

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

**General Objectives:** Development of varieties in combination of multiple traits such as quick seedling emergence and vigorous growth; short growth duration (95-100 days); tolerance to lodging, drought and pre-harvest sprouting (viviparous); medium slender to medium bold grains and good eating quality and grain yield 4.0-4.5 t/ha.

**Project Leader:** M. Akhlasur Rahman

### Experiment 1.1: Hybridization

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

**Materials and Methods:** The parent materials were grown in three different sets at 7 days interval to synchronize flowering. Seeding was done starting from 15th July and three weeks old seedlings were transplanted per set in the hybridization block at BRRI, Gazipur. 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<sub>4</sub>) 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.

**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Thirty-nine crosses were made using twenty-five parents (Table 1.1a).

**Table 1.1a: List of parents for hybridization, Development of Upland Rice (B. Aus), 2023-24**

Sl.	Genotype	Days to maturity	Plant height (cm)	Yield (t/ha)
1	BR12857-5R-55	105	94	3.0
2	BR12859-5R-31	108	107	3.47
3	BR12859-5R-32	105	101	3.18
4	BR12862-5R-3	106	121	3.15
5	BR12867-5R-125	106	114	3.24
6	BR12867-5R-129	104	116	2.9
7	BR12873-5R-46	106	99	3.32
8	BR12873-5R-48	106	83	3.48
9	BR12873-5R-60	106	98	3.06
10	BR12873-5R-65	105	99	3.44
11	BR12873-5R-97	106	91	3.32
12	BR12876-5R-40	106	106	3.07
13	BR12880-5R-266	100	97	3.13
14	BR12880-5R-308	103	115	3.34
15	BR12235-5R-10	107	99	2.8
16	BR12236-5R-6	104	103	3.0
17	BR12248-5R-18	104	93	3.6
18	BR12248-5R-22	105	96	3.7
19	BR12248-5R-37	106	109	3.1
20	BR12248-5R-65	107	104	3.5
21	BR12248-5R-122	105	100	4.1
22	BR12263-5R-75	105	112	3.4
23	BR10756-2B-8-72	105	105	3.1
24	BRRI dhan83 (Ck)	105	103	3.8
25	BRRI dhan98 (Ck)	112	106	5

**Table 1.1b: List of Crosses made, Development of Upland Rice (B. Aus), 2023-24**

Sl.	Cross combination	No. of F <sub>1</sub> seeds
1	BR12108-4R-232/Vandana	100
2	Hasikalmi/BR13125-4R-92	13
3	BR13113-4R-63/Hasikalmi	16
4	BR11716-4R-102/Hasikalmi	78
5	BR13125-4R-92/Kalobinni	14
6	BR13122-4R-136/Kalobinni	45
7	BR13111-4R-63/Gallong (pure)	50
8	BR11716-4R-102/BR24	130
9	Luyin-46/BR24	54
10	BR13125-4R-92/BR24	17
11	BR13115-4R-116/China-70 ACC 7/70	41
12	BR13115-4R-116/BRRI dhan83	25
13	BR12248-4R-18/China-70 ACC 7/70	25
14	BR11716-4R-102/BRRI dhan83	40
15	BR13122-4R-136/BRRI dhan83	41
16	BRRI dhan83/BR13115-4R-116	16
17	BR13106-4R-38/BRRI dhan83	100
18	BRRI dhan83/BR11716-4R-102	42
19	BRRI dhan83/BR13108-4R-232	37
20	BR13113-4R-63/BRRI dhan83	13
21	BR13108-4R-232/BRRI dhan83	35
22	BR13115-4R-116/BR12239-4R-201	13
23	BR12239-4R-201/BR13115-4R-116	31
24	BR13125-4R-92/BR12239-4R-201	25
25	Luyin-46/BR12239-4R-201	19
26	BR13111-4R-63/BR12239-4R-201	43
27	BR13111-4R-63/BR12235-5R-10	69
28	BR13111-4R-63/BRRI dhan83	15
29	BR12873-5R-65/BR13113-4R-63	19
30	BRRI dhan83/BR13113-4R-63	23
31	BR11716-4R-102/BR12239-4R-183	43
32	BR13122-4R-136/Vandana	14
33	BR13125-4R-92/BRRI dhan83	34
34	BR13113-4R-63/BR12263-4R-75	14
35	BR10756-2B-8-72/BR13125-4R-92	24
36	BR13115-4R-116/BR12263-4R-75	37
37	BR12248-4R-22/BR13115-4R-116	68
38	BR1116-4R-102/BR12239-4R-183	14
39	BR12248-4R-22/BR13113-4R-63	87

**Experiment 1.2: F<sub>1</sub> Confirmation**

**Specific Objectives:** Confirmation of crosses as true F<sub>1</sub>.

**Materials and Methods:** The F<sub>1</sub> 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 1.1.

**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Eleven crosses were confirmed (Table 1.2) by careful observation of plant characters. After confirmation, the F<sub>2</sub> seeds were collected and preserved. These confirmed F<sub>1</sub>s were registered into BRRI cross list with BR number.

**Table 1.2: List of F<sub>1</sub> confirmation, Development of Upland Rice (B. Aus), 2023-24**

Sl.	Cross combination	Trait	F <sub>1</sub> 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, high amylose, drought tolerance, short duration	12
5	BR11863-5R-50/BR12244-5R-14	High yield, high amylose, drought tolerance, good taste	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, high amylose, 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, high amylose, drought tolerance, fine grain	29
10	BR12263-5R-31/Basmati	High yield, high amylose, drought tolerance, fine grain	37
11	BR12244-5R-14/BR12248-5R-4	High yield, high amylose, drought tolerance, fine grain	29

### Experiment 1.3: Growing of FRGA population

**Specific objectives:** To quickly advance progenies from segregating population

**Materials and Methods:** Seeds of each cross were seeded in a seedbed and twenty-one days old seedlings will be transplanted @ single seedling in a 5cm × 5cm spacing. Fertilizer dose will be applied @ one third of the normal dose. Total amount of P, K, Gypsum and ZnSO<sub>4</sub> will be applied at final land preparation. Table 1.3a and 1.3b shows the list of F<sub>2</sub> and F<sub>3</sub> for Upland Rice.

#### Status of experiment

- a) Date of initiation: April 2023
- b) Date of completion: August 2023

**Location:** BRRI, Gazipur

**Principal Investigator:** M A Rahman

**Co- Investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Six F<sub>2</sub> populations were advanced to F<sub>3</sub> and eight F<sub>4</sub> populations were advanced to F<sub>5</sub>. Populations were seeded directly in 5.0 m long apart from 25 cm with 25-30 lines for each cross (Table 1.3a and 1.3b). Fertilizer doses were same as in Experiment 1.1. Weeding was done in two/three times during the period of early seedling to maximum tillering stage.

**Table 1.3a: List of materials for F<sub>2</sub> -FRGA, Development of Upland Rice (B. Aus), 2023-24**

Sl.	Cross combination	BR No.	Trait
1	BR11864-5R-32/ BR10418-32-1-58	BR15484	High yield, high amylose, drought tolerance
2	BR10409-15-2-8/ BR11863-5R-271	BR15485	High yield, high amylose, drought tolerance
3	BR11863-5R-271/Dharial	BR15486	High yield, high amylose, drought tolerance, good taste
4	BR11864-5R-92/ Hashikalmi	BR15487	High yield, high amylose, drought tolerance, short duration
5	BR11864-5R-32/BRRI dhan83	BR15488	High yield, high amylose, Kataktara type grain, drought tolerance, short duration
6	BR26/ BR11864-5R-12	BR15489	High yield, high amylose, drought tolerance, fine grain

**Table 1.3b: List of materials for F<sub>3</sub>-FRGA, Development of Upland Rice (B. Aus), 2023-24**

SN	BR No.	Cross combination	Traits	*HP
1	14439	BR10757-2B-9-23/ BRRI dhan65	High yield, high amylose, drought tolerance, fine grain	1150
2	14440	BR10757-2B-9-23/Dharial	High yield, high amylose, drought tolerance, good taste	1310
3	14441	BR10757-2B-9-23/ Kataktara	High yield, high amylose, drought tolerance, good grain quality	1180
4	14442	BR10757-2B-9-23/ Panbira	High yield, high amylose, drought tolerance, fine grain	1310
5	14443	BR10757-2B-9-26/Hashikalmi	High yield, high amylose, drought tolerance, short duration	1220
6	14444	BR10757-2B-9-26/LalDular	High yield, high amylose, drought tolerance, reddish hull	1300
7	14445	BR10757-2B-9-42/BRRI dhan65	High yield, high amylose, drought tolerance, fine grain	1230
8	14446	BR10757-2B-9-42/BRRI dhan83	High yield, high amylose, Kataktara type grain, drought tolerance	1370

\*HP: Harvested plant

#### **Experiment 1.4: Observational Yield Trial (OYT), Development of Upland Rice (B. Aus), 2023-24**

**Specific objectives:** To select lines homogeneous for morpho-agronomic characters having early seedling emergence, good seedling vigor, uniformity in heading, short growth duration and tolerance to lodging at upland field condition.

**Materials and Methods:** Sixty-four genotypes were seeded directly in augmented RCB design with unit plot size of 5.0 m × 4 rows with spacing of 25 cm between the rows with sufficient moisture in the field. Fertilizer application was done as in experiment 1.4. BRRI dhan43, BRRI dhan65, BRRI dhan83 and Hasikalmi will be used as standard check after every 10<sup>th</sup> entry.

**Data to be collected:** Date of seeding, flowering and maturity; % emergence score, stand count at 30 days after seedling emergence; phenotypic acceptance at maturity stage; plant height, panicle/m<sup>2</sup>, filled grains/panicle, sterility (%) and yield (t/ha).

#### **Status of experiment**

- Date of initiation: April 2023
- Date of completion: August 2023

**Location:** BRRI, Gazipur

**Principal Investigator:** M A Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Thirty-four entries were selected out of sixty-four considering growth duration, yield, uniformity of morpho-agronomic traits and superiority in one or more traits over the standard checks (Table 1.4).

**Table 1.4: List of genotypes for selected OYT, Development of Upland Rice (B. Aus), 2023-24**

SL	Genotype	Plant height (cm)	Days to maturity	Yield(tha <sup>-1</sup> )
2	BR11820-5R-5	111	119	3.6
3	BR11820-5R-8	115	110	3.9
4	BR11820-5R-14	109	110	5.3
5	BR11820-5R-43	119	108	3.7
6	BR11820-5R-52	116	122	4.7
7	BR11820-5R-60	107	106	3.7
9	BR11820-5R-79	83	106	3.5
10	BR11820-5R-82	109	114	4.1
16	BR11820-5R-208	116	121	4.0
17	BR13293-5R-41	106	111	4.3
21	BR13294-5R-111	84	103	5.3
25	BR13295-5R-65	98	121	3.7

SL	Genotype	Plant height (cm)	Days to maturity	Yield( $\text{tha}^{-1}$ )
26	BR13295-5R-90	84	111	4.0
27	BR13295-5R-140	103	121	4.5
28	BR13295-5R-194	120	125	3.5
29	BR13295-5R-208	104	113	5.0
30	BR13296-5R-40	106	108	4.6
31	BR13296-5R-75	111	113	5.3
34	BR13296-5R-186	118	104	6.1
35	BR13297-5R-68	114	123	4.0
37	BR13298-5R-11	86	104	3.5
38	BR13298-5R-35	105	102	3.6
39	BR13298-5R-41	114	125	5.2
40	BR13298-5R-81	114	99	3.7
41	BR13298-5R-86	107	113	3.5
46	BR13299-5R-179	101	112	4.0
47	BR13299-5R-183	101	113	5.7
51	BR13300-5R-19	106	103	3.8
54	BR13300-5R-50	104	105	3.6
55	BR13300-5R-67	117	106	4.0
56	BR13300-5R-70	115	125	4.2
57	BR13300-5R-72	111	123	3.8
63	BR13302-5R-8	104	129	3.6
64	BR13302-5R-36	106	113	4.3
<b>check1</b>	<b>BRRRI dhan65</b>	<b>88</b>	<b>100</b>	<b>3.0</b>
<b>check2</b>	<b>BRRRI dhan83</b>	<b>103</b>	<b>103</b>	<b>3.9</b>
<b>check3</b>	<b>BRRRI dhan98</b>	<b>104</b>	<b>105</b>	<b>4.8</b>
<b>check4</b>	<b>Hashikalmi</b>	<b>106</b>	<b>90</b>	<b>2.7</b>
	<b>LSD &lt; 0.05</b>	<b>8.33</b>	<b>6.26</b>	<b>0.59</b>
	<b>H<sup>2</sup>b</b>	<b>0.14</b>	<b>0.2</b>	<b>0.34</b>

#### **Experiment 1.5: Preliminary Yield Trial (PYT), Development of Upland Rice (B. Aus), 2023-24**

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

**Materials and Methods:** Twenty-seven genotypes were evaluated in PYT and BRRRI dhan43, BRRRI dhan65, BRRRI dhan83, BRRRI dhan98 and local check Hasikalmi were used as check varieties. The trials will be seeded directly following randomized complete block design (RCBD) with three replications with unit plot size of 5.0 m  $\times$  10 rows and spacing of 25 cm between the rows with sufficient moisture in the field. Fertilizers @ 60:20:40: 100:10 kg NPKS/ha will be used with split application of N at 15, 30, 50 days after seeding (DAT). Total amount of P K S will be applied at the time of final land preparation.

**Data collection:** Data were collected on plant height, days to flowering, days to maturity, PAcp, tiller per plant, panicle per plant, spikelet sterility (%), 1000 seed weight and yield per plot.

**Date of initiation:** April 2023

**Date of completion:** August 2023

**Location:** BRRRI HQ

**Principal investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Sixteen entries were selected out of 27 genotypes considering growth duration, yield, uniformity of morpho-agronomic traits and superiority in one or more traits over the standard checks (Table 1.5)

**Table 1.5: List of genotypes for PYT, Development of Upland Rice (B. Aus), 2023-24**

SL	Genotype	Plant height (cm)	Days to maturity	Yield( $\text{tha}^{-1}$ )
<b>1</b>	<b>BR12857-5R-55</b>	<b>113</b>	<b>101</b>	<b>3.2</b>
2	BR12857-5R-85	114	104	2.7
<b>3</b>	<b>BR12857-5R-112</b>	<b>102</b>	<b>101</b>	<b>2.9</b>
<b>4</b>	<b>BR12858-5R-116</b>	<b>118</b>	<b>102</b>	<b>2.5</b>
<b>5</b>	<b>BR12859-5R-31</b>	<b>107</b>	<b>107</b>	<b>4.5</b>
6	BR12859-5R-32	116	107	3.2
<b>7</b>	<b>BR12860-5R-79</b>	<b>116</b>	<b>113</b>	<b>3.9</b>
<b>8</b>	<b>BR12862-5R-3</b>	<b>116</b>	<b>104</b>	<b>3.5</b>
<b>9</b>	<b>BR12867-5R-125</b>	<b>116</b>	<b>101</b>	<b>4.4</b>
10	BR12867-5R-129	115	114	3.0
11	BR12873-5R-46	98	103	2.5
12	BR12873-5R-48	82	104	2.5
<b>13</b>	<b>BR12873-5R-60</b>	<b>107</b>	<b>104</b>	<b>2.8</b>
<b>14</b>	<b>BR12873-5R-65</b>	<b>105</b>	<b>104</b>	<b>2.5</b>
<b>15</b>	<b>BR12873-5R-73</b>	<b>118</b>	<b>103</b>	<b>2.3</b>
16	BR12873-5R-97	109	101	2.8
17	BR12873-5R-104	117	104	2.2
<b>18</b>	<b>BR12874-5R-33</b>	<b>109</b>	<b>101</b>	<b>2.8</b>
19	BR12874-5R-116	120	102	2.2
20	BR12876-5R-3	104	107	1.9
<b>21</b>	<b>BR12876-5R-37</b>	<b>114</b>	<b>107</b>	<b>2.1</b>
<b>22</b>	<b>BR12876-5R-40</b>	<b>118</b>	<b>102</b>	<b>2.9</b>
23	BR12877-5R-121	77	107	2.1
<b>24</b>	<b>BR12880-5R-266</b>	<b>113</b>	<b>107</b>	<b>3.1</b>
<b>25</b>	<b>BR12880-5R-291</b>	<b>114</b>	<b>113</b>	<b>2.6</b>
26	BR12880-5R-302	111	104	2.5
<b>27</b>	<b>BR12880-5R-308</b>	<b>123</b>	<b>101</b>	<b>3.3</b>
check1	BRRRI dhan43	119	123	3.1
check2	BRRRI dhan65	84	116	2.8
check3	BRRRI dhan83	116	107	4.1
check4	BRRRI dhan98	96	109	3.8
check5	Hashikalmi	97	116	2.1
	LSD < 0.05	2	1.8	1.8
	H <sup>2</sup> b	1	0.7	0.7

**Experiment 1.6: Advanced Yield Trial (AYT), Development of Upland Rice (B. Aus), 2023-24**

**Specific objective:** Confirmatory evaluation of selected materials for yield and other agronomic traits in replicated trial

**Materials and Methods:** Thirteen genotypes were tested along with five checks as same as PYT experiment 1.6. The trial will be carried out using RCBD with three replications. The unit plot size will be 5.0 m × 10 rows. Forty days old seedlings were transplanted @ 2-3 seedlings with 20 × 15 cm spacing. Fertilizers @ 60:20:40: 100:10 kg N:P:K:S/ha (130: 100: 80 kg Urea-TSP-MoP/ha) will be used with split application of N at 15, 30, 50 days after transplanting (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, PAcp, tiller per plant,

panicle per plant, spikelet sterility (%), 1000 grain weight and yield per plot. List of materials for AYT are shown in Table 1.6.

**Date of initiation:** April 2023

**Date of completion:** August 2023

**Location:** BRRI, Gazipur

**Principal investigator:** M A Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Six genotypes such as BR12236-5R-6, BR12248-5R-22, BR12248-5R-37, BR12248-5R-122, BR12263-5R-75, BR10756-2B-8-72 were selected on the basis of yield and growth duration (earliness) for further trial (**Table 1.6**).

**Table 1.6: List of genotypes for AYT, Development of Upland Rice (Aus), 2023-24**

SL	Genotype	Plant height (cm)	Days to maturity	Yield( $\text{tha}^{-1}$ )
1	BR12235-5R-10	113	100	2.7
2	<b>BR12236-5R-6</b>	<b>105</b>	<b>100</b>	<b>3.5</b>
3	BR12244-5R-14	112	107	2.4
4	BR12244-5R-24	106	108	2.8
5	BR12244-5R-210	108	100	2.2
6	BR12248-5R-18	103	104	2.9
7	<b>BR12248-5R-22</b>	<b>109</b>	<b>100</b>	<b>3.6</b>
8	<b>BR12248-5R-37</b>	<b>99</b>	<b>105</b>	<b>4.6</b>
9	BR12248-5R-65	119	107	2.9
10	<b>BR12248-5R-122</b>	<b>107</b>	<b>102</b>	<b>4</b>
11	<b>BR12263-5R-75</b>	<b>122</b>	<b>110</b>	<b>3.4</b>
12	BR11262-B-109-3-47	127	105	3.2
13	<b>BR10756-2B-8-72</b>	<b>106</b>	<b>113</b>	<b>3.4</b>
	BRRI dhan65 (Ck)	98	105	3.2
	BRRI dhan83 (Ck)	116	103	3.5
	Hashikalmi (L. Ck)	95	98	2.9
	LSD < 0.05	1.44	4.94	0.57
	H <sup>2</sup> b	0.99	0.26	0.56

## **PROJECT 1A: DEVELOPMENT OF JHUM RICE FOR HILLY AREAS**

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

**Project Leader:** M. Akhlasur Rahman

Experiment 1A.1: Hybridization

**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**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<sub>4</sub>) 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); BRRRI dhan83; promising advanced breeding lines (BR12239-5R-183, BR12239-5R-201, BR12236-5R-8) having good performance in terms of yield in rainfed situation, drought tolerance capacity and other remarkable traits following respective product profile were involved.

**Results:** Thirty-nine crosses were made using seventeen parents (**Table 1A.1**).

**Table 1A.1: List of parents for hybridization, Development of Jhum Rice (B. Aus), 2023-24**

Sl.	Parent	Plant height(cm)	Days to maturity	Yield (t/ha)	Source
1	IR18R1137 *	120	112	3.55	OYT (Jhum)28
2	IR18R1181 *	111	108	3.54	OYT (Jhum)42
3	IR18R1089	120	116	3.52	OYT (Jhum)44
4	IR18R1111 *	120	110	4	OYT (Jhum)45
5	IR18R1162 *	120	109	3.48	OYT (Jhum)35
6	IR18R1145 *	119	117	3.27	OYT (Jhum)29
7	IR18R1164	119	110	3.27	OYT (Jhum)43
8	IR18R1073 *	120	109	3.24	OYT (Jhum)38
9	IR18R1160 *	120	114	3.19	OYT (Jhum)34
10	IR19L1007	120	109	3.03	OYT (Jhum)46
11	IR18R1156 *	121	124	3	OYT (Jhum)33
12	BR12239-5R-183	105	111	2.3	PYT-3 (Jhum)
13	BR12239-5R-201	107	100	2.5	PYT-3 (Jhum)
14	BR12236-5R-8	108	100	3.1	PYT-3 (Jhum)
15	BRRRI dhan83	105	103	3.7	
16	Kalo binni				
17	Lal binni				

\*Remarks for aroma

### Experiment 1A.2: F<sub>1</sub> Confirmation

**Specific Objectives:** Confirmation of crosses as true F<sub>1</sub>.

**Materials and Methods:** The F<sub>1</sub> seeds along with their respective parents were germinated in the petri-dish and were seeded in earthen pots at BRRRI, 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 1.1.

**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Seventeen crosses were confirmed (**Table 1A.2**) by careful observation of plant characters. After confirmation, the F<sub>2</sub> seeds were collected and preserved. These confirmed F<sub>1</sub>s were registered in BRRRI cross list with BR number.

**Table 1A.2: List of F<sub>1</sub> confirmation, Development of Jhum Rice (B. Aus), 2023-24**

Sl.	Designation	F1 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.3: Growing of F<sub>2</sub> population

**Specific Objective:** Growing of F<sub>2</sub> population from F<sub>1</sub> progenies.

**Materials and Methods:** Previously confirmed F<sub>1</sub> 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 1.1. Weeding was done during the period of early seedling to maximum tillering stages. Table 1A.3a shows the list of F<sub>2</sub> population. Table 1A.3b and Table 1A.3c allocate the lists of F<sub>3</sub>-FRGA and F<sub>5</sub>-FRGA for Jhum rice respectively.

**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results and Discussion:** Six F<sub>2</sub> populations were advanced to F<sub>3</sub> and six F<sub>4</sub> populations were advanced to F<sub>5</sub>. Populations were seeded directly in 5.0 m long apart from 25 cm with 25-30 lines for each cross (**Table 1A.3a and 1A.3b**). Fertilizer doses were same as in experiment 1.1. Weeding was done in two/three times during the period of early seedling to maximum tillering stage.

**Table 1A.3a: List of F<sub>2</sub>-FRGA, Development of Jhum Rice (B. Aus), 2023-24**

Sl.	Cross combination	BR No.	Common Trait
1	BR26/ Binni (Red) (9)	BR15490	
	Chubu 125/ BR10411-59-5-33	BR15491	
2	BR10411-59-5-5/ Monqui	BR15492	High yield, intermediate amylose,
3	Japanese black rice/ BR11864-5R-32	BR15493	good grain quality, acceptable to
4	Japanese black rice/Gunda-1	BR15494	ethnic population
5	Japanese black rice/Gunda-2	BR15495	
6	Japanese black rice/Monqui	BR15496	

- Each F<sub>2,3</sub> population contain more than 2000 progenies.

**Table 1A.3b: List of materials for F<sub>3</sub>-FRGA, Development of Jhum Rice (B. Aus), 2023-24**

Sl.	BR No.	Cross combination	Traits	HP
1	14447	Mongthongno/BRRI dhan82	High yield, drought tolerance,	1200
2	14448	Kopro/BRRI dhan62	intermediate amylose, acceptable to ethnic	1310
3	14449	Kopro/BRRI dhan82	group	1180
4	14450	Bekui/ BRRI dhan82		1320
5	14451	Company/ BRRI dhan82		1210
6	14452	Galong/BRRI dhan83		1280

**Table 1A.3c: List of materials for F<sub>5</sub>-FRGA, Development of Jhum Rice (B. Aus), 2023-24**

Sl.	BR No.	Parentage	No. of progenies
1	13855	Chinese rice/BR24	280
2	13856	Chinese rice /BRRRI dhan62	550
3	13857	Kanbui/BR26	600
4	13858	Kanbui/BRRRI dhan55	620
5	13859	Kanbui/BRRRI dhan60	560
6	13860	Ranqui/BRRRI 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/BRRRI dhan62	420
11	13865	Takanari/BRRRI dhan55	410
12	13866	Takanari/BRRRI dhan60	400
13	13867	Takanari/BRRRI dhan62	520
14	13868	Takanari/ Bish Number	400
15	13869	BRRRI dhan55/ Hokuriku193	480
16	13870	BRRRI dhan60/ Hokuriku193	620
17	13871	BRRRI dhan62/ Hokuriku193	560
<b>Total</b>			<b>9,180</b>

**Experiment 1A.4: Identification of superior fixed lines from Line Stage Testing (LST)**

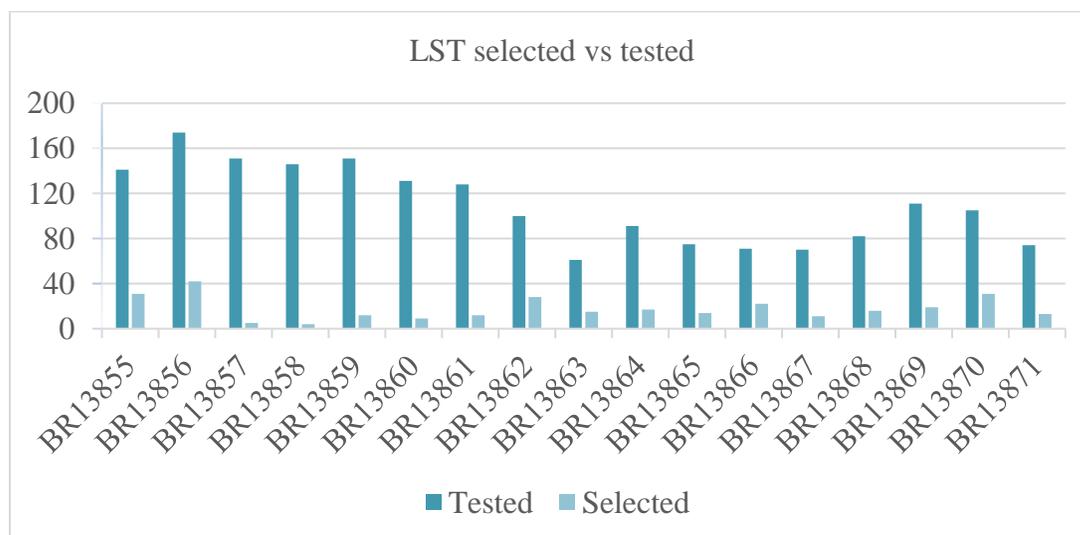
**Principal Investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Specific Objectives:** Isolation of homogeneous 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 1862 genotypes comprising 17 crosses were grown for evaluation under targeted hill condition of three 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 will be 20m<sup>2</sup> (5m × 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 were applied at the time of planting in the dibbled hole. The remaining two third of urea were top dressed in two equal splits at different stages of crop growth.

**Results:** Out of 1862 lines, a total of 301 lines comprising 17 crosses were selected from LST based on identical flowering, grain type traits and phenotypic acceptability under field condition (**Table 1A.4, Fig.1**).



**Fig.1 Line Stage Testing (LST) population, Upland Rice, 2023-24**

**Table 1A.4: List of materials for Line Stage Testing (LST), Upland Rice, 2023-24**

Sl. No.	BR No.	Parentage	Genotypes	
			Tested	Selected
1	BR13855	Chinese rice/BR24	141	31
2	BR13856	Chinese rice /BRRRI dhan62	174	42
3	BR13857	Kanbui/BR26	151	5
4	BR13858	Kanbui/BRRRI dhan55	146	4
5	BR13859	Kanbui/BRRRI dhan60	151	12
6	BR13860	Ranqui/BRRRI dhan55	131	9
7	BR13861	BR10466-2B-15/ Ranqui	128	12
8	BR13862	Bish Number/BR24	100	28
9	BR13863	Bish Number /BR26	61	15
10	BR13864	Bish Number/BRRRI dhan62	91	17
11	BR13865	Takanari/BRRRI dhan55	75	14
12	BR13866	Takanari/BRRRI dhan60	71	22
13	BR13867	Takanari/BRRRI dhan62	70	11
14	BR13868	Takanari/ Bish Number	82	16
15	BR13869	BRRRI dhan55/ Hokuriku193	111	19
16	BR13870	BRRRI dhan60/ Hokuriku193	105	31
17	BR13871	BRRRI dhan62/ Hokuriku193	74	13
<b>Total</b>			<b>1862</b>	<b>301</b>

**Experiment 1A.5: Preliminary Yield Trial (PYT), Development of Jhum Rice development, 2023-24**

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

**Materials and Methods:** Twenty-two genotypes were evaluated in PYT and BRRRI dhan65 and BRRRI dhan83 will be used as check varieties. The trials were seeded directly following randomized complete block design (RCBD) with three replications with unit plot size of 5.0 m × 10 rows and spacing of 25 cm between the rows with sufficient moisture in the field. Fertilizers @ 60:20:40: 100:10 kg NPKS/ha will be used with split application of N at 15, 30, 50 days after seeding (DAT). Total amount of P K S will be applied at the time of final land preparation.

**Data collection:** Data were collected on plant height, days to flowering, days to maturity, PAcP, tiller per plant, panicle per plant, spikelet sterility (%), 1000 seed weight and yield per plot.

**Date of initiation:** April 2023

**Date of completion:** August 2023

**Location:** BRRRI HQ

**Principal investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Four genotypes were selected from twenty-two material based on growth duration, yield, uniformity of morpho-agronomic traits and superiority in one or more traits over the standard checks.

**Table 1.7: List of genotypes for PYT, Development of Jhum Rice development, 2023-24**

SL	Genotype	Plant height (cm)	Days to maturity	Yield( $\text{tha}^{-1}$ )
1	TL Aus-Gaz8-45-4-3*	123	121	2.2
2	TL Aus-Gaz10-2-40-4-3*	115	115	2.6
3	BR9178-7-2-4-4*	132	120	1.7
<b>4</b>	<b>BR10062-9-1-3</b>	<b>116</b>	<b>120</b>	<b>3.4</b>
5	BR10068-22-1-3-1-P2	118	117	2.5

6	<b>IR18R1066 *</b>	<b>114</b>	<b>116</b>	<b>3.1</b>
7	IR18R1117 *	118	120	1.9
8	<b>IR18R1137 *</b>	<b>130</b>	<b>116</b>	<b>2.9</b>
9	<b>IR18R1145 *</b>	<b>118</b>	<b>121</b>	<b>2.9</b>
10	IR18R1153 *	118	117	1.5
11	IR18R1154 *	115	120	2.2
12	IR18R1156 *	123	120	1.7
13	IR18R1160 *	117	116	2.4
14	IR18R1162 *	119	120	2.8
15	IR18R1068 *	117	113	2.4
16	IR18R1073 *	116	115	2.2
17	IR18R1119 *	120	112	2
18	IR18R1181 *	119	120	1.9
19	IR18R1164	116	118	2.6
20	IR18R1089	131	120	2.6
21	IR18R1111 *	117	116	2.6
22	IR19L1007	113	113	1.8
<b>check1</b>	<b>BRRRI dhan65</b>	<b>92</b>	<b>130</b>	<b>2.8</b>
<b>check2</b>	<b>BRRRI dhan83</b>	<b>113</b>	<b>107</b>	<b>3.9</b>
	<b>LSD &lt; 0.05</b>	<b>2.16</b>	<b>2.7</b>	<b>0.42</b>
	<b>H<sup>2</sup>b</b>	<b>0.96</b>	<b>0.81</b>	<b>0.46</b>

#### **Experiment 1A.5: Advanced Yield Trial (AYT-1), Development of Jhum Rice development, 2023-24**

**Specific objective:** Confirmatory evaluation of selected materials for yield and other agronomic traits in replicated trial.

**Materials and Methods:** Twenty-two genotypes were evaluated in SYT and BRRRI dhan43, BRRRI dhan65, BRRRI dhan69 and BRRRI dhan83 will be used as check varieties. The unit plot size will be 5.0 m × 10 rows. Forty days old seedlings were transplanted @ 2-3 seedlings with 20 × 15 cm spacing. Fertilizers @ 60:20:40: 100:10 kg N:P:K:S/ha (130: 100: 80 kg Urea-TSP-MoP/ha) were used with split application of N at 15, 30, 50 days after transplanting (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, PAcp, tiller per plant, panicle per plant, spikelet sterility (%), 1000 grain weight and yield per plot.

**Date of initiation:** April 2023

**Date of completion:** August 2023

**Location:** BRRRI, Gazipur

**Principal investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** Eight genotypes were selected from ten materials based on growth duration, yield, uniformity of morpho-agronomic traits and superiority in one or more traits over the standard checks.

**Table 1A.5: List of genotypes for AYT-1, Development of Jhum Rice development, 2023-24**

SL	Genotype	Plant height (cm)	Days to maturity	Yield(th <sup>a</sup> )
1	<b>IR83140-B-11-B</b>	<b>109</b>	<b>103</b>	<b>4.3</b>
2	<b>GSR IR 1-DQ121-Y6-D2</b>	<b>103</b>	<b>111</b>	<b>5.7</b>
3	<b>IR83140-B-11-B</b>	<b>118</b>	<b>113</b>	<b>5.3</b>
4	<b>BR(Bio)10376-AC4-1-3</b>	<b>105</b>	<b>104</b>	<b>3.8</b>
5	<b>BR12236-5R-8</b>	<b>107</b>	<b>101</b>	<b>4.4</b>

6	BR12236-5R-17	110	100	2.8
7	<b>BR12239-5R-5</b>	<b>115</b>	<b>111</b>	<b>5.5</b>
8	<b>BR12239-5R-25</b>	<b>111</b>	<b>110</b>	<b>4.4</b>
9	BR12239-5R-183	108	101	2.7
10	<b>BR12239-5R-201</b>	<b>114</b>	<b>111</b>	<b>4.4</b>
check1	<b>BRRRI dhan43</b>	<b>116</b>	<b>115</b>	<b>3.8</b>
check2	<b>BRRRI dhan55</b>	<b>106</b>	<b>99</b>	<b>3.4</b>
check3	<b>BRRRI dhan65</b>	<b>97</b>	<b>99</b>	<b>3.7</b>
check4	<b>BRRRI dhan69</b>	<b>102</b>	<b>112</b>	<b>3.8</b>
check5	<b>BRRRI dhan83</b>	<b>117</b>	<b>106</b>	<b>4.2</b>
<b>LSD &lt; 0.05</b>		<b>4.6</b>	<b>2.5</b>	<b>0.52</b>
<b>H<sup>2</sup>b</b>		<b>0.81</b>	<b>0.91</b>	<b>0.58</b>

### Experiment 1A.6: Advanced Yield Trial (AYT-2) of Jhum rice in Chattogram hill districts, 2023-24

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

**Materials and Methods:** Twelve genotypes were grown in two replicated trials under targeted hill condition of three 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 will be 20m<sup>2</sup> (5m × 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 were applied at the time of planting in the dibbled hole. The remaining two third of urea were top dressed in two equal splits at different stages of crop growth.

Design: Randomized complete block (RCB) Design

No. of entries including checks: 12

No. of replication: 2

Unit plot area = 5m × 4m = 20 m<sup>2</sup>

Total plot area (each AYT) = 18.5m × 36.8m = 680.8 m<sup>2</sup> = 681 m<sup>2</sup> = 17 decimal

**Principal investigator:** M. Akhlasur Rahman

**Co-Investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Results:** One promising line of BRRRI designated as BR12239-5R-93 and BRRRI dhan83 variety performed best among all materials evaluated. Fig. 2 shows the performance of selected breeding lines.

**Table 1.9: List of genotypes for AYT-2, Development of Jhum Rice development, 2023-24**

SL	Genotype	PH (cm)	GD (days)	L1	L2	L3	L4	L5	L6	Yield (tha <sup>-1</sup> )
1	Chandranath-3	109	141	1.6	2.1	1.6	1.7	1.8	1.2	1.8
2	BR(Bio)10331-AC1-2	117	89	1.6	2.3	2.0	2.1	1.5	1.7	2.1
3	Luyin-46	119	100	2.5	2.7	2.4	2.9	3.1	2.5	3.0
4	D(R)-6	121	97	1.9	2.2	2.3	1.8	2.0	2.3	2.3
5	<b>BR12239-5R-93</b>	<b>111</b>	<b>107</b>	<b>2.7</b>	<b>3.5</b>	<b>2.9</b>	<b>3.3</b>	<b>3.1</b>	<b>3.2</b>	<b>3.4</b>
6	BRRRI dhan75	113	93	2.9	2.5	2.1	2.1	3.2	2.5	2.8
7	<b>BRRRI dhan83</b>	<b>108</b>	<b>106</b>	<b>3.1</b>	<b>3.5</b>	<b>4.2</b>	<b>3.7</b>	<b>3.7</b>	<b>2.8</b>	<b>3.8</b>
8	BRRRI dhan98	112	93	2.6	2.5	2.6	2.1	3.2	2.8	2.9
9	BRRRI dhan104	113	99	2.3	2.5	2.1	1.7	1.8	2.1	2.3
LSD<0.05		2.32	2.90	0.12	0.23	0.21	0.11	0.08	0.14	0.26
H2b		0.91	0.78	0.70	0.79	0.76	0.91	0.78	0.90	0.95

\* PH=Plant Height(cm); GD= Growth duration (days); L1=Matiranga, Khagrachori; L2=Sadar, Khagrachori; L3= Sadar, Khagrachori; L4=Sadar, Rangamati; L5=Rowangchori, Bandarban; L6= Rowangchori, Bandarban



**Fig. 2 Performance of breeding lines at hill district**

**PROJECT 2: DEVELOPMENT OF PARTIALLY IRRIGATED RICE (T. Aus), 2023-2024**

**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 & J Ferdousy

**Specific Objectives:** Introgression of earliness, pre-harvest sprouting tolerance, and quality grain traits into high yielding genotypes genetic background.

**Materials and Methods:** The crossing program for 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 in BRRI Headquarters, Gazipur. 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 & 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<sub>4</sub>) 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<sub>4</sub>) 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 and Discussion:** Twenty-three crosses were made using 28 parents for development of partially irrigated rice (T. Aus) from 2023-24 season and 2139 F<sub>1</sub> seeds were collected (Table 2.1).

**Table 2.1. List of the crosses, Development of Partially Irrigated Rice (T. Aus), 2023-24**

SN	Parentage	No. of F <sub>1</sub> seed	Introgression of target genes
1	BR11596-5R-39/BR12087-5R-196	05	Earliness, fine grain
2	BR12091-4R-9/BR11866-5R-312	20	Earliness
3	BR11601-14-4-1/BR11596-5R-39	30	Earliness, aromatic and fine grain
4	BR9829-30-3-2-1-4/BR11596-5R-39	39	Earliness, fine grain
5	7 FBR-189/BR11866-5R-312	13	Earliness
6	7 FBR-190/BR12087-5R-196	33	Earliness
7	7 FBR-376/BR11596-5R-39	39	Earliness, fine grain
8	7 FBR-336/BRRI dhan98	64	Earliness
9	BR11866-5R-312/IR64-EMF	10	Earliness, EMF
10	BRRRI dhan98/BR11601-14-4-1	26	Earliness, aromatic and fine grain
11	BRRRI dhan99/BR11867-5R-103	56	Earliness, BB resistance

12	BR11723-4R-12/BRRI dhan101	71	BB resistance
13	BR9138-4-4-5-5-P3-HR3-HR5/BR11607-4R-72	45	BB resistance
14	Bangabandhu dhan100/BR8781-16-1-3-P2	135	Lodging tolerance
15	BRRRI dhan87/BR8781-16-1-3-P2	38	Lodging tolerance
16	BR9006-40-2-3-1*3/BR11607-4R-72	286	BB resistance
17	BR9830-53-3-5-2*3/BR11607-4R-72	35	BB resistance
18	BR11723-4R-12*3/N22	190	High temperature tolerant rice
19	BR11867-4R-371*3/ IR64-EMF <sub>3</sub>	329	Earliness, EMF
20	BR11723-4R-12*2/IR12N177	145	High temperature tolerant rice
21	BR12121-4R-53*2/ IR12N177	252	High temperature tolerant rice
22	BR11723-4R-172*3/IR64-EMF <sub>3</sub>	94	Earliness, EMF
23	BR12442-4R-49*2/ IR64-EMF <sub>3</sub>	184	Earliness, EMF
<b>Total</b>		<b>2139</b>	

## Experiment 2.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma & J Ferdousy

**Specific Objective:** Confirmation of F<sub>1</sub>s as true crosses and selection of promising ones.

**Materials and Methods:** Around 16 crosses were grown (Table 2.2). F<sub>1</sub> 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 with single seedling at a spacing of 25 × 15 cm in the net house. Respective parental seedlings were transplanted on both sides of each F<sub>1</sub> population. The cross confirmation was done by careful observation of plant characters. After confirmation promising F<sub>1</sub>s were selected and used for double and multiple crosses. Complex crosses were mainly done for the F<sub>1</sub>s which using local cultivars or low yielding genotypes with valuable traits. The F<sub>2</sub> and multiple F<sub>1</sub> crosses were preserved carefully after proper drying in a cool place. Crop management was done as described in experiment 2.1.

**Results:** All F<sub>1</sub>s were confirmed successfully during T. Aus 2023-24.

**Table 2.2. F<sub>1</sub> confirmation, T. Aus2023-24**

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

## Experiment 2.3: Field RGA nursery (F<sub>2</sub>-F<sub>4</sub> Generation)

**Principal Investigator:** M 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 33,300 progenies from 77 crosses were grown (**Table 2.3 and 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 and Discussion:** In T. Aus program, a total of 33,300 progenies of 77 crosses in T. Aus season were advanced through modified RGA in greenhouse and FRGA.

**Table 2.3. List of F<sub>2</sub> population grown in FRGA, T. Aus2023-24**

SN	BR No.	Cross combination	No. of Plants	Progenies
	<b>F<sub>2</sub>, T Aus (BB)</b>			
1	BR14994-3BB+Pi9	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21, xa5, xa13, Pita, Pi9, TSV1</i> )	P#1	600
2	BR14994-3BB	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21, xa5, xa13</i> )	P#2,3,5,6	600
3	BR14994- <i>Xa21+xa13</i>	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21, xa13</i> )	P#9,10,12,14,24,28	600
4	BR14994- <i>Xa21+xa5</i>	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21, xa5</i> )	P#23,25,26	600
5	BR14994- <i>xa5+xa13+Pi9</i>	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>xa5, xa13, Pi9, TSV1</i> )	P#19	600
6	BR14994- <i>Pi9+Pita</i>	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Pi9, Pita</i> )	P#17	600
7	BR14995	BR9830-53-3-5-2*2/ BR11607-4R- 72( <i>Xa21, xa13</i> )	P#1	600
8	BR14679	BR11723-4R-172/IR64-EMF3 ( <i>qHTSF4.1</i> )	P#2,4,5,7	600
9	BR14681	BR11723-4R-12/N22 ( <i>qHTSF4.1</i> )	P#1,2,4,7,9,10,11	600
10	BR14996	BR11867-4R-371*2/ IR64-EMF3 ( <i>Xa21</i> )	1-7,9-11,15,16,19-21	600
11	BR14997- <i>Xa21+xa5</i>	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, xa5</i> )	P#3,4,8,17,18,21	600
12	BR14997-3BB	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, xa5, xa13</i> )	P#14,15,19	600
13	BR14997- <i>Xa21+xa5+fgr</i>	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, xa5, fgr</i> )	P#6	600
14	BR14997- <i>Xa21+qHTSF4.1</i>	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, qHTSF4.1</i> )	P#1,16	600
15	BR14998-3BB+ <i>fgr</i>	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa5, xa13, fgr</i> )	P#27,40,72	600
16	BR14998-3BB+ <i>Pi9</i>	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa5, xa13, Pi9, Pita, Pbl</i> )	P#29,32,41,45	600
17	BR14998-3BB	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa5, xa13</i> )	P#30,39,44,47	600
18	BR14998- <i>Xa21+xa13</i>	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa13</i> )	P#36,37,50,53,54,62- 66	600
19	BR14998- <i>Xa21+xa5</i>	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa5</i> )	P#55-57,61	600
20	BR14998-3BBF2	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21, xa5, xa13-homozygous</i> )	P#28,33,42,46	600
21	BR15009	BR11723-4R-12/IR12N177 ( <i>xa5, Pita, qHTSF4.1</i> )	P#2,5,6,8,10,12	600
22	BR15013- <i>Xa21+qHTSF4.1+fgr</i>	BR12442-4R-49/ IR64- EMF3( <i>Xa21, qHTSF4.1, fgr</i> )	P#2,8,9,10,12	600
23	BR15014	BR12121-4R-53/ IR12N177 ( <i>xa5, Pita, qHTSF4.1</i> )	P#1,2,3,10	600
24	BR15015-3BB+ <i>Pi9</i>	BR11723-4R-12/N22// BR11867-4R-371/ IR64-EMF3 ( <i>Xa21, xa5, xa13, Pi9</i> )	P#1	600
25	BR15015- <i>Xa21+qHTSF4.1</i>	<i>Xa21, xa5, qHTSF4.1</i>	P#3	600
26	BR15015- <i>Xa21+Pi9</i>	<i>Xa21, xa5, Pita, Pi9</i>	P#15,20,22,24,28	600
27	BR15016	BR8781-16-1-3-P2/ BR12442-4R-49 ( <i>Xa21, qHTSF4.1, fgr</i> )	P#5,9,12	600
			<b>Total</b>	<b>11400</b>

**Table 2.4. List of F<sub>3-6</sub> population grown in FRGA, T. Aus2023-24**

<b>SN</b>	<b>BR No.</b>	<b>Designation</b>	<b>Imp. Features</b>	<b>Progenies</b>
<b>F<sub>3</sub>, T Aus</b>				
1	BR14674-R	BR9006-40-2-3-1/ BR11607-4R-72	BB resistance	500
2	BR14675-R	BR9830-53-3-5-2/ BR11607-4R-72	BB resistance	500
3	BR14676-R	BR9011-25-4-1-3/ BR11723-4R-172	BB resistance	500
4	BR14677-R	BR9830-53-3-5-2/ BR11723-4R-172	BB resistance	500
5	BR14678-R	BR9829-78-1-2-1/ BR11723-4R-12	BB resistance	500
6	BR14679-R	BR11723-4R-172/IR64-EMF <sub>3</sub>	BB resistance	500
7	BR14680-R	7 FBR-376/ BR11723-4R-172	BB resistance	500
8	BR14681-R	BR11723-4R-12/N22	BB resistance	500
9	BR14682-R	7 FBR-222/ BR11723-4R-12	BB resistance	500
10	BR14683-R	BR11868-5R-2/BRBa-1-4-9	BB resistance	500
11	BR14684-R	BR11868-5R-2/7 FBR-376	BB resistance	500
12	BR14685-R	BR11867-4R-371/ IR64-EMF <sub>3</sub>	BB resistance	500
13	BR14686-R	BR9006-40-2-3-1*2/ BR11868-5R-23	BB resistance	500
14	BR14687-R	BR9006-40-2-3-1/ BR11868-5R-23// BR11723-4R-172	BB resistance	500
15	BR14688-R	BR9829-78-1-2-1*2/ BR11607-4R-192	BB resistance	500
16	BR14689-R	BR9829-78-1-3-2*2/ BR11868-5R-23	BB resistance	500
17	BR14690-R	BR9829-78-1-3-2/ BR11868-5R-23// BR11723-4R-12	BB resistance	500
18	BR14691-R	BR11600-4R-230/N22//BR11723-4R-172	BB resistance	500
19	BR14692-R	BR11868-5R-23/N22// BR11723-4R-172	BB resistance	500
<b>Total</b>				<b>9500</b>
<b>SN</b>	<b>BR No.</b>	<b>Designation</b>	<b>Imp. Features</b>	<b>Progenies</b>
<b>F<sub>4</sub>, T Aus (BB)</b>				
1	BR14304-2R	BR9006-40-2-3-1 / HHZ12-Y4-Y1-DT1	Earliness	400
2	BR14305-2R	BR9006-40-2-3-1 / BR11600-4R-230	Earliness	400
3	BR14307-2R	BR8781-16-1-3-P2/ HHZ12-Y4-DT1-Y3	Earliness	400
4	BR14311-2R	BR11868-5R-23/N22	BB, High temp. tol.	400
5	BR14312-2R	BR9029-37-2-1-3-P1/ HHZ15-DT7-SAL4-SAL1	Earliness	400
6	BR14313-2R	7 FBR-400/ IR99853-B-B-B-460	BB, High temp. tol.	400
7	BR14315-2R	BR11600-4R-230/ BRR1 dhan43	BB, Earliness	400
8	BR14319-2R	7 FBR-416/ BR9651-15-2-1-4	Earliness	400
9	BR14321-2R	BRR1 dhan92/ IR99853-B-B-B-460	BB, High temp. tol.	400
10	BR14327-2R	BRR1 dhan98/ BR11102-4R-247	Earliness	400
11	BR14329-2R	BRR1 dhan99/ BR11102-4R-247	Earliness	400
12	BR14332-2R	BRR1 dhan43/ BR11102-4R-247	Earliness	400
13	BR14336-2R	BR11723-4R-172/ USPi9	Earliness	400
14	BR14306-2R	BR9006-40-2-3-1/ BR11868-5R-23	BB, High temp. tol.	400
15	BR14308-2R	BR9829-78-1-2-1/ BR11607-4R-192	BB, High temp. tol.	400
16	BR14309-2R	BR9829-78-1-3-2/ BR11868-5R-23	BB, High temp. tol.	400
17	BR14310-2R	BR11600-4R-230/N22	BB, High temp. tol.	400
18	BR14314-2R	BR9830-53-3-5-2/ BR11600-4R-43	BB res	400
19	BR14316-2R	BRR1 dhan98/ BR11600-4R-230	BB res	400
20	BR14317-2R	7 FBR-416/ BR11868-5R-59	BB res	400
21	BR14318-2R	7 FBR-400/ BR11868-5R-89	BB res	400
22	BR14320-2R	BR11600-4R-230/ BR11607-4R-153	BB res	400
23	BR14322-2R	BRR1 dhan89/ BR11607-4R-192	BB, High temp. tol.	400
24	BR14323-2R	BR11600-4R-140/ BR11607-4R-153	BB res	400
25	BR14324-2R	BR11604-4R-84/ BR11600-4R-230	BB res	400
26	BR14325-2R	BR11723-4R-12/ BR11868-5R-89	BB res	400
27	BR14326-2R	BR11723-4R-172/ BR11607-4R-192	BB, High temp. tol.	400
28	BR14328-2R	BRR1 dhan99/ BR11103-4R-97	BB res	400
29	BR14331-2R	7 FBR-400/ BR11103-4R-97	BB res	400
30	BR14333-2R	BRR1 dhan98/ IR64-Pi9	Blast res	400
31	BR14343-2R	BRR1 dhan71*2/ IR127152-3-22-2-1-B	BB res	400
<b>Total</b>				<b>12400</b>

## Experiment 2.4: Line Stage Testing (LST)

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma & J Ferdousy

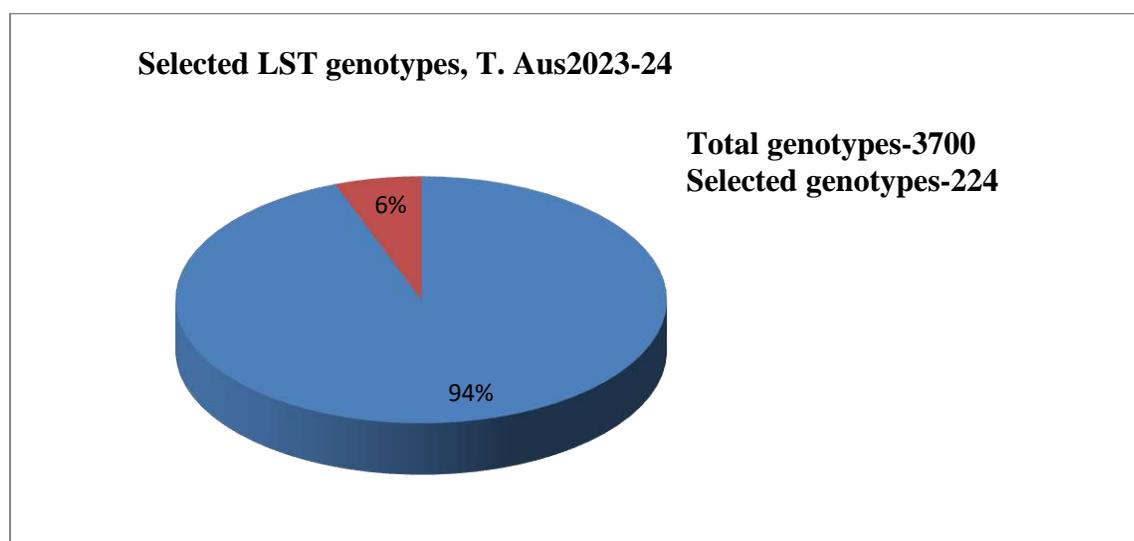
**Specific Objective:** Isolation of homogeneous breeding lines with improved plant type, disease free, and short duration.

**Materials and Methods:** Line Stage Testing consisting of 3700 genotypes were evaluated in T. Aus2023-24 season (**Table 2.5**). 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 fertilizer and crop management was done as described in experiment 2.1.

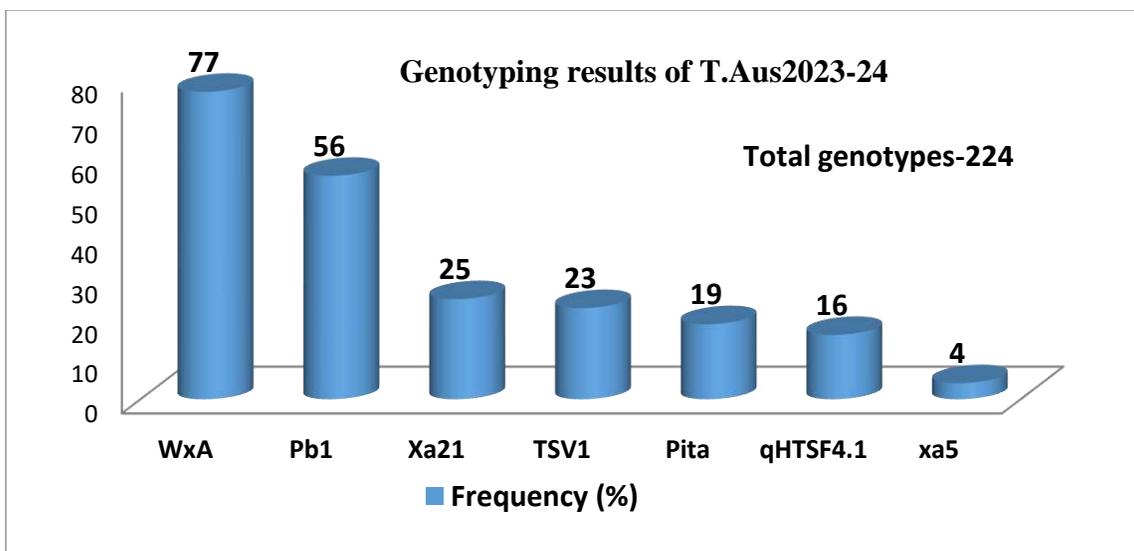
**Results and Discussion:** In total, 3700 breeding lines of 14 crosses were evaluated in the Line Stage Testing (LST) in T. Aus season. Among the evaluated lines, 224 lines were selected based on homogeneity, plant type, days to flowering, disease reaction at the field level and presence of favorable trait marker alleles which were confirmed by trait-based SNP genotyping. Selection intensity applied for selecting LST lines was 6.0% (**Fig. 2.1**). Considering the trait genotyping of selected 224 LST materials the frequency (%) of BB resistance gene was (*Xa21*-25.0 and *xa5*-4.0) and frequency (%) of Blast resistance gene was (*Pbl*-56.0, *Pita*-19.0) and frequency (%) of Rice Tungro Virus (RTV) resistance gene was (*TSV1*-23.0) (**Fig. 2.2**). Favorable allele of high amylose (*Wx-A*) was 77.0% and high temperature spikelet fertility (*qHTSF4.1*) was 16.0%.

