladesh. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 15 cm in different locations. The plot size was 5.4 m × 12 rows. The design was RCB with three replications. Fertilizers doses and crop management were done as Experiment no. **4.1**. Fertilizer doses were changed based on AEZ, location and soil fertility status.

Location: Gazipur, Cumilla, Satkhira, Kushtia, Rangpur, Rajshahi and Sonagazi

Results: None of the genotypes were selected for ALART due to none significant higher yield performancees than check varieties **(Table 4.9).**

Table 4.9: Performance of genotypes in Regional Yield Trial (RYT), Development of Rainfed Lowland Rice, T. Aman 2022-23

SN	Designation	PH (cm)	GD (days)	Grain yield (t/ha) Cum	Gaz	Kus	Raj	Rang	Sona	Satk	Mean
1	BR10458-20-2-3-1-3	126	134	6.19	6.92	5.84	4.76	4.51	4.13	3.82	5.17

2	BR10475-1-2-3-5-5	129	120	5.82	6.06	5.38	5.45	6.48	5.09	4.44	5.53
3	BR10482-1-2-3-1-3	142	133	5.31	5.77	4.45	5.96	4.53	4.82	3.85	4.96
4	BR10490-1-2-3-11-3	122	118	5.44	5.2	5.19	5.99	3.85	4.35	4.24	4.89
5	BRRI dhan49 (Ck)	122	134	5.7	5.68	5.42	5.86	3.65	4.26	4.33	4.99
6	BRRI dhan71 (Ck)	127	117	5.33	5.16	5.01	5.38	6.09	4.92	5.66	5.36
7	BRRI dhan87 (Ck)	131	128	5.59	5.39	5.17	5.89	4.4	4.54	4.96	5.13
8	BRRI dhan93 (Ck)	128	133	5.75	5.91	5.13	5.12	3.56	5.06	4.24	4.97
	LSD<0.05	11.26	6.64	0.955	0.65	0.716	0.871	0.813	0.983	0.59	0.512
	H2b	0.69	0.78	0.57	0.71	0.83	0.79	0.61	0.59	0.88	0.67

PROJECT 05A: Improvement of Deep-Water Rice

Project leader: A S M Masuduzzaman

Experiment 5A.1: Proposed Variety Trial (PVT)

Specific objectives: Evaluation of proposed lines by NSB team for release as a new deep-water rice variety suitable for shallow flooded conditions.

Principal Investigator: A S M Masuduzzaman

Co-Investigators: K M Iftekharuddaula, A A Shoily, all concerned regional station scientists.

Materials and methods: One proposed line (BR10260-5-15-21-6B) was evaluated with check BRRI dhan91 in different 10 locations.

Results and Discussion: Proposed line BR10260-5-15-21-6B gave 1.45 t/ha higher yield than check variety BRRI dhan91 (**Table 5A.1**). However, The PVT material was suggested for re-trail as locations were few due to damage of crops in 3 locations.

Table 5A.1.Performance of the proposed line (BR10260-5-15-21-6B) in Proposed Variety Trial (PVT) under shallow flooded condition, B. Aman 2022-23

Locations	Proposed lines (BR10260-5-15-21-6B)		Check variety (BRRI dhan91)	
	Duration (days)	Yield (t/ha)	Duration (days)	Yield (t/ha)
Talma, Faridpur	197	3.35	160	3.14
BRRI, Gopalganj	187	6.58	166	2.95
Rangunia, Chattogram	186	5.06	156	3.51
BRRI, Cumilla	203	3.08	208	2.22
Baraigram, Natore	166	1.15	158	1.10
Sahajadpur, Sirajganj	185	5.96	162	3.17
BRRI Gazipur	187	1.88	176	0.83
Average	**187**	**3.86**	**169**	**2.41**

Experiment 5A.2: Advanced Line Adaptive Research Trial (ALART), Stagnant Water.

Principal Investigator: ARD Scientists

Co-Investigators: A S M Masuduzzaman, K M Iftekharuddaula, N Jahan and A A Shoily

Specific objectives: To evaluate specific and general adaptability of the advance breeding lines as compared with standard checks in on-farm condition.

Materials and methods: six genotypes along with one check variety (**Table 5.2**) were evaluated in different locations under direct dry seeding methods at 25 cm spacing between row by continuous seeding @ 30 kg seeds/ha. The unit plot size was 5 m × 5 m and the field layout were RCB design with three replications.

Results and discussion: In ALART for Deep water Rice (water depth: 100-150 cm), two brddging lines BR10230-7-19-2B (3.05 t/ha) and BR9392-6-2-1B (3.01 t/ha) were selected among six lines based on yield. The ALART materials were suggested for re-trial due to the crops were damaged in 4 locations (**Table 5A.2**).

Table 5A.2 Grain yield performance of genotypes in Advanced Line adaptive research trial (ALART), development of deep-water Aman rice varieties, T. Aman 2022-23.

Sl no.	Designation	GD (Days) mean	PH (cm)	Locations				Mean Yield (t/ha)
				Faridpur	Sadar, Gopalg	Shahjad, Sirajganj	Sadar, Gazipur	
1	BR10230-7-19-2B	169	177	4.09	3.5	2.06	2.58	3.05
2	BR9892-6-2-2B	167	179	3.64	2.8	1.14	2.35	2.48
3	BR9376-6-2-2B	167	160	3.59	3.1	1.12	2.3	2.52
4	BR9392-6-2-1B	168	167	4.31	3.1	1.67	2.99	3.01
5	BR-KM(Mun)-PL-5-7-3-B	167	209	2.82	2.6	1.59	2.13	2.28
6	BR-DL(Hbj)-PL-12-4-7-B	176	211	2.22	2.4	1.54	1.89	2.01
7	Fulkori (Ck)	177	179	1.82	2.7	1.86	1.77	2.03
	LSD<0.05	14	0.45			0.46		

Experiment 5A.3: Regional Yield Trial (stagnant water) development of deep-water Aman rice varieties, T. Aman 2022-23.

Principal Investigator: A S M Masuduzzaman

Co-Investigators: A S M Masuduzzaman, K M Iftekharuddaula, N Jahan and A A Shoily

Specific Objectives: Evaluation of high yielding, tall and lodging tolerant breeding lines in representative areas.

Materials and Methods: Four materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Seed rate in seedbed was 60 g seeds per square meter. Unit plot size was 20 m^2. Spacing was 25 cm x 15 cm @2-3 Seedling/hill. Special fertilizer doses were applied with modified application time and splits: 24-15-10-10-1 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Full TSP, full gypsum, full Zn, and 17 kg MoP was applied during land preparation. Urea was applied at 4 splits at basal (7 kg/bigha), 22-25 DAT (7 kg/bigha), 45-50 DAT (7 kg/bigha) before panicle initiation (PI) and beginning of heading time (3 kg/bigha). Fertilizer was applied uniformly. Crop management such as weeding was done in proper time and proper care. Rats, insects, diseases and other pests were controlled properly. The crop cut was done at 80% maturity. Data was collected on date of seeding, date of transplanting, plant height (cm), phenotypic acceptability, lodging tolerance score, panicle length, no. of effective tillers/hill, days to flowering, total grain/panicle and grain yield (t/ha).

Results and discussion:

The highest yield was given by, BR10247-14-18-7-3B (5.53 t/ha) with comparative medium growth duration (159 days) followed byBR10238-5-1-9-3B (5.47 t/ha) and BR9892-8-2-2B (5.24 t/ha).

Table 5A. 3: Performance of RYT-Tall materials (stagnant water) development of deepwater Aman rice varieties, T. Aman 2022-23.

Entry	Genotype	PH (cm)	GD (days)	Sona gazi	Habiganj	Gopalganj	Average Yield (tha^{-1})
1	BR9892-8-2-2B	140	158	5.13	5.35	3.63	5.24

2	BR10247-14-18-7-3B	142	159	5.5	5.56	3.76	5.53
3	BR10238-5-1-9-3B	142	160	5.64	5.3	3.53	5.47
4	BR9392-12-6-2-4B	147	167	3.25	4.96	3.38	4.1
5	BRRI dhan91 (Ck.)	176	160	3.03	3.42	2.26	3.22
	LSD < 0.05	5.2	1.2	0.7	0.8	0.2	
	H2b	0.98	0.97	0.96	0.97	0.99	

PROJECT 05B: IMPROVEMENT OF SUPERIOR HIGH YIELDING FINE QUALITY RICE

Experiment 5B.1: Proposed Variety Trial (PVT), Boro 2022-23

Specific objectives: Evaluation of proposed line by NSB team for release as medium slender grain type like Jirashail suitable for Boro season.

Principal Investigator: A S M Masuduzzaman

Co-Investigators: K M Iftekharuddaula, A A Shoily, all concerned regional scientists.

Locations: BRRI Gazipur, BINA, Mymensingh, BRRI, Faridpur, BRRI, Rangpur, Sadar Jashore, Sadar Feni, Laksham, Cumilla, Bogura Sadar, Babuganj, Barishal and Sadar, Dinajpur.

Materials and methods: One proposed line (BRH11-9-11-4-5B) was evaluated with standard check BRRI dhan100 in 10 locations of Bangladesh. Materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Seed rate in seedbed was 60 g seeds per square meter. Unit plot size was 20 m2. Spacing was 25 cm x 15 cm @2-3 Seedling/hill. Special fertilizer doses were applied with modified application time and splits: 24-15-10-10-1 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Full TSP, full gypsum, full Zn, and 17 kg MoP was applied during land preparation.

Results: The genotype BRH11-9-11-4-5B was evaluated in PVT and this proposed line was recommended for release as medium slender grain type rice variety like Jirashail which is suitable for Boro season. (**Table 5B.1**).

Table 5B. 1. Performance of the proposed line (BRH11-9-11-4-5B) at Proposed Variety Trial (PVT), Boro 2022-23

Locations	Proposed Variety (BRH11-9-11-4-5B)		Standard Check (BRRI dhan100)		% Yield increase over check
	Duration (days)	Yield (t/ha)	Duration (days)	Yield (t/ha)	
BRRI, Gazipur	150	7.93	144	6.71	18.18%
BINA, Mymensingh	146	6.43	144	8.23	-21.87%
BRRI, Faridpur	155	9.38	144	8.28	13.29%
Sadar, Jashore	149	10.17	145	8.08	25.87%
Sadar, Feni	143	8.82	142	7.64	15.45%
Laksham, Cumilla	139	8.06	134	6.54	23.24%
Bogura, Sadar	148	8.08	143	7.44	8.60%
Babuganj, Barishal	129	7.84	129	6.87	14.12%
BRRI, Rangpur	152	9.87	145	8.80	12.16%
Sadar, Dinajpur	145	8.63	145	7.03	22.76%
Mean	146	8.52	142	7.56	

Experiment 5B.2a: Advanced Line Adaptive Research Trial (ALART)

Principal Investigator: ARD Scientist

Co-Investigators: A S M Masuduzzaman, K M Iftekharuddaula, N Jahan and A A Shoily

Specific objectives: To evaluate specific and general adaptability of the advance breeding lines as compared with standard checks in on-farm condition.

Materials and methods: In ALART (Jirashail type) five materials were evaluated with check Jirashail and BRRI dhan57 in different 11 locations. On the other hand, in ALART (ELS & LS Type) five materials were evaluated with check BRRI dhan62 and BRRI dhan75 in different 11 locations. Seeding was done on well prepared seed bed. Seed rate in seedbed was 60 g seeds per square meter. Unit plot size was 20 m2. Spacing was 25 cm x 15 cm @2-3 Seedling/hill. Special fertilizer doses were applied with modified application time and splits: 24-15-10-10-1 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Full TSP, full gypsum, full Zn, and 17 kg MoP was applied during land preparation.

Results and discussion

The line BRH13-2-4-7-2B (5.0 t/ha) line was recommended on the basis of yield, growth duration for PVT (**Table 5B.2a**). In ALART (ELS and LS type), five materials were evaluated with check BRRI dhan62 and BRRI dhan75 but none of the entries were selected (**Table 5B.2b**).

Table 5B.2a: Advanced Line Adaptive Research Trial (ALART) SHR-1, Jirashail Type, T. Aman 2022-23

SL	Genotypes	GD (days)	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	Mean
1	BRH15-24-7B	110	5.3	4.2	4.0	5.0	4.8	5.9	5.1	5.7	6.3	4.5	4.6	5.0
2	BRH13-1-9-7B	112	4.7	5.1	3.6	5.2	4.8	6.1	5.1	5.3	5.9	5.0	4.3	5.1
3	BRH13-2-4-7-2B	111	5.8	3.9	4.0	5.4	5.2	6.0	4.8	5.4	5.8	4.3	4.4	5.0
4	BRH10-1-14-6-2B	111	5.7	4.1	4.6	5.4	4.1	5.0	5.1	4.9	5.5	4.0	4.4	4.8
5	BR10247-4-7-4B	111	4.0	3.1	3.6	5.0	3.3	3.4	3.7	4.6	4.2	4.0	4.1	3.9
6	Jirashail (Ck)	106	3.8	2.9	3.4	4.3	3.9	4.5	3.7	4.2	4.9	3.3	4.3	3.9
7	BRRI dhan57 (Ck)	107	4.4	3.6	4.4	4.7	3.7	4.9	3.8	5.1	4.8	4.2	4.2	4.3

L1=Sadar, Satkhira, L2= Dinajpur (Parbotipur), L3= Rangpur (Pirganj), L4= Dinajpur (Chirirbondor), L5= BRRI HQ (Gazipur), L6=Barguna Sadar, L7= Kustia Sadar, L8= Gangni, Meherpur, L9=Gadagari, Rajshahi, L10= Natore (Bagatipara), L11= Mohadebpur, Noagaon

Table5B.2b: Advanced Line Adaptive Research Trial (ALART) SHR-2, ELS and LS type) Type, T. Aman 2022-23

SL	Genotypes	PH (cm)	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	Mean
1	BR9392-1-9-7-5B	114	5.3	3.5	4.8	4.1	4.0	4.2	3.7	4.5	4.5	4.3	4.1	4.3
2	BR10247-14-18-4	107	5.2	4.4	5.6	4.6	4.0	3.8	2.7	4.0	-	3.7	3.5	4.2
3	BR9392-40-50-1B	111	4.3	4.0	4.5	3.6	3.4	3.4	3.0	4.0	3.9	4.2	3.6	3.8
4	IR12A-177	116	5.4	5.1	5.8	5.0	4.1	5.0	4.0	4.1	4.6	4.2	4.2	4.6
5	BR10238-5-1-4-2	116	5.8	5.2	5.2	4.7	4.1	4.7	3.9	3.9	4.3	4.0	4.0	4.5
6	BRRI dhan62 (Ck)	106	4.4	4.3	4.9	3.8	4.3	4.0	4.1	3.5	3.3	3.4	4.6	4.1
7	BRRI dhan75 (Ck)	107	5.2	5.3	6.6	4.9	-	4.4	-	4.2	4.1	4.1	5.4	5.0

Experiment 5B.3: Regional Yield Trial (RYT-Jira type) under recommended management practices, Boro, 2022-23

Principal Investigator: **A S M Masuduzzaman**

Co-investigators: KM Iftekharuddaula, A A Shoily, all concerned regional station scientists.

Specific objectives: To evaluate fine grain Jira- type high yielding breeding lines under integrated improved management practices in different agro-climatic conditions of Bangladesh.

Materials and Methods: Four materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Seed rate in seedbed was 60 g seeds per square meter. Unit plot size was 25 $m^{2.}$ Spacing was 25 cm x 15 cm @2-3 Seedling/hill. Special fertilizer doses were applied with modified application time and splits: 24-15-15-10-1 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Full TSP, full gypsum, full Zn, and 17 kg MoP was applied during land preparation. Urea was applied at 4 splits at basal (8 kg/bigha), 25-30 DAT (8 kg/bigha), 55-60 DAT (8 kg/bigha) Fertilizer was applied uniformly. Always 4-5 cm standing water was kept from panicle initiation (PI) to hard dough stage. Crop management such as weeding was done in proper time and proper care. Rats, insects, diseases and other pests were controlled properly. The crop cut was done at 95% maturity. Due To maximize proper filling of grains in a panicle under integrated improved management practices and by harvesting crop at 95% maturity (no shattering). Data was collected on date of seeding, date of transplanting, plant height (cm), phenotypic acceptability, lodging tolerance score, panicle length, no. of effective tillers/hill, days to 100% flowering, total grain/panicle and grain yield (t/ha).

Results and discussion

The yield and growth duration of advanced lines and local variety suitable for superior high yielding and fine quality rice are presented in **Table 5B.4.** Based on average yield and duration - BRH13-9-5-3B and BRH9-3-1-14-2B were selected for ALART**.**

Table 5B.4: Performance of RYT-Jira type materials, Development of Superior High Yielding Rice, Boro, 2022-23

Sl	Genotype	GD (days)	PH (cm)	Grain yield (t/ha)								
				L1	L2	L3	L4	L5	L6	L7	L8	Mean
1	BRH13-9-5-3B	146	92	6.7	6.2	7.2	6.2	6.0	9.2	6.3	5.6	6.7
2	BRH9-3-1-14-2B	145	97	4.7	6.5	6.7	5.5	6.0	9.0	5.3	5.5	6.2
3	BRH12-1-7B-P1	146	97	6.5	5.5	5.9	5.7	4.6	6.7	4.2	5.9	5.6
4	BRH13-7-9-3-2B	150	105	5.6	7.0	6.6	5.8	5.2	8.4	4.2	5.2	6.0
5	BR10247-4-7-4B	147	103	6.4	5.9	6.3	5.7	3.7	8.2	5.1	6.9	6.0
6	Jirashail (Ck)	142	98	4.0	5.7	6.5	5.2	5.7	7.9	4.4	6.3	5.7
7	BRRI dhan28 (ck)	144	98	5.0	5.7	5.8	5.4	5.0	8.1	4.1	5.3	5.6
	$LSD_{0.05}$			0.3	0.3	0.4	0.9	0.7	0.7	0.5	0.76	
	H2b			0.99	0.95	0.9	0.1	0.9	0.89	0.98	0.8	

L1= Sonagazi, L2= Charbadna, L3=Cumilla, L4=Sirajganj, L5=Kushtia, L6=Bhanga, L7= Habiganj, L8=Rangpur

Experiment 5B.4: Regional Yield Trial.RYT-SS (Short Slender), under recommended management practices Boro, 2022-23

Principal Investigator: A S M Masuduzzaman

Co-investigators: KM Iftekharuddaula, A A Shoily, all concerned regional station scientists.

Specific objectives:

1. To evaluate fine grain high yielding breeding lines under integrated improved management practices in different agro-climatic conditions of Bangladesh.

Materials and Methods: Six materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Healthy seedling raising using 50 grams' seeds/squire meter seed bed. Unit plot size was 4 m x 5m = 20 m2. Spacing was 25 cm x 15 cm @ 2-3 Seedling/hill. Special fertilizer doses: 36-17-20-15-1.5 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Urea in 4 splits and mixed with soil. Full amount of TSP, gypsum, Zn, and 17 kg MoP were applied during land preparation. Urea was applied at 4 splits at basal, 25-30 DAT, before PI, 55-60 DAT, before PI and 75-80 DAT (beginning of heading time). Fertilizer was applied uniformly. Crop harvesting at 95% maturity, no grain was shattered. Those lines are highly shattering tolerance.

Results and discussion

Among the tested genotypes, BRH14-2-1-7B (6.6 t ha^{-1}) gave highest yield in Satkhira followed by BR9392-1-7-5B (6.6 t ha^{-1}) than check Katari (5.8 tha^{-1}). In Kushtia, BRH18-9-4-2-3B (5.9 t ha^{-1}), BRH13-5-12-2-2B (5.8 t ha^{-1}), BRH14-2-1-7B (5.5 t ha^{-1}), and BRH9-3-2B (5.5 t ha^{-1}) entries gave statistically higher yield than Katari (4.6 t ha^{-1}). No entry gave higher yield in Parbotipur and Sirajganj.The growth duration of the lines ranged from 144-153 days.

Table 5B.4: Performance of RYT-SS (Short Slender) type materials, Development of Superior High Yielding Rice, Boro, 2022-23 at different locations

Entry	Genotype	GD (days)	PH (cm)	Grain yield (t/ha)				
				Satkhira	Kushtia	Parbotipur	Sirajganj	Mean
1	BRH18-9-4-2-3B	145	94	6.5	5.9	6.5	6.7	6.4
2	BRH13-5-12-2-2B	144	92	6.5	5.8	6.6	6.9	6.4
3	BRH14-2-1-7B	146	85	6.6	5.5	5.6	6.1	5.8
4	BRH9-3-2B	146	95	5.8	5.5	6.4	6.5	6.0
5	BR9392-1-7-5B	146	83	6.6	5.1	5.6	6.3	5.7
6	Katari	153	99	5.8	4.6	6.5	6.8	5.9
	$LSD_{0.05}$			0.8	0.7	0.18	0.5	
	H2b			0.7	0.76	0.98	0.8	

Experiment 5B.5: Regional Yield Trial, (RYT-late transplanting) under recommended management practices Boro, 2022-23

Principal Investigator: A S M Masuduzzaman

Co-investigator: KM Iftekharuddaula, A A Shoily, all concerned regional station scientists.

Specific Objectives: To evaluate fine grain high yielding breeding lines under integrated improved management practices in late transplanting Boro season.

Materials and Methods: Four materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Healthy seedling raising using 50 g seeds/squire meter seed bed. Unit plot size was 4 m x 5m = 20 m2. Spacing was 25 cm x 15 cm @ 2-3 Seedling/hill. Special fertilizer doses: 40-17-20-15-1.5 kg Urea, TSP, MoP, Gypsum, Zn/ Bigha. Urea in 4 splits and mixed with soil. Full amount of TSP, gypsum, Zn, and 17 kg MoP were applied during land preparation. Urea was applied at 4 splits at basal, 25-30 DAT, before PI, 55-60 DAT, before PI and 75-80 DAT (beginning of heading time). Fertilizers were applied uniformly. Crop harvesting at 95% maturity.

Results and discussion: In RYT-late transplanting three materials were evaluated against check BRRI dhan28. In Sirajganj, BRH17-23-8-2-7B (6.4 t ha^{-1}) genotype gave statistically higher yield than BRRI dhan 28 (5.9 t ha-1). In Kushtia, BRH13-2-4-6-4B (5.4 t ha^{-1}) genotype gave statistically higher yield than BRRI dhan 28 (4.9 t ha^{-1}). In Rangpur, no entry gave higher yield than BRRI dhan 28. In Satkhira, BRH17-23-8-2-7B (5.7 t ha^{-1}) gave statistically higher yield than BRRI dhan 28 (3.6 t ha^{-1}). Based on average performance, none entries were selected.

Table 5B.5: Performance of RYT-late transplanting, Development of Superior High Yielding Rice, Boro, 2022-23

Entry	Genotype	Growth Duration (days)	Plant height (cm)	Grain yield (t/ha)				
				Siraj ganj	Kus htia	Ran gpur	Satk hira	Mean
1	BRH13-2-4-6-4B	123	95	5.7	5.4	6.1	3.8	5.3
2	BRH11-7-17-10B	120	98	6.1	5.0	6.4	4.8	5.6
3	BRH17-23-8-2-7B	123	95	6.4	5.0	6.0	5.4	5.7
4	BRRI dhan28	119	102	5.9	4.9	6.6	3.6	5.3
	$LSD_{0.05}$			0.4	0.4	0.1	1.2	
	H2b			0.74	0.58	0.97	0.64	

Experiment 5B.6: Regional Yield Trial, RYT-Haor under recommended management practices Boro, 2022-23

Principal Investigator: A S M Masuduzzaman

Co-investigator: KM Iftekharuddaula, A A Shoily, all concerned regional station scientists.

Specific objectives: Evaluation of high yielding, tall and lodging tolerant breeding lines in representative low lying haor areas as better substitute of BR18.

Materials and Methods: Six materials were raised under integrated improved management practices following RCB design with 3 replications. Seeding was done on well prepared seed bed. Healthy seedling raising using 60 grams' seeds/squire meter seed bed. Unit plot size was 5 m x 6m = 30 m2. Spacing was 25 cm x 20 cm @ 2-3 Seedling/hill. Special fertilizer doses: 42 kg Urea: 17 kg TSP: 20 kg MP: 15 kg Gypsum: 1.5 kg $ZnSO_4$ kg/Bigha. Full amount of TSP, gypsum, Zn, and 17 kg MoP were applied during land preparation. Urea was applied at 4 splits at basal, 25-30 DAT, before PI, 55-60 DAT, before PI and 75-80 DAT (beginning of heading time). All fertilizers were applied uniformly.

Results and discussion: The yield and growth duration of advanced lines and local variety for superior high yielding and fine quality rice are presented in **Table 5B.6.** In Habiganj the line BR9396-6-2-2B (5.6 t ha^{-1}) gave statistically higher yield than check BRRI dhan18 (5.0 t ha^{-1}).

Table 5B.6: Performance of RYT-Haor, Development of Superior High Yielding Rice, Boro, 2022-23 at different locations

Sl no	Genotype	Growth Duration (days)	Plant height (cm)	Grain yield (t/ha)		
				Habiganj	Bhanga	Mean
1	BR9396-6-2-2B	150	104	5.6	7.1	6.4
2	BR9392-6-2-1B	175	173	4.2	-	4.2
3	BRH18-7-14B	152	105	4.1	7.1	5.6
4	BRH13-7-9-3-2B	157	109	4.5	7.0	5.8
5	BR9390-6-2-1B	148	111	4.2	6.2	5.2
6	BR9392-6-2-1-3-4	160	118	5.3	7.0	6.2
7	BR18	157	117	5.0	6.9	6.0
	$LSD_{0.05}$			0.5	0.7	
	H2b			0.9	0.4	

PROJECT 6: DEVELOPMENT OF SALT-TOLERANT RICE (STR) FOR SOUTHERN COASTAL BANGLADESH

General objective: Development of improved genotypes with high yield potential (4.5 t/ha under salt-stress and ≥8.0 t/ha under non-stress conditions), earliness and acceptable grain quality to achieve climate change adaptation (reduce the risk of harmful effects due to climate change) for southern coastal ecosystem in Bangladesh during Boro season

Project Leader: M. Akhlasur Rahman

Experiment 6.1: Hybridization

Principal investigator: M. Akhlasur Rahman

Co-investigator: Hasina Khatun

Specific objective: To introgress high yielding and salt-tolerance traits into elite genetic background considering product profile for target region during T. Aman and Boro season.

Materials and Methods: Thirty-one and 40 detailed-characterized parents were grown in five different dates starting July 2022 for T. Aman; from November 2022 for Boro season, respectively, with an interval of seven days for flowering synchronization to achieve desired cross combinations. Twenty-five days old seedlings in T. Aman and forty-day-old seedlings in Boro were transplanted @ single seedling with a spacing of 20 cm × 15 cm in a 5.4 m × 2 rows plot in the plant breeding net house, Gazipur. Fertilizers @ 80:60:40:20 kg N, P_2O_5, K_2O, S/ha were used with split application of N at 15, 30, 50 days after transplanting (DAT) in T. Aman and 120:60:40:20 kg N, P_2O_5, K_2O, S/ha were used with split application of N at 15, 40, 60 DAT in Boro season. Total amount of P, K, S were applied at the time of final land preparation. The experiment was conducted at BRRI, Gazipur.

Results and discussion: In T. Aman season, 43 crosses were made using 40 well characterized elite parents. and 37 crosses were made using 64 elite parents in Boro season, respectively (**Table 6.1**). These crosses were made to develop desirable F_1s having salinity tolerance with other traits. Parent selection for crossing was done on the basis of the following criteria such as i) phenotypic value that improves breeding value, ii) genetic distance, iii) no sister lines used for making cross, iv) the most of the OYT and PYT lines used that are well characterized using trait markers for high amylose+high yield+*Saltol*+Tr (*Chalk5*) + Grain size shape + Pi54;Pi9 (Blast)+*BPH17*+*Xa21*+x*a13*), previous mega varieties (BR11, BRRI dhan28 and 29) excluded; and vi) specific line(s) not used more than 3 to 5 times in the crossing program. For line augmentation, 4 BC_2F_1, 2 BC_2 F_1 and $2BC_2F_2$ cross are confirmed for desirable traits **(Table 6.1a)**

Table 6. 1: List of crosses (Elite/Elite) made for generating F_1s, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23 and Boro 2022-23

SL#	BR No.	Cross combinations	F_1 seeds	Traits of interest
		T. Aman 2022-23		
1	15399	BR12466-4R-275/BR12460-4R-156	93	
2	15400	BR12465-4R-47/BR12459-4R-209	52	
3	15401	BR12465-4R-18/BR12466-4R-159	71	
4	15402	BR12460-4R-102/BR12459-4R-39	62	
5	15403	BR13104-4R-75/IRRI154Pi9	18	
6	15404	BR12459-4R-183/BR12477-4R-13	80	*Saltol+qSES1.2-2+qSES1.2-3+ qSES1.2-4*
7	15405	BR12459-4R-49/BR12461-4R-70	59	
8	15406	BR12465-4R-181/BR12460-4R-107	18	

9	15407	BR12459-4R-14/BR12477-4R-305	125	*qSES1.2-2+qSES1.2-3+qSES1.2-4*
10	15408	BR11712-4R-218/IR58443-6B-10-3	115	*qSES1.2-4*
11	15409	BR12465-4R-309/BR12465-4R-223	6	
12	15410	BR12459-4R-103/BR12461-4R-6	208	
13	15411	BR11723-4R-172/BR11607-4R-72	162	*qSES1.2-4*
14	15412	BR12460-4R-58/BR12477-4R-13	132	*Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4*
15	15413	BR12459-4R-117/BR12469-4R-213	129	
16	15414	BR12459-4R-286/BR12459-4R-214	107	
17	15415	BR13711-4R-190/IR58443-6B-10-3	76	
18	15416	BR11715-4R-186/IR127152-3-22-2-1-21	66	*qSES1.2-4*
19	15417	BR11723-4R-172/BR12465-4R-27	55	*qSES1.2-4*
20	15418	BR12466-4R-169/BR12477-4R-64	45	*Saltol+qSES1.2-3+qSES1.2-4*
21	15419	BR11712-4R-218/IRRI154Pi9	37	*qSES1.2-4*
22	15420	BR12462-4R-6/BR12477-4R-358	24	*qSES1.2-3+qSES1.2-4*
23	15421	BR11388-4R-11/BR12459-4R-18	23	
24	15422	BR11716-4R-123/BR11386-5R-5	22	*qSES1.2-4*
25	15423	BR11716-4R-102/BR11607-4R-72	14	*qSES1.2-4*
26	15424	BRRI dhan92/IR58443-6B-10-3	44	
27	15425	BRRI dhan92/BR12459-4R-103	76	
28	15426	BR12478-4R-185/Bangabandhu dhan100	9	*Saltol+qSES1.2-2+qSES1.2-4*
29	15427	BRRI dhan87/BR12459-4R-209	27	*qSES1.2-4*
30	15428	BRRI dhan92/IR58448-6B-10-3	7	
31	15429	BRRI dhan89/BRRI dhan99	40	*qSES1.2-4*
32	15430	BRRI dhan92/BRRI dhan99	4	*qSES1.2-4*
33	15431	BR11715-4R-218*2/BR11607-4R-72	33	
34	15432	BRRI dhan92/BR22	30	
35	15433	BRRI dhan92/BR23	14	
36	15434	BR22/D(R) – 6	6	
37	15435	BR22/IRRI154	31	
38	15436	BR22/BR11315-5R-17	6	
39	15437	BR12477-4R-13/BR22	62	*Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4*
40	15438	BR23/BRRI dhan54	9	
41	15439	BR23/BRRI dhan36	18	
42	15440	BR23/BR13104-4R-80-P1	80	
43	15441	BR23/IRRI154	78	
	Boro 2022-23			
1	15784	BR12661-4R-21/BR12650-4R-77	15	
2	15785	BR12274-4R-339/IR126952-3-22-2-1-B	42	
3	15786	BR12273-4R-202/BR12658-4R-159	32	
4	15787	BR11714-4R-418/BR11715-4R-24	110	
5	15788	BR12650-4R-72/BR11723-4R-107	16	
6	15789	BR12661-4R-21/BR12655-4R-239	62	
7	15790	BR12650-4R-55/BR12646-4R-78	85	
8	15791	BR11720-4R-89/BRAC dhan-2	46	
9	15792	BR13709-4R-3/BR12839-4R-157-2	55	
10	15793	BR12656-4R-138/BR12646-4R-123	28	
11	15794	BR12276-4R-104/IR126952-22-2-1-B	9	
12	15795	BR12657-4R-178/BR12650-4R-77	32	

13	15796	BR11712-4R-93/BRRI dhan29	65
14	15797	BRAC dhan-2/IR58443-6B-10-3	45
15	15798	BR12650-4R-77/IR58443-6B-10-3	75
16	15799	BR12276-4R-104/BR11720-4R-89	42
17	15800	BR11271-4R-196/BR11712-4R-93	35
18	15801	BR11715-4R-186/BRAC dhan-2	32
19	15802	BR11712-4R-6/BR12646-4R-123	75
20	15803	BR11723-4R-236/BR12646-4R-123	52
21	15804	BR12276-4R-183/IR58443-6B-10-3	22
22	15805	BR12656-4R-138/BR12645-4R-71	43
23	15806	BR12646-4R-123/Black rice (Vietnam)	15
24	15807	BR11723-4R-107/BR12650-4R-72	12
25	15808	BR11276-4R-132/IRRI 154 (Pi9)	33
26	15809	BR12661-4R-21/BR12273-4R-202	48
27	15810	IR58443-6B-10-3/BRAC dhan-2	42
28	15811	BR12655-4R-239/BRAC dhan-2	55
29	15812	BR13709-4R-3/BR12839-4R-51	43
30	15813	IR58443-6B-10-3/BR12839-4R-157-2	20
31	15814	BRAC dhan-2/D (R)-6	28
32	15815	BRAC dhan-2/BRRI dhan28	26
33	15816	BRAC dhan-2/BRRI dhan29	55
34	15817	BR11728-4R-89/BR13709-4R-3	62
35	15818	BR13709-4R-3/BRAC dhan-2	44
36	15819	BR13709-4R-3/IRRI 154 (Pi9)	55
37	15820	BR13709-4R-3/BR12650-4R-77	33

Table 6. 2a: Line augmentation report

Sl	BR No.	Parentage	Total plant	QTLs / genes	No of plants target allele	Traits of Interest	Boro 2022-23
1	BR14992	BR11723-4R-12*2 / IR127152-3-22-2-1-B	156	*Xa5+Xa21+Xa13*	33	BLB	BC_2F_1 confirmed
2	BR14993	BR11723-4R-172*2/ IR127152-3-22-2-1-B	166	*Xa5+Xa21+Xa13*	18	BLB	BC_2F_1 confirmed
3	BR14730	BR11723-4R-12*2/ IRRI154-Pi9	79	*Pi9*	19	Blast	BC_2F_1 confirmed
4	BR14732	BR11723-4R-172*2/ IRRI154-Pi9	221	*Pi9*	22	Blast	BC_2F_1 confirmed
5	BR14729	BR11723-4R-12*1/ IR127152-3-22-2-1-B	30	*Xa5+Xa21+Xa13*	25	BLB	BC_1F_1
6	BR14731	BR11723-4R-172*1/IR127152-3-22-2-1-B	99	*Xa5+Xa21+Xa13*	30	BLB	BC_1F_1
7	BR14729	BR11723-4R-12*2/IR127152-3-22-2-1-B		*Xa5+Xa21+Xa13*	1175	BLB	BC_2F_2
8	BR14732	BR11723-4R-172*2/IRRI154-Pi9		*Pi9*	1200	Blast	BC_2F_2

Experiment 6.2: Hybridity test for confirming F_1s

Principal investigator: Hasina Khatun

Co-investigator: M A Rahman

Specific objective: To confirm of F_1s as true hybrid and confirmed F_1s registered into BRRI cross list and B4R database.

Materials and Methods: Thirty-four and 32 F_1s were grown along with their respective parents in the hybridization block at Gazipur respectively in T Aman and and Boro season. Twenty-five-day-old seedlings in T. Aman and forty-day-old seedlings in Boro season were transplanted @ single seedling with a spacing of 20 cm × 15 cm. Fertilizers and crop management followed were the same as Experiment 6.1.

Results and discussion: A total of 34 and 32 F_1s was confirmed as true hybrid through F_1 verification by visual comparison of all the crosses with respective parents and also quality check (QC) genotyping with purity SNP panel both in T. Aman and Boro season respectively (**Table 6.2**). The F_1 plants with heterozygous alleles at least two or more SNP loci were declared as true F_1s (hybrids). After confirmation, the F_2 seeds were collected and preserved. These confirmed F_1s were registered in BRRI cross list with BR number in T. Aman and Boro season.

Table 6.2: List of confirmed F_1s, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23 and Boro 2022-23

SN#	BR Number	Cross combination	Traits
T. Aman 2022-23			
1	15445	BR11714-4R-418/BR12275-4R-13	
2	15446	BR11716-4R-102/BR11723-4R-322	*qSES1.2-4*
3	15474	BR11716-4R-123/BR11714-4R-182	*qSES1.2-4*
4	15448	BR11714-4R-74/BR11723-4R-172	*qSES1.2-4*
5	15449	BR12274-4R-46/BR11716-4R-105	*qSES1.2-4*
6	15450	BR11714-4R-74/IR96184-24-1-1-AJY2	
7	15451	BR12274-4R-362/BR11714-4R-179	
8	15453	BR11714-4R-362/BR11715-4R-13	
9	15454	BR11716-4R-123/BR11714-4R-228	*qSES1.2-4*
10	15455	BR11716-4R-123/BR11714-4R-69	*qSES1.2-4*
11	15456	BR11723-4R-48/BR11714-4R-322	*qSES1.2-4*
12	15457	BR11714-4R-74/BR11714-4R-148	
13	15458	BR11716-4R-102/BR11714-4R-69	*qSES1.2-4*
14	15459	BR11716-4R-123/BR11715-4R-24	*qSES1.2-4*
15	15460	BR11723-4R-27/BR11714-4R-74	*qSES1.2-4*
16	15461	BR11716-4R-105/IR96184-24-1-1-AJY2	*qSES1.2-4*
17	15462	BR11723-4R-48/BR11714-4R-148	*qSES1.2-4*
18	15463	BR11716-4R-102/BR11714-4R-418	*qSES1.2-4*
19	15464	BR11714-4R-74/BR11714-4R-322	
20	15466	BR11716-4R-105/TP20532	*qSES1.2-4*
21	15467	BR11716-4R-123/BR11718-4R-8	*qSES1.2-4*
22	15468	BR11723-4R-48/BR11714-4R-74	*qSES1.2-4*
23	15469	BR11723-4R-48/IR96184-24-1-1-AJY2	*qSES1.2-4*
24	15470	BR11714-4R-148/BR11718-4R-8	
25	15471	IR108007-B-BRLA-BRLA-25-1/IR87870-6-1-1-1-1-B	
26	15472	BR11723-4R-48/BR11714-4R-69	*qSES1.2-4*
27	15473	BR11714-4R-179/BR11716-4R-105	*qSES1.2-4*
28	15474	BR11716-4R-123/BR11714-4R-182	*qSES1.2-4*
29	15475	BR11716-4R-123/BR11714-4R-322	*qSES1.2-4*
30	15476	BR11716-4R-123/BR11714-4R-184	*qSES1.2-4*
31	15477	BR11716-4R-123/BR11714-4R-74	*qSES1.2-4*
32	15478	BR11723-4R-48/BR11714-4R-418	*qSES1.2-4*
33	15479	BR11714-4R-74/BR11714-4R-112	
34	15481	BR11716-4R-102/BR11714-4R-74	*qSES1.2-4*

Boro 2022-23		
1	15399	BR12466-4R-275/BR12460-4R-156
2	15400	BR12465-4R-47/BR12459-4R-209
3	15401	BR12465-4R-18/BR12466-4R-159
4	14040	BR11716-4R-105/IR58443-6B-10-3
5	15402	BR12460-4R-102/BR12459-4R-39
6	15403	BR13104-4R-75/IRRI 154 Pi9
7	15404	BR12459-4R-183/BR12477-4R-13
8	15405	BR12459-4R-49/BR12461-4R-70
9	15406	BR12465-4R-181/BR12460-4R-107
10	15407	BR12459-4R-14/BR12477-4R-305
11	15408	BR11712-4R-218/IR58443-6B-10-3
12	15409	BR12465-4R-309/BR12465-4R-223
13	15410	BR12459-4R-103/BR12461-4R-6
14	15411	BR11723-4R-172/BR11607-4R-72
15	15412	BR12460-4R-58/BR12477-4R-13
16	15413	BR12459-4R-117/BR12469-4R-213
17	15414	BR12459-4R-286/BR12459-4R-214
18	15415	BR13711-4R-190/IR58443-6B-10-3
19	15416	BR11715-4R-186/IR127152-3-22-2-1-2
20	15417	BR11723-4R-172/BR12465-4R-27
21	15418	BR12466-4R-169/BR12477-4R-64
22	15419	BR11712-4R-218/IRRI 154 Pi9
23	15420	BR12462-4R-6/BR12477-4R-358
24	15421	BR11388-4R-11/BR12459-4R-18
25	15422	BR11716-4R-123/BR11386-5R-5
26	15423	BR11716-4R-102/BR11607-4R-72
27	15424	BRRI dhan92/IR58443-6B-10-3
28	15425	BRRI dhan92/BR12459-4R-103
29	15427	BRRI dhan87/BR12459-4R-209
30	14719	BR11712-4R-218/BRRI dhan99
31	15430	BRRI dhan92/BRRI dhan99
32	15431	BR11715-4R-218*3/BR11607-4R-72

Experiment 6.3: Field Rapid Generation Advance (FRGA)
Principal investigator: M A Rahman

Co-investigator: Hasina Khatun

Specific objectives: Rapid advancement of segregating population for shortening the breeding cycle.

Materials and Methods: In total, 61663 segregating progenies from 110 crosses in T Aman season and 110054 individual progenies from 120 crosses were grown in Boro season comprising F_2, F_3, F_4, and F_5 population in field following RGA method of breeding at BRRI Gazipur respectively. Twenty-five days and 25 days old seedlings were transplanted at 5×5 cm spacing in the field. Fertilizer management was done using the half doses of all fertilizers used in Experiment 1. At maturity, a single panicle was harvested from each plant of each cross. Freshly harvested seeds were dried and brokedown seed dormancy using the dry heat treatments @ 45°C for 5 days to initiate the next cycle of RGA immediately.

Results and discussion: Segregating progenies from F_2 to F_5 generation were rapidly advanced in the field condition in T. Aman and Boro season. In total 45168 progenies in T. Aman and 67164 segregating progenies in Boro season were harvested from in F_2-F_5 generations using FRGA technique (**Table 6.3.1 and 6.3.2**)

Table 6.3.1: List of segregating populations advanced through Field Rapid Generation Advance (FRGA), T. Aman 2022-23

SL#	BR Reg No.	Cross combination	No. of progenies	
			Planted	Harvested
T. Aman 2022-23				
F_2 generation				
Sl	**BR No.**	**Parentage**		
1	BR14291	BR10045-15-23-5/BRRI dhan99	1500	1220
2	BR14292	HHZ8-SAL14-SAL3-Y2/ IR87870-3-7-1-1-1-1-B	1500	1050
3	BR14293	BR11388-4R-6/BRRI dhan97	1500	1320
4	BR14294	BR11388-4R-23/IR58443-6B-10-3	1500	1300
5	BR14734	BR11723-4R-172/IR58443-6B-10-3	1500	1280
6	BR14295	BR11388-4R-6/BRRI dhan99	1500	1350
7	BR14296	BR10441-17-1-5/IR87870-3-7-1-1-1-1-B	1500	1290
8	BR14297	BR11388-4R-134/BRRI dhan99	1500	1320
9	BR14298	BR10441-17-1-5/IR59418-7B-21-3	1500	1180
10	BR14299	BR10441-17-1-5/IR87870-3-7-1-1-1-1-B	1500	1230
11	BR14300	BR10440-4-12-5/BRRI dhan99	1500	1310
12	BR14301	BR11723-4R-172/BRRI dhan99	1500	1280
13	BR14302	HHZ8-SAL14-SAL3-Y2/ BRRI dhan97	1500	1320
14	BR14303	BR10441-17-1-5/BRRI dhan99	1500	1310
15		I-14/I-71-3	1500	1000
16		I-14/I-71-2	1500	1000
		Total	**24000**	**19760**
F_3 generation				
Sl	**BR No.**	**Parentage**		
1	BR14030	IR93915-82-CMU2-2-CMU3_AJYB/ IR788761-B-SATB1-52-1	850	710
2	BR14031	IR103854-8-3-AJY1/IR83484-3-B-7-1-1-1	675	870
3	BR14032	IR92860-33-CMU1-1-CMU2-AJYB/ IR83484-3-B-1-1-1	922	810
4	BR14033	BR12716-4R-105 / TP30654	921	780
5	BR14034	BR11716-4R-105/IR59418-7B-21-3	680	580
6	BR14035	HHZ5-DT1-DT2/IR59418-7B21-3	720	660
7	BR14036	IR93915-82-CMU2-2-CMU3AJYB/IR58443-6B-10-3	820	780
8	BR14037	IR93915-82-CMU2-2-CMU3-AJYB/IR59418-7B-21-3	821	770
9	BR14038	TP30654/IR59418-7B-21-3	714	680
10	BR14039	IR93915-82-CMU2-2-CMU3-AJYB/ TP30654	720	611
11	BR14040	BR11716-4R-105/IR58443-6B-10-3	891	720
12	BR14041	IR104002-CMU28-CMU1-CMU3 /BRRI dhan89	920	750
13	BR14042	BR11716-4R-105 /IR83484-3-B-7-1-1-1	880	690
14	BR14043	IR59418-7B-21-3/TP30654	650	590
15	BR14044	IR83484-3-B-7-1-1-1/TP30654	950	720
16	BR14045	HHZ5-DT1-DT2/IR58443-6B-10-3	1050	900
17	BR14046	BR11716-4R-105/WANXIAN7777-P10	1020	820
18	BR14047	IR93915-82-CMU2-2-CMU3-AYJB/IR83484-3-B-7-1-1-1	950	780
19	BR14048	IR103854-8-3-AJY1/WANXIAN7777-P10	750	690
20	BR14049	BR12716-4R-123 / TP30654	650	590

21		BRRI dhan74-291/BRRI dhan74-2568	550	480
		Total	**17104**	**14981**
F_4 generation				
Sl	**BR No.**	**Parentage**		
1	BR13665	BR11712-4R-227/IR87870-3-7-1-1-1-1-B	215	51
2	BR13666	BR11716 -4R-129/IR59418-7B-21-3	238	90
3	BR13667	BR11715-4R-186/IR83484-3-B-7-1-1-1	468	
4	BR13668	BR11716-4R-102/IR87870-3-7-1-1-1-1-B	238	69
5	BR13669	BR11712-4R-232/IR58443-6B-10-3	261	120
6	BR13670	BRRI dhan87/WANXIAN7777-P8	238	93
7	BR13672	BR7528-B-AK-BHA/IR58443-6B-10-3	422	117
8	BR13673	BR11716-4R-105/BRRI dhan67	238	84
9	BR13674	BR10/ Akundi	610	
10	BR13675	BRRI dhan30/Akundi	675	
11	BR13676	BR23/IR58443-6B-10-3	215	87
12	BR13677	BR11715-4R-186/IR58443-6B-10-3	261	114
13	BR13678	IR107989-B-BRGA-BRGA-452/ WANXIAN7777-P10	261	102
14	BR13679	BR11716-4R-105/IR58443-6B-10-3	215	99
15	BR13680	IR99051-B-BL-B-B01-1/BR11716-4R-113	261	105
16	BR13682	BR11712-4R-227/IR58443-6B-10-3	238	96
17	BR13683	BR11723-4R-48/IR58443-6B-10-3	215	87
18	BR13684	HHZ-12-SAL12-Y3-Y2/ IR59418-7B-21-3	261	135
19	BR13685	BR11723-4R-48 /WANXIAN7777-P10	169	75
20	BR13686	BRRI dhan30/WANXIAN7777-P10	138	108
21	BR13687	BR11715-4R-196 / IR58443-6B-10-3	215	78
22	BR13688	BR11716-4R108/iR59418-7B-21-3		
23	BR13689	BR11716-4R-196 / IR58443-6B-10-3	260	75
24	BR13690	BRRI dhan30 / WANXIAN7777-P8	307	162
25	BR13691	BR11723-4R-12 / IR87870-3-7-1-1-1-1-B	250	57
26	BR13692	IR103757-B-BRGA-BRGA-BRGA-102 / BRRI dhan67	307	117
27	BR13693	BR7528-2R-HR16-2-24-1 /IR58443-6B-103	230	117
28	BR13694	IR58443-6B-10-3 / BR11715-4R-114	192	75
29	BR13695	BR11723-4R-12 / IR58443-6B-10-3	215	102
30	BR13696	BR10 / D(R)6	238	120
31	BR13697	BR11716-4R-105 / IR58443-6B-10-3	146	54
32	BR13698	BR11723-4R-27 /IR83484-3-B-7-1-1-1	169	63
33	BR13699	BR10 / WANXIAN7777-P10	192	78
34	BR13700	HHZ12-SAL12-Y3-Y2 / IR58443-6B-10-3	215	111
35	BR13701	BR7528-2R-HR16-2-24-1/IR58443-6B-10-3	376	219
36	BR13702	BR11712-4R-227 / IR83484-3-B-7-1-1-1	399	258
37	BR13703	BR11723-4R-48 / IR83484-3-B-7-1-1-1	215	117
38	BR13704	BR11716-4R-102 / IR83484-3-B-7-1-1-1	284	102
39	BR13705	D(R)6 / IR59418-7B-21-3	437	222
40	BR13706	BR23/ Akundi	322	
41	BR13707	IR58443-6B-10-3*2/Patnai	215	93
42	BR13708	BR7528-B-AK-BHA / BR11716-4R-120	284	114
43	BR13489	BRRI dhan63/I-14	238	81
44	BR13431	BRRI dhan67/I-14	192	87
45	BR13493	BRRI dhan74/I-14	215	99
		Total	**11950**	**4233**
F_5 generation				
Sl #	**BR No.**	**Cross combination**		

1	BR13439	IR59418-7B-21-3/TP24439	360	412
2	BR13440	WANXIAN7777-P10/TP30716	360	352
3	BR13441	Binadhan-10/BR7528-B-AK-BHA	370	310
4	BR13442	IR77674-3B-8-10-8-AJY2/IR103960-CMU1-CMU2-2	390	478
5	BR13443	IR87870-6-1-1-1-1-B / BR7528-B-AK-BHA	400	248
6	BR13444	IR83484-3-B-7-1-1-1/IR77674-3B-8-3-10-8-AJY2	390	150
7	BR13445	IR83484-3-B-7-1-1-1/BR8743-B-1-2-2	390	190
8	BR13446	IR83484-3-B-7-1-1-1/IR7861-B-SATBI-52-1	240	100
9	BR13447	IR83484-3-B-7-1-1-1/Fatema dhan	180	72
10	BR13448	BR8743-B-1-2-2/TP24493	390	244
11	BR13449	IR9330-14-3-1-2-2-3/BR9154-2-7-1-2	390	278
12	BR13450	BR9072-B-4-1-1 / TP20532	225	170
13	BR13451	BR9072-B-4-1-1 / IR103960-CMU1-CMU2 -2	125	70
14	BR13452	BR9072-B-4-1-1 / IR100679-AJY30-AJY2-CMU2	330	186
15	BR13454	IR100679-AJY30-AJY2-CMU2/IR90082-SUB-35-3-2-2	201	130
16	BR13455	IR103960-CMU1 -CMU2-2 / IR77674-38-8-3-10-3-AJY2	225	188
17	BR13456	IR103960-CMU1 -CMU2-2 /BR7843-B-1-2-2	450	256
18	BR13457	TP30716/5/D(R)6	390	184
19	BR13459	TP22025/IR83484-3-B-7-1-1-1	390	250
20	BR13460	TP30698/Fatema dhan	324	232
21	BR13461	IR100679-AJY30-AJY2-CMU2/WANXN7777-P10	102	72
22	BR13462	Fatema dhan / TR30701	430	290
23	BR13463	TP30701/Fatema dhan	225	176
24	BR13464	Waxian7777-P10/ BRRI dhan89	231	234
25	BR13465	BRRI dhan29/Fatema dhan	390	216
26	BR13494	BRRI dhan63 / I-14	160	212
27	BR13495	BRRI dhan67/I-71	231	340
28	BR13496	BRRI dhan74 / I-71	320	124
		Total	**8609**	**6164**
		Grand Total	**61663**	**45138**

Table 6.3.2: List of segregating population advanced through Field Rapid Generation Advance (FRGA), Boro 2022-23

SL #	BR Reg No.	Cross combination	No. of progenies	
			Planted	Harvested
Boro2022-23				
F_2 generation				
1	BR14737	IR96184-24-1-1-AJY2/BRRI dhan99	1500	291
2	BR14733	BR11723-4R-128/BRRI dhan67	1500	276
3	BR14735	BR11723-4R-172/IR58443-6B-10-3	1500	750
4	BR14706	BR11921-4R-124/TP30649	1500	1100
5	BR14707	BR11920-4R-521/BR11712-4R-27	1500	1250
6	BR14708	BR11716-4R-129/BR11919-4R-26	1500	261
7	BR14710	BR11716-4R-105/BRRI dhan99	1500	1000
8	BR14712	BR11716-4R-227/BR11920-4R-521	1500	780
9	BR14713	BR11052-4R-273/BR11940-4R-167	1500	291
10	BR14715	BR11712-4R-227/BR388-4R-292	1500	720

11	BR14716	BR11712-4R-186/BRRI dhan99	1500	880
12	BR14718	BR11723-4R-27/IR15T1464	1500	790
13	BR14721	BR11723-4R-27/BRRI dhan99	1500	810
14	BR14714	BR11712-4R-27/BRRI dhan100	1500	520
15	BR14725	BR11052-4R-273/IR15T1464	1500	670
16	BR14724	BR11716-4R-129/TP30649	1500	620
17	BR14711	BR11921-4R-129/BRRI dhan99	1500	920
18	BR14727	BR11716-4R-147/TP30649	1500	1050
19	BR14704	BR11716-4R-105/BR11911-4R-386	1500	880
20	BR14719	BR11712-4R-218/BRRI dhan99	1500	770
21	BR14705	BR11910-4R-233/BR11388-4R-292	1500	820
22	BR14723	BRRI dhan87/TP30649	1500	720
23	BR14726	BR10/BR11716-4R-147	1500	811
24	BR14728	TP30649/BR11712-4R-105	1500	520
25	BR14734	BR11723-4R-172/IR117834-24-1RGA-1RGA-1RGA-1	1500	670
26	BR14709	BR11712-4R-102/IR15T1464	1500	1050
27	BR14722	BRRI dhan89/BR11940-4R-167	1500	880
28	BR14719	BR11712-4R-218/BRRI dhan99	1500	720
29	BR14720	BR11723-4R-172/IR15T1464	1500	620
30	BR14702	BR11712-4R-227/IR108158-B-2-AJY1	1500	780
31	BR14730	BR11723-4R-12/IRRI154-Pi9	1500	720
32	BR14732	BR11723-4R-172/IRRI154-Pi9	1500	680
33	BR14703	BR11940-4R-167/BR11716-4R-105	1500	720
34	BR14717	IR15T1464/BR11921-4R-100	1500	810
35	BR14736	TP20532/IR87870-6-1-1-1-1-B	1500	870
36	BR15442	BRRI dhan87/BRRI dhan97	1500	800
37	BR15443	BRRI dhan87/BRRI dhan99	1500	700
38	BR15444	BRRI dhan87/BRRI dhan67	1500	670
		Total	**57000**	**28190**
		F_3 generation		
Sl	**BR No.**	**Parentage**		
1	BR14291	BR10045-15-23-5/BRRI dhan99	1500	1220
2	BR14292	HHZ8-SAL14-SAL3-Y2/ IR87870-3-7-1-1-1-1-B	1500	1050
3	BR14293	BR11388-4R-6/BRRI dhan97	1500	1320
4	BR14294	BR11388-4R-23/IR58443-6B-10-3	1500	1300
5	BR14734	BR11723-4R-172/IR58443-6B-10-3	1500	1280
6	BR14295	BR11388-4R-6/BRRI dhan99	1500	1350
7	BR14296	BR10441-17-1-5/IR87870-3-7-1-1-1-1-B	1500	1290
8	BR14297	BR11388-4R-134/BRRI dhan99	1500	1320
9	BR14298	BR10441-17-1-5/IR59418-7B-21-3	1500	1180
10	BR14299	BR10441-17-1-5/IR87870-3-7-1-1-1-1-B	1500	1230
11	BR14300	BR10440-4-12-5/BRRI dhan99	1500	1310
12	BR14301	BR11723-4R-172/BRRI dhan99	1500	1280
13	BR14302	HHZ8-SAL14-SAL3-Y2/ BRRI dhan97	1500	1320
14	BR14303	BR10441-17-1-5/BRRI dhan99	1500	1310
15		I-14/I-71-3	1500	1000
16		I-14/I-71-2	1500	1000
		Total	**24000**	**19760**
		F_4 genaration		
Sl	**BR No.**	**Parentage**		
1	14030	IR93915-82-CMU2-2-CMU3_AJYB/IR788761-B-SATB1-52-1	850	710
2	14031	IR103854-8-3-AJY1/IR83484-3-B-7-1-1-1	675	870

3	14032	IR92860-33-CMU1-1-CMU2-AJYB/ IR83484-3-B-1-1-1	922	810
4	14033	BR12716-4R-105 / TP30654	921	780
5	14034	BR11716-4R-105/IR59418-7B-21-3	680	580
6	14035	HHZ5-DT1-DT2/IR59418-7B21-3	720	660
7	14036	IR93915-82-CMU2-2-CMU3AJYB/IR58443-6B-10-3	820	780
8	14037	IR93915-82-CMU2-2-CMU3-AJYB/IR59418-7B-21-3	821	770
9	14038	TP30654/IR59418-7B-21-3	714	680
10	14039	IR93915-82-CMU2-2-CMU3-AJYB/TP30654	720	611
11	14040	BR11716-4R-105/IR58443-6B-10-3	891	720
12	14041	IR104002-CMU28-CMU1-CMU3 /BRRI dhan89	920	750
13	14042	BR11716-4R-105 /IR83484-3-B-7-1-1-1	880	690
14	14043	IR59418-7B-21-3/TP30654	650	590
15	14044	IR83484-3-B-7-1-1-1/TP30654	950	720
16	14045	HHZ5-DT1-DT2/IR58443-6B-10-3	1050	900
17	14046	BR11716-4R-105/WANXIAN7777-P10	1020	820
18	14047	IR93915-82-CMU2-2-CMU3-AYJB/IR83484-3-B-7-1-1-1	950	780
19	14048	IR103854-8-3-AJY1/WANXIAN7777-P10	750	690
20	14049	BR12716-4R-123 / TP30654	650	590
21		BRRI dhan74-291/BRRI dhan74-2568	550	480
		Total	**17104**	**14981**
F5				
Sl	**BR No.**	**Parentage**		
1	BR13665	BR11712-4R-227/IR87870-3-7-1-1-1-1-B	215	51
2	BR13666	BR11716 -4R-129/IR59418-7B-21-3	238	90
3	BR13667	BR11715-4R-186/IR83484-3-B-7-1-1-1	468	
4	BR13668	BR11716-4R-102/IR87870-3-7-1-1-1-1-B	238	69
5	BR13669	BR11712-4R-232/IR58443-6B-10-3	261	120
6	BR13670	BRRI dhan87/WANXIAN7777-P8	238	93
7	BR13672	BR7528-B-AK-BHA/IR58443-6B-10-3	422	117
8	BR13673	BR11716-4R-105/BRRI dhan67	238	84
9	BR13674	BR10/ Akundi	610	
10	BR13675	BRRI dhan30/Akundi	675	
11	BR13676	BR23/IR58443-6B-10-3	215	87
12	BR13677	BR11715-4R-186/IR58443-6B-10-3	261	114
13	BR13678	IR107989-B-BRGA-BRGA-452/WANXIAN7777-P10	261	102
14	BR13679	BR11716-4R-105/IR58443-6B-10-3	215	99
15	BR13680	IR99051-B-BL-B-B01-1/BR11716-4R-113	261	105
16	BR13682	BR11712-4R-227/IR58443-6B-10-3	238	96
17	BR13683	BR11723-4R-48/IR58443-6B-10-3	215	87
18	BR13684	HHZ-12-SAL12-Y3-Y2/ IR59418-7B-21-3	261	135
19	BR13685	BR11723-4R-48 /WANXIAN7777-P10	169	75
20	BR13686	BRRI dhan30/WANXIAN7777-P10	138	108
21	BR13687	BR11715-4R-196 / IR58443-6B-10-3	215	78
22	BR13688	BR11716-4R108/iR59418-7B-21-3		
23	BR13689	BR11716-4R-196 / IR58443-6B-10-3	260	75
24	BR13690	BRRI dhan30 / WANXIAN7777-P8	307	162
25	BR13691	BR11723-4R-12 / IR87870-3-7-1-1-1-1-B	250	57
26	BR13692	IR103757-B-BRGA-BRGA-BRGA-102 / BRRI dhan67	307	117
27	BR13693	BR7528-2R-HR16-2-24-1 /IR58443-6B-103	230	117
28	BR13694	IR58443-6B-10-3 / BR11715-4R-114	192	75
29	BR13695	BR11723-4R-12 / IR58443-6B-10-3	215	102

30	BR13696	BR10 / D(R)6	238	120
31	BR13697	BR11716-4R-105 / IR58443-6B-10-3	146	54
32	BR13698	BR11723-4R-27 /IR83484-3-B-7-1-1-1	169	63
33	BR13699	BR10 / WANXIAN7777-P10	192	78
34	BR13700	HHZ12-SAL12-Y3-Y2 / IR58443-6B-10-3	215	111
35	BR13701	BR7528-2R-HR16-2-24-1/IR58443-6B-10-3	376	219
36	BR13702	BR11712-4R-227 / IR83484-3-B-7-1-1-1	399	258
37	BR13703	BR11723-4R-48 / IR83484-3-B-7-1-1-1	215	117
38	BR13704	BR11716-4R-102 / IR83484-3-B-7-1-1-1	284	102
39	BR13705	D(R)6 / IR59418-7B-21-3	437	222
40	BR13706	BR23/ Akundi	322	
41	BR13707	IR58443-6B-10-3*2/Patnai	215	93
42	BR13708	BR7528-B-AK-BHA / BR11716-4R-120	284	114
43	BR13489	BRRI dhan63/I-14	238	81
44	BR13431	BRRI dhan67/I-14	192	87
45	BR13493	BRRI dhan74/I-14	215	99
		Total	**11950**	**4233**
		Grand Total	**110054**	**67164**

Experiment 6.4: Line Stage Testing (LST) Trial

Principal Investigator : M A Rahman

Co-investigators: Hasina Khatun, R F Disha, N. Jahan and T.H. Ansari

Specific objectives: To assess FRGA/RGA derived advanced breeding lines for uniformity at heading, other desirable agronomic traits and grain type.

Materials and Methods: A total of 5085 from 28crosses and 6277 from 28 crosses advanced breeding line in T Aman and Boro season, respectively were grown at BRRI R/S Satkhira. Thirty-five- and 40-days old seedlings were transplanted in a 5.4 m × 1 rows plot with a spacing of 20 cm× 20 cm. Single seedling was transplanted. Fertilizer doses and time of application were the same as in Experiment no.6.1. Hand weeding was done in time.

Results and discussion: Out of 5085 lines, 452 lines were selected that derived from 28 crosses in LST trial during T Aman 2022-23 based on identical flowering, grain type traits and phenotypic acceptability under field condition **(Table 6.4.1).** The frequency distribution of selected LST was shown in **Figure 6.4.1a.** The highest number (58 lines) of LST lines from the cross BR13336-4R (BR8743-B-1-2-2/ IR10351-B-AJY10-3) and the lowest number of lines (9 lines) were selected from the cross BR13499-4R (BRRI dhan74/I-14//BRRI dhan74/I-71 respectively **(Table 6.4.1).** High selection intensity (8%) was applied in LST in T Aman 2022-23 (**Fig. 6.4.2b**). Out of 6277 lines, a total of 959 lines from 28 crosses were selected in LST trial during Boro 2022-23 based on identical flowering, acceptable grain type (MS/LS) traits and phenotypic acceptability under field condition. high selection intensity (13%) was applied in LST in Boro season 2022-23 (**Fig. 6.4.2c**). The highest number (76 lines) of LST lines from the cross BR13456-4R (IR103960-CMU1 -CMU2-2 /BR7843-B-1-2-2) and the lowest number of lines (3 lines) were selected from the cross BR13447-4R (IR83484-3-B-7-1-1-1/Fatema dhan) respectively (**Table 6.4.2 and Fig 6.4.2.b).**

Table 6.4.1: List of superior fixed lines selected from LST, T Aman 2022-23

SL	BR Reg No.	Cross combination	No. of genotypes	
			Tested	**Selected**
1	BR13331-4R	IR77674-3B-8-1-3-10-3AJY2 / IR103513-B-AJY15-3	300	32
2	BR13332-4R	IR78671-B-SATB1-52-1 / IR103403-B-AJY5	310	46
3	BR13334-4R	IR83484-3-B-7-1-1-1/ IR78761-B-SATB1-52-1	300	28
4	BR13336-4R	BR8743-B-1-2-2 / IR10351-B-AJY10-3	300	58

5	BR13337-4R	IR78671-B-SATB1-52-1 / IR84095-AJY-301-SDO4	370	21
6	BR13339-4R	IR78761-B-SATB1-52-1 / BR9635-3-1-9	284	39
7	BR13340-4R	BR8743-B-1-2-2 / IR103403-B-B-AJY1	330	22
8	BR13341-4R	IR83484-3-B-7-1-1-1 / IR77674-3B-8-1-3-10-AJY2	280	14
9	BR13344-4R	IR78761-B-SATB1-52-1 / IR103402-B-B-AJY5	388	31
10	BR13345-4R	IR77674-3B-8-1-3-10-AJY2 / BR9535-3-1-9	300	14
11	BR13347-4R	IR83484-3-B-7-1-1-1 / IR78761-B-SATB1-52-1	300	24
12	BR13349-4R	IR96321-1447-521-B-2-1-2 / WANXIAN7777-P10	300	19
13	BR13497(3)-4R	BRRI dhan63 x I-14//BRRI dhan63 x I-71	220	12
14	BR13497(5)-4R	BRRI dhan63 x I-14//BRRI dhan63 x I-71	284	37
15	BR13497(6)-4R	BRRI dhan63 x I-14//BRRI dhan63 x I-71	300	30
16	BR13498-4R	BRRI dhan67x I-14//BRRI dhan67 x I-71	300	16
17	BR13499-4R	BRRI dhan74x I-14//BRRI dhan74 x I-71	219	9
		Total	**5085**	**452**

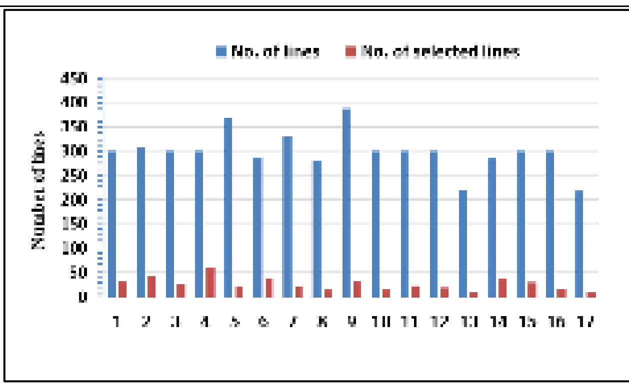


Fig.6.4.1a: Frequency distribution shows the selected LST lines depending on the uniformity and grain types, T. Aman, 2022-23

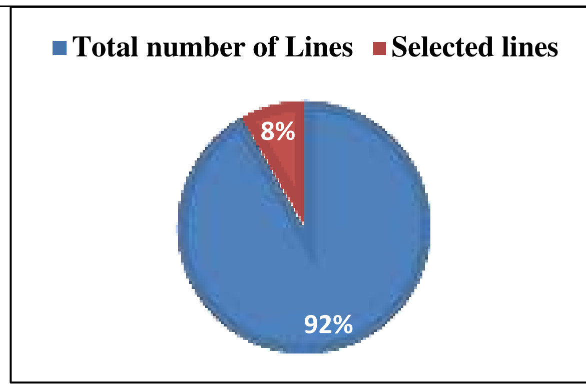


Fig.6.4.1b: The selection pressure imposed during identification of desirable LST in T. Aman 2022-23

Table 6.4.2: List of superior fixed lines identified from LST, Boro 2022-23

Sl	BR No.	Cross Combination	No. of genotypes Tested	No. of genotypes Selected
1	BR13439-4R	IR59418-7B-21-3/TP24439	412	63
2	BR13440-4R	WANXIAN7777-P10/TP30716	352	50
3	BR13441-4R	Binadhan-10/BR7528-B-AK-BHA	310	56
4	BR13442-4R	IR77674-3B-8-10-8-AJY2/IR103960-CMU1-CMU2-2	478	40
5	BR13443-4R	IR87870-6-1-1-1-1-B / BR7528-B-AK-BHA	248	44
6	BR13444-4R	IR83484-3-B-7-1-1-1/IR77674-3B-8-3-10-8-AJY2	150	9
7	BR13445-4R	IR83484-3-B-7-1-1-1/BR8743-B-1-2-2	190	52
8	BR13446-4R	IR83484-3-B-7-1-1-1/IR7861-B-SATBI-52-1	100	14
9	BR13447-4R	IR83484-3-B-7-1-1-1/Fatema dhan	72	3
10	BR13448-4R	BR8743-B-1-2-2/TP24493	244	6
11	BR13449-4R	IR89330-14-3-1-2-2-3/BR9154-2-7-1-2	278	20
12	BR13450-4R	BR9072-B-4-1-1 / TP20532	170	28
13	BR13451-4R	BR9072-B-4-1-1 / IR103960-CMU1-CMU2 -2	70	12
14	BR13452-4R	BR9072-B-4-1-1 / IR100679-AJY30-AJY2-CMU2	186	15
15	BR13454-4R	IR100679-AJY30-AJY2-CMU2/IR90082-SUB-35-3-2-2	130	23
16	BR13455-4R	IR103960-CMU1 -CMU2-2 / IR77674-38-8-3-10-3-AJY2	188	37
17	BR13456-4R	IR103960-CMU1 -CMU2-2 /BR7843-B-1-2-2	256	76
18	BR13457-4R	TP30716/5/D(R)6	184	32
19	BR13459-4R	TP22025/IR83484-3-B-7-1-1-1	250	22
20	BR13460-4R	TP30698/Fatema dhan	232	45
21	BR13461-4R	IR100679-AJY30-AJY2-CMU2/WANXN7777-P10	72	12
22	BR13462-4R	Fatema dhan / TR30701	349	41
23	BR13463-4R	TP30701/Fatema dhan	176	44

24	BR13464-4R	Waxian7777-P10/ BRRI dhan89	234	53
25	BR13465-4R	BRRI dhan29/Fatema dhan	216	55
26	BR13494-4R	BRRI dhan63 / I-14	212	27
27	BR13495-4R	BRRI dhan67/I-71	340	67
28	BR13496-4R	BRRI dhan74 / I-71	178	13
	Total		**6277**	**959**

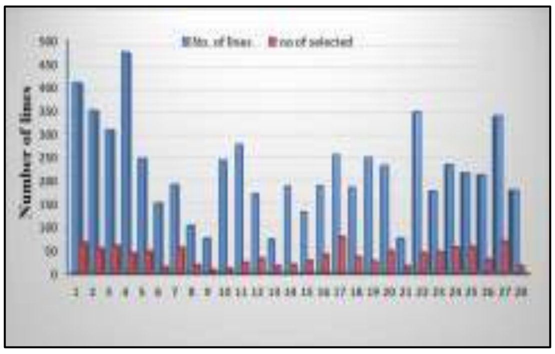


Fig. 6.4.2a.: Graphically showing the tolal number of LST and Selected lines in LST, Boro2022-23

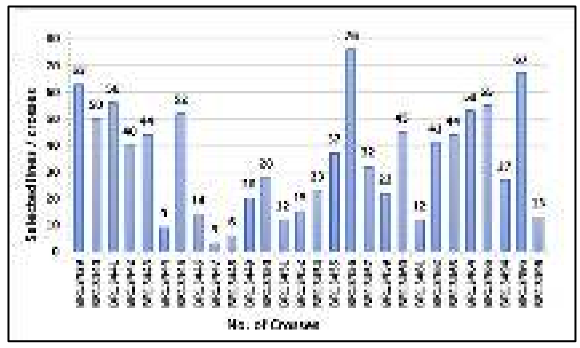


Fig.6.4.2b: Number of selected lines/cross of LST population, Boro2022-23

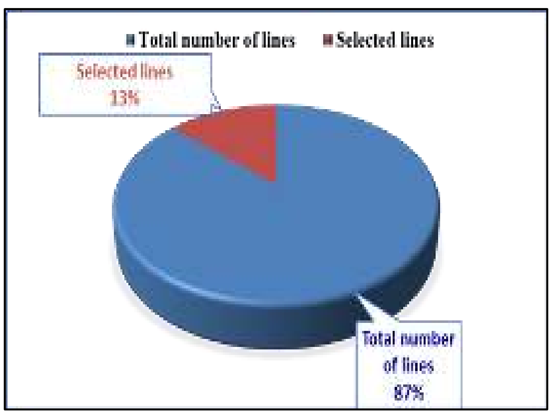


Fig. 6.4.2c: Selection Intensity of LST genotypes, Boro 2022-23

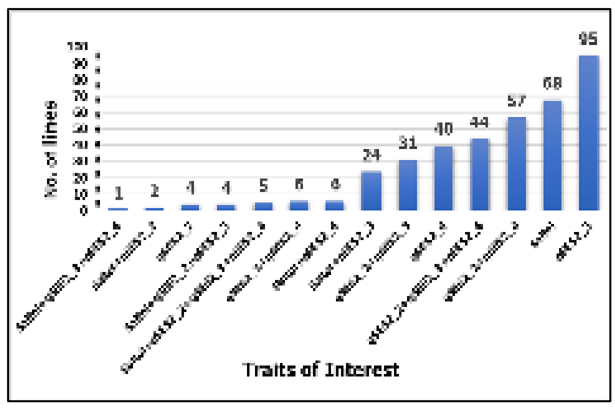


Fig. 6.4.2d: Frequency distribution of LST genotypes for traits of interest associated with target product profile and STR, Boro 2022-23

Experiment 6.5: Observational Yield Trial (OYT)

Principal Investigator: M. A. Rahman

Co-investigators: Hasina Khatun, R F Disha, Avijt Biswas, Asif Rahman, A A Shoily and S M M Islam

Specific objectives: Identification of genetically fixed (homozygous) lines which are uniform in flowering and other agronomic traits.

Materials and Methods: A total of 772 genotypes were evaluated at three locations in OYT (Satkhira, Kaliganj and Gazipur) following the sparse Testing model of genomic selection. A total 372 genotypes in which about 48% of total genotypes were tested at each of three sites as training population in T. Aman using BR23, BRRI dhan30, BRRI dhan73 and BRRI dhan87 as checks and OYT in IRSSTN, 18 genotypes were evaluated at Satkhira along with BRRI dhan87 and BRRI dhan73. In Boro season, 313 genotypes were evaluated in non-replicated trial as OYT-1. BRRI dhan67 BRRI dhan89 and BRRI dhan99 as check varieties under OYT IRSSTN 19 genotypes were evaluated with checks BRRI dhan67 and BRRI dhan49. These trials were carried out following augmented randomized complete block design with 4 replicaation. The unit plot size was 5.4 m × 4 rows. Thirty-day-old-seedling in T. Aman and forty-day-old seedlings in Boro season were transplanted @ single seedling with a spacing of 20 cm × 20 cm.

Fertilizers and crop management followed were the same as Experiment 6.1. Data were collected on plant height, days to flowering, days to maturity, PAcp and yield per plot.

Results and discussion: In T Aman season, out of 772 genotypes, a total of 237 genotypes were selected from Gazipur and Satkhira based on growth duration, plant height, phenotypic acceptability at maturity (PAcp) and grain yield (**Table 6.5.1**). The Frequency distribution were shown the number of individuals from OYT for growth duration, yield at Gazipur and Satkhira, T Aman 2022-23 in **Fig 6.5.1c**. The performance of the best material is shown in **Fig.6.5.1a & b**). In T. Aman season 4 genotypes were selected from IRSSTN _OYT (**Table 6.5.2**). Considering yield and growth duration, phenotypic acceptability at maturity (PAcp) compared to check varieties, out of 313 genotypes, 143 entries were selected in Boro season. The best performing 43 genotypes from Gazipur and Satkhira were shown in **Table 6.5.3.** The yield range was from 2.32-10.15t/ha and 1.15-8.65 t/ha at Gazipur and Satkhira respectively.the salinity lavel was 5.3 to 7.77 dSm^{-1}. In OYT- IRSSTN, four genotypes were selected from 19 genotypes compared to the yield of the check's varieties in Boro season (**Table 6.5.4**).

Table 6.5.1: Yield and agronomic characters of the selected genotypes from OYT, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23.

Sl #	Designation	Growth duration (days)	Plant height (cm)	Grain Yield (t/ha)
1	BR13103-4R-8	141	129	5.13
2	BR13104-4R-162	129	114	2.79
3	BR13105-4R-107	138	113	5.37
4	BR13105-4R-143	137	108	5.43
5	BR13105-4R-178	137	120	6.20
6	BR13105-4R-187	138	118	5.31
7	BR13105-4R-200	132	119	4.42
8	BR13105-4R-212	137	115	6.58
9	BR13105-4R-216	138	116	3.71
10	BR13105-4R-231	137	112	4.28
11	BR13105-4R-36	139	116	4.15
12	BR13105-4R-40	138	126	6.82
13	BR13105-4R-46	138	118	4.28
14	BR13106-4R-168	118	108	4.74
15	BR13106-4R-376	114	129	4.65
16	BR13106-4R-389	118	119	4.97
17	BR13106-4R-432	108	121	3.10
18	BR13106-4R-458	114	106	3.57
19	BR13106-4R-493	117	116	2.56
20	BR13107-4R-170	133	116	3.45
21	BR13107-4R-194	133	108	1.45
22	BR13108-4R-2	124	120	6.31
23	BR13108-4R-275	120	118	3.36
24	BR13110-4R-192	127	104	1.28
25	BR13111-4R-143	129	112	2.87
26	BR13111-4R-24	120	119	3.89
27	BR13111-4R-38	124	114	1.54
28	BR13112-4R-69	107	118	3.90
29	BR13113-4R-121	120	112	3.40
30	BR13113-4R-176	126	120	4.63
31	BR13115-4R-114	127	108	3.31
32	BR13115-4R-146	132	110	4.03
33	BR13115-4R-22	141	97	3.13
34	BR13115-4R-4	124	98	2.11

35	BR13115-4R-8	130	104	5.69
36	BR13122-4R-106	116	114	4.06
37	BR13122-4R-2	117	110	4.31
38	BR13122-4R-7-1	118	110	3.95
39	BR13131-4R-87	125	131	4.58
40	BR11936-4R-11	115	97	2.99
41	BR13103-4R-56	99	146	4.22
42	BR13104-4R-27	132	95	1.80
43	BR13105-4R-115	133	97	1.94
44	BR13105-4R-133	133	102	2.88
45	BR13105-4R-136	133	102	2.77
46	BR13105-4R-156	133	100	2.76
47	BR13105-4R-191	133	90	1.06
48	BR13105-4R-197	132	103	2.56
49	BR13105-4R-213	134	100	2.50
50	BR13105-4R-3	134	101	2.29
51	BR13105-4R-39	134	106	3.57
52	BR13105-4R-65	135	95	3.00
53	BR13106-4R-188	112	104	2.60
54	BR13106-4R-422	112	95	3.41
55	BR13106-4R-489	104	109	3.66
56	BR13107-4R-143	127	85	2.30
57	BR13107-4R-26	130	92	2.20
58	BR13108-4R-133	112	107	3.38
59	BR13108-4R-320	111	92	3.01
60	BR13108-4R-41	109	105	2.82
61	BR13108-4R-90	111	99	3.44
62	BR13111-4R-104	112	103	6.64
63	BR13111-4R-109	112	105	5.92
64	BR13111-4R-120	114	102	3.36
65	BR13111-4R-156	116	99	4.37
66	BR13111-4R-186	119	109	3.99
67	BR13111-4R-80	121	107	3.14
68	BR13111-4R-83	116	104	2.86
69	BR13115-4R-168	144	90	2.81
70	BR13115-4R-21	140	92	4.05
71	BR13115-4R-99	138	91	4.12
72	BR13120-4R-43	113	94	3.66
73	BR13122-4R-44	112	99	2.57
74	BR13128-4R-1	132	93	5.90
75	BR13128-4R-46	131	94	3.14
76	BR13124-4R-199	112	83	4.41
77	BR13124-4R-239	120	107	5.26
78	BR13124-4R-248	117	103	5.85
79	BR13124-4R-90	119	104	7.31
80	BR13127-4R-89	125	120	4.98
81	BR13129-4R-29	120	108	4.65
82	BR13131-4R-14	120	112	4.49
83	BR13131-4R-52	120	114	4.95
84	BR13104-4R-21	129	105	5.29
85	BR13104-4R-227	122	111	4.40
86	BR13104-4R-81	116	107	3.53
87	BR13105-4R-10	132	112	6.92
88	BR13105-4R-108	132	109	6.11

89	BR13105-4R-109	133	110	6.26
90	BR13105-4R-139	130	108	5.74
91	BR13105-4R-184	131	110	5.62
92	BR13105-4R-21	132	108	4.55
93	BR13105-4R-28	131	112	3.32
94	BR13105-4R-31	132	107	6.06
95	BR13105-4R-32	132	114	2.90
96	BR13105-4R-50	132	108	5.13
97	BR13105-4R-51	130	109	2.58
98	BR13105-4R-72	132	114	6.39
99	BR13105-4R-81	130	113	5.87
100	BR13105-4R-83	128	103	6.11
101	BR13105-4R-87	129	112	6.00
102	BR13105-4R-93	130	110	5.37
103	BR13106-4R-241	106	105	5.57
104	BR13106-4R-253	108	104	4.91
105	BR13106-4R-408	113	122	4.46
106	BR13106-4R-418	111	102	3.60
107	BR13106-4R-451	111	103	4.88
108	BR13108-4R-117	127	120	6.08
109	BR13108-4R-214	109	111	4.89
110	BR13110-4R-282	109	135	4.05
111	BR13110-4R-41	121	122	1.44
112	BR13111-4R-113	116	118	5.96
113	BR13111-4R-52	113	115	2.99
114	BR13113-4R-14	117	110	3.80
115	BR13113-4R-46	112	111	3.70
116	BR13113-4R-9	110	118	5.62
117	BR13115-4R-101	137	108	3.65
118	BR13115-4R-123	115	104	3.97
119	BR13115-4R-158	139	108	3.70
120	BR13115-4R-180	136	97	5.37
121	BR13115-4R-92	136	104	3.78
122	BR13116-4R-213	113	108	3.43
123	BR13117-4R-147	127	122	4.14
124	BR13119-4R-30	107	116	4.75
125	BR13120-4R-11	111	151	3.66
126	BR13121-4R-101	119	129	3.45
127	BR13121-4R-68	115	137	4.99
128	BR13122-4R-137	116	102	3.67
129	BR13122-4R-14	112	111	1.89
130	BR13122-4R-146	114	111	3.83
131	BR13122-4R-17	118	121	6.28
132	BR13122-4R-251	116	114	4.62
133	BR13122-4R-4	114	107	5.59
134	BR13122-4R-56	104	115	6.06
135	BR13123-4R-118	111	110	6.02
136	BR13123-4R-226	112	102	4.67
137	BR13124-4R-224	106	125	2.31
138	BR13125-4R-107	106	103	4.66
139	BR13125-4R-17	107	111	5.41
140	BR13125-4R-63	103	128	5.67
141	BR13127-4R-33	110	105	3.81
142	BR13128-4R-71	123	104	3.61

143	BR13131-4R-29	111	124	7.20
144	BR13103-4R-13	140	152	3.87
145	BR13103-4R-22	145	157	5.07
146	BR13103-4R-25	134	141	4.30
147	BR13103-4R-26	129	159	3.52
148	BR13103-4R-29	136	152	2.71
149	BR13103-4R-41	135	150	3.24
150	BR13103-4R-52	144	145	2.34
151	BR13103-4R-6	131	120	3.33
152	BR13103-4R-73	134	151	2.71
153	BR13103-4R-83	131	150	2.78
154	BR13103-4R-95	140	149	3.66
155	BR13103-4R-98	133	140	2.77
156	BR13104-4R-104	118	104	4.51
157	BR13104-4R-125	121	124	4.28
158	BR13104-4R-136	116	109	4.16
159	BR13104-4R-148	127	118	4.96
160	BR13104-4R-244	112	101	3.39
161	BR13104-4R-258	111	116	3.84
162	BR13104-4R-40	114	109	4.83
163	BR13104-4R-75	121	106	3.63
164	BR13104-4R-80	119	111	2.34
165	BR13107-4R-147	134	104	4.57
166	BR13107-4R-189	129	99	3.43
167	BR13107-4R-241	116	98	3.11
168	BR13107-4R-312	127	108	3.73
169	BR13107-4R-34	115	101	5.09
170	BR13107-4R-66	114	98	4.58
171	BR13113-4R-154	129	145	2.73
172	BR13115-4R-108	129	88	4.07
173	BR13115-4R-117	136	108	2.75
174	BR13115-4R-122	136	105	4.62
175	BR13115-4R-129	125	107	4.07
176	BR13115-4R-136	113	100	3.53
177	BR13115-4R-171	127	106	3.81
178	BR13115-4R-175	133	99	2.86
179	BR13115-4R-20	131	95	3.72
180	BR13115-4R-23	134	101	2.97
181	BR13115-4R-32	136	115	4.59
182	BR13115-4R-37	121	109	4.99
183	BR13115-4R-43	122	98	4.21
184	BR13115-4R-5	117	97	3.05
185	BR13115-4R-63	136	104	3.38
186	BR13115-4R-66	137	96	4.55
187	BR13115-4R-70	140	103	3.71
188	BR13115-4R-83	130	104	3.68
189	BR13115-4R-94	134	100	2.99
190	BR13115-4R-98	123	98	3.22
191	BR13116-4R-261	136	107	3.42
192	BR13117-4R-117	114	122	4.15
193	BR13117-4R-95	138	126	2.69
194	BR13118-4R-111	113	109	4.01
195	BR13118-4R-24	119	106	4.98
196	BR13118-4R-57	110	111	4.10

197	BR13118-4R-61	113	109	5.13
198	BR13118-4R-76	115	107	4.48
199	BR13118-4R-91	112	101	3.73
200	BR13118-4R-97	108	119	3.30
201	BR13123-4R-11	113	95	2.75
202	BR13123-4R-132	110	104	3.99
203	BR13123-4R-22	112	106	3.75
204	BR13123-4R-229	119	111	4.18
205	BR13124-4R-235	113	106	4.61
206	BR13124-4R-291	113	103	4.19
207	BR13125-4R-88	112	113	3.79
208	BR13127-4R-54	115	105	5.31
209	BR13131-4R-62	118	101	4.97
210	BR13115-4R-106	136	100	4.69
211	BR13105-4R-141	132	110	7.04
212	BR13106-4R-184	130	105	2.91
213	BR13106-4R-438	120	114	4.03
214	BR13106-4R-469	113	128	5.35
215	BR13111-4R-63	121	120	4.59
216	BR13113-4R-63	119	106	3.95
217	BR13115-4R-93	141	104	3.34
218	BR13121-4R-40	139	110	2.11
219	BR13122-4R-136	125	123	4.83
220	BR13125-4R-92	115	103	4.32
221	BR13115-4R-159	140	103	3.54
222	BR13115-4R-60	134	108	4.45
223	BR13110-4R-260	107	107	2.61
224	BR13123-4R-70	119	105	4.45
225	BR13123-4R-72	115	105	5.35
226	BR13124-4R-182	119	101	6.08
227	BR13124-4R-185	126	112	4.46
228	BR13124-4R-189	115	96	4.78
229	BR13124-4R-195	125	107	4.36
230	BR13124-4R-249	128	108	4.09
231	BR13124-4R-255	125	112	4.37
232	BR13124-4R-282	125	110	6.02
233	BR13124-4R-314	120	111	5.65
234	BR13103-4R-37	135	108	Plant selection
235	BR13103-4R-7	130	110	Plant selection
236	BR13105-4R-37	132	108	Plant selection
237	BR13104-4R-204	113	112	5.63
238	BRRI dhan73 (Ck)	119	123	4.13
239	BRRI dhan87 (S. Ck)	126	121	4.72
240	BR10 (Ck)	142	121	4.69
241	BR 23 (Ck)	152	117	4.33

Fig.6.5.1a: Pictorial view of OYT, Experimental plot, Satkhira, T. Aman, 2022

Fig.6.5.1b: Field view of Promising genotypes in OYT, STR, T. Aman 2022 at Gazipur

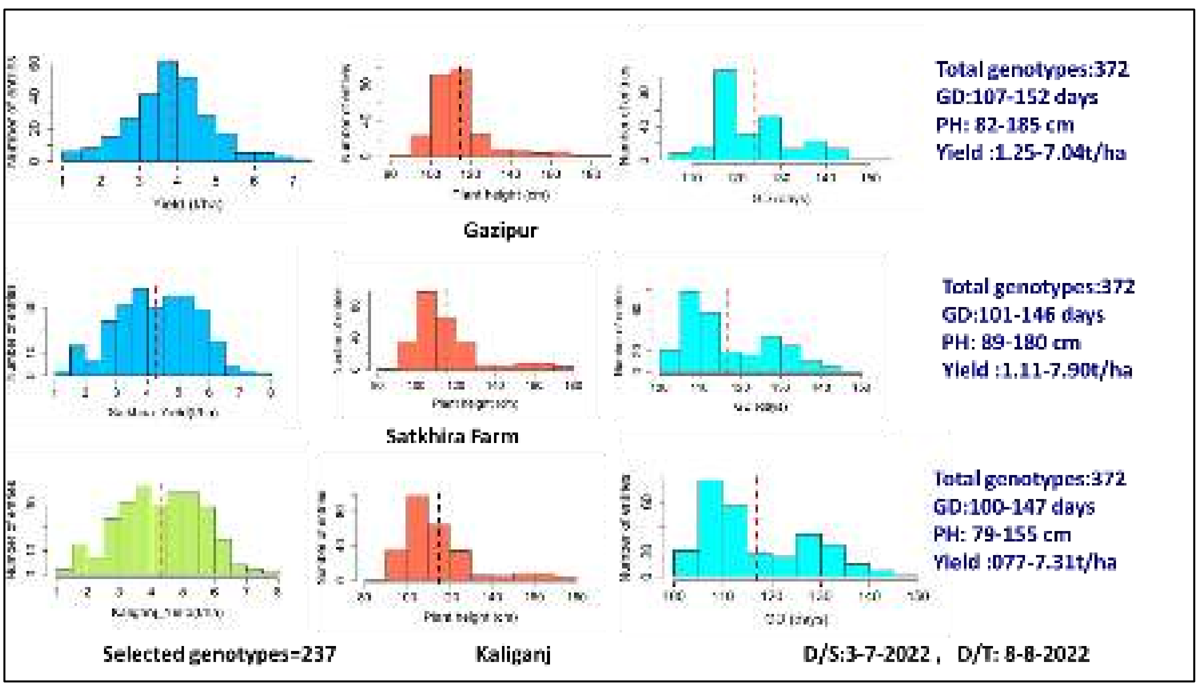


Fig 6.5.1c: Frequency distribution shows the number of individuals from OYT for growth duration, yield at Gazipur and Satkhira, T Aman 2022-23

Table 6.5.2: Yield and agronomic characters of the selected genotypes from OYT (IRSSTN), Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23, Satkhira

SL #	Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)	Effective tiller	PAcp
1	SV0483	117	97	4.58	11	5
2	SV0484	116	96	5.14	10	6
3	SV0486	113	101	2.92	10	7
4	SV0487*	110	111	5.23	12	7
5	SV0488	112	109	4.71	10	6
6	SV0489	115	95	4.06	10	7
7	SV0490	113	94	2.48	12	7
8	SV0510	132	97	3.69	12	6
9	SV0513	109	95	5.39	10	7
10	SV0708*	116	104	5.71	10	5
11	SV0720*	113	96	5.53	12	5
12	SV0760	116	95	5.10	11	6
13	SV0827	128	104	3.87	11	5
14	SV0837	114	100	4.83	10	5
15	SV0839	113	117	3.89	10	7

16	SV0845	129	149	5.22	9	7
17	SV0846	125	105	4.60	9	7
18	SV1101*	119	93	5.66	9	6
19	BRRI dhan73	129	99	5.29	12	5
20	BRRI dhan87	114	125	4.63	10	5
	LSD <0.05	5.75	12.10	3.04	2.38	1.35
	H2b	0.91	0.89	0.30	-	0.70

***Selected genotypes**

Table 6.5.3: Yield and agronomic characters of the selected 43 genotypes in OYT, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23 at Gazipur and Satkhira

Sl#	Designation	Gazipur			Satkhira			PAcp	
		GD (days)	PH (cm)	*Yield (t/ha)	GD (days)	PH (cm)	*Yield (t/ha)	Satkhira	Gazipur
1	BR13197-4R-24	160	100	5.88	142	108	4.86	7	5
2	BR13197-4R-30	153	97	5.93	138	99	5.59	5	5
3	BR13197-4R-63	157	100	7.10	142	105	5.23	7	5
4	BR13199-4R-136	146	109	7.78	139	105	5.48	7	5
5	BR13201-4R-103	142	112	8.99	132	96	3.88	7	5
6	BR13201-4R-15	143	101	6.52	138	100	2.35	9	5
7	BR13201-4R-16	152	108	7.04	146	115	5.32	7	5
8	BR13201-4R-18	147	95	6.98	136	97	7.2	7	6
9	BR13201-4R-196	141	90	8.81	136	99	2.42	7	5
10	BR13201-4R-219	144	108	8.80	136	100	3.3	7	3
11	BR13201-4R-249	148	114	9.13	140	121	5.19	7	5
12	BR13201-4R-250	148	115	6.30	147	111	3.88	7	5
13	BR13201-4R-268	142	103	9.99	134	100	6.18	7	5
14	BR13201-4R-27	153	105	7.96	142	112	2.85	7	5
15	BR13201-4R-287	139	98	7.61	135	102	3.19	7	5
16	BR13201-4R-296	152	105	6.35	146	105	5.66	7	6
17	BR13201-4R-299	143	101	7.43	137	102	4.25	7	3
18	BR13201-4R-30	140	102	7.28	135	100	5.06	7	5
19	BR13201-4R-304	142	106	8.85	135	111	3.72	7	5
20	BR13201-4R-61	137	88	7.72	134	108	5	7	3
21	BR13201-4R-91	137	102	7.47	136	102	3.46	7	5
22	BR13201-4R-98	153	112	9.97	146	104	4.82	7	5
23	BR13204-4R-96	141	109	7.71	141	104	4.36	7	5
24	BR13205-4R-1	144	96	6.33	136	102	4.26	7	5
25	BR13205-4R-179	153	106	5.94	147	96	3.55	7	5
26	BR13205-4R-188	149	108	10.15	138	102	5.6	5	5
27	BR13205-4R-190	144	90	6.67	138	97	3.26	7	5
28	BR13205-4R-240	152	112	5.70	146	106	3.3	7	5
29	BR13206-4R-120	137	111	7.68	134	106	4.63	5	5
30	BR13206-4R-134	144	95	6.40	134	87	5.73	5	5
31	BR13206-4R-17	151	103	8.91	136	103	5.9	7	5
32	BR13206-4R-50	143	116	8.14	133	100	4.09	5	5
33	BR13206-4R-63	143	111	5.88	137	107	6.54	5	6
34	BR13207-4R-1	141	101	7.29	148	99	4.26	7	5
35	BR13208-4R-24	142	115	7.83	134	103	4.2	5	5
36	BR13208-4R-46	144	90	5.89	136	94	4.32	5	5
37	BR13208-4R-89	152	98	7.24	140	99	6.42	7	5
38	BR13209-4R-1	147	118	8.47	135	101	5.06	7	5
39	BR13210-4R-39	139	91	8.81	128	97	8.04	5	5
40	BR13215-4R-109	141	85	7.31	134	96	6.83	6	5
41	BR13218-4R-1	139	124	9.22	133	121	5.56	7	5
42	BR13218-4R-114	138	126	6.07	133	110	5.54	7	6

43	BR13218-4R-66	141	117	7.70	133	109	3.07	7	5
44	BRRI dhan67(ck)	141	122	6.85	132	103	3.43	6	5
45	BRRI dhan89(ck)	152	108	6.96	143	106	4.18	6	5
46	BRRI dhan99(ck)	152	104	7.02	141	99	5.26	6	5
	LSD <0.05	4.6	20.1	4.6	9.57	7.44	3.59	2.76	
	H2b	0.95	0.58	0	0.68	0.9	0.25	0.26	
	Yield range		2.32-10.15			1.15-8.65			
	Salinity level (dSm^{-1}) 5.3-7.77								

Table6.5.4: Yield and agronomic characters of the selected genotypes in OYT (IRSSTN) under Salt-Tolerant Rice (STR) Breeding, Boro 2022-23, Satkhira

Sl	Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)	PAcp
1	SV0483*	136	101	5.43	7
2	SV0484*	133	94	6.00	6
3	SV0486*	135	97	5.30	7
4	SV0487	132	85	4.82	7
5	SV0488*	134	86	5.12	7
6	SV0489	133	87	2.90	7
7	SV0490	133	94	4.53	7
8	SV0513	134	85	2.72	7
9	SV0720	133	101	5.04	7
10	SV0827	138	110	4.47	7
11	SV0837	145	106	3.55	7
12	SV0839	133	110	3.84	7
13	SV0845	119	123	2.92	7
14	SV0846	133	148	1.79	7
15	SV1101	138	97	4.01	7
16	BRRI dhan67	126	106	5.24	5
17	BRRI dhan89	143	104	4.57	6
	LSD <0.05	2.86	2.16	0.64	1.0
	H2b	0.97	0.97	0.96	0.01

***Selected genotypes**

Experiment 6.6: Preliminary Yield Trial (PYT)

Principal Investigator: M. A. Rahman

Co-investigators: Hasina Khatun, R F Disha, Asif Rahman, A A Shoily and S M M Islam and T H Ansari

Specific objectives: Initial evaluation of breeding lines for yield and other agronomic characteristics in replicated trial.

Materials and methods: A total of two hundred eleven genotypes were tested in four PYTs trials along with BR23, BRRI dhan, BRRI dhan73 as tolerant checks and BRRI dhan87 as sensitive check in T. Aman 2022-23 at Gazipur, Kaliganj and Debhata. A total of 159 breeding lines were evaluated in three PYTs, at Debhata, Satkhira; Kaliganj, Satkhira and BRRI, Gazipur. BRRI dhan67 and BRRI dhan97 and BRRI dhan99 were used as tolerant checks and BRRI dhan89 as suceptable check. The unit plot size was 5.4 × 5 rows. The field layout was Alpha lattice design with two replications. Twenty-five and forty-day-old-seedlings were transplanted @ 1-2 seedlings with the spacing of 20 cm × 20 cm in T. Aman and Boro season, respectively. Fertilizers and crop management followed were the same as Experiment 6.1. Data were collected on plant height, days to flowering, days to maturity, PAcp, panicle per plant, and yield per plot.

Results and discussion: In T. Aman, considering yield, grain quality, earliness, out of 211 genotypes, a total of 107 were selected from PYT-1, PYT-2 PYT3 and PYT-4 (**Table 6.6.1, Table 6.6.2**, **Table 6.6.3, Table 6.6.3a** and **Table 6.6.4**). In PYT-1, the grain yield ranged from 2.05 t/ha to 8.17 t/ha at Gazipur, 1.53t/ha to 5.0 t/ha at Debhata and 0.31 t/ha to 6.61 t/ha at Kaliganj. The growth duration of the genotypes over the locations ranged from 114 days to 144 days. The average yield of genotypes over the locations ranges from 1.18 t/ha to 5.78 t/ha (**Table 6.6.1** and **Fig.6.6.1**). In PYT-2, the grain yield ranged from 2.43 t/ha to 4.99 t/ha at Gazipur, 0.73 t/ha to 4.88 t/ha at Debhata, and 0.70 t/ha to 4.54 t/ha at Kaliganj. The average yield range was from 1.19 t/ha to 4.18 t/ha and growth duration of the genotypes over the locations ranged from 110 days to 144 days (**Table 6.6.2** and **Fig.6.6.2**). In PYT-3, the grain yield ranged from 2.00 t/ha to 5.0 t/ha at Gazipur (Table 6.6.3) 1.90 t/ha to 5.09 t/ha at Kaliganj and 1.85 t/ha to 4.10 t/ha at Debhata. The average growth duration of the genotypes over the two locations ranged from 115 days to 133 days (**Table 6.6.3a).** The yield range of PYT-4, from 1.89t/ha to 4.75 t/ha at Gazipur, 0.98 t/ha to 4.52 t/ha at Debhata and 2.96 t/ha to 6.06 t/ha at kaliganj repectively (Table .6.6.4).

In Boro season, out of 159 genotypes, 45 genotypes were selected considering yield, grain quality, earliness from PYT-1 and PYT-2 (**Table 6.6.5 to 6.6.6**). The genotypes revealed a wide range of variations in yield over the locations. In PYT-1, the grain yield ranged from 1.68 t/ha to 4.36 t/ha at Gazipur, 1.63 t/ha to 5.43 t/ha at Satkhira farm and 2.95 t/ha to 5.63 t/ha at Debhata and the average growth duration of the genotypes ranged from 128 days to 148 days (**Table 6.6.5**). The average salinity level varied from 4.4 dSm^{-1} to 8.12 dSm^{-1} of the two location (**Fig. 6.6.1**). In PYT-2, the grain yield ranged from 2.17 t/ha to 7.38 t/ha at Gazipur, 1.96 t/ha to 6.49 t/ha at Satkhira farm and 2.71 to 4.50 t/ha at Debhata (**Table 6.6.6**). Predicted yield based on BLUP was estimated. Shrunk genotype means represent the addition of general mean and the best linear unbiased prediction (BLUP) of genotypes considered as a random-effect term in a mixed model solved using the residual maximum likelihood (REML) algorithm. The BLUP method is described by shrinkage properties, i.e., above-average individual means are shrunk downward toward the overall mean, whereas below-average individual means are shrunk upward toward the overall mean. Ranking of varieties tested on the basis of the same number of replicates remain unchanged. The lower the number of replicates, the greater the shrinkage effect. The shrinkage effect adjusts performance all the more as it is either extremely high or extremely low. The heritability (H2b) ranged from 51% to 80%. The H2b is important as it is mentioned in the breeder's equation to predict the response to selection. Also, the H2b is a descriptive measure used to assess the usefulness and precision of results from breeding lines evaluation trials. In Boro season, the most of genotypes in PYT-3 were damaged due to severe salinity at Debhata, therefore, the results were not shown in Table **(Fig.6.6.5)**

Table 6.6.1: Yield and agronomic traits of selected genotypes from PYT-1, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23

Sl No.	Designation	PH	GD	Grain yield (t/ha)			
		(cm)	(days)	Gazipur	Debhata	Kaliganj	Avreage
*1	BR12459-4R-127	112	127	4.19	4.49	2.67	3.38
*2	BR12459-4R-172	121	124	3.79	4.29	2.77	3.33
*3	BR12459-4R-225	122	129	3.20	1.86	3.83	3.12
4	BR12459-4R-228	112	126	3.37	4.80	1.81	3.24
*5	BR12459-4R-37	102	133	3.64	3.39	4.01	3.35
*6	BR12459-4R-54	107	122	3.66	2.43	Damage	3.12
7	BR12459-4R-69	112	131	4.61	3.28	Damage	3.34
8	BR12460-4R-1	107	126	3.64	2.98	2.93	3.19
9	BR12460-4R-100	109	119	2.77	4.80	1.40	3.13
10	BR12460-4R-28	105	123	3.16	4.04	2.07	3.16
11	BR12460-4R-41	96	119	3.34	3.43	0.98	3.00
12	BR12460-4R-50	108	129	4.05	4.37		3.41
13	BR12460-4R-72	108	124	4.17	3.45	1.41	3.14

14	BR12460-4R-98	113	119	3.38	3.10	5.76	3.48
15	BR12461-4R-28	108	133	2.12	2.56	1.45	2.83
16	BR12461-4R-6	107	121	4.31	3.04	2.93	3.27
*17	BR12461-4R-70	108	144	2.88	Damage	Damage	
*18	BR12462-4R-160	100	128	3.19	2.94	3.90	3.24
*19	BR12462-4R-204	102	122	3.84	2.58	4.19	3.31
*20	BR12462-4R-227	105	138	3.39	2.68	3.75	3.22
*21	BR12462-4R-241	108	136	4.15	4.22	5.84	3.69
*22	BR12462-4R-253	109	131	3.73	4.27	4.65	3.52
*23	BR12462-4R-82	120	129	3.95	4.95	6.61	3.83
24	BR12463-4R-12	95	112	2.35	3.74	1.76	3.01
25	BR12463-4R-14	93	114	4.03	1.66	2.97	3.10
26	BR12463-4R-144	113	124	3.21	2.94	2.31	3.07
27	BR12463-4R-179	101	112	3.32	2.88	1.17	2.96
28	BR12463-4R-23	106	118	3.10	4.43	2.24	3.22
29	BR12463-4R-231	109	113	3.21	3.06	2.52	3.11
30	BR12463-4R-286	110	118	3.57	3.08	2.81	3.18
31	BR12463-4R-305	108	116	3.42	3.16	3.04	3.20
32	BR12463-4R-312	98	120	2.97	Damage	Damage	3.16
33	BR12463-4R-396	110	115	3.64	2.28	damage	3.11
34	BR12463-4R-531	117	119	3.39	3.61	3.28	3.27
35	BR12463-4R-578	107	111	2.23	1.53	1.10	2.69
36	BR12464-4R-155	105	118	3.12	2.97	2.45	3.09
37	BR12464-4R-291	96	124	3.00	3.98	1.53	3.08
38	BR12466-4R-138	104	125	3.32	2.48	4.11	3.23
*39	BR12466-4R-148	109	123	3.41	2.43	2.52	3.06
40	BR12466-4R-189	99	120	3.31	3.40	2.20	3.13
41	BR12466-4R-249	103	127	3.80	5.00	2.96	3.43
*42	BR12466-4R-293	111	120	3.62	2.15	Damage	3.09
43	BR12466-4R-317	103	128	2.75	4.26	3.73	3.32
44	BR12466-4R-79	104	124	3.56	3.20	3.10	3.23
45	BR12466-4R-98	110	130	4.13	2.56	3.08	3.22
*46	BR12469-4R-147	107	113	2.72	3.49	3.68	3.23
47	BR12469-4R-191	106	122	3.02	5.00	1.78	3.22
48	BR12469-4R-235	110	114	3.13	3.51	2.77	3.18
49	BR12469-4R-259	103	115	2.81	3.11	3.27	3.15
50	BR12469-4R-292	102	121	3.33	4.37	2.40	3.25
*51	BR12469-4R-298	117	123	3.62	4.28	3.71	3.41
52	BR12470-4R-237	95	122	2.48	3.46	0.83	2.90
53	BR12471-4R-212	116	119	Damage	4.04	Damage	2.88
54	BR12471-4R-31	117	116	2.60	3.61	1.29	2.97
55	BR12473-4R-134	80	128	3.11	2.04	0.31	2.76
56	BR12473-4R-176	85	115	2.79	2.78	2.39	3.07
57	BR12474-4R-257	108	121	2.05	4.85	Damage	3.17
58	BR12474-4R-493	94	124	5.17	3.35	4.12	3.52
59	BRRI dhan73 (Ck)	126	119	3.06	4.37	3.91	3.39
60	BRRI dhan87 (Ck)	111	126	3.04	3.41	4.20	3.31
	$LSD_{0.05}$	11.0	8.6	1.6	1.2	1.2	1.5
	H2b (%)	81	88	90	78	89	39

***Selected genotypes**

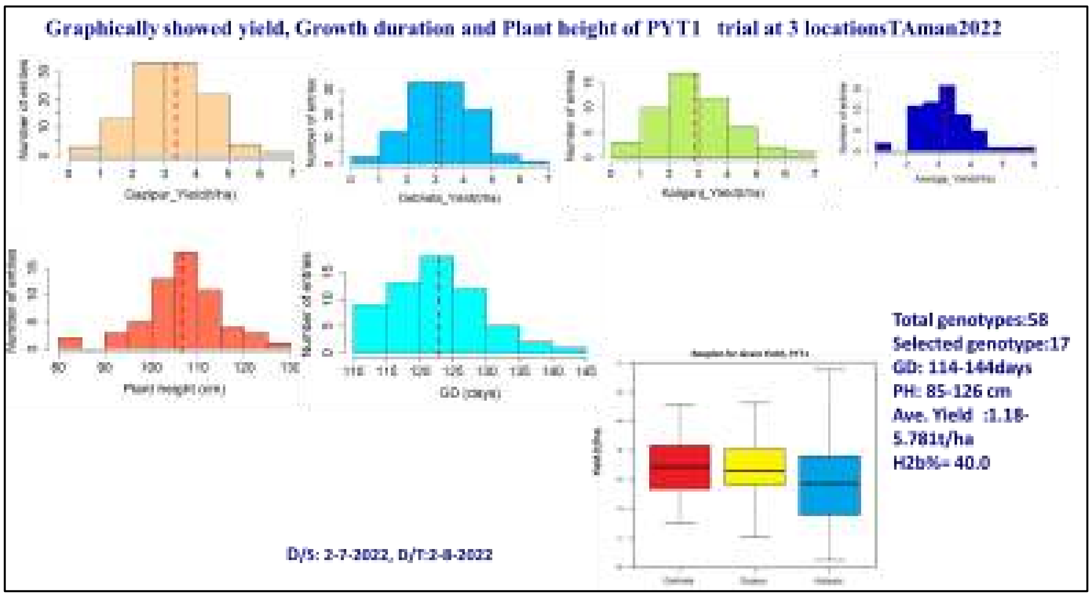


Fig 6.6.1: Frequency distribution of genotypes in PYT1 for growth duration, Plant height and grain yield, at Kaliganj, Debhata and Gazipur duringT. Aman 2022-23

Table 6.6.2: Yield and agronomic traits of selected genotypes from PYT-2, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23

Sl#	Designation	plant height (cm)	Growth duration (days)	Grain Yield (t/ha_BLUE)			
				Gazipur	Debhata	Kaliganj	Ave.GY (t/ha)
1*	BR12459-4R-103	104	129	3.88	2.21	3.64	3.24
2	BR12459-4R-105	114	129	4.25	3.99	3.60	3.94
3*	BR12459-4R-114	120	133	3.44	3.78	4.54	3.92
4*	BR12459-4R-118	120	132	4.14	3.88	4.16	4.06
5*	BR12459-4R-120	109	131	3.07	2.84	2.30	2.74
6	BR12459-4R-126	124	137	4.04	3.72		3.65
7*	BR12459-4R-14	123	132	4.50	4.51	3.74	4.25
8	BR12459-4R-203	100	134	3.40	4.47	1.90	3.26
9*	BR12459-4R-209	102	133	4.56	3.56	4.15	4.09
10	BR12459-4R-238	129	129	3.71	3.79	3.74	3.75
11	BR12459-4R-247	117	130	3.49	3.80	2.16	3.15
12*	BR12459-4R-26	114	131	3.89	3.55	2.60	3.35
13*	BR12459-4R-265	122	127	4.55	4.25	2.65	3.82
14	BR12459-4R-271	100	133	3.62	3.96	1.87	3.15
15*	BR12459-4R-283	95	131	3.33	2.85	2.25	2.81
16*	BR12459-4R-286	119	130	3.85	4.21	3.51	3.86
17	BR12459-4R-301	119	129	3.90	3.93	3.81	3.88
18*	BR12459-4R-33	89	137	3.60	3.11		3.11
19*	BR12459-4R-39	102	134	3.90	3.93	2.77	3.53
20*	BR12459-4R-40	107	133	4.31	2.80		3.32
21*	BR12459-4R-61	105	133	3.50	4.19	4.17	3.95
22	BR12459-4R-75	125	118	3.67	4.09	3.93	3.90
23*	BR12459-4R-80	114	133	3.78	4.88	3.28	3.98
24	BR12459-4R-85	112	130	3.29	2.33	3.77	3.13
25	BR12459-4R-88	104	132	3.51	2.76		2.90
26*	BR12460-4R-102	115	131	3.85	4.26	3.54	3.88
27*	BR12460-4R-120	122	133	3.22	3.28	3.65	3.38
28*	BR12460-4R-145	99	134	3.75	3.85	3.52	3.71
29*	BR12460-4R-189	116	131	3.48	4.09	3.43	3.67
30	BR12460-4R-29	108	130	3.29	4.53	2.95	3.59
31*	BR12460-4R-86	101	120	2.99	3.46	1.81	2.75
32	BR12462-4R-185	107	121	3.69	2.41	2.03	2.71

33	BR12463-4R-213	103	124	2.78	2.89		2.60
34	BR12463-4R-24	113	121	2.88	2.93	2.16	2.66
35	BR12463-4R-300	100	119	3.62	2.73	1.86	2.74
36*	BR12463-4R-308	104	117	2.90	1.50	1.94	2.11
37*	BR12463-4R-377	115	122	2.69	3.06	2.66	2.81
38	BR12464-4R-191	105	127	3.27	4.45	1.78	3.17
39	BR12464-4R-337	107	120	2.53	3.24	1.14	2.30
40	BR12464-4R-46	106	124	3.77	4.55	2.32	3.55
41	BR12464-4R-49	103	126	3.93	2.80	2.12	2.95
42	BR12466-4R-148	98	122	3.42	3.04	1.56	2.68
43*	BR12466-4R-175	118	121	2.87	4.78	3.02	3.56
44	BR12466-4R-93	105	124	2.99	2.85		2.68
45*	BR12468-4R-231	104	129	4.99	3.32	2.66	3.65
46	BR12469-4R-213	131	123	2.74	2.31	2.61	2.56
47*	BR12471-4R-98	106	122	4.89	3.14		3.78
48	BR12472-4R-203	112	124	3.52	3.49	2.34	3.12
49	BR12473-4R-82	124	121	3.01	3.29	2.91	3.07
50	BR12474-4R-147	97	117	3.44	2.90	1.91	2.75
51	BR12474-4R-401	87	126	3.21	0.73	2.80	2.25
52	BR12474-4R-515	101	127	3.83	2.84	1.66	2.78
53	BR12477-4R-212	110	118	2.86	1.68	0.70	1.75
54	BR12477-4R-394	103	127	2.48	2.62	1.50	2.20
55	BR12478-4R-69	110	114	3.50	2.83	2.85	3.06
56	BR12466-4R-45	97	124	2.43			2.09
57	BR12464-4R-7	104	117	4.01			3.67
58	BRRI dhan73 (Ck)	125	122	4.22	3.46	1.74	3.14
59	BRRI dhan87 (S. Ck)	111	129	4.26	2.77	3.16	3.39
	LSD <0.05	11.8	7.5	1.1	1.1	0.7	1.1
	H2b	0.84	0.80	0.55	0.77	0.91	0.68

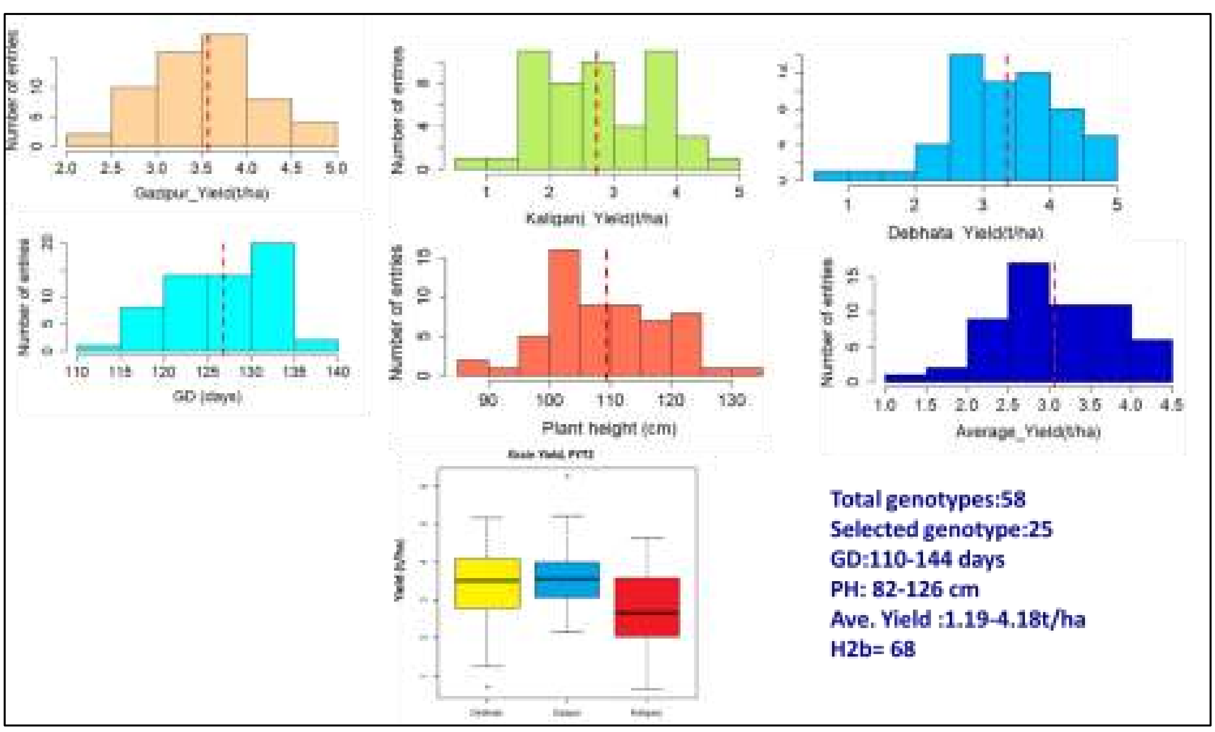


Fig 6.6.2: Frequency distribution of genotypes from PYT2 for growth duration, Plant height and yield, at Kaliganj, Debhata and Gazipur, T. Aman 2022-23

Table 6.6.3: Yield and agronomic characters of genotypes from PYT- 3 at Gazipur Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23

Sl	Designation	Growth duration (days)	Plant height (days)	Grain yield (t/ha)
*1	BR12459-4R-106	125	123	5.0
*2	BR12459-4R-113	126	139	4.8
*3	BR12459-4R-140	125	125	4.2
*4	BR12459-4R-16	123	114	4.8
*5	BR12459-4R-3	123	133	3.4
*6	BR12459-4R-41	124	128	3.3
7	BR12459-4R-9	126	105	3.5
8	BR12460-4R-107	117	110	3.4
9	BR12460-4R-116	123	135	3.6
*10	BR12460-4R-122	125	107	3.9
11	BR12460-4R-156	126	118	3.3
*12	BR12460-4R-24	126	104	3.5
*13	BR12460-4R-44	125	125	5.4
14	BR12460-4R-5	124	126	3.6
*15	BR12460-4R-9	125	103	3.4
*16	BR12461-4R-51	125	117	3.5
*17	BR12462-4R-147	124	115	5.4
*18	BR12462-4R-283	124	135	3.6
19	BR12463-4R-370	108	125	3.6
20	BR12463-4R-416	116	112	3.9
21	BR12463-4R-500	104	117	2.3
22	BR12464-4R-273	121	117	2.4
*23	BR12464-4R-298	120	110	3.3
24	BR12464-4R-345	124	108	2.0
25	BR12464-4R-86	121	128	4.9
26	BR12465-4R-126	125	118	4.2
*27	BR12465-4R-201	120	118	3.5
28	BR12465-4R-228	126	157	3.3
*29	BR12465-4R-28	124	105	3.5
30	BR12465-4R-30	124	100	3.6
31	BR12465-4R-63	126	100	4.1
32	BR12465-4R-68	127	98	3.6
*33	BR12465-4R-85	125	102	4.4
34	BR12466-4R-117	117	104	3.0
*35	BR12466-4R-179	124	105	3.2
36	BR12466-4R-20	124	99	3.1
37	BR12466-4R-42	123	100	2.8
38	BR12466-4R-49	123	116	3.5
39	BR12468-4R-317	137	96	2.1
*40	BR12468-4R-337	125	123	3.7
*41	BR12469-4R-204	115	117	3.4
42	BR12469-4R-228	120	114	2.9
43	BR12474-4R-273	121	104	3.2
*44	BR12474-4R-311	121	100	3.9
45	BR12474-4R-352	120	100	3.1
46	BR12474-4R-377	118	118	3.8
47	BR12474-4R-428	120	116	2.5
48	BR12474-4R-531	123	97	1.6

49	BR12477-4R-11	126	100	3.0
50	BR12477-4R-15	124	126	3.6
51	BR12477-4R-198	120	126	3.2
52	BR12477-4R-205	120	114	4.0
53	BR12477-4R-22	123	95	3.3
54	BR12477-4R-253	107	116	2.5
55	BR12477-4R-358	122	71	2.3
*56	BR12477-4R-371	125	125	5.0
57	BR12477-4R-383	124	130	4.2
58	BR12477-4R-43	120	80	2.8
59	BR12477-4R-64	117	123	3.6
60	BR13711-4R -1	120	95	3.5
*61	BR13711-4R -190	120	110	4.0
62	BR23 (Ck)	150	118	2.5
63	BRRI dhan30 (Ck)	124	118	3.2
64	BRRI dhan73 (Ck)	111	117	2.6
65	BRRI dhan87 (S. Ck)	123	110	2.9
	LSD <0.05	1.9	6.1	1.3
	H2b (%)	99	98	67

*Selected genotypes

Table 6.6.3a: Yield and agronomic characters of genotypes from PYT- 3 under Salt-Tolerant Rice (STR) Breeding at Satkhira, T. Aman 2022-23

SL	Designation	Growth duration (days)	Plant height (cm)	Grain Yield (t/ha_BLUE)		
				Kaliganj	Debhata	Average (t/ha)
1	BR12459-4R-106	131	104	4.61	2.33	3.47
*2	BR12459-4R-113	129	117	4.26	2.60	3.43
3	BR12459-4R-140	134	97	3.85		3.43
4	BR12460-4R-107	123	108	4.69	2.52	3.61
5	BR12460-4R-116	118	110	4.27	2.88	3.58
6	BR12460-4R-156	131	105	4.38	2.93	3.66
*7	BR12460-4R-24	131	105	2.70	3.84	3.27
8	BR12460-4R-44	133	112	3.47	3.3	3.38
9	BR12460-4R-5	128	116	3.89	2.64	3.26
10	BR12460-4R-9	126	102	4.19	3.02	3.6
*11	BR12462-4R-147	128	104	3.47	1.85	2.66
*12	BR12462-4R-283	133	95	3.18	3.23	3.21
13	BR12463-4R-416	122	103	4.60	2.89	3.74
14	BR12464-4R-273	126	89	3.46	4.00	3.73
15	BR12464-4R-298	124	95	2.95	2.23	2.59
16	BR12464-4R-345	130	104	5.06	2.94	4.00
17	BR12464-4R-86	130	103	3.72	3.01	3.36
*18	BR12465-4R-228	129	139	3.85	2.32	3.09
*19	BR12465-4R-28	128	96	4.74	3.52	4.13
20	BR12465-4R-30	127	88	4.19	4.25	4.22
21	BR12465-4R-68	127	90	3.10	2.03	2.56
*22	BR12466-4R-179	130	85	4.24	2.29	3.27
23	BR12466-4R-42	121	101	4.56	2.13	3.34
*24	BR12468-4R-337	128	108	4.01	2.40	3.20
25	BR12469-4R-204	115	111	3.00	2.79	2.89
26	BR12474-4R-377	126	88	3.11	3.81	3.46
27	BR12474-4R-428	124	93	4.20	3.78	3.99
28	BR12477-4R-15	128	104	4.41	3.77	4.09

29	BR12477-4R-205	119	107	2.88	3.27	3.07
*30	BR12477-4R-371	125	103	4.14	3.53	3.84
31	BR12477-4R-383	124	108	4.19	4.10	4.15
32	BR12477-4R-43	129	75	1.90	3.06	2.48
33	BR13711-4R -1	122	99	5.09	3.38	4.24
34	BR23	126	106	4.17		3.74
35	BRRI dhan73	136	106	3.30	3.30	3.30
36	BRRI dhan87	129	110	4.31	2.06	3.18
	LSD<0.05	6.07	12.9	1.66	0.62	1.37
	H2b (%)	85	89	14	88	51

*Selected genotypes

Table 6.6.4: Yield and agronomic performance of the genotypes tested in PYT-4, Salt-Tolerant Rice (STR) Breeding, TAman 2022-23

Sl	Designation	GD (day)	PH (cm)	Grain Yield (t/ha) BLUE			
				Gazipur	Debhata	Kaliganj	*Average
*1	BR12459-4R-117	142	119	3.61	4.52	3.55	4.04
2	BR12459-4R-119	133	102	3.85	3.29	3.53	3.41
3	BR12459-4R-122	132	120	1.89	3.62	4.43	4.02
4	BR12459-4R-183	135	112	3.74	1.96	4.08	3.02
5	BR12459-4R-205	131	117	3.86	3.52	4.66	4.09
*6	BR12459-4R-277	136	100	4.16	3.43	4.49	3.96
7	BR12459-4R-44	129	101	3.82	1.15	4.11	2.63
*8	BR12459-4R-97	129	121	3.29	3.86	4.48	4.17
9	BR12460-4R-12	134	88	3.31	1.38	4.01	2.70
*10	BR12460-4R-66	128	93	3.16	1.62	2.59	2.10
11	BR12460-4R-91	132	110	4.24	4.30	3.76	4.03
12	BR12461-4R-23	131	98	3.94	4.40	4.03	4.22
13	BR12462-4R-358	133	96	4.70	0.98	3.64	2.31
14	BR12463-4R-527	124	101	2.26	2.57	2.96	2.76
15	BR12464-4R-134	137	98	3.18	1.22	3.48	2.35
*16	BR12465-4R-100	131	97	3.52	1.90	4.25	3.08
*17	BR12465-4R-113	132	98	4.32	3.32	3.34	3.33
18	BR12465-4R-118	130	102	4.16	3.75	3.64	3.70
*19	BR12465-4R-132	139	97	4.04	2.72	4.44	3.58
20	BR12465-4R-14	138	93	2.93	1.06	3.64	2.35
21	BR12465-4R-170	132	95	3.39	3.73	4.41	4.07
22	BR12465-4R-18	136	98	4.14	2.91	4.37	3.64
23	BR12465-4R-181	135	96	4.74	2.06	4.63	3.34
24	BR12465-4R-22	132	106	3.82	3.86	3.76	3.81
25	BR12465-4R-220	133	100	3.20	3.34	4.81	4.08
*26	BR12465-4R-223	133	98	3.69	3.58	4.16	3.87
27	BR12465-4R-231	132	100	4.12	4.41	6.07	5.24
*28	BR12465-4R-26	135	97	4.53	1.85	3.78	2.82
29	BR12465-4R-27	130	103	2.65	2.51	4.01	3.26
30	BR12465-4R-309	133	103	3.99	2.59	3.50	3.04
31	BR12465-4R-312	136	100	3.40	3.51	4.58	4.05
*32	BR12465-4R-321	130	94	3.91	4.37	4.78	4.57
33	BR12465-4R-38	135	112	3.51	2.61	3.08	2.85
34	BR12465-4R-50	134	101	2.89	2.61	3.83	3.22
35	BR12465-4R-59	130	98	3.73	3.69	4.18	3.93
*36	BR12465-4R-61	134	100	4.12	3.94	4.05	3.99
37	BR12465-4R-91	132	109	3.93	4.47	4.96	4.71

38	BR12466-4R-106	129	100	4.52	2.55	4.59	3.57
39	BR12466-4R-134	140	107	3.95	3.37	5.12	4.25
40	BR12466-4R-14	129	89	3.69	2.56	5.08	3.82
*41	BR12466-4R-159	132	102	4.00	3.46	4.03	3.74
42	BR12466-4R-167	135	108	4.75	3.19	4.74	3.97
*43	BR12466-4R-169	124	116	3.41	3.32	5.54	4.43
44	BR12466-4R-180	134	102	4.57	1.94	4.35	3.14
*45	BR12466-4R-275	124	99	4.03	3.76	4.30	4.03
46	BR12466-4R-61	132	88	3.44	2.19	4.77	3.48
47	BR12469-4R-18	124	111	2.44	2.33	3.48	2.91
48	BR12473-4R-214	127	88	3.25	2.85	3.29	3.07
*49	BR12477-4R-13	131	113	4.60	3.84	3.58	3.71
*50	BR12477-4R-186	133	113	4.44	2.81	4.11	3.46
51	BR12477-4R-73	130	117	4.15	3.32	3.25	3.29
52	BR12459-4R-1	129	103	4.66			
53	BR12459-4R-241	139	109	3.59		4.47	4.47
54	BR12459-4R-45	137	122	4.20		4.68	4.68
55	BR12465-4R-130	146	99	3.76		3.85	3.85
56	BR23 (Ck)	143	107	2.51	1.98	3.16	2.57
57	BRRI dhan30 (Ck)	140	111	3.50	4.59	3.51	4.05
*58	BRRI dhan73 (Ck)	119	112	3.54	2.75	4.12	3.44
*59	BRRI dhan87 (S. Ck)	128	106	2.77	3.27	4.66	3.96
	LSD <0.05	7.06	8.41	1.10	0.54	0.97	0.98
	H2b (%)	77	88	62	97	71	48

*Selected genotypes, *Ave.= Average of two locations excluding Gazipur

Table 6.6.5: Yield and agronomic performance of the genotypes tested in PYT-1, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23 at Gazipur

Sl	Designation	GD (days)	PH (cm)	Yield (t/ha)
1	BR12639-4R-43	160	115	2.07
2	BR12639-4R-70	160	128	2.67
3	BR12640-4R-231	157	110	3.51
4	BR12640-4R-250	156	110	3.19
5	BR12641-4R-13	156	105	2.18
6	BR12641-4R-18	157	102	3.10
7	BR12641-4R-22	155	121	2.41
8	BR12641-4R-68	161	111	3.41
9	BR12642-4R-25	161	115	2.56
10	BR12642-4R-56-P1	161	119	1.68
11	BR12642-4R-56-P2	159	130	2.86
12	BR12642-4R-89	151	118	2.54
13	BR12645-4R-88	162	108	2.18
14	BR12645-4R-91	157	118	2.86
15	BR12646-4R-39	157	104	3.24
16	BR12650-4R-13	161	126	2.39
17	BR12652-4R-32	152	116	2.71
18	BR12652-4R-52	157	119	3.20
19	BR12653-4R-140	158	109	2.53
20	BR12655-4R-143	157	113	2.40
21	BR12655-4R-192	154	116	2.23
22	BR12656-4R-63	157	108	3.25
23	BR12657-4R-105	157	118	4.36
24	BR12658-4R-263	157	109	2.49

25	BR12660-4R-21	149	108	2.53
26	BR29-Backcross-4R-17	155	90	3.15
27	BR29-Backcross-4R-30	156	128	2.99
28	BRRI dhan67 (Ck)	148	112	2.49
29	BRRI dhan89 (S. Ck)	156	110	3.30
30	BRRI dhan99 (Ck)	157	108	2.77
	LSD <0.05	7.50	2.61	1.61
	H2b	0.73	0.99	0.60

Table 6.6.4 Yield and agronomic performance of the genotypes tested in PYT-1, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23 at Satkhira

Sl	Designation	GD (days)	PH (cm)	Yield (t/ha)			PA cp	Salinity reaction at field
				BRRI Sat	Debhata	Mean		
				BLUE	BLUE	BLUE		
1	BR 12639-4R-17	131	91	1.73	3.75	2.740	8	40% salt damage
*2	BR 12639-4R-216	140	98	5.49	4.66	5.078	6	
3	BR 12639-4R-230	141	107	4.91	3.63	4.270	7	100% salt damage
4	BR 12639-4R-56	134	105	2.17	4.74	3.455	7	40% salt damage
*5	BR12640-4R-113	136	102	3.43	4.31	3.870	7	50% salt damage
6	BR12640-4R-231	139	95	3.38	4.81	4.095	7	30% rat damage
7	BR12640-4R-250	146	98	4.90	4.01	4.453	7	
8	BR12643-4R-135	128	108	4.60	3.66	4.130	8	
9	BR12643-4R-57	142	94	2.55	3.70	3.123	6	65% salt damage
*10	BR12645-4R-123	142	92	2.35	4.22	3.285	8	40% salt damage
11	BR12645-4R-125	148	95	3.59	4.59	4.088	7	
12	BR12645-4R-151	135	106	4.58	4.51	4.543	6	
*13	BR12645-4R-154	138	96		2.95	2.451	8	100% salt damage
*14	BR12645-4R-71	134	100	2.95	3.78	3.363	6	
15	BR12645-4R-82	142	98	3.85	3.91	3.878	7	Missing
16	BR12645-4R-88	143	91	3.11	4.05	3.580	7	100% salt damage
17	BR12645-4R-91	137	94	3.16		3.654	7	50% salt damage
*18	BR12649-4R-121	140	108	2.69	4.91	3.800	7	40% salt damage
*19	BR12650-4R-13	141	106	4.21	5.29	4.750	6	
20	BR12650-4R-186	131	94	3.09	4.60	3.845	7	60% salt damage
21	BR12650-4R-196	132	107	3.99		4.484	6	50% rat damage
22	BR12652-4R-107	137	96	2.54	4.50	3.520	8	
*23	BR12652-4R-32	143	98	NA	4.33	3.831	7	100% salt damage
24	BR12652-4R-40	134	106	2.40		2.894	7	50% salt damage
25	BR12652-4R-81	137	101	2.87	4.21	3.535	7	
26	BR12653-4R-140	129	87	2.99	4.18	3.585	6	30% rat damage
27	BR12655-4R-1	140	95	2.84	3.13	2.980	7	100% salt damage
*28	BR12655-4R-143	142	93	4.77	3.69	4.228	7	30% salt damage
*29	BR12655-4R-172	144	88	NA	3.27	2.776	7	100% salt damage
30	BR12655-4R-192	136	95	5.09	4.14	4.613	7	
31	BR12655-4R-32	141	92	4.76	4.97	4.863	6	20% salt damage
32	BR12655-4R-91	146	99	4.56		5.054	6	
*33	BR12656-4R-125	135	106	1.80	5.42	3.608	8	80% salt damage
34	BR12656-4R-134	133	79	4.74	3.81	4.275	6	
35	BR12656-4R-20	138	90	3.90	4.55	4.225	5	
36	BR12656-4R-63	138	96	2.29	4.70	3.493	6	70% salt damage
37	BR12657-4R-105	140	99	2.44	3.86	3.150	8	50% salt damage
*38	BR12658-4R-257	138	97	3.72	4.33	4.025	6	100% salt damage

39	BR12658-4R-263	146	108	1.63	4.84	3.230	6	
*40	BR12660-4R-21	142	106	5.11	5.63	5.368	6	
*41	BR12660-4R-62	138	101	2.10	5.30	3.698	6	70% salt damage
42	BR29 backcross-4R-2	131	91		4.49	3.991	6	100% salt damage
*43	BR29 backcross-4R-28	136	105		4.11	3.616	7	100% salt damage
*44	BR29 backcross-4R-56	136	106	2.90	5.02	3.955	6	50% salt damage
45	BRRI dhan67 (Ck)	133	100	3.80	5.46	4.630	6	20% salt damage
46	BRRI dhan89 (S. Ck)	146	105	4.60	5.40	5.000	6	
47	BRRI dhan97 (Ck)	140	101	3.26	5.87	4.563	6	
48	BRRI dhan99 (Ck)	140	101	3.03	4.79	3.908	6	
	LSD <0.05	7.20	10.9	1.90	0.80	1.90		
	H2b	0.75	0.64	0.59	0.84	0.50		

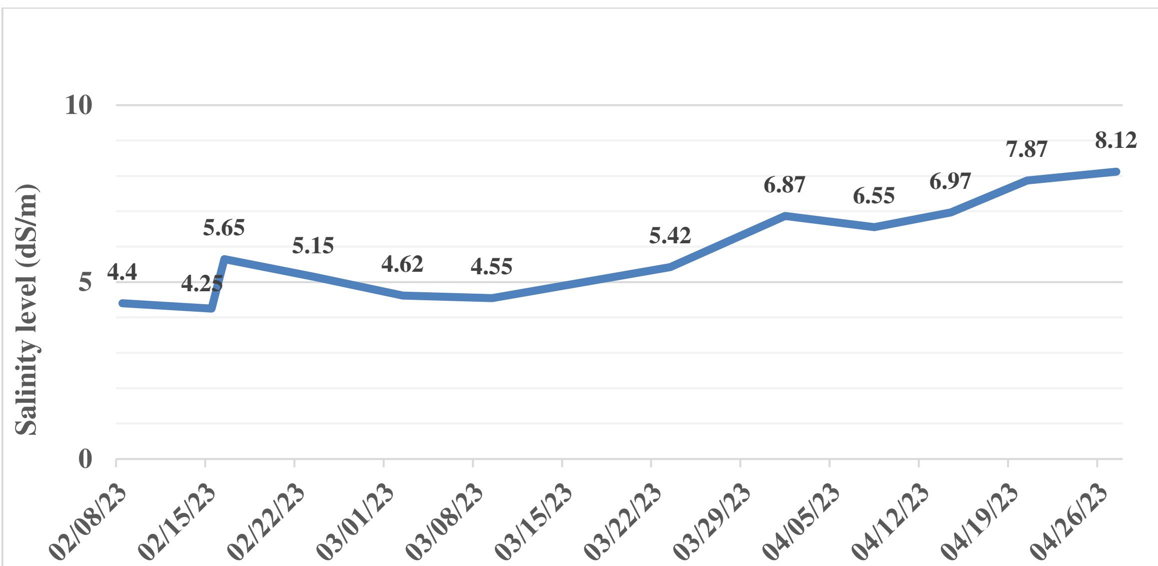


Fig. 6.6.3: Salinity dynamics of PYT-1 and 2 experimental fields at Debhata, Satkhira during Boro 2022-23

Table 6.6.6: Yield and agronomic performance of the genotypes tested in PYT-2, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23

Sl	Designation	GD (days)	Yield (t/ha) Gazipur		GD (day)	PH (cm)	Yield (t/ha)				Salinity damage (%)
							BRRI Sat	Deb	Mean		
			BLUE	BLUP			BLUE	BLUE	BLUE	BLUP	
***1	BR12639-4R-126	137	3.68	4.40	135	117	3.23	3.47	3.35	3.96	30% salt damage both rep
2	BR12639-4R-145	144	5.43	5.29	139	128	4.13	4.46	4.30	3.96	
3	BR12639-4R-155	145	6.97	6.10	140	122	4.07	4.11	4.09	3.96	60% salt damage, 2nd
*4	BR12639-4R-17	137	7.32	6.28	131	106	5.53	2.87	4.20	3.96	25% salt damage, both rep
5	BR12639-4R-216	137	3.92	4.55	132	115	6.49	3.56	5.03	3.96	10% rat damage
**6	BR12639-4R-219	144	4.68	4.96	140	117	3.78	2.95	3.37	3.96	35% salt damage
7	BR12639-4R-25	145	5.21	5.20	132	103	5.75	4.37	5.06	3.96	20% salt damage, 2nd
8	BR12639-4R-93	143	4.38	4.80	135	113	3.73	4.12	3.92	3.96	40% salt damage

9	BR12640 -4R-9	151	4.47	4.83	140	103	3.64	3.72	3.68	3.96	35% salt damage, both rep
**10	BR12642 -4R-95	142	6.23	5.72	133	90	2.94	4.32	3.63	3.96	50% salt damage, rep2
11	BR12643 -4R-159	144	4.71	4.92	140	122	2.46	4.25	3.35	3.96	80% salt damage, 2nd rep
*12	BR12645 -4R-118	144	3.26	4.20	136	103	2.01	4.50	3.25	3.96	100% salt damage, 2nd rep
13	BR12645 -4R-166	134	6.26	5.75	136	114	4.92	4.45	4.69	3.96	25% salt damage, both rep
14	BR12645 -4R-47	139	6.57	5.91	129	85	3.33	4.38	3.86	3.96	70% salt damage, 2nd rep
***15	BR12645 -4R-71	145	5.91	5.56	134	108	4.81	4.02	4.42	3.96	
**16	BR12645 -4R-81	146	2.17	3.64	142	104	3.79	3.85	3.82	3.96	70% salt damage, 2ndrep
17	BR12646 -4R-123	146	3.23	4.18	143	108	4.92	4.40	4.66	3.96	40% salt damage, rep2
18	BR12646 -4R-48	144	5.53	5.34	145	108	2.22		2.22	3.96	
19	BR12646 -4R-5	134	5.59	5.37	134	112	5.10	3.75	4.43	3.96	20% salt damage, 2nd rep
20	BR12646 -4R-78	122	7.17	6.18	130	84	4.67	4.08	4.38	3.96	
21	BR12650 -4R-1	138	6.40	5.80	136	109	3.21	3.61	3.41	3.96	50% salt damage
*22	BR12650 -4R-123	134	5.87	5.56	135	106	2.06	4.60	3.33	3.96	70% salt damage both rep
23	BR12650 -4R-158	134	7.38	6.29	127	90	2.54	4.24	3.39	3.96	60% salt damage, 2nd
24	BR12650 -4R-196	145	6.18	5.73	134	149	2.41	4.23	3.32	3.96	40% salt damage, 2nd rep
**	BR12650 -4R-24	129	5.96	5.58	133	112	3.10	3.93	3.51	3.96	100% salt damage 2nd rep
**26	BR12650 -4R-36	142	6.17	5.67	137	108	3.20	4.12	3.66	3.96	50% salt damage, rep2
*27	BR12650 -4R-49	136	4.96	5.07	135	109	3.61	3.90	3.75	3.96	20% salt damage, 60% salt damage 2nd rep
**28	BR12650 -4R-55	137	7.11	6.16	135	106	5.94	4.31	5.12	3.96	
*29	BR12650 -4R-72	140	4.88	5.03	136	112	3.83	4.76	4.30	3.96	45% salt damage, 2nd rep
*30	BR12650 -4R-77	138	4.57	4.86	136	112	3.87	3.71	3.79	3.96	70% salt damage
**31	BR12650 -4R-82	137	6.51	5.87	139	103	4.92	3.05	3.98	3.96	55% salt damage, 2nd rep
**32	BR12650 -4R-85	145	5.20	5.20	137	126	4.03	4.20	4.11	3.96	50% salt damage 2nd rep
33	BR12651 -4R-40	137	5.49	5.35	139	122	4.25	4.18	4.21	3.96	50% salt damage, 2nd
34	BR12652 -4R-43	148	3.76	4.44	144	101	3.16	4.02	3.59	3.96	40% salt damage, both rep
35	BR12653 -4R-42	148	3.18	4.13	142	120	6.32	4.38	5.35	3.96	
**36	BR12653 -4R-51	144	4.48	4.85	138	103	4.34	3.44	3.89	3.96	30% salt damage, both rep
37	BR12655 -4R-239	145	3.37	4.26	133	88	5.64	3.65	4.65	3.96	
38	BR12656 -4R138	138	5.61	5.38	136	102	5.27	4.33	4.80	3.96	
39	BR12657 -4R-178	148	3.60	4.36	144	105	1.96	3.91	2.93	3.96	40% salt damage, 100% 2nd rep
40	BR12657 -4R-180	143	6.09	5.63	147	118	2.44	3.82	3.13	3.96	70% salt damage, 2nd

41	BR12657 -4R-201	136	5.56	5.38	136	103	5.36	4.22	4.79	3.96	
*42	BR12658 -4R-12	145	4.77	4.97	138	112	3.41	3.37	3.39	3.96	60% salt damage both rep
**43	BR12658 -4R-143	137	6.84	6.03	136	111	3.03	3.93	3.48	3.96	25% & 60% rat damage both rep
	BR12658 -4R-150	150	3.43	4.29							
**44	BR12658 -4R-159	145	5.20	5.20	138	106	5.10	2.71	3.91	3.96	
**45	BR12658 -4R-242	139	4.64	4.92	141	117	2.37	3.38	2.87	3.96	50% salt damage, 100% 2nd rep
**46	BR12658 -4R-255	137	6.71	5.96	136	111	6.03	3.84	4.93	3.96	
47	BR12660 -4R-64	148	2.94	4.04	144	108	4.58	3.56	4.07	3.96	35% salt damage, 2nd rep
**48	BR12661 -4R-21	139	4.61	4.91	133	105	4.00	3.70	3.85	3.96	35% salt damage, both rep
*49	BR12661 -4R-33	138	4.13	4.64	135	116	4.28	4.02	4.15	3.96	35% salt damage
*50	BR29BC -4R-3	144	6.53	5.89	140	96	3.94	4.03	3.98	3.96	
51	BRRI dhan67	125	6.63	5.90	135	100	4.22	4.23	4.23	3.96	60% salt damage, 2nd
52	BRRI dhan89	147	3.90	4.56	150	104	4.40	3.98	4.19	3.96	
53	BRRI dhan99	144	4.98	5.11	140	100	6.61	4.06	5.33	3.96	40% salt damage, 2nd
LSD <0.05		3.2	2.5		4.8	20.7	2.6	0.6	1.9		
H2b		0.96	0.51		0.86	0.57	0.54	0.80	0.43	0.51	

Fig 6.6.4. Pictorial view of PYT-1 & 2 experimental fields at Debhata, and Satkhira farm (upper two picture) and Kaliganj (lower two image) during Boro 2022-23

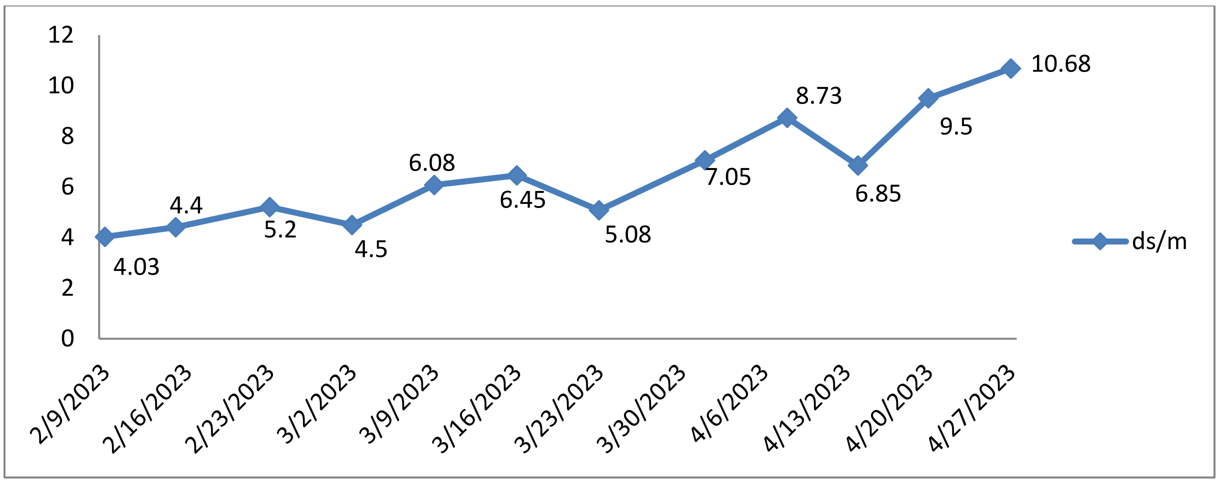


Fig. 6.6.5 Salinity dynamics of PYT3 experimental fields at Debhata, Satkhira during Boro 2022-23

Experiment 6.7: Advanced Yield Trial (AYT)

Principal Investigator: M. A. Rahman

Co-investigators: Hasina Khatun, R F Disha, Asif Rahman, A A Shoily and S M M Islam and T H Ansari

Specific objective: Confirmatory evaluation of selected genotypes from PYT for yield and other agronomic traits in replicated trial

Materials and Methods: One hundres five and 53 genotypes were evaluated in two AYTs in T. Aman and two AYTs in Boro season, respectively at BRRI Gazipur, Kaliganj, Satkhira farm and Debhata. BRRI dhan73 and BRRI dhan87 were used as standard checks in T. Aman season whereas BRRI dhan99, BRRI dhan97, BRRI dhan67 and BRRI dhan89 were used as checks in Boro season. The unit plot size was 5.4 m × 8 rows. The trial layout was done using Alpha lattice design with two replications. Twenty-five and forty-day-old-seedlings were transplanted @ 2-3 seedlings with the spacing of 20 cm × 20 cm in T. Aman and Boro season, respectively. Fertilizers and crop management followed were the same as Experiment 6.1. Data were collected on plant height, days to flowering, days to maturity, PAcp, panicle per plant, and yield per plot.