**Table 2.5. List of materials for Line Stage Testing (LST), Development of Partially Irrigated Rice, T. Aus2023-24**

SN	BR No.	Parentages	Important Features	Progenies
1	BR13619-4R	BRR1 dhan27/HHZ12-Y4-DT1-Y3	Earliness	300
2	BR13620-4R	BRR1 dhan27/ 7 FBR-189	Earliness	300
3	BR13615-5R	BR9011-62-2-1-2/Nania	Short duration	300
4	BR13616-5R	BR9830-5-2-2-3/BRR1 dahn87	Short duration	300
5	BR13617-5R	BR9830-5-2-2-3/Nania	Short duration	300
6	BR13963-4R	BR9011-25-4-1-3/IR64-EMF <sub>3</sub>	EMF	300
7	BR13964-4R	BRR1 dahn89/IR99853-B-B-B-460	Heat tolerant	300
8	BR13966-4R	7 FBR-400/ IR99853-B-B-B-460	Heat tolerant	300
9	BR13968-4R	BR9011-62-2-1-2*2/ IR12N177	Heat tolerant	300
10	BR13649-4R	BRR1 dhan84*2/Mineasahi	Blast res	200
11	BR13652-4R	BR9943-35-2-1-2-B2*2/Mineasahi	Blast res	200
12	BR13658-4R	BRR1 dhan88*2/Mineasahi	Blast res	200
13	BR13659-4R	HHZ12-SAL2-Y3-Y2*2/Mineasahi	Blast res	200
14	BR13660-4R	BRR1 dhan89*2/Mineasahi	Blast res	200
<b>Total</b>				<b>3700</b>



**Fig. 2.1. Pie chart showing frequency distribution of LST lines in T. Aus2023-24**



**Fig. 2.2. Bar graph of trait marker profiles showing favorable alleles for different key target traits of the selected LST lines, T. Aus2023-24**

### Experiment 2.5: Observational Yield Trial (OYT)

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma, J Ferdousy (Plant Breeding), N Jahan, M Salahuddin and M A Islam (Cumilla), Anisar Rahman and M R Hasan (Rangpur), S Abedin, M R Islam and 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.

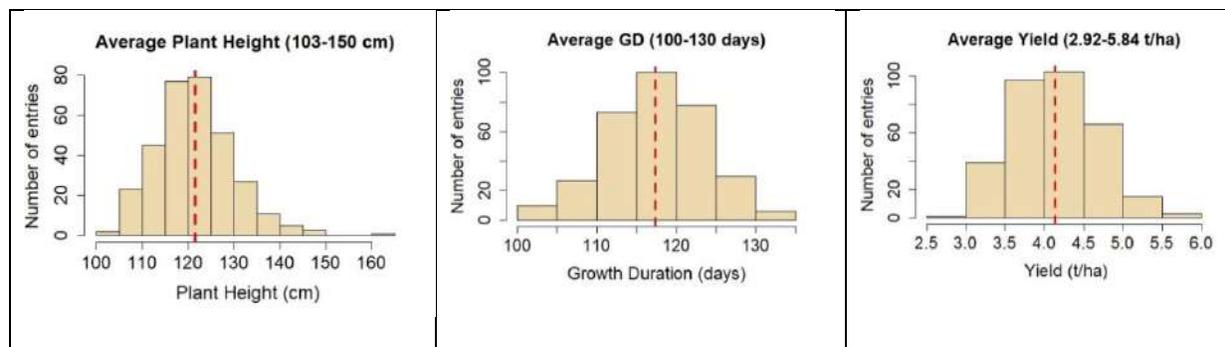
**Location:** BRRI, Gazipur, Cumilla, Rangpur, and Rajshahi.

**Materials and Methods:** A total of 674 advanced breeding lines in OYT#1 and 118 advanced breeding lines in OYT#2 along with the standard check BRRI dhan48, BRRI dhan82, BRRI dhan83, and BRRI dhan98 were evaluated in a non-replicated trial (**Table 2.6**). 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:** In T. Aus program, 674 breeding lines were evaluated at four locations (Gazipur, Cumilla, Rajshahi, and Rangpur) in OYT following sparse testing model of genomic selection in T. Aus2023-24. The common population consisted of 202 breeding lines and subset of 118 breeding lines were evaluated in four locations showed variable yield performance. Yield of the advanced breeding lines showed a wide range of variation in plant height that was varied from 103-150 cm, growth duration varied from 100 to 130 days and yield range was 2.92-5.84 t/ha (**Fig. 2.3**). Performance of top twenty genotypes out of 320 based on better performance with homogeneity in flowering and grain quality evaluation were shown in **Table 2.6**. Average yield performance (4.99-5.84 t/ha) of the twenty advanced lines was observed and yield advantage of the selected lines was >10% than the popular check variety BRRI dhan48 and similar yield to BRRI dhan98. Growth duration was 107-120 day whereas the growth duration was 107 days for BRRI dhan48 and 108 days for BRRI dhan98. Three promising lines, BR13166-4R-91, BR13165-4R-95 and BR13165-4R-123, showed 10-15% yield advantage than the high yielding check variety BRRI dhan98 (**Table 2.6**).

Considering the 1K RiCA trait genotyping of OYT materials, the frequency (%) of BB resistance gene was (*Xa21*-13.0, *xa13-5* and *xa5*-8.0) and frequency (%) of Blast resistance gene was (*Pi33*-13.0, *Pita*-44.0) and frequency (%) of Rice Tungro Virus (RTV) resistance

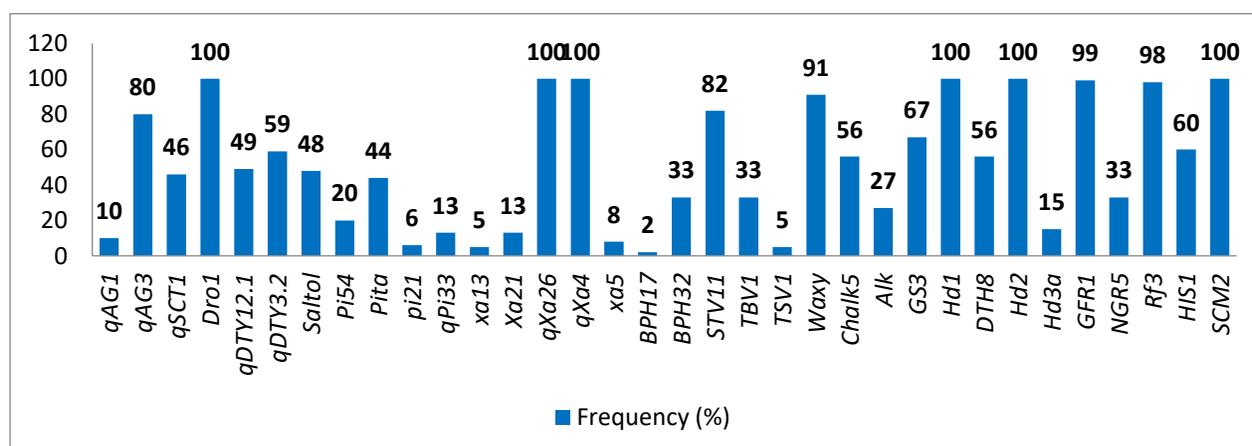
gene was (*TSV1-5.0*, *TBVI-33.0*). Favorable allele of high amylose (*Wx-A*) was 91.0% and favorable allele of *chalk5* was 56.0% (**Fig. 2.4**). Moreover, favorable allele of abiotic stress tolerance frequencies%, viz. *AG1*, *AG3*, *qDTY12.1*, *qDTY3.2*, *Saltol* were abundant in these genotypes (**Fig. 2.4**).



**Fig. 2.3:** Histogram showing the plant height, growth duration, and yield performance of 320 entries tested in OYT at four locations during T. Aus2023-24

**Table 2.6.** Agronomic performance of the selected top yielder materials from observational yield trial (OYT), Favorable condition, T. Aus2023-24

SN	Designation	PH (cm)	DM (days)	Yield (t/ha)				
				Cumilla	Gazipur	Rajshahi	Rangpur	Pooled
*1	BR13165-4R-123	120.8	108	3.72	5.97	6.22	7.47	5.84
*2	BR13165-4R-95	111.5	111	5.11	7.27	5.18	5.52	5.77
*3	BR13166-4R-91	134.1	116	5.61	5.08	5.37	6.20	5.57
4	BR13170-4R-32	126.3	120	4.83	5.98	5.89	5.15	5.46
5	BR13162-4R-177	110.8	112	5.04	6.01	4.73	5.96	5.44
6	BR12889-5R-81	120.7	117	4.13	6.50	5.16	5.94	5.43
7	BR13169-4R-32	117.0	111	5.00	6.87	6.02	3.80	5.42
8	BR12893-5R-56	107.9	115	4.56	5.07	6.16	5.74	5.38
9	BR13164-4R-132	107.4	111	2.15	5.11	6.32	5.63	5.28
10	BR13169-4R-145	114.6	109		6.93	6.00	3.64	5.26
11	BR13159-4R-93	105.8	105	3.59	6.90	6.15	4.35	5.25
12	BR13159-4R-161	116.4	115		6.63	6.10	4.39	5.23
13	BR13168-4R-13	138.4	115	6.72	4.39	5.21	4.37	5.17
14	BR13170-4R-60	122.6	115	5.19	5.86	3.98	5.52	5.14
15	BR13160-4R-196	121.2	120	4.86	4.02	6.13	5.34	5.09
16	BR13164-4R-27	122.5	107	4.87	6.11	4.65	4.50	5.03
17	BR13169-4R-83	118.7	110	3.46	6.37	6.13	4.12	5.02
18	BR13161-4R-294	125.6	114		4.84	6.02	5.57	5.00
19	BR13160-4R-37	119.2	112	4.38	5.46	5.80	4.33	4.99
20	BR13169-4R-202	119.4	115	4.67	5.45	6.20	3.64	4.99
	<b>BRR1 dhan48</b>	<b>108.1</b>	<b>107</b>	<b>2.39</b>	<b>4.79</b>	<b>5.24</b>	<b>5.47</b>	<b>4.47</b>
	BRR1 dhan82	112.0	104	2.08	4.60	5.07	5.32	4.27
	BRR1 dhan83	114.4	108	3.19	4.51	4.61	4.15	4.11
	<b>BRR1 dhan98</b>	<b>105.5</b>	<b>108</b>	<b>3.61</b>	<b>5.59</b>	<b>5.64</b>	<b>5.42</b>	<b>5.07</b>
	LSD (0.05)	8.52	9.15	1.52	1.43	0.48	0.55	1.36
	H2	0.23	0.37	0.22	0.60	0.82	0.69	0.47



**Fig. 2.4.** Trait marker profiles (1K RiCA) showing favorable alleles for different key target traits of the selected OYT lines, T. Aus2023-24

## Experiment 2.6: Advanced Yield Trial (AYT)

**Principal Investigator:** M Khatun

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

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

**Location:** BRRI, Gazipur, Cumilla, and Rajshahi.

**Materials and Methods:** Advanced yield trial consisting of 40 genotypes along with the check BRRI dhan48, and BRRI dhan98 were evaluated. Three weeks old seedlings were transplanted with single seedling per hill at a spacing of 20 × 15 cm in a 5.4 m × 5 rows plot. The field layout was Latinized Row Column 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:** Six advanced lines out of 40 from AYT for favorable condition were selected on the basis of homogeneity with respect to plant height, growth duration and yield. The selected breeding lines showed 3.24-4.94 t/ha with 102-115 days growth duration. Considering average yield performance, the selected six entries (4.68-4.94 t/ha) showed similar yield to the check variety BRRI dhan48 (4.77 t/ha) and BRRI dhan98 (5.09 t/ha) (**Table 2.7**).

**Table 2.7. Agronomic performance of the top yielder materials from Advanced Yield Trial (AYT), Favorable condition, T. Aus2023-24**

SN	Designation	PH (cm)	DM (day)	Yield (t/ha)				Mean
				Cumilla	Gazipur	Rajshahi	Rangpur	
1	BR 12109-4 R-10	97.4	110	3.73	3.71	<b>6.33</b>	3.62	4.35
2	BR 12109-4 R-16	105.7	104	3.89	5.03	4.90	3.42	4.31
3	BR 12428-5 R-106	115.9	115	3.97	5.17	4.73	3.81	4.42
*4	BR 12428-5 R-63	109.5	114	4.41	4.86	5.35	5.01	<b>4.91</b>
5	BR 12431-5 R-118	115.5	112	3.79	2.86	5.01	4.13	3.95
6	BR 12435-5 R-40	119.6	115	4.92	2.82	3.89	2.59	3.55
7	BR 12448-4 R-7	106.4	106	4.52	3.09	4.44	3.91	3.99
8	BR 12589-4 R-257	111.8	105	4.15	5.51	5.06	3.77	4.62
9	BR 12589-4 R-259	116.6	110	4.44	5.17	5.43	3.39	4.61
10	BR 12589-4 R-27	114.0	108	4.39	3.69	4.47	4.62	4.29
*11	BR 12589-4 R-332	108.1	104	3.88	5.98	5.30	4.60	<b>4.94</b>
12	BR 12589-4 R-343	112.0	109	4.28	5.19	4.48	4.20	4.53
*13	BR 12590-4 R-131	99.8	113	3.91	4.47	<b>6.58</b>	4.18	<b>4.79</b>
14	BR 12591-4 R-316	112.9	105	3.85	2.75	4.56	4.90	4.01
15	BR 12591-4 R-74	110.0	102	4.08	3.32	2.78	2.78	3.24
16	BR 12592-4 R-168	106.9	107	3.80	4.98	5.50	3.99	4.57
*17	BR 12592-4 R-190	108.0	106	4.09	<b>5.68</b>	5.55	4.42	<b>4.94</b>
18	BR 12592-4 R-67	109.9	103	4.15	3.35	2.03	3.57	3.28
19	BR 12593-4 R-109	111.6	106	5.40	3.86	5.26	3.84	4.59
20	BR 12593-4 R-321	118.4	107	<b>5.45</b>	2.71	5.59	3.23	4.24
21	BR 12593-4 R-44	117.0	106	4.25	3.70	4.54	3.55	4.01
22	BR 12593-4 R-59	114.6	111	4.12	3.86	5.17	4.33	4.37
23	BR 12597-4 R-374	101.3	111	3.73	3.93	4.85	3.59	4.03
24	BR 12598-4 R-62	104.3	106	3.84	5.71	4.64	4.78	4.74
25	BR 12601-4 R-104	117.2	107	4.12	2.78	4.33	3.82	3.76
26	<b>BR 12603-4 R-161</b>	<b>120.1</b>	<b>113</b>	<b>3.94</b>	<b>3.53</b>	<b>4.81</b>	<b>4.60</b>	<b>4.22</b>
27	<b>BR 12603-4 R-170</b>	<b>115.8</b>	<b>103</b>	<b>3.92</b>	<b>4.68</b>	<b>3.19</b>	<b>4.61</b>	<b>4.10</b>
28	BR 12603-4 R-185	114.0	104	4.22	2.80	5.38	4.53	4.23
29	<b>BR 12603-4 R-189</b>	<b>124.4</b>	<b>113</b>	<b>3.97</b>	<b>2.13</b>	<b>3.90</b>	<b>3.22</b>	<b>3.31</b>
30	<b>BR 12603-4 R-208</b>	<b>116.3</b>	<b>106</b>	<b>3.99</b>	<b>2.70</b>	<b>4.50</b>	<b>4.55</b>	<b>3.93</b>
31	BR 12603-4 R-393	113.9	105	5.38	3.75	5.10	4.18	4.60
*32	BR 12616-4 R-104	112.5	110	5.22	4.79	5.93	3.56	<b>4.88</b>
33	BR 12616-4 R-112	115.0	110	3.93	4.01	5.36	3.86	4.29
34	BR 12616-4 R-121	114.8	110	4.01	3.49	4.78	4.54	4.20

35	BR 12616-4 R-132	116.5	111	4.07	6.06	5.62	3.15	4.72
36	BR 12616-4 R-183	113.4	108	5.26	4.28	4.98	3.25	4.44
37	BR 11851-4R-37	122.7	115	5.13	3.35	5.38	3.63	4.37
38	BR 12596-5R-67	100.8	108	5.40	4.05	4.29	2.90	4.16
39	BR 12598-4R-189	105.3	106	4.26	3.81	4.76	3.71	4.14
*40	BR 12599-4R-105	105.8	108	3.69	<b>5.49</b>	5.04	4.51	<b>4.68</b>
41	BRRRI dhan48 (Ck)	103.6	107	5.10	4.95	5.20	3.83	4.77
42	BRRRI dhan98 (Ck)	110.5	108	5.26	5.02	5.74	4.34	5.09
LSD (0.05)		12.28	6.91	0.61	1.54	0.76	0.72	0.83
H2		0.58	0.48	0.60	0.28	0.67	0.53	0.20

## Experiment 2.7: Regional Yield Trial (RYT)

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma, J Ferdousy and Scientists of different regional stations

**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 consisting of 23 genotypes for RYT#1 and RYT#2 along with the standard check BRRRI dhan48 and BRRRI dhan98 were evaluated for high yield performance in T. Aus growing areas (Gazipur, Cumilla, Kushtia, Rangpur, Rajshahi, and Sonagazi) (**Table 2.8 and Table 2.9**). 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. The field layout was RCBD 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 and Discussion:** There are twelve advanced breeding lines along with the standard checks were evaluated in six different geographical locations viz. Cumilla, Kushtia, Rajshahi, Rangpur, Gazipur, and Sonagazi in the RYT#1 (favorable condition). Among six geographical locations, Rangpur data was excluded due to most of entries were affected by bird and rat damage. The advanced breeding lines yielded ranging from 3.98-5.24 t/ha with 104-120 days growth duration. Considering average yield performance, highest yield (5.24 t/ha) was observed in the breeding line BR11863-5R-82 that was 5.6% higher yield than the standard check variety BRRRI dhan48 (4.96 t/ha) and BRRRI dhan98 (4.95 t/ha) with similar growth duration (**Table 2.8**). The three genotypes such as BR11863-5R-82, BR12087-5R-31, and BR12091-4R-169 were selected for promoting in further trial.

**Table 2.8. Agronomic performance of the selected materials from Regional Yield Trial (RYT#1), Favorable condition, T. Aus2023-24**

SN	Designation	PH (cm)	GD (days)	Yield (t/ha)					
				Cumilla	Gazipur	Kushtia	Rajshahi	Sonagazi	Mean
1	BR11898-5R-241	114.2	120	4.52	3.09	4.64	4.52	4.61	4.28
2	BR12087-5R-25	107.4	105	4.31	4.51	4.57	4.31	4.34	4.41
*3	BR12087-5R-31	105.6	107	5.10	4.96	4.90	5.10	5.33	<b>5.08</b>
4	BR12087-5R-132	107.8	105	4.68	4.42	4.75	4.68	5.22	4.75
5	BR12090-5R-233	104.6	106	5.18	3.89	4.96	5.18	4.32	4.71
6	BR12091-4R-9	106.8	107	5.40	4.82	5.14	5.40	4.50	5.05
7	BR12091-4R-97	100.6	104	4.89	5.16	4.70	4.89	4.12	4.75
*8	BR12091-4R-169	97.4	106	5.19	5.89	5.21	5.19	4.37	<b>5.17</b>
9	BR12101-5R-76	98.8	104	4.90	5.00	4.87	4.90	0.23	3.98
10	BR12102-4R-58	107.7	108	5.45	4.10	4.80	5.45	5.49	5.06
*11	BR11863-5R-82	101.0	104	5.12	5.62	5.22	5.12	5.11	<b>5.24</b>
12	BR11864-5R-31	99.8	108	5.00	4.04	5.29	5.00	4.81	4.83
13	BRRRI dhan48 (Ck.)	101.2	106	4.78	4.75	5.21	4.78	5.26	4.96
14	BRRRI dhan98 (Ck.)	99.8	108	5.25	4.82	5.00	5.25	4.43	4.95

LSD (0.05)	10.00	5.08	0.36	0.83	0.29	0.36	0.85	0.36
H2	0.38	0.63	0.85	0.46	0.40	0.93		0.21

In another regional yield trial (RYT#2), there are eleven advanced breeding lines along with the standard checks in six different geographical locations viz. Cumilla, Kushtia, Rajshahi, Rangpur, Gazipur, and Sonagazi were evaluated. Among six geographical locations, Rangpur data was excluded due to most of entries were affected by bird and rat damage. The advanced breeding lines like BR11866-5R-147, BR 11867-5R-442, and BR12096-4R-25 yielded 5.41 t/ha, 5.41 t/ha, and 5.19 t/ha respectively with similar growth duration (108 days) of the check varieties BRRi dhan48 and BRRi dhan98. These three genotypes were selected to proceed for further trial (Table 2.9 and Fig. 2.5).

**Table 2.9. Agronomic performance of the selected materials from Regional Yield Trial (RYT#2), T. Aus2023-24**

SN	Designation	PH (cm)	GD (day)	Yield t/ha)						BB score (art)
				Cumi	Gazi	Kush	Raj	Sona	Mean	
1	BR11607-4R-258	108.1	110	4.89	3.66	4.52	4.38	3.86	4.26	3
*2	BR11866-5R-147	99.0	108	6.15	5.61	5.32	5.41	4.54	<b>5.41</b>	<b>3</b>
3	BR 11866-5 R-215	98.9	110	5.45	4.57	5.28	5.20	4.24	4.95	1
4	BR 11866-5 R-312	105.6	108	4.99	5.23	5.26	5.53	4.78	5.16	5
5	BR11867-5R-87	111.1	114	4.98	2.90	4.63	4.60	5.09	4.44	5
6	BR 11867-5 R-103	103.9	108	6.18	4.82	4.17	5.24	3.61	4.80	1
7	BR 11867-5 R-188	98.4	106	5.27	4.90	5.48	4.87	4.64	5.03	5
*8	BR 11867-5 R-442	107.5	108	6.22	5.96	5.49	4.47	4.93	<b>5.41</b>	<b>1</b>
*9	BR12096-4R-25	108.3	109	6.20	4.98	5.09	5.33	4.36	<b>5.19</b>	<b>3</b>
10	BR12096-4R-103	114.3	118	4.92	4.13	4.62	5.11	4.28	4.61	5
11	BR12096-4R-124	121.1	119	4.97	4.70	4.54	4.35	4.77	4.67	3
12	BRRi dhan48 (Std. Ck.)	104.2	106	5.12	5.14	5.23	5.47	4.58	5.11	9
13	BRRi dhan98 (Std. Ck.)	103.5	108	5.33	5.09	5.09	5.65	5.10	5.25	7
LSD (0.05)		10.58	5.52	0.38	1.28	0.29	0.35	0.34	0.57	
H2		0.50	0.52	0.72	0.34	0.72	0.56	0.32	0.29	



**Fig. 2.5. Pictorial view of the genotypes T. Aus2023-24**

## PROJECT 3: DEVELOPMENT OF RICE FOR SHALLOW FLOODED AND SEMI-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:** S Maniruzzaman, M M Yasmin, 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 ten parents (**Table 3.1**) 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 206 F<sub>1</sub> seeds were obtained from seven crosses (**Table 3.2**). These were recorded and labeled properly. The F<sub>1</sub> seeds were sun-dried and stored in a cool and dry place.

**Table 3.1: List of Parents for hybridization to be grown, Shallow Flooded Rice Breeding, T. Aman 2023-24**

SL.	Designation	Traits
1	BR11690-5R-98-P6	Shallow and semi-deep water
2	BR11186-5R-119	Shallow and semi-deep water
3	BR12494-5R-69	Shallow and semi-deep water
4	BR12487-5R-95-2	Shallow and semi-deep water
5	BR11686-5R-1	Shallow and semi-deep water
6	PCR-97003-2B	Shallow and semi-deep water
7	BR10260-5-15-21-6B	Shallow and semi-deep water
8	BR9390-6-2-1B	Shallow and semi-deep water
9	BR9163-1-30-1-25	Shallow and semi-deep water
10	BR11315-5R-17 (tall)	Shallow and semi-deep water

**Table 3.2: List of cross combination, Shallow Flooded Rice Breeding, T. Aman 2023-24**

SL No.	Cross combinations	Number of F1 Seeds	Objectives of crossing
1	BR11690-5R-98-P6/BR9390-6-2-1B	60	Sub+Shallow deep
2	BR11186-5R-119/BR9390-6-2-1B	30	Sub+Shallow deep
3	BR12494-5R-69/BR9390-6-2-1B	40	Sub+Shallow deep

4	BR12487-5R-95-2/BR10260-5-15-21-6B	30	Sub+Shallow deep
5	PCR-97003-2B/BR9390-6-2-1B	25	Sub+Shallow deep
6	PCR-97003-2B/BR9163-1-30-1-25	15	Sub+Shallow deep
7	BR11315-5R-17/BR9163-1-30-1-25	6	Sub+Shallow deep
<b>Total</b>		<b>206</b>	

### Experiment 3.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, A S M Masuduzzaman and K M Itekharuddaula

**Specific objective:** Confirmation of F<sub>1</sub>s as true crosses and selection of promising ones.

**Materials and Methods:** A total 22 crosses were grown to be confirmed as true crosses. F<sub>1</sub> 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<sub>1</sub> population, leaf samples were collected from each of the plants from F<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>. 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<sub>1</sub>s were selected.

**Results:** Based on QC profile of the test F<sub>1</sub>s, 21 crosses were confirmed as true F<sub>1</sub>. The F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity, F<sub>2</sub> seeds of all confirmed plants were harvested individually, dried, cleaned and preserved in cold room (Table 3.3).

**Table 3.3: List of confirmed F<sub>1</sub>s, Shallow Flooded Rice Breeding, T. Aman 2023-24**

SL.	BR Number	Parentages	Ave predicted Yield(t/ha)
1	BR15275	BR9789-2-2-1/BR7730-1-1-2B	4.5
2	BR15276	BRRi dhan92/Vobani	4.7
3	BR15277	IR16F1097-P1/BR7730-1-1-2B	4.4
4	BR15278	IR15F1709/BR7919-1-1-3B	4.0
5	BR15279	IR16F1243/Vobani	4.0
6	BR15280	IR13F450-4/Khoiya motor	3.9
7	BR15281	IR108042-B-B-B-4-B-B-1/Khoiya motor	4.1
8	BR15282	IR16F1097-P1/Vobani	4.3
9	BR15283	IR15F1709/BR7730-1-1-2B	4.4
10	BR15284	BR9789-2-2-1/BR7919-1-1-3B	4.2
11	BR15286	IR15F1709/Vobani	4.1
12	BR15287	BR9789-2-2-1/Khoiya motor	4.2
13	BR15288	IR13F450-4/BR7919-1-1-3B	4.1
14	BR15289	IRRI 154/BR10260-7-19-2B	4.6
15	BR15290	IRRI 176/BR10260-7-19-2B	4.5
16	BR15291	Fatema dhan/BR11186-5R-1	4.2
17	BR15292	IR16T1356/BR10260-7-19-2B	4.6
18	BR15293	IR14L545/BR10260-7-19-2B	4.4
19	BR15294	IR 126998-B-10-5-1-3/Khoiya motor	4.5
20	BR15295	BRRi dhan92/BR11186-5R-1	4.8
21	BR15297	BR11186-5R-1/IRRI 154	4.6

DS: 25/07/2023

DT: 14/08/2023

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

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, A S M Masuduzzaman and K M Iftekharuddaula

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

**Materials and Methods:** A total sixty-one crosses comprising of 7 F<sub>2</sub>, 15 F<sub>3</sub>, 19 F<sub>4</sub> and 20 F<sub>5</sub> populations were grown in Boro 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 shallow flooded rice breeding program, 6601 progenies from 61 crosses in T. Aman 2023-24 comprising F<sub>2</sub> to F<sub>5</sub> generation were speedily advanced through FRGA technique (Table 3.5).

**Table 3.4 RGA Summary, SFR breeding, T. Aman 2023-24**

Generation	No. of crosses	Progenies grown	Progenies harvested
F <sub>2</sub>	7	2,872	2,465
F <sub>3</sub>	15	1,652	1,268
F <sub>4</sub>	19	1,512	1,371
F <sub>5</sub>	20	1,726	1,497
<b>Total</b>	<b>61</b>	<b>7,762</b>	<b>6601</b>

**Table 3.5: List of F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub> and F<sub>5</sub> populations advanced through RGA, SFR breeding, T. Aman 2023-24**

F <sub>2</sub> population					
SL No	BR Number	Crosses	Progenies Grown	Progenies Harvested	Population recovery (%)
1	BR14486	IRRI 119/Khoiya motor	252	240	95
2	BR14487	BR11186-5R-1/Vobani	620	500	81
3	BR14488	BR11186-5R-549/BR7730-1-1-2B	400	360	90
4	BR14489	BRR1 dhan91/Khoiya motor	400	350	88
5	BR14490	BRR1 dhan91/Vobani	400	350	88
6	BR14491	BRR1 dhan91/CN6	400	325	81
7	BR14492	BRR1 dhan91/ BR7919-1-1-3B	400	340	85
Total progenies			2,872	2,465	86
F <sub>3</sub> population					
Sl. no.	BR Number	Parentages	Progenies Grown	Progenies Harvested	Population recovery (%)
1	BR13908	BR11186-5R-377/LalMohon	134	122	91
2	BR13909	BR11186-5R-377/Dud Laki	154	130	84
3	BR13911	BR11186-5R-377/Bashiraj	97	75	77
4	BR13915	BR11186-5R-672/ Dud Laki	218	195	89
5	BR13917	BR11186-5R-1/LalMohon	110	100	91
6	BR13918	BR11186-5R-1/Dud Laki	83	70	84

7	BR13922	BRRi dhan87/BRRi dhan91	57	48	84
8	BR13923	BRRi dhan77/BRRi dhan91	117	104	89
9	BR13924	BRRi dhan87/BR10260-7-19-2B	105	85	81
10	BR13926	BRRi dhan76/LalMohon	80	66	83
11	BR13929	BRRi dhan77/LalMohon	107	0	0
12	BR13932	BRRi dhan87/LalMohon	69	0	0
13	BR13933	BRRi dhan87/Dud Laki	98	78	80
14	BR13934	BRRi dhan87/Jalkumari	78	70	90
15	BR13921*	BRRi dhan94/BRRi dhan91	145	125	86
Total Population			1,652	1,268	77

#### F<sub>4</sub> population

SL	BR Number	Crosses	Progenies Grown	Progenies Harvested	Population recovery (%)
1	BR13379	BR7932-17-2-1-2-1-1-1-12/Laxmi Digha	26	25	96
2	BR13380	BR9175-9-1-3-20-3 /Laxmi Digha	84	80	95
3	BR13381	BR9175-9-2-1-12-5 /Jal Kumari	90	80	89
4	BR13382	BRRi dhan77/BR10230-15-27-7B	187	150	80
5	BR13383	BRRi dhan76/BR10230-15-27-7B	68	60	88
6	BR13384	BRRi dhan76/BR10260-7-19-2B	166	150	90
7	BR13385	BRRi dhan77/BR10260-7-19-2B	132	120	91
8	BR13386	BR9175-9-1-3-20-3/BR10230-15-27-7B	64	60	94
9	BR13388	BR9175-9-2-1-12-5 /Laxmi Digha	48	42	88
10	BR13389	IR13F441/Jal Kumari	59	51	86
11	BR13390	BRRi dhan 76/ Dud Laki	64	58	91
12	BR13391	BRRi dhan 77/Dud Laki	48	45	94
13	BR13392	BR7932-17-2-1-2-1-1-1-12/Dud Laki	20	20	100
14	BR13393	BR8146-5-2-2-1-1-1-2/Dud Laki	36	35	97
15	BR13394	Bashiraj/BR10260-7-19-2B	104	95	91
16	BR13395	IR13F441/Dud Laki	80	75	94
17	BR13396	IR13F441/Hizal Digha	88	85	97
18	BR13397	BRRi dhan 76/Jal Kumari	84	80	95
19	BR13398	BRRi dhan 77/Jal Kumari	64	60	94
Total Progenies			1,512	1,371	91

#### F<sub>5</sub> population

SL	BR Number	Crosses	Progenies Grown	Progenies Harvested	Population recovery (%)
1	BR12968	BR8157-50-1-6-2-1-27/ Fulkari	80	78	98
2	BR12969	BR8157-50-1-6-2-1-27/ Laxmi Digha	29	25	86
3	BR12970	BR8157-50-1-6-2-1-27/ Bajail 65	60	58	97
4	BR12971	IR90082-SUB-35-3-2-2/ Lal Khama	203	195	96
5	BR12972	IR90082-SUB-35-3-2-2/ Hbj. A. II	133	125	94
6	BR12973	IR90082-SUB-35-3-2-2/ Lal Digha	64	60	94
7	BR12974	IR90082-SUB-35-3-2-2/ Gour Kajol	53	52	98
8	BR12975	BR9163-1-30-1-25/ Lal Khama	16	15	94
9	BR12976	BR9163-1-30-1-25/ IR13F582	92	90	98
10	BR12977	BR9163-1-30-1-25/ Til Bajal	54	50	93
11	BR12978	BR9163-1-30-1-25/ Bajail 65	31	30	97
12	BR12979	IR92689-SUB-SUB-92-1-B/ Fulkari	90	86	96
13	BR12980	IR92689-SUB-SUB-92-1-B/ Bajail 65	123	0	0
14	BR12981	IR85261-18-158-Gaz-3B-62/ Lal Khama	26	0	0
15	BR12982	IR85261-18-158-Gaz-3B-62/ Gour Kajol	74	70	95
16	BR12983	IR85261-18-158-Gaz-3B-62/ Til Bajal	40	38	95
17	BR12984	IR13F458/ Til Bajal	97	95	98
18	BR12985	BRRi dhan52/ Lal Digha	20	20	100
19	BR12986	BRRi dhan79/ Dud Laki	113	110	97
20	BR12987	BRRi dhan79/ Hbj. A. IV	328	300	91
Total Progenies			1,726	1,497	87

DS: 22/06/2023

### Experiment 3.4: Line Stage Testing (LST)

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, A S M Masuduzzaman 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 tolerance.

**Materials and Methods:** In total 1541 lines from 18 crosses were transplanted in 12-hills single-row plots using systematic arrangement with respective parents and check varieties. Thirty days old single seedling was transplanted at 20 cm × 20 cm spacing. Fertilizers were applied following the rate given in experiment 1. Crop management was done as recommended for modern rice cultivation for Boro 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 358 lines were selected from 1548 progenies of 18 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 and the list of selected better lines are given in the **Table 3.6**.

**Table 3.6. List of superior fixed lines selected from LST populations, SFR breeding, T. Aman 2023-24**

SL	BR. No	Crosses	Progenies transplanted	Selected lines
<b>Single cross</b>				
1	BR12930	PCR89350-B-R-3-1-2-1/Tilbajal	34	3
2	BR12931	BRR1 dhan67/Barsha dhan	35	12
3	BR12932	BR8157-50-1-6-2-1-27/Gour kajol	60	20
4	BR12933	PCR89350-B-R-3-1-2-1/BR8159-20-8-5-8-2	120	22
5	BR12934	Hbj Aman-IV/Binadhan-12	50	10
6	BR12935	Barsha dhan/IR13F582	53	7
7	BR12936	IR92689-SUB-SUB-92-1-B/BR8159-20-8-5-8-2	140	0
<b>Multiple cross</b>				
1	BR12937	BR8159-20-8-5-8-2/ Hbj aman IV//BRR1 dhan51	120	68
2	BR12938	Barsha dhan/BR9158-19-9-6-7-50//BR9163-1-30-1-25	150	19
3	BR12939	BRR1 dhan52/ Hbj AmanII//BR9163-1-30-1-25	120	27
4	BR12940	Bajail65/Til Bajal//IR85261-18-158-Gaz-3B-62	75	28
5	BR12941	IR09F236(Sub)/Gour Kajol//BRR1 dhan79	65	41
6	BR12942	BRR1 dhan52/ Hbj AmanII//BRR1 dhan79	120	47
7	BR12943	Bajail65/Til Bajal//IR13F582	60	6
8	BR12944	IR09F236/Gour Kajol//BR8157-50-1-6-2-1-27	75	9
9	BR12945	BR9159-8-5-40-13-52/Lal Khama//BRR1 dhan79	90	16
10	BR12946	BRR1 dhan44/ Lal Khama//BRR1 dhan79	54	10
11	BR12947	BR8159-20-8-5-8-2/ Hbj aman IV// IR90082-SUB-35-3-2-2	120	13
<b>Total lines</b>			<b>1,541</b>	<b>358</b>

DS: 24/06/2023

DT: 14/08/2023

### Experiment 3.5: Observational Yield Trial (OYT)

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, 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, 74 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 the tested entries eight lines were selected based on agronomic performance and phenotypic acceptability. The genotype BR12950-5R-134 significantly produced highest yield (3.6 t/ha) followed by BR12956-5R-38 (3.3 t/ha) and BR12926-5R-73 (3.1 t/ha) (**Table 3.7**). All selected entries performed better over check variety BRR1 dhan91 (1.9 t/ha). The tested entries were lodged due to heavy storm during flowering stage, which caused poor grain yield. The heritability obtained from plant height, growth duration, and grain yield were 67%, 82%, and 62%, respectively, indicating a high level of precision of the experiment (**Table 3.7**).

**Table 3.7. Performance of the selected entries of OYT, SFR breeding, T. Aman 2023-24**

SL No	Designation	PH (cm)	TN	PAcp	GD (Days)	Yield (t/ha)
1	BR12485-5R-42	150	10	5	138	2.9
2	BR12950-5R-134	140	8	5	137	3.6
3	BR12956-5R-38	144	9	5	136	3.3
4	BR12960-5R-69	139	7	5	140	2.7
5	BR12917-5R-11	180	7	5	135	2.8
6	BR12926-5R-73	147	9	5	139	3.1
7	BR12966-5R-13	140	7	5	134	2.9
8	BR12966-5R-95	144	8	5	138	2.5
9	BR9390-6-2-1B (Ck)	130	9	5	140	2.5
10	BRR1 dhan91 (Ck)	140	8	7	139	1.9
<b>P Value</b>		<b>**</b>	<b>ns</b>	<b>*</b>	<b>**</b>	<b>*</b>
<b>LSD (0.05)</b>		<b>5.6</b>		<b>1.2</b>	<b>5.1</b>	<b>0.5</b>
<b>H2</b>		<b>74</b>		<b>65</b>	<b>77</b>	<b>60</b>

DS: 10/07/2023

DT: 02/08/2023

### Experiment 3.6: Preliminary Yield Trial (PYT)

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, A S M Masuduzzaman and K M Iftekharuddaula

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

**Materials and methods:** In total, 23 entries with two 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 seven lines were selected based on agronomic performance and phenotypic acceptability. The genotype BR9241-5R-5 gave highest yield (3.8 t/ha) followed by BR11686-5R-1 (3.7 t/ha) and BR10260-7-19-2B (3.5 t/ha), whereas check variety BRR1 dhan91 yielded only 2.2 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 3.8).

**Table 3.8. Performance of the entries of PYT, SFR breeding, T. Aman 2023-24**

SL No	Designation	PH (cm)	TN	PAcp	GD (Days)	Yield (t/ha)	Traits
1	BR11686-5R-1*	146	9	5	137	3.7	<i>Sub1, Wx-A, Xa7, Pita2, Chalk5, Gn1a</i>
2	BR9789-3-1-1	144	8	5	134	3.1	<i>Wx-A, Wx-10, DTH8, Chalk5, Gn1a</i>
3	BR10260-7-19-2B	155	10	5	136	3.5	<i>Wx-A, Wx-10</i>
4	BR10212-12-1-2-6	148	7	5	135	3.3	<i>Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a</i>
5	BR12489-5R-40	162	9	5	133	3.0	<i>Wx-A, Gn1a, Xa4</i>
6	BR12490-5R-134	156	9	5	140	2.9	<i>Wx-A, Gn1a, Xa4</i>
7	BR9241-5R-5	150	10	3	136	3.8	<i>Wx-A</i>
8	BRRi dhan44 (Ck)	135	11	5	135	3.0	<i>Wx-A, Wx-10, Xa4</i>
9	BRRi dhan91 (Ck)	145	10	7	139	2.2	<i>Wx-A, Wx-10, Xa4</i>
<b>P Value</b>		<b>**</b>	<b>*</b>	<b>*</b>	<b>**</b>	<b>**</b>	
<b>LSD (0.05)</b>		<b>9.5</b>	<b>1.8</b>	<b>1.4</b>	<b>4.1</b>	<b>0.8</b>	
<b>H2</b>		<b>78</b>	<b>65</b>	<b>70</b>	<b>77</b>	<b>65</b>	

DS: 10/07/2023

DT: 26/08/2023

### Experiment 3.7: Advanced Yield Trial (AYT)

**Principal Investigator:** Sharmistha Ghosal

**Co-investigators:** S Maniruzzaman, M M Yasmin, 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, 14 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 five lines were selected based on agronomic performance and phenotypic acceptability. The genotype BR11186-5R-119 gave highest yield (3.6 t/ha) followed by BR11186-5R-549 (3.5 t/ha) and BR11186-5R-672 (3.5 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 3.9).

**Table 3.9. Performance of the selected entries of AYT, SFR breeding, T. Aman 2023-24**

SL No	Designation	PH (cm)	TN	PAcp	GD (Days)	Yield (t/ha)	Traits
1	BR11186-5R-549	159	9	5	135	3.5	<i>Sub1, Wx-A, Pita2</i>
2	BR11186-5R-119	149	9	3	138	3.6	<i>Sub1, Wx-A, Xa7, Pita2, Chalk5, Gn1a</i>

3	BR11186-5R-672	162	9	5	133	3.5	<i>Sub1, Wx-A, Xa4</i>
4	BR10211-22-9-2_PS4	147	9	5	137	3.7	<i>Wx-A, Wx-10, Xa4</i>
5	BR11186-5R-377	156	8	5	136	3.4	<i>All Sub1, Wx-A, Pita2</i>
6	BRR1 dhan44 (Ck)	134	10	5	134	3.3	<i>Wx-A, Wx-10, Xa4</i>
7	BRR1 dhan91 (Ck)	147	8	7	138	2.1	<i>Wx-A, Wx-10, Xa4</i>
<b>P Value</b>		<b>*</b>	<b>ns</b>	<b>*</b>	<b>***</b>	<b>*</b>	
<b>LSD (0.05)</b>		<b>10.2</b>	<b>1.5</b>	<b>5.8</b>	<b>0.7</b>		
<b>H2</b>		<b>73</b>	<b>62</b>	<b>81</b>	<b>68</b>		

DS: 08/07/2023 DT: 31/08/2023

#### 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:** Dr. Md Abdul Kader

##### Experiment 4.1: Hybridization

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

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

**Materials and Method:** Twenty-five 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<sub>4</sub>) 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 on 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 crosses were made with 23 true parents (**Table 4.1a**) and 2,892 seeds were made. **Table 4.1b** shows the list of crosses made in the season. Mature F<sub>1</sub> 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 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	GY_ BLUP	Genotypic information
1	BR11745-5R-76	132	115	5.42	<i>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</i>
2	BR12631-5R-51	106	118	5.42	<i>qDTY2.1 (5)+qDTY3.1 (1)+qDTY3.1 (2)+qDTY3.1 (4)+qDTY1.1_4+qDTY2.2_1+qDTY3.2_1+DTY4.1_2+Wx-A</i>
3	BR11732-5R-11	117	117	5.25	<i>qDTY3.1 (1)qDTY3.1 (2)+qDTY1.1_4+ qDTY3.2_1+ BPH32+Wx-A+DTY12.1_2</i>
4	BR11748-5R-16	141	116	5.23	<i>qDTY3.1 (1)qDTY3.1 (2)+qDTY1.1_4+Wx-A</i>
5	BR11748-5R-2	100	112	5.21	<i>qDTY2.1 (1)qDTY2.1 (2)+qDTY2.1 (3)qDTY2.1 (4)+qDTY3.1 (1)+qDTY3.1 (2)+qDTY1.1_4+Wx-A</i>

SN	Designation	Plant height (cm)	Growth duration (days)	GY_ BLUP	Genotypic information
6	BR11728-170	-5R-103	104	5.18	<i>qDTY2.1 (1)qDTY2.1 (2)qDTY2.1 (5)+qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+qDTY3.2_1+Wx-A</i>
7	BR11739-5R-53	100	108	5.17	<i>qDTY2.1 (3)qDTY2.1 (4)+qDTY3.1 (2)+qDTY1.1_4+qDTY2.2_2+qDTY3.2_1+BPH17_3+Wx-A</i>
8	BR11731-5R-135	119	114	5.15	<i>qDTY3.1 (1)qDTY3.1 (2)+qDTY1.1_4+Wx-A+Gm4_4</i>
9	BR11743-5R-87	103	118	5.11	<i>Wx-10+qDTY3.1 (3)+qDTY3.1 (4)+qDTY3.1 (4)+qDTY1.1_4+qDTY2.2_1+BPH17_3+ BPH32+Wx-A</i>
10	BR11752-5R-105	119	104	5.10	<i>qDTY2.1 (1)qDTY2.1 (3)qDTY2.1 (4)+qDTY3.1 (1)+qDTY1.1_4+qDTY2.2_1+Wx-A</i>
11	BR11736-5R-64	138	139	5.09	<i>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</i>
12	BR11743-5R-98	114	129	5.08	<i>qDTY1.1_4+BPH32+Pb1_1</i>
13	BR11755--5	125	129	5.08	<i>qDTY3.1 (1)qDTY3.1 (2)qDTY3.1 (4)+qDTY1.1_4+ qDTY3.2_1+DTY4.1_2+Wx-A</i>
14	BR11739-5R-33	109	134	5.07	<i>qDTY2.1 (1)+qDTY3.1 (1)+qDTY3.1 (2)+qDTY1.1_4+qDTY3.2_1+BPH17_3+BPH32+Wx-A+Gm4_3+Gm4_4</i>
15	BR11753-5R-157	133	131	5.07	<i>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+ DTY12.1_2</i>
16	BR11743-5R-76	121	136	5.07	<i>qDTY2.1 (5)+ qDTY3.1 (1)+qDTY3.1 (2)+ qDTY1.1_4+qDTY2.2_1+BPH32+Wx-A</i>
17	BR12294-5R-187	124	134	5.07	<i>qDTY3.1 (1)+ DTY12.1_2</i>
18	BR12635-5R-131	130	130	5.06	<i>Wx-10+xa5+qDTY3.1 (1)+qDTY3.1 (2)+qDTY3.2_1+ Wx-A</i>
19	BR12296-5R-100	106	130	5.06	<i>fgr-1+Wx-10+qDTY2.1 (4)+qDTY2.1 (5)+qDTY3.1 (2)+ BPH32+Wx-A+ DTY12.1_2</i>
20	BR12293-5R-47	134	136	5.06	<i>Wx-10+qDTY2.1 (5)+ qDTY3.1 (1)+qDTY3.1 (2)+ qDTY3.2_1+Wx-A+ DTY12.1_2</i>
21	IR 126952-41-58-26-4-12-1-9	129	126	4.25	<i>xa5+qDTY2.1 (1)+qDTY2.1 (2)+qDTY2.1 (4)+qDTY2.1 (5)+qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+BPH17_3+ Wx-A+ Pb1_1+ qDTY12.1_2+Pi9_1</i>
22	Gigoj	-	-	-	Local rice good for puffed rice for Barishal region
23	Chamara	-	-	-	Local rice good for puffed rice for Barishal region
24	Nakuchimota	-	-	-	Local rice good for puffed rice for Barishal region
25	Chachra	-	-	-	Local rice good for puffed rice for Barishal region

**Table 4.1b: List of the crosses, Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	Cross combinations	Characteristics	No of seeds	Average_ BLUP
1	BR11745-5R-76/BR12631-5R-51	High yielding HYV	105	5.42
2	BR12631-5R-51/BR11732-5R-11	High yielding HYV	120	5.33
3	BR11748-5R-16/BR11732-5R-11	High yielding HYV	65	5.24
4	BR11748-5R-2/BR11745-5R-76	High yielding HYV	65	5.32
5	BR11728 -5R-170/BR11732-5R-11	High yielding HYV	70	5.22
6	BR11739-5R-53/BR11731-5R-135	High yielding HYV	100	5.16
7	BR11752-5R-105/BR11745-5R-76	High yielding HYV	190	5.26
8	BR11736-5R-64/BR11743-5R-98	High yielding HYV	130	5.08
9	BR12293-5R-47/BR11745-5R-76	High yielding HYV	30	5.24
10	BR11745-5R-76/BR11731-5R-135	High yielding HYV	200	5.29
11	BR12631-5R-51/BR11743-5R-87	High yielding HYV	50	5.26
12	BR11732-5R-11/BR11752-5R-105	High yielding HYV	105	5.17
13	BR11748-5R-16/BR11736-5R-64	High yielding HYV	95	5.16
14	BR11748-5R-2/BR11743-5R-98	High yielding HYV	75	5.15
15	BR11728 -5R-170/BR11755-5R-5	High yielding HYV	100	5.13
16	BR11739-5R-53/BR11739-5R-33	High yielding HYV	90	5.12
17	BR12631-5R-51/BR11739-5R-33	High yielding HYV	36	5.25
18	BR11732-5R-11/BR11753-5R-157	High yielding HYV	180	5.16
19	BR11748-5R-16/BR11743-5R-76	High yielding HYV	90	5.15
20	BR11748-5R-2/BR12294-5R-187	High yielding HYV	140	5.14
21	BR11732-5R-11/BR12294-5R-187	High yielding HYV	50	5.16
22	BR11748-5R-16/BR12635-5R-131	High yielding HYV	120	5.15
23	BR11748-5R-2/BR12296-5R-100	High yielding HYV	46	5.14
24	BR11728 -5R-170/BR11743-5R-76	High yielding HYV	75	5.13
25	IR 126952-41-58-26-4-12-1-9/ BR11743-5R-76	High yielding HYV, Drought tol.	235	-
26	BR12631-5R-51/ IR 126952-41-58-26-4-12-1-9	High yielding HYV, Drought tol.	80	-
27	BR11745-5R-76/ Gigoj	High yielding HYV, Gigoj type grain	50	-
28	BR11745-5R-76/ Nakuchimota	High yielding HYV, Good for popped rice	50	-
29	BR12631-5R-51/ Gigoj	High yielding HYV, Gigoj type grain	100	-
30	BR12631-5R-51/ Nakuchimota	High yielding HYV, Good for popped rice	50	-
<b>Total</b>			<b>2,892</b>	

## Experiment 4.2: Hybridity test and confirmation of F<sub>1</sub>

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** To confirm the crosses as true F<sub>1</sub>s and use of the selected F<sub>1</sub>s to produce F<sub>2</sub> seeds and use in making different types of crosses.

**Materials and Methods:** A total of 30 crosses were grown along with their parents in the crossing blocks at BIRRI Gazipur using single seedling/hill at 20 cm × 20 cm spacing in 12-hill three/four row plots. Fertilizers and crop management were done following the protocol described in Experiment 4.1. Leaf samples were collected from each of the plants of F<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>s. 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<sub>1</sub>. All the 30 crosses were identified as true F<sub>1</sub>. Seeds of these F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity stage, F<sub>2</sub> seeds of all selected plants were harvested individually. Then they were dried, cleaned and preserved in cold rooms for proper storage (Table 4.2).

**Table 4.2: The list of F<sub>1</sub>s confirmed, Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	BR Reg. No.	Cross combinations	Characteristics
1	BR15538	Bangabandhu dhan100/ BR10799-6R-151	Medium GD (≤135 days) with High Zn and yield
2	BR15539	Bangabandhu dhan100/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield and Zn
3	BR15540	Bangabandhu dhan100/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn
4	BR15541	Bangabandhu dhan100/ BR10802-6R-242	Medium GD (≤135 days) with High Zn and yield
5	BR15542	Bangabandhu dhan100/ BR10802-6R-66	Medium GD (≤135 days) with High Zn and yield
6	BR15543	Bangabandhu dhan100/ BR11222-6R-64	Medium GD (≤135 days) with High Zn and yield
7	BR15545	Bangabandhu dhan100/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield, Zn and aroma
8	BR15546	Bangabandhu dhan100/ BR11910-4R-127	Moderate photo sensitive
9	BR15547	Bangabandhu dhan100/ BR12007-6R-61	Short duration (≤120 days) with acceptable yield and Zn
10	BR15548	BR10458-20-2-3-1-3/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield
11	BR15549	BR10475-1-2-3-5-5/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield
12	BR15550	BR10475-1-2-3-5-5/ BR10800-6R-1	Medium GD (≤135 days) with high yield
13	BR15551	BR10475-1-2-3-5-5/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and aroma
14	BR15552	BR10482-1-2-3-1-3/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield
15	BR15553	BR11716-4R-102/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield
16	BR15554	BR11716-4R-102/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield
17	BR15555	BR11716-4R-102/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield
18	BR15556	BR11716-4R-102/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield
19	BR15557	BIRRI dhan101/ BR10800-6R-1	Short duration (≤120 days) with acceptable yield and BB resistant
20	BR15558	BIRRI dhan101/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and BB resistant
21	BR15559	BIRRI dhan102/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield and Zn
22	BR15561	BIRRI dhan102/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn
23	BR15562	BIRRI dhan102/ BR11334-6R-35	Short duration (≤120 days) with acceptable yield and Zn
24	BR15563	BIRRI dhan87/ BR10800-6R-54	Short duration (≤120 days) with acceptable yield and Zn
25	BR15564	BIRRI dhan87/ BR10802-6R-66	High yield
26	BR15565	BIRRI dhan87/ BR12007-6R-61	High yield
27	BR15566	SVIN297/ BR 10795-6R-46	Short duration (≤120 days) with acceptable yield
28	BR15567	BIRRI dhan87/ Beroi (Backcross)	Beroi type grain with yield
29	BR15568	BR23/BIRRI dhan46	Photo sensitive
30	BR15569	BIRRI dhan46/BR23	Photo sensitive

## 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 M I H Joy

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

**Materials and Method:** A total of 34,170 individual segregating progenies grew during the reporting period. Among these, 22,460 progenies of 59 crosses of F<sub>3</sub> and F<sub>5</sub> generations were grown in T. Aman and 11,710 progenies of 36 crosses from F<sub>4</sub> 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. Half doses of the fertilizers that were used in experiment 4.1 were applied in the experiment. At maturity stage, a single panicle was harvested from each bunch of hills. Harvested panicles were dried and subjected to keep in the oven at 50°C for breaking dormancy and repeat the same method to initiate next cycle of RGA immediately.

**Results and Discussion:** A total of 29,020 individual segregating progenies were harvested during the reporting period. Among these, 18,920 progenies of 59 crosses of F<sub>3</sub> and F<sub>5</sub> generations were harvested in T. Aman and 10,100 progenies of 36 crosses from F<sub>4</sub> 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, Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	BR Reg. No.	Cross combinations	No. of progenies transplanted	No of progenies harvested
<b>F<sub>3</sub> generation</b>				
1	BR14935	SVIN139/ IR98377-B-B-B-B-24	400	320
2	BR14936	SVIN139/ SVIN297	400	350
3	BR14937	SVIN139/ SVIN405	400	330
4	BR14938	SVIN297/ BR8492-9-5-3-2-HR1	400	350
5	BR14939	SVIN297/ SVMET302	400	350
6	BR14940	BR9574-9-5-3-1-1/ Bangabandhudhan100	400	350
7	BR14941	Bangabandhudhan100/ BR9574-9-5-3-1-1	400	350
8	BR14942	Bangabandhudhan100/ SVIN352	400	355
9	BR14943	Bangabandhudhan100/ SVIN405	400	360
10	BR14944	Bangabandhudhan100/ SVMET302	400	350
11	BR14945	Bangabandhudhan100/ SVMET306	400	365
12	BR14946	IR98377-B-B-B-B-24/ Bangabandhudhan100	400	350
13	BR14947	SVIN297/ Bangabandhudhan100	400	320
14	BR14948	SVMET302/ Bangabandhudhan100	400	360
15	BR14949	SVMET306/ Bangabandhudhan100	400	320
16	BR14950	Bangabandhudhan100/ IR83484-3-B-7-1-1-1	400	350
17	BR14951	BR9571-13-1-9-1-1/ BR8548-8-22-5-15	400	360
18	BR14952	BR9571-13-1-9-1-1/ BR9140-5-22-5-1	400	360
19	BR14953	SVIN139/ BR9140-5-22-5-1	400	320
20	BR14954	SVIN139/ BR9840-52-1-2-1	400	320
21	BR14955	BRH14-9-13-16B/ IR101791-10-1-4-3-24	400	300
22	BR14956	SVIN139/ BRH14-9-13-16B	400	375
23	BR14957	SVIN139/ BRH15-24-7-B	400	380
24	BR14958	SVIN139/ BR10490-1-2-3-8-7	400	375
25	BR14959	BR11604-4R-84/ Bangabandhudhan100	400	350
26	BR14960	Bangabandhudhan100/ BR11604-4R-84	400	350
27	BR14961	BR9571-13-1-9-1-1/ Gainja	400	360
28	BR14962	BR9571-13-1-9-1-1/ Malshira	400	150
29	BR14963	BR9574-9-5-3-1-1/ Gainja	400	110
30	BR14964	BR9574-9-5-3-1-1/ Malshira	400	180
31	BR14965	BR9840-52-1-2-1/ Mele(Aus)_1671	400	350
32	BR14966	BR8492-9-5-3-2-HR1/ Mele(Aus)_1671	400	320
33	BR14967	BR9574-9-5-3-1-1/ Mele(Aus)_1671	400	360
34	BR14968	BR9840-52-1-2-1/ Duksail(TA)_2022	400	360
35	BR14969	BR9571-13-1-9-1-1/ Duksail(TA)_2022	400	330
36	BR14970	BR9574-9-5-3-1-1/ Duksail(TA)_2022	400	170
<b>Total</b>			<b>14,400</b>	<b>11,710</b>
<b>F<sub>5</sub> generation</b>				
1	BR14348	SVIN197/ IR17A1080	420	350
2	BR14349	SVIN197/ IR17A1211	300	280
3	BR14350	SVIN096/ BR8442-12-1-3-1-B5	240	240
4	BR14351	SVIN085/ IR17A1779	400	350
5	BR14352	SVIN096/ IR66946-3R-116-1-1	244	220
6	BR14353	IR83484-3-B-7-1-1-1/ BR10001-94-2-B	260	230
7	BR14354	IR83484-3-B-7-1-1-1/ BR8442-12-1-3-1-B5	160	160
		IR83484-3-B-7-1-1-1/ HHZ5-DT20-DT2-	292	
8	BR14355	DT1		250
9	BR14356	IR83484-3-B-7-1-1-1/ HHZ12-SAL2-Y3-Y2	260	230

10	BR14357	HHZ5-DT20-DT2-DT1/ IR17A1080	360	320
11	BR14358	HHZ5-DT20-DT2-DT1/ IR17A1211	500	420
12	BR14359	HHZ5-DT20-DT2-DT1/ BR9574-9-5-3-1-1	450	410
13	BR14360	SVIN085/ HHZ5-DT20-DT2-DT1	450	400
14	BR14361	HHZ5-DT20-DT2-DT1/ BR8548-8-22-5-15	350	320
15	BR14362	SVIN197/ BR8548-8-22-5-15	500	480
16	BR14363	SVIN085/ BR8548-8-22-5-15	450	420
17	BR14364	SVIN096/ BR9140-5-22-5-1	500	480
18	BR14365	HHZ5-DT20-DT2-DT1/ Malshira	500	475
19	BR14366	HHZ12-SAL2-Y3-Y2/ Nizersail	500	465
20	BR14367	IR83484-3-B-7-1-1-1/ Rosulbhog	100	100
21	BR14368	SVIN197/ Malshira	150	150
22	BR14369	SVIN085/ Rosulbhog	140	140
23	BR14370	SVIN096/ Gainja	330	320
<b>Total</b>			<b>8,060</b>	<b>7210</b>
<b>Grand Total</b>			<b>22,460</b>	<b>18,920</b>

**Table 4.3b: List of segregating progenies harvested from greenhouse and field RGA nurseries, Development of Rainfed Lowland Rice, Boro 2023-24**

SN	BR Reg. No.	Cross combinations	No of progenies transplanted	No. of progenies harvested
<b>F<sub>4</sub> generation</b>				
1	BR14935	SVIN139/ IR98377-B-B-B-B-24	320	280
2	BR14936	SVIN139/ SVIN297	350	300
3	BR14937	SVIN139/ SVIN405	330	280
4	BR14938	SVIN297/ BR8492-9-5-3-2-HR1	350	300
5	BR14939	SVIN297/ SVMET302	350	310
6	BR14940	BR9574-9-5-3-1-1/ Bangabandhudhan100	350	300
7	BR14941	Bangabandhudhan100/ BR9574-9-5-3-1-1	350	310
8	BR14942	Bangabandhudhan100/ SVIN352	355	320
9	BR14943	Bangabandhudhan100/ SVIN405	360	310
10	BR14944	Bangabandhudhan100/ SVMET302	350	300
11	BR14945	Bangabandhudhan100/ SVMET306	365	310
12	BR14946	IR98377-B-B-B-B-24/ Bangabandhudhan100	350	285
13	BR14947	SVIN297/ Bangabandhudhan100	320	285
14	BR14948	SVMET302/ Bangabandhudhan100	360	320
15	BR14949	SVMET306/ Bangabandhudhan100	320	300
16	BR14950	Bangabandhudhan100/ IR83484-3-B-7-1-1-1	350	320
17	BR14951	BR9571-13-1-9-1-1/ BR8548-8-22-5-15	360	310
18	BR14952	BR9571-13-1-9-1-1/ BR9140-5-22-5-1	360	275
19	BR14953	SVIN139/ BR9140-5-22-5-1	320	285
20	BR14954	SVIN139/ BR9840-52-1-2-1	320	260
21	BR14955	BRH14-9-13-16B/ IR101791-10-1-4-3-24	300	280
22	BR14956	SVIN139/ BRH14-9-13-16B	375	270
23	BR14957	SVIN139/ BRH15-24-7-B	380	315
24	BR14958	SVIN139/ BR10490-1-2-3-8-7	375	320
25	BR14959	BR11604-4R-84/ Bangabandhudhan100	350	300
26	BR14960	Bangabandhudhan100/ BR11604-4R-84	350	315
27	BR14961	BR9571-13-1-9-1-1/ Gainja	360	320
28	BR14962	BR9571-13-1-9-1-1/ Malshira	150	120
29	BR14963	BR9574-9-5-3-1-1/ Gainja	110	100
30	BR14964	BR9574-9-5-3-1-1/ Malshira	180	150
31	BR14965	BR9840-52-1-2-1/ Mele(Aus)_1671	350	310
32	BR14966	BR8492-9-5-3-2-HR1/ Mele(Aus)_1671	320	280
33	BR14967	BR9574-9-5-3-1-1/ Mele(Aus)_1671	360	315
34	BR14968	BR9840-52-1-2-1/ Duksail(TA)_2022	360	320
35	BR14969	BR9571-13-1-9-1-1/ Duksail(TA)_2022	330	285
36	BR14970	BR9574-9-5-3-1-1/ Duksail(TA)_2022	170	140
<b>Total</b>			<b>11,710</b>	<b>10,100</b>

#### Experiment 4.4: Line Stage Testing (LST)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** To select uniform genotypes in terms of plant height and days to 50% flowering with key target traits.

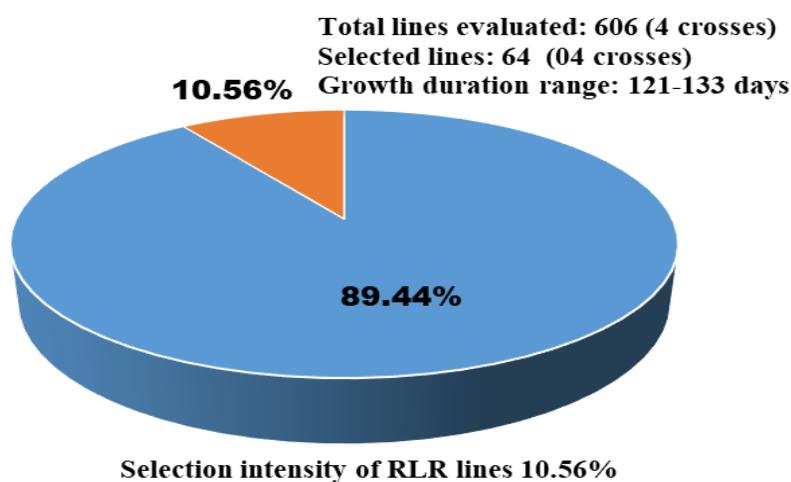
**Materials and Method:** Total 606 progenies from four crosses were grown in T. Aman season in a 2.6 m single-row plot with a spacing of 20 cm × 20 cm in the field using systematic arrangement pattern. Thirty-day-old single seedling was transplanted at 20 cm × 20 cm in the

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.

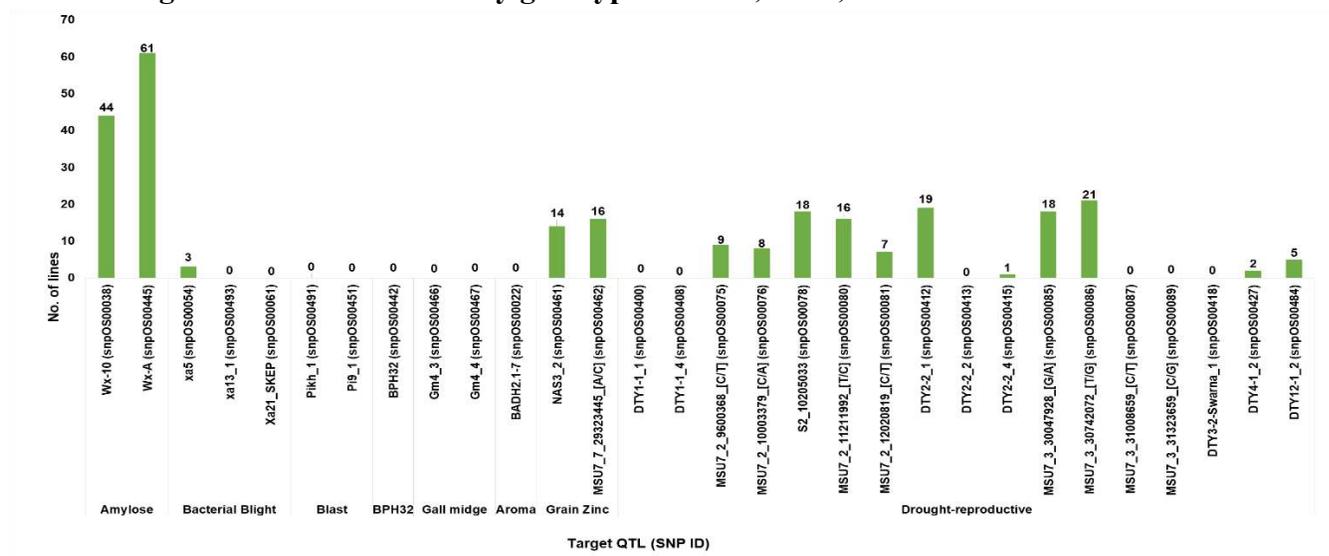
**Results and Discussion:** A total of 64 genotypes were selected from 606 progenies of LST trial based on visual observation on homogeneity in flowering, plant height and grain size and shape (Table 4.4a). The initially selected lines showed a wide range of variation in plant height and growth duration starting from 97-135 days and the selection intensity was found 10.56% (Fig. 4.1a). The trait marker profile of the genotypes of LST is presented in Fig. 4.4b. The most of the selected materials from LST contained genes of high amylose and high zinc and some of the materials also showed drought tolerance QTLs. All the RGA derived fixed lines of the 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 2023-24**

SN	BR Cross	Parentage	No. of progenies transplanted	No. of selected lines
1	BR13872	BR23/BRR1 dhan89	160	16
2	BR13873	BRR1 dhan46/BRR1 dhan87	96	20
3		BR23/BR8526-38-3-2-1-		
	BR13874	HR2	120	4
4	BR13875	BRR1 dhan46/BR8526-L8	230	24
<b>Total</b>			<b>606</b>	<b>64</b>



**Fig. 4.4a: Selection intensity genotypes of LST, RLR, T. Aman 2023-24**



**Fig. 4.4b: Trait marker profile of genotypes of LST, RLR, T. Aman 2023-24**

**Table 4.4b: List of LST lines with enriched traits/genes originated different cross families, Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	Cross family	Parentage	Trait family	No. of lines
1	BR13872	BR23/ BRRIdhan89	<i>Wx-10+ Wx-A+ Gm4_4+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-10+ Wx-A+ Gm4_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30742072_[T/G]+ qDTY4-1_2</i>	1
			<i>Wx-10+ Wx-A+ Gm4_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-10+ Wx-A+ Gm4_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2</i>	1
			<i>Wx-10+ Wx-A+ Gm4_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30742072_[T/G]+ qDTY12-1_2</i>	1
			<i>Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-10+ Wx-A+ S2_10205033+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-A+ Gm4_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2</i>	1
			<i>Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-A+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1</i>	1
			<i>Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	4
			<i>Wx-A+ S2_10205033+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	2
2	BR13873	BRRIdhan46/ BRRIdhan87	<i>Wx-10+ MSU7_7_29323445_[A/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY4-1_2+ qDTY12-1_2</i>	1
			<i>Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+</i>	1
			<i>Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2</i>	1
			<i>Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ S2_10205033+ qDTY2-2_4+ MSU7_3_30742072_[T/G]</i>	1
			<i>Wx-10+ Wx-A</i>	7
			<i>Wx-10+ Wx-A+ NAS3</i>	1
			<i>Wx-10+ Wx-A+ NAS3_2</i>	1
			<i>Wx-10+ Wx-A+ NAS3_2+ NAS3</i>	5
			<i>Wx-A</i>	1
3	BR13874	BR23/ BR8526-38-3-2-1-HR2	<i>Wx-10+ Wx-A+ NAS3_2+ NAS3</i>	1
			<i>Wx-A</i>	2
4	BR13875	BRRIdhan46/ BR8526-L8	<i>Wx-10+ Wx-A</i>	8
			<i>Wx-10+ Wx-A+ NAS3</i>	1
			<i>Wx-10+ Wx-A+ NAS3_2+ NAS3</i>	7
			<i>Wx-A</i>	1
			<i>Wx-A+ xa5</i>	7

#### Experiment 4.5: Observational Yield Trial (OYT)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

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

**Materials and Methods:** Four hundred thirty-two genotypes along with standard checks were evaluated in three OYTs. In OYT#1, 250 lines (GD: 94-120 days) along with BRRIdhan71 and BRRIdhan75, in OYT#2, 133 lines (GD: 121-140 days) along with BRRIdhan49 and BRRIdhan87 and in OYT#3, 49 lines along with Tukad Petanu, BRRIdhan71 and BRRIdhan75

dhan75 were evaluated. Thirty days old seedlings were transplanted in a 3.3 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.

**Result and Discussion:** From the trial OYT#1, 18 lines, from OYT#2, 15 lines and from OYT#3, 7 lines were selected based on grain yield and phenotypic performance (Table 4.5). Grain yield was ranged from 5.36 -6.98 t/ha in OYT#1, 5.67-7.5 t/ha in OYT#2 and 5.81-6.31 t/ha in OYT#3.

**Table 4.5: List of selected materials of Observational Yield Trial (OYT), Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
				Gazi	Cum	Rang	GY (BLUE)	GY (BLUP)	
<b>OYT#1</b>									
1	BR13519-4R-629	140	131	6.31	3.96	6.7	5.66	4.79	
2	BR13519-4R-839	149	122	6.35	6.15	4.4	5.62	4.78	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
3	BR13519-4R-972	138	126	5.78	6.51	4.2	5.48	4.77	qDTY2.1_1+ qDTY3.1_2+ qDTY3.2+ Waxy_A
4	BR13519-4R-1024	145	131	5.25	6.2	5.1	5.51	4.77	qDTY3.1_1+ qDTY3.1_2+ Waxy_A
5	BR13519-4R-10	123	130	6.23	6.94	4.7	5.95	4.82	qDTY3.2+ Waxy_A + Waxy_10
6	BR13519-4R-4	127	132	5.78	5.55	5.2	5.52	4.77	qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ Pita + Waxy_A + Waxy_10
7	BR13519-4R-15	142	126	5.32	5.51	5.3	5.38	4.76	qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_5+ qDTY3.1_2+ qDTY3.2+ qDTY12.1+ Waxy_A + Waxy_10
8	BR13519-4R-509	135	127	5.11	5.37	5.6	5.37	4.76	qDTY3.1_2+ Waxy_A
9	BR13519-4R-412	125	131	5.77	6.09	4.3	5.39	4.76	qDTY2.1_1+ qDTY3.2+ qDTY12.1+ Waxy_A + Waxy_10
10	BR12989-4R-33	124	123	6.27	4.8	5.4	5.49	4.77	Waxy_A + Waxy_10
11	BR12990-4R-180	128	125	4.33	6.63	5.8	5.57	4.78	qDTY2.1_4+ qDTY2.1_5+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1+ Waxy_A + Waxy_10
12	BR12990-4R-156	124	128	6.83	5.39	6.4	6.21	4.84	qDTY3.1_2+ Waxy_A
13	BR12990-4R-170	135	121	5.61	4.74	6.7	5.68	4.79	qDTY3.1_2+ Waxy_A
14	BR12991-4R-44	130	130	5.5	6.51	4.4	5.47	4.77	qDTY1.1_2+ qDTY3.2+ qDTY12.1+ Waxy_A
15	BR12991-4R-413	131	135	5.64	6.59	4.2	5.47	4.77	qDTY2.1_3+ qDTY2.1_4+ qDTY2.2-1+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ qDTY12.1+ Waxy_A + Waxy_10
16	BR12996-4R-322	132	130	6.3	3.94	6.8	5.68	4.79	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
17	BR12997-4R-113	125	125	6.38	5.97	8.6	6.98	4.92	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+

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data		
				Gazi	Cum	Rang	GY (BLUE)	GY (BLUP)			
18	BR13046-4R-168	135	132	6.43	4.06	5.6	5.36	4.76	<i>qDTY3.2+</i> <i>Waxy_A</i> + <i>Waxy_10</i>	<i>qDTY3.1_1+</i> <i>qDTY3.1_2+</i>	<i>qDTY3.2+</i> <i>Waxy_A</i> + <i>Waxy_10</i>
19	BRRIdhan71 (Ck)	115	115	5.87	5.39	4.8	5.36	4.76			
20	BRRIdhan75 (Ck)	109	113	5.69	5.47	4.6	5.24	4.75			
	LSD (0.05) h2b	14.4 0.76	16 -	0.826 0.76	0.274 0.87	3.439 -	1.259 0.1				
<b>OYT#2</b>											
1	BR13519-4R-985	142	128	7.22	5.14	5.27	5.88	5.23	<i>qDTY2.1_1+</i> <i>qDTY3.2+</i> <i>qDTY12.1+</i> <i>Pita</i> + <i>Waxy_A</i> + <i>Waxy_10</i>		
2	BR13519-4R-683	133	148	5.69	6.21	5.98	5.96	5.25	<i>qDTY2.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>Pita</i>		
3	BR13519-4R-268	132	135	7.21	5.84	5.78	6.28	5.34	<i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>Waxy_A</i>		
4	BR13519-4R-310	142	132	5.96	6.35	6.83	6.38	5.36	<i>qDTY3.1_2+</i> <i>qDTY3.2+</i> <i>qDTY12.1+</i> <i>Waxy_A</i> + <i>Waxy_10</i>		
5	BR13519-4R-686	141	133	5.7	6.24	6.12	6.02	5.27	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>xa5</i> + <i>Pita</i> <i>Waxy_A</i>		
6	BR12988-4R-195	141	131	6.75	5.84	4.41	5.67	5.17	<i>qDTY1.1_2+</i> <i>qDTY2.2-1+</i> <i>qDTY3.2+</i> <i>qDTY12.1+</i> <i>Waxy_A</i>		
7	BR12989-4R-199	138	140	7.33	6.3	8.87	7.5	5.67	<i>qDTY3.1_2+</i> <i>Waxy_A</i> + <i>Waxy_10</i>		
8	BR12993-4R-123	133	135	7.29	6.27	6.37	6.64	5.44	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_3+</i> <i>qDTY3.1_4+</i> <i>qDTY3.2+</i> <i>qDTY12.1+</i> <i>Waxy_A</i> + <i>Waxy_10</i>		
9	BR12996-4R-225	117	130	6.18	6.23	4.72	5.71	5.18	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY2.2-1+</i> <i>qDTY2.2-2+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>qDTY12.1+</i> <i>Waxy_A</i> + <i>Waxy_10</i>		
10	BR12997-4R-36	127	130	6.23	5.18	5.59	5.67	5.17	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>Waxy_A</i> + <i>Waxy_10</i>		
11	BR12997-4R-38	145	133	6.71	6.4	4.58	5.9	5.23	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY3.2+</i> <i>Waxy_A</i>		
12	BR13049-4R-85	143	134	5.67	6.41	5.24	5.77	5.2	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY2.2-1+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>Pita</i> + <i>Waxy_A</i> + <i>Waxy_10</i>		
13	BR13049-4R-271	146	133	6.75	7.15	4.39	6.1	5.29	<i>qDTY2.2-1+</i> <i>qDTY2.2-2+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>Pita</i> + <i>Waxy_A</i> + <i>Waxy_10</i>		
14	BR13050-4R-6	126	137	5.73	5.83	5.73	5.76	5.2	<i>qDTY2.1_1+</i> <i>qDTY2.1_2+</i> <i>qDTY2.1_3+</i> <i>qDTY2.1_4+</i> <i>qDTY2.1_5+</i> <i>qDTY3.1_1+</i> <i>qDTY3.1_2</i> <i>qDTY3.2+</i> <i>xa5</i> + <i>Pita</i> <i>Waxy_A</i>		
15	BR13050-4R-29	129	132	6.75	4.96	5.51	5.74	5.19	<i>qDTY3.1_1+</i> <i>qDTY3.2+</i> <i>Pita</i> <i>Waxy_A</i>		

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Genotypic data	
				Gazi	Cum	Rang	GY (BLUE)	GY (BLUP)	
16	BRRRI dhan49 (Ck)	108	134	5.87	5.69	5.17	5.58	5.15	
17	BRRRI dhan87 (Ck)	126	128	5.84	5.94	4.02	5.26	5.06	
	LSD (0.05)	15.4	10.1	2.08	1.214	0.842	1.482		
	h2b	0.63	0.59	0.31	0.75	0.93	0.27		
<b>OYT#3 (Standard Boro)</b>									
1	IR 144478-1-1-1-B	115	118	6.58	5.28	-	5.93	5.12	-
2	IR 144483-1-2-3-B	103	124	6.97	5.23	-	6.1	5.12	-
3	IR 144484-1-2-5-B	107	121	5.1	6.51	-	5.81	5.12	-
4	IR 144485-1-1-3-B	109	121	5.26	6.73	-	5.99	5.12	-
5	IR 144485-1-3-1-B	110	124	6.32	6.3	-	6.31	5.12	-
6	IR 144490-1-1-3-B	110	118	7.37	4.83	-	6.1	5.12	-
7	IR 144491-1-2-1-B	112	118	5.27	6.63	-	5.95	5.12	-
8	Tukad Petanu (Res Ck)	109	125	5.34	3.97	-	4.65	5.12	-
9	BRRRI dhan71 (Ck)	109	116	5.75	5.4	-	5.57	5.12	-
10	BRRRI dhan75 (Ck)	111	115	5.76	5.79	-	5.77	5.12	-
	LSD (0.05)	9.5	5.1	0.545	0.099	-	1.536		
	h2b	-	0.35	0.87	0.79	-	-		

OYT#1 Gaz: D/S- 26.06.23 D/T- 25.07.23, Rang: D/S- 01.07.23 D/T- 29.07.22, Cum: D/S- 04.07.23 D/T- 23.07.23

OYT#2 Gaz: D/S- 26.06.23 D/T- 24.07.23, Rang: D/S- 01.07.23 D/T- 31.07.22, Cum: D/S- 05.07.23 D/T- 31.07.23

OYT#3 Gaz: D/S- 03.07.23 D/T- 30.07.23, Cum: D/S- 13.07.23 D/T- 07.08.23

#### Experiment 4.6: Advanced Yield Trial (AYT)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

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

**Materials and Methods:** Forty-two genotypes with BRRRI dhan71 and BRRRI dhan75 as standard checks in AYT#1 (GD: 101-120 days) and 62 genotypes in AYT#2 (GD: 120-140 days) along with BRRRI dhan49 and BRRRI 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:** BRRRI, Gazipur; Cumilla and Rangpur.

**Result and Discussion:** From the trial AYT#1, seven lines and from AYT#2 and thirteen lines were selected based on grain yield and phenotypic performance (**Table 4.6**). Grain yield was ranged from 5.76 -6.33 t/ha in AYT#1 and 5.28-6.35 t/ha in AYT#2.

**Table 4.6: List of selected materials of Advanced Yield Trial (AYT), Development of Rainfed Lowland Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Genotypic data	
				Gaz	Cum	Rang	GY (BLUE)	GY (BLUP)	
<b>AYT#1</b>									
1	BR12631-5R-28	118	118	6	6.78	4.58	5.79	5.49	<i>qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+</i>

SN Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
			Gaz	Cum	Rang	GY (BLUE)	GY (BLUP)	
2 BR12303-5R-341	136	135	6.07	6.61	5.11	5.93	5.56	<i>qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ qDTY4.1_2+ Wx-A 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</i>
3 BR12631-5R-146	124	120	6.31	6.38	5.02	5.91	5.55	<i>qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.1 (4)+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ Wx-A+ qDTY12.1_2</i>
4 BR12631-5R-51	118	116	6.21	6.39	4.67	5.76	5.47	<i>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</i>
5 BR12294-5R-187	120	120	7.34	6.67	4.98	6.33	5.76	<i>qDTY3.1 (1)+ qDTY12.1_2</i>
6 BR12303-5R-49	108	123	6.77	5.29	5.92	6	5.59	<i>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</i>
7 BR12293-5R-47	112	119	6.72	6.56	5.4	6.23	5.71	<i>Wx-10+ qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A+ qDTY12.1_2</i>
8 BRR1 dhan71 (Ck)	110	116	5.99	5.39	4.96	5.45	5.32	-
9 BRR1 dhan75 (Ck)	111	114	5.76	5.41	5.03	5.4	5.29	-
LSD (0.05)	12.1	101.7	1.068	0.586	0.76	1.049	12.1	
Heritability	0.74	-	0.87	0.9	0.58	0.63	0.74	
<b>AYT#2</b>								
1 BR12631-5R-35	117	128	7.28	5.37	5.33	5.99	5.23	<i>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</i>
2 BR11752-5R-22	141	135	6.3	6.84	5.93	6.35	5.29	<i>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</i>
3 BR11754-5R-97	125	135	4.9	4.83	7.43	5.72	5.19	<i>qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY3.2_1+ Wx-A</i>
4 BR11752-5R-105	135	132	6.8	5.62	5.86	6.09	5.25	<i>qDTY2.1 (1)+ qDTY2.1 (3)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY1.1_4+ qDTY2.2_1+ Wx-A</i>
5 BR11747-5R-6	126	133	5.61	5.49	5.99	5.7	5.18	<i>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+</i>
6 BR12305-5R-107	132	132	5.18	5.51	6.48	5.72	5.19	<i>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</i>
7 BR11732-5R-107	120	137	7.2	4.49	6.13	5.94	5.22	<i>qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY4.1_2+ Wx-A+ qDTY12.1_2</i>
8 BR11747-5R-67	122	138	6	5.45	5.61	5.68	5.18	<i>qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A+</i>
9 BR11748-5R-16	130	138	5.69	5.51	6.32	5.84	5.21	<i>qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A</i>
10 BR11731-5R-183	130	137	6.73	4.49	6.64	5.95	5.23	<i>qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ Wx-A+ Gm4_4+</i>
11 BR11730-5R-32	134	137	4.71	6.15	6.39	5.75	5.19	<i>Wx-10+ qDTY2.1 (1)+ qDTY3.1 (1)+ qDTY1.1_4+ qDTY3.2_1+</i>

SN Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data	
			Gaz	Cum	Rang	GY (BLUE)	GY (BLUP)		
12 BR11135-20-1-3-3	125	133	5.61	6.27	5.33	5.73	5.19	<i>qDTY4.1_2+</i> <i>Wx-A+</i> <i>qDTY12.1_2</i>	
13 BR11139-3-5-2-4	131	133	6.99	5.54	5.01	5.85	5.21		
14 BRRI dhan49 (Ck)	106	135	5.98	5.65	5.83	5.82	5.2		
15 BRRI dhan87 (Ck)	124	128	6.19	5.97	3.69	5.28	5.11		
LSD (0.05)	12.2	5	1.575	0.585	2.664	1.822	12.2		
Heritability	0.87	0.9	0.43	0.89	0.71	0.38	0.87		
AYT#1 Gaz:	D/S- 24.06.23	D/T- 24.07.23	Cum: D/S- 08.07.23		D/T- 02.08.23		Rang: D/S- 01.07.23		D/T- 31.07.23
AYT#2 Gaz:	D/S- 25.06.23	D/T- 24.07.23	Cum: D/S- 09.07.23		D/T- 02.08.23		Rang: D/S- 01.07.23		D/T- 30.07.23

#### Experiment 4.9: Regional Yield Trial (RYT)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**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:** Nine genotypes from RYT#1 along with BRRI dhan71 and BRRI dhan75 as standard checks and seven genotypes from RYT#2 along with BRRI dhan49 and BRRI dhan87 as standard checks were evaluated at seven locations of Bangladesh. Twenty-five to thirty 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, Kushtia, Rajshahi, Rangpur, Barishal, Satkhira, Shirajganj and Sonagazi.

**Results and Discussion:** None of the genotypes were selected for ALART due to not significant higher yield performances than check varieties. One genotype from RYT#1 and two genotypes from RYT#2 were selected for re-trial (**Table 4.9a**). The physicochemical properties of the genotypes of RYT is shown in the **Table 4.9b**. pBLUP (grain yield) value of the genotypes of RLR was analysed from the year 2019 to 2023. The genetic trend of pBLUP (grain yield) in respect of trial year indicated an annual 77.67 kg/ha equivalent to about 1.67% increase per year based on yield of 2019 (**Fig 4.9c**). So, the grain yield of the genotypes area increasing in a tolerable rate.

**Table 4.9a: Performance of genotypes in Regional Yield Trial (RYT), Development of Rainfed Lowland Rice, T. Aman 2023-24**

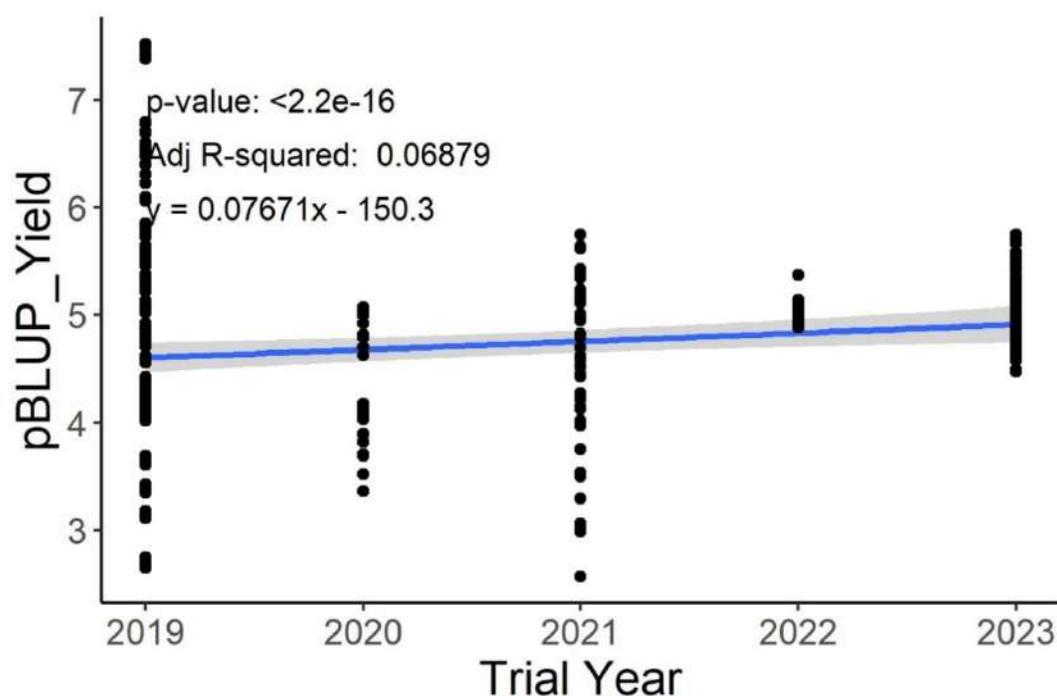
SN Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)										BLUE	BLUP
			Gazi pur	Cum illa	Kush tia	Rajs hahi	Rang pur	Bari shal	Satk hira	Shiraj ganj	Sona gazi			
<b>RYT#1</b>														
1 BR12001-6R-205	132	114	5.13	6.01	4.94	3.65	4.68	3.31	4.16	5.5	4.31	4.63	4.64	
2 BR10795-6R-133	140	120	5.39	5.49	4.85	2.5	3.8	3.29	4.9	5.09	4.23	4.39	4.47	
3 BR12005-6R-14	137	127	5.92	5.19	5.81	4.17	4.36	4.09	5.44	5.33	5.04	5.04	4.92	
4 BR10797-6R-140	118	114	4.78	5.55	5.33	4.23	3.14	3.46	4.47	5.33	4	4.48	4.53	
5 BR10799-6R-104	132	125	4.85	5.58	5.06	3.1	4.31	3.61	4.39	5.64	4.3	4.54	4.57	
6 BR12007-6R-61	137	114	4.95	5.1	4.67	3.14	3.19	-	5.47	2.72	2.51	3.84	4.12	
7 BR11333-6R-4	122	123	5.1	5.51	4.95	3.85	3.98	3.43	4.32	5.12	4.43	4.52	4.56	

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)										
				Gazi pur	Cum illa	Kush tia	Rajs hahi	Rang pur	Bari shal	Satk hira	Shiraj ganj	Sona gazi	BLUE	BLUP
8	BR11333-6R-84	112	119	5.97	5.28	5.41	5.35	4.18	3.54	4.35	5.4	5.03	4.94	4.85
9	BR10799-6R-31	133	124	4.52	6.27	5.27	3.72	4.35	3.69	4.5	6.44	4.48	4.81	4.76
10	BRRIdhan71 (ck)	120	116	5.1	5.29	5.67	5.21	5.2	3.95	4.77	5.46	4.49	5.02	4.9
11	BRRIdhan75 (ck)	111	112	3.47	5.57	5.24	5.22	4.1	-	5.28	6.4	5.01	4.91	4.82
LSD (0.05)		6.1	5	0.498	0.402	0.201	0.671	0.339	0.243	0.237	0.234	0.303	0.529	
Heritability		0.96	0.89	0.86	0.71	0.91	0.89	0.92	0.8	0.94	0.98	0.97	0.73	
<b>RYT#2</b>														
1	BR12011-6R-178	127	114	6.53	5.33	4.93	3.41	4.24		5.11	5.14	4.61	4.77	4.89
2	BR10797-6R-24	131	128	6.32	5.64	5.47	4.95	5.72	3.3	4.69	4.26	4.72	5.01	4.92
3	BR10799-6R-70	131	115	6.34	6.15	5.1	4.12	3.27	3.31	5.22	4.24	4.39	4.68	4.88
4	BR11343-6R-51	110	125	6.1	6.19	5.28	5.34	4.56	3.92	4.08	4.92	5.09	5.05	4.93
5	BR11227-6R-98	157	137	6.11	6.3	5.54	3.99	4.66	3.16	3.19	4.46	4.46	4.65	4.87
6	BR10802-6R-66	141	135	5.73	6.13	5.34	3.94	4.68	3.6	5.09	4.63	4.48	4.85	4.9
7	BR11336-6R-10	149	137	4.81	4.98	5.73	5.62	5.1	4.33	3.06	4.66	4.94	4.8	4.89
8	BRRIdhan49 (Ck)	109	132	6.2	5.71	5.39	5.36	4.83	3.86	4.36	5.4	4.99	5.12	4.94
9	BRRIdhan87 (Ck)	127	126	5.9	5.82	5.9	5.37	4.28	4.28	4.65	5.51	5.15	5.21	4.95
LSD (0.05)		7.2	5.4	0.713	0.362	0.297	0.658	0.379	0.213	0.209	0.292	0.294	0.516	
Heritability		0.95	0.98	0.49	0.85	0.83	0.8	0.83	0.94	0.92	0.98	0.9	0.18	

**Table 4.9b: Physicochemical properties of genotypes in Regional Yield Trial (RYT), Development of Rainfed Lowland Rice, T. Aman 2023-24**

Variety/Line	Milling outturn (%)	Head rice recovery (%)	Milled rice length (mm)	Milled rice breadth (mm)	L-B ratio	Size and Shape	1000 grain wt. (g)	Amylose (%)	Protein content (%)	ER	IR
<b>RYT#1</b>											
BR12001-6R-205	68.0	56.4	6.6	2.0	3.3	LS	25.6	21.5	8.5	1.4	4.6
BR10795-6R-133	69.0	58.0	6.6	2.0	3.3	LS	24.2	25.0	8.1	1.3	4.2
BR12005-6R-14	70.6	57.6	5.6	2.4	2.3	MB	24.7	26.5	7.0	1.6	4.1
BR10797-6R-140	70.4	61.7	5.4	2.0	2.7	MB	19.5	22.0	9.0	1.7	4.8
BR10799-6R-104	69.3	52.9	6.4	1.9	3.3	LS	19.9	23.0	8.8	1.4	4.5
BR12007-6R-61	70.3	54.3	6.0	1.8	3.3	MS	17.0	22.5	7.7	1.4	4.3
BR11333-6R-4	69.7	58.5	6.1	1.9	3.2	LS	20.6	25.0	9.3	1.4	4.4
BR 11333-6R-84	70.3	63.5	5.4	2.0	2.7	MB	18.3	25.0	9.5	1.5	4.3
BR10799-6R-31	70.1	53.9	6.3	2.1	3.0	LB	22.0	25.5	9.0	1.3	4.5
BRRIdhan71 (Ck)	67.8	58.8	5.8	2.2	2.8	LB	23.9	22.1	6.9	1.5	3.1
BRRIdhan75 (Ck)	69.4	60.1	6.2	1.9	2.7	LS	20.2	20.4	9.2	1.2	3.2
<b>RYT#2</b>											
BR12011-6R-178	68.9	58.3	6.2	1.9	3.2	LS	20.1	23.6	8.3	1.5	4.3
BR10797-6R-24	69.5	57.2	5.4	2.4	2.2	MB	22.6	26.0	9.6	1.5	4.6
BR10799-6R-70	68.5	55.9	5.6	2.1	2.6	MB	22.9	27.0	7.7	1.7	4.1
BR11343-6R-51	68.9	63.1	5.5	1.9	2.8	MB	18.3	26.4	8.9	1.5	3.7

BR11227-6R-98	68.5	54.9	6.0	2.2	2.7	MB	22.9	27.0	8.5	1.6	3.7
BR 10802-6R-66	67.7	55.9	5.5	2.2	2.5	MB	24.8	27.7	9.2	1.5	4.0
BR11336-6R-10	68.6	60.4	5.5	2.2	2.5	MB	21.6	28.0	9.6	1.5	4.3
BRRIdhan49 (Ck)	67.3	59.6	5.5	2.0	2.7	MB	17.6	24.7	9.2	1.4	3.4
BRRIdhan87 (Ck)	67.9	52.9	6.3	2.0	3.1	LS	21.8	27.0	7.1	1.4	4.6



**Fig. 4.9c:** Genetic trend of pBLUP (grain yield) in respect of trial year indicated an annual 77.67 kg/ha equivalent to about 1.67% increase in grain yield per year based on yield of 2019

## PROJECT 5. DEVELOPMENT OF HEAT TOLERANT RICE (HTR)

**General objectives:** Development of varieties/lines tolerant to heat stress quality grains into high yielding genotypes in T. Aus season

### Experiment 5.1: Hybridization

**Principal Investigator:** M Khatun

**Co-investigator:** S K Debsharma

**Materials and Methods:** The crossing program for developing heat-tolerant rice was followed in both T. Aman and Boro seasons for good seed setting. T. Aman season started on 01 July and Boro season started on 15 November. The experiment was conducted in BRRIdhan49 Headquarter, Gazipur. 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 & thirty-five-day-old seedlings for Boro season were transplanted in a 5.4 m × 2 rows plot with a 25 × 20 cm spacing. 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<sub>4</sub>) kg NPKS<sub>Zn</sub>/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<sub>4</sub>) kg/ha NPKS<sub>Zn</sub> were applied in Boro season. Single seedling was used for transplanting. 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:** Nineteen crosses were made using 16 parents for the development of heat-tolerant rice (HTR) from Boro 2023-24 and 2269 F<sub>1</sub> seeds were collected (**Table 5.1**).

**Table 5.1. List of the crosses, Development of heat tolerant rice (HTR), Boro 2023-24**

SN	Parentage	No of F <sub>1</sub> seed	Trait/ Genes of interest
1	BR9006-40-2-3-1*3/BR11607-4R-72	286	<i>qHTSF4.1, Xa21, Xa5, xa13</i>
2	BR9830-53-3-5-2*2/BR11607-4R-72	35	<i>qHTSF4.1, Xa21, Xa5, xa13</i>
3	BR9006-40-2-3-1*3/BR11868-5R-23	99	<i>qHTSF4.1, Xa21, Xa5</i>
4	BR9829-78-1-2-1*3/BR11607-4R-192	274	<i>qHTSF4.1, Xa21, Xa5, xa13</i>
5	BR9829-78-1-3-2*2/BR11868-5R-23	278	<i>qHTSF4.1, Xa21, Xa5</i>
6	BR9829-78-1-2-1*3/IR127152-3-22-2-1-B	269	<i>qHTSF4.1, Xa21, Xa5, xa13</i>
7	7 FBR-222/BR11603-4R-49	27	<i>qHTSF4.1, Xa21, Xa5</i>
8	BR11723-4R-12/BR12442-4R-49	122	<i>qHTSF4.1, Xa21, Xa5</i>
9	BR8781-16-1-3-P2/BR12442-4R-49	113	<i>qHTSF4.1, Xa21, Xa5</i>
10	BRR1 dhan43/BR11102-4R-247	55	<i>qHTSF4.1, Xa21, Xa5</i>
11	BR11723-4R-172/IR64-EMF3	24	<i>qHTSF4.1</i>
12	BR11723-4R-12/N22	15	<i>qHTSF4.1</i>
13	BR11867-4R-371*2/IR64-EMF3	61	<i>qHTSF4.1, Xa21</i>
14	BR11723-4R-12/IR12N177	94	<i>qHTSF4.1</i>
15	7 FBR-376/IR64-EMF3	5	<i>EMF3</i>
16	7 FBR-222/BR11603-4R-49	27	<i>qHTSF4.1, Xa21, Xa5</i>
17	BR12442-4R-49/IR64-EMF3	108	<i>qHTSF4.1, Xa21, Xa5</i>
18	BR12121-4R-53/IR12N177	269	<i>qHTSF4.1</i>
19	BR11723-4R-12/N22//BR11867-4R-371/IR64-EMF3	108	<i>qHTSF4.1, Xa21, Xa5,</i>
	Total	2269	

### Experiment 5.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** Mahmuda Khatun

**Co-investigator:** S K Debsharma

**Specific objective:** Confirmation of F<sub>1</sub>s as true crosses and selection of promising ones.

**Materials and Methods:** Eight crosses were grown (Table 5.2). F<sub>1</sub> 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 with single seedlings at a spacing of 25 × 15 cm in the net house. Respective parental seedlings were transplanted on both sides of each F<sub>1</sub> population. F<sub>1</sub>'s confirmation was done by both quality check (QC) genotyping and observation techniques. After confirmation promising F<sub>1</sub>s were selected and used for double and multiple crosses. Complex crosses were mainly done for the F<sub>1</sub>s which using local cultivars or low yielding genotypes with valuable traits. The F<sub>2</sub> and multiple F<sub>1</sub> crosses were preserved carefully after proper drying in a cool place. Crop management was done as described in experiment 17.1.

**Results:** All F<sub>1</sub>s of eight crosses were confirmed successfully during Boro 2023-24.

**Table 5.2. F<sub>1</sub> confirmation, Development of heat tolerant rice (HTR), Boro 2023-24**

SN	BR No.	Designation	Trait/ Genes of interest
1	BR15990	BRR dhan98*2/IR05N412	<i>qHTSF4.1</i>
2	BR15991	BRR dhan98*2/IR12N177	<i>qHTSF4.1</i>
3	BR15992	BRR dhan98*2/IR64-EMF3	<i>EMF3</i>
4	BR16015	BR13169-4R-229 /EMF-1	<i>EMF3</i>
5	BR16017	BR9829-78-1-3-2/EMF-1	<i>EMF3</i>
6	BR16018	BRR1 dhan98/EMF-1	<i>EMF3</i>
7	BR16019	BRR1 dhan98/EMF-3	<i>EMF3</i>
8	BR16020	BRR1 dhan106 /EMF-4	<i>qHTSF4.1, EMF3</i>

### Experiment 5.3: Field RGA nursery (F<sub>2</sub>-F<sub>5</sub> 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 conditions.

**Materials and methods:** A total of 10,000 progenies from 20 crosses were grown (**Table 5.3**). Each progeny was grown in a 1.2 m single-row plot. Thirty-day-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:** The development of heat-tolerant rice (HTR) program consists of 10,000 progenies of 20 crosses in the Boro season that were advanced through modified FRGA.

**Table 5.3. Field RGA Nursery, Development of heat tolerant rice (HTR), 2023-24**

SN	BR No.	Parentage	Plant Number	Progenies
<b>F<sub>3</sub>, T. Aus (HTR)</b>				
1	BR15505-R	BR11866-5R-312 / IR64-EMF	P#2-8	500
2	BR15515-R	BR11723-4R-12*3/N22	P#1-5,9,10,23-25	500
3	BR15516-R	BR11867-4R-371*3/ IR64-EMF3	P#1-7,13,16,18	500
4	BR15522-R	BR11723-4R-12*2/IR12N177	P#1-8	500
5	BR15523-R	BR12121-4R-53*2/ IR12N177	P#1-8	500
			<b>Total</b>	<b>2500</b>
<b>F<sub>4</sub>, T Aus (HTR)</b>				
1	BR14679-2R	BR11723-4R-172/IR64-EMF3 ( <i>qHTSF4.1</i> )	P#2, 4, 5, 7	500
2	BR14681-2R	BR11723-4R-12/N22 ( <i>qHTSF4.1</i> )	P#1,2,4,7,9,10,11	500
3	BR14997-2R	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, qHTSF4.1</i> )	P#1, 16	500
4	BR15008-2R	BR12121-4R-53/ BR9138-4-4-5-5-P3-HR3-HR5( <i>xa5, Xa21, qHTSF4.1</i> )	P#4-12	500
5	BR15009-2R	BR11723-4R-12/IR12N177 ( <i>xa5, Pita, qHTSF4.1</i> )	P#2,5,6,8,10,12	500
6	BR15012-2R	BR11723-4R-12/ BR12442-4R-49 ( <i>Xa21, qHTSF4.1, fgr</i> )	P#4,5,6,8,9,10	500
7	BR15013-2R	BR12442-4R-49/ IR64-EMF3( <i>xa5, xa13, Xa21, qHTSF4.1, fgr</i> )	P#5	500
8	BR15013-2R	BR12442-4R-49/ IR64-EMF3( <i>Xa21, qHTSF4.1, fgr</i> )	P#2,8,9,10,12	500
9	BR15014-2R	BR12121-4R-53/ IR12N177 ( <i>Xa5, Pita, qHTSF4.1</i> )	P#1,2,3,10	500
10	BR15016-2R	BR8781-16-1-3-P2/ BR12442-4R-49 ( <i>Xa21, qHTSF4.1, fgr</i> )	P#5,9,12	500
			<b>Total</b>	<b>5000</b>
<b>F<sub>5</sub>, T Aus (HTR)</b>				
1	BR14679-3R	BR11723-4R-172/IR64-EMF3	P#1-8	500
2	BR14681-3R	BR11723-4R-12/N22	P#1-8	500
3	BR14685-3R	BR11867-4R-371/ IR64-EMF3	P#1-8	500
4	BR15000-3R	BR9006-40-2-3-1*2/ IRRI154-Pi9 ( <i>Xa21, qHTSF4.1</i> )	P#4,9,11	500
5	BR15001-3R	BR8781-16-1-3-P2*2/ IRRI154-Pi9 ( <i>Pi9, fgr, qHTSF4.1, TSV1</i> )	P#9,16,18	500
			<b>Total</b>	<b>2500</b>
			<b>Grand total</b>	<b>10000</b>

#### Experiment 5.4: Line Stage Testing (LST)

**Principal Investigator:** M Khatun

**Co-investigator:** S K Debsharma

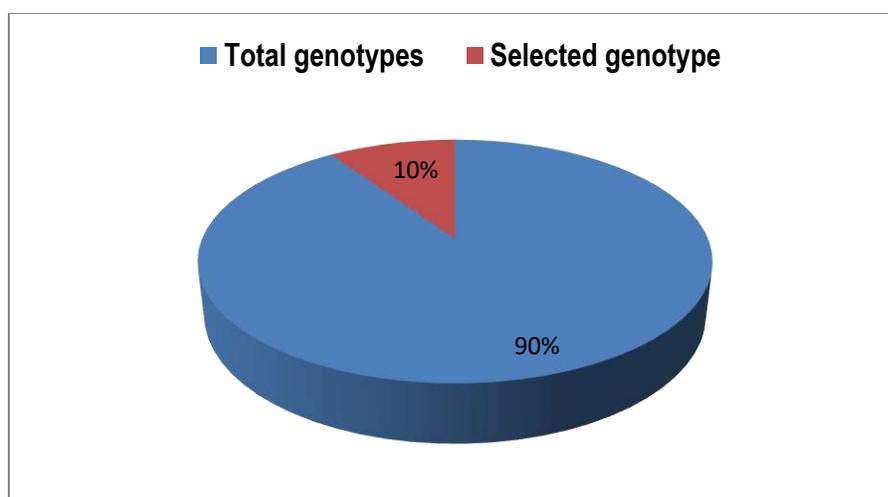
**Specific objective:** Isolation of homogeneous breeding lines with improved plant type, disease free and short duration.

**Materials and Methods:** Line Stage Testing consisting of 986 lines (**Table 5.4**) was evaluated in Boro2023-24. 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 fertilizer & crop management was done as described in experiment 17.1.

**Results:** Out of 986 lines of four crosses, 104 uniform lines were selected from LST based on uniformity in heading, plant height and acceptable grain type in the field condition. Selection applied for selecting LST lines was 10% (Fig 5.1). Final selection will be made based on trait marker profiles BB, Blast, BPH resistance and different grain quality traits.

**Table 5.4. List of materials for Line Stage Testing (LST), Development of heat tolerant rice (HTR), Boro, 2023-24**

F <sub>6</sub> , HTR, Boro			Imp. features	Progenies
1	BR14321-4R	BRR1 dhan92/ IR99853-B-B-B-460	Heat tolerant rice	362
2	BR14322-4R	BRR1 dhan89/ BR11607-4R-192	Heat tolerant rice	274
3	BR14326-4R	BR11723-4R-172/ BR11607-4R-192	Heat tolerant rice	200
4	BR15001-2R	BR8781-16-1-3-P2*2/ IRR1154-Pi9 ( <i>Pi9, frg, qHTSF4.1, TSV1</i> )	Heat tolerant rice	150
			<b>Total</b>	<b>986</b>



**Fig 5.1.** Frequency distribution of LST lines of heat tolerant rice lines in Boro 2023-2024

#### **Experiment 5.5: Advanced Yield Trial (AYT)**

**Principal Investigator:** Mahmuda Khatun

**Co-investigator:** S K Debsharma (Plant Breeding), A Rahman (Plant Breeding), N Tamanna (Plant Breeding), M R Hasan (Rangpur), S Abedin, M R Islam & M F Islam (Rajshahi), M Asif Rahman and M M Dewan (Kushtia)

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

**Location:** BRRI, Gazipur, Rajshahi, Kushtia and Rangpur

**Materials and methods:** Advanced yield trial consisting of thirty-eight genotypes for AYT#1, and twenty-nine for AYT#2 were evaluated. The check varieties Bina dhan14, BRR1 dhan28, BRR1 dhan98 and N22 were used for AYT#1 and BRR1 dhan58, BRR1 dhan89 and BRR1 dhan98 were used for AYT#2. Three-four weeks old seedlings were transplanted with single seedling per hill at a spacing of 20 × 15 cm in a 5.4 m × 5 rows plot. The field layout was Latinized Row Column 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.

**Result:** In Gazipur, it has observed that the maximum temperature status was more than 35°C and minimum temperature was more than 25°C during flowering to maturity stage that was drastically affected the pollen viability, spikelet fertility and as well as grain yield. Erratic and low rainfall (mm) of Gazipur in late Boro 2024 also enhanced to reduce spikelet fertility. Spikelet sterility of rice was increased by as much as 80% when HS occurred at the time of the reproductive stage (Fig. 5.2 & Fig. 5.3), The genotype BR12894-5R-46 had the highest yield with the highest fertility percentage in Gazipur, achieving 74.0%. This suggests a strong ability

for successful pollination and grain filling, which is essential for high yield potential (**Table 5.5**)

The highest yielding genotype in Rajshahi was BR13157-4R-173, which produced 6.73 t/ha. The high yield can be attributed to the favorable growth conditions in the region and the genotype's ability to efficiently utilize the available resources (**Table 5.6**). The genotype BR11847-4R-105 had the highest fertility percentage in Rajshahi, achieving 72.43%. In Rajshahi, the maximum temperature was often 35°C and minimum temperature was not exceeding 25°C during flowering to maturity stage of the heat tolerant genotypes caused better yield and increased spikelet fertility%. On the other hand, amount of rainfall of Rajshahi region in late Boro 2024 was not sufficient during March to June but comparatively low night temperature mitigated the heat stress as a result of increased the spikelet fertility and grain yield of the heat tolerant genotypes (**Fig. 5.4, 5.5**).

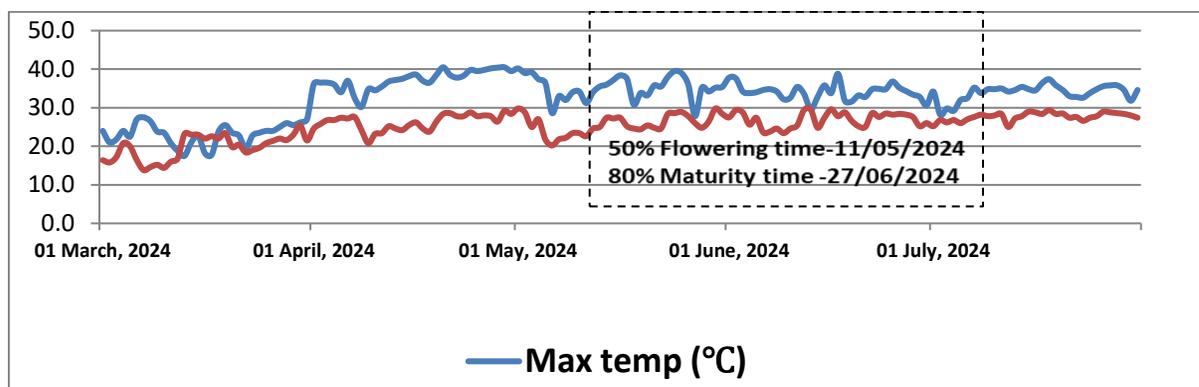
The genotype BR13157-4R-173 achieved the highest yield in Kushtia, producing 4.74 t/ha with the highest fertility percentage in Kushtia (73.69%), suggesting its strong adaptability and reproductive success in this region. The results from Kushtia emphasize the need for selecting genotypes that balance growth duration and yield potential, with BR12894-5R-150 standing out as a strong candidate for achieving higher yields (**Table 5.7**). In Kushtia, it has also observed that the maximum temperature was more than 35°C and minimum temperature was more than 25°C during flowering to maturity stage that was drastically affected the pollen viability, spikelet fertility and as well as grain yield. Amount of rainfall of Kushtia in late Boro 2024 was about 160 mm during March to June but, uneven distribution of rainfall was help to exaggerate the spikelet sterility (**Fig. 5.6 & 5.7**).

The genotype BR12894-5R-241 produced the highest yield of 7.22 t/ha, demonstrating superior performance in Rangpur's conditions. The highest fertility percentage was 83.5% of N22 (Tol Ck), indicating strong reproductive success. The genotype BR13169-4R-202 had the lowest fertility percentage at 55.3%, potentially due to temperature sensitivity during flowering (**Table 5.8**). In Rangpur, the maximum temperature was around 35°C and minimum temperature was not exceeding 25°C during flowering to maturity stage that was the most favourable condition when across the reproductive stage of the heat tolerant genotypes and produced better yield as well as spikelet fertility%. On the other hand, amount of rainfall of Rangpur region in late Boro 2024 was about 300 mm during March to June and in the late June sufficient rainfall occurred that was promoted to the spikelet fertility and grain yield of the heat tolerant genotypes (**Fig. 5.8 & 5.9**).

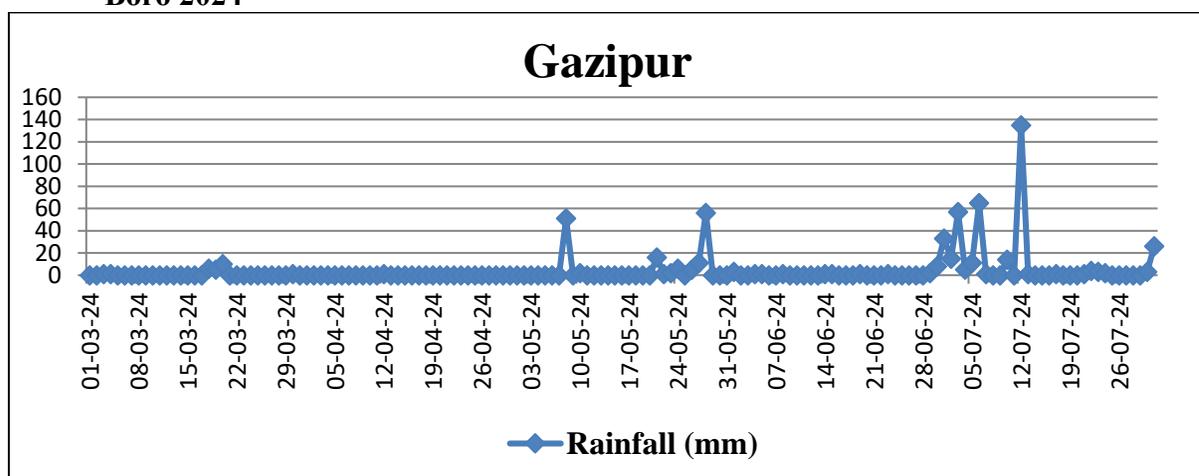
Combined growth duration and yield of AYT#1 are presented in the **Table 5.9**. Average growth duration of the heat tolerant genotypes was 93-120 days. Considering yield, ranged was 2.11-5.65 t/ha, 2.34-4.74 t/ha, 3.36-6.92 t/ha and 3.76-7.26 t/ha in Gazipur, Kushtia, Rajshahi and Rangpur, respectively. Average yield ranged of the heat tolerant genotypes was 3.17-5.87 t/ha (**Table 5.9**). Among the 42 heat tolerant rice genotypes six genotypes were selected considering yield and growth duration compared to the check varieties. The genotypes were BR13157-4R-173 (5.82 t/ha), BR11845-4R-180 (5.73 t/ha), BR12894-5R-150 (5.72 t/ha), BR12894-5R-239 (5.61 t/ha), BR12894-5R-281 (5.99 t/ha) and IR99853-B-B-B-509 (5.72 t/ha). These heat tolerant genotypes produced 6.0-15.0% higher yield than the highest yielding check variety BRRI dhan98 (5.12 t/ha). Growth duration (GD) were ranged from 96-111 days where growth duration of the high yielding tolerant check variety Binadhan14 (108 day), sensitive check variety BRRI dhan28 (107 day), standard check variety BRRI dhan98 (108 day) and local Indian improved tolerant check variety N22 (103 day). From the study, the genotypes BR13157-4R-173, BR11845-4R-180, BR12894-5R-150, BR12894-5R-239, BR12894-5R-281 and IR99853-B-B-B-509 can be identified to use as heat tolerant genetic resource and promoted as heat resilient varieties for cultivation in heat stress (HS) areas of Bangladesh.