Results and discussion: In T. Aman season, a total 45 genoypes were selected from AYT1 and AYT2 compared with respective checks (**Table 6.7.1 and Tale 6.7.2**). In T Aman, the genotypes showed a wide range of variations in yield in different locations. In AYT-1, the grain yield ranged from 1.67 t/ha to 4.36 t/ha at Gazipur, 1.41 t/ha to 3.96 t/ha at Debhata and 1.17 t/ha to 4.55 t/ha at Kaliganj. The average growth duration of the genotypes over the locations ranged from 108 days to132 days (**Table 6.7.1**). The yield of AYT2 the grain yield ranged from 1.97 t/ha to 4.31 t/ha at Gazipur, 1.94 t/ha to 4.47 t/ha at Debhata and 1.44 t/ha to 6.86 t/ha at Kaliganj. The average growth duration of the genotypes over the locations ranged from 108 days to137 days (**Table 6.7.2**).

In Boro**,** thirty-one genotypes were selected considering yield, earliness and phenotypic acceptability, and yield of the selected genotypes were shown in **Table 6.7.3 to 6.7.4**. The genotypes showed wide range of variations in yield in different locations. In AYT-1, the grain yield ranged from 2.86 t/ha to 7.70 t/ha at Gazipur, 3.08/ha to 6.64 t/ha at Satkhira farm and 3.12 t/ha to 5.25 t/ha at Debhata (**Table 6.7.3**). The average yield of the genotypes over the locations ranged from 3.68 t/ha to 5.59t/ha (BLUE) with average growth duration ranging from 132 days to 143 days (**Table 6.7.3**). The check variety, BRRI dhan89 yielded 4.80 t/ha with 136 days' growth duration, BRRI dhan67 yielded 5.59 t/ha with 132 days growth duration, BRRI dhan97 yielded 6.64 t/ha with 136 days growth duration at Satkhira (**Table.6.7.3**).

In AYT-2, the grain yield ranged from 2.53 t/ha to 7.69 t/ha at Gazipur, 3.51 t/ha to 6.26 t/ha at Satkhira farm and 4.10 t/ha to 5.75 t/ha at Debhata (**Table 6.7.3**). The average yield of the genotypes over the locations ranged from 3.93 t/ha to 6.02 t/ha with average growth duration ranging from 131 days to 146 days. The check variety, BRRI dhan89 yielded 4.04 t/ha with 142 days' growth duration, BRRI dhan67 yielded 5.53 t/ha with 131 days growth duration, BRRI dhan97 yielded 5.94 t/ha with 137 days growth duration at Satkhira (**Table.6.7.4**).

Table 6.7.1: Yield and agronomic performance of the genotypes tested in AYT-1, Salt-Tolerant Rice (STR) Breeding, T. Aman 2022-23

Sl#	Designation	GD (days)	PH (Cm)	Grain Yield (t/ha_BLUE)			
				Gazipur	Debata	Kaliganj	Mean
1	BR11388-4R-103	117	108	2.61	3.70	4.40	3.57
*2	BR11388-4R-125	127	112	3.90	2.45	3.02	3.12
3	BR11388-4R-292	123	98	2.51	2.67	2.91	2.70
4	BR11391-4R-144	117	113	2.82	1.41	2.19	2.14
5	BR11392-3R-184	122	120	2.56	2.54	2.71	2.60
6	BR11392-4R-123	116	100	2.53	2.12	1.89	2.18
7	BR11394-4R-157	115	97	2.76	2.37	2.71	2.61
*8	BR11395-4R-62	111	113	2.81	2.73	2.76	2.77
9	BR11395-4R-65	110	120	2.37	2.95	1.66	2.32
*10	BR11395-4R-86	124	94	3.49	2.20	1.17	2.28
11	BR11910-4R-12	132	102	3.75		1.78	2.82
12	BR11910-4R-94	129	96	3.12		3.15	3.19
13	BR11913-4R-315	118	106	2.27	3.01	2.26	2.51
*14	BR11919-4R-135	120	102	2.12	3.32	2.61	2.68
*15	BR11920-4R-226	111	104	3.25	2.88	2.45	2.86
16	BR11920-4R-478	121	96	2.97	2.53	2.19	2.56
17	BR11920-4R-521	117	108	3.13	3.01	1.48	2.54
18	BR11920-4R-624	113	96		2.52	2.54	2.62
*19	BR11921-4R-100	110	99	4.36	3.14	2.07	3.19
20	BR11921-4R-117	112	110	3.48	3.35	1.30	2.71
21	BR11921-4R-143	112	94	2.52	3.10	2.12	2.58
22	BR11921-4R-196	116	106	2.13	2.03	2.13	2.09
*23	BR11921-4R-205	121	99	3.17	3.11	2.09	2.79
24	BR11921-4R-265	120	102	3.12	2.21	2.37	2.57
*25	BR11921-4R-267	121	99	3.53	3.26	2.66	3.15
*26	BR11921-4R-280	111	106	1.67	2.72	2.04	2.14
27	BR11921-4R-323	111	113	3.25	2.85	2.64	2.91
28	BR11921-4R-335	118	110	2.43	2.82	2.74	2.66
29	BR11921-4R-364	120	98	2.72	2.67	2.01	2.47
*30	BR11921-4R-385	112	96	2.94	2.86	1.58	2.46
31	BR11921-4R-394	109	101	3.44	3.14	2.77	3.12
32	BR11921-4R-397	113	92	2.49	2.05	2.51	2.35
*33	BR11921-4R-402	119	105	2.47	3.68	2.41	2.85
34	BR11921-4R-419	120	109	2.56	3.13	2.11	2.60
*35	BR11921-4R-48	121	101	4.05	2.31	2.33	2.89
*36	BR11921-4R-485	114	109	3.45	3.95	1.82	3.07
*37	BR11921-4R-54	123	112	4.15	3.04	2.47	3.22
38	BR11925-4R-198	122	112	2.56	2.89	2.19	2.54
39	BR11925-4R-287	122	110	3.04	3.12	2.05	2.74
*40	BR11925-4R-48	121	116	3.10	2.68	3.10	2.96
*41	BR11933-4R-29	114	99	2.77	2.86	2.52	2.72
*42	BR11933-4R-319	109	113	3.63	3.70	2.61	3.31
43	BR11933-4R-387	122	107	2.75	2.99	3.25	2.99
*44	BR11933-4R-402	117	113	3.30	3.17	4.14	3.54
*45	BR11933-4R-421	110	107	3.47	3.39	1.40	2.75
46	BR11933-4R-425	108	105	2.75	3.16		2.81

47	BR11933-4R-478	120	115	3.46	2.36	2.27	2.70
48	BR11933-4R-48	118	107	2.30	3.04	3.17	2.83
*49	BR11933-4R-486	111	117	3.34	3.03	2.73	3.03
*50	BR11933-4R-90	111	106	2.68	3.21	1.81	2.57
*51	BR11940-4R-167	111	118	3.16	3.20	2.43	2.93
*52	BR11940-4R-2	126	117	2.79	2.95	2.68	2.81
*53	BR11940-4R-24	114	111	2.53	3.96	3.21	3.23
*54	BR11940-4R-3	111	121	3.64	3.52	3.66	3.61
*55	BR11940-4R-61	116	108	3.12	2.61	4.55	3.42
*56	BR11940-4R-93	110	119	3.79	3.10	2.34	3.07
57	BRRI dhan87	125	119	2.75	3.75	3.54	3.35
58	BRRI dhna73	116	118	2.75	3.13	2.41	2.76
	LSD	6.66	10.6	1.16	0.67	0.71	0.78
	H2b (%)	82	78	48	77	86	23

*Selected genotypes, *Ave.= Average of two locations excluding Gazipur

Table 6.7.2: Yield and agronomic performance of the genotypes tested in AYT-2, Salt-Tolerant Rice (STR) Breeding, at Gazipur, T. Aman 2022-23

Sl	Designation	GD (days)	PH (cm)	Grain Yield (t/ha) BLUE			
				Gazipur	Debata	Kaliganj	Mean
1	BR11905-4R-153	130	102	3.59	2.19	4.80	3.49
*2	BR11905-4R-155	120	101	3.04	4.47	5.11	4.79
*3	BR11905-4R-211	128	99	3.52	4.11	4.21	4.16
*4	BR11905-4R-224	122	98	3.47	4.12	4.77	4.44
5	BR11905-4R-246	130	100	3.39	3.64	4.25	3.95
*6	BR11905-4R-251	130	99	3.08	1.96	6.86	4.41
7	BR11905-4R-270	132	102	3.22	3.38	4.45	3.92
8	BR11905-4R-40	128	102	3.00	3.63	4.46	4.04
9	BR11905-4R-56	127	98	2.54	2.76	4.33	3.55
*10	BR11905-4R-57	126	104	3.55	3.78	5.72	4.75
11	BR11905-4R-70	130	99	3.27	3.15	4.62	3.88
12	BR11905-4R-78	132	102	3.27	3.76	4.63	4.19
*13	BR11905-4R-79	131	102	3.33	4.04	6.26	5.15
14	BR11910-4R-113	127	100	2.79	3.49	4.34	3.91
*15	BR11910-4R-133	120	100	3.30	3.61	4.62	4.11
*16	BR11910-4R-147	137	99	3.26	3.23	5.49	4.36
17	BR11910-4R-167	128	98	3.32	1.94	4.41	3.18
*18	BR11910-4R-243	125	98	3.74	4.19	5.03	4.61
*19	BR11910-4R-247	136	100	4.31	4.13	4.53	4.33
20	BR11910-4R-31	131	100	2.86	3.53	3.81	3.67
*21	BR11910-4R-59	126	100	3.50	3.84	5.64	4.74
22	BR11911-4R-160	113	114	3.57	2.94	3.50	3.22
*23	BR11919-4R-1	114	103	2.09	3.61	5.91	4.76
24	BR11919-4R-26	126	108	3.52	2.15	3.75	2.95
25	BR11919-4R-34	121	100	3.59	2.58	5.84	4.21
26	BR11919-4R-55	120	111	4.29	2.11	5.40	3.75
27	BR11919-4R-59	135	106	3.59	3.09	4.96	4.03
*28	BR11919-4R-86	119	110	2.43	3.99	5.54	4.76
29	BR11919-4R-96	116	114	3.00	3.52	3.29	3.40
*30	BR11921-4R-124	119	98	2.07	3.38	6.12	4.75
31	BR11921-4R-13	113	101	2.87	3.24	4.71	3.98
32	BR11921-4R-16	119	103	3.30	3.06	4.73	3.89
33	BR11921-4R-356	115	99	2.85	2.02	3.68	2.85

*34	BR11921-4R-478	117	108	2.74	3.87	5.52	4.69
35	BR11921-4R-73	118	106	2.75	3.13	2.91	3.02
36	BR11921-4R-81	118	101	1.97	3.27	4.02	3.64
37	BR11921-4R-9	113	96	3.43	2.01	3.86	2.94
38	BR11925-4R-32	119	101	3.13	3.33	5.26	4.30
39	BR11925-4R-65	110	102	2.47	2.94	1.44	2.19
40	BR11925-4R-9	108	100	2.99	2.86	5.04	3.95
41	BR11925-4R-95	109	99	3.57	3.15	3.77	3.46
42	BR11933-4R-307	111	120	2.95	3.36	2.92	3.14
43	BR11933-4R-495	108	101	3.04	2.88	4.25	3.57
44	BR11940-4R-119	120	110	3.18	3.10	5.32	4.21
45	BR11940-4R-171	111	107	3.86	2.43	4.91	3.67
46	BR11940-4R-216	110	104	3.45	3.47	4.26	3.87
47	BR11940-4R-220	114	100	3.05	2.48	5.46	3.97
*48	BR11940-4R-61	111	107	3.25	2.74	5.47	4.11
49	BR11910-4R-61	128	98	2.10		4.46	2.23
50	BRRI dhan73 (Ck)	115	106	2.76	2.95	4.16	3.56
51	BRRI dhan87 (S. Ck)	127	111	3.36	3.12	5.91	4.51
52	BR23 (Ck)	138	110			5.16	4.67
	LSD <0.05	9.8	7.6	1.3	0.7	1.4	1.05
	H2b	0.88	0.75	0.42	0.84	0.73	0.78

Fig 6.7.1: Field view of Kaliganj experimental plots, T. Aman 2022-23

Table 6.7.3: Yield and agronomic performance of selected genotypes of AYT-1, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23

SL	Designation	GD (days)		PH (cm)	Yield (t/ha)					
		Gaz	Satk		Gazipur		BRRI Sat	Deb	Mean	
					BLUE	BLUP	BLUE	BLUE	BLUE	BLUP
1	BR11276-4R-100*	150	139	120	6.04	5.79	5.64	4.71	5.18	5.08
2	BR11276-4R-104*	151	138	117	5.99	5.85	4.86	3.12	3.99	4.54
3	BR11276-4R-139*	151	139	112	4.47	4.73	5.12	4.52	4.82	4.92
4	BR11276-4R-150*	154	144	93	6.34	5.99	4.80	4.24	4.52	4.78
5	BR11276-4R-152	152	137	113	6.46	6.23	6.38	4.12	5.25	5.12
6	BR11276-4R-166*	143	132	99	5.82	5.64	5.13	4.25	4.69	4.86

7	BR11276-4R-21*	152	138	116	4.17	4.52	5.69	4.25	4.97	4.99
8	BR11276-4R-212*	152	137	107	6.12	5.84	4.92	5.07	4.99	5.0
9	BR11276-4R-228	153	138	119	5.50	5.43	6.06	5.25	5.66	5.30
10	BR11276-4R-67*	141	139	97	6.79	6.3	4.69	4.47	4.58	4.81
11	BR11276-4R-8*	156	141	109	3.48	4.06	6.06	4.45	5.25	5.12
12	BR11718-4R-10	154	143	105	3.19	3.86	6.05	4.55	5.30	5.14
13	BR11718-4R-175*	153	135	110	5.89	5.77	5.92	4.23	5.08	5.04
14	BR11718-4R-125*	153	135	110	2.86	3.64	5.92	4.23	5.08	5.04
15	BR11718-4R-178	151	140	95	6.45	6.07	5.73	4.56	5.14	5.07
16	BR11718-4R-230*	153	143	105	3.15	3.83	6.07	4.16	5.11	5.06
17	BR11718-4R-230*	147	143	105	3.15	3.83	6.07	4.16	5.11	5.06
18	BR11718-4R-268*	144	138	102	3.80	4.27	6.41	5.01	5.71	5.33
19	BR11720-4R-89*	152	137	114	4.23	4.56	3.08	4.74	3.91	4.51
20	BR11723-4R-236	142	146	103	7.67	6.89	5.00	3.03	4.01	4.55
21	BR11723-4R-37	156	141	114	6.29	5.96	5.20	3.61	4.40	4.73
22	BR12274-4R-183	143	145	94	3.04	3.76	4.93	4.21	4.57	4.81
23	BR12274-4R-193*	148	132	103	5.68	5.54	3.23	4.13	3.68	4.40
24	BR12274-4R-205*	152	139	101	4.25	4.58	6.64	4.72	5.68	5.31
25	BR12274-4R-255*	152	136	98	3.16	3.84	4.97	4.57	4.77	4.9
26	BR12274-4R-310*	151	143	105	7.70	6.92	5.84	4.05	4.95	4.98
27	BR12275-4R-13	154	137	104	3.29	3.93	6.26	4.59	5.43	5.20
28	BR12275-4R-215		143	105	4.58	4.8	4.26	4.59	4.42	4.74
29	BRRI dhan 67	142	132	105	6.51	6.11	6.29	4.89	5.59	5.27
30	BRRI dhan89	150	136	111	7.19	6.57	5.35	5.68	4.83	4.96
31	BRRi dhan97	145	136	108	7.05	6.16	7.90	5.38	6.64	5.75
32	BRRI dhan99	144	137	103	7.06	6.48	6.58	4.93	5.76	5.35
	LSD <0.05		7.1	8.1	1.7		1.7	1.2	1.3	
	H2b		0.76	0.88	0.67		0.24	0.93	0.59	
Salinity (dS/m)							5.1-6.1	4.1-8.0		

*Selected genotypes

Table 6.7.4: Yield and agronomic performance of genotypes of AYT2, Salt-Tolerant Rice (STR) Breeding, Boro 2022-23

Sl	Designation	GD (days)		PH (cm)	Yield (t/ha)				Mean	PA cp
		Gazipur	Satkhira		Gazipur		BRRI Sat	Debhata		
					BLUE	BLUP	BLUE	BLUE	BLUE	
1	BR11276-4R-132*	143	135	99	6.53	6.18	6.26	5.19	5.73	6
2	BR11276-4R-19*	140	131	107	6.57	6.21	6.15	4.89	5.52	5
3	BR11276-4R-196*	141	133	110	6.42	6.11	4.24	5.75	4.99	6
4	BR11276-4R-210*	143	133	101	7.24	6.61	6.05	4.75	5.40	5
5	BR11276-4R-221*	151	134	106	7.09	6.52	5.11	4.58	4.85	7
6	BR11276-4R-229*	150	134	105	5.38	5.48	5.88	5.07	5.48	6
7	BR11718-4R-110*	150	140	98	6.06	5.9	5.36	4.44	4.90	7
8	BR11718-4R-245*	143	136	106	6.66	6.26	5.42	4.79	5.11	6
9	BR11718-4R-379*	150	139	103	4.94	5.21	5.20	4.42	4.81	6
10	BR11718-4R-46*	143	136	105	4.85	5.16	5.44	4.42	4.93	7
11	BR11718-4R-78*	139	133	93	5.21	5.37	6.06	4.10	5.08	6
12	BR11718-4R-84*	141	135	103	7.44	6.74	5.05	4.30	4.67	7
13	BR11718-4R-92	154	146	110	7.69	6.89	4.62	4.51	4.56	6
14	BR12273-4R-202	143	137	95	4.94	5.21	5.54	4.75	5.15	7
15	BR12274-4R-101	142	139	103	6.80	6.35	4.72	4.40	4.56	7
16	BR12274-4R-110	150	139	98	4.77	5.11	5.68	4.33	5.01	6
17	BR12274-4R-113*	149	141	101	2.53	3.74	3.41	4.46	3.93	7
18	BR12274-4R-138*	151	133	96	3.15	4.12	6.39	4.89	5.64	6
19	BR12274-4R-188*	143	133	93	6.41	6.11	5.03	4.26	4.64	6

20	BR12274-4R-339	154	136	100	4.98	5.23	4.54	4.41	4.48	
21	BR12274-4R-37	151	133	96	7.25	6.62	3.51	4.58	4.05	
22	BR12274-4R-9	154	145	100	3.21	4.16	3.84	4.38	4.11	
23	BR12274-4R-93*	143	132		5.17	5.35	6.02		6.02	5
24	BR12275-4R-125*	143	135		3.55	4.36	5.40		5.40	5
25	BR12275-4R-90	153	143	98	3.01	4.04	5.74	4.91	5.32	6
26	BRRI dhan67	141	131	104	6.95	6.44	5.34	5.72	5.53	6
27	BRRI dhan89	150	142	105	6.12	5.93	4.03	4.07	4.05	5
28	BRRI dhan97	150	137	100	7.055	6.5	6.67	5.21	5.94	5
	LSD <0.05		4.1	9	2.6		1.8	0.3	2.2	
	H2b		0.91	0.74	0.61		0.42	0.81	0.4	

***Selected genotypes**

Experiment 6.8: Regional yield trial (RYT)

Principal Investigator: M. A. Rahman

Co-investigators: Hasina Khatun, R F Disha, Asif Rahman, A A Shoily and S M M Islam and T H Ansari and BRRI regional Scientists

Specific objective: To assess specific and general adaptability for selecting the suitable genotypes on station and/on farm conditions (by participating farmers' preferences) in saline prone areas

Materials and methods: Sixteen most promising genotypes in RYT-1, and RYT-2 in T. Aman season and total 26 promising genotypes in RYT-1, RYT-2 and RYT3 in Boro season were evaluated, respectively at six locations in RYT1 and RYT2 in T. Aman season and 11 locations in RYT1 and 4 location in RYT2 and 5 location in RYT3 in Boro season**.** Twenty-five days-old seedling and 40 days old seedling were transplanted @ 2-3 seedlings with a spacing of 20 x 20 cm in T Aman and Boro season respectively. The unit plot size was 5.4 m x 8 rows with two replications. BRRI dhan87 and BRRI dhan73 were used as checks in T. Aman season. on the other hand, BRRI dhan67, BRRI dhan89 and BRRI dhan99 were used as tolerant and sensitive checks in Boro. Fertilizer doses and time of application were the same as in Experiment no. 6.1. Crop management such as weeding, controlling disease was done in time.

Results and Discussion: Out of 10 genotypes, two genotypes were selected from RYT-1 in T Aman season based on yield, growth duration, earliness and phenotypic acceptability with comparing checks (**Table 6.8.1**). From RYT2, two genotypes were selected out of six genotypes based on grain yield and grain quality **(Table 6.8.2).** The mean grain yield of selected lines ranged from 4.41 t/ha to 4.51 t/ha which were higher than the check varieties BRRI dhan87 (3.61 t/ha) and BRRI dhan73 (3.69 t/ha).

In Boro, Among the 7 genotypes 4 genotypes were selected in RYT1 namely BR11712-4R-44, BR11712-4R-93, BR11717-4R-1 and BR11727-4R-6 for ALART based on grain yield and grain quality **(Table 6.8.3).** The mean grain yield of selected lines ranged from 6.2 t/ha (BR11712-4R-44) to 6.7 t/ha (BR11717-4R-12) which were higher than the check varieties BRRI dhan89 (6.5 t/ha) and BRRI dhan67 (6.4 t/ha) **(Table 6.8.3).** From RYT2 and RYT3, three and ten genotypes were selected respectively (**Table 6.8.4 & Table 6.8.5**).

Table 6.8.1: Yield and agronomic performance of genotypes in RYT-1, Salt tolerant Rice, T Aman 2022-23

Sl	Designation	GD (days)	PH (cm)	Grain yield BLUE (t/ha)						
				Gazi	Debh	Kaliganj	Satkhira Farm	Sonagazi	Sonagazi on field	Ave
1	BR10430-7-4-5B1	114	106	1.81	3.00	4.25	3.95	3.44	2.72	3.47
2	BR10440-1-1-1	116	109	2.59	2.80	4.67	4.61	4.28	3.65	4.00

3	BR10440-20-5-6B1*	117	106	4.49	3.79	5.62	5.16	5.28	4.92	4.95
4	BR10440-4-12-5	118	109	3.22	3.45	5.29	4.55	4.46	4.17	4.38
5	BR10441-17-1-5*	118	101	3.03	2.86	5.61	5.26	4.45	4.33	4.50
6	BR11395-4R-62	113	111	3.14	2.99	4.59	4.39	4.52	3.39	3.97
7	BR11712-4R-218-P1	123	100	2.87	2.28	5.11	4.98		2.46	2.97
8	BR11716-4R-120	124	101	3.39	2.17	4.50	5.57	4.48	4.61	4.26
9	BR11716-4R-123	123	100	3.40	2.32	4.94	4.70	4.47	3.99	4.08
10	BR11716-4R-147	123	101	3.50	2.65	5.77	5.40	4.35	4.02	4.44
11	BRRI dhan73(ck)	119	118	3.60	3.07	4.57	4.13	4.94	4.59	4.26
12	BRRI dhan87(ck)	128	116	3.84	2.49	4.89	4.64	4.87	4.62	4.30
	LSD <0.05	2.74	6.67	1.35	0.32	0.74	0.88	0.86	0.84	0.73
	H2b	0.95	0.88	0.45	0.94	0.70	0.60	0.53	0.84	0.52

*Selected genotypes

Fig. 6.8.1: Pictorial view of genotypes in RYT-1 and 2 Salinity Breeding, T. Aman 2022-23 at different regional station

Table 6.8.2: Yield and agronomic performance of genotypes in RYT2, Salt tolerant Rice, T Aman 2022-23

Sl	Designation	GD (days)	PH (cm)	Grain yield (t/ha) _BLUE						
				Gazipur	Debhata	Kaliganj	Satkhira_Farm	Sona_Farmer's field	Sonagazi	Average
1	BR11388-4R-11*	116	116	3.48	4.17	4.72	4.55	4.14	4.95	4.51
2	BR11388-4R-5	118	104	4.02	3.09	5.36	4.98	3.81	4.54	4.36
3	BR11388-4R-6*	125	105	3.67	2.86	4.93	4.88	4.54	4.86	4.41
4	BR11389-4R-184	135	132	3.69	1.99	3.67	3.05	3.43	3.49	3.13
5	BR11391-4R-335	120	118	2.98	3.66	4.74	5.73	3.58	3.84	4.31
6	BR11395-4R-86	120	111	3.38	2.67	4.67	4.48	3.73	5.23	4.16
7	BRRI dhan73(ck)	119	117	3.56	2.76	3.64	4.14	3.53	4.37	3.69
8	BRRI dhan87(ck)	126	114	3.47	1.36	3.23	4.33	4.23	4.88	3.61
	LSD <0.05	6.19	8.23	0.99	0.19	0.57	0.46	0.66	0.75	0.63
	H2b	0.76	0.90	0	0.99	0.93	0.95	0.63	0.79	0.75

*Selected genotypes *Tropical cyclone sitrang effect Oct 24, 2022

Table 6.8.3: Yield and agronomic performance of genotypes in RYT-1, Salt Tolerant Rice, Boro 2022-23

SL	Designation	**GD (days)**	**PH (cm)**	**Grain yield (/tha)**											
				L1	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9**	**L10**	**L11**	**Mean**
1	BR11712-4R-44*	146	111	5.9	4.1	4.5	8.2	6.7	5.1	4.8	6.7	8.7	6.8	7.03	6.2
2	BR11712-4R-93*	140	110	5.2	4.2	3.0	8.3	8.1	7.8	5.5	5.4	8.6	7.1	7.85	6.5 (6.87)

3	BR11717-4R-12*	147	110	7.6	4.7	4.7	7.2	7.7	7.7	6.7	6.4	8.9	6.4	5.95	6.7
4	BR11727-4R-6*	146	94	7.5	6.6	4.8	6.6	7.8	7.1	6.1	5.3	8.6	7.0	5.86	6.6
5	BR11712-4R-346	147	92	6.7	5.0	3.9	7.0	8.1	6.8	5.6	5.8	8.8	5.6	5.13	6.2
6	BR11712-4R-70	147	108	5.9	4.6	3.3	5.9	7.5	7.1	5.1	6.5	8.3	7.1	5.51	6.1
7	BR11713-4R-398	150	87	6.6	4.4	4.4	6.1	7.7	6.6	5.1	4.9	8.6	5.8	6.4	6.1
8	BRRI dhan67 (T.Ck)	142	105	6.6	5.2	4.5	6.6	7.0	6.8	5.8	6.1	7.4	6.4	7.71	6.4
9	BRRI dhan89 (S.Ck)	151	104	5.3	3.1	2.5	7.4	8.0	7.7	7.2	6.8	8.2	6.7	7.36	6.5 (6.37)
10	BRRI dhan99 (T.Ck)	150	98.7	7.5	5.6	4.3	7.3	7.8	7.4	6.5	6.2	8.3	6.9	6.6	6.8
	LSD < 0.05	1.96	4.02	0.3	0.67	0.69	0.81	0.25	0.64	0.28	0.75	1.03	0.53	2.57	
	H2b	0.89	0.95	0.7	0.9	0.9	0.9	0.96	0.91	0.41	0.8	0.39	0.88	0.38	

Locations: L1=Satkhira Farm, L2=Debhata, L3=Kaliganj, L4=Sonagazi, L5=Rajshahi, L6=Rangpur, L7=Habiganj, L8=Kushtia, L9=Bhanga, L10=Cumilla and L11=Gazipur, ***Selected genotypes**

Fig. 6.8.1c: Pictorial view of RYT1 at Kaliganj, Satkhira, Salt Tolerant Rice, Boro 2022-23

Fig.6.8.1d: RYT-1 experimental fields at Debhata, Satkhira during Boro 2022-23

Table 6.8.4: Yield and agronomic performance of genotypes in RYT2, Salt Tolerant Rice, Boro 2022-23

Sl	Designation	Gazipur			Satkhira							Mean Yield (t/ha)	
					GD	Yield(t/ha)							
		GD (day)	PH (cm)	Yield (t/ha)		BBRI Farm		Debhata		Kaliganj			
						BL UE	BL UP	BL UE	BL UP	BL UE	BL UP	BL UE	BL UP
1	BR11712-4R-121	155	120	4.61	138	6.18	6.84	4.48	4.47	3.06	3.03	4.57	4.46
2	BR11712-4R-149	150	113	5.35	137	5.94	5.83	3.88	3.89	2.53	2.66	4.11	4.15
3	BR11712-4R-328	147	95	4.65	133	5.28	5.36	4.3	4.29	3.27	3.18	4.28	4.27
4	BR11712-4R-60*	149	122	5.31	135	6.26	6.06	3.75	3.76	2.65	2.74	4.22	4.22
5	BR11712-4R-73***	165	114	5.53	136	6.3	6.09	5.18	5.15	3.32	3.21	4.93	4.7
6	BR11714-4R-208**	149	89	5.41	139	4.57	4.85	3.9	3.91	3.02	3	3.83	3.96
7	BR11719-4R-22	158	107	5.52	148	3.77	4.28	3.91	3.91	-	-	3.16	3.63
8	BR11722-4R-360	164	105	5.86	133	6.45	6.20	5.46	5.42	3.10	3.06	5	4.75
9	BR11723-4R-107	165	85	5.11	134	5.33	5.40	4.25	4.24	1.67	2.06	3.75	3.91
10	SVIN208	147	104	5.25	136	5.92	5.82	5.12	5.09	4.02	3.7	5.02	4.76
11	BRRI dhan67	141	118	4.56	132	5.40	5.45	2.74	2.78	2.46	2.61	3.53	3.76
12	BRRI dhan89	151	105	5.45	141	5.31	5.39	-	-	-	-	3.97	4.14

13	BRRI dhan99	153	105	4.89	141	5.81	5.74	3.91	3.91	3.56	3.38	4.44	4.36
	LSD<0.05$_{0.05}$	12.6	5.7	2.70	3.6	1.1	-	0.4		0.90	-	1	-
	H2b	0.54	0.97	0.42	0.93	0.72	-	0.97	-	0.70		0.78	-
Salinity (dS/m)						3.43-5.97		4.05-5.97		4.0-12.0			

*Selection only Satkhira farm** selection at two location***Selection at three locations

Table 6.8.5: Yield and agronomic performance of genotypes in RYT3, Salt Tolerant Rice, Boro 2022-23

Sl	Designation	Gazipur			Satkhira Combined							Mean Yield (t/ha)	
						Grain Yield (t/ha)							
		GD (day)	PH (cm)	Yield (t/ha)	GD (day)	BBRI Farm		Debhata		Kaliganj			
						BL UE	BL UP	BL UE	BL UP	BL UE	BL UP	BL UE	BL UP
1**	BR11714-4R-145	152	98	2.49	135	5.21	5.55	4.18	4.17	2.79	2.86	4.06	4.29
2***	BR11714-4R-148_5	159	102	5.77	137	6.17	5.95	4.61	4.59	4.93	4.82	5.23	4.87
3**	BR11714-4R-203	152	101	4.35	133	5.11	5.51	3.41	3.43	3.43	3.45	3.98	4.26
4**	BR11714-4R-418_21	152	102	4.95	138	6.49	6.08	4.09	4.08	4.1	4.07	4.89	4.7
5**	BR11714-4R-418_3	155	97	3.28	143	5.6	5.71	3.25	3.27	3.03	3.08	3.96	4.24
6**	BR11715-4R-16	157	97	5.54	144	5.63	5.73	3.72	3.73	4.44	4.37	4.6	4.56
7***	BR11715-4R-24	152	97	3.64	136	6.74	6.19	4.19	4.19	3.98	3.95	4.97	4.74
8**	BR11716-4R-55	155	97	5.14	143	4.65	5.32	3.76	3.77	4.21	4.16	4.2	4.37
9**	BR11719-4R-15	160	114	3.49	146	5.87	5.82	4.52	4.5	3.24	3.28	4.54	4.53
10**	BR11722-4R-73	153	84	4.45	138	5.83	5.81	5.83	5.77	4.03	4	5.23	4.87
11	BRRI dhan67	141	114	6.83	129	6.1	5.92	3.82	3.83	3.11	3.16	4.34	4.43
12	BRRI dhan89	151	108	4.89	142	5.64	5.73	3.48	3.5	-	-	4.14	4.38
13	BRRI dhan99	152	105	6.43	138	6.31	6.01	4.27	4.26	3.1	3.14	4.56	4.54
	LSD<0.05	1.5	2.8	3.8	3.1	1.2		0.3		0.5		0.9	
	H2b	0.99	0.98	0.36	0.95	0.42		0.97		0.92		0.64	
Salinity lavel			-			3.43-5.37		4.05-5.97		4.0-12.0		-	

*Selectrion only Satkhira farm

** selection at two locations (Debhata and Kaliganj)

***Selection at three locations (Satkhira, Debhata and Kaliganj)

Experiment 6.9: Advanced lines Adaptive Research Trial (ALART)

Specific objective: On-farm evaluation of advanced breeding lines compared to standard checks for testing their specific and general adaptability.

Principal Investigator: ARD Scientist

Co-Investigators: M.A. Rahman, Hasina Khatun. Ribed Farzana Disha, Md. R.S, A. A. Shoily, and T. H. Ansari

Materials and methods: Three genotypes along with BRRI dhan73 (Tol.ck) and BRRI dhan87 (Sus.ck) were evaluated in ten locations of Bangladesh during T. Aman 2022-23. Twenty-five days old seedling of each genotype were transplanted @ 2-3 seedlings with a spacing of 20 cm × 20 cm. The unit plot size were 5.4 m × 12 rows and the field layout were RCB design with three replications. Fertilizers @ 200 kg Urea: 62 kg TSP: 83kg MoP: 56kg Gypsum: 5 kg Zn kg/ha were applied in the trial. All amount of Urea, TSP, MoP and ZnSO 4 were applied at the time of final land preparation and nitrogen were applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Crop management such as weeding, controlling disease and insect pests were done when necessary. Data were collected such as Date of seeding and transplanting, days to 50% flowering and maturity (80%), phenotypic acceptance at vegetative and maturity stage, plant height (cm), lodging tolerance, SES score, Soil Salinity (EC dSm-1) and grain yield (t/ha), insect and disease infestation.

Results: In ALART, three genotypes were evaluated along with susceptible check BRRI dhan87and tolerant check BRRI dhan73. In the trial, the genotypes BR11716-4R-102produced almost half ton/ha higher yield than the susceptible and one-ton than tolerant check variety with same growth duration (Table 6.9.1). The advanced line having good grain quality. Therefore, the line was recommended for Proposed Variety Trial (PVT) by ALART monitoring committee.

Table.6.9.1. Yield Performance of genotypes in ALART STR Breeding, T. Aman 2022-23

Genotype	**Growth duration (days)**	**Grain yield (t/ha)**								
		L1	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**Mean**
V1= BR11712-4R-218	121	4.05	4.34	4.47	4.57	4.57	6.03	4.91	2.89	4.48
V2= BR11716-4R-102	**121**	**4.29**	**4.42**	**4.27**	**4.90**	**4.90**	**6.52**	**5.30**	**3.30**	**4.74**
V3= BR11723-4R-172	122	3.64	4.34	4.37	4.47	4.47	5.86	5.11	2.43	4.34
V4= BRRI dhan73 (Ck)	122	1.51	4.08	3.93	4.00	4.00	4.82	4.44	2.81	3.70
V5= BRRI dhan87 (S. Ck)	127	4.17	4.08	4.00	4.43	4.43	5.44	5.00	2.58	4.27
% increase over BRRI dhan87		**2.89**	**8.33**	**6.65**	**10.61**	**10.61**	**20.0**	**6.0**	**27.91**	**11.0**
LSD <0.05					**0.323**					
CV (%)	**7.74**									

L1= BRRI gazipur; L2= Kaliganj, Satkhira, L3= Dekhata, Satkhira; L4= Sadar, Gopalganj; L5= Sadar, Bagerhat; L6= Sonagazi, Feni; L7= Companiganj, Noakhali and L8= Kolapara, Patuakhali

Fig.6.9.1. Field view of ALART plot at 3 locations ,T Aman2022-23

PROJECT 6.10: AGGRI-ALLIANCE (ACCELERATED GENETIC GAIN IN RICE)

6.10.1: Technical report on AGGRi network trials in Bangladesh for salt-stress prone environment, T. Aman 2022-23 (Wet season)

Summary: One hundred ten (110) breeding lines from IRRI along with seven international check varieties and five national check varieties were evaluated at Satkhira during T. Aman 2022 under Experiment 1 to select superior genotypes aiming to include directly in the variety release system or use as parents in the breeding program. Wide variations were observed for grain yield ranging from 0.85 t/ha to 3.58 t/ha and growth duration 106 days to 130 days respectively. Among 110 entries, a total of 31genotypes were selected based on grain type and grain yield. However, five genotypes such as IR20R1083 (3.41 t/ha), IR20R1048 (3.58 t/ha), IR20R1907 (3.39 t/ha), IR20R1685 (3.34 t/ha) and IR20R1210 (3.36 t/ha) produced statistically significant higher grain yield than all checks except check IRRI47 (3.39 t/ha). These lines may be used in the advanced yield trials and also used as parents in the breeding program. In Experiment 2, Among 18 entries, five genotypes were selected based on grain yield. However, five genotypes such as 22QWS-2(4.05 t/ha), 22QWS-3(4.02 t/ha), 22QWS-14(4.08 t/ha), 22QWS-17(4.06 t/ha) and 22QWS-18 (4.08 t/ha) produced significantly higher grain yield than two checks viz BRRI dhan49 (3.00 t/ha) and BRRI dhan71 (2.64t/ha) and also higher than BRRIdhan75 (3.56 t/ha) but statistically insignificant whereas all genotypes produced lower grain yield than BRRI dhan87 (4.48 t/ha). Therefore, selected elite genotypes were used as parents in crossing program for developing biotic stress tolerant rice to increase productivity

Background/Rationale: Rice cultivation (horizontal expansion) in the southern coastal region (SCR) needs to be increased combining medium to high saline zone through the development and use of high-yielding salt-tolerant rice varieties for sustaining the food security in Bangladesh. AGGRi network trial consists of diverse elite breeding lines that help to select desirable genotypes suitable for salt-stress-prone environments to align with the target product profile. Moreover, we can identify more adaptable salinity resilient lines with the broader genetic base from this elite diverse panel of AGGRi network trials. These new lines may help in climate change adaptation through minimizing the negative effect of climate change in SCR. These materials will also be useful to generate breeding population that enhances the rate of genetic gain through productivity improvement and replacement of older varieties.

Experiment 6.10.1: Evaluation of genotypes of AGGRi Network Trial 2022 Wet Season

General objective: Development of salt-tolerant rice variety suitable for the salinity prone areas of coastal districts in T. Aman season

Specific objective: To evaluate the genotypes in the natural salinity-prone environment at the farmers' field of Satkhira region in T. Aman season.

Materials and methods: A total of 110 elite genotypes were evaluated in this trial along with IRRI 147, IR29, BRRI dhan73, BINA dhan8 and BINA dhan10 as tolerant checks and BRRI dhan87, IRRI 154 as sensitive at Satkhira **(Table 6.10.1).** The unit plot size was 5.2 × 5 rows. The field layout was done following Alpha lattice design with two replications. Twenty-five days' seedlings were transplanted @ 2-3 seedlings per hill with the spacing of 20 cm × 20 cm. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5(117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg ZnSO4) kg N P K S Zn/ha were applied in the trial. All amount of P, K, S and Zn were applied at the time of final land preparation and nitrogen (urea) were applied in three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). Crop management such as weeding, irrigation was done on time. Pest management and other cultural operations were also performed when deemed necessary.

Table 6.10.1: Performance of the tested genotypes during T. Aman 2022 at Satkhira under AGGRi Alliance

Entry code	Designation	GD (days)	PH (cm)	yield (t/ha)	PN/ hill	PAcp	Rice bug	Remarks
E-001	IR20R1990	112	124	2.69	9	2		
E-002	IR20R1815	121	85	0.52	12	0		100% lodging
E-003	**IR20R1267**	**122**	**102**	**3.2**	**10**	**3**		brown spot 40%
E-004	**IR20R1926**	**126**	**88**	**3.07**	**10**	**3**		
E-005	IR20R1524	119	91	2.82	10	2		
E-006	IR20R1505	119	95	1.57	10	3		
E-007	IR20R1677	120	92	2.35	10	3		
E-008	IR20R1822	113	83	2.97	10	3	20%	
E-009	IR20R1663	124	94	2.35	10	3	30%	
E-010	**IR20R1699**	**119**	**102**	**3.13**	**11**	**2**		
E-011	IR20R1834	121	86	2.11	10	3		50% brown spot, mixture
E-012	IR20R1402	115	99	1.97	10	3		
E-013	IR20R1450	120	98	2.17	10	2		
E-014	**IR20R1778**	**115**	**107**	**3.09**	**10**	**3**		
E-015	**IR20R1985**	**110**	**122**	**2.46**	**10**	**2**		
E-016	**IR20R1399**	**117**	**98**	**3.02**	**10**	**3**		
E-017	**IR20R1682**	**123**	**95**	**2.43**	**10**	**2**		
E-018	**IR20R1358**	**121**	**102**	**3.02**	**10**	**2**		
E-019	IR20R1393	117	89	2.79	10	3	40%	
E-020	IR20R1421	120	100	2.39	10	3	70%	
E-021	IR20R1691	120	99	2.87	10	3	40%	
E-022	IR20R1895	111	115	2.19	9	3	40%	
E-023	**IR20R1083**	**122**	**104**	**3.41**	**12**	**3**		
E-024	IR20R1992	113	116	2.53	9	3		
E-025	IR20R1302	125	99	3.08	10	3		
E-026	IR20R1736	121	94	2.43	10	3		
E-027	IR20R1780	116	101	2.97	10	3		
E-028	IR20R1848	121	92	2.89	10	3		
E-029	IR20R1687	123	96	2.21	10	3		
E-030	IR20R1794	119	102	2.71	10	3	20%	40% brown spot
E-031	IR20R1543	120	92	2.84	10	3		
E-032	IR20R1171	119	101	3.05	11	3		
E-033	IR20R1902	112	161	2.32	8	3	20%	30% lodging
E-034	IR20R1961	126	96	1.73	10	3		
E-035	IR20R1472	116	103	3.16	11	2		
E-036	**IR20R1359**	**122**	**105**	**2.52**	**10**	**2**		
E-037	IR20R1962	120	123	2.44	9	3		30% brown spot
E-038	IR20R1885	111	147	2.65	9	3		
E-039	**IR20R1048**	**126**	**102**	**3.58**	**10**	**3**		
E-040	IR20R1411	115	102	2.8	11	3		
E-041	**IR20R1351**	**128**	**99**	**2.55**	**11**	**2**	**10%**	
E-042	IR20R1904	-	-	-	-	-		100% rat damage
E-043	IR20R1932	114	102	2.57	9	2		irregular
E-044	IR20R1593	120	99	2.8	10	3	20%	30% brown spot
E-045	IR20R1831	117	92	1.65	11	3		irregular,
E-046	IR20R1839	121	95	2.36	10	3		
E-047	IR20R1637	121	101	2.23	10	3	50%	
E-048	IR20R1879	119	105	2.88	10	2	10%	40% brown spot,

Entry code	Designation	GD (days)	PH (cm)	yield (t/ha)	PN/ hill	PAcp	Rice bug	Remarks
E-049	**IR20R1155**	**116**	**88**	**2.13**	**10**	**3**	**40%**	
E-050	IR20R1525	116	90	2.83	10	2	20%	60% brown spot
E-051	IR20R1980	116	133	2.43	8	3	60%	
E-052	**IR20R1113**	**126**	**95**	**2.98**	**9**	**3**		
E-053	IR20R1502	121	91	2.69	10	3		
E-054	IR20R1578	117	109	2.7	10	2		
E-055	IR20R1954	115	89	1.32	11	3	50%	irregular
E-056	IR20R1817	117	85	2.18	10	3		
E-057	**IR20R1503**	**121**	**104**	**2.47**	**10**	**3**		
E-058	**IR20R1685**	**122**	**91**	**3.34**	**10**	**3**	**40%**	
E-059	IR20R1859	-	-	-	-	-	-	100% rat damage
E-060	IR20R1785	122	102	2.16	11	2		
E-061	IR20R1931	108	98	2.64	10	3	20%	
E-062	IR20R1840	-	-	-	-	-	-	100% rat damage
E-063	**IR20R1583**	**121**	**99**	**3.02**	**11**	**3**		
E-064	IR20R1799	115	98	2.45	10	3		
E-065	IR20R1159	122	87	1.77	10	3	50%	
E-066	IR20R1174	118	97	1.65	11	3	40%	
E-067	IR20R1746	122	97	2.84	10	3		70% brown spot
E-068	IR20R1965	120	95	2.37	10	3		mixture
E-069	IR20R1791	123	101	2.59	10	3		100% rat
E-070	**IR20R1044**	**124**	**103**	**2.83**	**11**	**3**		
E-071	IR20R1957	117	99	1.88	10	2		80% brown spot
E-072	IR20R1949	115	101	2.79	10	3		
E-073	**IR20R1364**	**126**	**94**	**2.41**	**10**	**3**		
E-074	**IR20R1474**	**118**	**99**	**3.04**	**10**	**3**		
E-075	**IR20R1654**	**120**	**105**	**2.21**	**10**	**2**		brown spot 65%
E-076	**IR20R1354**	**120**	**104**	**3.07**	**11**	**2**		
E-077	IR20R1818	118	82	2.63	10	3		30% lodging
E-078	IR20R1635	123	104	2.44	10	3		
E-079	IR20R1418	118	93	1.63	10	3		20% mixture,
E-080	IR20R1808	121	84	1.13	10	0		20% rat damage,
E-081	IR20R1981	115	146	2.14	8	3		
E-082	IR20R1832	111	102	2.68	11	3		100% lodging
E-083	IR20R1967	123	94	2.76	10	3		mixture
E-084	IR20R1880	122	98	2.36	11	3		irregular
E-085	IR20R1711	116	91	3.05	10	2	30%	
E-086	**IR20R1210**	**122**	**99**	**3.36**	**10**	**3**		
E-087	**IR20R1252**	**127**	**104**	**3.17**	**10**	**3**		
E-088	IR20R1813	118	88	1.37	9	3		mixture, 50% rat
E-089	IR20R1622	119	97	2.92	10	2		
E-090	**IR20R1907**	**117**	**104**	**3.39**	**10**	**2**		
E-091	**IR20R1404**	**120**	**95**	**3.03**	**10**	**3**		70% brown spot,
E-092	IR20R1209	124	106	3.29	10	3		
E-093	**IR20R1433**	**123**	**103**	**2.7**	**10**	**2**		
E-094	IR20R1388	122	95	2.64	10	3		
E-095	IR20R1894	112	131	3.05	9	3		
E-096	IR20R1565	121	110	1.82	10	2		60% brown spot
E-097	**IR20R1735**	**123**	**92**	**2.58**	**10**	**3**		
E-098	IR20R1527	117	88	1.64	10	2		50 % lodging
E-099	CSR 28	114	108	2.71	10	2		irregular
E-100	**A69-1**	**130**	**103**	**2.10**	**10**	**2**		

Entry code	Designation	GD (days)	PH (cm)	yield (t/ha)	PN/ hill	PAcp	Rice bug	Remarks
E-101	**IRRI 239**	**120**	**107**	**2.26**	**9**	**2**		brown spot 60%
E-102	SAMBHA MAHSURI							
E-103	IRRI 147	118	100	3.39	10	2		
E-104	**IR 54447-3B-10-2**	**115**	**105**	**2.03**	**10**	**3**		
E-105	IR 29							80% rat damage,
E-106	IRRI 154	122	97	2.67	10	3		mixture
E-107	BRRI dhan73	117	116	2.79	9	2		
E-108	BRRI dhan87	128	102	2.38	10	2		
E-109	BINA Dhan 8	114	103	1.80	10	2		
E-110	BINA Dhan 10	106	95	0.87	9	2		90% rat damage
	LSD<0.05	3.39	5.08	0.65	1.59			
	H2b	0.94	0.99	0.85	0.81			

Results and discussion: Among 110 entries, 31 genotypes were selected based on phenotypic acceptability (PAcp), grain type, and grain yield. However, five genotypes such as IR20R1083 (3.41 t/ha), IR20R1048 (3.58t/ha), IR20R1907 (3.39 t/ha), IR20R1685 (3.34 t/ha) and IR20R1210 (3.36 t/ha) produced significantly higher grain yield than all checks except IRRI47 (3.39 t/ha). The yield of the rest 16 selected genotypes ranged from 2.03 t/ha to 3.2 t/ha with growth duration range from 110 days to 130 days. The trial heritability obtained for different traits such as growth duration, plant height, grain yield, and panicle number per hill were 0.94, 0.99, 0.85, 0.42 and 0.81 respectively, indicating the usefulness and precision of results from the trial. The accuracy of the trial was high **(Table 6.10.1**). All the 31 selected breeding lines are shown in **Table 6.10.2** and these lines will further be evaluated as AYT in the next T. Aman season 2023. Most of genotypes were infested by rice bug and brown spots (**Fig. 6.10.1)** and some entries were completely damaged because of rat attack and lodging **(Table 6.10.1).** On the other, the soil nutrient quality of the land was very poor due to sandy soil. Overall, all genotypes exhibited poor performance in grain yield due to the above factors. However, selected elite genotypes will be used in the advanced yield trials and also used in breeding population development to increase productivity and genetic gain.

Table 6.10.2: List of selected genotypes in T. Aman 2022 at Debhata, AGGRi Alliance

ENTRY CODE	Designation	Growth duration (days)	Plant height (cm)	Grain yield (t/ha)	Panicle number/ hill	Plot quality score
E-003	IR20R1267	122	102	3.2	10	3
E-004	IR20R1926	126	88	3.07	10	3
E-010	IR20R1699	119	102	3.13	11	2
E-014	IR20R1778	115	107	3.09	10	3
E-015	IR20R1985	110	122	2.46	10	2
E-016	IR20R1399	117	98	3.02	10	3
E-017	IR20R1682	123	95	2.43	10	2
E-018	IR20R1358	121	102	3.02	10	2
E-023	IR20R1083	122	104	3.41	12	3
E-036	IR20R1359	122	105	2.52	10	2
E-039	IR20R1048	126	102	3.58	10	3
E-041	IR20R1351	128	99	2.55	11	2
E-049	IR20R1155	116	88	2.13	10	3
E-052	IR20R1113	126	95	2.98	9	3
E-057	IR20R1503	121	104	2.47	10	3

E-058	IR20R1685	122	91	3.34	10	3
E-063	IR20R1583	121	99	3.02	11	3
E-070	IR20R1044	124	103	2.83	11	3
E-073	IR20R1364	126	94	2.41	10	3
E-074	IR20R1474	118	99	3.04	10	3
E-075	IR20R1654	120	105	2.21	10	2
E-076	IR20R1354	120	104	3.07	11	2
E-086	IR20R1210	122	99	3.36	10	3
E-087	IR20R1252	127	104	3.17	10	3
E-090	IR20R1907	117	104	3.39	10	2
E-091	IR20R1404	120	95	3.03	10	3
E-093	IR20R1433	123	103	2.70	10	2
E-097	IR20R1735	123	92	2.58	10	3
E-100	A69-1	130	103	2.10	10	2
E-101	IRRI 239	120	107	2.26	9	2
E-103	IRRI 147	118	100	3.39	10	2
E-104	IR 54447-3B-10-2	115	105	2.03	10	3
E-106	IRRI 154	122	97	2.67	10	3
E-107	BRRI dhan73	117	116	2.79	9	2
E-108	BRRI dhan87	128	102	2.38	10	2
E-109	BINA Dhan 8	114	103	1.80	10	2
E-110	BINA Dhan 10	106	95	0.87	9	2
LSD<0.05		3.39	5.08	0.65	1.59	
H2b		0.94	0.99	0.85	0.81	

Fig.6.10.1: Field view of AGGRi network trial of salinity Breeding at Satkhira

Experiment 610.2: Assessment of QTL effect on different biotic traits, T. Aman 2022-23

Objective: To find out the best performing parental lines against the specific QTL effect

Materials and methods: A total of 22 elite genotypes were evaluated in trial along with four checks such as BRRI dhan49, BRRI dhan71, BRRI dhan75 and BRRI dhan87 at Satkhira (**Table 6.10.3**). The unit plot size was 5.0 m × 12 rows. The field layout was done using Alpha lattice design with two replications. Twenty-five days' seedlings were transplanted @ 2-3 seedlings per hill with the spacing of 20 cm × 20 cm. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14(78 kg Gypsum): 4.3 (12 kg Zn SO4) kg N P K S Zn/ha were applied in the trial. All amount of P, K, S and Zn were applied at the time of final land preparation and nitrogen were applied at three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). Crop management such as weeding, irrigation was done on time. Pest management and other cultural operations were done when deemed necessary.

Table 6.10.3: Performance of the genotypes in AGGRi Alliance, T. Aman 2022 at Satkhira

ENTRY CODE	Growth duration (days)	Plant height (cm)	Grain yield (t/ha)
22QWS-01	120	91	3.48
22QWS-02	**121**	**95**	**4.05**
22QWS-03	**120**	**91**	**4.02**
22QWS-04	120	93	3.86
22QWS-05	119	91	3.95
22QWS-06	122	89	3.84
22QWS-07	121	96	3.35
22QWS-08	123	92	3.71
22QWS-09	124	93	3.64
22QWS-10	120	95	3.83
22QWS-11	120	93	3.82
22QWS-12	119	93	3.83
22QWS-13	120	90	2.95
22QWS-14	**120**	**90**	**4.08**
22QWS-15	116	95	3.33
22QWS-16	113	95	2.64
22QWS-17	**118**	**94**	**4.06**
22QWS-18	**118**	**94**	**4.08**
22QWS-19 (BRRI dhan49)	127	87	3.00
22QWS-20 (BRRI dhan71)	112	97	2.64
22QWS-21(BRRI dhan75)	110	89	3.56
22QWS-22 (BRRI dhan87)	**121**	**105**	**4.48**
LSD (0.05)	3.9	6.9	0.9
H2b	0.86	0.59	0.53

Results and discussion: Among 18 entries, five genotypes were selected based on grain yield. However, five genotypes such as 22QWS-2(4.05t/ha), 22QWS-3(4.02t/ha), 22QWS-14 (4.08 t/ha), 22QWS-17(4.06 t/ha) and 22QWS-18 (4.08 t/ha) produced statistically significant higher grain yield than two checks viz BRRI dhan49 (3.00 t/ha) and BRRI dhan71 (2.64 t/ha) but statistically similar yield with BRRI dhan75 (3.56 t/ha). All genotypes gave lower grain yield than BRRI dhan87 (4.48t/ha). The yield of rested genotypes were ranged from 2.65 t/ha to 3.94 t/ha with growth duration ranged from 110 days to 124 days. The trial heritability obtained for different traits such as growth duration, plant height, grain yield, and panicle number per hill were 0.86, 0.59, and 0.53 respectively, indicating the trial accuracy which was high (**Table 6.10.3**). However, selected elite genotypes will be used in crossing program for increasing the frequency biotic stress tolerant alleles in the breeding program to increase the productivity and genetic gain.

Experiment 6.11.1: Evaluation of genotypes under AGGRi Network Trial 2022-23, Boro

General objective: Development of salt-tolerant rice variety suitable for the salinity prone areas of coastal districts in Boro season

Specific objective: To evaluate the genotypes in the natural salinity-prone environment at the farmers' field of Satkhira region in Boro season.

Materials and methods: A total of 200 elite genotypes were evaluated in this trial along with A69-1, **IRRI242, IRRI147**, BRRI dhan67, BRRI dhan99 and BINA dhan10 as tolerant checks and BRRI dhan28, **IRRI240, IRRI 241 and** IRRI 154 as sensitive at Satkhira. The unit plot size was 3.12 square meter (5 rows× 13 hills). The field layout was done following Alpha lattice design with two replications. Thirty-five days' seedlings were transplanted @ 2-3 seedlings per hill with the spacing of 20 cm × 20 cm. Fertilizer were applied at the rate of 300 kg Urea: 100 kg TSP: 165 kg MoP: 112 kg Gypsum: 12 kg $ZnSO_4$ kg per hectare in the trial. All amount of P, K, S and Zn was applied at the time of final land preparation and nitrogen (urea) were applied in three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). Crop management such as weeding, irrigation was done in time. Pest management and other cultural operations were also performed when necessary. list of survival genotypes was shown in **Table 6.11.1.**

Table 6.11.1: List of the survived genotypes in Boro 2022 at Shyamnagar under AGGRi Alliance

ENTRY CODE	Designation	Growth duration (days)	Plant height (cm)	Grain yield (t/ha)	Panicle number/ hill	PAcp
E-003	IR21LT1191	132	73	0.86	7	7
E-005	IR21LT1650	133	89	0.38	8	5
E-007	IR21LT1674	130	81	0.47	9	5
E-010	IR21LT1081	120	90	0.72	8	7
E-031	IR21LT1089	132	82	0.67	8	7
E-032	IR21LT1076	138	81	1.08	9	5
E-038	IR21LT1152	132	87	0.62	9	7
E-054	IR21LT1560	142	74	0.34	9	7
E-056	IR21LT1204	132	70	0.61	8	7
E-058	IR21LT1564	125	93	2.02	9	5
E-059	IR21LT1045	130	81	1.06	9	7
E-062	IR21LT1037	132	79	0.59	9	7
E-069	IR21LT1007	142	70	0.67	7	5
E-073	IR21LT1009	128	75	0.62	8	7
E-076	IR21LT1610	141	78	0.70	10	5
E-077	IR21LT1627	136	77	0.53	8	7
E-082	IR21LT1321	136	81	0.44	7	7
E-086	IR21LT1167	126	75	0.49	9	7
E-088	IR21LT1608	133	78	0.58	8	5
E-098	IR21LT1215	132	74	0.96	7	5
E-105	IR21LT1522	132	91	0.68	8	7
E-107	IR21LT1597	137	71	0.76	10	7
E-114	IR21LT1211	125	88	0.94	9	7
E-115	IR21LT1079	132	81	1.15	9	5
E-129	IR21LT1338	132	86	0.97	7	7
E-130	IR21LT1328	133	71	0.88	8	7
E-131	IR21LT1613	128	83	0.67	8	7
E-135	IR21LT1290	126	85	1.06	9	7
E-144	IR21LT1163	132	78	0.45	9	5
E-147	IR21LT1203	139	88	0.71	9	5
E-161	IR21LT1223	129	95	0.51	8	7
E-163	IR137772-B-B-R-B-R-38 R	143	84	0.92	7	5
E-164	IR21LT1232	135	79	0.48	7	7
E-176	IR21LT1239	147	93	1.06	8	5
E-179	IR21LT1024	135	90	0.61	9	7
E-182	IR21LT1218	126	90	0.7	9	7

ENTRY CODE	Designation	Growth duration (days)	Plant height (cm)	Grain yield (t/ha)	Panicle number/ hill	PAcp
E-183	IR21LT1615	141	71	0.51	8	5
E-191	IRRI 147	132	81	1.25	8	5
E-194	IRRI 242	135	77	0.63	8	7
E-196	A69-1	132	90	2.02	10	5
E-199	BRRI dhan99	139	81	1.49	9	5
E-200	BINA Dhan-10	132	90	1.69	9	5

Results and discussion:

In Shyamnagar, grain yield ranged from 0.34 tha^{-1} (IR21LT1560) to 2.02 tha^{-1} (A69-1, IR21LT1564) and growth duration 120 days (IR21LT1081) to 147 days (IR21LT1239), respectively. Among 200 entries, only 13 genotypes from were selected based on grain type and grain yield. Only one genotype IR21LT1564 produced better yield (2.02 tha^{-1}) than BRRI dhan99 (1.49 tha^{-1}) and BINA Dhan-10 (1.69 tha^{-1}) and similar yield with A69-1. This one genotype may be considered as potential to evaluate in the advanced yield trials and also recycle as a parent in the breeding program. On the contrary, none of the genotypes including checks were survived in Kaliganj, Satkhira. None of the entries were selected due to complete damage of that trial. **Figure 6.11.1 and 6.11.2** present the salinity level at Shyamnagar and Kaliganj, respectively during Boro season 2022. **Figure 6.11.3** comprises the graphics for snapshot covering different field views of the experiment.

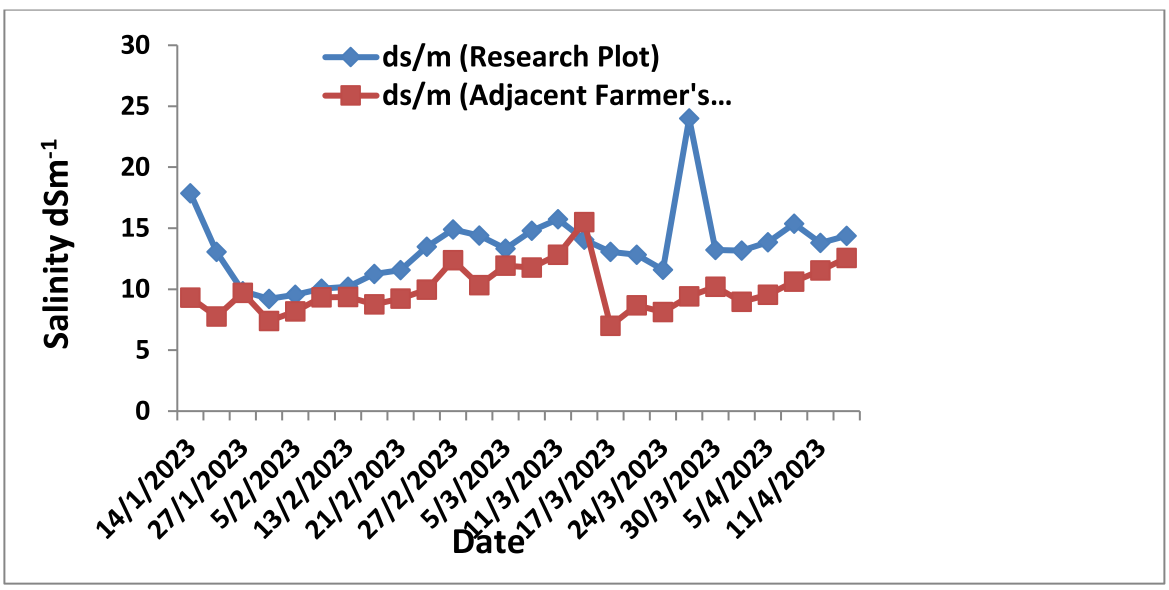


Figure 6.11.1. Salinity level at Shyamnagar during Boro season 2022-23

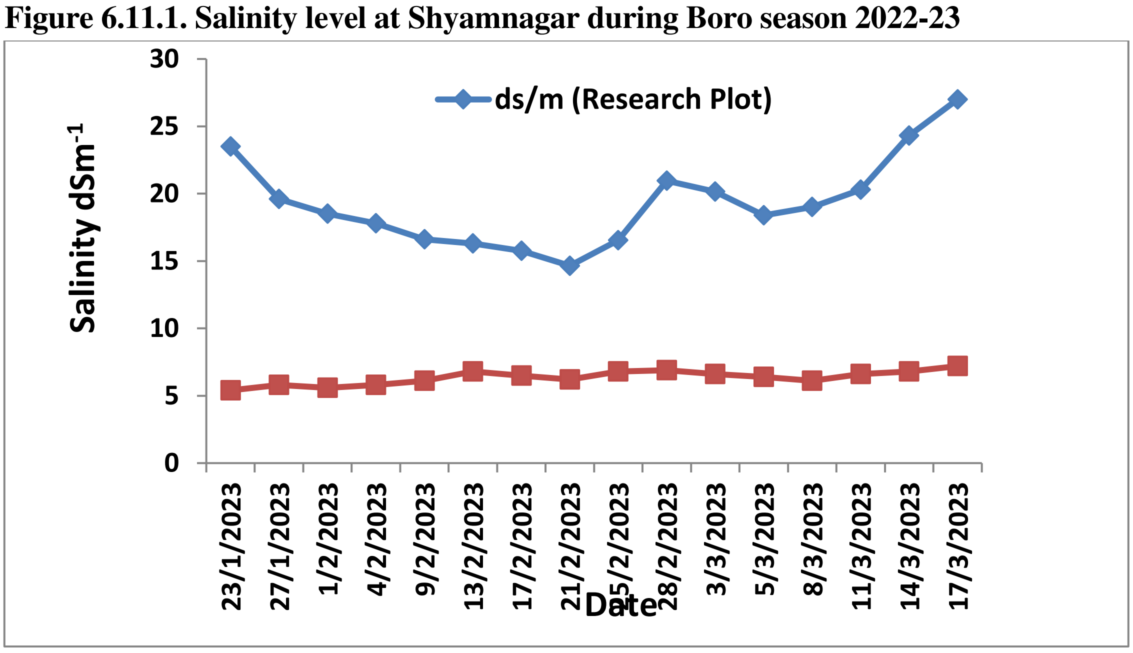
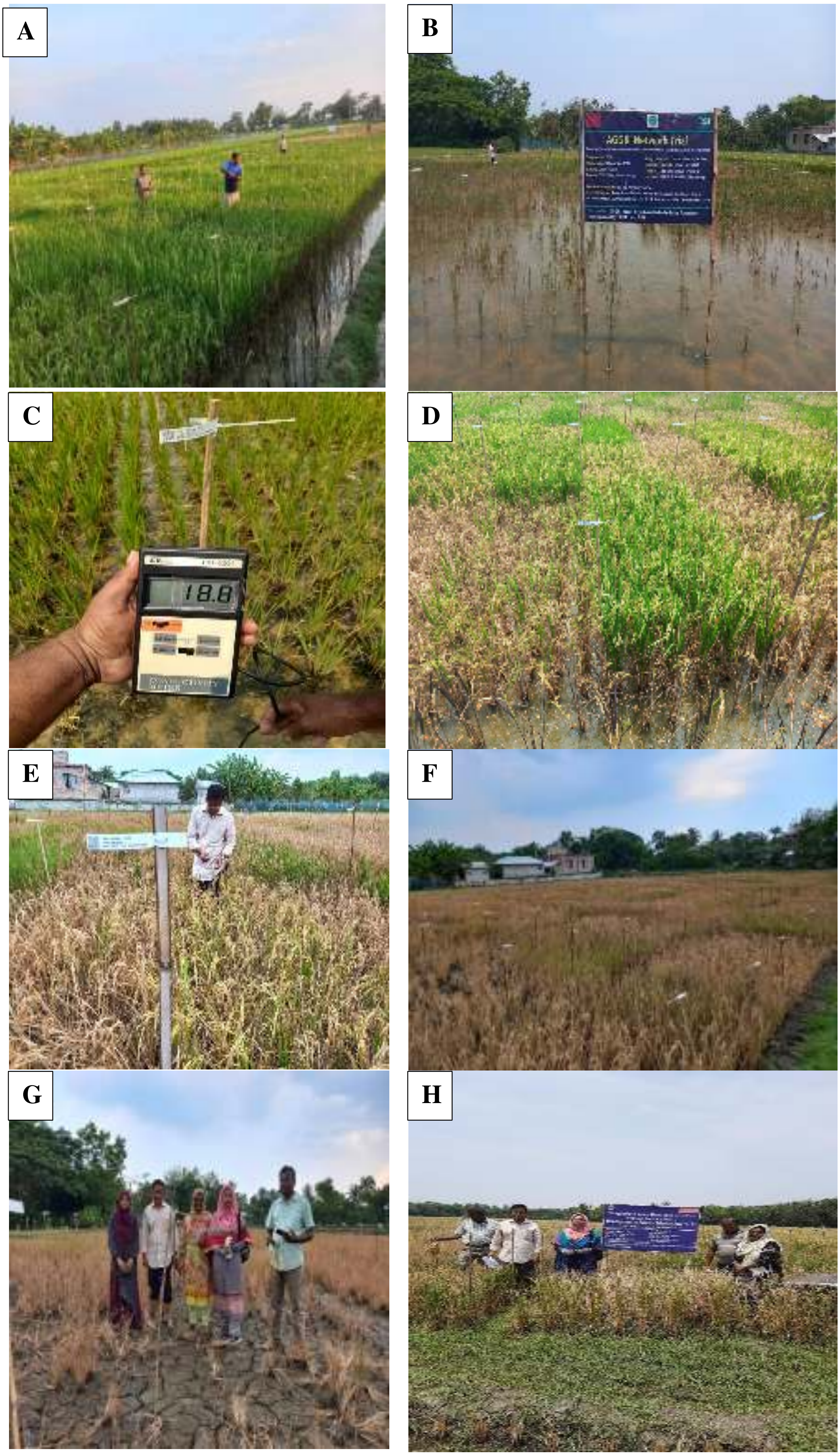


Figure 6.11.2. Salinity level at Kaliganj during Boro season 2022-23. The trial at Kaliganj was completely damaged immediately after transplanting due to high salinity (EC 15.0-20.0 dS/m) at the seedling stage.


A
B
C
18.8
D
E
F
G
H

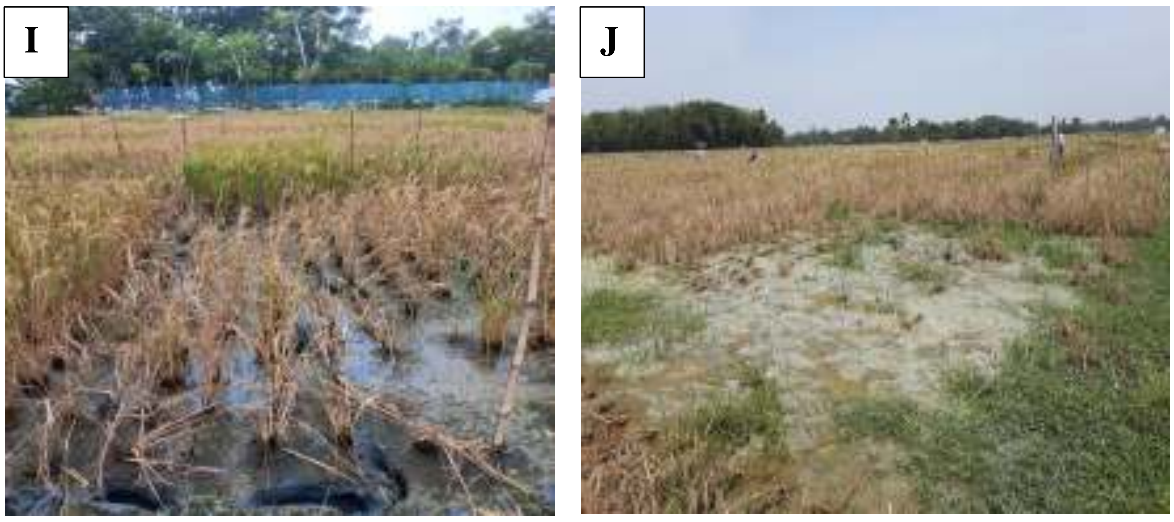


Figure 6.11.3. Pictorial field view of AGGRi network trial under salinity Breeding at Shyamnagar and Kaliganj upazillas of Satkhira during Boro season 2022-23.

A. during vegetative stage
B. Seedling damage at Shyamnagar due to salinity
C. Salinity level at Kaliganj
D. Damage at reproductive stage
E, F & G, H: Field view of Shyamnagar
I. Localized damage at Shyamnagar
J. Salt crust formed at Kaliganj

It is important to note that when the trial plot was salinized using irrigation water with high salinity (EC ~7.0 dS/m), the irrigation water enters into the trial plot from one side and then this salt water ran off towards the other end of trial plot and salt accumulated in the distal (other part) part of the trial field. The salinity gradient in two opposite directions of the trial site was not equal. Thus, the genotypes of the distal part of the trial did not survive due to excessive accumulation of salt consequently the salt stress was higher as well. Although we were unable to collect data from both the replications in these unavoidable circumstances however, we had selected 13 genotypes based on phenotypic acceptability, yield under salt stress in hotspot salinity condition.

PROJECT: AFACI: Asian Food & Agriculture Cooperation Initiative (Stress Tolerant High Yielding Rice (SHR) Project)

Experiment 6.12.1: Evaluation of AFACI Stage1 material in Boro season

Specific objectives: Initial evaluation of yield, salt tolerance and other agronomic characteristics of selected materials in replicated trial.

Materials and Methods: One hundred six genotypes along with two checks viz. BRRI dhan67 (Tol.ck) and BRRI dhan89 (sus.ck) were evaluated in stage 1 at Debhata and Kaliganj Upazillas of Satkhira district **(Table 6.12.1).** The trial was carried out following alfa lattice design with three replications. The unit plot size was 5.2 meters × 5 rows. Forty-day old seedlings were transplanted @ 2-3 seedlings with 20 x 20 cm spacing. Fertilizers @ 120:19:60: 20:3.6 kg NPKSZn/ha (260-97-120-110-11 kg/ha or 35-13-16-15-1.5kg/bigha Urea-TSP-MoP-Gypsum-$ZnSO_4$) were used with split application of N at 15, 30, 50 days after seeding (DAT). Total amount of P K S was applied at the time of final land preparation**.** Data were collected on plant height, days to flowering, days to maturity, panicle per plant, spikelet sterility and yield per plot as per SES scoring of IRRI 2013 protocol. Genotypic performance of the selected entries is shown in **Table 6.12.2. Figure 6.12.1** presented the field view of AFACI-1 trial during irrigated season (Boro) 2022-23.

Table6.12.1: List of the tested genotypes in Stage 1, AFACI, Boro 22-23

Sl	Designation	Sl	Designation
1	IR16T1656	55	IR17L1609
2	IR18R1081	56	IR17F1053
3	IR18T1346	57	IR16T1054
4	IR18T1059	58	IR14G3595
5	IR17R1003	59	IR16F1147
6	IR18T1104	60	IR16F1148
7	IR19R1181	61	IR16T1317
8	IR19R1124	62	IR14L545
9	IR19R1158	63	IR11T205
10	IR19R1057	64	IR16L1890
11	IR19R1202	65	IR 126999-B-32-2-1-3
12	IR19R1147	66	IRRI 249
13	IR19R1076	67	IR 129434-B-8-B-3-1
14	IR16T1646	68	IR 129391-B-35-B-1-1
15	IR16T1356	69	IR18L1298
16	IR18T1186	70	IR16T1661
17	IR19R1159	71	IR16M1904
18	IR18T1073	72	IR16T1503
19	IR16T1348	73	IR 121151-307-1-1-1-1
20	IR19R1065	74	IR 92831-22-BAY 2-1-CMU 1
21	IR19R1101	75	IR 126990-B-8-1-1-1
22	IR18T1276	76	IR14G3964
23	IR15F1729	77	IR16L1478
24	IR 108175-B-22-AJY 3-B-1	78	IR17L1415
25	IR15T1319	79	IR 129462-B-46-B-1-1
26	IRRI 132	80	IR18T1327
27	IR19L1045	81	IR18M1011
28	IR 126998-B-10-5-1-3	82	IR14L345
29	IR15F1697	83	IR 54447-3B-10-2
30	IR15F1868	84	IR15T1303
31	IR16F1251	85	IR13L337
32	IR18T1045	86	IR 126957-B-48-5-1-3
33	GSR IR 1-5-S14-S2-Y2	87	IR18T1330
34	IR16F1065	88	IR16L1795
35	IR16T1538	89	IR19L1016
36	IR 127034-B-14-1-2-3	90	IR13V163
37	IR18T1337	91	IR15L1008
38	IR 117833-21-1 RGA-1 RGA-1 RGA-1	92	IRRI 184
39	IR18T1021	93	IR 121113-314-1-1-1-2
40	IR18R1208	94	IR16T1662
41	IR18T1135	95	IR 99853-B-B-B-275
42	IR18T1137	96	IR14G2711
43	IR 99853-B-B-B-182	97	IR16T1339
44	IR17M1710	98	IR 129420-B-30-B-2-1
45	IR 117750-B-25-3-1	99	IR18T1029
46	IR 121147-B-B-CMU 11-1-2	100	IR 99853-46-1-1-1
47	IR15F1982	101	IR15L1564
48	IR 126952-443-12-47-8-59-B	102	IRRI 104
49	IR19L1024	103	IRRI 147
50	IR16F1026	104	IRRI 154
51	IR15F1943	105	POKKALI
52	PR 25997-B-B-B	106	IRRI 230

53	IR18T1214	107	BRRI dhan67(Tol. Ck)
54	GSR IR 1-12-S2-Y3-Y2	108	BRRI dhan89(Sus.ck)

Table 6.12.2: The performance of selected genotypes from AFACI-1, Salinity Tolerant Rice (STR) Breeding in Kaliganj, Satkhira during Boro 2022-23

Entry no.	Designation	GD	PH	ET	Yield (tha^{-1})
25	IR15T1319	126	89	61	0.15
42	IR18T1137	126	87	65	0.22
60	IR16F1148	126	91	71	0.20
98	IR129420-B-30-B-2-1	127	78	77	0.05
102	IRRI 104	127	83	79	0.18
104	IRRI 154	127	82	79	0.13
106	IRRI 230	130	83	81	0.18

GD= Growth duration in days, PH= plant Height in cm, ET= Effective tiller number

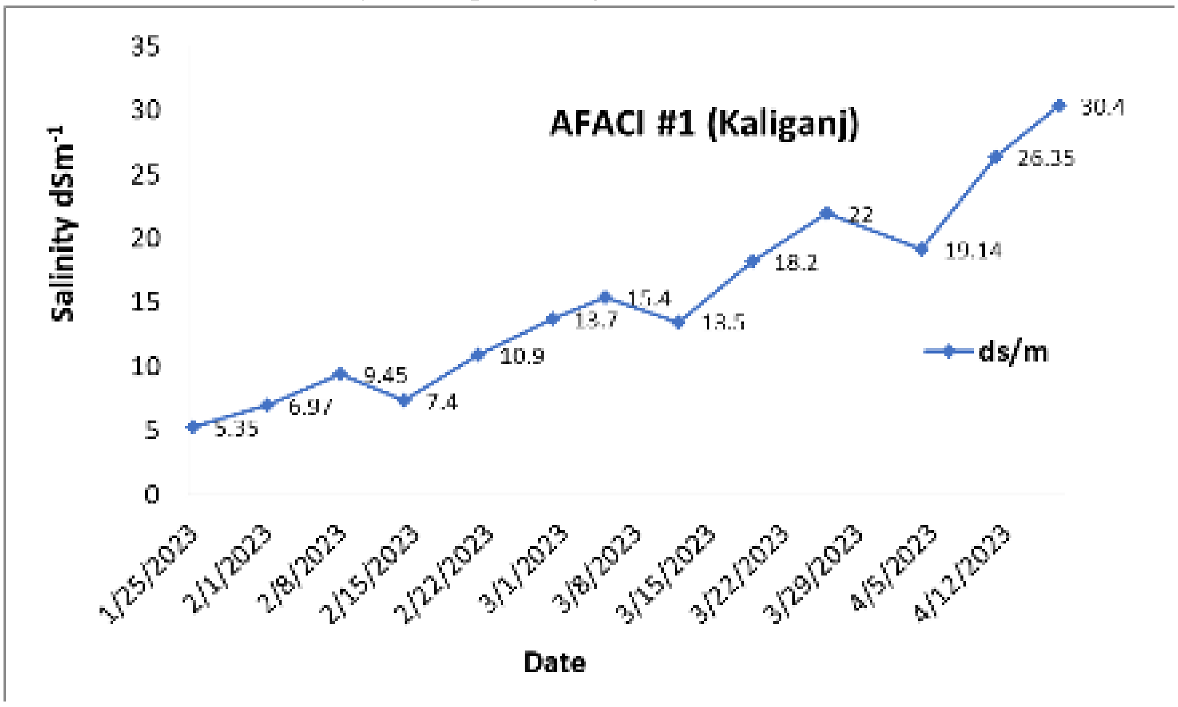


Fig 6.12.1: Water salinity level of AFACI trial at at Kaliganj during Boro 2022-23

Results: Only seven entries survived in Kaliganj out of 104 tested entries. whereas, no entries were survived due to sever salinity in Debhata. Th survival genotypes and their performance are shown in Table **6.12.1.** Those genotypes showed poor yield performance which were existed. Due to the extremities of salinity in Kaliganj, almost all the entries were damaged and yield performance of seven entries were very minimal. For instance, highest yield was 0.22 tha^{-1} for IR18T1137.

The both checks BRRI dhan89 and BRRI dhan67 completely damaged. The salinity graph of Kaliganj revealed that the genotypes faced the gradual upraise of salinity stress from transplanting to maturity during the vulnerable reproductive phase **(Figure 6.12.1).**

Fig. 6.12.2: Field view of AFACI-1 trial during irrigated season (Boro) 2022-23

Conclusion: The selected genotypes will be utilized as a potential source for backcross breeding as well as forward breeding of STR breeding program.

Experiment 6.12.2: Evaluation of Selected AFACI material in Stage2 in Boro 2022-23

Specific objectives: Initial evaluation of yield, salt tolerance and other agronomic characteristics of selected materials in replicated trial.

Materials and Methods: Eleven genotypes including three check varieties (BRRI dhan67 and BINA dhan10 as tolerant and BRRI dhan89 as susceptible) were evaluated in stage 2 at Debhata and Kaliganj Upazillas of Satkhira district. The trial was carried out following randomized complete block design with three replications. The unit plot size was 5.2 meters × 8 rows. Forty-day old seedlings were transplanted @ 2-3 seedlings with 20 x 20 cm spacing. Fertilizers @ 120:19:60: 20:3.6 kg NPKSZn/ha (260-97-120-110-11 kg/ha or 35-13-16-15-1.5kg/bigha Urea-TSP-MoP-Gypsum-$ZnSO_4$) were used with split application of N at 15, 30, 50 days after seeding (DAT). Total amount of P K S was applied at the time of final land preparation**.** Data were collected on plant height, days to flowering, days to maturity, panicle per plant, spikelet sterility and yield per plot as per SES scoring of IRRI 2013 protocol. The list of the entries and genotypic performance of the Debhata and kaliganj trial is shown in Table3, 4 and 5, respectively. Graphical distribution for the water salinity level of kaliganj during crop establishment is presented in figure 3. Figure 4 provides the field view of both trials in Kaliganj and Debhata during irrigated season (Boro) 2022-23 in stress condition.

Table 6.12.2: The list of selected genotypes from AFACI, Salinity Tolerant Rice (STR) Breeding during Boro 2022-23

SL	Designation	Remarks
1	IR117841-4-1 RGA1	Tested entries
2	IR117833-3-1	
3	IR117840-3-1	
4	IR18R1204	
5	IR18T1045	
6	IR18T1137	
7	SVIN401	
8	IR112462-B-25-2	
9	BINAdhan10	Tolerant check
10	BRRI dhan67	Tolerant check
11	BRRI dhan89	Susceptible check

Table 6.12.3: The performance of survived genotypes from AFACI, Salinity Tolerant Rice (STR) Breeding in Debhata, Satkhira during Boro 2022-23

Sl	Designation	GD	PH	ET	Yield (tha^{-1}),
1	IR117841-4-1 RGA1	142	97.7	10	4.3
2	IR117833-3-1	142	90.9	10	2.4
3	IR117840-3-1	150	88.7	10	2.3
6	IR18T1137	150	88.1	9	2.5
7	SVIN401	151	100.6	10	3.7
9	BINA dhan10	140	102.9	9	4.0
10	BRRI dhan67	138	92.0	9	3.6
	LSD (<0.05)	1.5	0.9	0.4	0.29
	H2b	0.99	1.00	0.89	0.98

GD= Growth duration in days, PH= plant Height in cm, ET= Effective tiller number

Table 6.12.4: The performance of survived genotypes from AFACI, Salinity Tolerant Rice (STR) Breeding in Kaliganj, Satkhira during Boro 2022-23

Sl	Designation	GD (days)	PH	ET	Yield (t/ha)
1	IR117841-4-1 RGA1	140	85.7	10.1	1.5
5	IR18T1045	137	85	11.3	1.7
7	SVIN401	141	77.2	10	1.5
9	BINA dhan10 (Ck)	133	95.5	9.9	3.7
10	BRRI dhan67 (Ck)	136	85.4	9.6	2.9
	LSD (<0.05)	0.72	1.22	0.74	0.46
	H2b			0.8	0.97

GD= Growth duration in days, PH= plant Height in cm, ET= Effective tiller number

Results: As both the trial was set in salt-stress condition, out of eight tested entries only five entries survived in Debhata whereas, in Kaliganj just three entries were existed. IR117841-4-1 RGA1 and SVIN401 was commonly withstand in both locations. In Debhata, two genotypes viz., IR117841-4-1 RGA1 (4.3 tha^{-1}) and SVIN401 (3.7 tha^{-1}) were selected. In Kaliganj trial, only genotype one (1.5 tha^{-1}) was selected **(Table 6.12.3 and 6.12.4).** In Debhata; beyond the selected entries, stressed yield performance of other survived genotypes was 2.4 tha^{-1} for IR117833-3-1, 2.3 tha^{-1} for IR117840-3-1, 2.5 tha^{-1} for IR18T1137, 4.0 tha^{-1} for BINA dhan10 and 3.6 tha^{-1} for BRRI dhan67 and rest of the entries were damaged. In kaliganj; only IR18T1045 (1.7 tha^{-1}), BINA dhan10 (3.7 tha^{-1}) and BRRI dhan67 (2.9 tha^{-1}) was survived. Susceptible check BRRI dhan89 was totally destroyed in both trials. The salinity graph of Kaliganj revealed that the genotypes faced the gradual upraise of salinity stress from transplanting to maturity with its extremeness during the vulnerable reproductive phase (**Figure.6.12.3**) and the field view of trial plots are shown in **Figure 6.12.4**.

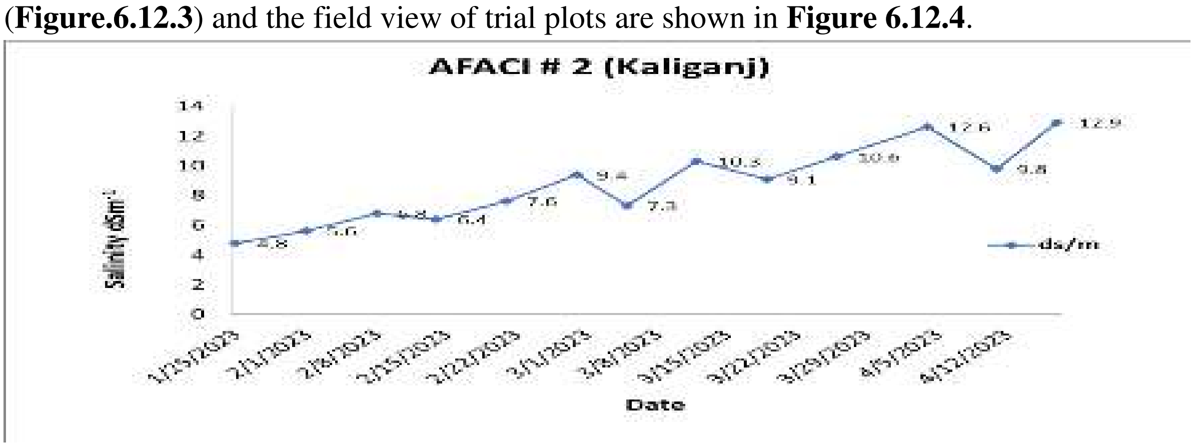


Fig 3: Water salinity level of AFACI trial at at Kaliganj during Boro season, 2022-23

Fig. 4: Field view of trial during irrigated season (Boro) 2022-23 in stress condition

PROJECT 7A: DEVELOPMENT OF PREMIUM QUALITY RICE (T. AMAN)

Experiment 7A.1: Hybridization

General objectives: Development of aromatic and non-aromatic fine grain quality rice with international and national standard (KaliJira/Chinigura/Kataribhog/BRRI dhan34 type).

Project Leader: Sharmistha Ghosal

Principal Investigator: Sharmistha Ghosal.

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula.

Specific objective: Development of progenies having strong plant type, photosensitivity, presence or absence of aroma and fine grain quality.

Materials and Methods: Twenty-four varieties/advanced lines under premium quality rice and 13 varieties/lines under photosensitive rice, were used for crossing (**Table 7A.1a**). Parents were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Around 30 days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 25 cm × 15 cm using single seedling/hill. Fertilizers were applied at the rate of 83 (180 kg Urea): 15 (74 kg TSP): 50 (100 kg MP): 12 (67 kg Gypsum): and 3.6 (10 kg $ZnSO_4$) kg N, P, K, S, and Zn, respectively per hectare. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen were applied at three equal splits at 5-10, 20-25 and 35- 40 days after transplanting (DAT). Other cultural and pest management practices were done as and when necessary.

Results: Under premium quality rice, a total of 32 single crosses and 12 backcrosses were made and under photosensitive rice, a total of nine single crosses were made. F_1 seeds were harvested, dried, and preserved in a glass container with silica gel (**Table 7A.1b).**

Table 7A.1a. List of parents grown for hybridization, Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	SL No	Designation
Premium Quality Rice			
1	BR11768-10-4-6-P2*	13	BR9590-45-1-3-2-P1
2	BR10821-15-7-8-5*	14	BR9844-7-4-1-2-4-2
3	BR9580-30-2-1-1*	15	BR8528-2-2-3-HR2
4	BR8515-8-7-8-3*	16	BR8234-1-3-7-1-3-HR2
5	BR8846-38-2-4-2*	17	BRRI dhan90
6	BR10062-8-3-2-1-P2*	18	Begunidhan
7	BR8493-12-7-4-P1*	19	Chini atop
8	BR10824-5-6-4-1*	20	Chini Shail
9	BR9126-15-3-4-1*	21	Bashful
10	BR10813-75-20-10-2*	22	Tepi Boro
11	BINA dhan13*	23	BRRI dhan50
12	BR9053-16-3-4-1	24	BR8862-29-1-5-1-3
Photosensitive Rice			
1	BR8845-21-1-10-3-4	8	FBR376
2	TL Aus-Gaz10-40-5-11*	9	Nania
3	Bashful_PM	10	BR11949-4R-258
4	BR10212-7-5-1	11	IR99285-1-1-1-P2 (Zn)
5	BR22	12	Rosulbhog
6	BR23	13	Laffa
7	BRRI dhan54		

Table 7A.1b. List of crosses made for development of Premium Quality Photosensitive Rice, T. Aman 2022-23

SL		Crosses	Objectives
Premium Quality Rice			
1	BR15312	BR9590-45-1-3-2-P1/BR11768-10-4-6-P2*	BRRI dhan34 type grain with aroma
2	BR15313	BR9590-45-1-3-2-P1/BR10821-15-7-8-5*	34 type grain with aroma
3	BR15188	BRRI dhan90/BR9580-30-2-1-1*	34 type grain with aroma
4	BR15314	Begunidhan/BR9580-30-2-1-1*	34 type grain with aroma
5	BR15315	BR9590-45-1-3-2-P1/BR8515-8-7-8-3*	34 type grain with aroma
6	BR15316	Begunidhan/BR8515-8-7-8-3*	34 type grain with aroma
7	BR15317	BR9053-16-3-4-1/BR8846-38-2-4-2*	34 type grain with aroma
8	BR15318	BR9590-45-1-3-2-P1/BR8846-38-2-4-2*	katary type grain with aroma
9	BR15319	BR9844-7-4-1-2-4-2/BR8846-38-2-4-2*	katary type grain with aroma
10	BR15320	Begunidhan/BR10062-8-3-2-1-P2*	katary type grain with aroma
11	BR15717	BRRI dhan90/BR8493-12-7-4-P1*	34 type grain with aroma
12	BR15321	BR8234-1-3-7-1-3-HR2/BR10824-5-6-4-1*	34 type grain with aroma
13	BR15189	BRRI dhan90/BR10824-5-6-4-1*	34 type grain with aroma
14	BR15322	Begunidhan/BR10824-5-6-4-1*	34 type grain with aroma
15	BR15323	BR9053-16-3-4-1/BR9126-15-3-4-1*	34 type grain with aroma
16	BR15324	BR8234-1-3-7-1-3-HR2/BR9126-15-3-4-1*	34 type grain with aroma
17	BR13736	BRRI dhan90/BR9126-15-3-4-1*	34 type grain with aroma
18	BR15325	BR9126-15-3-4-1*/Begunidhan	34 type grain with aroma
19	BR15326	BR8234-1-3-7-1-3-HR2/BR10813-75-20-10-2*	34 type grain with aroma
20	BR15190	BR10813-75-20-10-2*/BRRI dhan90	34 type grain with aroma
21	BR15327	Begunidhan/BR10813-75-20-10-2*	34 type grain with aroma
22	BR15191	BINA dhan13*/BRRI dhan90	34 type grain with aroma
23	BR15328	Chiniatop/BR9126-15-3-4-1*	34 type grain with aroma
24	BR15329	Chinisail/BR9126-15-3-4-1*	34 type grain with aroma
25	BR15330	Bashful/ BRRI dhan50	Improvement of Bashful
26	BR15192	Tepi Boro/BRRI dhan50	34 type grain with aroma
27	BR15193	BR10821-15-7-8-5*/ BRRI dhan90	34 type grain with aroma
28	BR15194	BR10821-15-7-8-5*/Bashful	Improvement of Bashful
29	BR15331	BR10821-15-7-8-5*/Begunidhan	34 type grain with aroma
30	BR15195	BRRI dhan90/ Begunbichi (Acc2073)	34 type grain with aroma
31	BR15332	Begunidhan/ BRRI dhan34	34 type grain with aroma
32	BR15312	Begunidhan/ BRRI dhan70	katary type grain with aroma
BC_1F_1		**Crosses**	
1	BR14507	BRRI dhan90/BR8493-3-5-1-P1	34 type grain with aroma
2	BR14508	BRRI dhan90/BR11213-12-2-3	34 type grain with aroma
3	BR14509	BRRI dhan90/BR10820-36-21-11-1	34 type grain with aroma
BC_2F_1			
1	BR14881	BRRI dhan90/BRRI dhan70// BRRI dhan90	90 type grain with aroma
2	BR14882	BRRI dhan70/BRRI dhan90// BRRI dhan90	90 type grain with aroma
3	BR14883	BR9590-45-1-3-2-P2/BRRI dhan70// BR9590-45-1-3-2-P2	katary type grain with aroma
4	BR14884	BR8528-2-2-3-HR2/BRRI dhan70// BR8528-2-2-3-HR2	katary type grain with aroma

5	BR14885	BR9844-7-4-1-2-4-2/BRRI dhan70// BR9844-7-4-1-2-4-2	katary type grain with aroma
6	BR14886	BRRI dhan90/Kalijira//BRRI dhan90	90 type grain with aroma
7	BR14887	BRRI dhan90/Tulsimala//BRRI dhan90	90 type grain with aroma
8	BR14888	Ranisalute/BRRI dhan90//BRRI dhan90	90 type grain with aroma
BC_3F_1			
1	BR14880	BRRI dhan90/BRRI dhan70/// BRRI dhan90	
Photosensitive Rice			
SL No	**BR Number**	**Designation**	**Objectives**
1	BR15348	BRRI dhan54/ BR23	Higher yield with photoensitivity
2	BR15349	Nania/BR10212-7-5-1	Higher yield with photoensitivity
3	BR15350	FBR376/BR23	Higher yield with photoensitivity
4	BR15351	Nania/BRRI dhan54	Higher yield with photoensitivity
5	BR15352	IR99285-1-1-1-P2 (Zn)/BR22	Higher yield with photoensitivity
6	BR15353	IR99285-1-1-1-P2 (Zn)/BR23	Higher yield with photoensitivity
7	BR15354	Rosulbhog/FBR-376	Higher yield with photoensitivity
8	BR15355	Rosulbhog/Nania	Higher yield with photoensitivity
9	BR15356	BR23/ Laffa	Higher yield with photoensitivity

Experiment 7A.2: Confirmation of F_1s

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific Objective: To confirm the crosses as true hybrid.

Materials and Methods: Under premium quality rice, 40 crosses along with their respective parents and under photosensitive rice 22 crosses and one backcross along with their respective parents were grown in the net house of Plant Breeding Division. The F_1 seeds were seeded in the earthen pots after germination. Thirty days old seedlings were transplanted at a spacing of 25 cm × 15 cm along with their respective parents using single seedling/hill in the F_1 confirmation block. Crop management was done as described in Experiment 7A.1. The leaf samples were collected from each of the 12 plants from each cross and respective parent for QC genotyping to determine true F_1. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F_1s were selected, harvested, dried, cleaned and preserved in cold room.

Results: Under premium quality rice, 40 single crosses and under photosensitive rice 22 single crosses and one backcross were confirmed as the plants with heterozygous alleles at two or more SNP loci were declared as true F_1s and selected as true hybrids and then registered into BRRI cross list with BR numbers. Selected F_1 plants were harvested and F_2 seeds were dried and stored in cold room (**Table 7A.2).**

Table 7A.2: List of confirmed and selected F_1s as true hybrids, Development of Premium Quality Rice, T. Aman 2022-23

SL No	BR Number	Cross combination	Objectives
Premium Quality Rice			
1	BR14506	BRRI dhan90/BR9178-7-2-4-4	34 type grain with aroma
2	BR14514	BRRI dhan90/BR8845-21-1-5-4-10-4	34 type grain with aroma
3	BR14517	BR9590-45-1-3-2-P2/BR9126-15-3-4-1	Katarybhog type with aroma
4	BR14518	BR9590-45-1-3-2-P2/BR10820-36-21-11-1	Katarybhog type with aroma
5	BR14520	BR8528-2-2-3-HR2/BR8845-21-1-5-4-10-4	Katarybhog type with aroma
6	BR14521	BR8882-30-2-5-2/BR10820-36-21-11-1	Katarybhog type with aroma

SL No	BR Number	Cross combination	Objectives
7	BR14522	BR8882-30-2-5-2/Black Rice Sylhet	Katarybhog type with aroma
8	BR14523	BR8882-30-2-5-2/BR8515-23-6-3	Katarybhog type with aroma
9	BR14528	BR8845-21-1-5-4-10-4/BR9844-7-4-1-2-4-2	Katarybhog type with aroma
10	BR14529	BR8845-21-1-5-4-10-4/BRRI dhan90	Katary type grain with aroma
11	BR14530	BR8845-21-1-5-4-10-4/BRRI dhan70	Katary type grain with aroma
12	BR14531	BR9581-16-3-5-3/BRRI dhan70	Katary type grain with aroma
13	BR14532	BR9126-15-3-4-1/BR8297-1-1-2-HR7	Katary type grain with aroma
14	BR14533	BR8297-1-1-2-HR7/Dadkhani	Katary type grain with aroma
15	BR14538	BR8526-2-1-4/BR8515-23-6-3	Katary type grain with aroma
16	BR14539	BR11806-8-5-3-3-4/BR10813-75-20-10-1	Katary type grain with aroma
17	BR14540	BR11806-8-5-3-3-4/BR8862-29-1-5-1-3	Kalijira type grain with aroma
18	BR14541	BR11806-8-5-3-3-4/Basmati 370	Basmati type grain with aroma
19	BR14542	BR11806-8-5-3-3-4/Pusa Basmati	Katary type grain with aroma
20	BR14543	BR11224-7-9-4-4/BR10813-75-20-10-1	Kalijira type grain with aroma
21	BR14544	BR11224-7-9-4-4/BR8862-29-1-5-1-3	Basmati type grain with aroma
22	BR14545	BR11224-7-9-4-4/Basmati 370	Basmati type grain with aroma
23	BR14546	BR11224-7-9-4-4/Pusa Basmati	Basmati type grain with aroma
24	BR14548	BRRI dhan81/BRRI dhan70	BRRI dhan70 type, higher yield
25	BR14549	BRH11-9-11-45B-HR3/BR8845-21-1-5-4-10-4	Katary type grain with aroma
26	BR14550	Ja Hua/BRRI dhan70	BRRI dhan70 type, high yield
27	BR14551	BR11224-3-24-2/ Basmati 370	Basmati type grain with aroma
28	BR14552	BR11802-11-3-1/BRRI dhan70	Basmati type grain with aroma
29	BR14553	BR11224-7-9-4-4/BRRI dhan70	Basmati type grain with aroma
30	BR14554	BR11224-3-24-2/ Pusa Basmati	Basmati type grain with aroma
31	BR14890	BR10824-5-6-4-1/ BRRI dhan90	BRRI dhan34 type with aroma
32	BR14891	BR8493-12-7-4-P1/ BRRI dhan90	BRRI dhan34 type with aroma
33	BR14893	BR8493-12-7-4-P1/Begunidhan	BRRI dhan34 type with aroma
34	BR14894	BRRI dhan81/IRRI154 frg1	BRRI dhan70 type, higher yield
35	BR14895	Begunidhan/BRRI dhan50	BRRI dhan70 type, higher yield
36	BR14896	IRRI 154 frg1/BRRI dhan90	BRRI dhan34 type with aroma
37	BR14897	BRRI dhan90/ IRRI 154 frg1	BRRI dhan34 type with aroma
38	BR14898	Pusa Basmati/IRRI 154 frg1	BRRI dhan70 type, higher yield
39	BR14899	BR9844-7-4-1-2-4-2/ IRRI 154 frg1	Katary type grain with aroma
40	BR14900	IRRI154-frg1/BR8862-29-1-5-1-3	Katary type grain with aroma
Photosensitive Rice			
1	BR14575	BR22/Beroi	High yield, photosensitivity
2	BR14576	BR22/Chinisail	High yield, photosensitivity
3	BR14577	BR22/Chiniatop	High yield, photosensitivity
4	BR14578	BR22/BR9130-78-1-1-4	High yield, photosensitivity
5	BR14579	BRRI dhan87/Malshira	High yield, photosensitivity
6	BR14580	BRRI dhan87/Gouchi	High yield, photosensitivity
7	BR14581	BRRI dhan87/Binasail	High yield, photosensitivity
8	BR14582	BRRI dhan87/Rosulbhog	High yield, photosensitivity
9	BR14583	BRRI dhan87/TL Aus-Gaz8-45-6-P2-1	High yield, photosensitivity
10	BR14584	BRRI dhan87/TL Aus-Kustia3	High yield, photosensitivity
11	BR14585	BR9130-78-1-1-4/Rosulbhog	High yield, photosensitivity
12	BR14586	JaHua/Gainza	High yield, photosensitivity
13	BR14587	JaHua/Nizersail	High yield, photosensitivity
14	BR14588	BR12180-5R-1/TL Aus-Gaz8-45-6-P2-1	High yield, photosensitivity
15	BR14589	Fatemadhan/Laffa	High yield, photosensitivity
16	BR14590	Fatemadhan/BR22	High yield, photosensitivity
17	BR14591	BRH11-9-11-45B-HR3/ BR22	High yield, photosensitivity
18	BR14592	TL Aus-Gaz10-2-40-4-P8/Gainza	High yield, photosensitivity
19	BR14593	TL Aus-Gaz10-2-40-4-P8/BR9130-78-1-1-4	High yield, photosensitivity
20	BR14594	BR23/ Chinisail	High yield, photosensitivity
21	BR14595	BR23/ Chini atop	High yield, photosensitivity
22	BR14596	BR23/ Beroi	High yield, photosensitivity
Backcross			
1	BR13953	BRRI dhan87/Nizersail// BRRI dhan87	High yield, photosensitivity

Experiment 7A.3: Rapid Generation Advance (RGA)

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Rapid advancement of segregating population for shortening breeding cycle and development of large RIL population.

Materials and Methods: Under Premium quality rice, a total of 14 F_2, 36 F_3, 12 F_4 and 14 F_5 populations and under photosensitive rice a total of 8 F_2, 5 F_3, 5 F_4 and 5 F_5 populations were grown in T. Aman 2022 season. Single seed progenies from single panicle of one plant were grown in the RGA nursery both in screen house and in field. In the green house, seeds were directly sown in the tray followed by thinning and tiller pruning. While in the field, part of the panicle was sown directly on the soil. No thinning or pruning was done. Fertilizer management was done using half of the dosages described in Expt. 7A.1. Appropriate pest management practices were done as and when necessary. During harvesting at maturity, one panicle was collected from each plant of all the crosses in different times and the plant was uprooted. Harvested seeds remaining in the panicles were dried and subjected for dormancy breakage to initiate next cycle of RGA. For dormancy breaking, at first, sun-drying was done for three days followed by oven drying with 50°C temperature for 72 hours.

Results and discussion: Under premium quality rice, a total of 14,962 individuals (7,083 individuals from 14 F_2, 6131 individuals from 36 F_3, 876 individuals 12 F_4 populations and 872 individuals from 14 F_5 populations) were harvested at the time of maturity and preserved and processed with proper labels (**Table 7A.3**). Under Photosensitive rice, a total of 2460 individuals (1001 individuals from eight F_2, 594 individuals from five F_3, 638 individuals from five F_4 populations and 227 individuals from five F_5 populations) were harvested at the time of maturity and preserved and processed with proper labels (**Table 7A.3**). All together 17,422 individuals were harvested out of 32,402 individuals. The population was lodged during flowering to hard dough stage of the crop due to a strong storm, which resulted in a lower number of the harvested population**.** The preserved population was processed, dried and preserved with proper labels.

Table 7A.3: List of F_2, F_3, F_4 and F_5 populations advanced through RGA, Development of Premium Quality Rice, T. Aman 2022-23

SL No	BR Noumber	Parentage	No. of Progenies	
			Planted	Harvested
Premium Quality Rice				
	F_2			
1	BR13938	BR8297-1-1-2-HR7 (com)/Tulsimala	656	372
2	BR13939	Ranisalute/ BRRI dhan90	528	434
3	BR14178	BR9590-45-1-3-2-P2/BR9178-7-2-4-4	194	177
4	BR14180	BR9844-7-4-1-2-4-2/BR9178-7-2-4-4	1024	400
5	BR14181	BR9178-7-2-4-4-P1/ BR9844-7-4-1-2-4-2	424	130
6	BR14182	BR8528-2-2-3-HR2/BR9178-7-2-4-4	756	394
7	BR14184	BRRI dhan90/ BR9178-7-2-4-4-P1	580	219
8	BR14185	BR9178-7-2-4-4-P1/ BRRI dhan90	1031	665
9	BR14186	BR9178-7-2-4-4-P1/ BRH13-1-9-7B	783	294
10	BR13943	BRRI dhan90/BRRI dhan70	1000	912
11	BR14515	BRRI dhan70/BRRI dhan90	1000	916
12	BR14519	BR8528-2-2-3-HR2/BRRI dhan70	1000	918
13	BR14527	BR9844-7-4-1-2-4-2/BRRI dhan70	1000	912
14	BR13943	BRRI dhan90/BRRI dhan70// BRRI dhan90	500	340
		Total	**10,476**	**7,083**

SL No	BR Noumber	Parentage	No. of Progenies	
			Planted	Harvested
F_3				
1	BR13716	Tulsimala/Dhonia	584	210
2	BR13717	Kalijira/Dhonia	368	45
3	BR13718	Dhonia/Kalijira	116	42
4	BR13719	Dhonia/Tulsimala	296	176
5	BR13720	Radhunipagol/BRRI dhan90	316	72
6	BR13721	BRRI dhan49/Dadkhani	550	239
7	BR13722	BRRI dhan80/BRRI dhan90	555	225
8	BR13723	BRRI dhan80/BR8536-27-2-1-2	576	314
9	BR13724	BRRI dhan87/Dadkhani	408	236
10	BR13725	Dadkhani/BRRI dhan34	440	86
11	BR13726	BRRI dhan34/ BRRI dhan90	92	40
12	BR13727	BRRI dhan90/Dhonia	44	22
13	BR13728	BR8536-27-2-1-2/BRRI dhan80	660	259
14	BR13729	BR8526-2-1-1-4/D. kataribhog	192	105
15	BR13730	BR8515-23-6-3/Kalijira	468	229
16	BR13731	BR8515-23-6-3/Tulsimala	344	165
17	BR13732	BR9054-6-1-2-3/Tulsimala	592	177
18	BR13733	BR8297-1-1-2-HR7/Kalijira	188	60
19	BR13735	BR9178-7-2-4-3/D. Kataribhog	240	207
20	BR13736	BR9126-15-3-4-1/BRRI dhan90	628	260
21	BR13737	BR9126-15-3-4-1/BRRI dhan34	248	115
22	BR13738	BR9126-15-3-4-1/Kalijira	168	85
23	BR13739	BRRI dhan87/Ranisalute	576	276
24	BR13734	BRRI dhan87/ BRRI dhan90	388	197
25	BR13942	BRRI dhan90/ BRRI dhan75	868	560
26	BR13943	BRRI dhan90/ BRRI dhan70	504	152
27	BR14179	BR9178-7-2-4-4/ BR9590-45-1-3-2-P2	356	185
28	BR14183	BR9178-7-2-4-4-P1/ BR8528-2-2-3-HR2	648	232
29	BR14187	Pusa Basmati/ BR8493-3-5-1-P1	340	362
30	BR14188	BR8493-3-5-1-P1/ Pusa Basmati	268	114
31	BR14189	BR9178-7-2-4-4/Pusa Basmati	116	242
32	BR14191	BR9178-7-2-4-4/Indian Basmati	624	160
33	BR14192	DR-6/ BR8493-3-5-1-P1	628	42
34	BR14193	BR8862-29-1-5-1-3/BR9178-7-2-4-4-P1	136	60
35	BR14194	SwarnaKatari (Poba)/BR9178-7-2-4-4	788	145
36	BR14195	BR9178-7-2-4-4/ SwarnaKatari (Poba)	408	35
		Total	**14,721**	**6,131**
		F_4		
1	BR13304	BR8850-24-6-7-3/IR9669-pp823-1	250	102
2	BR13305	BR8536-27-2-1-2/Aftab-5	236	115
3	BR13306	BR8536-27-2-1-2/BR8493-3-5-1(Com)	168	130
4	BR13307	BR8493-3-5-1(Com)/BR9178-7-2-4-4	18	16
5	BR13308	BR8535-2-1-2/Noyonmoni-1	150	52
6	BR13309	Noyonmoni-2/BR8535-2-1-2	100	85
7	BR13310	BR8887-26-8-2-3/Dudulata	348	140
8	BR13311	BR8887-26-8-2-3/Kataribhog	188	60
9	BR13312	BR9584-6-3-5-3/kataribhog	180	42
10	BR13313	BR9593-5-1-1-1/Krishnobhog	112	40
11	BR13314	IR9669-pp823-1/Chinigura	92	62
12	BR13315	Krishnobhog/BR8536-27-2-1-2	40	32
		Total	**1882**	**876**

SL No	BR Noumber	Parentage	No. of Progenies	
			Planted	Harvested
F5				
1	BR12806	BR8536-12-8-3-2-2/BRRI dhan34	48	34
2	BR12807	BR8297-1-1-2-HR7/BR9582-10-6-1-2	252	70
3	BR12808	BR8297-1-1-2-HR7/NMKP102-3-2-1-1	388	110
4	BR12809	BR8493-4-1-2-1(Com)/Kalijira	104	48
5	BR12810	BR8493-4-1-2-1(Com)/Krishnobhog	100	45
6	BR12811	BR8493-4-2-1-1(Com)/Kalijira	42	32
7	BR12812	BR8850-10-3-3/BR8234-1-3-1-7-HR21	140	45
8	BR12813	BR8850-10-3-3/Krishnobhog	132	72
9	BR12814	BR9593-19-1-2-1/Kalijira	140	120
10	BR12815	BR9593-5-1-1-2/Krishnobhog	40	72
11	BR12816	BR9593-5-1-1-2/NMKP102-3-2-1-1	344	62
12	BR12817	Radhunipagal/ BR8535-2-1-2	92	60
13	BR12818	Radhunipagal/ /NMKP102-3-2-1-1	44	40
14	BR12819	Sakhorkhana/BR8515-28-1-1-3-HR3(Com)	104	62
		Total	**1,970**	**872**
		Photosensitive Rice		
F2				
1	BR13947	BRRI dhan87/BR22	100	36
2	BR13949	BRRI dhan87/Gainza	300	244
3	BR13950	BRRI dhan95/BR22	250	185
4	BR13951	BRRI dhan95/BR23	200	140
5	BR13952	BRRI dhan95/Gainza	100	80
6	BR13953	BRRI dhan87/Nizersail	100	94
7	BR13955	BR22/BRRI dhan54	200	144
8	BR13956	Rosulbhog/BR22	100	78
		Total	**1350**	**1001**
F3				
1	BR13744	BRRI dhan71*2 /Gainza	133	150
2	BR13747	NMKP102-3-2-1-1/Beroi	365	275
3	BR13748	NMKP102-3-2-1-1/TB Gura		
4	BR13749	BR8845-21-1-5-4-10-4/BR22	67	85
5	BR13750	BR8845-21-1-5-4-10-4/BR23	88	84
		Total	**653**	**594**
F4				
1	BR13326	Gainza/BRRI dhan71	190	137
2	BR13327	BR23/NMKP102-3-2-1	100	67
3	BR13328	Gainza/TB Gura	300	272
4	BR13329	Nizersail/ TL Aus Gaz-10-2-40-5	100	65
5	BR13330	TL Aus Gaz-10-45 ph1/Gainza	200	97
		Total	**890**	**638**
F5				
1	BR12844	SP21-1-6-1/Ganza	50	23
2	BR12845	SylhetBalam/Habudhan	85	42
3	BR12847	TL Aus-Gaz-10-2-40-5/BR22	200	102
4	BR12848	BRRI dhan49 (UNK)/Gainza	25	5
5	BR12851	SP21-1-5-4-10-4/SylhetBalam	100	55
		Total	**460**	**227**
		Grand total	**32,402**	**17,422**

Experiment 7A.4: Line Stage Testing (LST)

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of uniform aromatic genotypes in terms of uniformity in flowering, plant height, amylose content, presence or absence of aroma with good plant type and higher predicted yield indicated by key target trait markers.

Materials and Methods: This trial was conducted in Boro 2022-23 season. A total of 1,000 fixed advanced lines (non- photosensitive) from four crosses were grown in 12-hills single-row plots using systematic arrangement design with respective parents and check varieties. Thirty days old single seedling was transplanted at 20 cm × 20 cm spacing. Fertilizer management was done following the dosages described in Expt. 7A.1. Crop management was done as recommended for modern rice cultivation practices. Leaf samples were collected from single plant of each entry for genotyping with specific trait markers using 10 trait-based SNP markers. At maturity, line selection was done considering uniformity in flowering and plant height, grain size and shape, lodging tolerance and tolerance to major disease and insect, presence and absence of aroma with good plant type and higher predicted yield indicated by key target trait markers.

Results and discussion: A total of 84 lines were selected from 1000 progenies from four crosses (**Table 7A.4a**) based on phenotypic acceptance, uniformity in flowering, plant height, grain size and shape, lodging tolerance and tolerance to major disease and insect, presence and absence of aroma with good plant type and higher predicted yield indicated by key target trait markers. A list of selected better lines with key traits is given in the Table 7A.4b. Within the whole population, the frequency of the amylose markers *(Wx-A, Wx-ex10)* was higher indicated that high amylose genes were abundant in the populations. The major key trait gene (*fgr-1*) responsible for aroma was presented in a frequency of 43% and almost all the selected lines possessed this gene **(Table 7A.4a).** Unfortunately, bacterial blight gene, *Xa21* was totally nearly absent in the populations (**Fig. 7A.1).**

Table 7A.4a: List of superior fixed lines selected from LST populations, Premium Quality Rice, Boro 22-23

SL No	BR Number	Parentage	No. of lines	
			Grown	Selected
1	BR13723-3R	BRRI dhan80/BR8536-27-2-1-2	191	9
2	BR13736-3R	BR9126-15-3-4-1/BRRI dhan90	181	8
3	BR13942-3R	BRRI dhan90/ BRRI dhan75	478	51
4	BR13943-3R	BRRI dhan90/ BRRI dhan70	150	17
		Total	**1,000**	**84**

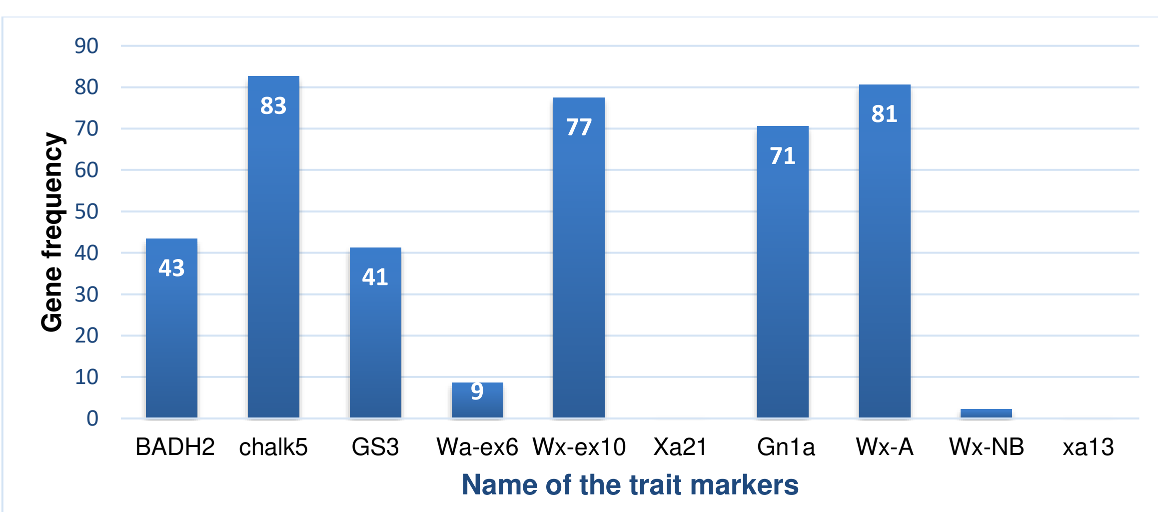


Figure 7A.1. Gene frequency in the LST Populations, Premium Quality Rice, Boro 22-23

Table 7A.4b. List of some superior fixed lines with key traits selected from LST populations, Premium Quality Rice, Boro 22-23

SL No	BR Number	Trait markers
1	BR13942-3R-1	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
2	BR13942-3R-2	*Frg-1, Chalk5, Wx-ex10, Gn1a, Wx-A*
3	BR13942-3R-76	*Frg-1, Chalk5, Wx-ex10, Gn1a, Wx-A*
4	BR13942-3R-91	*Chalk5, Wx-ex10, Gn1a, Wx-A*
5	BR13942-3R-32	*Chalk5, Wx-ex10, Gn1a, Wx-A*
6	BR13942-3R-101	*Frg-1, Chalk5, GS3(het), Wx-ex10, Gn1a,Wx-A*
7	BR13942-3R-186	*Frg-1, Chalk5, GS3(het), Wx-ex10,Gn1a,Wx-A*
8	BR13942-3R-106	*Frg-1, Chalk5, GS3(het), Wx-ex10, Gn1a,Wx-A*
9	BR13942-3R-118	*Frg-1(het), Chalk5,Wx-ex10,Gn1a,Wx-A*
10	BR13942-3R-123	*Frg-1, Chalk5, GS3(het), Wx-ex10,Gn1a,Wx-A*
11	BR13942-3R-127	*Frg-1, Chalk5, Wx-ex10, Gn1a,Wx-A*
12	BR13942-3R-128	*Frg-1, Chalk5, GS3(het), Wx-ex10,Gn1a,Wx-A*
13	BR13942-3R-143	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
14	BR13942-3R-149	*Frg-1, Chalk5, GS3, Wx-ex10,Wx-A*
15	BR13942-3R-159	*Frg-1(het),Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
16	BR13942-3R-163	*Frg-1, Chalk5,Wx-ex10,Wx-A*
17	BR13942-3R-170	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
18	BR13942-3R-175	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
19	BR13942-3R-181	*Frg-1(het),Chalk5, GS3,Wx-ex10,Wx-A*
20	BR13942-3R-195	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
21	BR13942-3R-213	*Frg-1, Chalk5, GS3(het),Wx-ex10,Gn1a,Wx-A*
22	BR13942-3R-214	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
23	BR13942-3R-229	*Frg-1(het),Chalk5,Wx-ex10,Gn1a,Wx-A*
24	BR13942-3R-239	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
25	BR13942-3R-240	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
26	BR13942-3R-259	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
27	BR13942-3R-263	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
28	BR13942-3R-273	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
29	BR13942-3R-287	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
30	BR13942-3R-289	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
31	BR13942-3R-299	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
32	BR13942-3R-308	*Chalk5,Wx-ex10,Gn1a,Wx-A*
33	BR13942-3R-314	*Frg-1, Chalk5, GS3, Wx-ex10, Gn1a, Wx-A*
34	BR13942-3R-336	*Frg-1, Chalk5, GS3, Wx-ex10,Wx-A*
35	BR13942-3R-338	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
36	BR13942-3R-339	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
37	BR13942-3R-340	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
38	BR13942-3R-354	*Frg-1, Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
39	BR13942-3R-357	*Frg-1, Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
40	BR13942-3R-398	*Frg-1, Chalk5,Wx-ex10,Gn1a(het),Wx-A*
41	BR13942-3R-401	*Frg-1, Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
42	BR13942-3R-350	*Frg-1(het),Chalk5, GS3(het),Wx-ex10,Gn1a,Wx-A*
43	BR13942-3R-409	*Frg-1, Chalk5, GS3(het),Wx-ex10,Gn1a,Wx-A*
44	BR13942-3R-418	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
45	BR13942-3R-419	*Frg-1, Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
46	BR13942-3R-421	*Frg-1, Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
47	BR13942-3R-420	*Frg-1(het),Chalk5, GS3,Wx-ex10,Gn1a,Wx-A*
48	BR13942-3R-429	*Frg-1, Chalk5,Wx-ex10,Gn1a(het),Wx-A*
49	BR13942-3R-435	*Frg-1, Chalk5,Wx-ex10,Wx-A*
50	BR13942-3R-436	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
51	BR13942-3R-457	*Frg-1(het),Chalk5,Wx-ex10,Gn1a,Wx-A*

SL No	BR Number	Trait markers
52	BR13943-3R-2	*Frg-1, Chalk5, Waxy exon 6,Gn1a*
53	BR13943-3R-4	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
54	BR13943-3R-22	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
55	BR13943-3R-28	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
56	BR13943-3R-33	*Frg-1(het),Chalk5,Wx-ex10,Gn1a,Wx-A*
57	BR13943-3R-46	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
58	BR13943-3R-47	*Frg-1(het),Chalk5,Waxy exon 6,Gn1a*
59	BR13943-3R-49	*Frg-1(het),Chalk5,Wx-ex10,Gn1a,Wx-A*
60	BR13943-3R-53	*Frg-1(het),Chalk5(het),GS3(het),Wx-ex10,Gn1a(het),Wx-A*
61	BR13943-3R-57	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
62	BR13943-3R-64	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
63	BR13943-3R-78	*Frg-1(het),Chalk5,Waxy exon 6(het),Wx-ex10,Gn1a, Wx-A(het)*
64	BR13943-3R-85	*Frg-1(het),Chalk5,Waxy exon 6,Gn1a*
65	BR13943-3R-91	*Frg-1(het),Chalk5,Waxy exon 6,Gn1a*
66	BR13943-3R-95	*Frg-1(het),Chalk5,Wx-ex10,Gn1a,Wx-A*
67	BR13943-3R-97	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
68	BR13943-3R-103	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
69	BR13722-3R-49	*Frg-1, Chalk5,Waxy exon 6,Gn1a*
70	BR13722-3R-50	*Frg-1, Chalk5,GS3(het),Waxy exon 6,Gn1a(het)*
71	BR13722-3R-165	*Frg-1, Chalk5, GS3,Wx-ex10,Wx-A*
72	BR13723-3R-14	*Frg-1,Wx-ex10,Wx-A*
73	BR13723-3R-55	*Frg-1(het),Chalk5,Wx-ex10,Wx-A*
74	BR13723-3R-114	*Frg-1, Chalk5, GS3,Wx-ex10,Wx-A*
75	BR13723-3R-130	*Frg-1,Wx-ex10,Wx-A*
76	BR13723-3R-176	
77	BR13736-3R-56	*Frg-1,Wx-ex10,Wx-A*
78	BR13736-3R-59	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
79	BR13736-3R-60	*Frg-1(het),Waxy exon 6,Gn1a*
80	BR13736-3R-74	*Frg-1, Chalk5,Wx-ex10,Gn1a,Wx-A*
81	BR13736-3R-139	*Frg-1,Waxy exon 6*
82	BR13736-3R-169	*Frg-1, Chalk5,Wx-ex10,Wx-A*
83	BR13736-3R-171	*Frg-1, Chalk5,Waxy exon 6*
84	BR13736-3R-177	*Frg-1, Chalk5,Waxy exon 6,Gn1a*

D/S - 25/12/2022 **D/T-25/01/2023**

Table 7A.5: Observational Yield Trial OYT#1 (OYT#1), Development of Premium Quality Rice (PQR), T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of genetically homogeneous breeding lines with strong plant type, fine grain properties with or without aroma.

Materials and Methods: A total of 35 fixed lines along with six checks were evaluated in Augmented RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 5.4 m × 4 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and discussion: A total of 11 genotypes were selected out of 35 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma and yield. The highest yielding genotype, BR9053-16-3-4-1 gave 5.4 t/ha yields with duration of 135 days (**Table 7A.5**). The grain type and plant type of this genotype is very good but aroma is absent. This genotype could be used as recipient parent for crossing. The yield of the selected genotypes ranged from 3.2 t/ha to 5.4 t/ha whereas that of the growth duration was 115 days to 140 days. The heritability obtained for plant height, growth duration and yield were 78%, 86% and 59%, respectively, indicating high level of precision in theis trial (**Table 7A.5**).

Experiment 7A.5: Observational Yield Trial#1 (OYT#1-PQR), Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	Amylose	Aroma	Size & Shape	PH (cm)	PAcp	GD (days)	Yield (t/ha)	Trait markers
1	BR9053-16-3-4-1	26	no	SR	104	1	135	5.4	Wx-ex10,Wx-A,Gn1a, Chalk5, DTH8
2	BR10820-2-3-3-5-3	21	**	SR	128	5	138	4.9	frg-1,Wx-int,Wx-A,xa5, Xa7,Gn1a,
3	BR11768-10-4-6-P2		**		115	5	138	4.8	frg-1,Wx-A,Wx-NB,
4	BR11811-9-2-2-P2	25	**	MB	117	5	119	4.0	frg-1,Wx-A,Wx-NB,Xa4,Gn1a, BPH32,DTH8
5	BR10812-8-4-3-2-P1	22	no	MB	129	5	136	4.5	Wx-int,GS3,Pita2
6	BR10812-8-4-3-2-P2	23	***	SB	113	5	136	4.9	frg-1,Wx-int,Wx-A,GS3, Pita2
7	BR10813-18-5-8-3	22	***	MB	126	3	140	4.8	frg-1,Wx-int,Gn1a,Chalk5, GS3,Pita2
8	BR10815-25-15-13-2	20	**	SB	128	5	117	4.3	frg-1,Wx-int,Wx-A
9	BR9844-6-5-1-1-1	25	no	MB	102	5	115	5.0	Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5, DTH8
10	BR10813-75-20-10-12	24	***	SB	113	5	140	3.2	frg-1,Wx-int,Wx-ex10,Xa4,DTH8, PGWC8-2
11	BR11806-8-5-3-3-4-P3	25	no	LS	132	3	129	4.2	Wx-A,Wx-NB,Xa7,Gn1a,Chalk5,GS3,
12	Kataribhog (Ck)	22	na	MB	156	7	136	2.7	frg-1,Wx-int,
13	Chinigura (Ck)	23	***	SB	143	3	135	1.8	frg-1,Wx-int,
14	Kalijira (Ck)	23	***	SB	139	3	136	2.1	frg-1,Wx-int,Pita2
15	BINA dhan13 (Ck)	21	***	SR	138	3	139	3.7	frg-1,Wx-int,Pita2
16	BRRI dhan34 (Ck)	23	***	SB	151	3	136	3.7	frg-1,Wx-int,
17	BRRI dhan90 (Ck)	23	no	SB	100	5	119	5.0	Wx-int,DTH8, PGWC8-2
	LSD (0.05)				5.1	2.1	5.9	0.42	
	P- value				**	**	***	**	
	H2b				0.78	0.63	0.86	0.59	

D/S - 06/07/2022 D/T-31/07/2022

Experiment 7A.6: Preliminary Yield Trial#1 (PYT#1-PQR), Development of Premium Quality Rice, T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary yield evaluation of advanced breeding lines with strong plant type, fine grain properties and presence or absence of aroma.

Materials and Methods: A total of 24 genotypes along with three checks were evaluated in RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 5.4 m × 8 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and Discussion: A total of 11 genotypes were selected out of 24 genotypes based on phenotypic acceptance, plant type, grain type, presence/absence of aroma and higher yield. The katary type aromatic genotype BR9178-7-2-4-4-P2 produced a yield of 5.8 t/ha with a growth duration of 130 days. The highest yielding genotype was a non-aromatic genotype (BR11224-

7-9-4-3) gave 6.0 t/ha with a duration of 132 days. The yield of the other selected genotypes ranged from 4.0 t/ha to 5.5 t/ha whereas that of the growth duration was 122 days to 140 days. The heritability obtained for plant height, growth duration and yield were 78%, 86% and 58%, respectively, indicating high level of precision in this experiment **(Table 7A.6).**

Table 7A.6: Performance of selected genotypes in PYT#1, (PYT#1-PQR), Development of Premium Quality Rice, T. Aman 2022-23

Sl No	Designation	Amylose	Aroma	Size Shape	PH (cm)	PAcp	GD (days)	Yield (t/ha)	Trait markers
1	BR8515-8-7-8-1	20.2	***	SB	125	5	130	4.8	Wx-ex10,Wx-A,Xa4,Gn1a, Alk,Chalk5,GS3,DTH8
2	BR8515-8-7-8-3	21.3	***	SB	128	5	137	4.3	frg-1,Wx-int,Gn1a,PGWC8-2
3	BR10821-15-7-8-5	22.3	**	SB	108	5	138	5.0	frg-1,Wx-int,Gn1a,Chalk5,
4	BR9178-7-2-4-4-P1	21.5	***	LS	116	3	120	5.5	frg-1,Wx-int,Xa4,Gn1a,GS3, DTH8
5	BR9178-7-2-4-4-P2	21.5	***	LS	130	5	130	5.8	frg-1,Wx-int,Xa4,Gn1a, GS3,DTH8
6	BR10813-75-20-10-1	24.5	nd	LS	128	5	140	4.0	frg-1,Wx-int,Wx-ex10,Xa4, Gn1a,GS3,DTH8,Pita2
7	BR9580-30-2-1-1	22.2	***	SB	114	3	138	5.1	frg-1,Wx-int,Wx-ex10, Gn1a,Chalk5,
8	BR9580-2-3-1-2	24.3	no	MB	104	5	131	4.9	Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,DTH8
9	BR9581-3-3-1-2	26.3	no	MB	114	5	122	4.8	Wx-ex10,Wx-A,Gn1a, Chalk5,DTH8
10	BR11224-7-9-4-3	20.8	no	MS	109	3	132	6.0	Wx-A,Wx-NB,Gn1a,Chalk5,GS3,DTH8
11	BR11224-7-9-4-3-P2	26.6	no	LS	103	3	133	5.0	Wx-ex10,Wx-A,Gn1a, Chalk5,DTH8
12	D. Kataribhog (Ck)	21.4	*	MB	146	7	132	2.2	frg-1,Wx-int,Pita2
13	Krishnobhog (Ck)	21.2	**	MB	151	7	134	2.0	frg-1,Wx-int,
14	BRRI dhan37 (Ck)	22.9	**	MB	139	7	136	3.3	frg-1,Wx-int,
15	BRRI dhan70 (Ck)	21.3	**	MS	128	3	132	5.0	frg-1,Wx-NB,xa5Alk,GS3, Pita2,Pi33
	LSD (0.05)				3.5	1.9	5.6	0.45	
	P- value				**	**	**	**	
	H2b				0.78	0.62	0.86	0.58	

D/S – 06/07/2022 **D/T-01/08/2022**

Experiment 7A.7: Preliminary Yield Trial#2 (PYT#2-PQR), Development of Premium Quality Rice, T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary yield evaluation of advanced breeding lines with strong plant type, fine grain properties and presence or absence of aroma.

Materials and Methods: A total of 12 genotypes along with two checks were evaluated in RCB design with two replications. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 5.4 m × 8 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and discussion: A total of five genotypes were selected out of 12 genotypes based on phenotypic acceptance, plant type, grain type, presence/absence of aroma and higher yield. The highest yielding genotype BR8845-18-8-45-4-11 gave 5.7 t/ha with a duration of 130 days followed by the genotype BR8845-18-8-45-4-6 (5.6 t/ha) having growth duration of 130 days. All the genotypes of this trial are aromatic with a little bigger grain than katary type grain. The heritability obtained for the plant height, growth duration and yield were 63%, 92% and 54%, respectively, indicating high level of precision in this experiment (**Table 7A.7**).

Table 7A.7: Performance of selected genotypes in PYT#2, (PYT#2-PQR), Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	PH (cm)	TN	PA cp	GD (days)	Yield (t/ha)	Trait markers
1	BR8845-18-8-45-4-11	122	11	1	130	5.7	*frg-1,Wx-int,Xa4,Gn1a,DTH8,GS3*
2	BR8845-18-8-45-4-6	121	12	1	130	5.6	*frg-1,Wx-ex10,Wx-A,DTH8,Pita2*
3	BR8845-18-8-45-4-1	121	5	5	126	5.2	*frg-1,Wx-ex10,Wx-A,Xa4,xa13, Alk,DTH8,PGWC8-2,Chalk5,GS3*
4	BR8845-21-1-10-6-1	124	9	5	135	5.0	*frg-1,Wx-A,DTH8,PGWC8-2*
5	BR8845-21-1-10-3-1	118	9	3	123	5.0	*frg-1,Wx-ex10,Wx-A,Xa4,xa13, Gn1a,DTH8,PGWC8-2,Chalk5, GS3*
6	BR8845-21-1-5-10-1-1	121	10	5	124	5.0	*frg-1,Wx-ex10,Wx-A,Xa4,xa13, Chalk5, Alk,DTH8,PGWC8-2*
7	BR8845-21-1-5-10-3-P1	133	9	5	137	5.0	*frg-1,Wx-int,Xa4*
8	BR8845-18-10-40-5-20	114	11	7	125	4.9	*frg-1,Wx-int,Xa4*
9	BR8845-18-10-40-5-19	117	8	5	127	4.8	*frg-1,Wx-int,Xa4,Gn1a,Alk*
10	BR8845-21-1-5-10-2	122	7	5	125	4.7	*frg-1,Wx-int*
11	BR8845-21-1-10-6-P7	140	9	9	120	4.4	*frg-1,Wx-int,Wx-ex10,Gn1a,Alk*
12	BR8845-18-8-45-4-3	110	7	9	122	4.0	*frg-1,Wx-ex10,Wx-A,Xa4,xa13, Gn1a,DTH8,PGWC8-2,Chalk5, GS3*
13	BRRI dhan70 (Ck)	130	8	5	133	4.2	*frg-1,Wx-NB,xa5Alk,GS3, Pita2,Pi33*
14	BRRI dhan80 (Ck)	128	9	5	130	4.5	*frg-1,Wx-NB,xa5Alk,GS3, Pita2,Pi33*
	P Value	**	ns	**	***	**	
	L(0.05)	4.8		1.3	5.1	1.2	
	H2b	0.63		0.74	0.92	0.54	

D/S – 06/07/2022 D/T-02/08/2022

Experiment 7A.8: Preliminary Yield Trial#3 (PYT#3-Photosensitive), Development of Premium Quality Rice, T. Aman 2021-22

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary yield evaluation of advanced breeding lines with strong plant type, fine grain properties and photosensitivity.

Materials and Methods: A total of 25 genotypes along with four checks were evaluated in RCB design with two replications. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 5.4 m × 8 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and discussion: A total of 11 genotypes were selected out of 25 genotypes based on phenotypic acceptance, plant type, grain type, photosensitivity and higher yield. The highest yielding genotype BR8845-21-1-10-3-4 gave 5.5 t/ha with a duration of 135 days. This genotype was also aromatic. The heritability obtained for the plant height, growth duration and yield were 59%, 78% and 82%, respectively, indicating high level of precision in this experiment (**Table 7A.8**).

Table 7A.8: Performance of selected genotypes in PYT#3, (PYT#3-Photosensitive), Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	PH (cm)	PA cp	GD (days)	Yield (t/ha)	Photosensitivity	Trait markers
1	BR8845-21-1-10-3-4	122	5	135	5.5	MPPS	frg-1,Wx-ex10,Wx-A,Xa4,xa13, Gn1a,Alk,DTH8,PGWC8-2,Pita2,GS3
2	BR8515-8-7-8-2	136	5	136	5.0	SPPS	Wx-ex10,Wx-A,Xa7,Gn1a,Chalk5,
3	TL Aus Kushtia-3(PR-2)	130	5	134	4.9	SPPS	Wx-A,Wx-NB,Xa4,Chalk5,GS3,DTH8
4	BR8845-21-1-10-3-3	121	5	127	4.6	MPPS	frg-1,Wx-ex10,Wx-A,Xa4,Alk,DTH8, Chalk5,GS3
5	TL Aus-Gaz10-40-5-11	112	5	139	4.5	SPPS	frg-1,Wx-ex10,Wx-A,DTH8,GS3
6	BR8845-21-1-10-3-6	122	5	132	4.6	MPPS	Wx-ex10,Wx-A,Xa4,xa13,Gn1a,Alk, DTH8,PGWC8-2,Pita2,GS3
7	BR8540-2-4-1-3	115	5	136	4.0	SPPS	frg-1,Wx-ex10,Wx-A,Xa4,xa13,Gn1a, Alk,DTH8,PGWC8-2,Chalk5,GS3
8	TL Aus-Gaz8-45-4-18	116	5	135	3.6	..	Wx-ex10,Wx-A,Xa4,Gn1a
9	BR10820-2-3-3-5-3	128	5	138	3.9	FSPPS	Wx-int,Wx-A,xa5,Xa7,Gn1a,
10	BR10821-15-7-8-5	103	5	136	3.5	SPPS	frg-1,Wx-int,Gn1a,Chalk5,
11	BR11768-10-4-6-P2	115	3	138	3.8	MPPS	frg-1,Wx-A,Wx-NB,
12	BR22 (Ck)	124	5	135	4.0	SPPS	Wx-int,DTH8
13	BR23 (Ck)	132	5	138	4.3	SPPS	Wx-ex10,Wx-A,Gn1a,DTH8,Pita2,GS3
	P Value	***	**	***	***		
	LSD (0.05)	5.3	2.2	6.5	0.5		
	H2b	0.59	0.6	0.78	0.82		

D/S: 26/07/2022 D/T: 16/08/2022

Experiment 7A.9: Advanced Yield Trial#1 (AYT#1-PQR), Development of Premium Quality Rice, T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Advanced yield evaluation of advanced breeding lines with strong plant type, fine grain properties and with or without aroma.

Materials and Methods: Ten genotypes along with two standard check varieties were evaluated in RCB design with two replications. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 5.4 m × 8 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and discussion: A total of four genotypes were selected out of ten genotypes based on phenotypic acceptance, plant type, grain type, presence/absence of aroma and higher yield. The genotype BR10824-5-6-4-1 having BRRI dhan34 type aromatic grain and stronger plant type produced 4.2 t/ha yield with similar growth duration of BRRI dhan34. Though this genotype was not recommended for RYT, it could be used as a good aromatic parent for crossing. The aromatic genotype BR11224-3-24-2 produced highest yield (5.0 t/ha) with a little bolder grain. The heritability obtained for the plant height, growth duration and yield were 55%, 83% and 78%, respectively, indicating high level of precision in this experiment (**Table 7A.9**).

Table 7A.9: Performance of selected genotypes in AYT#1 (AYT#1-PQR), Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	Amylose	Aroma	Size& Shape	PH (cm)	PA cp	GD (days)	Yield (t/ha)	Trait markers
1	BR10824-5-6-4-1	23.7	*	SB	120	1	135	4.2	frg-1,Wx-int,Wx-ex10, Chalk5,DTH8,PGWC8-2

SL No	Designation	Amylose	Aroma	Size& Shape	PH (cm)	PAcp	GD (days)	Yield (t/ha)	Trait markers
2	BR9126-15-3-4-1	22.7	*	SR	122	5	132	3.8	frg-1,Wx-int,DTH8P, GWC8-2
3	BR11224-3-24-2	27.2	**	LB	106	5	135	5.0	frg-1,Wx-A,Wx-NB,Xa4, Gn1a,Chalk5,GS3,DTH8
4	BR8493-12-7-4-P1		**	LS	108	3	130	4.5	frg-1,Wx-ex10,Wx-A, Xa4,Gn1a,DTH8
5	BR10816-15-7-5-3	23.8	**	SB	116	9	126	2.0	frg-1,Wx-int,Wx-ex10, Wx-A,Xa4,BPH32, DTH8,PGWC8-2
6	BR10813-75-20-10-2	23.5	**	SB	126	5	125	2.8	frg-1,Wx-int,Wx-A,Xa4, BPH32,DTH8,GWC8-2
7	BR8234-1-3-7-1-3-HR2				112	5	127	5.0	Wx-int,xa5,Gn1a,DTH8
8	BR11811-9-2-2	26.0	*	MB	117	7	119	4.9	frg-1,Wx-A,Wx-NB,Xa4, Gn1a,BPH32,DTH8
9	BR10066-26-3-2-2E	25.6	no	MB	108	7	130	5.2	Wx-ex10,Wx-A,Xa4,xa5, Gn1a,DTH8,Pi54
10	BR10066-26-3-2-2	26.5	no	MB	113	7	129	5.5	Wx-A,Wx-NB,Xa4,xa5, Gn1a,DTH8,Pi54
11	BRRI dhan34 (Ck)	22.7	**	SB	120	5	138	3.5	Wx-A,Wx-NB,Xa4,xa5, Gn1a,DTH8,Pi54
12	BRRI dhan90 (Ck)	22.7	no	SB	110	5	127	4.6	frg-1,Wx-NB,xa5Alk, GS3, Pita2,Pi33
	P Value				**	*	***	***	
	LSD (0.05)				6.2	1.1	5.3	0.56	
	H2b				0.55	0.6	0.83	0.78	

D/S: 06/07/2022 D/T:31/07/2022

Experiment 7A.10: Advanced Yield Trial#2 (AYT#2-Photosensitive), Development of Premium Quality Rice, T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Secondary yield evaluation of advanced breeding lines with strong plant type, fine grain properties and photosensitivity.

Materials and Methods: Twenty-two genotypes along with two checks were evaluated in RCB design with two replications. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 5.4 m × 8 rows. Fertilizers were applied as described in experiment 7A.1. Crop management was done as and when necessary.

Results and discussion: A total of nine genotypes were selected out of 22 genotypes based on phenotypic acceptance, plant type, grain type, photosensitivity and higher yield. The genotype BR10212-4-3-1 produced significantly higher yield (6.6 t/ha) than the check varieties BR22 (4.6 t/ha) and BR23 (5.2 t/ha) followed by the genotype BR10212-17-3-2 (6.5 t/ha) having strong photosensitivity (**Table 7A.10).** The yield of the selected genotypes was ranged from 5.0 t/ha to 6.6 t/ha. The heritability obtained for the plant height, growth duration and yield were 76%, 90% and 80%, respectively, indicating high level of precision in this experiment (**Table 7A.10**).

Table 7A.10: Performance of selected genotypes in AYT#2, (AYT#2-Photosensitive), Development of Premium Quality Rice, T. Aman 2022-23

SL No	Designation	GD (days)	PH (cm)	PA cp	Yield (t/ha)	Photo sensitivity	Trait Markers
1	BR10212-17-3-2-2	126	106	5	6.5	SPPS	Wx-A_group, Wx-A-NB, Xa4, Xa7, Pi33, Chalk5, Gn1a, GS3
2	BR10212-4-3-1	127	116	3	6.6	FSPPS	Sub1, Wx-A_group, Xa4, DTH8, Chalk5, GS3
3	IR16F1097-P1	128	118	3	5.7	MPPS	Sub1, Wx-A, Wx-NB, Xa4, Pita2, DTH8, Chalk5, Gn1a, GS3
4	IR13F441	130	105	5	6.3	MPPS	Sub1,Wx-A,Pi54,Xa7,Pita2, AG3,GS3,Wx-op,BPH17,Hd3a
5	IR13F652-1-P3	130	112	5	5.5	MPPS	Sub1, Wx-A, Wx-int, Xa4, Pi54, Pita2, GS3
6	BR11196-5R-5	133	124	3	5.5	..	Sub1, Wx-A, Wx-int, Pita2, DTH8, Gn1a, GS3
7	BR10211-30-2-1-4	127	114	3	5.3	MPPS	Wx-A,Wx-NB,Pi33,Pi54,Xa4, xa5, Xa7,Pita2,GS3,AG3,Gn1a,Hd1&Hd3
8	BR10212-10-4-1	130	130	3	5.3	..	Sub1, Wx-A, Wx-NB, Xa4, Hd1, pi33, DTH8, Chalk5, Gn1a
9	BR10212-10-3-1	124	115	5	5	SPPS	Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Pi33, Gn1a, GS3
10	BR22 (Ck)	129	111	5	4.6	SPPS	Wx-int, DTH8
11	BR23 (Ck)	130	108	5	5.2	SPPS	Wx-ex10, Wx-A, Gn1a, DTH8, Pita2, GS3
	P Value	****	***	****	***		
	LSD (0.05)	2.23	6.6	0.9	1.0		
	H2b	90	76	92	80		

D/S: 27/07/2022 D/T: 18/08/2022

Experiment 7A.11: Advanced Line Adaptive Research Trial (ALART)

Principal Investigator: Sharmistha Ghosal

Co-Investigators: KM Iftekharuddaula, S Maniruzzaman, M M Yasmin, ZA Riyadh, respective scientist/s of BRRI regional station and respective scientist/s of ARD.

Specific objective: Advanced yield evaluation of promising breeding lines

Materials and Methods: Two advanced lines along with two standard checks were evaluated with three replications in ten locations. Twenty-five to thirty days old seedlings were transplanted @ 2-3 seedlings at a spacing of 20 cm × 15 cm. The plot size was 20m^2 (5m × 4m). Fertilizers were applied @180 kg urea, 65 kg TSP, 70 kg MoP, 60 kg gypsum and 5 kg zinc sulphate/ha Urea was applied in equal three splits at 10, 25 and 40 days after transplanting. The fertilizers other than urea was applied as basal during final land preparation.

Results and discussion: The aromatic genotype BR8493-3-5-1-P1 produce significantly higher yield than the check variety BRRI dhan34 having shorter growth duration and similar grain type (polao rice), but produced similar yield with the check variety BRRI dhan70 (**Table 7A.11**). However, this genotype was not recommended for proposed variety trial (PVT).

Table 7A.11: Performance of selected genotypes in ALART, PQR, T. Aman 2022-23

SL No	Genotypes	PH (cm)	GD (days)	Grain yield (t/ha)							
				L1	L2	L3	L4	L5	L6	L7	Mean
1	BR8493-3-5-1-P1	119	134	4.68	4.46	5.17	5.37	2.9	4.15	4.38	**4.44**
2	BR9590-45-1-3-2-P2	111	135	3.66	5.02	5.02	3.08	4.45	2.93	2.68	**3.83**
3	BRRI dhan34 (ck)	135	142	3.77	4.29	3.39	1.97	2.69	2.49	2.24	**2.98**
4	BRRI dhan70 (ck)	130	126	4.24	3.98	4.32	4.42	3.23	4.31	4.38	**4.13**
	LSD	**1.58**	**0.24**				**0.62**				**0.51**
	CV (%)	**3.41**	**0.49**				**10.28**				

L1= Sadar, Kustia, L2= Mohadebpur, Naogaon, L3= Parbotipur, Dinajpur, L4= Sadar Bogura, L5= Sonagazi, Feni L6= Bhanga, Faridpur L7= Kolaroa, Satkhira

PROJECT 7B: DEVELOPMENT OF PREMIUM QUALITY RICE (BORO)

General objectives: Development of aromatic and non-aromatic fine quality rice with international (Basmati/Banglamati/Soru Balam type) standards in Boro season for domestic use and export.

Project Leader: Md. Abdul Kader

Experiment 7B.1: Hybridization

Principal Investigator: Md. Abdul Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: Introgression of extra-long grain and small grain with or without aroma into high yielding rice genetic background.

Materials and Methods: Twenty-six varieties/lines were used for crossing. Seeding was done in the hybridization block at three dates with an interval of seven days to synchronize flowering among the male and female parents. Forty days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 20 cm × 15 cm. Single seedling was used for transplanting. Fertilizers @138 (300 kg Urea): 20 (100 kg TSP): 83 (165 kg MP): 20 (112 kg Gypsum): 4 (11 kg ZnSO4) kg/ha NPKSZn were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen was applied at three equal splits at 10, 30 and 50 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Results and discussion: Totally 3,559 F_1 seeds were obtained from 44 single crosses (Table 7B.1). These were recorded and labeled properly. The F_1 seeds were sun-dried and stored in a cool and dry place.

Table 7B.1. List of crosses made, Development of Premium Quality Rice (PQR), Boro 2022-23

SN	Cross combinations	Characteristics	No. of F_1 seeds
1	BR10645-6-4-8-1-2/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	4
2	BR10646-3-2-2-4-3/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	50
3	BR10646-3-2-2-4-4/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	130
4	BR10646-3-2-2-4-4/ Tepi Boro	High yield, LS grain, High ER	23
5	BR10646-3-3-3-1-4/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	30
6	BR10646-3-3-3-1-4/ Bsamati370	High yield, LS grain, High ER	26
7	BR10646-3-3-3-1-4/ Pusa basmati	High yield, LS grain, High ER	18
8	BR8862-29-1-5-1-3/ Tepi Boro	High yield, LS grain, High ER	25
9	BR9930-2-3-2-2/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	135
10	BRRI dhan88/ BR8862-29-1-5-1-3	High yield, LS grain, High ER	90
11	Koushik-Hili/ BR8862-29-1-5-1-3	High yield, LS grain, High ER	5
12	Lomba Jira (Tanor)/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	30
13	Lomba Jira (Tanor)/ Bsamati370	High yield, LS grain, High ER	55

SN	Cross combinations	Characteristics	No. of F_1 seeds
14	Lomba Jira (Tanor)/ Pusa basmati	High yield, LS grain, High ER	70
15	Lomba Jira (Tanor)/ Tepi Boro	High yield, LS grain, High ER	50
16	Miniket, Ballobpur/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	16
17	Miniket, Ballobpur/ Bsamati370	High yield, LS grain, High ER	50
18	Miniket, Ballobpur/ Pusa basmati	High yield, LS grain, High ER	25
19	Miniket, Ballobpur/ Tepi Boro	High yield, LS grain, High ER	100
20	Jira, Nachol/ BR8862-29-1-5-1-3	High yield, LS grain, Aroma	30
21	Jira, Nachol/ Bsamati370	High yield, LS grain, High ER	50
22	Jira, Nachol/ Pusa basmati	High yield, LS grain, High ER	25
23	Jira, Nachol/ Tepi Boro	High yield, LS grain, High ER	120
24	(Rata Boro/Bangabandh dhan100)// Bangabandhu dhan100	High yield, LS grain, High ER	120
25	BRRI dhan102/ Basmati (4488)	High yield, LS grain, Aroma	
26	BRRI dhan102/ Basmati 370 (4489)	High yield, LS grain, Aroma	70
27	BRRI dhan102/ Basmati 37 (4491)	High yield, LS grain, Aroma	125
28	BRRI dhan102/ Basmati 406 (4508)	High yield, LS grain, Aroma	130
29	BRRI dhan89/ Basmati (4488)	High yield, LS grain, Aroma	84
30	BRRI dhan89/ Basmati 370 (4489)	High yield, LS grain, Aroma	70
31	BRRI dhan89/ Basmati 37 (4491)	High yield, LS grain, Aroma	280
32	BRRI dhan89/ Basmati 406 (4508)	High yield, LS grain, Aroma	40
33	BRRI dhan92/ Basmati (4488)	High yield, LS grain, Aroma	
34	BRRI dhan92/ Basmati 370 (4489)	High yield, LS grain, Aroma	180
35	BRRI dhan92/ Basmati 37 (4491)	High yield, LS grain, Aroma	250
36	BRRI dhan88/ Basmati (4488)	High yield, LS grain, Aroma	5
37	BRRI dhan88/ Basmati 370 (4489)	High yield, LS grain, Aroma	250
38	BRRI dhan88/ Basmati 37 (4491)	High yield, LS grain, Aroma	280
39	BRRI dhan88/ Basmati 406 (4508)	High yield, LS grain, Aroma	100
40	BR8862-29-1-5-1-3/ IR64-pi9 NILS	High yield, LS grain, Aroma	100
41	Lomba Jira (Tanor)/ IR64-pi9 NILS	High yield, LS, Aroma	8
42	Miniket, Ballobpur/ IR64-pi9 NILS	High yield, LS grain, Aroma	75
43	BRRI dhan102/ IR64-pi9 NILS	High yield, LS grain, Zinc, Aroma	135

SN	Cross combinations	Characteristics	No. of F_1 seeds
44	BRRI dhan89/ Basmati 370 (4489)	High yield, LS grain, Aroma	70
		Total	**3,559**

* LS: Long length Slender, ER: Elongation Ratio.

Experiment 7B.2: Confirmation of F_1s

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objectives: To confirm the crosses as true hybrid.

Materials and methods: Twenty-five crosses along with their respective parents were grown in the net house of Plant Breeding Division, BRRI Gazipur. The seeds were seeded in the earthen pots after germination. Forty days old seedlings were transplanted at a spacing of 20 cm × 15 cm along with their respective parents. Single seedling was used for transplanting. Fertilizers doses and management were done as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Results: Twenty-one F_1s crosses were selected and confirmed as true hybrid **(Table 7B.2).**

Table 7B.2. List of confirmed F_1's, Development of Premium Quality Rice (PQR), Boro 2022-23

SN	BR. No.	Crosses	Characteristics
1	BR15358	Basmati (TH)/ Basmati TAPL-90 (2517)	LS grain, high elongation, high yield
2	BR15359	Basmati (TH)/ BR10337-2-3-1-5-B2	LS grain, high elongation, high yield
3	BR15360	BR10335-2-3-1-10-B2/ Indian Basmati	LS grain, high elongation, high yield
4	BR15361	BR10335-2-3-1-5-B2/ Indian Basmati	LS grain, high elongation, high yield
5	BR15362	BR10646-3-2-2-2-2/ Indian Basmati	LS grain, high elongation, high yield
6	BR15363	BR10646-3-2-2-2-2/ DA26	LS grain grain, high yield
7	BR15364	BR10646-3-2-2-3-1/ Indian Basmati	LS grain, high elongation, high yield
8	BR15365	BR10646-3-2-2-4-4/ Indian Basmati	LS grain, high elongation, high yield
9	BR15356	BR10646-3-3-3-1-2/ BR10646-3-2-2-2-2	High yield
10	BR15367	BR10646-3-3-3-1-2/ Indian Basmati	LS grain, high elongation, high yield
11	BR15368	BR8862-29-1-5-1-3/ Basmati TAPL-90 (2517)	LS grain, high elongation, aroma, high yield
12	BR15369	BR8862-29-1-5-1-3/ Indian Basmati	LS grain, high elongation, aroma, high yield
13	BR15370	BR8862-29-1-6-1-3/ BR10335-2-3-1-10-B2	LS grain, high elongation, aroma, high yield
14	BR15371	BR8862-29-1-6-1-3/ BR10337-2-3-1-5-B2	LS grain, high elongation, aroma, high yield
15	BR15372	BR8862-29-1-6-1-3/ BR10646-3-2-2-2-2	LS grain, high elongation, aroma, high yield
16	BR15373	BR8862-29-1-6-1-3/ BR10646-3-2-2-4-4	LS grain, high elongation, aroma, high yield
17	BR15374	BR8862-29-1-6-1-3/ Tepi Boro	LS grain, high elongation, aroma, high yield
18	BR15375	BR9930-2-3-2-2/ Indian Basmati	LS grain, high elongation, high yield
19	BR15376	BR9930-2-3-3-1/ Indian Basmati	LS grain, high elongation, high yield
20	BR15377	DA26/ Indian Basmati	LS grain, high elongation, high yield
21	BR15378	Rata Boro/ Bangabandhu dhan100	LS grain, high elongation, high yield

Experiment 7B.3: RGA/FRGA nursery

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: Advancement of generation for high yielding genotypes.

Materials and Methods: In total, 19,774 progenies from F_2 to F_5 generations were grown in RGA screen house and FRGA field of BRRI, Gazipur. Minimum amounts of N, P, K, S and Zn were applied at the time of final land/soil preparation. For FRGA spacing was 5 cm × 5 cm. Crop management such as thinning, irrigation etc. were done in time. Insects, diseases and other pests were controlled properly.

Results: Total 19,165 progenies were harvested from F_2 to F_5 generations respectively through RGA/FRGA method at the time of maturity and these were preserved and processed with proper labels (**Table 7B.3**).

Table 7B.3. List of FRGA nursery, Development of Premium Quality Rice (PQR), Boro 2022-23

SN	BR cross	Parentage	Progenies harvested
F_2 population			
1	BR14766	Swarna Katari (Tanor)/ Basmati-107 (4501)	400
2	BR14767	Swarna Katari (Tanor)/ Basmati Pardnr442 (4497)	380
3	BR14768	Miniket (Ballobpur)/ BR8862-29-1-5-1-3	400
4	BR14769	Miniket (Ballobpur)/ Indian Basmati	390
5	BR14770	Subollata (Jhenaidah)/ BR8862-29-1-5-1-3	400
6	BR14771	BR8526-38-2-1-HR1/ Lata Balam	390
7	BR14772	BR9930-2-3-2-2/ Basmati TAPL-90 (2517)	370
8	BR14773	BR9930-2-3-3-1/ Basmati Nanot 439 (4496)	390
9	BR14774	BR8862-29-1-5-1-3/ BRRI dhan50	385
10	BR14775	Lata Balam/ IR64-pi9 NILS	395
11	BR14776	Bashful/ IR64-pi9 NILS	380
12	BR14777	BR9930-2-3-2-2/ Basmati Pardnr442 (4497)	395
13	BR14778	BR9930-2-3-3-1/ Basmati-433 (4509)	400
14	BR14779	BR10322-23-1-2-4 / Lata Balam	400
15	BR14780	BR10322-23-6-3-7-B2/ Gochi	385
16	BR14781	BR8862-29-1-5-1-3/ Gochi	390
17	BR14782	BR8526-38-2-1-HR1/ Gochi	395
18	BR14783	Subollata (Jhenaidah)/ IR64-pi9 NILS	380
19	BR14784	BR8862-29-1-5-1-3/ Lafa	375
20	BR14785	BR8526-38-2-1-HR1/ Lafa	400
21	BR14786	BR9930-2-3-3-1/ Lafa	395
22	BR14787	BR8526-38-2-1-HR1/ Pusa Basmati	385
23	BR14788	BR8862-29-1-5-1-3/ Pusa Basmati	395
24	BR14789	Subollata (Jhenaidah/) Indian Basmati	400
		Sub-total	**9375**
F_3 population			
1	14196	BR8995-2-5-5-2-1/ Bashful	200
2	14197	BR9937-22-3-2-3/ Pusha Basmati	420
3	14198	BR8526-38-2-1-HR1/ IR64-pi9 NILS	420
4	14199	Habu Balam/ BR9713-63-5-2-2	450
5	14200	BR9937-22-3-2-3/ DR-6	420
6	14201	BR9930-2-2-4-1/ DR-6	400

SN	BR cross	Parentage	Progenies harvested
7	14202	BR9937-22-3-2-3/ Sonamukhi	480
8	14203	BRRI dhan81/ Bashful	485
9	14204	DR-6/ Habu Balam	490
10	14205	DR-6/Bashful	485
11	14206	BR8862-29-1-5-1-3/ Tapi Boro	350
12	14207	BR9930-2-2-4-1/ Sonamukhi	480
13	14208	BR9207-45-2-2/ IR64-pi9 NILS	485
14	14209	BR8590-5-2-5-2-1/ Rata Boro	490
15	14210	Super Basmati/ BR9937-22-3-2-3	485
16	14211	Basmati Sufaid 187/ BR9930-2-2-4-1	480
17	14212	Indian Basmati/ BR8526-38-2-1-HR1	490
18	14213	USPi9/ BR9207-45-2-2	420
		Sub-total	**7,930**
F_5 population			
1	BR13256	BRRI dhan50/ BR8862-29-1-5-1-3	480
2	BR13257	BRRI dhan63/ BR8862-29-1-5-1-3	450
3	BR13258	BR8862-29-1-5-1-3/ Shampakatari (Shingra-Natore)	460
4	BR13259	BR7372-18-2-1-HR1-HR6/ Shampakatari (Shingra-Natore)	470
		Sub-total	**1860**
		Grand-total	**19,165**

Experiment 7B.4: Line Stage Testing (LST) Trial

Specific objectives: Selection of uniform genotypes in terms of plant height and days to maturity with key target traits.

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Materials and Methods: In Boro season, around 2,017 advance breeding lines (**Table 7B.4**) were grown at BRRI, Gazipur. Forty-five days old seedlings were transplanted in a 2.6 m single-row plot with a spacing of 20 cm × 20 cm in the field. Fertilizers doses and management were done as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Results and discussion: In total, 174 lines were selected based on uniformity, plant height, growth duration, grain type and lodging tolerance (**Table 7B.4**). Agronomic performances will be observed of these lines in the next Boro season.

Table 7B.4: List of materials for Line Stage Testing (LST) Trial, Development of Premium Quality Rice (PQR), Boro 2022-23

SN	Cros/ Plant	Designation	Parentage	Plant height (cm)	Growth duration (days)
1	1/8	BR12582-4R-8	BRRI dhan80/ Poshusail (Hbj B VI)	111	147
2	1/9	BR12582-4R-9	BRRI dhan80/ Poshusail (Hbj B VI)	106	149
3	1/10	BR12582-4R-10	BRRI dhan80/ Poshusail (Hbj B VI)	118	147
4	1/14	BR12582-4R-14	BRRI dhan80/ Poshusail (Hbj B VI)	99	145
5	1/16	BR12582-4R-16	BRRI dhan80/ Poshusail (Hbj B VI)	104	149
6	1/17	BR12582-4R-17	BRRI dhan80/ Poshusail (Hbj B VI)	104	149
7	1/21	BR12582-4R-21	BRRI dhan80/ Poshusail (Hbj B VI)	95	148
8	1/32	BR12582-4R-32	BRRI dhan80/ Poshusail (Hbj B VI)	102	147

SN	Cros/ Plant	Designation	Parentage	Plant height (cm)	Growth duration (days)
9	1/41	BR12582-4R-41	BRRI dhan80/ Poshusail (Hbj B VI)	103	148
10	1/49	BR12582-4R-49	BRRI dhan80/ Poshusail (Hbj B VI)	103	146
11	1/52	BR12582-4R-52	BRRI dhan80/ Poshusail (Hbj B VI)	104	147
12	1/57	BR12582-4R-57	BRRI dhan80/ Poshusail (Hbj B VI)	103	148
13	1/75	BR12582-4R-75	BRRI dhan80/ Poshusail (Hbj B VI)	106	145
14	1/83	BR12582-4R-83	BRRI dhan80/ Poshusail (Hbj B VI)	105	145
15	1/85	BR12582-4R-85	BRRI dhan80/ Poshusail (Hbj B VI)	112	145
16	1/93	BR12582-4R-93	BRRI dhan80/ Poshusail (Hbj B VI)	113	143
17	1/99	BR12582-4R-99	BRRI dhan80/ Poshusail (Hbj B VI)	92	146
18	1/105	BR12582-4R-105	BRRI dhan80/ Poshusail (Hbj B VI)	103	145
19	1/106	BR12582-4R-106	BRRI dhan80/ Poshusail (Hbj B VI)	102	145
20	1/118	BR12582-4R-118	BRRI dhan80/ Poshusail (Hbj B VI)	104	145
21	1/122	BR12582-4R-122	BRRI dhan80/ Poshusail (Hbj B VI)	116	146
22	1/131	BR12582-4R-131	BRRI dhan80/ Poshusail (Hbj B VI)	111	146
23	1/147	BR12582-4R-147	BRRI dhan80/ Poshusail (Hbj B VI)	104	145
24	1/151	BR12582-4R-151	BRRI dhan80/ Poshusail (Hbj B VI)	97	143
25	1/153	BR12582-4R-153	BRRI dhan80/ Poshusail (Hbj B VI)	115	143
26	1/175	BR12582-4R-175	BRRI dhan80/ Poshusail (Hbj B VI)	74	144
27	1/177	BR12582-4R-177	BRRI dhan80/ Poshusail (Hbj B VI)	114	144
28	1/182	BR12582-4R-182	BRRI dhan80/ Poshusail (Hbj B VI)	103	144
29	1/187	BR12582-4R-187	BRRI dhan80/ Poshusail (Hbj B VI)	102	143
30	1/188	BR12582-4R-188	BRRI dhan80/ Poshusail (Hbj B VI)	102	143
31	1/191	BR12582-4R-191	BRRI dhan80/ Poshusail (Hbj B VI)	111	143
32	1/197	BR12582-4R-197	BRRI dhan80/ Poshusail (Hbj B VI)	108	143
33	1/200	BR12582-4R-200	BRRI dhan80/ Poshusail (Hbj B VI)	118	143
34	1/212	BR12582-4R-212	BRRI dhan80/ Poshusail (Hbj B VI)	116	144
35	1/213	BR12582-4R-213	BRRI dhan80/ Poshusail (Hbj B VI)	105	144
36	1/219	BR12582-4R-219	BRRI dhan80/ Poshusail (Hbj B VI)	107	143
37	1/232	BR12582-4R-232	BRRI dhan80/ Poshusail (Hbj B VI)	110	143
38	1/238	BR12582-4R-238	BRRI dhan80/ Poshusail (Hbj B VI)	109	143
39	1/245	BR12582-4R-245	BRRI dhan80/ Poshusail (Hbj B VI)	98	143
40	1/253	BR12582-4R-253	BRRI dhan80/ Poshusail (Hbj B VI)	109	142
41	1/259	BR12582-4R-259	BRRI dhan80/ Poshusail (Hbj B VI)	120	142
42	1/261	BR12582-4R-261	BRRI dhan80/ Poshusail (Hbj B VI)	103	142
43	1/280	BR12582-4R-280	BRRI dhan80/ Poshusail (Hbj B VI)	106	143
44	1/281	BR12582-4R-281	BRRI dhan80/ Poshusail (Hbj B VI)	293	143
45	1/290	BR12582-4R-290	BRRI dhan80/ Poshusail (Hbj B VI)	105	145
46	1/292	BR12582-4R-292	BRRI dhan80/ Poshusail (Hbj B VI)	95	145
47	1/294	BR12582-4R-294	BRRI dhan80/ Poshusail (Hbj B VI)	102	145
48	1/301	BR12582-4R-301	BRRI dhan80/ Poshusail (Hbj B VI)	109	146
49	1/302	BR12582-4R-302	BRRI dhan80/ Poshusail (Hbj B VI)	102	146
50	1/304	BR12582-4R-304	BRRI dhan80/ Poshusail (Hbj B VI)	99	146
51	1/311	BR12582-4R-311	BRRI dhan80/ Poshusail (Hbj B VI)	112	147
52	1/313	BR12582-4R-313	BRRI dhan80/ Poshusail (Hbj B VI)	106	147
53	1/330	BR12582-4R-330	BRRI dhan80/ Poshusail (Hbj B VI)	104	145
54	1/334	BR12582-4R-334	BRRI dhan80/ Poshusail (Hbj B VI)	107	145
55	1/339	BR12582-4R-339	BRRI dhan80/ Poshusail (Hbj B VI)	110	143
56	1/350	BR12582-4R-350	BRRI dhan80/ Poshusail (Hbj B VI)	116	147
57	1/363	BR12582-4R-363	BRRI dhan80/ Poshusail (Hbj B VI)	113	146
58	1/377	BR12582-4R-377	BRRI dhan80/ Poshusail (Hbj B VI)	102	146
59	1/379	BR12582-4R-379	BRRI dhan80/ Poshusail (Hbj B VI)	105	147

SN	Cros/ Plant	Designation	Parentage	Plant height (cm)	Growth duration (days)
60	1/382	BR12582-4R-382	BRRI dhan80/ Poshusail (Hbj B VI)	101	147
61	1/384	BR12582-4R-384	BRRI dhan80/ Poshusail (Hbj B VI)	102	147
62	1/403	BR12582-4R-403	BRRI dhan80/ Poshusail (Hbj B VI)	102	146
63	1/416	BR12582-4R-416	BRRI dhan80/ Poshusail (Hbj B VI)	105	146
64	1/428	BR12582-4R-428	BRRI dhan80/ Poshusail (Hbj B VI)	121	146
65	1/438	BR12582-4R-438	BRRI dhan80/ Poshusail (Hbj B VI)	102	145
66	1/447	BR12582-4R-447	BRRI dhan80/ Poshusail (Hbj B VI)	108	145
67	2/1	BR12583-4R-1	Poshusail (Hbj B VI)/ BRRI dhan80	105	145
68	2/5	BR12583-4R-5	Poshusail (Hbj B VI)/ BRRI dhan80	122	147
69	2/6	BR12583-4R-6	Poshusail (Hbj B VI)/ BRRI dhan81	102	147
70	2/7	BR12583-4R-7	Poshusail (Hbj B VI)/ BRRI dhan82	99	149
71	2/19	BR12583-4R-19	Poshusail (Hbj B VI)/ BRRI dhan83	140	149
72	2/32	BR12583-4R-32	Poshusail (Hbj B VI)/ BRRI dhan84	113	149
73	2/37	BR12583-4R-37	Poshusail (Hbj B VI)/ BRRI dhan85	140	149
74	2/40	BR12583-4R-40	Poshusail (Hbj B VI)/ BRRI dhan86	128	149
75	2/41	BR12583-4R-41	Poshusail (Hbj B VI)/ BRRI dhan87	133	149
76	2/46	BR12583-4R-46	Poshusail (Hbj B VI)/ BRRI dhan88	121	149
77	2/68	BR12583-4R-68	Poshusail (Hbj B VI)/ BRRI dhan89	120	143
78	2/89	BR12583-4R-89	Poshusail (Hbj B VI)/ BRRI dhan90	119	150
79	2/106	BR12583-4R-106	Poshusail (Hbj B VI)/ BRRI dhan91	139	150
80	2/146	BR12583-4R-146	Poshusail (Hbj B VI)/ BRRI dhan92	134	152
81	2/166	BR12583-4R-166	Poshusail (Hbj B VI)/ BRRI dhan93	117	151
82	2/168	BR12583-4R-168	Poshusail (Hbj B VI)/ BRRI dhan94	129	149
83	2/189	BR12583-4R-189	Poshusail (Hbj B VI)/ BRRI dhan95	109	154
84	2/197	BR12583-4R-197	Poshusail (Hbj B VI)/ BRRI dhan96	106	145
85	2/225	BR12583-4R-225	Poshusail (Hbj B VI)/ BRRI dhan97	108	152
86	2/245	BR12583-4R-245	Poshusail (Hbj B VI)/ BRRI dhan98	116	151
87	2/246	BR12583-4R-246	Poshusail (Hbj B VI)/ BRRI dhan99	120	151
88	2/334	BR12583-4R-334	Poshusail (Hbj B VI)/ BRRI dhan100	128	151
89	2/341	BR12583-4R-341	Poshusail (Hbj B VI)/ BRRI dhan101	94	151
90	2/386	BR12583-4R-386	Poshusail (Hbj B VI)/ BRRI dhan102	117	148
91	3/14	BR12584-4R-14	BRRI dhan50/ BR8076-1-2-2-3	111	148
92	3/17	BR12584-4R-17	BRRI dhan50/ BR8076-1-2-2-3	113	148
93	3/31	BR12584-4R-31	BRRI dhan50/ BR8076-1-2-2-4	121	147
94	3/52	BR12584-4R-52	BRRI dhan50/ BR8076-1-2-2-5	122	149
95	3/55	BR12584-4R-55	BRRI dhan50/ BR8076-1-2-2-6	124	143
96	3/56	BR12584-4R-56	BRRI dhan50/ BR8076-1-2-2-7	123	143
97	3/58	BR12584-4R-58	BRRI dhan50/ BR8076-1-2-2-8	106	146
98	3/68	BR12584-4R-68	BRRI dhan50/ BR8076-1-2-2-9	123	143
99	3/82	BR12584-4R-82	BRRI dhan50/ BR8076-1-2-2-10	102	143
100	3/87	BR12584-4R-87	BRRI dhan50/ BR8076-1-2-2-11	107	143
101	3/90	BR12584-4R-90	BRRI dhan50/ BR8076-1-2-2-12	123	146
102	3/92	BR12584-4R-92	BRRI dhan50/ BR8076-1-2-2-13	105	146
103	3/117	BR12584-4R-117	BRRI dhan50/ BR8076-1-2-2-14	118	148
104	3/126	BR12584-4R-126	BRRI dhan50/ BR8076-1-2-2-15	120	149
105	3/130	BR12584-4R-130	BRRI dhan50/ BR8076-1-2-2-16	117	143
106	3/139	BR12584-4R-139	BRRI dhan50/ BR8076-1-2-2-17	102	148
107	3/144	BR12584-4R-144	BRRI dhan50/ BR8076-1-2-2-18	120	147

SN	Cros/ Plant	Designation	Parentage	Plant height (cm)	Growth duration (days)
108	3/150	BR12584-4R-150	BRRI dhan50/ BR8076-1-2-2-19	114	146
109	4/6	BR12585-4R-6	BR8076-1-2-2-3/ BRRI dhan50	112	146
110	4/13	BR12585-4R-13	BR8076-1-2-2-3/ BRRI dhan50	117	147
111	4/23	BR12585-4R-23	BR8076-1-2-2-3/ BRRI dhan50	116	147
112	4/28	BR12585-4R-28	BR8076-1-2-2-3/ BRRI dhan50	95	151
113	4/43	BR12585-4R-43	BR8076-1-2-2-3/ BRRI dhan50	125	147
114	4/59	BR12585-4R-59	BR8076-1-2-2-3/ BRRI dhan50	124	151
115	4/63	BR12585-4R-63	BR8076-1-2-2-3/ BRRI dhan50	100	148
116	4/90	BR12585-4R-90	BR8076-1-2-2-3/ BRRI dhan50	102	148
117	4/99	BR12585-4R-99	BR8076-1-2-2-3/ BRRI dhan50	113	147
118	5/5	BR12586-4R-5	BRRI dhan63/ BRRI dhan80	108	151
119	5/13	BR12586-4R-13	BRRI dhan63/ BRRI dhan80	129	153
120	5/15	BR12586-4R-15	BRRI dhan63/ BRRI dhan80	134	153
121	5/48	BR12586-4R-48	BRRI dhan63/ BRRI dhan80	121	146
122	5/51	BR12586-4R-51	BRRI dhan63/ BRRI dhan80	115	148
123	5/68	BR12586-4R-68	BRRI dhan63/ BRRI dhan80	121	146
124	5/80	BR12586-4R-80	BRRI dhan63/ BRRI dhan80	130	146
125	5/82	BR12586-4R-82	BRRI dhan63/ BRRI dhan80	290	144
126	5/105	BR12586-4R-105	BRRI dhan63/ BRRI dhan80	115	152
127	5/114	BR12586-4R-114	BRRI dhan63/ BRRI dhan80	129	152
128	5/133	BR12586-4R-133	BRRI dhan63/ BRRI dhan80	129	148
129	6/7	BR12587-4R-7	BRRI dhan80/ BRRI dhan63	118	151
130	6/16	BR12587-4R-16	BRRI dhan80/ BRRI dhan63	129	151
131	6/17	BR12587-4R-17	BRRI dhan80/ BRRI dhan63	128	151
132	6/28	BR12587-4R-28	BRRI dhan80/ BRRI dhan63	113	147
133	6/30	BR12587-4R-30	BRRI dhan80/ BRRI dhan63	109	147
134	6/33	BR12587-4R-33	BRRI dhan80/ BRRI dhan63	94	148
135	6/38	BR12587-4R-38	BRRI dhan80/ BRRI dhan63	112	148
136	6/41	BR12587-4R-41	BRRI dhan80/ BRRI dhan63	104	147
137	6/44	BR12587-4R-44	BRRI dhan80/ BRRI dhan63	106	147
138	6/55	BR12587-4R-55	BRRI dhan80/ BRRI dhan63	116	148
139	6/94	BR12587-4R-94	BRRI dhan80/ BRRI dhan63	123	146
140	6/101	BR12587-4R-101	BRRI dhan80/ BRRI dhan63	112	147
141	6/114	BR12587-4R-114	BRRI dhan80/ BRRI dhan63	106	148
142	6/117	BR12587-4R-117	BRRI dhan80/ BRRI dhan63	98	148
143	6/131	BR12587-4R-131	BRRI dhan80/ BRRI dhan63	111	143
144	6/135	BR12587-4R-135	BRRI dhan80/ BRRI dhan63	107	148
145	6/139	BR12587-4R-139	BRRI dhan80/ BRRI dhan63	103	150
146	6/165	BR12587-4R-165	BRRI dhan80/ BRRI dhan63	101	146
147	6/167	BR12587-4R-167	BRRI dhan80/ BRRI dhan63	98	146
148	6/183	BR12587-4R-183	BRRI dhan80/ BRRI dhan63	97	148
149	6/195	BR12587-4R-195	BRRI dhan80/ BRRI dhan63	102	149
150	6/196	BR12587-4R-196	BRRI dhan80/ BRRI dhan63	104	149
151	6/198	BR12587-4R-198	BRRI dhan80/ BRRI dhan63	101	147
152	6/201	BR12587-4R-201	BRRI dhan80/ BRRI dhan63	104	151
153	6/211	BR12587-4R-211	BRRI dhan80/ BRRI dhan63	115	149
154	6/221	BR12587-4R-221	BRRI dhan80/ BRRI dhan63	97	146
155	6/229	BR12587-4R-229	BRRI dhan80/ BRRI dhan63	114	147
156	6/245	BR12587-4R-245	BRRI dhan80/ BRRI dhan63	110	145
157	6/257	BR12587-4R-257	BRRI dhan80/ BRRI dhan63	110	143
158	6/260	BR12587-4R-260	BRRI dhan80/ BRRI dhan63	107	147

SN	Cros/ Plant	Designation	Parentage	Plant height (cm)	Growth duration (days)
159	6/261	BR12587-4R-261	BRRI dhan80/ BRRI dhan63	104	150
160	6/262	BR12587-4R-262	BRRI dhan80/ BRRI dhan63	100	149
161	6/266	BR12587-4R-266	BRRI dhan80/ BRRI dhan63	114	148
162	6/267	BR12587-4R-267	BRRI dhan80/ BRRI dhan63	109	148
163	6/273	BR12587-4R-273	BRRI dhan80/ BRRI dhan63	125	149
164	6/274	BR12587-4R-274	BRRI dhan80/ BRRI dhan63	116	149
165	6/297	BR12587-4R-297	BRRI dhan80/ BRRI dhan63	114	145
166	6/319	BR12587-4R-319	BRRI dhan80/ BRRI dhan63	114	149
167	6/322	BR12587-4R-322	BRRI dhan80/ BRRI dhan63	103	146
168	7/7	BR12588-4R-7	BRRI dhan50/ Hatisail (Balam type)	113	149
169	7/142	BR12588-4R-142	BRRI dhan50/ Hatisail (Balam type)	118	149
170	7/148	BR12588-4R-148	BRRI dhan50/ Hatisail (Balam type)	100	146
171	7/174	BR12588-4R-174	BRRI dhan50/ Hatisail (Balam type)	105	143
172	7/224	BR12588-4R-224	BRRI dhan50/ Hatisail (Balam type)	114	143
173	7/355	BR12588-4R-355	BRRI dhan50/ Hatisail (Balam type)	117	149
174	7/388	BR12588-4R-388	BRRI dhan50/ Hatisail (Balam type)	120	147

Experiment 7B.5: Observational Yield Trial (OYT)

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: Selection of homogeneous breeding lines with fine grain properties having high yield with good plant type.

Materials and methods: Eight hundred eight genotypes in three OYTs along with BRRI dhan50, BRRI dhan63 BRRI dhan81 and BRRI dhan92 as standard checks were evaluated. The trial was conducted in augmented RCB design with two replications. Forty-three days old seedlings were transplanted at the rate 2-3 seedlings at a spacing of 20 cm × 15 cm. The unit plot size for OYT was 5.4 m × 4 rows. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled if necessary.

Results and discussion: In total 153 genotypes were selected from OYTs and advanced for yield trial in next season. In OYT#1, 32 genotypes out of 330, in OYT#2, 94 genotypes out of 374 and in OYT#3, 27 genotypes out of 104 were selected based on their yield performances, grain type and amylose content in comparison to check varieties **(Table 7B.5).**

Table 7B.5: Performances of genotypes in Observational Yield Trial (OYT), PQR, Boro 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)		
				Gazipur	Rajshahi	Mean
OYT#1						
1	BR11965-4R-278	88	144	7.68	6.51	7.10
2	BR11965-4R-345	103	143	8.07	6.94	7.51
3	BR11965-4R-73	87	143	7.36	6.93	7.14
4	BR11966-4R-107	98	144	7.32	6.58	6.95
5	BR11966-4R-138	100	144	7.78	6.63	7.20
6	BR11966-4R-245	98	143	7.71	6.94	7.32
7	BR11966-4R-262	103	144	7.59	6.65	7.12
8	BR11966-4R-313	99	143	7.20	6.96	7.08

SN	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)		
				Gazipur	Rajshahi	Mean
9	BR11966-4R-41	98	144	7.47	6.85	7.16
10	BR11966-4R-439	109	147	7.84	6.81	7.33
11	BR11966-4R-471	106	145	7.28	6.88	7.08
12	BR11966-4R-94	104	142	7.19	7.27	7.23
13	BR11967-4R-206	90	142	7.61	6.43	7.02
14	BR11967-4R-347	130	142	7.02	-	7.02
15	BR11967-4R-61	111	141	8.35	7.32	7.85
16	BR11968-4R-1	102	144	7.98	6.74	7.36
17	BR11968-4R-122	90	143	7.56	7.01	7.29
18	BR11968-4R-154	106	143	7.54	6.51	7.03
19	BR11968-4R-224	104	146	7.42	6.64	7.03
20	BR11968-4R-324	96	145	7.82	7.43	7.62
21	BR11968-4R-474	92	146	8.36	7.72	8.04
22	BR11968-4R-86	100	142	8.00	7.41	7.70
23	BR11969-4R-301	93	148	7.32	7.33	7.32
24	BR11970-4R-419	96	146	8.74	7.49	8.12
25	BR11970-4R-542	96	144	8.20	8.16	8.18
26	BR11971-4R-217	92	146	7.30	6.80	7.05
27	BR11973-4R-103	108	144	7.82	7.24	7.53
28	BR11973-4R-176	92	143	7.57	6.82	7.19
29	BR11978-4R-201	86	144	8.02	8.09	8.06
30	BR11978-4R-260	84	140	8.67	7.96	8.31
31	BR11979-4R-202	96	143	7.81	7.06	7.44
32	BR11979-4R-256	87	151	7.45	7.22	7.33
33	BRRI dhan50 (Ck)	80	147	6.37	5.68	6.03
34	BRRI dhan63 (Ck)	85	143	7.08	6.59	6.84
35	BRRI dhan81 (Ck)	93	143	7.56	6.66	7.11
	LSD (0.05)	**8.2**	**4.3**	**0.61**	**0.59**	**0.75**
	H2b	**0.88**	**0.83**	**0.76**	**0.71**	**0.59**
OYT#2						
1	BR11965-4R-1	106	145	8.02	7.54	7.78
2	BR11965-4R-45	96	144	7.67	7.19	7.43
3	BR11965-4R-46	93	143	6.92	6.44	6.68
4	BR11965-4R-75	92	145	7.15	6.67	6.91
5	BR11966-4R-294	109	146	7.50	7.02	7.26
6	BR11966-4R-344	104	143	8.25	7.77	8.01
7	BR11966-4R-349	98	142	7.24	6.76	7.00
8	BR11966-4R-372	95	150	7.13	6.65	6.89
9	BR11966-4R-402	111	147	8.60	8.12	8.36
10	BR11966-4R-405	104	147	6.86	6.38	6.62
11	BR11966-4R-406	105	150	7.77	7.29	7.53
12	BR11966-4R-420	108	149	7.34	6.86	7.10
13	BR11966-4R-421	97	144	8.64	8.57	8.60
14	BR11966-4R-451	108	150	7.92	7.44	7.68
15	BR11966-4R-479	123	149	7.81	7.33	7.57
16	BR11966-4R-491	107	149	8.15	7.67	7.91
17	BR11966-4R-522	96	143	7.64	7.16	7.40
18	BR11966-4R-528	95	142	6.96	6.48	6.72
19	BR11966-4R-578	110	154	7.08	6.60	6.84
20	BR11968-4R-144	93	147	7.40	6.93	7.17
21	BR11968-4R-162	94	145	7.50	7.02	7.26

SN	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)		
				Gazipur	Rajshahi	Mean
22	BR11968-4R-311	90	146	7.16	6.68	6.92
23	BR11968-4R-403	101	146	7.47	6.99	7.23
24	BR11968-4R-411	96	145	7.54	7.06	7.30
25	BR11968-4R-432	96	149	7.37	6.89	7.13
26	BR11970-4R-111	95	148	7.07	6.59	6.83
27	BR11970-4R-118	94	145	7.72	7.24	7.48
28	BR11970-4R-141	104	145	7.47	7.00	7.24
29	BR11970-4R-145	101	147	6.85	6.37	6.61
30	BR11970-4R-164	136	141	8.06	-	8.06
31	BR11970-4R-373	98	144	8.15	7.68	7.92
32	BR11970-4R-384	94	144	7.15	6.67	6.91
33	BR11970-4R-385	99	145	7.12	6.64	6.88
34	BR11970-4R-403	101	144	7.23	6.75	6.99
35	BR11970-4R-404	96	144	7.55	7.07	7.31
36	BR11970-4R-432	104	146	6.99	6.51	6.75
37	BR11970-4R-456	107	145	7.32	6.84	7.08
38	BR11970-4R-460	101	143	7.72	7.25	7.49
39	BR11970-4R-603	94	147	7.36	6.88	7.12
40	BR11970-4R-607	104	144	7.79	7.31	7.55
41	BR11970-4R-642	95	144	7.93	7.45	7.69
42	BR11970-4R-647	104	147	7.14	6.66	6.90
43	BR11970-4R-649	93	143	7.52	7.04	7.28
44	BR11970-4R-654	103	149	7.40	6.92	7.16
45	BR11970-4R-662	93	144	6.98	6.50	6.74
46	BR11970-4R-663	99	146	7.29	6.81	7.05
47	BR11970-4R-99	103	145	8.61	8.13	8.37
48	BR11971-4R-1	90	147	7.32	6.84	7.08
49	BR11971-4R-111	92	143	7.53	7.05	7.29
50	BR11971-4R-114	91	143	7.01	6.53	6.77
51	BR11971-4R-129	103	150	7.68	7.20	7.44
52	BR11971-4R-219	102	146	7.64	7.13	7.38
53	BR11971-4R-228	109	146	7.51	7.03	7.27
54	BR11972-4R-11	92	144	7.40	6.92	7.16
55	BR11972-4R-127	90	145	7.55	7.08	7.31
56	BR11972-4R-151	98	153	8.07	7.59	7.83
57	BR11972-4R-41	98	139	6.93	6.46	6.70
58	BR11972-4R-87	108	146	7.44	6.96	7.20
59	BR11973-4R-129	103	149	8.05	7.57	7.81
60	BR11973-4R-186	100	151	7.66	7.18	7.42
61	BR11973-4R-196	102	144	7.78	7.30	7.54
62	BR11973-4R-203	98	147	7.73	7.25	7.49
63	BR11973-4R-210	104	144	7.09	6.61	6.85
64	BR11973-4R-213	103	148	7.59	7.12	7.36
65	BR11973-4R-224	97	144	7.77	7.29	7.53
66	BR11973-4R-252	103	140	8.69	8.21	8.45
67	BR11973-4R-309	109	144	7.88	7.40	7.64
68	BR11973-4R-316	91	145	8.13	7.65	7.89
69	BR11973-4R-330	116	145	7.87	7.39	7.63
70	BR11973-4R-344	108	144	8.55	8.07	8.31
71	BR11973-4R-356	103	144	8.02	7.54	7.78
72	BR11973-4R-365	100	146	7.19	6.71	6.95

SN	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)		
				Gazipur	Rajshahi	Mean
73	BR11973-4R-532	95	146	7.40	6.92	7.16
74	BR11973-4R-583	104	142	7.32	6.84	7.08
75	BR11973-4R-599	102	144	7.08	6.60	6.84
76	BR11973-4R-75	97	151	7.06	6.58	6.82
77	BR11973-4R-85	99	147	6.94	6.46	6.70
78	BR11973-4R-92	104	160	7.07	6.59	6.83
79	BR11974-4R-133	131	141	7.24	6.76	7.00
80	BR11974-4R-543	99	142	7.66	7.18	7.42
81	BR11978-4R-101	85	141	7.49	7.01	7.25
82	BR11978-4R-112	101	150	7.25	6.77	7.01
83	BR11978-4R-213	92	149	7.60	7.12	7.36
84	BR11978-4R-308	95	146	7.10	6.62	6.86
85	BR11978-4R-42	84	139	7.38	6.90	7.14
86	BR11978-4R-69	100	154	6.88	6.40	6.64
87	BR11978-4R-86	93	142	6.93	6.45	6.69
88	BR11979-4R-73	98	152	7.17	6.69	6.93
89	BR11980-4R-3	110	148	7.71	7.23	7.47
90	BR11980-4R-370	113	153	7.42	6.94	7.18
91	BR11980-4R-454	106	145	7.54	7.06	7.30
92	BR11980-4R-471	110	150	7.23	6.75	6.99
93	BR11980-4R-498	106	144	7.54	7.06	7.30
94	BR11980-4R-635	111	142	6.94	6.46	6.70
95	BRRI dhan50 (Ck)	81	153	6.59	6.77	6.68
96	BRRI dhan63 (Ck)	86	144	7.24	6.11	6.68
97	BRRI dhan81 (Ck)	91	143	6.34	5.86	6.10
	LSD (0.05)	**7.5**	**5.6**	**0.69**	**0.57**	**0.72**
	H2b	**0.81**	**0.76**	**0.82**	**0.73**	**0.57**
OYT#3						
1	BR11966-4R-468	122	150	8.06	6.53	7.29
2	BR11971-4R-200	100	152	7.13	7.05	7.09
3	BR11971-4R-212	104	149	7.28	7.71	7.50
4	BR11971-4R-234	106	150	7.44	6.92	7.18
5	BR11971-4R-251	118	149	8.07	7.46	7.77
6	BR11971-4R-282	102	146	7.84	7.36	7.60
7	BR11973-4R-115	112	143	7.31	7.74	7.53
8	BR11973-4R-153	103	145	7.76	7.87	7.82
9	BR11973-4R-250	106	143	8.83	6.51	7.67
10	BR11973-4R-363	94	147	8.64	6.73	7.68
11	BR11973-4R-369	110	154	7.60	6.82	7.21
12	BR11973-4R-450	102	146	8.19	7.76	7.98
13	BR11973-4R-488	110	151	7.14	7.56	7.35
14	BR11973-4R-523	110	143	7.44	7.42	7.43
15	BR11973-4R-535	98	152	7.44	8.48	7.96
16	BR11973-4R-562	111	143	8.48	8.33	8.41
17	BR11973-4R-572	93	145	7.98	6.99	7.49
18	BR11974-4R-25	101	141	7.67	7.19	7.43
19	BR11974-4R-559	104	140	7.27	-	7.27
20	BR11978-4R-136	107	151	7.91	6.90	7.40
21	BR11978-4R-25	100	148	7.52	7.45	7.48
22	BR11978-4R-374	95	143	7.42	7.10	7.26
23	BR11978-4R-45	98	151	6.96	7.22	7.09

SN	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)		
				Gazipur	Rajshahi	Mean
24	BR11978-4R-51	101	147	7.67	6.84	7.26
25	BR11978-4R-92	99	151	8.55	7.86	8.21
26	BR11980-4R-139	103	147	7.60	8.57	8.08
27	BR11980-4R-575	114	149	6.97	7.42	7.20
28	BRRI dhan50	79	146	6.70	6.21	6.45
29	BRRI dhan63	85	143	7.07	6.92	6.99
30	BRRI dhan81	95	141	7.00	5.95	6.48
31	BRRI dhan92	109	154	7.26	7.48	7.37
	LSD (0.05)	**9.2**	**6.3**	**0.5**	**0.7**	**0.9**
	H2b	**0.79**	**0.82**	**0.69**	**0.63**	**0.56**

D/S: 04/12/2022, D/T: 17/01/2023 (OYT#1), 16/01/2023 (OYT#2), 17/01/2023 (OYT#3)

Experiment 7B.6: Advanced Yield Trial (AYT)

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: Advance yield evaluation of advanced lines compared to standard checks.

Materials and methods: Sixty-two genotypes were evaluated in three AYTs along with BRRI dhan50, BRRI dhan58, BRRI dhan63 BRRI dhan81 and BRRI dhan92 as standard checks. The trial was conducted following RCB design with two replications. Forty days old seedlings were transplanted at the rate of 2-3 seedlings at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 10 rows. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Results and discussion: In total 21 genotypes were selected from three AYTs and advanced for regional yield trial (RYT) in next boro season. In AYT#1, 6 genotypes out of 17, in AYT#2, 5 genotypes out of 15 and in AYT#3, 10 genotypes out of 30 were selected based on their yield performances, grain type and amylose content in comparison to check varieties **(Table 7B.6).**

Table 7B.6: Performances of genotypes in Advanced Yield Trial (AYT), PQR, Boro 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			
				Gazipur	Rajshahi	Rangpur	Mean
1	BR11359-4R-101	102	143	6.65	5.54	5.83	6.01
2	BR11359-4R-133	102	143	7.02	5.87	5.54	6.14
3	BR11359-4R-147	102	144	6.66	5.63	4.86	5.72
4	BR11359-4R-150	99	144	6.58	5.18	5.14	5.63
5	BR11359-4R-158	99	144	6.03	5.16	5.08	5.42
6	BR11359-4R-24*	110	144	7.71	6.90	6.50	7.04
7	BR11359-4R-283	103	144	5.93	5.29	5.71	5.64
8	BR11359-4R-319	103	143	6.89	5.64	4.61	5.71
9	BR11359-4R-335	103	144	6.94	5.84	4.86	5.88
10	BR11359-4R-341*	100	143	7.27	6.11	6.55	6.64
11	BR11359-4R-78	102	144	6.57	5.26	5.26	5.70
12	BR11361-4R-149*	95	140	7.45	-	6.65	7.05
13	BR11366-4R-133*	118	146	7.83	6.85	6.34	7.00
14	BR11366-4R-179*	124	146	8.53	7.32	5.27	7.04
15	BR11371-4R-259	96	147	6.81	6.22	6.10	6.38

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			
				Gazipur	Rajshahi	Rangpur	Mean
16	BR11371-4R-322	100	148	7.28	6.05	5.92	6.41
17	BR11371-4R-522*	100	146	8.06	6.82	6.52	7.13
18	BRRI dhan50 (Ck)	89	154	6.83	5.76	5.13	5.90
19	BRRI dhan63 (Ck)	113	147	7.09	6.34	6.59	6.67
20	BRRI dhan81 (Ck)	96	144	7.18	6.74	5.88	6.60
	LSD (0.05)	**8.9**	**4.5**	**0.57**	**0.63**	**0.55**	**0.68**
	H2b	**0.78**	**0.83**	**0.73**	**0.75**	**0.69**	**0.61**
AYT#2							
1	BR11359-4R-11*	106	147	7.89	6.97	7.77	7.54
2	BR11359-4R-164	109	151	7.88	7.59	5.88	7.12
3	BR11359-4R-169*	106	148	7.92	7.94	6.65	7.50
4	BR11359-4R-250*	104	152	7.69	7.81	6.41	7.30
5	BR11359-4R-27	115	151	7.84	6.88	6.05	6.92
6	BR11359-4R-281	104	152	7.57	7.16	6.33	7.02
7	BR11361-4R-154*	101	149	7.98	7.42	6.92	7.44
8	BR11361-4R-172	106	148	6.63	6.25	6.42	6.44
9	BR11363-4R-155	101	147	8.00	6.90	5.87	6.92
10	BR11363-4R-190	104	148	8.37	5.66	4.73	6.25
11	BR11363-4R-20*	104	150	8.07	7.58	6.18	7.28
12	BR11363-4R-32	108	147	7.77	5.74	6.36	6.63
13	BR11365-4R-1	115	147	7.73	5.61	4.29	5.87
14	BR11365-4R-112	109	149	7.59	5.55	4.71	5.95
15	BR11366-4R-121	111	149	7.99	6.99	5.51	6.83
16	BRRI dhan50 (Ck)	81	154	7.57	6.83	5.69	6.69
17	BRRI dhan58 (Ck)	100	153	8.00	7.29	7.06	7.45
18	BRRI dhan63 (Ck)	84	147	7.81	6.51	5.91	6.74
	LSD (0.05)	**11.2**	**6.1**	**0.63**	**0.59**	**0.51**	**0.58**
	H2b	**0.72**	**0.83**	**0.79**	**0.73**	**0.69**	**0.58**
AYT#3							
1	BR11359-4R-181*	143	156	7.83	7.29	6.63	7.25
2	BR11359-4R-195	109	153	6.45	7.34	5.87	6.56
3	BR11359-4R-211*	110	154	7.99	7.91	6.92	7.61
4	BR11359-4R-212	107	157	6.88	6.98	7.60	7.15
5	BR11359-4R-225	96	156	6.62	6.87	5.89	6.46
6	BR11359-4R-236	106	156	6.42	6.31	5.22	5.98
7	BR11359-4R-260*	108	155	7.50	7.62	7.04	7.39
8	BR11359-4R-263*	110	156	7.96	7.78	7.86	7.87
9	BR11359-4R-267	100	154	7.06	7.01	5.71	6.60
10	BR11359-4R-275*	111	156	7.91	7.78	7.79	7.83
11	BR11359-4R-279*	109	154	7.81	7.82	7.52	7.72
12	BR11359-4R-288*	103	157	7.93	7.88	7.33	7.71
13	BR11359-4R-299	107	155	7.52	7.30	6.55	7.12
14	BR11359-4R-304*	103	157	7.85	7.47	7.59	7.63
15	BR11359-4R-311	105	156	6.50	6.83	5.76	6.36
16	BR11359-4R-351*	103	156	7.50	7.38	6.91	7.26
17	BR11359-4R-373*	104	157	7.80	7.99	7.00	7.60
18	BR11359-4R-409	104	158	6.80	6.75	7.45	7.00
19	BR11359-4R-410	109	156	6.64	6.93	5.81	6.46
20	BR11363-4R-3	105	154	5.94	7.01	5.78	6.24
21	BR11366-4R-173	100	152	6.12	6.36	5.41	5.96
22	BR11371-4R-192	98	157	6.68	6.86	5.21	6.25

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			
				Gazipur	Rajshahi	Rangpur	Mean
23	BR11371-4R-293	100	150	6.98	6.85	5.74	6.52
24	BR11371-4R-320	108	156	6.20	6.27	3.79	5.42
25	BR11371-4R-385	106	155	6.84	6.88	5.79	6.50
26	BR11371-4R-494	102	155	5.12	5.39	4.07	4.86
27	BR11371-4R-511	102	155	6.49	6.84	6.44	6.59
28	BR11371-4R-537	106	153	7.11	7.13	6.32	6.86
29	BR11371-4R-539	98	150	6.55	6.80	5.50	6.28
30	BR11371-4R-687	104	154	6.32	6.64	5.79	6.25
31	BRRI dhan50 (Ck)	82	153	6.60	6.68	6.01	6.43
32	BRRI dhan63 (Ck)	88	146	7.09	6.93	5.25	6.42
33	BRRI dhan92 (Ck)	106	156	7.31	8.09	7.45	7.62
	LSD (0.05)	**9.5**	**6.2**	**0.48**	**0.53**	**0.61**	**0.51**
	H2b	**0.87**	**0.81**	**0.73**	**0.69**	**0.77**	**0.59**

D/S: 01/12/2022, D/T: 10/01/2023 (AYT#1), 10/01/2023 (AYT#2), D/T: 09/01/2023 (AYT#3)
*Selected genotypes

Experiment 7B.7: Regional High yield Trial (RYT)

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: To evaluate specific and general adaptability of the advance breeding lines as compared with standard checks in on-station condition.

Materials and methods: Twelve genotypes under two RYTs were evaluated at eight locations of BRRI HQ and R/S along with BRRI dhan50, BRRI dhan63 and BRRI dhan81 as standard checks. The trial was conducted following RCB design with three replications. Around forty days old seedlings were transplanted at the rate of 2-3 seedlings at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 12 rows. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Results and discussion: Five genotypes were selected as compared to check varieties based on their specific and general adaptability in eight regional stations of BRRI **(Table 7B.7.1 and 7B.7.2)** and advanced for ALART in next boro season. Grain quality parameter of the tested lines is shown in **Table 7B.7.3.**

Table.7B.7.1. Performances of genotypes in Regional Yield Trial (RYT#1), PQR, Boro 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)								
				L1	L2	L3	L4	L5	L6	L7	L8	Mean
1	BR10645-6-4-8-1-2*	103	150	7.5	5.5	7.2	5.2	7.3	6.2	6.7	6.1	6.46
2	BR10646-3-2-2-4-3*	107	152	7.4	5.7	7.3	5.3	7.4	6.4	6.9	6.8	6.66
3	BR10646-3-2-2-4-4	99	147	7.4	5.3	7.1	5.1	7.0	6.2	6.8	6.5	6.44
4	BR10646-3-3-3-1-4	108	152	7.7	5.1	7.4	5.1	7.5	6.3	6.4	6.5	6.50
5	BR10648-12-1-3-4-1*	103	147	7.7	5.5	7.5	5.3	7.3	6.0	6.9	5.9	6.51
6	Koushik-Hili	99	152	7.1	5.4	7.2	5.6	7.0	6.3	6.9	6.6	6.50
7	Lomba Jira, Tanor	101	148	7.2	5.9	6.3	5.9	5.8	6.2	5.4	6.8	6.19
8	Miniket, Ballobpur	102	146	7.4	5.8	7.1	4.9	7.1	5.9	6.8	5.7	6.33
9	Jira, Nachol*	104	146	7.5	5.6	7.0	5.5	7.0	6.2	6.8	6.6	6.52
10	BRRI dhan63 (Ck)	88	144	7.5	5.6	6.4	5.0	6.4	5.4	7.0	6.2	6.18

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)								
				L1	L2	L3	L4	L5	L6	L7	L8	Mean
11	BRRI dhan81 (Ck)	95	144	7.7	5.7	6.4	4.0	6.6	5.6	4.7	6.4	5.86
	LSD (0.05)	**12.30**	**6.89**	**0.5**	**0.6**	**0.6**	**0.5**	**0.6**	**0.6**	**0.7**	**0.5**	
	H2b	**0.72**	**0.82**	**0.8**	**0.7**	**0.7**	**0.8**	**0.6**	**0.6**	**0.6**	**0.6**	

*Selected genotypes; L1- Gazipur, L2- Kustia, L3-Naogaon, L4- Parbotipur, L5- Rajshahi, L6-Ranpur, L7- satkhira, L8-Cumilla

Table.7B.7.2. Performances of genotypes in Regional Yield Trial (RYT#2), PQR, Boro 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)								
				L1	L2	L3	L4	L5	L6	L7	L8	Mean
1	BR10642-4-5-1-2-1	107	157	6.8	5.3	4.5	4.8	4.6	6.2	5.2	6.4	5.5
2	Katari, Shibganj*	99	153	7.6	5.6	7.2	5.5	7.1	6.3	6.7	7.2	6.6
3	Shova (TH)	83	163	7.1	5.9	5.9	5.5	5.9	6.4	5.7	6.7	6.1
4	BRRI dhan50 (Ck)	84	152	7.1	5.6	6.0	5.7	6.1	6.9	6.9	6.5	6.3
5	BRRI dhan63 (Ck)	86	146	7.2	5.8	6.4	5.6	6.4	6.1	7.0	6.3	6.3
	LSD (0.05)	**10.71**	**5.63**	**2.39**	**0.57**	**0.67**	**0.43**	**0.49**	**0.57**	**0.55**	**0.53**	
	H2b	**0.63**	**0.79**	**0.67**	**0.61**	**0.72**	**0.53**	**0.56**	**0.73**	**0.63**	**0.69**	

*Selected genotypes; L1- Gazipur, L2- Kustia, L3-Naogaon, L4- Parbotipur, L5- Rajshahi, L6-Ranpur, L7- satkhira, L8-Cumilla

Table.7B.7.3: Physico-chemical properties of Regional Yield Trial, PQR, Boro 2022-23

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (mm)	Milled Rice breadth (mm)	L-B ratio	Size & Shape	Amylose (%)	1000 grain weight (g)	Protein (%)	ER	IR	Chalkiness (%)
BR10645-6-4-8-1-2*	70	57	6.5	2.0	3.3	LS	25.7	19.4	8.1	1.5	3.9	72
BR10646-3-2-2-4-3*	70	56	6.3	1.9	3.3	LS	25.0	19.4	8.1	1.5	4.8	71
BR10646-3-2-2-4-4	69	60	6.2	1.8	3.5	LS	25.1	18.8	8.4	1.5	4.3	76
BR10646-3-3-3-1-4	69	57	6.2	1.9	3.3	LS	25.1	17.8	8.4	1.4	4.1	70
BR10648-12-1-3-4-1*	69	61	6.3	1.9	3.4	LS	25.4	18.3	8.0	1.7	4.5	81
Koushik-Hili	69	66	5.7	1.8	3.2	LS	24.3	13.2	8.8	1.3	4.8	47
Lomba Jira, Tanor	69	59	6.1	2.0	3.1	LS	24.3	17.8	7.5	1.3	4.8	57
Miniket, Ballobpur	71	62	5.8	2.0	2.9	MB	25.7	18.0	6.5	1.4	4.8	67
Jira, Nachol*	70	61	6.1	2.0	3.1	LS	25.4	17.8	7.7	1.4	4.3	50
Katari, Shibganj*	62	60	4.9	1.8	2.8	SB	25.0	13.5	8.1	1.6	4.8	64
BRRI dhan63 (Ck)	70	47	6.6	1.8	3.7	LS	26.1	19.6	8.7	1.4	4.7	78
BRRI dhan81 (Ck)	69	43	6.7	2.0	3.4	LS	25.6	19.4	9.0	1.4	4.7	81

Experiment 7B.8: Proposed Varietal Trial (PVT)

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: On-farm evaluation of advance breeding lines compared to standard checks for testing their specific and general adaptability.

Materials and methods: The genotype Lata Balam along with standard check BRRI dhan50 were evaluated in ten locations of Bangladesh (**Table 7B.8.1**). Thirty-five to forty days old seedlings of each genotype were transplanted at the rate of 2-3 seedlings with a spacing of 20 cm × 20 cm. The unit plot size was 5.4 m × 20 and the field layout was RCB design with three replications. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, controlling disease and insect pests were done in time.

Results and discussion: The genotype Lata balam remarkably produced higher yield over check variety in every location and in average gave 17.67% higher yield than check variety (Table 7B.8.1). In average, the proposed line produced 8.19 t/ha yield with similar growth duration, in contrast the check variety produced only 7.00 t/ha only. The grain quality parameters and antioxidant properties of the line shown in **Table 7B.8.2** and **Table 7B.8.3**). Based on field performance, grain quality, DUS and VCU test the line was recommended by SCA for release as new premium quality rice variety in boro season.

Table 7B.8.1: Performance of the line Lata Balam in Proposed Variety Trial (PVT), PQR, Boro 2022-23

Locations	Lata Balam (Proposed Variety)		BRRI dhan50 (Check variety)		% Yield advantage over BRRI dhan50*
	Growth duration (days)	Grain yield (t/ha)	Growth duration (days)	Grain yield (t/ha)	
BRRI, Gazipur	141	7.11	146	5.92	20.18
Cumilla	135	7.54	137	6.07	24.17
Feni	144	9.57	149	7.37	29.88
Bogura	148	7.50	148	6.32	18.55
Dinajpur	145	7.71	145	6.90	11.83
BRRI R/S Bhanga	147	7.91	146	7.19	10.02
Barishal	135	6.34	129	5.54	14.39
Joshore	148	9.38	146	8.40	11.71
BINA, Mymensingh	141	9.36	145	8.09	15.66
BRRI R/s Rangpur	148	9.46	152	8.18	15.69
Range	135-148	6.34-9.57	129-152	5.54-8.40	10.02 - 29.88
Mean	**143**	**8.19**	**144**	**7.00**	**17.67**

Table 7B.8.2: Physico-chemical properties of the genotypes Lata Balam in Proposed Variety Trial (PVT), PQR, Boro 2022-23

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (mm)	Milled Rice breadth (mm)	L-B ratio	Size & Shape	1000 grain weight (g)	Appearance
Lata Balam (Proposed Variety)	70.8	60.1	7.6	1.8	4.2	Extra LS	26.1	Very Good
BRRI dhan50 (Ck)	70.5	59.9	6.6	1.6	4.0	LS	19.0	Good

Table 7B.8.3: Physico-chemical properties of the genotypes Lata Balam in Proposed Variety Trial (PVT), PQR, Boro 2022-23

Designation	Amylose (%)	Protein (%)	Cooking time (min)	ER	IR	Chalkiness	Antioxidant properties	
							TPC (ug/g GAE)	FRAP (uM AAE)
Lata Balam (Proposed Variety)	29.1	9.8	15.0	1.4	4.2	Tr	6.70	266
BRRI dhan50 (Ck)	26.8	8.2	17.3	1.2	3.9	Tr/ Opaque (few)	6.46	257

Tr: Translucent, TPC: Total Phenolic Content, FRAP: Ferric Reducing Antioxidant Power Assay

TPC is important plant constituents with redox properties responsible for antioxidant activity. It can be calculated as natural compound (gallic acid) equivalent (GAE)

*FRAP measures the antioxidant potential in samples through the reduction of ferric iron (Fe^{3+}) to ferrous iron (Fe^{2+}) by antioxidants present in the samples.

Experiment 7B.9: GxE interaction of PQR (Basmati type) on physico-chemical properties

Principal Investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, and U R Shaha.

Specific objective: On-farm evaluation of Basmati type genotypes for testing their physico-chemical properties.

Materials and methods: Twenty Basmati type genotypes were evaluated at ten locations along with Rata Boro, Tepi Boro, BRRI dhan50, BRRI dhan63, BRRI dhan81 and BRRI dhan104 as standard checks (**Table 7B.9**). The trial was conducted following RCB design with two replications. Around forty days old seedlings were transplanted at the rate of 2-3 seedlings at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 6 rows. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled when necessary.

Locations: BRRI Gazipur, BRRI R/S Rangpur (Rangpur, Dinajpur, Panchagarh), BRRI R/S Rajshahi (Rajshahi, Naogaon), BRRI R/S Kushtia (Kushtia, Chuadanga), BRRI R/S Barishal, BRRI R/S Satkhira, BRRI R/S Gopalganj, BRRI R/S Sonagazi, BRRI R/S Cumilla and BRRI R/S Habiganj.

Results and discussion: This are the 1st time experiment to findout and fisibility study of international grade (Elongation & aroma) Basmati rice cultivation area in Bangladesh. This experiment will be continued for several years to findout GxE interaction on the basis of international standard Basmati rice cultivation and screenining protocol. That's why, here we are presenting only grain yield performance, growth duration and phant height data **(Table 7B.9)** except any grain quality, DUS and VCU test results.

Table 7B.9: performance of Basmati genotypes on physico-chemical properties in GxE interaction of PQR (Basmati type), PQR, Boro 2022-23

SN	Designation	PH	GD	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	Mean
1	Basmati-433 (4509)	121	142	5.1	3.4	2.6	4.5	1.8	5.7	3.7	4.6	5.1	6.8	5.0	4.4
2	Basmati (1230)	128	142	6.9	2.6	3.7	4.3	7.8	4.7	4.0	4.6	4.4	7.5	6.1	5.2
3	Basmati (4488)	123	142	6.5	4.3	3.7	5.9	3.8	5.4	4.6	4.6	4.7	7.2	-	5.1
4	Basmati (4754)	133	141	4.8	3.5	4.1	2.7	5.3	4.9	3.5	4.5	3.1	6.3	-	4.3
5	Basmati (6614)	108	142	4.4	3.1	3.9	2.6	1.8	4.9	3.3	5.4	7.1	5.0	5.7	4.3
6	Basmati (D) (3928)	114	137	3.6	3.4	3.4	3.0	3.8	5.0	3.5	4.3	5.4	5.4	4.9	4.2
7	Basmati (N13) (4493)	81	155	2.8	3.3	4.1	2.8	1.6	4.8	3.5	4.7	4.6	6.3	4.3	3.9
8	Basmati 107 (4501)	134	142	4.5	3.2	3.6	2.7	3.6	5.6	3.3	5.7	5.3	5.9	4.2	4.3
9	Basmati 37 (4491)	125	142	4.8	3.4	3.1	3.5	5.6	4.5	3.8	3.8	5.2	6.2	5.1	4.5

SN	Designation	PH	GD	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	Mean
10	Basmati 370 (4489)	130	139	3.9	4.1	3.6	3.7	3.9	4.3	4.9	4.9	4.6	6.3	4.9	4.5
11	Basmati 370 (4494)	116	142	3.7	3.9	3.0	3.7	4.3	4.7	4.2	3.5	3.0	6.7	5.5	4.2
12	Basmati 377 (4507)	133	142	5.1	3.0	3.8	3.3	2.9	3.7	4.6	6.6	1.9	6.0	-	4.1
13	Basmati 406 (4508)	123	142	2.3	3.5	3.8	2.8	4.6	4.9	3.8	4.6	4.4	5.1	-	4.0
14	Basmati Nanot 439 (4496)	126	142	3.4	2.6	3.4	2.4	1.8	4.5	3.2	5.2	4.6	6.4	3.8	3.7
15	Basmati Pardnr442 (4497)	101	142	5.8	4.0	2.8	3.1	3.2	4.6	4.3	3.9	6.0	6.9	5.8	4.6
16	Basmati Sufaid 187	125	142	5.2	3.6	3.5	4.1	2.3	4.8	3.6	4.3	5.7	7.7	4.5	4.5
17	Basmati TAPL-90(2517)	130	142	3.2	2.3	3.7	2.1	6.6	4.6	4.2	4.6	3.3	7.3		4.2
18	Pusha Basmati	110	142	6.0	4.5	3.8	3.3	4.3	3.8	4.4	4.3	5.9	5.6	6.1	4.7
19	Indian Basmati	98	142	4.7	3.7	4.0	2.9	6.0	5.0	4.6	4.4	6.3	5.7	4.8	4.7
20	Super basmati	101	142	2.4	3.0	3.0	1.7	5.1	3.4	3.0	5.1	3.3	-	5.7	3.6
21	Rata Boro (Ck)	128	142	5.3	3.7	3.9	4.6	1.8	4.7	3.6	5.1	6.3	6.0	5.2	4.5
22	Tepi Boro (Ck)	128	142	5.1	4.7	4.0	4.0	-	5.2	4.5	5.1	5.5	-	5.9	4.9
23	BRRI dhan50 (Ck)	94	142	4.8	3.4	3.9	3.9	5.4	5.4	3.5	3.6	4.2	7.1	4.6	4.5
24	BRRI dhan63 (Ck)	85	142	6.7	3.7	3.8	5.0	6.1	5.7	4.3	3.9	5.7	6.4	6.2	5.2
25	BRRI dhan81 (Ck)	87	142	4.5	4.1	4.2	5.1	4.7	5.3	4.3	4.4	6.4	7.6	6.3	5.2
26	BRRI dhan104 (Ck)	102	142	5.0	3.5	4.8	0.9	4.3	5.5	4.0	5.3	3.8	5.6	6.6	4.5

L1=BARI, L2= Dinajpur, L3= Gopalganj, L4= Gazipur, L5= Habiganj, L6= Kushtia, L7= Panchagarh, L8= Rangpur, L9= Sonagazi, L10= Satkhira and L11= Cumilla

PROJECT 8: DEVELOPMENT OF RICE VARIETIES FOR FAVORABLE BORO ECOSYSTEM

General objective: Development of improved genotypes with high yield potential (≥8.0 t/ha), earliness and acceptable grain quality for irrigated ecosystem in Bangladesh.

Project Leader: Partha Sarathi Biswas

Experiment 8.1: Parental purification and Hybridization

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman and M Istiak Hossain Joy

Specific objectives: To create variations for the development of new high yielding genotypes with acceptable grain quality.

Materials and Method: Twenty-nine varieties/lines (**Table 8.1a**) were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Thirty-five-day old seedling was transplanted in 8-hill triple rows plot at 25 cm × 20 cm spacing. Fertilizer management was done at the rate of 260:100:120: 110:11 kg Urea, TSP, MP, Gypsum and ZnSO4/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of TSP, MP, Gypsum and ZnSO4 were applied at final land preparation. For parental purification, leaf samples were collected from all plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique genomic profiles of each parent were used to make crosses. To make desired cross combination, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glassine paper bags. Pollination was performed with just anthesized panicles of the male parent by dusting pollens on the emasculated panicles of the female parent.

Results and discussion: Thirty-four crosses were made (**Table 8.1b**) using 29 varieties/lines as parents targeting to develop high-yielding breeding lines enriched with favorable alleles of key target traits, viz. disease resistance (blast and BLB), insect resistance (BPH) and acceptable grain quality (amylose, chalkiness, palatability, zinc content, etc).

Table 8.1a: List of parents used in making crosses for the development of varieties for favorable environments during 2022-23

Sl	Designation	Characters/gene (s) of inheritance
1	BR12419-6R-102	*Wx(a),Wx.10*
2	BR12520-5R-67	*Wx(a),Wx.10,SCT1,BPH32,Pb1,xa13*
3	BR12512-5R-78	*Wx(a),Wx.10, SCT1*
4	BR12527-5R-1	*Wx(a),Wx.10, SCT1*
5	BR12567-5R-91	*Wx(a),Wx.10, SCT1,Cold1.jap,Pb1*
6	IR18A1398	*Wx(a),Wx.10*
7	BR12520-5R-75	*Wx(a),Wx.10, SCT1,BPH32, Pb1*
8	BR12509-5R-45	*Wx(a),Wx.10,SCT1,BPH32*
9	BR12557-5R-105	*Wx(a),Wx.10,Pi9*
10	BR12517-5R-57	*Wx(a),Wx.10,Pb1,Pita,xa5*
11	BR12559-5R-30	*Wx(a),Wx.10,BPH32,Pita*
12	BR12096-4R-25-1	*Wx(a),Wx.10, xa5, xa13, Xa21*
13	BR12423-6R-38	*Wx(a),Wx.10, SCT1*
14	SVIN109	*Wx(a),Wx.10, SCT1, Xa21*
15	BR11315-5R-17	*Wx(a), PSST6*
16	BR9945-5R-21	*Wx(a)*
17	BR11640-5R-86	*Wx(a), SCT1*
18	BR10317-5R-25	*Wx(a), Wx-10, chalk5*
19	BR10604-5R-58	*wx(b), SCT1*
20	BR11318-5R-106	*Wx(a), Wx-10, chalk5*
21	BR12096-4R-124-1	*Wx(a),Wx.10, xa5, xa13, Xa21*
22	BR12524-5R-56	*Wx(a),Wx.10, SCT1,Pb1,BPH32,Pita*
23	IR20X1002:IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx.10, Pi9, Xa5*
24	BR12416-6R-219	*Wx(a),Wx.10, Pb1, Pita, Pi9,xa5, xa13, Xa21*
25	BR(path)12452- BC3-42-22-11-4	*Pi9*
26	BR11607-4R-72	*Wx(a),Wx.10, xa5, xa13, Xa21*
27	BR12421-4R-171	-
28	IR126952-29-82-206-12-8	*bph17, bph32, Pi9*
29	BR11607-4R-72	*Wx(a),Wx.10, xa5, xa13, Xa21*

Table 8.1b: List of crosses made for forward breeding and line augmentation under Development of Favorable Boro Rice project during 2022-23.

SL	Cross Combinations	Objectives/Gene of inheritance	No. of F1's Seeds
Forward Breeding			
1	BR12419-6R-102/BR12096-4R-124-1	*Wx(a),Wx.10, xa5, xa13, Xa21*	23
2	BR12520-5R-67/BR12524-5R-56	*Wx(a),Wx.10,SCT1,Pb1,BPH32,Pita Pb1,xa13*	23
3	BR12512-5R-78/BR12557-5R-105	*Wx(a),Wx.10,Pi9,SCT1*	12
4	BR12527-5R-1/BR12524-5R-56	*Wx(a),Wx.10,SCT1,Pb1,BPH32,Pita, SCT1*	7
5	BR12567-5R-91/BR12524-5R-56	*Wx(a),Wx.10,SCT1,Pb1,BPH32,Pita, Cold1.jap*	8
6	IR18A1398/BR12557-5R-105	*Wx(a),Wx.10,Pi9*	22
7	IR18A1398/BR12096-4R-124-1	*Wx(a),Wx.10, xa5, xa13, Xa21*	44
8	BR12419-6R-102/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx.10, Pi9, Xa5*	21
9	IR18A1398/BR12416-6R-219	*Wx(a),Wx.10, Pb1, Pita, Pi9,xa5, xa13, Xa21*	29
10	BR12520-5R-75/BR12509-5R-45	*Wx(a),Wx.10,SCT1,BPH32,Pb1*	120
11	BR12509-5R-45/BR(path)12452-BC3-42-22-11-4	*Wx(a),Wx.10,SCT1,BPH32*	140
12	BR12557-5R-105/BR12096-4R-25-1	*Wx(a),Wx.10, xa5, xa13, Xa21,Pi9*	110
13	BR12517-5R-57/BR(path)12452-BC3-42-22-11-4	*Wx(a),Wx.10,Pb1,Pita,xa5*	44
14	BR12509-5R-45/BR12096-4R-25-1	*Wx(a),Wx.10, xa5, xa13, Xa21, SCT1,BPH32*	22
15	BR12559-5R-30/BR12096-4R-25-1	*Wx(a),Wx.10, xa5, xa13, Xa21,BPH32,Pita*	88
16	BR12509-5R-45/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx.10, Pi9, Xa5,SCT1,BPH32*	27
17	BR12559-5R-30/BR12416-6R-219	*Wx(a),Wx.10, Pb1, Pita, Pi9,xa5, xa13, Xa21,BPH32*	80
18	BR12096-4R-25-1/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx.10, Pi9, Xa5,Xa13.Xa21*	35
19	BR12517-5R-57/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx.10, Pi9, Xa5,Pita*	70
20	BR12423-6R-38/BR12416-6R-219	*Wx(a),Wx.10, Pb1, Pita, Pi9,xa5, xa13,Xa21.SCT1*	40
21	BR12517-5R-57/BR11607-4R-72	*Wx(a),Wx.10, xa5, xa13, Xa21,Pb1, Pita*	10
22	BR12423-6R-38/BR11607-4R-72	*Wx(a),Wx.10, xa5, xa13, Xa21,SCT1*	18
23	SVIN109/BR12421-4R-171	*Wx(a),Wx.10, SCT1, Xa21*	19
Line Augmentation			
24	BR11315-5R-17/IR126952-29-82-206-12-8	*bph17, bph32*	70
25	BR9945-5R-21/IR126952-29-82-206-12-8	*bph17, bph32*	36
26	BR11640-5R-86/IR126952-29-82-206-12-8	*bph17, bph32*	40

27	BR10317-5R-25/BR11607-4R-72	*Wx(a),Wx.10, xa5, xa13, Xa21, chalk5*	117
BC1F1			
28	BR11315-5R-17*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22) (42. BR15122)	*Pi9, Hd9, xa5, TSV1*	70
29	BR11640-5R-86*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22) (44. BR15124)	*Pi9, Hd9, xa5, TSV1*	103
30	BR10604-5R-58*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22) (45. BR15125)	*Pi9, Hd9, xa5, TSV1*	7
31	BR11318-5R-106*2/BR11607-4R-72 (46. BR15089)	*Wx(a), Wx-10, chalk5*	13
32	BR11315-5R-17*2/BR11607-4R-72 (47. BR15113)	*xa5, xa13, Xa21*	121
33	BR9945-5R-21*2/BR11607-4R-72 (48. BR15114)	*xa5, xa13, Xa21*	79
34	BR10604-5R-58*2/BR11607-4R-72 (50. BR15116)	*xa5, xa13, Xa21*	11

Experiment 8.2: Hybridity test and confirmation of F1

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman and M Istiak Hossain Joy

Specific objectives: To confirm the crosses as true F1s and use of the selected F1s to produce F2 seeds or use in making different types of crosses.

Materials and Methods: A total of 39 crosses were grown along with their parents in the crossing blocks at BRRI Gazipur using single seedling/hill at 20 cm × 20 cm spacing in 8-hill single row plots. Fertilizer management was done following the protocol described in Experiment 8.1. Leaf samples were collected from each of the plants of F1 and parents for QC genotyping to determine true F1s. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. All genotyping results were analyzed using Flapjack.

Results and discussion: The plants with heterozygous alleles at two or more SNP loci were declared as true F1. A total of 36 crosses were identified as true F1. Seeds of these F1 plants were selfed to produce F2 seeds. At maturity stage, F2 seeds of all selected plants were harvested individually. Then they were dried, cleaned and preserved in cold room for proper storage (Table 8.2).

Table 8.2. List of crosses confirmed for forward breeding under Development of Favorable Boro Rice project during 2022-23.

SL	BR No.	Parentage	Objectives/segregated genes
1	BR14601	BR11318-5R-18/BR8938-194-3-4-1-1-P2-HR3	*Wx(a), Wx-10, Pb1, Xa21*
2	BR14606	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Hbj)/BR11723-4R-172	*Wx(a), Wx-10, Gn1a*
3	BR14616	BRRI dhan88/BRRI dhan89	*Wx(a), Wx-10*
4	BR14618	BU dhan2/BRRI dhan81	*Wx(a), Wx-10, Xa21, SCT1*
5	BR14620	BINA dhan14/BR11723-4R-172	*Wx(a), Wx-10, Gn1a*
6	BR15088	BR11303-5R-156/IR64EMF3	*Wx(a), Wx-10, EMF3*
7	BR14641	BR11303-5R-156/IR20X1003:IRRI154-Pi35	*Wx(a), Wx-10, xa5, Pi35*
8	BR14647	BR8899-14-4-1-2-2-1/IR19X1001: IRRI 154-Cold1	*Wx(a), Wx-10, xa5, Cold1*
9	BR14650	BR11318-5R-106/IR20X1003:IRRI154-Pi35	*Wx(a), Wx-10, xa5, Pi35*
10	BR15090	BR11318-5R-106/IR64EMF3	*Wx(a), Wx-10, EMF3*
11	BR14656	BR12266-44-11-32-5-1-1-HR10-B/BR11315-5R-17	*Wx(a), Wx-10, HTSF4.1, Gn1a*

12	BR14657	BR12266-44-11-32-5-1-1-HR10-B/ IR20X1002: IRRI 154-Pi9+Hd9 (N22)	*Wx(a),Wx-10,Pi9,xa5,HTSF4.1*
13	BR14658	BR12266-44-11-32-5-1-1-HR10-B/IR64EMF3	*Wx(a), Wx-10, EMF3, HTSF4.1*
14	BR15091	BR11636-5R-194/BR11894-R-R-R-R-270	*Wx(a), Wx-10, SCT1, TSV1*
15	BR15092	BR11660-5R-254/BR11894-5R-77	*Wx(a), Wx-10, Pita, SCT1*
16	BR15093	BR11660-5R-254/BR11894-R-R-R-R-110	*Wx(a),Wx-10,Pita, SCT1, TSV1*
17	BR15094	BR11660-5R-254/BR11894-R-R-R-R-270	*Wx(a), Wx-10, Pita, TSV1*
18	BR15095	BR11660-5R-254/BR11894-R-R-R-R-299	*Wx(a), Wx-10, Pita*
19	BR15096	BR11660-5R-254/GSR IR1-17-D6-Y1-D1-11	*Wx(a), Wx-10, Pita, SCT1*
20	BR15097	BR11887-5R-368/BR11894-R-R-R-R-110	*Wx(a),Wx-10,Pita,SCT1, TSV1*
21	BR15098	BR11887-5R-368/BR11894-R-R-R-R-270	*Wx(a),Wx-10,Pita, SCT1,TSV1*
22	BR15099	BR11894-R-R-R-R-110/BR11894-R-R-R-R-299	*Wx(a), Wx-10*
23	BR15101	BR11894-R-R-R-R-110/TP30697	*Wx(a), Wx-10, SCT1*
24	BR15104	BR11894-R-R-R-R-270/BR8333-2-3-1-3	*Wx(a), Wx-10, TSV1*
25	BR15105	BR11894-R-R-R-R-299/BR11896-5R-28	*Wx(a), Wx-10, SCT1*
26	BR15106	BR11636-5R-194/BRRI dhan100	*Wx(a), Wx-b, SCT1*
27	BR15107	BR11660-5R-254/BRRI dhan100	*Wx(a), Wx-b, Wx-10, Pi-ta,*
28	BR15108	BR11887-5R-368/BRRI dhan100	*Wx(a), Wx-b, SCT1, Pi-ta*
29	BR15109	BR11894-5R-77/BRRI dhan100	*Wx(a), Wx-b, SCT1, Pi-ta*
30	BR15110	BR11894-R-R-R-R-110/BRRI dhan100	*Wx(a), TSV1*
31	BR15111	BR11894-R-R-R-R-270/BRRI dhan100	*Wx(a), Wx-10, TSV1*
32	BR15112	BR11894-R-R-R-R-299/BRRI dhan100	*Wx(a), Wx-10*
33	BR15117	BR11894-R-R-R-R-329/BR12421-4R-171	*Wx(a), Wx-10, SCT1*
34	BR15118	BR11315-5R-17 (long)/BR12421-4R-171	*Wx(a), Wx-10*
35	BR15119	BR10604-5R-58/BR12421-4R-171	*Wx(a), Wx-10*
36	BR15120	BRRI dhan89/HRB-190-23-17-B-5	*Wx(a), Wx-10*

Experiment 8.3: Advancing segregating progenies in RGA nurseries

Principal investigator: PS Biswas

Co-Investigators: M Anisuzzaman, M Istiak Hossain Joy, and KM Iftekharuddaula

Specific objectives: Rapid advancement of segregating population for shortening breeding cycle.

Materials and Method: A total of 33,903 individual segregating progenies of 118 crosses comprising 9,462 progenies of 25 F2, 12,281 progenies of 39 F3, 6,651 progenies 32 F4 and 5,509 progenies of 22 F5 populations were grown at Gazipur under greenhouse and field RGA condition. In case of field RGA, panicles were directly seeded on the raised bed at 5 cm × 5 cm spacing. A wooden frame was used to make single-row plots on the beds. Fertilizer management was done using the half doses of all fertilizers used in Experiment 8.1. At maturity stage, single panicle was harvested from each bunch of hills. Harvested panicles were dried and subjected to keep in the oven at 500C for breaking dormancy and the same method was repeated to initiate next cycle of RGA immediately.

Results: In total 29,069 individual progenies of 118 crosses of different generations were harvested (**Table 8.3).**

Table 8.3: List of segregating progenies of F2-F5 generations advanced in RGA nurseries under Development of Favorable Boro Rice project during 2022-23

SL	BR Number	Parentage	Plants grown	No. plants Harvested
F_2 population				
1	BR14630	BR11712-4R-227/IR20X1003:IRRI154-Pi35	540	344
2	BR14631	BR11712-4R-227/IR20X1005:IRRI154-Pi54(Ttp)+Pi35	540	390

3	BR14639	BR10317-5R-25/BR11315-5R-17	540	195
4	BR14645	BR8899-14-4-1-2-2-1/IR20X1003:IRRI154-Pi35	540	390
5	BR14646	BR8899-14-4-1-2-2-1/IR20X1005:IRRI154-Pi54(Ttp)+Pi35	540	228
6	BR14649	BR8899-14-4-1-2-2-1/IR64EMF3	540	390
7	BR14848	BR11318-5R-106/IR20X1005:IRRI154-Pi54(Ttp)+Pi35	350	255
8	BR14849	BR11660-5R-254/BR11887-5R-368	400	360
9	BR14850	BR11894-5R-77/BR11894-R-R-R-R-213	250	168
10	BR14851	BR11894-5R-77/BR11896-5R-28	350	186
11	BR14852	BR11894-R-R-R-R-110/BR11896-5R-28	540	315
12	BR14853	BR11894-R-R-R-R-110/GSRIR1-17-D6-Y1-D1-11	540	380
13	BR14855	BR11894-R-R-R-R-169/BRRI dhan 29-CS3-28-16-10-6-HR6(com)-HR1(Gaz)-P8(Hbj)	450	378
14	BR14856	BR12421-4R-171/BRRI dhan 29-CS3-28-16-10-6-HR6(com)-HR1(Gaz)-P8(Hbj)	324	279
15	BR14857	BR11894-R-R-R-R-329/BR11894-R-R-R-R-169	324	324
16	BR14858	BR8899-14-4-1-2-2-1/HRB-190-23-17-B-5	324	240
17	BR14869	BR11318-5R-156*2/IR20X1002:IRRI154-Pi9+Hd9 (N22)	150	126
18	BR14870	BR11318-5R-106*2/IR20X1002:IRRI154-Pi9+Hd9 (N22)	108	93
19	BR14871	BR11303-5R-156*3/BR11607-4R-72	216	141
20	BR14872	BR8899-14-4-1-2-2-1*3/BR11607-4R-72	250	219
21	BR14873	IR126952-29-82-206-12-8/BR10317-5R-25*2	324	324
22	BR14874	BR11318-5R-18*2/IR126952-29-82-206-12-8	324	291
23	BR14878	BR10317-5R-25/IR20X1002:IRRI154-Pi9+Hd9 (N22)	350	300
24	BR14659	BR11303-5R-156*2/BR11607-4R-72	324	300
25	BR14666	BR11303-5R-156/IR20X1002:IRRI154-Pi9+Hd9 (N22)	324	300
		Sub Total	**9,462**	**6,916**
F_3 Generation				
1	BR14597	BR10317-5R-25/BR11303-5R-156	601	561
2	BR14598	BR11303-5R-156/BR11723-4R-172	533	501
3	BR14599	BR11303-5R-19/BR11723-4R-172	459	432
4	BR14600	BR11303-5R-19/IR107995-B-BRGA-BRGA-2-1	480	456
5	BR14601	BR11318-5R-18/BR8938-194-3-4-1-1-P2-HR3	173	159
6	BR14602	BR11318-5R-18/BR8631-12-3-5-P2	387	357
7	BR14603	BR11330-5R-29/BR11342-5R-5	572	522
8	BR14604	BR11330-5R-29/BR8899-14-4-1-2-2-1	494	474
9	BR14605	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)- P8(Hbj)/BR9943-26-2-3-6	202	180
10	BR14607	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)- P8(Hbj)/BR8912-12-6-1-1-1-1	270	249
11	BR14608	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)- P8(Hbj)/IR99285-1-1-1-P2	200	186
12	BR14609	BR11607-4R-72/BR9943-26-2-3-6	446	396
13	BR14610	BR11607-4R-72/IR64-Pi9	540	480
14	BR14611	BR11723-4R-172/BR8912-12-6-1-1-1-1	554	480
15	BR14612	BR11723-4R-172/BR8631-12-3-5-P2	467	411
16	BR14613	BR8631-12-3-5-P2/IR17A2244	492	435
17	BR14614	IR107995-B-BRGA-BRGA-2-1/BINA dhan17	346	309
18	BR14615	TP26717/IR96925-B-B-B-B-61	240	210

19	BR14616	BRRI dhan88/BRRI dhan89	140	120
20	BR14617	BU dhan2/BR11723-4R-172	118	99
21	BR14618	BU dhan2/BRRI dhan81	90	90
22	BR14619	BR11303-5R-156/BR11868-5R-59	319	285
23	BR14620	BINA dhan14/BR11723-4R-172	80	75
24	BR14621	BR12266-44-11-32-5-1-1-HR10-B/BINA dhan14	90	90
25	BR14622	BINA dhan14/BR11712-4R-227	346	315
26	BR14630	BR11712-4R-227/IR20X1003:IRRI154-Pi35	135	114
27	BR14631	BR11712-4R-227/IR20X1005:IRRI154-Pi54(Ttp)+Pi35	196	180
28	BR14634	BR11712-4R-227/IR20X1002:IRRI154-Pi9+Hd9 (N22)	235	204
29	BR14635	BR11712-4R-227/IR64EMF3	247	228
30	BR14636	BR10317-5R-25/IR20X1003:IRRI154-Pi35	293	276
31	BR14640	BR10317-5R-25/IR64EMF3	84	84
32	BR14642	BR11303-5R-156/IR20X1005:IRRI154-Pi54(Ttp)+Pi35	214	192
33	BR14650	BR11318-5R-106/IR20X1003:IRRI154-Pi35	206	186
34	BR14652	BR11318-5R-106/BR11315-5R-17	211	189
35	BR14653	BR12266-44-11-32-5-1-1-HR10-B/IR20X1003: IRRI154-Pi35	460	405
36	BR14654	BR12266-44-11-32-5-1-1-HR10-B/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	357	300
37	BR14657	BR12266-44-11-32-5-1-1-HR10-B/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	342	309
38	BR14266	BR9651-15-2-1-3/BR11000-5R-2	580	501
39	BR14661	IR126952-29-82-206-12-8/BR10317-5R-25	82	78
		Sub Total	**12,281**	**11,118**
F_4 Generation				
1	BR14215	BR10317-5R-25/BR11303-5R-116	229	210
2	BR14216	BR10317-5R-25/BR11318-5R-106	279	270
3	BR14218	BR10318-5R-1/BR8899-14-4-1-2-2-1	362	351
4	BR14221	BR11303-5R-19/BR8899-14-4-1-2-2-1	242	234
5	BR14222	BR11303-5R-19/BR11388-4R-17	87	87
6	BR14223	BR11318-5R-106/BR8899-14-4-1-2-2-1	234	234
7	BR14225	BR11318-5R-18/BR8912-12-6-1-1-1-1	280	270
8	BR14226	BR11318-5R-18/IR99285-1-1-1-P2	322	309
9	BR14227	BR11318-5R-18/BR11388-4R-17	302	294
10	BR14229	BR11342-5R-5/BR11607-4R-72	332	309
11	BR14231	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)- P8(Hbj)/BR8631-12-3-5-P2	236	180
12	BR14232	BR9942-1-2-1-1-B2/BR9943-26-2-3-6	182	171
13	BR14233	BR9942-1-2-1-1-B2/IR17A2244	296	270
14	BR14234	BR9942-1-2-1-1-B2/IR64-Pi9	261	240
15	BR14236	BR8912-12-6-1-1-1-1/IR17A2244	294	285
16	BR14237	IR99285-1-1-1-P2/IR107995-B-BRGA-BRGA-2-1	394	330
17	BR14238	BINA dhan17/IR17A2244	274	249
18	BR14239	BR11607-4R-72/IR17A2244	286	258
19	BR14240	BR10317-5R-25/IR126952-28-94-31-B	31	31
20	BR14241	BR11303-5R-156/IR126952-28-94-31-B	120	105
21	BR14242	BR11318-5R-106/IR126952-28-94-31-B	40	40
22	BR14244	BR10317-5R-25/BR11868-5R-59	123	108
23	BR14245	BR10589-5R-39/BR11868-5R-59	42	42
24	BR14246	BR11303-5R-116/BR11868-5R-59	250	225

25	BR14247	IR16L1172/IR96925-B-B-B-B-61	162	150
26	BR14249	HR(Path)-10/BR7812-19-1-6-1-P2	155	153
27	BR14252	BR11001-5R-37/TP26717	101	99
28	BR14257	BR11303-5R-19/BR11868-5R-59	142	126
29	BR14258	BR10317-5R-25/IR17A2244	287	270
30	BR14259	BR11303-5R-156/IR17A2244	175	165
31	BR14261	BR8899-14-4-1-2-2-1/IR17A2244	71	69
32	BR14265	BR12266-44-11-32-5-1-1-HR10-B/BR11723-4R-172	60	60
		Sub Total	**6,651**	**6,194**
F_5 Generation				
1	BR13983	WANXIAN-P10/BR11663(132A3)-29-8	180	180
2	BR13984	WANXIAN-P10/BR11000-5R-2	127	126
3	BR13985	TP26717/BR11000-5R-31	305	300
4	BR13986	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	203	201
5	BR13987	HR(Path)-10/IR16L1172	120	120
6	BR13988	BRRI dhan89/BR11000-5R-2	215	213
7	BR13989	BR9943-40-3-2/BR11000-5R-2	181	180
8	BR13990	BR9943-24-3-3/BR8899-17-1-1-1-1-1	130	129
9	BR13991	BR9943-24-3-3/BR11000-5R-31	52	51
10	BR13992	BR9651-15-2-1-3/TP26717	496	495
11	BR13995	BR8910-B-6-3-CS1-5-CS2-P3-1-1/IR96925-B-B-B-B-61	360	360
12	BR13996	BR8899-17-1-1-1-1-1/ IR96925-B-B-B-B-61	468	468
13	BR13997	BR8899-17-1-1-1-1-1/BR11000-5R-31	318	318
14	BR13998	BR8631-12-3-5-P2/BR9943-40-3-2	459	353
15	BR13999	BR8631-12-3-5-P2/BR7812-19-1-6-1-P2	215	227
16	BR14000	BR7812-19-1-6-1-P2/IR96925-B-B-B-B-61	231	198
17	BR14001	BR7812-19-1-6-1-P2/BR8910-B-6-3-CS1-5-CS2-P3-1-1	343	167
18	BR14002	BR7812-19-1-6-1-P2/BR11000-5R-31	241	212
19	BR14003	BR7812-19-1-6-1-P2/BR11000-5R-2	233	136
20	BR14005	BR11001-5R-37/BR8899-17-1-1-1-1-1	187	118
21	BR14006	BR8631-12-3-5-P2/HR(Path)-10	321	147
22	BR14007	BRRI dhan88/IR16L1484	124	142
		Sub Total	**5,509**	**4,841**
		Grand Total	**33,903**	**29,069**

Experiment 8.4: Line Stage Testing (LST)

Principal investigator: PS Biswas

Co-Investigators: M Anisuzzaman, M Istiak Hossain Joy, and KM Iftekharuddaula

Specific objectives: To select uniform genotypes in terms of plant height and days to flowering with key target traits.

Materials and Method: Total 2,548 progenies from 25 crosses were grown in Boro season in 12- hills single-row plots using systematic arrangement design. Thirty-five-day-old single seedling was transplanted at 20 cm × 20 cm in the plots. Fertilizer management was done following the protocol described in Experiment 8.1. Leaf samples were collected from single plant of each entry for genotyping with trait markers using trait-based SNP markers. At maturity stage, line selection was done considering uniformity in plant height, days to flowering, grain size and shape, lodging tolerance and tolerance to major disease and insect over check varieties under field condition and presence of target key traits. Additionally, five plants were harvested from selected LST lines to compare the grain weight among selected progenies of same cross combination.

Results and discussion: Initially 259 LST lines (**Table 8.4a**) were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape. Finally, 219 lines were selected based on the presence of favorable alleles of high amylose specific Wx, blast resistance, BB resistance, BPH resistance and cold tolerant genes (Fig.8.1). The genotypic profiles showed that all the selected lines had favourable alleles for high amylose specific markers Wx(a), Wx-10, 9 lanes had blast resistant gene Pi9. In contrast, 23 lines had favourable allele for BB resistance gene xa5 and 29 lines had Xa21 gene. However, 67 lines had seedling stage cold tolerant allele SCT1. Total 6 lines had reproductive stage cold tolerant gene qPSST3, 57 lines had qPSST7 and 5 lines had heat tolerance gene qPSST9 (**Table 8.4b**).

Table 8.4a. List of selected fixed lines from 2548 lines tested in LST during Boro 2022-23

Sl	BR No	Parentage	Generation	Total no. of lines	No. of selected line	No. of lines selected after genotyping
1	BR13983	WANXIAN-P10/BR11663 (132A3)-29-8	F4	119	17	15
2	BR13984	WANXIAN-P10/BR11000-5R-2	F4	82	22	14
3	BR13985	TP26717/BR11000-5R-31	F4	124	17	17
4	BR13986	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	F4	145	25	23
5	BR13987	HR(Path)-10/IR16L1172	F4	69	16	16
6	BR13988	BRRI dhan89/BR11000-5R-2	F4	119	6	6
7	BR13989	BR9943-40-3-2/BR11000-5R-2	F4	110	13	13
8	BR13990	BR9943-24-3-3/BR8899-17-1-1-1-1-1	F4	57	17	17
9	BR13991	BR9943-24-3-3/BR11000-5R-31	F4	32	2	2
10	BR13992	BR9651-15-2-1-3/TP26717	F4	145	5	4
11	BR13995	BR8910-B-6-3-CS1-5-CS2-P3-1-1/IR96925-B-B-B-B-61	F4	116	14	11
12	BR13996	BR8899-17-1-1-1-1-1/ IR96925-B-B-B-B-61	F4	71	6	5
13	BR13997	BR8899-17-1-1-1-1-1/BR11000-5R-31	F4	105	10	8
14	BR13998	BR8631-12-3-5-P2/BR9943-40-3-2	F4	66	2	2
15	BR13999	BR8631-12-3-5-P2/BR7812-19-1-6-1-P2	F4	122	8	7
16	BR14000	BR7812-19-1-6-1-P2/IR96925-B-B-B-B-61	F4	124	3	1
17	BR14001	BR7812-19-1-6-1-P2/BR8910-B-6-3-CS1-5-CS2-P3-1-1	F4	97	9	9
18	BR14002	BR7812-19-1-6-1-P2/BR11000-5R-31	F4	101	0	0
19	BR14003	BR7812-19-1-6-1-P2/BR11000-5R-2	F4	87	2	2
20	BR14005	BR11001-5R-37/BR8899-17-1-1-1-1-1	F4	103	10	1
21	BR14006	BR8631-12-3-5-P2/HR(Path)-10	F4	103	4	4
22	BR14007	BRRI dhan88/IR16L1484	F4	47	4	2
23	BR13712	BRRI dhan81/BR10707-5R-98	F5	173	26	26
24	BR13713	IR16A2287/IR15A3768	F5	145	6	6
25	BR13714	IR90688-125-1-1-1-1/WANXIAN-7777-P10	F5	86	15	8
	Total			**2548**	**259**	**219**

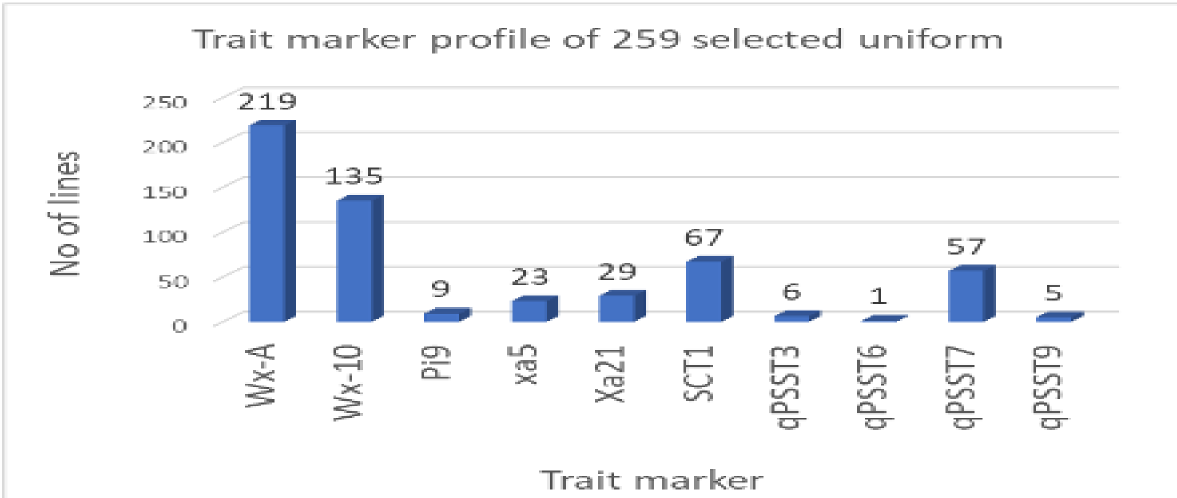


Fig 8.1. Trait marker profile of 259 uniform breeding lines selected from LST trial during Boro 2022-23

Table 8.4b. List of genetically superior lines identified from 2548 LST tested during Boro 2022-23

Gene combination	Traits	No. of lines
Pi9	Blast	9
Pi9+SCT1	Blast+ Seedling stage cold tolerance	7
Pi9+Xa21+SCT1	Blast+BLB+Seedling stage cold tolerance	1
SCT1+Xa21	BLB+Seedling stage cold tolerance	13
SCT1+qPSST3	Seedling and reproductive stage cold tolerance	1
xa5+Xa21+qPSST3	BLB+Reproductive stage cold tolerance	3
Total		34

Experiment 8.5: Observational Yield Trial (OYT)

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, M Istiak Hossain Joy, KM Iftekharuddaula (Gazipur), Anisar Rahman (Rangpur), MR Hassan (Rangpur), M A Syed (Habiganj), AKM Shalahuddin (Cumilla)

Specific objective: Selection of superior lines with desired agronomic characters.

Materials and Methods: A total of 668 genotypes were evaluated at four locations (Gazipur, Habiganj, Cumilla, and Rangpur) following sparse model of genomic selection (**Fig. 8.2**). A total of 368 genotypes, in which around 40% of the total genotypes were tested at each of four sites as training population. In this trial, BRRI dhan28, BRRI dhan89, BRRI dhan92 and BRRI dhan96 were used as standard check varieties. Forty-day-old seedlings of each entry were transplanted in 5.4 m × 5 rows plot using single seedling at a spacing of 20 × 20 cm. Fertilizer doses and application method were the same as in Experiment 8.1. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Green leaf tissues from all 694 breeding lines including the check varieties were collected in labeled glassine bags at 4-5 weeks after transplanting and stored immediately on ice. The samples were stored in a -80^{0}C freezer until processing for genotyping. Genotyping with genome-wide 1024 SNP markers including 92 trait-specific markers named as 1k-RiCA panel (Arbelaez *et al.* 2019) was performed at an outsourcing genotyping service provider with the help of IRRI Genotyping Services Laboratory. The genotyping data of 1k-RiCA SNPs were filtered using TASSEL v5.0 (Bradbury *et al.* 2007) following the criteria that the individuals with more than 15% of heterozygous loci were removed, markers with more than 15% of missing values and minor allele frequency below 0.05 were removed. After filtering, 889 markers were retained for doing downstream analysis.

For genomic prediction of yield performance of the untested breeding lines was performed using the rrBLUP model. Individual GEBVs were then obtained using estimated marker effects on yield of the breeding lines in training population. The GS accuracy was estimated as the correlation coefficient of the GEBVs and the adjusted phenotypic values for all accessions.

Results and discussion: In the trial, 694 breeding lines showed a wide range of variation in growth duration starting from 137 days to 154 days with 5.2 –5.5 t/ha yield over the locations. However, the training population consisting of 368 breeding lines (a subset of 694) that were tested at four locations, showed variable yield performance. Among all, 368 the lines tested at Cumilla had a range of yield between 2.6-8.2 t/ha with growth duration of 143-162 days, 368 breeding lines yielded 4/0-8.0 – 8.2 t/ha with 139 – 158 days growth duration at Gazipur, 368 breeding lines yielded 3.5-8.6 t/ha at Habiganj and 368 breeding lines tested at Rangpur yielded 4.2-8.7 t/ha with 147 -165 days growth duration. The trial heritability ranged from 43% to 55% across the four locations. This might be due to inconsistent performance of the breeding lines at different trial sites. Based on the predicted yield of all 694 lines at all four sites 47 lines at each site were selected for further trial (**Table 8.6**). The genomic prediction accuracy (r2) ranged from 0.572 to 0.712 (**Fig. 8.3**) across four sites.

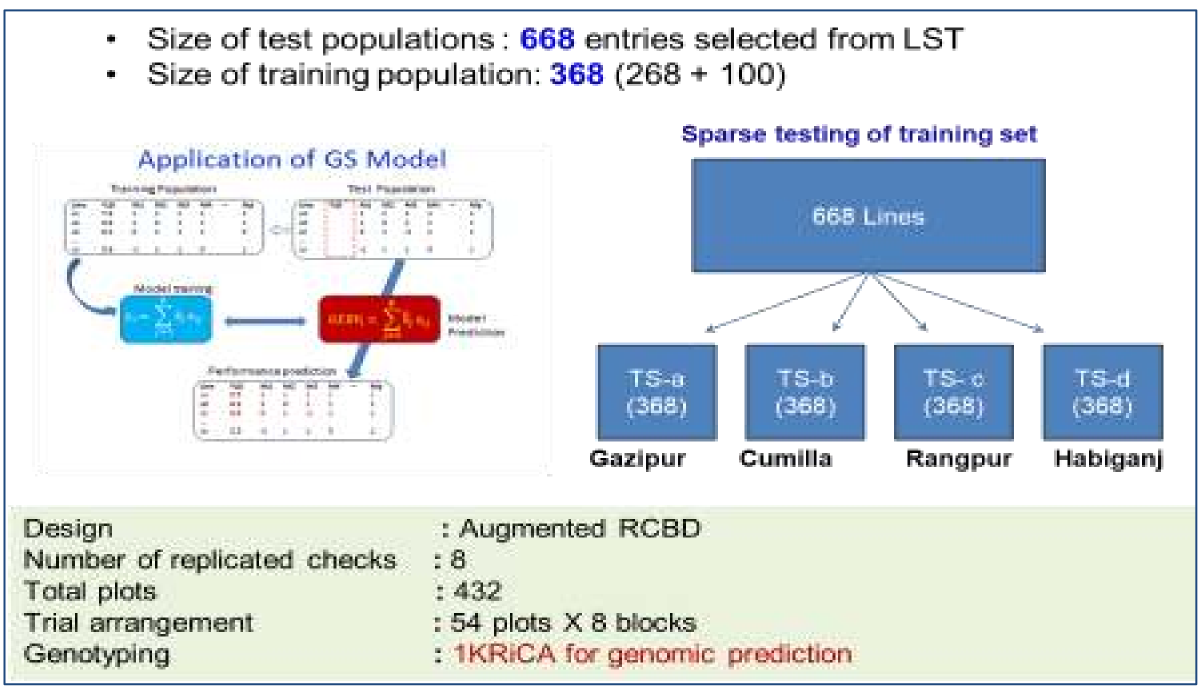


Fig 8.2 Sparse testing 668 breeding lines at four locations during Boro 2022-23 for genomic selection

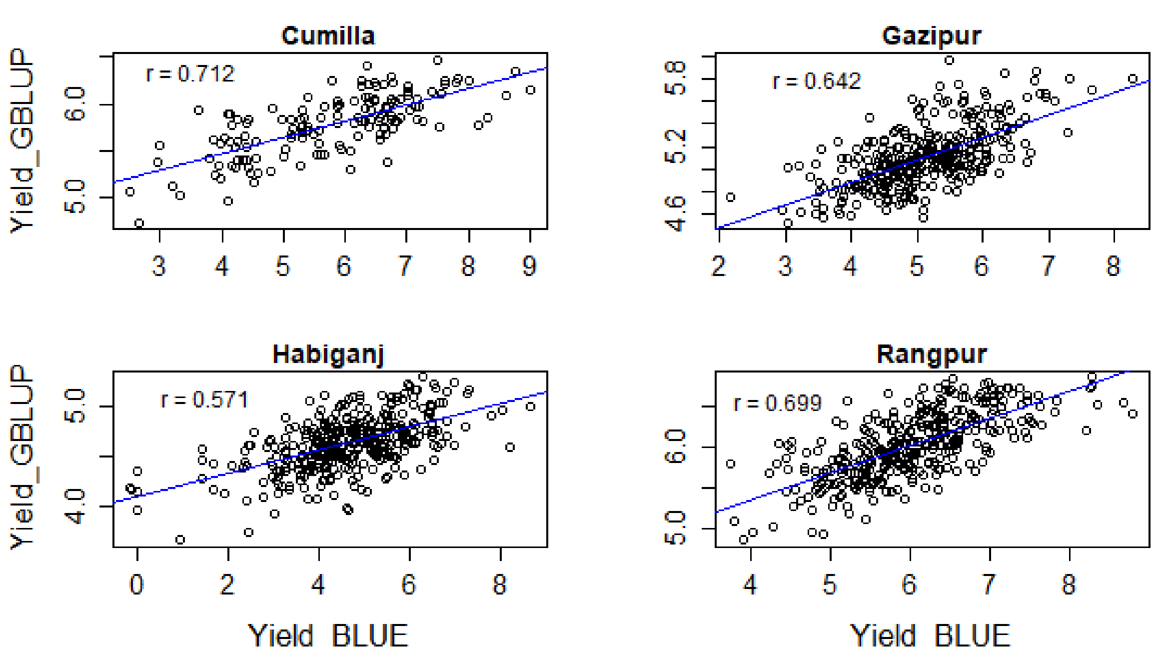


Fig.8.3 Accuracy of genomic prediction in the OYT conducted at four locations during Boro 2022-23

Table 8.6. Yield performance of 39 selected breeding lines from 694 breeding lines in OYT at four locations following sparse testing model of genomic selection during Boro 2022-23

Sl	Designation	GD (days)	PH (cm)	Yield (t/ha)					
				Gaz	Hab	Ran	Cum	Ave	GBLUP
1	BR13134-5R-27	140	101.55	5.00	8.67	5.48	6.48	6.30	5.47
2	BR13136-5R-164	144	104.62	NA	7.24	NA	NA	7.94	5.48
3	BR13136-5R-166	142	112.05	NA	NA	7.85	NA	7.24	5.48
4	BR13137-5R-107	143	117.80	6.00	6.45	7.04	NA	6.54	5.56
5	BR13137-5R-129	149	124.80	NA	NA	7.82	NA	7.21	5.41
6	BR13138-5R-134	147	100.54	4.00	3.92	7.62	6.74	5.65	5.43
7	BR13138-5R-141	145	99.81	6.00	8.06	7.39	NA	7.40	5.49
8	BR13140-5R-113	145	111.27	NA	NA	NA	7.6	7.21	5.47
9	BR13140-5R-157	146	101.22	6.00	4.80	8.26	5.34	6.10	5.46
10	BR13140-5R-21	147	97.94	4.00	5.37	8.27	NA	6.07	5.45
11	BR13140-5R-61	147	96.42	7.00	NA	NA	NA	7.03	5.50
12	BR13141-5R-103	138	108.86	NA	6.17	6.70	NA	6.48	5.55
13	BR13141-5R-149	144	110.89	NA	NA	7.04	NA	6.43	5.55
14	BR13141-5R-22	137	106.91	7.00	6.96	6.95	6.31	6.77	5.56
15	BR13141-5R-91	145	108.29	NA	5.97	7.61	NA	6.84	5.57
16	BR13142-5R-51	139	125.63	NA	NA	NA	6.37	5.98	5.47
17	BR13142-5R-54	145	111.29	NA	6.73	NA	NA	7.44	5.52
18	BR13142-5R-63	144	107.22	NA	6.50	NA	NA	7.20	5.47
19	BR13142-5R-81	139	82.88	NA	6.62	NA	NA	7.32	5.39
20	BR13144-5R-137	146	114.08	NA	NA	8.68	NA	8.07	5.44
21	BR13149-5R-87	137	109.37	5.00	4.62	7.52	5.86	5.80	5.45
22	BR13153-5R-136	138	94.42	NA	NA	NA	7.51	7.11	5.46
23	BR13153-5R-63	148	107.94	5.00	4.83	7.65	4.54	5.61	5.42
24	BR13153-5R-86	144	98.67	7.00	7.27	8.29	NA	7.68	5.55
25	BR13153-5R-91	139	110.05	7.00	4.37	7.53	6.89	6.36	5.50
26	BR13154-5R-118	146	111.63	5.00	5.85	8.79	NA	6.69	5.42
27	BR13154-5R-127	150	101.96	5.00	7.81	6.29	NA	6.52	5.39
28	BR13155-5R-110	141	102.83	7.00	3.91	4.24	7.25	5.67	5.39
29	BR13155-5R-233	144	125.67	NA	NA	NA	8.29	7.90	5.39
30	BR13409-5R-26	140	114.77	8.00	6.54	8.21	3.19	6.55	5.43
31	BR13409-5R-41	140	102.43	7.65	3.73	5.10	2.67	4.79	5.35
32	BR13414-5R-6	148	110.50	4.42	NA	NA	NA	4.72	5.27
33	BR13417-5R-26	138	108.21	4.67	8.19	5.71	NA	6.32	5.39
34	BR13418-5R-103	137	88.22	NA	6.48	NA	NA	7.18	5.47
35	BR13418-5R-18	149	102.53	7.33	3.53	5.61	NA	5.62	5.44
36	BR13418-5R-51	137	83.25	6.12	4.18	5.48	NA	5.39	5.38
37	BR13428-5R-25	147	97.24	NA	NA	8.34	NA	7.73	5.42
38	BR13431-5R-168	144	98.94	4.68	4.57	6.35	NA	5.33	5.35
39	BR13431-5R-194	139	105.82	NA	5.25	NA	NA	5.96	5.38
	BRRI dhan28	140	97.38	5.48	5.52	5.97	4.73	5.79	5.43
	BRRI dhan67	145	108.22	6.00	5.19	6.32	7.17	6.05	5.49
	BRRI dhan89	152	102.90	5.00	4.46	6.93	7.96	6.17	5.45
	BRRI dhan92	154	106.43	4.00	4.83	6.65	4.9	5.19	5.41
	Range (N=694)	137-154	82.88-125.67	4.00-8.00	3.53-8.67	4.24-8.79	2.67-8.29	4.72-8.07	5.27-5.57
	LSD (0.05)	12.14	13.27	1.96	3.82	1.36	3.36	1.60	
	H2b	0.80	0.65	0.54	0.45	0.47	0.42	0.36	

D/S:18.12.2022(Gazipur);13.12.2022(Habiganj);06.12.2022(Rangpur);28.12.2022(Cumilla)
D/T:24.01.2023(Gazipur);14.01.2023(Habiganj);29.01.2023(Rangpur);06.02.2023(Cumilla)

Experiment 8.7a: Advanced Yield trial (AYT Early)

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, M Istiak Hossain Joy, KM Iftekharuddaula (Gazipur), MA Rahman (Rangpur), MR Hassan (Rangpur), M A Syed (Habiganj), AKM Shalahuddin (Cumilla)

Specific objective: Initial evaluation for yield potential in replicated trial.