Combined growth duration and yield of AYT#2 are presented in the Among the 29 heat tolerant rice genotypes six genotypes were selected considering yield and growth duration compared to the check varieties. The genotypes were BR12605-4R-105 (5.48 t/ha), BR12605-4R-125

(5.54 t/ha), BR12605-4R-182 (5.46 t/ha), BR12605-4R-200 (5.74 t/ha), BR12605-4R-72 (5.57 t/ha) and BR13173-4R-154 (5.46 t/ha). These heat tolerant genotypes produced 10.0% higher yield than the highest yielding check variety BRRi dhan89 (4.73 t/ha). Growth duration (GD) of the selected genotypes were ranged from 111-118 days where growth duration of the high yielding tolerant check variety BRRi dhan58 (111 day), sensitive check variety BRRi dhan89 (126 day), and standard check variety BRRi dhan98 (111 day). From the study, the selected genotypes can be identified to use as heat tolerant genetic resource and promoted as heat resilient varieties for cultivation in heat stress (HS) areas of Bangladesh.



**Fig 5.2.** The line graph shows maximum and minimum temperature of Gazipur in Late Boro 2024



**Fig 5.3** The line graph shows rainfall (mm) of Gazipur in Late Boro 2024

**Table 5.5.** Agronomic Performance of the materials from Advanced yield trial (AYT#1), Heat Tolerant Rice, Gazipur, Late Boro 2024

Treatment	Designation	PH (cm)	GD (day)	Yield (t/ha)	Fertility (%)
1	BR13169-4R-223	114.3	126	3.06	51.9
2	BR13157-4R-173	118.2	115	4.04	56.4
3	BR12890-5R-31	125.5	128	3.17	53.7
4	BR13169-4R-240	104.1	122	3.85	51.1
5	BR13169-4R-324	102.4	113	3.86	55.4
6	BR13169-4R-202	115.4	135	3.78	57.3
7	BR13157-4R-177	122.2	123	3.08	50.3
8	BR13169-4R-68	104.4	122	4.70	53.7
9	BR12169-4R-233	105.8	115	3.75	58.8
10	BR13169-4R-121	119.8	127	3.58	52.9
11	BR13169-4R-194	106.4	112	3.77	51.6
12	BR11845-4R-9	98.6	113	4.04	52.8
13	BR11845-4R-14	99.2	112	4.22	54.3
14	BR11845-4R-15	103.8	112	4.07	55.0
15	BR11845-4R-38	114.6	126	3.34	50.9
16	BR11845-4R-117	104.4	111	3.34	46.5
17	BR11845-4R-180	98.8	110	4.12	51.6

18	BR11847-4R-105	95.2	112	3.95	45.4
19	BR11847-4R-142	107.2	111	3.62	53.1
20	BR11991-6R-28	105.4	112	3.97	53.1
21	BR11991-6R-33	118.8	111	5.49	70.3
22	BR12605-4R-283	102.2	112	4.06	50.5
23	BR12883-5R-119	122.0	126	2.49	44.3
24	BR12894-5R-13	112.8	111	5.50	67.8
25	BR128994-5R-14	118.6	135	3.48	55.1
26	BR12894-5R-46	104.6	111	5.65	74.0
27	BR12894-5R-71	103.6	111	4.22	57.1
28	BR12894-5R-150	104.0	114	3.55	56.4
29	BR12894-5R-221	102.6	113	3.76	55.3
30	BR12894-5R-222	96.0	112	3.20	49.4
31	BR12894-5R-239	99.8	113	4.82	40.8
32	BR12894-5R-240	96.0	110	3.55	43.7
33	BR128994-5R-241	106.5	123	4.42	51.6
34	BR12894-5R-246	103.6	113	3.34	44.7
35	BR12894-5R-249	107.0	114	3.50	58.6
36	BR12894-5R-281	92.2	112	5.49	67.2
37	IR99853-B-B-B-322	94.0	110	3.43	48.0
38	IR99853-B-B-B-509	99.6	112	5.53	64.2
39	Bina dhan14 (Tol Ck)	92.6	113	3.73	64.1
40	BRRI dhan28 (Sen Ck)	111.7	110	3.88	62.2
41	BRRI dhan98 (Std Ck)	102.8	111	4.74	58.5
42	N22 (Tol Ck)	123.6	114	2.11	62.7
LSD (0.05)		7.58	6.66	0.53	7.25
H2b		0.68	0.59	0.83	0.55

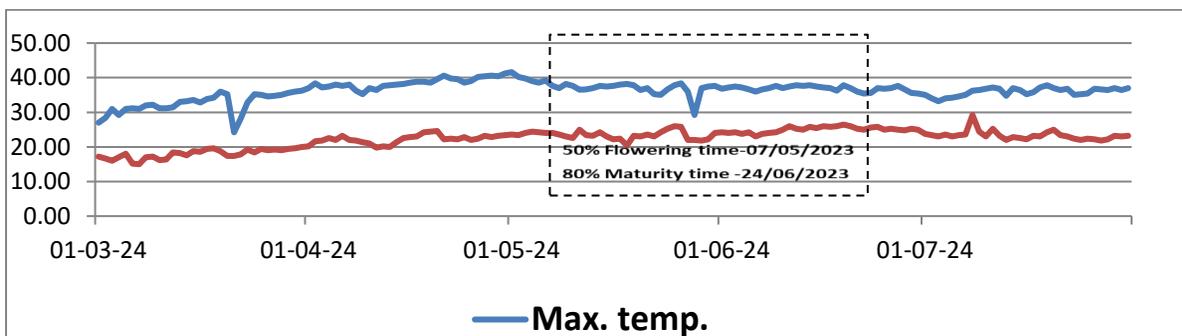


Fig 5.4. The line graph shows maximum and minimum temperature of Rajshahi in Late Boro 2024

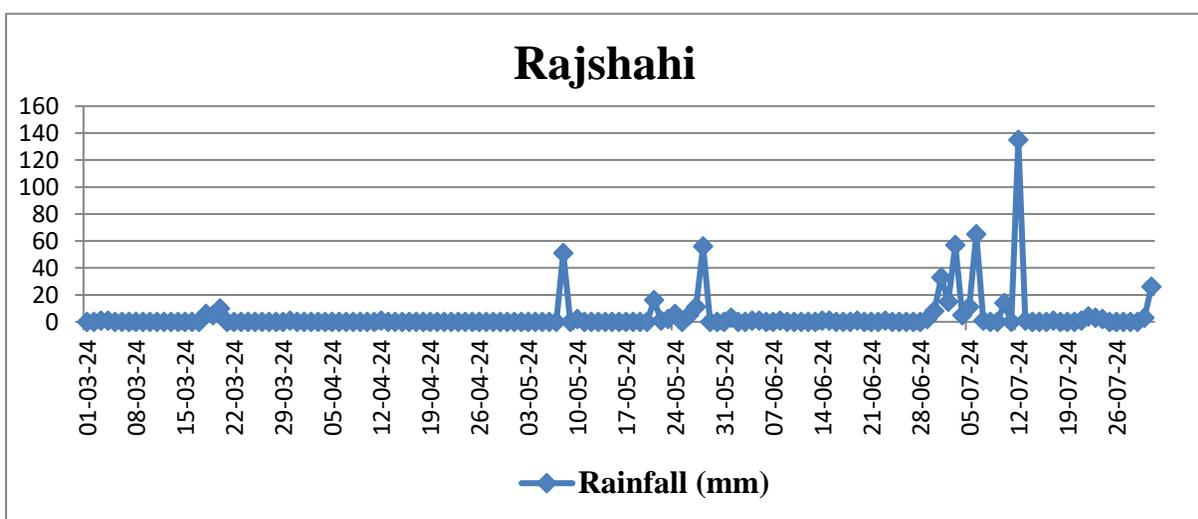
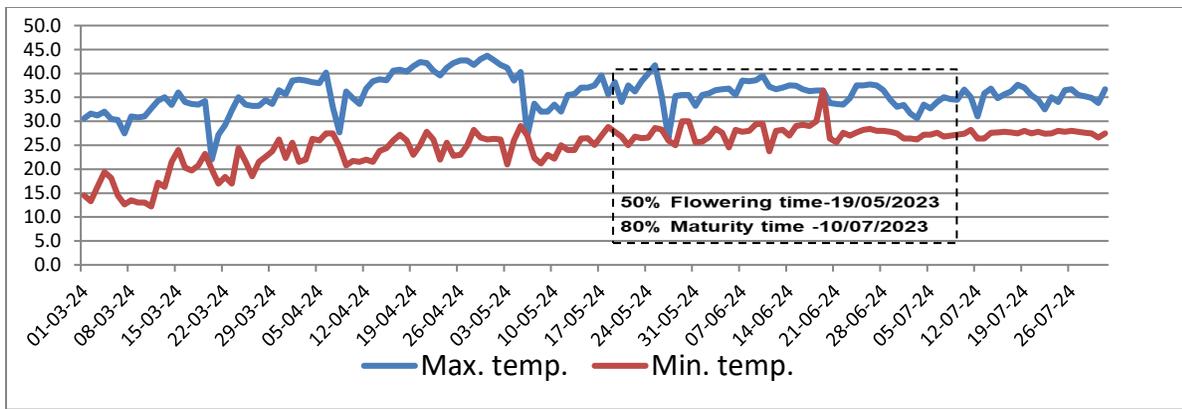


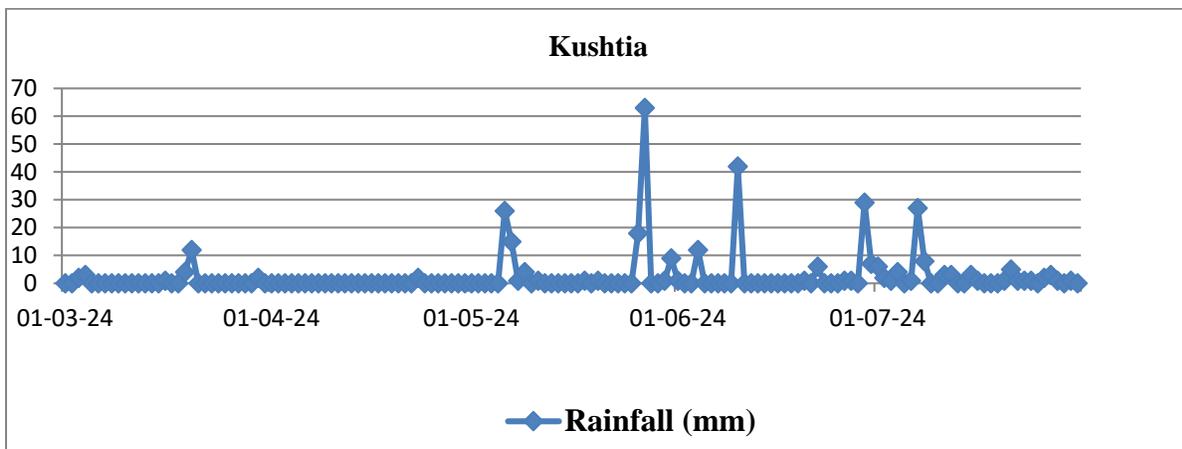
Fig 5.5. The line graph shows rainfall (mm) of Rajshahi in Late Boro 2024

**Table 5.6. Agronomic Performance of the materials from Advanced yield trial (AYT#1), Heat Tolerant Rice, Rajshahi, Late Boro 2024**

Treatment	Designation	PH (cm)	GD (day)	Yield (t/ha)	Fertility (%)
1	BR13169-4R-223	114.5	98	4.68	65.54
2	BR13157-4R-173	117.0	110	6.92	61.72
3	BR12890-5R-31	119.5	119	6.48	61.53
4	BR13169-4R-240	112.0	119	6.22	63.62
5	BR13169-4R-324	122.5	115	4.54	54.66
6	BR13169-4R-202	116.5	113	5.75	67.24
7	BR13157-4R-177	124.5	120	5.34	66.79
8	BR13169-4R-68	114.5	118	5.11	62.4
9	BR13169-4R-233	125.5	114	4.78	66.55
10	BR13169-4R-121	123.0	119	5.55	72.63
11	BR13169-4R-194	117.0	113	5.71	66.36
12	BR11845-4R-9	114.5	107	6.70	52.87
13	BR11845-4R-14	111.5	110	6.49	55.48
14	BR11845-4R-15	107.5	108	6.19	51.68
15	BR11845-4R-38	115.0	108	5.92	67.31
16	BR11845-4R-117	104.5	108	6.35	54.90
17	BR11845-4R-180	105.5	109	6.68	62.43
18	BR11847-4R-105	105.0	108	6.48	72.43
19	BR11847-4R-142	112.5	103	6.72	70.84
20	BR11991-6R-28	116.5	107	5.72	58.30
21	BR11991-6R-33	113.5	110	5.64	62.87
22	BR12605-4R-283	109.5	108	5.48	59.53
23	BR12883-5R-119	108.5	110	6.79	51.88
24	BR12894-5R-13	106.5	108	6.27	69.07
25	BR12894-5R-14	126.0	121	4.40	67.97
26	BR12894-5R-46	104.5	111	5.89	60.67
27	BR12894-5R-71	105.5	108	5.98	53.73
28	BR12894-5R-150	104.0	108	6.24	67.54
29	BR12894-5R-221	94.5	108	5.58	55.41
30	BR12894-5R-222	109.0	111	5.48	56.73
31	BR12894-5R-239	97.5	108	6.36	64.02
32	BR12894-5R-240	101.5	109	5.75	64.58
33	BR12894-5R-241	100.0	108	5.54	59.17
34	BR12894-5R-246	104.0	107	5.29	54.14
35	BR12894-5R-249	108.0	109	5.31	48.00
36	BR12894-5R-281	94.0	108	6.73	68.22
37	IR 99853-B-B-B-322	91.0	106	5.71	59.62
38	IR 99853-B-B-B-509	100.0	108	6.56	56.05
39	Bina dhan14 (Ck)	95.5	109	5.24	67.10
40	BRRRI dhan28 (Ck)	116.0	108	5.82	64.50
41	BRRRI dhan98 (Ck)	108.0	109	5.45	58.53
42	N22 (Tol Ck)	113.0	98	3.36	71.18
	LSD (0.05)	2.69	1.57	0.48	9.41
	h2b	0.95	0.95	0.80	0.19



**Fig 5.6.** The line graph shows maximum and minimum temperature of Kushtia in Late Boro 2024

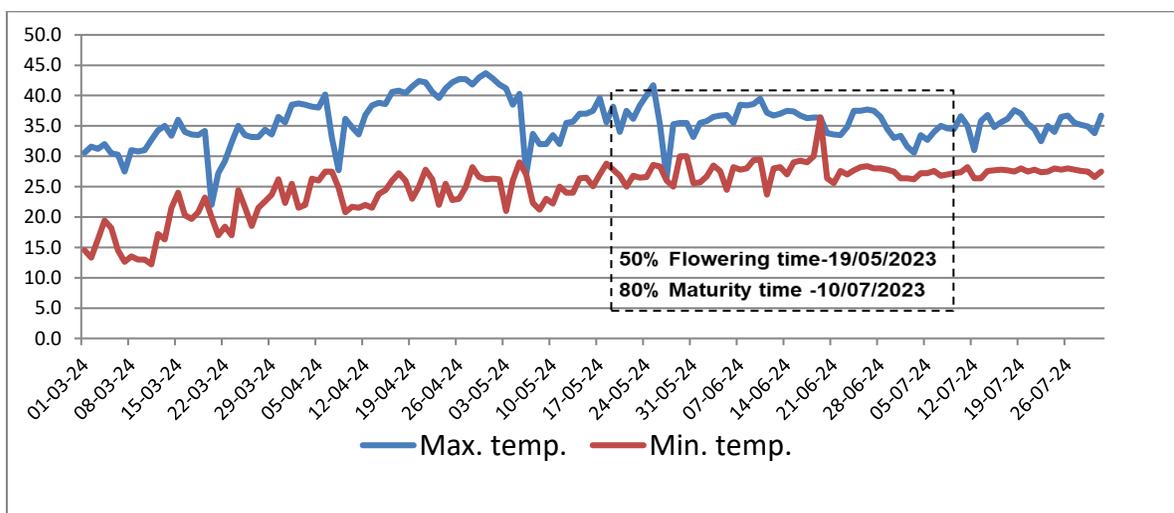


**Fig 5.7.** The line graph shows rainfall (mm) of Kushtia in Late Boro 2024

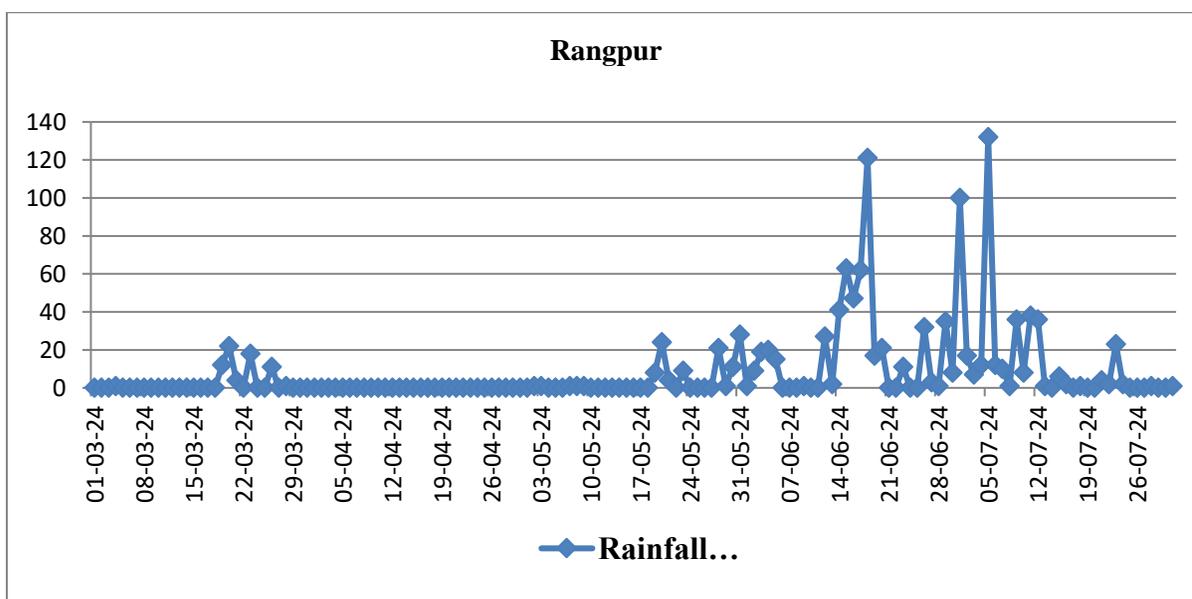
**Table 5.7.** Agronomic Performance of the materials from Advanced yield trial (AYT), Heat Tolerant Rice, Kushtia, Late Boro2024

Treatment	Designation	PH (cm)	GD (day)	Yield (t/ha)	Fertility (%)
1	BR13169-4R-223	102.0	111	3.73	43.84
2	BR13157-4R-173	98.0	106	3.81	73.69
3	BR12890-5R-31	104.0	115	3.19	39.85
4	BR13169-4R-240	95.0	116	3.01	51.00
5	BR13169-4R-324	103.0	110	3.45	45.70
6	BR13169-4R-202	98.0	113	3.47	60.53
7	BR13157-4R-177	98.2	103	3.45	63.02
8	BR13169-4R-68	95.0	116	2.64	38.94
9	BR13169-4R-233	96.0	102	3.71	57.03
10	BR13169-4R-121	104.0	119	1.74	30.51
11	BR13169-4R-194	96.0	115	2.06	37.90
12	BR11845-4R-9	92.0	104	3.75	59.41
13	BR11845-4R-14	94.0	99	4.20	57.16
14	BR11845-4R-15	91.0	101	3.94	63.55
15	BR11845-4R-38	96.0	105	3.12	50.64
16	BR11845-4R-117	96.0	100	3.00	57.46
17	BR11845-4R-180	93.0	101	3.76	60.17
18	BR11847-4R-105	100.0	112	3.58	48.24
19	BR11847-4R-142	103.0	101	3.90	53.57
20	BR11991-6R-28	101.0	101	3.69	54.91
21	BR11991-6R-33	105.0	100	3.54	61.67
22	BR12605-4R-283	100.0	103	3.58	65.19
23	BR12883-5R-119	88.0	102	3.48	58.42

24	BR12894-5R-13	87.0	105	3.68	55.66
25	BR12894-5R-14	87.0	120	2.64	49.40
26	BR12894-5R-46	93.0	105	4.00	53.20
27	BR12894-5R-71	94.0	99	4.04	51.96
28	BR12894-5R-150	91.0	100	4.75	51.82
29	BR12894-5R-221	95.0	103	3.17	45.68
30	BR12894-5R-222	109.0	104	4.21	56.39
31	BR12894-5R-239	93.0	100	3.37	56.26
32	BR12894-5R-240	89.0	102	3.94	50.46
33	BR12894-5R-241	84.0	101	3.73	53.81
34	BR12894-5R-246	91.0	103	3.09	53.41
35	BR12894-5R-249	92.0	103	3.86	56.08
36	BR12894-5R-281	97.0	102	4.01	54.41
37	99853-B-B-B-322	93.0	103	3.48	52.97
38	IR 99853-B-B-B-509	94.0	101	4.69	57.68
39	Bina dhan14 (Ck)	93.0	100	3.72	56.75
40	BRR1 dhan28 (Ck)	93.0	102	3.33	57.02
41	BRR1 dhan98 (Ck)	97.0	103	3.75	59.29
42	N22 (Tol Ck)	112.0	89	3.79	58.35
LSD (0.05)		9.47	1.12	0.46	14.54
h <sup>2</sup> b		0.43	0.98	0.72	0.16



**Fig 5.9. The line graph shows maximum and minimum temperature of Rangpur in Late Boro 2024**



**Fig 5.10. The line graph shows rainfall (mm) of Rangpur in Late Boro 2024**

**Table 5.8. Agronomic Performance of the materials from Advanced yield trial (AYT#1), Heat Tolerant Rice, Rangpur, Late Boro2024**

Treatment	Designation	PH (cm)	GD (day)	Yield (t/ha)	Fertility%
T1	BR13169-4R-223	121.3	121	4.82	72.6
T2	BR13157-4R-173	116.6	125	6.85	79.3
T3	BR12890-5R-31	108.7	125	5.23	55.8
T4	BR13169-4R-240	106.0	110	4.22	78.3
T5	BR13169-4R-324	104.8	110	5.34	70.7
T6	BR13169-4R-202	106.3	110	4.63	55.3
T7	BR13157-4R-177	129.1	110	5.13	75.4
T8	BR13169-4R-68	99.8	110	6.06	72.3
T9	BR12169-4R-233	102.5	110	5.30	64.1
T10	BR13169-4R-121	104.7	110	4.95	80.0
T11	BR13169-4R-194	104.9	110	6.04	67.9
T12	BR11845-4R-9	122.3	110	5.82	64.4
T13	BR11845-4R-14	108.8	110	6.65	70.4
T14	BR11845-4R-15	118.0	110	5.90	64.1
T15	BR11845-4R-38	108.4	110	5.49	63.5
T16	BR11845-4R-117	130.6	123	6.53	67.6
T17	BR11845-4R-180	105.7	110	6.69	69.4
T18	BR11847-4R-105	119.8	127	6.27	74.5
T19	BR11847-4R-142	107.2	110	5.76	73.1
T20	BR11991-6R-28	110.5	110	5.73	76.9
T21	BR11991-6R-33	104.3	110	5.87	79.1
T22	BR12605-4R-283	107.6	110	6.45	66.2
T23	BR12883-5R-119	128.1	123	4.77	62.2
T24	BR12894-5R-13	104.5	110	6.33	56.6
T25	BR128994-5R-14	108.7	110	5.44	63.9
T26	BR12894-5R-46	105.5	110	6.62	80.5
T27	BR12894-5R-71	105.5	110	6.38	70.8
T28	BR12894-5R-150	105.1	110	6.69	70.2
T29	BR12894-5R-221	113.3	110	6.62	69.8
T30	BR12894-5R-222	104.6	110	6.43	76.9
T31	BR12894-5R-239	98.3	110	6.94	73.8
T32	BR12894-5R-240	104.2	117	6.92	72.4
T33	BR128994-5R-241	109.7	110	7.22	77.1
T34	BR12894-5R-246	106.2	124	6.64	71.0
T35	BR12894-5R-249	118.5	110	6.23	75.8
T36	BR12894-5R-281	103.7	110	7.15	69.2
T37	IR99853-B-B-B-322	107.3	118	6.04	76.4
T38	IR99853-B-B-B-509	110.8	119	6.52	74.7
T39	Bina dhan14 (Ck)	123.0	114	5.18	69.6
T40	BRRI dhan28 (Ck)	128.6	126	5.20	72.1
T41	BRRI dhan98 (Ck)	102.2	110	6.45	71.0
T42	N22 (Tol Ck)	111.1	120	3.76	83.5
	LSD (0.05)	2.12	0.91	0.44	6.53
	h <sup>2</sup> b	0.90	0.99	0.87	0.35

**Table 5.9. Agronomic Performance of the materials from Advanced yield trial (AYT#1), Heat Tolerant Rice, Late Boro2024**

SN	DESIGNATION	PH (cm)	GD (day)	Gazipur	Kushtia	Rajshahi	Rangpur	Yield (t/ha)
1	BR13169-4R-223	118	110	3.06	3.59	4.67	4.74	4.34
*2	BR13157-4R-173	122	111	4.04	3.74	6.91	6.81	5.82
3	BR12890-5R-31	110	115	3.17	3.13	6.47	5.28	4.96
4	BR13169-4R-240	110	104	3.85	2.74	6.22	4.24	4.40
5	BR13169-4R-324	113	110	3.86	3.36	4.53	5.39	4.43
6	BR13169-4R-202	117	111	3.78	3.65	5.74	4.53	4.64

7	BR13157-4R-177	121	120	3.08	4.10	5.34	5.11	4.41
8	BR13169-4R-68	109	102	4.70	2.56	5.10	6.06	4.58
9	BR13169-4R-233	118	110	3.75	3.33	4.78	5.24	4.45
10	BR13169-4R-121	114	114	3.58	3.74	5.55	5.08	4.49
11	BR13169-4R-194	116	106	3.77	2.34	5.71	6.01	4.69
12	BR11845-4R-9	108	104	4.04	3.54	6.69	5.77	5.34
13	BR12894-5R-14	108	110	4.22	2.54	4.40	5.50	4.15
14	BR11845-4R-15	105	101	4.07	3.53	6.19	6.05	5.25
15	BR11845-4R-38	111	113	3.34	3.11	5.92	5.49	4.84
16	BR11845-4R-117	114	98	3.34	3.14	6.35	6.55	5.35
*17	BR11845-4R-180	103	100	4.12	3.79	6.67	6.73	5.73
18	BR11847-4R-105	109	102	3.95	4.09	6.48	6.24	5.54
19	BR11847-4R-142	108	104	3.62	3.78	6.71	5.80	5.30
20	BR11991-6R-28	112	106	3.97	3.91	5.72	5.73	5.12
21	BR11991-6R-33	115	111	5.49	3.82	5.64	5.83	5.10
22	BR12605-4R-283	112	103	4.06	3.42	5.47	6.43	5.11
23	BR12883-5R-119	121	109	2.49	3.36	6.78	4.74	4.96
24	BR12894-5R-13	120	99	5.50	3.62	6.26	6.32	5.40
25	BR11845-4R-14	108	104	3.48	3.63	6.49	6.59	5.57
26	BR12894-5R-46	105	101	5.65	4.07	5.88	6.64	5.53
27	BR12894-5R-71	106	104	4.22	4.35	5.98	6.38	5.57
*28	BR12894-5R-150	99	98	3.55	4.32	6.24	6.60	5.72
29	BR12894-5R-221	106	98	3.76	3.64	5.58	6.61	5.28
30	BR12894-5R-222	99	103	3.20	4.01	5.47	6.48	5.32
*31	BR12894-5R-239	101	99	4.82	3.41	6.36	7.05	5.61
32	BR12894-5R-240	101	100	3.55	3.98	5.75	6.84	5.53
33	BR12894-5R-241	115	97	4.42	3.73	5.54	7.26	5.51
34	BR12894-5R-246	104	100	3.34	3.32	5.29	6.54	5.05
35	BR12894-5R-249	108	103	3.50	3.69	5.31	6.31	5.10
*36	BR12894-5R-281	97	96	5.49	4.01	6.73	7.24	5.99
37	IR 99853-B-B-B-322	105	93	3.43	3.63	5.71	5.95	5.14
*38	IR 99853-B-B-B-509	105	97	5.53	4.28	6.56	6.49	5.78
39	Bina dhan14 (Ck)	99	99	3.73	3.84	5.24	5.18	4.95
40	BRR1 dhan28 (Ck)	114	108	3.88	3.11	5.82	5.20	4.71
41	BRR1 dhan98 (Ck)	105	102	4.74	3.80	5.45	6.49	5.25
42	N22 (Tol Ck)	112	110	2.11	3.43	3.36	3.75	3.51
LSD (0.05)		5.43	5.72	0.43	0.50	0.52	0.47	1.39
h <sup>2</sup> b		0.81	0.46	0.90	0.72	0.81	0.90	0.43



BR13169-4R-194



BR13968-4R-283

**Fig 5.9. Pictorial view of the advanced lines under AYT#1, Late Boro**

**Table 5.10. Agronomic Performance of the materials from Advanced yield trial (AYT#2), Heat Tolerant Rice, Late Boro2024**

SN	Designation	PH (cm)	GD (Days)	Gazipur	Rajshahi	Rangpur	YLD (t/ha)
1	BR11845-4R-193	99.85	111.00	1.52	5.14	6.42	4.36
2	BR11845-4R-42	104.38	112.17	2.65	6.12	5.62	4.80
3	BR12098-4R-35	118.14	117.67	1.18	6.91	4.30	4.13
4	BR12098-4R-97	117.85	118.32	1.86	6.02	4.93	4.27
5	BR12432-5R-36	123.44	126.83	1.21	5.13	4.71	3.68
*6	BR12605-4R-105	113.90	112.83	4.43	5.52	6.49	5.48
*7	BR12605-4R-125	113.73	111.33	4.27	5.61	6.74	5.54
*8	BR12605-4R-182	112.18	115.83	3.83	6.95	5.60	5.46
*9	BR12605-4R-200	117.21	112.67	4.21	6.41	6.60	5.74
*10	BR12605-4R-72	118.92	117.33	4.45	6.75	5.50	5.57
11	BR12605-4R-81	119.66	117.83	3.34	6.56	5.28	5.06
12	BR126894-5R-152	122.90	112.01	2.90	3.21	6.51	4.21
13	BR12883-4R-40	128.79	120.50	2.97	5.26	6.92	5.05
14	BR12883-5R-138	112.87	115.00	3.73	5.88	5.22	4.94
15	BR12890-5R-32	139.82	119.16	2.27	5.41	5.79	4.49
16	BR12894-5R-10	131.58	110.67	2.29	5.82	5.70	4.60
17	BR13157-4R-174	116.51	115.33	3.64	6.62	5.73	5.33
18	BR13157-4R-338	125.59	128.83	1.19	3.79	4.76	3.25
19	BR13157-4R-42	119.60	119.67	2.40	6.76	4.87	4.67
20	BR13166-4R-191	127.88	121.00	3.31	6.17	5.40	4.96
21	BR13169-4R-185	122.57	120.50	3.96	2.66	4.06	3.56
22	BR13169-4R-224	98.56	116.84	2.38	4.58	4.18	3.71
23	BR13169-4R-260	134.61	123.00	2.75	4.29	4.73	3.92
24	BR13169-4R-29	121.11	122.17	0.77	5.50	4.31	3.53
25	BR13169-4R-41	120.79	126.01	1.26	4.22	3.84	3.10
26	BR13169-4R-42	121.01	127.84	1.91	3.66	5.06	3.54
27	BR13171-4R-66	119.26	116.50	2.98	3.19	3.34	3.17
*28	BR13173-4R-154	128.74	118.50	3.95	6.54	5.89	5.46
29	IR99853-B-B-B-310	104.23	116.00	3.93	6.25	4.72	4.97
30	BRRRI dhan58 (Ck)	107.63	111.34	3.23	6.00	4.68	4.64
31	BRRRI dhan89 (Ck)	122.15	126.33	3.25	6.17	4.78	4.73
32	BRRRI dhan98 (Ck)	108.10	110.67	4.08	5.51	6.84	5.48
LSD (0.05)		9.55	5.72	0.31	0.74	0.47	1.90
h2b		0.64	0.57	0.97	0.89	0.91	0.32

### Experiment 5.6: Regional Yield Trial (RYT)

**Principal Investigator:** Mahmuda Khatun

**Co-investigator:** S K Debsharma, A Rahman, N Tamanna (Plant Breeding), M R Hasan (Rangpur), S Abedin, M R Islam & M F Islam (Rajshahi), M Asif Rahman and M M Dewan (Kushtia)

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

**Location:** BRRI, Gazipur, Rajshahi, Kushtia, Alampur, Rangpur and Mithapukur.

**Materials and methods:** In Regional yield trial five genotypes were evaluated. The check varieties Bina dhan14, BRRRI dhan28, BRRRI dhan98. Three-four 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. The field layout was RCBD 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.

**Result:** The genotype BR12605-4R-298 was produced higher yield (5.32 t/ha) than the check variety BRRI than28 and Binadhan14 but produced similar yield to the highest yield producing check variety BRRI dhan98. However, some lines were chosen for use as parents in a subsequent heat-tolerant breeding effort (**Table 5.11**).

**Table 5.11: Grain yield and agronomic parameters of RYT trial, Late Boro 2023-24**

SN	Designation	GD (days)	PH (cm)	Gazi	Kush	Raj	Rang	Alam	Mitha	Yield (t/ha)
1	BR11845-48-50	93	93	2.37	3.74	5.76	5.75	4.12	3.86	4.26
2	BR11991-6R-58	94	94	2.12	3.07	4.39	5.54	3.17	3.54	3.62
3	BR12605-4R-275	89	89	5.33	3.93	5.96	5.46	4.29	4.08	4.84
4	BR12605-4R-297	85	85	5.10	4.20	4.12	5.10	4.63	5.32	4.75
*5	BR12605-4R-298	89	89	5.39	4.58	5.78	5.62	4.92	5.62	5.32
6	BRRI dhan28 (Ck)	88	88	3.61	3.37	4.43	6.21	3.81	5.12	4.41
7	BRRI dhan98 (Ck)	81	81	6.11	4.61	5.42	6.03	5.01	5.24	5.41
8	Bina dhan14 (Ck)	76	76	3.92	4.28	5.23	6.10	4.73	4.52	4.80
	LSD (0.05)	1.8	3.8	0.49	0.39	0.41	0.51	0.41	0.31	0.54
	H2	0.47	0.47	0.96	0.75	0.83	0.37	0.12	0.93	0.38

## 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  $\geq 8.0$  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:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**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:** Sixty and 64 detailed-characterized parents were grown in five different dates starting July 2022 for T. Aman; from November 2023 for Boro season, respectively, with an interval of seven days for flowering synchronization to achieve desired cross combinations. Twenty-five-day-old seedlings in T. Aman and forty-day-old seedlings in Boro were transplanted @ single seedling with a spacing of 20 cm  $\times$  15 cm in a 5.4 m  $\times$  2 rows plot in the plant breeding net house, Gazipur. Fertilizers @ 80:60:40:20 kg N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, S per 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<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, 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, 55 crosses were made using 60 well characterized elite parents (**Table 6.1**) and 32 crosses were made using 64 elite parents in Boro season (**Table 6.1**). These crosses were made to generate desirable F<sub>1</sub>s having salinity tolerance with other useful 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*+*xa13*), previous mega varieties (BR11, BRRI dhan28 and 29) excluded; and vi) specific line(s) used not more than 3 to 5 times in the crossing program. For

line augmentation, 4 BC<sub>2</sub>F<sub>1</sub>, 2 BC<sub>2</sub> F<sub>1</sub> and 2BC<sub>2</sub>F<sub>2</sub> cross are confirmed for desirable traits (Table 6.1a)

**Table 6.1: List of crosses (Elite/Elite) made for generating F<sub>1</sub>s, Salt-Tolerant Rice (STR) Breeding, T. Aman 2023-24 and Boro 2023-24**

SI No	Cross Combination (Elite/Elite: Cycle-2)	No of seeds	Trait of interest
<b>T. Aman 2023-24</b>			
1	BR13115-4R-93/BR13103-4R-37	57	+ <i>qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
2	BR13115-4R-93/BR11716-4R-102	82	+ <i>qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
3	BR13122-4R-136/BR10441-17-1-5	72	
4	BR11715-4R-186/BR13486-4R-94	75	
5	BR13115-4R-117/BR12477-4R-371	14	
6	BR13103-4R-7/BR11391-4R-335	10	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
7	BR13115-4R-70/BR13106-4R-38	56	
8	BR13115-4R-70/BR13103-4R-37	71	
9	BR12459-4R-113/BR13115-4R-93	44	+ <i>qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
10	BR12459-4R-113/BR11716-4R-102	36	+ <i>qSES1.2-4</i>
11	BR11391-4R-335/BR13115-4R-63	15	
12	BR11391-4R-335/BR12477-4R-371	77	
13	BR13106-4R-38/BR13103-4R-7	38	+ <i>qSES1.2-4</i>
14	BR13106-4R-38/BR11716-4R-102	46	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
15	BR13106-4R-38/BR13117-4R-95	30	
16	BR13106-4R-38/BR11723-4R-172	103	
17	BR13115-4R-63/BR13105-4R-37	41	
18	BR13111-4R-63/BR13103-4R-37	16	
19	BR13115-4R-116/BR11715-4R-277	37	+ <i>qSES1.2-4</i>
20	BR13103-4R-37/BR13115-4R-106	139	+ <i>qSES1.2-4</i>
21	BR12477-4R-371/BR13103-4R-7	68	<i>Saltol+qSES1.2-3+qSES1.2-4</i>
22	BR11388-4R-6/BR13111-4R-63	23	+ <i>qSES1.2-4</i>
23	BR11716-4R-102/BR12113-4R-63	114	+ <i>qSES1.2-3+qSES1.2-4</i>
24	BR13115-4R-117/BR13103-4R-37	66	
25	BR12459-4R-16/BR13106-4R-38	153	+ <i>qSES1.2-4</i>
26	BR11716-4R-102/BR13122-4R-136	84	+ <i>qSES1.2-4</i>
27	BR11716-4R-102/BR13125-4R-92	101	
28	BR11716-4R-102/BR13111-4R-63	37	
29	BR11716-4R-102/BR13108-4R-232	134	<i>Saltol+qSES1.2-2+qSES1.2-4</i>
30	BR11716-4R-102/IR58443-6B-10-3	91	+ <i>qSES1.2-4</i>
31	BR11716-4R-102/BR13106-4R-38	37	
32	BR12459-4R-113/BR11716-4R-102	74	
33	BR13103-4R-7/BR11716-4R-102	32	
34	BR10440-4-12-5/BR11716-4R-102	40	
35	IR58443-6B-10-3/BR11716-4R-102	41	
36	BR10440-4-12-5/BR11716-4R-102	66	
37	BRR1 dhan87/BR13486-4R-94	141	+ <i>qSES1.2-4</i>
38	BR13115-4R-32/BR23	117	+ <i>qSES1.2-4</i>
39	BR23/BR22	115	
40	BR23/BR11716-24-102	138	
41	BR22/BR11716-24-102	54	
42	(BR23/BR13104-4R-80-P1) × BR23	84	
43	BR12459-4R-16/A69-1	114	
44	BRR1 dhan92/A69-1	23	<i>Salinity+Alkalinity+Fe Toxicity</i>
45	BR13103-4R-52/Khatobabu	49	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
46	BR13106-4R-106/Khatobabu	177	+ <i>qSES1.2-4</i>
47	BR13115-4R-117/Khatobabu	33	+ <i>qSES1.2-4</i>
48	BR13122-4R-136/Khatobabu	34	
49	BR13115-4R-159/Khatobabu	136	
50	BR12477-4R-371/Khatobabu	19	
51	BR13106-4R-38/Rodminiket	41	<i>qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
52	BR11391-4R-335/Rodminiket	78	
53	BR12477-4R-371/Rodminiket	109	
54	BR10440-4-17-5/Fatemadhan	19	
55	BR13103-4R-7/BR13115-4R-93	19	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>

Boro 2023-24		
Sl. No.	Cross Combination	Number of seed
1	BR13108-4R-184/IRRI 154	50
2	BR13104-4R-148-P2/BR13111-4R-63	22
3	BR13104-4R-80-P3/IR58443-6B-103	84
4	BR13125-4R-92/BR13104-4R-80-P2(White)	17
5	BR13408-4R-232/BR13104-4R-80-P1	22
6	BR13104-4R-80-P3/BR13108-4R-232	57
7	BR13104-4R-148-P1/BR13113-4R-63	23
8	BR11714-4R-112/Fatema dhan	39
9	BR13113-4R-63/BR12177-4R-1	9
10	BR13203-4R-76/BR13104-4R-81-P1	17
11	BR13198-4R-35/BR13104-4R-102	45
12	BR13201-4R-225/IR58443-6B-10-3	12
13	BR13113-4R-63/BR13104-4R-80-P2	28
14	BR13198-4R-35/BR13104-4R-80-P2	28
15	BR11714-4R-148/BR13122-4R-136	53
16	BR13201-4R-298/Jira dhan	20
17	BR13201-4R-268/BR13113-4R-63	36
18	BR13122-4R-136/BR13106-4R-438	30
19	BR13108-4R -232/BR13104-4R-81-P2	12
20	BR13106-4R-438/A-69	71
21	BR11715-4R-186/BR13201-4R-27	56
22	BRR1 dhan104/A-69	40
23	BR11712-4R-227/BR13113-4R-185	26
24	BR13199-4R-136/BR13104-4R-55-P2	11
25	A-69/BR13104-4R-81-P1	100
26	BR11712-4R-27/BR13106-4R-438	70
27	BR13108-4R-438/BR13104-4R-80-P2	60
28	BR11716-4R-147/Fatema dhan	30
29	BR13111-4R-63/BR13104-4R-148-P1	32
30	BR13106-4R-438/BR13201-4R-250	37
31	BR9891-18-5-2-7/Fatema dhan	40
32	BR11723-4R-27/ Fatema dhan	30

**Table 6.1a: Line augmentation report**

Deployment of blast resistant genes (*Pi9*), BB resistant genes (*xa5*, *xa13* and *Xa21*), through line augmentation approach using elite recipient and elite donor.

BR No.	Parentage	QTLs / genes	Traits of Interest	Boro 2023-24
BR14992	BR11723-4R-12*2/IR127152-3-22-2-1-B	<i>Xa5+Xa21+Xa13</i>	BLB	RGA (F4)
BR14993	BR11723-4R-172*2/IR127152-3-22-2-1-B	<i>Xa5+Xa21+Xa13</i>	BLB	RGA (F4)
BR14730	BR11723-4R-12*2/IRRI154-Pi9	<i>Pi9</i>	Blast	RGA (F4)
BR14732	BR11723-4R-172*2/IRRI154-Pi9	<i>Pi9</i>	Blast	RGA (F4)
BR14729	BR11723-4R-12*1/IR127152-3-22-2-1-B	<i>Xa5+Xa21+Xa13</i>	BLB	OYT
BR14731	BR11723-4R-172*1/IR127152-3-22-2-1-B	<i>Xa5+Xa21+Xa13</i>	BLB	OYT
BR14729	BR11723-4R-12*2/IR127152-3-22-2-1-B	<i>Xa5+Xa21+Xa13</i>	BLB	OYT
BR14732	BR11723-4R-172*2/IRRI154-Pi9	<i>Pi9</i>	Blast	OYT

### Experiment 6.2: Hybridity test for confirming F<sub>1</sub>s

**Principal investigator:** M. Akhlasur Rahman

**Co-investigator:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**Specific objective:** To confirm of F<sub>1</sub>s as true hybrid and confirmed F<sub>1</sub>s registered into BRR1 cross list and BR database.

**Materials and Methods:** Forty-four and 37 F<sub>1</sub>s were grown along with their respective parents in the hybridization block at Gazipur respectively at T. Aman and and Boro season. Twenty-five-day-old seedlings in T. Aman and forty-day-old seedlings in Boro season transplanted @ single seedling with a spacing of 20 cm × 15 cm. Fertilizers and crop management followed were the same as Experiment 6.1. The experiment was conducted at BRR1, Gazipur.

**Results and discussion:** A total of 44 and 37 F<sub>1</sub>s was confirmed as true hybrid through F<sub>1</sub> verification by visual comparison of all the crosses with respective parents and also genotyping with purity SNP panel for quality check (QC) both in T. Aman and Boro season respectively (**Table 6.2**). The F<sub>1</sub> plants with heterozygous alleles at least two or more SNP loci were declared as true F<sub>1</sub>s (hybrids). After confirmation, the F<sub>2</sub> seeds were collected and preserved. These confirmed F<sub>1</sub>s were registered into BRRi cross list with BR number in T. Aman and Boro season.

**Table 6.2: List of confirmed F<sub>1</sub>s, Salt-Tolerant Rice (STR) Breeding, T. Aman 2023-24 and Boro 2023-24**

SL. No.	BR No.	Cross combinations (Elite/Elite)	Traits
<b>T. Aman 2023-24</b>			
1	15399	BR12466-4R-275/BR12460-4R-156	<i>qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
2	15400	BR12465-4R-47/BR12459-4R-209	<i>+qSES1.2-4</i>
3	15401	BR12465-4R-18/BR12466-4R-159	
4	15402	BR12460-4R-102/BR12459-4R-39	
5	15403	BR13104-4R-75/IRRI154Pi9	
6	15404	BR12459-4R-183/BR12477-4R-13	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
7	15405	BR12459-4R-49/BR12461-4R-70	
8	15406	BR12465-4R-181/BR12460-4R-107	
9	15407	BR12459-4R-14/BR12477-4R-305	<i>+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
10	15408	BR11712-4R-218/IR58443-6B-10-3	<i>+qSES1.2-4</i>
11	15409	BR12465-4R-309/BR12465-4R-223	
12	15410	BR12459-4R-103/BR12461-4R-6	
13	15411	BR11723-4R-172/BR11607-4R-72	<i>+qSES1.2-4</i>
14	15412	BR12460-4R-58/BR12477-4R-13	<i>Saltol+qSES1.2-2+qSES1.2-3+qSES1.2-4</i>
15	15413	BR12459-4R-117/BR12469-4R-213	
16	15414	BR12459-4R-286/BR12459-4R-214	
17	15415	BR13711-4R-190/IR58443-6B-10-3	
18	15416	BR11715-4R-186/IR127152-3-22-2-1-21	<i>+qSES1.2-4</i>
19	15417	BR11723-4R-172/BR12465-4R-27	<i>+qSES1.2-4</i>
20	15418	BR12466-4R-169/BR12477-4R-64	<i>Saltol+qSES1.2-3+qSES1.2-4</i>
21	15419	BR11712-4R-218/IRRI154Pi9	<i>+qSES1.2-4</i>
22	15420	BR12462-4R-6/BR12477-4R-358	<i>+qSES1.2-3+qSES1.2-4</i>
23	15421	BR11388-4R-11/BR12459-4R-18	
24	15422	BR11716-4R-123/BR11386-5R-5	<i>+qSES1.2-4</i>
25	15423	BR11716-4R-102/BR11607-4R-72	<i>+qSES1.2-4</i>
26	15424	BRRi dhan92/IR58443-6B-10-3	
27	15425	BRRi dhan92/BR12459-4R-103	
28	15426	BR12478-4R-185/Bangabandhu dhan100	<i>Saltol+qSES1.2-2+qSES1.2-4+Zn</i>
29	15427	BRRi dhan87/BR12459-4R-209	<i>+qSES1.2-4</i>
30	15428	BRRi dhan92/IR58448-6B-10-3	
31	15429	BRRi dhan89/BRRi dhan99	<i>+qSES1.2-4</i>
32	15430	BRRi dhan92/BRRi dhan99	<i>+qSES1.2-4</i>
33	15431	BR11715-4R-218*2/BR11607-4R-72	
34	15432	BRRi dhan92/BR22	
35	15433	BRRi dhan92/BR23	
36	15433	BRRi dhan92/BR23	
37	15434	BR22/BRD(R) - 6	
38	15435	BR22/IRRI154	
39	15436	BR22/BR11315-5R-17	

40	15437	BR12477-4R-13/BR22	<i>Saltol+qSESI.2-2+qSESI.2-3+qSESI.2-4</i>
41	15438	BR23/BRR1 dhan54	
42	15439	BR23/BRR1 dhan36	
43	15440	BR23/BR13104-4R-80-P1	
44	15441	BR23/IRRI154	

#### **Boro 2023-24**

<b>SI. No.</b>	<b>Cross Combination</b>	<b>Traits</b>
1	BR13115-4R-93/BR13103-4R-37	<i>Saltol+qSESI.2-2+qSESI.2-3+qSESI.2-4</i>
2	BR13115-4R-93/BR11716-4R-102	
3	BR11715-4R-186/BR13486-4R-94	
4	BR13103-4R-7/BR11391-4R-335	
5	BR12459-4R-113/BR13115-4R-93	
6	BR12459-4R-113/BR11716-4R-102	
7	BR11391-4R-335/BR12477-4R-371	
8	BR13106-4R-38/BR11716-4R-102	
9	BR13106-4R-38/BR13117-4R-95	
10	BR13115-4R-116/BR11715-4R-277	
11	BR12477-4R-371/BR13103-4R-7	
12	BR11388-4R-6/BR13111-4R-63	
13	BR11716-4R-102/BR13113-4R-63	
14	BR13115-4R-117/BR13103-4R-37	
15	BR12459-4R-16/BR13106-4R-38	
16	BR11716-4R-102/BR13122-4R-136	
17	BR11716-4R-102/BR13125-4R-92	
18	BR11716-4R-102/BR13111-4R-63	
19	BR11716-4R-102/BR13108-4R-232	
20	BR11716-4R-102/IR58443-6B-10-3	
21	BR11716-4R-102/BR13106-4R-38	
22	BR12459-4R-113/BR11716-4R-102	
23	IR58443-6B-10-3/BR11716-4R-102	
24	BRR1 dhan87/BR13486-4R-94	
25	BR13201-4R-284/BR13210-4R-39	
26	BR13201-4R-285/BR13204-4R-195	
27	BR13208-4R-2/BR13204-4R-195	
28	BR13207-4R-28/BR13205-4R-203	
29	BR12459-4R-16/A69-1	
30	BR13106-4R-106/Khato Babu	
31	BR13115-4R-117/Khato Babu	
32	BR13122-4R-136/Khato Babu	
33	BR13115-4R-159/Khato Babu	
34	BR12477-4R-371/Rodminiket	
35	BR13103-4R-7/BR13115-4R-93	
36	BR10440-4-1-2-5/BR11716-4R-102	
37	BR13115-4R-32/BR23	

#### **Experiment 6.3: Field Rapid Generation Advance (FRGA)**

**Principal investigator:** M Akhlaur Rahman

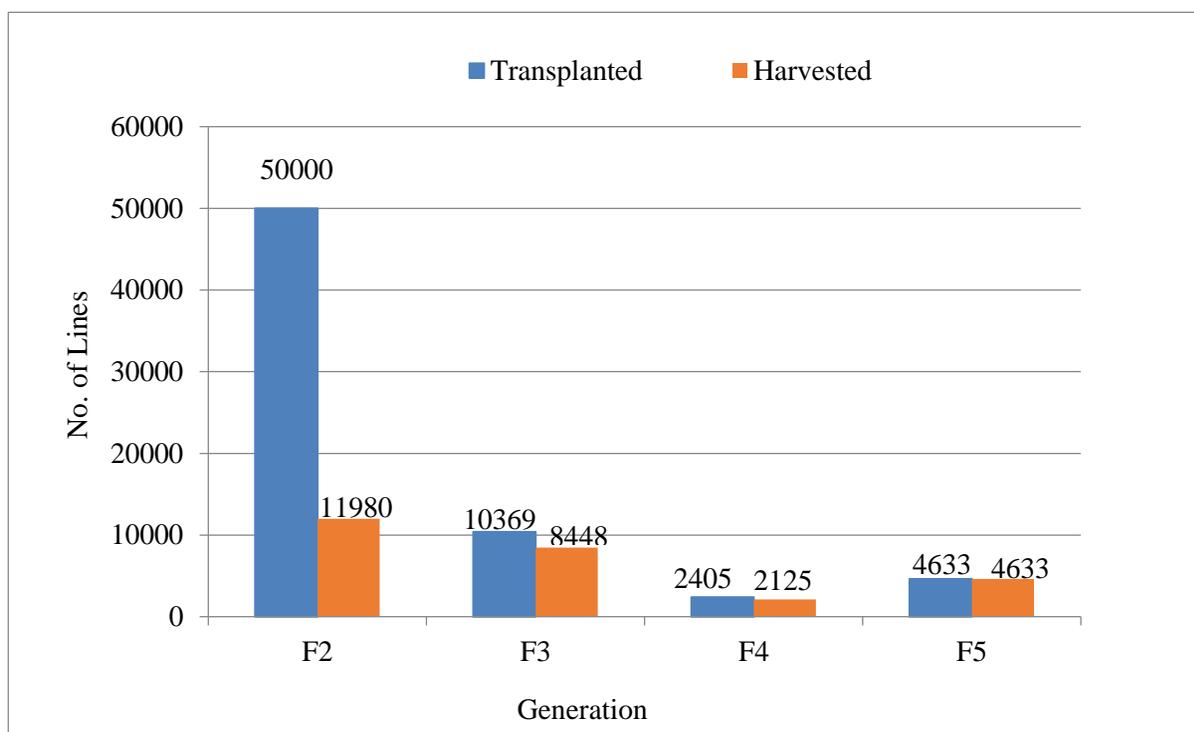
**Co-investigator:** Nusrat Jahan, Armin Akter Setu and R F Disha

**Specific objectives:** Rapid advancement of segregating population for reducing the time of breeding and product cycle.

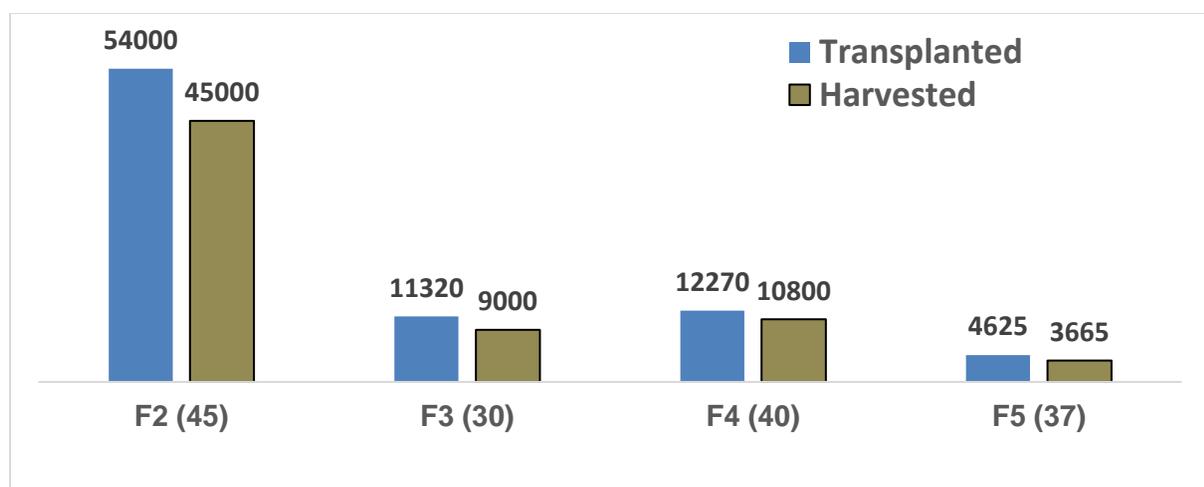
**Materials and Methods:** In total, 67407 segregating progenies from 115 crosses in T Aman season and 82215 individual progenies from 104 crosses were grown in Boro season comprising F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub>, and F<sub>5</sub> population in field following RGA method of breeding at BRR1 Gazipur respectively. Thirty-day-old and 45 days 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. One single panicle was harvested at maturity from each plant of each cross. Freshly harvested seeds were dried and broken seed dormancy using the dry heat treatments @ 45°C for 5 d to initiate the next cycle of RGA immediately.

**Results and discussion:** Segregating progenies from F<sub>2</sub> to F<sub>5</sub> generation were rapidly advanced in the field condition in T. Aman and Boro season. In total 27186 progenies in T. Aman (Fig. 1) and 52535 segregating progenies in Boro season (Fig. 2) were harvested from in F<sub>2</sub>-F<sub>5</sub> generations using FRGA technique.



**Fig. 6.3.1: Total number of RGA Population, T. Aman 2023-24**



**Fig. 6.3.2: Total number of RGA Population, Boro 2023-24**

#### **Experiment 6.4: Line Stage Testing (LST) Trial**

**Principal Investigator :** M A Rahman

**Co-investigators:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**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 7009 from 41 crosses advanced breeding lines and 3321 from 19 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. The experiment was conducted at BRRF Farm, Satkhira.

**Results:** Out of 7009 lines, 748 lines were selected that derived from 41 crosses in LST trial during T Aman 2023-24 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 (BRRF dhan74/I-14//BRRF dhan74/I-71 respectively (**Table 6.4.1**). High selection pressure (selection intensity 8%) was applied in LST in T Aman 2022-23 (**Fig. 6.4.2b**). Out of 3321 lines, a total of 425 lines from 19 crosses were selected in LST trial during Boro 2023-24 based on identical flowering, acceptable grain type (MS/LS) traits and phenotypic acceptability under field condition. High selection intensity (11%) was applied in LST in Boro season 2023-24 (**Fig. 6.4.2c**).

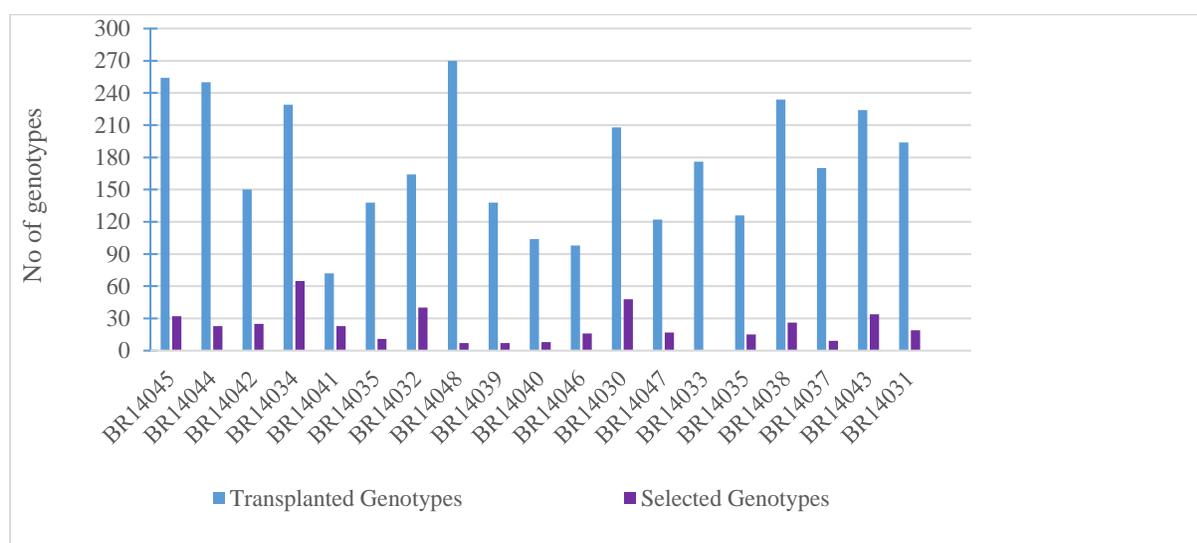
**Table 6.4.1: List of superior fixed lines selected from LST, T Aman 2023-24**

SN	BR no.	Parentage	No of Tested Lines	Selected Lines
1	BR13665	BR11712-4R-227/IR87870-3-7-1-1-1-1-B	93	1
2	BR13666	BR11716 -4R-129/IR59418-7B-21-3	148	25
3	BR13668	BR11716-4R-102/IR87870-3-7-1-1-1-1-B	120	18
4	BR13669	BR11712-4R-232/IR58443-6B-10-3	200	18
5	BR13670	BRRF dhan87/WANXIAN7777-P8	238	39
6	BR13672	BR7528-B-AK-BHA/IR58443-6B-10-3	174	20
7	BR13673	BR11716-4R-105/BRRF dhan67	146	36
8	BR13676	BR23/IR58443-6B-10-3	168	2
9	BR13677	BR11715-4R-186/IR58443-6B-10-3	192	21
10	BR13678	IR107989-B-BRGA-BRGA-452/WANXIAN7777-P10	194	12
11	BR13679	BR11716-4R-105/IR58443-6B-10-3	198	11
12	BR13680	IR99051-B-BL-B-B01-1/BR11716-4R-113	218	21
13	BR13682	BR11712-4R-227/IR58443-6B-10-3	114	33
14	BR13683	BR11723-4R-48/IR58443-6B-10-3	108	30
15	BR13684	HHZ-12-SAL12-Y3-Y2/ IR59418-7B-21-3	156	9
16	BR13685	BR11723-4R-48 /WANXIAN7777-P10	132	20
17	BR13686	BRRF dhan30/WANXIAN7777-P10	204	15
18	BR13687	BR11715-4R-196 / IR58443-6B-10-3	172	19
19	BR13688	BR11716-4R108/IR59418-7B-21-3	162	11
20	BR13689	BR11716-4R-196 / IR58443-6B-10-3	158	14
21	BR13690	BRRF dhan30 / WANXIAN7777-P8	162	3
22	BR13691	BR11723-4R-12 / IR87870-3-7-1-1-1-1-B	64	1
23	BR13692	IR103757-B-BRGA-BRGA-BRGA-102 / BRRF dhan67	148	9
24	BR13693	BR7528-2R-HR16-2-24-1 /IR58443-6B-103	242	16
25	BR13694	IR58443-6B-10-3 / BR11715-4R-114	160	30
26	BR13695	BR11723-4R-12 / IR58443-6B-10-3	212	29
27	BR13696	BR10 / D(R)6	192	27
28	BR13697	BR11716-4R-105 / IR58443-6B-10-3	116	4
29	BR13698	BR11723-4R-27 /IR83484-3-B-7-1-1-1	112	13
30	BR13699	BR10 / WANXIAN7777-P10	212	27
31	BR13700	HHZ12-SAL12-Y3-Y2 / IR58443-6B-10-3	244	26
32	BR13701	BR7528-2R-HR16-2-24-1/IR58443-6B-10-3	328	25
33	BR13702	BR11712-4R-227 / IR83484-3-B-7-1-1-1	216	14
34	BR13703	BR11723-4R-48 / IR83484-3-B-7-1-1-1	150	9
35	BR13704	BR11716-4R-102 / IR83484-3-B-7-1-1-1	100	7
36	BR13705	D(R)6 / IR59418-7B-21-3	350	25
37	BR13707	IR58443-6B-10-3*2/Patnai	152	18
38	BR13708	BR7528-B-AK-BHA / BR11716-4R-120	196	47

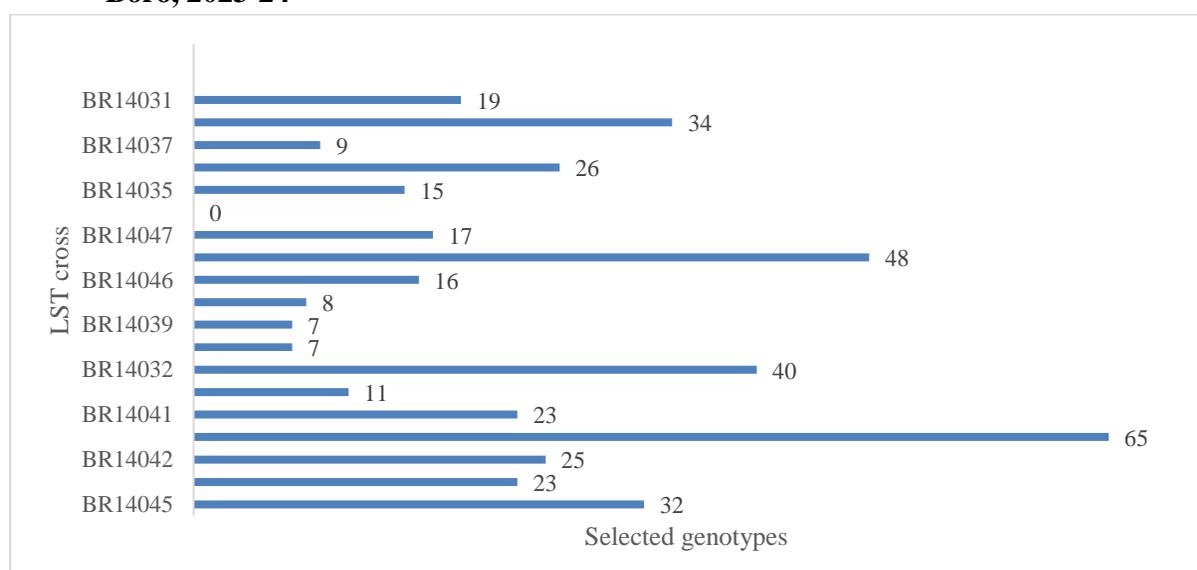
39	BRR I dhan63 /I-14	32	4
40	BRR I dhan67 /I-14	140	14
41	BRR I dhan74 /I-14	186	3
<b>Total</b>		<b>7009</b>	<b>748</b>

**Table 6.4.2: List of superior fixed lines identified from LST, Boro 2023-24**

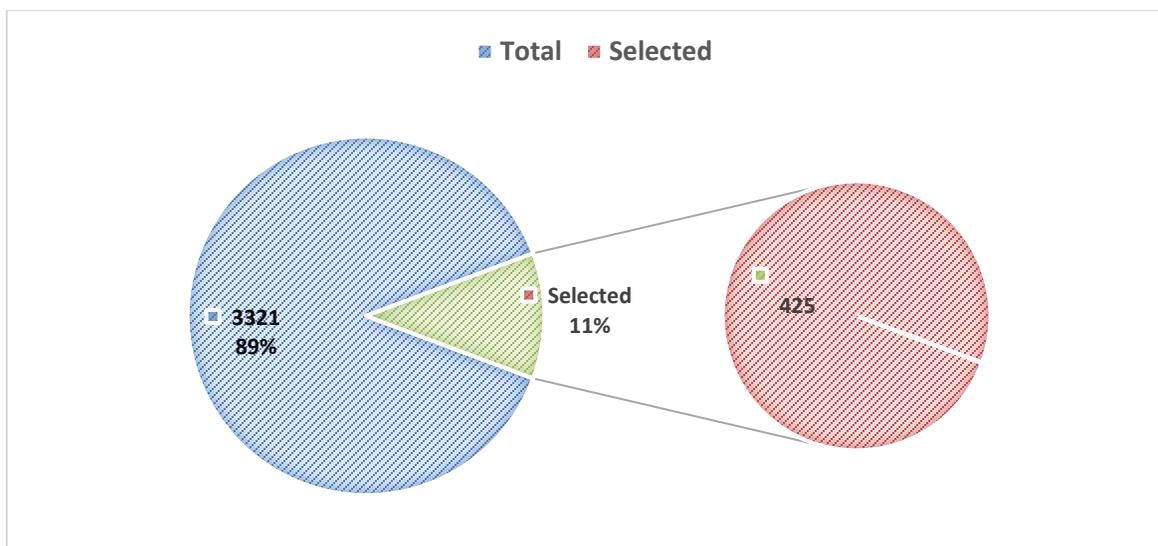
Sl. No.	Designation	Transplanted Genotypes	Selected Genotypes
1	BR14045	254	32
2	BR14044	250	23
3	BR14042	150	25
4	BR14034	229	65
5	BR14041	72	23
6	BR14035	138	11
7	BR14032	164	40
8	BR14048	270	7
9	BR14039	138	7
10	BR14040	104	8
11	BR14046	98	16
12	BR14030	208	48
13	BR14047	122	17
14	BR14033	176	0
15	BR14035	126	15
16	BR14038	234	26
17	BR14037	170	9
18	BR14043	224	34
19	BR14031	194	19
<b>Total</b>		<b>3321</b>	<b>425</b>



**Fig. 6.4.2a: Graphical illustration of the total number of LST and Selected lines in LST, Boro, 2023-24**



**Fig. 6.4.2b: Number of selected lines/cross of LST population, Boro 2023-24**



**Fig. 6.4.2c Selection Intensity of LST genotypes, Boro 2023-24**

### Experiment 6.5: Observational Yield Trial (OYT)

**Principal Investigator:** M. A. Rahman

**Co-investigators:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

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

**Materials and Methods:** A total of 450 genotypes were evaluated at three locations in OYT (Satkhira, Kaliganj and Gazipur) using BR10, BR23, BRRI dhan30, BRRI dhan73 and BRRI dhan87 as checks. In Boro season, 957 genotypes were evaluated in OYT. BRRI dhan67, BRRI dhan89, BRRI dhan97 and BRRI dhan99 were used as check varieties. These trials were carried out following augmented randomized complete block design with 4 replications. The unit plot size was 5.4 m × 4 rows following augmented RCBD with 4 replications. 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 was collected on plant height, days to flowering, days to maturity, PAcP and yield per plot.

**Results:** Out of 450 genotypes, a total of 120 genotypes were selected from Gazipur and Satkhira based on growth duration, plant height, phenotypic acceptability at maturity (PAcP) and grain yield and the genotypes were shown in **Table 6.5.1**. Considering yield and growth duration, phenotypic acceptability at maturity (PAcP) compared to check varieties, out of 957 genotypes, 246 entries were selected in Boro season. In OYT-1, 79 genotypes were selected out of 472 genotypes and in OYT-2, 168 genotypes were selected out of 485 genotypes. The best performing 43 genotypes from Gazipur and Satkhira were shown in **Table 6.5.2**. and **Table 6.5.3**. respectively. The yield range was from 1.6-9.4 t/ha and 1.14-7.38 t/ha at Gazipur and Satkhira respectively.

**Table 6.5.1: Yield and agronomic characters of the selected genotypes from OYT, Salt-Tolerant Rice (STR) Breeding, T. Aman 2023-24, Gazipur and Satkhira**

SI	Designation	GD (days)	PH (cm)	Yield (t/ha)		
				Gazipur	Kaliganj	Satkhira farm
1	BR13331-4R-75	135	139	1.65	2.21	1.97
2	BR13331-4R-82	133	124	3.85	4.49	2.93
3	BR13331-4R-88	132	118	-	3.31	2.46
4	BR13331-4R-119	129	125	4.06	2.02	-
5	BR13331-4R-120	137	139	3.55	4.48	4.50
6	BR13331-4R-170	127	132	4.34	3.02	4.87
7	BR13331-4R-193	126	119	2.98	4.47	-
8	BR13331-4R-280	130	113	4.48	2.89	3.49
9	BR13331-4R-283	127	127	4.96	3.72	3.31

10	BR13331-4R-288	124	102	3.23	2.25	2.94
11	BR13332-4R-9	138	110	3.82	4.08	4.73
12	BR13332-4R-13	138	109	-	3.68	-
13	BR13332-4R-31	136	139	4.42	4.16	2.03
14	BR13332-4R-33	133	129	1.52	3.08	-
15	BR13332-4R-40	135	111	4.81	3.29	2.68
16	BR13332-4R-49	134	133	3.98	4.00	3.60
17	BR13332-4R-76	143	135	-	3.64	1.89
18	BR13332-4R-87	136	160	3.19	3.83	3.87
19	BR13332-4R-92	140	131	4.69	4.02	-
20	BR13332-4R-107	138	154	4.15	3.93	5.01
21	BR13332-4R-146	134	111	2.24	3.00	-
22	BR13332-4R-157	140	147	2.56	1.08	-
23	BR13332-4R-161	142	132	5.16	4.57	-
24	BR13332-4R-165	135	133	7.01	4.71	2.59
25	BR13332-4R-201	138	133	2.88	4.80	3.65
26	BR13332-4R-202	136	151	3.86	4.45	3.25
27	BR13332-4R-203	139	106	2.99	3.68	2.98
28	BR13332-4R-204	133	132	2.87	3.80	4.12
29	BR13332-4R-244	139	149	4.59	4.17	1.52
30	BR13334-4R-30	142	124	4.17	3.17	2.96
31	BR13334-4R-84	122	123	5.19	2.96	5.67
32	BR13334-4R-134	137	132	3.96	4.26	-
33	BR13334-4R-209	135	150	4.41	3.80	3.91
34	BR13334-4R-251	138	140	4.13	3.12	2.66
35	BR13334-4R-264	127	132	5.08	1.20	3.15
36	BR13336-4R-12	127	138	3.12	4.04	5.08
37	BR13336-4R-27	136	136	0.97	3.44	1.64
38	BR13336-4R-53	116	129	3.18	3.24	2.66
39	BR13336-4R-63	122	115	4.91	2.04	1.86
40	BR13336-4R-75	125	134	3.86	3.82	-
41	BR13336-4R-83	127	128	4.46	2.80	5.32
42	BR13336-4R-130	132	117	6.67	-	-
43	BR13336-4R-136	128	138	4.52	3.55	3.67
44	BR13336-4R-146	133	137	2.24	2.24	2.15
45	BR13336-4R-148	124	142	5.30	4.33	2.97
46	BR13336-4R-155	132	138	3.17	4.16	1.00
47	BR13336-4R-163	144	133	0.84	4.78	3.60
48	BR13336-4R-179	137	139	1.93	4.46	-
49	BR13336-4R-203	135	114	5.07	4.22	1.93
50	BR13336-4R-231	130	144	-	3.48	3.86
51	BR13336-4R-234	124	131	5.21	3.69	3.63
52	BR13336-4R-246	137	111	5.26	4.44	2.30
53	BR13336-4R-254	121	127	7.07	4.59	2.70
54	BR13336-4R-257	145	138	3.57	2.53	-
55	BR13336-4R-275	130	132	6.80	3.81	3.49
56	BR13336-4R-278	135	128	3.83	4.51	2.37
57	BR13337-4R-103	119	144	2.23	4.06	2.76
58	BR13337-4R-141	120	133	-	2.71	3.86
59	BR13337-4R-146	121	135	-	3.48	2.74
60	BR13337-4R-173	134	140	1.47	3.91	3.47
61	BR13337-4R-213	135	137	1.93	2.83	3.52
62	BR13337-4R-248	139	151	3.64	3.86	5.22
63	BR13339-4R-12	122	128	-	3.37	4.53
64	BR13339-4R-55	126	129	3.55	1.33	4.17
65	BR13339-4R-78	133	136	-	2.73	3.89
66	BR13339-4R-90	134	151	6.07	2.74	2.97
67	BR13339-4R-95	127	148	5.43	2.06	0.00
68	BR13339-4R-131	122	130	-	1.60	4.22

69	BR13339-4R-159	130	105	7.98	2.97	1.47
70	BR13339-4R-163	134	142	2.00	2.65	3.71
71	BR13339-4R-165	142	129	2.94	2.13	1.96
72	BR13339-4R-177	122	141	1.89	4.39	3.51
73	BR13339-4R-184	137	142	4.56	2.47	-
74	BR13339-4R-187	133	157	5.44	4.20	2.67
75	BR13339-4R-203	126	125	4.78	3.46	2.74
76	BR13339-4R-211	126	140	4.50	4.94	2.10
77	BR13339-4R-216	125	148	4.48	3.04	4.58
78	BR13339-4R-225	127	98	3.12	5.12	-
79	BR13339-4R-241	126	130	5.40	6.18	-
80	BR13339-4R-242	125	140	4.16	3.61	-
81	BR13339-4R-245	135	141	3.26	2.35	-
82	BR13339-4R-257	137	106	3.83	3.49	7.08
83	BR13339-4R-280	124	130	4.78	1.79	4.49
84	BR13339-4R-286	121	146	3.64	4.05	2.41
85	BR13339-4R-287	141	135	2.83	3.72	1.85
86	BR13339-4R-289	128	146	5.17	2.45	3.60
87	BR13339-4R-291	120	135	3.51	4.20	4.16
88	BR13340-4R-88	130	128	4.98	3.97	1.50
89	BR13340-4R-89	125	137	4.73	4.15	3.56
90	BR13340-4R-177	135	131	3.64	3.50	5.14
91	BR13340-4R-226	130	119	6.93	3.65	4.25
92	BR13341-4R-16	132	119	4.48	4.38	2.38
93	BR13341-4R-26	138	154	4.56	4.17	3.85
94	BR13341-4R-28	137	143	2.43	3.11	-
95	BR13341-4R-73	140	148	4.29	-	3.91
96	BR13341-4R-92	131	138	4.76	4.38	2.36
97	BR13341-4R-123	136	134	5.44	3.05	4.20
98	BR13341-4R-132	137	140	4.11	4.65	-
99	BR13344-4R-34	122	132	2.89	3.83	-
100	BR13344-4R-36	124	109	3.74	3.91	3.57
101	BR13344-4R-108	130	133	3.82	3.73	2.63
102	BR13344-4R-130	119	116	4.24	4.48	-
103	BR13344-4R-153	127	115	2.38	3.14	2.82
104	BR13344-4R-158	135	122	3.12	4.03	4.17
105	BR13344-4R-178	121	108	5.71	3.30	4.49
106	BR13345-4R-28	138	112	3.16	-	1.19
107	BR13345-4R-39	136	124	5.04	3.99	2.89
108	BR13345-4R-124	135	132	5.43	4.90	3.58
109	BR13345-4R-138	131	122	1.92	2.42	2.55
110	BR13345-4R-279	133	121	2.24	4.14	2.45
111	BR13347-4R-78	127	129	3.53	3.97	-
112	BR13347-4R-144	129	121	1.24	4.66	2.69
113	BR13347-4R-161	132	122	4.15	2.68	3.81
114	BR13347-4R-210	130	125	4.55	3.64	2.24
115	BR13347-4R-259	138	139	3.70	4.33	1.69
116	BR13349-4R-10	127	125	4.39	3.23	3.96
117	BR13349-4R-111	125	139	3.19	3.80	-
118	BR13349-4R-142	124	134	2.66	3.87	3.91
119	BR13349-4R-148	137	132	3.51	2.58	3.55
120	BR13349-4R-156	138	158	-	4.18	-

**Table 6.5.3: Yield and agronomic characters of the genotypes in OYT-1, Salt-Tolerant Rice (STR) Breeding, Boro 2023-24 at Gazipur and Satkhira**

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
1	BR13439-4R-15	142	103	5.96	3.75
2	BR13439-4R-16	140	111	3.53	4.77

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
3	BR13439-4R-24	142	96	3.58	4.5
4	BR13439-4R-31	139	95	4.51	1.98
5	BR13439-4R-38	141	100	4.25	4.3
6	BR13439-4R-41	142	124	4.52	5.24
7	BR13439-4R-46	140	114	3.8	4.09
8	BR13439-4R-64	142	111	3.81	3.4
9	BR13439-4R-72	139	111	1.69	2.33
10	BR13439-4R-90	141	107	4.8	4.81
11	BR13439-4R-97	144	101	4.73	5.7
12	BR13439-4R-109	144	114	5.07	4.11
13	BR13439-4R-110	145	122	3.66	4.65
14	BR13439-4R-116	138	104	4.73	5.36
15	BR13439-4R-121	141	107	3.57	5.3
16	BR13439-4R-122	149	114	4.12	6.02
17	BR13439-4R-123	145	114	3.17	
18	BR13439-4R-124	142	114	2.7	
19	BR13439-4R-130	151	122	3.37	5.0
20	BR13439-4R-135	140	113	4.87	4.89
21	BR13439-4R-140	145	125	4.23	6.06
22	BR13439-4R-145	147	117	4.19	5.75
23	BR13439-4R-149	146	114	4.39	5.23
24	BR13439-4R-150	138	113	6.4	4.15
25	BR13439-4R-159	137	115	3.57	
26	BR13439-4R-161	139	113	6.19	4.97
27	BR13439-4R-163	145	120	7.17	5.23
28	BR13439-4R-167	151	119	3.62	
29	BR13439-4R-174	144	117	3.44	4.73
30	BR13439-4R-176	139	132	3.9	1.99
31	BR13439-4R-177	144	123	4.83	6.11
32	BR13439-4R-178	144	95	3.56	5.6
33	BR13439-4R-183	147	103	6.21	4.06
34	BR13439-4R-193	140	113	3.9	5.15
35	BR13439-4R-196	145	115	3.61	4.68
36	BR13439-4R-206	147	99	4.52	4.96
37	BR13439-4R-213	143	124	3.61	
38	BR13439-4R-214	146	132	3.35	5.83
39	BR13439-4R-218	143	108	4.36	
40	BR13439-4R-219	151	133	4.44	5.36
41	BR13439-4R-221	144	112	3.84	5.19
42	BR13439-4R-222	137	121	4.75	
43	BR13439-4R-243	137	116	5.07	2.08
44	BR13439-4R-244	145	124	4.21	6.26
45	BR13439-4R-249	140	114	5.11	5.08
46	BR13439-4R-286	151	126	5.74	4.29
47	BR13439-4R-287	151	132	4.45	5.96
48	BR13439-4R-311	138	115	5.7	4.81
49	BR13439-4R-315	157	112	3.31	4.4
50	BR13439-4R-317	151	128	3.84	3.96
51	BR13439-4R-325	139	103	4.09	5.1
52	BR13439-4R-329	142	132	6.53	
53	BR13439-4R-337	142	118	4.17	
54	BR13439-4R-343	144	122	5.53	5.76
55	BR13439-4R-347	154	132	5.97	2.53
56	BR13439-4R-354	137	124	5.4	4.69
57	BR13439-4R-357	152	112	5.05	5.32
58	BR13439-4R-359	144	131	4.27	6.15
59	BR13439-4R-367	144	107	3.28	5.45
60	BR13439-4R-385	140	124	4.62	4.67
61	BR13439-4R-388	144	131	5.06	
62	BR13439-4R-400	139	130	3.89	4.98
63	BR13439-4R-403	144	120	5.07	5.89
64	BR13439-4R-405	138	132	3.87	4.49
65	BR13440-4R-5	151	109	5.26	5.48
66	BR13440-4R-10	146	113	5.96	4.53
67	BR13440-4R-11	147	97	5.4	4.38
68	BR13440-4R-12	152	124	3.65	4.46

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
69	BR13440-4R-16	151	113	3.55	5.84
70	BR13440-4R-18	150	102	3.93	7.05
71	BR13440-4R-25	149	104	3.39	4.32
72	BR13440-4R-32	149	113	3.61	3.02
73	BR13440-4R-37	143	123	3.31	3.71
74	BR13440-4R-38	152	121	4.38	4.27
75	BR13440-4R-40	151	115	4.72	5.73
76	BR13440-4R-45	151	103	5.38	4.13
77	BR13440-4R-46	147	112	5.97	6.52
78	BR13440-4R-47	147	133	2.87	5.16
79	BR13440-4R-50	150	123	6.42	4.75
80	BR13440-4R-57	151	115	5.76	3.52
81	BR13440-4R-59	145	103	3.38	5.34
82	BR13440-4R-60	149	111	5.65	6.63
83	BR13440-4R-64	148	95	3.81	5.69
84	BR13440-4R-67	154	105	3.69	3.79
85	BR13440-4R-68	151	115	3.71	4.65
86	BR13440-4R-69	151	113	5.54	2.93
87	BR13440-4R-76	151	97	4.65	5.85
88	BR13440-4R-87	146	102	7.26	6.06
89	BR13440-4R-89	151	113	4.29	3.36
90	BR13440-4R-92	147	101	6.66	5.02
91	BR13440-4R-102	150	119	5.43	6.2
92	BR13440-4R-107	151	114	5.26	5.91
93	BR13440-4R-109	152	113	3.87	4.64
94	BR13440-4R-111	151	112	5.49	4.88
95	BR13440-4R-114	145	114	5.46	5.22
96	BR13440-4R-119	153	107	3.76	4.65
97	BR13440-4R-135	141	115	5.59	5.06
98	BR13440-4R-177	141	111	4.13	5.05
99	BR13440-4R-194	142	132	5.11	3.95
100	BR13440-4R-209	146	116	3.55	6
101	BR13440-4R-210	149	124	5.57	4.54
102	BR13440-4R-212	151	122	6.13	4.54
103	BR13440-4R-264	144	132	4.06	6.08
104	BR13440-4R-268	151	124	4.97	5.33
105	BR13440-4R-290	150	110	4.83	3.02
106	BR13440-4R-293	137	133	3.07	6.36
107	BR13440-4R-297	151	116	3.92	4.1
108	BR13440-4R-299	154	121	6.13	2.64
109	BR13440-4R-310	151	123	4.13	5.79
110	BR13440-4R-317	144	113	4.22	4.86
111	BR13440-4R-326	151	106	3.57	3.84
112	BR13440-4R-334	146	116	5.13	4.95
113	BR13440-4R-341	145	144	5.41	3.23
114	BR13440-4R-350	147	115	8.06	5.08
115	BR13441-4R-3	144	105	2.81	4.81
116	BR13441-4R-9	147	102	3.87	5.95
117	BR13441-4R-16	146	111	5.1	5.87
118	BR13441-4R-20	138	103	4.19	4
119	BR13441-4R-29	147	123	3.29	6.33
120	BR13441-4R-31	145	133	5.19	5.94
121	BR13441-4R-35	154	117	3.71	5.63
122	BR13441-4R-43	149	115	4.2	4.97
123	BR13441-4R-46	152	116	4.05	4.87
124	BR13441-4R-49	147	113	3.93	5.39
125	BR13441-4R-50	153	115	4.28	5.34
126	BR13441-4R-51	151	95	4.62	7.16
127	BR13441-4R-53	140	105	3.85	5.13
128	BR13441-4R-57	147	112	3.86	5.48
129	BR13441-4R-63	148	113	3.76	6.56
130	BR13441-4R-69	143	114	4.27	4.65
131	BR13441-4R-75	140	116	3.22	4.11
132	BR13441-4R-79	149	115	3.61	5.01
133	BR13441-4R-81	151	120	3.69	4.76
134	BR13441-4R-92	146	95	4.2	4.37

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
135	BR13441-4R-93	140	113	4.88	5.58
136	BR13441-4R-117	139	116	8.27	6.3
137	BR13441-4R-118	151	105	3.94	5.06
138	BR13441-4R-119	144	132	3.49	5.58
139	BR13441-4R-126	144	125	3.97	5.77
140	BR13441-4R-131	147	123	3.57	5.62
141	BR13441-4R-134	147	132	2.84	5.86
142	BR13441-4R-139	146	116	3.5	6.7
143	BR13441-4R-140	154	124	3.83	3.11
144	BR13441-4R-142	139	118	4.28	5.71
145	BR13441-4R-160	143	122	4.12	4.13
146	BR13441-4R-166	140	108	3.58	5.85
147	BR13441-4R-178	141	112	4.14	5.57
148	BR13441-4R-180	151	131	5.59	6.07
149	BR13441-4R-181	145	114	2.34	5.72
150	BR13441-4R-188	147	115	3.91	5.37
151	BR13441-4R-189	151	132	6.65	5.36
152	BR13441-4R-190	147	114	5.71	4.58
153	BR13441-4R-202	151	116	3.35	4.02
154	BR13441-4R-211	151	106	3.89	5.86
155	BR13441-4R-219	147	114	5.87	6.04
156	BR13441-4R-226	143	114	3.26	4.37
157	BR13441-4R-228	144	118	3.82	4.61
158	BR13441-4R-230	145	120	5.51	5.62
159	BR13441-4R-239	149	131	3.44	6.82
160	BR13441-4R-240	151	115	3.22	6.68
161	BR13441-4R-246	148	123	3.15	5.03
162	BR13441-4R-253	142	122	3.57	4.9
163	BR13441-4R-254	147	145	6.47	5.72
164	BR13441-4R-264	151	128	3.95	5.76
165	BR13441-4R-275	144	124	3.91	4.66
166	BR13441-4R-279	146	123	3.51	4.71
167	BR13441-4R-288	146	139	5.86	2.88
168	BR13441-4R-290	146	132	3.82	
169	BR13441-4R-302	140	112	3.51	4.31
170	BR13441-4R-303	139	112	4.38	5.33
171	BR13442-4R-6	151	105	5.9	6.85
172	BR13442-4R-10	149	114	4.01	5.88
173	BR13442-4R-11	145	96	5.52	5.89
174	BR13442-4R-15	142	113	5.3	5.53
175	BR13442-4R-24	140	116	3.78	6.34
176	BR13442-4R-26	136	117	3.64	
177	BR13442-4R-36	147	96	3.9	5.24
178	BR13442-4R-38	141	110	3.77	5.07
179	BR13442-4R-39	153	112	4.05	4.43
180	BR13442-4R-46	138	111	5.04	3.54
181	BR13442-4R-61	146	111	4.57	2.97
182	BR13442-4R-75	153	102	4.77	4.31
183	BR13442-4R-80	154	104	4.95	5.13
184	BR13442-4R-87	138	113	0	5.21
185	BR13442-4R-97	142	102	6.43	3.61
186	BR13442-4R-109	143	122	3.69	5.03
187	BR13442-4R-145	151	121	3.83	
188	BR13442-4R-150	142	114	3.55	5.39
189	BR13442-4R-154	141	130	3.7	6.01
190	BR13442-4R-157	139	115	3.85	6.03
191	BR13442-4R-160	138	108	5.09	4.86
192	BR13442-4R-171	145	115	3.65	5.5
193	BR13442-4R-250	142	120	1.69	3.72
194	BR13442-4R-254	144	116	3.64	4.76
195	BR13442-4R-300	143	132	3.86	5.08
196	BR13442-4R-314	144	124	4.55	4.95
197	BR13442-4R-323	151	124	5.09	4.5
198	BR13442-4R-334	143	123	6.12	5.79
199	BR13442-4R-340	152	123	3.66	4.48
200	BR13442-4R-365	139	121	5.48	5.52

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
201	BR13442-4R-370	137	123	3.83	5.71
202	BR13442-4R-388	151	118	2.8	5.79
203	BR13442-4R-412	141	112	5.7	5.58
204	BR13442-4R-446	145	115	3.98	6.49
205	BR13442-4R-454	145	116	4.27	5.14
206	BR13442-4R-463	137	118	4.76	
207	BR13442-4R-465	137	112	4.19	
208	BR13442-4R-467	144	114	5	5.99
209	BR13442-4R-469	147	116	4.64	5.74
210	BR13442-4R-471	146	122	1.9	4.98
211	BR13443-4R-3	145	121	5.36	4.73
212	BR13443-4R-6	154	105	4.48	5.95
213	BR13443-4R-13	153	115	3.69	3.87
214	BR13443-4R-14	144	93	4.87	4.55
215	BR13443-4R-21	147	114	3.86	
216	BR13443-4R-22	140	111	4.47	6.92
217	BR13443-4R-23	147	114	3.85	5.46
218	BR13443-4R-24	141	103	5.95	5.93
219	BR13443-4R-25	144	106	3.8	4.34
220	BR13443-4R-26	140	104	2.25	6.05
221	BR13443-4R-27	143	123	5.06	5.45
222	BR13443-4R-32	151	107	3.81	
223	BR13443-4R-39	147	114	3.7	4.78
224	BR13443-4R-42	151	107	1.57	1.69
225	BR13443-4R-43	142	104	5.14	4.3
226	BR13443-4R-47	145	122	5.15	5.09
227	BR13443-4R-56	147	103	6.6	4.94
228	BR13443-4R-65	138	97	3.38	5.83
229	BR13443-4R-75	144	96	3.85	5.96
230	BR13443-4R-79	141	112	4.36	7.04
231	BR13443-4R-88	147	110	3.37	
232	BR13443-4R-90	140	101	3.55	5.92
233	BR13443-4R-96	145	111	4.46	4.27
234	BR13443-4R-100	143	101	3.78	4.51
235	BR13443-4R-101	145	115	3.41	2.87
236	BR13443-4R-103	145	98	5.17	4.34
237	BR13443-4R-105	145	112	5.63	1.62
238	BR13443-4R-109	146	125	4.25	5.17
239	BR13443-4R-112	144	122	3.82	3.05
240	BR13443-4R-113	145	116	3.39	6.14
241	BR13443-4R-121	142	123	5.42	5.78
242	BR13443-4R-130	147	116	3.8	5.93
243	BR13443-4R-131	147	103	4.5	3.88
244	BR13443-4R-133	139	117	5.38	6.35
245	BR13443-4R-135	148	124	3.81	4.05
246	BR13443-4R-138	146	122	7.04	5.91
247	BR13443-4R-147	151	108	0	6.67
248	BR13443-4R-155	146	116	6.57	4.05
249	BR13443-4R-156	144	120	3.5	4.36
250	BR13443-4R-170	153	114	3.67	5.26
251	BR13443-4R-182	146	131	2.69	3.41
252	BR13443-4R-191	154	128	3.55	3.68
253	BR13443-4R-224	147	123	3.71	4.27
254	BR13444-4R-19	137	105	3.57	
255	BR13444-4R-53	149	111	3.97	
256	BR13444-4R-63	141	104	3.6	5.25
257	BR13444-4R-71	147	114	4.56	2.96
258	BR13444-4R-76	154	104	3.89	
259	BR13444-4R-77	141	98	2.1	4.27
260	BR13444-4R-92	141	122	4.12	2.07
261	BR13444-4R-127	142	125	3.85	
262	BR13444-4R-128	144	119	3.6	5.03
263	BR13445-4R-1	151	121	4.09	5.76
264	BR13445-4R-3	153	95	4.26	3.08
265	BR13445-4R-5	140	121	3.37	5.4
266	BR13445-4R-7	145	111	4.13	4.19

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
267	BR13445-4R-9	150	116	3.58	3.76
268	BR13445-4R-10	153	112	5.01	3.26
269	BR13445-4R-11	147	94	4.18	0
270	BR13445-4R-13	140	105	4.97	5.28
271	BR13445-4R-16	139	113	4.9	6.92
272	BR13445-4R-20	155	109	3.93	
273	BR13445-4R-29	153	116	4.27	
274	BR13445-4R-36	147	106	3.37	3.59
275	BR13445-4R-37	147	114	3.7	3.66
276	BR13445-4R-40	144	96	4.11	4.27
277	BR13445-4R-41	147	99	4.82	3.05
278	BR13445-4R-43	145	118	3.55	4.02
279	BR13445-4R-49	147	116	3.98	3.41
280	BR13445-4R-51	155	116	3.35	
281	BR13445-4R-52	152	114	3.82	5.91
282	BR13445-4R-53	151	102	2.36	6.96
283	BR13445-4R-54	151	105	3.65	
284	BR13445-4R-58	143	113	3.52	4.92
285	BR13445-4R-59	144	116	3.96	
286	BR13445-4R-60	154	111	3.89	5.52
287	BR13445-4R-61	140	132	4.19	5.75
288	BR13445-4R-63	147	117	4.82	3.32
289	BR13445-4R-66	147	112	4.83	3.25
290	BR13445-4R-67	151	123	3.68	2.52
291	BR13445-4R-71	146	131	3.27	6.48
292	BR13445-4R-78	150	113	4.75	4.85
293	BR13445-4R-81	141	115	3.53	4.77
294	BR13445-4R-89	154	123	5.49	
295	BR13445-4R-91	147	102	6.06	4.89
296	BR13445-4R-93	154	106	3.67	5.35
297	BR13445-4R-95	137	122	5.86	
298	BR13445-4R-102	151	122	3.42	6.03
299	BR13445-4R-107	146	114	3.45	4.75
300	BR13445-4R-108	151	113	3.67	5.79
301	BR13445-4R-132	147	113	4.72	6.19
302	BR13445-4R-138	147	122	3.5	2.69
303	BR13445-4R-141	143	123	3.48	4.06
304	BR13445-4R-142	148	111	5.11	4.5
305	BR13445-4R-154	155	131	3.76	3.82
306	BR13445-4R-155	151	124	3.03	5.48
307	BR13445-4R-160	148	131	6.02	3.58
308	BR13445-4R-170	151	108	3.6	4.49
309	BR13445-4R-178	147	121	3.84	5.86
310	BR13445-4R-182	151	115	3.51	3.93
311	BR13445-4R-185	144	122	3.84	5.03
312	BR13446-4R-1	153	114	1.67	5.77
313	BR13446-4R-2	139	102	3.51	4.48
314	BR13446-4R-13	147	112	6.31	4.38
315	BR13446-4R-17	151	113	3.92	2.69
316	BR13446-4R-19	154	95	3.94	3.04
317	BR13446-4R-26	142	125	5.49	6.41
318	BR13446-4R-30	151	124	5.3	4.53
319	BR13446-4R-39	156	101	4.49	
320	BR13446-4R-41	145	115	4.06	4.05
321	BR13446-4R-50	144	114	3.86	
322	BR13446-4R-55	147	104	4.99	4.57
323	BR13446-4R-59	146	98	4.02	4.47
324	BR13446-4R-84	151	124	5.34	
325	BR13446-4R-92	151	113	4.17	4
326	BR13447-4R-11	150	112	3.51	5.15
327	BR13447-4R-16	151	97	4.77	
328	BR13447-4R-123	164	116	3.95	1.56
329	BR13448-4R-29	143	103	4.7	
330	BR13448-4R-48	157	123	3.74	
331	BR13448-4R-107	141	102	4.66	
332	BR13448-4R-114	146	115	3.29	

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
333	BR13448-4R-159	150	99	3.15	
334	BR13448-4R-209	151	123	2.27	
335	BR13449-4R-7	151	95	9.36	4.76
336	BR13449-4R-19	146	111	5.21	4.07
337	BR13449-4R-47	149	114	1.3	6.55
338	BR13449-4R-78	154	110	3.03	4.8
339	BR13449-4R-80	154	104	4.19	
340	BR13449-4R-82	149	113	2.04	5.12
341	BR13449-4R-83	153	115	3.9	2.61
342	BR13449-4R-130	144	104	3.48	5.54
343	BR13449-4R-131	153	113	4.3	4.12
344	BR13449-4R-136	150	123	4.28	5.24
345	BR13449-4R-176	151	122	3.55	4.79
346	BR13449-4R-181	147	116	4.13	6.34
347	BR13449-4R-183	154	123	3.91	2.95
348	BR13449-4R-208	140	105	3.01	4.27
349	BR13449-4R-215	147	117	3.42	5.81
350	BR13449-4R-218	151	115	3.57	
351	BR13449-4R-230	140	101	4.15	6.06
352	BR13449-4R-231	139	131	2.72	6.92
353	BR13449-4R-235	153	115	4.37	4.59
354	BR13449-4R-236	143	122	5.13	4.03
355	BR13450-4R-3	147	105	3.65	
356	BR13450-4R-5	141	95	3.57	3.01
357	BR13450-4R-7	140	121	5.78	4.57
358	BR13450-4R-8	143	96	4.01	
359	BR13450-4R-21	144	96	3.96	4.18
360	BR13450-4R-31	145	96	1.56	4.47
361	BR13450-4R-34	151	112	3.57	
362	BR13450-4R-37	152	132	3.55	5.53
363	BR13450-4R-38	156	114	3.52	
364	BR13450-4R-39	151	106	3.64	
365	BR13450-4R-41	145	108	4.18	6.05
366	BR13450-4R-44	138	115	3.65	5.33
367	BR13450-4R-51	144	123	3.4	1.66
368	BR13450-4R-53	151	115	3.56	5.7
369	BR13450-4R-58	137	114	4.7	4.3
370	BR13450-4R-63	144	132	4.95	5.11
371	BR13450-4R-69	144	103	4.81	3.98
372	BR13450-4R-77	142	107	5.31	5.61
373	BR13450-4R-80	147	123	4.1	2.67
374	BR13450-4R-84	151	114	5.68	4.51
375	BR13450-4R-85	140	110	3.55	4.5
376	BR13450-4R-94	138	97	4.4	4.81
377	BR13450-4R-101	150	117	4.25	5.03
378	BR13450-4R-102	139	115	5.48	5.29
379	BR13450-4R-113	153	103	5.44	0
380	BR13450-4R-117	151	112	2.62	2.97
381	BR13450-4R-126	147	114	5.38	5.55
382	BR13450-4R-128	136	123	4.09	3.59
383	BR13451-4R-4	139	113	5.2	5.72
384	BR13451-4R-5	162	104	3.55	
385	BR13451-4R-6	157	104	2.44	
386	BR13451-4R-14	139	117	3.52	6.37
387	BR13451-4R-20	156	96	3.66	
388	BR13451-4R-24	147	93	3.65	4.88
389	BR13451-4R-29	151	116	3.53	
390	BR13451-4R-30	141	111	4.19	6.05
391	BR13451-4R-31	146	111	3.87	5.89
392	BR13451-4R-65	153	113	3.42	0
393	BR13451-4R-66	145	102	4.69	2.03
394	BR13451-4R-67	142	113	3.34	5.05
395	BR13451-4R-220	147	119	2.23	
396	BR13452-4R-12	138	96	3.52	4.51
397	BR13452-4R-58	144	113	3.89	5.94
398	BR13452-4R-61	144	114	4.17	6.37

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
399	BR13452-4R-91	145	112	4.99	7.09
400	BR13452-4R-100	151	124	3.86	3.75
401	BR13452-4R-102	149	104	3.74	4.92
402	BR13452-4R-110	137	113	4.83	3.71
403	BR13452-4R-122	149	112	3.95	4.62
404	BR13452-4R-123	146	121	6	
405	BR13452-4R-139	147	123	3.48	6.04
406	BR13452-4R-146	142	122	3.66	4.89
407	BR13452-4R-148	150	111	5.6	7.19
408	BR13452-4R-154	146	119	3.49	5.43
409	BR13452-4R-158	147	121	6.25	4.04
410	BR13452-4R-180	154	112	3.7	
411	BR13454-4R-3	153	114	3.74	5.56
412	BR13454-4R-11	153	106	3.84	4.19
413	BR13454-4R-15	152	117	3.54	5.12
414	BR13454-4R-21	147	105	3.62	6.15
415	BR13454-4R-23	152	116	3.37	6.94
416	BR13454-4R-33	153	105	4.44	3.55
417	BR13454-4R-36	143	117	4.14	
418	BR13454-4R-42	142	114	4.23	5.98
419	BR13454-4R-43	151	94	3.97	4.5
420	BR13454-4R-45	146	115	4.13	3.62
421	BR13454-4R-46	140	95	2.44	4.82
422	BR13454-4R-47	146	104	4.87	1.91
423	BR13454-4R-51	154	113	0	1.14
424	BR13454-4R-62	139	115	4.27	6.96
425	BR13454-4R-68	146	133	6.09	4.65
426	BR13454-4R-70	142	124	4.35	3
427	BR13454-4R-72	155	102	3.88	
428	BR13454-4R-86	142	105	3.41	
429	BR13454-4R-88	144	94	3.4	
430	BR13454-4R-94	150	120	3.41	
431	BR13454-4R-101	145	117	3.56	6
432	BR13454-4R-113	146	118	3.7	3.44
433	BR13454-4R-120	145	113	3.85	6.01
434	BR13455-4R-1	138	113	5.53	4.76
435	BR13455-4R-3	151	101	1.82	5.27
436	BR13455-4R-14	149	113	3.31	5
437	BR13455-4R-20	151	118	6.56	5.71
438	BR13455-4R-22	151	116	6.03	5.85
439	BR13455-4R-23	147	113	4.05	3.35
440	BR13455-4R-30	141	116	3.91	5.05
441	BR13455-4R-33	151	123	6.29	5.49
442	BR13455-4R-44	136	106	5.73	
443	BR13455-4R-48	138	97	5.86	5.38
444	BR13455-4R-56	145	98	4.53	5.22
445	BR13455-4R-65	151	106	4.07	3.81
446	BR13455-4R-66	142	112	4.93	3.96
447	BR13455-4R-80	144	112	3.05	4.61
448	BR13455-4R-84	137	114	5.16	5.4
449	BR13455-4R-85	143	114	4.39	
450	BR13455-4R-89	151	95	3.65	5.11
451	BR13455-4R-91	142	124	5.86	4.12
452	BR13455-4R-92	147	114	3.39	4.05
453	BR13455-4R-93	147	105	4.08	5.09
454	BR13455-4R-94	137	112	3.98	4.51
455	BR13455-4R-99	151	114	3.96	4.75
456	BR13455-4R-100	150	113	3.75	4.65
457	BR13455-4R-101	151	112	6.08	3.76
458	BR13455-4R-103	151	113	5.64	6.16
459	BR13455-4R-115	144	122	5.6	5.61
460	BR13455-4R-119	137	122	4.16	3.42
461	BR13455-4R-123	153	124	4.9	5.28
462	BR13455-4R-125	153	113	3.22	5.71
463	BR13455-4R-127	146	113	3.97	3.7
464	BR13455-4R-129	153	123	5.81	7.38

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
465	BR13455-4R-130	137	114	3.86	
466	BR13455-4R-152	142	117	3.62	5.05
467	BR13455-4R-155	142	131	2.78	6.02
468	BR13455-4R-158	152	123	4.18	4.29
469	BR13455-4R-167	154	113	3.86	
470	BR13455-4R-174	153	131	5.39	5.05
Check1	BRR1 dhan67	140	111	6.04	6.42
Check1	BRR1 dhan67	147	112	4.31	5.7
Check1	BRR1 dhan67	143	113	3.87	5.64
Check1	BRR1 dhan67	144	103	3.4	2.65
Check2	BRR1 dhan97	151	107	6.23	5.53
Check2	BRR1 dhan97	151	109	5.61	4.47
Check2	BRR1 dhan97	151	114	5.05	3.6
Check2	BRR1 dhan97	-949	104	3.66	2.83
Check3	BRR1 dhan99	147	110	4.78	5.33
Check3	BRR1 dhan99	147	113	4.43	4.91
Check3	BRR1 dhan99	142	115	3.89	4.91
Check3	BRR1 dhan99	145	115	3.53	4
Check4	BRR1 dhan89	151	111	6.51	5.63
Check4	BRR1 dhan89	151	113	4.36	4.29
Check4	BRR1 dhan89	154	111	3.62	2.27
Check4	BRR1 dhan89	151	110	3.38	2.03

**Table 6.5.4: Yield and agronomic characters of the genotypes from OYT-2, Salt-Tolerant Rice (STR) Breeding, Boro 2023-24, at Gazipur and Satkhira**

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
1	BR13456-4R-1	143	114	3.41	4.15
2	BR13456-4R-3	145	113	4.52	5.52
3	BR13456-4R-5	140	108	4.71	2.38
4	BR13456-4R-6	139	116	2.71	
5	BR13456-4R-8	145	113	4.04	3.51
6	BR13456-4R-11	148	118	3.58	3.43
7	BR13456-4R-14	142	116	4.35	2.74
8	BR13456-4R-16	142	122	2.8	3.52
9	BR13456-4R-18	147	111	3.51	3.9
10	BR13456-4R-19	141	113	3.73	5.13
11	BR13456-4R-24	141	117	2.43	3.72
12	BR13456-4R-26	145	117	4.97	3.58
13	BR13456-4R-27	145	102	4.2	4.01
14	BR13456-4R-28	140	116	5.06	4.22
15	BR13456-4R-32	144	121	3.89	3.79
16	BR13456-4R-37	139	109	4.9	2
17	BR13456-4R-42	151	116	3.72	3.46
18	BR13456-4R-49	147	111	3.22	4.3
19	BR13456-4R-54	145	112	4.12	2.65
20	BR13456-4R-56	145	113	3.87	3.27
21	BR13456-4R-60	147	114	2.57	3.84
22	BR13456-4R-64	141	114	1.98	4.48
23	BR13456-4R-68	143	120	7.8	5.09
24	BR13456-4R-75	146	106	3.58	3.47
25	BR13456-4R-83	147	124	3.79	3.63
26	BR13456-4R-85	142	132	3.12	3.32
27	BR13456-4R-92	144	124	0.32	3.77
28	BR13456-4R-94	145	117	4.9	3.97
29	BR13456-4R-98	144	121	2.98	4.39
30	BR13456-4R-102	145	115	4.46	4.63
31	BR13456-4R-104	141	112	6.1	2.08
32	BR13456-4R-110	147	101	3.29	4.01
33	BR13456-4R-119	142	113	3.83	4.16
34	BR13456-4R-124	142	110	3.96	5.01
35	BR13456-4R-140	146	115	4.14	4.67
36	BR13456-4R-143	142	103	5.02	5.03
37	BR13456-4R-145	139	109	2.62	4.83
38	BR13456-4R-149	142	117	4.19	4.83

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
39	BR13456-4R-150	142	122	5.38	3.6
40	BR13456-4R-154	142	113	3.51	3.93
41	BR13456-4R-155	165	113	3.87	1.96
42	BR13456-4R-156	145	114	3.66	3.73
43	BR13456-4R-158	142	115	3.73	3.46
44	BR13456-4R-163	140	117	3.81	4.96
45	BR13456-4R-166	145	114	2.87	5.07
46	BR13456-4R-168	142	117	4.1	4.13
47	BR13456-4R-171	142	113	4.17	4.38
48	BR13456-4R-176	142	113	2.06	3.73
49	BR13456-4R-178	141	114	4.6	4.16
50	BR13456-4R-179	140	118	4.64	4.69
51	BR13456-4R-181	140	115	3.04	4.78
52	BR13456-4R-184	159	114	4.93	3.88
53	BR13456-4R-185	145	114	4.14	4.02
54	BR13456-4R-186	144	119	4.75	4.27
55	BR13456-4R-191	144	114	3.34	4.67
56	BR13456-4R-193	147	114	3.73	4.67
57	BR13456-4R-195	140	113	2.87	4.94
58	BR13456-4R-200	143	124	3.68	3.31
59	BR13456-4R-202	142	116	4.69	4.92
60	BR13456-4R-205	142	114	3.96	4.03
61	BR13456-4R-206	149	123	3.83	3.48
62	BR13456-4R-207	144	114	3.76	3.88
63	BR13456-4R-208	145	114	4.41	3.86
64	BR13456-4R-211	139	112	5.58	3.68
65	BR13456-4R-212	143	107	4.63	2.79
66	BR13456-4R-214	146	109	5.45	4.95
67	BR13456-4R-219	144	113	2.55	4.21
68	BR13456-4R-221	152	100	4.02	2.81
69	BR13456-4R-222	142	126	1.85	3.8
70	BR13456-4R-228	147	115	3.54	4.07
71	BR13456-4R-230	140	139	3.98	5.23
72	BR13456-4R-231	145	121	5.6	5
73	BR13456-4R-233	140	114	5.34	5.23
74	BR13456-4R-235	145	110	4.84	4.08
75	BR13456-4R-237	143	115	3.83	3.43
76	BR13456-4R-239	153	123	3.58	4.37
77	BR13457-4R-1	142	121	4.39	2.97
78	BR13457-4R-2	155	112	2.33	3.79
79	BR13457-4R-8	151	110	2.24	3.72
80	BR13457-4R-13	155	98	2.96	2.71
81	BR13457-4R-17	144	109	4.29	3.56
82	BR13457-4R-19	152	112	4.08	3.67
83	BR13457-4R-22	147	113	6.44	3.94
84	BR13457-4R-23	142	109	3.23	3.48
85	BR13457-4R-27	139	113	4.02	4.28
86	BR13457-4R-28	146	95	4.67	3.75
87	BR13457-4R-29	156	107	4.18	2.31
88	BR13457-4R-31	144	121	4.83	4.83
89	BR13457-4R-33	142	112	3.07	1.81
90	BR13457-4R-37	143	122	5.15	4.23
91	BR13457-4R-42	147	107	6.19	4.06
92	BR13457-4R-50	140	113	4.42	4.39
93	BR13457-4R-69	145	113	2.82	2.55
94	BR13457-4R-70	144	123	3.87	3.82
95	BR13457-4R-94	143	113	4.66	4.47
96	BR13457-4R-98	141	105	3.51	4.07
97	BR13457-4R-100	145	129	3.79	0
98	BR13457-4R-105	143	115	4.95	3.59
99	BR13457-4R-110	141	116	3.19	4.4
100	BR13457-4R-122	151	113	2.09	1.81
101	BR13457-4R-141	142	105	3.03	0
102	BR13457-4R-149	153	116	3.17	2.38
103	BR13457-4R-150	141	117	5.48	4.55
104	BR13457-4R-153	151	124	2.92	3.81