Materials and Method: A total of 15 genotypes were evaluated at four locations (Gazipur, Habiganj, Cumilla and Rangpur) along with standard check varieties BRRI dhan28, BRRI dhan81and BRRI dhan96, respectively. Thirty-five-day-old seedlings of each genotype were transplanted in a 5.4 m×6 rows plot using 2/3 seedling/hill at a spacing of 20 cm × 20 cm in two replications. Fertilizer doses were the same as in experiment no. 8.1. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Results and discussion: The trial heritability for yield ranged from 13% to 70% across the four locations but it was only 40% over the location. This might be due to inconsistent performance of the breeding lines at different trial sites (**Table 8.7a**). The check varieties BRRI dhan28 and BRRI dhan96 yielded 5.5 t/ha with 146 days growth duration and 5.9 t/ha with 147 days growth duration, respectively. In this trial, 3 breeding lines were selected for further evaluation as they showed 6.8 -7.5 t/ha grain yield potentiality with 149- 153 days growth duration.

Table 8.7a. Yield performance of the selected breeding lines from 15 breeding lines tested in AYT-E during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Gazipur	Habiganj	Rangpur	Mean
BR12574-5R-168	149 (146-153)	117	8.58	6.12	6.98	7.23
BR12574-5R-52	150 (147-155)	114	7.39	5.99	7.05	6.81
BR12520-5R-67	153 (147-158)	94	9.32	7.36	5.94	7.54
BRRI dhan28 (Ck)	146 (145-148)	101	6.55	4.63	5.37	5.51
BRRI dhan81(Ck)	149 (146-153)	91	4.57	3.55	5.53	4.55
BRRI dhan96(Ck)	147 (144-153)	87	6.20	5.85	5.86	5.97
Range (N=15)	149-153	94-127	7.39-9.32	5.99-7.36	5.94-7.05	6.81-7.54
LSD (0.05)	6.35	8.50	2.53	1.42	0.88	1.26
H2B	62.0	90.22	13.49	69.88	48.27	40.7

D/S: 28.11.2022(Gazipur); 21.11.2022 (Habiganj); 27.11.2022 (Rangpur)
D/T: 04.01.2023(Gazipur);29.12.2022 (Habiganj); 20.01.2023 (Rangpur)

Experiment 8.7b: Advanced Yield trial (AYT ML)

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, M Istiak Hossain Joy, KM Iftekharuddaula (Gazipur), MA Rahman (Rangpur), MR Hassan (Rangpur), M A Syed (Habiganj), AKM Shalahuddin (Cumilla)

Specific objective: Initial evaluation for yield potential in replicated trial.

Materials and Method: A total of 21 genotypes were evaluated at four locations (Gazipur, Habiganj, Cumilla and Rangpur) along with standard check varieties BRRI dhan81 and BRRI dhan89. Thirty-five-day-old seedlings of each genotype were transplanted in a 5.4 m×6 rows plot using 2/3 seedling/hill at a spacing of 20 cm × 20 cm in two replications. Fertilizer doses were the same as in experiment no. 8.1. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Results and discussion: The trial heritability for yield ranged from 10% to 59% across the four locations but it was only 31% over the location. This might be due to inconsistent performance of the breeding lines at different trial sites (**Table 8.7b**). The check varieties BRRI dhan81, BRRI dhan89, BRRI dhan92 and BRRI dhan96 yielded 4.5 t/ha with 149 days growth duration, 5.7 t/ha with 160 days growth duration, 6.4 t/ha with 161 days growth duration and 6.5 t/ha with 148 days growth duration, respectively. In this trial, six breeding lines were selected for further evaluation as they showed 5.44 -6.76 t/ha grain yield potentiality with 153- 154 days growth duration.

Table 8.7b Yield performance of the selected breeding lines from 21 breeding lines tested in AYT-ML during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Gazipur	Habiganj	Rangpur	Across the sites
BR12508-5R-5	154 (151-161)	102	5.44	8.28	8.02	7.25
BR12517-5R-57	154 (151-160)	112	6.31	7.76	7.62	7.23
BR12514-5R-97	154 (151-158)	99	5.73	6.94	8.50	7.05
BR12520-5R-11	153 (151-156)	101	6.76	6.46	7.48	6.90
BR12423-6R-38	154 (149-160)	104	6.33	5.74	7.90	6.65
BR12514-5R-27	153 (149-159)	106	6.57	6.26	6.66	6.49
BRRI dhan81(Ck)	149 (146-154)	97	-	3.14	6.81	4.59
BRRI dhan89(Ck)	160 (156-167)	103	4.66	3.98	8.56	5.73
BRRI dhan92(Ck)	161 (156-167)	108	4.22	6.86	8.20	6.43
BRRI dhan96(Ck)	148 (146-152)	95	-	6.67	7.22	6.55
Range (N=21)	153-154	99-112	5.44-6.76	5.74-8.28	6.66-8.50	6.49-7.25
LSD (0.05)	7.17	10.85	1.63	2.38	0.96	1.83
H2B	69.13	78.97	9.39	40.78	58.74	31.11

D/S:28.11.2022(Gazipur); 21.11.2022 (Habiganj);27.11.2022(Rangpur)
D/T: 10.01.2023(Gazipur);29.12.2022 (Habiganj);20.01.2023(Rangpur)

Experiment 8.8a: Regional Yield Trial (RYT_SD)

Investigators: PS Biswas, M Anisuzzaman and KM Iftekharuddaula (Gazipur), M R A Sarker and RJ Promee (Bhanga), M R Hasan and M R S Ripon (Rangpur), B Karmakar (Sonagazi), M R Dewan and MI Uddin (Kushtia), M R Islam and AKM Shahlahuddin (Cumilla), MR Islam and M F Islam (Rajshahi), MA Syed (Habiganj), T Shaha and M A Hossain (Barishal)

Specific Objectives: Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh

Materials and Methods: A total of 9 entries including BRRI dhan28 and BRRI dhan96 as check varieties at BRRI-Gazipur, Barishal, Sonagazi, Rangpur, Kushtia, Habiganj, Rajshahi, Bhanga and Cumilla. Thirty-five-day-old seedlings of each genotype were transplanted in 5.4 m×10 rows plot using single seedling at a spacing of 20 cm × 20 cm in three replications. Fertilizer doses and application methods were the same as in Experiment 8.1. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Results and discussion: The trial heritability for yield ranged from 67% to 96% among the sites but the heritability over the site was 80% (**Table 8.8a**). The highest yield was observed at Bhanga (7.4-8.8 t/ha) followed by Rajsahi site (6.9 -8.2 t/ha) whereas the least yield was found at Rangpur (5.4 –7.3 t/ha). The check varieties, BRRI dhan28 and BRRI dhan96 yielded 5.6 t/ha and 6.2 t/ha with 143 days and 143 days' growth duration respectively. Three breeding lines BR11903-5R-56, BR11894-5R-376 and BR11900-5R-24 showing 1.1-1.5 t/ha yield advantage and growth duration similar to BRRI dhan81 was selected for further evaluation.

Table 8.8a: Yield performances of the genotypes tested in RYT-SD, Development of Favourable Boro rice during Boro 2022-23

Designation	GD (days)	PH (cm)	Yield (t/ha)									
			Cum	Gaz	Hab	Kus	Ran	Bar	Bha	Raj	Son	Av
BR11637-5R-140	145	120	**7.15**	5.77	5.77	4.84	6.39	4.54	7.41	7.21	5.90	6.18
BR11894-5R-376*	150	114	7.09	6.19	6.19	5.16	6.88	6.18	**8.83**	7.95	5.46	6.70
BR11900-5R-24*	152	100	5.96	6.31	6.31	5.56	**7.33**	**6.55**	8.60	**8.17**	6.04	6.75
BR11903-5R-56*	144	101	6.89	6.51	6.51	**6.58**	7.09	**6.55**	8.72	7.74	6.41	**7.00**
BR12180-5R-17	154	117	6.33	5.26	5.26	4.76	6.64	6.28	8.29	7.42	6.02	6.32
BR12180-5R-29	152	107	6.77	5.23	5.23	5.96	6.94	6.15	8.49	6.87	5.59	6.46
BR12208-5R-274	147	120	5.38	6.29	6.29	5.71	5.38	5.06	7.65	7.43	5.66	6.02
BR12208-5R-394	148	90	6.19	6.38	6.38	6.12	6.09	5.76	8.23	7.27	6.25	6.53
BR12208-5R-402	149	92	6.80	**6.63**	**6.63**	5.96	5.70	5.69	8.51	7.35	**6.64**	6.59
BRRI dhan28(Ck)	143	100	6.29	6.21	6.21	5.17	6.33	4.66	6.06	6.98	4.47	5.60
BRRI dhan96(Ck)	143	88	6.54	6.23	6.23	5.41	5.72	5.13	7.88	7.08	5.48	6.24
Range (N=9)	144-154	90-12	5.4-7.1	5.2-6.6	5.2-6.6	4.8-6.6	5.4-7.3	4.5-6.6	7.4-8.8	6.9-8.2	5.5-6.6	6-7
LSD (0.05)	4.4	4.33	0.422	0.53	0.24	0.61	0.25	0.38	0.68	0.22	0.72	0.63
H2b	96.7	98.22	83.38	67.3	96.8	76.6	96.2	93.9	81.34	92.02	66.6	80.5

* Selected entries

D/S:19.11.2022(Cumilla);20.11.2022(Gazipur);21.11.2022(Habiganj);26.11.2022(Rangpur);02.12.2022(Barishal);19.11.2022(Rajshahi);27.11.2022(Sonagazi)
D/T:25.12.2022(Cumilla);27.12.2022(Gazipur);04.01.2023(Habiganj);10.01.2023(Rangpur);30.12.2022(Barishal);25.12.2022(Rajshahi);13.01.2023(Sonagazi)

Experiment 8.8b: Regional Yield Trial (RYT_MD)

Investigators: PS Biswas, M Anisuzzaman and KM Iftekharuddaula (Gazipur), M R A Sarker and RJ Promee (Bhanga), M R Hasan and M R S Ripon (Rangpur), B Karmakar (Sonagazi), M R Dewan and MI Uddin (Kushtia), M R Islam and AKM Shahlahuddin (Cumilla), MR Islam and M F Islam (Rajshahi), MA Syed (Habiganj), T Shaha and M A Hossain (Barishal)

Specific Objectives: Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh.

Materials and Methods: A total of 9 entries including BRRI dhan81 and BRRI dhan89 as check varieties were grown at BRRI-Gazipur, Barishal, Sonagazi, Rangpur, Kushtia, Habiganj, Rajshahi, Bhanga and Cumilla. Thirty-five-day-old seedlings of each genotype were transplanted in 5.4 m×10 rows plot using single seedling at a spacing of 20 cm × 20 cm in three replications. Fertilizer doses and application methods were the same as in Experiment 8.1. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Results and discussion: The trial heritability for yield ranged from 26% to 98% among the sites but the heritability over the site was 73% (Table 8.8b). The highest yield was observed at Bhanga site (6.4-9.8 t/ha) followed by Bhanga (5.9-7.6 t/ha) whereas the least yield was found at Gazipur (5.5 – 6.9 t/ha). The check varieties, BRRI dhan81 and BRRI dhan89 yielded 5.6 t/ha and 7.1 t/ha with 143 days and 154 days' growth duration, respectively, over the locations. Three breeding lines IR18A1398, IR18A1907and IR18A2119 yielded almost similar to BRRI dhan89.

Table 8.8b: Yield performances of the genotypes tested in RYT-MD, Development of Favourable Boro rice during Boro 2022-23

Designation	GD (days)	PH (cm)	Yield (t/ha)										
			Cum	Gaz	Hab	Kus	Ran	Bar	Bha	Raj	Sat	Son	Ave
BR11342-5R-23	148	108	6.85	6.81	6.17	5.41	5.72	5.79	8.82	7.92	5.19	6.05	6.47
BR12177-5R-43	155	115	6.99	5.53	4.41	6.13	6.27	5.40	8.05	6.83	5.86	5.95	6.14
BR8899-14-4-1-2-2-1	146	86	5.81	6.48	7.67	6.53	5.62	5.63	8.92	7.41	6.17	6.94	6.72
IR17A1275	141	92	6.21	6.48	6.79	5.98	5.19	4.68	8.77	6.75	5.79	6.42	6.31
IR17A1694	150	91	7.43	5.95	7.07	5.57	6.26	5.66	7.94	7.35	5.15	6.93	6.53
IR17A1735	142	86	6.49	5.91	6.95	5.68	4.90	4.44	7.11	7.17	4.81	6.34	5.98
IR18A1398*	151	107	7.37	6.98	7.55	5.75	7.69	6.46	8.13	7.66	6.10	7.85	**7.16**
IR18A1907*	150	110	6.76	6.70	6.11	5.76	6.30	5.51	9.88	7.51	5.73	7.66	**6.79**
IR18A2119*	145	91	6.75	5.86	7.55	6.52	5.41	5.34	8.36	6.88	5.72	6.44	**6.48**
BRRI dhan81	143	93	5.52	5.59	6.16	5.62	4.82	5.45	6.48	6.76	5.21	4.96	5.66
BRRI dhan89	154	106	6.90	6.33	7.57	6.63	7.70	7.17	8.19	7.83	6.14	6.86	7.13
Range (N=9)	141-155	86-115	5.8-7.4	5.5-7.0	4.4-7.7	5.4-6.5	4.9-7.7	4.4-6.5	7.1-9.9	6.7-7.9	4.8-6.2	6.0-7.9	6.0-7.2
LSD (0.05)	3.7	3.97	0.56	0.46	0.25	0.41	0.29	0.24	0.53	0.23	0.78	0.46	0.60
H2b	98.0	98.4	77.23	84.2	98.2	75.1	97.9	97.3	91.5	92.3	25.5	91.4	83.9

* Selected entries

D/S:19.11.2022(Cumilla);20.11.2022(Gazipur);19.11.2022(Habiganj);25.11.2022(Rangpur);30.11.2022(Barishal);01.12.2022(Bhanga);19.11.2022(Rajshahi);24.11.2022(Sonagazi);27.11.2022(Satkhira)

D/T:25.12.2022(Cumilla);26.12.2022(Gazipur);30.12.2022(Habiganj);05.01.2023(Rangpur);30.12.2022(Barishal);09.01.2023(Bhanga);26.12.2022(Rajshahi);31.12.2022(Sonagazi);07.01.2023(Satkhira)

Experiment 8.8c: Regional Yield Trial (RYT_LD)

Investigators: PS Biswas, M Anisuzzaman and KM Iftekharuddaula (Gazipur), M R A Sarker and RJ Promee (Bhanga), M R Hasan and M R S Ripon (Rangpur), B Karmakar (Sonagazi), M R Dewan and MI Uddin (Kushtia), M R Islam and AKM Shahlahuddin (Cumilla), MR Islam and M F Islam (Rajshahi), MA Syed (Habiganj), T Shaha and M A Hossain (Barishal)

Specific Objectives: Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh

Materials and Methods: A total of five entries including BRRI dhan81, BRRIdhna89 and BRRI dhan92 as check varieties were grown at BRRI-Gazipur, Barishal, Sonagazi, Rangpur, Kushtia, Habiganj, Rajshahi, Bhanga and Cumilla. Thirty-five-day-old seedlings of each genotype were transplanted in 5.4 m×10 rows plot using single seedling at a spacing of 20 cm × 20 cm in three replications. Fertilizer doses and application methods were the same as in Experiment 8.1. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Results and discussion: The trial heritability for yield ranged from 57% to 98% among the sites but the heritability over the site was 94% (Table 8.8c). The check varieties, BRRI dhan81 yielded 5.4 t/ha with 147 days' growth duration, BRRI dhan89 yielded 7.4 t/ha with 158 days growth duration and BRRI dhan92 yielded 7.5 t/ha with 159 days growth duration. BR11318-5R-148, BR11318-5R-84 and BR11894-5R-260 yielded 7.3 t/ha, 7.9 t/ha and 7.2 t/ha over the locations.

Table 8.8c: Yield performances of the genotypes tested in RYT-LD, Development of Favourable Boro rice during Boro 2022-23

Designation	GD (days)	PH (cm)	Yield (t/ha)									
			Cum	Gaz	Hab	Kus	Ran	Bar	Bha	Raj	Son	Av
BR10301-5R-89	157	106	5.93	5.08	6.67	6.67	9.01	6.52	7.40	6.83	6.66	6.75
BR11318-5R-148*	156	102	7.19	7.00	6.93	5.76	8.77	6.50	8.56	8.38	6.94	7.34
BR11318-5R-84*	161	108	7.29	7.58	7.98	6.49	8.90	7.49	9.61	8.44	8.09	7.99
BR11660-5R-6	150	101	5.76	5.56	7.06	5.91	6.36	4.99	6.39	7.60	4.56	6.02
BR11894-5R-260*	153	105	6.17	5.22	8.86	6.66	8.52	5.60	8.20	8.13	7.46	7.20
BRRI dhan81	147	90	5.65	3.63	5.78	5.96	6.24	5.44	5.60	5.35	5.19	5.43
BRRI dhan89	158	99	7.07	5.93	8.12	6.58	8.99	6.81	8.21	8.34	6.65	7.41
BRRI dhan92	159	107	6.80	5.75	8.03	6.67	8.55	7.41	8.84	8.09	7.50	7.52
Range (N=5)	150-161	101-108	5.8-7.3	5.1-7.6	6.7-8.9	5.8-6.7	6.4-9.0	5.0-7.5	6.4-9.6	6.8-8.4	4.6-8.1	6.0-8.0
LSD (0.05)	5.2	3.2	0.40	0.54	0.26	0.46	0.38	0.25	0.50	0.22	0.35	0.67
H2b	97.9	96.1	90.8	57.3	98.26	62.0	97.7	98.1	85.0	99.03	97.8	94.01

* Selected entries

D/S:10.11.2022 D/T:18.12.2022 (Cumilla); D/S: 06.11.2022 D/T:19.12.2022(Gazipur)
D/S:10.11.2022 D/T: 21.12.2022 (Habiganj); D/S: 23.11.2022 D/T: 04.01.2023 (Rangpur)
D/S: 29.11.2022 D/T: 29.12.2022 (Barishal); D/S: 16.11.2022 D/T: 21.12.2022 (Bhanga)
D/S:11.11.2022 D/T: 14.12.2022 (Rajshahi) D/T: 07.11.2022 D/T: 15.12.2022(Sonagazi)

Experiment 8.8d: Regional Yield Trial (RYT_ELS)

Investigators: PS Biswas, M Anisuzzaman and KM Iftekharuddaula (Gazipur), M R A Sarker and RJ Promee (Bhanga), M R Hasan and M R S Ripon (Rangpur), B Karmakar (Sonagazi), M R Dewan and MI Uddin (Kushtia), M R Islam and AKM Shahlahuddin (Cumilla), MR Islam and M F Islam (Rajshahi), MA Syed (Habiganj), T Shaha and M A Hossain (Barishal)

Specific Objectives: Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh

Materials and Methods: A total of 6 entries including BRRI dhan50, BRRI dhan63 and BRRI dhan86 as check varieties were grown at BRRI-Gazipur, Barishal, Sonagazi, Rangpur, Kushtia, Habiganj, Rajshahi, Bhanga and Cumilla. Thirty-five-day-old seedlings of each genotype were transplanted in 5.4 m×10 rows plot using single seedling at a spacing of 20 cm × 20 cm in three replications. Fertilizer doses and application methods were the same as in Experiment 8.1. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Results and discussion: The trial heritability for yield ranged from 39% to 97% among the sites but the heritability over the site was 41% (Table 8.7d). BRRI dhan50, BRRI dhan63 and BRRI dhan86 yielded 5.76 t/ha, 5.59 t/ha and 5.96 t/ha with 152 days, 146 days and 144 days' growth duration, respectively, over the locations. Four breeding lines BR7528-2R-19-16-RIL-52, BR7528-2R-19-16-RIL-55, BR7528-2R-19-16-RIL-59 and BR9945-5R-21 yielded more than 0.6-0.8 t/ha yield advantage over BRRI dhan50 with similar growth duration were selected for further evaluation.

Table 8.7d: Yield performance of the selected genotypes from RYT-ELS, Development of Favourable Boro rice during Boro 2022-23

Designation	GD (days)	PH (cm)	Yield (t/ha)									
			Bar	Bha	Cum	Gaz	Hab	Kus	Raj	Sat	Ran	Son	Av
BR10604-5R-58	148	101	5.81	7.39	5.78	3.01	5.63	6.40	6.08	5.74	5.99	6.26	5.81

BR7528-2R-19-16-RIL-52*	152	103	6.57	8.51	6.92	5.81	5.28	4.47	6.55	5.83	5.51	6.63	6.21
BR7528-2R-19-16-RIL-55*	152	100	6.70	7.87	5.84	6.10	5.82	5.05	7.26	5.92	6.81	6.43	6.38
BR7528-2R-19-16-RIL-59*	151	100	6.17	7.92	6.18	6.46	5.23	5.08	6.91	5.93	7.17	6.82	6.39
IR18A2102	146	93	5.55	6.12	6.37	4.68	5.62	5.87	7.32	5.86	5.68	7.49	5.94
BR9945-5R-21*	149	102	7.18	6.96	6.14	3.08	6.31	5.73	6.69	6.84	7.01	5.48	6.34
BRRI dhan50(Ck)	152	84	5.40	7.17	5.96	4.66	4.80	5.64	6.21	5.76	6.56	4.98	5.76
BRRI dhan63(Ck)	146	85	6.48	4.83	6.22	3.86	5.17	5.63	6.25	7.18	5.30	5.52	5.59
BRRI dhan86(Ck)	144	90	5.91	8.07	6.48	3.59	5.28	5.55	6.35	6.98	5.82	6.34	5.96
Range (N=6)	146-152	93-103	5.5-7.2	4.8-8.51	5.8-6.9	3.0-6.5	5.2-6.3	4.5-6.4	6.1-7.3	5.7-6.8	5.5-7.2	5.5-7.5	5.5-6.39
LSD(0.05)	3.75	3.37	0.3	0.70	0.4	0.35	0.2	0.4	0.3	0.5	0.4	0.5	0.61
H2b	91.09	96.09	96.3	90.6	64.1	94.5	96.5	83.6	92.3	38.9	91.9	92.1	40.7

* Selected entries

D/S:19.11.2022(Cumilla);(Gazipur);21.11.2022(Habiganj);25.11.2022(Rangpur);03.12.2022(Barishal);01.12.2022(Bhanga);19.11.2022(Rajshahi);24.11.2022(Sonagazi);27.11.2022(Satkhira)
D/T:25.12.2022(Cumilla);(Gazipur);04.01.2023(Habiganj);11.01.2023(Rangpur);09.01.2023(Barishal);10.01.2023(Bhanga);26.12.2022(Rajshahi);01.01.2023(Sonagazi);08.01.2023(Satkhira)

Experiment 8.7e: Regional Yield Trial (RYT_Late Boro)

Investigators: PS Biswas, M Anisuzzaman, KM Iftekharuddaula (Gazipur) and M R Hasan, M A Rahman

Specific Objectives: Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh

Materials and Methods: Seventeen entries including BRRI dhan28, BRRI dhan98 and BINA dhan14 as check varieties under RYT_ Late Boro were grown at five locations in potato growing areas of Rangpur, Dinajpur, Nilphamari, Kurigram and Lalmonirhat districts. Twenty-five-day-old seedlings of each genotype were transplanted in 5.4 m×10 rows plot using single seedling at a spacing of 20 cm × 20 cm in three replications. Fertilizer doses and application methods were the same as in Experiment 8.1. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Results and discussion: BRRI dhan28 showed average yield of 6.3 t/ha with 106 days growth duration. In contrast, BRRI dhan98 and BINA dhan14 yielded 6.9 t/ha in 112 days and 5.8 t/ha in 104 days, respectively. BR11845-4R-62 yielded 7.6 t/ha in 110 days and BR12266-BC3-23-1 yielded 7.4 t/ha in 108 days. In this trial, BRRI dhan29-SC3-28-16-10-6-HR6 (Com)-HR1 (Gaz)-P11 (Hbj) yielded 6.7 t/ha with only 95 days growth duration. Therefore, these three lines were selected for evaluation in adaptive trial.

Table 8.7e: Yield performance of the selected genotypes from RYT (Late Boro), Development of Favourable Boro rice during Boro 2022-23

Designation	GD (days)	PH (cm)	Yield (t/ha)					
			L1	L2	L3	L4	L5	Ave
BR(Bio)9777-118-6-4	118	108	5.8	6.4	5.1	7.2	7.0	6.3
BR(Bio)9777-26-4-3	123	116	6.2	6.9	6.0	7.2	6.9	6.6
BR(Bio)9787-BC2-16-3-1 (HR-1)	117	106	6.4	6.7	6.2	5.7	7.2	6.4
BR(Bio)9787-BC2-48-4-1	119	102	6.1	5.7	5.6	6.2	6.8	6.1

BR11712-4R-218	128	100	5.7	3.9	-	4.4	-	4.6
BR11716-4R-105	125	102	6.3	5.3	-	4.7	-	5.4
BR11845-4R-62*	110	98	7.5	7.4	6.8	8.6	7.6	7.6
BR11847-4R-78	110	105	7.0	6.4	5.7	7.0	7.1	6.7
BR12098-4R-112	113	106	5.8	6.4	6.1	7.8	7.4	6.7
BR12266-BC3-23-1*	108	104	6.7	7.3	6.6	7.7	8.7	7.4
BR12266-BC3-30-14	107	105	6.0	5.9	4.8	6.9	6.7	6.1
BRRI dhan29-SC3-28-16-10 -P8	95	92	7.6	-	7.4	7.0	4.9	6.7
BRRI dhan29-SC3-28-16-10-P11	97	98	5.7	-	-	-	8.7	7.0
HHZ5-DT20-DT20-DT1	120	98	5.9	7.4	5.2	5.9	6.5	6.2
BINA dhan14(ck)	104	99	6.1	5.2	5.8	6.9	5.2	5.8
BRRI dhan28(ck)	106	106	6.7	6.9	4.9	5.8	7.3	6.3
BRRI dhan98 (ck.)	112	103	7.5	6.7	6.2	6.3	7.8	6.9
LSD (0.05)	4.19	8.89	0.57	0.79	0.96	0.94	0.84	0.77
H2b	99.5	88.8	84.8	86.1	50.9	84.2	85.2	84.8

Experiment 8.9 International Irrigated Rice Observational Nursery (IIRON)

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman and S Ghoshal

Specific Objectives: To select best breeding lines with higher breeding value and good agronomic characters.

Materials and Methods: A total of 40 IRRI lines/varieties of IRRI along with standard check varieties BRRI dhan28, BRRI dhan35, BRRI dhan74 and BRRI dhan 101 were evaluated. Thirty-five-day-old seedlings of each entry were transplanted in 5.4 m × 4 rows plot using single seedling at a spacing of 20×20 cm in two replications. Fertilizer doses and method of application were the same as in Experiment 8.1. Data on PAcp (vegetative and maturity) plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Results and discussion: The entries showed a wide yield range of grain yield from 6.7 to 7.3 t/ha with growth duration of 143-146 days whereas the check varieties, BRRI dhan28, BRRI dhan35, BRRI dhan74 and BRRI dhan101 yielded 6.2 t/ha, 5.7 t/ha, 6.5 t/ha and 6.1 t/ha with growth duration of 145 days, 152 days, 146days and 155 days, respectively. Considering yield advantage and growth duration 6 lines were selected for further evaluation (**Table 8.9**).

Table 8.9: Agronomic performances of best performing materials (Top 6) from IIRON during Boro 2022-23

Sl.	Designation	Plant height (cm)	Growth duration (days)	Yield (t/ha)
1	SV_0434	86	145	7.1
2	SV_0456	92.4	145	7.0
3	SV_0436	96.2	145	6.7
4	SV_0438	87.8	146	7.3
5	SV_0206	90.4	146	6.9
6	SV_0444	103.8	143	7.0
7	BRRI dhan28 (Ck)	92.2	145	6.2
8	BRRI dhan35 (Ck)	84.2	152	5,7
9	BRRI dhan74 (Ck)	89	146	6.5
10	BRRI dhan101 (Ck)	84.4	155	6.1
	LSD<0.05	8.1	3.4	1.20

D/S: 08-12-2022, D/T: 14-01-2023 (Gazipur)

PROJECT 9: DEVELOPMENT OF COLD TOLERANT RICE (CTR)

General objective: Development of high yielding rice varieties tolerant to cold stress at seedling and reproductive stage

Project Leader: P S Biswas

Experiment 9.1: Parental purification and use in hybridization

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman and S Sarker

Specific objectives: To create variations for the development of new genotypes with cold tolerance at reproductive and seedling stage with acceptable grain quality.

Materials and Methods: Thirty-two varieties/lines (Table 9.1a) were grown in the hybridization block of Plant Breeding Division, Gazipur at three staggers with an interval of seven days to synchronize flowering among male and female parents. Thirty-five-day old seedling was transplanted in 1.6 m triple-row plots at 25 cm × 20 cm spacing. Fertilizer management was done at the rate of 260:100:120:110:11 kg Urea, TSP, MP, Gypsum and ZnSO4/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of TSP, MP, Gypsum and ZnSO4 were applied at final land preparation. Leaf sample was collected from all 24 plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique profiles of each parent were used to make crosses following the pre-designed and selected high value cross combinations. At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glassine paper bag. Pollination was performed with just anthesized panicles of the male parent by dusting pollens on the emasculated panicle of the female parent.

Results and discussion: A total of 2400 plants samples of 32 parents were genotyped with 10 QC SNPs. The plants with unique profile for all 10 SNPs were declared as true plants of that parent. The true plants were used making crosses. A total of 21 single crosses and 14 backcrosses were made (Table 9.1b). Mature F1 seeds were harvested, sun dried and stored separately in paper bags with proper labeling.

Table 9.1a. List of crosses made for the development of cold tolerant rice during Boro 2022-23

Sl	Designation	Characters/gene (s) of inheritence
1	IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
2	Rata Boro	*Wx(a), chalk5*
3	TP16199	*Wx(a), qPSST3, qPSST7, qPSST9*
4	Bhutan	*Wx(a), Wx-10, SCT1, TSV1*
5	BR10317-5R-25	*Wx(a), Wx-10, chalk5*
6	BR11303-5R-156	*Wx(a), Pb1, Wx-10, chalk5*
7	BR11318-5R-106	*Wx(a), Wx-10, chalk5*
8	BR11636-5R-194	*Wx(a), Wx-b, SCT1*
9	BR11660-5R-254	*Wx(a), Wx-b, Wx-10, Pi-ta,*
10	BR11712-4R-218	*Dense panicle, strong plant, lodg. tolerant*
11	BR11712-4R-227	*Wx(a), Wx-10*
12	BR11887-5R-368	*Wx(a), Wx-b, SCT1, Pi-ta*
13	BR11894-5R-77	*Wx(a), Wx-b, SCT1, Pi-ta*
14	BR11894-R-R-R-R-110	*Wx(a), TSV1*
15	BR11894-R-R-R-R-169	*Wx(a), Wx.10, Ctb*
16	BR11894-R-R-R-R-270	*Wx(a), Wx-10, TSV1*
17	BR11894-R-R-R-R-329	*Vegetative stage cold tolerance*

18	BR12416-6R-219	*Wx(a),Wx.10, Pb1, Pita, Pi9,xa5, xa13, Xa21*
19	BR12419-6R-102	*Wx(a),Wx.10*
20	BR12512-5R-78	*Wx(a),Wx.10, SCT1*
21	BR12520-5R-67	*Wx(a),Wx.10,SCT1,BPH32,Pb1,xa13*
22	BR12524-5R-56	*Wx(a),Wx.10, SCT1,Pb1,BPH32,Pita*
23	BR12527-5R-1	*Wx(a),Wx.10, SCT1*
24	BR12557-5R-105	*Wx(a),Wx.10,Pi9*
25	BR12567-5R-91	*Wx(a),Wx.10, SCT1,Cold1.jap,Pb1*
26	BRRI dhan 74	*Wx(a), BPH17, HZn*
27	BRRI dhan 97	*Wx(a), Wx-10,*
28	BRRI dhan 98	*Wx(a), Wx-10,*
29	BRRI dhan67	*Wx(a)*
30	BRRI dhan81	*Xa21, Wx(a), SCT1, Pi33*
31	BRRI dhan84	*Wx(a)*
32	IR18A1398	*Wx(a),Wx.10*

Table 9.1b. List of crosses made for forward breeding and line augmentation under Development of Cold Tolerant Rice during Boro 2022-23.

SL	Cross Combinations	Objectives/Gene of inheritance	No of seed
Forward breeding (F1)			
1	BR12419-6R-102/BR11894-R-R-R-R-329	*Wx(a), Wx.10, SCT1*	7
2	BR12512-5R-78/BR12567-5R-91	*Wx(a),Wx.10, SCT1,Cold1.jap,Pb1*	10
3	BR12512-5R-78/TP16199	*Wx(a),Wx.10,SCT1,PSST3,PSST7,PSST9SCT1*	78
4	IR18A1398/TP16199	*Wx(a),Wx.10,QPSST3,QPSST7,QPSST9*	46
5	IR18A1398/BR11894-R-R-R-R-169	*Wx(a), Wx.10, Ctb*	8
6	BR12520-5R-67/TP16199	*Wx(a),Wx.10,QPSST3,QPSST7, QPSST9, SCT1,BPH32,Pb1,xa13*	18
7	BR12520-5R-67/BR11894-R-R-R-R-169	*Wx(a), Wx.10, Ctb,SCT1, BPH32, Pb1,xa13*	11
8	BR12527-5R-1/BR11894-R-R-R-R-169	*Wx(a), Wx.10, Ctb,SCT1,BPH32,Pb1 ,xa13, SCT1*	45
9	BR12557-5R-105/BR12567-5R-91	*Wx(a),Wx.10, SCT1,Cold1.jap,Pb1, Pi9*	20
10	BR12557-5R-105/TP16199	*Wx(a), QPSST3, QPSST7, QPSST9,Pi9*	10
11	BR12416-6R-219/BR12567-5R-91	*Wx(a),Wx.10, SCT1,Cold1.jap,Pb1,Pita, Pi9,xa5, xa13, Xa21*	76
12	BR12416-6R-219/BR12524-5R-56	*Wx(a),Wx.10,SCT1,Pb1,BPH32,Pita,Pita, Pi9,xa5, xa13, Xa21*	32
13	BR11894-R-R-R-R-270/Rata Boro	*Wx(a),Wx.10. chalk5, TSV1*	19
14	BR11660-5R-254/Rata Boro	*Wx(a),Wx-b, Wx-10, Pi-ta, chalk5*	18
15	BRRI dhan81/Bhutan	*Wx(a),Wx-10,SCT1,TSV1,Xa21,SCT1, Pi33*	8
16	BR11303-5R-156/Rata Boro	*Wx(a), Pb1, Wx-10, chalk5*	30
17	BR12419-6R-102/IR83222-F11-173	*Wx(a),Wx.10,QPSST3, QPSST7, QPSST9*	7
18	BR11712-4R-218/IR83222-F11-173	*QPSST3, QPSST7, QPSST9*	60
19	BR11894-5R-77/TP16199	*Wx(a),QPSST3,QPSST7,QPSST9,SCT1,Pi-ta*	50
20	BR11894-R-R-R-R-270/TP16199	*Wx(a), QPSST3, QPSST7, QPSST9, TSV1*	16
21	BR11318-5R-106/BR11318-5R-106/IR83222-F11-173	*Wx(a), Wx-10, chalk5*	54
Line Augmentation/pre-breeding (BC_2F_1)			
22	BR11894-5R-77*3/IR83222-F11-173	*Wx(a),Wx-b,SCT1,Pi-ta,qPSST3,qPSST7, qPSST9*	50
23	BR11636-5R-194*3/TP16199	*Wx(a), Wx-b, SCT1, Ctb*	11
24	BRRI dhan 74*3/Bhutan	*Wx(a), bph17, Ctb*	49

25	BRRI dhan84*3/Bhutan	*Wx(a), Ctb*	33
26	BRRI dhan 97*3/Bhutan	*Ctb*	33
27	BRRI dhan 98*3/Bhutan	*Ctb*	45
28	BR11712-4R-227*3/Rata Boro	*Ctb*	20
29	BR10317-5R-25*3/Rata Boro	*Wx(a),Wx-10,chalk5,qPSST3,qPSST7, qPSST9*	268
30	BR11636-5R-194*2/IR83222-F11-173	*Wx(a),Wx-b,SCT1,,qPSST3,qPSST7, qPSST9*	62
31	BR11660-5R-254*2/IR83222-F11-173	*Wx(a), Wx-b, Wx-10, Pi-ta, qPSST3, qPSST7, qPSST9*	150
32	BR11887-5R-368*2/IR83222-F11-173	*Wx(a), Wx-b, SCT1, Pi-ta, , qPSST3, qPSST7, qPSST9*	291
33	BR11894-R-R-R-R-110*2/IR83222-F11-173	*Wx(a), TSV1, , qPSST3, qPSST7, qPSST9*	89
34	BR11894-R-R-R-R-270*2/IR83222-F11-173	*Wx(a), Wx-10, TSV1, qPSST3, qPSST7, qPSST9*	13
35	BRRI dhan67*2/Bhutan	*Wx(a), Ctb*	14

Experiment 9.2: Hybridity test and confirmation of true F1

Principal investigator: P S Biswas

Co-Investigator: M Anisuzzaman and S Sarker

Specific objectives: To confirm the cross as true F1s and use of the selected F1s to produce F2 seeds and use in making different types of crosses

Materials and Methods: Twenty-nine crosses were grown along with their parents in the crossing blocks using single seedling/hill at 25 cm × 20 cm spacing in 8-hill single row plots. Fertilizer management was done following the protocol described in Experiment 9.1. Leaf samples were collected from each of the plants from F1 and parents for QC genotyping to determine true F1. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack.

Results and discussion: The crosses showing at least two heterozygous SNP loci in any sample F_1 plant were considered as true F_1. The analysis of genotyping data identified 2-5 true F_1 plants from 30 crosses out of 39 crosses. At maturity, seeds were collected only from true F_1 plants. **Table 9.2** shows the list of confirmed crosses and genes segregating in them. At maturity, seeds were collected only from true F1 plants. The parents of these confirmed crosses were also investigated for gene of inheritance. Seeds of these selected F1 plants were selfed to produce F2 seeds. At maturity, F2 seeds of all selected plants were harvested individually, dried, cleaned and preserved in cold room.

Table 9.2. List of crosses confirmed for the development cold tolerant rice during Boro 2022-23

SL	BR No.	Parentage	Objectives/segregated genes
1	BR15121	BR11723-4R-172/BR11894-R-R-R-R-169	*Gn1a, qPSST3, qPSST7, qPSST9*
2	BR14664	BR11318-5R-106/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
3	BR15089	BR11318-5R-106/BR11607-4R-72	*xa5, xa13, Xa21*
4	BR15122	BR11315-5R-17/IR20X1002:IRRI154-Pi9+Hd9 (N22)	*Pi9, xa5, TSB1*
5	BR15124	BR11640-5R-86/IR20X1002:IRRI154-Pi9+Hd9 (N22)	*Pi9, xa5, TSB1*
6	BR15125	BR10604-5R-58/IR20X1002:IRRI154-Pi9+Hd9 (N22)	*Pi9, xa5, TSB1*
7	BR15113	BR11315-5R-17/BR11607-4R-72	*xa5, xa13, Xa21*

8	BR15114	BR9945-5R-21/BR11607-4R-72	*xa5, xa13, Xa21*
9	BR15116	BR10604-5R-58/BR11607-4R-72	*xa5, xa13, Xa21*
10	BR15126	BR11636-5R-194/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
11	BR15128	BR11887-5R-368/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
12	BR15129	BR11894-R-R-R-R-110/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
13	BR15130	BR11894-R-R-R-R-270/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
14	BR15131	BR11894-R-R-R-R-299/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
15	BR15132	BRRI dhan100/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
16	BR15133	BRRI dhan67/Bhutan	*qPSST3, qPSST7, qPSST9*
17	BR15134	BRRI dhan100/Bhutan	*qPSST3, qPSST7, qPSST9*
18	BR15186	BR10317-5R-25*2/IR20X1002:IRRI154-Pi9+Hd9 (N22)	*Pi9, xa5, TSV1, Hd1*
19	BR15187	BR11318-5R-106*2/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
20	BR15135	BR11894-5R-77*2/IR83222-F11-173	*qPSST3, qPSST7, qPSST9*
21	BR15136	BR11636-5R-194*2/TP16199	*Ctb*
22	BR15137	BR11887-5R-368*2/TP16199	*Ctb*
23	BR15138	IR83222-F11-173*2/TP16199	*Ctb*
24	BR15139	BRRI dhan 74*2/Bhutan	*qPSST3, qPSST7, qPSST9*
25	BR15140	BRRI dhan84*2/Bhutan	*qPSST3, qPSST7, qPSST9*
26	BR15141	BRRI dhan 97*2/Bhutan	*qPSST3, qPSST7, qPSST9*
27	BR15142	BRRI dhan 98*2/Bhutan	*qPSST3, qPSST7, qPSST9*
28	BR15183	BR11712-4R-227*2/Rata Boro	*qPSST3, qPSST7, qPSST9*
29	BR15184	BR10317-5R-25*2/Rata Boro	*qPSST3, qPSST7, qPSST9*
30	BR15185	BR11318-5R-106*2/Rata Boro	*qPSST3, qPSST7, qPSST9*

Experiment 9.3: Advancing segregating progenies in RGA nurseries

Principal investigator: P S Biswas

Co-Investigator: M anisuzzaman, S Sarker and KM Iftekharuddaula

Specific objectives: Rapid advancement of segregating population for shortening breeding cycle.

Materials and Methods: In total 7,656 segregating progenies comprising 6,066 F_2, 1,445 F_3 and 134 F_4 progenies were advanced in greenhouse and field RGA nursery. Sowing of seeds at both greenhouse and field RGA nurseries was staggered into seven batches to ease management. The first batch was seeded on 12 January 2022 and last batch was on 14 February 2022. Therefore, crop of the RGA populations are at different growth stages. At maturity of the crop of each stagger, a single panicle was harvested from each bunch grown from a single panicle of previous generation. Fertilizer management was done using the half doses of all fertilizers used in Experiment 9.1. At maturity, single panicle was harvested from each plant of each cross. Harvested seed was dried and was subjected to 50^0 C for breaking dormancy to initiate next cycle of RGA immediately.

Results and discussion: A total of 5,712 progenies comprising 4,314 F_3 progenies from 19 crosses, 1,269 F_4 progenies from 7 crosses, 129 F_5 progenies from 1 cross were harvested from 7,656 progenies comprising 6,066 F_2, 1445 F_3 and 145 F_4 for advancing in the next generation (**Table 9.3**).

Table 9.3. List of segregating progenies of different generations grown in the RGA nurseries during Boro 2022-23

SL	BR number	Parentage	No. of plants grown	No of plants Harvested
F_2 Generation				
1	BR14632	BR10317-5R-25/IR19X1001: IRRI 154-Cold1	540	444

2	BR14643	BR11303-5R-156/IR19X1001: IRRI 154-Cold1	540	420
3	BR14264	BR8899-14-4-1-2-2-1/IR83222-F11-173	540	51
4	BR14651	BR11318-5R-106/IR19X1001: IRRI 154-Cold1	400	360
5	BR14854	BR11894-R-R-R-169/BRRI dhan67	420	300
6	BR14859	BR11894-5R-77/IR83222-F11-173	400	360
7	BR14860	BR11636-5R-194/TP16199	324	252
8	BR14861	BR11887-5R-368/TP16199	150	78
9	BR14862	IR83222-F11-173/TP16199	160	126
10	BR14863	BRRI dhan74/Bhutan	108	81
11	BR14864	BRRI dhan84/Bhutan	108	69
12	BR14867	BRRI dhan98/Bhutan	324	252
13	BR14875	BR10317-5R-25*2/IR83222-F11-173	324	279
14	BR14876	BR11318-5R-106*2/IR83222-F11-173	324	237
15	BR14877	BR8899-14-4-1-2-2-1*2/IR83222-F11-173	540	411
16	BR14263	BR11318-5R-106/IR83222-F11-173	432	369
17	BR14623	BR11712-4R-227/Rata Boro	108	42
18	BR14624	BR10317-5R-25/Rata Boro	108	51
19	BR14627	BR11318-5R-106/Rata Boro	216	132
		Sub Total	**6066**	**4314**
F_3 Generation				
1	BR14632	BR11712-4R-227/IR19X1001: IRRI 154-Cold1	165	150
2	BR14638	BR10317-5R-25/IR19X1001: IRRI 154-Cold1	168	150
3	BR14643	BR11303-5R-156/IR19X1001: IRRI 154-Cold1	190	168
4	BR14651	BR11318-5R-106/IR19X1001: IRRI 154-Cold1	170	165
5	BR14655	BR12266-44-11-32-5-1-1-HR10-B/IR19X1001: IRRI 154-Cold1	61	60
6	BR14254	BRRI dhan88/BR8909-B-12-2-CS1-4-CS2-P2-3-2	520	405
7	BR14663	BR10317-5R-25/IR83222-F11-173	171	171
		Sub Total	**1445**	**1269**
F_4 Generation				
1	BR14264	BR8899-14-4-1-2-2-1/IR83222-F11-173	145	129
		Sub Total	**145**	**129**
		Grand Total	**7656**	**5712**

Experiment 9.4: Evaluation of breeding lines in the Observational Yield Trial under Cold stress and non-stress field condition

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman (Gazipur); MR Islam and MA Syed (Habiganj)

Specific objective: Selection of superior and cold tolerant lines under natural cold condition.

Materials and Methods: A total of 414 (OYT#1_CS) and 427 (OYT#2_NS) genotypes were evaluated at two locations (Gazipur and Habiganj) with two sowing staggers (one in the 3rd week of October and another in 3rd week of November) following Row-Column design with two replications. BRRI dhan28, BRRI dhan67 and BRRI dhan89 were used as standard check varieties. Sowing of seeds in the 3rd week of October was done to allow the booting stage of the crop to be exposed to low temperature in the end of January to first week of February. Forty-five-day-old seedlings of each entry were transplanted in 2.0 m×2 rows plot using single seedling at a spacing of 20 × 20 cm. Fertilizer doses and application method were the same as in Experiment 9.1. Leaf samples were collected from single plant of each entry for genotyping with 1k-RiCA SNP set. Data on days to flowering and maturity, plot yield, lodging and disease and insect infestation were recorded. Also, maximum and minimum temperatures were collected throughout the growth stages of the crop.

Results: The breeding lines of the October sowing batch flowered in between 24 February to 26 March 2023 at Gazipur site and 23 February to 25 March 2023 at Habiganj site (**Fig 9.5a** and **Fig 9.5b**). The average temperature at Gazipur fell down to 20^{0}C and remained static with few little exceptions until 7 February and then it gradually increased but remained below 220^{0}C until 21 February 2023. At Habiganj site, the average temperature went below 20^{0}C on 27 December 2022 and continued to remain below 20^{0}C with frequent fluctuations until 24 January 2023 and it fluctuated between 20^{0}C -25^{0}C until 28 February 2023. This temperature pattern suggested that the breeding lines with short to medium duration experienced low to moderate level of cold shock at PI to booting stage at both locations and thereby yield low compared to non-stress regular time sown trial.

In the cold stressed early sown OYT-1_CS, the breeding lines/varieties yielded 132-843 g in 0.96 sqm plot over two locations (**Table 9.5a**), while at the non-stress regular trial these lines yielded 244-889 g (**Table 9.5b**). Due to cold stress vegetative stage, growth duration of the breeding lines in the stress-trial was increased from the growth duration in non-stress trial. In the stress trial, the growth duration of the breeding lines ranged from 150-173 days, however it was 139-157 days in non-stress trial. The check varieties, BRRI dhan28, BRRI dhan67 and BRRI dhan89 yielded 433.78 g, 492.76 g and 524.43 g, respectively in the non-stress trial, while in the stress trial these varieties yielded 348.26 g, 374.42 g and 443.33 g, which indicated 15-24% yield reduction happened due to cold stress in case of the check varieties. A total 37 breeding lines form cold stress trial (**Table 9.51**) and 42 lines from non-stress trial (**Table 9.5b**) showing at least 30% yield advantage over the check varieties were selected for further evaluation in advanced trials.

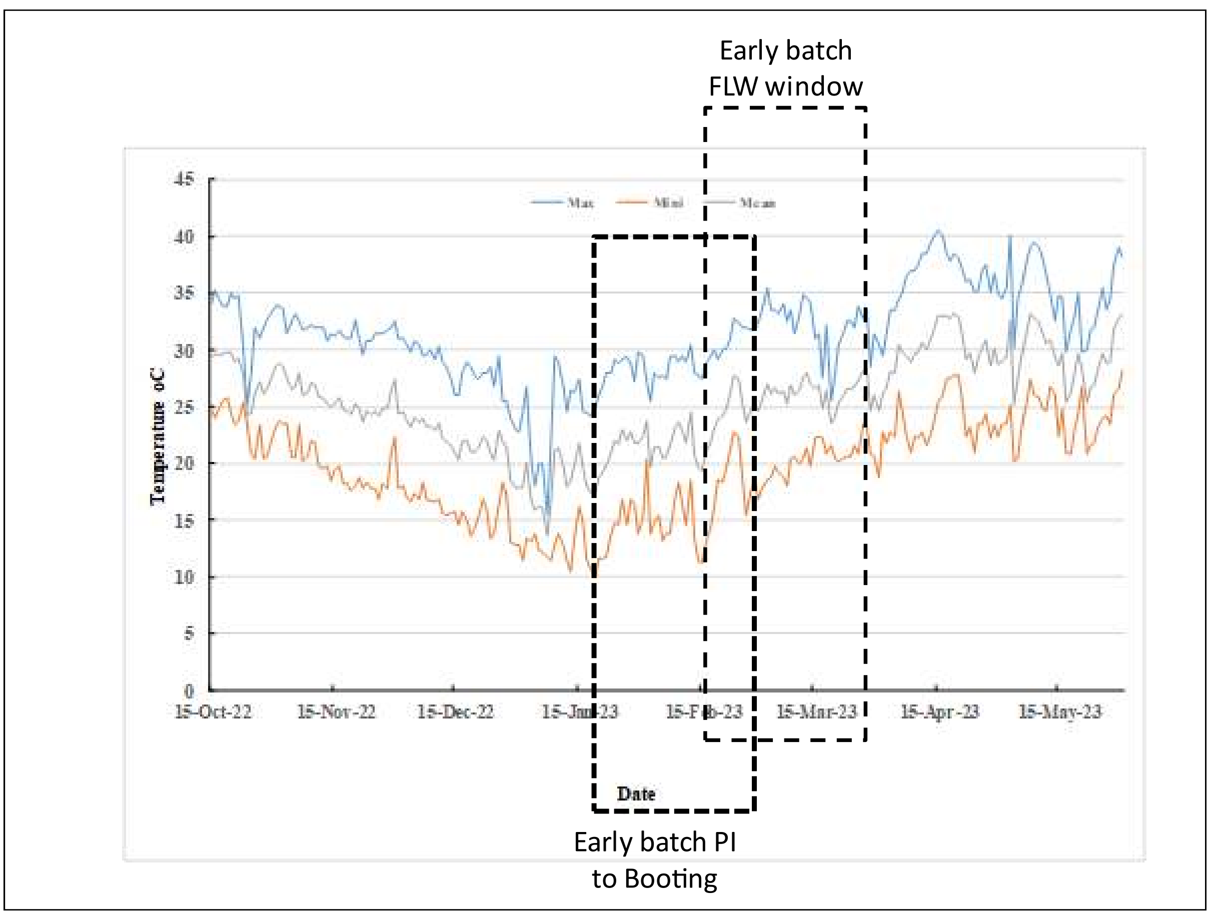


Fig. 9.5a. Maximum and minimum temperature during different growth phase of the crops in OYT -1 at Gazipur during Boro 2022-23. Dotted box represents the flowering window of the entries tested in OYT-1 under early sowing batch (OYT-1_CS).

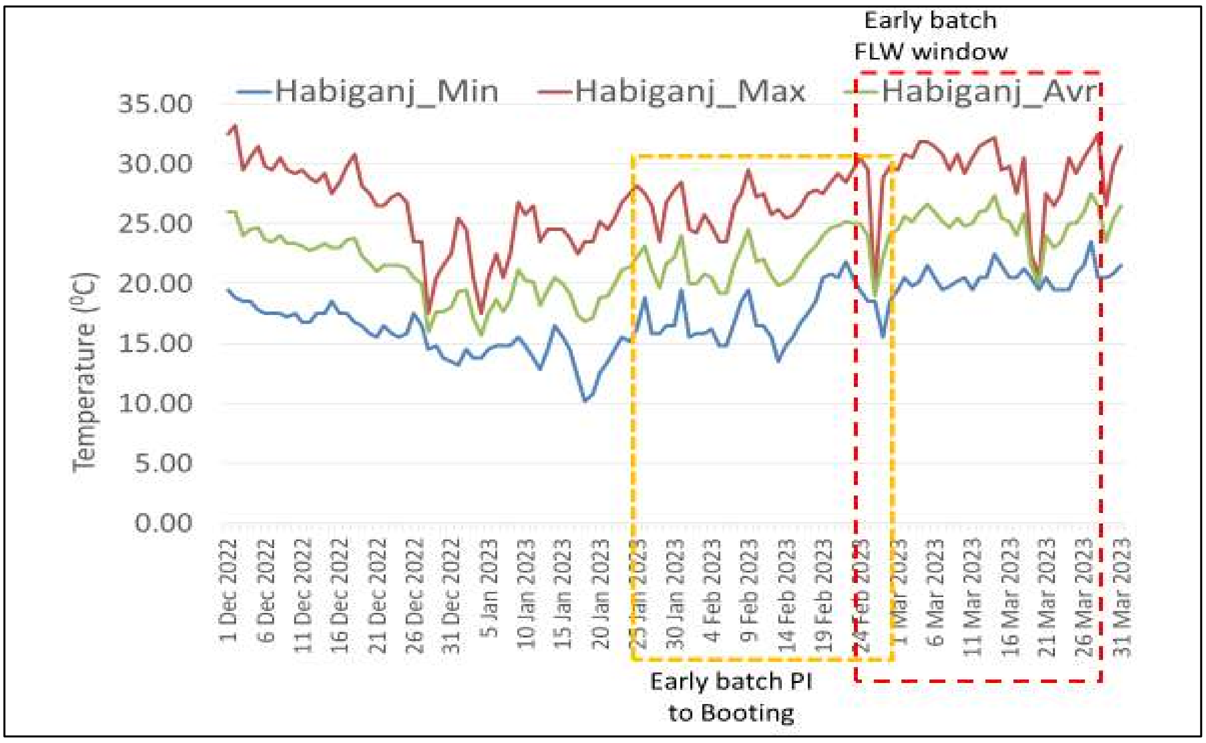


Fig. 9.5b. Maximum and minimum temperature during different growth phase of the crops in OYT -1 at Habiganj during Boro 2022-23. Dotted box represents the flowering window of the entries tested in OYT-1 under early sowing batch (OYT-1_CS).

Table 9.5a Yield performance of 37 selected breeding lines out 414 breeding lines tested under early sowing time (26 October) in OYT-1_CS at two locations during Boro 2022-23

Sl	Designation	Growth duration (days)	Plant Height (cm)	Plot Yield (g)		
				Gazipur	Habiganj	Average
1	BR13026-BC1-3R-36	162	93	794.4	892.4	843.4
2	BR13027-BC1-3R-149	163	93	744.5	774.8	759.6
3	BR13027-BC1-3R-51	161	95	621.8	665.8	643.8
4	BR13026-BC1-3R-138	162	98	701.1	-	636.1
5	BR13027-BC1-3R-11	164	96	614.8	629.1	622.0
6	BR13027-BC1-3R-40	163	90	423.8	798.1	610.9
7	BR13027-BC1-3R-139	164	93	614.3	604.9	609.6
8	BR13026-BC1-3R-209	160	98	600.8	612.9	606.8
9	BR13027-BC1-3R-108	161	93	598	575.8	586.9
10	BR13026-BC1-3R-53	165	101	555.9	610.2	583
11	BR13027-BC1-3R-119	162	98	651.4	511.8	581.6
12	BR13026-BC1-3R-3	164	109	451.1	710.8	580.9
13	BR13027-BC1-3R-198	163	96	786.4	373.6	580
14	BR13027-BC1-3R-77	158	96	562.2	588.2	575.2
15	BR13026-BC1-3R-57	164	93	565.6	580.7	573.1
16	BR13027-BC1-3R-76	159	87	555.6	584.8	570.2
17	BR13026-BC1-3R-165	163	107	473.3	665.2	569.3
18	BR13026-BC1-3R-1	163	100	588.9	527.7	558.3
19	BR13026-BC1-3R-203	161	95	589.5	516.4	552.9
20	BR13027-BC1-3R-96	156	96	612.5	644.1	628.3
21	BR13027-BC1-3R-58	157	168	552.5	643.8	598.2
22	BR13026-BC1-3R-151	156	94	519.5	672.2	595.9
23	BR13027-BC1-3R-52	157	99	496.3	676.2	586.2
24	BR13027-BC1-3R-102	157	99	564.4	502.4	533.4

25	BR13026-BC1-3R-197	158	102	663.2	399.9	531.5
26	BR13026-BC1-3R-29	156	98	611.7	417.1	514.4
27	BR13027-BC1-3R-180	155	91	565.2	404.3	484.7
28	BR13026-BC1-3R-42	158	94	556.4	398.7	477.5
29	BR13027-BC1-3R-220	158	88	421.7	532.8	477.2
30	BR13026-BC1-3R-190	156	96	387	561.5	474.2
31	BR13027-BC1-3R-24	157	97	605.8	332.2	469
32	BR13027-BC1-3R-164	158	93	600.5	335.3	467.9
33	BR13026-BC1-3R-200	157	99	556.9	372.3	464.6
34	BR13026-BC1-3R-103	157	105	557.3	358.7	458
35	BR13026-BC1-3R-41	157	89	567.6	345.5	456.6
36	BR13026-BC1-3R-188	158	91	501.9	403.6	452.7
37	BR13027-BC1-3R-18	157	86	418.6	482.2	450.4
	BRRI dhan28 (Ck)	158	96	359.9	336.62	348.26
	BRRI dhan67 (Ck)	159	105	491.47	257.37	374.42
	BRRI dhan89 (Ck)	168	102	440.34	446.33	443.33
	Range (N=414)	150-173	75-185	124-868	29-892	132-843
	LSD (0.05)	8.36	18.37	158.21	225.82	199.73
	H2b	61	13.67	32.52	41.08	33.88

Table 9.5b. Yield performance of 42 selected breeding lines out 427 breeding lines tested under regular sowing time (16 November) in OYT-1_NS at two locations during Boro 2022-23

Sl	Designation	Growth duration (days)	Plant Height (cm)	Plot Yield (g)		
				Gazipur	Habiganj	Average
1	BR13027-BC1-3R-13	142	79	1041.6	443.7	742.6
2	BR13027-BC1-3R-77	145	100	597.9	799.8	698.8
3	BR13027-BC1-3R-76	144	101	674.4	713.7	694
4	BR13027-BC1-3R-1	144	103	758.6	597.7	678.2
5	BR13027-BC1-3R-164	143	90	680	644.8	662.4
6	BR13027-BC1-3R-123	143	101	494.1	830.1	662.1
7	BR13027-BC1-3R-212	144	91	638.4	682	660.2
8	BR13027-BC1-3R-108	144	99	625.4	655.6	640.5
9	BR13027-BC1-3R-101	145	101	585.3	684.8	635
10	BR13026-BC1-3R-211	144	98	668	602	635
11	BR13026-BC1-3R-43	142	96	543.5	721.2	632.3
12	BR13027-BC1-3R-96	144	96	696.1	549.3	622.7
13	BR13026-BC1-3R-155	142	90	691.4	-	616.3
14	BR13026-BC1-3R-104	145	96	659.7	564.9	612.3
15	BR13027-BC1-3R-127	143	101	736.6	474.5	605.6
16	BR13026-BC1-3R-144	143	111	586.7	617	601.9
17	BR13027-BC1-3R-149	147	101	772.1	995.5	883.8
18	BR13026-BC1-3R-8	150	89	656.4	1012.2	834.3
19	BR13027-BC1-3R-139	146	91	664.9	970.1	817.5
20	BR13027-BC1-3R-24	145	87	739.1	841.7	790.4
21	BR13027-BC1-3R-180	145	81	768.4	721.3	744.8
22	BR13027-BC1-3R-132	149	86	654.5	792.1	723.3
23	BR13027-BC1-3R-67	145	100	603.4	828.8	716.1
24	BR13026-BC1-3R-194	146	99	720.5	703.2	711.9
25	BR13027-BC1-3R-91	146	89	660.5	758.8	709.6
26	BR13026-BC1-3R-126	146	103	779	-	703.9
27	BR13027-BC1-3R-138	146	97	623	780.6	701.8
28	BR13026-BC1-3R-92	145	93	945.6	438.5	692

29	BR13027-BC1-3R-47	149	98	647.8	735.3	691.6
30	BR13027-BC1-3R-128	149	100	675.3	703.1	689.2
31	BR13027-BC1-3R-51	145	96	649.6	719.1	684.3
32	BR13027-BC1-3R-136	147	108	570.6	792.1	681.4
33	BR13026-BC1-3R-6	145	99	632.2	718.8	675.5
34	BR13027-BC1-3R-21	147	109	636	713.7	674.9
35	BR13026-BC1-3R-101	146	94	631.6	704.6	668.1
36	BR13027-BC1-3R-71	145	96	718.8	609.2	664
37	BR13026-BC1-3R-58	145	110	872	448.2	660.1
38	BR13026-BC1-3R-10	146	95	743.4	571.6	657.5
39	BR13026-BC1-3R-27	148	98	592.1	721.6	656.9
40	BR13027-BC1-3R-121	146	102	611.5	700.3	655.9
41	BR13026-BC1-3R-159	146	96	645.9	660.2	653
42	BR13027-BC1-3R-181	152	105	568.2	734.7	651.4
	BRRI dhan28	145	110	584.87	282.68	433.78
	BRRI dhan67	150	110	669.8	315.71	492.76
	BRRI dhan89	153	111	484.05	564.8	524.43
	Range (N= 427)	139-157	79-154	288-1042	61-1012	244-889
	LSD (0.05)	4.23	27.68	197.46	228.11	244.35
	H2B	47	15.39	12.24	63.76	19.96

Experiment 9.6: Validation of QTL effect for reproductive stage cold tolerance

Principal investigator: P S Biswas

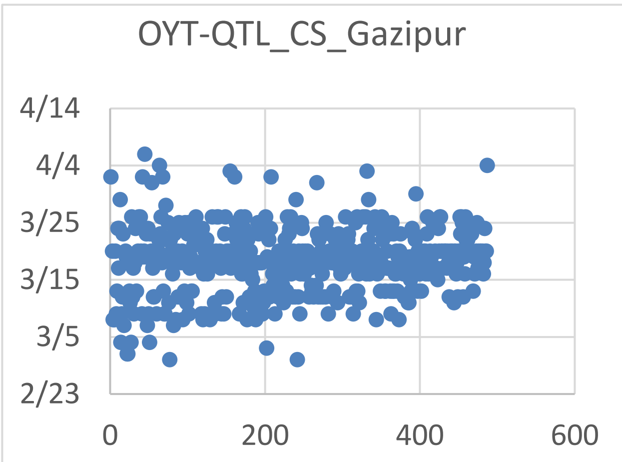
Co-Investigators: M Anisuzzaman (Gazipur); MR Islam and MA Syed (Habiganj)

Specific objective: Selection of superior and cold tolerant lines under natural cold condition.

Materials and Method: A total of 235 (OYT#QTL_CS_NS) genotypes were evaluated at Gazipur and Habiganj locations. BRRI dhan28, BRRI dhan67 and BRRI dhan89 were used as standard check varieties. Sowing of seeds in the 3rd week of October was done to allow the booting stage of the crop to be exposed to low temperature in the end of January to first week of February. Forty-five-day-old seedlings of each entry were transplanted in 2.0 m×2 rows plot using single seedling at a spacing of 20 × 20 cm. Fertilizer doses and application method were the same as in Experiment 9.1. Leaf samples were collected from single plant of each entry for genotyping with 1k-RiCA SNP set. Data on days to flowering and maturity, plot yield, lodging and disease and insect infestation were recorded. Also, maximum and minimum temperatures were collected throughout the growth stages of the crop.

Results and discussion: Majority of the breeding lines of the October sowing batch at Gazipur and Habiganj flowered in between 3 March 2023 and 25 March 2023 (**Fig. 9.6**), which indicated that vegetative stage of the crop was exposed relatively low average temperature (<20^{0}C) starting from end of December and continued till first week February (PI stage of the crop) and then the average temperature started increasing and the lines were exposed moderate level of cold stress (20^{0}C-22^{0}C) until 15 February when short duration lines were at booting stage at both locations (**Fig. 9.5a and Fig. 9.5b**). Growth duration of the breeding lines in the October sowing batch has been longer than that in the regular time sowing batch (**Table 9.6a** and **Table 9.6b**).

Under such circumstances, the breeding lines in October sowing batch yielded 61-843 g per plot (0.96 sqm) with growth duration of 149 – 186 days over the locations. In the non-stress regular batch, the lines yielded 92.3-945.4 g per plot with growth duration of 135 -163 days. The check varieties, BRRI dhan28, BRRI dhan67 and BRRI dhan89 yielded 606.2 g, 672.3 g and 717.3 g, respectively in the non-stress trial, while in the October sown stress trial these varieties yielded 345.5 g, 627.2 g and 545.2 g, which indicated 43.1%, 6.7% and 24.0% yield reduction compared to non-stress crop happened due to cold stress in case of BRRI dhan28, BRRI dhan67 and BRRI dhan89, respectively. A total 9 breeding lines form cold stress trial (**Table 9.6a**) and 18 lines from non-stress trial (**Table 9.6b**) showing at least 30% yield advantage over the check varieties with similar growth duration were selected for further evaluation in advanced trials.



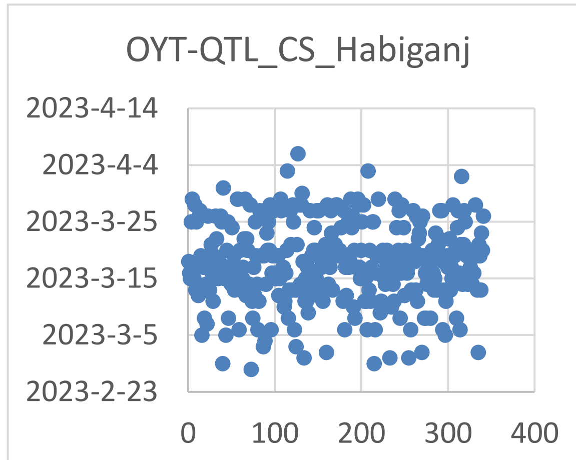


Fig. 9.6. Dot plot showing flowering window of the breeding tested in OYT-QTL under early sown cold stress batch during Boro 2022-23

Table 9.6a. Yield performance of 9 selected breeding lines out of 235 breeding lines tested under early sowing time (October) in OYT-QTL_CS at two locations during Boro 2022-23

Sl	Designation	Growth Duration (days)	Plant height (cm)	Plot Yield (g)		
				Gazipur	Habiganj	Average
1	BR12570-5R-66-3	169	104	768	917	843
2	BR12570-5R-189-1	167	108	832	661	747
3	BR12570-5R-195-2	172	106	784	687	735
4	BR12570-5R-177-3	168	108	804	663	733
5	BR12570-5R-37-1	169	103	729	715	722
6	BR12552-3R-182	176	106	704	725	715
7	BR12421-4R-171	157	92	566	521	543
8	BR12570-5R-150-3	151	97	358	546	452
9	BR12570-5R-150-2	155	113	392	489	441
	BRRI dhan28 (Ck)	157	92	319	372	345
	BRRI dhn67 (Ck)	166	99	737	517	627
	BRRI dhan89 (Ck)	170	98	605	486	545
	Range (N=235)	149-186	83-114	72-842	46-917	61-843
	LSD (0.05)	4.40	17.96	150.40	210.78	154.09
	H2b	78.54	0.00	82.41	58.71	75.36

Table 9.6b. Yield performance of selected breeding lines tested under early sowing time (November)in OYT-QTL_NS at two locations during Boro 2022-23

Sl	Designation	Growth Duration (days)	Plant height (cm)	Plot Yield (g)		
				Gazipur	Habiganj	Average
1	BR12552-3R-179	157	107	1128	743	935
2	BR12570-5R-110-2	150	96	833	973	903
3	BR12421-4R-43	146	99	688	951	820
4	BR12570-5R-189-2	152	92	754	845	800
5	BR12552-3R-60	152	107	720	874	797
6	BR12570-5R-146-1	148	96	667	957	812
7	BR12570-5R-204-1	154	106	885	661	773

8	BR12552-3R-149	150	100	646	933	790
9	BR12570-5R-202-1	149	95	830	724	777
10	BR12570-5R-187-3	150	106	764	746	755
11	BR12552-3R-182	153	104	876	646	761
12	BR12570-5R-189-3	155	104	672	816	744
13	BR12552-3R-229	159	91	880	602	741
14	BR12570-5R-44-3	152	98	546	930	738
15	BR12552-3R-208	148	101	687	775	731
16	BR12570-5R-33-2	153	98	675	797	736
17	BR12570-5R-107-2	151	90	639	832	735
18	BR12570-5R-204-3	152	94	743	714	729
	BRRI dhan28 (Ck)	148	91	800	413	606
	BRRI dhan67 (Ck)	149	101	704	641	672
	BRRI dhan89 (Ck)	151	98	686	748	717
	Range (N=235)	135 163	81-114	111-1128	34.3 -973	92.3-945.4
	LSD (0.05)	4.40	16.69	173.94	224.29	200.33
	H2b	78.54	7.19	74.6	70.17	71.06

Experiment 9.7. Evaluation of IRRI breeding lines under natural haor environment at BRRI Habiganj

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman (Gazipur); MR Islam and MA Syed (Habiganj)

Specific objective: Selection of superior and cold tolerant lines under natural cold condition.

Materials and Methods: A total of 216 genotypes were evaluated at Habiganj locations. BRRI dhan67, BRRI dhan88, BRRI dhan89 and BRRI dhan92 were used as standard check varieties. Sowing of seeds in the 3rd week of October was done to allow the booting stage of the crop to be exposed to low temperature in the end of January to first week of February. Forty-five-day-old seedlings of each entry were transplanted in 2.0 m×2 rows plot using single seedling at a spacing of 20 × 20 cm. Fertilizer doses and application method were the same as in Experiment 9.1. Leaf samples were collected from single plant of each entry for genotyping with 1k-RiCA SNP set. Data on days to flowering and maturity, plot yield, lodging and disease and insect infestation were recorded. Also, maximum and minimum temperatures were collected throughout the growth stages of the crop.

Results: The genotypes showed wide range of variations in yield. The grain yield ranged from 1.79 to 9.95 t/ha with average growth duration ranged from 136 to 162 days. The check variety, BRRI dhan28 yielded 4.15 t/ha with 144 days growth duration, BRRI dhan88 yielded 5.9 t/ha with 149 days growth duration, BRRI dhan67 yielded 5.4 t/ha with 154 days growth duration, BRRI dhan89 yielded 7.4 t/ha with 161 days growth duration and BRRI dhan92 yielded 7.0 t/ha with 159 days growth duration (**Table9.7a**). Considering yield and growth duration compared to check varieties 2 entries with short (143 -144 days) growth duration with yield ranging from 6.8-7.3 t/ha, 18 genotypes medium (146 to 153 days) growth duration with yield ranging from 7.6-8.8 t/ha and two entries for late growth duration (154 to 159 days) with yield ranging from 8.4 – 9.9 t/ha were selected for further evaluation **(Table 9.7b).**

Table 9.7a: Summary result of 260 IRRI breeding lines tested at BRRI Habiganj during Boro 2022-23

Breeding lines	Yield (t/ha)	Growth duration (days)	Remarks
All 216 lines	1.79 – 9.95	136 - 162	H^2b = 65.4
2 SD lines	6.8 – 7.3	143-144	BRRI dhan28 (4.15 t/ha, 144 d) BRRI dhan88 (5.9 t/ha, 149 d)
18 MD lines	7.6 – 8.8	146 - 153	BRRI dhan67 (5.4 t/ha, 154 d)
2 LD lines	8.4 – 9.9	154 - 159	BRRI dhan89 (7.4 t/ha, 161 d) BRRI dhan92 (7.0 t/ha, 159 d)

Table 9.7b: Yield and other agronomic performances of the selected 23 breeding lines out of 216 tested at BRRI Habiganj during Boro 2022-23

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)
1	IR19A9296	145	108	7.00
2	IR19A9069	143	104	6.85
3	IR19A9292	147	115	7.66
4	IR19A9150	151	117	8.54
5	IR19A9140	150	97	7.82
6	IR19A8978	151	109	7.82
7	IR19A8531	147	102	8.27
8	IR19A8524	148	104	7.62
9	IR19A8326	153	111	7.85
10	IR19A8209	153	108	8.80
11	IR19A8120	152	106	7.81
12	IR19A9083	151	105	7.57
13	IR19A9078	152	109	8.18
14	IR19A8596	152	104	8.11
15	IR19A8226	151	110	8.44
16	IR19A8214	153	107	8.69
17	IR19A8211	153	114	7.76
18	IR19A8206	151	117	8.30
19	IR19A7843	151	96	7.65
20	IR19A7550	150	112	7.72
21	IR19A8594	155	102	8.46
22	IR19A8589	159	104	9.95
Ck	BRRI dhan28	144	117	4.11
Ck	BRRI dhan67	157	111	5.45
Ck	BRRI dhan88	149	95	5.92
Ck	BRRI dhan89	161	117	7.41
Ck	BRRI dhan92	160	109	7.03
	LSD (0.05)	1.68	0.52	1.27
	H2b	0.85	0.27	0.65

Experiment 9.8: Evaluation of breeding lines in the Advanced Yield Trial under natural haor environment

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MR Islam and MA Syed (Habiganj)

Specific objective: Evaluation of breeding lines for yield potential in multi-locations in replicated trials.

Materials and Method: In total, 55 (AYT_1_CS_NS), 42 (AYT_2_CS_NS) and 33 (AYT_3_CS_NS) genotypes were evaluated at three locations (Habiganj, Nikli, and Tahirpur) along with three standard check varieties BRRI dhan28, BRRI dhan67 and BRRI dhan89. Thirty-five days old seedlings of each genotype were transplanted in 5.4 m × 6 rows plot using 2/3 seedlings/hill at a spacing of 20 cm × 20 cm with two replications. Fertilizer doses and application methods were the same as in Experiment 9.1. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Results: At Nikli site, all the short to medium duration breeding lines in AYT-1_CS, AYT-2_CS and AYT-3_CS flowered in between 13 February 2023 and 05 March 2023 (**Fig. 9.8a**), At Tahirpur and Habiganj sites, the breeding lines with short to medium duration in three AYT trials flowered in between 25 February to 15 March (**Fig. 9.8b** and **Fig 9.8c**). Fig 1 showed that the average temperature during 15 January to 15 February (PT to booting stage of the crop) was exposed to low temperature of 18^0C - 22^0C at Nikli, 16^0C-21^0C at Tahirpur and 20^0C-22^0C at Habiganj. These results indicated that the breeding with short duration to medium duration was suffered significantly cold stress and gave lower yield at all three sites.

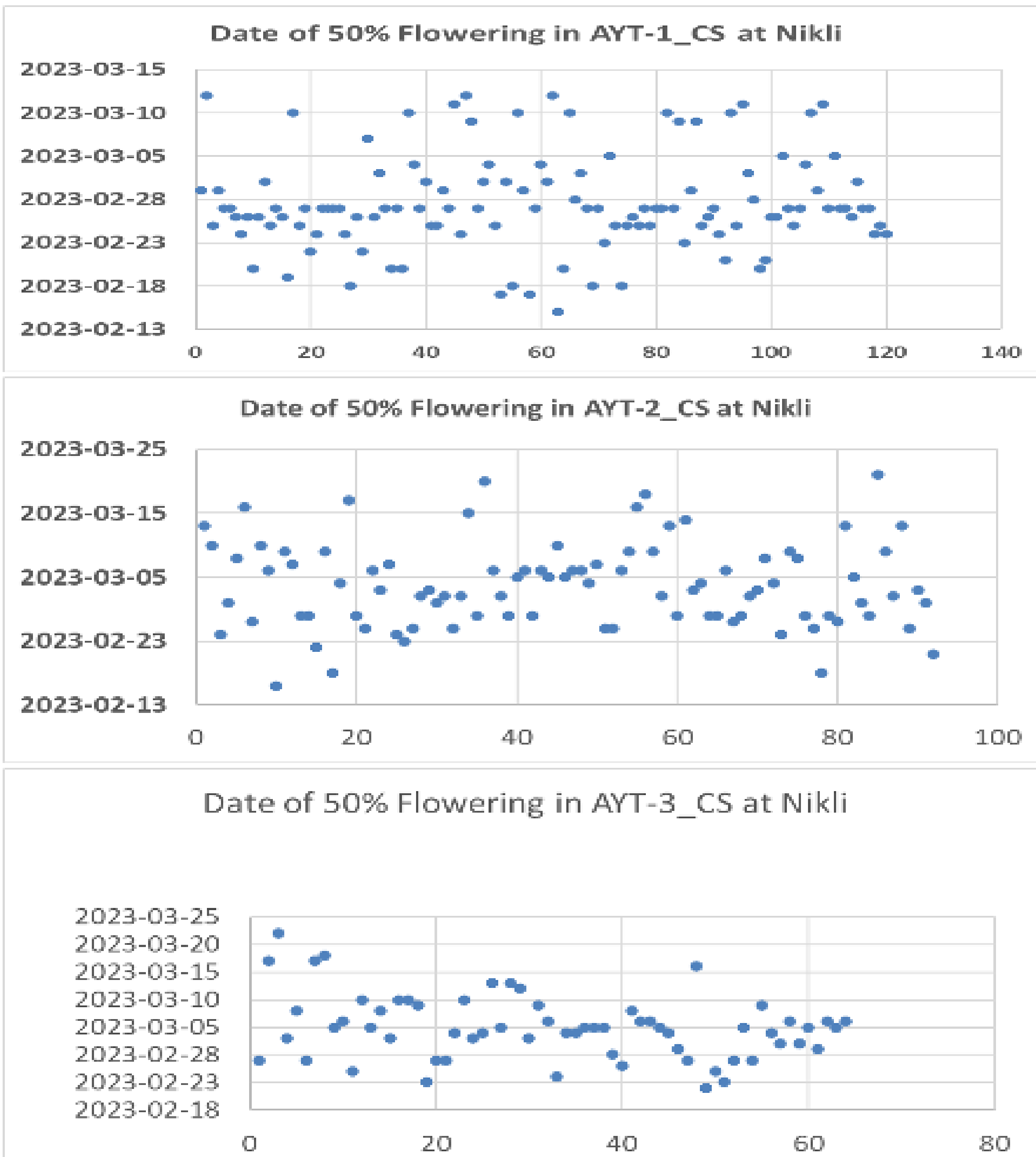
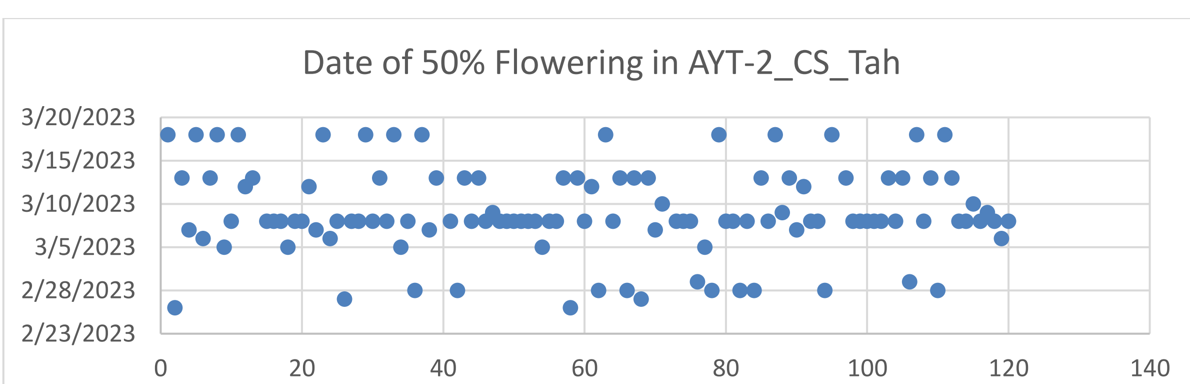


Fig 9.8a: Dot plots showing distribution of Date 50% Flowering of the breeding lines tested in early sowing (21-25 October) batch of three AYT trials in haor areas of Nikli (Kishoregonj) during Boro 2022-23



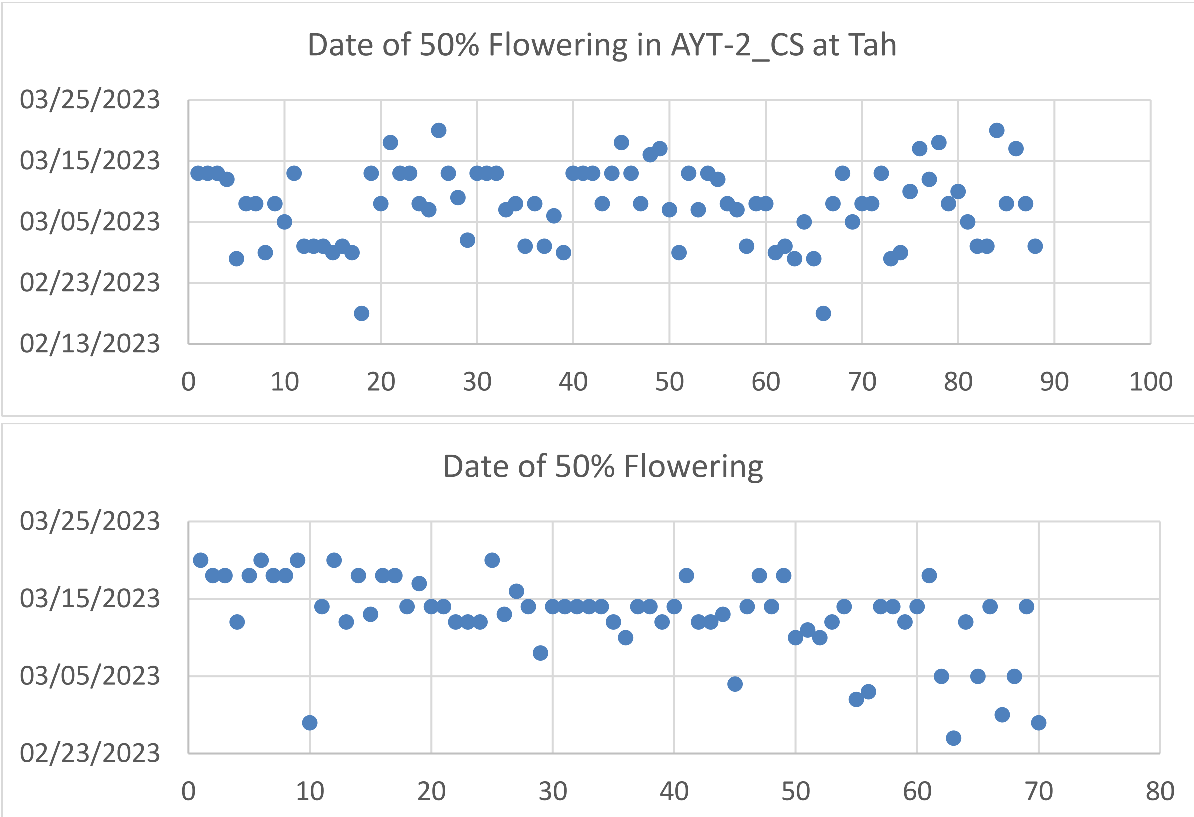


Fig 9.8b Dot plots showing distribution of Date 50% Flowering of the breeding lines tested in early sowing (21-25 October) batch of three AYT trials in haor areas of Tahirpur (Sunamganj) during Boro 2022-23

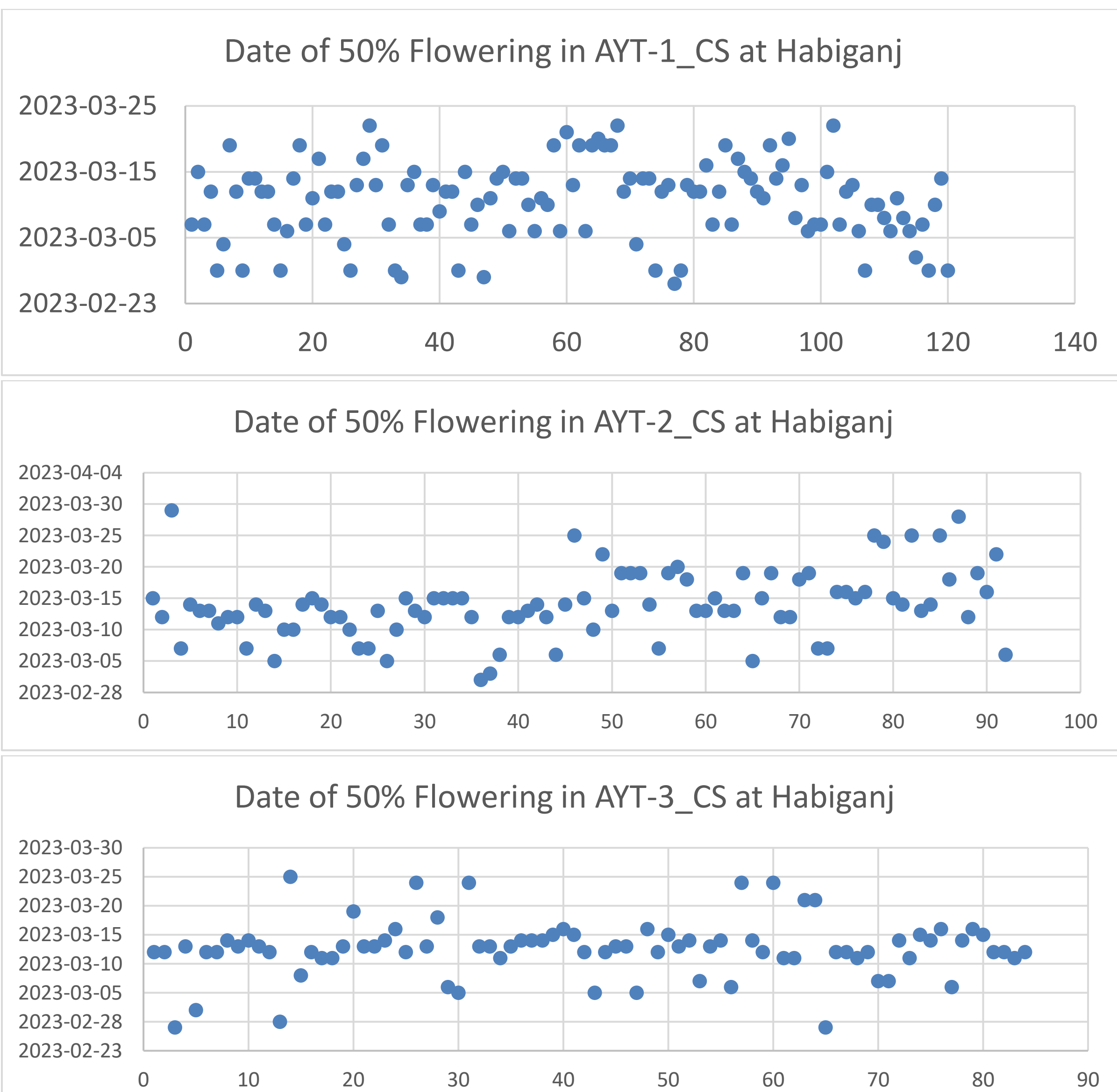


Fig 9.8c Dot plots showing distribution of Date of 50% Flowering of the breeding lines tested in early sowing (21-25 October) batch of three AYT trials at BRRI Habiganj during Boro 2022-23

Fifty-five breeding lines/varieties grown under early sowing (21-23 October) in the AYT-1 showed 147-165 days' growth duration, 69-113 cm plant and 3.18-7.46 t/ha yield over three locations (**Table 9.8a**), while these lines when grown in regular time (i.e., 15-20 November) showed 142-162 days growth duration, 69-113 cm plant height and 3.9-8.6 t/ha yield (**Table 0.8b**). The check varieties BRRI dhan28, BRRI dhan67 and BRRI dhan89 produced respectively 3.29 t/ha, 4.39 t/ha and 5.07 t/ha with growth duration of 154 days, 156 days and 160 days in early sowing batch while in regular batch these check varieties produced 4.19 t/ha, 6.84 t/ha and 6.36 t/ha, respectively with 143 days, 150 days and 155 days' growth duration. Four breeding lines showing 5.85 – 6.83 t/ha with 151-154 days' growth duration from early sowing batch (**Table 9.8a**) and four breeding lines having 7.0-7.8 t/ha yield and 148 days growth duration (**Table 9.8b**) from regular sowing batch were selected.

Table 9.8a. Yield performance of the selected breeding lines from 55 breeding lines tested under early sowing time (21-23 October) in three haor locations (AYT-1_CS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
BR13027-BC1-3R-77	154 (148-158)	90	5.60	6.82	8.98	6.83
IR17A2875	153 (156-160)	81	-	8.02	6.14	5.89
BR11894-R-R-R-R-72	154 (151-157)	99	5.93	7.90	6.06	6.63
IR17A2940	151 (143-162)	80	-	4.71	9.38	5.85
BRRI dhan28 (Ck)	154(148-158)	87	-	4.34	4.63	3.29
BRRI dhan67 (Ck)	156 (155-160)	92	4.05	5.22	5.41	4.39
BRRI dhan89 (Ck)	160 (155-167)	93	4.04	4.79	6.37	5.07
Range (N=55)	147-165	69-113	0.37-5.93	3.54-9.86	1.82-11.83	3.18-7.46
LSD (0.05)	8.1	10.7	0.57	0.48	0.48	0.31
H2b	0.69	0.69	0.94	0.46	062	0.30

D/S:27.10.2022(Nikli);27.10.2022(Tahirpur);30.10.2022 (Habiganj)
D/T: 01.12.2022(Nikli);08.12.2022(Tahirpur);09.12.2022(Habiganj)

Table 9.8b. Yield performance of the selected breeding lines from 55 breeding lines tested under regular sowing time (15-20 November) in three haor locations (AYT-1_NS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
BR13027-BC1-3R-14	148 (145-150)	95	6.8	10.5	6.2	7.8
BR13026-BC1-3R-10	148 (147-149)	98	5.1	9.9	6.8	7.3
BR11894-R-R-R-R-158	148 (146-149)	95	6.6	8.8	6.1	7.2
BR11894-R-R-R-R-148	148 (146-149)	98	6.3	8.8	5.9	7.0
BRRI dhan28(Ck)	143 (142-145)	89	4.84	5.28	2.46	4.19
BRRI dhan67(Ck)	150 (148-154)	92	6.41	8.10	6.00	6.84
BRRI dhan89(Ck)	155 (152-158)	95	5.51	7.02	6.56	6.36
Range (N=55)	142-162	74-117	3.4-7.3	3.7-11.7	3.9-8.6	3.9-8.6
LSD (0.05)	3.5	11.86	0.31	0.55	0.33	0.54
H2b	0.87	0.59	0.60	0.83	057	0.65

D/S:15.11.2022(Nikli);19.11.2022(Tahirpur);20.11.2022(Habiganj)
D/T:24.12.2022(Nikli);23.12.2022(Tahirpur);29.12.2022(Habiganj)

Forty-two breeding lines/varieties grown under early sowing (21-23 October) in the AYT-2 showed 144-167 days' growth duration, 84-123 cm plant and 1.86-6.80 t/ha yield over three locations (**Table 9.8c**), while these lines when grown in regular time (i.e., 15-20 November) showed 141-160 days growth duration, 87-129 cm plant height and 2.18-7.76 t/ha yield (**Table**

9.8d). The check varieties BRRI dhan28, BRRI dhan67 and BRRI dhan89 produced respectively 4.06 t/ha, 5.67 t/ha and 6.29 t/ha with growth duration of 152 days, 157 days and 160 days in early sowing batch while in regular batch these check varieties produced 3.97 t/ha, 6.42 t/ha and 6.82 t/ha, respectively with 145 days, 151 days and 154 days growth duration. Three breeding lines showing 6.11-6.80 t/ha with 153-155 days growth duration from early sowing batch (**Table 9.8c**) and three breeding lines having 6.22-7.76 t/ha yield and 144-148 days growth duration (**Table 9.8d**) from regular sowing batch were selected.

Table 9.8c. Yield performance of the selected breeding lines from 42 breeding lines tested under early sowing time (21-23 October) in three haor locations (AYT-2_CS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
BR11894-R-R-R-R-152	153 (149-156)	100	6.06	8.05	6.29	6.80
BR11894-R-R-R-R-70	154 (152-157)	111	4.76	8.07	6.55	6.46
BR11894-R-R-R-R-221	155 (150-162)	101	4.12	8.36	5.86	6.11
BRRI dhan28	152 (146-158)	94	2.17	4.88	5.14	4.06
BRRI dhan67	157 (153-161)	99	4.26	6.87	-	5.67
BRRI dhan89	160 (158-161)	99	4.71	7.79	6.39	6.29
Range (N=42)	144-167	84-123	0.57-6.06	1.08-8.90	1.26-6.55	1.86-6.80
LSD (0.05)	6.97	13.9	0.35	0.56	0.63	0.38
H2b	0.67	0.66	0.73	0.90	0.33	0.67

D/S: 28.10.2022(Nikli);28.10.2022(Tahirpur);30.10.2022(Habiganj)
D/T: 03.12.2022(Nikli);10.12.2022(Tahirpur);09.12.2022(Habiganj)

Table 9.8d. Yield performance of the selected breeding lines from 42 breeding lines tested under regular sowing time (15-20 November) in three haor locations (AYT-2_NS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
BR11894-R-R-R-R-59	148 (146-149)	96	NA	7.34	8.57	7.76
BR11894-R-R-R-R-115	145 (143-147)	105	7.89	6.66	6.06	6.87
BR13026-BC1-3R-60	144 (143-144)	89	5.54	6.24	6.88	6.22
BRRI dhan28 (Ck)	145 (144-147)	96	NA	4.85	3.48	3.97
BRRI dhan67 (Ck)	151 (148-154)	106	6.51	7.06	5.68	6.42
BRRI dhan89 (Ck)	154 (152-155)	102	7.19	6.68	6.59	6.82
Range (N=42)	141-160	87-129	1.10-7.89	2.75-7.82	2.38-8.57	2.18-7.76
LSD (0.05)	3.0	10	0.32	0.35	0.34	0.31
H2b	89.2	90.5	86.0	70.2	80.9	84.7

D/S:16.11.2022(Nikli); 21.11.2022(Tahirpur); 20.11.2022(Habiganj)
D/T: 27.12.2022(Nikli); 25.12.2022(Tahirpur); 29.12.2022(Habiganj)

Thirty-three breeding lines/varieties grown under early sowing (21-23 October) in the AYT-3 showed 136-160 days growth duration, 70-123 cm plant and 2.03-6.93 t/ha yield over three locations (**Table 9.8e**), while these lines when grown in regular time (i.e., 15-20 November) showed 145-157 days growth duration, 88-115 cm plant height and 5.33-8.91 t/ha yield (**Table 9.8f**). The check varieties BRRI dhan28, BRRI dhan67 and BRRI dhan89 produced respectively 3.07 t/ha, 5.10 t/ha and 6.03 t/ha yield with growth duration of 147 days, 152 days and 156 days in early sowing batch while in regular batch these check varieties produced 6.14 t/ha, 6.87 t/ha and 7.04 t/ha, respectively with 146 days, 149 days and 156 days growth duration. Four breeding lines showing 6.23-6.93 t/ha yield with 149-160 days growth duration from early sowing batch (**Table 9.8f**) and four breeding lines having 7.04-7.58 t/ha yield and 145-152 days growth duration (**Table 9.8e**) from regular sowing batch were selected.

Table 9.8e. Yield performance of the selected breeding lines from 33 breeding lines tested under early sowing time (21-23 October) in three haor locations (AYT-3_CS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
IR19A1473	159 (142-171)	90	6.26	7.93	6.61	6.93
IR19A5712	153 (142-162)	93	5.14	6.45	8.80	6.80
IR19A2719	160 (143-170)	99	5.12	8.08	6.99	6.73
IR19A4821	149 (136-158)	92	5.63	5.63	7.44	6.23
BRRI dhan28 (Ck)	147 (136-158)	94	0.51	3.79	4.91	3.07
BRRI dhan67(Ck)	152 (137-163)	110	3.99	6.50	4.82	5.10
BRRI dhan89(Ck)	156 (141-168)	97	4.24	7.55	6.31	6.03
Range (N=33)	136-160	70-123	0.44-6.26	2.02-8.08	2.71-8.80	2.03-6.93
LSD (0.05)	14	11	0.38	0.50	0.46	0.28
H2B	94.3	93.5	95.0	78.6	83.9	82.2

D/S: 29.10.2022(Nikli);29.10.2022(Tahirpur); 30.10.2022(Habiganj)
D/T: 05.12.2022(Nikli);11.12.2022(Tahirpur); 09.12.2022(Habiganj)

Table 9.8f. Yield performance of the selected breeding lines from 33 breeding lines tested under regular sowing time (15-20 November) in three haor locations (AYT-3_NS) during Boro 2022-23

Designation	Growth duration (days)	Plant Height (cm)	Yield (t/ha)			
			Nikli	Tahirpur	Habiganj	Across the sites
IR18A2427	145 (143-148)	98	7.01	8.97	5.33	7.20
IR19A4821	147 (146-148)	90	6.93	7.81	6.36	7.13
IR17A2922	152 (150-155)	104	7.75	7.14	6.23	7.04
IR19A7068	152 (149-156)	88	7.25	8.01	7.05	7.58
BRRI dhan28	146 (143-149)	96	NA	7.10	5.09	6.14
BRRI dhan67	149 (149-150)	105	5.94	9.26	5.42	6.87
BRRI dhan89	156 (150-160)	103	7.82	7.51	5.79	7.04
Range (N=33)	145-157	88-115	3.63-7.75	5.37-8.97	3.76-8.49	5.33-8.91
LSD (0.05)	6.0	14	0.27	0.20	0.64	0.40
H2B	40.25	33.01	74.9	78.47	63.75	40.3

D/S: 18.11.2022(Nikli); 22.10.2022(Tahirpur); 20.11.2022(Habiganj)
D/T: 25.12.2022(Nikli); 27.12.2022(Tahirpur); 29.12.2022(Habiganj)

Experiment 9.9: Evaluation of breeding lines in the Regional Yield Trial for yield under cold stress and non-stress conditions at Haor areas

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MR Islam and MA Syed (Habiganj)

Specific objective: Evaluation of breeding lines for yield potential in multi-locations in replicated trials.

Materials and Method: In total, six genotypes were evaluated Habiganj (3), Nikli (3) and Tahirpur (3) locations along with three standard check varieties, BRRI dhan28, BRRI dhan67 and BRRI dhan89 at cold stress 1(CS1), cold stress2(CS2) and non stress (NS) conditions. Thirty-five-day-old seedlings of each genotype were transplanted in 5.4 m × 10 rows plot using 2/3 seedlings/hill at a spacing of 20 cm × 20 cm with three replications. Fertilizer doses and application methods were the same as in Experiment 9.1. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded.

Results and discussion: **Fig 9.9a** show the maximum, minimum, and average temperature at the project sites. The temperature pattern shows that the average temperature remained below 20^0C for three weeks at Nikli (starting from 24 December 2022 to 27 January 2023) and four weeks at Tahirpur (starting from 21 December 2022 to 31 January 2023. The average temperature prevailed between 20^0C-22^0C from starting from 27 January 2023 to 20 February 2023 at Nikli and at Tahirpur, average temperature 20^0C-22^0C prevailed from 01 -14 February 2023. At Habiganj, the average temperature went below 20^0C on 27 December 2022 and continued to 20 January 2023 with frequent jump slightly over 20^0C. However, prolonged minimum temperature (10^0C-20^0C) remained from 29 November 2022 to 14 January 2023 at Habiganj site. At Gazipur, the average temperature did not go below 20^0C during the Boro 2022-23 season, but it was between 20^0C-22^0C starting from 27 December 2022 to 14 February 2023. However, the minimum temperature retained close to 15^0C during 3rd week of December 2022 to the middle of January 2023

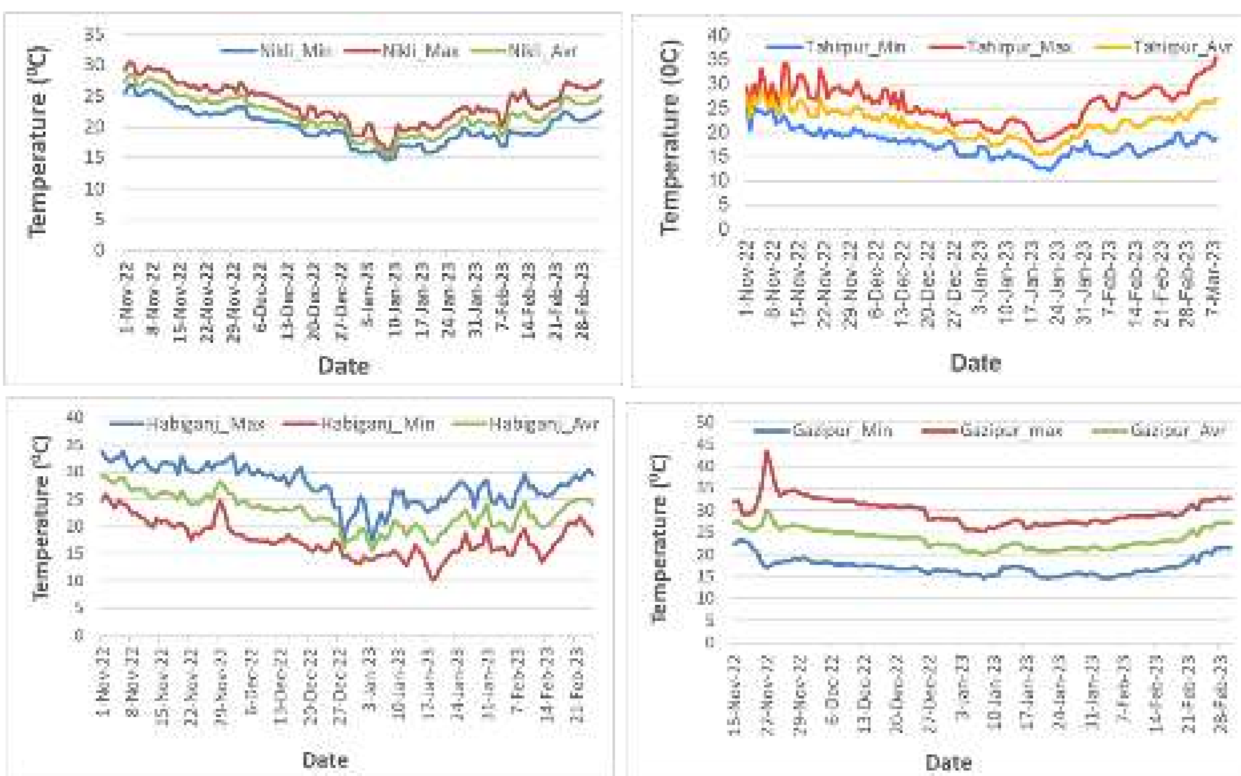


Fig 9.9a. Maximum, minimum, and average temperature at the project sites during Boro 2022-23.

Fig.9.9b, 9.9c and **9.9d** show the flowering period of entries tested at 10 locations in haor areas. At Nikli sites all the entries under early sowing CS1 batch flowered in a period between 19 February 2023 to 01 March 2023 except BRRI dhan67 (V8) and BRRI dhan89 (V9). I Tahirpur sites, the entries flowered in between 18 February 2023 to 5 March 2023 except BRRI dhan67 and BRRI dhan89. Flowering window was very long (14 February 2023 to 17 March 2023) at Habiganj sites **(Fig. 9.9d),** although the central period was between 19 february 2023 to 07 March 2023. The flowering window at Nikli in Fig 9.9b shows that PI to booting stage of the crop was between 19 January to 01 February when average temperatures were between 18^0C-21^0C, while at Tahirpur at PI to booting stage (27 January to 25 February) of the crop was exposed to 20^0C-22^0C and at Habiganj, the PI to booting stage (18 January to 25 February) of the crop suffered from 17^0C-25^0C with frequent fluctuations.

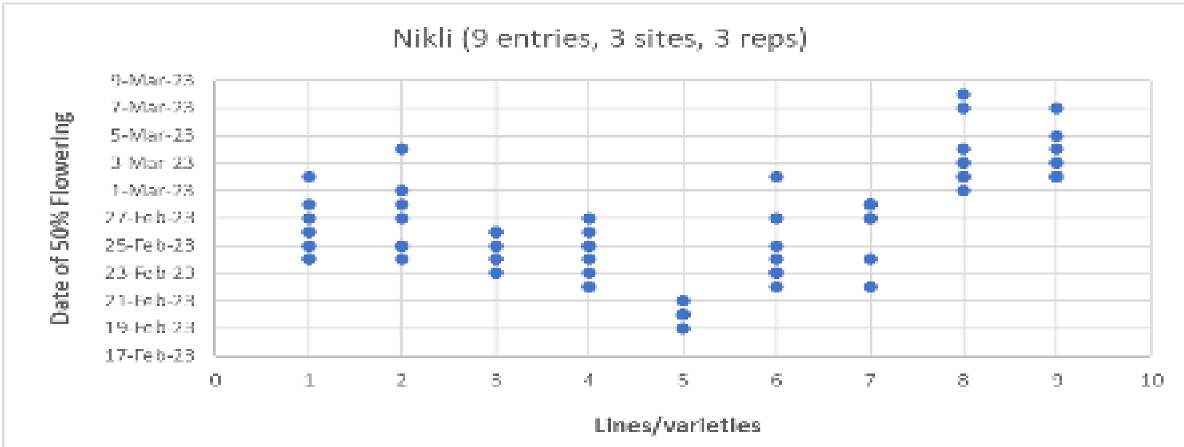


Fig 9.9b. Dot plot showing date of 50% heading of the lines/varieties tested in early sowing (CS1) batch of RYT conducted in the haor sites in Nikli (Kishoregonj) during Boro 2022-23. 1 = BR11646-5R-388; 2 = BR11894-R-R-R-R-105; 3 = BR11894-R-R-R-R-169; 4 = BR11894-R-R-R-R-228; 5 = BR11894-R-R-R-R-329; 6 = IR18A1859; 7 = BRRI dhan28, 8 = BRRI dhan67 and 9 = BRRI dhan89

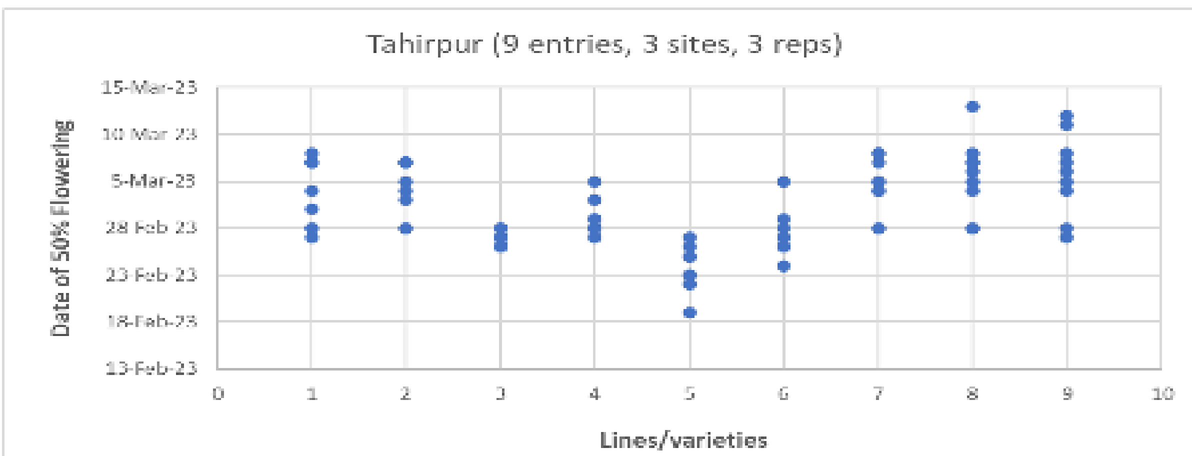


Fig 9.9c. Dot plot showing date of 50% heading of the lines/varieties tested in early sowing (CS1) batch of RYT conducted in the haor sites in Tahirpur (Sunamganj) during Boro 2022-23. 1 = BR11646-5R-388; 2 = BR11894-R-R-R-R-105; 3 = BR11894-R-R-R-R-169; 4 = BR11894-R-R-R-R-228; 5 = BR11894-R-R-R-R-329; 6 = IR18A1859; 7 = BRRI dhan28, 8 = BRRI dhan67 and 9 = BRRI dhan89

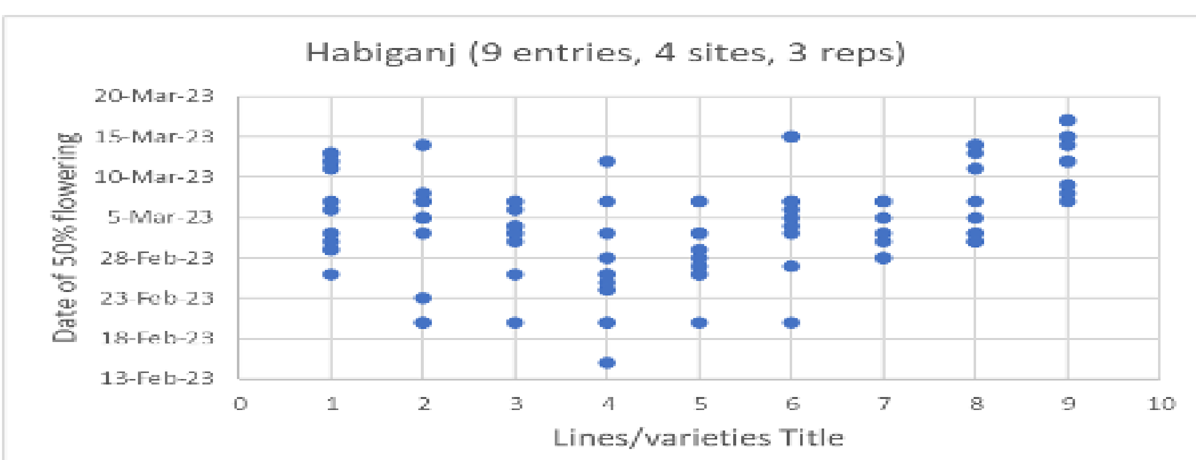


Fig 9.9d. Dot plot showing date of 50% heading of the lines/varieties tested in early sowing (CS1) batch of RYT conducted in the haor sites in Habiganj during Boro 2022-23. 1 = BR11646-5R-388; 2 = BR11894-R-R-R-R-105; 3 = BR11894-R-R-R-R-169; 4 = BR11894-R-R-R-R-228; 5 = BR11894-R-R-R-R-329; 6 = IR18A1859; 7 = BRRI dhan28, 8 = BRRI dhan67 and 9 = BRRI dhan89

In the CS1 batch, the six breeding lines showed growth duration of 141-153 days at Nikli sites, 143-157 days at Tahirpur sites and 148-163 days at Habiganj sites **(Table 9.9a).** In the CS2 batch, the breeding lines had growth duration of 143-154 days at Nikli sites, 151-158 days at

Tahirpur and 143-160 days at Habiganj sites **(Table 9.9b).** On the other hand, in NS batch they showed growth duration ranging from 146 days to 153 days at Nikli sites, 140 days to 150 days at Tahirpur and 137 days to 151 days in Habiganj sites **(Table 9.9c). Fig.9.9e** shows the response growth duration of the entries including check varieties to the sowing time. GD was greatly varied among the three sowing times in the case of all entries except BR11894-R-R-R-R-329, which indicated its low sensitivity to ambient temperature.

Table 9.9a. Growth duration of the breeding lines tested under early sowing time (25-27 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2022-23

Designation	Growth duration (days)										
	Nikli 1	Nikli 2	Nikli 3	Tah1	Tah 2	Tah 3	Hab1	Hab2	Hab3	Hab4	Average
BR11646-5R-388	149	148	147	150	156	155	163	164	159	154	155
BR11894-R-R-R-R-105	153	147	148	151	155	157	162	158	158	146	155
BR11894-R-R-R-R-169	152	146	144	149	149	149	162	156	156	154	150
BR11894-R-R-R-R-228	153	146	144	150	152	151	161	154	155	148	150
BR11894-R-R-R-R-329	150	141	141	143	147	146	151	150	153	151	146
IR18A1859	149	144	144	147	151	150	163	157	159	152	150
BRRI dhan28(Ck)	147	149	147	151	157	155	149	158	156	153	153
BRRI dhan67(Ck)	150	152	155	151	159	157	166	163	153	154	157
BRRI dhan89(Ck)	155	151	153	151	157	160	173	168	162	167	159
LSD (0.05)	1.02	1.54	2.93	2.00	2.71	2.14	9.17	2.13	2.78	4.59	3.74
H2b (%)	100	99	99	99	98.5	99.3	93.3	96.06	95.71	85.7	97.04

D/S:27.10.2022 (Nikli); 26.10.2022 (Tahirpur); 25.10.2022 (Habiganj)

D/T: 26-28 Nov & 02 Dec 2022 (Nikli); 29 Nov & 06 Dec 2022 (Tahirpur); 25, 27 Nov & 01,02 Dec (Habiganj)

Table 9.9b. Growth duration of breeding lines under early sowing time (5 November) in three haor locations in Regional Yield Trial (RYT-CS2) during Boro 2022-23

Designation	Growth duration (days)										
	Nikli1	Nikli2	Nikli3	Tah1	Tah2	Tah3	Hab1	Hab2	Hab3	Hab4	Average
BR11894-R-R-R-R-105	154	152	151	157	158	155	160	147	151	153	153
BR11894-R-R-R-R-169	150	151	151	157	157	155	157	147	150	152	152
BR11894-R-R-R-R-329	143	143	145	151	153	151	151	143	150	147	147
BRRI dhan28(Ck)	144	145	146	151	154	150	155	144	153	150	149
BRRI dhan67(Ck)	151	152	151	157	158	154	156	149	155	154	154
BRRI dhan89(Ck)	156	156	155	158	162	160	162	153	160	160	158
LSD (0.05)	1	1	2	1	2	3	5	3	2	1	2
H2b (%)	99.1	97.7	97.0	99.4	89.1	91.5	99.1	82.3	90.8	99.1	98.3

D/S: 05.11.2022(Nikli); 05.11.2022(Tahirpur); 05.11.2022(Habiganj)

D/T:07-09 Dec 2022(Nikli), 12-14 Dec 2022(Tahirpur); 07Dec & 11-13 Dec 2022(Habiganj)

Table 9.9c. Growth duration of the breeding lines tested under regular sowing time (15-20 November) in three haor locations in Regional Yield Trial (RYT-NS) during Boro 2022-23

Designation	Growth duration (days)										
	Nikli1	Nikli2	Nikli3	Tah1	Tah2	Tah3	Hab1	Hab2	Hab3	Hab4	Average
BR11646-5R-388	149	148	146	145	146	149	148	141	150	150	147
BR11894-R-R-R-R-105	153	152	152	147	146	150	151	150	150	150	150
BR11894-R-R-R-R-169	152	152	152	145	145	144	148	145	148	142	147
BR11894-R-R-R-R-228	153	151	152	145	145	149	148	145	150	150	149
BR11894-R-R-R-R-329	150	150	147	141	142	146	143	137	144	144	145

IR18A1859	149	149	149	140	144	142	144	138	146	142	144
BRRI dhan28(Ck)	147	143	145	142	144	149	143	138	145	142	144
BRRI dhan67(Ck)	150	148	148	144	147	149	153	150	153	150	149
BRRI dhan89(Ck)	155	155	154	148	151	151	152	152	157	150	153
LSD (0.05)	1	1	1	2	2	3	3	4	3	0	2
H2b (%)	95.6	96.9	94.5	94.7	88.9	78.0	84.6	91.6	91.1	99.9	95.7

D/S: 13.11.2022(Nikli); 18.11.2022(Tahirpur); 15.11.2022(Habiganj)
D/T: 20-22 Dec 2022(Nikli); 18-19 Dec & 21 Dec 2022(Tahirpur); 16Dec, 20-21 Dec & 26 Dec 2022(Habiganj)

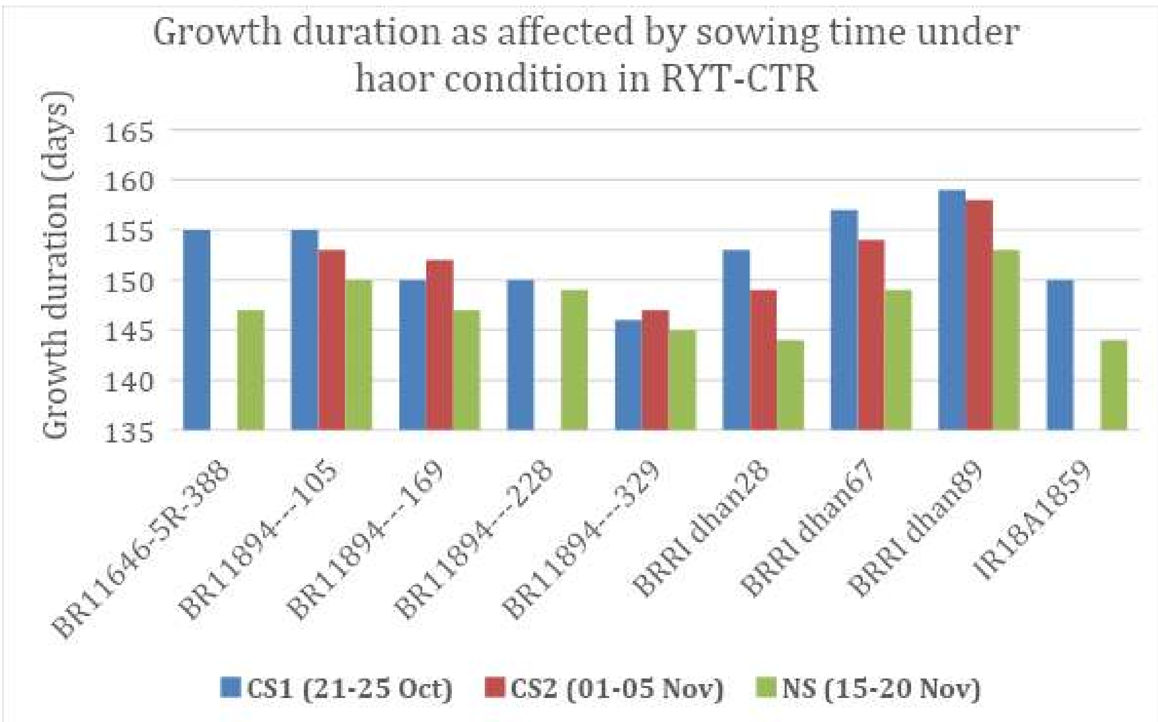


Fig 9.9d. Barplot showing the effect of temperature modulated by sowing time on growth duration of tested breeding lines at three locations in haor during Boro 2022-23

Plant height of the breeding lines and the check varieties varied across the sowing time. The variety BRRI dhan28 showed 77-98 cm with an average of 89 cm plant height under CS1 batch (**Table 9.9d**), 78-101 cm with an average value of 92 cm in CS2 (**Table 9.9e**) and 79-106 cm with an average value of 94 cm in NS batch (**Table 9.9f**). The breeding line BR11894-R-R-R-R-105, BR11894-R-R-R-R-169 and BR11894-R-R-R-R-329 had plant height 93 cm (83-103 cm), 100 cm (84-110 cm) and 86 cm (77-98 cm), respectively in CS1 batch, while in NS batch, these lines produced 99 cm (90-104 cm), 100 cm (80-110 cm) and 94 cm (85-102 cm), respectively.

Table 9.9d. Plant height of the breeding lines tested under early sowing time (21-25 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2022-23

Designation	Plant Height (cm)										
	Nikli1	Nikli2	Nikli3	Tah1	Tah2	Tah3	Hab1	Hab2	Hab3	Hab4	Average
BR11646-5R-388	98	79	86	77	77	75	101	93	96	84	87
BR11894-R-R-R-R-105	100	87	90	84	83	86	103	102	98	85	93
BR11894-R-R-R-R-169	110	101	101	89	84	89	110	101	110	93	100
BR11894-R-R-R-R-228	103	86	86	82	78	80	98	97	97	75	89
BR11894-R-R-R-R-329	100	83	81	82	77	77	98	93	95	78	86
IR18A1859	93	84	77	80	73	77	100	104	97	85	88
BRRI dhan28	98	86	89	86	77	79	96	90	98	86	89

BRRI dhan67	111	102	105	90	93	85	116	107	101	94	102
BRRI dhan89	99	90	90	81	80	80	106	101	98	88	92
LSD (0.05)	3.5	1.5	2.9	2.0	2.7	2.1	2.0	5.9	7.9	7.2	6.4
H2b (%)	93.85	95	88	87	87.5	94.09	98.12	74.35	32.73	64.87	94.95

D/S:27.10.2022 (Nikli); 26.10.2022 (Tahirpur); 25.10.2022 (Habiganj)
D/T: 26-28 Nov & 02 Dec 2022 (Nikli); 29 Nov & 06 Dec 2022 (Tahirpur); 25, 27 Nov & 01,02 Dec (Habiganj)

Table 9.9e. Plant height of breeding lines tested under early sowing time (05 November) in three haor locations in Regional Yield Trial (RYT-CS2), Boro 2022-23

Designation	Plant Height (cm)										
	Nikli1	**Nikli2**	**Nikli3**	**Tah1**	**Tah2**	**Tah3**	**Hab1**	**Hab2**	**Hab3**	**Hab4**	**Mean**
BR11894-R-R-R-R-105	105	101	95	92	97	90	101	104	100	94	98
BR11894-R-R-R-R-169	113	114	107	98	96	92	107	99	100	97	102
BR11894-R-R-R-R-329	96	91	91	87	91	91	96	100	100	84	93
BRRI dhan28(Ck)	101	94	96	87	94	88	92	91	100	78	92
BRRI dhan67(Ck)	114	108	108	98	100	96	111	109	100	104	105
BRRI dhan89(Ck)	100	100	93	87	95	90	97	103	96	85	95
LSD (0.05)	6.4	3.3	4.7	4.4	3.5	3.4	5.3	9.4	0.8	4.9	3.8
H2b (%)	80.5	96.8	90.7	90.8	84.0	53.4	85.5	39.3	95.4	80.5	94.4

D/S: 05.11.2022(Nikli); 05.11.2022(Tahirpur); 05.11.2022(Habiganj)
D/T: 07-09 Dec 2022(Nikli), 12-14 Dec 2022(Tahirpur); 07Dec & 11-13 Dec 2022(Habiganj)

Table 9.9f. Plant height of breeding lines tested under regular sowing time (15-20 November) in three haor locations in Regional Yield Trial (RYT-NS), Boro 2022-23

Designation	Plant Height (cm)									
	Nikli1	**Nikli2**	**Nikli3**	**Tah1**	**Tah2**	**Hab1**	**Hab2**	**Hab3**	**Hab4**	**Average**
BR11646-5R-388	98	93	90	92	92	102	89	94	74	91
BR11894-R-R-R-R-105	100	104	102	100	96	103	109	90	93	99
BR11894-R-R-R-R-169	110	108	104	103	95	108	107	80	94	100
BR11894-R-R-R-R-228	103	93	99	94	92	98	100	89	91	94
BR11894-R-R-R-R-329	100	91	99	96	93	99	102	88	85	94
IR18A1859	99	82	84	86	82	102	95	93	74	86
BRRI dhan28(Ck)	97	95	98	96	91	96	106	90	79	94
BRRI dhan67(Ck)	99	110	109	103	102	114	112	89	97	104
BRRI dhan89(Ck)	111	96	99	98	97	106	107	82	89	96
LSD (0.05)	3.9	4.6	4.8	2.8	3.1	2.8	8.6	6.9	3.4	4.8
H2b (%)	91.2	92.9	88.9	93.3	91.4	93.7	62.2	41.2	96.9	92.6

D/S: 13.11.2022(Nikli); 18.11.2022(Tahirpur); 15.11.2022(Habiganj)

D/T: 20-22 Dec 2022(Nikli); 18-19 Dec & 21 Dec 2022(Tahirpur); 16Dec, 20-21 Dec & 26 Dec 2022(Habiganj)

In the case grain yield, BR11894-R-R-R-R-228 yielded the highest followed by BR11894-R-R-R-R-329 and BR11894-R-R-R-R-169 at Nikli1, while BR11894-R-R-R-R-169 yield maximum at Nikli2, Tahirpur3, Habganj2 and Habganj3 sites under CS1 batch (**Table 9.9g**). In the CS2 batch, BR11894-R-R-R-R-105 yielded the highest at Tahirpur3, Habiganj1, Habiganj2 and Habiganj3 (**Table 9.9h**). In the NS batch, the highest yield was obtained with BR11894-R-R-R-R-105 at Nikli2, Tahirpur1 and Habiganj3, with BR11894-R-R-R-R-169 at Nikli3, Tahirpur3, Habiganj1, Habiganj2 and Habiganj4, with BR11894-R-R-R-R-228 at

Nikli1 and with BR11894-R-R-R-R-329 at Tahirpur1 (**Table 9.9i**). However, over the 10 locations in the CS1 batch, the test breeding lines yielded 2.44 t/ha to 5.97 t/ha with growth duration of 150-155 days, while the check variety BRRI dhan28 yielded 4.31 t/ha with 153 days, BRRI dhan67 yielded 5.00 t/ha with 157 days and BRRI dhan89 yielded 5.17 t/ha with 159 days growth duration (**Table 9.9j**). One breeding line IR11894-R-R-R-R-169 yielded the highest in the CS1 batch over the location. While in the NS condition, the breeding lines yielded 4.95 t/ha to 6.91 t/ha with growth duration of 144-147 days. The highest yield (6.97t/ha) was obtained with BR11894-R-R-R-R-169 having growth duration of 147 days. Contrary, the check variety BRRI dhan28 yielded 4.53 t/ha with 144 days growth duration. However, BR11894-R-R-R-R-169 in the CS2 batch, which was shown in the 1st week of November 6.24 t/ha with growth duration of 152 days. Among the breeding lines IR18A1859 showed the lowest yield across the sites in CS1 batch. The yield reduction (%) among the test breeding lines in CS1 batch compared to NS batch ranged from 13.6% (IR11894-R-R-R-R-169) to 55.9% (IR18A1859), while the growth duration increased ranging from 1 day (BR11894-R-R-R-R-228 and BR11894-R-R-R-R-329) to 8 days (BR11646-5R-388). No height reduction was noticed in the case of IR11894-R-R-R-R-169 and IR18A1859, contrary R11894-R-R-R-R-329 showed 8 cm plant height reduction in the CS1 batch compared to that in NS batch.

Table 9.9g. Yield of the breeding lines tested under early sowing time (21-25 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2022-23

Designation	Yield (t/ha)								
	Nikli1	**Nikli2**	**Nikli3**	**Tah2**	**Tah3**	**Hab1**	**Hab2**	**Hab3**	**Avg**
BR11646-5R-388	4.39	4.16	3.99	5.32	4.21	4.21	2.18	4.54	4.12
BR11894-R-R-R-R-105	6.60	4.65	5.30	3.10	2.83	5.14	4.69	2.81	4.68
BR11894-R-R-R-R-169	6.59	5.17	4.84	5.39	7.64	6.82	5.76	7.84	5.97
BR11894-R-R-R-R-228	7.02	4.76	4.59	3.54	3.34	4.35	3.92	3.85	4.42
BR11894-R-R-R-R-329	6.78	4.09	3.71	3.79	4.08	4.30	4.18	2.26	4.15
IR18A1859	-	0.98	0.93	1.90	2.53	2.43	3.37	1.73	2.44
BRRI dhan28(Ck)	4.06	3.92	3.11	4.52	4.45	5.47	3.63	5.31	4.31
BRRI dhan67(Ck)	5.56	4.62	5.50	4.59	3.58	5.50	5.73	4.91	5.00
BRRI dhan89(Ck)	6.48	5.46	6.33	5.35	5.48	4.54	5.24	2.44	5.17
LSD (0.05)	0.68	0.46	0.66	0.79	0.39	0.81	0.25	0.37	0.44
H2b (%)	96.95	88.63	95.73	90.29	85.33	88.35	73.84	92.38	90.19

D/S:27.10.2022 (Nikli); 26.10.2022 (Tahirpur); 25.10.2022 (Habiganj)

D/T: 26-28 Nov & 02 Dec 2022 (Nikli); 29 Nov & 06 Dec 2022 (Tahirpur); 25, 27 Nov & 01,02 Dec (Habiganj)

Table 9.9h. Yield of breeding lines tested under early sowing time 05 November) in three haor locations in Regional Yield Trial (RYT-CS2) during Boro 2022-23

Designation	Yield (t/ha)									
	Nikli1	**Nikli2**	**Nikli3**	**Tah1**	**Tah2**	**Tah3**	**Hab1**	**Hab2**	**Hab3**	**Average**
BR11894-R-R-R-R-105	6.12	6.3	6.16	7.04	7.09	7.59	6.6	6.91	5.22	6.39
BR11894-R-R-R-R-169	6.51	6.1	6.54	8.56	7.24	7.01	5.96	5.65	5.12	6.24
BR11894-R-R-R-R-329	5.71	5.3	5.55	6.56	7.57	5.97	4.6	3.95	3.98	5.10
BRRI dhan28(Ck)	4.26	4.3	4.39	4.35	5.38	4.14	4.67	4.72	4.77	4.55
BRRI dhan67(Ck)	6.1	4.8	6.28	7.25	6.58	5.86	5.95	4.3	5.08	5.48

BRRI dhan89(Ck)	6.3	6.5	6.67	8.51	7.18	6.59	4.82	4.5	5.44	5.94
LSD (0.05)	0.69	0.51	0.32	0.49	0.29	0.37	0.49	0.68	0.15	0.27
H2b (%)	95.67	98.27	96.5	93.28	62.75	97.54	79.83	96.02	55.85	97.16

D/S: 05.11.2022(Nikli); 05.11.2022(Tahirpur); 05.11.2022(Habiganj)

D/T:07-09 Dec 2022(Nikli), 12-14 Dec 2022(Tahirpur); 07Dec & 11-13 Dec 2022(Habiganj)

Table 9.9h. Yield of the breeding lines tested under regular sowing time (15-20 November) in three haor locations in Regional Yield Trial (RYT-NS) during Boro 2022-23

Designation	Yield (t/ha)										
	Nikli1	Nikli2	Nikli3	Tah1	Tah2	Tah3	Hab1	Hab2	Hab3	Hab4	Mean
BR11646-5R-388	4.39	3.74	4.25	7.50	5.7	6.54	4.62	3.68	4.17	3.85	4.95
BR11894-R-R-R-R-105	6.6	7.28	6.48	7.53	8.1	6.67	5.57	5.69	7.07	4.96	6.78
BR11894-R-R-R-R-169	6.59	6.69	6.79	7.65	7.66	7.46	6.15	6.96	6.26	4.71	6.91
BR11894-R-R-R-R-228	7.02	6.66	6.58	5.85	7.26	7.29	5.46	6.48	5.42	4.41	6.45
BR11894-R-R-R-R-329	6.78	6.43	5.18	8.28	7.48	6.79	5.93	5.08	5.15	4.42	6.34
IR18A1859	5.68	5.03	5.19	7.12	5.4	6.43	5.39	5.72	3.79	4.37	5.53
BRRI dhan28(Ck)	4.07	5.11	4.01	7.68	4.81	4.84	4.26	4.36	4.67	4.87	5.47
BRRI dhan67(Ck)	5.56	5.99	4.65	7.49	6.91	6.39	4.81	4.88	5.2	3.26	5.76
BRRI dhan89(Ck)	6.49	6.88	6.21	8.02	6.88	7.44	6.39	4.85	4.33	4.59	6.39
LSD (0.05)	0.39	0.54	0.53	0.29	0.82	0.31	0.30	0.40	0.74	0.30	0.46
H2b (%)	95.58	96.01	93.03	55.64	86.05	48.4	48.54	91.38	89.93	48.92	93.22

D/S: 13.11.2022(Nikli); 18.11.2022(Tahirpur); 15.11.2022(Habiganj)

D/T: 20-22 Dec 2022(Nikli); 18-19 Dec & 21 Dec 2022(Tahirpur); 16Dec, 20-21 Dec & 26 Dec 2022(Habiganj)

Table 9.9j. Plant height, growth duration and yield of the breeding lines tested under cold stress and non-stress condition over 10 haor locations in Regional Yield Trial during Boro 2022-23

Designation	Plant Height (cm)			Growth duration (days)			Yield (t/ha)		
	CS1	CS2	NS	CS1	CS2	NS	CS1	CS2	NS
BR11646-5R-388	87	-	91	155	-	147	4.12	-	4.95
BR11894-R-R-R-R-105	93	98	99	155	153	150	4.68	6.39	6.78
BR11894-R-R-R-R-169	100	102	100	150	152	147	5.97	6.24	6.91
BR11894-R-R-R-R-228	89	-	94	150	-	149	4.42	-	6.45
BR11894-R-R-R-R-329	86	93	94	146	147	145	4.15	5.10	6.34
IR18A1859	86	-	86	150	-	144	2.44	-	5.53
BRRI dhan28(Ck)	89	92	94	153	149	144	4.31	4.55	5.47
BRRI dhan67(Ck)	102	105	104	157	154	149	5.00	5.48	5.76
BRRI dhan89(Ck)	92	95	96	159	158	153	5.17	5.94	6.39
Range (Lines)	86-100	93-102	86-100	146-155	147-153	144-150	2.44-5.97	5.10-6.39	4.95-6.91
LSD (0.05)	6.4	3.8	4.8	3.74	2.0	2.0	0.44	0.27	0.46
H2b (%)	94.95	94.4	92.6	97.04	98.3	95.7	90.19	97.16	93.22

Designation	Plant height reduction (cm)		Growth duration increased (days)		Yield reduction (%)	
	NS-CS1	NS-CS2	NS-CS1	NS-CS2	NS-CS1	NS-CS2
BR11646-5R-388	4.0	-	8.0	-	16.8	-
BR11894-R-R-R-R-105	6.0	1.0	5.0	3.0	31.0	5.8
BR11894-R-R-R-R-169	0.0	-2.0	3.0	5.0	13.6	9.7
BR11894-R-R-R-R-228	5.0	-	1.0	-	31.5	-
BR11894-R-R-R-R-329	8.0	1.0	1.0	2.0	34.5	19.6
IR18A1859	0.0	-	6.0	-	55.9	-
BRRI dhan28(Ck)	5.0	2.0	9.0	5.0	21.2	16.8
BRRI dhan67(Ck)	2.0	-1.0	8.0	5.0	13.2	4.9
BRRI dhan89(Ck)	4.0	1.0	6.0	5.0	19.2	7.0
Range (Lines)	0.0 – 8.0	-2 -1.0	1.0 – 8.0	2.0 – 5.0	13.6-55.9	5.8-19.6
LSD (0.05)	-	-	-	-	-	-
H2b (%)	-	-	-	-	-	-

The above findings it can be concluded that BR11894-R-R-R-R-169 yielded 5.97 t/ha even it was sown in late October seeding (CS1) and the crop was exposed to at low temperature <20^0C in the PI to booting stage but it produced 6.91 t/ha with 148-150 days growth duration at a non-stress regular time (NS) in mid November. Another line, BR11894-R-R-R-R-329 yielded 6.34 t/ha with only 145 days growth duration showing no sensitivity of ambient temperature variation on its growth duration. The IRRI bred line IR18A1859 was found not sensitive to plant height reduction in low temperature of October seeding (CS1) compared to mid November seeding (NS) but highly sensitive to low temperature for grain yield.