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
105	BR13457-4R-164	143	114	3.93	4.83
106	BR13457-4R-165	147	113	3.51	3
107	BR13457-4R-168	141	98	3.19	4.42
108	BR13457-4R-172	142	119	3.03	3.34
109	BR13459-4R-3	151	119	5.23	2.97
110	BR13459-4R-22	151	114	0	0
111	BR13459-4R-90	146	99	4.47	2.46
112	BR13459-4R-114	148	112	3.99	4.57
113	BR13459-4R-121	146	115	2.99	4.19
114	BR13459-4R-126	156	115	2.01	2.75
115	BR13459-4R-129	146	115	2.63	4.55
116	BR13459-4R-133	145	115	3.01	3.83
117	BR13459-4R-135	142	134	3.68	4.28
118	BR13459-4R-140	147	113	6.21	4.45
119	BR13459-4R-154	146	116	3.75	4.71
120	BR13459-4R-160	142	137	3.05	4.45
121	BR13459-4R-164	147	121	6.42	
122	BR13459-4R-165	147	115	5.07	4.94
123	BR13459-4R-177	153	112	3.74	3.47
124	BR13459-4R-180	147	113	3.82	3.84
125	BR13459-4R-184	145	120	3.66	4.33
126	BR13459-4R-204	147	115	4.68	4.93
127	BR13459-4R-210	139	147	5.88	2.49
128	BR13459-4R-212	141	134	3.02	3.2
129	BR13459-4R-218	145	115	4.18	3.22
130	BR13459-4R-225	147	116	5.26	3.9
131	BR13460-4R-2	143	117	4.08	4.27
132	BR13460-4R-4	142	128	3.55	4.07
133	BR13460-4R-6	145	111	4.16	4.92
134	BR13460-4R-8	143	115	4.34	2.99
135	BR13460-4R-10	146	114	9	4.64
136	BR13460-4R-11	151	104	4.41	3.42
137	BR13460-4R-23	143	118	4.32	4.45
138	BR13460-4R-25	144	116	3.82	3.35
139	BR13460-4R-28	147	115	3.64	1.44
140	BR13460-4R-31	140	133	4.27	3.13
141	BR13460-4R-34	144	116	5.47	0
142	BR13460-4R-36	146	123	3.53	3.18
143	BR13460-4R-38	140	113	5.31	4.51
144	BR13460-4R-40	154	121	2.39	3.79
145	BR13460-4R-41	147	107	1.36	
146	BR13460-4R-48	145	110	4.43	4.6
147	BR13460-4R-49	140	115	3.87	2.39
148	BR13460-4R-50	143	113	4.81	4.93
149	BR13460-4R-53	142	118	4.05	4.61
150	BR13460-4R-55	144	116	2.73	4.98
151	BR13460-4R-57	144	114	2.95	3.46
152	BR13460-4R-65	143	114	3.1	3.57
153	BR13460-4R-69	147	113	4.96	3.07
154	BR13460-4R-85	148	126	2.9	3.73
155	BR13460-4R-86	147	114	3.37	
156	BR13460-4R-101	140	115	4.71	5.54
157	BR13460-4R-115	148	117	3.73	4.13
158	BR13460-4R-127	147	113	3.41	3.32
159	BR13460-4R-137	145	117	4.29	3.51
160	BR13460-4R-142	141	121	3.44	3.7
161	BR13460-4R-149	155	123	3.69	4.55
162	BR13460-4R-154	163	116	4.65	4.85
163	BR13460-4R-160	147	115	4.12	3.91
164	BR13460-4R-172	163	107	1.97	4.59
165	BR13460-4R-183	145	112	2.85	4.66
166	BR13460-4R-184	143	107	4.68	3.73
167	BR13460-4R-185	145	112	3.66	4.91
168	BR13460-4R-189	145	131	4.75	3.61
169	BR13460-4R-194	147	114	5.05	4.15
170	BR13460-4R-195	144	114	3.8	4.76

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
171	BR13460-4R-199	145	117	4.39	3.83
172	BR13460-4R-201	142	124	5.35	5.17
173	BR13460-4R-203	145	112	4.49	3.5
174	BR13460-4R-214	144	117	3.46	3.29
175	BR13460-4R-216	144	112	4.47	3.79
176	BR13461-4R-9	140	120	3.24	4.16
177	BR13461-4R-15	146	114	3.76	4.32
178	BR13461-4R-18	142	116	3.78	3.92
179	BR13461-4R-24	137	116	5.46	3.64
180	BR13461-4R-28	140	116	4.11	4.97
181	BR13461-4R-35	157	111	3.69	3.78
182	BR13461-4R-39	153	115	3.84	
183	BR13461-4R-51	164	117	4.9	5.17
184	BR13461-4R-56	151	114	3.28	4.71
185	BR13461-4R-58	154	112	5.03	3.68
186	BR13461-4R-61	160	117	3.91	3.66
187	BR13461-4R-63	151	116	3.59	3.7
188	BR13462-4R-11	151	116	3.51	2.09
189	BR13462-4R-23	140	118	3.85	4.19
190	BR13462-4R-31	144	95	6.99	4.72
191	BR13462-4R-42	143	110	3.83	3.73
192	BR13462-4R-56	153	117	3.81	3.42
193	BR13462-4R-67	140	118	5.17	3.8
194	BR13462-4R-70	145	103	2.23	3.34
195	BR13462-4R-71	139	126	2.99	2.7
196	BR13462-4R-81	142	113	4.28	4.04
197	BR13462-4R-103	151	114	4.07	4.05
198	BR13462-4R-107	151	115	4.05	4.77
199	BR13462-4R-108	140	120	3.31	4.27
200	BR13462-4R-109	159	122	4.35	4.57
201	BR13462-4R-122	147	112	4.78	2.43
202	BR13462-4R-123	145	113	4.89	4.31
203	BR13462-4R-133	141	110	5.54	3.93
204	BR13462-4R-137	148	115	1.32	3.54
205	BR13462-4R-148	151	117	5.16	3.65
206	BR13462-4R-152	140	119	2.04	3.85
207	BR13462-4R-153	138	113	3.86	0
208	BR13462-4R-154	145	96	2.87	3.18
209	BR13462-4R-161	139	113	3.83	4.36
210	BR13462-4R-164	143	122	3.2	4.18
211	BR13462-4R-177	151	113	2.49	
212	BR13462-4R-196	140	123	3.95	4.54
213	BR13462-4R-199	158	114	3.82	
214	BR13462-4R-200	147	111	3.83	3.24
215	BR13462-4R-215	145	116	2.58	3.79
216	BR13462-4R-216	153	108	3.18	4.55
217	BR13462-4R-217	142	114	3.95	3.14
218	BR13462-4R-235	147	124	3.99	
219	BR13462-4R-250	146	113	4.13	3.96
220	BR13462-4R-265	142	116	4.39	3.22
221	BR13462-4R-266	147	114	3.49	3.46
222	BR13462-4R-268	151	97	3.07	4.57
223	BR13462-4R-271	145	123	3.92	4.53
224	BR13462-4R-272	142	124	3.63	3.58
225	BR13462-4R-274	140	114	4.95	4
226	BR13462-4R-284	154	120	4.66	2.11
227	BR13462-4R-285	158	108	3.86	3.64
228	BR13462-4R-290	140	122	4.22	3.66
229	BR13463-4R-5	154	103	3.92	
230	BR13463-4R-11	151	116	4.59	3.92
231	BR13463-4R-12	142	108	4.98	
232	BR13463-4R-14	153	116	4.22	4.87
233	BR13463-4R-19	146	107	4.64	3.53
234	BR13463-4R-35	162	115	3.06	2.82
235	BR13463-4R-36	151	113	4.89	5.03
236	BR13463-4R-37	142	131	0.95	3.22

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
237	BR13463-4R-45	157	115	3.99	5.01
238	BR13463-4R-49	158	121	1.5	
239	BR13463-4R-55	145	129	3.8	4.99
240	BR13463-4R-61	158	109	3.91	4.54
241	BR13463-4R-71	163	119	5.57	3.66
242	BR13463-4R-72	163	115	2.92	2.75
243	BR13463-4R-75	154	104	3.81	5.28
244	BR13463-4R-78	158	125	4.01	3.78
245	BR13463-4R-84	162	116	3.28	3.06
246	BR13463-4R-89	158	111	4.07	3.15
247	BR13463-4R-90	146	118	5.77	
248	BR13463-4R-91	158	110	5	4.17
249	BR13463-4R-94	144	114	3.03	4.08
250	BR13463-4R-95	157	107	3.92	2.75
251	BR13463-4R-97	147	113	5.24	4.87
252	BR13463-4R-99	145	114	2.26	2.49
253	BR13463-4R-100	146	117	4.95	4.52
254	BR13463-4R-102	141	111	3.55	3.69
255	BR13463-4R-108	147	123	5.71	3.9
256	BR13463-4R-111	141	113	3.87	3.07
257	BR13463-4R-112	147	115	4.44	3.97
258	BR13463-4R-120	153	118	2.22	4.1
259	BR13463-4R-122	158	103	4.11	3.99
260	BR13463-4R-126	142	109	3.07	3.67
261	BR13463-4R-129	139	107	5.55	3.75
262	BR13463-4R-131	163	97	3.22	1.76
263	BR13463-4R-135	162	112	4.35	2.02
264	BR13463-4R-136	163	115	3.31	4.28
265	BR13463-4R-137	147	115	4.66	3.3
266	BR13463-4R-138	143	119	5.96	4.64
267	BR13463-4R-145	159	115	3.82	2.34
268	BR13463-4R-149	154	117	5.65	4.26
269	BR13463-4R-152	145	114	4.02	4.6
270	BR13463-4R-167	148	118	3.23	5.1
271	BR13463-4R-170	160	116	3.03	3.42
272	BR13463-4R-174	142	114	4.94	2.64
273	BR13464-4R-1	144	114	1.34	3.25
274	BR13464-4R-5	156	116	3.23	4.94
275	BR13464-4R-9	146	119	4.7	4.15
276	BR13464-4R-11	142	124	4.14	2.18
277	BR13464-4R-13	146	116	3.03	3.86
278	BR13464-4R-14	145	102	2.87	4.51
279	BR13464-4R-17	152	101	3.19	4.01
280	BR13464-4R-27	146	112	5.47	4.22
281	BR13464-4R-28	148	119	3.66	4.29
282	BR13464-4R-29	142	115	4.15	3.05
283	BR13464-4R-34	154	115	3.81	4.73
284	BR13464-4R-36	150	119	3.93	3.64
285	BR13464-4R-37	145	114	3.5	3.11
286	BR13464-4R-40	158	112	3.01	3.58
287	BR13464-4R-41	141	114	4.71	4.23
288	BR13464-4R-44	153	103	5.76	4.44
289	BR13464-4R-53	141	114	3.64	4.95
290	BR13464-4R-55	151	118	6.21	4.73
291	BR13464-4R-57	147	122	3.07	3.55
292	BR13464-4R-58	139	118	3.51	3.61
293	BR13464-4R-66	143	114	2.7	4.32
294	BR13464-4R-68	155	116	4.87	3.36
295	BR13464-4R-72	145	117	2.27	2.73
296	BR13464-4R-84	143	115	3.12	4.03
297	BR13464-4R-90	144	114	3.19	4.16
298	BR13464-4R-91	144	101	3.3	2.91
299	BR13464-4R-98	139	113	5.43	4.82
300	BR13464-4R-100	143	115	3.91	
301	BR13464-4R-103	143	103	5.29	3.5
302	BR13464-4R-108	140	138	3.01	3.13

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
303	BR13464-4R-119	157	114	5.15	3.7
304	BR13464-4R-127	145	119	4.99	
305	BR13464-4R-128	151	113	3.03	3.74
306	BR13464-4R-129	142	143	3.2	5.05
307	BR13464-4R-132	154	132	3	
308	BR13464-4R-136	151	115	4.42	3.85
309	BR13464-4R-137	152	131	4.08	3.97
310	BR13464-4R-144	152	115	3.18	2.63
311	BR13464-4R-149	145	121	2.76	4.89
312	BR13464-4R-152	154	121	5.76	
313	BR13464-4R-153	154	115	5.41	
314	BR13464-4R-155	151	116	3.23	4.95
315	BR13464-4R-156	147	100	3.19	5.45
316	BR13464-4R-164	155	118	5.22	5.08
317	BR13464-4R-165	142	137	4.38	4.31
318	BR13464-4R-171	151	114	4.62	4.43
319	BR13464-4R-174	154	116	5.22	2.2
320	BR13464-4R-183	151	111	4.01	3.66
321	BR13464-4R-189	145	115	1.47	1.8
322	BR13464-4R-201	158	114	4.01	
323	BR13464-4R-216	141	118	4.56	3.53
324	BR13464-4R-224	145	110	5.34	2.68
325	BR13465-4R-2	147	114	5.09	2.97
326	BR13465-4R-8	142	114	4.51	4.36
327	BR13465-4R-14	156	110	4.4	4.74
328	BR13465-4R-19	144	116	3.1	3.29
329	BR13465-4R-20	154	112	3.71	0
330	BR13465-4R-21	151	116	3.51	3.07
331	BR13465-4R-22	164	113	2.43	
332	BR13465-4R-25	142	115	3.41	
333	BR13465-4R-27	145	114	3.57	
334	BR13465-4R-32	162	123	1.96	
335	BR13465-4R-33	151	106	5.03	2.79
336	BR13465-4R-44	151	124	5	3.55
337	BR13465-4R-45	140	98	5.28	4.68
338	BR13465-4R-57	145	118	3.99	3.62
339	BR13465-4R-73	146	111	5.36	3
340	BR13465-4R-77	151	114	5.16	3.55
341	BR13465-4R-79	158	123	5.29	3.41
342	BR13465-4R-81	153	116	3.43	5.52
343	BR13465-4R-83	146	112	4.13	4.33
344	BR13465-4R-85	145	108	3.19	
345	BR13465-4R-89	151	116	5.1	3.97
346	BR13465-4R-98	160	115	2.87	4.44
347	BR13465-4R-99	159	119	5.25	3.51
348	BR13465-4R-114	140	113	4.85	3.32
349	BR13465-4R-131	144	113	4.6	3.65
350	BR13465-4R-132	153	115	3.84	3.36
351	BR13465-4R-136	145	115	5.11	5.1
352	BR13465-4R-142	141	102	5.16	
353	BR13465-4R-145	151	125	6.27	3.28
354	BR13465-4R-146	146	112	5.22	
355	BR13465-4R-148	142	105	2.7	4.53
356	BR13465-4R-151	144	104	6	3.08
357	BR13465-4R-158	146	122	4.56	3.72
358	BR13465-4R-163	153	110	5.32	2.67
359	BR13465-4R-164	156	116	4.76	
360	BR13465-4R-165	142	96	4.4	3.93
361	BR13465-4R-166	142	112	4.83	3.02
362	BR13465-4R-167	151	104	3.99	4.23
363	BR13465-4R-173	154	113	3.03	2.77
364	BR13465-4R-176	140	113	3.83	1.99
365	BR13465-4R-181	147	122	5.06	4.25
366	BR13465-4R-183	147	109	3.87	2.65
367	BR13465-4R-186	158	120	5.42	4.94
368	BR13465-4R-187	145	123	5.27	3.72

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
369	BR13465-4R-188	158	123	5.5	4.1
370	BR13465-4R-193	146	118	4.3	4.3
371	BR13465-4R-194	141	131	3.68	3.12
372	BR13465-4R-195	145	115	3.03	4.29
373	BR13465-4R-197	143	112	6.12	3.31
374	BR13465-4R-198	139	112	4.19	3.69
375	BR13465-4R-200	136	118	3.7	4.42
376	BR13465-4R-201	140	111	3.01	4.57
377	BR13465-4R-204	157	113	5.46	
378	BR13465-4R-206	139	115	5	4.15
379	BR13465-4R-211	160	119	3.71	
380	BR13494-4R-4	139	114	3.83	3.61
381	BR13494-4R-9	144	113	2.96	5.54
382	BR13494-4R-16	145	114	3.82	3.54
383	BR13494-4R-17	151	111	2.87	5.21
384	BR13494-4R-25	145	114	2.85	4.61
385	BR13494-4R-30	145	113	3.98	3.54
386	BR13494-4R-38	147	113	4.95	
387	BR13494-4R-42	145	116	3.41	3.55
388	BR13494-4R-59	142	106	3.41	3.35
389	BR13494-4R-61	139	115	3.86	3.72
390	BR13494-4R-71	144	112	4.85	4.54
391	BR13494-4R-74	145	112	4.86	4.73
392	BR13494-4R-77	140	114	4.58	4.21
393	BR13494-4R-93	141	113	3.04	4.28
394	BR13494-4R-105	148	134	3.51	4.87
395	BR13494-4R-109	154	113	5.15	
396	BR13494-4R-127	146	120	9.26	4.69
397	BR13494-4R-130	147	117	4.67	4.14
398	BR13494-4R-132	141	121	0	
399	BR13494-4R-141	142	121	2.54	2.37
400	BR13494-4R-145	144	103	4.37	3.04
401	BR13494-4R-148	143	118	4.74	3.77
402	BR13494-4R-149	140	124	3.66	4.38
403	BR13494-4R-154	147	113	3.73	
404	BR13494-4R-162	147	106	4.62	2.07
405	BR13494-4R-167	145	114	3.03	3.98
406	BR13494-4R-180	153	113	5.18	3.06
407	BR13495-4R-3	144	121	2.39	5.08
408	BR13495-4R-8	145	116	1.94	3.24
409	BR13495-4R-11	139	100	5.47	4.08
410	BR13495-4R-13	138	114	6.97	
411	BR13495-4R-18	146	113	5.43	
412	BR13495-4R-19	163	117	1.6	3.44
413	BR13495-4R-21	140	113	3.17	3.68
414	BR13495-4R-22	141	112	2.96	4.22
415	BR13495-4R-28	153	118	3.35	3.71
416	BR13495-4R-32	140	116	3.72	3.49
417	BR13495-4R-36	140	112	5.31	3.4
418	BR13495-4R-39	154	119	4.31	3.72
419	BR13495-4R-41	147	117	2.2	3.82
420	BR13495-4R-43	158	119	0.3	3.95
421	BR13495-4R-48	158	107	5.85	2.49
422	BR13495-4R-51	162	114	3.55	3.11
423	BR13495-4R-52	163	116	4.45	
424	BR13495-4R-59	146	113	5.03	4.22
425	BR13495-4R-60	153	103	3.53	4
426	BR13495-4R-61	142	121	5.15	4.16
427	BR13495-4R-76	146	122	3.59	
428	BR13495-4R-77	145	111	0	1.69
429	BR13495-4R-86	147	115	4.05	
430	BR13495-4R-103	151	119	2.55	
431	BR13495-4R-107	140	116	6.02	2.89
432	BR13495-4R-114	147	120	3.17	2.95
433	BR13495-4R-123	140	117	2.85	4.56
434	BR13495-4R-127	147	125	4.12	3.99

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
435	BR13495-4R-132	142	115	4.44	4.89
436	BR13495-4R-133	145	119	4.34	2.94
437	BR13495-4R-135	148	114	2.87	3.68
438	BR13495-4R-136	147	118	5.35	4.72
439	BR13495-4R-146	151	120	10.67	4
440	BR13495-4R-149	145	122	5.3	4.86
441	BR13495-4R-150	144	115	4.7	6.2
442	BR13495-4R-155	151	111	4.51	3.64
443	BR13495-4R-156	146	104	2.58	4.29
444	BR13495-4R-157	147	114	3.49	4.39
445	BR13495-4R-158	154	114	3.56	3.68
446	BR13495-4R-160	144	105	3.92	3.81
447	BR13495-4R-161	144	114	3.91	1.24
448	BR13495-4R-170	155	115	3.29	4.11
449	BR13495-4R-179	156	121	4.02	3.39
450	BR13495-4R-190	147	103	5.21	3.14
451	BR13495-4R-197	151	104	4.62	4.12
452	BR13495-4R-200	160	123	1.31	3.95
453	BR13495-4R-201	143	130	5.22	
454	BR13495-4R-206	142	107	4.12	2.22
455	BR13495-4R-208	147	112	3.19	4.48
456	BR13495-4R-210	151	120	3.97	4.75
457	BR13495-4R-215	142	116	1.87	4.53
458	BR13495-4R-235	145	117	2.24	3.17
459	BR13495-4R-243	147	118	3.81	2.98
460	BR13495-4R-245	153	116	4.63	3.97
461	BR13495-4R-269	147	124	5.19	5.01
462	BR13495-4R-271	147	115	3.75	3.9
463	BR13495-4R-275	145	114	4.01	3.61
464	BR13495-4R-290	152	114	8.02	5.11
465	BR13495-4R-292	146	124	4.92	
466	BR13495-4R-295	145	123	2.7	5.22
467	BR13495-4R-296	140	116	4.67	
468	BR13495-4R-304	144	114	1.88	3.62
469	BR13495-4R-305	142	122	4.14	
470	BR13495-4R-310	139	114	3.17	3.26
471	BR13495-4R-322	151	120	3.83	2.3
472	BR13495-4R-338	142	105	1.4	3.53
473	BR13496-4R-7	154	116	2.8	
474	BR13496-4R-31	159	128	3.93	4.81
475	BR13496-4R-51	137	115	2	3.21
476	BR13496-4R-57	142	120	5.91	3.73
477	BR13496-4R-62	133	122	1.84	
478	BR13496-4R-78	138	121	0.16	
479	BR13496-4R-83	151	114	3.79	3.84
480	BR13496-4R-94	148	101	3.01	3.79
481	BR13496-4R-95	163	116	4.59	3.36
482	BR13496-4R-117	144	113	3.01	5.04
483	BR13496-4R-128	145	129	5.39	4.66
484	BR13496-4R-147	148	115	4.83	3.75
485	BR13496-4R-159	145	120	4.37	
486	Blank	151	113	4.36	
487	Blank	147	122	4.18	
488	Blank	147	114	3.03	
check1	BRR1 dhan67	142	119	5.74	4.96
check1	BRR1 dhan67	148	115	5.05	3.57
check1	BRR1 dhan67	144	116	5.04	3.56
check1	BRR1 dhan67	142	116	4.05	3.45
check2	BRR1 dhan97	148	113	4.63	3.95
check2	BRR1 dhan97	151	118	4.61	3.94
check2	BRR1 dhan97	145	120	3.18	3.35
check2	BRR1 dhan97	151	113	3.03	3.1
check3	BRR1 dhan99	145	115	5.12	5.29
check3	BRR1 dhan99	147	111	3.77	4.26
check3	BRR1 dhan99	146	111	3.52	4.05
check3	BRR1 dhan99	143	113	3.36	3.68

Sl. No.	Designation	GD (Days)	PH (cm)	Yield (t/ha)	
				Gazipur	Satkhira
check4	BRRRI dhan89	151	113	5.19	5.23
check4	BRRRI dhan89	152	120	5.17	4.24
check4	BRRRI dhan89	153	114	4.51	3.8
check4	BRRRI dhan89	151	116	3.94	2.15

### Experiment 6.6: Preliminary Yield Trial (PYT)

**Principal Investigator:** M. A. Rahman

**Co-investigators:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

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

**Materials and methods:** A total of two hundred thirty-two genotypes were tested in three PYTs trials along with BR23, BRRRI dhan30, BRRRI dhan73 as tolerant checks and BRRRI dhan87 as sensitive check at Gazipur, Kaliganj, and Koikhali in T. Aman season. In Boro season, A total of 109 breeding lines were evaluated in two PYTs, at Debhata, Kaliganj, Satkhira farm in Satkhira, and Gazipur. BRRRI dhan67, BRRRI dhan97 and BRRRI dhan99 were used as tolerant checks and BRRRI dhan89 as susceptible 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 232 genotypes, a total of 58 were selected from PYT-1, PYT-2 PYT3 (Table 6.5.1, Table 6.5.2, Table 6.5.3). In PYT-1, nine genotypes were selected and the grain yield ranged from 3.36 t/ha to 6.21 t/ha at Gazipur, 2.41t/ha to 3.87 t/ha at Kaliganj and 1.99 t/ha to 3.49 t/ha at Koikhali. The growth duration of the genotypes over the locations ranged from 124 days to 154 days. The average yield of genotypes over the locations ranges from 1.99 t/ha to 6.21 t/ha (Table 6.5.1). In PYT-2, thirty-one genotypes were selected from one hundred six tested genotypes and the grain yield ranged from 2.64 t/ha to 5.93 t/ha at Gazipur, 2.4 t/ha to 5.93 t/ha at Kaliganj, and 1.07 t/ha to 3.8 t/ha at Koikhali. The average yield range was from 1.07 t/ha to 5.93 t/ha and growth duration of the genotypes over the locations ranged from 106 days to 132 days (Table 6.5.2). In PYT-3 ten entries were visually selected but no data could be collected due to the rat damage and Midhili Cyclone before harvesting. In Boro season, out of 109 genotypes, 53 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 in different locations. In PYT-1, twenty-one genotypes were selected out of 50 genotypes. the grain yield ranged from 3.8-9.0 t/ha at Gazipur, 1.4-4.9 t/ha at Satkhira farm and 1.4-3.0 t/ha at Debhata and the average growth duration of the genotypes ranged from 139 days to 153 days (**Table 6.6.5**). In PYT-2, the grain yield ranged from 2.9-7.1 t/ha at Gazipur, 0.8-6.3 t/ha at Satkhira farm and 0.7-5.6 t/ha at Debhata (**Table 6.6.6**). Trial at Kaliganj, Satkhira was completely damaged due to salinity. Predicted yield based on BLUP was estimated. Shrunken 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 (H<sup>2</sup><sub>b</sub>) ranged from 51% to 80%. The H<sup>2</sup><sub>b</sub> is important as it is mentioned in the breeder's equation to predict the response to selection. Also, the H<sup>2</sup><sub>b</sub> 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 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Grain yield (t/ha)			Remarks	Gazipur and Kaliganj	
				Gazipur	Kaliganj	Koikhali		emmeans	pBLUP
		BLUE	BLU E	BLUE	BLUE	Mean			
10	BR13104-4R-21	125	95	5.46	3.1	2.39		4.28	3.78
12	BR13103-4R-95	154	165	3.36	3.04	0	Late, BPH and damage	3.2	3.33
14	BR13105-4R-81	126	126	6.06	3.17	2.71		4.62	3.91
15	BR13105-4R-28	125	121	3.67	3.22	3.49		3.45	3.43
16	BR13105-4R-72	124	127	5.14	2.65	1.99		3.9	3.62
17	BR13105-4R-108	126	126	5.34	2.84	2.6		4.09	3.69
18	BR13105-4R-93	126	128	5.29	2.44	2.77		3.87	3.6
20	BR13105-4R-10	126	122	5.31	2.41	1.98		3.86	3.6
23	BR13105-4R-32	125	121	6.21	3.87	2.11		5.04	4.09
28	BR 23 (Ck)	154	107	2.69	2.6	0	Missing	2.65	3.1
29	BRRI dhan30(Ck)	126	122	3.97	2.25	2.92		3.11	3.29
30	BRRI dhan87(Ck)	125	100	3.71	2.23	2.42		2.97	3.23
	H2b								0.26
	LSD (<0.05)								1.78
	Reliability								0.41
	Salinity range				1.5 to 6.5 dSm <sup>-1</sup>		1.0 to 4.0 dSm <sup>-1</sup>		

**Table 6.6.2: Yield and agronomic traits of selected genotypes from PYT-2, Salt-Tolerant Rice (STR) Breeding, T. Aman 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Grain yield (t/ha)			Remarks	Grain yield (t/ha)	
				Gazipur	Kaliganj	Koikhali		emmeans	pBLUP
		BLUE	BLU E	BLUE	BLUE	BLU E			
3	BR13131-4R-62	117	112	4.95	4.95	2.95		4.95	4.24
7	BR13106-4R-253	111	112	3.16	3.44	0	100% rat damage	3.3	3.63
8	BR13125-4R-63	111	131	5.47	5.47	0	100% rat damage	5.47	4.44
10	BR13123-4R-118	107	128	5.93	5.93	2.41		5.93	4.61
13	BR13106-4R-241	107	111	3.92	2.92	0	100% rat damage	3.42	3.67
15	BR13108-4R-214	114	115	3.3	2.91	2.82		3.1	3.56
17	BR13115-4R-136	111	121	3.52	3.17	1.07		3.35	3.65
18	BR13113-4R-14	120	123	3.83	3.62	2.44		3.73	3.79
31	BR13122-4R-14	110	120	4.11	4.43	2.94		4.27	3.99
38	BR13122-4R-4	117	131	3.77	2.51	2.55		3.14	3.57
39	BR13116-4R-213	116	127	2.66	2.61	3.28		2.64	3.38
48	BR13125-4R-107	116	105	2.64	4.31	1.17		3.48	3.69
51	BR13104-4R-258	111	121	3.22	3.62	2.17		3.42	3.67
52	BR13122-4R-56	107	128	4	4.26	1.08		4.13	3.94
55	BR13107-4R-34	118	126	3.99	4.36	2.67		4.18	3.95
66	BR13108-4R-320	115	121	3.31	5.56	1.8		4.43	4.05
67	BR13108-4R-41	106	118	3.55	3.55	0	100% rat Damage	3.55	3.72
70	BR13122-4R-44	114	125	3.41	5.43	1.4		4.42	4.04
71	BR13111-4R-109	106	123	3.49	4.48	2.03		3.98	3.88
74	BR13107-4R-143	132	111	3.07	4.17	2.27		3.62	3.75

75	BR13123-4R-229	116	125	4.35	2.4	2.81		3.37	3.66
77	BR13106-4R-422	113	119	3.61	3.72	1.34		3.66	3.76
78	BR13128-4R-46	122	121	2.97	3.78	3.8		3.37	3.66
83	BR13106-4R-489	111	132	4.03	3.75	3.29		3.89	3.85
88	BR13111-4R-104	118	132	4.03	3.59	2.47		3.81	3.82
89	BR13108-4R-133	117	132	3.86	2.99	2.04		3.42	3.67
94	BR13111-4R-83	117	130	4.54	3.41	3.07		3.97	3.88
96	BR13120-4R-43	107	129	2.99	4.46	0	100% rat Damage	3.72	3.79
98	BR13115-4R-171	107	105	3.21	2.68	0	Missing	2.94	3.5
105	BR11936-4R-11	117	124	3.16	5.49	2.14		4.33	4.01
106	BR13111-4R-156	115	114	3.61	4.41	1.4		4.01	3.89
108	BRR1 dhan73(ck)	114	121	4.46	4.41	3.69		4.44	4.05
109	BRR1 dhan87(ck)	128	123	4.01	4.54	3.77		4.28	3.99
h2b									0.23
LSD (5%)									1.16
Reliability									0.37



**Fig. 6.6.1: PYT Plot in Gazipur at 10,16 and 24 August, 2023**



**Fig.6.6.2: Some High Yielding Lines from PYT Trial T. Aman 2023-24**



**Fig.6.6.3: Field condition after the Cyclone Midhili on 17 November 2023 in Kaliganj, Satkhira**

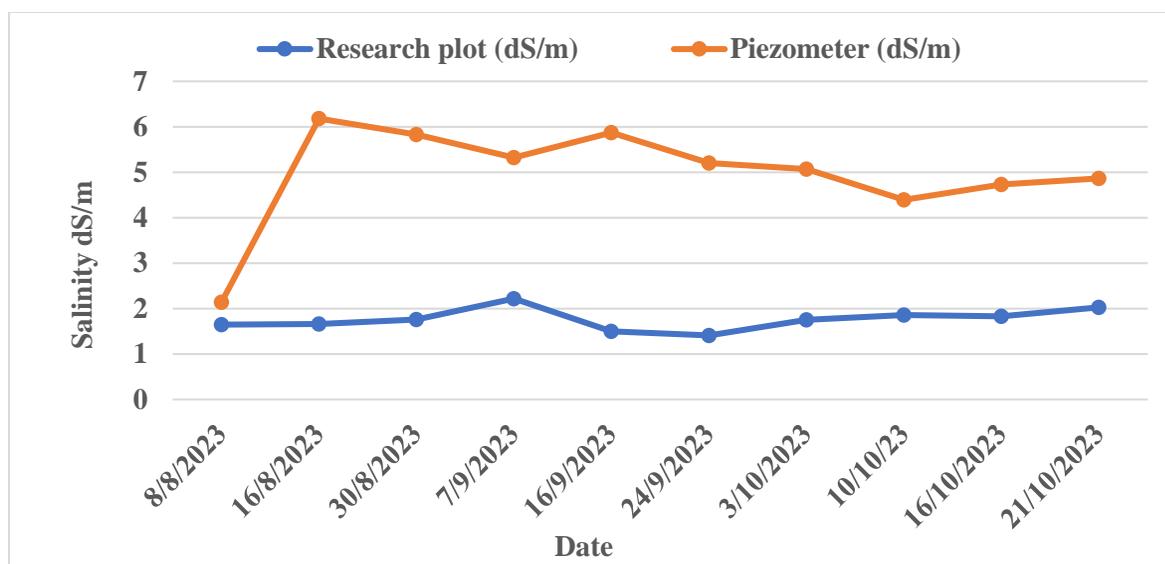


Fig.6.6.4: Salinity level at Kaliganj during T. Aman 2023

Table 6.6.5: Yield and agronomic performance of the genotypes tested in PYT-1, Salt Tolerant Rice (STR) Breeding, Boro 2023-24

Sl. No.	Designation	PH (cm)	GD (Days)	Yield (t/ha)			BLUE	BLUP	PAcp
				Gazipur	Satkhira farm	Debhata			
1	BR13208-4R-51	108	149	6.8	3.1	2.9	5.0	5.1	7
2	<b>BR13208-4R-16</b>	<b>115</b>	<b>145</b>	<b>6.5</b>	<b>4.1</b>	<b>2.5</b>	<b>5.3</b>	<b>5.1</b>	<b>5</b>
3	<b>BR13207-4R-1</b>	<b>94</b>	<b>146</b>	<b>7.5</b>	<b>1.4</b>	<b>1.4</b>	<b>4.4</b>	<b>4.5</b>	<b>5</b>
5	<b>BR13210-4R-218</b>	<b>121</b>	<b>141</b>	<b>7.8</b>	<b>4.2</b>	<b>2.1</b>	<b>6</b>	<b>5.4</b>	<b>3</b>
6	<b>BR13209-4R-179</b>	<b>121</b>	<b>140</b>	<b>7.3</b>	<b>4.9</b>	<b>2.4</b>	<b>6.1</b>	<b>5.8</b>	<b>5</b>
7	BR13206-4R-94	100	146	7.1	2.6	2.6	4.8	5.8	7
8	<b>BR13201-4R-252</b>	<b>120</b>	<b>147</b>	<b>6.9</b>	<b>4</b>	<b>2.4</b>	<b>5.5</b>	<b>5.2</b>	<b>3</b>
9	<b>BR13197-4R-30</b>	<b>97</b>	<b>147</b>	<b>6</b>	<b>4.2</b>	<b>1.9</b>	<b>5.1</b>	<b>4.9</b>	<b>5</b>
10	<b>BR13201-4R-186</b>	<b>121</b>	<b>148</b>	<b>8.6</b>	<b>3.5</b>	<b>2.4</b>	<b>6</b>	<b>5.8</b>	<b>5</b>
11	BR13201-4R-296	108	148	7.1	3.4	2.5	5.3	5.3	7
13	<b>BR13202-4R-141</b>	<b>124</b>	<b>153</b>	<b>7.3</b>	<b>1.5</b>	<b>1.5</b>	<b>4.4</b>	<b>4.7</b>	<b>5</b>
14	BR13209-4R-198	123	141	8.3	3.1	2.3	5.7	5.3	7
15	<b>BR13201-4R-72</b>	<b>110</b>	<b>146</b>	<b>7.2</b>	<b>2.3</b>	<b>2.3</b>	<b>4.7</b>	<b>5</b>	<b>5</b>
16	BR13210-4R-183	108	143	6.9	2.5	2.4	4.7	4.4	7
17	BR13208-4R-24	118	143	6.7	3.5	2.2	5.1	5.4	7
18	BR13215-4R-76	111	145	9.0	3.7	1.7	6.4	4.8	7
19	BR13205-4R-240	107	153	7.2	1.9	1.9	4.5	4.8	7
20	BR13201-4R-18	103	145	8.4	2.5	2.2	5.4	5.2	7
21	<b>BR13201-4R-181</b>	<b>112</b>	<b>148</b>	<b>6.7</b>	<b>4.3</b>	<b>1.8</b>	<b>5.5</b>	<b>4.9</b>	<b>3</b>
22	<b>BR13206-4R-147</b>	<b>108</b>	<b>143</b>	<b>7.5</b>	<b>4.2</b>	<b>2.4</b>	<b>5.8</b>	<b>4.6</b>	<b>5</b>
23	BR13201-4R-131	123	145	7.1	2.1	2.2	4.6	5.2	7
24	<b>BR13197-4R-186</b>	<b>102</b>	<b>150</b>	<b>7.8</b>	<b>1.8</b>	<b>1.8</b>	<b>4.8</b>	<b>4.6</b>	<b>5</b>
25	<b>BR13201-4R-98</b>	<b>113</b>	<b>149</b>	<b>8</b>	<b>3.7</b>	<b>2.4</b>	<b>5.9</b>	<b>5.7</b>	<b>5</b>
26	BR13206-4R-63	111	142	7.1	4.1	2.6	5.6	4.7	7
27	BR13218-4R-66	122	139	7.7	3.3	2.5	5.5	4.7	7
28	BR13208-4R-72	102	148	6.2	3.3	2.6	4.8	5.7	7
29	BR13204-4R-265	105	145	7.6	2.4	1.6	5.0	5.6	7
30	BR13201-4R-287	102	140	7.8	4.0	2.2	5.9	5.4	7
31	BR13204-4R-80	112	145	7.1	3.2	2.3	5.2	5.0	7
32	BR13218-4R-1	118	140	3.8	2.4	2.6	3.1	4.9	7
33	BR13197-4R-95	111	147	7.2	2.6	2.4	4.9	5.7	7
34	<b>BR13197-4R-181</b>	<b>114</b>	<b>150</b>	<b>7.9</b>	<b>3.5</b>	<b>2.1</b>	<b>5.7</b>	<b>5.2</b>	<b>3</b>
35	<b>BR13201-4R-16</b>	<b>101</b>	<b>147</b>	<b>8</b>	<b>2.2</b>	<b>2.2</b>	<b>5.1</b>	<b>5</b>	<b>5</b>
36	BR13201-4R-282	105	145	6.9	4.5	1.9	5.7	4.9	7
37	BR13208-4R-73	106	148	5.9	1.8	1.8	3.9	5.5	7
38	BR13206-4R-50	115	143	8.4	3.2	1.7	5.8	4.9	7

39	BR13210-4R-91	114	140	7.4	3.1	2.3	5.2	5.7	7
<b>40</b>	<b>BR13205-4R-245</b>	<b>114</b>	<b>151</b>	<b>7.4</b>	<b>2.8</b>	<b>1.7</b>	<b>5.1</b>	<b>4.8</b>	<b>3</b>
<b>41</b>	<b>BR13218-4R-3</b>	<b>121</b>	<b>143</b>	<b>7</b>	<b>3.5</b>	<b>2.2</b>	<b>5.2</b>	<b>5.5</b>	<b>5</b>
<b>42</b>	<b>BR13205-4R-201</b>	<b>104</b>	<b>153</b>	<b>6.5</b>	<b>1.6</b>	<b>1.6</b>	<b>4</b>	<b>4.2</b>	<b>5</b>
<b>43</b>	<b>BR13197-4R-111</b>	<b>114</b>	<b>148</b>	<b>6.4</b>	<b>3.4</b>	<b>3</b>	<b>4.9</b>	<b>5</b>	<b>3</b>
44	BR13215-4R-119	118	140	7.1	3.2	3.0	5.1	5.2	7
<b>45</b>	<b>BR13205-4R-179</b>	<b>107</b>	<b>153</b>	<b>6.7</b>	<b>3.1</b>	<b>2.4</b>	<b>4.9</b>	<b>4.2</b>	<b>3</b>
47	BR13215-4R-109	98	143	6.8	3.7	3.0	5.2	5.1	7
<b>48</b>	<b>BR13201-4R-61</b>	<b>111</b>	<b>143</b>	<b>7.6</b>	<b>3.9</b>	<b>2.9</b>	<b>5.7</b>	<b>5.1</b>	<b>5</b>
50	BR13209-4R-145	118	140	7.5	4.2	2.1	5.8	5.0	7
51	BR13206-4R-13	114	140	6.7	4.3	2.1	5.5	5.5	7
52	BR13199-4R-137	112	146	7.2	2.1	2.1	4.7	5.3	7
53	BR13206-4R-17	107	143	7.4	4.0	2.9	5.7	5.6	7
	BRRi dhan67	115	140	7.1	3.7	5	5.4	5.2	2.3
	BRRi dhan89	109	150	7.5	2.3	5	4.9	4.3	1.7
	BRRi dhan99	105	146	7.4	3.7	3	5.5	5.2	2.2
	BRRi dhan97	116	147	7	2.5	5	4.7	4.1	1.5
	LSD (0.05)	5.9	2.9	1.6	0.6		0.83		0.8
	H2b	0.68	0.72	0.5	0.63			0.52	0.47

**Table 6.6.4 Yield and agronomic performance of the genotypes tested in PYT-2, Salt-Tolerant Rice (STR) Breeding, Boro 2023-24**

Sl. No.	Designation	PH (cm)	GD (Days)	Yield (t/ha)			BLUE	BLUP	PAcp
				Gazipur	Satkhira farm	Debhata			
<b>2</b>	<b>BR13201-4R-260</b>	<b>111</b>	<b>147</b>	<b>5.7</b>	<b>2.7</b>	<b>2.5</b>	<b>4.2</b>	<b>4.1</b>	<b>5</b>
3	BR13209-4R-125	110	144	5.3	3.8	2.8	4.5	4.1	7
4	BR13206-4R-96	105	144	4.3	3.8	2.7	4.3	4.5	7
5	BR13205-4R-182	98	145	5.2	3.2	1.8	4.2	4.3	7
<b>6</b>	<b>BR13197-4R-24</b>	<b>103</b>	<b>149</b>	<b>5.5</b>	<b>5.8</b>	<b>5.5</b>	<b>5.5</b>	<b>5.2</b>	<b>5</b>
<b>7</b>	<b>BR13197-4R-150</b>	<b>102</b>	<b>148</b>	<b>5.5</b>	<b>3.8</b>	<b>2.6</b>	<b>4.6</b>	<b>4.5</b>	<b>7</b>
<b>8</b>	<b>BR13201-4R-12</b>	<b>101</b>	<b>143</b>	<b>5.4</b>	<b>4.7</b>	<b>2.5</b>	<b>5.1</b>	<b>4.9</b>	<b>3</b>
9	BR13196-4R-124	109	147	4.7	2.6	2.2	3.9	4.2	7
<b>10</b>	<b>BR13210-4R-38</b>	<b>110</b>	<b>146</b>	<b>5.7</b>	<b>3.7</b>	<b>2.8</b>	<b>4.7</b>	<b>4.5</b>	<b>5</b>
<b>11</b>	<b>BR13197-4R-41</b>	<b>97</b>	<b>148</b>	<b>5.9</b>	<b>3.4</b>	<b>1.9</b>	<b>4.7</b>	<b>4.4</b>	<b>3</b>
12	BR13207-4R-137	117	150	5.3	3.3	1.7	4.3	4.4	7
13	BR13203-4R-188	101	150	5.3	3.1	1.3	4.2	4.3	7
<b>14</b>	<b>BR13208-4R-2</b>	<b>97</b>	<b>147</b>	<b>5.7</b>	<b>2.3</b>	<b>1.7</b>	<b>4</b>	<b>4</b>	<b>5</b>
16	BR13197-4R-133	97	148	4.8	1.6	2.7	3.5	4.0	7
17	BR13204-4R-172	105	146	5.1	4.1	1.9	4.6	4.6	5
<b>19</b>	<b>BR13197-4R-181</b>	<b>102</b>	<b>154</b>	<b>6.3</b>	<b>6.3</b>	<b>2.3</b>	<b>6.3</b>	<b>5.7</b>	<b>5</b>
20	BR13210-4R-143	112	147	5.1	2.9	1.3	4.1	4.1	5
21	BR13205-4R-243	103	152	4.6	3.3	<b>6.3</b>	4.1	4.1	5
<b>22</b>	<b>BR13218-4R-58</b>	<b>107</b>	<b>140</b>	<b>5.6</b>	<b>3.5</b>	<b>2.3</b>	<b>4.5</b>	<b>4.4</b>	<b>5</b>
23	BR13206-4R-74	105	145	4.2	2.5	1.4	3.7		5
<b>24</b>	<b>BR13197-4R-70</b>	<b>102</b>	<b>149</b>	<b>5.6</b>	<b>3.2</b>	<b>1.9</b>	<b>4.4</b>	<b>4.3</b>	<b>3</b>
<b>25</b>	<b>BR13201-4R-114</b>	<b>106</b>	<b>148</b>	<b>5.2</b>	<b>3.4</b>	<b>3.0</b>	<b>4.3</b>	<b>4.3</b>	<b>5</b>
<b>26</b>	<b>BR13197-4R-148</b>	<b>108</b>	<b>153</b>	<b>5</b>	<b>3.7</b>	<b>2.9</b>	<b>4.3</b>	<b>4.4</b>	<b>3</b>
27	BR13208-4R-31	98	148	5.6	5.6	<b>1.9</b>	5.3	5.3	7
<b>28</b>	<b>BR13201-4R-70</b>	<b>93</b>	<b>140</b>	<b>6</b>	<b>4.1</b>	<b>3.8</b>	<b>5</b>	<b>4.7</b>	<b>3</b>
29	BR13197-4R-87	101	141	3.6	3.8	5.6	4.1	4.3	7
<b>31</b>	<b>BR13209-4R-11</b>	<b>107</b>	<b>143</b>	<b>5.2</b>	<b>3.4</b>	<b>2.3</b>	<b>4.3</b>	<b>4.3</b>	<b>5</b>
<b>32</b>	<b>BR13215-4R-159</b>	<b>104</b>	<b>141</b>	<b>4.5</b>	<b>4.1</b>	<b>2.2</b>	<b>4.3</b>	<b>4.4</b>	<b>5</b>
33	BR13201-4R-139	102	147	5.3	2.7	1.1	4.0	4.1	7
<b>34</b>	<b>BR13208-4R-45</b>	<b>110</b>	<b>142</b>	<b>4.2</b>	<b>4</b>	<b>2.8</b>	<b>4.1</b>	<b>4.3</b>	<b>3</b>
<b>35</b>	<b>BR13197-4R-131</b>	<b>93</b>	<b>146</b>	<b>2.9</b>	<b>2</b>	<b>3.0</b>	<b>2.4</b>	<b>3.3</b>	<b>5</b>

36	BR13218-4R-32	115	145	4.9	3.5	2.1	4.3		7
37	<b>BR13197-4R-19</b>	<b>100</b>	<b>148</b>	<b>6.5</b>	<b>3.2</b>	<b>1.8</b>	<b>4.9</b>	<b>4.5</b>	<b>7</b>
38	<b>BR13209-4R-214</b>	<b>116</b>	<b>146</b>	<b>5.4</b>	<b>3</b>	<b>2.2</b>	<b>4.2</b>	<b>4.4</b>	<b>5</b>
39	<b>BR13197-4R-12</b>	<b>107</b>	<b>143</b>	<b>5.5</b>	<b>2.3</b>	<b>2.4</b>	<b>3.9</b>	<b>3.9</b>	<b>5</b>
40	BR13205-4R-10	95	148	4.3	0.8	1.4	3.1	4.3	7
41	BR13208-4R-57	105	142	5.6	3.9	2.1	4.6	4.5	5
42	BR13203-4R-145	89	143	7.0	1.0	2.9	3.7	4.2	5
43	<b>BR13215-4R-40</b>	<b>95</b>	<b>149</b>	<b>5.5</b>	<b>5.5</b>	<b>0.7</b>	<b>5.5</b>	<b>5.2</b>	<b>3</b>
44	<b>BR13215-4R-166</b>	<b>100</b>	<b>148</b>	<b>5.4</b>	<b>2.6</b>	<b>2.4</b>	<b>4</b>	<b>4</b>	<b>5</b>
45	<b>BR13210-4R-98</b>	<b>105</b>	<b>144</b>	<b>5.1</b>	<b>3.1</b>	<b>1.0</b>	<b>4.1</b>	<b>4.1</b>	<b>3</b>
46	<b>BR13201-4R-285</b>	<b>104</b>	<b>147</b>	<b>5.7</b>	<b>3.7</b>	<b>5.5</b>	<b>4.7</b>	<b>4.5</b>	<b>5</b>
47	BR13208-4R-92	103	144	5.4	3.5	1.7	4.4	5.2	5
48	BR13208-4R-60	109	147	4.8	2.8	3.2	4.0	4.0	5
49	<b>BR13201-4R-90</b>	<b>105</b>	<b>148</b>	<b>5.7</b>	<b>2.9</b>	<b>1.7</b>	<b>4.3</b>	<b>4.2</b>	<b>5</b>
50	<b>BR13208-4R-75</b>	<b>106</b>	<b>145</b>	<b>5.9</b>	<b>1.1</b>	<b>2.4</b>	<b>3.5</b>	<b>3.5</b>	<b>5</b>
51	<b>BR13201-4R-62</b>	<b>102</b>	<b>145</b>	<b>6.1</b>	<b>4.1</b>	<b>2.1</b>	<b>5.1</b>	<b>4.8</b>	<b>5</b>
52	BR13215-4R-37	104	145	4.4	2.1	3.0	3.6	4.0	5
53	BR13203-4R-194	101	148	4.9	3.6	1.1	4.3	4.2	5
54	<b>BR13218-4R-20</b>	<b>109</b>	<b>141</b>	<b>4.9</b>	<b>3.1</b>	<b>2.4</b>	<b>4</b>	<b>4.1</b>	<b>3</b>
55	<b>BR13207-4R-48</b>	<b>95</b>	<b>148</b>	<b>5.4</b>	<b>0.9</b>	<b>1.6</b>	<b>3.1</b>	<b>3.3</b>	<b>5</b>
58	<b>BR13206-4R-104</b>	<b>107</b>	<b>146</b>	<b>5.9</b>	<b>4.3</b>	<b>0.8</b>	<b>5.1</b>	<b>4.8</b>	<b>3</b>
59	BR13201-4R-153	104	144	5.8	2.4	2.4	4.0	4.1	5
60	BR13197-4R-89	94	145	6.0	3.0	0.9	4.3	4.3	7
61	<b>BR13215-4R-92</b>	<b>106</b>	<b>147</b>	<b>4</b>	<b>2.6</b>	<b>2.3</b>	<b>3.3</b>	<b>3.8</b>	<b>3</b>
62	BR13205-4R-197	110	147	4.2	4.1	2.3	4.4	4.0	7
63	BR13201-4R-284	106	148	7.1	3.5	1.9	4.7	4.8	5
64	<b>BR13197-4R-143</b>	<b>102</b>	<b>141</b>	<b>5.2</b>	<b>4</b>	<b>2.4</b>	<b>4.6</b>	<b>4.5</b>	<b>5</b>
	<b>BRR1 dhan67</b>	<b>106</b>	<b>143</b>	<b>5.5</b>	<b>4</b>	<b>2.1</b>	<b>4.8</b>	<b>4.8</b>	<b>5</b>
	<b>BRR1 dhan97</b>	<b>101</b>	<b>146</b>	<b>5.1</b>	<b>2.9</b>	<b>1.7</b>	<b>4</b>	<b>4.2</b>	<b>3</b>
	<b>BRR1 dhan89</b>	<b>101</b>	<b>149</b>	<b>5.3</b>	<b>2</b>	<b>2.3</b>	<b>3.6</b>	<b>4.1</b>	<b>5</b>
	<b>BRR1 dhan99</b>	<b>102</b>	<b>147</b>	<b>4.7</b>	<b>3</b>	<b>2.1</b>	<b>3.8</b>	<b>4</b>	<b>5</b>
	<b>LSD (0.05)</b>	<b>5.38</b>	<b>3.74</b>	<b>1.57</b>	<b>1.35</b>	<b>0.88</b>	<b>0.85</b>		
	<b>H2b</b>	<b>0.38</b>	<b>0.54</b>	<b>0.4</b>	<b>0.79</b>	<b>0.92</b>		<b>0.48</b>	

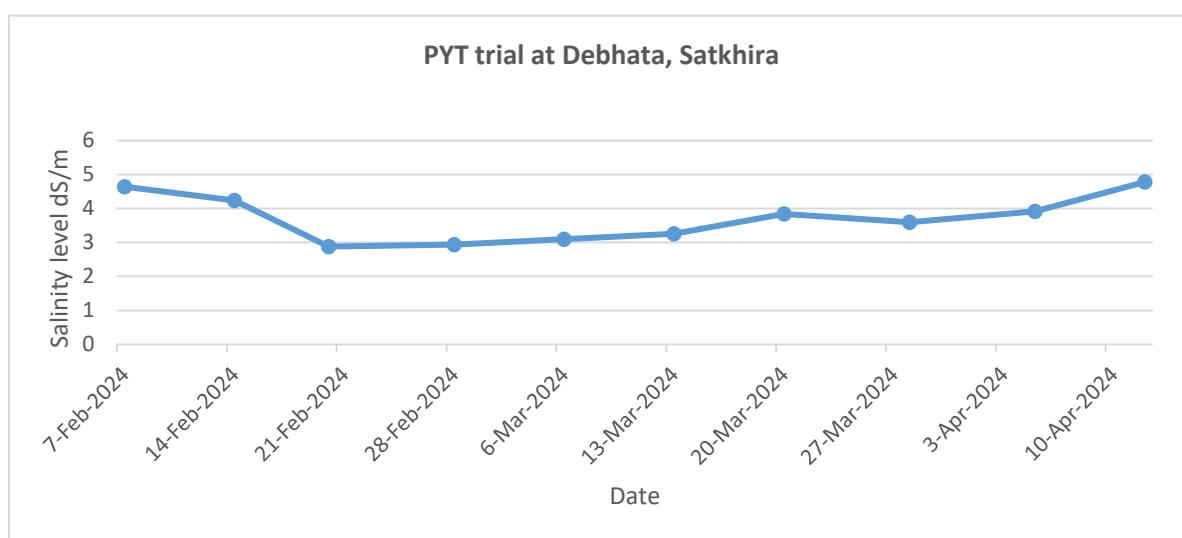


Fig. 6.6.3: Salinity dynamics of PYT-1 and 2 experimental fields at Debhata, Satkhira during Boro 2023-24



**Fig 6.6.4. Pictorial view of PYT-1 and 2 experimental fields at Debhata, and Satkhira farm during Boro 2023-24**

### **Experiment 6.7: Advanced Yield Trial (AYT)**

**Principal Investigator:** M. A. Rahman

**Co-investigators:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

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

**Materials and Methods:** A total of one hundred seven genotypes was tested in two AYT trials along with BRRI dhan73 as tolerant checks and BRRI dhan87 as sensitive check and two AYT trials 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, sixty-three genotypes were selected from AYT-1 and AYT-2 based on their phenotypic acceptance, grain yield and grain type. In T Aman, the genotypes showed a wide range of variations in yield in different locations. In AYT-1, the grain yield ranged from 1.30 t/ha to 8.37 t/ha (BR12459-4R-114) at Gazipur and 2.00 t/ha to 5.43 t/ha at Kaliganj. In Koikhali, Satkhira the most of the entries were damaged due to water stagnation, rat and brown plant hopper (BPH) attack, thus data of this location was analyzed. The average growth duration of the genotypes over the locations ranged from 110 days to 140 days (**Table 6.7.1**).

In AYT-2, the grain yield ranged from 1.85 t/ha to 5.35 t/ha at Gazipur, 2.23 t/ha to 4.06 t/ha at Kaliganj. In Koikhali most of the entries damaged due to rat and average yield ranged from 1.56t/ha to 3.90t/ha at Koikhali. The average yield of the genotypes over the locations ranged from 1.56t/ha to 5.35t/ha and growth duration ranging from 117 days to 142 days (Table 6.7.6). One the other hand the check variety, BRRI dhan73 yielded 3.86t/ha with 135 days' growth duration and BRRI dhan87 yielded 3.48t/ha with 120 days growth duration (Table.6.7.2).

In Boro, fifty-seven 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 4.9-8.6 t/ha at Gazipur, 2.6-5.7 t/ha at Satkhira farm and 0.9-6.9 t/ha at Debhata (**Table 6.7.3**). The average yield of the genotypes over the locations ranged from 5.0 t/ha to 6.1 t/ha (BLUE) with average growth duration ranging from 136 days to 149 days (**Table 6.7.3**). The check variety, BRRI dhan89 yielded 3.9 t/ha with 150 days' growth

duration, BRRI dhan67 yielded 4.9 t/ha with 138 days growth duration, BRRI dhan97 yielded 4.7 t/ha with 147 days growth duration at Satkhira (**Table.6.7.3**).