PROJECT 10: INTERNATIONAL NETWORK FOR GENETIC EVALUATION OF RICE (INGER)

General Objective: This program was focused on sharing germplasm and breeding lines through international platform for the acceleration of genetic improvement of rice varieties.

Experiment 10.1: Nursery sets

National coordinator: Khandakar Md. Iftekharuddaula

Key cooperator: Sharmistha Ghosal

Key Contact Scientists: Partha Sarathi Biswas, M A Kader, M Akhlasur Rahman, Mahmuda Katun, M Abdul Latif, Sheikh Samiul Haque, Md. Ruhul Amin Sarker, Rafiqul Islam, Rakibul Hassan, Md Abu Syed, Fahamida Akter.

Specific objective: Evaluation of germplasm from diverse origin in the local environment for direct use as variety and/or use as parents in the breeding program.

Materials and Methods: A total of seven nurseries, five in T Aman season and two in Boro season comprising of 236 genotypes were received and distributed to the concerned investigators at all the locations. The nurseries were managed and data were collected following instructions supplied by concerned scientists of IRRI.

Results: Totally 49 genotypes were selected out of 195 genotypes of nine INGER nursery sets of which four genotypes were selected out of 32 genotypes of one INGER nursery set of Aus, 31 genotypes out of 109 genotypes from six INGER nursery sets of T. Aman and 14 genotypes out of 54 genotypes from two INGER nursery sets of Boro season were selected to be used in different breeding programs for direct use in the breeding pipeline (**Table 10.1**). The detail information showing the performance of the genotypes will be reported by the respective breeding programs.

Table 10.1: Nursery sets and Number of selections made per set of INGER Nurseries, Aus, Aman and Boro 2022-23

SL No	Nursery Name	Total genotypes	Selected genotypes
Aus 2022-23			
1	International Upland Rice Observational Nursery (IURON)-1set	32	4
T. Aman 2022-23			
1	International Rice Soil Stress Tolerance Nursery (IRSSTN)- 1set	19	4
2	International Rainfed Lowland Rice Observational Nursery (IRLON)-3 sets	28	6
3	International Rice Bacterial Blight Nursery (IRBBN)- 2sets	54	5
4	International Rice Brown Plant Hopper Nursery (IRBPHN)-2 sets	41	4
5	International Rice Tungro Nursery (IRTN)-2 sets	15	2
6	International Rice Stress Tolerance Nursery-Flood Prone (IRSTN-FP)	38	10
Boro 2022-23			
7	International Irrigated Rice Observational Nursery (IRRON)-3 sets	35	10
8	International Rice Soil Stress Tolerance Nursery (IRSSTN-1 set)	19	4
	Total	**195**	**49**

PROJECT 11: DEVELOPMENT OF ZINC ENRICHED RICE (ZER)

General objectives: Development of high yielding rice varieties with improved nutritional quality in term of high zinc (Zn≥24 mg/kg) in polished grain as well as development of stress tolerant with zinc enriched rice varieties like submergence + zinc, drought + zinc, salinity + zinc and cold + zinc with improved grain yield.

Project Leader: M A Kader

Experiment 11.1: Hybridization

Principal Investigator: M A Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific objectives: Development of new genotypes with high zinc content along with tolerant to submergence, drought, salinity, cold, major insect pests and diseases, and acceptable grain quality.

Materials and methods: Twenty-one parents in T. Aman and nineteen parents in Boro season were grown in four staggers with an interval of 7 days to synchronize flowering for cross combinations. Twenty-five-day-old in T. Aman and thirty-five-day-old seedlings in Boro were transplanted in the hybridization block. Single seedling was transplanted at a spacing of 20 cm × 20 cm. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg Zn SO_4) kg NPKSZn/ha were applied in the trial in T. Aman season. In Boro season, fertilizers at the rate of 138 (300 kg Urea): 20 (100 kg TSP): 83 (165 kg MP): 20 (112 kg Gypsum): 4 (11 kg Zn SO4) kg/ha NPKSZn were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen were applied at three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). At flowering, emasculation was done on the day before anthesis using vacuum emasculator and bagging of the emasculated panicle of the recipient parents was done with glycine bag labeled properly. Pollination was performed with just anthesized panicles of the donor parent by dusting pollens on the emasculated panicle of the recipient parent.

Results and discussion: Twenty single crosses were made in T. Aman, while in Boro season fifteen single crosses were made **(Table 11.1a** and **11.1b)**. Mature F_1 seeds were harvested, sun dried and stored separately in paper bags with proper labeling.

Table 11.1a: List of crosses, Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	Cross Combination	Characteristics	No. of F_1 seeds
1	BR11144-6-1-1-3/ BR7833-11-1-3-1-2-B1	High yield and high zinc	310
2	BR11144-6-1-1-3/ BR10537-7-2-1-3-2	High yield and high zinc	315
3	BR11146-1-4-2-3/ BR10537-7-2-1-3-2	High yield and high zinc	50
4	BR11146-1-4-2-3/ BR11742-6R-27	High yield and high zinc	50
5	BR11146-1-4-2-4/ BR10542-4-2-1-2-1	High yield and high zinc	240
6	BR11146-1-4-4-6/ BR8441-46-4-2-8	High yield and high zinc	35
7	BR11146-1-4-4-6/ BR10542-4-2-1-2-1	High yield and high zinc	0
8	BR11148-1-3-2-4/ BR10537-7-2-1-3-2	High yield and high zinc	320
9	BR11148-1-3-2-4/ BR11742-6R-27	High yield and high zinc	110
10	BR11148-1-3-6-5/ BR7833-11-1-3-1-2-B1	High yield and high zinc	20
11	BR11151-1-4-2-6/ BR11742-6R-27	High yield and high zinc	250
12	BR11153-1-2-2-5/ BR10542-4-2-1-2-1	High yield and high zinc	350
13	BR11174-1-2-3-5/ BR7833-11-1-3-1-2-B1	High yield and high zinc	0
14	BR12004-6R-56/ BR7833-11-1-3-1-2-B1	High yield and high zinc	180
15	BR12004-6R-56/ BR10537-7-2-1-3-2	High yield and high zinc	350
16	BR12004-6R-56/ BR11742-6R-27	High yield and high zinc	180
17	BR12022-6R-40/ BR8441-46-4-2-8	High yield and high zinc	120
18	BR12022-6R-40/ BR10537-7-2-1-3-2	High yield and high zinc	40
19	BR12022-6R-40/ BR11742-6R-27	High yield and high zinc	20
20	BR12021-6R-117/ BR10542-4-2-1-2-1	High yield and high zinc	15
		Total	**2,955**

Table 11.1b: List of crosses, Development of Zinc enriched rice (ZER), Boro 2022-23

SN	Cross combination	Characteristics	No. of F_1 seeds
1	BR9674-1-4-1-3-P1 / BR8419-8-2-1-4-1-3-8-5	MB, high yield, high amylose and high zinc	50
2	BR9674-7-3-2-1-P2 / BR7840-54-3-4-3	LS, long panicle, high yield, high amylose and high zinc	80
3	BR9674-7-3-2-1-P2 / BR7833-11-1-3-1-2-B1	LS, high yield, high amylose and high zinc	120
4	BR9674-3-9-2-1-P3 / BR8441-46-4-2-8	MS, high yield, high amylose and high zinc	120
5	BR9674-7-3-2-2-P2 / BR8419-8-2-1-4-1-3-8-5	MS, high yield, high amylose and high zinc	35
6	BR9674-7-3-2-2-P2 / BR7879-17-2-4-HR3-P1	MS, high yield, high amylose and high zinc	185
7	BR10571-15-6-8-5 / BR10580-4-3-3-2	MS, high yield and high zinc	300
8	BR10575-1-2-1-4 / BR8419-8-2-1-4-1-3-8-5	LS, high yield, high amylose and high zinc	130

SN	Cross combination	Characteristics	No. of F_1 seeds
9	BR10576-16-2-4-2 / BR7833-11-1-3-1-2-B1	MS, high yield and high zinc	135
10	BR11894-4R-169/ BR7833-11-1-3-1-2-B1	LS, Cold tolerance in reproductive stage, high zinc	120
11	BR11686-5R-179/ T27A	MB, Submarge tolerance, high yield, high zinc	85
12	IR16F1063/ BR7881-62-2-3-7-P3	LS, Submarge tolerance, high yield, high zinc	85
13	IR16F1063/ BR8441-46-4-2-8	LS, Submarge tolerance, high yield, high zinc	55
14	BR11714-4R-148/ BR7840-54-3-4-3	MB, Salt tolerance, long panicle, high yield and high zinc	130
15	BR11714-4R-75/ BR8419-8-2-1-4-1-3-8-5	MB, Salt tolerance, high amylose and high zinc	9
		Total	**1639**

Experiment 11.2: Confirmation of F_1

Principal Investigator: M A Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific objectives: To confirm the crosses as true F_1s and use of the selected F_1s to produce F_2 seeds and use making different types of crosses.

Materials and methods: Fifty-nine and twenty single crosses were grown in T. Aman and Boro season, respectively. The F_1 seeds along with their parents were germinated in petri dish and sown on puddled soil in earthen pots. Twenty-five-day-old to thirty-five-day-old seedlings was transplanted at 20 cm × 20 cm in the net house along with respective parents. Fertilizer and crop management was done following the protocol of Experiment 11.2. From flowering to maturity stage, the F_1 plants of each cross were compared with their respective parents for different phenotypic traits to identify true F_1s.

Results and discussion: A total of forty-five and eleven crosses in T. Aman and Boro season were selected and confirmed as true F_1 comparing with their parents respectively (**Table 11.2a** and **11.2b**) and registered in the BR Cross resister.

Table 11.2a: List of crosses confirmed, Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	BR Reg. No.	Crosses	Characteristics
1	BR15028	BR10005-25-8-4-7-20 /BR10537-7-2-1-3-2	High yield, high zinc
2	BR15029	BR10005-25-8-4-7-20 /BR7833-11-1-3-1-2-B1	High yield, high zinc
3	BR15030	BR10005-25-8-4-7-20 /BR8441-46-4-2-8	High yield, high zinc
4	BR15031	BR10022-2-8-9-5-22 /BR10535-5-1-2-4-1	High yield, high zinc
5	BR15032	BR10022-2-8-9-5-22 /BR7833-11-1-3-1-2-B1	High yield, high zinc
6	BR15033	BR10022-2-8-9-5-22 /BR7881-62-2-3-7-P3	High yield, high zinc
7	BR15034	BR10471-1-2-3-24-4 /BR10537-7-2-1-3-2	High yield, high zinc
8	BR15035	BR10471-1-2-3-24-4 /BR10542-4-2-1-2-1	High yield, high zinc
9	BR15036	BR10471-1-2-3-24-4 /BR7881-62-2-3-7-P3	High yield, high zinc
10	BR15037	BR10475-1-2-3-5-5/BR10537-7-2-1-3-2	High yield, high zinc
11	BR15038	BR10475-1-2-3-5-5/BR7833-11-1-3-1-2-B1	High yield, high zinc
12	BR15039	BR10475-1-2-3-5-5/BR7881-62-2-3-7-P3	High yield, high zinc
13	BR15040	BR10480-1-2-3-1-3 /BR10542-4-2-1-2-1	High yield, high zinc

SN	BR Reg. No.	Crosses	Characteristics
14	BR15043	BR10480-1-2-3-7-2/BR10537-7-2-1-3-2	High yield, high zinc
15	BR15045	BR10480-1-2-3-7-2/BR7881-62-2-3-7-P3	High yield, high zinc
16	BR15046	BR10490-1-2-3-11-3/BR10535-5-1-2-4-1	High yield, high zinc
17	BR15047	BR10490-1-2-3-11-3/BR10542-4-2-1-2-1	High yield, high zinc
18	BR15048	BR10490-1-2-3-11-3/BR8441-46-4-2-8	High yield, high zinc
19	BR15049	BR10490-1-2-3-8-7 /BR10537-7-2-1-3-2	High yield, high zinc
20	BR15051	BR10490-1-2-3-8-7 /BR7881-62-2-3-7-P3	High yield, high zinc
21	BR15053	BR10492-1-2-3-1-1 /BR7881-62-2-3-7-P3	High yield, high zinc
22	BR15054	BR10492-1-2-3-7-5 /BR10537-7-2-1-3-2	High yield, high zinc
23	BR15055	BR10492-1-2-3-7-5 /BR10542-4-2-1-2-1	High yield, high zinc
24	BR15056	BR10492-1-2-3-7-5 /BR7881-62-2-3-7-P3	High yield, high zinc
25	BR15057	BR10493-1-2-3-21-7 /BR10542-4-2-1-2-1	High yield, high zinc
26	BR15058	BR10493-1-2-3-21-7 /BR7879-17-2-4-HR3-P1	High yield, high zinc
27	BR15059	BR10493-1-2-3-21-7 /BR8441-46-4-2-8	High yield, high zinc
28	BR15060	BR10538-2-1-2-3-2/BR10535-5-1-2-4-1	High yield, high zinc
29	BR15062	BR10538-2-1-2-3-2/BR7881-62-2-3-7-P3	High yield, high zinc
30	BR15063	BR10540-4-1-2-4-1/BR10537-7-2-1-3-2	High yield, high zinc
31	BR15065	BR10540-4-1-2-4-1/BR8441-46-4-2-8	High yield, high zinc
32	BR15066	BR9674-1-1-5-2-P4 /BR10537-7-2-1-3-2	High yield, high zinc
33	BR15067	BR9674-1-1-5-2-P4 /BR10542-4-2-1-2-1	High yield, high zinc
34	BR15068	BR9674-1-1-5-2-P4 /BR7833-11-1-3-1-2-B1	High yield, high zinc
35	BR15069	BRRI dhan97/BR10535-5-1-2-4-1	High yield, high zinc
36	BR15072	BRRI dhan99/BR10537-7-2-1-3-2	High yield, high zinc
37	BR15074	IR101791-10-1-4-3-2-4 /BR7833-11-1-3-1-2-B1	High yield, high zinc
38	BR15075	IR101791-10-1-4-3-2-4 /BR7881-62-2-3-7-P3	High yield, high zinc
39	BR15076	IR101791-10-1-4-3-2-4 /BR8441-46-4-2-8	High yield, high zinc
40	BR15077	IR126952-41-148-38-9-60-B /BR10535-5-1-2-4-1	High yield, high zinc
41	BR15078	IR126952-41-148-38-9-60-B /BR10537-7-2-1-3-2	High yield, high zinc
42	BR15080	IR126952-41-148-38-9-60-B /BR7881-62-2-3-7-P3	High yield, high zinc
43	BR15081	IR16F1148 /BR10537-7-2-1-3-2	High yield, high zinc
44	BR15082	IR16F1148 /BR10542-4-2-1-2-1	High yield, high zinc
45	BR15084	IR16F1148 /BR7881-62-2-3-7-P3	High yield, high zinc

Table 11.2b: List of crosses confirmed, Development of Zinc Enriched Rice (ZER), Boro 2022-23

SN	BR Reg. No	Crosses	Characteristics
1	BR15385	BR9674-8-15-3-28-P3/ T27A	High yield, high zinc
2	BR15386	BR9674-3-9-2-1-P3/BR8441-46-4-2-8	High yield, high zinc
3	BR15387	BR9674-3-9-2-1-P3/ NSIC158	High yield, high zinc
4	BR15388	BR9674-7-3-2-2-P1/ BR10580-4-3-3-2	High yield, high zinc
5	BR15389	BR9674-7-3-2-2-P1/ BR7881-62-2-3-7-P3	High yield, high zinc
6	BR15390	BR9674-7-3-2-2-P1/ NSIC158	High yield, high zinc
7	BR15391	BR11716-4R-105/ BR7879-17-2-4-HR3-P1	High yield, high zinc
8	BR15393	BR11716-4R-105/ T27A	High yield, high zinc
9	BR15394	BR11712-4R-227/ BR8419-8-2-1-4-1-3-8-5	High yield, high zinc
10	BR15395	BR11712-4R-227/ NSIC158	High yield, high zinc
11	BR15396	BR11712-4R-227/ BR7879-17-2-4-HR3-P1	High yield, high zinc

Experiment 11.3: Advancing segregating progenies in FRGA nurseries

Principal Investigator: M A Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific objective: Rapid advancement of segregating population for shortening breeding cycle.

Materials and Methods: A total of 90,450 individual segregating progenies were grown during the reporting period. Among these, 30,800 progenies of 114 crosses were grown in T. Aman and 59,650 progenies of 169 crosses were grown in Boro season from F_2, F_3, F_4 and F_5 generations at Gazipur under field RGA condition. Twenty-five-day-old seedlings were transplanted at with a spacing of 5 cm × 5 cm using single seedling per hill in the field. Fertilizer management was same as in experiment 11.2. Weeding was done during the period of early seedling to maximum tillering stages. Thinning of tillers was practiced in maximum tillering stage and so on. At maturity, single mature tiller was harvested from each plant under field condition.

Results and discussion: A total of 79456 individual segregating progenies were harvested during the reporting period. Among these, 23,376 progenies of 114 crosses were harvested in T. Aman and 56,080 progenies of 169 crosses were harvested in Boro season from F_2, F_3, F_4 and F_5 generations at Gazipur under greenhouse and field RGA condition (**Table 11.3a and Table 11.3b**).

Table 11.3a: List of segregating progenies harvested from field RGA nurseries, Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	BR No.	Parentage	Panicle Harvested
F_2 Generation			
1	BR14391	BR10001-94-2-B/ BR7879-17-2-4-HR3-P1	238
2	BR14392	BR10001-94-2-B/ BR7840-34-4-2-2	216
3	BR14393	BR10001-94-2-B/ BR7528-2R-19-HR16-9-3-P7-2-2	273
4	BR14394	BR10001-94-2-B/ BR8444-37-2-3-1-1-B3	143
5	BR14395	BR9868-19-40-3-B/ IR99641-115-2-3	230
6	BR14396	BR9868-19-40-3-B/ BR7833-11-1-3-1-2-B1	258
7	BR14401	BR8442-12-1-3-1-B5/ BR7833-11-1-3-1-2-B2	294
8	BR14402	BR8442-12-1-3-1-B5/ BR8441-46-4-2-8	265
9	BR14403	BR8442-12-1-3-1-B5/ IR101760-48-1	165
10	BR14406	BR7528-2R-HR16-2-24-1/ BR7833-11-1-3-1-2-B1	338
11	BR14407	BR7528-2R-HR16-2-24-1/ BR7833-11-1-3-1-2-B2	256
12	BR14408	BR10534-2-3-2-1-1/ BR7833-11-1-3-1-2-B1	378
13	BR14409	BR10534-2-3-2-1-1/ IR101760-48-1	265
14	BR14410	BR10534-2-3-2-1-1/BR7528-2R-19-HR16-9-3-P7-2-2	319
15	BR14412	BR10534-2-3-2-1-1/ BR8444-37-2-3-1-1-B3	268
16	BR14413	BR10535-5-1-2-2-1/ BR8441-46-4-2-8	252
17	BR14414	BR10535-5-1-2-2-1/ BR7833-11-1-3-1-2-B2	378
18	BR14416	BR10535-5-1-2-2-1/ BR7840-34-4-2-2	356
19	BR14417	BR10535-5-1-2-2-1/ BR7833-11-1-3-1-2-B1	267
20	BR14418	HHZ5-DT20-DT2-DT1/ IR17A1080	258
21	BR14419	HHZ5-DT20-DT2-DT1/ IR101760-48-1	400
22	BR14420	HHZ5-DT20-DT2-DT1/ BR7833-11-1-3-1-2-B2	400
23	BR14421	HHZ5-DT20-DT2-DT1/ BR7881-62-2-3-7-P3	213
24	BR14428	BR8548-8-22-5-15/ BR8441-46-4-2-8	171
25	BR14429	BR8548-8-22-5-15/ BR7879-17-2-4-HR3-P1	141

SN	BR No.	Parentage	Panicle Harvested
26	BR14430	BR9158-19-9-6-50-2-HR1/ BR8444-37-2-3-1-1-B3	226
27	BR14431	BR9158-19-9-6-50-2-HR1/ IR99641-115-2-3	195
28	BR14432	IR13F441/ BR7879-17-2-4-HR3-P1	265
29	BR14435	IR13F441/ IR101760-48-1	253
30	BR14436	BR7528-2R-HR16-2-24-1/ IR17A1211	345
31	BR14437	BR7528-2R-HR16-2-24-1/ IR17A1080	271
		Total	**8,297**
F_3 Generation			
1	BR13837	BRRI dhan71/ BR9674-1-1-5-4-P4	240
2	BR13838	BRRI dhan73 / BR7528-2R-19-HR16-E5-136-1	246
3	BR13839	BRRI dhan79 / BR9674-1-1-5-4-P4	180
4	BR13840	BRRI dhan80/ BR7528-2R-19-HR16-E5-136-1	173
5	BR13841	BRRI dhan84/ BR9674-1-1-5-4-P4	245
6	BR13842	BR7528-2R-HR16-2-24-1/ BRRI dhan43	228
7	BR13843	BR8442-12-1-3-1-B1/ BRRI dhan42	218
8	BR13844	IR101760-48-1 / BRRI dhan43	236
9	BR13845	IR99641-115-2-3/ BR9674-1-1-5-4-P4	230
10	BR13846	BRRI dhan89/ BR 7881-62-2-3-7-P3	240
11	BR13847	BRRI dhan80/ BR9674-1-1-5-4-P4	245
12	BR13848	BRRI dhan84/ BR 7528-2R-19-HR16-E5-136-1	228
13	BR13849	BRRI dhan87/ BR9674-1-1-5-4-P4	248
14	BR13850	BR8444-37-2-3-1-1-B3/ BR9674-1-1-5-4-P4	230
15	BR13851	IR101760-48-1/ BRRI dhan42	258
16	BR13852	BRRI dhan80/ BR7528-2R-19-HR16-9-3-P7-2-2	250
17	BR13853	BRRI dhan87/ BR 7528-2R-19-HR16-E5-136-1	240
18	BR13854	BRRI dhan89/ BR9674-1-1-5-4-P4	235
		Total	**4,170**
F_4 Generation			
1	BR13263	BRRI dhan71/BR7833-11-1-3-1-2-B1	185
2	BR13264	BRRI dhan71/ BR7833-11-1-3-1-2-B2	196
3	BR13265	BRRI dhan71/BR8441-46-4-2-8	188
4	BR13266	BRRI dhan71/ BR 7881-62-2-3-7-P3	136
5	BR13267	BRRI dhan71/BR 7879-17-2-4-HR3-P1	200
6	BR13268	BRRI dhan71/BR7528-2R-19-HR16-9-3-P7-2-2	144
7	BR13269	BRRI dhan73/BR7833-11-1-3-1-2-B1	195
8	BR13270	BRRI dhan73/BR7833-11-1-3-1-2-B2	148
9	BR13271	BRRI dhan73/BR8441-46-4-2-8	177
10	BR13272	BRRI dhan73/ BR 7881-62-2-3-7-P3	153
11	BR13273	BRRI dhan73/BR 7879-17-2-4-HR3-P1	115
12	BR13274	BRRI dhan73/BR7840-34-4-2-2	173
13	BR13275	BRRI dhan73/BR7528-2R-19-HR16-9-3-P7-2-2	150
14	BR13276	BRRI dhan79/BR7833-11-1-3-1-2-B1	182
15	BR13277	BRRI dhan79/BR7833-11-1-3-1-2-B2	175
16	BR13278	BRRI dhan79/BR 7881-62-2-3-7-P3	136
17	BR13279	BRRI dhan79/BR 7879-17-2-4-HR3-P1	154
18	BR13281	BRRI dhan80/ BR 7881-62-2-3-7-P3	154
19	BR13282	BRRI dhan84/BR 7879-17-2-4-HR3-P1	167
20	BR13283	BR7528-2R-HR16-2-24-1/BR7528-2R-19-HR16 9-3-P7-2-2	138
21	BR13284	BR8410-16-4-17-9-1/BR7833-11-1-3-1-2-B1	148
22	BR13285	BR8410-16-4-17-9-1/BR7833-11-1-3-1-2-B2	172

SN	BR No.	Parentage	Panicle Harvested
23	BR13286	BR8410-16-4-17-9-1/BR8441-46-4-2-8	172
24	BR13287	BR8444-37-2-3-1-1-B3/BR8441-46-4-2-8	200
25	BR13288	BRRI dhan79/BR8444-37-2-3-1-1-B3	200
26	BR13289	BRRI dhan84/BR7833-11-1-3-1-2-B2	200
27	BR13290	BR7528-2R-16-2-24-1/BR7833-11-1-3-1-2-B1	170
		Total	**4,528**
F_5 Generation			
1	BR12686	BRRI dhan39/BR7528-2R-16-2-24-1	182
2	BR12687	BRRI dhan39/BR8410-16-4-17-9-1	130
3	BR12688	BRRI dhan39/BR7833-11-1-3-1-2-B1	168
4	BR12689	BRRI dhan39/BR8441-46-4-2-8	190
5	BR12690	BRRI dhan39/BR7881-62-2-3-7-P3	108
6	BR12691	BRRI dhan39/BR7879-17-2-4-HR3-P1	149
7	BR12693	BRRI dhan49/BR8410-16-4-17-9-1	144
8	BR12695	BRRI dhan49/BR8441-46-4-2-8	140
9	BR12696	BRRI dhan49/BR7881-62-2-3-7-P3	175
10	BR12697	BRRI dhan49/BR7879-17-2-4-HR3-P1	139
11	BR12698	BRRI dhan49/BR7840-34-4-2-2	180
12	BR12699	BRRI dhan52/BR7528-2R-HR16-2-24-1	169
13	BR12700	BRRI dhan52/BR8410-16-4-17-9-1	128
14	BR12701	BRRI dhan52/BR7833-11-1-3-1-2-B1	158
15	BR12702	BRRI dhan52/BR8441-46-4-2-8	152
16	BR12703	BRRI dhan52/BR7881-62-2-3-7-P3	146
17	BR12704	BRRI dhan52/BR7879-17-2-4-HR3-P1	160
18	BR12705	BRRI dhan52/BR7840-34-4-2-2	200
19	BR12708	BRRI dhan62/BR7840-34-4-2-2	200
20	BR12709	BRRI dhan63/BR7528-2R-HR16-2-24-1	154
21	BR12710	BRRI dhan63/BR8410-16-4-17-9-1	175
22	BR12711	BRRI dhan63/BR7833-11-1-3-1-2-B1	175
23	BR12712	BRRI dhan63/BR8441-46-4-2-8	130
24	BR12713	BRRI dhan63/BR7881-62-2-3-7-P3	168
25	BR12714	BRRI dhan63/BR7879-17-2-4-HR3-P1	183
26	BR12715	BRRI dhan63/BR7840-34-4-2-2	195
27	BR12716	BRRI dhan66/BR7528-2R-HR16-2-24-1	200
28	BR12717	BRRI dhan66/BR8410-16-4-17-9-1	198
29	BR12718	BRRI dhan66/BR7833-11-1-3-1-2-B1	174
30	BR12719	BRRI dhan66/BR8441-46-4-2-8	154
31	BR12720	BRRI dhan66/R7881-62-2-3-7-P3	193
32	BR12722	BRRI dhan66/BR7840-34-4-2-2	200
33	BR12723	BRRI dhan71/BR7528-2R-HR16-2-24-1	140
34	BR12724	BRRI dhan71/BR8410-16-4-17-9-1	200
35	BR12725	BRRI dhan71/BR7833-11-1-3-1-2-B1	180
36	BR12726	BRRI dhan71/R8441-46-4-2-8	144
37	BR12728	BRRI dhan71/BR7840-34-4-2-2	200
38	BR12729	BRRI dhan57/ BR7879-17-2-4-HR3-P1	200
		Total	**6,381**
Grand Total			**23,376**

Table 11.3b: List of segregating progenies harvested from field RGA nurseries, Development of Zinc Enriched Rice (ZER), Boro 2022-23

SN	BR No.	Parentage	Panicle Harvested
F_2 Generation			
1	BR14790	BR8912-12-6-1-1-1-1/BR9674-3-12-2-2-P1	350
2	BR14791	BR8912-12-6-1-1-1-1/BR8419-8-2-1-4-1-3-8-5	360
3	BR14792	BR8912-12-6-1-1-1-1/BR7840-54-3-4-3	390
4	BR14793	BR8912-12-6-1-1-1-1/BR7881-62-2-3-7-P3	340
5	BR14794	BR8912-12-6-1-1-1-1/BR8441-46-4-2-8	400
6	BR14795	BR8912-12-6-1-1-1-1/BR7833-11-1-3-1-2-B1	350
7	BR14796	IR105837-8-95-2-1 /BR8419-8-2-1-4-1-3-8-5	350
8	BR14797	IR105837-8-95-2-1 /BR7840-54-3-4-3	380
9	BR14798	IR105837-8-95-2-1 /BR7881-62-2-3-7-P3	330
10	BR14799	IR105837-8-95-2-1 /BR8441-46-4-2-8	400
11	BR14800	BRRI dhan102 /BR9674-3-12-2-2-P1	400
12	BR14801	BRRI dhan102 /BR8419-8-2-1-4-1-3-8-5	380
13	BR14802	BRRI dhan102 /BR7840-54-3-4-3	360
14	BR14803	BRRI dhan102 /BR7881-62-2-3-7-P3	400
15	BR14804	BRRI dhan102 /BR8441-46-4-2-8	390
16	BR14805	BRRI dhan102 /BR7833-11-1-3-1-2-B1	400
17	BR14806	BRRI dhan100/BR9674-3-12-2-2-P1	330
18	BR14807	BRRI dhan100/BR7840-54-3-4-3	390
19	BR14808	BRRI dhan100/BR7881-62-2-3-7-P3	400
20	BR14809	BRRI dhan100/BR7833-11-1-3-1-2-B1	380
21	BR14810	IR101791-10-1-4-3-2-4/BR7881-62-2-3-7-P3	300
22	BR14811	BRRI dhan97/BR9674-3-12-2-2-P1	400
23	BR14812	BRRI dhan97/BR8441-46-4-2-8	400
24	BR14813	BRRI dhan97/BR7833-11-1-3-1-2-B1	380
25	BR14814	BRRI dhan99/BR9674-3-12-2-2-P1	350
26	BR14815	BRRI dhan99/BR8419-8-2-1-4-1-3-8-5	350
27	BR14816	BRRI dhan99/BR7840-54-3-4-3	380
28	BR14817	BRRI dhan99/BR7881-62-2-3-7-P3	300
29	BR14818	BRRI dhan99/BR7879-17-2-4-HR3-P1	340
30	BR14819	BRRI dhan99/BR7833-11-1-3-1-2-B1	400
31	BR14820	BRRI dhan81/BR8441-46-4-2-8	330
32	BR14821	BRRI dhan81/BR7833-11-1-3-1-2-B1	400
33	BR14822	BRRI dhan88/BR9674-3-12-2-2-P1	400
34	BR14823	BRRI dhan88/BR8441-46-4-2-8	300
35	BR14824	BRRI dhan89/BR7840-54-3-4-3	390
36	BR14825	BRRI dhan89/BR7881-62-2-3-7-P3	350
37	BR14826	BRRI dhan89/BR8441-46-4-2-8	340
38	BR14827	BRRI dhan89/BR7833-11-1-3-1-2-B1	350
39	BR14828	BRRI dhan92/BR9674-3-12-2-2-P1	400
40	BR14829	BRRI dhan92/BR8419-8-2-1-4-1-3-8-5	380
41	BR14830	BRRI dhan92/BR8441-46-4-2-8	370
42	BR14831	BRRI dhan92/BR7833-11-1-3-1-2-B1	400
43	BR14832	BRRI dhan96/BR9674-3-12-2-2-P1	400
44	BR14833	BRRI dhan96/BR8419-8-2-1-4-1-3-8-5	390
45	BR14834	BRRI dhan96/BR7840-54-3-4-3	400
46	BR14835	BRRI dhan96/BR7879-17-2-4-HR3-P1	300
47	BR14836	BRRI dhan96/BR8441-46-4-2-8	390
48	BR14837	BRRI dhan96/BR7833-11-1-3-1-2-B1	340

SN	BR No.	Parentage	Panicle Harvested
49	BR14838	IR64-pi9 NILS /BR9674-3-12-2-2-P1	400
50	BR14839	IR64-pi9 NILS /BR8419-8-2-1-4-1-3-8-5	380
51	BR14840	IR64-pi9 NILS /BR7881-62-2-3-7-P3	320
52	BR14841	7 FBR-336/BR9674-3-12-2-2-P1	390
53	BR14842	7 FBR-355 /BR9674-3-12-2-2-P1	330
54	BR14843	7 FBR-355 /BR8419-8-2-1-4-1-3-8-5	350
55	BR14844	7 FBR-355 /BR7840-54-3-4-3	380
56	BR14845	7 FBR-355 /BR7881-62-2-3-7-P3	400
57	BR14846	7 FBR-355 /BR8441-46-4-2-8	400
58	BR14847	7 FBR-355 /BR7833-11-1-3-1-2-B1	300
		Total	**21,360**
F_3 Generation			
1	BR14106	BRRI dhan88/BR9966-12-5-6-3-2	350
2	BR14107	BRRI dhan88/BRRI dhan100	380
3	BR14108	BRRI dhan88/BR7881-62-2-3-7-P3	340
4	BR14109	BRRI dhan88/BR7879-17-2-4-HR3-P1	350
5	BR14110	BRRI dhan88/BR7840-54-3-4-3	400
6	BR14111	BRRI dhan89/IR105837-8-95-2-1	400
7	BR14112	BRRI dhan89/IR99285-1-1-1-P1	390
8	BR14113	BRRI dhan89/BRRI dhan102	330
9	BR14114	BRRI dhan89/BR9966-12-5-6-3-2	350
10	BR14115	BRRI dhan67/BR9966-12-5-6-3-2	420
11	BR14116	BRRI dhan67/BRRI dhan100	350
12	BR14117	BRRI dhan67/BRRI dhan102	430
13	BR14118	BRRI dhan67/IR99285-1-1-1-P1	450
14	BR14119	BRRI dhan67/IR105837-8-95-2-1	380
15	BR14120	IR83484-3-B-7-1-1-1/BR9966-12-5-6-3-2	400
16	BR14121	IR83484-3-B-7-1-1-1/BRRI dhan102	380
17	BR14122	IR83484-3-B-7-1-1-1/IR99285-1-1-1-P1	400
18	BR14123	IR83484-3-B-7-1-1-1/IR105837-8-95-2-1	300
19	BR14124	IR83484-3-B-7-1-1-1/BR8912-12-6-1-1-1-1	340
20	BR14125	IR83484-3-B-7-1-1-1/BRRI dhan100	380
21	BR14126	BRRI dhan92/BR7840-54-3-4-3	400
22	BR14127	BRRI dhan92/BR7881-62-2-3-7-P3	300
23	BR14128	BRRI dhan92/BR7879-17-2-4-HR3-P1	300
24	BR14129	BRRI dhan92/IR105837-8-95-2-1	280
25	BR14130	BRRI dhan92/IR99285-1-1-1-P1	300
26	BR14131	BRRI dhan92/BRRI dhan102	350
27	BR14132	BRRI dhan92/BR9966-12-5-6-3-2	400
28	BR14133	Rata Boro/BR9966-12-5-6-3-2	390
29	BR14134	Rata Boro/BRRI dhan102	330
30	BR14135	Rata Boro/IR99285-1-1-1-P1	300
31	BR14137	BRRI dhan81/BR9966-12-5-6-3-2	300
32	BR14138	BRRI dhan81/BRRI dhan100	300
33	BR14139	BRRI dhan81/BRRI dhan102	340
34	BR14140	BRRI dhan81/IR99285-1-1-1-P1	360
35	BR14141	BRRI dhan81/IR105837-8-95-2-1	300
36	BR14142	BRRI dhan100/BR9966-12-5-6-3-2	300
37	BR14143	BRRI dhan100/BR7840-54-3-4-3	260
38	BR14144	BRRI dhan100/BR7881-62-2-3-7-P3	300
39	BR14145	BRRI dhan100/BR7879-17-2-4-HR3-P1	300
40	BR14146	BRRI dhan102/BR7840-54-3-4-3	400

SN	BR No.	Parentage	Panicle Harvested
41	BR14147	BRRI dhan102/BR7881-62-2-3-7-P3	340
42	BR14148	BRRI dhan102/BR7879-17-2-4-HR3-P1	400
43	BR14149	BRRI dhan102/IR105837-8-95-2-1	440
44	BR14150	BRRI dhan102/Rata Boro	400
45	BR14151	BR9966-12-5-6-3-2/BR7881-62-2-3-7-P3	400
46	BR14152	BR9966-12-5-6-3-2/BR7879-17-2-4-HR3-P1	450
47	BR14153	BR9966-12-5-6-3-2/BR7840-54-3-4-3	400
48	BR14154	IR105837-8-95-2-1/IR99285-1-1-1-P1	350
49	BR14155	IR105837-8-95-2-1/BRRI dhan102	340
		Total	**17,550**
F_4 Generation			
1	BR13570	BRRI dhan81/ BR7879-17-2-4-HR3-P1	300
2	BR13571	BRRI dhan81/ BR7881-62-2-3-7-P3	250
3	BR13572	BRRI dhan81/ BRRI dhan43	200
4	BR13573	BRRI dhan81/ BRRI dhan42	330
5	BR13574	BRRI dhan81/ BR7840-54-3-4-3	300
6	BR13575	BRRI dhan89/ BR7879-17-2-4-HR3-P1	350
7	BR13576	BRRI dhan89/ BR7881-62-2-3-7-P3	380
8	BR13577	BRRI dhan89/ BRRI dhan43	250
9	BR13578	BRRI dhan89/ BRRI dhan42	350
10	BR13579	BRRI dhan89/ BR7840-54-3-4-3	240
11	BR13580	BRRI dhan67/ BRRI dhan42	200
12	BR13581	BRRI dhan67/ BR7840-54-3-4-3	250
13	BR13582	BRRI dhan67/ BRRI dhan43	300
14	BR13583	IR83484-3-B-7-1-1-1(salt)/ BRRI dhan43	250
15	BR13584	IR83484-3-B-7-1-1-1(salt)/ BRRI dhan42	380
16	BR13585	IR87870-6-1-1-1-1-B (salt)/ BRRI dhan43	300
17	BR13586	IR87870-6-1-1-1-1-B (salt)/ BR7879-17-2-4-HR3-P1	150
18	BR13588	BRRI dhan102/ BR7881-62-2-3-7-P3	300
19	BR13589	BRRI dhan102/ BRRI dhan42	330
20	BR13590	BR8912-12-6-1-1-1-1/ BR7879-17-2-4-HR3-P1	300
21	BR13591	BR8912-12-6-1-1-1-1/ BRRI dhan43	300
22	BR13592	IR105837-8-83-1-1/ BR7840-54-3-4-3	390
23	BR13593	IR105837-8-83-1-1/BR7881-62-2-3-7-P3	250
24	BR13594	IR105837-8-95-2-1/ BRRI dhan42	240
25	BR13595	IR105837-8-95-2-1/ BR7881-62-2-3-7-P3	200
26	BR13596	BR8634-23-1-1-BHA-2/ BR7840-54-3-4-3	300
27	BR13598	IR105837-8-95-2-1/ BRRI dhan43	200
28	BR13599	BR8634-23-1-1-BHA-5/ BRRI dhan42	300
29	BR13600	BR8634-23-1-1-BHA-5/ BR7879-17-2-4-HR3-P1	350
30	BR13601	Rata Boro/ BR7879-17-2-4-HR3-P1	200
31	BR13604	BRRI dhan42/ Rata Boro	150
32	BR13605	BR 7879-17-2-4-HR3-P1/ Rata Boro	300
33	BR13606	IR100722-B-B-B-1-1/ BRRI dhan42	340
34	BR13607	IR100722-B-B-B-1-1/ BRRI dhan43	300
35	BR13608	IR100722-B-B-B-1-1/ BR 7879-17-2-4-HR3-P1	250
36	BR13609	IR100722-B-B-B-1-1/ BR 7881-62-2-3-7-P3	240
37	BR13610	BR8631-12-3-6-P3/BRRI dhan42	240
38	BR13611	BR8631-12-3-6-P3/BRRI dhan43	380
		Total	**10,640**
F_5 Generation			
1	BR13060	BRRI dhan28/BR8258-7-1-5-2B4	300

SN	BR No.	Parentage	Panicle Harvested
2	BR13061	BRRI dhan29/BR7833-19-2-3-5-P1	300
3	BR13062	BRRI dhan42/BR7840-54-3-4-3	280
4	BR12027	BRRI dhan50/BR7879-17-2-4-HR3-P1	300
5	BR13064	BRRI dhan60/BR7528-2R-19-16-RIL-51	300
6	BR13065	BRRI dhan63/BR7881-62-3-7-P3	270
7	BR13066	BRRI dhan81/BR7879-17-2-4-HR3-P1	300
8	BR13067	BR7879-17-2-4-HR3-P1/BR7528-2R-19-16-RIL-51	250
9	BR13068	BRRI dhan43/BR7879-17-2-4-HR3-P1	300
10	BR13069	BRRI dhan63/BR8258-7-1-5-2B4	280
11	BR13070	BRRI dhan81/BR7840-54-3-4-3	230
12	BR13071	BRRI dhan28/BR7528-2R-19-16-RIL-51	300
13	BR13072	BRRI dhan28/IR95132-12-8-6-8-GBS	300
14	BR13073	BRRI dhan28/IR99676-17-1-1	300
15	BR13074	BRRI dhan42/IR99676-17-1-1	280
16	BR13075	BRRI dhan42/IR95132-12-8-6-8-GBS	300
17	BR13076	BRRI dhan42/BR7528-2R-19-16-RIL-51	300
18	BR13077	BRRI dhan42/BR8258-7-1-5-2B4	250
19	BR13078	BRRI dhan43/IR99676-17-1-1	280
20	BR13079	BRRI dhan43/IR95132-12-8-6-8-GBS	300
21	BR13080	BRRI dhan43/BR7528-2R-19-16-RIL-51	230
22	BR13081	BRRI dhan60/BR8258-7-1-5-2B4	300
23	BR13082	BRRI dhan81/IR99676-17-1-1	280
24	BR13083	BRRI dhan81/IR95132-12-8-6-8-GBS	300
		Total	**6530**
		Grand Total	**56,080**

Experiment 11.4: Line Stage Testing (LST)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific objectives: To select uniform genotypes in terms of plant height and days to flowering with key target traits.

Materials and Method: Total 2,856 progenies from 16 crosses were grown in T. Aman season and 7,065 progenies from 27 crosses in Boro season in a 2.6 m single-row plot with a spacing of 20 cm × 20 cm in the field using systematic arrangement design. Thirty--day-old single seedling was transplanted at 20 cm × 20 cm in the plots. Fertilizer and crop management was done following the protocol described in experiment 11.2. Leaf samples were collected from single plant of selected entries for genotyping with trait markers using trait-based SNP markers. Selection was done considering uniformity in plant height, days to flowering, grain size and shape, lodging tolerance and tolerance to major disease and insect over check varieties under field condition and presence of target key traits. Additionally, five plants were harvested from selected LST lines to compare the grain weight among selected progenies of same cross combination.

Results: Initially 239 LST lines in T. Aman and 484 LST lines in Boro were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape **(Table 11.4a** and **11.4b).**

Table 11.4a: List of selected genotypes Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	BR Reg. No.	Parentage	No. of lines	
			Transplanted	Selected
F_6 generation				
1	BR12143	BRRI dhan32/BR7528-2R-19-16-RIL-50	386	32
2	BR12144	BRRI dhan49/BRRI dhan42	253	21
3	BR12145	BRRI dhan49/BR7528-2R-19-16-RIL-50	606	30
4	BR12146	BRRI dhan32/IR91143-AC3-1	346	30
5	BR12147	BRRI dhan50/HUA 565	124	11
6	BR12149	BRRI dhan50/SHIMBALT	78	7
7	BR12150	BRRI dhan50/LALSHITA::IRGC 4395-1	178	13
8	BR12152	BRRI dhan62/KLALIA::IRGC 34699-1	63	8
9	BR12153	HUA 565/IR91143-AC 19-1	166	10
F_7 generation				
1	BR11665	BRRI dhan32/ BR7840-34-4-2-2	122	10
2	BR11666	BRRI dhan49/ BR8441-46-4-2-8	114	11
3	BR11667	BRRI dhan49/ BR7879-17-2-4-HR3-P1	114	8
4	BR11669	BRRI dhan52/ BR8441-46-4-2-8	191	20
5	BR11672	BRRI dhan66/ BR7879-17-2-4-HR3-P1	50	10
6	BR11673	IR82589-B-B-84-3/ BR7879-17-2-4-HR3-P1	30	8
7	BR11679	BRRI dhan52/ Juma	35	10
		Total	**2,856**	**239**

Table 11.4b: List of selected genotypes Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), Boro 2022-23

SN	BR Reg. No.	Parentage	Progenies transplanted	Selected lines
1	BR11411	BRRI dhan28 / LORI	45	2
2	BR11412	BRRI dhan28 / SHONI	90	9
3	BR11413	BRRI dhan28 / KALI SAITA	30	2
4	BR11416	BRRI dhan28 / PORANGI	105	3
5	BR11417	BRRI dhan28 / BOTWESWOR	75	2
6	BR11418	BRRI dhan28 / LOLA DAMA	135	3
7	BR11420	BRRI dhan28 / CHENGRI	150	11
8	BR11422	BRRI dhan58 / LORI	180	13
9	BR11423	BRRI dhan58 / KALI SAITA	240	29
10	BR11427	BRRI dhan58 / KALA SAITA	135	5
11	BR11430	BRRI dhan58 / BR239-19-4-3-1	75	9
12	BR11431	BRRI dhan58 / JUMA	480	17
13	BR11432	BRRI dhan58 / LOLA DAMA	210	3
14	BR11433	BRRI dhan58 / BITHRI	135	11
15	BR11435	BRRI dhan58 / BAWLA	75	2
16	BR11437	BRRI dhan58 / KHUDEY BORA	120	7
17	BR12025	BRRI dhan28/BR7840-34-4-2-2	555	58
18	BR12026	BRRI dhan50/BR7528-2R-19-16-RIL-50	810	66
19	BR12027	BRRI dhan50/BR7879-17-2-4-HR3-P1	555	24
20	BR12028	BRRI dhan50/BR7833-11-1-3-1-2-B-1	660	52
21	BR12030	BRRI dhan50/BR7840-34-4-2-2	315	23
22	BR12031	BRRI dhan63/BR7528-2R-19-16-RIL-50	315	23
23	BR12033	BRRI dhan63/BR7879-17-2-4-HR3-P1	240	6

SN	BR Reg. No.	Parentage	Progenies transplanted	Selected lines
24	BR12035	BRRI dhan63/BR7840-34-4-2-2	60	4
25	BR12036	BR7528-2R-19-16-RIL-51/BR7833-11-1-3-1-2-B-2	750	61
26	BR12038	IR95029:2-8-23-3-3-GBS/BR7840-34-4-2-2	480	35
27	BR12041	IR99676-17-1-1/ BR7833-11-1-3-1-2-B-2	45	4
		Total	**7,065**	**484**

Experiment 11.5: Observational Trial (OT)

Principal Investigator: M. A. Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific Objective: To select genetically fixed lines with desirable agronomic characters viz, homogeneity in flowering with less or no unproductive tiller, intermediate plant height, short growth duration, acceptable grain quality, zinc content and high yield potential.

Materials and methods: A total of 70 phenotypically fixed genotypes were evaluated along with five standard check varieties BRRI dhan39, BRRI dhan49, BRRI dhan62, BRRI dhan72 and BRRI dhan87 in T. Aman season. Twenty-five-day-old seedlings in T. Aman of each genotype were transplanted in 5.4 m×4 rows plot using single seedling at a spacing of 20 cm ×20 cm in augmented RCB design. Fertilizer and crop management was done as in Experiment no. 11.2. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease infestation score, yield per plot of the selected entries along with checks were recorded.

Results: In T. Aman, a total of 15 genotypes selected from 70 genotypes based on their performances and grain yield in comparison to check varieties. (**Table 11.5a**).

Table 11.5a: List of selected materials from Observational Trial (OT), Development of Zinc Enriched Rice (ZER), T. Aman, 2022-23

SN	Designation	Plant Height (cm)	Growth duration (days)	Grain yield (t/ha)	Zn content (mg/kg)	PAcp (Maturity)
1	BR11664-3R-2-1**	142	135	6.25	22.2	5
2	BR11664-3R-2-2	126	143	5.64	20.3	5
3	BR11664-3R-2-3**	136	133	6.87	23.5	5
4	BR11664-3R-5-2	137	119	5.53	20.7	5
5	BR11664-3R-5-3	131	118	5.68	22.8	5
6	BR11665-3R-3-2	134	131	5.58	20.2	5
7	BR11665-3R-3-5	136	130	5.67	21.3	5
8	BR11665-3R-5-2**	130	113	6.33	19.7	5
9	BR11665-3R-5-3	137	128	5.56	26.1	5
10	BR11665-3R-5-7	135	134	6.05	25.4	5
11	BR11665-3R-10-2**	130	131	6.67	23.6	5
12	BR11665-3R-10-3	129	130	5.53	24.2	5
13	BR11665-3R-10-4**	141	129	7.14	21.4	5
14	BR11665-3R-10-6	135	131	5.58	25.0	5
15	BR11665-3R-10-7	135	131	5.9	25.9	5
16	BR11666-3R-6-2**	114	131	6.48	22.0	5
17	BR11666-3R-12-2	137	130	5.55	22.1	5
18	BR11666-3R-19-4	132	134	5.5	25.7	7
19	BR11667-3R-19-3	140	133	5.68	26.2	7
20	BR11669-3R-17-1	124	114	5.55	22.7	7

21	BR11669-3R-17-2	121	131	5.66	22.3	5
22	BR11670-3R-5-6	121	129	5.76	19.9	5
23	BR11670-3R-8-2	127	132	5.85	23.1	5
24	BR11670-3R-10-2	125	125	5.51	20.3	5
25	BR11670-3R-10-6	129	115	5.57	21.6	5
26	BR11670-3R-10-7	133	133	5.7	23.8	5
27	BR11672-3R-3-1**	157	119	7.05	23.9	5
28	BR11672-3R-3-2**	143	119	6.43	25.3	5
29	BR11672-3R-3-3	138	131	5.84	27.5	5
30	BR11672-3R-3-4**	153	119	6.76	24.8	5
31	BR11672-3R-6-3**	138	119	6.8	22.1	5
32	BR11672-3R-9-2	136	128	5.64	22.8	5
33	BR11672-3R-13-1**	136	127	6.23	24.5	5
34	BR11672-3R-13-4	144	128	5.79	21.3	7
35	BR11673-3R-5-1	135	130	5.85	21.5	5
36	BR11673-3R-5-3	134	130	5.7	20.7	5
37	BR11673-3R-5-6	135	130	5.5	24.5	5
38	BR11673-3R-10-2	131	126	5.56	25.4	5
39	BR11673-3R-10-3	128	127	5.5	21.0	5
40	BR11673-3R-10-5	135	128	5.7	20.6	5
41	BR11674-3R-4-5	132	117	5.67	21.3	7
42	BR11674-3R-6-4	147	126	5.53	21.9	7
43	BR11674-3R-10-2	148	131	6.02	19.9	5
44	BR11675-3R-9-1**	139	118	6.62	20.2	5
45	BR11675-3R-9-5	143	124	5.71	20.5	5
46	BR11679-3R-3-2	138	132	5.57	27.4	7
47	BR11679-3R-3-4	151	122	5.78	22.3	5
48	BR11679-3R-3-5	164	134	5.77	23.9	7
49	BR11679-3R-6-4	160	128	5.59	22.3	5
50	BR11679-3R-8-3	116	126	5.84	21.5	5
51	BR11679-3R-8-4	138	131	5.63	22.3	5
52	BR12144-3R-1	115	113	5.61	23.6	5
53	BR12144-3R-4	119	130	5.5	20.7	5
54	BR12144-3R-7	127	117	5.61	21.3	7
55	BR12144-3R-12	123	129	5.66	25.0	7
56	BR12145-3R-5**	135	114	6.23	26.8	5
57	BR12145-3R-15	143	130	5.58	23.6	5
58	BR12145-3R-19**	138	129	6.22	18.5	5
59	BR12145-3R-25**	122	133	6.32	19.3	5
60	BR12145-3R-29	130	131	5.97	21.7	5
61	BR12145-3R-31	129	147	5.58	22.6	5
62	BR12146-3R-1	125	118	5.62	24.6	5
63	BR12146-3R-2	138	123	5.97	23.1	5
64	BR12146-3R-10	122	114	5.65	21.5	5
65	BR12146-3R-13	130	131	5.52	23.0	5
66	BR12146-3R-17	131	123	5.91	24.1	5
67	BR12146-3R-18	132	119	5.94	22.3	7
68	BR12146-3R-37	135	123	5.53	25.0	5
69	BR12147-3R-10	113	132	5.61	25.0	5
70	Farmers Seed (Khagrachori)	123	132	5.52	19.0	5
71	BRRI dhan72 (Ck)	126	127	5.99	22.8	5
72	BRRI dhan39 (Ck)	117	118	5.72	18.3	5
73	BRRI dhan49 (Ck)	111	131	5.55	17.4	5

74	BRRI dhan62 (Ck)	106	106	5.59	19.2	5
75	BRRI dhan87 (Ck)	126	124	6.1	18.5	5
	LSD (0.05)	**7.81**	**4.01**	**0.84**		
	H2b	**0.92**	**0.96**	**0.43**		

****Selected genotypes** **D/S: 28/06/22** **D/T: 27/07/22**

Experiment 11.6: Preliminary Yield Trial (PYT)

Principal Investigator: M A Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific objectives: Evaluation of initial yield potential in a replicated trial.

Materials and methods: A total of 56 entries in PYT#1 and PYT#2 were evaluated in T. Aman and another 61 entries in Boro season were evaluated against standard check varieties. Twenty-six-days-old seedlings of each genotype were transplanted with three replications along with five standard check varieties namely BRRI dhan39, BRRI dhan62, BRRI dhan72, BRRI dhan87 and BRRI dhan49 in T. Aman; and in Boro, thirty-seven-day-old seedlings of each genotype were transplanted with three replications along with four standard check varieties namely BRRI dhan28, BRRI dhan29, BRRI dhan74 and Bangabandhu dhan100. In both season, seedlings were transplanted in 5.4 m × 10 rows plots. Single seedling was transplanted at a spacing of 20 cm × 15 cm. Fertilizer and crop management was done as in experiment no. 11.2. Data on days to flowering, maturity, plant height phenotypic acceptance, disease infestation score and yield per plot were recorded.

Results and discussion: In T. Aman season, 08 genotypes were selected from PYT#1 and PYT#2 based on better grain yield and other agronomic performances **(Table 11.6a)**. In Boro season, 12 genotypes were selected from PYT. The selected genotypes were better than check varieties in terms of grain yield and other agronomic performances **(Table 11.6b)**.

Table 11.6a: Yield performances of the genotypes of Preliminary Yield Trial (PYT), Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type	Amylose %	PAcp (M)
PYT#1								
1	BR11136-3-2-4-4	125.7	117	6.108	15.1	LB	23.1	5
2	BR11136-3-3-7-4	131.4	109	5.614	21.6	LS	17.7	5
3	BR11137-2-2-7-3	143.0	118	5.876	22.4	LS	21.3	5
4	BR11139-30-3-3-2	125.3	115	4.732	16.7	MB	23.4	5
5	BR11139-30-3-9-5	125.1	113	5.068	17.4	MB	24.1	5
6	BR11140-4-5-4-3**	124.1	111	5.529	22.6	LB	27.3	5
7	BR11140-4-5-4-4	122.0	118	5.422	20	MB	26.0	5
8	BR11142-13-4-4-3**	122.7	117	5.802	22.4	MB	23.8	5
9	BR11142-32-3-2-1	117.8	112	5.949	14.2	LB	26.3	5
10	BR11143-2-1-1-3	119.1	109	4.982	20.6	LS	21.1	5
11	BR11143-2-1-4-5	119.7	109	5.261	18.5	LS	21.0	5
12	BR11143-5-3-6-3	122.7	112	5.406	22.2	LS	21.8	5
13	BR11144-6-1-1-3	124.0	115	5.478	26.1	MB	13.9	7
14	BR11146-1-4-2-3	117.3	106	4.614	24.7	LS	20.8	7
15	BR11146-1-4-2-4	125.8	113	4.225	25.3	MB	21.3	7
16	BR11146-1-4-4-6	139.8	112	4.513	26.5	MS	19.5	7
17	BR11148-1-3-6-1	134.4	109	4.469	21.3	MB	16.8	5
18	BR11151-1-6-2-4**	113.6	111	5.355	23.4	MB	25.4	5
19	BR11153-1-2-5-1	131.9	119	5.774	21.8	LS	26.4	5

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type	Amylose %	PAcp (M)
20	BR11157-1-3-4-8	130.6	112	5.108	21.9	LS	24.3	5
21	BRRI dhan39 (CK)	116.2	118	5.554	18.3	LB	26.4	5
22	BRRI dhan49 (CK)	114.2	127	5.750	16.4	MB	25.5	5
23	BRRI dhan62 (CK)	105.4	101	5.070	19.4	LS	22.6	5
24	BRRI dhan72 (CK)	122.9	126	5.850	22.4	LB	26.1	5
25	BRRI dhan87 (CK)	123.2	125	5.810	18.5	LS	26.6	5
	SED	**2.71**	**0.51**	**0.38**				
	LSD (0.05)	**5.32**	**0.99**	**0.74**				
	H2b	**0.95**	**1**	**0.73**				

****Selected genotypes** **D/S: 28/06/2022** **D/T: 20/07/2022**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type	Amylose %	PAcp (M)
PYT#2								
1	BR11135-20-1-3-3	115.1	126	5.750	15.6	LS	24.1	5
2	BR11135-20-3-6-2	122.0	122	4.874	21.1	LS	26.3	7
3	BR11136-3-3-6-3	134.6	135	5.050	22.0	LB	24.5	7
4	BR11136-3-2-4-2	134.0	132	5.617	21.5	LS	24.8	5
5	BR11137-2-2-2-3	145.5	125	5.701	20.0	MB	23.6	7
6	BR11138-1-2-2-3	147.1	132	4.456	21.5	MB	25.2	5
7	BR11139-3-2-4-2	133.6	131	5.603	16.2	MB	18.9	5
8	BR11139-3-5-2-4	136.7	130	5.862	15.1	LB	24.9	5
9	BR11139-30-3-1-3	141.5	131	5.892	16.0	MB	25.0	5
10	BR11140-4-4-2-2	126.2	120	6.164	19.4	MB	24.2	5
11	BR11140-4-4-2-6**	106.6	129	5.692	21.6	MB	24.6	5
12	BR11140-4-4-7-2	126.1	120	5.198	18.6	SB	25.6	5
13	BR11140-4-4-7-4	107.2	131	5.477	19.3	MB	25.7	5
14	BR11140-4-5-1-1	130.6	122	5.301	18.9	SB	25.6	5
15	BR11140-4-6-1-1	114.9	117	5.773	18.6	MB	25.6	5
16	BR11141-4-5-7-2	116.8	128	4.761	24.3	SR	23.8	5
17	BR11141-4-5-7-5	126.7	122	5.603	21.0	SR	23.9	5
18	BR11142-13-4-4-1	116.3	131	5.598	16.5	MB	15.6	5
19	BR11143-5-3-3-4**	120.9	130	6.096	21.7	LS	24.5	5
20	BR11148-1-3-2-4	115.3	130	5.446	26.8	LS	21.5	5
21	BR11148-1-3-6-4	122.3	116	4.685	19.8	LB	25.7	7
22	BR11148-1-3-6-5	116.6	122	4.977	25.6	LB	16.6	7
23	BR11151-1-4-2-6	127.8	121	4.060	28.2	MB	20.4	7
24	BR11153-1-2-2-3	91.9	122	5.365	21.3	MB	24.1	7
25	BR11153-1-2-2-5**	133.7	127	5.712	25.0	LS	24.0	5
26	BR11153-5-1-1-1**	135.5	121	5.628	23.3	LS	25.4	7
27	BR11153-5-1-1-2	139.5	120	5.347	21.1	LS	25.2	7
28	BR11153-5-1-1-4	124.4	120	5.144	19.0	MB	25.7	5
29	BR11153-5-1-6-4	140.3	130	4.565	20.8	MB	21.2	7
30	BR11153-5-1-6-5	137.2	132	5.145	22.5	LS	25.8	5
31	BR11173-2-2-6-4	137.1	130	4.101	22.3	MB	24.6	5
32	BR11173-2-2-6-5	127.2	133	5.843	19.2	MB	21.7	5
33	BR11174-1-2-3-5**	142.2	132	5.409	26.9	LB	24.5	7
34	BR11175-4-3-6-3	142.4	124	4.914	20.4	MB	24.6	7
35	BR11176-4-3-5-2	148.9	134	5.709	21.2	LS	24.5	7
36	BR11176-13-1-2-4	139.6	133	5.096	22.2	LS	23.5	7

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type	Amylose %	PAcp (M)
37	BRRI dhan39 (CK)	113.7	116	5.272	18.3	LB	26.1	5
38	BRRI dhan49 (CK)	109.9	132	5.680	16.4	MB	24.9	5
39	BRRI dhan62 (CK)	110.0	104	4.870	19.4	LS	25.7	5
40	BRRI dhan72 (CK)	121.9	129	5.620	22.4	LB	27.2	5
41	BRRI dhan87 (CK)	125.3	125	5.590	18.5	LS	26.6	5
	SED	9.02	0.72	0.36				
	LSD (0.05)	17.67	1.41	0.70				
	H2b	0.76	0.99	0.74				

****Selected genotypes** **D/S: 25/06/2022** **D/T: 19/07/2022**

Table 11.6b: Yield performance of genotypes of Preliminary Yield Trial (PYT), Development of Zinc Enriched Rice (ZER), Boro 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type	Amylo se (%)	PAcp (M)
1	BR11397-10-5-1-2	98.0	152	7.000	22.5	LS	24.0	5
2	BR11397-23-5-5-1	103.7	153	6.659	19.1	LS	25.0	5
3	BR11397-47-1-3-1	105.7	149	6.959	21.4	LS	24.8	5
4	BR11397-47-1-7-1	104.4	153	7.316	20.2	LS	26.2	5
5	BR11397-6-1-1-3	101.8	150	6.860	21.3	MB	24.8	5
6	BR11400-15-5-3-3	108.6	151	7.622	22.1	MB	15.3	5
7	BR11400-8-5-2-1	102.0	153	6.527	22.9	LB	15.1	5
8	BR11400-9-5-7-3	107.3	151	6.521	22.9	LS	21.5	5
9	BR11401-1-2-4-1**	104.4	149	8.030	20.2	MB	26.2	5
10	BR11401-10-5-1-1	106.3	151	6.671	22.5	LS	23.0	5
11	BR11401-6-5-1-2	98.5	151	7.011	20.7	-	-	5
12	BR11401-8-3-1-1**	99.2	152	7.532	22.3	MB	23.3	5
13	BR11401-9-7-1-1	105.8	151	6.565	23.3	MB	25.9	5
14	BR11403-8-5-4-1	103.7	150p	6.803	22.5	MB	26.2	5
15	BR11405-6-2-3-2	108.1	148	5.882	25.3	LB	24.9	5
16	BR11406-4-2-4-2	100.8	152	6.828	18.9	LB	18.8	5
17	BR11406-8-6-1-3**	110.2	154	8.291	19.2	MB	23.4	5
18	BR11406-8-6-4-3	111.5	153	6.843	17.5	LB	25.7	5
19	BR11407-34-1-2-2	105.1	150	7.065	23.8	MB	15.8	5
20	BR11407-43-3-1-2	107.5	150	7.253	21.4	MB	25.1	5
21	BR12025-31-2-1	103.7	158	5.972	20.2	LS	26.7	5
22	BR12025-83-2-2	103.6	149	7.106	19.8	LB	20.7	5
23	BR12026-110-1-3	98.1	150	6.773	22.6	LS	21.1	5
24	BR12026-154-3-3	97.2	153	6.652	22.9	LS	22.5	5
25	BR12026-213-1-2	104.9	150	6.830	21.7	LS	22.6	5
26	BR12026-302-1-1	105.5	153	6.740	21.3	LS	26.9	5
27	BR12027-72-2-2	113.7	157	5.940	25.6	LS	24.2	5
28	BR12027-87-4-3	105.2	154	6.686	27.7	MS	26.6	5
29	BR12028-102-4-1	86.6	152	7.709	24	LS	15.3	5
30	BR12028-112-2-2	106.5	153	5.976	21.5	LB	26.5	5
31	BR12028-126-5-3	108.0	154	6.345	19.9	LS	20.0	5
32	BR12028-142-4-3	100.5	151	6.497	23.4	LB	26.9	5
33	BR12030-92-5-1	98.6	152	7.258	26.8	LS	22.1	5
34	BR12031-98-2-2	106.9	152	7.175	26.8	LS	25.8	5
35	BR12034-8-2-2	106.4	149	6.480	22.5	LS	25.5	5
36	BR12034-8-4-2	93.9	149	5.710	24.8	LS	25.3	5
37	BR12035-14-2-1	105.8	151	7.626	25.9	LB	15.0	5
38	BR12035-20-1-1	107.2	152	7.505	22	MB	14.5	5
39	BR12035-20-1-3	97.0	152	6.619	21.4	MB	25.2	5

40	BR12035-24-2-2**	99.9	149	7.658	24.6	-	-	5
41	BR12035-8-4-2	97.2	149	7.552	27.2	LS	15.0	5
42	BR12038-22-1-2	100.3	148	6.597	21.0	MB	26.8	5
43	BR12038-3-3-2	103.6	149	7.431	23.2	MB	15.4	5
44	BR12038-3-3-3	116.3	152	6.795	25.5	LS	25.9	5
45	BR12038-36-5-2**	108.2	152	7.708	24.7	MB	26.8	5
46	BR12038-65-2-1**	102.4	149	7.623	26	MB	25.4	5
47	BR12038-75-2-2	113.0	152	5.972	24	MB	27.0	5
48	BR12041-16-3-3	98.1	149	6.533	25.8	MB	22.2	5
49	BR12041-16-6-2**	105.8	149	7.654	22.8	LS	23.2	5
50	BR12041-17-5-1**	104.8	150	7.482	22.5	LS	26.8	5
51	BR12041-17-5-4	104.5	149	6.883	25.5	MB	25.5	5
52	BR12041-2-3-1	122.3	152	6.759	24.1	LS	26.3	5
53	BR12041-2-3-2	97.6	151	6.645	23.2	LS	25.6	5
54	BR12041-34-1-3**	111.4	149	7.706	24.2	MB	21.5	5
55	BR12041-36-2-2	99.2	149	7.192	23.1	LS	27.1	5
56	BR12041-45-3-3**	108.6	149	8.213	19.0	LS	26.1	5
57	BR12041-6-1-2	91.7	154	6.399	23.4	LS	24.9	5
58	BR12041-6-1-3**	114.2	149	7.658	23.5	LS	26.1	5
59	BR12041-78-1-2	106.4	150	7.381	27.2	LS	24.3	5
60	BR12041-8-4-2	101.9	154	6.551	24.4	MB	27.0	5
61	BR12041-8-4-3**	102.1	152	7.816	24.2	LS	27.6	5
62	Bangabandhu dhan100 (Ck)	94.4	149	7.134	25.8	MS	26.6	5
63	BRRI dhan28 (Ck)	92.0	151	6.854	17.8	MS	26.3	5
64	BRRI dhan29 (Ck)	91.5	157	7.524	19.2	MS	26.8	5
65	BRRI dhan74 (Ck)	93.7	151	7.584	24.5	MB	25.4	5
	LSD	**4.637**	**2.592**	**0.852**				
	H2b	**0.43**	**0.81**	**0.73**				

Selected genotypes **D/S: 26/11/2022** **D/T: 07/01/2023**

Experiment 11.7: Secondary Yield Trial (SYT)

Principal Investigator: M A Kader

Co-investigators: R R Majumder, U R Shaha, T K Hore and S M T Islam

Specific Objectives: Confirmation of yield potential in replicated plots.

Materials and methods: A total of 11 genotypes in T. Aman and 15 genotypes were transplanted in Boro season along with standard check varieties. Twenty-six-days-old seedlings in T. Aman and thirty-seven-days-old seedlings in Boro season were transplanted in 5.4 m× 10 rows plots with three replications. Single seedling was transplanted at a spacing of 20 cm ×15 cm. Fertilizer and crop management was done as in Experiment no. 11.2. Data on days to flowering, maturity, plant height phenotypic acceptance, disease infestation score and yield per plot were recorded.

Results: In T. Aman, 04 genotypes were selected (**Table 11.7a**). In Boro season, five breeding lines were selected (**Table 11.7b**).

Table 11.7a: Yield performance of the genotypes in Secondary Yield Trial (SYT), Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Amylose (%)	PAcp (Maturity)
1	BR10854-4-1-1-2-8**	126.2	139	5.690	30.9	24.4	5
2	BR10855-3-2-5-2-5**	140.3	131	5.872	23.2	24.5	5

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Amylose (%)	PAcp (Maturity)
3	BR10855-3-2-5-2-6	145.3	131	5.131	22.2	24.7	6
4	BR10862-13-9-3-4-7	131.7	128	5.565	29.2	24.2	6
5	BR10863-8-3-5-3-2**	121.2	129	6.230	27.3	24.4	5
6	BR10863-8-3-5-3-4	133.0	128	4.936	27.5	25.8	5
7	BR11176-16-7-4-4-2**	150.8	135	6.072	35.0	24.1	5
8	IR17A1147	114.7	111	5.250	27.6	20.8	5
9	IR17A1824	106.0	134	4.923	23.5	26.8	5
10	IR17A1258	102.3	134	4.233	28.2	22.8	5
11	IR 66946-3R-116-1-1	116.2	110	5.409	27.7	21.9	5
12	BRRI dhan39 (Ck)	117.5	117	4.780	18.3	26.7	5
13	BRRI dhan49 (CK)	114.0	133	5.590	16.4	25.5	5
14	BRRI dhan62 (CK)	106.2	104	4.520	19.4	21.7	5
15	BRRI dhan72 (CK)	127.9	130	5.670	22.4	26.3	5
16	BRRI dhan87 (CK)	125.9	126	5.580	18.5	27.1	5
	LSD (0.05)	**3.77**	**0.52**	**0.74**			
	H2b	**0.99**	**-**	**0.77**			

****Selected genotypes D/S: 24/06/2022 D/T: 18/07/2022**

Table 11.7b: Yield performance of the genotypes in Secondary Yield Trial (SYT), Development of Zinc Enriched Rice (ZER), Boro 2022-23

E. No.	Designation	Plant Height cm	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	PAcp (Maturity)
1	BR10552-1-1-3-4**	115.9	155	7.466	21.9	4
2	BR10552-1-1-4-6**	105.0	155	7.117	23.8	5
3	BR10564-2-7-5-2	101.3	156	7.166	20.4	5
4	BR10570-12-4-4-1	99.3	154	7.126	21.0	5
5	BR10570-29-7-3-2**	89.8	155	7.132	25.0	5
6	BR10570-32-2-1-1	93.6	155	6.855	23.7	5
7	BR10571-15-6-8-5**	91.1	155	7.436	23.1	5
8	BR10572-2-6-4-3	106.9	156	6.827	22.5	5
9	BR10572-2-7-1-4**	114.9	156	7.796	23.3	5
10	BR10574-3-1-3-5	105.6	156	6.910	23.1	5
11	BR10575-1-2-1-4	106.1	156	7.085	21.6	5
12	BR10575-1-4-2-2	96.0	157	6.906	21.9	3
13	BR10575-1-4-4-2	93.7	157	6.524	21.9	5
14	BR10576-16-2-4-2	107.2	156	6.643	21.4	5
15	BR10580-4-1-2-3	104.3	156	6.839	24.4	5
16	BRRI dhan28 (Ck)	101.1	149	7.158	17.8	5
17	BRRI dhan29 (Ck)	94.0	157	7.780	19.2	5
18	BRRI dhan74 (Ck)	95.1	152	7.531	24.5	5
19	BRRI dhan84 (Ck)	101.8	149	7.064	27.6	5
	LSD	2.686	3.017	0.813		
	H2b	0.99	0.78	0.72		

****Selected genotypes D/S: 24/11/2022 D/T: 05/01/2023**

Experiment 11.8: Regional Yield trial (RYT)

Principal Investigator: M A Kader

Co-investigators: HQ and R/S Scientists

Specific Objectives: Evaluation of elite breeding to determine specific and general adaptability under on-station condition.

Materials and methods: 04 genotypes in T. Aman and 03 genotypes in Boro season were evaluated against standard check varieties at ten regional stations of BRRI. Twenty-five to forty-five-days-old seedling was transplanted at 20 cm × 15 cm spacing in 5.4m × 12 rows plots with 3 replications. Fertilizer and crop management was done as in Experiment no. 11.2. Fertilizer doses were changed as per the requirement of AEZ. At maturity, data on plant height, days to maturity and grain yield were recorded.

Location: BRRI Gazipur, BRRI Rangpur, BRRI Cumilla, BRRI Kushtia, BRRI Sonagazi, BRRI Barisal, BRRI Sirajganj, BRRI Satkhira, BRRI Bhanga and BRRI Rajshahi

Results: None of the entries were selected for Advanced Line Adaptive Research Trial both in T. Aman and one genotype selected for re-RYT in Boro season (**Table 11.8a** and **Table 11.8c).**

Table 11.8a: Yield performance of the genotypes in Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

SN	PH	GD	Grain yield (t/ha)										Zn (mg/ kg)
			Rang	Cum	B.shal	S.khira	Raj	Kus	S.gazi	S.ganj	Gaz	Mean	
G1	108	113	5.63	5.91	3.68	4.63	6.11	4.32	5.69	1.45	6.15	4.84	25.7
G2	124	115	5.74	5.16	3.44	4.40	6.32	5.08	5.86	3.02	6.23	5.03	22.8
G3	123	118	5.57	5.65	3.64	4.30	6.45	6.29	6.17	4.34	5.46	5.32	25.2
G4	119	118	5.62	6.18	3.74	4.12	6.09	5.40	6.77	5.61	6.01	5.50	27.0
CK1	123	124	4.72	5.59	4.17	4.15	6.11	6.25	6.03	3.99	5.60	5.18	22.4
CK2	127	124	5.12	5.86	4.21	4.76	6.39	5.30	5.66	4.10	5.63	5.23	18.5
LSD	**3.60**	**3.10**	**0.334**	**0.43**	**0.17**	**0.47**	**0.65**	**1.15**	**1.36**	**1.56**	**0.50**	**0.59**	
H2b	**0.98**	**0.90**	**0.91**	**0.80**	**0.96**	**0.57**	**0.73**	**0.69**	**0.60**	**0.84**	**0.63**	**0.64**	

G1= BR10490-1-2-3-8-7, G2= BR10470-1-2-3-13-5, G3= BR10471-1-2-3-15-1, G4= BR9674-1-1-5-2-P4-HR1; CK1= BRRI dhan72, CK2= BRRI dhan87

None of the entries were selected

Table 11.8b: Physico-chemical properties of the genotypes of Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), T. Aman 2022-23

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (L) (mm)	Milled Rice breadth (mm)	L/B	1000 grain Wt (gm)
BR10490-1-2-3-8-7**	70	60	5.6	1.9	2.9	17.8
BR10470-1-2-3-13-5**	67	55	6.2	2.2	2.8	21.1
BR10471-1-2-3-15-1	70	61	5.9	2.4	2.5	23.2
BR9674-1-1-5-2-P4-HR1	71	62	6.3	2.2	2.9	19.5
BRRI dhan72 (Ck)	70	59	6.4	2.4	2.7	28.9
BRRI dhan87 (Ck)	67	56	6.1	2.1	2.9	23.2

Designation	Size & Shape	Appearance	Chalkiness (%)	Amylose (%)	Protein (%)	Zinc (mg/kg)	ER	IR
BR10490-1-2-3-8-7**	MB	V. good	69	25.2	8.9	25.7	1.4	3.7
BR10470-1-2-3-13-5**	LB	Good	71	25.3	7.0	22.8	1.4	4.5
BR10471-1-2-3-15-1	MB	Good	64	26.7	8.5	25.2	1.4	3.7
BR9674-1-1-5-2-P4-HR1	LB	Good	62	26.8	8.3	27.0	1.5	3.6
BRRI dhan72 (Ck)	LB	Good	43	26.7	8.6	22.4	1.4	3.7

BRRI dhan87 (Ck)	LB	Good	37	27.3	8.0	18.5	1.3	4.2

Table 11.8c: Yield performance of the genotypes in Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), Boro 2022-23

SN	Designation	PH (cm)	GD days	Grain Yield (t/ha) Kus	Cum	Bari	Sat	Raj	Sgazi	Habi	Bha	Gaz	Mean	Zinc (mg/kg)
1	BR9674-1-4-1-3-P1*	106.0	151	6.17	7.40	7.05	7.83	7.63	6.63	6.11	7.84	7.84	7.17	24.4
2	BR9674-1-4-1-3-P2	104.4	152	5.85	7.21	6.18	6.97	7.28	6.80	5.71	8.32	7.52	6.87	24.9
3	BR9674-7-3-2-1-P2	97.9	150	5.58	7.12	7.86	6.93	7.50	7.76	5.64	7.06	7.11	6.95	23.4
4	BRRI dhan29 (Ck)	97.2	152	6.51	7.16	7.89	6.68	7.30	7.55	6.16	8.10	7.31	7.19	18.2
5	BRRI dhan74 (Ck)	90.7	141	5.86	6.81	6.14	7.30	6.87	7.70	6.03	7.49	7.44	6.85	24.4
6	BRRI dhan84 (Ck)	107.2	138	5.20	6.35	5.81	6.79	6.12	6.36	4.79	3.85	6.86	5.79	27.6
	LSD (0.05)	**-**	**2.071**	**0.55**	**0.601**	**0.47**	**0.327**	**0.26**	**0.517**	**0.269**	**1.09**	**0.57**	**0.520**	
	H2b	**-**	**0.99**	**0.55**	**0.00**	**0.96**	**0.95**	**0.73**	**0.91**	**0.85**	**0.62**	**0.68**	**0.69**	

None of the entries were selected for ALART

* Selected for re-RYT

Table 11.8d: Physico-chemical properties of the genotypes of Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), Boro 2022-23

Genotypes	Milling outturn (%)	Head rice yield (%)	Milled Rice length (mm)	Milled Rice breadth(mm)	L-B ratio	1000 grain wt (g)	Size & Shape	Chalkiness (%)	Amylose (%)	Protein (%)	Zinc (mg/ kg)	ER	IR
BR9674-1-4-1-3-P1	70	64	5.0	2.2	2.3	17.4	MB	14	26.2	7.7	24.4	1.5	4.3
BR9674-1-4-1-3-P2	70	64	4.9	2.2	2.2	17.6	SB	25	26.2	7.9	24.9	1.6	4.3
BR9674-7-3-2-1-P2	71	60	6.0	2.0	3.1	20.1	MS	47	27.4	8.1	23.4	1.4	3.6
BRRI dhan29 (Ck)	69	58	6.2	2.0	3.1	20.9	LS	38	25.9	7.3	18.2	1.5	4.2
BRRI dhan74 (Ck)	70	43	6.2	2.3	2.7	27.8	LB	35	25.6	8.6	24.4	1.6	4.8
BRRI dhan84 (Ck)	68	53	6.1	1.9	3.2	20.8	LS	25	26.0	8.4	27.6	1.5	4.0

PROJECT 12: DEVELOPMENT OF INSECT RESISTANT RICE

General objectives: Development of rice varieties resistant to brown plant hopper (BPH) and gall midge (GM).

Project Leader: Md. Ruhul Amin Sarker

Experiment 12.1: Hybridization

Principal Investigator: M R A Sarker

Co-investigators: H Khatun and M A Rahman

Specific objectives: Transfer of gall midge and brown plant hopper resistance gene(s) into modern high yielding elite genetic background.

Materials and Methods: Twenty parents including donors for gall midge (GM) and brown plant hopper (BPH) resistance were grown in T. Aman 2022-23 and 14 parents were used for crossing in Boro 2022-23 in three sets at BRRI Gazipur. Seed sowing started from July for T. Aman and November for Boro with an interval of seven days to synchronize flowering for making desired cross combinations at BRRI Gazipur (**Table 12.1**). Thirty- and 45-day old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 20 cm × 20 cm in T. Aman and Boro seasons, respectively. Single seedling was used for transplanting. Fertilizers at the rate of 70:10:40 kg NPK/ha (150-55-80 kg/ha Urea-TSP-MOP) was applied. Also, Gypsum and Zinc Sulfate was applied at the rate of 100 kg/ha and 10 kg/ha, respectively. For Boro season, fertilizer doses were at the rate of 120-20-60 kg NPK/ha (260-100-120 kg Urea-TSP-MoP/ha) and 100 kg/ha Gypsum and 10 kg/ha Zinc sulphate. Total amount of P, K, Gypsum and Zinc sulfate were applied at final land preparation. Urea was applied in three equal splits at 10-15 days after transplanting, maximum tillering and panicle initiation stage. Hand weeding was done in time. Plant protection measure was taken for pest infestation if necessary.

Results and discussion: Nineteen crosses for forward breeding, three BC_1F_1 and four BC_2F_1 crosses for Line Augmentation, and one BC_2F_1 and three BC_1F_2 crosses for QTL Deployment were made in T. Aman, and 20 crosses for forward breeding, three crosses for pre-breeding, three F_1, three BC_2F_1 and three BC_2F_2 crosses for Line Augmentation were made in Boro season. Mature F_1 seeds were harvested, sun dried and stored separately along with parents in paper bags with proper labeling (**Table 12.1**).

Table 12.1: List of crosses made, Development of Insect Resistant Rice (IRR), T. Aman and Boro 2022-23

Sl#	Cross combination	Trait of interest	No. of F_1 seeds
T. Aman 2022-23			
Forward breeding			
1	BR 12180-5 R-62/BR 12208-5 R-227	*Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-GBSS-ex10, Wx-A_group*	31
2	BR 12177-5 R-156/BR 11035-4 R -101	*Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-A_group, Wx-GBSS-ex10*	60
3	BR 12193-5 R-63/BR 11295-4 R -100	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-A_group*	28
4	BR 12193-5 R-63/IRBPHN-SVIN013-18	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-A_group*	18
5	BR 12208-5 R-227/IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4_3, Gm4_4, Pi9, xa5, Wx-A_group*	4
6	BR 11044-4 R -47/IRBPHN-SVIN013-18	*Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-GBSS-ex10, Wx-A_group*	4
7	BR 11295-4 R -100/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, Bph32, Gm4_3, Gm4_4*	10
8	BR 12177-5 R-156/IR126952-29-82-206-12-3	*Bph17_all, Bph32, GM4_4, Pi9, xa5, Wx-A_group*	139
9	BR 12180-5 R-62/IR126952-29-82-206-12-3	*Bph17_all, Bph32, GM4_4, Pi9, xa5, Wx-A_group*	25
10	IRBPHN-SVIN013-18/IR107736-7-1-2-1	*Bph17_all, Bph18, Bph32, xa5, Xa21*	17
11	BR 11035-4 R -101/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, Bph32, Gm4_3, Gm4_4, Wx-A_group*	111

12	BR11948-4 R-129 /IR101791-10-1-4-3-2-4	*Bph9, Bph17_all, Bph21, Gm4_3, Gm4_4, Wx-A_group*	45
13	BR11948-4 R-129 /IR107736-7-1-2-1	*Bph9, Bph17_all, Bph18, GM4_4, Wx-A_group*	63
14	BR11948-4 R-129 / IR126952-29-12-103-8-2	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Pi9, xa5, Wx-A_group*	32
15	BR 12208-5 R-65 /IR101791-10-1-4-3-2-4	*Bph9, Bph17_all, Bph21, Gm4_3, Gm4_4, Wx-A_group*	19
16	BR 12208-5 R-65 /IR107736-7-1-2-1	*Bph9, Bph17_all, Bph18, GM4_4, Wx-A_group*	48
17	BR 12208-5 R-65 / IR126952-29-12-103-8-2	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Pi9, xa5, Wx-A_group*	42
18	BR11712-4R-218/BR11921-4R-35	*Bph32, Gm4_3, Gm4_4, Wx-A_group*	24
19	BR11044-4R-47/BR11296-4R-215	*Bph17_all, Gm4_3, Gm4_4, Wx-A_group*	21
Line Augmentation (BC_1F_1)			
1	BR11949-4R-258*2 / IR126952-29-82-206-12-3	BR11949-4R-258*2 / IR126952-29-82-206-12-3	175
2	BR11941-4R-441*2 / IR126952-29-82-206-12-3	BR11941-4R-441*2 / IR126952-29-82-206-12-3	567
3	BR11593-5R-55*2 / IR126952-29-82-206-12-3	BR11593-5R-55*2 / IR126952-29-82-206-12-3	500
BC_2F_1			
1	BR11296-4R-215*3 / IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A*	1077
2	BR11302-4R-75*3 / IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A*	48
3	BR11723-4R-172*3 / IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A*	105
4	BR11039-4R-162*3 / IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A*	81
QTL Deployment (BC_2F_1)			
1	D (R) 6*3 / Rathuhenathi	*Bph17_all, Bph32*	65
QTL Deployment (BC_1F_2)			Plants#
1	D (R)6/Rathuhenathi	*bph17, bph32*	17
2	BRRI dhan87/ Rathuhenathi	*bph17, bph32*	10
3	D (R)6/Babawee	*bph17*	10
Boro 2022-23			
Forward Breeding			
1	BR 12671-4 R-73/BR 12685-4 R-122	*bph9, Gm4_3, Gm4_4, Wx-A_group,*	45
2	BR 12671-4 R-73/BR 12279-4 R-11	*bph32, Gm4_3, Gm4_4, Wx-A_group*	125
3	BR 12671-4 R-73/ IR101791-10-1-4-3-2-4	*bph32, bph17, bph21, Gm4_3, Gm4_4, Wx-A_group*	75
4	BR 12671-4 R-73/ BR 12208-5 R-402	*bph32, Gm4_3, Gm4_4, Wx-A_group*	36
5	BR 12676-4 R-302/BR 12208-5 R-402	*bph9, bph17, bph32, Gm4, W-A_group*	135
6	BR 12676-4 R-302/BR 12279-4 R-11	*bph9, bph17, bph32, Gm4, W-A_group*	72
7	BR 12676-4 R-302/IR107736-7-1-2-1	*bph9, bph17, bph18, Gm4, W-A_group*	25
8	BR 12676-4 R-302/ IR101791-10-1-4-3-2-4	*bph9, bph17, bph21, W-A_group*	122
9	BR 12685-4 R-122/BR 12208-5 R-402	*bph9, bph32, Wx-A_group*	70
10	BR 12685-4 R-122/IR107736-7-1-2-1	*bph9, bph18, xa5, Xa21, Wx-A_group*	62

11	BR 12180-5 R-17/BR 12208-5 R-402	*bph32, Wx-A_group*	120
12	BR 12180-5 R-17/IR107736-7-1-2-1	*bph18, xa5, Xa21, Wx-A_group*	42
13	BR 12180-5 R-17/IR101791-10-1-4-3-2-4	*bph17, bph21, Wx-A_group*	92
14	BR 12208-5 R-402/IR107736-7-1-2-1	*bph18, bph32, xa5, Xa21, Wx-A_group*	46
15	BR 12208-5 R-402/IR101791-10-1-4-3-2-4	*bph17, bph21, bph32, Wx-A_group*	42
16	BR 12279-4 R-11/BR 11593-5 R-70	*bph32, Gm4_3, Gm4_4, xa5, Wx-A_group,*	82
17	BR 11949-4 R-137/IR101791-10-1-4-3-2-4	*bph17, bph21, Wx-A_group*	145
18	BR 11593-5 R-70/IR126952-29-82-206-12-3	*bph17, bph32, Gm4, xa5, xa13, Xa21, Wx-A_group*	85
19	BR 12208-5 R-402/BRRI dhan89	*bph32, Wx-A_group*	42
20	BR 12208-5 R-402/BRRI dhan29	*bph32, Wx-A_group*	112
Pre-Breeding			
1	BR 12671-4 R-73/LT489	*bph, Gm4, Wx-A_group, MS grain*	66
2	BR 12180-5 R-17/LT489	*bph, Wx-A_group, MS grain*	55
3	BR 12208-5 R-402/LT489	*bph32, Wx-A_group, MS grain*	38
Line Augmentation (F_1)			
1	BR 12671-4 R-73/IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Wx-A_group*	65
2	BR 12180-5 R-17/IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Wx-A_group*	55
3	BR 12208-5 R-402/IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Wx-A_group*	48
BC_2F_1			
1	BR11949-4R-258*3/ IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Pi9, Waxy-A*	120
2	BR11941-4R-441*3/ IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Pi9, Waxy-A*	134
3	BR11593-5R-55*3/ IR126952-29-82-206-12-3	*bph17, bph32, Gm4, Pi9, Waxy-A*	165
BC_2F_2			
1	BR11296-4R-215*3/IR126952-29-82-206-12-8	*bph17, bph32, Gm4, Pi9, Waxy-A*	2
2	BR11302-4R-75*3/IR126952-29-82-206-12-8	*bph17, bph32, Gm4, Pi9, Waxy-A*	1
3	BR11723-4R-172*3/IR126952-29-82-206-12-8	*bph17, bph32, Gm4, Pi9, Waxy-A*	10
4	BR11039-4R-162*3/IR126952-29-82-206-12-8	*bph17, bph32, Gm4, Pi9, Waxy-A*	6

Experiment 12.2: F_1 confirmation

Principal Investigator: M R A Sarker

Co Investigators: Hasina Khatun, Ribed F Disha and M A Rahman

Specific objective: Confirmation of crosses as true hybrid with introgression of genes of interest into modern genetic background.

Materials and Methods: List of F_1's is shown in **Table 12.2**. The F_1 seeds along with their respective parents were germinated in the petridish. Thirty- and 45-days old seedling were transplanted in 5.4 m × 1 rows plot with a spacing of 20 × 15 cm in T. Aman and Boro seasons at BRRI Gazipur, respectively. Single seedling was used for transplanting. Fertilizer doses and application were the same as in Experiment 12.1. Hand weeding was done in time. Plant protection measure was taken for only disease infestation if necessary. Leaf samples were collected from each of the plants of F_1 and respective parents for QC genotyping to determine true F_1s. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. In flowering time, phenotypically good and resistant plants were used for back crossing.

Results and discussion: Fifteen and 16 crosses were confirmed through F_1 verification using quality check (QC) genotyping with purity SNP panel as well as careful observation of plant characters in T. Aman and Boro seasons, respectively. After confirmation, F_2 seeds were collected and preserved. These confirmed F_1s' were registered into BRRI cross list with BR number (**Table 12.2**).

Table 12.2: List of confirmed F_1s, Development of Insect Resistant Rice (IRR), T. Aman and Boro 2022-23

Sl#	BR cross #	Cross combination	Trait of Interest (ToI)
T. Aman 2022-23			
1	BR15143	BR11296-4R-215/IR107736-7-1-2-1	*Bph18 (BPH score-5), xa5, Xa21*
2	BR15144	IR107736-7-1-2-1/BR11044-4R-279	*Bph18, Bph32, Gm4, xa5, Xa21, Gn1a, Chalk5*
3	BR15145	BR11039-4R-165/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, Bph32, Pi-ta, Waxy-A, Gn1a*
4	BR15146	BR11295-4R-221/IR126952-41-148-38-9-60-B	*Bph17_all, Bph32, Gm4, Pi-ta, xa5, Xa21, Waxy-A, Chalk5*
5	BR15147	BR11295-4R-221/IR107736-7-1-2-1	*Bph18, Gm4, xa5, Xa21, Pi-ta, Chalk5*
6	BR15148	BR11302-4R-75/BR11052-4R-273	*Bph17_all, Bph32, Gm4, Gn1a, Waxy-A*
7	BR15149	IR101791-10-1-4-3-2-4/BR11044-4R-279	*Bph17_all, Bph21, Bph32, Gm4, Gn1a, Chalk5*
8	BR15150	BR12177-5R-308/IR126952-29-82-206-12-8	*Bph17_all, Bph32, Gm4, Pi9, Waxy-A*
9	BR15151	BR11723-4R-172/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, high amylose*
10	BR15152	BRRI dhan87/BR12177-4R-108	*Bph17_all, high amylose*
11	BR15153	BRRI dhan87/BR12180-4R-12	*Bph32, Wx-A_group*
12	BR15154	BRRI dhan99/BR11921-4R-227	*Bph32, Wx-A_group*
13	BR15155	BR13093-4R-5/BR10162-4R-17	*Bph32, Wx-A_group*
14	BR15156	BRRI dhan87/BR12177-4R-171	*Bph32, Wx-A_group*
15	BR15157	BRRI dhan87/BR12180-4R-14	*Bph32, Wx-A_group*
Boro 2022-23			
1	BR15618	BR 12180-5 R-62/BR 12208-5 R-227	*Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-GBSS-ex10, Wx-A_group*
2	BR15619	BR 12193-5 R-63/BR 11295-4 R -100	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-A_group*
3	BR15620	BR 12177-5 R-156/BR 11035-4 R -101	*Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-A_group, Wx-GBSS-ex10*
4	BR15621	BR 11448-4 R -129/ IR101791-10-1-4-3-2-4	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Wx-GBSS-ex10, Wx-A_group*
5	BR15622	BR 11295-4 R -100/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, Bph32, Gm4_3, Gm4_4*

6	BR15623	BR 12177-5 R-156/IR126952-29-82-206-12-3	*Bph17_all, Bph32, GM4_4, Pi9, xa5, Wx-A_group*
7	BR15624	BR 12480-5 R-62/IR126952-29-82-206-12-3	*Bph17_all, Bph32, GM4_4, Pi9, xa5, Wx-A_group*
8	BR15625	IRBPHN-SVIN013-18/IR107736-7-1-2-1	*Bph17_all, Bph18, Bph32, xa5, Xa21*
9	BR15626	BR 11035-4 R -101/IR101791-10-1-4-3-2-4	*Bph17_all, Bph21, Bph32, Gm4_3, Gm4_4, Wx-A_group*
10	BR15627	BR 12208-5 R-65 /IR101791-10-1-4-3-2-4	*Bph9, Bph17_all, Bph21, Gm4_3, Gm4_4, Wx-A_group*
11	BR15628	BR 12208-5 R-65 /IR107736-7-1-2-1	*Bph9, Bph17_all, Bph18, GM4_4, Wx-A_group*
12	BR15629	BR 12208-5 R-65 / IR126952-29-12-103-8-2	*Bph9, Bph17_all, Bph32, Gm4_3, Gm4_4, Pi9, xa5, Wx-A_group*
13	BR15630	BR11712-4R-218/BR11921-4R-135	*Bph32, Gm4_3, Gm4_4, Wx-A_group*
14	BR15631	BR11948-4 R-129 /IR107736-7-1-2-1	*Bph9, Bph17_all, Bph18, GM4_4, Wx-A_group*
15	BR15633	BR11948-4 R-129 / IR126952-29-12-103-8-2	*Bph9, GM4_4, Wx-A_group*
16	BR15634	BR11948-4 R-129 /BR11246-4R-215	*Bph9, GM4_4, Wx-A_group*

Experiment 12.3: Field Rapid Generation Advance (FRGA)
Principal Investigator: M R A Sarker
Co-investigators: H Khatun, Ribed F Disha and M A Rahman
Specific objectives: Rapid advancement of segregating population for reducing the breeding cycle.
Materials and Method: Individual progenies from 82 (T. Aman) and 79 (Boro) crosses were grown involving F_2, F_3 and F_4 population in field following SSD method of breeding at BRRI Gazipur. Thirty- and 45-days old seedling were transplanted at 5 cm × 5 cm spacing in the field in T. Aman and Boro seasons, respectively. In F_5 generation, populations were grown in field following SSD method of breeding in single-hill plot at a spacing of 5 cm × 5 cm on raised bed in the field. A small portion of a panicle with 8-10 seed from a single plant harvested from previous generation was seeded directly on the bed. A specialized wooden frame was used to furrow on the puddled bed at 5 cm apart to sow seeds. Fertilizer management was done using the half doses of all fertilizers used in Experiment 12.1. At maturity, single panicle was harvested from each plant of each cross. Harvested seed was dried and treated with 45^0 C for five days to break dormancy for initiating next cycle of RGA immediately.

Results and discussion: In total 47,400 (T. Aman) and 16,755 (Boro) individual progenies were harvested from rapid generation advance (RGA) of segregating populations in different generations (**Table 12.3.1** and **Table 12.3.2**).

Table 12.3.1: List of segregating population advanced in Field Rapid Generation Advance (FRGA), Development of Insect Resistant Rice (IRR), T. Aman 2022-23

Sl#	BR Reg. #	Cross combination	No. of progenies	
			Transplanted	Harvested
F_2 generation				
1	BR14267	BRRI dhan75*2/ARC5984	1500	1300
2	BR14268	BR9880-27-4-1-18/SVIN350	1500	1270
3	BR14269	BR9881-24-2-2-25/BR8441-46-4-2-8	1500	1180
4	BR14270	BRRI dhan87/IR126952-41-148-38-1-52-B	1500	1400
5	BR14271	BR9881-24-2-2-25/SVIN350	1500	1320

6	BR14272	BR9880-27-4-1-18/SVIN357	1500	1280
7	BR14273	BR9881-24-2-2-25/IR126952-443-12-47-4-8-B	1500	1420
8	BR14274	BRRI dhan75*2/Jamai Binni	1500	1370
9	BR14275	BR9880-2-2-2-1/WANXIAN7777-P10	1500	1180
10	BR14276	BR9880-27-4-1-18/IR126952-41-148-38-9-44-B	1500	1290
11	BR14277	IR126953-624-22-18-8-1-B/SVIN357	1500	1300
12	BR14278	BR9880-2-2-2-1/SVIN350	1500	1320
13	BR14279	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	1500	1280
14	BR14280	BR9880-27-4-1-18/BR9942-1-2-1-1-B1	1500	1290
15	BR14281	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	1500	1150
16	BR14282	BR9880-27-4-1-18/SVIN351	1500	1270
17	BR14283	BRRI dhan87*2/ARC5984	1500	1300
18	BR14284	BR9881-24-2-2-25/SVIN350	1500	1320
19	BR14285	BR12231-5R-128/BRRI dhan49	1500	1280
20	BR14286	BR9888-1-2-2-5/SVIN266	1500	1310
21	BR14287	BRRI dhan49/LT489	1500	1290
22	BR14288	BRRI dhan87/LT489	1500	1320
		Sub-total	**33000**	**28440**
F_3 generation				
1	BR14009	BR9880-27-4-1-18 / IR126952-41-148-38-2-49-B	420	330
2	BR14010	BR9667-54-2-2-97 / Fatema dhan	420	390
3	BR14011	BR9880-27-4-1-18 / D (R)-6	580	470
4	BR14012	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	550	480
5	BR14014	BR10698-12-1-5 / IR126952-41-148-38-2-49-B	600	470
6	BR14015	BR9669-23-3-2-23 / IR126953-524-22-18-8-1-B	420	380
7	BR14016	BR9669-21-2-1-19 / IR12652-29-12-475-14-3	722	650
8	BR14017	BR9669-15-3-2-31 / D (R)-6	780	610
9	BR14018	BR9669-21-2-1-19 / IR08N210	550	420
10	BR14019	BRRI dhan29 / LT 489	520	410
11	BR14021	Sunamukhi / LT 489	520	470
12	BR14022	BR8340-5-6-1 / LT 489	410	360
13	BR14023	BR9880-27-4-1-18 / IR126952-41-125-24-4-2-B	670	610
14	BR14024	BR10698-12-1-5 / IR08N210	540	440
15	BR14025	BR8340-5-6-1 / Fatema dhan	620	520
16	BR14026	BR9669-15-3-2-31 / IR08N210	720	580
17	BR14027	BRRI dhan75*2 / Fatema dhan	680	600
18	BR14028	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	820	520
19	BR14029	BR9669-23-3-2-23 / WANXIAN7777-P10	680	670
20	BR14069	D (R)-6 / BR8340-5-6-1	1050	870
21	BR14070	Fatema dhan / BR8338-34-4-3*2	660	550
		Sub-total	**12932**	**10800**
F_4 generation				
1	BR13757	BR9880-36-4-2-33 / SVIN049	284	165
2	BR13759	BR9881-24-2-2-25*2 /ARC11704	261	159
3	BR13760	BRRI dhan75 /SVIN013	230	198
4	BR13761	BRRI dhan49 / IR126942-29-12-415-8-2	238	129
5	BR13762	BR7528-B-AK-BHA / BRRI dhan89	240	132
6	BR13763	BRRI dhan75 / SVIN049	284	135
7	BR13764	BRRI dhan39 /BR11723-4R-48	220	177
8	BR13765	BR7528-B-AK-BHA/ BR11716-4R-108	192	120
9	BR13766	D(R)-6 / ARC11704	238	144

10	BR13768	BRRI dhan79 / ARC11704	260	156
11	BR13769	BRRI dhan29 / BR7528-B-AK-BHA	220	120
12	BR13770	BRRI dhan87 / BR11715-4R-105	210	117
13	BR13771	BR7528-B-AK-BHA / BR11712 -4R-123	350	141
14	BR13772	BR9880-24-2-1-14 / SVIN049	220	192
15	BR13773	BRRI dhan49 / IR126952-29-12-475-8-2	180	75
16	BR13774	IR126952-29-12-475-8-2 / BRRI dhan49	210	111
		Sub-total	**3837**	**2271**
F_5 generation				
1	BR13466	Jamaibabu (Red) / D(R)6	390	280
2	BR13467	China line (Red) / CN6	390	372
3	BR13468	BR8340-5-6-1 / BRRI dhan89	249	318
4	BR13469	BR8338-34-4-3 / BR8693-17-6-2-1	270	249
5	BR13470	BRRI dhan89 / D(R)6	280	322
6	BR13471	Fatema dhan / SVIN340	120	94
7	BR13472	BRRI dhan49 / Fatema dhan	280	204
8	BR13473	BRRI dhan75 / Fatema dhan	370	382
9	BR13474	Sunamukhi / BRRI dhan89	321	372
10	BR13476	BRRI dhan89 / Fatema dhan	390	236
11	BR13477	BR7528-B-AK-BHA / Breeding line_SAT	390	288
12	BR13478	BRRI dhan89 / BR7528-B-AK-BHA	390	242
13	BR13479	Fatema dhan / BRRI dhan63	390	198
14	BR13480	BRRI dhan83 / Fatema dhan	390	214
15	BR13481	D(R)6 / Fatema dhan	390	280
16	BR13482	Fatema dhan /Jashore Miniket	390	211
17	BR13483	BRRI dhan89 /Sunamukhi	390	326
18	BR13484	BR7528-B-AK-BHA / CN6	150	134
19	BR13485	BRRI dhan89 / Jashore Miniket	250	144
20	BR13486	BRRI dhan86 / Fatema dhan	273	238
21	BR13487	BRRI dhan81 / Fatema dhan	250	218
22	BR13488	Fatema dhan / BR8338-34-4-3	260	234
23	BR13489	BR7528-B-AK-BHA / D(R)6	390	333
		Sub-total	7366	5889
		Grand Total	**57132**	**47400**

Table 12.3.2: List of segregating population advanced in Field Rapid Generation Advance (FRGA), Development of Insect Resistant Rice (IRR), Boro 2022-23

Sl#	**BR Reg. #**	**Cross combination**	**No. of progenies**	
			TP	**HP**
F_2 generation				
1	BR14740	BR9667-54-2-2-97*2/Fatema dhan	1000	350
2	BR14741	BR11593-5R-54/BR11386-4R-325	1000	350
3	BR14742	BR9669-23-3-2-23/IR107995-B-BRGA-BRGA-2-1	1000	350
4	BR14743	BR12208-5R-1/BR8340-5-6-1	1000	350
5	BR14744	IR108007-B-BRLA-BRLA-25-1/BR11386-4R-287	1000	350
6	BR14745	BR11591-5R-12/LT489	1000	350
7	BR14746	BR11588-5R-1/LT489	1000	350
8	BR14747	BR11723-4R-172/IR126952-41-148-38-9-60-B	1000	350
9	BR14748	BR12180-5R-1/IR126952-41-148-38-9-60-B	1000	350
10	BR14750	D (R)- 6/IR126952-29-82-206-12-8	1000	350
11	BR14751	BR12177-5R-94/IR126952-29-82-206-12-8	1000	350
12	BR14752	BR11723-4R-172/IR126952-29-82-206-12-8	1000	350
13	BR14753	BRRI dhan93/BR11052-4R-273	1000	350

14	BR14754	BR10762-4R-17/BR11035-4R-101	1000	350
15	BR14755	BR12177-5R-94/IR101791-10-1-4-3-2-4	1000	350
16	BR14756	BR12208-4R-352/IR101791-10-1-4-3-2-4	1000	350
17	BR14757	BR12177-5R-17/IR101791-10-1-4-3-2-4	1000	350
18	BR14758	BR111716-4R-120/IR101791-10-1-4-3-2-4	1000	350
19	BR14759	BR10/IR101791-10-1-4-3-2-4	1000	350
20	BR14760	BR12177-5R-1/IR126952-29-82-206-12-8	1000	350
		Sub-total	**20000**	**7000**
F_3 generation				
1	BR14267	BRRI dhan75*2/ARC5984	1280	222
2	BR14268	BR9880-27-4-1-18/SVIN350	1050	126
3	BR14269	BR9881-24-2-2-25/BR8441-46-4-2-8	700	96
4	BR14270	BRRI dhan87/IR126952-41-148-38-1-52-B	600	93
5	BR14271	BR9881-24-2-2-25/SVIN350	300	84
6	BR14272	BR9880-27-4-1-18/SVIN357	880	126
7	BR14273	BR9881-24-2-2-25/IR126952-443-12-47-4-8-B	220	123
8	BR14274	BRRI dhan75*2/Jamai Binni	280	105
9	BR14275	BR9880-2-2-2-1/WANXIAN7777-P10	200	84
10	BR14276	BR9880-27-4-1-18/IR126952-41-148-38-9-44-B	320	63
11	BR14277	IR126953-624-22-18-8-1-B/SVIN357	220	147
12	BR14278	BR9880-2-2-2-1/SVIN350	380	120
13	BR14279	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	420	129
14	BR14280	BR9880-27-4-1-18/BR9942-1-2-1-1-B1	600	123
15	BR14281	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	480	135
16	BR14282	BR9880-27-4-1-18/SVIN351	470	126
17	BR14283	BRRI dhan87*2/ARC5984	1050	147
18	BR14284	BR9881-24-2-2-25/SVIN350	820	111
19	BR14285	BR12231-5R-128/BRRI dhan49	320	90
20	BR14286	BR9888-1-2-2-5/SVIN266	1150	228
21	BR14287	BRRI dhan49/LT489	900	220
22	BR14288	BRRI dhan87/LT489	720	159
		Sub-total	**13360**	**2867**
F_4 generation				
1	BR14009	BR9880-27-4-1-18 / IR126952-41-148-38-2-49-B	**330**	186
2	BR14010	BR9667-54-2-2-97 / Fatema dhan	390	198
3	BR14011	BR9880-27-4-1-18 / D (R)-6	470	279
4	BR14012	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	480	219
5	BR14014	BR10698-12-1-5 / IR126952-41-148-38-2-49-B	470	195
6	BR14015	BR9669-23-3-2-23 / IR126953-524-22-18-8-1-B	380	219
7	BR14016	BR9669-21-2-1-19 / IR12652-29-12-475-14-3	650	255
8	BR14017	BR9669-15-3-2-31 / D (R)-6	610	234
9	BR14018	BR9669-21-2-1-19 / IR08N210	420	207
10	BR14019	BRRI dhan29 / LT 489	410	183
11	BR14021	Sunamukhi / LT 489	470	75
12	BR14022	BR8340-5-6-1 / LT 489	360	132
13	BR14023	BR9880-27-4-1-18 / IR126952-41-125-24-4-2-B	610	324
14	BR14024	BR10698-12-1-5 / IR08N210	440	174
15	BR14025	BR8340-5-6-1 / Fatema dhan	520	372
16	BR14026	BR9669-15-3-2-31 / IR08N210	580	150
17	BR14027	BRRI dhan75*2 / Fatema dhan	600	228
18	BR14028	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	520	150
19	BR14029	BR9669-23-3-2-23 / WANXIAN7777-P10	670	153
20	BR14069	D (R)-6 / BR8340-5-6-1	870	183
21	BR14070	Fatema dhan / BR8338-34-4-3*2	550	66

		Sub-total	10800	4182
F_5 generation				
1	BR13757	BR9880-36-4-2-33 / SVIN049	195	182
2	BR13759	BR9881-24-2-2-25*2 /ARC11704	190	180
3	BR13760	BRRI dhan75 /SVIN013	308	308
4	BR13761	BRRI dhan49 / IR126942-29-12-415-8-2	136	136
5	BR13762	BR7528-B-AK-BHA / BRRI dhan89	132	128
6	BR13763	BRRI dhan75 / SVIN049	145	142
7	BR13764	BRRI dhan39 /BR11723-4R-48	190	190
8	BR13765	BR7528-B-AK-BHA/ BR11716-4R-108	120	120
9	BR13766	D(R)-6 / ARC11704	144	134
10	BR13768	BRRI dhan79 / ARC11704	186	166
11	BR13769	BRRI dhan29 / BR7528-B-AK-BHA	120	102
12	BR13770	BRRI dhan87 / BR11715-4R-105	197	178
13	BR13771	BR7528-B-AK-BHA / BR11712 -4R-123	192	182
14	BR13772	BR9880-24-2-1-14 / SVIN049	192	278
15	BR13773	BRRI dhan49 / IR126952-29-12-475-8-2	125	122
16	BR13774	IR126952-29-12-475-8-2 / BRRI dhan49	169	158
		Sub-total	**2741**	**2706**
		Grand Total	**46901**	**16755**

Experiment 12.4: Line Stage Testing (LST)

Principal Investigator: M R A Sarker

Co-investigators: H Khatun, Ribed F Disha and M A Rahman

Specific Objective: Evaluation of FRGA derived advanced lines for uniformity and desirable agronomic characters.

Materials and Method: Total 2803 advanced breeding lines (**Table 12.4**) from 16 families for BPH and GM were grown at BRRI Gazipur during T. Aman 2022-23. BRRI dhan33 (for gall midge) and T27A (for BPH) were used as resistant checks and BRRI dhan49 and BR3 used as susceptible checks. Five thousand eight hundred eighty-nine $F_{5:6}$ lines from 23 families for BPH were grown at BRRI Gazipur during Boro 2022-23. Thirty- and 45-days old seedling were transplanted in a 2.4 m (12 hills) × 1 row plot with a spacing of 20 cm × 20 cm in T. Aman and Boro seasons, respectively. Single seedling was used for transplanting. Fertilizer doses and application were the same as in Experiment 12.1. Hand weeding was done in time. Importantly, no insecticides were applied in this experiment.

Results and discussion: A total of 229 lines were selected out of 2803 lines derived from 16 different crosses during T. Aman 2022-23 (**Fig. 12.4.1a; Table 12.4.1**). Total 794 out of 5889 lines comprising 23 different crosses were selected in Boro 2022-23 (**Fig. 12.4.1b; Table 12.4.2**). Selection was done based on flowering uniformity, phenotypic acceptability, pest infestation under field condition and the presence of favourable alleles for target traits. The 50% flowering of selected lines ranged from 89-115 days in T. Aman and 118-142 days in Boro season (**Fig. 12.4.2**).

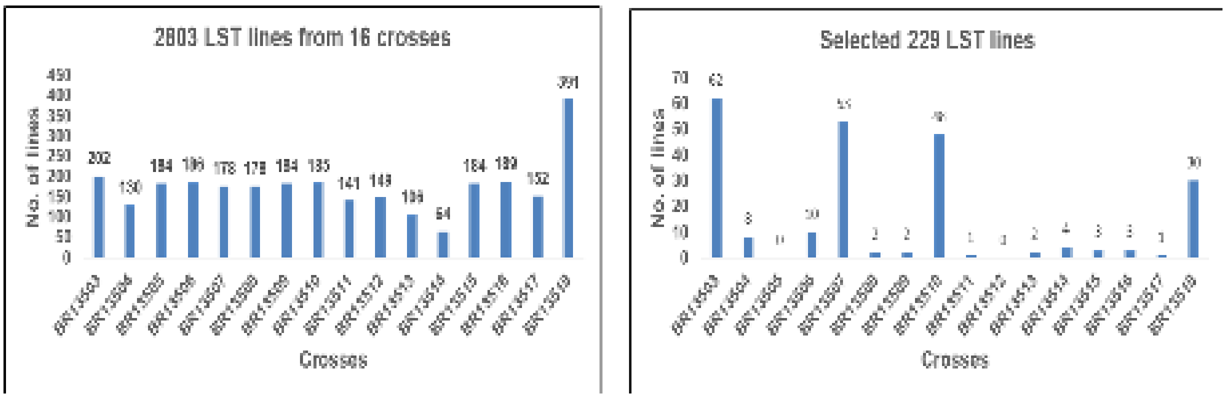


Fig. 12.4.1a Frequency distribution of LST lines, 2803 lines from 16 crosses, and finally selected based on phenotypic characters and trait marker (229 lines from 16 crosses) during T. Aman 2022-23

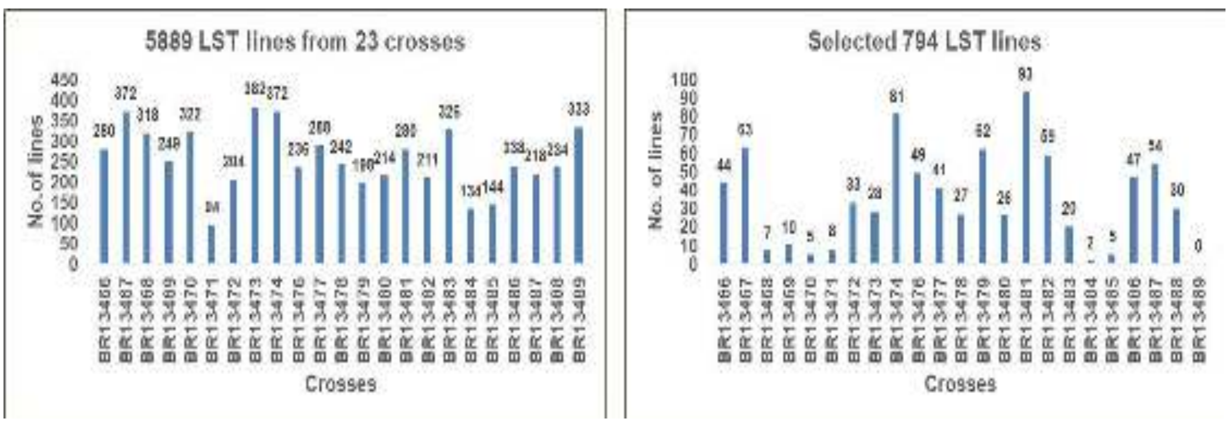


Fig. 12.4.1b Frequency distribution of LST lines, 5889 lines from 23 crosses, and finally selected based on phenotypic characters (794 lines from 22 crosses) during Boro 2022-23

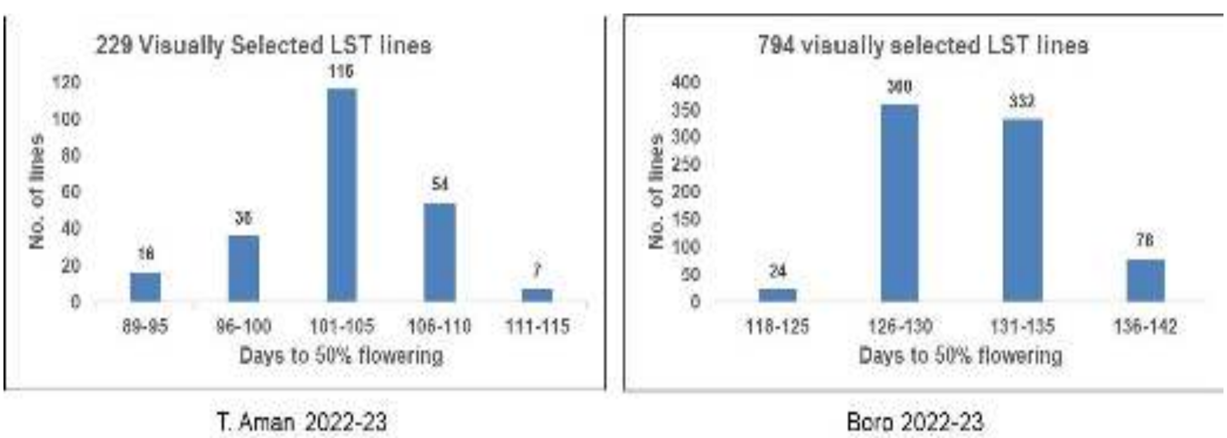


Fig. 12.4.2 Frequency distributions of days to flowering of visually selected LST lines during T. Aman and Boro 2022-23

Table 12.4.1: List of fixed lines identified from Line Stage Testing (LST), Development of Insect Resistant Rice (IRR), T. Aman 2022-23

SL#	Designation	Cross Combination	No. of genotype evaluated	No. of genotype selected
1	BR13503-4R	BR9881-24-2-2-25 / ARC11704	202	62
2	BR13504-4R	BRRI dhan87/ ARC 5987	130	8
3	BR13505-4R	BR9880-24-2-1-14 / ARC5987	184	0
4	BR13506-4R	BR8693-17-6-2-2 / ARC11704	186	10
5	BR13507-4R	BRRI dhan49/ BRRI dhan33	178	53
6	BR13508-4R	ARC79 / ARC5987	178	2
7	BR13509-4R	BR9881-24-2-1-25 / ARC11704	184	2
8	BR13510-4R	BR9880-36-4-2-33 / ARC11704	185	48

9	BR13511-4R	BR9143-55-3-2-1 / ARC5987	141	1
10	BR13512-4R	BR9881-24-2-2-25 / ARC11704	149	0
11	BR13513-4R	BRRI dhan72/ ARC5984	106	2
12	BR13514-4R	Habu dhan*2 / BRRI dhan52	64	4
13	BR13515-4R	BRRI dhan87/ ARC 5984	184	3
14	BR13516-4R	BRRI dhan75/ ARC 11704	189	3
15	BR13517-4R	BRRI dhan75 /ARC 5984	152	1
16	BR13518-4R	BR9880-36-4-2-33 / ARC5927	391	30
Total			**2803**	**229**

Table 12.4.2: List of fixed lines identified from Line Stage Testing (LST), Development of Insect Resistant Rice (IRR), Boro 2022-23

Sl#	Desination	Cross Combination	No. of genotype evaluated	No. of genotype selected
1	BR13466-4R	Jamaibabu (Red) / D(R)6	280	44
2	BR13467-4R	China line (Red) / CN6	372	63
3	BR13468-4R	BR8340-5-6-1 / BRRI dhan89	318	7
4	BR13469-4R	BR8338-34-4-3 / BR8693-17-6-2-1	249	10
5	BR13470-4R	BRRI dhan89 / D(R)6	322	5
6	BR13471-4R	Fatema dhan / SVIN340	94	8
7	BR13472-4R	BRRI dhan49 / Fatema dhan	204	33
8	BR13473-4R	BRRI dhan75 / Fatema dhan	382	28
9	BR13474-4R	Sunamukhi / BRRI dhan89	372	81
10	BR13476-4R	BRRI dhan89 / Fatema dhan	236	49
11	BR13477-4R	BR7528-B-AK-BHA/Breeding line_SAT	288	41
12	BR13478-4R	BRRI dhan89 / BR7528-B-AK-BHA	242	27
13	BR13479-4R	Fatema dhan / BRRI dhan63	198	62
14	BR13480-4R	BRRI dhan83 / Fatema dhan	214	26
15	BR13481-4R	D(R)6 / Fatema dhan	280	93
16	BR13482-4R	Fatema dhan /Jashore Miniket	211	59
17	BR13483-4R	BRRI dhan89 /Sunamukhi	326	20
18	BR13484-4R	BR7528-B-AK-BHA / CN6	134	2
19	BR13485-4R	BRRI dhan89 / Jashore Miniket	144	5
20	BR13486-4R	BRRI dhan86 / Fatema dhan	238	47
21	BR13487-4R	BRRI dhan81 / Fatema dhan	218	54
22	BR13488-4R	Fatema dhan / BR8338-34-4-3	234	30
23	BR13489-4R	BR7528-B-AK-BHA / D(R)6	333	0
Total			**5889**	**794**

Experiment 12.5: Observational Yield Trial (OYT)

Principal Investigator: M R A Sarker

Co-investigators: H Khatun, Ribed F Disha & M A Rahman (BRRI Gazipur), M R Islam, A K M Salauddin & I Zahan (BRRI R/S, Cumilla) and M R Hasan & Anisar Rahman (BRRI R/S, Rangpur)

Specific objectives: Selection of homozygous breeding lines with desirable grain quality having high yield and resistant to Brown Plant hopper (BPH) and Gall Midge (GM).

Materials and Method: Total 228 and 360 advanced breeding lines for BPH and GM were grown at three locations of BRRI Gazipur, Rangpur and Cumilla during T. Aman and Boro Seasons, respectively. BRRI dhan33 (for gall midge) was used as resistant checks and BRRI dhan49 & BRRI dhan87 used as standard checks for T. Aman season. T27A was used as resistant check for BPH and BR3, BRRI dhan88 & BRRI dhan89 were used as susceptible and standard checks for Boro season. Thirty and 45-days old seedling were transplanted in 5.4 m×5 rows plot with a spacing of 20 × 20 cm. Single seedling was used for transplanting. Fertilizer doses and application were the same as in Experiment 12.1. Hand weeding was done in time. Importantly, no insecticides were applied in this experiment.

Results and discussion: In T. Aman season, yield of the advanced breeding lines ranged from 3.0-7.5 t/ha in Gazipur, 3.2-7.6 t/ha in Cumilla and 1.8-5.9 t/ha in Rangpur (**Fig. 12.5.1**). The average yield ranged from 2.5-5.8 t/ha with the average of 104-136 days growth duration. Forty-nine genotypes from 228 genotypes were selected for further evaluation, as they showed higher yield over the respective check varieties **(Table 12.5.1)**. One selected OYT genotypes had *bph17_1, bph17_2, bph17_2, bph32 and Gm4* SNP favorable alleles **(Table 12.5.1)**. In Boro season, yield of the advanced breeding lines ranged from 3.1-9.4 t/ha in Gazipur, 3.9-8.0 t/ha in Cumilla and 4.0-9.2 t/ha in Rangpur (**Fig. 12.5.2**). The average yield ranged from 4.2-8.3 t/ha with the average of 144-163 days growth duration. Out of 360 genotypes, 84 were selected for further evaluation, as they showed higher yield over the respective check varieties (**Table 12.5.2**). Selection was made based on flowerings uniformity, phenotypic acceptability and pest infestation under field condition. Three genotypes from 360 genotypes showed 5 score during artificial screening at Entomology Division, BRRI in Boro season, which considered as moderately sustable to BPH **(Table 12.5.2**).

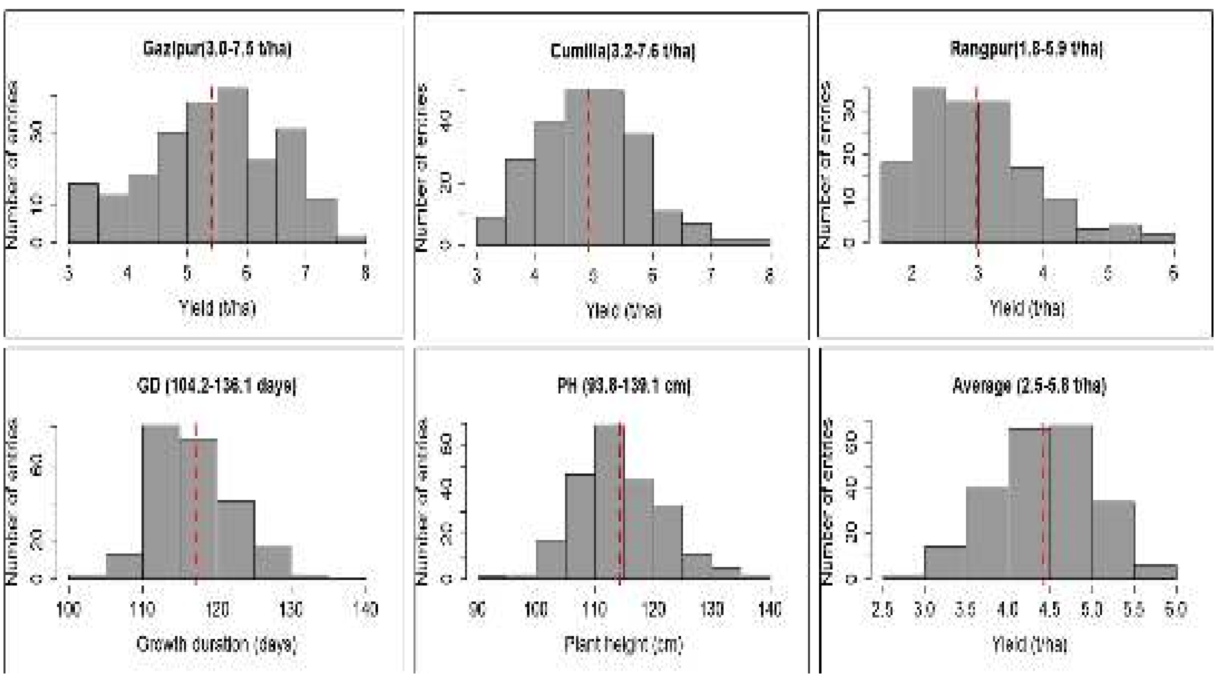


Fig. 12.5.1 Histogram of average growth duration, plant height and yield performance of 228 genotypes tested in OYT at three locations during T. Aman 2022-23

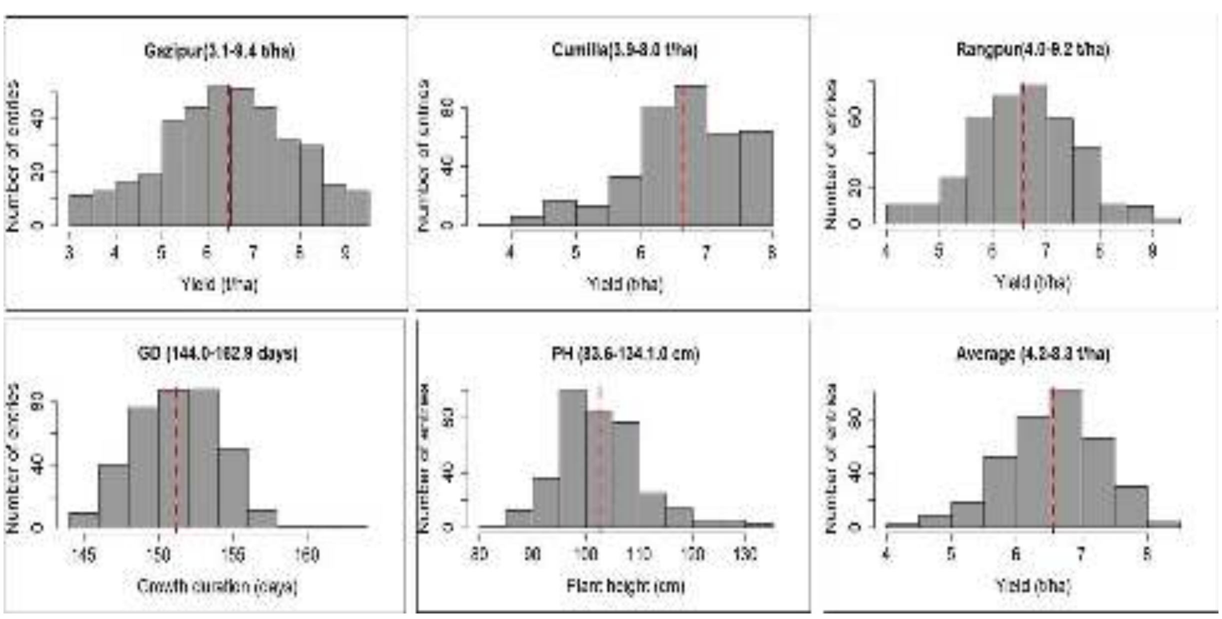


Fig. 12.5.2 Histogram of average growth duration, plant height and yield performance of 360 genotypes tested in OYT at three locations during Boro 2022-23

Table 12.5.1: Agronomic performance of the genotypes selected from observational yield trial (OYT), Development of Insect Resistant Rice (IRR), T. Aman 2022-23

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha) Gaz	Cum	Ran	BLUE	Trait of Interest (ToI)
1	BR 13088-4 R-2	112	117	4.8	7.0	2.8	4.9	*Bph32, Wx-A_group*
2	BR 13088-4 R-21	114	129	4.8	5.0	4.1	4.7	*Bph32, Wx-A_group*
3	BR 13088-4 R-94	115	116	3.8	3.8	2.3	3.3	*Bph32, Wx-A_group*
4	BR 13088-4 R-234	120	116	5.7	6.0	NA	5.2	*Bph32, Wx-A_group*
5	BR 13088-4 R-408	104	102	5.4	5.9	3.2	4.8	*Bph32, Wx-A_group*
6	BR 13088-4 R-423	118	112	7.1	6.6	3.4	5.7	*Bph32, Wx-A_group*
7	BR 13091-4 R-7	115	131	5.5	5.2	3.9	4.9	*Wx-GBSS-ex10, Wx-A_group*
8	BR 13093-4 R-7	121	122	5.2	4.7	1.8	3.9	*Bph32, Wx-GBSS-ex10, Wx-A_group*
9	BR 13093-4 R-204	115	115	NA	5.9	3.4	5.1	*Bph32, Wx-A_group*
10	BR 13093-4 R-227	114	111	5.1	4.5	3.5	4.3	*Bph32, Wx-A_group*
11	BR 13093-4 R-259	113	111	5.1	3.8	3.1	4.0	*Bph32, Wx-A_group*
12	BR 13094-4 R-15	114	115	4.5	3.8	3.5	3.9	*Bph32, Wx-A_group*
13	BR 13094-4 R-68	113	112	5.9	5.5	2.5	4.6	*Bph32, Wx-A_group*
14	BR 13094-4 R-83	121	113	5.9	3.6	3.2	4.2	*Bph32, Wx-A_group*
15	BR 13094-4 R-123	115	111	6.8	6.3	NA	5.9	*Bph32, Wx-A_group*
16	BR 13094-4 R-162	112	117	5.5	3.6	5.3	4.8	*Bph32, Wx-A_group*
17	BR 13094-4 R-218	113	114	6.9	3.5	1.6	4.0	*Bph32, Wx-A_group*
18	BR 13094-4 R-238	104	109	5.3	3.9	3.3	4.2	*Bph32, Wx-A_group*
19	BR 13094-4 R-241	112	110	5.8	3.6	3.7	4.4	*Bph32, Wx-A_group*
20	BR 13094-4 R-249	7.7	3.8	NA	5.0	121	126	*Bph32, Wx-A_group*
21	BR 13094-4 R-251	112	121	7.2	5.1	3.6	5.3	*Bph32, Wx-A_group*
22	BR 13096-4 R-11	117	116	7.1	4.3	4.3	5.2	*Bph32, Wx-A_group*
23	BR 13096-4 R-44	113	114	6.0	3.5	2.8	4.1	*Bph32, Wx-A_group*
24	BR 13096-4 R-46	115	110	7.4	4.4	3	4.9	*Bph32, Wx-A_group*
25	BR 13096-4 R-72	112	110	5.6	4.0	2.4	4.0	*Bph32, Wx-A_group*
26	BR 13096-4 R-86	113	116	5.0	6.7	3.3	5.0	*Bph32, Wx-A_group*
27	BR 13096-4 R-102	121	113	6.5	4.3	3.3	4.7	*Bph32, Wx-A_group*
28	BR 13096-4 R-108	117	111	5.3	5.9	2.6	4.6	*Bph32, Wx-A_group*
29	BR 13096-4 R-110	118	122	5.9	3.6	2.9	4.1	*Bph32, Wx-A_group*
30	BR 13096-4 R-125	126	116	4.3	NA	3.8	4.3	*Bph32, Wx-A_group*
31	BR 13096-4 R-199	116	109	7.3	5.6	2.7	5.2	*Bph32, Wx-A_group*
32	BR 13096-4 R-203	114	110	5.9	4.8	1.7	4.1	*Bph32, Wx-A_group*
33	BR 13096-4 R-275	127	113	5.2	5.1	2.7	4.3	*Bph32, Wx-A_group*
34	BR 13097-4 R-12	118	119	5.9	4.4	2.7	4.4	*Bph32, Wx-A_group*
35	BR 13097-4 R-105	115	104	5.1	3.9	5.6	4.8	*Bph32,Gm4_3,Gm4_4*
36	BR 13097-4 R-113	114	100	5.2	5.6	4.9	5.3	*Bph32*
37	BR 13097-4 R-151	125	104	6.2	5.6	NA	5.2	*Bph32,Gm4_3, Gm4_4*
38	BR 13098-4 R-143	117	108	NA	NA	3.8	5.2	*Wx-GBSS-ex10,Wx-A_group,Gm4_3,Gm4_4*
39	BR 13099-4 R-82	124	120	5.0	7.5	3.5	5.4	*Wx-A_group, Gm4_4*
40	BR 13099-4 R-166	119	121	6.9	6.0	3.3	5.4	*Wx-A_group, Gm4_4*
41	BR 13100-4 R-255	111	105	5.4	4.2	3.1	4.2	*Bph17_1,Bph17_3, Bph17_2,Bph32, Gm4_3, Gm4_4*
42	BR 13102-4 R-33	123	116	5.3	5.5	5.9	5.6	
43	SV 2020	117	125	6.0	4.8	3.2	4.7	
44	BR 12213-5 R-81	127	116	7.2	7.6	2.0	5.6	
45	BR 12213-5 R-145	120	119	5.5	5.6	1.9	4.3	

46	BR 12213-5 R-175	116	119	6.0	5.4	2.0	4.5
47	BR 12213-5 R-187	125	119	7	5.4	NA	5.5
48	BR 12213-5 R-220	113	113	6.8	4.8	NA	5.1
49	BR 12213-5 R-272	119	128	6.2	4.3	3.8	4.8
	BRRI dhan33 (Ck)	116	110	6.2	4.2	2.5	4.3
	BRRI dhan49 (Ck)	125	107	5.8	5.6	2.2	4.5
	BRRI dhan87 (Ck)	121	120	6.0	5.7	3.0	4.9
	LSD (0.05)	9.2	12.7	1.1	0.7	1.3	0.6
	H2b (%)	0.8	0.43	0.4	0.85	0.50	0.12

Table 12.5.2: Agronomic performance of the selected genotypes from observational yield trial (OYT), Development of Insect Resistant Rice (IRR), Boro 2022-23

Sl #	Designation	GD (day)	PH (cm)	Yield (t/ha)				BPH Score (SES)	Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE		
1	BR 13219-4 R-1	149	92	9.2	6.6	7.4	7.7	9	*Bph17_all+Bph32+Wx_A group+Gm4*
2	BR 13219-4 R-2	146	98	8.9	6.3	5.8	7.0	9	*Bph32+Wx_A group+Gm4*
3	BR 13219-4 R-4	154	99	5.0	7.5	7.4	6.6	7	*Bph17_all+Wx_A group*
4	BR 13219-4 R-6	150	99	9.0	7.2	5.1	7.1	7	*Bph17_all+Wx_A group +Gm4*
5	BR 13219-4 R-31	152	104	7.5	NA	6.8	7.2	9	*Bph32+Wx_A group+Gm4*
6	BR 13219-4 R-38	153	96	8.2	7.1	6.8	7.4	9	*Bph32+Wx_A group*
7	BR 13219-4 R-48	150	100	8.4	6.3	6.4	7.0	7	*Bph32+Wx_A group+Gm4*
8	BR 13219-4 R-85	151	101	8.4	5.4	6.8	6.9	9	*Bph32+Wx_A group+Gm4*
9	BR 13219-4 R-95	151	90	7.1	6.6	5.9	6.5	7	*Bph17_all+Wx_A group+Gm4*
10	BR 13219-4 R-96	149	101	7.1	6.6	6.2	6.6	7	*Bph32+Wx_A group+Gm4*
11	BR 13219-4 R-123	152	99	8.7	6.4	6.3	7.1	9	*Bph32+Wx_A group+Gm4*
12	BR 13219-4 R-124	150	102	6.5	6.5	6.9	6.6	7	*Bph17_all+Wx_A group*
13	BR 13219-4 R-139	150	102	6.2	7.6	7.2	7.0	7	*Bph32+Wx_A group+Gm4*
14	BR 13219-4 R-167	149	99	7.4	6.6	6.7	6.9	9	*Wx_A group*
15	BR 13219-4 R-244	147	104	8.9	7.7	7.2	7.9	9	*Bph32+Wx_A group*
16	BR 13219-4 R-249	155	92	6.4	6.8	8.8	7.3	9	*Bph17_all+Bph32+Wx_A group*
17	BR 13219-4 R-252	147	98	6.9	6.5	8.8	7.4	9	*Bph32+Wx_A group*
18	BR 13219-4 R-270	152	96	8.2	NA	5.5	6.9	7	*Bph32+Wx_A group+Gm4*
19	BR 13219-4 R-283	152	99	6.9	6.8	7.2	6.9	7	*Bph17_all+Bph32+Wx_A group*
20	BR 13219-4 R-287	147	99	8.2	7.6	6.5	7.5	9	*Bph32+Wx_A group*
21	BR 13219-4 R-339	149	107	7.8	6.6	6.3	6.9	9	*Bph32+Wx_A group+Gm4*
22	BR 13219-4 R-366	149	102	7.4	6.3	6.0	6.6	9	*Bph32+Wx_A group+Gm4*
23	BR 13219-4 R-382	151	106	6.7	7.4	5.3	6.5	5	*Bph17_all+Bph32+Wx_A group*
24	BR 13218-4 R-18	147	106	9.3	7.3	7.1	7.9	7	*Bph32+Wx_A group*
25	BR 13218-4 R-65	149	97	8.5	7.6	7.6	7.9	9	*Bph32+Wx_A group*
26	BR 13218-4 R-110	149	95	7.1	7.0	6.2	6.8	5	*Bph32+Wx_A group*
27	BR 13218-4 R-227	148	95	7.7	6.9	6.3	6.9	9	*Wx_A group+Gm4*
28	BR 13217-4 R-135	156	113	8.2	7.7	7.6	7.8	9	*Bph17_all+BPH32+Wx_A group*
29	BR 13217-4 R-227	153	110	9.4	7.2	6.8	7.8	9	*Bph17_all+BPH32+Wx_A group*
30	BR 13221-4 R-129	149	92	7.1	6.1	7.1	6.8	9	*Wx_A group*
31	BR 13223-4 R-1	149	101	7.1	7.2	8.4	7.6	9	*Wx_A group*
32	BR 13223-4 R-53	146	102	9.3	6.6	6.8	7.6	9	*Wx_A group*
33	BR 13223-4 R-82	150	100	7.7	7.1	5.7	6.8	9	*Wx_A group*
34	BR 13223-4 R-196	148	105	7.2	6.3	7.1	6.9	7	*Wx_A group+Gm4*
35	BR 13224-4 R-54	147	108	8.4	7.7	6.5	7.5	9	*Bph32+Wx_A group*
36	BR 13224-4 R-79	151	110	9.2	7.8	6.6	7.9	7	*Bph32+Wx_A group*
37	BR 13224-4 R-101	149	97	6.4	7.4	6.8	6.8	7	*Wx_A group*

38	BR 13224-4 R-129	149	104	7.4	7.6	5.9	7.0	7	*Bph32+Wx_A group*
39	BR 13224-4 R-234	147	102	8.3	7.0	7.2	7.5	9	*Bph32+Wx_A group*
40	BR 13227-4 R-74	148	93	7.2	6.4	6.1	6.6	-	*Wx_A group*
41	BR 13228-4 R-72	151	121	8.0	6.0	7.0	7.0	-	*Bph32+Wx_A group*
42	BR 12668-4 R-34	153	92	7.6	5.2	6.8	6.5	9	
43	BR 12668-4 R-163	150	105	8.4	7.7	6.9	7.7	9	
44	BR 12669-4 R-79	153	101	8.2	5.9	7.9	7.3	7	
45	BR 12669-4 R-198	155	103	8.1	7.6	7.3	7.7	9	
46	BR 12670-4 R-43	154	98	5.9	6.3	7.3	6.5	9	
47	BR 12670-4 R-74	153	101	8.7	6.5	6.6	7.2	9	
48	BR 12670-4 R-139	153	99	6.7	7.9	8.0	7.5	9	
49	BR 12671-4 R-123	151	99	8.4	7.7	7.2	7.8	9	
50	BR 12671-4 R-138	149	111	7.5	5.1	8.3	7.0	7	
51	BR 12671-4 R-185	153	101	7.9	7.3	7.5	7.6	9	
52	BR 12671-4 R-195	154	95	7.5	7.6	6.6	7.3	9	
53	BR 12671-4 R-253	153	106	9.4	7.3	7.5	8.0	9	
54	BR 12671-4 R-297	153	109	9.3	4.9	7.9	7.4	9	
55	BR 12671-4 R-312	155	115	8.2	6.7	7.7	7.5	9	
56	BR 12671-4 R-319	154	105	7.9	7.4	6.8	7.3	9	
57	BR 12671-4 R-321	155	111	8.7	7.0	7.5	7.7	9	
58	BR 12671-4 R-328	152	97	8.5	6.8	9.2	8.2	9	
59	BR 12671-4 R-377	153	107	8.6	6.3	7.0	7.3	9	
60	BR 12671-4 R-464	154	95	7.5	7.7	8.0	7.7	9	
61	BR 12671-4 R-491	152	115	9.1	6.5	7.7	7.8	9	
62	BR 12671-4 R-502	149	102	9.1	6.2	9.0	8.1	7	
63	BR 12671-4 R-521	153	108	9.4	5.8	8.2	7.8	7	
64	BR 12671-4 R-531	151	96	6.2	7.5	7.3	7.0	9	
65	BR 12671-4 R-560	152	112	5.7	7.1	8.1	7.0	9	
66	BR 12672-4 R-59	151	95	5.0	7.1	7.9	6.7	9	
67	BR 12672-4 R-82	152	100	NA	7.7	8.9	8.3	9	
68	BR 12672-4 R-175	155	103	6.2	7.5	9.0	7.5	9	
69	BR 12672-4 R-197	153	107	8.5	7.2	7.1	7.6	7	
70	BR 12672-4 R-205	152	106	NA	7.6	7.9	7.7	9	
71	BR 12672-4 R-252	154	106	7.7	7.4	7.7	7.6	9	
72	BR 12672-4 R-261	149	107	8.3	7.3	7.6	7.8	7	
73	BR 12676-4 R-146	151	95	5.5	7.2	6.9	6.5	9	
74	BR 12676-4 R-162	157	101	7.8	7.8	7.3	7.6	9	
75	BR 12676-4 R-393	153	98	7.0	6.3	5.9	6.4	5	
76	BR 12677-4 R-70	148	101	8.3	7.6	6.6	7.5	9	
77	BR 12677-4 R-134	154	101	8.2	6.0	7.3	7.1	7	
78	BR 12677-4 R-190	154	106	8.9	7.6	6.9	7.8	9	
79	BR 12677-4 R-242	150	113	8.1	6.6	7.0	7.2	7	
80	BR 12671-4 R-161	151	105	6.3	6.6	8.1	7.0	7	
81	BR 12678-4 R-187	154	95	7.9	6.5	7.6	7.3	9	
82	BR 12685-4 R-143	152	96	7.7	5.8	5.9	6.5	9	
83	BR 12685-4 R-203	156	103	9.4	6.7	7.1	7.7	9	
84	BR 12685-4 R-251	151	100	9.4	7.0	6.9	7.8	7	
	BRRI dhan88 (Ck)	146	95	6.5	6.7	6.1	6.4	7	
	BRRI dhan89 (Ck)	156	108	7.5	6.7	7.4	7.2	9	
	BR3 (Ck)	163	92	5.5	6.0	6.1	5.9	9	
	T27A (Ck)	144	127	5.4	5.2	5.1	5.3	5	
	LSD (0.05)	7.6	11.3	1.4	0.5	1.4	1.2		
	H2b	0.34	0.50	0.64	0.73	0.53	0.90		

Experiment 12.6: Preliminary Yield Trial (PYT)

Principal Investigator: M R A Sarker

Co-investigators: H Khatun, Ribed F Disha & M A Rahman (BRRI Gazipur), M R Hasan & M A Rahman (BRRI R/S, Rangpur) and M R Islam, A K M Salauddin & I Zahan (BRRI R/S, Cumilla)

Specific objective: Initial yield evaluation and selection of desirable lines compared to standard checks in replicated trials.

Materials and Method: Total 100 genotypes comprising PYT-1 and PYT-2 were evaluated at three locations of BRRI Gazipur, Rangpur and Cumilla in T. Aman 2022-23 against GM and BPH along with BRRI dhan33 (resistant check for GM), BRRI dhan49 (susceptible check), BRRI dhan52, BRRI dhan75 and BRRI dhan87 (Standard checks). Total 82 advanced breeding lines for BPH were grown at three locations of BRRI, Gazipur, Rangpur and Cumilla during Boro 2022-23. BRRI dhan88, BRRI dhan89 and BRRI dhan92 were used as standard checks. Twenty-five- and 45-days old seedling of each genotype was transplanted at the rate of 2-3 seedlings with a spacing of 20 × 20 cm following Row-Column design with two replications. The unit plot size was 5.4 m×5 rows. Fertilizer doses and application were the same as in Experiment 12.1. Crop management such as weeding, controlling disease was done in time. Importantly, no insecticides were applied in this experiment.

Results and discussion: In T. Aman season, yield of the advanced breeding lines ranged from 3.3-7.4 t/ha in PYT-1 and 2.8-6.5 t/ha in PYT-2 at Gazipur, 3.2-7.0 t/ha in PYT-1 and 4.1-7.1 t/ha in PYT-2 at Cumilla, and 1.9-4.7 t/ha in PYT-1 and 2.2-6.2 t/ha in PYT-2 at Rangpur (**Fig. 12.6.1** and **12.6.2**). The average plant height ranged from 96.0-128.0 cm in PYT-1 and 100-133 cm in PYT-2. The average yield ranged from 3.4-5.9 t/ha and 3.8-5.2 t/ha with the average of 106-126 days and 114-138 days growth duration in PYT-1 and PYT-2, respectively. Twenty-four (12 in PYT-1 and 12 in PYT-2) genotypes from 100 genotypes were selected compared to check varieties for further evaluation **(Table 12.6.1 and 12.6.2)**. Yield of the advanced breeding lines ranged from 5.0-8.6 t/ha in Gazipur, 4.4-7.9 t/ha in Cumilla and 5.5-9.9 t/ha in Rangpur (**Fig. 12.6.3)**. The average plant height ranged from 80-119 cm. The average yield ranged from 5.8-8.1 t/ha with the average of 142-158 days growth duration. Thirty genotypes were selected compared to the respective check varieties for further evaluation **(Table 12.6.3)** in Boro season. Selection was done based on flowering uniformity, phenotypic acceptability, growth duration, yield and pest infestation under field condition.

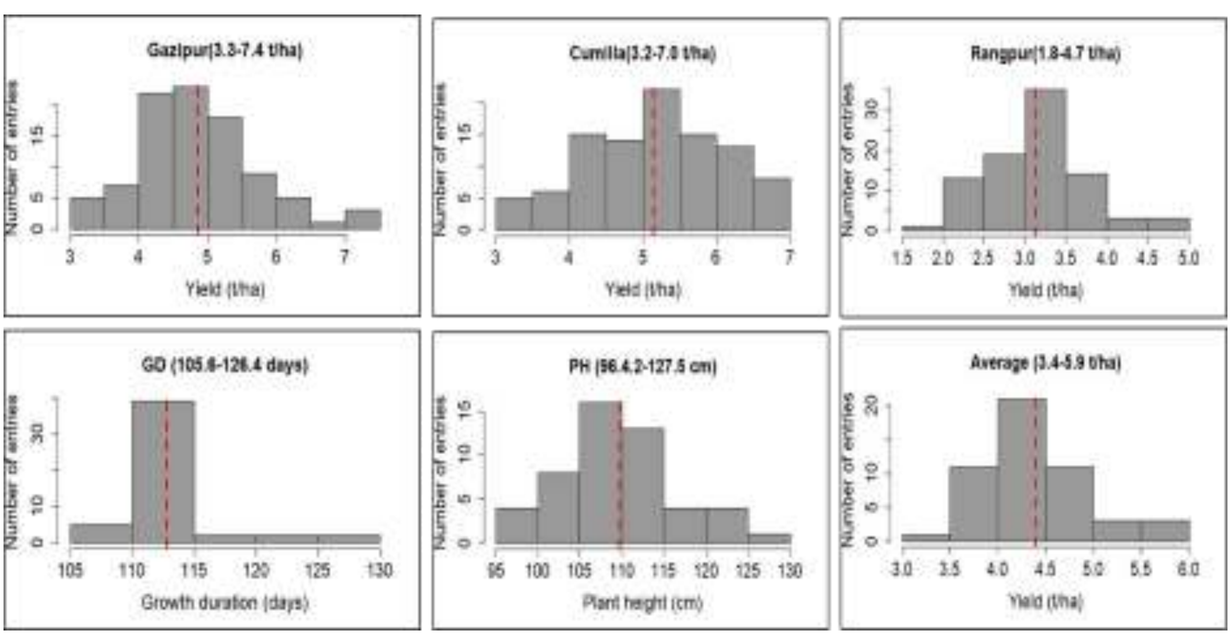


Fig. 12.6.1 Histogram of average growth duration, plant height and yield performance of 48 genotypes tested in PYT-1 at three locations during T. Aman 2022-23

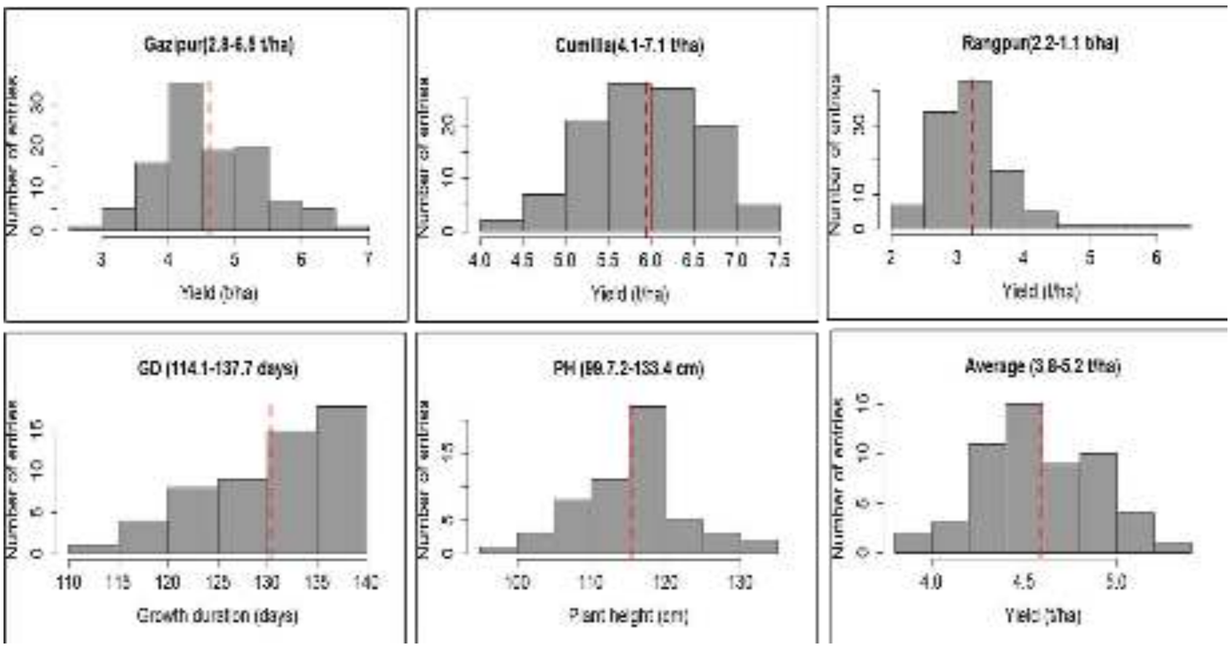


Fig. 12.6.2 Histogram of average growth duration, plant height and yield performance of 52 genotypes tested in PYT-2 at three locations during T. Aman 2022-23

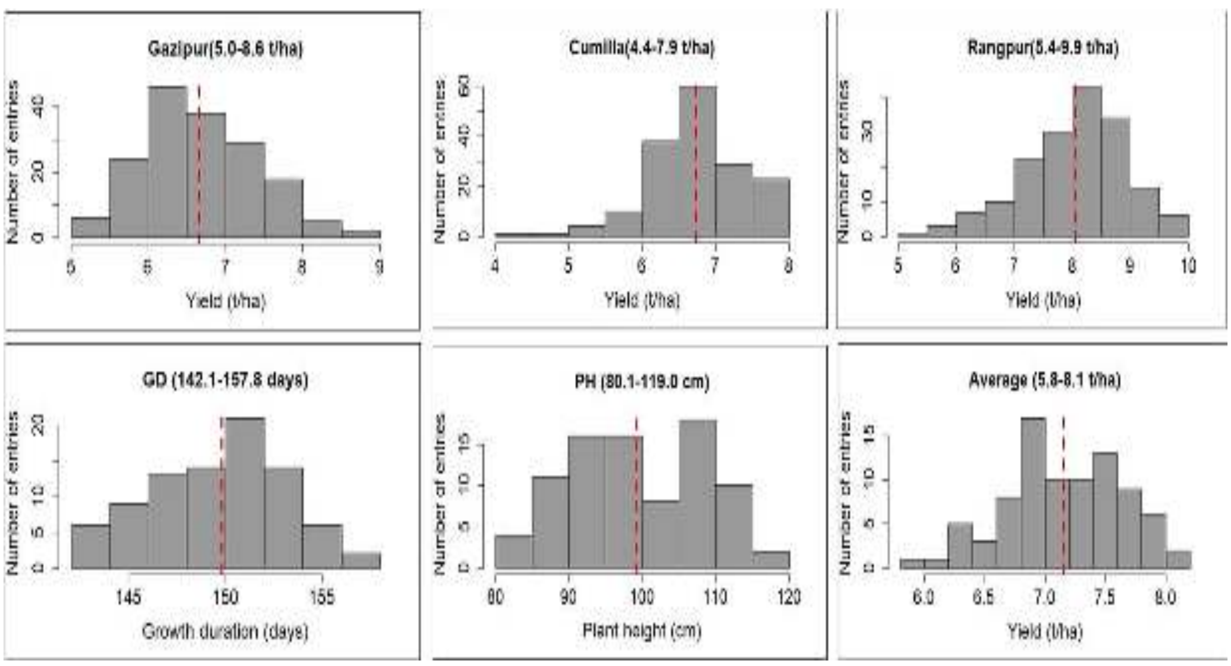


Fig. 12.6.3 Histogram showing average growth duration, plant height and yield performance of 82 genotypes tested in PYT at three locations during Boro 2022-23

Table 12.6.1: Performance of selected genotypes from PYT-1, Development of Insect Resistant Rice (IRR), T. Aman 2022-23

Sl #	Designation	GD (day)	PH cm	Yield (t/ha)				Field BPH Score (SES)	BPH Score (SES)	Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE			
1	BR 12208-5 R-2	112	106	6.1	6.6	3.5	5.4	5	9	*Bph32, Wx-A_group*
2	BR 12208-5 R-23	113	120	4.8	4.4	3.7	4.3	3	9	*Bph32, Gm4_4, Wx-A_group*
3	BR 12208-5 R-30	112	108	4.2	6.0	4.2	4.8	5	7	*Bph32, Wx-A_group*
4	BR 12208-5 R-42	113	104	5.1	5.6	3.1	4.6	5	7	*Gm4, Wx-A_group*
5	BR 12208-5 R-69	112	119	NA	4.8	3.2	4.3	3	7	*Bph32, Wx-A_grou*
6	BR 12208-5 R-110	112	108	4.7	6.0	3.2	4.7	5	7	*Bph32, Wx-A_group*
7	BR 12208-5 R-310	112	104	5.2	5.2	2.9	4.5	5	9	*Gm4, Wx-A_group*
8	BR 12208-5 R-344	112	108	4.2	5.7	3.6	4.5	3	9	*Bph32, Wx-A_group*
9	**BR 12211-5 R-179**	**126**	**110**	**6.8**	**6.2**	**NA**	**5.9**	7	9	*Bph32, Gm4*
10	**BR 12216-5 R-28**	**126**	**97**	**5.9**	**6.4**	**NA**	**5.6**	5	9	*Bph17, Wx-A_group*

11	BR 12229-5 R-162	121	124	4.1	5.5	3.1	4.2	5	9	*Bph32, Gm4*
12	BR 12183-5 R-28	113	111	5.0	6.2	3.4	4.9	5	9	*Wx-A_group*
	BRRI dhan33 (Ck)	113	103	4.6	4.8	3.0	4.1	9	7	
	BRRI dhan75 (Ck)	112	103	5.5	5.5	3.3	4.8	7	7	
	LSD (0.05)	3	9	0.8	0.9	0.5	1.3			
	H2b	0.72	0.82	0.3	0.23	0.7	0.19			

Table 12.6.2: Performance of selected genotypes from PYT-2, Development of Insect Resistant Rice (IRR), T. Aman 2022-23

Sl#	Designation	GD day	PH cm	Yield (t/ha)				Field BPH Score SES	BPH Score SES	Trait of Interest (ToI)
				L1	L2	L3	BLUE			
1	BR 12180-5 R-43	136	118	4.8	6.4	3.1	4.7	3	7	*Bph32, Wx-A_group*
2	BR 12180-5 R-62	134	118	4.8	6	2.8	4.5	5	7	*Bph32, Gm4, Wx-A_group*
3	BR 12186-5 R-35	123	125	4.8	6.5	3.3	4.9	5	7	*Bph32, Gm4*
4	BR 12193-5 R-54	130	100	4.6	5.4	3.3	4.4	3	7	*Bph9, Bph17_all, Wx-A_group*
5	BR 12208-5 R-80	124	124	3.6	5.8	3.4	4.3	5	7	*Bph32, Wx-A_group*
6	BR 12214-5 R-39	136	118	4.3	5.4	5	4.9	3	7	*Bph32, Wx-A_group*
7	BR 12214-5 R-70	137	117	4.5	5.4	3.3	4.4	3	9	*Gm4, Wx-A_group*
8	BR 12214-5 R-195	136	116	4.1	6.9	2.7	4.6	3	7	*Wx-A_group, Gm4*
9	BR 12216-5 R-31	132	117	6.1	5.4	3.3	4.9	5	7	*Bph17_all*
10	BR 12229-5 R-2	131	108	4.1	6.4	3.0	4.5	5	9	*Bph32, Gm4, Wx-A_group*
11	BR 12208-5 R-19	124	132	5.1	6	4.1	5.0	5	7	
12	BR 12208-5 R-215	130	127	5.7	6.5	3.4	5.2	5	7	
	BRRI dhan49 (Ck)	133	104	4.4	5.8	3.1	4.4	7	7	
	BRRI dhan52 (Ck)	138	114	4.8	5.9	3.1	4.6	7	7	
	BRRI dhan87 (Ck)	127	120	4.1	6.3	3.3	4.6	7	7	
	LSD (0.05)	6.7	12.2	0.8	0.7	0.5	1.6			
	H2b	0.54	0.56	0.5	0.5	0.8	0.26			

L1= Gazipur, L2= Cumilla, L3= Rangpur

Table 12.6.3: Performance of selected genotypes from PYT, Development of Insect Resistant Rice (IRR), Boro 2022-23

Sl #	**Designation**	**GD days**	**PH cm**	**Yield (t/ha)**				**BPH SES**	**Trait of Interest (ToI)**
				L1	**L2**	**L3**	**BLUE**		
1	BR 12667-4 R-86	147	97	8.1	7.0	8.5	7.9	7	*Bph17_all+WX-A_Group+Gm4*
2	BR 12669-4 R-161	143	109	6.2	6.8	7.8	6.9	7	*Bph17_all+WX-A_Group*
3	BR 12670-4 R-20	151	109	7.1	7.1	9.3	7.8	7	*WX-A_Group*
4	BR 12671-4 R-29	153	98	5.3	6.9	8.1	6.8	9	*WX-A_Group*
5	BR 12671-4 R-88	152	102	7.7	7.2	8.8	7.9	9	*WX-A_Group*
6	BR 12671-4 R-95	148	117	6.9	6.9	9.9	7.9	9	*WX-A_Group+fgr 1+BAHD1*
7	BR 12671-4 R-154	151	113	7.4	6.6	8.6	7.5	9	*WX-A_Group+Gm4 +fgr-1*
8	BR 12675-4 R-125	149	99	7.1	7.2	8.1	7.4	9	*WX-A_Group+Gm4 +fgr-1+BAHD1*
9	BR 12675-4 R-216	150	101	6.4	6.4	6.4	6.4	7	*Bph17_all+WX-A_Group+Gm4+Bph9*
10	BR 12676-4 R-148	155	94	6.0	5.9	7.0	6.3	**5**	*Bph17_all+WX-A_Group +Gm4+fgr-1+BAHD1*

11	BR 12676-4 R-192	152	101	6.0	7.3	7.7	7.0	9	*WX-A_Group+Gm4 +fgr-1+BAHD1+Bph9*
12	BR 12676-4 R-237	147	85	6.4	7.0	6.9	6.8	9	*Bph17_al+WXA_Group+ Gm4+fgr1+BAHD1*
13	BR 12676-4 R-256	147	89	6.5	7.0	8.4	7.3	9	*WX-A_Group+Gm4 +fgr-1+BAHD1*
14	BR 12676-4 R-392	145	88	6.3	7.0	7.8	7.0	**5**	*WX-A_Grroup+Gm4*
15	BR 12677-4 R-60	153	111	6.0	4.5	7.7	6.1	-	*WX-A_Group+Gm4 +fgr-1+BAHD1*
16	BR 12677-4 R-286	152	105	7.2	7.5	8.6	7.8	9	*WX-A_Group*
17	BR 12679-4 R-2	153	98	6.2	6.6	9.2	7.3	-	*WX-A_Group+Gm4 +fgr-1+BAHD1*
18	BR 12679-4 R-6	151	103	8.2	7.2	8.7	8.0	9	*WX-A_Group+Gm4 +fgr-1+BAHD1*
19	BR 12679-4 R-36	155	105	7.6	5.6	8.3	7.2	9	*WX-A_Group*
20	BR 12679-4 R-41	153	110	7.1	7.4	8.1	7.5	9	*WX-A_Group+Gm4 +fgr-1+BAHD1*
21	BR 12679-4 R-63	152	91	6.5	7.2	8.3	7.3	7	*WX-A_Group+Gm4 +fgr-1+BAHD1*
22	BR 12679-4 R-67	153	105	7.0	7.3	8.0	7.4	-	*WX-A_Group+Gm4*
23	BR 12679-4 R-70	151	102	5.5	6.9	7.8	6.7	-	*WX-A_Group+Gm4*
24	BR 12679-4 R-98	151	106	7.9	6.4	8.7	7.7	-	*WX-A_Group+Gm4*
25	BR 12679-4 R-168	152	88	6.3	6.9	8.4	7.2	-	*WX-A_Group+Gm4*
26	BR 12679-4 R-173	152	96	6.5	7.2	8.8	7.5	-	*WX-A_Group+Gm4 +fgr-1+BAHD1*
27	BR 12679-4 R-187	150	90	NA	NA	9.0	8.1	-	*WX-A_Group+Gm4 +fgr-1+BAHD1*
28	BR 12681-4 R-135	143	91	7.0	6.1	7.3	6.8	9	*WX-A_Group*
29	BR 12682-4 R-50	148	111	6.7	6.7	9.3	7.6	7	*WX-A_Group*
30	BR 12685-4 R-159	152	110	7.0	6.4	8.4	7.3	-	*WX-A_Group*
	BRRI dhan88 (Ck)	146	93	6.7	6.7	7.7	7.1	7	
	BRRI dhan89 (Ck)	153	107	7.4	6.6	9.9	8.0	9	
	BRRI dhan92 (Ck)	157	109	6.9	6.7	8.9	7.5	9	
	LSD (0.05)	7.6	7.9	0.7	0.6	0.8	1.1		
	H2b	0.57	0.66	0.6	0.63	0.7	0.25		

L1= Gazipur, L2= Cumilla, L3= Rangpur

Experiment 12.7: Advanced Yield Trial (AYT)

Principal Investigator: M R A Sarker

Co-investigators: H Khatun, R F Disha & M A Rahman (BRRI Gazipur), M R Islam, A K M Salauddin & I Zahan (BRRI R/S, Cumilla) and M R Hasan & M A Rahman (BRRI R/S, Rangpur)

Specific objective: Confirmatory yield evaluation and selection of desirable lines compared to standard checks.

Materials and Method: Twenty-eight genotypes were evaluated at three locations of BRRI Gazipur, BRRI R/S Rangpur and BRRI R/S Cumilla in T. Aman season against GM and BPH along with BRRI dhan33 (resistant check for GM), BRRI dhan49 (susceptible check) and BRRI dhan87 (Standard check). Total 30 genotypes were evaluated at three locations of BRRI Gazipur, BRRI R/S Cumilla and BRRI R/S Rangpur against BPH along with the checks BRRI dhan88, BRRI dhan89 and BRRI dhan92 in Boro season. Twenty-five- and 45-days old seedling of each genotype were transplanted at the rate of 2-3 seedlings with a spacing of 20 × 20 cm following Row-Column design with two replications. The unit plot size was 5.4 m×5 rows. Fertilizer doses and application were the same as in Experiment 12.1. Crop management such as weeding, controlling disease was done in time. Importantly, no insecticides were applied in this experiment.

Results and discussion: In T. Aman season, yield of the advanced breeding lines ranged from 3.2-7.8 t/ha in Gazipur, 3.9-6.8 t/ha in Cumilla and 2.4-5.3 t/ha in Rangpur (**Fig. 12.7.1**). The average plant height ranged from 107.2-126.9 cm. The average yield ranged from 3.7-5.4 t/ha with the average of 112-140 days growth duration. Ten genotypes from 28 genotypes were selected compared to check varieties for further evaluation **(Table 12.7.1)**. In Boro season, yield of the advanced breeding lines ranged from 5.4-8.4 t/ha in Gazipur, 4.2-8.0 t/ha in Cumilla and 4.5-9.2 t/ha in Rangpur (**Fig. 12.7.2**). The average plant height ranged from 91-113 cm. The average yield ranged from 5.9-8.0 t/ha with average 145-158 days growth duration. Out of 30 genotypes, 14 were selected for further evaluation, as they showed higher yield over the respective check varieties **(Table 12.7.2)**.

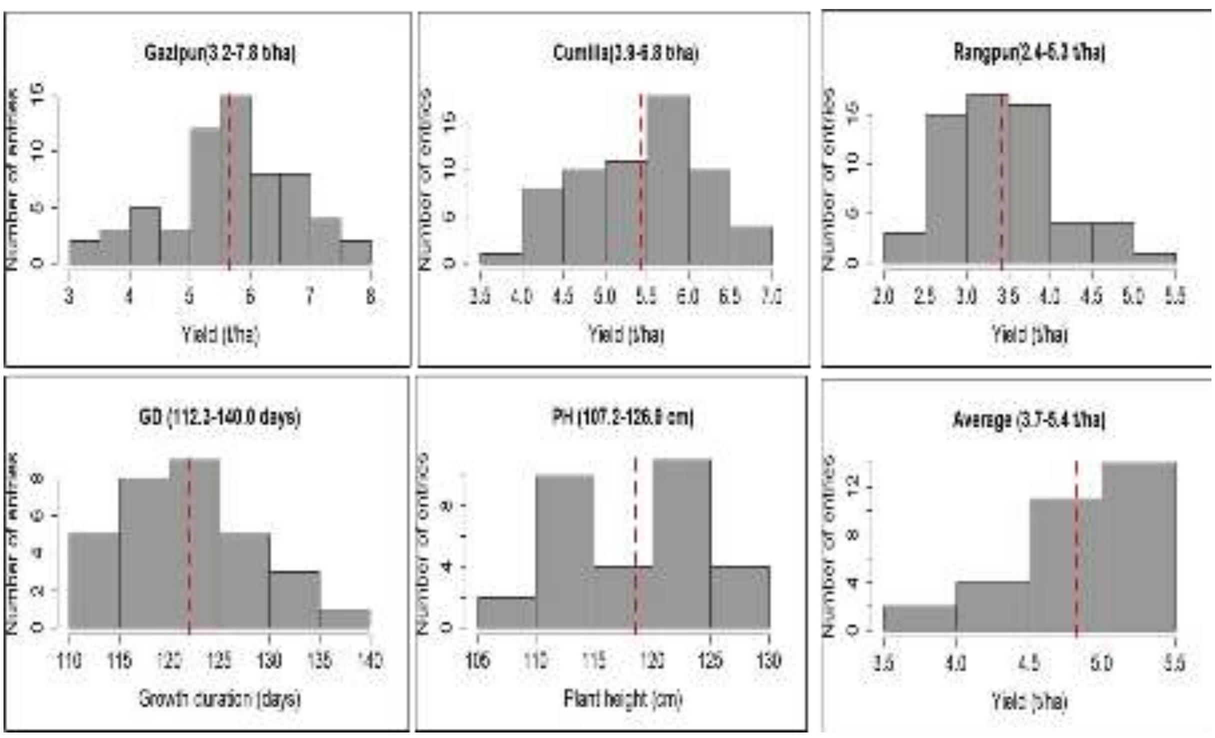


Fig. 12.7.1 Histogram of average growth duration, plant height and yield performance of 28 genotypes tested in AYT at three locations during T. Aman 2022-23

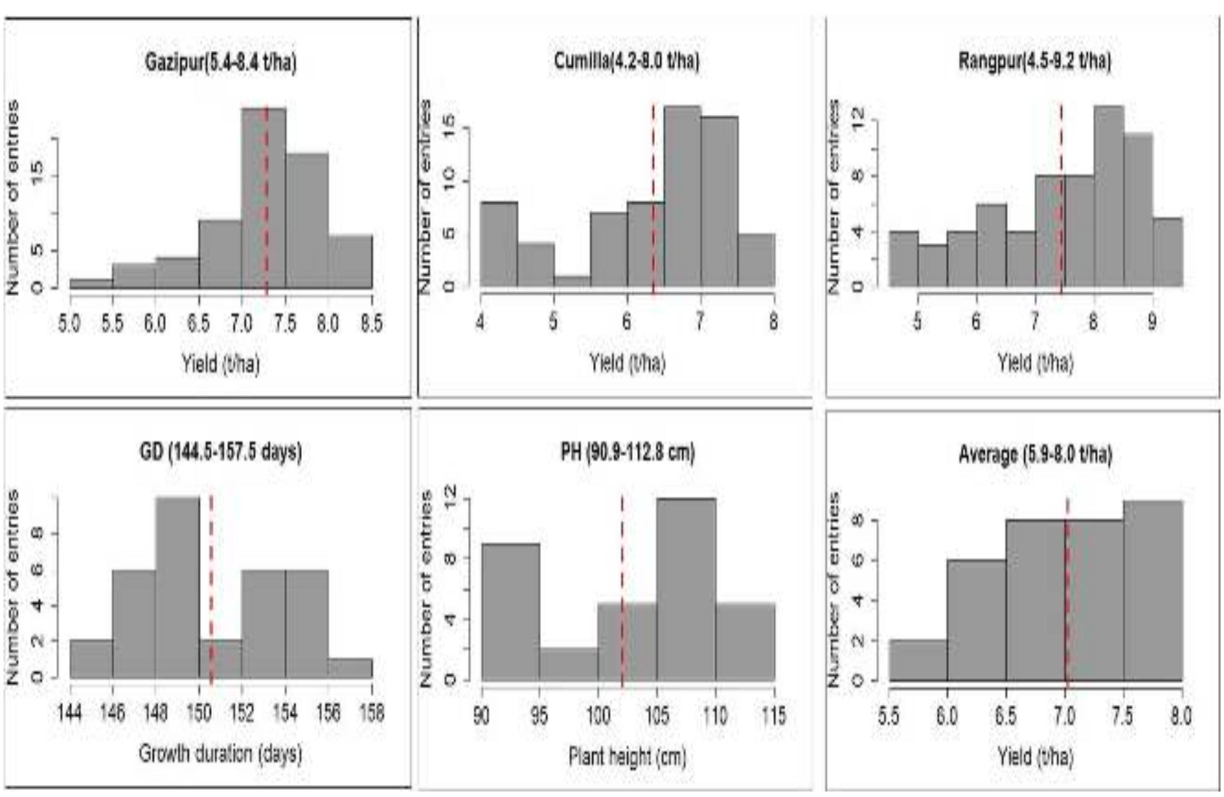


Fig. 12.7.2 Histogram of average growth duration, plant height and yield performance of 30 genotypes tested in AYT at three locations during Boro 2022-23

Table 12.7.1: Performance of selected genotypes from AYT, Development of Insect Resistant Rice (IRR), T. Aman 2022-23

Sl #	Designation	GD days	PH cm	Yield (t/ha)				Field BPH SES	BPH SES	Trait of Interest (ToI)
				L1	L2	L3	Pooled			
1	BR 11296-4 R -74	128	119	6.4	5.6	3.3	5.1	3	7	*Bph32, Wx-A_group*
2	BR 11296-4 R -74	128	119	6.4	5.6	3.3	5.1	3	5	*Bph32, Wx-A_group*
3	BR 11044-4 R -47	117	115	5.6	4.7	4.9	5.0	5	5	*Bph17_all, Gm4, Wx-A_group*
4	BR 11295-4 R -387	130	126	6.1	5.3	2.9	4.8	5	7	*Bph32, Gm4*
5	BR 11035-4 R -101	114	123	7.2	5.4	3.4	5.3	5	5	*Bph17_all, Bph32, Gm4, Wx-A_group*
6	BR 11052-4 R -234	119	114	6.6	5.4	3.4	5.1	7	9	*Bph17_all, Bph32, Wx-A_group*
7	BR 11295-4 R -486	122	114	6.2	5.3	2.9	4.8	5	7	*Bph32*
8	IRBPHN-SVIN013-18	117	123	4.2	6.6	4.3	5.0	5	5	*Bph17_all, Bph32*
9	BR 11040-4 R -137	123	123	6.3	5.9	3.7	5.3	3	7	*Bph32,Wx-A_ group*
10	BR 11033-4 R -33	126	126	5.6	6.4	2.8	4.9	6	5	*Gm4, Wx-A_group*
	BRRI dhan33 (Ck)	112	112	5.7	4.8	3.3	4.6	9	9	
	BRRI dhan49 (Ck)	131	108	5.9	5.9	4.3	5.4	5	7	
	BRRI dhan87 (Ck)	123	121	5.7	5.8	4.3	5.3	7	7	
	LSD (0.05)	5.8	7.2	0.8	0.4	0.5	1.6			
	H2b	0.73	0.33	0.9	0.8	0.8	0.22			

L1= Gazipur, L2= Cumilla, L3= Rangpur

Table 12.7.2: Performance of selected genotypes from AYT, Development of Insect Resistant Rice (IRR), Boro 2022-23

Sl #	Designation	GD days	PH cm	Yield (t/ha)					BPH Score (SES)	Trait of Interest (ToI)
				L1	L2	L3	BL UE	BL UP		
1	BR 12177-5 R-1	155	113	7.6	7.3	6.9	7.3	7.1	-	*Wx-A_Group+Gm4*
2	BR 12208-5 R-19	149	107	7.6	6.9	7.1	7.2	7.1	9	*Wx-A_Group*
3	BR 12208-5 R-87	148	100	7.2	7.4	8.9	7.8	7.1	9	*Bph32+Wx-A_Group +BAHD1*
4	BR 12208-5 R-31	147	92	7.4	7.1	8.3	7.6	7.1	7	*Bph32+Wx-A_Group*
5	BR 12208-5 R-107	147	91	7.9	6.9	8.6	7.8	7.1	9	*Bph32+Wx-A_Group*
6	BR 12208-5 R-227	149	93	7.4	7.0	7.6	7.3	7.1	7	*Bph32+Wx-A_Group*
7	BR 12208-5 R-278	147	93	8.0	7.1	8.9	8.0	7.2	9	*Bph32+Wx-A_Group*
8	BR 12208-5 R-326	148	93	8.0	7.1	8.2	7.7	7.1	9	*Bph32+Wx-A_Group*
9	BR 12208-5 R-330	148	92	8.3	4.3	8.9	7.2	7.0	9	*Bph32+Wx-A_Group*
10	BR 12208-5 R-403	149	91	7.7	6.5	9.0	7.7	7.1	9	*Bph32+Wx-A_Group*
11	BR 12279-4 R-10	153	107	7.8	7.1	7.1	7.4	7.1	5	*Wx-A_Group*
12	BR 11948-4 R-162	153	107	7.7	7.8	6.9	7.4	7.1	7	*Wx-A_Group*
13	BR 11949-4 R-39	146	101	7.3	6.2	6.7	6.8	7.0	9	*Bph32+Wx-A_Group*
14	BR 11949-4 R-137	148	111	7.3	7.0	8.4	7.5	7.1	9	*Wx-A_Group*
	BRRI dhan88 (Ck)	145	95	7.6	6.8	8.5	7.6	7.1		
	BRRI dhan89 (Ck)	155	105	7.4	6.8	8.9	7.7	7.1		
	BRRI dhan92(Ck)	158	108	7.4	6.8	8.3	7.5	7.1		
	LSD (0.05)	6.4	7.2	0.6	0.5	1.0	1.2			
	H2b	0.69	0.71	0.39	0.86	0.56	0.60			

Project 13: DEVELOPMENT OF DISEASE RESISTANT RICE

General objective: Development of genotypes resistant to bacterial blight (BB), blast & RTV.

Project Leader: Dr Mahmuda Khatun

Experiment 13.1: Hybridization for BB & blast resistance rice genotypes
Principal Investigator: M Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objective: Introgression of resistant genes against bacterial blight (BB) and blast.

Materials and Methods: The experiment was conducted in BRRI Gazipur. The crossing program for the development of BB & blast resistant genotype was started from 01 July in T. Aman for good seed setting. Seeding was done in the hybridization block at three dates with an interval of 7 days to synchronize flowering times between male and female parents. Twenty-five-day-old seedlings for T. Aman were transplanted in a 5.4 m × 2 rows plot with a spacing of 25 × 20 cm. Single seedling was used for transplanting. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg $ZnSO_4$) kg NPKSZn/ha in T. Aman and @120 (261 kg Urea): 19 (95 kg TSP): 60 (120 kg MP): 20 (111 kg Gypsum): 4 (11 kg $ZnSO_4$) kg NPKSZn/ha were applied in Boro season. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen was applied at three equal splits at 10, 25-30 and 40-45 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly.

Results and discussion: Seven crosses for bacterial blight (BB) and 18 for blast and RTV were made in T. Aman season and 12 crosses for BB and 10 crosses for blast and RTV in Boro season were made. High yield, BB, RTV and blast resistance, drought tolerance, lodging tolerance, low water requirement, cold tolerance was emphasized in crossing program. A total of 5577 F_1 seeds for T. Aman season and 3676 F_1 seeds for Boro season were produced from forty-seven crosses (**Table 13.1.1** and **Table 13.1.2**).

Table 13.1.1 List of the crosses made, Development of BB & blast Resistant Rice, T. Aman 2022-23

SN	Designation	No. of F_1 seeds	Important features
BB resistance			
1	BR12091-4R-99 / BR11866-5R-312	20	*Xa4, Xa21, xa5*
2	7 FBR-189 / BR11866-5R-312	13	*Xa4, Xa21, xa5*
3	BRRI dhan99 / BR11867-5R-103	56	*Xa4, Xa21*
4	BR11723-4R-12/BRRI dhan101	71	*Xa4, Xa21, Xa7*
5	BR9138-4-4-5-5-P3-HR3-HR5 /BR11607-4R-72	45	*Xa4, Xa21, xa5,xa13*
6	BR9006-40-2-3-1*3/ BR11607-4R-72	286	*Xa4, Xa21, xa5,xa13*
7	BR9830-53-3-5-2*3/ BR11607-4R-72	35	*Xa4, Xa21, xa5, xa13*
Blast & RTV resistance			
8	BR9006-40-2-3-1*3/ IRRI154-Pi9	454	*Pi9, TSV1*
9	BR8781-16-1-3-P2*3/ IRRI154-Pi9	472	*Pi9, TSV1*
10	BRAC dhan2 *2/ IRRI154-Pi9	15	*Pi9, TSV1*
11	BRRI dhan80*3/ IRRI154-Pi9	663	*Pi9, TSV1*
12	BR11723-4R-12*3/ IRRI154-*Pi9*	89	*Pi9, TSV1*
13	BRRI dhan70*3/ IRRI154-*Pi9*	459	*Pi9, TSV1*
14	BR11864-5R-99 / IRRI154-Pi9	12	*Pi9, TSV1*
15	BR11723-4R-12*3/ IR64-Pi9	240	*Pi9*
16	BRBa-1-4-9*3/ IR64-Pi9	281	*Pi-ta*
17	7 FBR-222*3/ IRBLta2-Pi(RL)-T(RL)	360	*Pi9, TSV1*
18	Bangabandhu dhan100*2/ IRRI154-Pi9	19	*Pi9, Pi-ta*

19	BRAC dhan2*2/BR12450-4R-24-1	357	*Pi9, TSV1*
20	BR11723-4R-12*2/ BR12450-4R-24-1	382	*Pi9, Pi-ta*
21	7 FBR-222*2/ IRRI154-Pi9	414	*Pi9, TSV1*
22	BR11723-4R-12*2/ IRBL9-W (Pi9)	270	*Pi9*
23	BR11607-4R-72 //BRRI dhan70*2/IRRI154-*Pi9*	129	*Pi9, TSV1*
24	BR11607-4R-72// BRAC dhan2 / IRRI154-Pi9	212	*Pi9, TSV1*
25	BR11607-4R-72//BR11723-4R-12*2/IRRI154-Pi9	223	*Pi9, TSV1*
	Total	**5577**	

Table 13.1.2 List of the crosses made, Disease resistant to BB and blast, Boro2022-23

SN	Parentage	No of F_1 seed	Targeted BB resistant genes
BB resistance			
1	BR11864-5R-99/BR9138-4-4-5-5-P3-HR3-HR5	13	*Xa4, Xa21, xa5*
2	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49	147	*Xa4, Xa21, xa5*
3	BR12442-4R-49/BR11603-4R-77	169	*Xa4, Xa21, xa5*
4	BR11603-4R-77/BR11603-4R-49	186	*Xa4, Xa21, xa13*
5	BR11603-4R-49/BR11607-4R-192	212	*Xa4, Xa21, xa5, xa13*
6	BR11603-4R-155/BR11607-4R-192	84	*Xa4, Xa21, xa5, xa13*
7	BR11867-5R-103/7 FBR-364	32	*Xa4, Xa21*
8	BR11867-5R-442/Gota IRRI	190	*Xa4, Xa21*
9	7 FBR-376/BR11867-5R-103	125	*Xa4, Xa21*
10	BR12091-4R-99/BRRI dhan101	75	*Xa4, Xa21, Xa7*
11	7 FBR-376/ BRRI dhan101	335	*Xa4, Xa21, Xa7*
12	BR9138-4-4-5-5-P3-HR3-HR5*2/BR11607-4R-72	130	*Xa4, Xa21, xa5, xa13*
	Blast resistance		
13	BR11867-5R-442/BR12454-BC2-56-81-27-3-30	155	*Pi9, TSV1*
14	BR11867-5R-87/BR12454-BC2-69-97-39-5-44	117	*Pi9, TSV1*
15	BRRI dhan102/BR12454-BC2-71-91-6-23-26	167	*Pi9, TSV1*
16	BRR dhan98/BR12454-BC2-75-32-31-39-7	63	*Pi9, TSV1*
17	BR11864-5R-99*2/IRRI154-Pi9	261	*Pi9, TSV1*
18	BR11607-4R-72/BR12450-4R-24	213	*Pi9, Pi-ta*
19	BRAC dhan2*3/BR12450-4R-24	191	*Pi9, Pi-ta*
20	BR11723-4R-12*3/ BR12450-4R-24	349	*Pi9, Pi-ta*
21	7 FBR-222*3/ IRRI154-Pi9	80	*Pi9, TSV1*
22	BR11723-4R-12*3/ IRBL9-W	382	*Pi9*
	Total	**3676**	

Experiment 13.2: Confirmation of F_1

Principal Investigator: M Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objectives: To confirm the crosses as true F_1s.

Materials and methods: The experiment was conducted in BRRI Gazipur. In total, forty-nine crosses were grown in both T. Aman and Boro (**Table 13.2.1** and **Table 13.2.2**). F_1 seeds of each cross and their respective parents were germinated in the petri dishes and then sown in earthen pots. Twenty-five-day-old seedlings for T. Aman season were transplanted at a spacing of 25 × 15 cm in the net house. Respective parental seedlings were transplanted on both sides of each F_1 population. The cross-confirmation was done by careful observation of plant characters. F_1's confirmation was done by both quality check (QC) genotyping and observation techniques. Leaf samples were collected from each of the plants from F_1 and parents for QC genotyping to determine true F_1. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation promising true F1's was selected and used for back and multiple crosses. Application of fertilizer & crop management was done as described in experiment 1.

Results and discussion: Thirteen for BB & 21 for blast were confirmed in T. Aman2022-23 (**Table 13.2.1**) and 11 for BB & nine for blast were confirmed in Boro2022-23 (**Table 13.2.2**) Seeds of these selected F_1 plants were self to produce F_2 seeds. At maturity, F_2 seeds of all selected plants were harvested individually, dried, cleaned, and preserved in the cold room.

Table 13.2.1 List of F1s confirmed, Development of BB, blast & RTV Resistant Rice, T. Aman 2022-23

SN	Designation	Remarks
BB resistance		
1	BR9006-40-2-3-1*2/ BR11607-4R-72	**BB resistance**
2	BR9830-53-3-5-2*2/ BR11607-4R-72	"
3	BR9006-40-2-3-1*3/ BR11868-5R-23	"
4	BR9829-78-1-2-1*3/ BR11607-4R-192	"
5	BR9829-78-1-2-1*3/ BR11607-4R-192	"
6	BR9829-78-1-3-2*2/ BR11868-5R-23	"
7	BR9138-4-4-5-5-P3-HR3-HR5/ BR11607-4R-72	"
8	Bangabandhu dhan100/ BR11607-4R-184	"
9	BR12121-4R-53/ BR9138-4-4-5-5-P3-HR3-HR5	"
10	7 FBR-222/ BR11603-4R-49	"
11	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49	"
12	BR11723-4R-12/ BR12442-4R-49	"
13	BR11864-5R-99/ BR11607-4R-72	"
Blast & RTV resistance		
14	BRRI dhan80*2/ IRRI154-Pi9	Blast & RTV resistance
15	BR9006-40-2-3-1*2/ IRRI154-Pi9	"
16	BR8781-16-1-3-P2*2/ IRRI154-Pi9	"
17	BR11723-4R-12*2/ IRRI154-*Pi9*	"
18	BRRI dhan70*2/ IRRI154-*Pi9*	"
19	BR11723-4R-12*2/ IR64-Pi9	"
20	BRBa-1-4-9*2/ IR64-Pi9	"
21	7 FBR-222*2/ IRBLta2-Pi(RL)-T(RL)	"
22	BRRI dhan87*3/ IRBL9-W (RL)	"
23	Bangabandhu dhan100/ IRRI154-Pi9	"
24	BRAC dhan2/ IRRI154-Pi9	"
25	BRAC dhan2/BR12450-4R-24-1	"
26	BR11723-4R-12/ BR12450-4R-24-1	"
27	7 FBR-222/ IRRI154-Pi9	"
28	BR12121-4R-53/ IRBL9-W	"
29	BRRI dhan71*3/ IR127152-3-22-2-1-B	"
30	BR9829-78-1-2-1*3/ IR127152-3-22-2-1-B	"
31	BRRI dhan99*3/ IR127152-3-22-2-1-B	"
32	Kataribhog/ IRBL9-W(RL)	"
33	Khasa (Cumilla)/IR64-Pi9*2	"
34	BRRI dhan87*2/ IRBL9-W (RL)	"

Table 13.2.2 List of F1s confirmed, Development of BB, blast & RTV Resistant Rice, Boro2022-23

SN	Designation	Remarks
BB resistance		
1	BR9006-40-2-3-1/ BR11607-4R-72	**BB resistance**
2	BR9830-53-3-5-2/ BR11607-4R-72	"
3	BR11868-5R-2/BRBa-1-4-9	"
4	BR11868-5R-2/7 FBR-376	"

5	BR9006-40-2-3-1*2/ BR11868-5R-23	"
6	BR9006-40-2-3-1/ BR11868-5R-23// BR11723-4R-172	"
7	BR9829-78-1-2-1*2/ BR11607-4R-192	"
8	BR9829-78-1-3-2*2/ BR11868-5R-23	"
9	BR9829-78-1-3-2/ BR11868-5R-23// BR11723-4R-12	"
10	BR11600-4R-230/N22//BR11723-4R-172	"
11	BR11868-5R-23/N22// BR11723-4R-172	"
Blast & RTV resistance		
12	BRRI dhan80/ IRRI154-Pi9 (Pi9)	Blast & RTV resistance
13	BR9006-40-2-3-1/ IRRI154-Pi9	"
14	BR8781-16-1-3-P2/ IRRI154-Pi9	"
15	BR11723-4R-12/ IRRI154-*Pi9*	"
16	BRRI dhan70/ IRRI154-*Pi9*	"
17	BR11723-4R-12/ IR64-Pi9	"
18	BRBa-1-4-9/ IR64-Pi9	"
19	7 FBR-222/ IRBLta2-Pi (RL)-T (RL	"
20	BRRI dhan87*2/ IRBL9-W (RL)	"

Experiment 13.3: Field RGA nursery

Principal Investigator: Mahmuda Khatun

Co-investigator: S K Debsharma & J Ferdousy

Specific objectives: To rapidly advancement of segregating population for shortening breeding cycle.

Materials and methods: The experiment was conducted in BRRI Gazipur. The progenies of 62 crosses for BB and 36 crosses for blast were grown in Boro and T. Aman season. About 1000 progenies of F_2 population for each cross of BB and blast were grown in field RGA (**Table 13.3.1 & 13.3.2).** F_4-F_6 generations were advanced in field RGA by direct seeded panicle drop method. Fertilizers were applied as per needed. Weeding, tiller cutting and other cultural operations were done in time. In direct seeded method panicle was placed directly in raised bed with 6 strips per bed at 8 × 8 cm spacing. At 15 days after seeding water stress was imposed and was continued up to flowering. At maturity, single panicle was harvested from each plant of each cross. Harvested seed was dried and was subjected to 50^0 C for dormancy breaking to initiate next cycle of RGA immediately.

BB: A total of 58200 progenies of 120 crosses consisting 25500 progenies of fifty-one crosses for F_2, 10800 of 19 crosses for F_3, 9500 of 19 crosses for F_4 in T. Aus, 12400 of thirty-one crosses for F_5 in T. Aus were grown in the FRGA nursery **(Table 13.3.1)**

Blast: A total of 14100 progenies of 24 crosses consisting 9600 of 15 crosses for F_3 and 4500 of nine crosses for F_4 generations were grown in the FRGA nursery **(Table 13.3.2).**

Results and discussion: A total of 72300 progenies of 144 crosses consisting 25500 progenies of 51 crosses for F2, 10800 of 19 crosses for F3, 9500 of 19 crosses for F4 in T. Aus, 12400 of 31crosses for F5 in T. Aus were advanced in the FRGA nursery (**Table 13.3.1)** and 14100 progenies of 24 crosses consisting 9600 of 15 crosses for F3 and 4500 of nine crosses for F4 generations were advanced in the FRGA nursery (**Table 13.3.2**).

Table 13.3.1 RGA Nursery, Development of Disease Resistant Rice for BB resistance, 2022-23

Sl	BR No.	Parentage	Plant Number	Progenies
F_2, BB				
1	BR15497	BR11596-5R-39/ BR12087-5R-196	P#3-5	500
2	BR15498	BR12091-4R-99 / BR11866-5R-312	P#3,5,7	500
3	BR15499	BR11601-14-4-1/ BR11596-5R-39	P#1,2,5-7	500
4	BR15500	BR9829-30-3-2-1-4/ BR11596-5R-39	P#5,6	500
5	BR15501	7 FBR-189 / BR11866-5R-312	P#1,8	500
6	BR15502	7 FBR-190 / BR12087-5R-196	P#1,2	500
7	BR15503	7 FBR-376/ BR11596-5R-39	P#1,2,8	500
8	BR15504	7 FBR-336/ BRRI dhan98	P#1-3.8	500
9	BR15505	BR11866-5R-312 / IR64-EMF	P#2-8	500
10	BR15506	BRRI dhan98 / BR11601-14-4-1	P#1,2,4,7,8	500
11	BR15507	BRRI dhan99 / BR11867-5R-103	P#1,3,6-8	500
12	BR15508	BR11723-4R-12/BRRI dhan101	P#1,2,4,6-8	500
13	BR15509	BR9138-4-4-5-5-P3-HR3-HR5 / BR11607-4R-72	P#1,3,6,8	500
14	BR15510	BR11864-5R-99 / IRRI154-Pi9	P#1,2,3, 4,6	500
15	BR15511	Bangabandhu dhan100 / BR8781-16-1-3-P2	P#1-7	500
16	BR15512	BRRI dhan87/ BR8781-16-1-3-P2	P#1,3,4,6-8	500
17	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#2	500
18	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#10	500
19	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#16	500
20	BR15514	BR9830-53-3-5-2*3/ BR11607-4R-72	P#1-2,4,6-9,10-12	500
21	BR15515	BR11723-4R-12*3/N22	P#1-5,9,10,23-25	500
22	BR15516	BR11867-4R-371*3/ IR64-EMF3	P#1-7,13,16,18	500
23	BR15517	BR9006-40-2-3-1*3/ IRRI154-Pi9	P#1-4,9,22,28,31,32	500
24	BR15518	BR8781-16-1-3-P2*3/ IRRI154-Pi9	P#4,5,21,28,41	500
25	BR15518	BR8781-16-1-3-P2*3/ IRRI154-Pi9	P#9,10,20,37	500
26	BR15519	BR11723-4R-12*3/ IR64-Pi9	P#2,10,14,16,18-20, 31,35,39	500
27	BR15521	7 FBR-222*3/ IRBLta2-Pi(RL)-T(RL)	P#2	500
28	BR15521	7 FBR-222*3/ IRBLta2-Pi(RL)-T(RL)	P#6	500
29	BR15522	BR11723-4R-12*2/IR12N177	P#1,2,5,79,11,14,20	500
30	BR15523	BR12121-4R-53*2/ IR12N177	P#1,4,5	500
31	BR15523	BR12121-4R-53*2/ IR12N177	P#11,13,15	500
32	BR15523	BR12121-4R-53*2/ IR12N177	P#18,22,23	500
33	BR15525	BRAC dhan2 *2/ IRRI154-Pi9	P#1-5,7-11	500
34	BR15525	BRAC dhan2 *2/ IRRI154-Pi9	P#6	500
35	BR15526	BRAC dhan2*2/BR12450-4R-24-1	P#4	500
36	BR15526	BRAC dhan2*2/BR12450-4R-24-1	P#5,9,12	500
37	BR15527	BR11723-4R-12*2/ BR12450-4R-24-1	P#1-3,5,8,9-14,16	500
38	BR15528	7 FBR-222*2/ IRRI154-Pi9	P#2,4,7,11,17,18,22 ,2627,30,32,34,5	500
39	BR15528	7 FBR-222*2/ IRRI154-Pi9	P#28,29	500
40	BR15529	BR11723-4R-12*2/ IRBL9-W (Pi9)	P#1,3,5,8,12,13,18, 22,26,31	500
41	BR15529	BR11723-4R-12*2/ IRBL9-W (Pi9)	P#6,14	500
42	BR15530	BR11607-4R-72 //BRRI dhan70*2 / IRRI154-Pi9	P#3,11,14,16,20,21, 25, 29-34,36	500
43	BR15530	BR11607-4R-72 //BRRI dhan70*2 / IRRI154-Pi9	P#7,19,27	500

44	BR15531	BR11607-4R-72// BRAC dhan2 / IRRI154-Pi9	P#2,3,5,11,13,14,16 -18,20-23,25-30	500
45	BR15531	BR11607-4R-72// BRAC dhan2 / IRRI154-Pi9	P#6	500
46	BR15532	BR11723-4R-172*3/IR64-EMF3	P#1,2,4	500
47	BR15533	BRRI dhan80*3/ IRRI154-Pi9	P#1,3-7,9-11,1315,18,19,23	500
48	BR15534	BR11723-4R-12*3/ IRRI154-Pi9	P#1-10	500
49	BR15535	BRRI dhan70*3/ IRRI154-Pi9	P#1,3-20	500
50	BR15536	BR11607-4R-72//BR11723-4R-12*2 /IRRI154-Pi9	P#1-20	500
51	BR15537	BR12442-4R-49*2/ IR64-EMF3	P#1-6	500

SN	BR No.	Parentage	Plant Number	Progenies
F_3, BB				
1	BR14994-R (3BB+Pi9)	BR9006-40-2-3-1*2/ BR11607-4R-72 (3 BB genes, Pita, Pi9, TSV1)	P#1	500
2	BR14995-R	BR9830-53-3-5-2*2/ BR11607-4R-72(*Xa21, xa13*)	P#1	500
3	BR14679-R	BR11723-4R-172/IR64-EMF3 (*qHTSF4.1*)	P#2, 4, 5, 7	600
4	BR14681-R	BR11723-4R-12/N22 (*qHTSF4.1*)	P#1,2,4,7,9,10,11	600
5	BR14996-R	BR11867-4R-371*2/ IR64-EMF3 (*Xa21*)	P#1-7,9-11, 15,16,19-21	600
6	BR14997-R	BR9006-40-2-3-1*3/ BR11868-5R-23 (*Xa21,xa5*)	P#3,4,8,17, 18,21	600
7	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 (3 BB genes, frg)	P#27,40,72	500
8	BR15008-R	BR12121-4R-53/ BR9138-4-4-5-5-P3-HR3-HR5(*xa5,Xa21,qHTSF4.1*)	P#4-12	600
9	BR15009-R	BR11723-4R-12/IR12N177 (*xa5,Pita,qHTSF4.1*)	P#2,5,6,8,10,12	600
10	BR15010-R	7 FBR-222/ BR11603-4R-49 (*xa5,Xa21, frg*)	P#8,9,11,12	600
11	BR15011-R	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49 (*Xa21*)	P#4,5,7,9,10	600
12	BR15012-R	BR11723-4R-12/ BR12442-4R-49 (Xa21,qHTSF4.1,frg)	P#4,5,6,8,9,10	600
13	BR15013-R	BR12442-4R-49/ IR64-EMF3(3 genes,*qHTSF4.1,frg*)	P#5	600
14	BR15014-R	BR12121-4R-53/ IR12N177 (*xa5,Pita,qHTSF4.1*)	P#1,2,3,10	600
15	BR15015-R	BR11723-4R-12/N22// BR11867-4R-371/ IR64-EMF3 (3 BB genes, Pi9)	P#1	500
16	BR15016-R	BR8781-16-1-3-P2/ BR12442-4R-49 (*Xa21,qHTSF4.1,frg*)	P#5,9,12	600
17	BR15023-R	BRRI dhan71*3/ IR127152-3-22-2-1-B (3 BB genes)	P#32	500
18	BR15024-R	BR9829-78-1-2-1*3/ IR127152-3-22-2-1-B *(Xa21,xa13)*	P#2,5,8,13,18, 19,20	600
19	BR15025-R	BRRI dhan99*3/ IR127152-3-22-2-1-B	P#6	500
		Total		**10800**
SN	**BR No.**	**Designation**	**Imp. features**	**Progenies**
F_4, T Aus (BB)				
1	BR14674-2R	BR9006-40-2-3-1/ BR11607-4R-72	FRGA	500
2	BR14675-2R	BR9830-53-3-5-2/ BR11607-4R-72	FRGA	500

3	BR14676-2R	BR9011-25-4-1-3/ BR11723-4R-172	Green house	500
4	BR14677-2R	BR9830-53-3-5-2/ BR11723-4R-172	Green house	500
5	BR14678-2R	BR9829-78-1-2-1/ BR11723-4R-12	Green house	500
6	BR14679-2R	BR11723-4R-172/IR64-EMF$_3$	Green house	500
7	BR14680-2R	7 FBR-376/ BR11723-4R-172	Green house	500
8	BR14681-2R	BR11723-4R-12/N22	Green house	500
9	BR14682-2R	7 FBR-222/ BR11723-4R-12	Green house	500
10	BR14683-2R	BR11868-5R-2/BRBa-1-4-9	Green house	500
11	BR14684-2R	BR11868-5R-2/7 FBR-376	Green house	500
12	BR14685-2R	BR11867-4R-371/ IR64-EMF$_3$	FRGA	500
13	BR14686-2R	BR9006-40-2-3-1*2/ BR11868-5R-23	FRGA	500
14	BR14687-2R	BR9006-40-2-3-1/ BR11868-5R-23// BR11723-4R-172	Green house	500
15	BR14688-2R	BR9829-78-1-2-1*2/ BR11607-4R-192	FRGA	500
16	BR14689-2R	BR9829-78-1-3-2*2/ BR11868-5R-23	Green house	500
17	BR14690-2R	BR9829-78-1-3-2/ BR11868-5R-23// BR11723-4R-12	Green house	500
18	BR14691-2R	BR11600-4R-230/N22//BR11723-4R-172	Green house	500
19	BR14692-2R	BR11868-5R-23/N22// BR11723-4R-172	Green house	500
		Total		**9500**

SN	BR No.	Cross combination	Imp. features	Progenies
F$_5$, Bacterial Blight (BB), T. Aus				
1	BR14304-3R	BR9006-40-2-3-1 / HHZ12-Y4-Y1-DT1	Earliness	400
2	BR14305-3R	BR9006-40-2-3-1 / BR11600-4R-230	Earliness	400
3	BR14307-3R	BR8781-16-1-3-P2/ HHZ12-Y4-DT1-Y3	Earliness	400
4	BR14311-3R	BR11868-5R-23/N22	BB, High temp. tol	400
5	BR14312-3R	BR9029-37-2-1-3-P1/HHZ15-DT7-SAL4-SAL1	Earliness	400
6	BR14313-3R	7 FBR-400/ IR99853-B-B-B-460	BB, High temp. tol	400
7	BR14315-3R	BR11600-4R-230/ BRRI dhan43	BB, Earliness	400
8	BR14319-3R	7 FBR-416/ BR9651-15-2-1-4	Earliness	400
9	BR14321-3R	BRRI dhan92/ IR99853-B-B-B-460	BB, High temp. tol	400
10	BR14327-3R	BRRI dhan98/ BR11102-4R-247	Earliness	400
11	BR14329-3R	BRRI dhan99/ BR11102-4R-247	Earliness	400
12	BR14332-3R	BRRI dhan43/ BR11102-4R-247	Earliness	400
13	BR14336-3R	BR11723-4R-172/ USPi9	Earliness	400
14	BR14306-3R	BR9006-40-2-3-1/ BR11868-5R-23	BB, High temp. tol	400
15	BR14308-3R	BR9829-78-1-2-1/ BR11607-4R-192	BB, High temp. tol	400
16	BR14309-3R	BR9829-78-1-3-2/ BR11868-5R-23	BB, High temp. tol	400
17	BR14310-3R	BR11600-4R-230/N22	BB, High temp. tol	400
18	BR14314-3R	BR9830-53-3-5-2/ BR11600-4R-43	BB res	400
19	BR14316-3R	BRRI dhan98/ BR11600-4R-230	BB res	400
20	BR14317-3R	7 FBR-416/ BR11868-5R-59	BB res	400
21	BR14318-3R	7 FBR-400/ BR11868-5R-89	BB res	400
22	BR14320-3R	BR11600-4R-230/ BR11607-4R-153	BB res	400
23	BR14322-3R	BRRI dhan89/ BR11607-4R-192	BB, High temp. tol	400
24	BR14323-3R	BR11600-4R-140/ BR11607-4R-153	BB res	400
25	BR14324-3R	BR11604-4R-84/ BR11600-4R-230	BB res	400
26	BR14325-3R	BR11723-4R-12/ BR11868-5R-89	BB res	400
27	BR14326-3R	BR11723-4R-172/ BR11607-4R-192	BB, High temp. tol	400
28	BR14328-3R	BRRI dhan99/ BR11103-4R-97	BB res	400
29	BR14331-3R	7 FBR-400/ BR11103-4R-97	BB res	400
30	BR14333-3R	BRRI dhan98/ IR64-Pi9	Blast res	400

31	BR14343-3R	BRRI dhan71*2/ IR127152-3-22-2-1-B	BB res	400
			Total	**12400**

Table 13.3.2 RGA Nursery, Development of Disease Resistant Rice for Blast resistance, 2022-23

F_3, Blast				
1	BR14999-R	BRRI dhan80*2/ IRRI154-Pi9 (*xa5, Pi9,TSV1*)	P#10,13,14,15,17,18,21,22,24,26,27,30,32-34	600
2	BR15000-R (Pi9)	BR9006-40-2-3-1*2/ IRRI154-Pi9 (*xa5,xa13, Pi9*)	P#1-3	600
3	BR15001-R (xa5+Pi9)	BR8781-16-1-3-P2*2/ IRRI154-Pi9 (*xa5,Pi9*)	P#1,15	600
4	BR15003-R	BRRI dhan70*2/ IRRI154-Pi9(*xa5,Pi9,Pita,TSV1, fgr*)	P#4,7,8,10	600
5	BR15004-R	BR11723-4R-12*2/ IR64-Pi9 (*qHTSF*)	P#1-3,5,6,8,9	600
6	BR15005-R	BRBa-1-4-9*2/ IR64-Pi9 (*TSV1*)	P#1-8	600
7	BR15006-R	7 FBR-222*2/ IRBLta2-Pi(RL)-T(RL) (Pi9,Pita)	P#1,5	600
8	BR15007-R	BRRI dhan87*3/ IRBL9-W (RL) (*Pi9, TSV1,qHTSF*)	P#11,12	600
9	BR15018-R	BRAC dhan2/ IRRI154-Pi9 (*xa5,TSV1,Pi9,frg*) Green house	P#1-5,7-10	600
10	BR15019-R	BRAC dhan2/BR12450-4R-24-1 (*Pita, Pi9,frg*)	P#1, 3-11	600
11	BR15021-R	7 FBR-222/ IRRI154-Pi9(*xa5,TSV1,Pi9,Pita*)	P#1-4,6-10	600
12	BR15022-R	BR12121-4R-53/ IRBL9-W (*Pita, Pi9, qHTSF*)	P#2-4,6,9-11	600
13	BR15026-R	Kataribhog/ IRBL9-W(RL) (*Pi9, qHTSF*)	P#1-6, 9-12	600
14	BR15027-R	Khasa (Cumilla)/IR64-Pi9*2 (*Pita,xa5,Pi9,frg*)	P#2,3,10	600
15	BR14701-R	BRRI dhan87*2/ IRBL9-W (RL) (*qHTSF,Pi9*)	P#7,30,32	600
		Total		**9000**

F_4, Blast, 2022-23			**Imp. features**	**Progenies**
1	BR14693-2R	BRRI dhan80*2/ IRRI154-Pi9	Blast res	500
2	BR14694-2R	BR9006-40-2-3-1/ IRRI154-Pi9	Blast res	500
3	BR14695-2R	BR8781-16-1-3-P2/ IRRI154-Pi9	Blast res	500
4	BR14696-2R	BR11723-4R-12/ IRRI154-*Pi9*	Blast res	500
5	BR14697-2R	BRRI dhan70/ IRRI154-*Pi9*	Blast res	500
6	BR14698-2R	BR11723-4R-12/ IR64-Pi9	Blast res	500
7	BR14699-2R	BRBa-1-4-9/ IR64-Pi9	Blast res	500
8	BR14700-2R	7 FBR-222/ IRBLta2-Pi(RL)-T(RL)	Blast res	500
9	BR14701-2R	BRRI dhan87*2/ IRBL9-W (RL)	Blast res	500
		Total		**4500**

Experiment 13.4: Line Stage Testing (LST)

Principal Investigator: M Khatun

Co-investigator: S K Debsharma and J Ferdousy

Specific objective: Isolation of homogeneous breeding lines with improved plant type, disease-free and short duration.

Materials and Methods: In Line Stage Testing with the BB resistant check IRBB60 and susceptible check BRRI dhan88, BRRI dhan29 & BRRI dhan58 were evaluated in Boro and BRRI dhan75, BRRI dhan87 in T. Aman season (**Table 13.4.1 & Table 13.4.2**). The unit plot size was 5.4 m × 1 row (12 hills). The spacing for transplanting was 25 cm x 15 cm and thirty-five-day-old seedlings were transplanted @ single seedling per hill. Application of fertilizer & crop management was done as described in experiment 1.

Results and discussion: A total of five thousand in T. Aman and four thousand seventy-one breeding lines were transplanted. BB resistance genotypes were advanced based on identical flowering, grain type, phenotypic acceptability (**Table 13.4.1**). High selection pressure was applied by selecting 382 LST lines during Boro season. Considering the trait genotyping of 333 LST materials having the *Xa21* gene in the 103 genotypes, *Pita* having 50, *Pi9* having 5 and *TSVI* having 51 genotypes (**Fig 13.1**) during T. Aman and a total of 382 genotypes were selected in LST during Boro season based on uniform flowering, grain type and phenotypic acceptability.

Table 13.4.1 List of materials for Line Stage Testing (LST), Development of Disease Resistant Rice for BB, T. Aman 2022-23

F_6, Bacterial blight (BB)			Important features	Progenies
1	BR13636-4R	Nania/BR8548-8-22-5-15	BB resistance.	250
2	BR13639-4R	BRRI dhan79/ BR9942-1-2-1-1-B2	"	250
3	BR13640-4R	BRRI dhan72/BR9942-1-2-1-1-B2	"	200
4	BR13641-4R	BRRI dhan71/ BR8548-8-22-5-15	"	250
5	BR13969-4R	BRRI dhan72*2/BR9942-1-2-1-1-B2	*Xa21, WaxA, Pb1*	300
6	BR13970-4R	BRRI dhan87*2/BR9942-1-2-1-1-B2	"	300
7	BR13971-4R	BRRI dahn87/ BR9942-1-2-1-1-B2	"	250
8	BR13973-4R	BINA dhan17/BR10397-3-2-1-1	"	250
9	BR13974-4R	BR10392-B-B-12-4 / BR9138-4-4-5-5-P3	"	250
10	BR13975-4R	BRRI dhan87/ BR10397-3-2-1-1-8	"	250
11	BR13976-4R	BRRI dhan71/ IR127152-3-22-2-1-B	"	250
12	BR13957-4R	BR9829-78-1-2-1/ IR127152-3-22-2-1-B	BB Res	250
13	BR13961-4R	GSR-IR 1-DQ-142-Y1-Y1/BR9636-8-6-10-2-3	BB Res	250
14	BR13962-4R	BRRI dhan99/IR127152-3-22-2-1-B	BB Res	300
15	BR13965-4R	BR9006-40-2-3-1/IR127152-3-22-2-1-B	BB Res	250
	Blast			
16	BR13650-4R	BRRI dhan70*2/ IRBL9-W(RL)	Blast res.	300
17	BR13661-4R	BRRI dahn87/IRBL9-W(RL)	"	200
18	BR13662-4R	BRRI dahn87/Mineasahi	"	100
19	BR13664-4R	BRRI dhan80/IRBL9-W(RL)	"	250
20	BR14341-3R	BRRI dhan87*2/ IRBL9-W (RL)	Blast res	300
		Total		**5000**

Table 13.4.2 List of materials for Line Stage Testing (LST), Development of Disease Resistant Rice for BB, Boro2022-23

SN	BR No	Designation	Imp. features	Progenies
F_5, Bacterial blight (BB)				
1	BR13614-5R	BRRI dhan89 /IR12N177	lodging tol	350
2	BR13618-4R	7 FBR-222/BRRI dhan89	lodging tol	339
3	BR13622-4R	7 FBR-400/BRRI dhan89	"	334

4	BR13623-4R	GSR-IR 1-DQ-142-Y1-Y1/BR9011-62-2-1-2	"	300
5	BR13624-4R	BR9011-62-2-1-2/ IR12N177	"	300
6	BR13625-4R	BR9830-44-1-8-2/ BRRI dhan89	"	129
7	BR13626-4R	BRRI dhan89/IR05N412	"	300
8	BR13627-4R	BR8784-4-1-2/BR9942-1-2-1-1-B2	"	300
9	BR13628-4R	BR9829-30-3-2-1/ BR9651-15-4-3-2	"	257
10	BR13629-4R	BRRI dhan89/IR12N177	"	260
11	BR13632-4R	IR100722-B-B-B-B-B /BR9650-108-2-3	BB res	353
12	BR13634-4R	IR100723-B-B-B-B-B /BR9650-108-2-3	BB res	88
13	BR13637-4R	7 FBR-336/BR9650-108-2-3	"	257
14	BR13638-4R	HHZ12-Y4-Y1-DT1/BR9943-2-2	"	252
15	BR13645-4R	Nania/BR9942-1-2-1-1-B2	"	252
		Total		**4071**

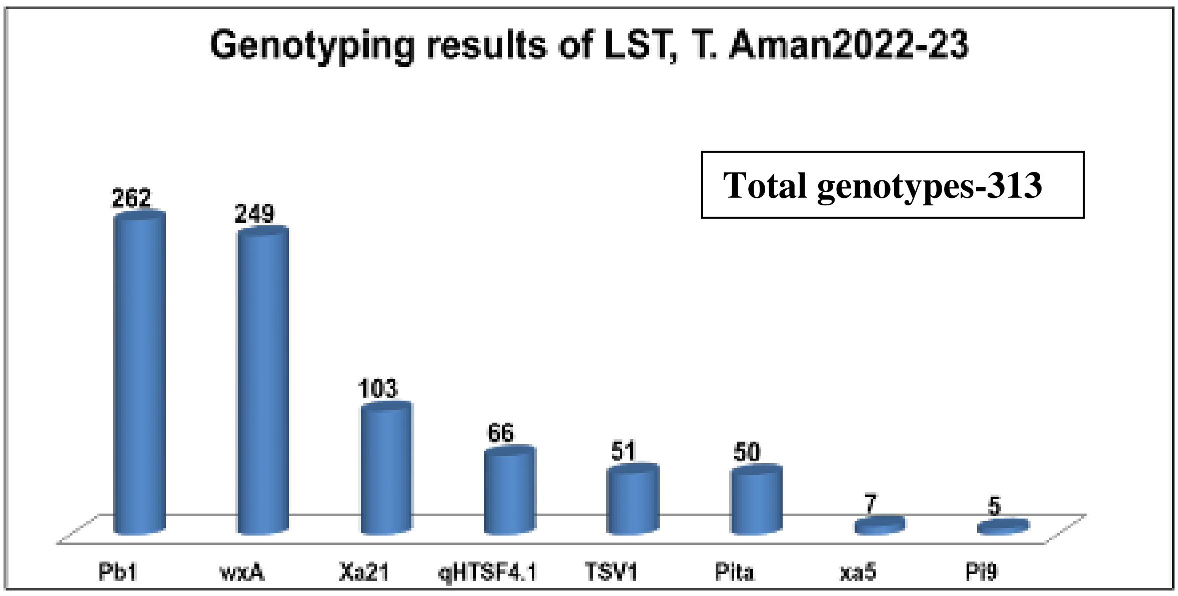


Fig 13.1. Trait marker profiles showing favorable alleles for different key target traits of the selected LST lines during T. Aman2022-23

Experiment 13.5: Observational Yield Trial (OYT)

Principal Investigator: M Khatun

Co-Investigators: S K Debsharma, J Ferdousy & M A I Khan (HQ), Anisar Rahman & M R Hasan (Rangpur), S Abedin & M F Islam (Rajshahi), N Jahan, M Salahuddin and R Islam (Cumilla)

Specific objective: Selection of homogeneous breeding lines with acceptable grain quality having high yield with good plant type and resistant to BB.

Materials and Methods: A total of 42 advanced lines in OYT during T. Aman2022-23 and 460 in Boro 2022-23 along with the standard checks BRRI dhan49, BRRI dhan87 and IRBB60 (Res. Ck.) for T. Aman and the standard checks BRRI dhan88, BRRI dhan89, BRRI dhan92 and BRRI dhan101 (Res. Ck.) for Boro were evaluated in Gazipur, Cumilla, Rangpur & Rajshahi (**Table 13.5.1 & 13.5.2)** under development of BB resistance. Twenty-five-day-old seedlings for T. Aman and thirty-five-day-old seedlings for Boro season were transplanted at a spacing of 25 cm × 15 cm. The plot size was 5.4 m × 4 rows. Single seedling was used for transplanting. Fertilizer doses and application were same as experiment no.1. Crop management such as weeding, irrigation etc. was done in time. Insects and other pests were controlled properly.

Results and discussion: Top nine genotypes out of 42 for OYT during T.Aman2022-23 based on better performance with homogeneity in flowering, PAcp, tolerance to BB and grain quality evaluation. The average plant height of the materials was varying from 103-123 cm, growth duration was about 114 to 134 days and the yield varied from 4.28 to 5.63 t/ha (**Fig.13.2**). In T. Aman, the top nine genotypes were selected on the basis of high yield, acceptable growth duration, high amylose (%), and resistance to BB (BB score 1-3 and incorporation of BB resistant gene) (**Table 13.5.1**).

In Boro2022-23, the top twenty genotypes were selected out of 460 genotypes based on growth duration, yield, BB score, introgression of BB-resistant gene high-yielding background and amylose (%). The average plant height of the materials was around 88-136 cm, growth duration was about 136 to 162 days and yield were varied from 3.0-9.0 t/ha (**Fig.3.2**). The top yield twenty genotypes were presented on the **Table 13.5.2**. The promising lines have dense panicle and looks very attractive (**Fig.3.3**)

Table 13.5.1 Performance of the advanced lines in observational trial (OYT), Development of BB resistance, T. Aman 2022-23

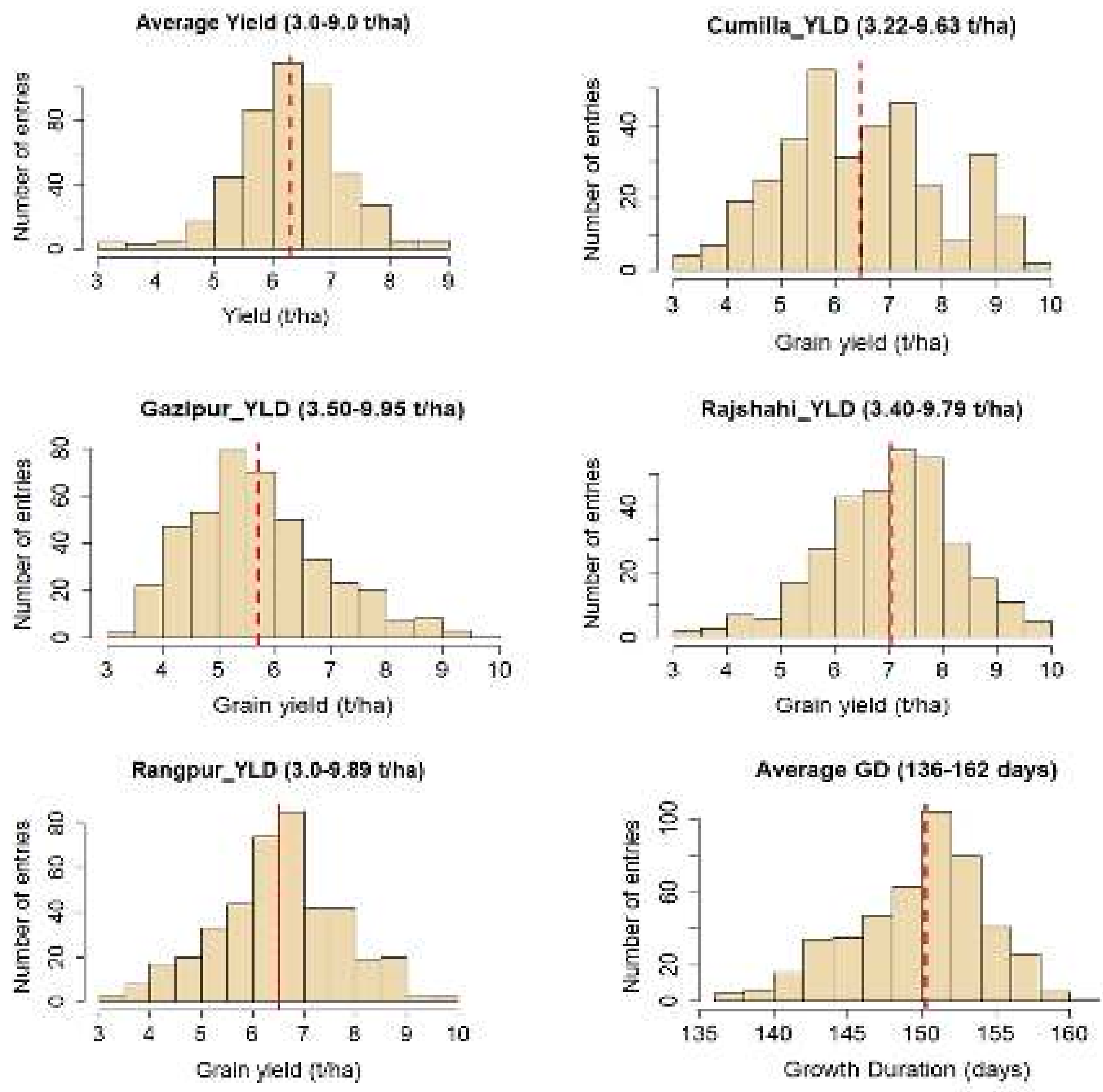
SN	Designation	PH (cm)	GD (days)	Yield (t/ha)				
				Gazi	Cumi	Raj	Rang	Mean
1	BR11110-3R-61-1	123	134	5.07	3.97	6.03	7.16	5.63
2	BR11127-4R-31-1	110	122	3.9	6.92	4.75	6.46	5.51
3	BR11127-4R-147-1	110	122	4.11	6.88	4.44	5.68	5.28
4	BR11127-4R-80-1	114	128	3.61	6.87	4.73	5.74	5.24
5	BR11127-4R-35-1	115	116	3.85	5.48	5.18	5.93	5.11
6	BR11996-4R-12-1	112	121	4.09	6.75	4.25	5.23	5.08
7	BR11127-4R-154-1	122	121	3.52	6.32	-	5.37	5.07
8	BR11603-4R-49-1	105	122	4.35	6.39	5.21	4.33	5.07
9	BR11127-4R-39-1	114	114	3.8	6.44	3.84	6.17	5.06
10	BRRI dhan87 (Ck)	119	125	4.06	5.80	4.49	5.40	4.94
11	BRRI dhan49 (Ck)	104	135	4.25	5.67	4.51	5.22	4.91
12	IRBB60 (Ck)	103	121	3.76	4.52	3.99	4.86	4.28
	LSD	5.1	6.45	0.64	0.49	1.97	1.34	1.06
	H2b	0.29	0.57	0.92	0.99	NA	0.34	0.25

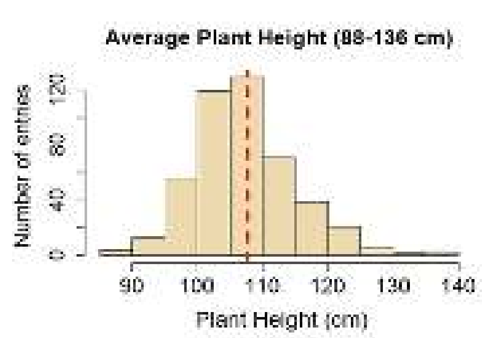
Table 13.5.2 Performance of the top yielder lines in observational yield trial (OYT) for BB, Development of Disease resistant rice, Boro 2022-23

SN	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)				
				Cum	Gaz	Ran	Raj	Average
1	BR13174-4R-13	147	102	-	7.92	9.60	7.64	8.39
2	BR13193-4R-5	139	120	-	7.25	8.35	9.45	8.35
3	BR13184-4R-32	149	98	-	7.68	8.81	-	8.25
4	BR13178-4R-197	145	110		8.95	8.18	7.50	8.21
5	BR13174-4R-379	144	97	8.87	9.49	6.22	-	8.19
6	BR13180-4R-202	152	106	-	7.20	7.76	9.05	8.00
7	BR12904-4R-198	137	107	-	9.05	6.82	-	7.93
8	BR12904-4R-78	148	108	6.96	7.36	7.85	9.53	7.93
9	BR13188-4R-184	146	113	-	7.56	8.08	7.99	7.88
10	BR12895-4R-204	153	114	8.76	5.84	7.34	9.10	7.76
11	BR12904-4R-299	148	109	7.55	5.96	8.56	8.92	7.75
12	BR13193-4R-94	153	116	8.37	7.57	7.24	-	7.72
13	BR13180-4R-160	155	110	-	6.72	8.89	7.53	7.71
14	BR12895-4R-193	150	118	7.58	-	-	7.79	7.68
15	BR13188-4R-244	151	107	8.77	7.31	7.37	7.17	7.65

16	BR13180-4R-259	156	105	7.33	7.78	7.84	-	7.65
17	BR13180-4R-99	152	110	9.56	7.68	5.67	-	7.64
18	BR13174-4R-315	150	107	7.27	9.43	6.55	7.27	7.63
19	BR13174-4R-5	153	97	7.03	5.25	10.61	-	7.63
20	BR13188-4R-321	154	121	9.01	7.21	6.57	7.70	7.62
	BRRI dhan89	152	102	5.26	6.86	7.50	8.28	6.97
	BRRI dhan92	157	104	6.45	5.24	6.53	8.08	6.58
	BRRI dhan101	149	105	6.66	5.20	5.98	7.55	6.35
	BRRI dhan88	145	91	6.51	5.95	5.48	7.36	6.33
	LSD <0.05	0.37	12.06	2.23	2.88	5.26	1.2	6.22
	H2b	0.9	0.27	0.90	0.95	0.99	0.79	0.27

*Selected entries based on yield, agronomic performance and grain characteristic





Total genotypes: 460
Check variety: BRRI dhan88 (Sus. & Std. Ck)
BRRI dhan89 (Sus. & Std. Ck)
BRRI dhan92 (Sus. & Std. Ck)
BRRI dhan101 (Res. Ck)

Fig 13.2 Frequency distribution of the genotypes showing yield and yield contributing traits Boro 2022-23

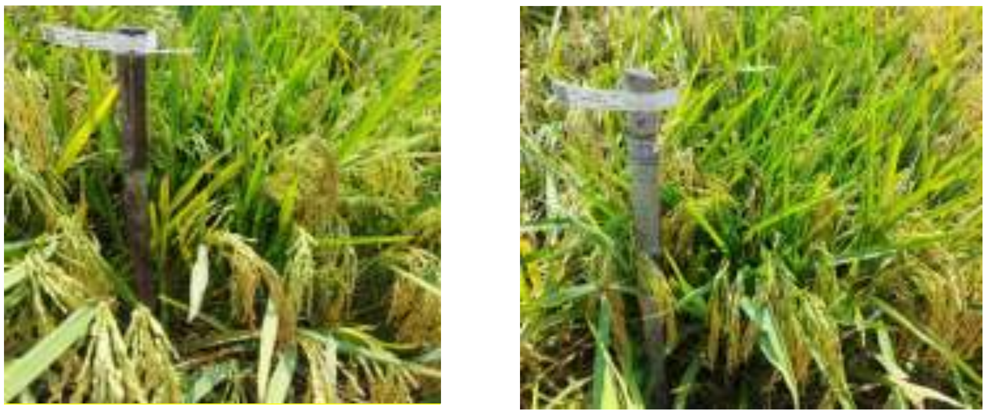


Fig 13.3. Pictorial view of the genotypes Boro2022-23

Experiment 13.6: Advanced Yield Trial (AYT)

Principal Investigator: M Khatun

Co-investigators: S K Debsharma and scientist from regional station

Specific objectives: Initial yield evaluation and selection of desirable lines as compared with standard checks in on-station conditions.

Materials and methods: The experiment was conducted at BRRI Gazipur, Cumilla and Rangpur. Seventeen advanced lines in T. Aman 2022-23 and sixty-seven in Boro 2022-23 along with the standard checks BRRI dhan75, BRRI dhan87 and IRBB60 (Res. Ck.) for T. Aman and the standard checks BRRI dhan88, BRRI dhan89 and BRRI dhan101 (Res. Ck.) for Boro season were evaluated (**Table 13.6.1, 13.6.2)** under development of BB resistance. Twenty-five-day-old seedlings for T. Aman and thirty-five-day-old seedlings for Boro season were transplanted at a spacing of 25 cm × 15 cm. The plot size was 5.4 m × 4 rows. Single seedling was used for transplanting. Fertilizer doses and application were the same as Experiment no.1. Crop management such as weeding, irrigation etc. was done in time. Insects and other pests were controlled properly.

Results and discussion: The average plant height of the materials was around 78-128 cm, growth duration was about 143 to 156 days and yield was varied from 4.5-7.26 t/ha (**Fig.13.4**). The genotype BR11986-4R-123, BR12121-4R-49, BR12121-4R-53 and BR12442-4R-49 was selected on grain yield, growth duration, resistance to BB and grain qualities **(Table 13.6.1).** In Boro season, the top ten genotypes were selected based on grain yield, growth duration, resistance to BB, and grain qualities to evaluate as replicated yield trial (RYT) **(Table 13.6.2).**

Table 13.6.1 Grain yield and agronomic parameters of the entries, AYT, Development of BB resistance, T. Aman2022-23

SN	Designation	GD (days)	PH (cm)	Gazi	Cumi	Rang	Pooled
*1	BR11986-4R-123	131	113	5.30	6.51	6.05	5.95
2	BR11987-4R-220	131	119	4.53	5.40	-	4.97
3	BR11995-4R-1	125	133	3.60	5.96	4.46	4.67
4	BR12098-4R-108	129	120	4.41	5.51	3.47	4.46
5	BR12098-4R-117	135	129	3.29	6.61	3.93	4.61
6	BR12098-4R-123	131	124	4.64	3.66	5.24	4.51
7	BR12098-4R-150	129	116	3.69	3.79	4.66	4.04
8	BR12098-4R-179	121	120	3.61	4.41	5.20	4.41
9	BR12098-4R-25	129	117	4.06	6.80	4.06	4.97
10	BR12098-4R-45	122	113	3.37	4.80	4.58	4.25
11	BR12098-4R-69	131	122	3.50	5.46	3.13	4.03
12	BR12098-4R-71	121	117	3.89	4.06	6.02	4.65
13	BR12098-4R-85	123	129	3.53	3.55	4.38	3.82

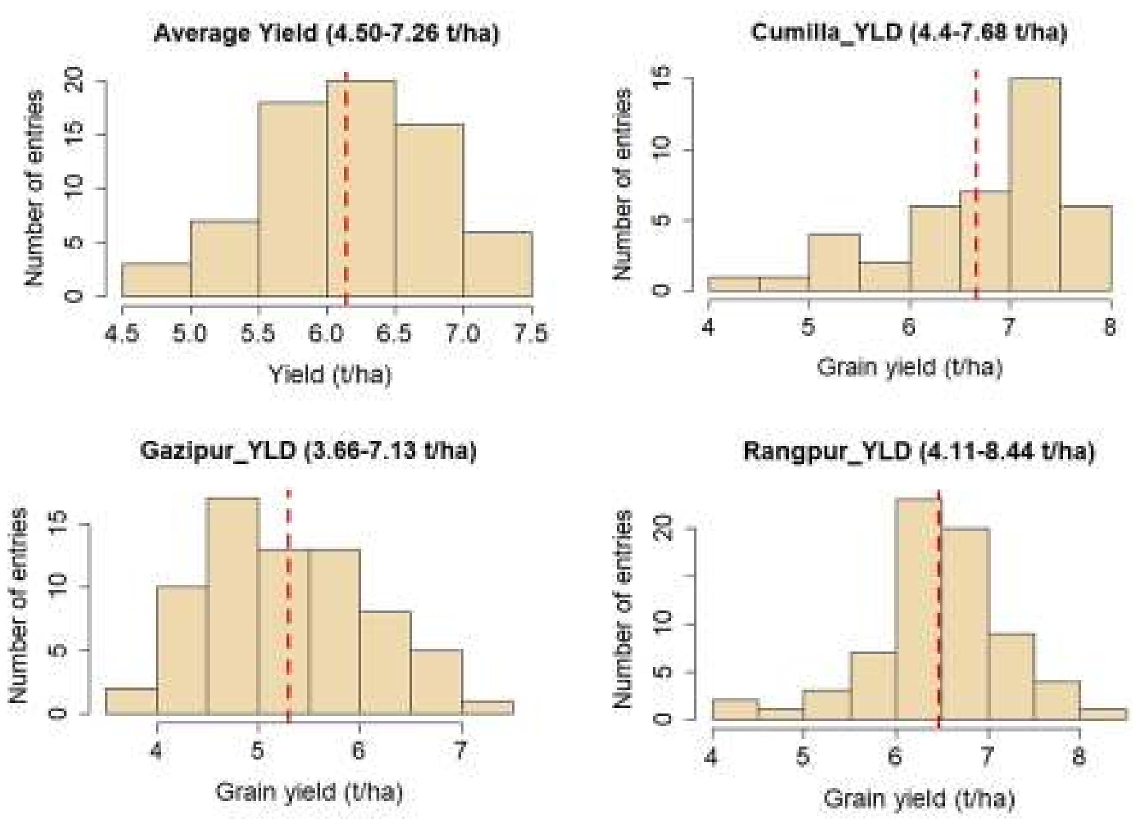
14	BR12098-4R-99	118	111	4.11	-	4.55	4.33
*15	BR12121-4R-49	123	119	3.56	6.31	5.48	5.12
*16	BR12121-4R-53	127	112	4.18	6.71	5.54	5.47
*17	BR12442-4R-49	118	110	4.34	6.49	4.71	5.18
18	BRRI dhan75 (Ck)	113	107	3.69	5.56	4.37	4.54
19	BRRI dhan87 (Ck)	128	125	4.94	5.82	5.30	5.35
20	IRBB60 (Ck)	118	104	3.68	4.47	2.55	3.57
	LSD<0.05	9.38	12.93	0.78	0.52	0.64	1.18
	H2b	0.38	0.88	0.31	0.40	0.93	0.20

Table 13.6.2 Grain yield and agronomic parameters of the entries, AYT, Development of BB resistance, Boro 2022-23

SN	Designation	DM (days)	PH (cm)	Yield (t/ha)			
				Rang	Gazi	Cumi	Ave
*1	BR11867-5R-119	153	89	6.11	4.77	5.10	5.33
2	BR11867-5R-122	155	97	4.25	4.12	5.13	4.50
3	BR11867-5R-159	154	90	5.78	4.00	6.40	5.39
4	BR11867-5R-295	150	92	6.04	5.29	6.51	5.95
5	BR11867-5R-296	150	93	6.83	4.88	7.05	6.25
6	BR11868-5R-80	145	104	5.00	4.24	5.42	4.88
7	BR11868-5R-94	152	98	6.34	4.99	6.78	6.04
8	BR11869-5R-119	147	101	6.16	6.12	-	6.14
*9	BR11869-5R-148	144	99	7.55	6.46	-	7.01
10	BR11869-5R-277	154	78	5.40	4.13	-	4.77
11	BR11872-5R-117	148	105	5.87	4.26	-	5.07
12	BR11866-5R-128	151	95	6.01	4.83	7.30	6.05
13	BR11866-5R-215	155	91	6.04	5.20	4.75	5.33
14	BR11866-5R-351	154	95	6.44	4.62	7.01	6.02
15	BR11867-5R-118	149	98	7.41	5.18	7.15	6.58
16	BR11867-5R-157	149	101	6.75	4.89	-	5.82
17	BR11867-5R-325	152	86	6.49	4.01	6.60	5.70
18	BR11867-5R-362	153	94	6.06	4.99	7.24	6.09
19	BR11867-5R-71	153	104	6.67	4.69	4.40	5.25
20	BR11867-5R-92	153	90	6.58	4.76	7.09	6.14
21	BR11869-5R-240	148	106	6.20	4.87	-	5.54
22	BR12624-4R-145	152	114	5.86	4.85	-	5.35
23	BR12111-5R-73	149	111	6.31	6.06	5.63	6.00
24	BR12115-5R-4	151	104	7.54	4.91	7.08	6.51
25	BR12115-5R-50	153	121	6.14	5.57	6.04	5.92
26	BR12115-5R-94	153	106	7.15	5.52	6.88	6.52
*27	BR12116-5R-267	147	100	6.52	6.65	7.53	6.90
28	BR12438-5R-28	151	128	6.74	5.82	-	6.28
29	BR12438-5R-43	149	126	6.21	5.90	7.18	6.43
30	BR12438-5R-155	147	124	5.94	4.92	6.30	5.72
31	BR12122-5R-153	147	108	6.57	5.17	7.38	6.37
32	BR12115-5R-64	151	115	7.35	5.67	-	6.51
33	BR12438-5R-363	152	128	6.40	5.10	-	5.75
34	BR12437-4R-109	155	100	6.07	5.84	-	5.96
*35	BR12115-5R-69	155	121	7.26	6.65	7.50	7.14
36	BR12115-5R-131	154	115	8.44	5.45	-	6.95
*37	BR12438-5R-99	149	126	7.11	5.92	-	6.52
38	BR12438-5R-100	148	117	7.76	5.98	-	6.87
39	BR12115-5R-218	151	109	6.79	5.95	-	6.37
*40	BR12116-5R-147	146	95	6.95	6.50	-	6.72
41	BR12439-5R-199	152	103	6.06		-	6.06
42	BR12122-5R-142	148	107	6.10	5.58	5.74	5.81

43	BR12122-5R-143	148	108	5.30	5.73	-	5.51
44	BR12125-6R-133	146	101	6.54	5.46	6.24	6.08
45	BR12125-6R-149	147	108	5.86	4.77	7.58	6.07
46	BR12125-6R-166	145	92	5.10	4.04	-	4.57
47	BR12125-6R-6	144	87	6.46	4.66	7.12	6.08
48	BR12125-6R-40	145	94	4.11	5.42	-	4.76
49	BR12125-6R-49	146	99	6.66	5.40	5.46	5.84
*50	BR12125-6R-79	146	88	6.39	6.18	7.29	6.62
*51	BR12437-4R-164	150	101	7.31	6.20	6.44	6.65
52	BR12437-4R-210	152	95	5.82	4.61	7.69	6.04
53	BR12437-4R-240	151	96	6.28	5.26	6.31	5.95
54	BR12438-5R-222	151	127	6.77	5.40	7.32	6.50
*55	BR12438-5R-23	152	123	6.57	6.16	7.17	6.63
*56	BR12438-5R-233	151	124	6.87	7.14	7.52	7.18
57	BR12438-5R-308	152	128	6.28	4.98	-	5.63
58	BR12438-5R-311	152	129	6.60	5.81	-	6.21
59	BR12438-5R-313	153	123	6.74	5.07	7.66	6.49
60	BR12443-4R-236	148	118	6.79	5.59	7.43	6.60
61	BR12443-4R-69	151	122	6.11	4.39	-	5.25
*62	BR12450-4R-108	150	103	7.48	5.20	-	6.34
*63	BR12450-4R-24	147	113	7.46	3.66	-	5.56
64	BR12608-4R-111	148	116	6.71	4.46	7.09	6.09
65	BR12442-4R-49	156	93	5.77	4.25	6.79	5.60
*66	BR11867-5R-331	153	107	6.73	6.37	-	6.55
67	BR11867-5R-339	148	92	6.77	4.33	-	5.55
68	BRRI dhan88 (Sus. Ck)	146	93	7.44	6.70	6.60	6.91
69	BRRI dhan89 (Std. Ck)	157	104	7.69	6.86	6.87	7.14
70	BRRI dhan101 (Res. Ck)	150	109	6.26	6.21	-	6.23
	LSD<0.05	7.76	7.95	1.20	0.88	0.70	1.21
	H2b	0.76	0.83	0.32	0.97	0.75	0.34

*Selected entries based on yield, agronomic performance and grain characteristic



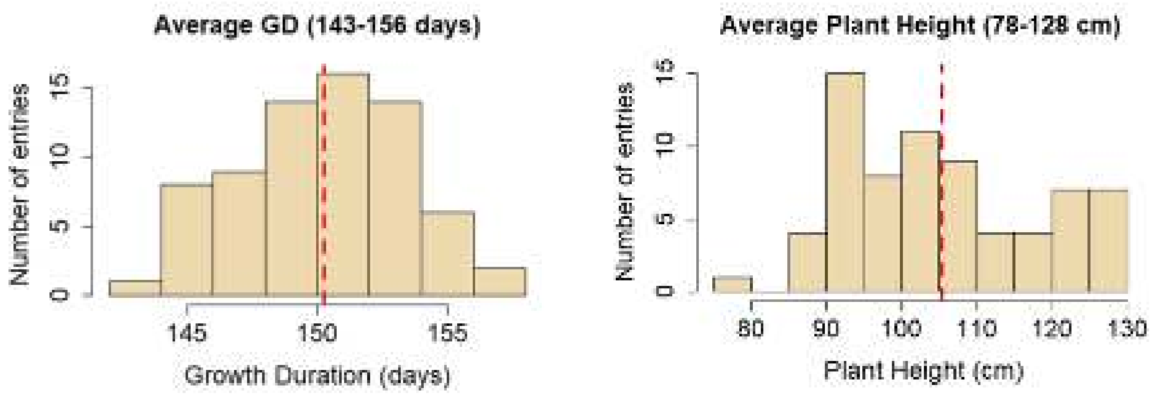


Fig.13.4 Frequncy distribution shows yield and yield components of the AYT genotypes, Boro 2022-23

Experiment 13.7: Regional Yield Trial (RYT)

Principal Investigator: M Khatun

Co-Investigators: S K Debsharma, J Ferdousy (Plant Breeding), MA Latif, Md. Rejwan Bhuiyan, A C Monidas, S A I Nihad, and M A I Khan (Plant Pathology), M R Hasan (Rangpur), M F Islam (Rajshahi), M Salahuddin and R Islam (Cumilla), M Asif Rahman & M M R Dewan (Kushtia), M A Rahman and T H Ansari (Satkhira), R S Ripon & B Karmaker (Sonagazi)

Specific objectives: To evaluate the specific and general adaptability of the advanced breeding lines as compared with standard checks in on-station conditions.

Materials and methods: The experiment was evaluated at BRRI Gazipur, Rangpur, Rajshahi, Cumilla, Sonagazi, Barishal, Sonagazi, Habigonj, Sirajgonj and Kushtia. Three advanced lines in T. Aman 2022-23 along with the standard checks BRRI dhan49, BRRI dhan87 and IRBB60 (Res Ck.) and eighteen for RYT#1 (BB) and ten for RYT#2 (BB & Blast) advanced lines in Boro 2022-23 along with the standard checks BRRI dhan58, BRRI dhan89, BRRI dhan92, BRRI dhan101 and IRBB60 (Res Ck.) were evaluated (**Table13.7.1, 13.7.2 & 13.7.3**). Twenty-five-day-old seedlings were transplanted at a spacing of 25 cm × 15 cm. The plot size was 5.4 m × 4 rows. Two-three seedlings were used for transplanting. Fertilizer doses and application were same as experiment no.1. Crop management such as weeding, irrigation etc. was done in time. Insects and other pests were controlled properly.

Results and discussion: The genotypes BR11869-5R-47 and BR11869-5R-72 for T.Aman and BR(Path)13800-BC3-8-1, BR(Path)13800-BC3-8-6, BR(Path)13800-BC3-8-9, and for BB (RYT#1) and BR(Path)13800-BC3-134-8, BR(Path)13800-BC3-8-5 and BR(Path)13800-BC3-8-11 for BB & Blast (RYT#2) were selected on grain yield, growth duration, resistance to BB & Blast and grain qualities parameters compared to the check varieties **(Table 13.7.1, Table 13.7.2, Table 13.7.3** and **Table 13.7.4).** The selected genotypes will be evaluated as ALART#BB and ALART#BB-Blast in Boro 2023-24.

Table 13.7.1. Grain yield and agronomic parameters of the entries, RYT, Development of BB resistance, T. Aman 2022-23

S N	Designation	GD days	PH cm	Yield (t/ha) Cum	Gazi	Kus	Raj	Rang	Son	Ave
*1	BR11869-5R-47	128	120	5.46	5.66	5.15	5.86	4.95	3.95	5.17
*2	BR11869-5R-72	129	118	5.45	6.48	5.54	5.39	4.30	4.47	5.27
3	BR11874-5R-109	116	108	4.16	5.97	4.46	5.64	4.62	5.47	5.05
4	BRRI dhan49 (S.Ck)	132	107	4.81	5.73	5.65	5.60	4.58	5.00	5.23
5	BRRI dhan87 (S. Ck)	126	126	6.27	5.89	6.53	5.51	3.26	5.46	5.49
6	IRBB60 (Res. CK)	115	91	3.46	4.59	3.48	4.60	3.87	5.54	4.26
	LSD<0.05	4.09	6.9	0.77	0.44	0.22	0.45	1.53	0.34	0.81
	H2b	0.75	0.79	0.56	0.74	0.97	0.69	NA	0.82	0.32

Table 13.7.2. Grain yield and agronomic parameters of the entries, RYT#1, Development of Disease Resistant Rice (DRR) for BB, Boro 2022-23

SN	Designation	GD days	PH cm	Yield (t/ha) Bari	Bha	Cum	Gaz	Habi	Raj	Ran	Sira	Son	Ave	BB score
1	BR(Path)13800-BC3-109-10	153	103	7.5	10.0	6.4	7.3	6.3	7.6	8.3	9.3	8.3	7.9	3
2	BR(Path)13800-BC3-224-28	153	105	7.1	10.2	6.8	7.0	6.9	7.0	7.8	8.4	7.8	7.7	3
*3	BR(Path)13800-BC3-8-1	154	101	7.2	10.2	6.7	8.4	6.7	8.0	7.7	9.2	7.7	8.0	1
*4	BR(Path)13800-BC3-8-6	155	98	7.0	10.5	5.6	8.2	6.2	7.9	8.1	8.3	8.1	7.8	1
5	BR(Path)13800-BC3-8-7	155	100	7.0	9.5	6.8	6.6	7.2	7.0	7.7	6.8	7.7	7.4	1
*6	BR(Path)13800-BC3-8-9	155	102	7.3	9.5	6.9	7.0	6.5	7.9	7.8	9.5	7.8	7.8	1
7	BR11604-4R-24	151	109	6.4	9.0	6.6	6.7	5.6	6.5	8.3	7.8	8.3	7.3	1
8	BR11607-4R-2	154	98	6.4	8.6	5.1	6.5	5.6	6.0	7.3	6.9	7.3	6.6	1
9	BR11607-4R-258	150	91	6.4	8.7	5.6	6.3	6.3	7.5	7.7	6.6	7.7	7.0	3
10	BR11866-5R-136	155	92	6.6	8.1	5.7	6.1	6.1	7.6	6.6	6.2	6.6	6.6	1
11	BR11866-5R-223	158	100	6.8	9.2	7.3	7.0	6.7	6.8	8.0	8.9	8.0	7.6	3
*12	BR11866-5R-277	156	95	6.4	8.5	6.3	8.2	5.6	8.0	7.7	8.2	7.7	7.4	1
*13	BR11866-5R-73	154	90	7.1	9.9	7.1	7.9	6.6	8.0	8.2	7.1	8.2	7.8	1
14	BR11867-5R-117	152	91	4.7	8.9	5.7	6.7	6.6	7.2	7.8	7.2	7.8	7.0	3
15	BR11867-5R-140	155	91	6.7	9.0	5.1	6.1	5.5	7.1	8.2	8.1	8.2	7.1	3
16	BR11867-5R-154	151	89	5.5	10.0	6.0	5.7	5.8	7.4	7.7	7.6	7.7	7.1	3
17	BR11867-5R-347	146	96	4.6	9.6	6.3	6.2	6.3	-	6.6	6.7	6.6	5.9	3
18	BR11868-5R-9	144	105	5.6	7.4	5.2	6.8	4.9	7.2	6.6	5.2	6.6	6.2	3
19	BRRI dhan101(Res. Ck)	150	110	6.4	9.2	6.8	7.0	6.5	7.4	7.1	7.2	7.1	7.2	1
20	BRRI dhan58 (Std. Ck)	150	99	6.7	8.9	6.6	6.5	6.5	6.8	7.2	6.1	7.2	6.9	5
21	BRRI dhan89 (Std. Ck)	155	104	7.5	9.4	6.7	8.4	7.5	7.8	7.7	6.2	7.7	7.7	5
22	BRRI dhan92 (Std. Ck)	157	109	7.3	9.7	6.5	7.4	7.2	7.9	7.7	8.3	7.7	7.7	5
	LSD<0.05	4.08	2.81	0.26	0.3	1.0	0.5	0.9	0.2	0.7	0.6	1.6	0.6	0.7
	H2b	0.71	0.82	0.93	0.9	0.3	0.7	0.5	0.9	0.3	0.5	0.6	0.5	0.4

*Selected entries; **Artificial inoculation

Table 13.7.3. Grain yield and agronomic parameters of the entries, RYT#2, Development of Disease Resistant Rice (DRR) for Blast and BB, Boro 2022-23

SN	Designation	GD (days)	PH (cm)	Yield (t/ha) Bari	Bha	Cumi	Dira	Gazi	Habi	Raj	Rang	Siraj	Sona	Ave	**Score Blast	BB
1	BR(Path)13800-BC3-110-19	154	102	6.84	8.25	6.10	8.69	5.06	6.12	7.57	8.61	9.03	7.40	7.37	3	1
2	BR(Path)13800-BC3-110-4	154	102	7.45	9.48	5.34	10.13	5.08	7.26	7.13	8.57	8.41	7.46	7.63	3	1
3	BR(Path)13800-BC3-12-13	152	105	7.28	8.32	5.69	10.04	5.16	6.47	7.54	8.77	8.77	7.66	7.57	3	1
4	BR(Path)13800-BC3-134-25	151	101	6.71	9.04	5.84	9.15	6.91	6.92	7.65	8.87	9.78	8.39	7.93	3	1
*5	BR(Path)13800-BC3-134-8	151	102	7.75	7.55	6.15	10.39	7.05	6.88	7.89	8.70	9.29	7.94	7.96	1	1
6	BR(Path)13800-BC3-224-17	151	105	7.02	9.15	6.02	10.04	4.19	6.55	7.57	8.92	9.33	7.27	7.61	3	1
7	BR(Path)13800-BC3-224-44	151	104	7.72	9.49	5.09	9.38	6.53	6.86	7.52	8.83	9.25	7.53	7.82	3	1
*8	BR(Path)13800-BC3-8-11	154	101	7.62	8.21	6.97	9.37	6.35	7.05	7.63	8.68	9.20	8.41	7.95	1	1

9	BR(Path)13800-BC3-8-37	153	102	7.21	8.09	5.82	9.11	4.62	6.37	6.98	8.78	9.36	7.06	7.34	3	1
*10	BR(Path)13800-BC3-8-5	153	104	7.70	8.37	6.37	9.34	6.92	6.42	7.51	8.90	9.52	8.51	7.96	1	1
11	BRRI dhan89 (Ck)	154	107	7.49	8.25	6.84	9.55	4.23	7.02	7.67	8.28	8.62	7.56	7.55	7	5
12	BRRI dhan92 (Ck)	157	111	7.35	8.43	6.61	9.59	5.24	7.34	7.72	8.53	9.22	8.00	7.80	5	5
	LSD<0.05	3.4	2.8	0.30	0.73	0.64	0.47	0.31	0.17	0.18	0.22	0.85	0.41	0.86		
	H2b	0.3	0.5	0.55	0.35	0.42	0.85	0.94	0.87	0.71	0.35	0.95	0.58	0.72		

*Selected entries; **Artificial inoculation

Table 13.7.4 Physicochemical and cooking properties of the advanced lines Regional Yield Trial (RYT) for BB, Boro2022-23

SN	Designation	Amy (%)	Milling outturn (%)	Head rice yield (%)	Size & shape	Protein (%)	ER	IR	Chalkiness
1	BR11866-5R-277	25.0	66.9	57.7	LB	8.3	1.3	27	Tr
2	BR11866-5R-73	25.5	69.8	59.2	LB	7.6	1.4	2.9	Wb1
3	BR11604-4R-24	25	68.0	50.2	LB	8	1.3	3.0	Wb1
4	BR11607-4R-2	25.2	65.3	43.2	LB	7.4	1.3	2.9	Tr
5	BRRI dhan58 (Sus Ck)	28.0	70.5	65.6	MS	7.9	1.5	4.0	Tr
	BRRI dhan29(Sus Ck)	29.4	67.1	55.9	MB	7.9	1.4	4.1	Tr
	BRRI dhan89(Sus Ck)	28.2	68..8	59.6	MB	7.7	1.3	2.9	Tr
8	IRBB60 (Res ck)	13.4	60.2	60.2	LB	8.3	1.5	3.0	Tr

Experiment 13.8: Advanced Line Adaptive Research Trial (ALART)

Principal Investigator: Scientists of ARD

Co-Investigators: T H Ansari, M Khatun, S K Debsharma

Specific objective: To evaluate specific and general adaptability of the advanced breeding lines as compared with standard checks under on-farm condition in different AEZ.

Materials and methods: The experiment was conducted Cumilla, Rajshahi, Bogura, Rangpur, Kishoganj, Faridpur, Habiganj, Jashore, Barishal and BRRI farm, Gazipur. In Boro season, four blast resistant genotypes were evaluated with two standard checks BRRI dhan28 and BRRI dhan88 in ten locations throughout the country under ALART#1 for short duration and another four advanced blast resistance lines were evaluated with two standard checks BRRI dhan89 and BRRI dhan29 under ALART#2. Thirty-five to forty-day-old seedlings were transplanted @ 2-3 seedlings at a spacing of 25 cm × 15 cm in different locations. The plot size was 5.4 m × 3 m. Fertilizer doses and application was same as experiment no. 1.1. Crop management such as weeding, irrigation etc. was done in time. Insects and other pests were controlled properly.

Results and discussion: The tested genotype BR (Path) 12452-BC3-42-22-11-4 produced 6.8 t/h yields that were significantly higher than the check BRRI dhan28. Highest yield (7.0t/h) observed in the promising line BR (Path) 12452-BC6-53-21-11. Growth duration (141-143) day was similar to the check variety BRRI dhan28 (147 days) and having good grain characters. Therefore, the tested advanced line was recommended for proposed variety trial (PVT) (**Table 13.8.1 & Table 13.8.2**). On the other hand, BR12454-BC2-69-97-39-5-44 and BR12454- BC2-75-32-31-39-7 produced 7.4 t/ha, and 7.5 t/ha, respectively with similar growth duration (156-157 day) of the check variety BRRI dhan29. The two promising lines were recommended for PVT (**Table 13.8.3 and Table 13.8.4).**

Table 13.8.1 Performance of the proposed blast resistance line at different zonal trial (ALART#SD), Boro, 2022-23

Variety/Line	GD (day)	Yield (t/ha)	Alkali Spreading Value	Amylose content (%)	Protein content (%)	Cooking time (min.)	ER	IR	Chalkiness
V1-BR(Path) 12452-BC3-42-22-11-4	141	6.8	4.5	27.5	9.8	17:30	1.4	4.3	Tr
V2-BR(Path) 12452-BC6-53-21-11	143	7.0	4.5	25.5	8.7	16.30	1.5	3.9	Tr & Wc1 (few)
BRRI dhan28 (Ck)	140	5.4	4.5	28.8	8.9	16:30	1.5	4.0	Tr

Table 13.8.2 Performance of the blast resistance line at different zonal trial (ALART#SD), Boro, 2022-23

Variety/Line	Milling outturn (%)	Head rice recovery (%)	Appearance	Milled rice length (mm)	Milled rice breadth (mm)	L/B ratio	Size & Shape	TGW (g)
V1-BR(Path) 12452-BC3-42-22-11-4	70	66	Good	6.4	2.0	3.2	LS	20.9
V2-BR(Path) 12452-BC6-53-21-11	70	63	Good	6.0	1.9	3.2	LS	20.3
BRRI dhan28	69	62	Good	5.6	1.8	3.1	MS	20.2

Table 13.8.3 Performance of the blast resistance line at different zonal trial (ALART#LD), Boro, 2022-23

SN	Variety/Line	Days)	Yield (t/ha)	Amylose content (%)	Protein content (%)	Alkali Spreading Value	Cooking time (min.)	ER	IR
1	BR12454- BC2-69-97-39-5-44	57	7.4	27.0	7.7	4.1	18.00	1.4	4.3
2	BR12454- BC2-75-32-31-39-7	156	7.5	27.7	7.6	3.7	18.30	1.5	4.3
3	BRRI dhan29 (S. Check)	157	7.3	27.8	7.7	4.5	17.00	1.4	4.5

Table 13.8.4 Performance of the blast resistance line at different zonal trial (ALART#LD), Boro, 2022-23

SN	Variety/Line	Milling outturn (%)	Head rice recovery (%)	Milled rice length (mm)	Milled rice breadth (mm)	L/B ratio	Size & shape	1000 grain wt. (g)
1	BR12454- BC2-69-97-39-5-44	69	65	5.0	2.0	2.5	MB	17.4
2	BR12454- BC2-75-32-31-39-7	70	61	5.7	1.9	3.0	MB	20.7
3	BRRI dhan29 (S. Check)	69	61	5.7	2.0	2.9	MB	19.8

PROJECT 14: DEVELOPMENT OF SUBMERGENCE AND STAGNANT FLOOD TOLERANT RICE VARIETIES

General objectives

- Development of high yielding rice varieties with two to three weeks of submergence, stagnant flood and anaerobic germination tolerances with yield target 6.0-6.5 t/ha (under stress 5.0 t/ha).
- Development of multiple stress tolerant rice varieties like submergence + stagnant flood, submergence + drought, submergence + anaerobic germination, submergence + biotic stress with yield target 6.0-6.5 t/ha (under stress 5.0 t/ha).
- Shorter growth duration.

Project Leader: Khandakar Md. Iftekharuddaula

Experiment 14.1: Hybridization

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: To introgress submergence and medium stagnant water tolerant genes into modern genetic background with short/long growth duration, weakly/strongly photoperiod sensitivity, grain quality etc.

Materials and Methods: Thirty-seven parents (**Table 14.1a**) were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Around 30 days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 20 cm × 20 cm. Single seedling was used for transplanting. Fertilizers were applied at the rate of 200 kg urea, 70 kg TSP, 100 kg MoP, 70 kg gypsum and 6 kg zinc sulphate. Total amount of TSP, gypsum and two-third MoP were applied at the time of final land preparation. Total amount of zinc sulphate was applied at first top dressing. Urea was applied in equal three splits at 10, 25 and 40 days after transplanting. Rest of the one-third MoP was applied during second top-dressing of urea. Other cultural and pest management practices were done as and when necessary. Leaf sample was collected from previously labeled four healthy plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique profiles of each parent were used to make crosses. At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glycine bag. Pollination was performed with just anthesised panicles of the male parent by dusting pollens on the emasculated panicle of the female parent.

Results and discussion: Totally 3,976 F_1 seeds were obtained from 43 crosses (**Table 14.1b**). These were recorded and labeled properly. The F_1 seeds were sun-dried and stored in a cool and dry place.

Table 14.1a: List of parents for hybridization, Submergence & Stagnant Flood Tolerant Breeding, T. Aman 2022-23

SL.	Parental genotypes	GD (days)	Yield (BLUP-t/ha)	Trait of interest
1	BR12162-5R-350	118	6.6	*Sub1, SCT3, AG3, Saltol-Aus, qXa4, Pi33, Wx-op, Wx-A, NAS3*
2	BR11196-5R-445	122	6.0	*Sub1, Wx-A, SCT, Saltol, qSES1-2_4, Xa4, Wx-op*
3	BR11690-5R-98	115	6.1	*Sub1,Saltol-Aus,Wx-A,Wx-10,GS3, Hd3a, Pi33*

SL.	Parental genotypes	GD (days)	Yield (BLUP-t/ha)	Trait of interest
4	BR11690-5R-351	116	5.5	*Sub1,AG3,Saltol-Aus, Wx-op, Wx-A, Hd3, GS3,*
5	BR11686-5R-179	130	6.0	*Sub1,Saltol-Aus,AG3, Wx-op, Wx-A, Hd3*
6	BR10212-7-5-1	138	6.5	*Sub1, SCT3, Saltol-Aus, qSES1-2_4, Pi33, Wx-op, Wx-A, Hd1*
7	BR10211-22-9-2-1	136	6.5	*Sub1, Saltol-Aus, Pi33, Wx-op, Wx-A, Waxy, NAS3, Hd1, Hd3, GS3*
8	IR19L1016	125	6.8	*Sub1, SCT, AG3, Saltol-Aro, qSES1-2_2, Pi33, Wx-A, Wx-10, Bph17_2*
9	IR19A1472	120	6.7	*Sub1, SCT, AG3_2, Saltol, Xa4, Pi33, Hd1, Wx-op, Wx-A*
10	IR13F652-1-PS2	122	5.7	*Sub1, SCT,qAG3, Saltol-Aro, Wx-op, Wx-A, Xa4, GNP1*
11	IR13F652-1(PS3)	142	5.5	*Sub1, SCT, Saltol, AG3, BPH17, Wx-op, Wx-A, GS3, Hd3*
12	IR13F441	140	5.4	*Sub1, SCT, Saltol, AG3, GS3, Wx-op, Wx-A, BPH17, Hd3a*
13	IR16F1063-P1	120	5.6	*Sub1, SCT, Saltol, qAG3, Xa4, Pi33, Wx-op, Wx-A, Waxy*
14	IR16F1063-P2	122	5.9	*Sub1, SCT, Saltol, Xa4, Pi33, Wx-op, Wx-A, Waxy*
15	IR18T1192	120	5.3	*Sub1, Saltol-Aus, Wx-A, Waxy*
16	IR17D1096	125	5.8	*Sub1, SCT, Saltol, Xa4, Xa5, Pi33, Wx-A, Wx-op, GNP1*
17	IR17D1067	124	5.5	*Sub1, SCT1, SCT2, SCT4, Saltol, BPH17, Wx-A, Wx-int, Wx-op, Waxy, Hd1, qXa4*
18	BR12208-5R-352-P1	125	6.8	*SCT, AG3, Saltol, GNP1, Xa4, Wx-op, Wx-A*
19	BR12208-5R-352-P2	125	6.4	*SCT, AG3, Saltol, GNP1, Wx-op, Waxy, Xa4*
20	BR11204-5R-224	125	6.5	*Wx-A,Wx10,Wx-op,SCT1,SCT2, SCT4,AG3,Saltol,qSES1-2_4, xa4_2*
21	Nania	146	6.5	*SCT, Saltol, Sub1, AG3, Pi33, Xa4, Xa26, Wx-A, Wx-10*
22	FBR-376	145	6.5	*SCT1, Saltol, qSIS1L, AG3, Sub1, Wx-A, Wx-10*
23	BR11949-4R-258	150	6.7	
24	BR11712-4R-218	160	6.8	*SCT, Saltol, qAG1, AG3, Xa4, Pi33, Wx-A, Wxx10, Hd1, Hd3a,*
25	BRRI dhan101	145	7.5	
26	BRRI dhan102	150	8.1	
27	BR11716-4R-102	163	6.5	*qSES1-2_4, qSub1,Wx-A,AG3, Pi33, Xa4*
28	BR10571-15-6-8-5	150	7.0	*Zn (23%),*
29	BRH11-9-11-4-5B	120	5.8	
30	BRH13-2-4-6-4B	120	5.7	
31	Guti Swarna	136	5.2	*Xa4, Xa7, Wx-A, Wx-10, Gn1a,*
32	BR10570-29-3-3-4	137	6.5	*Zn(21%),*
33	Ranjit Swarna	136	5.5	

SL.	Parental genotypes	GD (days)	Yield (BLUP-t/ha)	Trait of interest
34	BR9930-2-3-2-2	150	6.6	
35	BR22	150	5.0	
36	IR12A173	152	6.8	*Wx.A,*
37	IR17A1694	146	6.9	*Wx.A,Wx.10, SCT1, Pita, Xa21*

Table 14.1b: **List of crosses for Submergence & Stagnant Flood Tolerant Breeding, T. Aman 2022-23**

SL	BR Reg.	Crosses	(BLUP t/ha	No of F1 seed	Objectives/Trait of interest
1	BR15233	BR12208-5R-352-P2/BR12162-5R-350	6.5	45	*Sub1, Wx-A, AG3, GNP1, Xa4, Pi33, NAS3*
2	BR15234	BR12208-5R-352-P1/ BR11690-5R-98	6.4	110	*Sub1, Wx-A*
3	BR15235	BR12208-5R-352-P1/IR19L1016	6.5	30	*Sub1,Wx-A,AG3,Pi33, GNP1, Xa4,Bph17_2*
4	BR15236	Nania/IR16F1063-P1	6.8	90	*Sub1,Wx-A,Saltol, Xa4, Pi33*
5	BR15237	Nania/BR11690-5R-98	6.3	50	*Sub1 Wx-A, Saltol,Xa4, Pi33*
6	BR15238	BRRI dhan101/BR11690-5R-351	6.5	90	*Sub1, Wx-A, AG3, Hd3*
7	BR15239	BRRI dhan101/IR16F1063	6.6	25	*Sub1,Wx,A.AG3_2,Saltol,Xa 4,Pi33,Hd1*
8	BR15240	BRRI dhan102/IR16F1063-P1	6.8	155	*Sub1,Wx-A,Saltol, Xa4, Pi33*
9	BR15241	BRRI dhan102/BR11690-5R-98	6.7	100	*Sub1, Wx-A, Hd3a, Pi33,*
10	BR15242	BRH11-9-11-4-5B/ BR11690-5R-98	5.8	120	*Sub1, Wx-A*
11	BR15243	Ranjit Swarna/BR11690-5R-98	5.9	70	*Sub1, Wx-A*
12	BR15244	IR17A1694/BR11686-5R-179	6.5	40	*Sub1, Wx-A, AG3, Hd3*
13	BR15245	FBR-376/BR11690-5R-351	6.5	280	*Sub1, Wx-A, AG3_2, Saltol, Xa4, Pi33*
14	BR15246	IR17A1694/IR18T1192	6.6	30	*Sub1, Wx-A,*
15	BR15247	Guti Swarna/BR11196-5R-445	5.7	120	*Sub1, Wx-A AG3, Hd3*
16	BR15248	IR17D1096/BR11690-5R-351	5.7	40	*Sub1, Wx-A, Hd3a, Pi33,*
17	BR15249	IR17D1067/BR11686-5R-179	5.8	150	*Sub1, Wx-A, Hd3a, Pi33,*
18	BR15250	BR11204-5B-224/BR11690-5R-98	6.3	60	*Sub1, Wx-A*
19	BR15251	FBR-376/IR19A1472	6.8	50	*Sub1, Wx-A, AG3, Xa4*
20	BR15252	IR13F652-1-PS2/BR10570-29-3-3-4	5.6	130	*Sub1, Wx-A, Saltol, Xa4,*
21	BR15253	IR17D1096/BRRI dhan102	6.5	150	*Sub1, Wx-A, AG3, Hd3*
22	BR15254	BR11204-5B-224/IR16F1063-P1	6.3	158	*Sub1, Wx-A, Hd3a, Pi33,*
23	BR15255	BR12208-5R-352-P2/IR17D1096	5.8	110	*Sub1,Wx-A,AG3,Hd1, BPH17,*

SL	BR Reg.	Crosses	(BLUP t/ha	No of F1 seed	Objectives/Trait of interest
24	BR15256	BR12208-5R-352-P/BR11690-5R-351	5.7	60	*Sub1,Wx-A,Xa4,Xa5,Pi33, GNP1, AG3, Hd3*
25	BR15257	BR10570-29-3-3-4/IR16F1063-P1	6	200	*Sub1, Wx-A, Pi33, Hd1*
26	BR15258	BR11690-5R-351/IR16F1063-P2	5.6	62	*Sub1, Wx-A, Xa4, GNP1*
27	BR15259	FBR-376/IR17D1096	6.6	20	*Sub1, Wx-A*
28	BR15261	BR10570-29-3-3-4/IR17D1096	5.9	45	*Sub1, Saltol, Xa4, Pi33*
29	BR15262	BR10571-15-6-8-5/IR17D1096	5.7	26	*Sub1, AG3, Wx-A, Hd3, GS3*
30	BR15263	BRH13-2-4-6-4B/IR17D1067	5.6	200	*Sub1, Wx-A, Saltol, AG3, BPH17, Hd3*
31	BR15264	IR12A173/BR11690-5R-351	6.5	35	*Sub1,Wx-A,Xa4,Xa5,Pi33, GNP1*
32	BR15265	BR11712-4R-218/IR17D1067	5.8	50	*Sub1, Wx-A,*
33	BR15266	BRH11-9-11-4-5B/BR11690-5R-351	5.7	100	*Sub1, Wx-A*
34	BR15267	IR12A173/BR11690-5R-98	6.6	20	*Sub1, Wx-A Hd3a, Pi33,*
35	BR15268	Nania/BR10210-4-5-5	6.2	150	*Sub1, Wx-A, Hd3a, Pi33,*
36	BR15269	BR10211-22-9-2_1/ IR13F652-1(PS3)	6.1	135	*Sub1, Wx-A, Saltol, qAG3, Xa4, Pi33, Hd1*
37	BR15270	BR23/IR13F441	5.6	100	*Sub1, Wx-A, Saltol,AG3, BPH17,Hd1, Hd3*
38	BR15271	BR22/IR13F441	5.6	50	*Sub1, Wx-A*
39	BR15272	BR10211-7-5-1/ IR16F1063-No tip col	6.2	100	*Sub1, Wx-A*
40	BR15273	Ranjit Swarna/IR13F652-1(PS3)	5.6	50	*Sub1,Wx-A,Saltol,qAG3,Xa4,Pi33*
41	BR15274	BR10211-7-5-1/Ranjit Swarna	6	120	*Sub1,Wx-A,Saltol,Pi33,NAS3,Hd1,AG3,BPH17*
42	BR15310	BRRI dhan92/IR13F652-1-PS2	6.7	130	*Sub1, Wx-A*
43	BR15311	BRH13-2-4-6-4B/IR13F652-1-PS2	6.5	120	*Sub1, Wx-A, Hd3a, Pi33, AG3, GNP1, Xa4*
		Total F_1 Seeds		**3,976**	

Experiment 14.2: F_1 Confirmation through hybridity test

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objective: Confirmation of F_1s as true crosses and selection of promising ones.
Materials and methods: A total of 35 single crosses along with their respective parents were grown. F_1 seeds of each cross and their respective parents were germinated in petri dishes and then sown in earthen pots. Twenty-five days old seedlings were transplanted at the rate of single seedling at a spacing of 20 cm x 20 cm. Respective parental seedlings were transplanted on both sides of each F_1 population. Crop management was done as described in Experiment 14.1. The leaf samples were collected from each of the 12 plants from each of the crosses and respective parents for QC genotyping to determine true F_1. QC genotyping was performed using 10 QC SNPs

panel at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F_1s were selected.