In AYT-2, the grain yield ranged from 5.6-9.3 t/ha at Gazipur, 0.7-6.6 t/ha at Satkhira farm and 0.7-6.6 t/ha at Debhata (**Table 6.7.3**). The average growth duration ranging from 143 days to 161 days (**Table 6.7.4**). The check variety, BRRI dhan89 yielded 6.3 t/ha with 160 days' growth duration, BRRI dhan67 yielded 2.4 t/ha with 148 days' growth duration, and BRRI dhan99 yielded 2.8 t/ha with 149 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 2023-24**

Sl#	Designation	GD (days) BLUE	PH (cm) BLUE	Grain yield (t/ha)							
				Gazipur		Kaliganj		Koikhali, Satkhira		Gazipur and Kaliganj	
				BLU E	BLU P	BLU E	BLU P	BLUE	Remarks	YLD_emme ans	pBLU P
1	BR13122-4R-46	117	123	6.31	6.25	4.87	4.81	0	Missing	5.59	4.62
2	BR13123-4R-91	118	124	2.87	2.91	4.73	4.71	0	Missing	3.8	4.6
3	BR12459-4R-127	110	100	4.44	4.44	4.91	4.86	3.95		4.67	4.61
4	BR12459-4R-172	110	99	4.69	4.69	4.91	4.86	2.99		4.8	4.61
5	BR12459-4R-225	121	134	3.56	3.58	4.22	4.28	3.09		3.89	4.6
6	BR12459-4R-37	123	135	5.58	5.55	4.3	4.34	3.74		4.94	4.61
7	BR12459-4R-54	121	133	4.65	4.65	4.64	4.64	0	Missing	4.64	4.61
8	BR12461-4R-70	122	132	2.9	2.95	4.64	4.64	0	Missing	3.77	4.59
9	BR12462-4R-160	126	148	4.67	4.66	4.73	4.71	3.09		4.7	4.61
10	BR12462-4R-204	128	147	4.19	4.2	5.13	5.04	2.87		4.66	4.61
11	BR12462-4R-227	129	120	5.1	5.08	4.41	4.44	3.5		4.75	4.61
12	BR12462-4R-241	130	121	5.6	5.58	4.36	4.4	2.6		4.98	4.61
13	BR12462-4R-253	130	125	4.61	4.61	4.99	4.93	2.69		4.8	4.61
14	BR12466-4R-148	131	124	4.01	4.02	4.27	4.32	3.6		4.14	4.6
15	BR12466-4R-293	140	125	4.54	4.54	4.71	4.7	2.86		4.63	4.61
16	BR12466-4R-317	138	125	4.31	4.31	5.02	4.95	2.73		4.66	4.61
17	BR12469-4R-147	133	115	1.3	1.38	5.1	5.02	0	Missing	3.2	4.59
18	BR12466-4R-98	134	116	5.36	5.34	5.1	5.02	0	Missing	5.23	4.61
19	BR12462-4R-82	133	117	6.61	6.56	4.11	4.19	0	Missing	5.36	4.62
20	BR12459-4R-103	132	118	6.19	6.15	5	4.93	0	Missing	5.59	4.62
21	BR12459-4R-114	135	119	8.37	8.27	4.44	4.46	4.08		6.4	4.63
22	BR12459-4R-118	135	120	5.42	5.4	5.43	5.3	3.45		5.42	4.62
23	BR12459-4R-120	135	120	5.04	5.02	4.58	4.58	3.14		4.81	4.61
24	BR12459-4R-14	136	121	4.88	4.87	4.62	4.62	3.44		4.75	4.61
25	BR12459-4R-209	133	125	5.64	5.62	4.89	4.84	3.17		5.26	4.61
26	BR12459-4R-26	135	124	4.82	4.82	4.21	4.28	3.76		4.52	4.6
27	BR12459-4R-265	120	120	5.18	5.17	4.18	4.24	2.98		4.68	4.61
28	BR12459-4R-283	122	121	5.47	5.45	4.49	4.51	3.21		4.98	4.61
29	BR12459-4R-286	126	124	4.41	4.42	4.51	4.52	3.3		4.46	4.6
30	BR12459-4R-33	128	125	5.15	5.13	5.02	4.95	3.2		5.08	4.61
31	BR12459-4R-39	127	112	5.42	5.4	3.44	3.63	1.3		4.43	4.6

Sl#	Designation	GD (days) BLUE	PH (cm) BLUE	Grain yield (t/ha)							
				Gazipur		Kaliganj		Koikhali, Satkhira		Gazipur and Kaliganj	
				BLU E	BLU P	BLU E	BLU P	BLUE	Remarks	YLD_emme ans	pBLU P
32	BR12459-4R-40	129	113	5.05	5.04	5.12	5.04	3.68		5.08	4.61
33	BR12459-4R-61	110	114	4.74	4.74	5.1	5.02	2.65		4.92	4.61
34	BR12459-4R-80	110	115	5.72	5.7	4.41	4.44	3.1		5.07	4.61
35	BR12460-4R-102	126	123	4.83	4.82	4.44	4.47	3.14		4.63	4.61
36	BR12460-4R-120	128	124	4.74	4.73	4.69	4.67	3.64		4.71	4.61
37	BR12460-4R-145	133	142	3.69	3.71	4.96	4.91	2.82		4.33	4.6
38	BR12460-4R-189	131	143	3.21	3.24	5	4.94	2.6		4.1	4.6
39	BR12460-4R-86	126	116	4.2	4.21	4.6	4.6	1.66		4.4	4.6
40	BR12463-4R-308	128	115	2.74	2.78	4.65	4.64	2.82	100% rat damage	3.69	4.59
41	BR12463-4R-377	136	141	3.17	3.21	3.96	4.06	1.48		3.57	4.59
42	BR12466-4R-175	138	140	3.63	3.65	3.98	4.08	3.16		3.8	4.6
43	BR12468-4R-231	127	136	4.17	4.18	4.42	4.45	3.84		4.29	4.6
44	BR12471-4R-98	128	135	4.07	4.08	4.19	4.25	3.13		4.13	4.6
45	BR12459-4R-106	133	122	4.86	4.85	4.83	4.8	1.37		4.84	4.61
46	BR12459-4R-113	130	121	4.26	4.27	5.25	5.15	3.06		4.75	4.61
47	BR12459-4R-140	121	133	5.36	5.34	4.85	4.81	2.93		5.11	4.61
48	BR12459-4R-16	121	132	4.83	4.82	4.77	4.74	3.29		4.8	4.61
49	BR12459-4R-3	131	115	3.78	3.8	4.35	4.39	3.46		4.07	4.6
50	BR12459-4R-41	134	116	4.6	4.6	4.58	4.59	3.72	Missing	4.59	4.61
51	BR12460-4R-122	132	130	4.44	4.45	4.85	4.81	0		4.65	4.61
52	BR12460-4R-24	132	131	4.64	4.64	4.58	4.59	2.87		4.61	4.61
53	BR12460-4R-44	127	139	4.72	4.72	5.31	5.19	1.86		5.01	4.61
54	BRRIdhan73(Ck)	130	140	2.64	2.69	4.29	4.34	3.06		3.47	4.59
55	BRRIdhan87(ck)	128	105	4.19	4.2	2	2.41	3.31		3.09	4.59
				H2b		0.95		0.73		0.41	
				LSD (0.05)		0.34		0.42		1.00	

**Table 6.7.2: Yield and agronomic performance of the genotypes tested in AYT-2, Salt-Tolerant Rice (STR) Breeding, at Gazipur, T. Aman 2023-24**

Sl #	Designation	GD (days)	PH (cm)	Grain yield (t/ha)							
				Gazipur		Kaliganj		Koikhali	Gazipur and Kaliganj		
				BLUE	BLUP	BLUE	BLUP		Average	Remarks	YLD_em means
1	BR12460-4R-9	129	114	3.84	3.83	3.84	3.79	0	Missing	3.84	3.55
2	BR12461-4R-51	128.5	147	5.25	5	3.55	3.53	0	Missing	4.4	3.58
3	BR12462-4R-147	135.5	120	4.85	4.67	2.89	2.92	0	Missing	3.87	3.55
4	BR12462-4R-283	134	118	3.38	3.45	3.38	3.37	0	100% rat damage	3.38	3.53
5	BR12464-4R-298	131	113	1.92	2.23	3.38	3.37	0	Missing	2.65	3.49
6	BR12465-4R-201	132	114	3.99	3.96	2.94	2.97	2.75		3.47	3.53
7	BR12465-4R-28	135.5	110	3.84	3.83	3.2	3.21	2.48		3.52	3.54
8	BR12465-4R-85	132	108	4.15	4.09	3.16	3.17	2.89		3.65	3.54

9	BR12466-4R-179	134	107	3.46	3.51	3.46	3.44	2.46			3.46	3.53
10	BR12468-4R-337	130	121	3.82	3.81	3.91	3.85	3.26			3.86	3.55
11	BR12469-4R-204	139	139	3.75	3.76	3.03	3.06	2.28			3.39	3.53
12	BR12474-4R-311	126.5	115	2.46	2.68	3.32	3.31	3.01			2.89	3.51
13	BR12477-4R-371	136	121	4.43	4.32	3.17	3.18	3.16			3.8	3.55
14	BR13711-4R -190	125	119	4.56	4.43	2.58	2.64	0	100% rat damage		3.57	3.54
15	BR12465-4R-228	135	151	3.76	3.76	3.76	3.72	3.32			3.76	3.55
16	BR12459-4R-117	136.5	138	4.29	4.2	3.54	3.52	3.48			3.92	3.55
17	BR12459-4R-277	137	120	4.43	4.32	4.03	3.96	3.26			4.23	3.57
18	BR12459-4R-97	135.5	140	4.2	4.13	2.96	2.99	3.09			3.58	3.54
19	BR12460-4R-66	133.5	113	2.23	2.49	2.23	2.33	2.33			2.23	3.47
20	BR12465-4R-100	137	109	4.31	4.22	2.88	2.92	3.25			3.59	3.54
21	BR12465-4R-113	137	114	4.78	4.61	3.59	3.56	2.98			4.18	3.57
22	BR12465-4R-132	142.5	110	2.23	2.49	2.51	2.58	2.13			2.37	3.48
23	BR12465-4R-223	136.5	110	4.61	4.47	3.74	3.7	2.68			4.18	3.57
24	BR12465-4R-231	136.5	117	4.09	4.04	3.74	3.7	2.94			3.91	3.55
25	BR12465-4R-26	138	102	3.45	3.5	2.97	3	0	100% rat damage		3.21	3.52
26	BR12465-4R-321	129.5	105	3.88	3.86	3.65	3.61	3.65			3.76	3.55
27	BR12465-4R-59	135.5	106	4.75	4.59	3.13	3.15	2.7			3.94	3.56
28	BR12465-4R-61	137	111	4.27	4.19	3.34	3.34	3.41			3.81	3.55
29	BR12465-4R-91	134	126	5.35	5.09	3.02	3.04	3.9			4.19	3.57
30	BR12466-4R-134	139	131	3.39	3.46	3.41	3.4	3.56			3.4	3.53
31	BR12466-4R-159	135.5	123	4.64	4.49	2.52	2.59	1.46			3.58	3.54
32	BR12466-4R-167	137.5	114	4.28	4.19	3.32	3.32	2.96			3.8	3.55
33	BR12466-4R-275	134.5	135	1.85	2.18	3.67	3.64	3.18			2.76	3.5
34	BR12466-4R-275	117.5	117	1.85	2.18	3.67	3.64	3.33			2.76	3.5
35	BR12477-4R-13	139.5	115	3.18	3.28	3.19	3.2	2.75			3.19	3.52
36	BR12477-4R-186	138.5	115	3.28	3.36	2.35	2.44	3.34			2.81	3.5
37	BR12477-4R-73	135.5	139	4.28	4.2	3.48	3.46	2.81			3.88	3.55
38	BR12459-4R-45	133	137	3.35	3.42	3.23	3.24	2.95			3.29	3.52
39	BR12465-4R-130	141	115	2.23	2.49	3.86	3.8	0	Missing		3.04	3.51
40	BR12465-4R-27	135	121	3.73	3.74	2.39	2.47	2.94			3.06	3.51
41	BR12465-4R-312	135.5	116	4.11	4.05	3.48	3.46	0	100% rat damage		3.79	3.55
42	BR12466-4R-106	135.5	113	4.99	4.79	3.48	3.46	2.75			4.24	3.57
43	BR12466-4R-14	134	118	4.26	4.18	4.06	3.99	0	Missing		4.16	3.57
44	BR12466-4R-180	132	110	2.45	2.67	4.06	3.99	2.99			3.25	3.52
45	BR12466-4R-61	137.5	118	4	3.96	3.94	3.88	0	Missing		3.97	3.56

46	BR12459-4R-183	133.5	105	5.23	4.98	3.54	3.51	3		4.38	3.58
47	BR12459-4R-241	137	123	3.2	3.3	3.07	3.09	3.83		3.13	3.52
48	BR12469-4R-204	135.5	138	3.75	3.76	3.03	3.06	2.43		3.39	3.53
49	BR12461-4R-23	139.5	116	3.24	3.33	3.84	3.79	2.9		3.54	3.54
50	BR12460-4R-12	138.5	104	3.05	3.17	3.07	3.09	0	Missing	3.06	3.51
51	BR12464-4R-134	136.5	109	3.36	3.43	2.94	2.98	2.51		3.15	3.52
52	BR12465-4R-14	138	117	2.89	3.04	2.94	2.97	2.51		2.92	3.51
53	BR12465-4R-181	123.5	107	4.52	4.4	2.94	2.97	0	100% rat damage	3.73	3.55
54	BRRIdhan73(ck)	135	112	3.79	3.79	3.86	3.81	0	Missing	3.83	3.55
55	BRRIdhan87(ck)	120.5	139	3.48	3.53	2.58	2.64	3.47		3.03	3.51
				H2b		0.44		0.34		-	
				LSD<0.05)		0.71		0.83		0.53 0.02	



Fig.6.7.1: AYT-1 and AYT-2 in Kaliganj, Satkhira

Table 6.7.3: Yield and agronomic performance of selected genotypes of AYT-1, Salt-Tolerant Rice (STR) Breeding, Boro 2023-24

Sl. No	Designation	PH (cm)	GD (Days)	Yield (t/ha)			BL UE	BLU P	Pac p
				Gazipur	Satkhira farm	Debhata			
2	BR12650-4R-55	120	142	6.9	4.8	6.9	5.8	5.3	7
3	BR13201-4R-304	104	137	6.7	3.9	1.6	5.3	5.3	7
4	<b>BR12655-4R-32</b>	<b>95</b>	<b>173</b>	<b>6.1</b>	<b>4.9</b>	<b>1.0</b>	5.6		<b>5</b>
5	<b>BR13201-4R-91</b>	<b>104</b>	<b>136</b>	<b>5.8</b>	<b>5.1</b>	<b>1.9</b>	5.6	5.6	<b>5</b>
6	<b>BR12661-4R-33</b>	<b>109</b>	<b>140</b>	<b>7.0</b>	<b>4.4</b>	<b>1.4</b>	5.6	5.2	<b>5</b>
8	BR12649-4R-121	117	147	6.8	4.9	0.9	5.8	5.5	7
9	BR13205-4R-1	103	145	6.6	4.9	1.5	5.7	5.1	7
10	<b>BR13208-4R-76</b>	<b>108</b>	<b>148</b>	<b>6.9</b>	<b>3.2</b>	<b>0.8</b>	5.1	5.3	<b>5</b>
11	<b>BR13201-4R-215</b>	<b>106</b>	<b>140</b>	<b>6.1</b>	<b>3.6</b>	<b>1.8</b>	5.1	5.5	<b>5</b>
12	<b>BR12650-4R-123</b>	<b>109</b>	<b>137</b>	<b>6.7</b>	<b>4.0</b>	<b>1.3</b>	5.4	5.9	<b>5</b>
13	<b>BR12650-4R-77</b>	<b>126</b>	<b>145</b>	<b>7.4</b>	<b>5.7</b>	<b>5.7</b>	6.3	5.7	<b>5</b>
14	BR12639-4R-126	114	137	4.4	5.7	1.9	5.5	5.9	7
15	<b>BR13207-4R-28</b>	<b>113</b>	<b>149</b>	<b>7.0</b>	<b>5.0</b>	<b>1.9</b>	5.9	5.6	<b>5</b>
17	<b>BR12650-4R-24</b>	<b>114</b>	<b>139</b>	<b>6.8</b>	<b>4.7</b>	<b>2.2</b>	5.7	5.4	<b>5</b>
18	BR12660-4R-21	104	147	5.7	6.0	1.2	6.0	5.4	7
19	<b>BR13201-4R-103</b>	<b>105</b>	<b>139</b>	<b>7.3</b>	<b>4.3</b>	<b>2.0</b>	5.7	5.7	<b>5</b>
20	BR12645-4R-71	124	137	6.8	4.9	4.9	5.8	6.1	7
21	BR13201-4R-27	117	144	6.6	3.1	3.1	5.0	5	7
22	<b>BR13201-4R-196</b>	<b>96</b>	<b>137</b>	<b>7.8</b>	<b>5.1</b>	<b>1.1</b>	6.1	5.8	<b>5</b>

23	BR12658-4R-12	116	143	6.9	3.8	1.4	5.4	5.8	7
24	BR13201-4R-49	99	145	6.0	3.6	1.5	5.0	5.1	7
<b>25</b>	<b>BR13197-4R-24</b>	<b>116</b>	<b>146</b>	<b>6.8</b>	<b>4.7</b>	<b>4.7</b>	5.7	5.6	<b>5</b>
<b>26</b>	<b>BR12650-4R-49</b>	<b>111</b>	<b>141</b>	<b>6.5</b>	<b>5.5</b>	<b>3.1</b>	6.0	5.3	<b>5</b>
27	BR13201-4R-268	101	140	8.0	4.9	1.1	6.1	5.2	7
<b>28</b>	<b>BR13201-4R-219</b>	<b>103</b>	<b>145</b>	<b>8.0</b>	<b>5.3</b>	<b>1.4</b>	6.3	6.1	<b>5</b>
29	BR13201-4R-56	93	137	7.9	2.6	1.9	5.2	6	7
30	BR 12639-4R-216	97	145	6.1	6.0	1.8	6.1	5.9	7
<b>31</b>	<b>BR12655-4R-143</b>	<b>109</b>	<b>149</b>	<b>5.2</b>	<b>3.8</b>	<b>5.2</b>	4.9	5.8	<b>5</b>
32	BR13199-4R-136	115	149	6.5	3.2	6.5	5.0	4.8	7
34	BR12643-4R-57	104	148	5.1	4.1	4.1	5.0	5	7
35	BR13208-4R-46	92	144	6.4	4.0	1.6	5.3	5.2	7
36	BR12661-4R-21	121	140	6.4	5.4	6.4	5.9	5.8	7
<b>38</b>	<b>BR13201-4R-30</b>	<b>99</b>	<b>137</b>	<b>7.5</b>	<b>5.4</b>	<b>1.6</b>	6.2	6	<b>5</b>
<b>39</b>	<b>BR13201-4R-250</b>	<b>111</b>	<b>151</b>	<b>5.9</b>	<b>4.4</b>	<b>5.9</b>	5.4	6.3	<b>5</b>
<b>40</b>	<b>BR13201-4R-299</b>	<b>101</b>	<b>146</b>	<b>7.3</b>	<b>5.1</b>	<b>1.2</b>	6.0	5.8	<b>5</b>
41	BR12639-4R-155	123	148	6.6	5.7	1.2	6.1	5.6	7
<b>42</b>	<b>BR12650-4R-72</b>	<b>110</b>	<b>143</b>	<b>6.9</b>	<b>5.1</b>	<b>1.6</b>	5.9	6.2	<b>5</b>
<b>43</b>	<b>BR12646-4R-123</b>	<b>119</b>	<b>148</b>	<b>6.5</b>	<b>4.5</b>	<b>6.5</b>	5.5	5.9	<b>5</b>
<b>44</b>	<b>BR13201-4R-298</b>	<b>100</b>	<b>136</b>	<b>8.6</b>	<b>5.3</b>	<b>0.9</b>	6.4	5.6	<b>5</b>
<b>45</b>	<b>BR13201-4R-15</b>	<b>101</b>	<b>139</b>	<b>7.6</b>	<b>4.8</b>	<b>1.9</b>	6.0	6.6	<b>5</b>
<b>46</b>	<b>BR13198-4R-35</b>	<b>109</b>	<b>141</b>	<b>5.2</b>	<b>4.2</b>	<b>1.2</b>	5.1	6.3	<b>5</b>
47	BR12655-4R-91	102	154	4.9	5.5	4.9	5.5	5.3	7
48	BR13206-4R-120	109	139	6.5	5.1	1.7	5.8	5.7	7
<b>49</b>	<b>BR13201-4R-225</b>	<b>96</b>	<b>137</b>	<b>7.2</b>	<b>5.2</b>	<b>1.3</b>	6.0	5.5	<b>5</b>
<b>50</b>	<b>BR13208-4R-89</b>	<b>115</b>	<b>147</b>	<b>6.6</b>	<b>3.9</b>	<b>6.6</b>	5.3	5.9	<b>5</b>
<b>51</b>	<b>BR12640-4R-250</b>	<b>105</b>	<b>149</b>	<b>7.1</b>	<b>4.7</b>	<b>1.4</b>	5.8	5.7	<b>5</b>
52	BR12658-4R-255	119	137	6.8	4.8	2.6	5.8	5.8	7
<b>53</b>	<b>BR13201-4R-249</b>	<b>114</b>	<b>143</b>	<b>7.8</b>	<b>5.8</b>	<b>1.2</b>	6.4	5	<b>5</b>
<b>54</b>	<b>BR13206-4R-50</b>	<b>109</b>	<b>142</b>	<b>6.8</b>	<b>4.4</b>	<b>1.7</b>	5.6	5.3	<b>5</b>
55	BR12652-4R-81	103	144	6.1	3.9	1.7	5.2	5.5	7
<b>56</b>	<b>BR13204-4R-96</b>	<b>105</b>	<b>145</b>	<b>6.2</b>	<b>4.3</b>	<b>1.3</b>	5.4	5.9	<b>5</b>
BRR1 dhan67 (Tol. Ck)		118	138	6.9	4.8	3	5.9	5.7	1.8
BRR1 dhan89 (S. Ck)		110	150	6.3	3.9	5	5.1	5.2	3.9
BRR1 dhan97 (Tol. Ck)		116	147	6.8	4.7	5	5.7	5.4	1.4
BRR1 dhan99 (Tol. Ck)		105	145	6.8	5	5	5.9	5.7	6.8
LSD (0.05)		4.39	8.97	0.76	0.46		0.75		0.43
H2b		0.72	0.68	0.54	0.82			0.32	0.57

**Table 6.7.4: Yield and agronomic performance of genotypes of AYT-2, Salt-Tolerant Rice (STR) Breeding, Boro 2023-24**

Sl. No.	Designation	PH (cm)	GD (Days)	Yield (t/ha)			BLU E	BLU P	PACP
				Gazipur	Satkhira farm	Debhat a			
<b>1</b>	<b>BR12274-4R-138</b>	<b>99</b>	<b>160</b>	<b>6</b>	<b>5.8</b>	<b>1.6</b>	<b>5.9</b>	<b>6.0</b>	<b>3</b>
2	BR12274-4R-205	103	150	6.1	2.3	1.2	4.2	4.4	7
3	BR11276-4R-132	102	151	6.5	2.5	2.5	4.5	4.6	7
<b>4</b>	<b>BR11718-4R-268</b>	<b>112</b>	<b>159</b>	<b>6.6</b>	<b>6.6</b>	<b>2.3</b>	<b>6.6</b>	<b>6.6</b>	<b>3</b>
5	BR11718-4R-245	94	151	6.6	2.3	6.6	4.4	4.6	<b>5</b>
<b>7</b>	<b>BR11718-4R-379</b>	<b>105</b>	<b>154</b>	<b>7.1</b>	<b>1.5</b>	<b>1.9</b>	<b>4.3</b>	<b>4.9</b>	<b>5</b>
<b>8</b>	<b>BR11276-4R-196</b>	<b>118</b>	<b>148</b>	<b>7.7</b>	<b>3.6</b>	<b>1.8</b>	<b>5.7</b>	<b>4.3</b>	<b>3</b>
<b>9</b>	<b>BR11276-4R-100</b>	<b>121</b>	<b>153</b>	<b>6.8</b>	<b>0.7</b>	<b>1.4</b>	<b>3.8</b>	<b>5.5</b>	<b>3</b>
<b>10</b>	<b>BR11276-4R-67</b>	<b>109</b>	<b>148</b>	<b>8.2</b>	<b>3.5</b>	<b>1.8</b>	<b>5.9</b>	<b>3.9</b>	<b>3</b>
11	BR12274-4R-93	101	149	7.5	2.2	1.2	4.8	5.6	<b>5</b>
<b>12</b>	<b>BR11720-4R-89</b>	<b>124</b>	<b>149</b>	<b>7.2</b>	<b>4.4</b>	<b>1.0</b>	<b>5.8</b>	<b>4.8</b>	<b>3</b>

13	BR11716-4R-175	119	152	5.9	3.1	1.1	4.5	5.7	5
14	<b>BR11276-4R-152</b>	<b>110</b>	<b>146</b>	<b>7.8</b>	<b>2.2</b>	<b>2.5</b>	<b>5.0</b>	<b>4.7</b>	<b>5</b>
15	<b>BR11276-4R-221</b>	<b>118</b>	<b>153</b>	<b>7.5</b>	<b>2.2</b>	<b>1.5</b>	<b>4.9</b>	<b>4.8</b>	<b>5</b>
16	BR11718-4R-78	90	145	6.8	3.2	1.3	5.0	4.8	5
17	BR11276-4R-210	110	150	8.2	0.8	1.7	4.5	5.0	5
18	<b>BR12275-4R-215</b>	<b>112</b>	<b>158</b>	<b>6.1</b>	<b>6.1</b>	<b>1.0</b>	<b>6.1</b>	<b>4.3</b>	<b>5</b>
19	<b>BR11276-4R-212</b>	<b>114</b>	<b>152</b>	<b>6.3</b>	<b>1.7</b>	<b>1.4</b>	<b>4.0</b>	<b>6.2</b>	<b>5</b>
20	BR11276-4R-21	117	152	7.6	1.0		4.3	4.2	1.0
21	<b>BR12276-4R-156</b>	<b>116</b>	<b>149</b>	<b>7.2</b>	<b>2.5</b>	<b>2.2</b>	<b>4.9</b>	<b>4.2</b>	<b>5</b>
22	BR11276-4R-229	112	151	7.0	2.6	3.8	4.8	4.8	7
23	BR11276-4R-166	104	146	6.4	2.0	1.6	4.2	4.8	5
24	BR12275-4R-90	95	153	7.3	2.4	1.2	4.9	4.3	7
25	<b>BR12274-4R-255</b>	<b>111</b>	<b>158</b>	<b>7.0</b>	<b>7.0</b>	<b>1.3</b>	<b>7.0</b>	<b>4.8</b>	<b>3</b>
28	<b>BR12274-4R-188</b>	<b>102</b>	<b>150</b>	<b>7.1</b>	<b>2.1</b>	<b>1.9</b>	<b>4.6</b>	<b>6.9</b>	<b>3</b>
29	BR12275-4R-125	100	150	5.8	1.9	1.7	3.8	4.3	5
30	<b>BR11276-4R-104</b>	<b>110</b>	<b>151</b>	<b>8.5</b>	<b>1.7</b>	<b>0.9</b>	<b>5.1</b>	<b>4.3</b>	<b>3</b>
31	<b>BR11276-4R-150</b>	<b>104</b>	<b>153</b>	<b>6.3</b>	<b>2.6</b>	<b>1.7</b>	<b>4.5</b>	<b>6.8</b>	<b>3</b>
32	<b>BR11276-4R-19</b>	<b>109</b>	<b>147</b>	<b>6.7</b>	<b>1.5</b>	<b>2.3</b>	<b>4.1</b>	<b>4.6</b>	<b>3</b>
33	<b>BR11718-4R-10</b>	<b>105</b>	<b>152</b>	<b>6.8</b>	<b>0.9</b>	<b>1.3</b>	<b>3.9</b>	<b>4.1</b>	<b>3</b>
34	BR11718-4R-84	100	148	7.6	2.3	1.2	4.9	4.6	5
35	<b>BR12274-4R-310</b>	<b>109</b>	<b>151</b>	<b>8.3</b>	<b>1.9</b>	<b>1.2</b>	<b>5.1</b>	<b>4.8</b>	<b>5</b>
36	<b>BR11276-4R-8</b>	<b>110</b>	<b>153</b>	<b>5.9</b>	<b>3.8</b>	<b>5.9</b>	<b>4.8</b>	<b>4.2</b>	<b>5</b>
37	<b>BR11718-4R-92</b>	<b>134</b>	<b>161</b>	<b>7.5</b>	<b>7.5</b>	<b>0.7</b>	<b>7.5</b>	<b>4.0</b>	<b>5</b>
38	<b>BR12274-4R-193</b>	<b>121</b>	<b>143</b>	<b>9.3</b>	<b>3.0</b>	<b>2.1</b>	<b>6.1</b>	<b>4.8</b>	<b>5</b>
39	<b>BR11718-4R-110</b>	<b>97</b>	<b>152</b>	<b>5.5</b>	<b>1.1</b>	<b>1.6</b>	<b>3.3</b>	<b>4.9</b>	<b>3</b>
41	BR12274-4R-113	103	150	7.1	1.4	1.4	4.3	7.2	5
42	<b>BR11718-4R-230</b>	<b>110</b>	<b>153</b>	<b>5.6</b>	<b>2.4</b>	<b>2.3</b>	<b>4.0</b>	<b>5.0</b>	<b>5</b>
43	<b>BR11718-4R-125</b>	<b>134</b>	<b>161</b>	<b>6.5</b>	<b>6.5</b>	<b>1.0</b>	<b>6.5</b>	<b>5.6</b>	<b>5</b>
44	<b>BR11276-4R-139</b>	<b>119</b>	<b>151</b>	<b>8.7</b>	<b>2.5</b>	<b>1.1</b>	<b>5.6</b>	<b>3.7</b>	<b>5</b>
45	BR12276-4R-210	126	158	5.1	5.1	5.1	5.1	4.3	7
46	<b>BR11718-4R-46</b>	<b>107</b>	<b>149</b>	<b>7.3</b>	<b>1.9</b>	<b>1.6</b>	<b>4.6</b>	<b>5.0</b>	<b>3</b>
47	<b>BR11276-4R-228</b>	<b>115</b>	<b>154</b>	<b>7.3</b>	<b>1.1</b>	<b>1.1</b>	<b>4.2</b>	<b>4.3</b>	<b>3</b>
48	<b>BR11276-4R-132</b>	<b>104</b>	<b>151</b>	<b>7.5</b>	<b>1.4</b>	<b>1.2</b>	<b>4.5</b>	<b>6.5</b>	<b>3</b>
	BRR1 dhan67	119	148	7.9	2.4	1.3	5.2	5.7	3
	BRR1 dhan89	120	160	5.8	6.3	1.8	5.7	5.2	5
	BRR1 dhan97	114	150	8.1	0.9	1.2	4.5	5.1	5
	BRR1 dhan99	110	149	7.0	2.8	1.5	4.9	5.7	5
	LSD <sub>0.05</sub>	8.21	3.66	0.81	0.65	0.65	1.55		5
	H2b	0.63	0.62	0.58	0.64	0.89	0.53		5

## Experiment 6.8: Regional Yield Trial (RYT)

**Principal Investigator:** M. A. Rahman

**Co-investigators:** Nusrat Jahan, Armin Akter Setu and Ribed Farzana Disha

**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:** Forty-nine most promising in RYT-1, RYT-2 and RYT-3 in T. Aman season were evaluated at eight locations and total 12 promising genotypes in RYT in Boro season were evaluated, respectively at six locations in RYT-1 and RYT-2 in T. Aman season and nine locations 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. In T. Aman, BRRI dhan89 and BRRI dhan73 were used as checks in T. Aman and BRRI dhan67, BRRI dhan89 and BRRI dhan99 were used as tolerant and sensitive checks in Boro, respectively. 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 twelve genotypes, two genotypes such as BR13118-4R-76 and BR13106-4R-438 gave higher yield than check varieties (**Table 6.8.1**) and their growth duration was also lower than check varieties. In RYT-2, 16 genotypes were evaluated and six genotypes as BR13103-4R-37, BR13103-4R-7, BR13105-4R-37, BR13115-4R-60, BR13115-4R-122 and BR13115-4R-70 were selected for ALART based on grain yield, photosensitivity and grain quality to replace popular variety BRRI dhan30 in the southern coastal zone (**Table 6.8.2**). Among them, BR13103-4R-37, BR13105-4R-37 and BR13103-4R-7 produced 4.14 t/ha, 4.4 t/ha and 4.1t/ha respectively which was higher than check varieties.

In Boro, from RYT, out of twelve genotypes, BR13113-4R-63, BR13113-4R-185, BR13106-4R-184 genotypes were selected to conduct ALART. In ALART-STR (Boro), one genotype BR11712-4R-44 was selected and recommended for ALART based on grain yield, salinity tolerance and grain quality (**Table 6.8.4 to 6.8.6; Fig 6.8.3**). BR11712-4R-44 gave more than 1.0 t/ha yield under favorable condition comparing with both the check varieties BRRI dhan67 and BRRI dhan89 (**Table 6.8.5**)

**Table 6.8.1: Yield and agronomic performance of genotypes in RYT-1, Salt tolerant Rice, T Aman 2023-24**

Sl.	Designation	GD (day s)	PH (cm)	Grain Yield (t/ha)								All locations (Pooled)	
				Gazipur	Cumilla	Satkhira farm	Kaliganj	Rajshahi	Rangpur	Sonagazi	Gopalganj	BLUE	pBLU P
				1	BR13113-4R-63	107	113	4.4	5.6	4.8	4.3	5.6	4
3	BR13118-4R-76	123	112	5	6.1	4.7	3.7	4.8	4.5	5.7	5.3	5.2	5
8	BR13106-4R-438	105	110	4.1	5.6	4.5	4.6	6.2	5	5.1	5.2	5.1	4.9
13	BRRI dhan73	125	120	4.3	5.2	4.3	4	5.7	4.9	5	5.2	5	4.8
14	BRRI dhan87	127	122	3.9	5.8	4	3.9	5.5	4.1	5.4	5.8	5	4.8
	H2b	0.55	0.81										0.42
	LSD<0.05	3.4	4.78										0.56
	Reliability												0.52



**Fig. 6.8.1: Pictorial view of genotypes in RYT-1 Salinity Breeding, T. Aman 2023-24 at different regional station**

**Table 6.8.2: Yield and agronomic performance of genotypes in RYT-2, Salt tolerant Rice, T Aman 2023-24**

Sl #	Designation	GD (days)	PH (cm)	Grain yield (t/ha)									
				Gazipur	Cumilla	Satkhirafarm	Kaliganj	Rangpur	Sonagazi	Gopalganj	All locations (Pooled)		
				BLUE	BLUE	BLUE	BLUE	BLUE	BLUE	BLUE	Emmenan	pBLUP	
1	BR13103-4R-37	145	129	2.5	6.7	2.5	2.8	4.4	5	5.2	4.1	4.0	
2	BR13103-4R-7	141	118	3	6.3	2.7	2.8	4.6	4.6	4.4	4.1	4.0	
3	BR13115-4R-159	138	125	2.1	4.8	3.1	1.3	2.8	2.9	3.9	3.0	3.2	
4	BR13115-4R-106	140	126	3.3	5.1	2.7	2	3	4.8	3.9	3.5	3.6	
5	BR13115-4R-93	139	108	2.8	4.8	2.7	1.8	2.5	4.2	4.1	3.3	3.4	
6	BR13105-4R-37	140	95	3.1	5.5	3.2	3.2	4.9	5.3	5.2	4.4	4.2	
7	BR13115-4R-60	138	122	2.8	6	3.9	1.7	3.5	4.2	4.2	3.7	3.7	
8	BR13115-4R-122	139	115	3.1	5.2	3.3	1.9	3.6	5.0	4.4	3.8	3.8	
9	BR13115-4R-8	139	119	3.3	4.8	4.2	1.7	3.8	4.4	3.6	3.7	3.7	
11	BR13121-4R-40	132	113	3.9	5.5	3.6	1.7	4.9	4.9	4.2	4.1	4.0	
12	BR13117-4R-95	138	136	3.2	5.9	2.5	1.8	4.1	3.7	5.9	3.9	3.8	
13	BR13115-4R-63	138	121	3.4	5.3	3	1.8	3.7	4.0	4.5	3.7	3.7	
14	BR13115-4R-70	143	120	2.6	3.8	2.7	1.6	3.3	3.8	4.3	3.2	3.3	
16	BR13115-4R-117	140	130	3.5	5.2	3	1.9	3.8	3.3	3.9	3.5	3.6	
17	BR23 (ck)	140	138	1.8	5.2	3.3	3.3	3.3	4.3	4.7	3.7	3.7	
18	BRRI dhan30 (ck)	138	122	3.6	4.9	3.2	2.3	4.5	4.2	4.4	3.9	3.8	
19	BRRI dhan87 (ck)	125	129	2.5	5.7	2.7	2.1	4.2	5.1	5.8	4.0	3.9	
LSD<0.05												0.32	
H2b				0.22	0.75	0.53	0.95	0.7	0.87	0.89	0.37		



**Fig. 6.8.2: Performance of same genotype in OYT, T. Aman 2022-23 and RYT-2 (Photosensitive), Salt Tolerant Rice, T. Aman 2023-24**

**Table 6.8.3: Yield and agronomic performance of genotypes in RYT, Salt Tolerant Rice, Boro 2023-24**

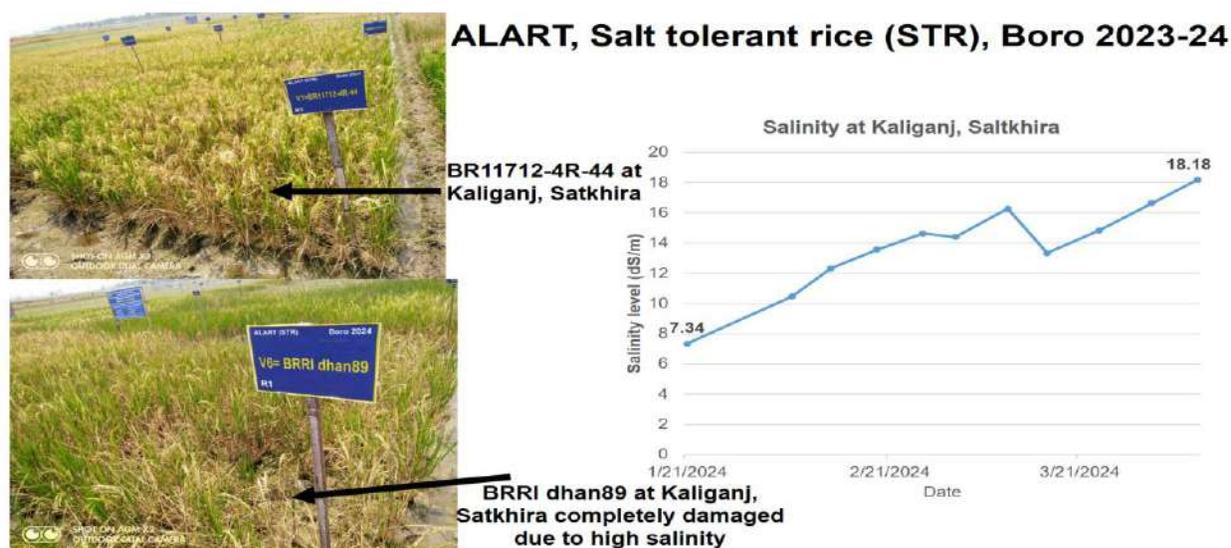
SL No	Designation	PH (cm)	GD (Days)	Bhanga	Cumilla	Gazipur	Gopalganj	Rajshahi	Rangpur	Satkhira	Sonagazi	Kushtia	Yield (t/ha)
<b>1</b>	<b>BR13113-4R-63</b>	<b>100</b>	<b>146</b>	<b>8.5</b>	<b>5.2</b>	<b>9.1</b>	<b>6.6</b>	<b>7.8</b>	<b>6.9</b>	<b>6.1</b>	<b>7.9</b>	<b>7.2</b>	<b>7.3</b>
2	BR13125-4R-92	95	150	7.4	6.1	9.7	6.2	7.6	6.9	5.2	7.8	7.5	7.2
3	BR131138-4R-76	101	151	8.5	6.8	8.3	7.3	7.7	6.9	5	7.7	7	7.2
<b>4</b>	<b>BR13113-4R-185</b>	<b>95</b>	<b>153</b>	<b>7.9</b>	<b>7.3</b>	<b>8.9</b>	<b>7</b>	<b>8.1</b>	<b>7.1</b>	<b>5.7</b>	<b>8.1</b>	<b>8</b>	<b>7.6</b>
5	BR13111-4R-191	106	158	7.8	5.9	6.2	7.1	8.3	7.3	4.4	7.3	7.1	6.8
6	BR13106-4R-469	112	155	7.5	7	8.5	8.1	7.8	5.6	5.8	7.2	6.8	7.1
7	BR13108-4R-232	105	151	7	5.7	8.9	7.1	7.9	6.8	5.7	8.3	6.6	7.1
8	BR13106-4R-438	104	152	7.2	5.3	8.5	7.7	8.2	6.1	5.4	8	7.3	7.1
9	BR13111-4R-63	105	152	7.5	6.9	8.5	7.4	8.2	6.3	5.7	8.4	6.9	7.3
<b>10</b>	<b>BR13106-4R-184</b>	<b>94</b>	<b>153</b>	<b>7.8</b>	<b>6.7</b>	<b>8.4</b>	<b>6.8</b>	<b>7.2</b>	<b>6.7</b>	<b>5.9</b>	<b>7.8</b>	<b>7.4</b>	<b>7.2</b>
11	BR13122-4R-136	106	156	8.1	7.1	9	5.9	8.2	6	5.6	8.3	7.6	7.3
12	BR13113-4R-116	102	150	7.5	6.6	9.1	6.4	7.6	7.4	6.2	8.6	7.1	7.4
13	BRRi dhan67	110	148	7.5	5.6	7.3	6.1	7.1	6.9	6.2	6.5	6.9	6.7
14	BRRi dhan28	103	145	6.8	6.3	5.5	6	7.2	6.5	6	3	6.3	5.9
15	BRRi dhan88	91	146	7	6.6	4.1	6.7	7.2	5.9	6.1	5.9	6.3	6.2
LSD< 0.05		5.42	3.23	0.7	0.6	0.84	0.84	0.34	0.59	0.6	0.9	0.7	0.84
H2b		0.69	0.88	0.83	0.71	0.56	0.6	0.63	0.87	0.9	0.65	0.7	0.43



**Fig. 6.8.1c: Pictorial view of RYT at East byde, Gazipur, Salt Tolerant Rice, Boro 2023-24**



**Fig.6.8.1.d: Pictorial view of RYT at Satkhira farm, Salt Tolerant Rice, Boro 2023-24**



**Fig.6.8.3: BR11712-4R-44 shows salinity tolerance at both seedling and reproductive stages in ALART at farmer's field Kaliganj, Satkhira (EC ranging from 7.34 to 18.18 dS/m) where BRRi dhan89 damages completely and exhibits sterility, Salt Tolerant Rice, Boro 2023-24**

**Table 6.8.4: Growth duration (Days) of the rice genotypes under ALART, Salt tolerant rice (STR), Boro 2023-24 (Saline area)**

SN	Designation	Growth duration (days)				Mean
		Bagerhat Sadar	Noakhali Sadar	Kaliganj, Satkhira	Shyamnagar, Satkhira	
<b>1</b>	<b>BR11712-4R-44</b>	<b>138</b>	<b>140</b>	<b>141</b>	<b>141</b>	<b>140</b>
2	BR11712-4R-93	141	142	143	143	142
3	BR11712-4R-12	141	149	142	143	144
4	BR11712-4R-6	146	142	137	138	141
5	BRRi dhan67 (Ck)	144	140	141	142	142
6	BRRi dhan89 (Ck)		150		149	150
	LSD <sub>0.05</sub>			1.12		
	CV (%)			0.48		

**Table 6.8.5: Grain yield of the rice genotypes under ALART, Salt tolerant rice (STR), Boro 2023-24 (Without salinity)**

SI.No	Designation	Yield (t/ha)						Mean
		Barishal Sadar	BRRi HQ	Companiganj Noakhali	Kolapara, Patuakhali	Satkhira Sadar	Sonagazi Feni	
<b>1</b>	<b>BR11712-4R-44</b>	<b>6.96</b>	<b>8.26</b>	<b>7.39</b>	<b>5.65</b>	<b>7.23</b>	<b>6.39</b>	<b>6.98</b>
2	BR11712-4R-93	7.41	8.07	6.64	5.47	6.18	5.88	6.61
3	BR11712-4R-12	6.28	7.34	6.24	4.57	5.56	6.4	6.06
4	BR11712-4R-6	7.1	8.09	5.89	4.48	7.52	0	6.62
5	BRRi dhan67	4.53	5.96	5.72	5.03	7.48	0	5.74
6	BRRi dhan89	6.27	6.79	6.13	4.95	5.14	5.64	5.82
	LSD <sub>0.05</sub>				0.94			
	CV%				8.89			

**Table 6.8.6: Grain yield of the rice genotypes under ALART, Salt tolerant rice (STR), Boro 2023-24 (Saline area)**

SI. No.	Designation	Yield (t/ha)				Mean
		Bagerhat Sadar	Noakhali Sadar	Kaliganj, Satkhira	*Shyamnagar, Satkhira	
<b>1</b>	<b>BR11712-4R-44</b>	<b>2.81</b>	<b>3.4</b>	<b>2.03</b>	<b>1.02</b>	<b>2.32</b>
2	BR11712-4R-93	2.01	3.94	2.05	0.9	2.23
3	BR11712-4R-12	2.88	3.13	2.04	1.06	2.28
4	BR11712-4R-6	2.55	3.71	1.64	1.22	2.28
5	BRRi dhan67	2.48	3.23	1.9	1.55	2.29
6	BRRi dhan89	0.0	2.52	0.0	0.20	1.36
	LSD <sub>0.05</sub>				0.43	
	CV (%)			11.51		

#### Experiment 6.9: Proposed Variety Trial (PVT)

BR11716-4R-102 has been recommended by National Technical Committee to release as BRRi dhan113 (lodging tolerant and salinity tolerant) for T. Aman season. This newly

recommended variety BRRi dhan113 has produced more than one t/ha yield comparing with BRRi dhan73 which is ~25.0% higher yield than this check (Table 6.7)

**Table.6.7. Yield Performance of genotypes in PVT Salinity Breeding, T. Aman 2023-24**

Location	Yield (kg/ha)		Growth duration (days)		Yield advantage over check (%)	Remarks
	I-0074 (BR11716-4R-102): Proposed variety	I-0073 (BRRi dhan73): Check	I-0074 (BR11716-4R-102): Proposed variety	I-0073 (BRRi dhan73): Check		
Gazipur	5165	4082	117	116	26.53	Check Lodging
Satkhira Farm	5986	4511	118	119	32.7	Check Lodging
Kaliganj, Satkhira	5279	3383	119	116	56.04	Check Lodging, Salinity affected
Dumuria, Khulna	4589	3768	113	113	21.79	Salinity and BPH
Jashore	3398	3064	128	128	10.9	Rat, BPH damage
Patuakhali	5163	3856	122	119	33.9	
BRRi Farm	4930	4600	130	123	7.17	
Sonagazi, Feni	4773	4321	118	115	10.46	
Sonagazi, Feni (On Farm)	4773	4321	118	115	10.46	
Companiganj, Noakhali	4140	3691	117	119	12.164	Tide affected
Gopalganj	6126	5300	118	115	15.6	
<b>Mean</b>	<b>5079.5</b>	<b>4070.5</b>	<b>120</b>	<b>118</b>	<b>24.79</b>	



**Fig.8. Field view of PVT plots at different locations, T Aman 2023-24**

### 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.

**Materials and methods:** Five genotypes along with BRRi dhan28 and BRRi dhan88 as standard checks were evaluated in ten locations of Bangladesh in Boro season. 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<sub>4</sub> 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<sup>-1</sup>) and grain yield (t/ha), insect and disease infestation.

Principal Investigator: ARD Scientist

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**Results:** In ALART, three genotypes; BR13113-4R-63 (7.5 t/ha), BR13113-4R-116 (7.3 t/ha), and were selected to conduct ALART with BRRi dhan28 and BRRi dhan88 as standard checks.

**Table.6.9.1. Yield Performance of genotypes in ALART Salinity Breeding, Boro 2023-24**

SI. No.	Designation	PH (cm)	GD (Days)	Yield (tha <sup>-1</sup> )						Mean Yield (t/ha)
				Bhanga	Cumilla	Gopalganj	Kushia	Rangpur	Satkhira	
<b>1</b>	<b>BR13113-4R-63</b>	<b>102</b>	<b>145</b>	<b>8.8</b>	<b>7.7</b>	<b>8.4</b>	<b>6.6</b>	<b>7.5</b>	<b>6.1</b>	<b>7.5</b>
2	BR13106-4R-184	101	150	8.4	8.2	8.1	6	6.6	5	7.1
<b>3</b>	<b>BR13113-4R-116</b>	<b>100</b>	<b>147</b>	<b>8.6</b>	<b>8.1</b>	<b>9.2</b>	<b>6.4</b>	<b>5.7</b>	<b>6</b>	<b>7.3</b>
4	BR13122-4R-136	109	152	8.5	8.4	9	6.3	7	5.2	7.4
5	BR13111-4R-63	106	148	7.9	8.5	8.8	6.8	7.7	5.9	7.6
6	BRRi dhan28 (Ck)	102	145	7.9	7.6	6.4	6.1	7.1	6.3	6.9
7	BRRi dhan88 (Ck)	101	147	7.3	7.7	7	6.1	7.4	5.6	6.8
LSD<0.05		7.8	4.37	0.59	0.55	0.49	0.35	0.51	0.35	0.67
H2b		0.42	0.6	0.82	0.71	0.7	0.79	0.62	0.52	0.47



**Fig.6.9.1. Field view of ALART plot Boro 2023-24**

**PROJECT: IRRI-NARES Network Trial in Bangladesh for salt-stress prone environment, T. Aman 2023-24 (Wet season)**

**Summary:** One hundred fifteen (115) and twenty-five (25) breeding lines from IRRI along with thirteen international check varieties and four national check varieties were evaluated at two locations viz., Shyamnagar and Kaliganj Upazillas of Satkhira during T. Aman 2023 to select superior genotypes aiming to include directly in the variety release system or use as parents in the breeding program. In Kaliganj, grain yield ranged from 0.92 tha<sup>-1</sup> to 5.70tha<sup>-1</sup> in stage-1 trial and 1.79 tha<sup>-1</sup> to 5.92 tha<sup>-1</sup> in stage-2 trial. One the other hand growth duration ranged from 102 days to 137 days in stage-1 trial and 107 days to 122 days in stage-2 trial respectively. Among 115 entries, 31 genotypes were selected based on grain type and salinity performance in Kaliganj. In Shyamnagar, most of the entries were damaged due to salinity

and rat. Among all these entries two genotypes were selected in stage-1 trial and one genotype was selected in stage-2 trial in Shyamnagar.