Results and discussion: Based on QC profile of the test F_1s, 34 crosses out of 35 crosses were confirmed and selected as true F_1. Seeds of these selected F_1 plants were selfed to produce F_2 seeds. At maturity, F_2 seeds of all selected plants were harvested individually, dried, cleaned and preserved in cold room (**Table 14.2**).

Table14.2. List of confirmed and selected F_1s, Submergence & Medium Stagnation Tolerance Breeding, T. Aman 2022-23

SL	BR Reg.	Cross combination	BLUP (t/ha)	Objectives
1	BR14453	BR11802-11-3-1/IR13F441	6.0	*Sub1*
2	BR14454	BR9590-45-1-3-2-P2/ IR13F441	6.2	*Sub1*
3	BR14455	BR11224-9-9-4-4/IR13F441	5.9	*Sub1*
4	BR14456	BRRI dhan67/IR100842-B-B RGA-B RGA-9	5.9	*Sub1, sal tol.*
5	BR14457	BRRI dhan67/BINA dhan11	5.8	*Sub1, sa ttol.*
6	BR14458	BRRI dhan71/BR10212-7-5-2	5.5	*Sub1, Dro. tol.*
7	BR14459	BRRI dhan71/IR16F1019	5.5	*Sub1, Dro. tol.*
8	BR14460	BRRI dhan99/IR16F1148-LB	6.0	*Sub1, sal tol.*
9	BR14461	BRRI dhan100/IR16F1148-LB	6.1	*Sub1, Zn*
10	BR14462	JaHua/IR13F441	6.0	*Sub1*
11	BR14463	JaHua/IR16F1019	6.0	*Sub1*
12	BR14464	JaHua/IR16F1148-LS	6.0	*Sub1*
13	BR14465	JaHua /IR16F1148-LB	6.0	*Sub1*
14	BR14466	BRH13-1-9-7B/ IR16F1148-LB	6.4	*Sub1*
15	BR14467	BR11723-4R-172/BINA dhan11	6.9	*Sub1, sal tol.*
16	BR14468	BR11723-4R-172/IR16F1148-LB	6.8	*Sub1, sal tol.*
17	BR14469	BR11723-4R-172/BR10211-1-2-4	6.8	*Sub1, sal tol.*
18	BR14470	BR11716-4R-105/BR10211-1-2-4	5.9	*Sub1, sal tol.*
19	BR14471	BR11716-4R-105/BR10211-1-1-1-PS1	6.0	*Sub1, sal tol.*
20	BR14472	BR11716-4R-102/IR16F1019	6.5	*Sub1, sal tol.*
21	BR14473	BR11712-4R-227/BINA dhan11	6.1	*Sub1, sal tol.*
22	BR14474	BR11712-4R-227/ IR16F1148-LS	6.5	*Sub1, sal tol.*
23	BR14475	BR11712-4R-227/BR10211-1-2-4	6.0	*Sub1, sal tol.*
24	BR14476	BR12180-5R-1/IR13F441	5.9	*Sub1*
25	BR14477	BR12180-5R-3/IR13F441	5.8	*Sub1*
26	BR14478	BR9674-2-9-10-1-P5/IR16F1148-LS	6.0	*Sub1, Zn*
27	BR14479	BR9674-2-9-10-1-P5/IR16F1148-LB	5.9	*Sub1, Zn*
28	BR14480	BR10571-15-6-5-3/IR16F1148-LS	6.2	*Sub1*
29	BR14481	BR10571-15-6-8-3/IR16F1148-LB	6.5	*Sub1*
30	BR14482	Fatema dhan/IR16F1148-LB	5.9	*Sub1*
31	BR14483	Fatema dhan/IR16F1148-LS	5.9	*Sub1*
32	BR14484	Fatema dhan/BINA dhan11	5.6	*Sub1*
33	BR13361	BRRI dhan87/IR 97383-88-B-B///BRRI dhan87	6.0	*Sub1*
34	BR13378	Guti Swarna/BRRI dhan52///Guti Swarna	6.0	*Sub1*

Experiment 14.3: Rapid Generation Advance (RGA)

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: Rapid advancement of segregating population for shortening breeding cycle and development of large RIL population.

Materials and Methods: A total of 25,592 progenies of 12 F_2, 22 F_3, 27 F_4, 9 F_5 and 10 F_6 populations were grown in T. Aman 2022 season. Single seed progenies from single panicle of one plant were grown in the RGA nursery both in screen house and field. In the screen house seeds were directly sown in the tray followed by thinning and tiller pruning. While in the field, part of the panicle was sown directly on the soil. No thinning or pruning was done. Fertilizer management was done using half of the dosages described in Expt. 14.1. During harvesting at maturity, one panicle was collected from each plant of all the crosses in different times and the plant was uprooted. Harvested seeds remaining in the panicles were dried and subjected for dormancy breakage to initiate next cycle of RGA immediately. For dormancy breaking, at first, sun-drying was done for three days followed by oven drying with 50°C temperature for 72 hours.

Results and discussion: Panicles of 24,335 individuals including 4,930 Progenies of 12 F_2, 12,220 Progenies of 22 F_3, 3,720 Progenies of 27 F_4, 810 Progenies of 9 F_5 and 2,655 Progenies of 10 F_6 populations were harvested at the time of maturity and preserved and processed with proper labels. The average recovery percentage of the RGA generations was 95% (**Table 14.3).**

Table 14.3: List of F_2, F_3, F_4, F_5 and F_6 populations advanced through RGA, Submergence and Medium Stagnant Tolerance Breeding, T. Aman 2022-23

SN	BR No.	Cross combinations	Objectives	No. of progenies Grown	No. of progenies Harvested	%Recovery
F_2 population						
1	BR13878	BRRI dhan94/BR9158-19-9-6-50-2-HR1	*Sub1, Wx-A*	400	370	93
2	BR13880	BRRI dhan94/IR13F441	*Sub1, Wx-A*	400	400	100
3	BR13884	BRRI dhan95/IR13F441	*Sub1, Wx-A*	416	400	96
4	BR13886	BRRI dhan87/BR 9158-19-9-6-50-2-HR1	*Sub1, Wx-A*	400	400	100
5	BR13888	IR16F1148/BR11196-5R-38	*Sub1, Wx-A*	576	560	97
6	BR13891	Guti Swarna/BR 9158-19-9-6-50-2-HR1	*Sub1, Wx-A*	400	400	100
7	BR13892	Guti Swarna/IR13F441	*Sub1, Wx-A*	400	400	100
8	BR13894	BR9880-2-2-2-1/BRRI dhan79	*Sub1, Wx-A*	400	400	100
9	BR13901	IR09A228/BRRI dhan79	*Sub1, Wx-A*	400	400	100
10	BR13904	IR16A2332/BRRI dhan79	*Sub1, Wx-A*	400	400	100
11	BR14159	BRH11-9-11-4B-HR3/ IR13F441	*Sub1, Wx-A*	400	400	100
12	BR14160	BRH11-7-17-10B/ IR13F441	*Sub1, Wx-A*	400	400	100
		Sub Total		**4,992**	**4,930**	**99**
F_3 population						
1	BR13876	BRRI dhan94/BR11185-5R-467-5	*Sub1, Wx-A*	560	530	95
2	BR13877	BRRI dhan94/BR11196-5R-38	*Sub1, Wx-A*	620	600	97
3	BR13882	BRRI dhan95/BR11185-5R-569-3	*Sub1, Wx-A*	620	600	97
4	BR13883	BRRI dhan95/BR11196-5R-611	*Sub1, Wx-A*	620	600	97
5	BR13885	BRRI dhan95/IR127165-1-12-13-1-B	*Sub1, Wx-A*	660	640	97
6	BR13889	IR16F1019//BR11196-5R-38	*Sub1, Wx-A*	620	600	97
7	BR13890	Guti Swarna/BR9158-3-2-2-14-3	*Sub1, Wx-A*	620	600	97
8	BR13896	BR9942-1-2-1-1-B1/BR11185-5R-569-3	*Sub1, Wx-A*	584	570	98
9	BR13897	IR 127152-3-22-3-1-B/BR7833-11-1-3-1-2-B1	*Sub1, Wx-A*	620	600	97
10	BR13898	IR127165-1-12-13-1-B/ BR7833-11-1-3-1-2-B1	*Sub1, Wx-A*	440	420	95

SN	BR No.	Cross combinations	Objectives	No. of progenies		%Recovery
				Grown	Harvested	
11	BR13899	IR09A228/BR11196-5R-38	*Sub1, Wx-A*	620	600	97
12	BR13900	IR09A228/BR11185-5R-467-5	*Sub1, Wx-A*	620	600	97
13	BR13902	IR16A2332/BR11196-5R-38	*Sub1, Wx-A*	520	500	96
14	BR13903	IR16A2332/BR11185-5R-467-5	*Sub1, Wx-A*	600	580	97
15	BR14156	BR8899-17-1-1-1-1-1/ IR16F1148	*Sub1, Wx-A*	620	600	97
16	BR14157	BR8899-17-1-1-1-1-1/ IR16F1019	*Sub1, Wx-A*	620	600	97
17	BR14158	BRH13-1-9-7B/ Binadhan-11	*Sub1, Wx-A*	440	410	93
18	BR14161	BR10-1-14-2-6B/ IR13F441	*Sub1, Wx-A*	620	520	84
19	BR14162	CN6/ IR16F1019	*Sub1, Wx-A*	672	650	97
20	BR14163	CN6/ IR16F1148	*Sub1, Wx-A*	520	510	98
21	BR13361	BC_2F_1 of BR13361/ BRRI dhan87	*Sub1, Wx-A*	480	460	96
22	BR13378	BC_2F_1 of BR13378/ Guti Swarna	*Sub1, Wx-A*	440	430	98
		Sub Total		**12,736**	**12,220**	96
F_4 population						
1	BR13353	BR7528-2R-HR16-2-24-1/ IR 127152-3-22-2-1-B	Zn+Sub+BB	80	80	100
2	BR13359	BRRI dhan75/BR9158-19-9-6-50-2-HR1	Sub+SD	200	180	90
3	BR13363	BRRI dhan87/BR9791-1-31-4-2-B1	Sub	100	100	100
4	BR13364	BRRI dhan87/ BRRI dhan79	Sub	200	200	100
5	BR13365	BRRI dhan87/ BR9158-19-9-6-50-2-HR1	Sub	400	380	95
6	BR13366	BR-RS(Raj)-PL4-B/BRRI dhan79	Sub	180	160	89
7	BR13367	BR-RS(Raj)-PL4-B/ Binadhan-12	Sub	100	100	100
8	BR13368	BR-RS(Raj)-PL4-B/BR9175-9-1-3-20-3	Sub	432	410	95
9	BR13371	BR-SF(Rang)-PL1-B/BR9158-19-9-6-50-2-HR1	Sub	444	320	72
10	BR13372	IR 97383-88-B-B/IR13F441	Sub	220	200	91
11	BR13373	IR 97383-88-B-B/BR9158-19-9-6-50-2-HR1	Sub+PS	444	400	90
12	BR13375	BRRI dhan79/IR127152-3-22-18-1-B-1	Sub	200	180	90
13	BR13377	Guti Swarna/BRRI dhan79	Sub	440	420	95
14	BR13905	BRRI dhan87/Kalojoma	Sub	176	160	91
15	BR13906	BRRI dhan87/DG1-349	Sub	440	430	98
			Sub Total	**4,056**	**3,720**	**92**
F_5 population						
1	BR13354	BR7528-2R-HR16-2-24-1/IR16F1063	Zn+Sub	80	80	100
2	BR13355	BRRI dhan71/IR 127152-3-22-2-1-B	Drought+Sub+SD+BB	80	80	100
3	BR13356	BRRI dhan71/Binadhan-11	Drought+Sub+SD	80	80	100
4	BR13358	BRRI dhan75/IR127152-3-22-2-1-B	Sub+Good grain + SD +BB	80	80	100
5	BR13360	BRRI dhan87/IR14F468	Sub	144	130	90
6	BR13361	BRRI dhan87/IR 97383-88-B-B	Sub+PS	100	100	100
7	BR13362	BRRI dhan87/R16F1063	Sub	80	80	100

SN	BR No.	Cross combinations	Objectives	No. of progenies		%Recovery
				Grown	Harvested	
8	BR11369	BR-SF(Rang)-PL1-B/IR 127152-3-22-2-1-B	Sub	100	100	100
9	BR13370	BR-SF(Rang)-PL1-B/IR14F468	Sub+BB	80	80	100
		Sub Total		**824**	**810**	**98**
F_6 population						
Single crosses						
1	BR12948	Suman Swarna/BRRI dhan79	Sub	380	380	100
2	BR12951	BR9158-19-9-6-50/IR13F582	Sub+Drought+SF	340	320	94
3	BR12953	BRRIdhan79/ WANXIAN7777-P10	Sub+BB+Salt	160	160	100
4	BR12958	BR10/BRRI dhan79	Sub+SF	240	230	96
5	BR12959	BRRI dhan30/BRRI dhan79	Sub+SF	220	210	95
6	BR12961	IR14D136/DR(6)	AG+ Long grain	320	310	97
7	BR12962	BRRI dhan87/BRRI dhan79	Sub	344	320	93
8	BR12963	Binadhan-11/ Binadhan-12	Sub+LS grain	340	220	65
			Multiple crosses			
1	BR12965	BRRI dhan51/BRRI dhan73//IR16F1036	Sub+Salt	320	295	92
2	BR12967	BR9158-19-9-6-50/IR64-Sub1//IR13F582	Sub+Drought	320	210	66
			Sub Total	**2,984**	**2,655**	**89**
		Grand Total		**25,592**	**24,335**	**95**

Experiment 14.4: Line Stage Testing (LST)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: Selection of uniform genotypes in terms of uniformity in flowering, plant height, amylose content with key target traits especially submergence tolerant.

Materials and Methods: In total 3,006 lines from 12 crosses were transplanted in 12-hills single-row plots using systematic arrangement with respective parents and five check varieties. Thirty days old single seedling was transplanted at 20 cm × 20 cm spacing. Fertilizers were applied following the rate given in experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time. Leaf samples were collected from single plant of phenotypically selected plants for genotyping with trait markers using trait-based SNP markers. At maturity, line selection was done considering uniformity in flowering and plant height, grain size and shape, lodging tolerance and tolerance to major disease and insect over check varieties under field condition and presence of target major traits.

Results and discussion: A total of 162 lines were selected from 3,006 progenies of twelve crosses based on the key trait marker (*Sub1*), especial trait markers (eg. *Wx-A, Wx-10, Wx-NB*), acceptable growth duration, plant height and uniformity in flowering for promoting in the observational yield trial. The list of progenies is given in **Table 14.4.1** and the list of selected better lines is given in the **Table 14.4.2**. Among the genotyped/lines all four alleles of *Sub1* gene were presented with a frequency of 60%. BLB resistant genes *Xa21* and *Xa13* were found in 3% and 5% lines, respectively. Amylose contributing gene *Wx-A_group* found in 98% lines, *Wx-10* and *Wx-A-NB* found in 66% and 45% line of LST populations, which indicated medium to high amylose genes were abundant in the populations. (**Fig. 14.4.2**).

Table 14.4.1. List of superior fixed lines selected from LST populations, Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SL	BR No.	Crosses	No. of LST lines		GD
			Transplanted	Selected	(days)
1	BR12484	BRRI dhan51/BRRI dhan73	222	14	112-135
2	BR12503	BR10/BRRI dhan51	251	13	129-144
3	BR12504	BR10/BRRI dhan52	237	12	116-138
4	BR12505	BR8159-20-8-5-8-2/BRRI dhan51	287	15	111-135
5	BR12950	IR13F582-1/WANXIAN7777-P10	200	11	115-132
6	BR12952	IR13F441/BRRI dhan75	290	17	107-138
7	BR12957	IR14D136/IR90082-SUB-35-3-2-2	280	14	127-145
8	BR12960	IR14D136/DR(6)	250	10	121-135
9	BR12918	BR9158-19-9-6-7-50/ BRRI dhan52//BRRI dhan79	250	21	125-141
10	BR12920	BR9159-8-5-40-13-52/Lal Khama//BRRI dhan73	256	13	110-138
11	BR12926	JataBalam/BINA dhan12//BRRI dhan79	248	10	119-143
12	BR12966	IR92689-SUB-SUB-92-1-B/BR9163-1-30-1-25//IR13F582-1	235	12	108-129
		Total	**3,006**	**162**	

Table 14.4.2. List of selected lines from LST populations, Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SL	Designation	Growth duration (days)	Traits of interest identified through trait linked SNPs
1	BR12484-5R-14	112	*Sub1, Wx-A*
2	BR12484-5R-19	128	*Sub1, Wx-A,Wx-10*
3	BR12484-5R-38	123	*Sub1, Wx-A,Wx-10*
4	BR12484-5R-45	119	*Sub1, Wx-A, Wx-NB*
5	BR12484-5R-48	112	*Sub1, Wx-A, Wx-10*
6	BR12484-5R-61	111	*Sub1, Wx-A,Wx-10, Wx-NB*
7	BR12484-5R-62	129	*Sub1, Wx-A, Wx-10*
8	BR12484-5R-65	134	*Sub1, Wx-A, Wx-10*
9	BR12484-5R-67	117	*Sub1, Wx-A*
10	BR12484-5R-76	126	*Sub1, Wx-A,Wx-10*
11	BR12484-5R-77	114	*Sub1, Wx-A,Wx-10*
12	BR12484-5R-82	135	*Sub1, Wx-A*
13	BR12484-5R-84	130	*Sub1, Wx-A*
14	BR12484-5R-88	132	*Sub1, Wx-A*
15	BR12484-5R-96	112	*Sub1, Wx-A,Wx-10*
16	BR12503-5R-104	115	*Sub1, Wx-A,Wx-10*
17	BR12503-5R-110	133	*Sub1, Wx-A*
18	BR12503-5R-112	130	*Sub1, Wx-A*
19	BR12503-5R-113	117	*Sub1, Wx-A*
20	BR12503-5R-115	119	*Sub1, Wx-A, Wx-NB*
21	BR12503-5R-117	131	*Sub1, Wx-A,Wx-10*
22	BR12503-5R-118	122	*Sub1, Wx-A,Wx-10*
23	BR12503-5R-119	136	*Sub1, Wx-A*
24	BR12503-5R-120	117	*Sub1, Wx-A,Wx-10*
25	BR12503-5R-121	106	*Sub1, Wx-A,Wx-10*
26	BR12503-5R-122	119	*Sub1, Wx-A,Wx-10*
27	BR12503-5R-123	112	*Sub1, Wx-A,Wx-10*
28	BR12503-5R-129	132	*Sub1, Wx-A, Wx-NB*
29	BR12503-5R-130	103	*Sub1, Wx-A*

SL	Designation	Growth duration (days)	Traits of interest identified through trait linked SNPs
30	BR12503-5R-132	115	*Sub1, Wx-A, Wx-NB*
31	BR12503-5R-135	131	*Sub1, Wx-A*
32	BR12503-5R-139	139	*Sub1, Wx-A,Wx-10*
33	BR12503-5R-14	108	*Sub1, Wx-A,Wx-10*
34	BR12503-5R-140	136	*Sub1, Wx-A*
35	BR12503-5R-142	133	*Sub1, Wx-A, Wx-NB*
36	BR12503-5R-144	118	*Sub1, Wx-A, Wx-NB*
37	BR12503-5R-15	137	*Sub1, Wx-A,Wx-10*
38	BR12503-5R-151	140	*Sub1, Wx-A*
39	BR12503-5R-17	132	*Sub1, Wx-A, Wx-NB*
40	BR12503-5R-20	110	*Sub1, Wx-A, Wx-NB*
41	BR12503-5R-22	126	*Sub1, Wx-A,Wx-10*
42	BR12503-5R-25	101	*Sub1, Wx-A,Wx-10*
43	BR12503-5R-28	125	*Sub1, Wx-A,Wx-10*
44	BR12503-5R-31	114	*Sub1, Wx-A,Wx-10*
45	BR12503-5R-32	139	*Sub1, Wx-A,Wx-10*
46	BR12503-5R-39	108	*Sub1, Wx-A, Wx-NB*
47	BR12503-5R-41	114	*Sub1, Wx-A,Wx-10*
48	BR12503-5R-46	134	*Sub1, Wx-A,Wx-10*
49	BR12503-5R-5	120	*Sub1, Wx-A, Wx-NB, Xa13*
50	BR12503-5R-52	122	*Sub1, Wx-A,Wx-10*
51	BR12503-5R-55	125	*Sub1, Wx-A,Wx-10*
52	BR12503-5R-6	128	*Sub1, Wx-A,Wx-10*
53	BR12503-5R-67	136	*Sub1, Wx-A, Wx-NB*
54	BR12503-5R-69	120	*Sub1, Wx-A, Wx-NB, Xa13*
55	BR12503-5R-7	135	*Sub1, Wx-A,Wx-10*
56	BR12503-5R-73	118	*Sub1, Wx-A, Wx-NB*
57	BR12503-5R-74	113	*Sub1, Wx-A,Wx-10*
58	BR12503-5R-82	122	*Sub1, Wx-A, Wx-NB*
59	BR12503-5R-86	129	*Sub1, Wx-A,Wx-10*
60	BR12503-5R-89	109	*Sub1, Wx-A, Wx-NB*
61	BR12503-5R-93	122	*Sub1, Wx-A*
62	BR12503-5R-95	110	*Sub1, Wx-A,Wx-10*
63	BR12503-5R-99	128	*Sub1, Wx-A,Wx-10*
64	BR12504-5R-101	140	*Sub1, Wx-A, Wx-NB*
65	BR12504-5R-111	118	*Sub1, Wx-A, Wx-10*
66	BR12504-5R-113	135	*Sub1, Wx-A, Wx-10*
67	BR12504-5R-114	122	*Sub1, Wx-A,Wx-10*
68	BR12504-5R-127	129	*Sub1, Wx-A,Wx-10*
69	BR12504-5R-137	133	*Sub1, Wx-A,Wx-10*
70	BR12504-5R-143	122	*Sub1, Wx-A,Wx-10*
71	BR12504-5R-148	115	*Sub1, Wx-A,Wx-10*
72	BR12504-5R-150	130	*Sub1, Wx-A,Wx-10*
73	BR12504-5R-151	130	*Sub1, Wx-A*
74	BR12504-5R-159	119	*Sub1, Wx-A,Wx-10*
75	BR12504-5R-166	127	*Sub1, Wx-A, Wx-NB*
76	BR12504-5R-176	127	*Sub1, Wx-A, Wx-NB*
77	BR12504-5R-181	126	*Sub1, Wx-A,Wx-10*
78	BR12504-5R-191	128	*Sub1, Wx-A*
79	BR12504-5R-205	135	*Sub1, Wx-A*
80	BR12504-5R-214	135	*Sub1, Wx-A,Wx-10*
81	BR12504-5R-222	138	*Sub1, Wx-A,Wx-10*

SL	Designation	Growth duration (days)	Traits of interest identified through trait linked SNPs
82	BR12504-5R-60	130	*Sub1, Wx-A,Wx-10*
83	BR12504-5R-65	126	*Sub1, Wx-A, Wx-10, Wx-NB*
84	BR12504-5R-71	136	*Sub1, Wx-A,Wx-10*
85	BR12504-5R-78	140	*Sub1, Wx-A,Wx-10*
86	BR12504-5R-96	135	*Sub1, Wx-A,Wx-10*
87	BR12505-5R-1	129	*Sub1, Wx-A, Wx-NB*
88	BR12505-5R-4	121	*Sub1, Wx-A,Wx-10*
89	BR12507-5R-10	126	*Sub1, Wx-A,Wx-10, Wx-NB*
90	BR12507-5R-11	125	*Sub1, Wx-A,Wx-10*
91	BR12507-5R-12	125	*Sub1, Wx-A, Wx-10*
92	BR12507-5R-13	125	*Sub1, Wx-A, Wx-10*
93	BR12507-5R-14	132	*Sub1, Wx-A, Wx-10*
94	BR12507-5R-16	125	*Sub1, Wx-A,Wx-10*
95	BR12507-5R-2	134	*Sub1, Wx-A,Wx-10*
96	BR12507-5R-21	121	*Sub1, Wx-A, Wx-NB*
97	BR12507-5R-24	136	*Sub1, Wx-A, Wx-NB*
98	BR12507-5R-25	140	*Sub1, Wx-A*
99	BR12507-5R-31	122	*Sub1, Wx-A,Wx-10*
100	BR12507-5R-32	118	*Sub1, Wx-A*
101	BR12507-5R-33	123	*Sub1, Wx-A,Wx-10*
102	BR12507-5R-34	125	*Sub1, Wx-A,Wx-10*
103	BR12507-5R-44	125	*Sub1, Wx-A,Wx-10*
104	BR12507-5R-48	132	*Sub1, Wx-A,Wx-10*
105	BR12507-5R-5	125	*Sub1, Wx-A,Wx-10*
106	BR12507-5R-55	129	*Sub1, Wx-A,Wx-10*
107	BR12507-5R-6	129	*Sub1, Wx-A,Wx-10*
108	BR12507-5R-63	134	*Sub1, Wx-A,Wx-10*
109	BR12507-5R-66	125	*Sub1, Wx-A,Wx-10*
110	BR12507-5R-68	125	*Sub1, Wx-A,Wx-10*
111	BR12507-5R-73	142	*Sub1, Wx-A,Wx-10*
112	BR12507-5R-75	121	*Sub1, Wx-A,Wx-10*
113	BR12507-5R-77	135	*Sub1, Wx-A,Wx-10*
114	BR12507-5R-78	127	*Sub1, Wx-A*
115	BR12507-5R-80	123	*Sub1, Wx-A,Wx-10*
116	BR12949-5R-103	125	*Sub1, Wx-A,Wx-10*
117	BR12949-5R-105	129	*Sub1, Wx-A*
118	BR12949-5R-4	131	*Sub1, Wx-A,Wx-10, Wx-NB*
119	BR12949-5R-6	126	*Sub1, Wx-A,Wx-10*
120	BR12949-5R-68	129	*Sub1, Wx-A,Wx-10*
121	BR12949-5R-7	130	*Sub1, Wx-A,Wx-10*
122	BR12949-5R-71	128	*Sub1, Wx-A,Wx-10*
123	BR12949-5R-8	129	*Sub1, Wx-A,Wx-10*
124	BR12949-5R-82	132	*Sub1, Wx-A,Wx-10*
125	BR12949-5R-86	127	*Sub1, Wx-A,Wx-10*
126	BR12949-5R-9	128	*Sub1, Wx-A,Wx-10*
127	BR12949-5R-98	138	*Sub1, Wx-A,Wx-10*
128	BR12952-5R-14	130	*Sub1, Wx-A*
129	BR12952-5R-15	136	*Sub1, Wx-A, Xa21*
130	BR12952-5R-18	134	*Sub1, Wx-A*
131	BR12952-5R-22	128	*Sub1, Wx-A,Wx-10, Xa21*
132	BR12952-5R-33	130	*Sub1, Wx-A*
133	BR12952-5R-59	135	*Sub1, Wx-A*

SL	Designation	Growth duration (days)	Traits of interest identified through trait linked SNPs
134	BR12952-5R-64	141	*Sub1, Wx-A, Wx-10, Xa21*
135	BR12952-5R-78	138	*Sub1, Wx-A, Wx-10*
136	BR12952-5R-90	142	*Sub1, Wx-A, Xa21*
137	BR12954-5R-1	135	*Sub1, Wx-A, Wx-10*
138	BR12954-5R-22	136	*Sub1, Wx-A*
139	BR12954-5R-24	141	*Sub1, Wx-A, Wx-10*
140	BR12955-5R-119	130	*Sub1, Wx-A, Wx-10*
141	BR12955-5R-122	133	*Sub1, Wx-A, Wx-NB*
142	BR12955-5R-128	133	*Sub1, Wx-A, Wx-NB*
143	BR12955-5R-28	132	*Sub1, Wx-A, Wx-NB*
144	BR12955-5R-37	134	*Sub1, Wx-A, Wx-10*
145	BR12955-5R-49	135	*Sub1, Wx-A, Wx-10*
146	BR12955-5R-50	142	*Sub1, Wx-A, Wx-10*
147	BR12955-5R-60	139	*Sub1, Wx-A, Wx-10, Wx-NB*
148	BR12955-5R-62	134	*Sub1, Wx-A, Wx-NB*
149	BR12955-5R-67	127	*Sub1, Wx-A, Wx-NB*
150	BR12955-5R-92	130	*Sub1, Wx-A, Wx-10*
151	BR12504-5R-60	125	*Sub1, Wx-A, Wx-NB*
152	BR12504-5R-65	141	*Sub1, Wx-A, Wx-10*
153	BR12504-5R-71	128	*Sub1, Wx-A, Wx-10*
154	BR12504-5R-78	127	*Sub1, Wx-A, Wx-10*
155	BR12504-5R-96	125	*Sub1, Wx-A, Wx-10*
156	BR12505-5R-1	127	*Sub1, Wx-A, Wx-10*
157	BR12505-5R-4	133	*Sub1, Wx-A, Wx-10*
158	BR12507-5R-10	131	*Sub1, Wx-A, Wx-10*
159	BR12507-5R-11	129	*Sub1, Wx-A, Wx-10*
160	BR12507-5R-12	125	*Sub1, Wx-A, Wx-10*
161	BR12507-5R-13	133	*Sub1, Wx-A, Wx-10*
162	BR12507-5R-54	138	*Sub1, Wx-A, Wx-NB*

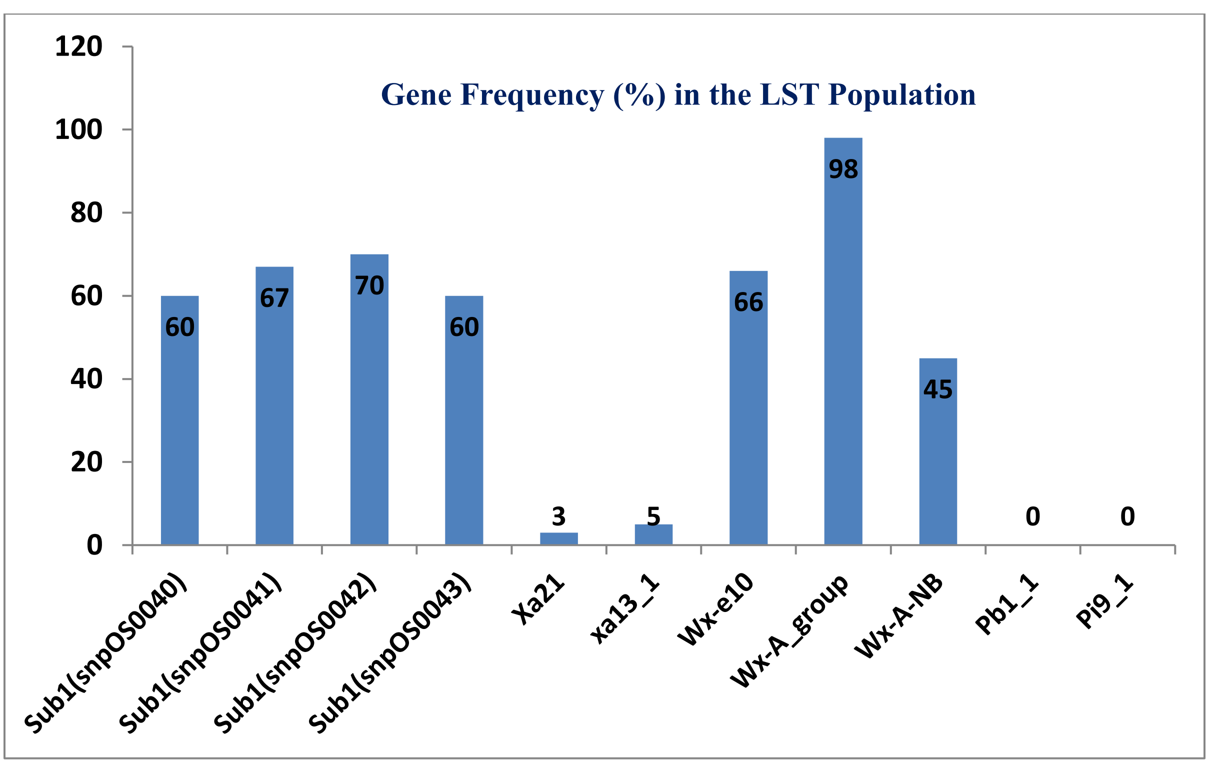


Fig.14.1. Frequency of trait makers showing favorable alleles for different key target traits in the selected LST lines in T. Aman 2022-23

Experiment 14.5. Observational Yield Trial (OYT-1)

Principal Investigator: Sharmistha Ghosal

Co-investigators: K M Iftekharuddaula, Z A Riyadh, S Maniruzzaman, Anisar Rahman and M R Hassan.

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population and higher yield potentials than the standard checks under rainfed conditions.

Materials and Methods: A total of 187 advanced lines with five checks were evaluated in Augmented RCB design. The trial conducted in six locations, two in controlled submergence tank and another two under rainfed condition in Gazipur and Rangpur and another two at flood prone farmers' field at Kurigram and Lalmonirhat. Twenty-five to thirty days old seedling with single seedlings per hill was transplanted at a spacing of 20 cm × 15cm in a 5.4m × 4 rows plot. For rainfed trial, fertilizers were applied following the rate given in experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time.

In case of controlled submergence screening, four extra lines of susceptible genotypes were transplanted at four places at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. At twenty-one days after transplanting, the lines were submerged with 1 meter of water depth for 16 days. Same basal doze of fertilizer of rainfed condition was applied during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 20 days after de submergence. Under flash flood condition, first top dress of Urea was done at ten days after water recession and 2nd top dress of Urea and half MoP were applied after 20-25 days after water recession. Under flood prone farmers' field condition fertilizer management decisions were taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Results and discussion: A total of 65 genotypes out of 187 genotypes were selected based on better phenotypic acceptance, homogeneity in the population, disease infestation and higher yield potentials **(Table 14.5).** Among the selected genotypes the genotype BR12487-5R-88 gave the highest yield (6.9 t/ha) in controlled submergence tank with 93% survivability and in flood prone farmers field it also produced a yield of 5.7 t/ha. The genotype BR12506-5R-62 was produced the highest yield (5.8 t/ha) in flash flood prone farmers' field condition. In rainfed on-station trial, the genotype BR12154-5R-65-2, was produced significantly higher yield (6.9 t/ha) with 136 days growth duration. The other selected genotypes gave yield ranging from 5.2 t/ha to 6.7 t/ha in controlled stress condition. The growth duration of the test entries was ranged from 111 to 145 days.

Table 14.5. Performance of some selected entries in Observational Yield Trial#1 (OYT#1), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SL No	Designation	PA cp	PH (cm)	GD (days)	Yield (t/ha)			Surviv ability %	Traits of interest identified through trait linked SNPs
					NS	FF	St		
1	BR12487-5R-60	5	113	120	4.9	5.5	6.7	90	*All Sub1, Wx-A, Wx-10, Chalk5, Pita2, Xa4, DTH8, Gn1a*
2	BR12487-5R-75	5	123	109	6.1	5.5	6.7	92	*All Sub1, Wx-A, Wx-NB, Chalk5, Xa4, DTH8, Gn1a*
3	BR12487-5R-88	3	124	133	4.6	5.7	6.9	93	*All Sub1, Wx-A, Wx-10, Chalk5, Xa4, Xa7, DTH8, Gn1a*

SL No	Designation	PA cp	PH (cm)	GD (days)	Yield (t/ha)			Survivability %	Traits of interest identified through trait linked SNPs
					NS	FF	St		
4	BR12487-5R-95-1-P2	5	106	121	5.0	4.5	5.2	87	*All Sub1, Wx-A, Wx-10, Chalk5, Pita2, Xa4, DTH8, Gn1a*
5	BR12489-5R-63	7	134	114	3.8	3.1	5.6	75	*All Sub1, Pi54, Chalk5, Alk, Xa4, Gn1a*
6	BR12489-5R-166	5	138	125	4.6	5	5.9	78	*All Sub1, Wx-A, Wx-10, Chalk5, ALk, Xa4, Xa7, DTH8, Gn1a*
7	BR12490-5R-110	7	145	128	4.8	3.5	5.8	83	*All Sub1, Wx-A, Wx-10, Chalk5, DTH8, Gn1a*
8	BR12490-5R-175	5	128	147	5.1	5.7	6.7	91	*All Sub1,Wx-A, Wx-NB, Chalk5, DTH8, Gn1a*
9	BR12506-5R-62	5	144	128	5.0	5.8	5.0	77	*All Sub1, Wx-A, Wx-10, Chalk5, Xa4, DTH8, Gn1a*
10	BR12154-5R-65-2	5	129	136	6.9	5.6	6.7	88	*All Sub1, Wx-A, Wx-10, DTH8, Chalk5, Gn1a, GS3*
11	BR11694-5R-130-PS2	7	127	110	4.8	5.5	5.8	80	*All Sub1, Wx-A, Wx-10, Xa4, Xa7, DTH8, Chalk5, Gn1a*
12	BR10212-16-1-1	5	133	132	4.5	3.8	5.8	95	*All Sub1, Wx-A, Wx-int, Xa4, DTH8, Gn1a, GS3*
13	IR16F1243-P2	7	131	132	4.6	4.5	6.0	79	
14	IR15F1869-P2	5	131	128	5.1	5	5.5	75	
15	BR12497-5R-133	5	139	139	5.6	3.4	0.2	8	*All Sub1, Wx-A, Xa4, DTH8, Gn1a*
16	BR12506-5R-174	5	127	140	6	4.8	6.7	65	
17	BR11690-5R-98	5	122	134	4.8	5	6.0	67	
18	BR10211-22-9-2_4	3	121	151	6.4	5.6	6.5	85	
19	BR10211-22-9-2_1-P1	5	106	145	5.6	5.5	6.2	33	
20	BINA dhan11(Ck)	7	105	120	4.0	4	4.4	74	*all Sub1, Wx-A, Wx-int, Xa4, DTH8, GS3*
21	BRRI dhan79(Ck)	5	113	139	5.7	5.2	5.2	69	*all Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
22	BRRI dhan52(Ck)	5	123	141	5.3	5	5.6	89	*all Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
23	BRRI dhan87(Ck)	9	108	130	5	3	0.4	1	*Wx-A, Wx-10, Xa4, DTH8, GS3, Chalk5, Gn1a*
24	BR23 (Ck)	7	129	149	4.3		3.2	34	
	P value	ns	**	***	**	NS	***	****	
	LSD (0.05)	2.8	16.9	5.7	0.4	2.1	0.5	5.1	
	H2b	0.6	0.87	0.88	0.64	0.57	0.89	0.80	

NS: Non-stress; FF: Farmer's Field; St: Stress

Experiment 14.6: Observational Yield Trial#2 (OYT#2 INGER_IRSTN_FP)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population and higher yield potentials than the standard checks under rainfed conditions.

Materials and Methods: A total of 38 advanced lines with two checks received under INGER nursery IRSTN_FP were evaluated in RCB design. Twenty-five days old seedling with 2/3 seedlings per hill was transplanted at a spacing of 20 cm × 20 cm. Fertilizers were applied following the experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time.

Results and discussion: The genotypes were selected depending on the growth duration, survivability, phenotypic acceptability and yield performance. The genotype SV1582 produced the highest grain yield (5.6 t/ha) with 10-16 days' shorter duration over check varieties. However, the over-all yield performance of the genotypes was lower because of late transplanting due to delay of seed arrival. Most of the selected lines produced higher yield with shorter growth duration over both the check varieties. The heritability obtained from plant height, growth duration and grain yield were 92%, 94% and 62%, respectively, indicating high level of precision in this experiment (**Table 14.6**). All the selected entries possessed all four alleles of *Sub1* gene having satisfactorily high amylose content.

Table 14.6. Performance of selected entries in Observational Yield Trial (OYT#3: INGER_IRSTN_FP), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

Ent. No.	Designation	PH (cm)	TN	Dis. (SES)	Insect. (SES)	Lod. (SES)	PAcp	GD (days)	YLD (t/ha)	Trait markers
1	SV1582	110	11	1	1	1	5	110	5.6	*Sub1, Wx-A*
2	SV1598	116	12	1	3	2	5	109	5.2	*Sub1, Wx-A. Wx-10*
3	SV1599	110	12	1	2	1	5	109	5.2	*Sub1, Wx-A. Wx-10*
4	SV0866	121	10	2	4	1	5	133	5.2	*Sub1, Wx-A*
5	SV1563	119	11	5	3	2	7	106	5.0	*Sub1, Wx-A*
6	SV1566	103	13	2	3	1	5	108	4.8	*Sub1, Wx-A*
7	SV1578	109	11	2	3	1	5	101	4.5	*Sub1, Wx-A*
8	SV0268	106	12	1	1	1	5	108	4.4	*Sub1, Wx-A*
9	SV1586	111	13	2	4	2	7	106	4.6	*Sub1, Wx-A*
10	SV1570	119	11	2	2	1	5	109	4.8	*Sub1, Wx-A*
11	BRRI dhan87(Ck)	120	12	1	3	2	5	120	4.8	
12	BRRI dhan52(Ck)	126	10	2	4	1	6	126	4.6	
	P Value	****	ns	****	*	***	***	****	**	
	LSD (0.05)	6.61		1.63	2.3	2.18	1.44	4.48	0.67	
	H2b	0.92		0.73	0.48	0.70	0.65	0.94	0.62	

D/S: 20/07/2022 D/T: 15/08/2022

Experiment 14.7: Observational Yield Trial#3 (OYT#3_ AGGRi Network Trial)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, Anisar Rahman, , M Faruquee, M M Ul Islam, M R Islam and K M Iftekharuddaula.

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population, shorter growth duration, better survivability and higher yield potentials than the standard checks varieties in controlled submergence condition as well as under rainfed conditions.

Materials and Methods: A total of 54 advanced lines with ten national and global checks were evaluated using alpha lattice design with two replications (**Table 14.7)** in rainfed and controlled stress condition at water tank. The trial conducted in three locations, two in controlled submergence tank and another trial under rainfed condition in Gazipur and Rangpur. Around 23 days old seedlings with single seedlings per hill were transplanted at a spacing of 20cm × 20cm in a 5.4 m × 4 rows plot. Fertilizers were applied following the experiment 14.1. Other cultural and pest management practices were done as and when necessary.

In case of controlled submergence screening, four lines of each entry (40 seedlings each) were transplanted in the tank following 20 cm × 15 cm spacing. The field layout was done using alpha lattice design with two replications. At the age of twenty-six days after transplanting, the lines were submerged with 1 meter of water depth for 15 days. Same basal doze of fertilizer of rainfed condition was applied during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 25 days after de submergence.

Results and discussion: Based on stressed and non-stressed performance of the trials, a total of 10 genotypes were selected out of 54 genotypes. The genotypes were selected depending on the growth duration, survivability, phenotypic acceptability and yield performance. The highest grain yield was produced by the genotype IR15F1887 (5.4 t/ha) with 116 days growth duration under rainfed condition, and in controlled stress condition also produce highest yield of (6.08 t/ha) with 49% survivability. The genotype IR20LT2385 produced 6.60 t/ha with growth duration of 124 days which was 8 days earlier than BRRI dhan52 with similar yield (6.69 t/ha) in controlled submergence tank. The heritability obtained from plant height, growth duration, survivality and grain yield were varied from 69% to 99%, indicating high precision of this experiment (**Table 14.7**).

Table 14.7. Performance of selected entries in Observational Yield Trial (OYT#3: AGGRi-Network Trial), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

Ent No	Designation	Non-Stress condition				Stress condition			Trait markers
		GD (days)	PA cp	PH (cm)	Yield (t/ha)	Survivality (%)	PAcp	Yield (t/ha)	
1	IR15F1887	116	5	116	5.4	49	3	6.08	*Sub1*
2	IR20LT2362	112	7	108	3.8	51	3	4.87	*Sub1*
3	IR19LT1767	106	5	104	5.4	26	5	1.02	*Sub1, Wx-A*
4	IR20LT2229	104	7	114	4.5	0	-	-	*Sub1, Wx-A*
5	IR19LT1738	100	7	107	3.6	59	5	4.63	*Sub1, Wx-A*
6	IR20LT2245	112	7	136	3.1	45	5	5.37	*Sub1, Wx-A*
7	IR20LT1998	113	5	110	5.4	59	5	6.44	*Sub1, Wx-A*
8	IR20LT2385	124	5	111	4.5	74	3	6.60	*Sub1, x13*
9	IR20LT2294	113	5	113	5.0	0	-	-	*Wx-A*
10	IR20LT2572	111	5	116	5.2	16	7	1.10	*Wx-A,xa13, xa21*
11	IRRI 224	126	5	114	5.1	18	5	4.92	
12	IR 42	131	7	110	4.0	7	6	1.06	
13	Ciherang-Sub1	109	7	119	4.5	68	5	5.25	
14	IRRI 119	124	5	124	5.4	55	5	6.28	
15	Swarna-Sub1	135	5	101	5.0	46	5	3.67	
16	BRRI dhan79	126	5	115	4.7	67	5	6.10	
17	BRRI dhan52	132	5	120	5.5	70	5	6.69	
18	BINA dhan11	115	6	114	4.8	48	5	3.66	
	LSD (0.05)	2.13	1.3	7.1	0.93	11.9	0.61	1.2	
	H2b	0.99	0.77	0.93	0.74	0.69	0.53	0.93	

Experiment 14.8: Preliminary Yield Trial (PYT)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, Anisar Rahman and M R Hassan and K M Iftekharuddaula

Specific objective: Preliminary evaluation of promising submergence tolerant breeding lines in replicated trial under controlled submerged condition, flood prone farmers' fields as well as under rainfed condition.

Materials and Methods: In total, 14 entries with four checks were evaluated in this trial (**Table 14.8**). The trial conducted in six locations, two in controlled submergence tank and another two under rainfed condition in Gazipur and Rangpur and another two at flood prone farmers' field at Kurigram and Lalmonirhat. Twenty-five to thirty days old seedling with single seedlings per hill was transplanted at a spacing of 20 cm × 15cm in a 5.4m × 6 rows plot. For rainfed trial, fertilizers were applied following the rate given in experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time.

In case of controlled submergence screening, four extra lines of susceptible genotypes were transplanted at four places at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. At twenty-one days after transplanting, the lines were submerged with 1 meter of water depth for 16 days. Same basal doze of fertilizer of rainfed condition was applied during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 20 days after de submergence. Under flash flood condition, first top dress of Urea was done at ten days after water recession and 2nd top dress of Urea and half MoP were applied after 20-25 days after water recession. Under flood prone farmers' field condition fertilizer management decisions were taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Results and discussion: Both the trials under farmers' field condition were received a low to moderate level of submergence stress (12 days at Kurigram and 7 days Lalmonirhat with a water depth 75-100cm at vegetative stage) (**Figure 14.2**). Eight genotypes were selected based on stressed and non-stressed performance of the trials. Among all entries, genotype BR12506-5R-83 and BR12506-5R-91 gave highest yield (6.7 t/ha) followed by BR12502-5R-275 (6.0 t/ha) in controlled stress condition with 90%-93% survivability. The genotype BR12506-5R-83 also gave significantly highest yield (6.0 t/ha) in flood prone farmers' fields. The growth duration of tested entries was ranged from 121 to 147 days. The heritability obtained from plant height, growth duration, survivability and grain yield were varied from 0.57 to 0.90, indicating high precision of this experiment (**Table 14.8**).

Table 14.8: Performance of top-ranking entries in Preliminary Yield Trial#1 (PYT#Early), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SN	**Designation**	**PAcp**	**PH (cm)**	**GD (days)**	**Yield (t/ha)**			**Survivability%**	**Traits of interest identified through trait linked SNPs**
					NS	**FF**	**St**		
1	BR12487-5R-1	5	124	124	4.6	4.7	5.3	79	*Sub1,Wx-A,Wx-NB, Chalk5, Alk,Xa4,DTH8,Gn1a*
2	BR12487-5R-68	7	135	144	4.2	4.8	3.3	35	*Sub1, Wx-A, Wx-10, Chalk5, Xa4, DTH8, Gn1a*
3	BR12489-5R-119	5	121	133	4.3	4.2	1.1	6	*Sub1,Wx-A,Wx-10,Chalk5, Xa4,Xa7*
4	BR12489-5R-123	6	140	132	4.5	4.2	5.6	80	*Sub1,Wx-A,Wx-10,Chalk5, Xa4,DTH8,Gn1a*
5	BR12489-5R-160	5	122	143	4.6	4.6	5.1	80	*Sub1,Wx-A,Wx-10,Chalk5, Xa7,DTH8*
6	BR12493-5R-61	7	129	135	4.1	4.4	3.1	73	*Sub1,Wx-A,Wx-10,Chalk5, Pita2,Xa4,Xa7,DTH8, Gn1a*

SN	Designation	PAcp	PH (cm)	GD (days)	Yield (t/ha) NS	FF	St	Survivability%	Traits of interest identified through trait linked SNPs
7	BR12493-5R-151	6	113	123	4.9	4.2	4.8	64	*Sub1,Wx-A,Chalk5,Xa4, Xa7,DTH8,Gn1a*
8	BR12502-5R-76	6	117	135	4.8	3.8	4.7	70	*Sub1,Wx-int,Wx-op,Chalk5, GS3,AG3, Xa4, Xa7, DTH8*
9	BR12502-5R-135	7	108	147	3.7	4.0	3.8	68	*Sub1, Wx-A, Wx-int, Chalk5, Alk, Xa7, DTH8, Gn1a*
10	BR12502-5R-175	6	108	130	4.1	4.4	5.5	91	*Sub1, Wx-A, Wx-NB, Chalk5, Xa4, DTH8, Gn1a*
11	BR12502-5R-275	7	148	123	5.5	5.3	6.0	90	*Sub1, Wx-A, Wx-NB, Chalk5, Xa4, DTH8, Gn1a*
12	BR12502-5R-298	5	137	144	4.3	4.1	4.0	94	*Sub1,Wx-int,Wx-op,Alk, GS3,AG3, Xa4,Chalk5, Xa7, DTH8*
13	BR12506-5R-83	5	139	146	6.0	5.0	6.7	93	*Sub1,Wx-A, Chalk5, Xa4, DTH8, Gn1a*
14	BR12506-5R-91	6	140	129	5.4	3.5	6.7	92	*Sub1, Wx-A, Wx-10, Chalk5, Xa4, DTH8, Gn1a*
15	BINA dhan11 (Ck)	6	101	121	4.4	3.3	4.2	94	*Sub1, Wx-A, Wx-int, Xa4, DTH8, GS3*
16	BRRI dhan79 (Ck)	6	112	142	4.4	4.8	5.9	92	*Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
17	BRRI dhan52 (Ck)	5	136	147	5.1	4.7	6.1	93	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
18	BRRI dhan87 (Ck)	5	117	127	5.5	3.7	0.6	1.0	*Wx-A, Wx-10, Xa4, DTH8, GS3, Chalk5, Gn1a*
	P Value	ns	***	***	**	***	***	***	
	LSD<0.05		5.5	8.0	1.1	0.7	1.5	12.5	
	H2b		0.89	0.90	0.57	0.77	0.78	0.80	

NS: Non-stress; FF: Farmer's Field; St: Stress

Fig 14.2: Pictorial view of the flooded and flood recovered fields, Boghdanga, Kurigram, Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

Experiment 14.9: Advanced Yield Trial#1 (AYT_Early)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, A Rahman and M R Hassan and K M Iftekharuddaula

Specific objectives: Advanced evaluation of promising submergence tolerant breeding lines in replicated trial under controlled submerged condition, flood prone farmers' fields as well as under rainfed condition.

Materials and Methods: A total of 120 entries along with seven checks were evaluated in RCB design with two replications (**Table 14.9**). The trial conducted in six locations, two in controlled submergence tank, two under rainfed condition in Gazipur and Rangpur and another two at flood prone farmers' field at Kurigram and Lalmonirhat. Twenty-five to thirty days old seedling with single seedlings per hill was transplanted at a spacing of 20 cm × 15cm in a 5.4m × 8 rows plot. For rainfed trial, fertilizers were applied following the rate given in experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time.

In case of controlled submergence screening, four extra lines of susceptible genotypes were transplanted at four places at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. At twenty-one days after transplanting, the lines were submerged with 1 meter of water depth for 16 days. Same basal doze of fertilizer of rainfed condition was applied during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 20 days after de submergence. Under flash flood condition, first top dress of Urea was done at ten days after water recession and 2nd top dress of Urea and half MoP were applied after 20-25 days after water recession. Under flood prone farmers' field condition fertilizer management decisions were taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Results and discussion: Both the trials under farmers' field condition were received a low to moderate level of submergence (12 days at Kurigram and 7 days Lalmonirhat with a water depth 75-100cm at vegetative stage) (**Figure 14.2**). Based on stressed and non-stressed performance of the trials, a total of eleven genotypes were selected based on the higher survivability and higher yield. The genotype IR19A1473 gave the highest yield (6.0 t/ha) both in rainfed and farmers field condition with a growth duration of 119 days only. The genotype BR11196-5R-5 and BR11196-5R-445 produced similar highest yield of 7.10 t/ha under controlled submergence condition with the 88% and 66% survivability respectively, followed by the genotype IR15F1886 (7.0 t/ha) with 95% survivability. The heritability obtained for survivability (tank), plant height, growth duration, grain yield (rainfed), grain yield (farmers' field) and yield (tank) were 88%, 55%, 76%, 47%, 49% and 89%, indicating high level of precision of this experiment **(Table 14.9).**

Table 14.9: Performance of selected entries in Advance Yield Trial#1 (AYT#1_Early), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SL	Designation	PH (cm)	PAcp	GD (days)	Yield(t/ha) NS	FF	St	Survivability (%)	Trait Markers
1	IR19A1862	121	5	131	5.4	5.4	6.6	88	*Sub1,Wx-A,WX-int, Pita2, Gn1a, Xa5*
2	IR18T1275	114	5	126	5.0	5.0	6.8	90	*Sub1,Wx-A,DTH8,Chalk5, Gn1a,*
3	IR16F1243	137	5	131	5.6	5.1	6.9	86	*Sub1,Wx-A, Xa4,DTH8, Chalk5, Gn1a*
4	IR14T156	119	5	128	5.6	5.6	6.1	64	*Sub1,Wx-A,Wx-op,Wx-int,Pi54,Pita2,Alk, Chalk5,AG1,AG3,GS3*
5	IR19A6666	102	7	124	4.5	4.5	5.7	72	*Sub1A-2,Wx-A,Wx-10,Wx-op,Pita2,Chalk5,GS3, Xa4,xa5,Xa13,Gn1a*
6	IR19A1473	114	5	119	6.0	6.0	6.5	68	*Sub1,Wx-A,Wx-int,Wx-op, Pita2,GS3,Xa4,Xa5, Gn1a*

SL	Designation	PH (cm)	PA cp	GD (days)	Yield(t/ha) NS	FF	St	Survivability (%)	Trait Markers
7	IR19A1472	118	5	119	5.2	5.2	6.5	84	*Sub1,Wx-A,Wx-int, Xa4, Pita2, Pi33,DTH8, GS3, Gn1a*
8	IR18A2495	113	5	123	4.8	4.8	6.4	80	*Wx-A, Wx-10, Pita2, Chalk5, Xa4, Xa5,GS3, Gn1a,*
9	IR18A2496	106	6	115	4.6	4.6	5.9	73	*Wx-A, Wx-10, Wx-op,Pita2, GS3, Chalk5, Xa4, DTH9*
10	IR87959-6-2-3-1-2-BAY-B-CMU1	111	5	125	5.2	5.2	6.1	81	*Sub1, Wx-A, Wx-op,Chalk5, GS3, Gn1a, Xa4*
11	IR15F1745	114	6	125	5.1	5.1	6.1	79	*Sub1, Wx-A, Wx-NB, Xa4, Pita2, Alk, DTH8, Chalk5, Gn1a, GS3*
12	IR15F1754	103	5	124	4.2	4.2	5.6	71	*Sub1, Wx-A, Wx-op, Wx-int, Xa4, Xa7, Pi33, Pita2, DTH8, Gn1a, GS3*
13	IR16F1065	144	5	142	4.9	4.9	6.8	75	*Sub1, Wx-A, Wx-NB, Xa4, Pita2, Alk, DTH8, Chalk5, Gn1a, GS3*
14	IR15F1869	126	5	124	5.4	5.4	5.8	67	*Sub1, Wx-A, Wx-int, Xa4, Pita2, DTH8, Chalk5, GS3*
15	SV1179	124	5	128	5.5	5.5	6.6	95	*Sub1, Wx-A, Wx-op,Chalk5, Xa4, GS3*
16	SV1171	127	6	123	4.1	4.1	5.9	78	*Sub1, Wx-A, Wx-op, Wx-int, Alk, Pi33, Pita2, Xa4, GS3*
17	IR17D1089	125	5	122	4.5	4.5	6.5	68	*Sub1, Wx-A, Wx-op, Wx-int, Xa4*
18	IR18L1148	127	6	124	5.9	5.8	5.4	74	*Sub1, Bph17, Xa4, Pi33, Wx-A, Wx-op, Wx-int, GS3, Gn1a,*
19	IR15F1886	112	5	123	5.3	5.2	7.0	95	*Sub1, Wx-A, Wx-int, Wx-op, Waxy, Xa4, xa5, Pita2, DTH8, Chalk5, Gn1a*
20	IR15D1046	121	5	128	5.4	5.4	6.6	88	*Sub1, Wx-int, Pita2,Chalk5, GS3, Xa4, Pi33*
21	IR19L1046 a	120	5	126	5.4	5.4	4.4	63	*Sub1, Frg-1, Xa4, Wx-A, Wx-op, Wx-int, Alk, Gnp1, GS3,*
22	IR18R1073 a	95	5	117	4.3	4.2	4.7	58	*Frg-1, qSub1, Xa4, Xa5, Wx-A, Wx-int, Wx-10, Gnp1, GS3,*
23	IR15A4029	121	5	131	4.9	4.8	5.6	81	*Sub1, SCT1, SCT2, SCT4, Saltol-Aro,Wx-A,Wx-op,Waxy,qXa4, xa5*
24	IR17D1096	116	5	116	5.0	5.0	6.1	81	*Sub1, Wx-A, Wx-int, Wx-op, Xa4, Pi33, Gnp1*
25	IR17D1067	113	5	124	4.5	4.5	6.8	60	*Sub1, SCT1, SCT2, SCT4, Saltol, BPH17,Wx-A,Wx-int,Wx-op, Waxy, Hd1, Xa4*
26	IR18T1340	115	5	138	5.4	5.4	6.5	80	*Sub1, AG1, AG3, Wx-A, Wx-10, Wx-op,Waxy,Pita2, Xa4, Chalk5, GS3*
27	BR12154-5R-184	146	5	138	5.4	5.4	7.0	70	*Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
28	BR12162-5R-350-3	134	5	120	5.5	5.5	7.0	85	*Sub1,Wx-A,Xa4,DTH8,Chalk5, Gn1a, GS3*
29	BR11692-5R-345	122	5	121	5.3	5.2	6.7	79	*Sub1,Wx-A,Wx-NB, Xa4,DTH8,Chalk5, Gn1a*

SL	Designation	PH (cm)	PA cp	GD (days)	Yield(t/ha) NS	FF	St	Survivability (%)	Trait Markers
30	BR11694-5R-339	125	7	118	5.0	5.0	5.1	83	*Sub1,Wx-A,Wx-10,Xa4, Xa7,DTH8,Chalk5, Gn1a*
31	BR11694-5R-101	116	5	123	4.0	4.0	6.7	92	*Sub1,Wx-A,Wx-10,Xa4,Pita2,DTH8,Chalk5, Gn1a*
32	BR11196-5R-445	121	5	120	3.6	3.6	7.1	66	*Sub1,Wx-A,Wx-op,Wx-int,Xa4, Xa7,Pita2,DTH8, Gn1a, GS3*
33	BR11196-5R-5	133	3	147	4.3	4.3	7.1	88	*Sub1,Wx-A,Wx-int, Pita2, DTH8, Gn1a, GS3*
34	BR10212-10-4-1	107	5	130	4.6	4.6	6.3	93	*Sub1,Wx-A,Wx-NB,Xa4,Hd1, pi33,DTH8,Chalk5, Gn1a*
35	IR126968-B-23-2-1-3	111	5	145	5.8	5.8	6.2	73	*Sub1,Wx-int, DTH8,Chalk5,GS3*
36	SVIN147_WS20-FP-15	127	5	114	4.5	4.7	5.8	68	*Sub1,Wx-A,Wx-int,Xa4,xa5, Pita2, DTH8,Chalk5, GS3*
37	IR19L1016	124	5	130	4.2	4.8	5.5	83	*Sub1,Wx-A,Wx-10,Xa7,Pita2, DTH8,Gn1a,GS3*
38	IR16F1033	117	6	125	4.0	4.0	5.8	92	*Sub1,Wx-A,Wx-int,Xa4,xa5, Pita2,DTH8,Chalk5, GS3*
39	IR13F652-1-PS2	122	5	119	4.1	4.9	6.9	84	*Sub1, Wx-A, Wx-int, Xa4, DTH8, GS3*
40	BR11196-5R-138	133	6	125	4.6	4.6	5.7	26	*Sub1,Wx-A,Wx-int,Xa7,Pita2, DTH8,Gn1a, GS3*
41	BR11196-5R-83	128	6	131	3.7	4.4	5.8	26	*Sub1, Wx-A, Wx-int, Xa7, Pita2, DTH8, Gn1a, GS3*
42	BINA dhan11	112	6	121	4.3	4.2	5.1	82	*Sub1, Wx-A, Wx-int, Xa4, DTH8, GS3*
43	BRRI dhan79	107	6	141	5.8	5.7	5.7	85	*Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
44	BRRI dhan52	118	7	141	5.7	5.7	6.5	85	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
45	BRRI dhan71	122	9	119	4.9	4.9	0.7	6	
46	BRRI dhan75	102	9	114	3.3	3.3	1.1	16	
47	BRRI dhan95	133	9	141	4.9	4.9	1.3	6	
48	BRRI dhan87	121	9	128	5.2	5.1	0.1	5	*Wx-A, Wx-10, Xa4, DTH8, GS3, Chalk5, Gn1a*
	P Value	***	***	***	***	***	***	***	
	H2b	0.55	0.68	0.76	0.5	0.5	0.9	0.88	
	LSD (0.05)	16.4	1.1	6.9	1.0	1.1	0.9	20.1	

NS: Non-stress; FF: Farmer's Field; St: Stress

Experiment 14.10: Advanced Yield Trial#2 (AYT#2_Late)

Principal Investigator: Sharmistha Ghosal

Co-investigators: ZA Riyadh, S Maniruzzaman, A Rahman and M R Hassan and K M Iftekharuddaula

Specific objectives: Advanced evaluation of promising submergence tolerant breeding lines in replicated trial under controlled submerged condition, flood prone farmers' fields as well as under rainfed condition.

Materials and Methods: In total, 35 entries with five checks were evaluated were evaluated in RCB design with two replications (**Table 14.10**). The trial conducted in six locations, two in controlled submergence tank, two under rainfed condition in Gazipur and Rangpur and another two at flood prone farmers' field at Kurigram and Lalmonirhat. Twenty-five to thirty days old seedling with single seedlings per hill was transplanted at a spacing of 20 cm × 15cm in a 5.4m × 8 rows plot. For rainfed trial, fertilizers were applied following the rate given in experiment 14.1. Crop management was done as recommended for modern rice cultivation for T. Aman season. Weeding and other cultural operations were done in time.

In case of controlled submergence screening, four extra lines of susceptible genotypes were transplanted at four places at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. At twenty-one days after transplanting, the lines were submerged with 1 meter of water depth for 16 days. Same basal doze of fertilizer of rainfed condition was applied during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 20 days after de submergence. Under flash flood condition, first top dress of Urea was done at ten days after water recession and 2nd top dress of Urea and half MoP were applied after 20-25 days after water recession. Under flood prone farmers' field condition fertilizer management decisions were taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Results and discussion: Both the trials under farmers' field condition were received a low to moderate level of submergence (12 days at Kurigram and 7 days Lalmonirhat with a water depth 75-100cm at vegetative stage) (**Figure 14.2**). Based on stressed and non-stressed performance of the trials, a total of 17 genotypes were selected considering higher survivability and higher yield. The genotype IR13F582 produced the highest yield under all the test environments (hotspots). Under rainfed condition, it produced 5.9 t/ha with 131 days growth duration, under controlled stress condition, it produced yield of 7.2 t/ha with 89% survivability whereas under farmers' field condition it produced 6.8 t/ha. The yield range of other selected genotypes were 4.4 t/ha to 7.1 t/ha under controlled submergence condition, 4.3 t/ha to 6.7 t/ha under farmers' field condition and 3.7 to 5.8 t/ha at rainfed condition. Under rainfed condition the yield performance was lower this is because the trial of BRRI, Gazipur was affected by storm. The heritability of all observed parameters was ranged from 0.67 to 0.93, indicating the high level of precision of this experiment (**Table 14.10**).

Table 14.10: Performance of top-ranking entries in Advance Yield Trial#2 (AYT#Late), Submergence & Medium Stagnant Tolerance Breeding, T. Aman, 2022-23

SN	Designation	PH (cm)	GD (days)	PA cp	Yield (t/ha) NS	FF	St	Survivability%	Trait of interest
1	IR13F582	116	131	3	5.9	6.8	7.2	89	
2	IR13F652-1-P3	122	150	3	4.9	5.6	6.4	90	*Sub1, Wx-A, Xa7, Pi54, Pita2, Chalk5*
3	IR16F1097-P1	136	148	7	4.6	6.7	6.2	82	*Sub1,Wx-A,Wx-NB,Xa4, GS3, Pita2,DTH8, Chalk5, Gn1a,*
4	BR12162-5R-149	137	145	5	5.8	5.0	5.9	84	*Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a, GS3*
5	BR11686-5R-173	123	143	7	3.7	4.5	5.9	82	*Sub1, Wx-A, Wx-NB, Xa7, Pita2, DTH8, Chalk5, Gn1a*
6	BR11196-5R-187	117	146	5	5.1	5.6	6.0	83	*Sub1, Wx-A, Wx-int, Xa7, Pita2, DTH8, Gn1a, GS3*
7	BR11196-5R-595	110	133	5	4.1	5.0	5.9	85	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*

SN	Designation	PH (cm)	GD (days)	PA cp	Yield (t/ha) NS	FF	St	Survivability%	Trait of interest
8	BR11690-5R-56	118	134	7	4.2	5.6	5.4	70	*Sub1, Wx-A, Wx-NB, DTH8, Chalk5, Gn1a*
9	BR11690-5R-187	105	142	7	3.4	4.7	5.3	66	*Sub1, Wx-A, Wx-NB, Xa4, Xa7, DTH8, Chalk5, Gn1a*
10	BR11690-5R-289-P1	132	133	5	-	4.6	6.2	82	*Sub1, Wx-int, Pi54, Pita2, DTH8, Chalk5, Gn1a*
11	BR11692-5R-297	130	133	5	5.8	6.1	5.7	78	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
12	BR10210-4-5-5	115	143	7	5.0	5.5	5.3	78	*Sub1, Wx-A, Wx-int, Xa4, DTH8, Gn1a, GS3*
13	BR12154-5R-10	119	156	7	4.4	4.3	5.5	65	*Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a*
14	BR12154-5R-31	126	139	7	3.2	5.0	4.4	31	*Sub1, Wx-A, Wx-10, DTH8, Chalk5, Gn1a, GS3*
15	BR12154-5R-258-P1	122	149	7	5.3	6.2	5.4	86	*Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a*
16	BR12154-5R-7-2	130	145	3	5.4	6.5	6.5	86	*Sub1, Pi33, Hd1, NS3,Wx-A,Wx-10,Alk,DTH8,Chalk5, GS3*
17	BR12154-5R-219	118	152	5	5.6	5.9	6.0	74	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a, GS3*
18	BR12154-5R-219-PS1	127	153	7	3.6	6.6	6.0	69	
19	BR12154-5R-371	143	157	7	3.2	4.5	5.6	49	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5*
20	BR10211-1-1-1-PS2	130	156	7	-	5.0	5.8	70	*Sub1, Wx-A, Wx-int, Xa4, DTH8, Gn1a, GS3*
21	BR10211-1-2-4	130	147	7	3.9	4.9	5.7	79	*Sub1, Wx-A, Wx-int, Xa4, DTH8, Gn1a, GS3*
22	BR10211-22-9-2_1	116	140	5	3.9	5.9	3.7	48	*Sub1, Wx-A,Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
23	BR10211-22-9-2_1-early	115	139	5	5.7	5.7	6.1	76	*Sub1, Wx-A,Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
24	BR10211-22-9-2_4	118	154	5	5.7	6.3	6.0	69	*Sub1, Wx-A,Wx-NB, Wx-10, Xa4, DTH8, Chalk5, Gn1a*
25	BR10212-5-5-3	133	139	5	5.4	6.6	6.6	72	*Sub1, Wx-A,Wx-NB, Xa4, DTH8, Chalk5, Gn1a, GS3*
26	IR16F1097	133	146	5	5.3	6.7	6.8	71	*Sub1, Wx-A,Wx-NB, Pita2, Chalk5, GS3, Gn1a, Xa4*
27	IR93339129-B-7-7-B-B-B-16	134	134	3	5.2	5.5	7.1	84	*Sub1, Wx-A, Xa4, DTH8, Chalk5, GS3*
28	BR10212-20-1-3	117	141	5	5.4	5.5	7.1	86	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Gn1a, GS3*
29	SVIN150_WS20-FP-15	115	142	7	4.1	5.6	5.7	89	*Sub1, Wx-A, Xa4, DTH8, Chalk5, GS3*
30	IR13F478-3	125	134	5	5.2	5.4	6.3	88	*Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a, GS3*
31	IR108042-B-B-B-4-B-B	137	143	5	5.3	5.6	6.2	86	*Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
32	BR11196-5R-38	129	140	5	5.5	6.1	6.3	85	*Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a, GS3*
33	IR13F652-1-P3	124	146	5	5.4	5.3	6.3	87	*Sub1, Wx-A, Wx-int, Xa4, Pi33, Pita2, GS3*

SN	Designation	PH (cm)	GD (days)	PA cp	Yield (t/ha) NS	FF	St	Survivability%	Trait of interest
34	BR11185-5R-569-3	109	146	7	5.6	4.7	5.5	80	*Sub1, Wx-A, Wx-int, Xa7, Pita2, DTH8, Gn1a, GS3*
35	BR11686-5R-11	116	150	7	4.5	4.3	6.3	78	*Sub1, Wx-A, Wx-NB, Xa7, Pita2, DTH8, Chalk5, Gn1a*
36	BRRI dhan79 (Ck)	123	141	5	5.3	5.4	6.6	81	*Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a*
37	BRRI dhan52 (Ck)	115	145	5	4.9	5.1	6.5	85	*Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a*
38	BRRI dhan94 (Ck)	110	145	9	3.0	5.2	1.1	7	
39	BRRI dhan87 (Ck)	119	126	9	1.9	5.1	0.0	2	*Wx-A, Wx-10, Xa4, DTH8, GS3, Chalk5, Gn1a*
40	BR23 (Ck)	127	149	9	2.3	4.4	1.5	14	
	P Value	***	****	***	***	***	****	****	
	LSD (0.05)	7.4	5.3	1.2	1.1	1.0	0.5	10.5	
	H2b	0.77	0.93	0.89	0.88	0.67	0.82	0.84	

NS: Non-stress; FF: Farmer's Field; St: Stress

Experiment 14.11: Participatory Variety Selection (PVS)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, Anisar Rahman and M R Hassan and K M Iftekharuddaula

Objective: Regional yield evaluation and adaptation of promising submergence tolerant breeding lines in replicated trial under controlled submerged condition, flood prone farmers' fields condition as well as under rainfed condition.

Materials and Methods: Ten submergence tolerant high yielding advanced genotypes along with four standard check varieties having submergence tolerance were evaluated in rainfed, controlled on-station and natural flash flooding conditions. The experiment was laid out in RCB design with three replications in 8 locations including two in controlled submergence tank, tow in on-station rainfed condition, and four in flash flood prone farmers' fields (Kurigram, Lalmonirhat, Gangachara, and Jalalgonj). The seedbed management was done in order to raise healthy seedlings. Twenty-five to thirty days old seedlings were transplanted using 2-3 seedlings per hill with the spacing of 20cm × 20cm. The unit plot size was 5.4 m ×10 rows. Under rainfed condition, fertilizers were applied at the rate of 200 kg urea, 70 kg TSP, 100 kg MoP, 70 kg gypsum and 6 kg zinc sulphate. Total amount of TSP, gypsum and two-third MoP were applied at the time of final land preparation. Total amount of zinc sulphate was applied at first top dressing. Urea was applied in equal three splits at 10, 25 and 40 days after transplanting. Rest of the one-third MoP was applied during second top-dressing of urea. Other cultural and pest management practices were done as and when necessary.

In case of controlled submergence screening, four extra lines of susceptible genotypes were transplanted at four places at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. At twenty-one days after transplanting, the trial was submerged with 1.0-meter depth of water for 16 days. Same fertilizers' dose for rainfed condition was applied as basal during land preparation. First top dress of urea was done after 15-20 DAS and 2nd top dress of Urea and half MoP after 35-40 DAS. The survivability of the seedling was counted at 20 days after de submergence. Under flash flood condition, first top dress of Urea was done at ten days after water recession and 2nd top dress of Urea and half MoP were applied after 20-25 days after water recession. Under flood prone farmers' field condition fertilizer management decisions were taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Results and discussion: Though the trial was conducted in four locations in submergence prone farmer's field in Rangpur, Kurigram and Lalmonirhat district, there was no flood in one location at Jalalgonj, Rangpur. The trial in Kurigram submerged for 12 days, in Lalmonirhat the trial submerged for seven days and the trial of Gangachara submerged for ten days with a water depth of 75-100 cm (**Figure 14.2 and 14.3**). Based on stressed and non-stressed performance of the trials one genotype was selected. The genotype BR10211-22-9-2_3 showed more stable performances over all the locations, and produced the highest average yield of 5.6 t/ha, whereas the best check variety BRRI dhan52 gave an average yield of 5.0 t/ha (**Table 14.11**). The Survivability of the selected line was 83% under controlled submergence condition and the growth duration was 137 days under rainfed condition. The plant type of the selected genotype was also stronger with medium plant height. The heritability of all observed parameters was ranged from 67% to 93%, which indicated high level of precision of this experiment.

Fig 14.3: Submerged view of the PVS trial at Gangachara during T. Aman, 2022-23

Table 14.11. Performance of entries in Participatory Variety Selection (PVS), Breeding for Submergence and Stagnant water tolerance, T. Aman 2022-23

SN	Designation	PH (cm)	PA cp	GD (days)	Yield (t/ha)						Mean	Survivability %	Trait markers
					Gaz	Ran	Kur	Gang	Jalal	Stress			
1	BR11693-5R-274	136	7	121	3.1	5.2	2.7	3.9	6.5	6.5	4.7	71	*Sub1, Wx-A, Wx-ex10, DTH8, Chalk5, Gn1a*
2	IR16F1063-P1	128	5	119	4.1	5.3	4.8	4.2	5.7	6.1	5.0	94	*Sub1, Wx-A, Wx-int,,Wx-op, Waxy, GS3, Gn1a, Chalk5, Xa4, SCT, Saltol, Pi33*
3	IR16F1063-P2	123	6	115	4.3	5.1	4.7	3.6	5.7	6.1	4.9	87	*Sub1, Wx-A, Wx-int, Wx-op, Waxy, GS3, Gn1a, Chalk5, Xa4, SCT, Saltol, qAG3, Pi33*
4	IR16F1081	128	5	116	3.9	4.0	4.7	3.7	5.1	6.2	4.6	77	*Sub1, Wx-A, Wx-int, DTH8, Chalk5, GS3*
5	BR11686-5R-179	131	7	129	4.0	5.0	5.1	5.0	5.0	5.5	4.9	68	*Sub1, Wx-A, Wx-NB, Xa7, Pita2, DTH8, Chalk5, Gn1a*
6	BR10211-22-9-2_3	123	5	137	4.9	6.0	5.5	5.0	6.2	5.9	5.6	83	*Sub1, Wx-A, Wx-NB, Wx-op, GS3, Gn1a, Chalk5, Pi33, Xa4, Hd1*
7	BR10211-5-5-7	133	6	131	2.3	6.8	4.4	3.7	5.3	6.9	4.9	80	*Sub1, Wx-A, Wx-NB, GS3, Gn1a, Chalk5, Xa4, Xa7*
8	BR10211-7-5-1	136	6	137	3.2	6.5	4.0	2.1	4.5	7.2	4.6	85	*Sub1, Wx-A, Wx-NB,Wx-op, Hd1, GS3, Gn1a, Chalk5, Xa4, SCT3, Saltol-Aus, qSES1-2_4, Pi33,*

SN	Designation	PH (cm)	PAcp	GD (days)	Yield (t/ha)						Mean	Survivability %	Trait markers
					Gaz	Ran	Kur	Gang	Jalal	Stress			
9	BR9793-13-2-1	131	7	132	3.2	3.9	3.0	3.0	3.8	4.9	3.6	56	*Sub1, Wx-A, Wx-NB, Xa4, Xa7, DTH8, Chalk5, Gn1a, GS3*
10	IR16F1201	133	5	129	3.5	3.3	0.6	4.3	5.0	5.8	3.8	74	*Sub1, Wx-A, Wx-NB, Alk, Xa7, Pita2, DTH8, Chalk5, Gn1a, GS3*
11	BINA dhan11	118	6	114	3.6	4.2	4.5	2.3	5.0	4.8	4.1	78	*Sub1, Wx-A, Wx-10, DTH8,Xa4 GS3*
12	BRRI dhan79	128	7	128	3.9	4.3	4.5	4.0	5.6	5.6	4.7	77	*Sub1, Wx-A, Wx-10, DTH8, Chalk5, Gn1a, GS3*
13	BRRI dhan52	130	5	130	3.9	5.2	4.9	4.3	5.6	5.8	5.0	75	*Sub1, Wx-A, Wx-10, DTH8, Chalk5, Gn1a, GS3*
14	BR23	138		148	2.5	3.2	4.1	0.0	0.0	0.0	2.0	0.0	
	P Value	***	**	****	**	***	**	***	***	***	***	***	
	LSD (0.05)	6.5	1.4	3.5	0.6	0.8	0.52	0.71	0.50	0.64	0.60	12.5	
	H2b	0.79	0.59	0.90	0.70	0.77	0.83	0.89	0.84	0.87	0.44	0.82	

Experiment 14.12: Advanced Line Adaptive Research Trial (ALART_Tidal Submergence)

Principal Investigator: Sharmistha Ghosal

Co-investigators: KM Iftekharuddaula, S Maniruzzaman, ZA Riyadh, T Shaha, A Hossain, respective scientist/s of BRRI regional stations and respective scientist/s of ARD.

Specific objectives: Evaluation of specific and general adaptability of tidal-submergence tolerant advanced genotypes in the tidal non-saline ecosystem in coastal areas in-order to release as a variety with higher yield.

Materials and methods: The tidal-submergence tolerant rice genotype BR9158-19-9-6-50-2-HR1 and IR13F441 were evaluated along with the susceptible check BRRI dhan44 and tolerant check BRRI dhan52 under tidal submergence prone areas of the southern part of the country (**Table 14.12**) in ten locations of the tidal non-saline ecosystem in coastal areas of Bangladesh. Around 30 days old seedlings were transplanted @ 3-4 seedlings per hill at a spacing of 20 × 20 cm. The unit plot size was 20 m^2 (5m × 4m; 20 rows @25 hills per row) and the field layout was Randomized Complete Block Design (RCBD) with three replications.

Fertilizers were applied @200 kg urea, 75 kg TSP, 100 kg MoP, 70 kg gypsum and 6 kg zinc sulphate/ha. Total amount of TSP, gypsum and two-third MoP were applied at the time of final land preparation. Total amount of zinc sulphate was applied at first top dressing. Urea was applied in equal three splits at 15, 30 and 45 days after transplanting. The rest of the one-third MoP was applied during second top-dressing of urea. Fertilizer doses and application date may be changed depending upon AEZ, soil fertility, soil texture and flooding time. Pest management and other cultural operations were done as and when necessary. Time to time regular visit is necessary to monitor tidal effect on plants.

Results and discussion: Two genotypes along with one susceptible check BRRI dhan44 and tolerant check BRRI dhan52 evaluated under tidal submergence prone areas of the southern part of the country in ALART. In this trial, both the genotypes BR9158-19-9-6-50-2-HR1 and IR13F441 produced almost similar yields (5.01 t/ha and 4.99 t/ha) with similar growth duration (**Table 14.12**). Both lines significantly performed better over both the check varieties. However, the advanced line BR9158-19-9-6-50-2-HR1 having accepted grain quality of the local people was selected for recommended for Proposed Variety Trial (PVT) in next season by ALART monitoring committee in tidal submergence region of Bangladesh. This line also has higher protein (10.6%) content (**Table 14.13**).

Table 14.12: Performance of the genotypes at different Zonal Trial under tidal non-saline ecosystem (Barishal region) of Bangladesh i.e., Advanced Line Adaptive Research Trial (ALART), T Aman 2022-23

SN	Designation	GD days	PH cm	Bari	Bor	CTG 1	CT G2	Gop al	Jhal	Patua	Gaz	Mean
1	BR9158-19-9-6-50-2-HR1	147	128	4.91	4.54	4.75	5.03	5.35	5.03	5.04	5.43	5.01
2	IR13F441	149	117	4.62	4.38	5.51	5.58	4.07	4.86	5.2	5.71	4.99
3	BRRI dhan44	146	121	4.01	3.99	4.90	4.5	3.37	4.26	4.61	4.95	4.31
4	BRRI dhan52	143	117	4.21	4.1	5.12	5.25	4.58	4.34	4.36	5.08	4.6
	$LSD_{0.05}$						0.67					0.22
	CV (%)							8.85				

CTG1: Mirsarai; CTG2: Rangunia

Table 14.13: Physiochemical properties of the genotypes, Advanced Line Adaptive Research Trial (ALART), T Aman 2022-23

SN	Designation	Amy (%)	Protein (%)	Milling outturn (%)	Head rice recovery (%)	L/B ratio	Size & shape	ER	IR	Trait markers
1	BR9158-19-9-6-50-2-HR1	25.4	10.6	72	61	2.4	MB	1.4	3.9	*Sub1,Wx-A,Wx-10, Chalk5,Xa4,DTH8, Gn1a,GS3,Pi33,Hd1,qAG1*
2	IR13F441	26.7	8.8	70	63	2.9	MB	1.4	4.7	*Sub1,Wx-A,Pi54, Xa7, Pita2, Pi54, AG3, GS3, Wx-op, Wx-A, BPH17, Xa7, Hd3a*
3	BRRI dhan44	26.7	8.9	72	61	2.4	MB	1.5	3.9	
4	BRRI dhan52	24.6	7.7	71	49	2.2	MB	1.6	3.9	

ER: Elongation ratio; IR: Imbibition ratio

Experiment 14.13: Proposed Variety Trial (PVT)

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, A Rahman and M R Hassan and K M Iftekharuddaula

Specific objectives: Evaluation of advanced submergence tolerant breeding line in the real flood prone environments in the farmers' field and under controlled submergence with standard checks by NSB team for release as a new variety.

Materials and methods: The submergence tolerant genotype IR16F1148 were evaluated with one submergence tolerant check variety BINA dhan11 in PVT at six locations of Bangladesh **(Table 14.13).** Around 25-30 days old seedlings were transplanted @ 2-3 seedlings per hill at a spacing of 20 x 15 cm. The unit plot size was 20 square meters (4m × 5m; 20 rows @34 hills per row) and the field layout was RCB Design with three replications. In case of controlled submergence trial, 4 extra lines of susceptible checks were transplanted beside the trial at the water tank for regular checking of imposed stress at different duration of submergence starting from 10 days after submergence. Fertilizers was applied @200 kg Urea, 70 kg TSP, 100 kg MP, 70 kg Gypsum, 6 kg ZnSO4. One third urea, half MoP and all other fertilizers were applied as basal. First top dress of urea was done after 15-20 DAS, and 2nd top dress of Urea and half MoP after 35-40 DAS. Under flash flood condition, first top dress of Urea was done 7 to 10 days after water recession and 2nd top dress of Urea and half MoP was applied after 20-25 days after water recession. Fertilizer doses and application date may be changed depending upon AEZ, soil fertility, soil texture and flooding time. Under flood prone farmers' field condition fertilizer management decisions had to be taken instantly depending on the natural submergence and de-submergence condition of the crop field following the management practice given for controlled submergence condition. Pest management and other cultural operations were done as and when necessary.

Observation during controlled submergence stress in water tank:

The crop was submerged at 20 days after transplanting with 110cm depth of water. After 10 days, the susceptible checks were regularly monitored by uprooting the plants from different places of the tank marked by label. When plants of the susceptible checks were started to rot and bad odor generated the water were completely drained out from tank at 15 days of full submergence.

Results and discussion: Though the trial was conducted in four flood prone sites of farmer's field in Rangpur, Kurigram and Lalmonirhat and Jamalpur districts, there was no flood in three locations i.e. Kodalkhata-Lalmonirhat, Jalalgonj-Mithapukur and Dewangonj-Jamalpur. Only in Kurigram the trial submerged for 12 days with a water depth of 75-100cm (**Figure 14.3**). The line IR16F1148 produced significantly higher yield in every location. In natural flooded condition at Kurigram the line produced 37.4% higher yield than standard check variety (**Table 14.13**). In average, the proposed line produced 5.28 t/ha yield, in contrast the check variety produced only 4.48 t/ha only. Though the proposed line produced 17.9% higher yield than check variety, the line was recommended for Re-PVT due to lesser exposure to natural flood (only in a single site).

Table 14.13: Performance of tested line IR13F1148 in Proposed Variety Trial (PVT) under the development of submergence tolerant rice, T Aman 2022-23

SN	Region	Trial Site	IR16F1148 (Proposed variety)		BINA dhan11 (Check variety)		% Yield increase over check	Remarks
			GD (days)	Yield (t/ha)	GD (days)	Yield (t/ha)	Yield advantage	
1.	Dhaka	L1	124	5.46	117	4.76	**14.70**	Rainfed/ non stress
2		L2	133	3.20	127	2.79	**14.69**	***Controlled submergence, 14 days
3		L3	122	5.85	119	4.82	**21.36**	No flood
4	Rangpur	L4	124	6.65	121	5.95	**11.76**	No flood
5		L5	124	4.93	121	3.56	**38.48**	**Flood for 12 days
6		L6	122	5.47	119	5.03	**8.75**	No flood
		Mean	**125**	**5.26**	**121**	**4.48**	**18.29**	

** 12 days of flash flood occurred; *** 14 days of submergence with 110cm depth of water

L1= BRRI Gazipur-1, L2= BRRI Gazipur-2, L3= Dewanganj, Jamalpur; L4= Jalalganj, Rangpur; L5= Bhogdanga, Kurigram and L6= Mogalhat, Lalmonirhat

PROJECT 15: DEVELOPMENT OF DROUGHT TOLARANT RICE

General objective: Development of genotypes superior to standard varieties and adaptable to rainfed lowland drought-prone environment in T. Aman season.

Project Leader: M. A. Kader

Experiment 15.1: Hybridization

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Introgression of drought tolerance gene into high yielding rice genetic background.

Materials and Method: Twenty-one varieties/lines (**Table 15.1a**) were grown in the hybridization block of plant breeding division at three staggers with an interval of seven days to synchronize flowering among male and female parents. The parents were chosen based on the grain yield, presence of favorable alleles of the key target traits like drought tolerance, medium duration etc. Twenty-five to thirty days old seedlings were transplanted in a 5.4 m × 2 rows plot with a spacing of 20 cm × 15 cm. Single seedling was used for transplanting. Fertilizers @108 (234 kg Urea): 17.4 (87 kg TSP): 58.5 (117 kg MP): 14 (78 kg Gypsum): 4.3 (12 kg Zn SO_4) kg NPKSZn/ha were applied in the trial. All amounts of P, K, S and Zn were applied at the time of final land preparation and nitrogen were applied at three equal splits at 5-10, 20-25 and 35-40 days after transplanting (DAT). Crop management such as weeding, irrigation etc. was done in time. Insects, diseases and other pests were controlled properly. For parental purification, leaf samples were collected from all plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique genomic profiles of each parent were used to make crosses. To make the desired cross combination, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glassine paper bags. Pollination was performed with freshly bloom panicles of the male parent by dusting pollens on the emasculated panicles of the female parent.

Results and discussion: Twenty-five crosses with 4,147 seeds were made with 15 true parents (**Table 15.1a**). **Table 15.1b** shows the list of crosses made in the season. Mature F_1 seeds were harvested, sun dried and stored separately in paper bags with proper labeling and packaging.

Table 15.1a: List of the parents used in hybridization, Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Special features
Recipient parents					
1	IR 126952-28-55-9-10-50-B	130	113	5.79	*qDTY1.1+qDTY2.1+qDTY12.1+ Xa5+Xa23+Sub1+BPH3+GM4*
2	IR 126952-28-55-9-9-4-2-7	158	125	5.62	*qDTY1.1+qDTY2.1+qDTY12. 1+Xa5+ Xa23+BPH3+GM4*
3	IR 126952-29-6-197-6-20-B				
4	IR 126952-29-6-197-6-20-B	146	86	5.6	*qDTY2.1+qDTY3.1+qDTY12. 1+Gm4+ pi9+BPH3*
5	IR 126952-29-65-16-2-10-B	132	125	5.74	*qDTY3.1+qDTY12.1+Sub1+B PH3+ Pi9*
6	IR 126952-41-58-26-4-12-5-1	162	118	5.61	*qDTY2.1+qDTY3.1+qDTY12. 1+Sub1+ Pita2A*
7	IR 126952-443-12-33-7-53-4-B	123	112	5.78	*qDTY2.1+qDTY3.1+qDTY12. 1+ Xa21+ Pi9+Pita2A*
8	IR 126953:632-AC 32-B-2-4-11-B	118	119	5.65	*qDTY3.1+Pita2+Xa4*
9	BRRI dhan71	108	115	5.5	High yielding, DTR
10	BRRI dhan87	122	127	6.5	High yielding
Donor parents					
1	BR10540-4-1-2-4-1	127	115	4.9	Yield reduction 43.9% at reproductive phase-controlled drought condition
2	BR11730-6R-26	127	118	5.12	*Pita+ Wx-10+ Wx-A+ qDTY1.1_4+ qDTY2.1+*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Special features
					qDTY3.1+ qDTY3.2_1+ BPH32
3	BR12016-6R-145	141	116	5.36	*Wx-A+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.1+ qDTY3.2_1+ qDTY4.1_2+ BPH32*
4	BR12022-6R-102	138	114	4.53	*Pita+ Wx-A+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.1+ qDTY2.2_1+ qDTY3.1+ qDTY3.2_1+ qDTY4.1_2*
5	BR12023-6R-111	112	110	5.45	*Wx-10+ Wx-A+ qDTY2.1+ qDTY2.2_1+ qDTY12.1_2*

Table 15.1b: Crosses made, Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Cross combination	Characteristics	No. of F_1 seeds	Grain yield (BLUP)
1	BRRI dhan71/ BR12023-6R-111	Drought tolerance, high yield	230	5.48
2	BRRI dhan71/ BR12016-6R-145	Drought tolerance, high yield	40	5.43
3	BRRI dhan87/ BR12023-6R-111	Drought tolerance, high yield	105	5.98
4	BRRI dhan87/ BR11730-6R-26	Drought tolerance, high yield	80	5.81
5	BRRI dhan87/ BR12022-6R-102	Drought tolerance, high yield	110	5.52
6	BRRI dhan87/ BR12016-6R-145	Drought tolerance, high yield	115	5.93
7	IR 126952-29-6-197-6-20-B/ BR12016-6R-145	Drought tolerance, high yield	250	5.48
8	IR 126952-41-58-26-4-12-5-1/ BR12023-6R-111	Drought tolerance, high yield	120	5.53
9	IR 126952-41-58-26-4-12-5-1/ BR12016-6R-145	Drought tolerance, high yield	285	5.49
10	IR 126952-28-55-9-9-4-2-7/ BR12023-6R-111	Drought tolerance, high yield	180	5.54
11	IR 126952-28-55-9-9-4-2-7/ BR12016-6R-145	Drought tolerance, high yield	115	5.49
12	IR 126953:632-AC 32-B-2-4-11-B/ BR12023-6R-111	Drought tolerance, high yield	300	5.55
13	IR 126953:632-AC 32-B-2-4-11-B/ BR11730-6R-26	Drought tolerance, high yield	250	5.39
14	IR 126953:632-AC 32-B-2-4-11-B/ BR12016-6R-145	Drought tolerance, high yield	250	5.51
15	IR 126952-29-65-16-2-10-B/ BR12023-6R-111	Drought tolerance, high yield	262	5.6
16	IR 126952-29-65-16-2-10-B/ BR11730-6R-26	Drought tolerance, high yield	150	5.43
17	IR 126952-29-65-16-2-10-B/ BR12016-6R-145	Drought tolerance, high yield	290	5.55
18	IR 126952-443-12-33-7-53-4-B/ BR12023-6R-111	Drought tolerance, high yield	200	5.62
19	IR 126952-443-12-33-7-53-4-B/ BR11730-6R-26	Drought tolerance, high yield	83	5.45

SN	Cross combination	Characteristics	No. of F_1 seeds	Grain yield (BLUP)
20	IR 126952-443-12-33-7-53-4-B/ BR12016-6R-145	Drought tolerance, high yield	182	5.57
21	IR 126952-28-55-9-10-50-B/ BR12023-6R-111	Drought tolerance, high yield	55	5.62
22	IR 126952-28-55-9-10-50-B/ BR11730-6R-26	Drought tolerance, high yield	45	5.46
23	IR 126952-28-55-9-10-50-B/ BR12016-6R-145	Drought tolerance, high yield	120	5.58
24	BRRI dhan87/ BR10540-4-1-2-4-1	Drought tolerance, high yield	50	5.7
25	IR 126952-28-55-9-10-50-B/ BR10540-4-1-2-4-1	Drought tolerance, high yield	280	5.35
		Total	**4,147**	

Experiment 15.2: Hybridity test and confirmation of F_1

Principal investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: confirmation of the crosses as true F_1s and use of the selected F_1s to produce F_2 seeds and use in making different types of crosses.

Materials and Methods: A total of fourteen crosses were grown along with their parents in the crossing blocks at BRRI Gazipur using single seedling/hill at 20 cm × 20 cm spacing in 8-hill single row plots. Fertilizer management was done following the protocol described in Experiment **15.1**. Leaf samples were collected from each of the plants of F_1 and parents for QC genotyping to determine true F_1s. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. All genotyping results were analyzed using Flapjack.

Results and discussion: The plants with heterozygous alleles at two or more SNP loci were declared as true F_1. All 14 crosses were identified as true F_1. Seeds of these F_1 plants were selfed to produce F_2 seeds. At maturity stage, F_2 seeds of all selected plants were harvested individually. Then they were dried, cleaned and preserved in cold room for proper storage (**Table 15.2**).

Table 15.2: List of confirmed F_1s, under Development of Drought Tolerant Rice, T. Aman 2022-23

SN	BR Reg. No.	Cross combinations	Characteristics
1	BR14971	BR10480-1-2-3-7-2 / BRRI Gene Bank Acc No. 1069)	Drought tolerance, high yield
2	BR14972	BR9674-1-1-5-2-P4 / IR126952-443-83-68-6-6-1-3	Drought tolerance, high yield
3	BR14973	BR9674-1-1-5-2-P4 / IR126952-41-58-26-4-12-1-21	Drought tolerance, high yield
4	BR14974	IR16F1148 / IR 126952-28-94-36-10-31-6-1	Drought tolerance, high yield
5	BR14975	IR16F1148 / IR 126952-28-55-37-2-20-4-B	Drought tolerance, high yield
6	BR14976	IR16F441 / IR96322-34-223-B	Drought tolerance, high yield
7	BR14977	BR11607-4R-184 / BRRI Gene Bank Acc No. 1434	Drought tolerance, high yield

8	BR14978	BR11607-4R-184 / IR96322-34-223-B-1-1-1	Drought tolerance, high yield
9	BR14979	BR11604-4R-84 / IR126952-41-148-1-5-9-8-1	Drought tolerance, high yield
10	BR14980	BR11604-4R-84 / IR96322-34-260-B-5-1-1-4-B	Drought tolerance, high yield
11	BR14981	BR10538-2-1-2-3-2 / HHZ23-DT16-DT1-DT1	Drought tolerance, high yield
12	BR14982	BR10539-8-1-3-2-2 / CAMPONI SML	Drought tolerance, high yield
13	BR14983	BR10539-43-1-1-1-1 / IR126952-443-83-68-6-6-1-3	Drought tolerance, high yield
14	BR14984	BR10540-4-1-2-4-1 / IR 126952-28-94-36-10-31-6-1	Drought tolerance, high yield

Experiment 15.2: Advancing segregating progenies in RGA/FRGA nurseries

Principal investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objective: To rapid advancement of segregating population for shortening breeding cycle.

Materials and Methods: In total, 4,543 progenies from 19 crosses of F_3 generation were grown in RGA/FRGA and 10,123 progenies of 33 crosses were grown in Boro season from F_2 and F_4 generations at Gazipur under greenhouse and field RGA condition. In case of field RGA, panicles were directly seeded on the raised bed at 5 cm × 5 cm spacing. A wooden frame was used to make single-row plots on the beds. Fertilizer and crop management was done using the half doses of all fertilizers used in Experiment **15.1**. At maturity stage, single panicle was harvested from each bunch of hills. Harvested panicles were dried and subjected to keep in the oven at 50ºC for breaking dormancy and repeat the same method to initiate next cycle of RGA immediately.

Results and discussion: In total 4,523 individual progenies of 19 crosses from F_3 generation were harvested from segregating generations in T. Aman and 9,570 progenies of 33 crosses from F_2 and F_4 generations were harvested from segregating generations from Boro season.

Table 15.3a: List of selected progenies from RGA/FRGA nursery, Development of Drought Tolerant Rice, T. Aman 2022-23

SN	BR Reg. No.	Cross combinations	No of progenies harvested
F_3 generation			
1	BR14371	BR9574-9-5-3-1-1/ HHZ23-DT16-DT1-DT1	200
2	BR14372	BR9574-9-5-3-1-1/ CAMPONI SML	340
3	BR14373	BR9574-9-5-3-1-1/ DRR dhan44	290
4	BR14374	BR10001-94-2-B/ CAMPONI SML	130
5	BR14375	BR9868-19-40-3-B/ DRR dhan44	350
6	BR14376	BR9868-19-40-3-B/ IR96322-34-223-B	200
7	BR14377	BR8442-12-1-3-1-B5/ HHZ23-DT16-DT1-DT1	260
8	BR14378	BR8442-12-1-3-1-B5/ IR96322-34-223-B	340
9	BR14379	HHZ5-DT20-DT2-DT1/ HHZ23-DT16-DT1-DT1	400
10	BR14380	HHZ5-DT20-DT2-DT1/ IR96322-34-223-B	450
11	BR14381	HHZ12-SAL2-Y3-Y2/ DRR dhan44	240
12	BR14382	HHZ12-SAL2-Y3-Y2/ CAMPONI SML	118
13	BR14383	BR8548-8-22-5-15/ DRR dhan44	236

14	BR14384	BR9158-19-9-6-50-2-HR1/ HHZ23-DT16-DT1-DT1	248
15	BR14385	BR9158-19-9-6-50-2-HR1/ CAMPONI SML	116
16	BR14386	BR9868-19-40-3-B/ BRRI Gene Bank Acc No. 1069	220
17	BR14387	BR8442-12-1-3-1-B5/ BRRI Gene Bank Acc No. 1353	85
18	BR14388	HHZ12-SAL2-Y3-Y2/ BRRI Gene Bank Acc No. 1434	260
19	BR14389	BR9158-19-9-6-50-2-HR1/BRRI Gene Bank Acc 1434	120
		Grand Total	**4,523**

Table 15.3b: List of segregating progenies harvested from greenhouse and field RGA nurseries, Development of Drought Tolerant Rice, Boro 2022-23

SN	BR Reg. No.	Cross combinations	No of progenies harvested
F_2 generation			
1	BR14971	BR10480-1-2-3-7-2/BRRI Gene Bank Acc No. 1069)	380
2	BR14972	BR9674-1-1-5-2-P4 / IR126952-443-83-68-6-6-1-3	390
3	BR14973	BR9674-1-1-5-2-P4 / IR126952-41-58-26-4-12-1-21	385
4	BR14974	IR16F1148 / IR 126952-28-94-36-10-31-6-1	380
5	BR14975	IR16F1148 / IR 126952-28-55-37-2-20-4-B	375
6	BR14976	IR16F441 / IR96322-34-223-B	300
7	BR14977	BR11607-4R-184 / BRRI Gene Bank Acc No. 1434	380
8	BR14978	BR11607-4R-184 / IR96322-34-223-B-1-1-1	385
9	BR14979	BR11604-4R-84 / IR126952-41-148-1-5-9-8-1	390
10	BR14980	BR11604-4R-84 / IR96322-34-260-B-5-1-1-4-B	395
11	BR14981	BR10538-2-1-2-3-2 / HHZ23-DT16-DT1-DT1	390
12	BR14982	BR10539-8-1-3-2-2 / CAMPONI SML	380
13	BR14983	BR10539-43-1-1-1-1 / IR126952-443-83-68-6-6-1-3	375
14	BR14984	BR10540-4-1-2-4-1 / IR 126952-28-94-36-10-31-6-1	370
		Total	**5,275**
F_4 generation			
1	BR14371	BR9574-9-5-3-1-1/ HHZ23-DT16-DT1-DT1	200
2	BR14372	BR9574-9-5-3-1-1/ CAMPONI SML	320
3	BR14373	BR9574-9-5-3-1-1/ DRR dhan44	290
4	BR14374	BR10001-94-2-B/ CAMPONI SML	130
5	BR14375	BR9868-19-40-3-B/ DRR dhan44	320
6	BR14376	BR9868-19-40-3-B/ IR96322-34-223-B	200
7	BR14377	BR8442-12-1-3-1-B5/ HHZ23-DT16-DT1-DT1	260
8	BR14378	BR8442-12-1-3-1-B5/ IR96322-34-223-B	320
9	BR14379	HHZ5-DT20-DT2-DT1/ HHZ23-DT16-DT1-DT1	350
10	BR14380	HHZ5-DT20-DT2-DT1/ IR96322-34-223-B	370
11	BR14381	HHZ12-SAL2-Y3-Y2/ DRR dhan44	240
12	BR14382	HHZ12-SAL2-Y3-Y2/ CAMPONI SML	110
13	BR14383	BR8548-8-22-5-15/ DRR dhan44	230
14	BR14384	BR9158-19-9-6-50-2-HR1/HHZ23-DT16-DT1-DT1	240
15	BR14385	BR9158-19-9-6-50-2-HR1/ CAMPONI SML	220
16	BR14386	BR9868-19-40-3-B/ BRRI Gene Bank Acc No. 1069	85
17	BR14387	BR8442-12-1-3-1-B5/BRRI Gene Bank Acc No. 1353	180
18	BR14388	HHZ12-SAL2-Y3-Y2/BRRI Gene Bank Acc No. 1434	120
19	BR14389	BR9158-19-9-6-50-2-HR1/ BRRI Gene Bank Acc 1434	120
		Total	**4,295**
		Grand total	**9,570**

Experiment 15.4: Line Stage Testing (LST)

Principal investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Selection of uniform genotypes in terms of plant height and days to flowering with key target traits.

Materials and Method: Total 2, 058 progenies from 17 crosses were grown in T. Aman season in a 12 hills single-row plots using systematic arrangement design. Thirty-five days old single seedling was transplanted at 20 cm × 20 cm in the plots. Fertilizer and crop management was done following the protocol described in Experiment **15.1**. Leaf samples were collected from single plant of each entry for genotyping with trait markers using trait-based SNP markers. At maturity stage, line selection was done considering uniformity in plant height, days to flowering, grain size and shape, lodging tolerance and tolerance to major disease and insect over check varieties under field condition and presence of target key traits. Additionally, five plants were harvested from selected LST lines to compare the grain weight among selected progenies of same cross combination.

Results and discussion: A total of 293 LST lines were harvested from 17 crosses based on visual observation on homogeneity in flowering, plant height and grain size and shape. Selection intensity were found 14.24 %. The initially selected lines showed a wide range of variation in plant height range starting from 82 cm to 160 cm and days to flowering starting from 97 days to 154 days and (**Fig. 15.4a**). The genotypic profiles also showed that majority lines had favorable alleles for high amylose specific marker *Wx-A,* W*x-10.* Among blast resistant genes *Pita* gene was present in 95 lines and four lines had *Pi9* genes. Thity four lines have bacterial blight resistant gene xa5 (**Fig. 15.1b**). Thirty-three lines have brown plant hopper resistant gene *BPH32* and a there were several lines having gall midge resistant gene qGm4. All the RGA derived fixed lines of 17 cross families were selected for initial yield evaluation.

Table 15.4a: List of selected genotypes from Line Stage Testing (LST), Development of Drought Tolerant Rice, T. Aman 2022-23

SN	BR Reg. No.	Parentage	No. of Lines	
			TP	Selected
F_6 generation (From Boro 2021-22)				
1	BR13530	IR98777-GAZ-13-1-2-4/HHZ23-DT16-DT1-DT1	132	48
2	BR13532	IR98841-GAZ-8-1-3-1 / HHZ23-DT16-DT1-DT1	68	25
3	BR13533	BRRI dhan87/CAMPONI SML	75	7
4	BR13534	BRRI dhan87/ HHZ23-DT16-DT1-DT1	108	33
5	BR13535	BRRI dhan89/ IR96322-34-223-B	38	6
6	BR13536	BRRI dhan89/CAMPONI SML	16	2
7	BR13537	BRRI dhan89/ Acc. No. 1250 (BRRI Gene Bank)	24	1
		Total	**461**	**122**
F_6 generation (From TA 2021-22)				
1	BR13051	BR8210-10-3-1-2/HHZ23-DT16-DT1-DT1	125	12
2	BR13052	BR8210-10-3-1-2/IR96322-34-223-B	100	11
3	BR13053	BR8743-B-1-2-2/HHZ23-DT16-DT1-DT1	104	5
4	BR13054	BR8743-B-1-2-2/IR96322-34-223-B	205	7
5	BR13055	BR9072-B-4-1-1/HHZ23-DT16-DT1-DT1	270	20
6	BR13056	BR9072-B-4-1-1/IR96322-34-223-B	75	12
7	BR13057	BR9208-8-1-1-1/IR96322-34-223-B	282	46
8	BR13058	BRRI dhan79/IR96322-34-223-B// IR74371-46-1-1	160	13
9	BR13059	IR96321-1447-428-B-1-1-1/IR96322-34-223-B// IR74371-46-1-1	141	17
10	BR13060	IR12N177/IR96322-34-223-B// IR74371-46-1-1	135	28
		Total	**1,597**	**171**
		Grand Total	**2,058**	**293**

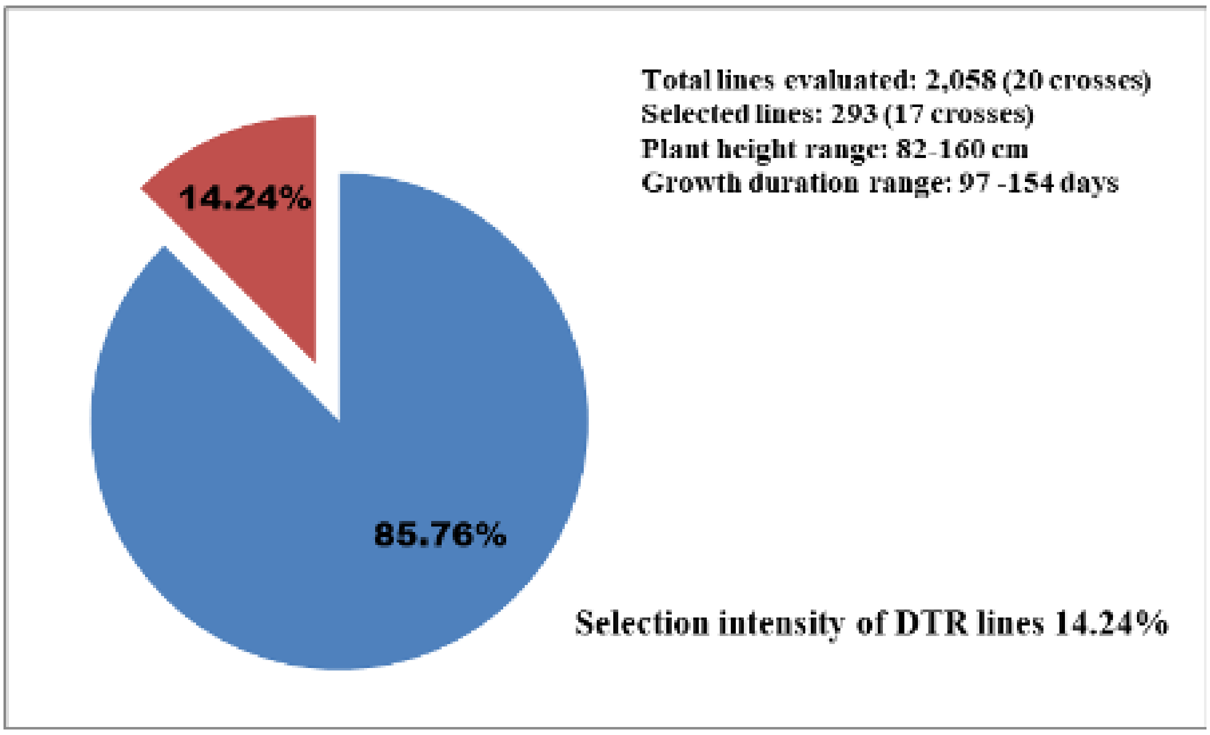


Fig. 15.4a: Selection intensity genotypes of LST, DTR, TA 2022-23

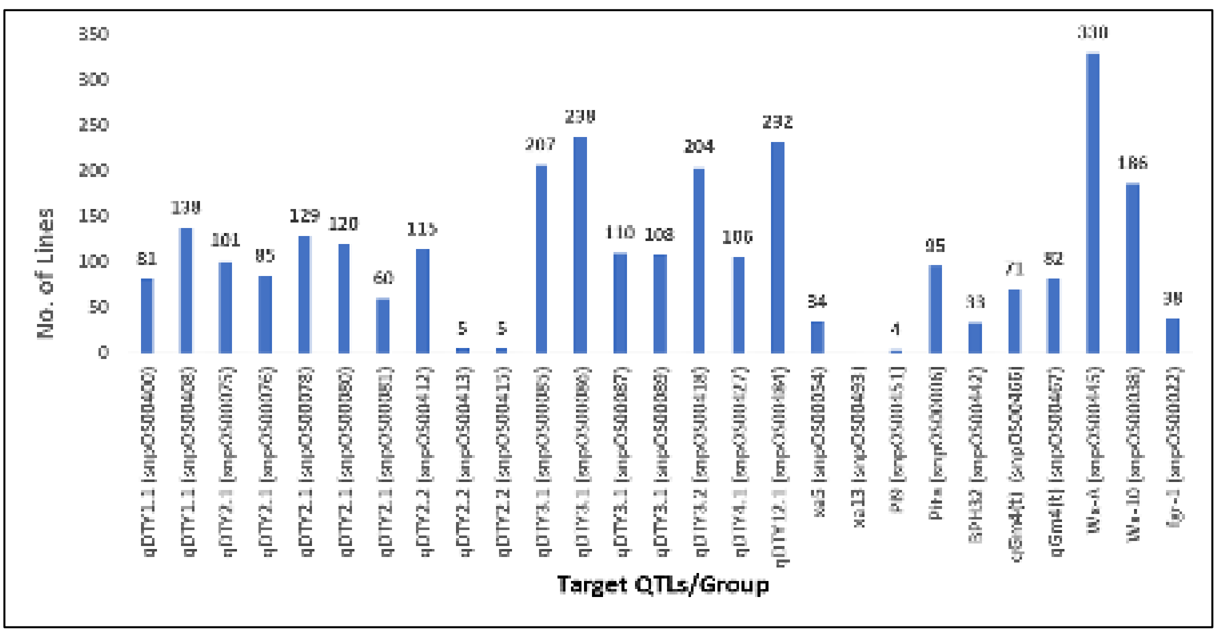


Fig 15.4b: Trait marker profile of genotypes of LST, DTR, TA 2022-23

Table 15.4b: List of LST lines with enriched traits/genes originated different cross families, Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Cross family	Enriched traits/genes	No. of selected lines
1	BR13051	*qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10*	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+ Pita+ qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+BPH32+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1BPH32+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A+Waxy_10	3
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1

SN	Cross family	Enriched traits/genes	No. of selected lines
2	BR13052	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+BPH32+Waxy_A*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+BPH32+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_2+qDTY2.1_3+qDTY3.1_3+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+BPH32+Waxy_A	2
		DTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY4.1+Waxy_A	1
3	BR13053	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_3+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	1
4	BR13054	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+Pita+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_3+qDTY3.2+Waxy_A	1
		qDTY1.1_2+qDTY2.1_2+qDTY3.1_3+qDTY3.2+Waxy_A	1
		qDTY2.1_2+qDTY2.1_3+qDTY3.1_3+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.2+Waxy_A+Waxy_10	1
5	BR13055	*qDTY1.1_2+qDTY2.1_1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10*	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A+Waxy_10	3
		qDTY1.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY2.1_1+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	2
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10+fgr-1	2
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10+fgr-1	2
6	BR13056	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qGm4(t)_2+Waxy_A+Waxy_10*	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY12.1Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+qGm4(t)_2+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY4.1+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Pita+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+Pita+Waxy_A	1
7	BR13057	*qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A*	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Pita+Waxy_A	2
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1Waxy_A	3
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1Waxy_A	2
		qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.2+qDTY12.1Waxy_A	1
		qDTY1.1_2+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY4.1+Pita+Waxy_A	1
		qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A	1
		qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Pita+Waxy_A	2

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	3
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+Waxy_A	2
		qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+xa5+Pita+Waxy_A+Waxy_10	4
		qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.1_4+qDTY3.2+qDTY12.1Waxy_A	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10+fgr-1	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	3
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Pita+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Pita+Waxy_A+Waxy_10	2
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY4.1+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A	1
		qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY3.1_2+Waxy_A	1
		qDTY3.1_3+qDTY3.1_4+qDTY12.1Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+Pita+Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A+Waxy_10	1
		qDTY3.1_3+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY4.1+Pita+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+Pita+Waxy_A	1
		qDTY1.1_1+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Waxy_A	2
8	BR13058	*qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10*	6
		qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1+xa5+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+xa5+qGm4(t)_1+qGm4(t)_2+Waxy_A	2

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY1.1_2+xa5+Waxy_A	1
		qDTY2.1_2+qDTY2.1_5+qDTY12.1Waxy_A	1
		qDTY2.1_5+qDTY3.1_1+qGm4(t)_1+	1
		qDTY3.1_2+qDTY3.2+qDTY4.1+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+xa5+Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+xa5+Pita+qGm4(t)_1+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY12.1+xa5+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+xa5+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+xa5+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_2+qDTY3.2+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+qDTY3.2+xa5+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+xa5+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+xa5+Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
9	BR13059	*qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10*	2
		qDTY1.1_2+qDTY3.1_3+qDTY3.1_4+Waxy_A	2
		qDTY2.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	19
		qDTY2.1_1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+Waxy_A+Waxy_10	1
		qDTY3.1_3+qDTY3.1_4+Waxy_A	1
		qDTY3.2+Waxy_A	4
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_2+qDTY4.1+Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1+xa5+Waxy_A	1
10	BR13060	*qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1*	1
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1	1
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY12.1	2
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1	1
		qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1Pita+Waxy_A	2
		qDTY3.1_3+	1
		Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY12.1	1

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1	5
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+qGm4(t)_1+qGm4(t)_2	3
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1qGm4(t)_2	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+xa5+Pita+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1	3
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+ qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+ qDTY4.1+qDTY12.1qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY4.1+ qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_2+ qDTY12.1qGm4(t)_2+	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2	6
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	2
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_3+qDTY3.1_4+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	3
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY12.1+xa5+Waxy_A	2
		qDTY1.1_1+qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY4.1+qDTY12.1Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY1.1_1+qDTY4.1+qDTY12.1Pita+qGm4(t)_2+Waxy_A	1
11	BR13530	qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+qGm4(t)_1+ qGm4(t)_2+Waxy_A+Waxy_10	2
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+ qDTY3.2+qDTY4.1+Pita+qGm4(t)_1+qGm4(t)_2+Waxy_A	4
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+ qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A+Waxy_10	2
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Pita+qGm4(t)_1+qGm4(t)_2+Waxy_Afgr-1	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Waxy_A	2
		qDTY2.2-1+qDTY3.1_2+qDTY12.1Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	2
		qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+qGm4(t)_1+qGm4(t)_2+Waxy_Afgr-1	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	4
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY4.1+Pita+Waxy_A	1
		qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1Pita+Waxy_A+Waxy_10	3
		qDTY3.1_1+qDTY3.1_2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A	1
		qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A	1
		qDTY3.1_2+qDTY4.1+qDTY12.1+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY3.1_2+qGm4(t)_1+qGm4(t)_2+Waxy_A	1
		qDTY3.2+Waxy_A	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+qGm4(t)_1+qGm4(t)_2	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.1_4+qDTY3.2+qDTY4.1+qGm4(t)_1+qGm4(t)_2	1

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+Waxy_A+Waxy_10	1
12	BR13532	*qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_2+qDTY12.1Pita+BPH32+Waxy_A*	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+BPH32+Waxy_A	1
		qDTY1.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY1.1_2+qDTY3.1_2+qDTY3.2+qDTY12.1BPH32+Waxy_A	1
		qDTY1.1_2+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+ qDTY3.1_2+qDTY12.1BPH32+qGm4(t)_1+qGm4(t)_2+Waxy_A	2
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1BPH32+Waxy_A	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10	2
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1BPH32+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1BPH32+Waxy_A	5
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+BPH32+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY3.1_2+qDTY3.2+BPH32+Waxy_A	2
		qDTY2.1_3+qDTY2.2-1+qDTY3.1_2+qDTY12.1BPH32+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY3.1_2+qDTY12.1BPH32+Waxy_A	1
		qDTY3.1_2+qDTY3.2+qDTY12.1Waxy_A	1
13	BR13533	*qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+BPH32+qGm4(t)_2+Waxy_A+Waxy_10*	1
		qDTY2.2-1+qDTY2.2-2+qDTY2.2-3+qDTY3.1_1+qDTY3.1_2+xa5+Waxy_A	1
		qDTY2.2-1+qDTY3.1_2+BPH32+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	2
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qGm4(t)_1+qGm4(t)_2+Waxy_A+Waxy_10	1
		qDTY1.1_1+qDTY1.1_2+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Waxy_A+Waxy_10	1
14	BR13534	*qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1*	7
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	2

SN	Cross family	Enriched traits/genes	No. of selected lines
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	2
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_2+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.1_4+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1+Pita+Waxy_A+Waxy_10+fgr-1	3
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+qDTY4.1+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY2.2-1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10+fgr-1	2
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	3
		qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
15	BR13535	qDTY1.1_2+qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY2.2-1+qDTY3.1_4+qDTY12.1Waxy_A	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Pita+Waxy_A+Waxy_10	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10+fgr-1	1
		qDTY2.1_1+qDTY2.1_2+qDTY2.1_3+qDTY2.1_5+qDTY3.1_1+qDTY3.1_2+qDTY3.1_3+qDTY3.1_4+qDTY4.1+Pita+Waxy_A+Waxy_10	1
		qDTY2.1_3+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
		qDTY3.1_1+qDTY3.1_2+Waxy_A+Waxy_10	1
16	BR13536	qDTY2.1_3+qDTY2.1_4+qDTY2.1_5+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1
		qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY3.2+Pita+Waxy_A+Waxy_10	1
17	BR13537	qDTY2.1_3+qDTY2.1_4+qDTY2.2-1+qDTY3.1_1+qDTY3.1_2+qDTY12.1Waxy_A+Waxy_10	1

Experiment 15.5: Observational Yield Trial (OYT)

Principal investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objective: Selection of superior lines with desired agronomic characters under natural drought.

Materials and Methods: Six hundred nineteen genotypes along with standard checks were evaluated in two OYTs. In OYT#1, 245 lines (GD: 100-120 days) along with BRRI dhan56 and BRRI dhan57 and 374 lines (GD: 121-140 days) along with BRRI dhan49, BRRI dhan56 and BRRI dhan71 were evaluated in OYT#2. Thirty days old seedlings were transplanted in a 5.4 m × 3 rows at spacing of 20 cm × 15 cm in the field in Augmented RCB design. Single seedling was used for transplanting. Fertilizers and crop management were done as experiment no. **15.1**.

Location: Gazipur (Control), Rajshahi (Stress) and Rangpur (Stress)

Results: Twenty-six genotypes were found superior from OYT#1 and 41 genotypes were found superior from OYT#2 based on uniformity of plant height, days to flowering, lodging tolerances and insect and disease susceptibility (**Table 15.5**). Grain yield ranged from 5.0-6.1 t/ha in OYT#1 and grain yield ranged from 5.0- 6.6 t/ha in OYT#2. During flowering stage drought stress was observed almost all three locations. Especially in Rajshai and Rangpur severe drought stress and in Gazipur moderate stress were recorded (**Fig 15.5a, Fig 15.5b** and **Fig 15.5c**).

Table 15.5: Performance of the selected genotypes of Observational Yield Trial (OYT), Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
OYT#1								
1	BR13017-4R-11	117	109	3.86	7.07	5.95	5.63	*Wx-10+ qDTY1.1_1+ qDTY2.2_1+ Wx-A+ Gm4_3+ Gm4_4+ DTY12.1_2*
2	BR13017-4R-28	124	101	4.44	5.27	6.26	5.33	*Wx-10+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ Wx-A+ DTY12.1_2*
3	BR13017-4R-85	119	112	5.09	4.19	6.34	5.21	*qDTY3.1 (3)+ qDTY3.1 (4)+ DTY4.1_2+ Gm4_3+ Gm4_4+ DTY12.1_2*
4	BR13018-4R-5	127	109	4.72	5.61	5.99	5.44	*qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
5	BR13018-4R-31	147	113	5.52	5.52	5.92	5.65	*qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ DTY12.1_2*
6	BR13018-4R-116	119	113	4.69	7.4	6.18	6.09	*qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
7	BR13018-4R-117	131	112	5.03	4.06	6.78	5.29	*qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
8	BR13018-4R-190	127	109	5.91	5.34	5.96	5.74	*Wx-10+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
9	BR13020-4R-35	113	119	7.41	4.34	5.56	5.77	*xa5+ + qDTY2.1 (1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
10	BR13021-4R-17	109	114	4.25	5.22	6.19	5.22	*Wx-10+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ Wx-A+ DTY12.1_2*
11	BR13021-4R-18	116	110	7.24	3.4	6.75	5.8	*Wx-10+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ Wx-A+ DTY12.1_2*
12	BR13021-4R-19	111	111	3.98	2.95	8.21	5.05	*Wx-10+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A+ DTY12.1_2*
13	BR13021-4R-21	117	111	5.3	5.17	5.87	5.45	*qDTY2.1 (4)+ qDTY1.1_4+ Wx-A*
14	BR13021-4R-32	117	108	4.21	6.98	6.39	5.86	*Wx-10+ qDTY3.1 (2)+ Wx-A+ DTY12.1_2*
15	BR13023-4R-33	112	117	5.91	3.74	5.93	5.19	*qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
16	BR12306-5R-14	122	119	4.77	5.56	5.33	5.22	*Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ DTY4.1_2+ Wx-A*
17	BR12306-5R-50	113	118	7.19	3.1	4.7	5	*Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ DTY4.1_2+ Wx-A+ DTY12.1_2*
18	BR12306-5R-110	125	109	5.1	4.88	5.39	5.12	*DTY4.1_2+ Wx-A*
19	BR12309-5R-21	122	115	5.28	5.34	4.45	5.03	*Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ Gm4_4*
20	BR12316-5R-63	125	115	4.31	5.9	6.72	5.64	*Pi-ta+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ Wx-A*
21	BR12316-5R-77	138	109	6.76	6.19	4.69	5.88	*qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
22	BR12316-5R-107	145	113	6.34	3.07	6.03	5.15	*qDTY3.1 (2)+ qDTY1.1_1+ qDTY3.2_1+ Wx-A*
23	BR11770-5R-71	130	109	6.72	6.15	3.64	5.5	*qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Gm4_3+ Gm4_4+ DTY12.1_2*
24	BR11788-5R-64	127	118	6.11	3.28	8.07	5.82	*Pi-ta+ Wx-10+ xa5+ + qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
								qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ BPH32+ Wx-A
25	BR11790-5R-10	131	115	2.62	6.32	6.28	5.07	*Wx-10+ xa5+ + qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_2+ qDTY3.2_1+ BPH32+ Wx-A*
26	BR11797-5R-85	133	113	3.59	5.69	6.39	5.22	*qDTY3.1 (1)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A*
27	BRRI dhan56 (Ck)	114	108	4.13	4.21	5.17	4.5	
28	BRRI dhan57 (Ck)	106	103	4.67	3.75	3.73	4.05	
	LSD (0.05)	1.72	8.85	1.204	0.739	2.444	2.063	
	Heritability	0.66	0.62	0.84	0.92	0.72	0.17	
OYT#2								
1	BR13023-4R-46	114	123	4.12	3.34	7.93	5.13	*qDTY3.1 (3)+ qDTY3.1 (4)+ DTY4.1_2+ Wx-A*
2	BR13024-4R-24	108	124	4.13	7.31	4.28	5.24	*Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ Wx-A*
3	BR12307-5R-48	114	129	4.44	7.8	4.56	5.6	*qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ Wx-A+ Gm4_4*
4	BR12307-5R-103	111	122	4.65	5.72	5.31	5.23	*Pi-ta+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
5	BR12307-5R-109	121	127	4.61	6.35	5.6	5.52	*Pi-ta+ qDTY1.1_4+ Wx-A*
6	BR12307-5R-136	112	124	4.7	5.07	6.02	5.26	*qDTY3.1 (2)+ Wx-A*
7	BR12307-5R-161	120	116	3.37	6.65	7.01	5.68	*qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ Wx-A+ Gm4_4*
8	BR12307-5R-226	106	128	4.17	5	6.21	5.13	*qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A+ Gm4_4*
9	BR12307-5R-240	114	118	7.03	3.45	5.24	5.24	*qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ DTY4.1_2+ Wx-A*
10	BR12308-5R-269	109	122	5.68	2.77	7.19	5.21	*Pi-ta+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
11	BR12309-5R-38	92	123	7.8		3.56	5.11	*qDTY2.1 (1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
12	BR12311-5R-69	112	120	4.62	3.35	7.59	5.19	*Wx-10+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
13	BR12311-5R-174	121	122	6.75	2.49	6.93	5.39	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
14	BR12312-5R-195	122	123	10.22	2.54	5.24	6	-
15	BR12313-5R-44	119	123	4.95	3.23	7.31	5.16	*Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
								qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ Gm4_4
16	BR12313-5R-267	115	127	4.39	4.78	10.04	6.4	*qDTY2.1 (1)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
17	BR12314-5R-85	107	119	6.59	2.26	7.79	5.55	*Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A*
18	BR12314-5R-180	112	118	6.88	2.64	6.01	5.18	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
19	BR12315-5R-74	105	121	4.71	5.41	5.3	5.14	*Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A*
20	BR12316-5R-27	115	117	4.66	2.89	8.88	5.48	*Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ DTY4.1_2+ Wx-A*
21	BR12316-5R-29	115	114	7.04	3.62	5.56	5.41	*qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A*
22	BR12316-5R-81	113	118	5.67	2.75	6.62	5.01	*qDTY3.1 (2)+ qDTY1.1_1+ qDTY2.2_1+ DTY4.1_2+ Wx-A*
23	BR12316-5R-133	126	122	4.61	4.75	6.47	5.28	*Pi-ta+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A*
24	BR11771-5R-42	122	133	5.17	2.13	8.04	5.11	*qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A*
25	BR11771-5R-177	121	119	5.97	4.86	5.89	5.57	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ BPH32+ Wx-A+ Gm4_3+ Gm4_4*
26	BR11779-5R-101	114	127	4.12	4.72	7.14	5.33	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A+ DTY12.1_2*
27	BR11781-5R-27	123	129	4.11	7.5	3.87	5.16	*qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A+ Gm4_3+ Gm4_4+ DTY12.1_2*
28	BR11781-5R-133	115	125	4.41	4.12	7.81	5.45	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ DTY4.1_2+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
29	BR11786-5R-114	119	115	5.67	6.18	6.86	6.24	*qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4*
30	BR11786-5R-124	110	119	4.94	6.77	4.87	5.53	*Wx-10+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ DTY4.1_2*
31	BR11787-5R-6	132	117	6	4.63	4.69	5.11	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A+ Gm4_4*
32	BR11788-5R-27	120	113	4.68	4.14	7.53	5.45	*Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A*
33	BR11789-5R-55	99	117	6.18	3.31	10.44	6.64	*Wx-10+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A*
34	BR11789-5R-84	118	115	3.91	5.04	7.03	5.33	*Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_2+ qDTY3.2_1+ Wx-A*
35	BR11790-5R-62	112	114	3.93	4.8	6.47	5.07	*Pi-ta+ Wx-10+ xa5+ + qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ BPH32+ Wx-A*
36	BR11792-5R-44	140	120	6.78	5.69	4.68	5.71	*qDTY2.1 (1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A+ Gm4_4*
37	BR11795-5R-8	120	120	4.36	6.23	6.39	5.66	*qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
38	BR11795-5R-51	111	126	6.28	4.26	6	5.51	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ Gm4_3+ Gm4_4*
39	BR11795-5R-81	112	120	5.22	5.36	7.12	5.9	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ Gm4_3+ Gm4_4*
40	BR11796-5R-34	120	135	5.12	2.53	7.99	5.21	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A*
41	BR11797-5R-67	124	117	6.8	5.13	5.03	5.65	*qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A*

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Desired traits
				Gaz	Raj	Rang	Mean	
42	BRRI dhan49	101	131	4.71	3.76	4.98	4.48	
43	BRRI dhan56	114	110	3.72	3.37	5.56	4.22	
44	BRRI dhan71	119	114	5.17	4.11	6.75	5.34	
	LSD (0.05)	16.32	9.63	1.474	0.646	0.782	2.687	
	Heritability	0.55	0.61	0.74	0.8		0.1	

OYT#1- Gaz: D/S- 14.07.22; D/T- 04.08.22, Raj: D/S- 21.07.22 D/T- 14.08.22 Rang: D/S- 09.07.22 D/T- 02.08.22

OYT#2- Gaz: D/S- 15.07.22 D/T- 06.08.22 Raj: D/S- 21.07.22 D/T- 15.08.22 Rang: D/S- 09.07.22 D/T- 02.08.22

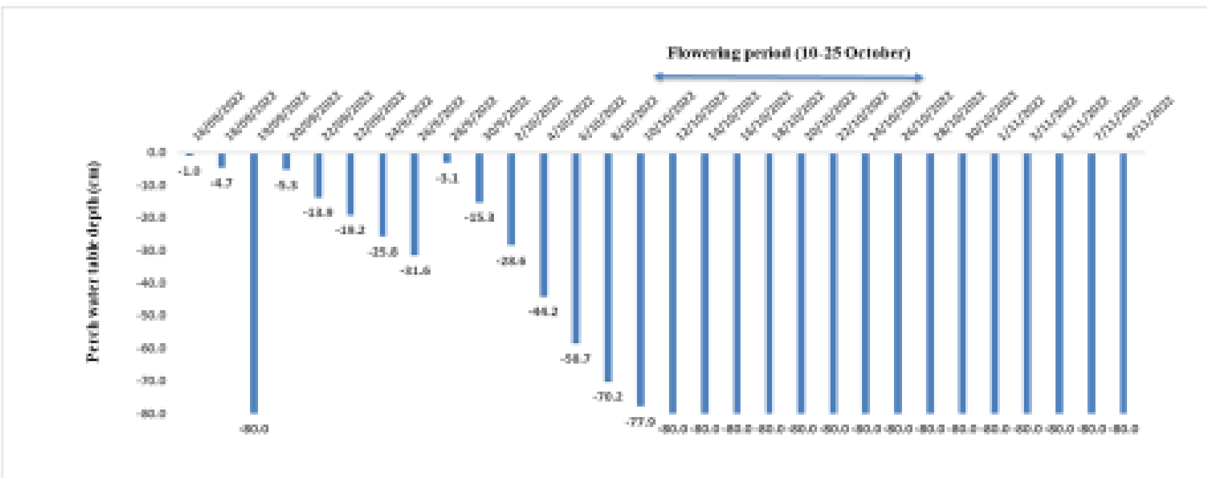


Figure 15.5a: Rainfall and perch water table depth in the experimental field of Rajshahi, T. Aman 2022-23

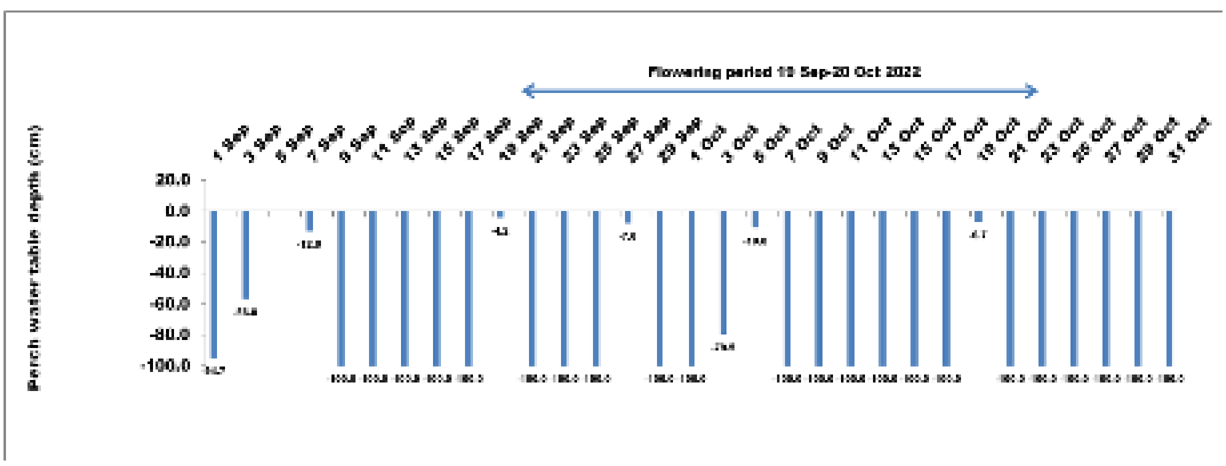


Figure 15.5b: Rainfall and perch water table depth in the experimental field of Rangpur, T. Aman 2022-23

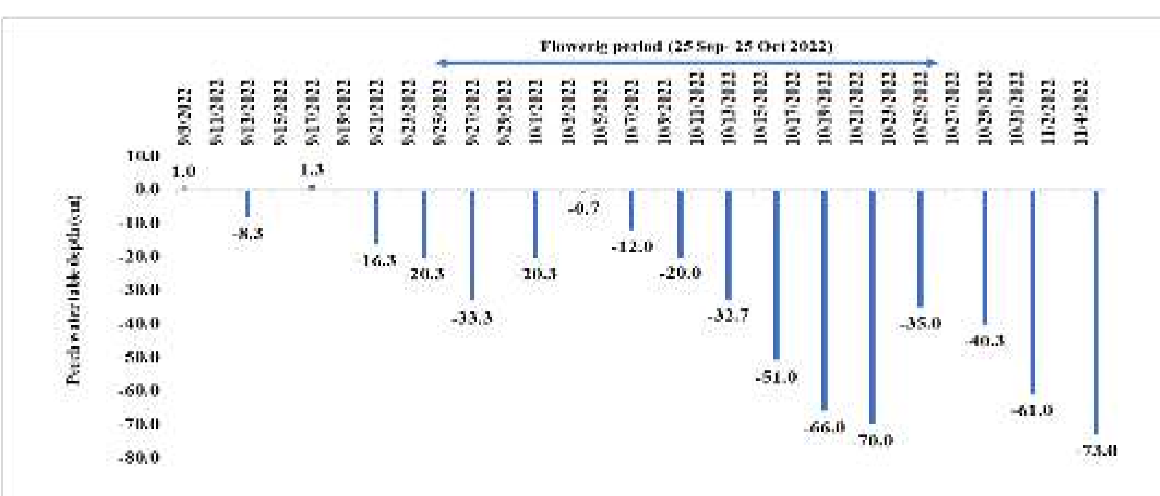


Figure 15.5c: Perch water table depth in the experimental field of Gazipur, T. Aman 2022-23

Experiment 15.6: Advanced Yield Trial (AYT)

Principal investigator: M. A. Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objective: Selection of superior lines with desired agronomic characters under natural drought.

Materials and Methods: Thirty genotypes along with standard checks were evaluated in two AYTs. In AYT#1, 18 lines along with BRRI dhan56 and BRRI dhan57 and 12 lines along with BRRI dhan56 and BRRI dhan71 were evaluated in AYT#2. Thirty days old seedlings were transplanted in a 5.4 m × 3 rows at spacing of 20 cm × 15 cm in the field in Alpha Lattice design. Single seedling was used for transplanting. Fertilizers and crop management were done as experiment no. **15.1**.

Location: Gazipur (Control), Rajshahi (Stress), Rangpur (Stress)

Results: Two genotypes from AYT#1 and five genotypes from AYT#2 were selected based on uniformity of plant height, days to flowering, lodging tolerances and insect and disease susceptibility (**Table 15.6**). Grain yield ranged from 4.5-4.6 t/ha in AYT#1 and grain yield ranged from 4.6-4.9 t/ha in AYT#2.

Table 15.6: Performance of the genotypes of Advanced Yield Trial (AYT), Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Designation	PH	GD	Grain yield (t/ha)				Trait of interest
				Gaz	Raj	Rang	Mean	
AYT#1								
1	BR12023-6R-30	108	110	5.53	3.86	3.46	4.28	*Wx-10+ Wx-A+ qDTY2.1+ qDTY2.2_1+ qDTY12.1_2*
2	BR12023-6R-111*	114	111	5.01	4.21	4.44	4.55	*Wx-10+ Wx-A+ qDTY2.1+ qDTY2.2_1+ qDTY12.1_2*
3	BR12024-6R-95	133	117	4.15	3.94	3.04	3.71	*Pita*
4	BR11730-6R-26	127	117	4.82	3.82	3.79	4.14	*Pita+ Wx-10+ Wx-A+ qDTY1.1_4+qDTY2.1+ qDTY3.1+qDTY3.2_1+ BPH32*
5	BR11253-6R-34	119	115	4.92	3.78	4.58	4.43	*qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.1+ qDTY4.1_2*
6	BR11246-6R-185	128	116	3.97	3.52	3.76	3.75	*Wx-10+ Wx-A+ qDTY1.1_4+ qDTY2.1+ qDTY2.2_1+ qDTY3.1+ qDTY3.2_1*
7	BR12019-6R-57	128	117	5.69	3.37	3.54	4.2	*Wx-A+ qDTY1.1_1+ qDTY1.1_4+ DTY2.2_1+ qDTY4.1_2+*
8	BR12016-6R-145	142	119	5.06	4.19	3.36	4.2	*Wx-A+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.1+ qDTY3.2_1+ qDTY4.1_2+ BPH32*
9	BR11248-6R-178	131	116	3.87	3.26	4.05	3.73	*Wx-A+ qDTY1.1_4+ qDTY2.1+ qDTY3.1+ BPH17_3*
10	BR11248-6R-219	124	116	3.46	3.72	4.55	3.91	*Wx-A+ qDTY1.1_4+ qDTY2.1+ qDTY3.1+ qDTY3.2_1*

11	BR11730-6R-1	136	115	4.74	4.07	4.28	4.36	*Wx-A+ qDTY1.1_4+ qDTY2.1+ qDTY3.1+ qDTY3.2_1+BPH32*
12	BR11729-6R-130	118	115	3.62	3.72	4.01	3.78	*Wx-A+ qDTY1.1_4+ qDTY2.1+ qDTY3.2_1*
13	BR12016-6R-183	139	117	5.15	3.37	2.97	3.83	*Wx-A+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.1+ qDTY3.2_1+qDTY4.1_2*
14	BR11248-6R-82	134	114	3.79	4.27	4.73	4.26	*Wx-A+ qDTY2.1+ qDTY3.1+ qDTY3.2_1*
15	BR12012-6R-132	101	121	4.38	3.87	3.83	3.96	*Wx-A+ qDTY2.1+ qDTY4.1_2*
16	BR12022-6R-40	126	113	5.09	2.9	4.18	4.38	*Wx-A+ DTY1.1_1+ qDTY2.2_1 +qDTY3.1+qDTY3.2_1+Gm4_3+ Gm4_4*
17	BR11742-6R-27	121	114	4.73	3.83	3.68	3.95	*qDTY4.1_2*
18	BR12021-6R-117*	130	111	5.5	4.47		4.46	-
19	BRRI dhan56 (Ck)	113	110	5.01	3.78	3.65	4.15	
20	BRRI dhan71 (Ck)	124	113	5.32	4.01	4.33	4.55	
	LSD (0.05)	13.9	4.9	0.974	0.50	0.245	0.648	
	H2b	0.87	0.85	0.74	0.8	0.22	.	
AYT#2								
1	IR82635-B-B-75-2	125	112	5.67	3.1	4.04	4.27	-
2	IR15L1718	111	105	4.24	2.95	5.37	4.18	-
3	IR15L1720*	128	113	5.83	3.37	4.68	4.62	-
4	IR127009-B-8-2-1-2*	127	116	5.08	3.57	6.15	4.93	-
5	IR17L1314*	129	110	4.98	3.77	5.14	4.63	-
6	IR15T1133	128	113	5.35	4.07	4.02	4.48	-
7	IR99853-B-B-B-363	120	114	4.74	4.27	2.74	3.92	-
8	IR14L586	123	109	4.49	3.83	4.77	4.36	-
9	IR100097-B-B-RGA-B-RGA-8*	120	114	4.49	4.73	4.83	4.68	-
10	IR12A173	116	110	4.83	3.23	4.82	4.3	-
11	IR17L1360*	120	110	5.22	3.1	5.45	4.59	-
12	IR17L1368	128	110	5.26	3.5	4.9	4.55	-
13	BRRI dhan56 (Ck)	123	108	5.17	3.67	4.38	4.4	
14	BRRI dhan71 (Ck)	124	112	6	4.13	4.23	4.79	
	LSD (0.05)	9.6	3.8	0.885	0.71	1.588	1.114	
	H2b	0.75	0.75	0.63	0.74	0.39	.	

*Selected for further trial

AYT#1- Gaz: D/S- 14.07.22 D/T- 03.08.22 Raj: D/S- 21.07.22 D/T- 16.08.22 Rang: D/S- 09.07.22 D/T- 02.08.22

AYT#2- Gaz: D/S- 14.07.22 D/T- 03.08.22 Raj: D/S- 21.07.22 D/T- 16.08.22 Rang: D/S- 09.07.22 D/T- 02.08.22

Experiment 15.7: Preliminary Yield Trial (PYT)

Principal investigator: MA Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and K Fatema

Specific objectives: Preliminary yield evaluation of advanced lines compared to standard checks.

Materials and Methods: Twelve genotypes along with four standard checks were evaluated at BBRI Gazipur. Twenty-five to thirty days old seedlings were transplanted at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 10 rows. The design was RCB with two replications. Fertilizers doses and crop management was done as experiment no. **15.1**.

Results and discussion: Although having multiple genes/QTLs none of the genotype was selected based on grain yield in comparison to check varieties (**Table 15.7**).

Table 15.7: Performance of genotypes in Preliminary Yield Trial (PYT), Development of Drought Tolerant Rice, T. Aman 2022-23

SN	Designation	PH (cm)	GD (days)	Yield (t/ha)	Desired traits
1	IR 126952-41-58-26-1-9-1-1	143	122	4.76	*qDTY$_{2.1}$ (1)+qDTY$_{2.1}$ (2)+qDTY$_{2.1}$ (3)+qDTY$_{2.1}$ (4)+qDTY$_{2.1}$ (5)+ qDTY$_{3.1}$ (1)+ qDTY$_{3.1}$ (2)+ qDTY$_{1.1}$_1+qDTY$_{1.1}$_4+ qDTY$_{3.2}$_1+Wx-A+ qDTY$_{12.1}$_2+ xa13_1*
2	IR 126953:192-AC 74-1-B	153	118	5.24	*Pi-ta+xa5+qDTY$_{2.1}$ (5)+qDTY$_{3.1}$ (1)+qDTY$_{3.1}$ (2)+ qDTY$_{1.1}$_1+ qDTY$_{1.1}$_4+ qDTY$_{2.2}$_1+qDTY$_{3.2}$_1Wx-A+xa13_1*
3	IR 126952-41-125-21-1-51-9-1	151	116	5.19	*xa5+qDTY$_{3.1}$ (1)+qDTY$_{3.1}$ (2)+ qDTY$_{1.1}$_1+qDTY$_{1.1}$_4+ qDTY$_{2.2}$_1 +qDTY$_{3.2}$_1+Wx-A+Gm4_3 +Gm4_4+qDTY$_{12.1}$_2+xa13_1*
4	IR 126952-41-58-26-4-12-5-9	142	120	4.57	*qDTY$_{2.1}$ (5)+qDTY$_{3.1}$ (1)+ qDTY$_{1.1}$_1+qDTY$_{1.1}$_4+ qDTY$_{2.2}$_1+ BPH17_3+ Wx-A*
5	IR 126952-41-58-26-4-12-1-9	151	133	5.04	*xa5+qDTY$_{2.1}$ (1)+qDTY$_{2.1}$ (2)+qDTY$_{2.1}$ (4)+qDTY$_{2.1}$ (5)+ qDTY$_{3.1}$ (2)+ qDTY$_{1.1}$_1+qDTY$_{1.1}$_4+ BPH17_3+Wx-A+ Pb1_1+qDTY$_{12.1}$_2+Pi9_1*
6	IR 126952-28-55-9-9-53-1-6	125	115	5.76	*Pi-ta+qDTY$_{3.1}$ (3)+qDTY$_{3.1}$ (4)+qDTY$_{1.1}$_1+qDTY$_{1.1}$_4+Wx-A*
7	IR 126952-29-65-22-2-5-B	119	126	4.55	*qDTY$_{3.1}$ (1)+qDTY$_{3.1}$ (3)+qDTY$_{3.1}$ (4)+ qDTY$_{4.1}$_2+BPH17_3+Wx-A+ qDTY$_{12.1}$_2*
8	IR 126952-41-125-21-2-50-B	125	116	4.61	*Pi-ta+xa5+qDTY$_{3.1}$ (3)+qDTY$_{3.1}$ (4)+ qDTY$_{1.1}$_1+ qDTY$_{1.1}$_4+ qDTY$_{2.2}$_1+ qDTY$_{3.2}$_1+Wx-A+ xa13_1*
9	IR 126952-28-55-9-9-4-4-3	115	120	5.44	*xa5+qDTY3.1 (1)+qDTY3.1 (2)+qDTY1.1_1+ qDTY1.1_4+ Wx-A+ Pb1_1+ qDTY12.1_2*
10	IR 126953:632-AC 15-B-1-1-12-B	115	108	5.2	*xa5+qDTY3.1 (1)+qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ Wx-A+Pb1_1+ qDTY12.1_2*
11	IR 126952-29-85-1-7-2-2-B	84	116	4.46	*Pi-ta+qDTY2.1 (1)+qDTY2.1 (2)+qDTY2.1 (3)+qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+qDTY1.1_1+qDTY1.1_4+*

12	IR 126952-41-148-38-2-49-3-9	85	107	4.71	*qDTY3.2_1+ qDTY4.1_2+ Wx-A+ Gm4_4 xa5+qDTY2.1 (1)+qDTY2.1 (3)+qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY1.1_1+ qDTY3.2_1+ BPH17_3+Wx-A+ Pb1_1+qDTY12.1_2*
13	BRRI dhan66 (Ck)	123	113	6.39	
14	BRRI dhan56 (Ck)	118	114	5.49	
15	BRRI dhan87 (Ck)	124	117	6.06	
16	BRRI dhan71 (Ck)	125	113	6.33	
	LSD (0.05)	6.7	10	1.043	
	Heritability	0.99	0.67	0.65	

Experiment 15.8: Advanced Lines Adaptive Research Trial (ALART)

Principal investigator: ARD scientists

Co-Investigators: M A Kader, R R Majumder, T K Hore, U R Shaha and K Fatema

Specific Objectives: Evaluation of genotypes for specific and general adaptability under on-farm condition of Bangladesh

Materials and Methods: Two genotypes along with BRRI dhan71 and BRRI dhan75 as standard checks were evaluated (**Table 15.8**). Twenty-five to thirty days old seedlings were transplanted @ 2-3 seedlings at a spacing of 20 cm × 15 cm in ten locations of Bangladesh. The plot size was 5.4 m × 12 rows. The design was RCB with 3 replications. Fertilizers and management were done as experiment no. **15.1**. Date of seeding, transplanting, flowering, maturity, plant height, phenotypic acceptance, disease and insect infestation score and yield per plot were recorded. Seeds were preserved from the selected entries.

Location: Taraganj, Rangpur; Pirganj, Rangpur; Gazipur (WB); Sadar, Bogura; Sadar, Kustia; Ganni, Meherpur; Debiddar, Cumilla; Mohadevpur, Naogoan; Godagari, Rajshahi; Nachole, ChapaiNawabganj

Results and discussion: None of the genotype were recommended by ARD due to similar grain yield performance to check varieties (**Table 15.8**).

Table 15.8: Agronomic performance of the genotypes of Advanced Line Adaptive Research Trial (ALART), Development of Drought Tolerant Rice, T. Aman 2022-23

SL	**Plant height (cm)**	**Growth duration (days)**	**Grain yield (t/ha)**										
			L1	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9**	**L10**	**Mean**
G1	116	110	5.41	3.8	2.67	5.08	5.18	5.69	1.9	4.6	5.96	3.93	4.42
G2	119	112	5.94	4.12	2.11	5.15	4.84	5.87	1.51	4.75	6.5	4.74	4.55
G3	122	111	5.85	4.2	4.09	4.95	5.3	5.98	2.43	4.66	6.18	4.18	4.78
G4	106	108	4.54	4.15	2.8	4.92	5.15	5.65	2.51	4.35	5.94	4.32	4.43
LSD(0.05)	1.74	38	0.77										0.24
CV (%)	2.91	0.67	10.41										

G1= BR10538-2-1-2-3-2; G2= BR10540-4-1-2-4-1; G3= BRRI dhan71 (Ck); G4= BRRI dhan75 (Ck)
L1= **Taraganj, Rangpur; L2= Pirganj, Rangpur; L3= Gazipur (WB); L4= Sadar, Bogura; L5= Sadar, Kustia; L6= Ganni, Meherpur; L7= Debiddar, Cumilla; L8= Mohadevpur, Naogoan; L9= Godagari, Rajshahi and L0= Nachole, Chapai, Nawabganj**

PROJECT 16: DEVELOPMENT OF WATER SAVING AND AEROBIC RICE VARIETIES

General Objective: Development of short duration water-use-efficient rice genotypes with 10% more yield than the check varieties under transplanted alternate wetting and drying (AWD) and aerobic condition.

Project Leader: Khandakar Md Iftekharuddaula

Experiment 16.1: Hybridization

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: To introgress water-use-efficient genes into modern genetic background with shorter growth duration and grain quality etc.

Materials and Methods: Fifteen parents (**Table 16.1a**) were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Around 45 days old seedlings were transplanted in a 2.4 m × 2 rows plot with a spacing of 20 cm × 20 cm. Single seedlings was used for transplanting. Fertilizers were applied at the rate of 260 kg urea, 120 kg TSP, 140 kg MoP, 80 kg gypsum and 10 kg zinc sulphate/ha. Urea was applied in equal three splits at 15, 35, and 55 days after transplanting. The fertilizers other than urea were applied as basal during final land preparation. Other cultural and pest management practices were done as and when necessary. Leaf sample was collected from previously labeled 4 healthy plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique profiles of each parent were used to make crosses. At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glycine bag. Pollination was performed with just anthesized panicles of the male parent by dusting pollens on the emasculated panicle of the female parents.

Results and discussion: Totally 2,850 F_1 seeds were obtained from 29 crosses (**Table 16.1b**). These were recorded and labeled properly. The F_1 seeds were sun-dried and stored in a cool and dry place.

Table 16.1a: List of parents for hybridization, Water Saving and Aerobic rice Breeding, Boro 2022-23

SN	Parental genotypes	GD (days)	Yield (t/ha)	Trait markers
1	BR11710-5B-351	153	6.6	*Wx-A, Wx-10, Sub1, Wx-op, SCT1, SCT3, GS3, AG3, Saltol, qSES1-2_4, xa4_2, Pi33*
2	BR11708-5B-224	150	6.4	*Wx-A, Wx-10, Wx-op, SCT1, SCT2, SCT4, AG3, Saltol, qSES1-2_4, xa4_2*
3	IR18R1120	153	7.5	*frg-1, Wx-A, Wx-10, Pita2, Chalk5, GS3, Gn1a, Xa4, xa5*
4	IR18R1109	152	8.1	*SCT1, SCT2, SCT4, fgr-1, Wx-A, Wx-op,Waxyq,Xa4, xa5, qPi33*
5	IR19L1051	150	7.2	*SCT1, SCT2, SCT4,fgr-1, Sub1, NAS3, Wx-int, Wx-op, Waxy, Hd1, qXa4*
6	IR18R1179	155	7.3	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A, Wx-10, Wx-op, Waxy, qXa4, xa5, qPi33*
7	IR18R1176	153	7.3	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A, Wx-10, Wx-op, Waxy, qXa4, xa5*
8	IR17A1694	146	7.8	*Wx-A*
9	IR18A1398	153	8.5	*Wx-A, Wx-10*
10	IR12A173	152	7.6	*Wx-A*

SN	Parental genotypes	GD (days)	Yield (t/ha)	Trait markers
11	BR12493-5R-151	145	7.3	*SCT1, SCT2, SCT4, GS3, AG1, AG3, Saltol, Sub1, Wx-A, Wx-op, Waxy, GS3, Hd3a*
12	BR12489-5R-119	150	7.7	*SCT1, SCT3, GS3, AG3, Saltol, Sub1, Wx-A, Wx-10, Wx-op, Waxy, GS3, Hd3a*
13	IRRI 249	145	6.9	
14	BRRI dhan101	142	7.7	*Wx-A*
15	BRRI dhan102	150	8.1	*Wx-A*

Table 16.1b: **Crosses made, Water Saving and Aerobic Rice Breeding, Boro 2022-23**

Sl.	BR Reg.	Crosses	No. of F_1 seeds	Ave. parental yield (BLUP-t/ha)
1	BR15753	BR11710-5B-351/IRRI 249	100	6.9
2	BR15754	BR11710-5B-351/IR18R1120	180	7.1
3	BR15755	BR12493-5R-151/IRRI 249	150	7.1
4	BR15756	BRRI dhan101/IR19L1051	150	7.5
5	BR15757	BR11708-5B-224/IR12A173	60	7.0
6	BR15758	BR12493-5R-151/IR18R1120	90	7.4
7	BR15759	Thailand Pajam/IR19L1051	200	6.8
8	BR15760	Kanak Lata/BR12493-5R-151	80	6.7
9	BR15761	Thailand Pajam/BR9674-8-15-3-28-P3	150	7.2
10	BR15762	BR11315-5R-17-52/Thailand Pajam	60	7.1
11	BR15763	BR10571-15-6-8-5/Thailand Pajam	100	7.4
12	BR15764	BR10571-15-6-8-5/IR17A1694	200	7.5
13	BR15765	BR10571-15-6-8-5/IR18R1120	150	7.6
14	BR15766	BR10571-15-6-8-5/BRH11-9-11-4-5B	150	8.1
15	BR15767	BR10571-15-6-8-5/IRRI 154	200	7.0
16	BR15768	BRH11-9-11-4-5B/BR9674-8-15-3-28-P3	50	8.0
17	BR15769	BR11712-4R-227/BRRI dhan101	100	8.2
18	BR15770	BR11712-4R-227/BR10571-15-6-8-5	60	8.1
19	BR15771	IR13F582/BR12839-4R-157-2	30	7.8
20	BR15772	BRH11-9-11-4-5B/IR18R1120	40	7.7
21	BR15773	BRRI dhan101/BR11712-4R-227	40	8.4
22	BR15774	BR11596-5R-39/BR9674-1-1-5-1-P3	70	7.9
23	BR15775	BRRI dhan58(T)/BR9674-8-15-3-28-P3	60	7.4
24	BR15776	BRRI dhan58(T)/IR19L1051	70	7.3
25	BR15777	BRRI dhan58(T)/BRRI dhan28(T) qEMF 3-5	80	7.4
26	BR15778	BRRI dhan58(T)/BRRI dhan28(T) qEMF 3-6	80	7.2
27	BR15779	BRRI dhan88/BRRI dhan28(T) qEMF 3-1	20	6.6
28	BR15780	BRRI dhan88/BRRI dhan28(T) qEMF 3-3	100	6.8
29	BR15781	BRRI dhan88/BRRI dhan28(T) qEMF 3-5	30	6.7
Total seed Number			**2,850**	

Experiment 16.2: Confirmation of F_1, Water Saving and Aerobic Rice Breeding, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: Confirmation of the cross as true F_1s and use of the selected F_1s to produce F_2 seeds.

Materials and Methods: A total of 16 single crosses along with their respective parents were grown. F_1 seeds of each cross and their respective parents were germinated in petri dishes and then sown in earthen pots. Forty days old seedling was transplanted in 2.4 m double rows plot at 20 cm × 20 cm spacing. Fertilizers management was done at the rate of 260:100:120:110:10 kg Urea, TSP, MP, Gypsum and $ZnSO_4$/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of TSP, MP, Gypsum and $ZnSO_4$ were applied at final land preparation. Leaf samples were collected from each of the 12 plants from each F_1 and parents for QC genotyping to determine true F_1. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack.

Results: Based on QC profile of the test F_1s, fourteen, out of sixteen, crosses were confirmed as true F_1. Seeds of these selected F_1 plants were selfed to produce F_2 seeds. At maturity, F_2 seeds of all selected plants were harvested individually, dried, cleaned and preserved in cold room (**Table 16.2**).

Table 16.2: List of confirmed F_1, Water Saving and Aerobic Rice Breeding, Boro 2022-23

Sl#	BR Number	Parentages	No. of confirmed F_1 plants
1	BR15208	FBR-376/Chiherang Sub1-AG1-AG2	1
2	BR15209	FBR-376/BR8899-17-1-1-1-1-1	1,3,6,7
3	BR15210	FBR-376/BRRI dhan92	3,4,5,7,8,12
4	BR15211	Nania/BRRI dhan92	1,2,3,4,5,6,7,8,9,10,11
5	BR15213	BR11716-4R-102/BRRI dhan92	3
6	BR15214	BR12208-5R-352/BRRI dhan92	2,4,6,9,10,11,12
7	BR15215	BR9674-1-1-5-2-P4/BRRI dhan92	2
8	BR15216	BR12177-5R-169/BR8899-17-1-1-1-1-1	1,2,3,4,6,7,8,9,10
9	BR15217	Fatema dhan/BRRI dhan92	2,3
10	BR15219	Nariya-14/FBR-376	4
11	BR15220	BR12208-5R-352-P1/FBR-376	2,5,6,7
12	BR15221	BRH13-1-9-7B/FBR-376	2,5,6,7,9,10,11,12
13	BR15222	BRH11-9-11-45B-HR3/Ja Hua	1,3,4,6,7
14	BR15223	BR11716-4R-105/ Ja Hua	1,2,3,4,5

Experiment 16.3: Rapid Generation Advance (RGA)

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objectives: Rapid advancement of segregating population for shortening breeding cycle and development of large RIL population.

Materials and Methods: A total 8,325 progenies of thirty crosses comprising of 13 F_2, 13 F_3, and 4 F_5 populations were grown in Boro 2022-23 season (**Table 16.3**). Single seed progenies from single panicle of one plant were grown in screen house and field RGA nursery. In the screen house seeds were directly sown in the tray followed by thinning and tiller pruning. Thinning, nutrient management and appropriate pest management practices were done as and when necessary. In field RGA, part of the panicle was sown directly on the soil. No thinning or pruning was done. Fertilizers were applied @100 kg urea, 80 kg TSP, 80 kg MoP, 50 kg gypsum and 5 kg zinc sulphate/ha. All fertilizers were applied during final land preparation. During harvesting at maturity, each panicle was collected from each plant of all the crosses in different times. Harvested seeds remaining in the panicles were dried and subjected for dormancy breakage to initiate next cycle of RGA immediately. For dormancy breaking, at first, sun-drying was done for three days followed by oven drying with 50°C temperature for 72 hours.

Results: In Total 8,037 progenies comprising 4,430 F_2, 3,315 F_3, and 292 progenies were harvested at the time of maturity and processed with proper labels and advanced through field RGA. The average recovery percentage of the RGA generations was 97% (**Table 16.3).**

Table 16.3: List of F_2, F_3, and F_5 populations advanced through GRGA, Water Save, Boro 2022-23

SL#	BR No	Crosses	No. of progenies Grown	No. of progenies Harvested	Recovery %
F_2 Population					
1	BR14493	BRH13-1-9-7B/Eu Muslema	420	400	95
2	BR14494	BRH11-9-11-45B-HR3/Eu Muslema	340	300	88
3	BR14495	BRH11-7-17-10B/Eu Muslema	440	400	91
4	BR14496	BRH13-1-9-7B/Ja Hua	450	400	89
5	BR14497	BRH11-9-11-45B-HR3/Ja Hua	300	294	98
6	BR14498	BRH11-7-17-10B/Ja Hua	320	300	94
7	BR14499	BR11723-4R-172/Ja Hua	320	317	99
8	BR14500	BR11716-4R-102/Ja Hua	320	313	98
9	BR14501	BR11716-4R-105/Ja Hua	290	280	97
10	BR14502	BR11712-4R-227/Ja Hua	330	328	99
11	BR14503	BR9674-2-9-10-1-P5 /Ja Hua	350	350	100
12	BR14504	CN6/Ja Hua	450	400	89
13	BR14505	CN6/Eu Muslema	360	348	97
		Sub Total	**4,690**	**4,430**	**94**
F_3 Population					
1	BR14164	BRRI dhan96/ IR15L1163	300	300	100
2	BR14165	BRRI dhan96/ IR16L1081	300	300	100
3	BR14166	BRRI dhan96/ IR16L1172	200	200	100
4	BR14167	BRRI dhan88/ IR15L1163	200	200	100
5	BR14169	BRRI dhan88/IR16L1172	260	252	97
6	BR14170	BRRI dhan92/BRRI dhan84	220	220	100
7	BR14171	BRRI dhan92/IR16L1090	250	250	100
8	BR14172	BRRI dhan92/BR11002-5R-112	260	258	99
9	BR14173	BRRI dhan92/BR8899-17-1-1-1-1-1	165	164	99
10	BR14174	BRRI dhan92/IR100740-89-B-2	280	276	99
11	BR14175	BRRI dhan92/BR11723-4R-172	300	300	100
12	BR14176	BR8899-17-1-1-1-1-1/ BR11002-5R-112	300	300	100
13	BR14177	BR8899-17-1-1-1-1-1/ IR100740-89-B-2	300	300	100
Sub Total			**3,335**	**3,315**	**99**
F5 Population					
	Single Cross				
1	BR13399	BRRI dhan28/BRRI dhan92	60	60	100
2	BR13400	BRRI dhan28/BRRI dhan84	60	60	100
3	BR13401	BRRI dhan84/ BRRI dhan92	60	60	100
4	BR13405	BRRI dhan81/ BRRI dhan84	120	112	93
Sub Total			**300**	**292**	**97**
Total Progenies			**8,325**	**8,037**	**97**

Experiment 16.4: Observational Yield Trial (OYT), Water Saving and Aerobic Rice Breeding, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objective: Selection of promising breeding lines for better phenotypic acceptability, homogeneity, adaptation under local climatic condition and grain yield potentials than the standard checks under on-station AWD condition.

Materials and Methods: In total, 62 advanced line with three checks were evaluated (**Table 16.4**). Thirty-eight days old seedlings were transplanted at a spacing of 20 × 20 cm with 2-3 seedlings per hill. The unit plot size was 5m^2. The field layout was augmented RCB design with two replications. Fertilizers were applied @300:125:150: 90:10 kg/ha Urea, TSP, MoP, Gypsum and Zinc sulphate, respectively. All the fertilizers except urea were applied during final land preparation. Urea was applied in three splits at 15 and 40 days after transplanting and one week before PI. Weeding, pest control measures and other cultural practices were done as and when necessary. In regards to water management Alternate Wetting and Drying (AWD) technique were followed from one month after transplanting to flowering.

Results: A total of 12, out of 62, genotypes were selected based on phenotypic acceptance, growth duration, grain quality and yield. Among all tested advanced breeding lines, the highest yield (7.3 t/ha) was produced by the genotype IR 129391-B-35-B-1-1 (7.3 t/ha) followed by two similar yielder genotypes IR16F1147 (7.0 t/ha) and IR 126999-B-32-2-1-3 (7.0 t/ha). The individual heritability obtained from growth duration, plant height and grain yield were 89%, 91% and 85% respectively, indicating high level of precision in this experiment, however F-test for tiller number and PAcp was non-significant (**Table 16.4**).

Table 16.4: Performance of the selected entries tested in Observational Yield Trial (OYT), Water Saving and Aerobic Rice Breeding, Boro 2022-23, Boro 2022-23

SL	Designation	GD (days)	PH (cm)	TN	PAcp	Yield (t/ha)	Available traits in the population
1	IR 129391-B-35-B-1-1	148	103	13	7	7.3	*Wx-A*
2	IR16F1147	150	112	11	3	7.0	*Wx-A, all Sub1*
3	IR 126999-B-32-2-1-3	147	113	10	5	7.0	*Wx-A*
4	IR16T1662	146	107	10	5	6.8	*Wx-A*
5	IR19L1045	151	104	14	3	6.4	*Wx-A, BADH2.1-7*
6	IR17L1415	139	102	12	3	6.3	*Wx-A*
7	IR18T1059	150	130	9	3	6.2	*Wx-A, BADH2.1-7*
8	IR20X1014	143	102	12	5	6.1	*Wx-A, Wx-10*
9	IR14L345	138	107	10	5	5.8	*Wx-A*
10	IR15L1008	140	116	12	5	5.3	*Wx-A*
11	IR16L1478	139	98	14	5	5.2	*Wx-A, Wx-10*
12	IR14G3964	141	105	14	3	5.1	*Wx-A, BADH2.1-7*
13	BRRI dhan58 (Ck)	144	97	12	7	6.8	
14	BRRI dhan88 (Ck)	135.5	95	12	7	6.5	
15	BRRI dhan100 (Ck)	139.5	103	10	7	6.7	
	P value	*	*	ns	ns	*	
	LSD (0.05)	4.0	5.0			0.3	
	H2b	0.89	0.91			0.85	

D/S: 13-12-2022 D/T: 20-01-2023

Experiment 16.5. Preliminary Yield Trial (PYT#1), Water Saving and Aerobic rice Breeding, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objective: Preliminary evaluation of promising breeding lines for their phenotypic acceptability, adaptation under local climatic condition and grain yield potentials under on-station AWD condition.

Materials and Methods: Total 53 genotypes along with two check varieties were evaluated (**Table 16.5**) following RCB design with two replications. Forty-one days old seedlings were transplanted at a spacing of 20 × 20 cm with 2-3 seedlings per hill. The unit plot size was 5.5 m^2. Fertilizers were applied @300:125:150: 90:10 kg/ha Urea, TSP, MoP, Gypsum and Zinc sulphate, respectively. All the fertilizers except urea were applied during final land preparation. Urea was applied in three splits at 15 and 40 days after transplanting and one week before PI. Weeding, pest control measures and other cultural practices were done as and when necessary.

In regards to water management Alternate Wetting and Drying (AWD) technique were followed from one month after transplanting to flowering.

Results: Out of 53 genotypes, 15 promising entries were selected based on phenotypic acceptance, growth duration, grain quality and yield. Most of the selected genotypes having aroma with slender grain type and medium growth duration. Among the tested entries two genotype IR18R1119 and IR18R1121 gave highest yield (6.3 t/ha) having aroma. The individual heritability obtained from plant height, growth duration and grain yield were 66%, 85%, and 45% respectively, indicating high level of precision in this experiment (**Table 16.5**).

Table 16.5: Performance of the entries in Preliminary Yield Trial (PYT#1), Water Saving and Aerobic Rice Breeding, Boro 2022-23

SL.	Designation	GD (Days)	PH (Cm)	TN	PAcp	Yield (t/ha)	Available traits in the population
1	IR18R1119	151	97	12	3	6.3	*Wx-A, Wx-10, fgr-1, Pita2, Gn1a, GS3, Chalk5*
2	IR18R1121	157	96	9	3	6.3	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A,Wx-10,Wx-op,Waxy,qXa4,xa5, qPi33*
3	IR18R1133	155	96	11	7	6.2	*SCT1, SCT2, SCT4, AG1, AG3, Saltol-Aro, qSIS1L,Sub1, Wx-A, Wx-op,Waxy, Hd1, GNP1, qXa4, qPi33*
4	IR19L1046	159	102	13	7	6.2	*SCT1, SCT2, SCT4, AG3,fgr-1, Wx-A, Wx-int, Wx-op, Waxy, Alk, GNP1, qXa4*
5	IR 122310:7-5-6	147	105	11	7	6.1	*Sub1, Wx-A, Wx-10, Pita2, Chalk5, GS3, xa4, xa5*
6	IR18R1149	150	96	12	5	6.0	*Wx-A, Wx-10, fgr-1, Pita2, Gn1a, GS3, Chalk5*
7	IR18R1160	154	101	13	5	6.0	*Wx-A, Wx-10, fgr-1, Pita2, Gn1a, GS3, Chalk5*
8	IR15A2619	146	100	11	5	5.9	*Wx-A, Wx-int, GS3, Chalk5, Pita2, Pi33*
9	IR19L1041	144	88	9	7	5.8	*Wx-A, Wx-NB, Pita2, Gn1a, GS3*
10	IR18R1124	153	95	10	7	5.7	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A, Wx-10, Wx-op, Waxy, qXa4, xa5, qPi33*
11	IR19L1051	145	99	10	5	5.7	*SCT1, SCT2, SCT4,fgr-1, NAS3, Wx-int, Wx-op, Waxy, Hd1, qXa4*
12	IR18R1120	151	93	11	5	5.5	*frg-1, Wx-A, Wx-10, Pita2, Chalk5, GS3, Gn1a, Xa4, xa5*
13	IR18R1118	152	95	15	5	5.4	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A, Wx-10, Wx-op, Waxy, qXa4, xa5, qPi33*
14	IR18R1117	153	101	12	5	5.4	*Wx-A, Wx-10, fgr-1, Pita2, Gn1a, GS3, Chalk5*
15	IR18R1179	153	95	11	9	5.2	*SCT1, SCT2, SCT4, Saltol-Aro,fgr-1, Wx-A, Wx-10, Wx-op, Waxy, qXa4, xa5, qPi33*
16	BRRI dhan88 (Ck)	142	88	13	7	5.6	*Wx-A, Wx-10*
17	BRRI dhan100	140	102	12	7	6.1	*Wx-A, Wx-10, AG3, Saltol-Aro,*

SL.	Designation	GD (Days)	PH (Cm)	TN	PAcp	Yield (t/ha)	Available traits in the population
	P value	****	****	ns	***	*	
	LSD (0.05)	4.5	8.4		1.9	1.0	
	H2b	0.85	0.69		0.66	0.45	

D/S:02/12/2022 D/T: 12/01/2023

Experiment 16.6. Preliminary Yield Trial (PYT#2), Water Saving and Aerobic Rice Breeding, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-investigator: Z A Riyadh, S Maniruzzaman and K M Iftekharuddaula

Specific objective: Preliminary evaluation of promising breeding lines for their phenotypic acceptability, adaptation under local climatic condition and grain yield potentials under on-station AWD condition.

Materials and Methods: Total twenty-seven genotypes with two checks were evaluated (**Table 16.6)** in west bayed BRRI. Thirty-eight days old seedlings were transplanted at a spacing of 20 × 20 cm with 2-3 seedlings per hill. The unit plot size was 5.5m^2. The field layout was RCB design with two replications. Fertilizers were applied @300:125:150: 90:10 kg/ha Urea, TSP, MoP, Gypsum and Zinc sulphate, respectively. All the fertilizers except urea were applied during final land preparation. Urea was applied in three splits at 15 and 40 days after transplanting and one week before PI. Weeding, pest control measures and other cultural practices were done as and when necessary. In regards to water management Alternate Wetting and Drying (AWD) technique were followed from one month after transplanting to flowering.

Results: A total of 13, out of 27, genotypes were selected based on phenotypic acceptance, growth duration, grain quality and higher yield potential. All the selected genotypes were slender grain type with short to medium growth duration. Among all tested advanced breeding lines, the genotype IR93339129-B-7-7-B-B-B-16 produced the highest yield (7.5 t/ha) followed by the genotype BR12493-5R-151 (7.3 t/ha). The yield range of the other selected genotypes was 5.3 t/ha to 7.2 t/ha with a growth duration ranging from 146 to 153 days. The individual heritability obtained from growth duration, plant height, PAcp and yield were 92%, 97%, 85% and 62% respectively, indicating high level of precision in this experiment (**Table 16.6**).

Table 16.6: Performance of the entries in Preliminary Yield Trial (PYT#2), Water Saving and Aerobic Rice Breeding, Boro 2022-23

Ent.	Designation	GD (days)	PH (Cm)	TN	PAcp	Yield (t/ha)	Available traits in the population
1	IR93339129-B-7-7-B-B-B-16	150	115	12	3	7.5	*Sub1,Wx-A, Wx-op, GNP1, GS3, Chalk5, qSCT1, Saltol, qDTY1.1, qDTY2.2*
2	BR12493-5R-151	148	100	12	3	7.3	*Sub1, Wx-A, Chalk5, Xa4, Xa7, DTH8, Gn1a*
3	BR11690-5R-98-P1	144	113	12	5	7.2	*Sub1, Wx-A, Wx-10, GS3, Hd3a, Pi33*
4	BR12489-5R-119	151	116	12	5	7.0	*Sub1, Wx-A, Wx-10, Chalk5, Xa4, Xa7*
5	IR15A2407	142	97	11	7	7.0	*Wx-A, Wx-10, Pita2, Gn1a, GS3, Chalk5*
6	BR11204-5B-219	138	98	11	7	7.0	*Wx-A, Wx-10, SCT1, SCT2, SCT4, AG3, Saltol, qSES1-2_4, xa4, Pi33*

7	IR15A3449	142	100	11	7	6.9	*Wx-int, GS3, Chalk5*
8	GSR IR 1-5-S14-S2-Y2	153	109	10	3	6.6	*Wx-A, Wx-10*
9	IR14L545	154	123	11	5	6.3	*No Wx Group*
10	GSR IR 1-12-S2-Y3-Y2	150	104	14	5	6.0	*Wx-A, Wx-10*
11	IR17L1446	150	97	13	7	5.9	*Wx-A, Wx-int, GS3, Chalk5, Pita2*
12	IR 121147-B-B-CMU 11-1-2	150	96	14	5	5.5	*Wx-A, Wx-10, BADH2.1-7*
13	IR18R1078	146	98	10	7	5.3	*Wx-A, Wx-10, Pita2, Gn1a, GS3, Chalk5*
14	BRRI dhan88 (Ck)	141	85	12	7	6.9	
	BRRI dhan100 (Ck)	139	106	13	7	6.4	
	P value	***	***	ns	***	**	
	LSD (0.05)	3.7	4.5		1.4	1.3	
	H2b	0.92	0.94		0.85	0.62	

D/S:02/12/2022 D/T: 12/01/2023

Experiment 16.7. Regional Yield Trial (RYT), Water Saving and Aerobic Rice Breeding, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-investigators: Z A Riyadh, S Maniruzzaman, K M Iftekharuddaula, S Parveen, M Salahuddin and R Islam, M F Islam, M R Hasan, M M R Dewan, M R A Sarker, M A Badshah, M Z Islam and P S Biswas

Specific objective: Evaluation of the breeding lines for yield potential and adaptability test under different agro-climatic conditions of Bangladesh.

Materials and Methods: Two genotypes and one standard check BRRI dhan58 were evaluated in Regional yield trial (**Table 1**). Forty to forty-five days old seedlings of each genotypes were transplanted @2-3 seedlings with a spacing of 20 cm × 20 cm. The unit plot size was 5m × 2m (25 hills × 10line). The field layout was RCBD with three replications. Fertilizers were applied @300:125:150: 100:12 kg/ha Urea, TSP, MP, Gypsum, and Zinc Sulphate, respectively. Urea were applied in three splits at 15 days after transplanting, 35 days after transplanting and 50 days after transplanting. Total amount of P, K, Gypsum and $ZnSO_4$ were applied at final land preparation. Weeding, pest control measures and other cultural practices were done as and when necessary. In regards to water management Alternate Wetting and Drying (AWD) technique were followed from one month after transplanting to flowering. To implement alternate wetting and drying (AWD) method, four to five AWD pipe, made of 25 cm long PVC pipe having 10 cm diameter, were placed in the field for easy monitoring of the water level. The bottom 15 cm of the tube is drilled with holes of 5 mm diameter spaced 2 cm apart on all sides. The drilled side of the tube was placed at a depth of 15cm so that 10 cm of its length remains above the soil surface. The soil inside the tube was removed until the bottom of the tube is visible. The first alternating wetting/drying cycle was started one month after transplanting and cycles were continued until the commencement of flowering. After first irrigation, the field was allowed to dry out until the soil surface inside the tube can be seen (i.e. 15 cm below the soil surface). Then, the field was re-flooded to 2-5 cm above the soil surface and then the next drying cycle begins.

Results: The genotype BR11710-5B-351 produced highest yield in Gazipur (6.7 t/ha), Sirajganj (6.7 t/ha) and Rajshahi (7.7 t/ha) with average growth duration of 154 days (**Table 16.7**). The early genotype BR11708-5B-224 produced highest yield in Rangpur (9.5 t/ha), Bhanga (5.4 t/ha) and Cumilla (6.8 t/ha) with a growth duration 0f 145 days which is one week earlier than the check variety BRRI dhan58 (152 days). However, on an average both the tested lines produced similar yields (6.6 t/ha) with the check variety BRRI dhan58 (6.8 t/ha). The genotype, BR11708-

5B-224 could be placed for RYT again with a check variety of similar growth duration. The heritability obtained for average growth duration and plant height was 90% and 89%. The individual heritability for yield in different locations varied from 45% to 95% (**Table 16.7**) indicating medium to high level of precision of these experiments.

Table 16.7: Performance of the lines in Regional Yield Trial (RYT_WS), Boro 2022-23

SN	Designation	GD (days)	PH (cm)	Yield (t/ha)								
				Gazipur	Kushtia	Rangpur	Siraj.	Bhanga	Cumilla	Rajsha.	Habi.	Mean
1	BR11710-5B-351	154	91	**6.7**	5.6	9.0	**6.7**	4.7	5.9	**7.7**	6.7	**6.6**
2	BR11708-5B-224	145	96	5.5	5.6	**9.5**	6.1	**5.4**	**6.8**	6.7	7.3	**6.6**
3	BRRI dhan58 (Ck)	152	97	6.6	**6.6**	9.1	6.2	4.0	6.5	7.6	**7.5**	**6.8**
	P Value	****	***	*	**	*	*	*	*	**	**	
	LSD (0.05)	5.2	5.0	0.89	0.3	0.5	0.4	1.0	0.4	0.3	0.3	
	H2b	0.90	0.89	0.62	0.96	0.45	0.75	0.69	0.90	0.95	0.94	

PROJECT 17: DEVELOPMENT AND VALIDATION OF HIGH BETA-CAROTENE RICE AND HIGH IRON & ZINC RICE VARIETIES (HEALTHIER RICE)

General objectives: Ingression of *Zmpsy1* and ApFer gene into popular rice varieties through backcross breeding and evaluation of agronomic and product performance (carotenoids/beta-carotene as well as Iron & Zinc level) of the introgressed advanced breeding lines of BRRI dhan29-Golden Rice and High Iron and Zinc Rice.

Project Leader: M A Kader

Experiment 17.1: Introgression of High Iron and Zinc trait into Aus, Aman and Boro varieties

Principal Investigator: M A Kader

Co-Investigators: R R Majumder, U R Shaha, T K Hore and K Fatema

Specific objective: Ingression of High Iron and Zinc gene into popular varieties/line BR11723-4R-27 (T. Aman), BRRI dhan71 (T. Aman), BRRI dhan81 (Boro), BRRI dhan87 (T. Aman), BRRI dhan89 (Boro), BRRI dhan98 (T. Aman).

Materials and Methods: In T. Aman 2022-23, Six BC_1F_1 generations and recurrent parents were grown in the hybridization block of BRRI green house at five dates with an interval of 7 days to synchronize flowering among male and female parents. Fertilizer management was done at the rate of 234:87:117: 78:12 kg Urea, TSP, MoP, Gypsum and $ZnSO_4$/ha. Urea was applied in three splits @ 65:70:65 kg/ha at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of P, K, Gypsum and $ZnSO_4$ was applied at final land preparation.

At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glycine bag. Pollination was performed with just anthesized panicles of the donor parent by dusting pollens on the emasculated panicle of the recipient parent.

Location : BRRI, Gazipur

Results and discussion: In T. Aman 2022-23 season, leaf samples of 180 BC_1F_1 plants were collected from six backcrosses for genotyping and 45 hemizygous plants (H type) were found for backcrossing and total 1,420 BC_2F_1 seeds were obtained from three backcrosses **(Table 17.1a).** However, in three 3 backcrosses (BR11723-4R-27, BRRI dhan81 and BRRI dhan87), none of the hemizygous plant (H type) was found. These were recorded and labeled properly. The F_1 seeds were sun-dried and stored in a cool and dry place. In Boro 2022-23 season, 980 F_1 seeds were obtained from 03 crosses **(Table 17.1b)** and a total of 260 BC_3F_1 seeds were obtained from 03 backcrosses **(Table 17.1c)** to develop high iron and zinc enriched rice.

Table 17.1a: Backcrosses made for Introgression of High Iron and Zinc gene, T. Aman 2022-23

SN	Parentage	No. of BC_2F_1 seeds
1	BRRI dhan71/ IR 135160 TR-3-B-19	720
2	BRRI dhan89/ IR 135160 TR-3-B-19	250
3	BRRI dhan98/ IR 135160 TR-3-B-19	450
Total		**1420**

Table 17.1b: Crosses made for Introgression of High Iron and Zinc gene, Boro 2022-23

SN	Parentage	No. of F_1 seeds
1	BR11723-4R-27/ IR 135160 TR-3-B-19	400
2	BRRI dhan81/ IR 135160 TR-3-B-19	240
3	BRRI dhan87/ IR 135160 TR-3-B-19	340
	Total	980

Table 17.1c: Backcrossed for Introgression of High Iron and Zinc *qTL,* Boro 2022-23

SN	BR No	Parentage	No. of BC_3F_1 seeds
1	15615	BRRI dhan71/ IR 135160 TR-3-B-19	50
2	15616	BRRI dhan89/ IR 135160 TR-3-B-19	60
3	15617	BRRI dhan98/ IR 135160 TR-3-B-19	150
		Total	260

Experiment 17.2: Introgression of GR2-E trait into Aus, Aman and Boro varieties

Principal investigator : M A Kader

Co-Investigators: R R Majumder, U R Shaha, T K Hore and K Fatema

Specific objectives: Introgression of GR2-E trait into six mega varieties: BRRI dhan48, BRRI dhan67 and BRRI dhan71, BRRI dhan84, BRRI dhan87 and BRRI dhan89 varieties developed by BRRI utilizing Marker-Assisted Selection procedures.

Materials and Methods: In T. Aman 2022 season, BC3F3 generations were grown in the hybridization Thirty-five days old seedlings were transplanted at 20 x 20 cm spacing using single seedling per hill in the field. Fertilizer management was done at the rate of 234:87:117: 78:12 kg Urea, TSP, MoP, Gypsum and ZnSO4/ha. Urea was applied in three splits @ 65:70:65 kg/ha at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of P, K, Gypsum and ZnSO4 was applied during final land preparation. In case of selection, plants of F_1 were selected considering plant architecture, tillering ability, panicle size, grain size and shape, lodging tolerance and tolerance to major diseases and insects under field condition and leaf samples were collected for confirming the presence of GR2-E trait. Marker Assisted Selection (MAS) approach was applied to select the plants from all segregating progenies.

Location : BRRI, Gazipur

Results and discussion: In T. Aman 2022-23 season, 567 homozygous plant (B type) were selected from 1047 plant of BC_3F_3 generation **(Table 17.2)**. The harvested seeds were sun-dried and stored in a cool and dry place.

Table 17.2: List of selected progenies from BC_3F_3, Development of Vitamin-A enriched rice (GR), T. Aman 2022-23

SN	BR#.	Designation	No. of plant sample collected	No. of A type plant (Azygous)	No. of H type plant (Hemizygous)	No. of B type plant (Homozygous)
1	BR14668	BRRI dhan48/ IR112060GR2-E:2-7-63-2-96	234	34	82	118
2	BR14669	BRRI dhan67/ IR112060GR2-E:2-7-63-2-96	87	12	35	40
3	BR14670	BRRI dhan71/ IR112060GR2-E:2-7-63-2-96	156	29	46	81
4	BR14671	BRRI dhan84/ IR112060GR2-E:2-7-63-2-96	162	34	32	96
5	BR14672	BRRI dhan87/ IR112060GR2-E:2-7-63-2-96	144	29	29	86
6	BR14673	BRRI dhan89/ IR112060GR2-E:2-7-63-2-96	264	83	35	146
Total			**1047**	**221**	**259**	**567**

Experiment 17.3: Contained trial (CT) of GR2-E BRRI dhan49 & GR2-E BRRI dhan62 Golden Rice in T. Aman season 2022-23

Principal investigator : M A Kader

Co-Investigators: R R Majumder, U R Shaha, T K Hore and K Fatema

Specific objective: To evaluate agronomic and product performance (Total carotene content) of the advanced introgressed breeding lines of pro-vitamin-A enriched GR2E BRRI dhan49 golden rice and GR2E BRRI dhan62 golden rice under screen house condition.

Materials and Methods: In T. Aman 2022-23 season, composed of 28 lines including 24 transgenic, three non-transgenic and one transgenic line was planted in a Randomized Complete Block Design (RCBD) with two replications. Single seedling was transplanted in a 3.2 meters × four rows plot where row-to-row distance and the distance between hills were both 20 cm. The total no. of hills per plot was 64. The net plot area was 143.36 m^2 and the net area per entry was 2.56 m^2. Fertilizer was applied at the rate of 234:87:117: 78:12 kg Urea, TSP, MoP, Gypsum and $ZnSO_4$/ha. Nitrogen was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 5 days before PI stage. Total amount of P, K, Gypsum and $ZnSO_4$ were applied at final land preparation.

Location : BRRI, Gazipur

Results: For evaluating potential unintended effects of the genetic modification, data from 24 pro-vitamin-A enriched GR2E BRRI dhan49 golden rice introgression lines and GR2E BRRI dhan62 golden rice introgression lines were pooled across all the genotypes and single-site statistical analyses were performed **(Table 17.3)**. Significant variations were found in most of the parameters among the tested introgressed lines. Highest 111 days to flower was observed for BR13263-GR2E:64-1-1-3, while the lowest 75 days was observed for BR13265-GR2E:10-1-1. On the other hand, the lowest days to maturity was found 99 days for BR13265-GR2E:10-1-1 and highest 135 days found for BR13263-GR2E:64-1-1-3. Plant height was ranged from 92.90-135.55 cm. Tiller no. per plant and panicle no. per plant was ranged from 9.20-12.50 and 8.00-9.55, respectively. Highest panicle length was found for BR13263-GR2E:85-1-1-3 (27.47 cm). Highest flag leaf length was observed for BR13265-GR2E:32-1-2-3 (42.87 cm) and highest flag leaf width was found for BR13263-GR2E:85-1-1-3 (1.68 cm). No. of spikelets per panicle was ranged from 954-2119. Grains with highest spikelet fertility was observed for BR13263-GR2E:12-1-1-3 (89.09%) while the lowest was observed for BR13265-GR2E:18-1-2-3 (73.91%). Grain length and grain width was ranged from 8.07-9.97 cm and 1.69-1.92 cm, respectively. Highest 1000 grain weight was found for BR13265-GR2E:18-1-2-3 (23.17 g) while the lowest was observed for BR13263-GR2E:88-1-1-3 (17.28g).

Highest grain yield per plot was found for BR13263-GR2E:12-1-1-3 (6.858 t/ha) followed by BR13265-GR2E:32-1-1-3 (6.612 t/ha), and BR13263-GR2E:17-1-1-3 (6.601 t/ha) **(Table 17.3, Figure 1)**. Carotenoid content after one-month harvest was measured 8.99 ug/g-15.11 ug/g.

Twelve promising lines i.e., BR13263-GR2E:24-1-1, BR13263-GR2E:36-1-1, BR13263-GR2E:12-1-1-3, BR13263-GR2E:17-1-1-3, BR13263-GR2E:64-1-1-3, BR13263-GR2E:66-1-1-3, BR13263-GR2E:85-1-1-3, BR13265-GR2E:10-1-1, BR13265-GR2E:32-1-1-3, BR13265-GR2E:68-1-1-3, BR13265-GR2E:87-1-1-3 and BR13265-GR2E:107-1-1-3 were selected based on their grain yield, carotenoid content and other yield contributing for further evaluation.

Table 17.3: Agronomic performance and Carotenoid content after one month of harvest of the pro-vitamin-A enriched GR2E BRRI dhan49 golden rice introgression lines and GR2E BRRI dhan62 golden rice introgression lines in Contained Trial (CT), Golden Rice (GR), T. Aman 2022-23

SN	Designation	DTF	DTM	PH	TNPP	PNPP	PL	FLL	FLW	NSPP
1	BR13263-GR2E:14-1-1	98	126	94	11	9.6	24.7	32.1	1.6	1135
2	BR13263-GR2E:24-1-1***	101	127	118	11	9.2	24.8	34.5	1.6	2119
3	BR13263-GR2E:36-1-1***	104	130	122	11	8.4	24.5	33.7	1.6	1311
4	BR13263-GR2E:56-1-1	92	118	97	10	8.1	23.7	30.2	1.5	1347
5	BR13263-GR2E:85-1-1	93	118	133	10	8.2	26	38.2	1.5	1631
6	BR13263-GR2E:2-1-1-3	92	118	94	10	8.6	24.1	29.2	1.6	1671
7	BR13263-GR2E:7-1-1-3	92	118	93	11	8.6	24.9	29.8	1.6	1278
8	BR13263-GR2E:12-1-1-3***	101	128	120	10	8.9	23	30.8	1.6	1061
9	BR13263-GR2E:15-1-1-3	105	131	123	12	8.7	25.8	34.1	1.6	1523
10	BR13263-GR2E:17-1-1-3***	89	113	135	11	8.5	23.4	32.5	1.6	1410
11	BR13263-GR2E:64-1-1-3***	111	135	107	9	8.2	23.6	30.3	1.5	1142
12	BR13263-GR2E:66-1-1-3***	87	109	127	11	8.6	24.3	37.2	1.6	1541
13	BR13263-GR2E:85-1-1-3***	103	129	114	10	8	27.5	36.2	1.7	1351
14	BR13263-GR2E:88-1-1-3	91	117	92	11	8.3	24.8	31.7	1.7	1444
15	BR13265-GR2E:10-1-1***	75	99	116	11	8.9	25.5	35	1.4	1531
16	BR13265-GR2E:98-1-1	78	108	119	10	8.7	26.1	37.9	1.4	1697

17	BR13265-GR2E:18-1-2-3	79	105	116	12	9	25.7	38.4	1.4	1212
18	BR13265-GR2E:32-1-1-3***	79	105	117	13	9.5	26.5	42.9	1.5	1110
19	BR13265-GR2E:32-1-2-3	78	104	105	11	9.2	26.2	37.4	1.6	1977
20	BR13265-GR2E:68-1-1-3***	81	105	103	11	9.2	25.1	38.1	1.5	1309
21	BR13265-GR2E:87-1-1-3***	78	102	98	11	8.7	24.1	34.7	1.5	954
22	BR13265-GR2E:87-1-2-3	78	102	99	10	9.4	23.6	29.5	1.4	1360
23	BR13265-GR2E:98-1-1-3	77	100	101	12	9.2	23.9	31.4	1.5	1283
24	BR13265-GR2E:107-1-1-3***	79	101	104	10	8.9	24.7	31.9	1.4	1672
25	BRRI dhan49 (Ck)	105	132	110	11	8.9	26.8	34.6	1.6	1594
26	BRRI dhan62 (Ck)	77	99	112	13	9	25.8	38	1.4	1708
27	BRRI dhan87 (Ck)	98	124	121	10	8.5	26	29.6	1.6	1275
28	IR112060 GR2-E:2-7-63-2-96 (Ck)	94	120	116	10	8.4	26.4	27	1.6	1274
LSD (0.05)		2.89	2.89	4.4	5	2	0.9	2.6	4.3	0.2
Level of significance		**	**	**	**	NS	NS	NS	**	NS
H2b		0.99	0.99	0.9	1	0	0.4	0.3	0.8	0.3

* Significant at 5% level, ** Significant at 1% level, *** Selected genotype
D/S: 1/7/2021 D/T: 26/7/2021
DTF=Days to 50% Flowering, DTM= Days to maturity, PH= Plant Height (cm), TNPP= Tiller Number per plant, PNPP= Panicle Number per plant (nos.), PL= Panicle Length (cm), FLL= Flag Leaf Length (cm), FLW= Flag Leaf Width (cm), NSPP= Number of Spikelets per plant

Table 17.3: Continued

SN	Designation	NFSPP	NUSPP	SF	GL	GW	TGW	Yield	TCC	**PAcp**
1	BR13263-GR2E:14-1-1	975	161	85.90	8.21	1.69	17.63	5.152	14.49	7
2	BR13263-GR2E:24-1-1***	1824	295	86.15	9.16	1.82	20.26	6.279	13.54	5
3	BR13263-GR2E:36-1-1***	1109	202	84.78	8.59	1.82	19.30	6.498	14.57	7
4	BR13263-GR2E:56-1-1	1114	233	82.73	8.77	1.88	20.88	5.488	13.95	5
5	BR13263-GR2E:85-1-1	1397	234	85.73	9.04	1.87	20.63	6.109	11.63	5
6	BR13263-GR2E:2-1-1-3	1326	346	79.40	8.35	1.78	18.96	5.525	12.63	5
7	BR13263-GR2E:7-1-1-3	999	279	78.21	8.38	1.75	17.86	5.390	12.81	7
8	BR13263-GR2E:12-1-1-3***	944	117	89.09	8.98	1.85	18.91	6.858	13.48	3
9	BR13263-GR2E:15-1-1-3	1223	300	80.36	8.55	1.81	18.54	5.972	13.00	5
10	BR13263-GR2E:17-1-1-3***	1167	243	82.79	8.07	1.87	20.92	6.601	10.61	3
11	BR13263-GR2E:64-1-1-3***	981	162	85.85	9.80	1.84	21.49	6.125	15.11	5
12	BR13263-GR2E:66-1-1-3***	1270	272	82.36	9.01	1.85	21.09	6.162	13.62	5
13	BR13263-GR2E:85-1-1-3***	1158	193	85.81	9.41	1.88	22.25	6.242	14.88	7
14	BR13263-GR2E:88-1-1-3	1156	288	79.99	8.48	1.80	17.28	5.188	13.68	7
15	BR13265-GR2E:10-1-1***	1293	238	84.52	9.78	1.81	20.28	6.356	10.41	5
16	BR13265-GR2E:98-1-1	1341	356	79.13	9.36	1.84	20.71	5.625	9.98	5
17	BR13265-GR2E:18-1-2-3	896	316	73.91	9.85	1.92	23.17	5.950	10.88	5
18	BR13265-GR2E:32-1-1-3***	876	235	78.90	9.43	1.89	22.93	6.612	11.18	5
19	BR13265-GR2E:32-1-2-3	1606	372	81.25	9.66	1.81	21.79	6.065	9.99	3
20	BR13265-GR2E:68-1-1-3***	1096	213	83.74	9.97	1.79	21.50	6.257	10.02	5
21	BR13265-GR2E:87-1-1-3***	795	159	83.33	9.31	1.87	21.57	6.212	10.06	5
22	BR13265-GR2E:87-1-2-3	1147	213	84.37	9.44	1.82	21.25	5.471	8.99	5
23	BR13265-GR2E:98-1-1-3	1045	238	81.52	9.62	1.87	21.96	5.584	10.01	7

24	BR13265-GR2E:107-1-1-3***	1336	336	79.97	9.46	1.80	19.92	6.242	9.93	5
25	BRRI dhan49 (Ck)	1269	326	79.57	8.77	1.83	20.50	5.915	0.00	5
26	BRRI dhan62 (Ck)	1327	381	77.72	9.84	1.85	21.35	5.845	0.00	5
27	BRRI dhan87 (Ck)	1027	249	80.54	9.20	1.86	20.40	6.062	0.00	5
28	IR112060 GR2-E:2-7-63-2-96 (Ck)	981	294	76.98	9.08	1.85	19.91	6.064	13.72	5
LSD (0.05)		141.7	81.91	3.841	0.63	0.10	1.697	0.967	0.735	
Level of significance		**	**	**	**	NS	**	NS	**	
Heritability		0.95	0.82	0.84	0.83	0.42	0.84	0.35	1	

* Significant at 5% level, ** Significant at 1% level, *** Selected genotype
D/S: 1/7/2021 D/T: 26/7/2021
NFSPP= Number of Filled Spikelets per plant (nos.), NUSPP= Number of Unfilled Spikelets per plant (nos.), SF= Spikelets fertility (%), GL= Grain Length (mm), GW= Grain Width (mm), TGW= 1000 Grain Weight (g), GY= Grain Yield (ton/ha), TCC= Total Carotenoid Content (ug/g).

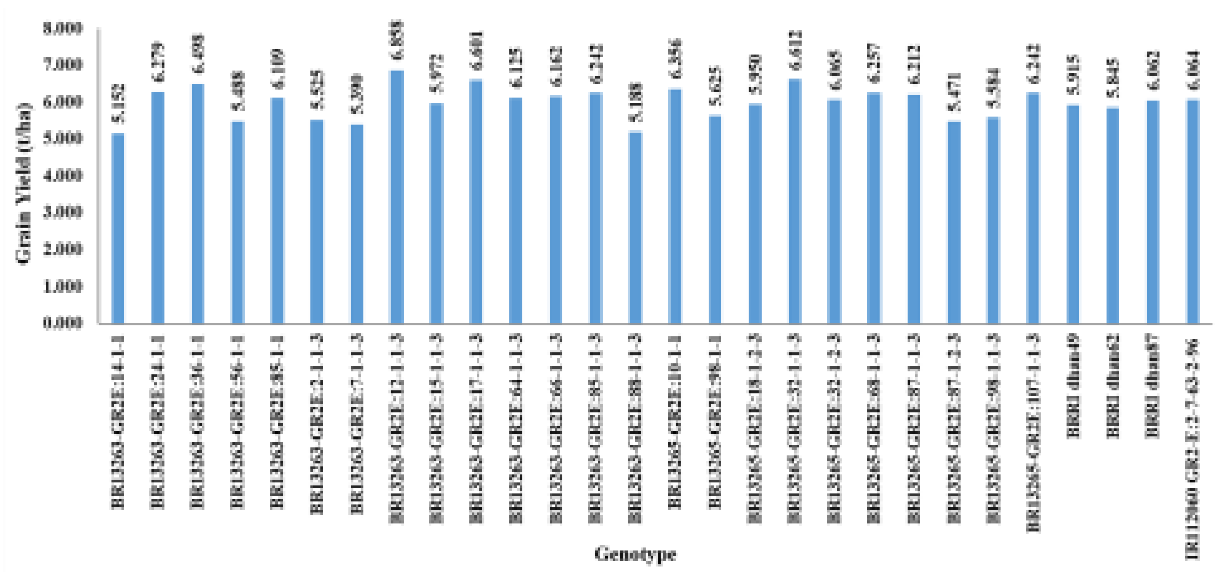


Figure 17.3.1. Graphical representation of yield performances of pro-vitamin-A enriched GR2E BRRI dhan49 golden rice introgression lines and GR2E BRRI dhan62 golden rice introgression lines in Contained Trial (CT), Golden Rice (GR), T. Aman 2022-23

Experiment 17.4: Carotenoid analysis of GR2E BRRI dhan29-Golden Rice (IR112060 GR2-E:2-7-63-2-96) to determine effect of storage duration and storage method

Principal investigator : M A Kader

Co-Investigators: R R Majumder, U R Shaha, T K Hore and K Fatema

Specific objective: To determine the losses of Beta-carotene due to various storage methods and storage duration of golden rice.

Material: Advanced breeding line of BRRI dhan29-Golden Rice (IR112060 GR2-E:2-7-63-2-96)

Storage Duration: 0-12 months

Storage method-

1. Gunny bag- Unparboiled
2. Gunny bag- Parboiled
3. Plastic bag- Unparboiled
4. Plastic bag - Parboiled
5. Drum- Unparboiled

6. Drum- Parboiled
7. Cold room- Unparboiled
8. Cold room- Parboiled

Samples were collected and polished (10%) from each source and were tested to determine Beta-carotene content. Beta-carotene were analyzed immediately after harvest on 3rd week of June . The result of carotenoid degradation of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) due to storage method and duration of 12 consecutive months were shown here **(Table 17.4)**.

Result: With the increasing storage duration, the carotenoid level in GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) was gradually decreasing. After the harvesting, the carotenoid level was highest (14.15 mg/kg) in all methods, but after 12 months of storage, the carotenoid level was lowest (3.20 mg/kg) in gunny bag parboiled storage methods. So, due to storage duration, a significant difference was present in carotenoied degradation in all methods of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) as determined by both AAS and HPLC methods **(Table 17.4 & 17.5 and Figure 2)**.

In different storage methods, no significant difference was observed in GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) except for the 7th and 8th months of storage as determined by AAS and the 2nd, 3rd, and 4th months of storage as determined by HPLC methods **(Table 17.4 & 17.5 and Figure 3).**

Table 17.4: Carotenoid degradation analysis by AAS of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) due to storage method and duration, 2022 (Sample of Boro 2020-21 of BRRI, Gazipur)

Method/ Duration	Amount of carotenoid (mg/kg)									LSD	Sig. Level
	Cold Room		Drum		Gunny bag		Plastic Bag		Mean		
	PB	UPB	PB	UPB	PB	UPB	PB	UPB			
0 M	13.48	14.15	13.48	14.15	13.48	14.15	13.48	14.15	13.82	2.77	**NS**
1 M	10.26	10.92	9.63	10.44	9.04	9.59	9.55	9.90	9.92	1.17	**NS**
2 M	7.56	7.70	7.25	7.53	5.91	6.59	6.19	7.06	6.97	1.34	**NS**
3 M	7.03	7.45	6.15	6.97	5.67	6.36	6.05	6.52	6.53	1.11	**NS**
4 M	6.36	6.78	5.70	5.84	5.50	5.61	4.97	5.81	5.82	1.27	**NS**
5 M	5.77	5.80	5.61	5.68	5.28	5.43	4.87	5.04	5.44	1.56	**NS**
6 M	5.36	5.46	4.59	4.85	4.34	4.64	4.47	4.70	4.80	1.83	**NS**
7 M	5.18	5.23	4.10	4.70	3.70	4.31	3.99	4.56	4.47	1.02	*
8 M	4.97	5.15	3.93	4.67	3.54	4.25	3.86	4.51	4.36	1.89	*
9 M	4.72	5.01	4.27	4.41	3.67	3.81	4.23	4.28	4.30	2.11	**NS**
10 M	4.60	4.89	4.18	4.39	3.44	3.77	4.06	4.12	4.18	1.49	**NS**
11 M	4.28	4.50	3.81	4.23	3.38	3.65	3.72	4.06	3.95	1.91	**NS**
12 M	4.11	4.27	3.23	4.09	3.20	3.54	3.46	3.82	3.72	1.69	**NS**
Mean	6.44	6.72	5.84	6.30	5.40	5.82	5.61	6.04	-	1.33	**NS**
LSD<0.05	2.75	3.34	4.11	4.17	3.76	3.97	4.38	4.11	5.34		
Sig. Level	***	***	***	***	***	***	***	***	**		

PB= Perboiled; UPB= Unperboiled; * P≤ 0.05, ** P≤ 0.01, *** P≤ 0.001

Table 17.5: Carotenoid degradation analysis by HPLC of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) due to storage method and duration, 2022 (Sample of Boro 2020-21 of BRRI, Gazipur)

Method/ Duration	Amount of carotenoid (mg/kg)									LSD	Sig. Level
	Cold Room		Drum		Gunny bag		Plastic Bag		Mean		
	PB	UPB	PB	UPB	PB	UPB	PB	UPB			
0 M	15.86	18.36	15.86	18.36	15.86	18.36	15.86	18.36	17.11	4.13	NS
1 M	14.47	15.97	14.77	15.00	14.70	16.37	13.65	14.77	14.96	2.94	NS
2 M	14.38	15.80	11.18	14.83	11.73	14.11	9.45	12.92	13.05	2.23	*
3 M	12.30	12.67	11.18	12.75	11.73	13.07	9.45	11.12	11.78	3.56	*
4 M	9.42	10.97	8.16	9.79	8.41	9.87	8.77	9.55	9.37	2.23	**
5 M	6.78	8.17	5.56	6.37	5.50	6.81	5.72	6.06	6.37	2.99	NS
6 M	5.19	5.62	4.61	4.89	4.56	5.55	4.02	4.91	4.92	2.34	NS
7 M	3.22	3.77	3.84	4.03	3.84	4.04	4.00	4.63	3.92	1.87	NS
8 M	3.01	3.67	2.90	2.99	3.07	3.42	3.05	3.33	3.18	1.51	NS
9 M	2.96	3.30	2.70	2.78	2.85	3.18	3.00	3.12	2.99	1.21	NS
10 M	1.92	2.26	1.65	1.73	1.80	2.14	1.85	2.07	1.93	0.87	NS
11 M	0.88	1.22	0.71	0.80	0.71	1.05	0.70	0.87	0.87	1.11	NS
12 M	0.05	0.18	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.43	NS
Mean	6.96	7.84	6.40	7.26	6.52	7.54	6.12	7.06	-	1.96	NS
LSD<0.05	3.11	2.73	3.23	4.45	3.39	3.97	3.51	4.17	4.79		
Sig. Level	***	***	***	***	***	***	***	***	**		

PB= Perboiled; UPB= Unperboiled; * P≤ 0.05, ** P≤ 0.01, *** P≤ 0.001

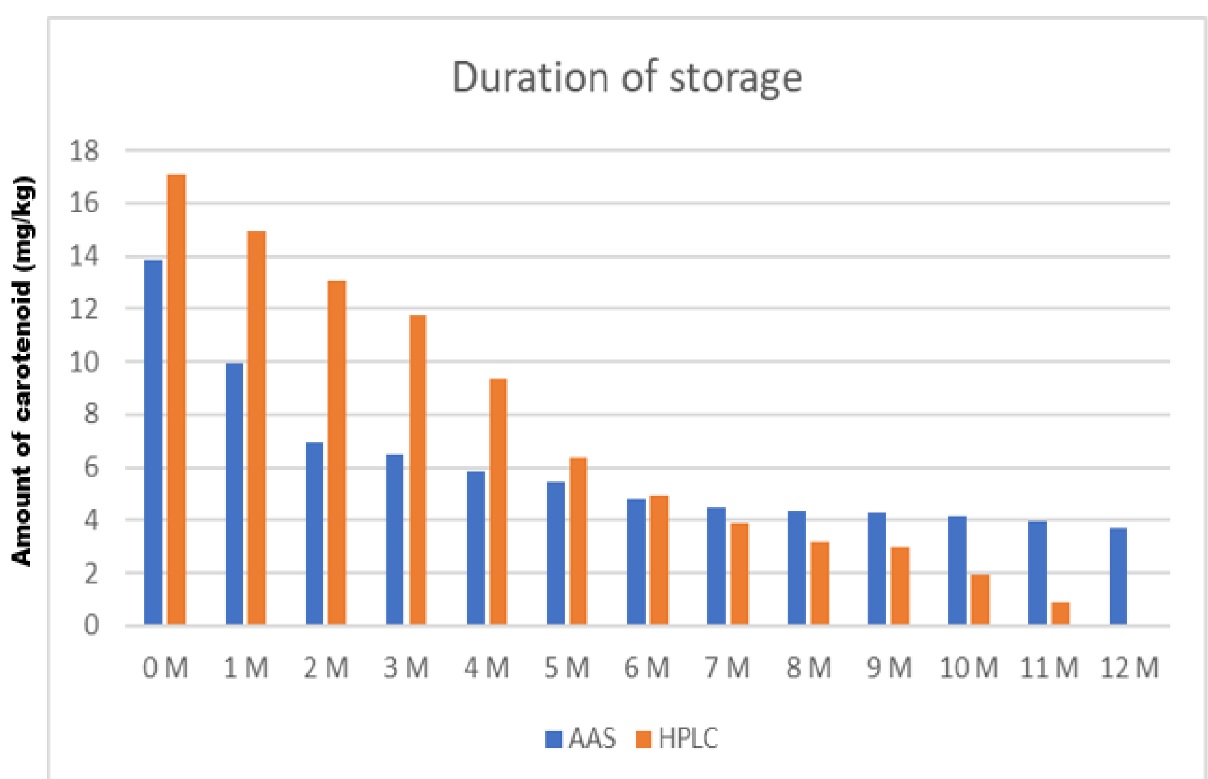


Figure 2: Carotenoid degradation of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) due to storage duration, 2022 (Sample of Boro 2020-21 of BRRI, Gazipur).

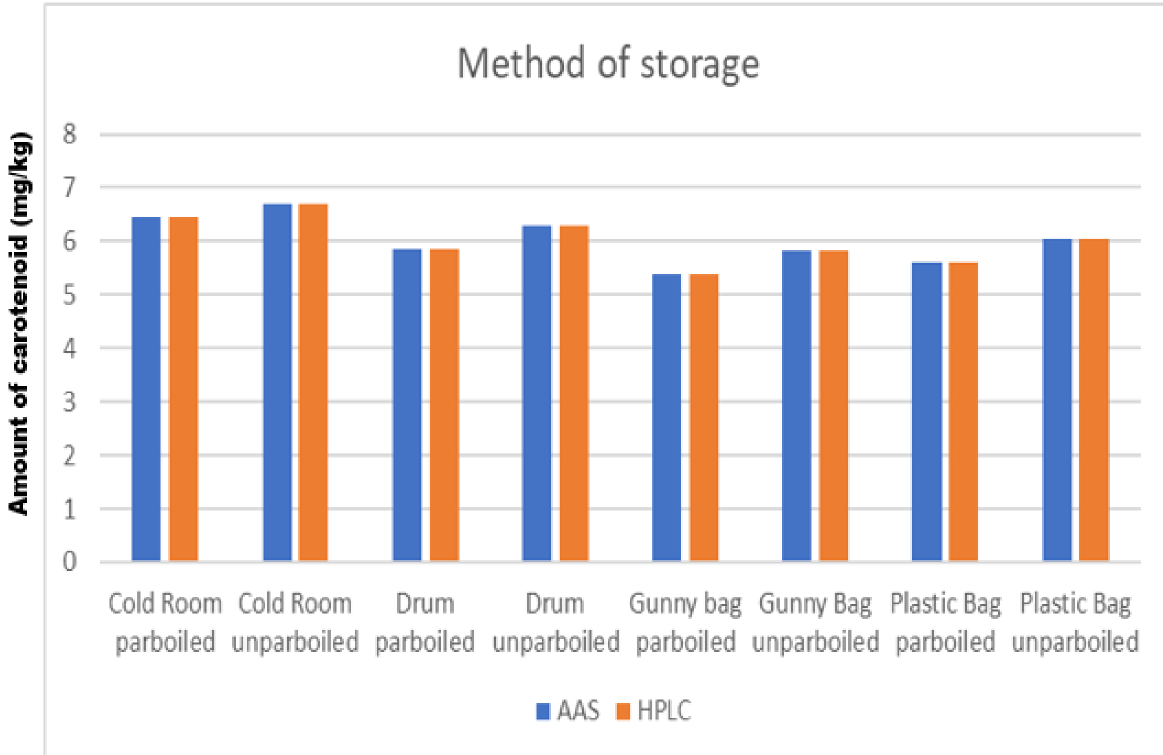


Figure 3: Carotenoid degradation of GR2E BRRI dhan29 golden rice (IR112060 GR2E:2-7-63-2-96) due to method of storage, 2022 (Sample of Boro 2020-21 of BRRI, Gazipur).

PROJECT18: DEVELOPMENT OF ANTIOXIDANT ENRICHED RICE (AER) VARIETY

General objectives: Development of anthocyanin enriched value-added rice genotypes with high yield potential for rainfed and irrigated ecosystems in Bangladesh.

Project Leader: Sharmistha Ghosal

Experiment 18.1: Hybridization

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: To introgress plant compounds with antioxidant properties including anthocyanin with or without aroma into high yielding genetic background.

Materials and Methods: A total of 42 genotypes (17 in Aman and 25 in Boro) were used for crossing **(Table 18.1a)**. Pigmented genotypes were used as donor parents. All the parents were grown in the hybridization block of Plant Breeding Division at three staggers with an interval of seven days to synchronize flowering among male and female parents. Fertilizers were applied at the rate of 200 kg urea, 70 kg TSP, 80 kg MOP, 60 kg gypsum and 5 kg zinc sulphate/ha in T Aman season and 260 kg Urea, 100 kg TSP, 120 kg MP, 110 kg Gypsum, 11 kg $ZnSO_4$/ha in Boro season. Urea was applied in equal three splits at 10-15, 25-30 and 40-45 days after transplanting. The fertilizers other than urea were applied as basal during final land preparation. Other cultural and pest management practices were done as and when necessary. Leaf samples were collected from labeled 12 healthy plants of each parent for QC genotyping with 10 SNP panel. The plants showing unique profiles of each parent were used to make crosses. At flowering, emasculation was done on the day before anthesis using vacuum emasculator and emasculated panicles were bagged with glycine bag. Pollination was performed with just anthesized panicles of the male parent by dusting pollens on the emasculated panicle of the female parent.

Results: A total of 38 crosses were made (in T Aman 15 crosses and 23 crosses were made in Boro season. A total of 8,870 F1 seeds were produced **(Table 18.1b).** The naked F_1 seeds were threshed, labeled, cleaned, dried and preserved properly.

Table18.1a: List of parents grown for hybridization, Development of Antioxidant enriched rice, T. Aman and Boro 2022-23

SL No	Designation	SL No	Designation
T Aman 2022-23			
1	BR11949-4R-258	10	Black Rice Nepal
2	BR9674-1-1-5-1P3 (Zn)	11	BR12839-4R-90-1
3	Bashful	12	BR12839-4R-93
4	Black Rice (Acc 8201)	13	BR12839-4R-157
5	Black Rice -07 (GQN)	14	BRRI dhan70
6	Black Rice -08 (GQN)	15	BRRI dhan80
7	Black Rice -09 (GQN)	16	IR12A173
8	Black Rice (Acc 4672)	17	IR17A1694
9	Black Rice (Acc 4968)		
Boro 2022-23			
1	Black Rice (Acc 4968)	14	BR11712-4R-227
2	Black Rice -10 (GQN)	15	BR9674-1-1-5-1P3
3	Black Rice -11 (GQN)	16	BR9674-8-15-3-28-P3
4	BR12836-4R-312	17	BR11315-5R-17-52
5	BR12836-4R-63	18	BRRI 45R
6	BR12839-4R-21	19	BRRI 47R
7	BR12839-4R-51	20	BRRI dhan89
8	BR12839-4R-138-4	21	BR10571-15-6-8-5
9	BR12839-4R-73	22	BR 11-9-11-4-5B
10	BR12835-4R-142	23	Purple rice
11	BR12836-4R-18	24	IR18A1398
12	BR12839-4R-157-2	25	BR1137-5R-140
13	BR12835-4R-218		

Table 18.1b: List of crosses made, Development of Anti-oxidant enriched rice, T. Aman and Boro 2021-22

SL No	BR Number	Parentage	Average Parental Yield (t/ha)	Seed no	Objectives
		T Aman 2022-23			
1	BR15333	BRRI dhan80/Black Rice (Acc 4672)	6.0	185	Pigmentation
2	BR15334	IR17A1694/Black Rice (Acc 4968)	6.0	111	do
3	BR15335	BRRI dhan70/BR12839-4R-93	6.0	342	do
4	BR15336	BR9674-1-1-5-1P3/BR12839-4R-93	7.0	153	do
5	BR15337	IR17A1694/BR12839-4R-90-1	7.0	88	do
6	BR15338	BR9674-1-1-5-1P3/ Black Rice (Acc 4672)	6.0	100	do
7	BR15339	BR12839-4R-90-1/BRRI dhan87	6.3	158	do
8	BR15340	BR12839-4R-93/BRRI dhan87	6.5	162	do
9	BR15341	BR12839-4R-90-1/ IR12A173	6.5	122	do
10	BR15342	BR12839-4R-157/ BRRI dhan90	6.0	286	do
11	BR15343	BR12839-4R-93/ IR12A173	6.6	125	do
12	BR15344	BRRI dhan87/ BR12839-4R-90-1	6.4	119	do
13	BR15345	BRRI dhan87/ Black Rice (Acc 8201)	6.0	249	do
14	BR15346	BRRI dhan87/ Black Rice (Acc 4968)	6.0	123	do
15	BR15347	BR12839-4R-157/ BRRI dhan87	6.5	150	do
		Total		**2,473**	
Boro 2022-23					
1	BR15730	BR1137-5R-140/ Black Rice (Acc 4968)	5.6	178	do

SL No	BR Number	Parentage	Average Parental Yield (t/ha)	Seed no	Objectives
2	BR15731	BR1137-5R-140 / BR12836-4R-312	7.0	292	do
3	BR15732	IR18A1398/ BR12839-4R-51	6.8	473	do
4	BR15733	BR11712-4R-227/ Black Rice -10 (GQN)	6.8	283	do
5	BR15734	BR11712-4R-227/ Black Rice -11 (GQN)	6.8	120	do
6	BR15735	BR9674-1-1-5-1P3/ BR12836-4R-312	6.8	411	do
7	BR15736	BR9674-1-1-5-1P3/ BR12839-4R-51	6.4	440	do
8	BR15737	BR9674-8-15-3-28-P3/ BR12839-4R-138-4	7.0	192	do
9	BR15738	BR9674-8-15-3-28-P3/ BR12839-4R-73	6.5	103	do
10	BR15739	BR9674-8-15-3-28-P3/ BR12835-4R-142	6.1	381	do
11	BR15740	BR11315-5R-17-52/ BR12836-4R-312	6.8	112	do
12	BR15741	BRRI 45R/ BR12836-4R-18	6.5	37	do
13	BR15742	BRRI 47R/ BR12839-4R-157-2	7.1	87	do
14	BR15743	IR19L1046/BR12839-4R-157-2	6.4	129	do
15	BR15744	BRRI dhan89/ BR12839-4R-157-2	7.6	127	do
16	BR15745	BRRI dhan89/ BR12836-4R-312	7.4	114	do
17	BR15746	BR10571-15-6-8-5/ BR12839-4R-157-2	7.5	428	do
18	BR15747	BR10571-15-6-8-5/ BR12836-4R-312	7.3	299	do
19	BR15748	BR10571-15-6-8-5/ BR12835-4R-142	6.4	686	do
20	BR15749	BR 11-9-11-4-5B/ BR12836-4R-63	6.8	488	do
21	BR15750	Purple rice/ BR12839-4R-21	5.7	490	do
22	BR15730	BR12835-4R-142/ BR11712-4R-227	8.5	114	do
23	BR15731	BR12835-4R-142/BR12835-4R-218	8.5	13	do
		Total		**5,997**	
		Grand total		**8,870**	

Experiment 18.2: Confirmation of F_1s

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Confirmation of F_1s as true crosses and selection of promising ones.

Materials and methods: A total of 23 single crosses (four crosses in Aman and 19 crosses in Boro) along with their respective parents were grown. F_1 seeds of each cross and their respective parents were germinated in petri dishes and then sown in earthen pots. Thirty to thirty-five days old seedlings were transplanted at the rate of single seedling at a spacing of 25 cm x 20 cm. Respective parental seedlings were transplanted on both sides of each F_1 population. Crop management were done as described in Experiment 18.1. The leaf samples were collected from each of the 12 plants from each cross and respective parents for QC genotyping to determine true F_1. QC genotyping were performed using 10 QC SNPs panel at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F_1s were selected. The F_2 seeds obtained from each cross were labeled, cleaned, dried and preserved properly.

Results: All the 23 crosses were confirmed and selected as true hybrids (**Table 18.2**).

Table 18.2: List of confirmed and selected F_1s as true hybrids, Development of Antioxidant Enriched Rice, T. Aman and Boro 2022-23

SL No	BR Number	Parentage	Characters
Aman 2022-23			
1	BR14902	Pusa Basmati/Black rice (Sylhet)*	High yield with pigmentation
2	BR14903	FBR-376/Black rice (Sylhet)*	do
3	BR14904	Nania/Black rice (Sylhet)*	do

SL No	BR Number	Parentage	Characters
4	BR14905	IR99285-1-1-1-P2 (Zn)/Black rice (Sylhet)*	do
5	BR14906	BR11716-4R-172/Black rice (Sylhet)*	do
6	BR14907	BR11712-4R-227/Black rice (Sylhet)*	do
7	BR14908	BR9930-2-3-2-2 (PQR Boro)/Black rice (Sylhet)*	do
8	BR14910	Nania/Black Rice (Acc.8096)	do
9	BR14912	BR11716-4R-172/Black Rice (Acc.8096)	do
10	BR14913	BR11712-4R-227/Black Rice (Acc.8096)	do
11	BR14916	BR8862-29-1-5-1-5/ Black Rice (Acc.8096)	do
12	BR14919	BRRI dhan90/ China70 (Acc.7170)	do
13	BR14920	BRRI dhan92/ China70 (Acc.7170)	do
14	BR14921	BRRI dhan50/China70 (Acc.7170)	do
15	BR14922	IRRI 154 frg1/ China70 (Acc.7170)	do
16	BR14923	IR99285-1-1-1- P2/China70 (Acc.7170)	do
17	BR14924	BR8862-29-1-5-1-5/ China70 (Acc.7170)	do
18	BR14925	China70 (Acc.7170)/ BR11716-14-172	do
19	BR14926	China70 (Acc.7170)/ FBR-376	do
20	BR14927	China70 (Acc.7170)/ BR11712-4R-227	do
21	BR14928	Black rice Sylhet/ BRRI dhan90	do
22	BR14929	BR8862-29-1-5-1-3/ Black rice (Sylhet)	do
23	BR14930	IRRI 154 frg1/Black rice (Indonesia)	do
24	BR14932	BR11712-4R-227/ Black rice (Indonesia)	do
25	BR14934	Begunidhan/Black rice (Sylhet)	do
Boro 2022-23			
1	BR15336	BR9674-1-1-5-1P3/BR12839-4R-93	do
2	BR15337	IR17A1694/BR12839-4R-90-1	do
3	BR15339	BR12839-4R-90-1/BRRI dhan87	do
4	BR15340	BR12839-4R-93/BRRI dhan87	do
5	BR15342	BR12839-4R-157/ BRRI dhan90	do
6	BR15347	BR12839-4R-157/ BRRI dhan87	do

Experiment 18.3: Rapid Generation Advance (RGA)

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Rapid advancement of segregating population for shortening breeding cycle and development of large RIL population.

Materials and Methods: In T Aman season, a total of eight F_2, four F_3, four F_4 and five F_5 populations were grown **(Table 18.3a)** and in Boro season a total of six F_2, 23 F_3, eight F_4 and four F_5 populations were grown **(Table 18.3b).** Single seed progenies from single panicle of one plant were grown in the RGA nursery both in screen house and in field. In the green house, seeds were directly sown in the tray followed by thinning and tiller pruning. While in the field, part of the panicle was sown directly on the soil. No thinning or pruning was done. Fertilizer management was done using half of the dosages described in Expt. 18.1. Appropriate pest management practices were done as and when necessary. During harvesting at maturity, one panicle was collected from each plant of all the crosses in different times and the plant was uprooted. Harvested seeds remaining in the panicles were dried and subjected for dormancy breakage to initiate next cycle of RGA. For dormancy breaking, at first, sun-drying was done for three days followed by oven drying with 50°C temperature for 72 hours.

Results and discussion: In Aman season, panicles of 10, 698 progenies from 21 crosses (6962 progenies of eight F_2 crosses, 2144 progenies of four F_3 crosses, 1025 progenies of four F_4 crosses and 567 progenies of five F_5 crosses) were advanced through RGA (**Table 18.3a**). And in Boro season panicles of 17, 400 progenies from 41 crosses (4000 progenies of six F_2 crosses, 10,100 progenies of 23 F_3 crosses, 2500 progenies of eight F_4 crosses and 800 progenies of four F_5 crosses) were advanced through RGA. (**Table 18.3b**). The harvested panicles were labeled, dried and preserved properly.

Table 18.3a: List of F_2, F_3, F_4 and F_5 populations advanced through RGA, Development of Antioxidant Enriched Rice, T. Aman 2022-23

SL	BR Reg.	Parentage	No. of progenies	
			Grown	Harvested
T Aman 2022-23				
F_2 Population				
1	BR14563	BRRI dhan90/Black rice (PKSF)	1825	1056
2	BR14564	BRRI dhan99/PadiBungi	1728	1240
3	BR14565	BRRI dhan100/Padichelam	1470	1150
4	BR14567	BRH11-9-11-45B-HR3/Black rice (Sylhet)*	1430	900
5	BR14568	Ja Hua/Black rice (Sylhet)*	1244	652
6	BR14571	BRRI dhan90/ Black rice (Sylhet)*	1292	800
7	BR14572	BR8882-30-2-5-2/ Black rice (Sylhet)*	1450	520
8	BR14574	BRRI dhan81/ Black rice (Sylhet)*	1330	644
		Total	**11,769**	**6,962**
F_3 Population				
1	BR13940	BRRI dhan100/Black Rice (Japanese)	892	588
2	BR13941	Black Rice (Japanese)/BRRI dhan100	704	512
3	BR13944	Black rice (Sylhet)/BRRI dhan70	1132	460
4	BR13945	BRRI dhan90/Black rice(aroma)	868	584
			3,596	2,144
F_4 generation				
1	BR13751	Purple rice (cum)/Black rice	352	300
2	BR13753	Purple rice (kochoa)/Black rice	432	345
3	BR13754	BRRI dhan87/ Black rice	124	100
4	BR13755	BRRI dhan87/Black rice(nepal)	360	280
			1,268	**1,025**
F_5 generation				
1	BR13318	Black rice (Nepal)/BRRI dhan81	188	150
2	BR13319	Purple rice (Breeding)/TB Gura	120	100
3	BR13321	Purple rice (Hbj)/TB Gura	128	110
4	BR13323	Purple rice (Kochoa)/Patnai23	184	132
5	BR13325	BRRI dhan81*2/Black rice	100	75
		Total	**720**	**567**
			Grand total	

Table 18.3b: List of F_2, F_3, F_4 and F_5 populations advanced through RGA, Development of Antioxidant Enriched Rice, Boro 2022-23

Sl	BR#	Parentage	Characteristics	Progenies
Boro 2022-23				
F_2 Population				
1	**BR14902**	**Pusa Basmati/Black rice (Sylhet)***	Pigmentation	700
2	BR14903	FBR-376/Black rice (Sylhet)*	do	500
3	BR14904	Nania/Black rice (Sylhet)*	do	500
4	BR14905	IR99285-1-1-1-P2 (Zn)/Black rice (Sylhet)*	do	400
5	BR14906	BR11716-4R-172/Black rice (Sylhet)*	do	500
6	BR14908	BR9930-2-3-2-2 (PQR Boro)/Black rice	do	400
7	**BR14910**	**Nania/Black Rice (Acc.8096)**	do	700

Sl	BR#	Parentage	Characteristics	Progenies
8	BR14912	BR11716-4R-172/Black Rice(Acc.8096)	do	500
9	BR14913	BR11712-4R-227/Black Rice(Acc.8096)	do	500
10	BR14916	BR8862-29-1-5-1-5/ Black Rice(Acc.8096)	do	400
11	BR14919	BRRI dhan90/ China70 (Acc.7170)	do	500
12	BR14920	BRRI dhan92/ China70 (Acc.7170)	do	500
13	BR14921	BRRI dhan50/China70 (Acc.7170)	do	500
14	BR14922	IRRI 154 frg1/ China70 (Acc.7170)	do	500
15	BR14923	IR99285-1-1-1- P2/China70 (Acc.7170)	do	500
16	**BR14925**	**China70 (Acc.7170)/ BR11716-14-172**	do	1700
17	BR14926	China70 (Acc.7170)/ FBR-376	do	500
18	**BR14927**	**China70 (Acc.7170)/ BR11712-4R-227**	do	1700
19	BR14928	Black rice Sylhet/ BRRI dhan90	do	500
20	BR14929	BR8862-29-1-5-1-3/ Black rice (Sylhet)	do	500
21	BR14930	IRRI 154 frg1/Black rice (Indonesia)	do	500
22	**BR14932**	**BR11712-4R-227/ Black rice (Indonesia)**	do	1200
23	BR14934	Begunidhan/Black rice (Sylhet)	do	500
			Sub total	**14,700**
F_3 generation				
1	BR14563	BRRI dhan90/Black rice (PKSF)	Pigmentation	1056
2	BR14564	BRRI dhan99/PadiBungi	do	1240
3	BR14565	BRRI dhan100/Padichelam	do	1150
4	**BR14567**	**BRH11-9-11-45B-HR3/Black rice**	do	**900**
5	**BR14568**	**Ja Hua/Black rice (Sylhet)**	do	**540**
6	BR14571	BRRI dhan90/ Black rice (Sylhet)	do	800
7	BR14572	BR8882-30-2-5-2/ Black rice (Sylhet)	do	520
8	BR14574	BRRI dhan81/ Black rice (Sylhet)	do	644
			Sub total	**6,850**
F_4 generation				
1	BR13940	BRRI dhan100/Black Rice (Japanese)	Pigmentation	288
2	BR13941	Black Rice (Japanese)/BRRI dhan100	do	212
3	BR13944	Black rice (sylhet)/BRRI dhan70	do	460
4	BR13945	BRRI dhan90/Black rice(aroma)	do	384
			Sub total	**1,344**
F_5 Population				
1	BR13751	Purple rice (cum)/Black rice	Pigmentation	120
2	BR13753	Purple rice (kochoa)/Black rice	Pigmentation	32
3	BR13754	BRRI dhan87/ Black rice	Pigmentation	72
4	BR13755	BRRI dhan87/Black rice(nepal)	Pigmentation	232
			Sub total	**456**
			Grand total	**23,350**

Experiment 18.4: Line Stage Testing (LST)

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of uniform pigmented genotypes in terms of uniformity in flowering, plant height, amylose content with higher predicted yield with key target traits.

Materials and Methods: In T Aman season a total of 1682 fixed lines from 11 crosses and in Boro season, a total of 300 fixed pigmented advanced lines from 18 crosses were grown in 12-hills single-row plots using systematic arrangement design with respective parents and check varieties. Twenty-five to thirty days old single seedlings were transplanted at 20 cm × 20 cm spacing. Fertilizer management was done following the dosages described in Expt. 18.1. Crop management was done as recommended for modern rice cultivation practices.

Results and discussion: In T Aman, 163 fixed lines from 1682 fixed lines were selected from 11 crosses of LST (Table 18.4a) and in Boro season, A total of 15 fixed lines were visually selected from 162 fixed lines of four crosses of LST (Table 18.4b) based on phenotypic acceptance, uniformity in flowering, plant height, grain size and shape, lodging tolerance and pigmentation and presence higher predicted yield.

Table 18.4a: List of superior fixed lines selected from LST populations, Antioxidant enriched rice, T. Aman, 2022-23

SN	BR No.	Parentage	No. of lines	
			Grown	Selected
1	BR13316	Aftab-5/Purple rice(Cum)	160	4
2	BR13317	Purple rice(Cum)/Aftab-5	160	5
3	BR13320	Purple rice(Cum)/BR8536-2-1-1-3	170	2
4	BR13322	Purple rice(Kochoa)/JessoBalam	180	2
5	BR13324	Purple rice (Sylhet)/BR8536-27-2-1-2	185	-
6	BR12831	BRRI dhan81/Black rice(GRS-1)	170	10
7	BR12833	BRRI dhan81/Black rice (Nepal)	180	29
8	BR12834	Black rice (Nepal)/BRRI dhan81	140	11
9	BR12835	Black rice (Nepal)/BRRI dhan28	100	21
10	BR12837	BRRI dhan50/Black rice (Nepal)	217	75
11	BR12838	Black rice(GRS-5)/BRRI dhan50	20	4
		Total	**1,682**	**163**

Table 18.4b: Table 18.4a: List of superior fixed lines selected from LST populations, Antioxidant enriched rice, Boro 2022-23

SN	BR No.	Parentage	Lines grown	Lines Selected
1	BR13751	Purple rice (cum)/Black rice	40	5
2	BR13753	Purple rice (kochoa)/Black rice	22	3
3	BR13754	BRRI dhan87/ Black rice	40	2
4	BR13755	BRRI dhan87/Black rice(Nepal)	60	5
		Total	**162**	**15**

Experiment 18.5: Observational Yield Trial #1 (OYT#1), Development of Antioxidant Enriched Rice, T. Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population, shorter growth duration and higher yield potentials with higher nutraceutical value than the standard checks varieties.

Materials and Methods: A total of 182 black rice genotypes along with five checks were evaluated in Augmented RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 5 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 36 genotypes were selected out of 182 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma, black pigmentation and higher yield. The yield was ranged from 4.4 to 6.8 t/ha with a growth duration of 122 to 135 days. The highest yielding genotype, BR12839-4R-8 gives 6.8 t/ha yields with duration of 126 days followed by the genotype BR12839-4R-181-1 having a yield of 6.6 t/ha (**Table 18.5**). The heritability obtained for the plant height, growth duration and yield were 53%, 95% and 74%, respectively, indicating high level of precision in this experiment (**Table 18.5a**).

Table 18.5: Performance of the top 16 selected genotypes of Observational Yield Trial#1, Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	PA cp	GD (days)	Yield (t/ha)	Trait of interest
1	BR12839-4R-95-1	145	3	123	5.2	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
2	BR12839-4R-138-2	136	5	127	4.4	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
3	BR12839-4R-160	140	5	122	4.7	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
4	BR12839-4R-181-1	123	3	125	6.6	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
5	BR12836-4R-284	126	5	125	4.8	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
6	BR12838-4R-336-1-P1	130	5	135	4.7	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
7	BR12836-4R-336-2	123	5	135	5.0	*Xa4_4,Wx-op,Wx-A, Wx-ex10, Alk, DTH8*
8	BR12835-4R-16-1	128	3	135	6.6	*Xa4_4,Wx-op,Wx-A, Wx-ex10, Alk, DTH8*
9	BR12835-4R-43	130	5	132	4.9	*Frg-1(BADH2)(het),Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
10	BR12839-4R-8	130	3	126	6.8	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
11	BR12839-4R-65-2	131	3	127	5.7	*Xa4_4,Wx-op,Wx-A, Wx-ex10, Alk, DTH8*
12	BR12839-4R-100	120	3	125	5.2	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-A, Wx-ex10*
13	BR12839-4R-102	116	3	122	5.1	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
14	BR12839-4R-145	120	5	125	5.5	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
15	BR12839-4R-176	134	5	129	6.1	*Xa4_4,Wx-op,Wx-A, Wx-ex10, Alk, DTH8*
16	BR12839-4R-193	135	3	128	5.2	*Xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
17	Black Rice (Indonesia)	130	7	120	4.7	*Xa4_4,Wx-op,Wx-A*
18	Black Rice (Japanise)	122	7	119	3.8	*Wx-op,Wx-A,DTH8*
19	BRRI dhan70 (Ck)	135	5	129	4.6	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-int, DTH8*
20	BRRI dhan72 (Ck)	132	5	124	5.7	
21	BRRI dhan80 (Ck)	132	5	129	5	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-int, DTH8*
22	BRRI dhan87 (Ck)	128	5	127	5.4	*Wx-op,Wx-A, Wx-ex10, DTH8*
	P value	***	***	***	***	
	LSD (0.05)	8.24	1.9	5.3	0.58	
	H2b	0.53	0.70	0.95	0.74	

D/S: 05/07/2022 D/T: 31/07/2022

Experiment 18.6: Observational Yield Trial # 2 (OYT#2_Aromatic), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population, shorter growth duration and higher yield potentials with higher nutraceutical value than the standard checks varieties.

Materials and Methods: A total of 63 black rice genotypes along with two checks were evaluated in Augmented RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m ×

5 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 15 genotypes were selected out of 63 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma, black pigmentation and higher yield. The yield was ranged from 4.2 to 5.8 t/ha with a growth duration of 122 to 138 days. The highest yielding genotype was BR12836-4R-101 (5.8 t/ha) with duration of 125 days followed by the genotype BR12839-4R-17 giving 5.6 t/ha yield **(Table 18.6)**. The heritability obtained for the plant height, growth duration and yield were 61%, 92% and 70%, respectively, indicating high level of precision in this experiment (**Table 18.6).**

Table 18.6: Performance of the selected genotypes of Observational Yield Trial#2 (Aromatic) Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	PA cp	GD (days)	Yield (t/ha)	Trait of interest
1	BR12839-4R-362	112	3	125	5.5	--
2	BR12839-4R-103	110	3	125	5.2	*Frg-1(BADH2),xa4_2,Wx-op,Wx-A, Wx-ex10, DTH8*
3	BR12839-4R-77*-1	122	5	128	4.6	--
4	BR12839-4R-117-1*	123	5	138	5.0	*Frg-1(BADH2),xa4_2,Wx-op,Wx-A, Wx-ex10, DTH8*
5	BR12839-4R-117-2*	125	5	132	4.2	*Frg-1(BADH2),xa4_2,Wx-op,Wx-A, Wx-ex10*
6	BR12839-4R-141-1*	115	5	125	4.6	*xa4_4,Wx-op,Wx-A, Wx-ex10,Alk, DTH8*
7	BR12835-4R-41*	125	5	134	5.2	*Frg-1(BADH2),xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
8	BR12836-4R-152*	120	3	126	5.4	*xa4_4,Wx-op,Wx-A, Wx-ex10,Alk*
9	BR12839-4R-105-1*	118	5	138	5.1	--
10	BR12839-4R-117*	116	5	127	4.5	*xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
11	BR12835-4R-58	110	5	125	4.6	*xa4_4,Wx-op,Wx-A, Wx-ex10, Alk, DTH8*
12	BR12839-4R-17	125	3	124	5.6	*xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
13	BR12838-4R-102*-	124	3	122	5.4	*xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
14	BR12836-4R-101*	120	3	125	5.8	*Frg-1(BADH2) (het),xa4_4,Wx-op, Wx-int, Wx-A, DTH8*
15	BR12836-4R-273	115	5	128	4.8	*Frg-1(BADH2),xa4_4,Wx-op,Wx-A, Wx-ex10, DTH8*
16	BRRI dhan70 (Ck)	132	5	132	4.8	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-int, DTH8*
17	BRRI dhan80 (Ck)	130	5	135	5.1	*Frg-1(BADH2),Xa4_4,Wx-op,Wx-int, DTH8*
	P value	***	***	***	***	
	LSD (0.05)	7.3	2.1	6.2	0.62	
	H2b	0.61	0.68	0.92	0.70	

D/S: 05/07/2022 D/T: 31/07/2022

Experiment 18.7: Observational Yield Trial # 3 (OYT#3_Short duration), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of materials with better phenotypic acceptance, homogeneity in the population, shorter growth duration and higher yield potentials with higher nutraceutical value than the standard checks varieties.

Materials and Methods: A total of 110 black rice genotypes along with two checks were evaluated in Augmented RCB design with two replications. Around thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 4 m × 5 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 32 genotypes were selected out of 110 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma, black pigmentation and higher yield. The yield was ranged from 5.5 to 7.5 t/ha with a growth duration of 144 to 156 days. The highest yielding genotype, BR12839-4R-167-1 gives 7.5 t/ha yields with duration of 145 days followed by the genotype BR12839-4R-65-2 having similar yield of 7.2t/ha yield (Table 18.5). The heritability obtained for the plant height, growth duration and yield were 86%, 58% and 62%, respectively, indicating high level of precision in this experiment (**Table 18.7**).

Table 18.7: Performance of the top 20 selected genotypes of Observational Yield Trial#3 (OYT#3), Development of Antioxidant Enriched Rice, Boro 2022-23

Ent No	Designation	PH	TN	PA cp	GD (days)	Yield (t/ha)	Traits linked SNPs
1	BR12839-4R-167-1	108	11	5	145	7.5	*Wx-ex10,Wx-A,Gn1a,Chalk5,GS3, DTH8, Pi54,Pita2*
2	BR12839-4R-65-2	113	9	5	145	7.2	*Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,Alk, DTH8,Pi54,Pita2*
3	BR12839-4R-181	107	9	5	146	6.8	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,Pi54*
4	BR12837-5R-40	106	11	5	152	6.7	--
5	BR12839-4R-153-1	103	14	5	147	6.6	*Wx-ex10,Wx-A,Gn1a,Chalk5,GS3, Alk,PGWC8-2,DTH8,Pi54,Pita2*
6	BR12838-4R-17-1	110	10	5	143	6.6	*Wx-ex10,Wx-A,Gn1a,Chalk5,GS3, Alk,PGWC8-2,DTH8,Pi54*
7	BR12837-5R-62	125	11	5	156	6.5	--
8	BR12839-4R-125-4ah	108	10	5	151	6.5	*frg-1,Wx-ex10,Wx-A,Chalk5,GS3, DTH8,Pi54*
9	BR12839-4R-77-1	104	7	5	150	6.4	*Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5, GS3,DTH8,Pi54,Pita2*
10	BR12839-4R-95-1	105	11	7	150	6.4	*Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5, GS3,Alk,PGWC8-2,DTH8,Pi54, Pita2*
11	BR12837-5R-43	117	9	7	151	6.3	--
12	BR12839-4R-15a	110	10	5	152	6.3	*frg-1,Wx-ex10,Wx-A, Xa4,Gn1a,Chalk5,GS3,Alk,Pi54,Pita 2*
13	BR12837-5R-41	121	10	5	156	6.2	--
14	BR12839-4R-102	109	10	5	149	6.1	*Wx-ex10,Wx-A,Gn1a,Chalk5, GS3,DTH8,Pi54*
15	BR12837-5R-55	117	9	5	152	6.1	
16	BR12839-4R-145a	110	12	5	149	6.0	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5, GS3,PGWC8-2,DTH8,Pi54*
17	BR12837-5R-37	114	9	5	152	6.0	--
18	BR12835-4R-41a	110	10	5	156	6.0	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5 ,GS3,Alk,PGWC8-2,DTH8,Pita2*
19	BR12837-5R-31	126	11	5	149	6.0	
20	BR12839-4R-8a	103	10	5	145	6.0	*frg-1,Wx-ex10,Wx-A,Gn1a,GS3,DTH8,Pi54*
21	BRRI dhan88 (Ck)	114	10	5	144	6.6	--
22	BRRI dhan84 (Ck)	130	11	5	139	6.4	--
	P value	*	*	*	*	**	
	LSD (0.05)	4.74	1.57	1.5	5.20	0.56	
	H2b	0.86	0.52	0.58	0.70	0.62	

D/S: 04/12/2022 D/T: 02/01/2023

Experiment 18.8: Preliminary Yield Trial #1 (PYT#1_Short duration), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary evaluation of black rice genotypes for shorter growth duration and higher yield potentials with higher nutraceutical value than the standard checks varieties.

Materials and Methods: A total of 25 fixed lines along with one check were evaluated in Augmented RCB design with two replications. Twenty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 6 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 6 genotypes were selected out of 25 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma, shorter duration, black pigmentation and higher yield. Again 30 single plants were selected from the entries showing segregation. The highest yielding genotype, BR12839-4R-137 gave 6.1 t/ha yields with duration of 123 days followed by the genotype BR12839-4R-8 giving 5.3 t/ha yield (Table 18.8). The heritability obtained for the plant height, growth duration and yield were 81%, 52% and 83%, respectively, indicating high level of precision in this experiment (**Table 18.8**).

Table 18.8: Performance of the selected genotypes of Preliminary Yield Trial#1 (PYT#1_Short duration) Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	TN	PA cp	GD (days)	Yield (t/ha)	Trait markers
1	BR12839-4R-72	119	10	3	113	5.4	Wx-op,Wx-A, Wx-ex10, Alk, Xa4_4
2	BR12839-4R-97-2	125	10	5	131	4.9	Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4
3	BR12839-4R-120	103	9	7	113	4.3	
4	BR12839-4R-137	119	9	3	123	6.1	Wx-op,Wx-A, Wx-ex10, DTH8
5	BR12839-4R-73	125	10	3	120	4.0	Wx-op,Wx-A,Wx-ex10,Alk, DTH8,Xa4_4
6	BR12839-4R-76	117	8	4	124	5.6	Wx-op,Wx-A,Wx-ex10,Xa4_2, Xa4_4
7	BRRI dhan62 (Ck)	123	11	7	128	2.9	
	P value	***	NS	***	NS	***	
	LSD (0.05)	9.21	1.76	2.26	16.63	1.05	
	H2b	0.81	0.10	0.81	0.52	0.83	

D/S: 04/07/2022 D/T: 28/07/2022

Experiment 18.9: Preliminary Yield Trial #2 (PYT#2_Medium duration), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal
Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula
Specific objective: Preliminary evaluation of black rice genotypes for medium growth duration and higher yield potentials with higher nutraceutical value than the standard checks varieties.
Materials and Methods: A total of 79 black rice genotypes along with two checks were evaluated in Augmented RCB design with two replications. Twenty-seven days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 6 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.
Results and discussion: A total of 40 genotypes were selected out of 165 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, presence/absence of aroma, black pigmentation and higher yield. The highest yielding genotype was BR12839-

4R-106 producing 6.2 t/ha yield with a growth duration of 129 days followed by the genotype BR12839-4R-157 having 5.8t/ha yield (Table 18.9). The heritability obtained for the plant height, growth duration and yield were 55%, 92% and 68%, respectively, indicating medium to high level of precision in this experiment (**Table 18.9**).

Table 18.9: Performance of selected genotypes in Preliminary Yield Trial PYT#2 (MD), Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Trait markers
1	BR12839-4R-106	127	9	3	129	6.2	Wx-op,Wx-A, Wx-ex10,Xa4_4
2	BR12839-4R-47-2	125	8	5	129	5.5	Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4
3	BR12839-4R-86-1	125	8	5	130	5.4	Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4
4	BR12839-4R-92	125	8	7	130	5.2	Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4
5	BR12839-4R-92-1	128	9	7	129	5.2	Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4
6	BR12839-4R-97	124	9	5	136	5.2	Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4
7	BR12839-4R-106-1	123	10	5	137	5.7	Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4
8	BR12839-4R-138-1	123	9	5	131	5.2	Wx-op,Wx-A, Wx-ex10, DTH8, Xa4_4
9	BR12839-4R-157	125	8	3	129	5.8	Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4
10	BR12836-4R-316	122	8	5	129	5.4	
11	BR12839-4R-133	122	9	5	130	5.2	Wx-op,Wx-A, Wx-ex10,DTH8,Xa4_4
12	Black Rice-Indonesia	129	8	7	120	4.2	Wx-op,Wx-A, Xa4_4
13	Black Rice-Japanise	125	9	7	119	3.4	Wx-op,Wx-A, Xa4_4
14	BRRI dhan70 (Ck)	131	10	5	129	4.3	Frg-1(BADH2),Wx-NB,xa5Alk,GS3, Pita2,Pi33
15	BRRI dhan72 (Ck)	131	10	5	124	5.3	
16	BRRI dhan80 (Ck)	129	9	5	129	4.8	Frg-1(BADH2),Wx-NB,xa5Alk,GS3, Pita2,Pi33
17	BRRI dhan87 (Ck)	127	9	5	127	5.0	Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,DTH8
	P value	***	ns	***	***	***	
	LSD (0.05)	7.2	1.8	2..0	2.7	0.9	
	H2b	0.55	0	0.59	0.92	0.68	

D/S: 04/07/2022 D/T: 28/07/2022

Experiment 18.10: Preliminary Yield Trial PYT#3 (aromatic), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary evaluation of aromatic black rice genotypes with good plant type and higher yield potentials.

Materials and Methods: A total of 20 aromatic black rice genotypes along with two checks were evaluated in Augmented RCB design with two replications. Twenty-eight days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 6 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 20 genotypes were selected out of 47 genotypes based on presence of aroma, good plant type, black pigmentation and higher yield The genotype BR1 BR12835-4R-57 and BR12839-4R-124-2 gave similar yield of 5.3 and 5.2 t/ha respectively. **(Table 18.10).** The heritability obtained for the plant height, growth duration and yield were 59%, 99% and 63%, respectively, indicating high level of precision in this experiment (**Table 18.10**).

Table 18.10: Performance of the selected genotypes of Preliminary Yield Trial PYT#3 (Aromatic) Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Trait markers
1	BR12839-4R-124-2	127	8	5	123	5.2	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10,Xa4_4,*
2	BR12836-4R-63	128	10	5	137	4.1	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4,*
3	BR12835-4R-57	122	11	5	132	5.3	*Frg-1,Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4,*
4	BR12836-4R-197	123	11	5	137	5.1	--
5	BR12836-4R-279-1	127	9	5	136	4.2	*Frg-1(BADH2),Wx-A, Xa4_4,*
6	BR12836-4R-312	124	9	3	123	5.2	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10,xa4_2,Xa4_4,*
7	BR12838-4R-27	118	10	5	131	4.0	*Frg-1(BADH2),,Wx-A,Wx-ex10, Xa4_4,*
8	BR12839-4R-8	124	9	5	133	5.5	*FFrg-1(BADH2),Wx-A,Wx-ex10, Xa4_4,*
9	BR12839-4R-95-1	128	9	5	133	5.0	*Frg-1,Wx-op,Wx-A, Wx-ex10, DTH8,xa4_2,Xa4_4,*
10	BR12839-4R-51	123	8	3	126	5.0	*Frg-1(BADH2),Wx-A,Wx-ex10, Xa4_4,*
11	BR12839-4R-125-4	119	9	5	129	4.9	*Frg-1(BADH2),, Xa4_4,*
12	BR12839-4R-140	121	10	3	125	3.8	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10,Xa4_4,*
13	BR12835-4R-142	114	8	5	125	4.4	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4,*
14	BRRI dhan70	125	8	5	130	4.2	*Frg-1(BADH2),Wx-NB,xa5Alk,GS3, Pita2,Pi33*
15	BRRI dhan80	123	9	5	130	4.5	*Frg-1(BADH2),Wx-NB,xa5Alk,GS3, Pita2,Pi33*
	P value	**	***	***	***	***	
	LSD (0.05)	6.35	1.27	1.23	1.62	1.12	
	H2b	0.59	0.81	0.87	0.99	0.63	

D/S: 05/07/2022 D/T: 29/07/2022

Experiment 18.11: Preliminary Yield Trial #4 (PYT#4_purple), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary evaluation of aromatic/ non aromatic purple rice (less black) genotypes with good plant type and higher yield potentials.

Materials and Methods: A total of 25 purple black rice genotypes with long to extra-long slender grain type along with one check were evaluated in RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 6 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: Seven genotypes were selected out of 25 genotypes based on presence/absence of aroma, better plant type, grain quality and higher yield. The genotype BR12836-4R-287 gave highest yield of 5.5 t/ha with a duration of 127 days followed by the genotype BR12836-4R-223 (5.1t/ha) (**Table 18.11**). The heritability obtained for the plant height, growth duration and yield were 79%, 98% and 56%, respectively, indicating high level of precision in this experiment (**Table 18.11**).

Table 18.11: Performance of the selected genotypes of Preliminary Yield Trial PYT#4 (purple), Development of Antioxidant Enriched Rice, T Aman 2022-23

SL	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Trait markers
1	BR12838-4R-46	118	8	5	128	4.5	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10,Xa4_4, Alk, DTH8*
2	BR12836-4R-223	119	9	5	128	5.1	*Wx-A, Wx-ex10,Xa4_4,Wx-op, DTH8*
3	BR12836-4R-23	123	8	5	129	5.0	*Wx-int, Xa4_4,Wx-op, DTH8*
4	BR12838-4R-5	120	10	5	126	4.9	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4,*
5	BR12836-4R-32	111	7	3	126	5.4	*Frg-1(BADH2),Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4,*
6	BR12836-4R-21	124	11	5	126	5.1	*Wx-A, Wx-op, Wx-int, Alk, DTH8,Xa4_4*
7	BR12836-4R-287	125	9	3	127	5.5	
8	BRRI dhan62	121	10	7	112	4	
9	BRRI dhan72	129	9	5	128	4.5	
	P value	***	ns	***	***	*	
	LSD (0.05)	8.89		1.55	1.67	0.54	
	H2b	0.79		0.75	0.98	0.56	

D/S: 05/07/2022 D/T: 31/07/2022

Experiment 18.12: Preliminary Yield Trial # 5 (PYT#5_Aromatic), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Preliminary evaluation of aromatic black rice genotypes with good plant type, higher antioxidant (C3G) content and higher yield potentials.

Materials and Methods: A total of 24 genotypes along with two checks were evaluated in Augmented RCB design with two replications. Around thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 4 m × 5 rows. Fertilizers were applied as described in Experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of seven genotypes were selected out of 24 genotypes based on presence of aroma, good plant type, higher antioxidant (Cyanidin-3-glucoside -C3G) content and higher yield. The yield of the selected genotypes was ranged from 6.18 t/ha to 6.49 t/ha with a growth duration of 144 to 156 days. The highest yielding genotype was BR12838-4R-126-1a (6.49 t/ha) with duration of 144 days. (Table 18.12). The heritability obtained for the plant height, growth duration and yield were 91%, 92% and 81%, respectively, indicating high level of precision in this experiment (Table 18.12).

Table 18.12: Performance of the selected genotypes of Preliminary Yield Trial, PYT#5_Aromatic, Development of Antioxidant Enriched Rice, Boro 2022-23

SN	Designatio	PH cm	T N	PAc p	GD days	Yield t/ha	Traits of interest identified through trait linked SNPs
1	BR12838-4R-126-1	108	11	5	144	6.49	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,Alk,PGWC8-2,DTH8,Pita2*
2	BR12839-4R-124-2-P1	115	9	5	156	6.45	*frg-1,Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,Pi54*
3	BR12839-4R-125-4	112	9	5	151	6.31	*frg-1,Wx-ex10,Wx-A,Chalk5,GS3,DTH8,Pi54*
4	BR12836-4R-362	113	10	5	156	6.05	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,Alk,DTH8*
5	BR12838-4R-46	108	9	5	147	6.39	*frg-1,Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,Alk,PGWC8-2,DTH8,Pi54*
6	BR12838-4R-5	106	11	5	147	6.29	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,Alk,Pi54,Pita2*
7	BR12836-4R-32	103	11	5	144	6.18	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,Alk,PGWC8-2,DTH8,Pi54*
8	BRRI dhan88	102	10	5	142	5.91	
9	BRRI dhan84	131	10	5	139	5.66	
	P value	****	ns	ns	****	***	
	LSD (0.05)	5.96	2.8		1.27	0.53	
	H2b	0.91			0.92	0.81	

D/S: 05/12/2022 D/T: 03/01/2023

Experiment 18.13: Advanced Yield Trial # 1 (AYT#1_medium duration), Development of Antioxidant Enriched Rice, T Aman 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Advanced evaluation of medium duration black rice genotypes for higher yield potentials with intense black pigmentation.

Materials and Methods: A total of 30 advanced black rice genotypes with along with six checks were evaluated in RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using single seedling/hill. The plot size was 4 m × 8 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: Eleven genotypes were selected out of thirty genotypes were selected. The genotype BR12839-4R-157-2 produced highest yield of 6.3 t/ha with a duration of 132 followed by the genotype BR12839-4R-5-2 giving a yield of 5.9 t/ha yield with 129 days growth duration (**Table 18.13**). The yield range of all-other selected genotypes was 5.2 to 5.8 t/ha. The heritability obtained for the plant height, growth duration and yield were 87%, 55% and 83%, respectively, indicating high level of precision in this experiment (**Table 18.13**).

Table 18.13: Performance of the selected genotypes of Advanced Yield Trial (AYT), Development of Antioxidant Enriched Rice, T Aman 2022-23

SL No	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	Trait of interest
1	BR12839-4R-5-2	129	9	3	130	5.9	*Wx-op, Wx-A, Wx-ex10, Alk, DTH8,Xa4_4*
2	BR12839-4R-21	132	9	3	126	5.6	*Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4*
3	BR12839-4R-47-1	124	9	3	127	5.6	*Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4*
4	BR12839-4R-78-1	122	9	5	122	5.0	*Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4*
5	BR12839-4R-86-1	132	8	5	125	5.6	*Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4*
6	BR12839-4R-90-1	125	9	3	127	5.8	*Wx-op,Wx-A, Wx-ex10,Xa4_4*
7	BR12839-4R-106-1	128	11	5	132	5.2	*Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4*
8	BR12839-4R-138-4	124	9	3	130	5.5	*Wx-op,Wx-A, Wx-ex10, DTH8,Xa4_4*
9	BR12839-4R-157-2	122	9	3	132	6.3	*Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4*
10	BR12839-4R-44-2	121	10	5	128	5.6	*Wx-op,Wx-A, Wx-ex10, Alk, DTH8,Xa4_4*
11	BR12839-4R-93	119	9	3	125	5.8	*Wx-op,Wx-A, Wx-ex10,Xa4_4*
12	Black Rice (Indonesia)	130	10	7	120	4.6	*Wx-op,Wx-A,Xa4_4*
13	Black Rice (Japanise)	125	8	7	119	4.2	*Wx-op,Wx-A,Xa4_4*
14	BRRI dhan70 (Ck)	131	10	5	131	4.4	*Frg-1,Wx-NB,xa5Alk,GS3, ita2,Pi33*
15	BRRI dhan72 (Ck)	130	10	5	126	5.5	
16	BRRI dhan80(Ck)	130	9	5	132	4.7	*Frg-1,Wx-NB,xa5Alk,GS3, Pita2,Pi33*
17	BRRI dhan87(Ck)	126	10	5	125	5.5	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,DTH8*
	P value	***	ns	***	***	***	
	LSD (0.05)	7.03		1.3	8.43	0.62	
	H2b	0.87		0.9	0.55	0.83	

D/S: 04/07/2022 D/T: 28/07/2022

Experiment 18.14: Advanced Yield Trial #2 (AYT#2_Medium duration), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Advanced evaluation of medium duration black rice genotypes with higher antioxidant (C3G) content and higher yield potentials.

Materials and Methods: A total of 27 aromatic black rice genotypes were evaluated in Augmented RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 4 m × 8 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of 11 genotypes were selected out of 27 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, antioxidant (C3G) content and higher yield. The genotypes BR12839-4R-106 gave highest yield of 7.49 t/ha followed by the genotype BR12839-4R-34-1 having 6.89 t/ha yield. The growth duration of these two genotypes were 152 days and 149 days respectively. The antioxidant content of these two genotypes were also highest which were 479mg/Kg and 459mg/Kg respectively. These two genotypes were selected for RYT in the next season. The yield range of other selected genotypes were 6 t/ha to 6.8t/ha (**Table 18.14**). The heritability obtained for the plant height, growth duration and yield were 83%, 49% and 78%, respectively, indicating medium to high level of precision in this experiment (**Table 18.14**).

Table 18.14: Performance of the selected genotypes of Advanced Yield Trial#2, Development of Antioxidant Enriched Rice, Boro 2022-23

Ent. No	Designation	PH (cm)	TN	PAcP	GD days	Yield (t/ha)	C3G (mg/kg)	Traits of interest identified through trait linked SNPs
1	BR12839-4R-106	119	11	3	152	7.49	479	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54*
2	BR12839-4R-34-1	113	10	3	149	6.89	459	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk, DTH8,Pi54,Pita2*
3	BR12839-4R-92-1	120	10	5	149	6.41	207	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54*
4	BR12839-4R-76	105	11	3	156	6.36	251	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,Pi54,Pita2*
5	BR12839-4R-8	117	10	5	151	6.18	374	*frg-1,Wx-ex10,Wx-A,Gn1a,GS3,DTH8,Pi54*
6	BR12836-4R-18	111	11	5	145	5.91	361	*frg-1,Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,PGWC8-2,DTH8,Pita2*
7	BR12839-4R-72-1	99	11	5	149	6.07	214	*Wx-A,Gn1a,Chalk5 ,GS3,Alk,Pi54*
8	BR12839-4R-95-1	106	11	5	150	6.04	154	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,Alk,PGWC8-2,DTH8,Pi54,Pita2*
9	BR12839-4R-1	105	11	5	155	6.05	346	
10	BR12839-4R-86-1	122	10	3	153	6.00	166	*Wx-ex10,Wx-A,Xa4,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54 ,Pita2*
11	BRRI dhan58(Ck)	127	12	5	148	6.84		
12	BRRI dhan84(Ck)	130	10	5	141	6.13		
13	BRRI dhan88(Ck)	110	11	5	143	6.01		
14	BRRI dhan89(Ck)	120	11	5	156	6.88		
	P value	****	ns	*	*	****		
	LSD (0.05)	5.9		1.3	10.4	0.6		
	H2b	0.83		0.51	0.49	0.78		

D/S: 01 /12/2022 D/T: 01/01/2023

Experiment 18.15: Advanced Yield Trial # 3 (AYT#3_Aromatic), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Selection of anthocyanin enriched breeding lines for high yield potential along with good plant type, higher antioxidant (C3G) content and aroma.

Materials and Methods: A total of 15 aromatic black rice genotypes were evaluated in Augmented RCB design with two replications. Thirty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size was 4 m × 8 rows. Fertilizers were applied as described in experiment 18.1. Crop management was done as and when necessary.

Results and discussion: A total of nine genotypes were selected out of 15 genotypes based on good plant type, grain type, presence of aroma, antioxidant (C3G) content and higher yield. The genotypes BR12839-4R-124-2 gave highest yield of 6.85 t/ha followed by the genotype BR12836-4R-312 (6.84 t/ha) and BR12838-4R-89-1a (6.82 t/ha). The antioxidant content of these genotypes were 242mg/kg, 305 mg/kg and 381mg/kg respectively. These genotypes were selected for RYT for next season. **(Table 18.15).** The heritability obtained for the plant height, growth duration and yield were 90%, 88% and 85%, respectively, indicating high level of precision in this experiment (**Table 18.15**).

Table 18.15: Performance of the selected genotypes of Advanced Yield Trial#3, Development of Antioxidant Enriched Rice, Boro 2022-23

SN	Designation	PH (cm)	TN	PAcp	GD (days)	Yield (t/ha)	C3G (mg/kg)	Traits of interest identified through trait linked SNPs
1	BR12839-4R-124-2	118	11	3	159	6.85	242	*frg-1,Wx-ex10,Wx-A,Xa4, Gn1a,Chalk5,GS3,Pi54*
2	BR12836-4R-312	105	9	3	155	6.84	305	*frg-1,Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8*
3	BR12838-4R-89-1	107	11	5	143	6.82	381	*frg-1,Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54, Pita2*
4	BR12839-4R-124-3	110	9	3	157	6.28	242	*frg-1,Wx-ex10,Wx-A,Xa4, Gn1a,Chalk5,GS3,Pi54*
5	BR12839-4R-185	122	11	5	159	6.30	242	*frg-1,Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,DTH8,Pi54,Pita2*
6	BR12839-4R-185-2	122	10	5	158	6.20	221	*frg-1,Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,DTH8,Pi54,Pita2*
7	BR12839-4R-51	117	11	5	158	5.70	211	*frg-1,Wx-ex10,Wx-A,Xa4,Gn1a,Chalk5,GS3,PGWC8-2,Pi54*
8	BR12836-4R-63	110	9	3	155	5.11	342	*frg-1,Wx-ex10,Wx-A, Gn1a,Chalk5,GS3,PGWC8-2,DTH8,Pita2*
9	BR128-4R-142	114	9	5	155	4.95	171	
	P value	****	ns	*	****	***		
	LSD (0.05)	3.61		1	1.63	0.58		
	H2b)	0.90		0.71	0.88	0.85		

D/S: 01/12/2022 D/T: 01/01/2023

Experiment 18.16: Regional Yield Trial (RYT#1_Medium duration), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Evaluation of anthocyanin enriched breeding lines for high yield potential and adaptability in different agro-climatic conditions.

Materials and methods: Eight breeding lines and two check varieties were evaluated in RCB design with three replications **(Table 18.16).** Thirty-five to forty days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size were 4 m × 8-10 rows. Fertilizers management were done as per recommended dose according to agro-ecological zone. In general, the dose was 260 kg Urea, 100 TSP, 120 MP, 110 Gypsum, 11 kg $ZnSO_4$/ha. Urea were applied in three splits at 15, 30 and 45 days after transplanting (before PI stage). Total amount of P, K, Gypsum and $ZnSO_4$ were applied at final land preparation. Weeding, pest control measures and other cultural practices were done as and when necessary.

Results and discussion: Two genotypes were selected out of ten genotypes based on higher yield and higher antioxidant (C3G) content. The genotype BR12839-4R-157-2 gave highest average yield of 6.6 t/ha with a duration of 142 days followed by the genotype BR12839-4R-5-2 which produced 6.3 t/ha yield. Both of the selected genotypes have higher C3G content i.e. 268 and 209 mg/Kg respectively. (**Table 18.16**). The all-other selected genotypes possessed aroma. The heritability obtained for the yield was ranged from 52%, to 88% indicating high level of precision in this experiment (**Table 18.16**).

Table 18.16: Performance of the selected genotypes of Regional Yield Trial (RYT#1_medium duration), Development of Antioxidant Enriched Rice, Boro 2022-23

SN	Designation	PH (cm)	GD days	Sonagazi	Rajshahi	Barishal	Rangpur	Kushtia	Cumilla	Sirajgonj	Bhanga	Gazipur	Mean Yield (t/ha)	C3G content	Traits of interest identified through trait linked SNPs
1	BR12839-4R-157-2	115	142	5.8	6.4	6.2	6.1	6.4	6.4	7.3	7.3	7.1	6.6	268.0	*Wx-ex10,Wx-A,Xa4, Chalk5,GS3,DTH8,Pita2*
2	BR12839-4R-5-2	107	140	4.9	6.4	5.9	5.4	6.3	6.1	7.3	7.1	6.8	6.3	209.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54*
3	BR12839-4R-93	107	138	5.1	5.8	6.4	5.5	6.4	6.7	6.4	5.8	6.2	6.0	10.0	*Wx-ex10,Wx-A,Gn1a,Chalk5,GS3,DTH8,Pi54*
4	BR12839-4R-47-1	111	142	4.1	6.5	6.6	6.0	6.5	6.9	7.1	6.9	6.4	6.3	2.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54,Pita2*
5	BR12839-4R-90-1	112	140	4.8	6.8	6.6	5.4	5.9	5.9	6.9	3.4	6.7	5.8	3.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,DTH8,Pi54,Pita2*
6	BR12839-4R-138-4	115	138	5.0	6.4	5.9	5.5	6.6	5.6	6.5	7.0	6.4	6.1	1.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,DTH8,Pi54*
7	BR12839-4R-78-1	112	144	5.0	5.6	6.3	5.2	6.2	7.0	7.1	8.3	6.2	6.3	2.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,Alk,PGWC8-2,DTH8,Pi54,Pita2*
8	BR12839-4R-21	117	138	4.9	6.0	6.0	5.6	6.5	6.1	6.5	6.3	6.8	6.1	65.0	*Wx-ex10,Wx-A,Gn1a, Chalk5,GS3,DTH8,Pi54, Pita2*
9	Indonesian Black Rice	131	133	5.1	4.8	5.9	4.6	5.5	5.3	7.1	6.1	5.5	5.5	82.7	
10	BRRI dhan88	101	131	5.7	6.6	6.0	5.4	5.3	6.7	6.6	7.1	6.2	6.2		
	P value	****	****	**	***	*	***	*	*	*	***	**			

LSD (0.05)	3.06	2.45	0.59	0.41	0.5	0.37	0.61	0.74	0.74	0.88	0.58	0.60
H2b	0.89	0.90	0.82	0.81	0.45	0.88	0.63	0.77	0.52	0.84	0.75	0.74

Experiment 18.17: Regional Yield Trial (RYT#2_Short duration), Development of Antioxidant Enriched Rice, Boro 2022-23

Principal Investigator: Sharmistha Ghosal

Co-Investigators: S Maniruzzaman, M M Yasmin, Z A Riyadh and K M Iftekharuddaula

Specific objective: Evaluation of anthocyanin enriched breeding lines for high yield potential and adaptability in different agro-climatic conditions.

Materials and methods: Three breeding lines and one check variety were evaluated in RCB design with three replications **(Table 18.17).** Thirty-five days old seedlings were transplanted at a spacing of 20 cm × 20 cm using two to three seedlings/hill. The plot size were 4 m × 8-10 rows. Fertilizer management was done as per recommended dose according to agro-ecological zone. In general, the dose was 260 kg Urea, 100 TSP, 120 MP, 110 Gypsum, 11 kg $ZnSO_4$/ha. Urea were applied in three splits at 15, 30 and 45 days after transplanting (before PI stage). Total amount of P, K, Gypsum and $ZnSO_4$ were applied at final land preparation. Weeding, pest control measures and other cultural practices were done as and when necessary.

Results and discussion: One genotype was selected out of three genotypes based on higher yield and higher antioxidant (C3G) content. The selected genotype BR12839-4R-137 gave the highest average yield of 6.0 t/ha with a duration of 130 days having the highest antioxidant content which was 244 mg/kg (**Table 18.17**).

Experiment 18.10: Regional Yield Trial (RYT#2_Short duration), Development of Antioxidant Enriched Rice, Boro 2022-23

Ent No	Designation	PH (cm)	GD (days)	Sonagazi	Rajshahi	Barishal	Rangpur	Kushtia	Sirajgonj	Bhanga	Gazipur	Mean Yield (t/ha)	C3G content	Traits of interest identified through trait linked SNPs
1	BR12839-4R-73	105	144	5.3	6.7	5.2	5.7	5.7	6.7	6.0	5.9	5.9	191	*Wx-ex10,Wx-A, Gn1a,Chalk5,GS3,Alk,Pi54*
2	BR12839-4R-137	101	130	5.7	5.8	5.2	5.7	6.2	6.6	5.4	7.1	6.0	244	*Wx-ex10,Wx-A, Gn1a,GS3,Alk,PGWC8-2,DTH8,Pi54, Pita2*
3	BR12839-4R-72	106	137	5.8	5.5	5.9	5.5	5.7	6.7	5.6	5.9	5.8	79	*Wx-A,Gn1a,Chalk5, GS3,Alk,Pi54*
4	BRRI dhan84(Ck)	107	131	6.3	5.8	5.9	5.9	5.9	6.2	6.0	6.6	6.1		
	P value	*	***	*	***	ns	ns	ns	ns	*	*			
	LSD (0.05)	3.02	0.67	0.8	**0.22**	0.28	0.63	0.47	0.00	0.22	0.7	0.40		
	H2b	0.83	0.99	0.5	0.9	0.7		0.52	0.9	0.9	0.6	0.54		