**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 1: Evaluation of genotypes under IRRI-NARES Network Trial T. Aman 2023**

**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 115 and 25 elite genotypes were evaluated in Stage-1 and Stage-2 along with IRRI 147, IRRI 242, CSR 28, A69-1, IR 29, IT 42, IRRI 119, IRRI 251, IRRI 224, IR05F101, CIHERANG, IRRI 154, IRRI 252, BRRI dhan79, Binadhan-23, BR10 and BR23 at Satkhira. The unit plot size was 3.00 square meter (5 rows× 15 hills). The field layout was done following Alpha lattice design and RCBD with two replications. Thirty-five days' seedlings were transplanted @ 2-3 seedlings per hill with the spacing of 20 cm × 20 cm. Per hectare fertilizer were applied at the rate of 300 kg Urea: 100 kg TSP: 165 kg MoP: 112 kg Gypsum: 12 kg ZnSO<sub>4</sub> kg 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 1: List of all genotypes in T. Aman 2023 at Kaliganj under IRRI-NARES Network Trial Stage-1**

Entry	Designation	GD (days)	PH (cm)	Yield (t/ha)	Yield (t/ha)
1	IR22LT1583	119	109	4.5	4.48
2	IR22LT1219	117	96	4.84	4.81
3	IR22LT1348	121	111	4.52	4.50
4	IR22LT1316	123	99	3.75	3.75
5	IR22LT1490	125	94	4.26	4.25
6	IR22LT1560	113	94	4.58	4.56
7	IR22LT1078	128	74	4.06	4.06
8	IR22LT1589	122	103	4.27	4.26
9	IR22LT1380	128	72	4.13	4.12
10	IR22LT1575	112	82	3.45	3.46
11	IR22LT1639	123	111	2.81	2.84
12	IR22LT1345	122	106	5.35	5.31
13	IR22LT1429	122	94	3.91	3.91
14	IR22LT1735	128	110	3.49	3.50
15	IR22LT1621	128	108	4.86	4.83
16	IR22LT1601	111	100	4.88	4.85
17	IR22LT1585	129	99	3.76	3.77
18	IR22LT1718	111	105	4.03	4.02
19	IR22LT1610	112	94	4.7	4.68

20	IR22LT1732	121	96	4.6	4.58
21	IR22LT1264	118	98	4.05	4.05
22	IR22LT1503	121	85	3.94	3.94
23	IR22LT1518	117	95	4.82	4.79
24	IR22LT1736	103	90	3.31	3.33
25	IR22LT1605	122	95	5.15	5.11
26	IR22LT1591	119	101	4.95	4.92
27	IR22LT1599	114	98	4.52	4.50
28	IR22LT1582	117	103	3.95	3.95
29	IR22LT1156	119	94	4.24	4.23
30	IR22LT1326	122	101	3.48	3.49
31	IR22LT1556	110	81	2.64	2.68
32	IR22LT1603	117	105	4.59	4.57
33	IR22LT1521	122	97	3.94	3.94
34	IR22LT1327	123	101	3.42	3.43
35	IR22LT1259	119	97	4.17	4.17
36	IR22LT1688	110	103	4.12	4.12
37	IR22LT1499	116	112	2.22	2.27
38	IR22LT1704	109	94	4.53	4.51
39	IR22LT1266	121	91	4.7	4.68
40	IR22LT1108	122	90	3.94	3.94
41	IR22LT1694	116	98	3.99	3.99
42	IR22LT1257	113	97	4.63	4.61
43	IR22LT1622	131	85	3.88	3.88
44	IR22LT1304	103	88	2.93	2.96
45	IR22LT1237	120	89	4.00	4.00
46	IR22LT1393	128	83	3.26	3.28
47	IR22LT1246	124	92	4.97	4.93
48	IR22LT1698	120	102	5.43	5.38
49	IR22LT1557	123	92	4.15	4.14
50	IR22LT1479	121	103	4.49	4.47
51	IR22LT1432	123	100	4.52	4.50
52	IR22LT1198	114	86	4.45	4.43
53	IR22LT1087	111	100	3.39	3.41
54	IR22LT1507	119	102	4.13	4.12
55	IR22LT1651	122	102	4.35	4.34
56	IR22LT1070	127	78	3.74	3.75
57	IR22LT1291	113	95	5.76	5.70
58	IR22LT1310	103	91	2.73	2.77
59	IR22LT1520	120	102	3.53	3.54
60	IR22LT1627	118	101	5.27	5.22
61	IR22LT1397	122	96	4.26	4.25
62	IR22LT1005	112	96	4.49	4.47
63	IR22LT1600	118	101	4.67	4.64
64	IR22LT1099	122	91	3.21	3.23
65	IR22LT1329	125	118	4.31	4.30
66	IR22LT1104	120	88	4.28	4.27
67	IR22LT1343	110	102	3.86	3.87
68	IR22LT1511	122	90	4.09	4.08
69	IR22LT1538	117	98	4.09	4.09
70	IR22LT1221	118	102	3.87	3.87
71	IR22LT1554	118	107	4.91	4.88
72	IR22LT1539	112	94	3.72	3.72
73	IR22LT1469	112	102	3.64	3.65
74	IR22LT1213	117	95	4.55	4.53
75	IR22LT1288	117	101	4.12	4.11
76	IR22LT1625	116	97	3.75	3.76

77	IR22LT1611	118	96	4.19	4.18
78	IR22LT1664	117	93	4.07	4.07
79	IR22LT1313	123	83	3.11	3.14
80	IR22LT1256	112	97	4.52	4.50
81	IR22LT1383	117	96	3.64	3.65
82	IR22LT1692	110	93	2.5	2.55
83	IR22LT1356	111	90	3.39	3.41
84	IR22LT1571	103	98	2.86	2.89
85	IR22LT1475	123	102	4.16	4.15
86	IR22LT1779	113	97	4.2	4.19
87	IR16F1065	127	104	4.68	4.66
88	IR20LT2435	136	103	4.31	4.30
89	IR21LT1495	110	103	4.45	4.44
90	IR21LT1266	108	92	3.91	3.91
91	IR18M1155	109	98	4.79	4.76
92	IR18LT1300	122	94	3.16	3.18
93	IR19R1216	119	93	4.23	4.22
94	IR19R1138	111	102	4.41	4.39
95	IR16T1666	122	102	4.52	4.50
96	IR16T1372	123	108	4.46	4.44
97	IR18M1150	127	80	2.24	2.30
98	IR21LT1456	124	114	2.81	2.85
99	IR21LT1445	121	101	4.96	4.93
100	IR19LT2069	121	95	3.63	3.64
101	IR19LT2055	111	103	4.19	4.18
102	IR21LT1388	118	88	3.62	3.63
103	IR17A2786	103	66	1.57	1.65
104	IR21LT1485	123	85	3.31	3.33
105	IR18A1133	122	93	3.59	3.60
106	IR18A1930	121	93	4.21	4.20
107	IR21LT1407	115	94	3.93	3.93
108	IR21LT1543	120	94	2.95	2.98
109	IR21LT1498	112	93	2.85	2.89
110	IR21LT1392	117	87	4.24	4.23
111	IR21LT1020	119	104	4.88	4.85
112	IR17A2780	102	88	2.57	2.61
113	IR17A2800	117	91	4.16	4.16
114	IR21LT1449	125	91	0.82	0.92
115	IR18A1251	116	115	4.32	4.31
116	IRRI 147	117	99	4.77	4.75
117	IRRI 242	111	100	4.72	4.70
118	CSR 28	119	97	4.59	4.57
119	A69-1	124	103	4.62	4.60
120	IR 29	117	94	4.64	4.62
121	IR 42	137	87	3.01	3.04
122	IRRI 119	128	104	3.95	3.95
123	IRRI 251	120	91	4.61	4.59
124	IRRI 224	128	97	3.7	3.71
125	IR05F101	132	87	3.81	3.81
126	CIHERANG	117	97	4.31	4.30
127	IRRI 154	112	98	3.99	3.99
128	IRRI 252	128	90	4.16	4.15
129	BIRRI dhan79	129	96	4.49	4.47
130	Binadhan-23	121	110	3.83	3.84
LSD <0.05		1.6	2.25	0.37	
Heritability		0.90	0.79	0.67	

**Table 2: List of all genotypes in T. Aman 2023 at Shyamnagar under IRRI-NARES Network Trial Stage-1**

Entry No	Designation	GD (days)	PH (cm)	Yield (t/ha)	Remarks
1	IR22LT1583				80% rat, salt, bph, late
2	IR22LT1219	123	94	2.72	
3	IR22LT1348	124	93	1.82	
4	IR22LT1316	122	86	1.50	
5	IR22LT1490	123	99	2.44	bph
6	IR22LT1560	122	95	2.01	
7	IR22LT1078				80%rat, salt, bph, late
8	IR22LT1589	124	95	2.48	
9	IR22LT1380				late, damage, salt
10	IR22LT1575				damage salt
11	IR22LT1639				late, salt
12	IR22LT1345	123	95	1.59	
13	IR22LT1429	126	90	1.55	
14	IR22LT1735				damage-salt
15	IR22LT1621				Late
16	IR22LT1625				rat damage 100%
17	IR22LT1585				Late
18	IR22LT1718				rat damage 100%
19	IR22LT1610	121	92	1.79	
20	IR22LT1732	122	80	2.00	
21	IR22LT1264				rat damage 100%
22	IR22LT1503	123			damage-salt
23	IR22LT1518	120	90	1.47	
24	IR22LT1736	111			100%rat damage, salt, bph
25	IR22LT1605	121	92	1.72	
26	IR22LT1591	121	100	2.90	
27	IR22LT1599	112			10%rat damage salt
28	IR22LT1582	125	97	1.22	
29	IR22LT1156	122	88	2.29	
30	IR22LT1326				late damage, bph, salt
31	IR22LT1556				rat damage 100%
32	IR22LT1603				100% rat damage
33	IR22LT1521	123	95	1.60	Late
34	IR22LT1327	123	88	1.36	Late
35	IR22LT1259				rat 100%
36	IR22LT1688				rat damage 100%
37	IR22LT1499				rat damage 100%
38	IR22LT1704				bph, salt damage
39	IR22LT1266				rat damage 100%
40	IR22LT1108	122	80	1.55	
41	IR22LT1694				rat damage 100%
42	IR22LT1257				rat damage
43	IR22LT1622				Late
44	IR22LT1304				rat 100%
45	IR22LT1237	119	87	1.65	
46	IR22LT1393				Rat and salt damage
47	IR22LT1246	130	91	2.37	
48	IR22LT1698	122	100	4.43	
49	IR22LT1557				damage, salt
50	IR22LT1479	123	95	2.63	10% rat damage
51	IR22LT1432	125	90	1.10	
52	IR22LT1198	121	88	1.69	
53	IR22LT1087	119	93	1.28	
54	IR22LT1507	121	98	2.67	

55	IR22LT1651	123	98	1.91	
56	IR22LT1070				late, bph,salt
57	IR22LT1291	124	95	1.87	
58	IR22LT1310				rat damage 100%
59	IR22LT1520	120	93	1.62	40%rat, bph
60	IR22LT1627	122	101	3.53	
61	IR22LT1397	124	96	2.41	
62	IR22LT1005				rat damage 100%
63	IR22LT1600	116	94	3.41	5% rat
64	IR22LT1099				Late
65	IR22LT1329	123	97	1.39	
66	IR22LT1104	123	79	2.58	
67	IR22LT1343				rat damage 100%
68	IR22LT1511	122	94	2.69	
69	IR22LT1538	116	87	2.41	
70	IR22LT1221	123	99	2.03	
71	IR22LT1554	120	93	2.86	
72	IR22LT1539				100% rat damage, salt
73	IR22LT1469	116	81	1.59	
74	IR22LT1213	123	93	1.85	
75	IR22LT1288				80%rat damage, salt
76	IR22LT1625				100% rat damage
77	IR22LT1611	119	93	1.36	
78	IR22LT1664	121	93	1.84	
79	IR22LT1313	122	67	1.07	
80	IR22LT1256				rat 100%, salt
81	IR22LT1383	119	94	1.69	40%rat
82	IR22LT1692				100% rat damage
83	IR22LT1356				rat 100%
84	IR22LT1571				rat damage 100%, bph
85	IR22LT1475				bph damage salt
86	IR22LT1779	121	86	1.33	
87	IR16F1065				Late
88	IR20LT2435				late salt
89	IR21LT1495				rat damage 100%
90	IR21LT1266				rat damage 100%
91	IR18M1155				rat damage 100%
92	IR18LT1300				rat 80%, bph, salt
93	IR19R1216	122	95	2.33	
94	IR19R1138	122	98	1.74	
95	IR16T1666	124	98	1.70	
96	IR16T1372	123	102	1.60	
97	IR18M1150				late damage salt bph
98	IR21LT1456				rat,damage,salt
99	IR21LT1445	124	97	2.48	
100	IR19LT2069				salt damage bph
101	IR19LT2055	120			80%rat, salt, bph
102	IR21LT1388				damage, salt, bph
103	IR17A2786				rat damage 100%
104	IR21LT1485				late damage salt
105	IR18A1133	128	88	1.64	
106	IR18A1930	123	85	1.83	
107	IR21LT1407				damage,BPH,rat
108	IR21LT1543				100%rat damage
109	IR21LT1498	120	88	1.57	
110	IR21LT1392				bph, salt damage
111	IR21LT1020	116	94	2.50	

112	IR17A2780				rat damage 100%
113	IR17A2800				80%rat, salt, bph,late
114	IR21LT1449				Late
115	IR18A1251	122	97	1.74	
116	IRRI 147				rat 100%, bph, salt
117	IRRI 242				100% rat damage
118	CSR 28	121	107	2.95	
119	A69-1	125	101	3.35	
120	IR 29				100% rat, bph, salt
121	IR 42				late damage salt
122	IRRI 119				late,bph,salt
123	IRRI 251	121	89	1.93	60%rat damage
124	IRRI 224				100% rat damage
125	IR05F101				late, salt
126	CIHERANG	123	90	1.137	
127	IRRI 154	123	102	1.64	
128	IRRI 252	131			Late
129	BRRIdhan79	124	87	1.87	
130	Binadhan-23	116	107	1.36	



**Fig. 1: Pictorial field view of IRRI-NARES Network trial under salinity Breeding at Shyamnagar and Kaliganj upazillas of Satkhira during T. Aman 2023.**

#### Results and discussion:

In Kaliganj, grain yield ranged from 0.92  $\text{tha}^{-1}$  (IR21LT1449) to 5.70  $\text{tha}^{-1}$  (IR22LT1291) and growth duration 102 days (IR17A2780) to 137 days (IR 42) respectively. Among 115 entries, only 31 genotypes were selected based on grain type and grain yield. Five entries produced IT22LT1605 (5.11  $\text{tha}^{-1}$ ), IR22LT1627 (5.22  $\text{tha}^{-1}$ ), IR22LT1345 (5.31  $\text{tha}^{-1}$ ), IR22LT1698 (5.38  $\text{tha}^{-1}$ ), IR22LT1291 (5.70  $\text{tha}^{-1}$ ) which was better than all check varieties (Table.1). These five genotypes may be considered as potential to evaluate in the advanced yield trials and also used as parents in the breeding program. In Shyamnagar most of the entries were damaged due to salinity, BPH and rat. For this reason, no analysis could be done. Among these entries only IR22LT1627 (3.53 $\text{tha}^{-1}$ ) and IR22LT1698 (4.43 $\text{tha}^{-1}$ ) yielded higher than A69-1(3.35 $\text{tha}^{-1}$ ) (Table.2).

**Table 3: List of all genotypes in T. Aman 2023 at Kaliganj under IRRI-NARES Network Trial Stage-2**

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha)	Yield (t/ha)
1	IR20R1252	115	92	4.12	4.12
2	IR20R1210				
3	IR20R1209	118	101	4.82	4.86

4	IR20R1044	121	111	3.91	3.90
5	IR20R1083	120	88	5.83	5.92
6	IR20R1048	121	97	5.54	5.62
7	IR20R1267	122	104	4.41	4.42
8	IR20R1691	120	99	4.64	4.67
9	IR20R1393	107	93	1.91	1.79
10	IR20R1907	114	93	3.83	3.81
11	IR20R1778	114	98	4.34	4.35
12	IR20R1985	121	101	4.23	4.23
13	IR20R1685	119	92	3.66	3.63
14	IR20R1472	112	86	4.39	4.40
15	IR20R1794	120	95	4.69	4.72
16	IR20R1711	110	100	2.80	2.73
17	IR20R1113	121	101	4.47	4.48
18	IR20R1635	121	98	3.78	3.76
19	IR20R1682	121	99	4.81	4.85
20	IR20R1699	116	91	5.37	5.44
21	IR20R1622	114	99	3.67	3.65
22	IR20R1926	116	101	4.30	4.31
23	IR20R1583	121	103	3.13	3.08
24	IR54447-3B-10-2	108	98	2.70	2.63
25	IR20R1302	121	95	4.39	4.41
26	BR10	121	116	4.85	4.89
27	BR23	119	97	4.38	4.39
LSD<0.05		3.27	8.56	0.56	
Heritability		0.94	0.84	0.95	

**Table 4: List of all genotypes in T. Aman 2023 at Shyamnagar under AGGRi Alliance Stage-2**

Entry No	Designation	GD (days)	PH (cm)	Yield (t/ha)	Remarks
1	IR20R1252				100% rat damage
2	IR20R1210	127	107	4.02	
3	IR20R1209	127	111	3.13	
4	IR20R1044	127	102	3.32	
5	IR20R1083				100% rat damage
6	IR20R1048	127	97	3.23	
7	IR20R1267				100% rat damage
8	IR20R1691				100% rat damage
9	IR20R1393				100% rat damage
10	IR20R1907	128	98	1.28	
11	IR20R1778	126	109	3.05	
12	IR20R1985	123	101	1.39	
13	IR20R1685	126	100	2.38	
14	IR20R1472	131	100	3.79	
15	IR20R1794	127	101	3.69	
16	IR20R1711				100% rat damage

17	IR20R1113	128	105	2.98	
18	IR20R1635	127	99	2.06	
19	IR20R1682	126	71	2.31	
20	IR20R1699	132	89	2.98	
21	IR20R1622	128	101	2.73	
22	IR20R1926	128	106	2.98	
23	IR20R1583	125	102	3.33	
	IR54447-3B-10-				
24	2	128	98	2.76	
25	IR20R1302	121	99	2.00	
26	BR10	134	80	3.21	
27	BR23				Late

### Results and discussion:

In Kaliganj, grain yield ranged from 1.79  $\text{tha}^{-1}$  (IR20R1393) to 5.92  $\text{tha}^{-1}$  (IR20R1083) and growth duration 107 days (IR20R1393) to 122 days (IR20R1267) respectively. Among 25 entries three entries IR20R1699 (5.44  $\text{tha}^{-1}$ ), IR20R1048 (5.62  $\text{tha}^{-1}$ ) and IR20R1083 (5.92  $\text{tha}^{-1}$ ) produced higher yield than all check varieties (**Table.3**). These three genotypes may be considered as potential to evaluate in the advanced yield trials and also used as parents in the breeding program. In Shyamnagar some entries were damaged due to rat. For this reason, no analysis could be done. Among these entries IR20R1210 (4.02  $\text{tha}^{-1}$ ), IR20R1472 (3.79  $\text{tha}^{-1}$ ) and IR20R1794 (3.69  $\text{tha}^{-1}$ ) yielded higher than CK1 (3.21  $\text{tha}^{-1}$ ) (Table.4).

Figure 1 and 2 present the salinity level at Kaliganj and Shyamnagar respectively, during T.Aman 2023.

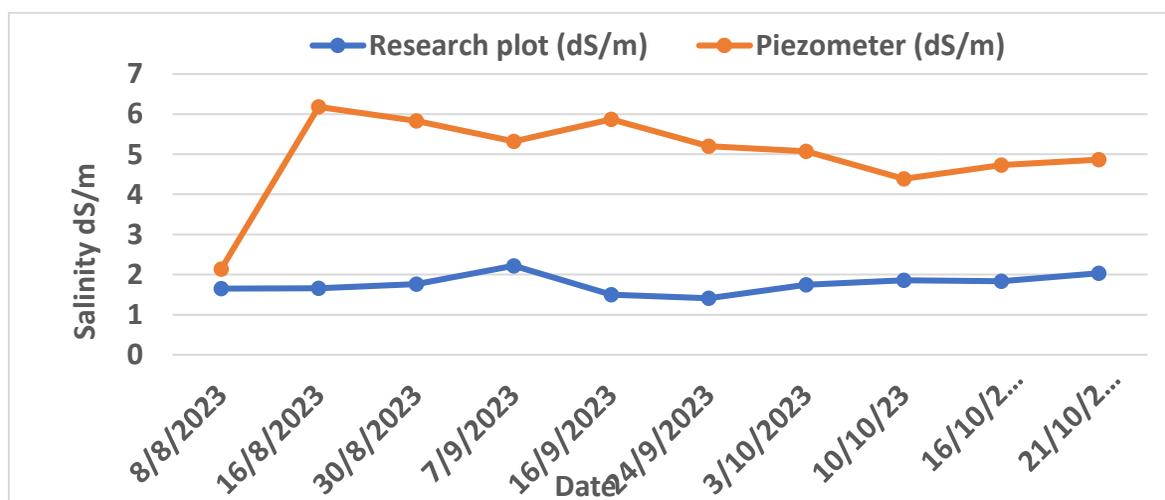


Figure 1. Salinity level at Kaliganj during T. Aman 2023

### Report of AFACI Trial during Boro 2023-24

**Material and Methods:** One hundred thirty-three genotypes were evaluated as OYT following augmented RCBD. BRR1 dhan67, BRR1 dhan97, BRR1 dhan99 and Binadhan-10 were used as check varieties that were replicated four times. The unit plot size was 5.4 m x 4 rows. Forty-days old seedlings were transplanted @ single seedling with the spacing of 20 x 20 cm. Fertilizers @ 120:19:60: 20:3.6 kg NPKSZn/ha (260-97-120-110-11 kg/ha or 35-13-16-15-1.5 kg/bigha Urea-TSP-MoP-Gypsum-ZnSO<sub>4</sub>) 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 was collected on plant height, days to flowering, days to maturity, PACp Tiller number, panicle number, Panicle length, filled grain and unfilled grain and Yield per plot. EC was measured 7 days interval in Dumuria, Khulna and Kaliganj, Satkhira.

**Result and Discussion:** Out of 133 tested entries twenty-seven entries were selected in Dumuria, Khulna on the basis of salinity tolerance label and grain types. The performance of all genotypes and check varieties are shown in Table 1. The selected genotypes showed low

yield performance 532kg/ha-4582kg/ha due to the moderately high salinity (4.08-5.95 dS m<sup>-1</sup>), high heat and drought stress. The salinity level is showed in Figure 1. In Kaliganj only eight entries were survived in vegetative stage but all the entries were damaged due to high salinity (10.63-22.65 dS m<sup>-1</sup>) in reproductive stage, so no yield should be collected. The salinity level is showed in Figure 2.

**Table 1: Performance of salinity tolerant rice lines at Dumuria, Khulna in Boro 2023-2024**

SI No	Designation	GD (days)	PH (cm)	ET	PACP	Yield (Kg/ha)	Remarks	Insect Infestation
1	IR21LT1026	129	101	10	7	1748	Heat & drought stress	stem borer 7%
<b>2</b>	<b>IR21LT1422</b>	<b>146</b>	<b>121</b>	<b>12</b>	<b>7</b>	<b>1728</b>	<b>Heat &amp; drought stress</b>	stem borer 3%
<b>3</b>	<b>IR21LT1628</b>	<b>135</b>	<b>94</b>	<b>14</b>	<b>5</b>	<b>3573</b>		stem borer 8%
4	IR21LT1191	134	91	10	5	2217	Heat & drought stress	stem borer 6%
5	IR21LT1428	129	89	14	7	2270		stem borer 12%
6	IR21LT1205	129	91	11	5	2897		stem borer 6%
7	IR21LT1330	125	100	11	7	3049		
8	IR21LT1393	137	85	11	7	1079		stem borer 3%
9	IR21LT1496	138	90	12	5	2680		stem borer 10%
<b>12</b>	<b>IR21LT1559</b>	<b>135</b>	<b>101</b>	<b>15</b>	<b>7</b>	<b>1950</b>	<b>Heat &amp; drought stress</b>	
13	IR21LT1101	137	102	12	7	1663		stem borer 6%
14	IR21LT1012	126	97	11	5	2931		stem borer 6%
<b>15</b>	<b>IR21LT1221</b>	<b>145</b>	<b>95</b>	<b>12</b>	<b>5</b>	<b>532</b>	<b>Heat &amp; drought stress</b>	
16	IR21LT1660	129	93	12	7	2126	Heat & drought stress	
<b>17</b>	<b>IR21LT1655</b>	<b>129</b>	<b>103</b>	<b>12</b>	<b>5</b>	<b>3557</b>		stem borer 10%
18	IR21LT1155	136	105	11	7	1592		
19	IR21LT1199	135	87	11	7	2224		stem borer 3%
20	IR21LT1433	132	91	12	5	2416	Heat & drought stress	stem borer 2%
21	IR21LT1671	137	99	12	5	870	Heat & drought stress	
23	IR21LT1396	138	86	11	7	2190		stem borer 10%
24	IR21LT1283	137	78	13	5	1207	Heat & drought stress	stem borer 9%
25	IR21LT1121	137	132	10	5	761		stem borer 8%
26	IR21LT1025	131	100	12	7	2606		stem borer 10%
27	IR21LT1453	122	98	13	7	3058		stem borer 3%
28	IR21LT1152	135	93	12	7	1547	Heat & drought stress	
29	IR21LT1667	129	105	10	7	2382		stem borer 6%
30	IR21LT1391	138	87	12	7	1841	Heat & drought stress	
<b>31</b>	<b>IR21LT1052</b>	<b>129</b>	<b>101</b>	<b>11</b>	<b>7</b>	<b>4102</b>		stem borer 6%
<b>32</b>	<b>IR21LT1126</b>	<b>135</b>	<b>97</b>	<b>11</b>	<b>7</b>	<b>1862</b>	<b>Heat &amp; drought stress</b>	stem borer 6%
33	IR21LT1138	146	79	19	7	737	Heat & drought stress	
35	IR21LT1356	129	96	12	7	2873		stem borer 3%
36	IR21LT1593	130	91	11	7	2312		stem borer 9%
<b>37</b>	<b>IR21LT1165</b>	<b>135</b>	<b>97</b>	<b>11</b>	<b>5</b>	<b>2581</b>	<b>Heat &amp; drought stress</b>	stem borer 12%
38	IR21LT1450	137	87	10	7	3597		stem borer 9%
<b>39</b>	<b>IR21LT1460</b>	<b>128</b>	<b>88</b>	<b>11</b>	<b>7</b>	<b>2955</b>		stem borer 8%
40	IR21LT1373	138	92	15	7	2297		stem borer 10%
<b>41</b>	<b>IR21LT1107</b>	<b>137</b>	<b>98</b>	<b>11</b>	<b>5</b>	<b>2202</b>	<b>Heat &amp; drought stress</b>	stem borer 3%
42	IR21LT1652	135	106	10	5	1641		
43	IR21LT1577	138	105	13	7	1937	Heat & drought stress	stem borer 4%
44	IR21LT1334	134	101	11	5	2794		stem borer 3%

45	IR21LT1682	138	92	13	5	2175	Heat & drought stress	
<b>46</b>	<b>IR21LT1707</b>	<b>137</b>	<b>88</b>	<b>12</b>	<b>5</b>	<b>2119</b>	<b>Heat &amp; drought stress</b>	stem borer 10%
47	IR21LT1662	130	85	13	5	3125		stem borer 5%
48	IR21LT1170	137	99	13	5	2200	Heat & drought stress	
49	IR21LT1653	135	92	11	7	2441	Heat & drought stress	stem borer 4%
50	IR21LT1575	131	100	12	5	3101		stem borer 6%
51	IR21LT1612	145	101	11	5	1331		stem borer 10%
52	IR21LT1200	137	106	11	7	1841	Heat & drought stress	
53	IR21LT1136	130	92	11	7	3233		stem borer 3%
54	IR21LT1618	138	84	11	7	3633		stem borer 5%
55	IR21LT1074	137	90	12	5	1646		
56	IR21LT1167	132	90	11	5	1896	Heat & drought stress	
57	IR21LT1536	134	97	12	7	2053		stem borer 3%
58	IR21LT1666	137	91	12	7	2803		stem borer 8%
59	IR21LT1572	137	76	12	7	2277		stem borer 3%
60	IR21LT1234	134	91	12	5	2260	Heat & drought stress	stem borer 8%
61	IR21LT1216	138	89	13	5	2855		stem borer 3%
62	IR21LT1096	139	85	13	5	1667	Heat & drought stress	
63	IR21LT1370	132	102	11	5	2945		
64	IR21LT1286	131	83	12	7	2015	Heat & drought stress	stem borer 3%
65	IR21LT1713	128	90	11	5	3142		
66	IR21LT1413	128	89	11	7	2278		stem borer 10%
67	IR21LT1342	133	92	12	7	1347	Heat & drought stress	stem borer 8%
68	IR21LT1537	134	87	12	5	3170		
69	IR21LT1375	131	99	11	7	2163		stem borer 7%
70	IR21LT1049	127	126	10	7	2441		stem borer 8%
<b>71</b>	<b>IR21LT1206</b>	<b>128</b>	<b>85</b>	<b>11</b>	<b>7</b>	<b>4582</b>		<b>stem borer 5%</b>
<b>72</b>	<b>IR21LT1717</b>	<b>136</b>	<b>100</b>	<b>10</b>	<b>7</b>	<b>1955</b>	<b>Heat &amp; drought stress</b>	stem borer 7%
73	IR21LT1647	134	94	11	7	1760		
74	IR21LT1426	138	85	12	7	2544		stem borer 8%
75	IR21LT1722	138	99	10	5	1071	Heat & drought stress	stem borer 8%
<b>76</b>	<b>IR21LT1691</b>	<b>129</b>	<b>80</b>	<b>10</b>	<b>7</b>	<b>2725</b>		
<b>77</b>	<b>IR21LT1192</b>	<b>137</b>	<b>95</b>	<b>11</b>	<b>7</b>	<b>2683</b>		stem borer 5%
78	IR21LT1090	129	94	11	7	3240		stem borer 3%
79	IR21LT1104	127	85	11	7	3187		stem borer 5%
80	IR21LT1645	130	100	11	5	1636		stem borer 3%
81	IR21LT1471	128	103	12	7	2737		stem borer 7%
82	IR21LT1463	131	102	12	7	2273	Heat & drought stress	stem borer 8%
83	IR21LT1328	125	88	12	7	2187		stem borer 5%
84	IR21LT1329	129	101	10	7	3462		stem borer 8%
85	IR21LT1274	137	105	11	7	1656	Heat & drought stress	stem borer 3%
86	IR21LT1609	126	102	11	7	3115		stem borer 3%
<b>87</b>	<b>IR21LT1629</b>	<b>129</b>	<b>101</b>	<b>11</b>	<b>7</b>	<b>3408</b>		stem borer 7%
88	IR21LT1230	136	76	11	7	2122	Heat & drought stress	
<b>89</b>	<b>IR21LT1683</b>	<b>129</b>	<b>91</b>	<b>11</b>	<b>7</b>	<b>3304</b>		
<b>90</b>	<b>IR21LT1631</b>	<b>134</b>	<b>89</b>	<b>11</b>	<b>5</b>	<b>2535</b>	<b>Heat &amp; drought stress</b>	stem borer 8%
91	IR21LT1477	133	85	12	7	2137	Heat & drought stress	
92	IR21LT1185	138	89	13	7	1752	Heat & drought stress	
93	IR21LT1291	129	95	11	5	2538		
94	IR21LT1514	130	109	10	7	3131		stem borer 7%
95	IR21LT1718	127	106	11	7	2406		stem borer 3%
96	IR21LT1430	126	87	11	5	2692		stem borer 5%
97	IR21LT1263	129	98	12	7	1664		stem borer 8%
98	IR21LT1250	133	94	12	7	2319		stem borer 7%

99	IR21LT1620	134	100	13	5	1922	Heat & drought stress	stem borer 3%
100	IR21LT1305	129	86	11	7	2876		stem borer 5%
<b>102</b>	<b>IRRI 240</b>	<b>132</b>	<b>98</b>	<b>11</b>	<b>5</b>	<b>3083</b>		stem borer 10%
103	IRRI 241	135	99	11	5	663	Heat & drought stress	
104	IRRI 154	136	104	13	5	1994		stem borer 5%
105	BR13197-4R-24	138	109	13	5	1902	Heat & drought stress	
106	BR13199-4R-136	138	104	10	7	3196		stem borer 3%
107	BR13201-4R-103	138	104	11	7	2224	Heat & drought stress	
<b>108</b>	<b>BR13201-4R-15</b>	<b>129</b>	<b>99</b>	<b>11</b>	<b>7</b>	<b>4164</b>		stem borer 6%
<b>109</b>	<b>BR13201-4R-196</b>	<b>128</b>	<b>106</b>	<b>9</b>	<b>7</b>	<b>2559</b>	<b>Heat &amp; drought stress</b>	stem borer 7%
110	BR13201-4R-219	127	100	10	7	2132	Heat & drought stress	
111	BR13201-4R-249	130	107	10	7	3355		stem borer 3%
<b>112</b>	<b>BR13201-4R-250</b>	<b>140</b>	<b>107</b>	<b>11</b>	<b>5</b>	<b>1387</b>	<b>Heat &amp; drought stress</b>	stem borer 5%
113	BR13201-4R-268	139	105	11	5	2120	Heat & drought stress	
114	BR13201-4R-27	135	103	11	5	2864		stem borer 6%
115	BR13201-4R-299	129	125	9	7	2790		stem borer 10%
116	BR13201-4R-30	129	100	11	5	3176		stem borer 3%
117	BR13201-4R-304	134	104	10	5	3271		stem borer 3%
118	BR13201-4R-91	130	105	10	7	2921		stem borer 4%
119	BR13204-4R-96	129	104	11	5	3870		
<b>120</b>	<b>BR13205-4R-1</b>	<b>140</b>	<b>99</b>	<b>11</b>	<b>5</b>	<b>1980</b>	<b>Heat &amp; drought stress</b>	
121	BR13205-4R-190	131	101	13	7	2200		stem borer 7%
122	BR13206-4R-120	135	102	11	5	2263	Heat & drought stress	stem borer 8%
<b>123</b>	<b>BR13206-4R-50</b>	<b>129</b>	<b>107</b>	<b>10</b>	<b>5</b>	<b>3305</b>		stem borer 10%
124	BR13208-4R-46	137	103	12	5	3310		stem borer 5%
125	BR13208-4R-89	132	91	12	5	2825		stem borer 3%
<b>126</b>	<b>BR13201-4R-215</b>	<b>138</b>	<b>102</b>	<b>12</b>	<b>5</b>	<b>2575</b>	<b>Heat &amp; drought stress</b>	stem borer 5%
127	BR13201-4R-225	129	105	11	7	2417	Heat & drought stress	
<b>128</b>	<b>BR13201-4R-49</b>	<b>130</b>	<b>99</b>	<b>12</b>	<b>7</b>	<b>2358</b>	<b>Heat &amp; drought stress</b>	stem borer 7%
129	BR13201-4R-56	130	103	13	5	2544	Heat & drought stress	
130	BR13201-4R-298	128	91	12	7	3258		stem borer 5%
<b>131</b>	<b>BR13208-4R-76</b>	<b>126</b>	<b>115</b>	<b>10</b>	<b>7</b>	<b>2168</b>	<b>Heat &amp; drought stress</b>	stem borer 9%
132	BR13207-4R-28	138	103	13	7	2258		stem borer 7%
133	BR13198-4R-35	137	116	10	5	1234	Heat & drought stress	
134	BINA dhan10	132	106	13	5	2630	Heat & drought stress	stem borer 8%
135	BIRRI dhan67	128	103	11	5	2441	Heat & drought stress	stem borer 9%
136	BIRRI dhan97	138	105	15	5	2616	Heat & drought stress	stem borer 5%
137	BIRRI dhan99	138	106	12	5	2660	Heat & drought stress	
	LSD<0.05	3.84	24.5	2.5		1774.21		
	Heritability	0.89	0.20	0.4	1	0.12		

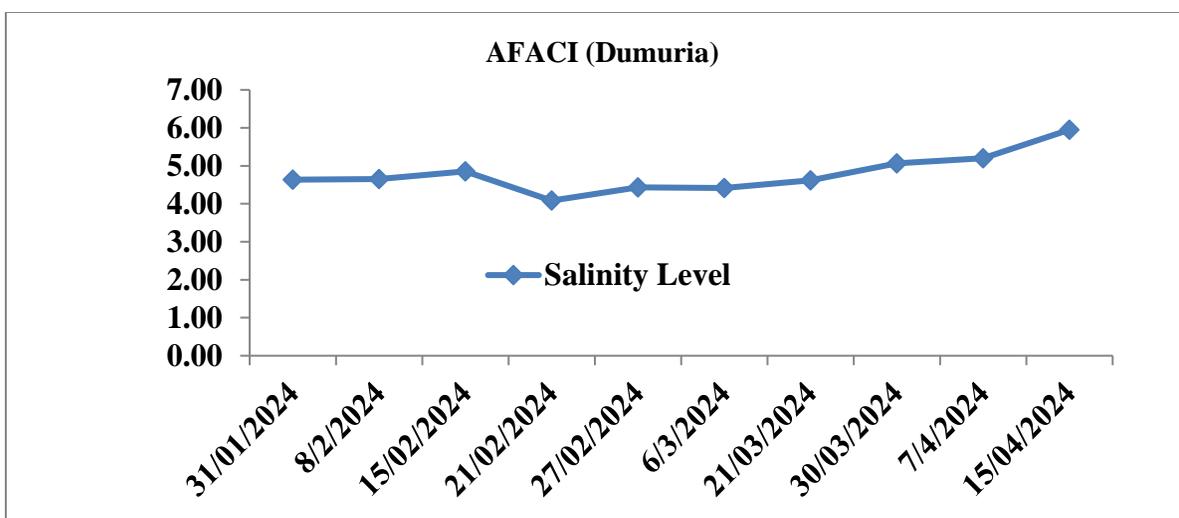


Fig. 1: Water salinity level of AFACI trial at Dumuria, Khulna during Boro season, 2023-24

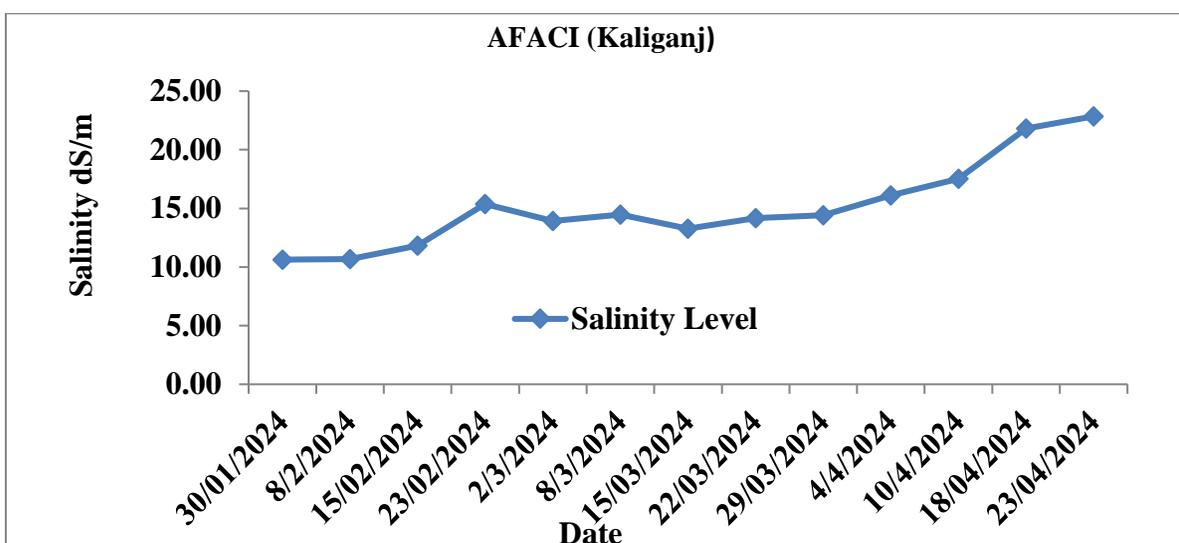
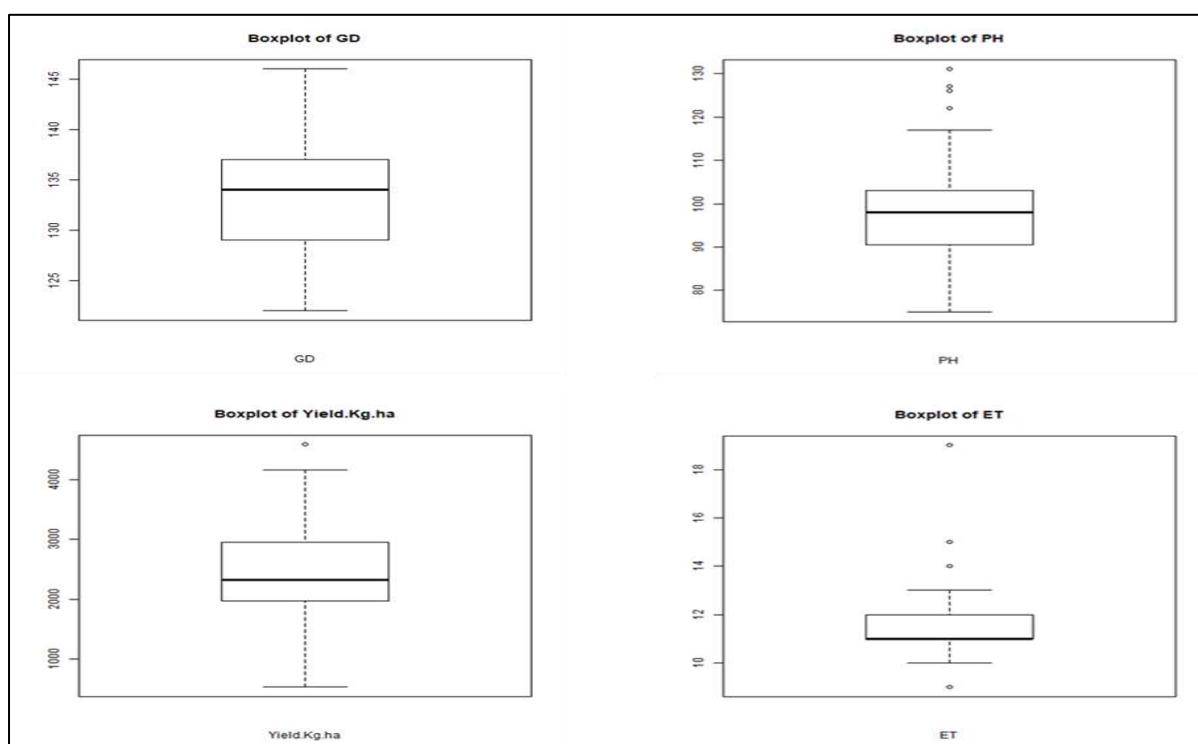


Fig. 2: Water salinity level of AFACI trial at Kaliganj, Satkhira during Boro season, 2023-24

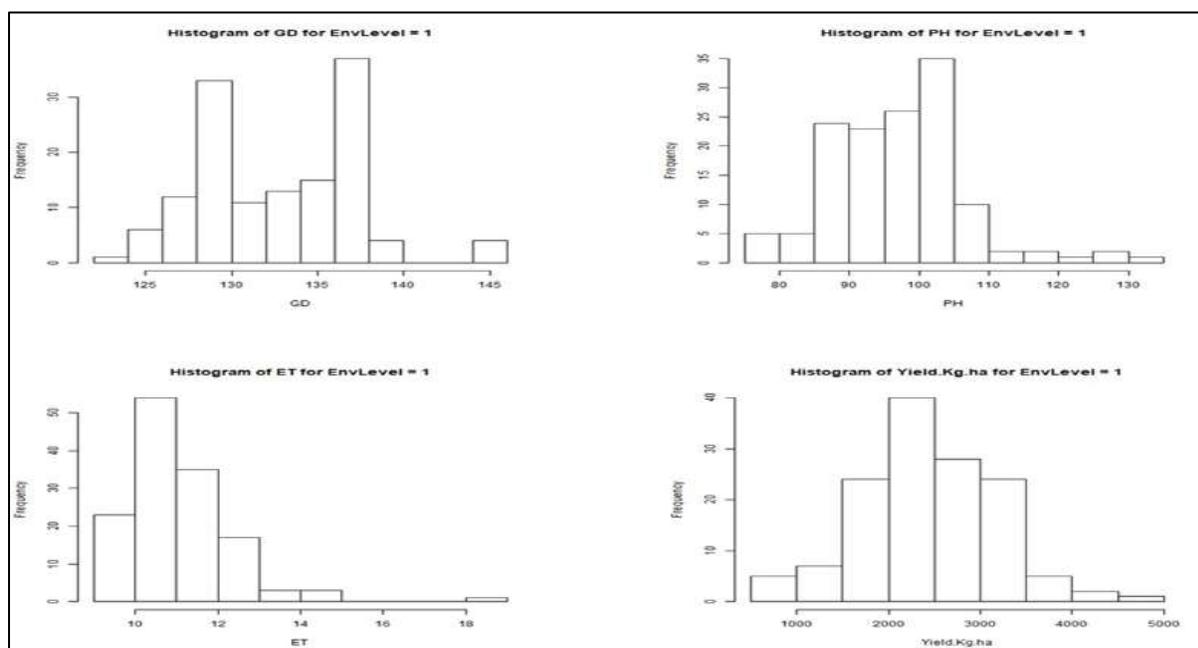
Table 2: Performance of selected salinity tolerant rice lines at Dumuria, Khulna in Boro 2023-2024

SI No	Designation	GD (days)	PH (cm)	ET	PaCp	Yield (Kg/ha)	Remarks	Insect Infestation
2	IR21LT1422	146	121	12	7	1728	Heat & drought stress	stem borer 3%
3	IR21LT1628	135	94	14	5	3573		stem borer 8%
12	IR21LT1559	135	101	15	7	1950	Heat & drought stress	
15	IR21LT1221	145	95	12	5	532	Heat & drought stress	
17	IR21LT1655	129	103	12	5	3557		stem borer 10%
31	IR21LT1052	129	101	11	7	4102		stem borer 6%
32	IR21LT1126	135	97	11	7	1862	Heat & drought stress	stem borer 6%
37	IR21LT1165	135	97	11	5	2581	Heat & drought stress	stem borer 12%
39	IR21LT1460	128	88	11	7	2955		stem borer 8%
41	IR21LT1107	137	98	11	5	2202	Heat & drought stress	stem borer 3%
46	IR21LT1707	137	88	12	5	2119	Heat & drought stress	stem borer 10%
71	IR21LT1206	128	85	11	7	4582		stem borer 5%
72	IR21LT1717	136	100	10	7	1955	Heat & drought stress	stem borer 7%
76	IR21LT1691	129	80	10	7	2725		
77	IR21LT1192	137	95	11	7	2683		stem borer 5%
87	IR21LT1629	129	101	11	7	3408		stem borer 7%

89	IR21LT1683	129	91	11	7	3304		
90	IR21LT1631	134	89	11	5	2535	Heat & drought stress	stem borer 8%
102	IRRI 240	132	98	11	5	3083		stem borer 10%
108	BR13201-4R-15	129	99	11	7	4164		stem borer 6%
109	BR13201-4R-196	128	106	9	7	2559	Heat & drought stress	stem borer 7%
112	BR13201-4R-250	140	107	11	5	1387	Heat & drought stress	stem borer 5%
120	BR13205-4R-1	140	99	11	5	1980	Heat & drought stress	
123	BR13206-4R-50	129	107	10	5	3305		stem borer 10%
126	BR13201-4R-215	138	102	12	5	2575	Heat & drought stress	stem borer 5%
128	BR13201-4R-49	130	99	12	7	2358	Heat & drought stress	stem borer 7%
131	BR13208-4R-76	126	115	10	7	2168	Heat & drought stress	stem borer 9%



**Fig. 3: Boxplot of Growth duration, Plant height, Yield and Effective tillers from AFACI trial at Dumuria, Khulna during Boro season, 2023-24**



**Fig. 4: Histogram of Growth duration, Plant height, Yield and Effective tillers from AFACI trial at Dumuria, Khulna during Boro season, 2023-24**



**Fig. 5: Pictorial Views of AFACI trial at Dumuria, Khulna during Boro season, 2023-24**



Fig. 5: Pictorial Views of AFACI trial at Kaliganj, Satkhira during Boro season, 2023-24

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

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

### Experiment 7A.1: Hybridization

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, 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:** A total seventeen varieties/advanced lines under premium quality rice were used for crossing (Table 7A.1a). Parents were grown in the hybridization block of the 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<sub>4</sub>) 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 was 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 17 single crosses and 14 backcrosses were made. F<sub>1</sub> 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 2023-24

SN	Designation	SL No.	Designation
1	BR10824-5-6-4-1*	10	BR9581-3-3-1-2
2	BR9580-30-2-1-1*	11	BR11224-7-9-4-3-P2

3	BR9178-7-2-4-4*	12	BR9674-1-1-5-1P3 (Zn)
4	BR8845-18-8-45-4-11*	13	BR9674-7-3-2-2-P1 (Zn)
5	BRRRI dhan70	14	BR9674-8-15-3-28-P3 (Zn)
6	BINA dhan13	15	BR10571-15-6-8-5 (Zn)
7	Bashful	16	BRRRI dhan90
8	BR9053-16-3-4-1	17	Begunidhan (BR9053-16-3-4-1)
9	BR9580-2-3-1-2		

**Table 7A.1b. List of crosses made for Premium Quality Rice, Development of Premium Quality Rice, T. Aman 2023-24**

SN	Cross combination	Number of seeds
1	BR9053-16-3-4-1/BR10824-5-6-4-1*	55
2	BR9053-16-3-4-1/BR9178-7-2-4-4*	45
3	BR9053-16-3-4-1/BR8845-18-8-45-4-11*	100
4	BR9053-16-3-4-1/BRRRI dhan70	110
5	BR9053-16-3-4-1/BINA dhan13	40
6	BR9581-3-3-1-2/BR8845-18-8-45-4-11*	80
7	BR11224-7-9-4-3-P2/BRRRI dhan70	115
8	BR9674-1-1-5-1P3/BR9178-7-2-4-4*	140
9	BR9674-7-3-2-2-P1/BRRRI dhan70	132
10	BR9674-8-15-3-28-P3/BR9178-7-2-4-4*	144
11	BR10571-15-6-8-5/BRRRI dhan70	154
12	BRRRI dhan90/Bashful	35
13	BRRRI dhan90/BR8845-18-8-45-4-11*	116
14	BRRRI dhan90/BINA dhan13	88
15	BRRRI dhan90/ BR10824-5-6-4-1*	86
16	BR9674-8-15-3-28-P3/ BRRRI dhan70	132
17	BR10571-15-6-8-5/ BRRRI dhan70	138
<b>BC<sub>1</sub>F<sub>1</sub></b>		
1	BR9053-16-3-4-1/BR8515-8-7-8-3/ BR9053-16-3-4-1	80
2	BR9053-16-3-4-1/BR10824-5-6-4-1/ BR9053-16-3-4-1	75
3	BR9053-16-3-4-1/BR9580-30-2-1-1/ BR9053-16-3-4-1	110
4	BR9053-16-3-4-1/ BRRRI dhan34/ BR9053-16-3-4-1	114
5	Bashful/ BRRRI dhan50/ BRRRI dhan50	132
6	BRRRI dhan90/BR8493-12-7-4-P1/ BRRRI dhan90	40
7	BINA dhan13/BRRRI dhan90/ BINA dhan13	136
<b>BC<sub>2</sub>F<sub>1</sub></b>		
1	BR14886 BRRRI dhan90/Kalizira//BRRRI dhan90	80
2	BR14887 BRRRI dhan90/Tulsimala//BRRRI dhan90	76
3	BR14888 Ranisalute/BRRRI dhan90//BRRRI dhan90	69
<b>BC<sub>3</sub>F<sub>1</sub></b>		
1	BR15201 BR9590-45-1-3-2-P2/BRRRI dhan70///BR9590-45-1-3-2-P2	12
2	BR15202 BR8528-2-2-3-HR2/BRRRI dhan70///BR8528-2-2-3-HR2	18
3	BR15203 BR9844-7-4-1-2-4-2/BRRRI dhan70///BR9844-7-4-1-2-4-2	12
<b>BC<sub>4</sub>F<sub>1</sub></b>		
1	BR15207 BRRRI dhan90/BRRRI dhan70///BRRRI dhan90	26

DS: 07/07/2023-21/07/23

DT: 07/08/2023-21/08/2023

### Experiment 7A.2: Confirmation of F1s

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, and K M Iftekharuddaula

**Specific Objective:** To confirm the crosses as true hybrids.

**Materials and Methods:** Eighteen crosses along with their respective parents were grown in the net house of Plant Breeding Division. The F1 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 F1 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 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. After confirmation, promising F1s were selected, harvested, dried, cleaned, and preserved in the cold room.

**Results:** A total of 18 crosses were confirmed as the plants with heterozygous alleles at two or more SNP loci were declared as true F1s and selected as true hybrids. Selected F1 plants were harvested and F2 seeds were dried and stored in cold room (Table 7A.2).

**Table 7A.2: List of confirmed and selected F1s as true hybrids, Development of Premium Quality Rice, T. Aman 2023-24**

SN	Cross combination	Objectives
1	BR9590-45-1-3-2-P1/BR11768-10-4-6-P2*	34 type grain with aroma
2	BR9590-45-1-3-2-P1/BR10821-15-7-8-5*	34 type grain with aroma
3	BR9590-45-1-3-2-P1/BR8515-8-7-8-3*	34 type grain with aroma
4	BR9053-16-3-4-1/BR8846-38-2-4-2*	34 type grain with aroma
5	BR9590-45-1-3-2-P1/BR8846-38-2-4-2*	Katary type grain with aroma
6	BR9844-7-4-1-2-4-2/BR8846-38-2-4-2*	Katary type grain with aroma
7	Begunidhan/BR10062-8-3-2-1-P2*	Katary type grain with aroma
8	BR8493-12-7-4-P1*/ BRR dhan90	34 type grain with aroma
9	BR8234-1-3-7-1-3-HR2/BR10824-5-6-4-1*	34 type grain with aroma
10	BR9053-16-3-4-1/BR9126-15-3-4-1*	34 type grain with aroma
11	BR8234-1-3-7-1-3-HR2/BR9126-15-3-4-1*	34 type grain with aroma
12	BR9126-15-3-4-1*/Begunidhan	34 type grain with aroma
13	BR8234-1-3-7-1-3-HR2/BR10813-75-20-10-2*	34 type grain with aroma
14	Begunidhan/BR10813-75-20-10-2*	34 type grain with aroma
15	Chiniatop/BR9126-15-3-4-1*	34 type grain with aroma
16	Chinisail/BR9126-15-3-4-1*	34 type grain with aroma
17	BR10821-15-7-8-5*/Begunidhan	34 type grain with aroma
18	BRR dhan90/ BRR dhan104	90 type grain with aroma

DS: 07/07/2023

DT: 07/08/2023

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

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, and K M Iftekharuddaula

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

**Materials and Methods:** A total of 32 F2, 43 F3, 26 F4 and 19 F5 populations were grown in T. Aman 2023 season. Single seed progenies from single panicle of one plant were grown in the RGA nursery in the field. The part of the panicle was sown directly on the soil. Thinning or pruning was not 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 to dormancy breakage to initiate the 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:** A total of 36,963 individuals (20,133 individuals from 32 F2, 10,564 individuals from 43 F3, 4,277 individuals 26 F4 populations and 1,989 individuals from 19 F5 populations) were harvested at the time of maturity and preserved and processed with proper labels (Table 7A.3).

**Table 7A.3: List of F2, F3, F4, and F5 populations advanced through RGA, Development of Premium Quality Rice, T. Aman 2023-24**

SN	BR No.	Parentage	Progenies grown	Progenies Harvested
<b>F<sub>2</sub></b>				
1	BR14517	BR9590-45-1-3-2-P2/BR9126-15-3-4-1	1100	990
2	BR14518	BR9590-45-1-3-2-P2/BR10820-36-21-11-1	1100	880
3	BR14521	BR8882-30-2-5-2/BR10820-36-21-11-1	1100	850
4	BR14522	BR8882-30-2-5-2/Black rice-Sylhet	1100	720
5	BR14523	BR8882-30-2-5-2/BR8515-23-6-3	1100	820
6	BR14531	BR9581-16-3-5-3/BRRI dhan70	1100	930
7	BR14532	BR9126-15-3-4-1/BR8297-1-1-2-HR7	1100	950
8	BR14533	BR8297-1-1-2-HR7/Dadkhani	1100	870
9	BR14538	BR8526-2-1-4/BR8515-23-6-3	1100	910
10	BR14539	BR11806-8-5-3-3-4/BR10813-75-20-10-1	1100	815
11	BR14540	BR11806-8-5-3-3-4/BR8862-29-1-5-1-3	1100	790
12	BR14551	BR11224-3-24-2/ Basmati 370	1100	860
13	BR14552	BR11802-11-3-1/BRRI dhan70	1100	960
14	BR14553	BR11224-7-9-4-4/BRRI dhan70	1100	910
15	BR14554	BR11224-3-24-2/ Pusa Basmati	1100	780
16	BR14890	BR10824-5-6-4-1/ BRRI dhan90	1100	820
17	BR14891	BR8493-12-7-4-P1/ BRRI dhan90	1100	790
18	BR15188	BRRI dhan90/BR9580-30-2-1-1*	300	228
19	BR15189	BRRI dhan90/BR10824-5-6-4-1*	250	204
20	BR14512	BRRI dhan90/BR9126-15-3-4-1*	300	280
21	BR15190	BR10813-75-20-10-2*/BRRI dhan90	250	160
22	BR15191	BINA dhan13*/BRRI dhan90	250	188
23	BR15193	BR10821-15-7-8-5*/ BRRI dhan90	300	232
24	BR15194	BR10821-15-7-8-5*/Bashful	300	288
25	BR15196	Begunidhan/ BRRI dhan70	300	200
26		Bashful/BRRI dhan50	200	108
27	BR15197	BRRI dhan90/BR8493-3-5-1-P1/ BRRI dhan90	1100	500
28	BR15200	BRRI dhan70/BRRI dhan90// BRRI dhan90	1100	500
29	BR15201	BR9590-45-1-3-2-P2/BRRI dhan70// BR9590-45-1-3-2-P2	1100	500
30	BR15202	BR8528-2-2-3-HR2/BRRI dhan70// BR8528-2-2-3-HR2	1100	500
31	BR15203	BR9844-7-4-1-2-4-2/BRRI dhan70// BR9844-7-4-1-2-4-2	1100	600
32	BR15207	BRRI dhan90/BRRI dhan70/// BRRI dhan90	1100	1000
		Sub Total	27750	20133
<b>F<sub>3</sub></b>				
1	BR14882	BRRI dhan70/BRRI dhan90/ BRRI dhan90	500	348
2	BR14883	BR9590-45-1-3-2-P2/BRRI dhan70/ BR9590-45-1-3-2-P2	500	428
3	BR14884	BR8528-2-2-3-HR2/BRRI dhan70/BR8528-2-2-3-HR2	400	304
4	BR14885	BR9844-7-4-1-2-4-2/BRRI dhan70/ BR9844-7-4-1-2-4-2	300	260
5	BR14880	BRRI dhan90/BRRI dhan70// BRRI dhan90	500	368
6	BR13938	BR8297-1-1-2-HR7(com)/Tulsimala	372	228
7	BR13939	Ranisalute/ BRRI dhan90	434	204
8	BR14178	BR9590-45-1-3-2-P2/BR9178-7-2-4-4	177	280
9	BR14180	BR9844-7-4-1-2-4-2/BR9178-7-2-4-4	400	160
10	BR14181	BR9178-7-2-4-4-P1/ BR9844-7-4-1-2-4-2	130	188

11	BR14182	BR8528-2-2-3-HR2/BR9178-7-2-4-4	394	232
12	BR14184	BRRi dhan90/ BR9178-7-2-4-4-P1	288	219
13	BR14185	BR9178-7-2-4-4-P1/ BRRi dhan90	665	326
14	BR14186	BR9178-7-2-4-4-P1/ BRH13-1-9-7B	294	175
15	BR13943	BRRi dhan90/BRRi dhan70	912	552
16	BR14515	BRRi dhan70/BRRi dhan90	916	400
17	BR14519	BR8528-2-2-3-HR2/BRRi dhan70	918	484
18	BR14527	BR9844-7-4-1-2-4-2/BRRi dhan70	912	288
19	BR13943	BRRi dhan90/BRRi dhan70// BRRi dhan90	340	280
20	BR14506	BRRi dhan90/BR9178-7-2-4-4	528	180
21	BR14514	BRRi dhan90/BR8845-21-1-5-4-10-4	536	220
22	BR14520	BR8528-2-2-3-HR2/BR8845-21-1-5-4-10-4	532	72
23	BR14528	BR8845-21-1-5-4-10-4/BR9844-7-4-1-2-4-2	532	180
24	BR14529	BR8845-21-1-5-4-10-4/BRRi dhan90	532	188
25	BR14530	BR8845-21-1-5-4-10-4/BRRi dhan70	532	308
26	BR14541	BR11806-8-5-3-3-4/Basmati 370	532	220
27	BR14542	BR11806-8-5-3-3-4/Pusa Basmati	532	152
28	BR14543	BR11224-7-9-4-4/BR10813-75-20-10-1	532	184
29	BR14544	BR11224-7-9-4-4/BR8862-29-1-5-1-3	536	288
30	BR14545	BR11224-7-9-4-4/Basmati 370	528	172
31	BR14546	BR11224-7-9-4-4/Pusa Basmati	528	116
32	BR14548	BRRi dhan81/BRRi dhan70	536	172
33	BR14549	BRH11-9-11-45B-HR3/BR8845-21-1-5-4-10-4	532	108
34	BR14550	Ja Hua/BRRi dhan70	532	152
35	BR14893	BR8493-12-7-4-P1/Begunidhan	532	260
36	BR14894	BRRi dhan81/IRRI154 frg1	532	180
37	BR14895	Begunidhan/BRRi dhan50	360	192
38	BR14896	IRRI 154 frg1/BRRi dhan90	532	180
39	BR14897	BRRi dhan90/ IRRI 154 frg1	360	112
40	BR14898	Pusa Basmati/IRRI 154 frg1	360	212
41	BR14899	BR9844-7-4-1-2-4-2/ IRRI 154 frg1	360	180
42	BR14900	IRRI154-frg1/BR8862-29-1-5-1-3	360	344
43	BR14507	BRRi dhan90/BR8493-3-5-1-P1	500	468
Sub Total			21,228	10564
<hr/>				
F4				
1	BR13716	Tulsimala/Dhonia	210	110
2	BR13717	Kalizira/Dhonia	45	30
3	BR13718	Dhonia/Kalizira	42	32
4	BR13719	Dhonia/Tulsimala	176	92
5	BR13720	Radhunipagol/BRRi dhan90	72	40
6	BR13721	BRRi dhan49/Dadkhani	239	150
7	BR13724	BRRi dhan87/Dadkhani	236	200
8	BR13725	Dadkhani/BRRi dhan34	86	50
9	BR13727	BRRi dhan90/Dhonia	22	15
10	BR13728	BR8536-27-2-1-2/BRRi dhan80	259	190
11	BR13729	BR8526-2-1-1-4/D. kataribhog	105	80
12	BR13730	BR8515-23-6-3/Kalizira	229	180
13	BR13731	BR8515-23-6-3/Tulsimala	165	110
14	BR13732	BR9054-6-1-2-3/Tulsimala	177	122
15	BR13733	BR8297-1-1-2-HR7/Kalizira	60	32
16	BR13735	BR9178-7-2-4-3/D. Kataribhog	207	152
17	BR13737	BR9126-15-3-4-1/BRRi dhan34	115	50
18	BR13738	BR9126-15-3-4-1/Kalizira	85	40
19	BR13739	BRRi dhan87/Ranisalute	276	180
20	BR13740	BRRi dhan87/ BRRi dhan90	197	108
21	BR14179	BR9178-7-2-4-4/ BR9590-45-1-3-2-P2	185	110
22	BR13943	BRRi dhan90/BRRi dhan70/ BRRi dhan90	512	412
23	BR14515	BRRi dhan70/BRRi dhan90/ BRRi dhan70	524	408
24	BR14519	BR8528-2-2-3-HR2/BRRi dhan70/ BR8528-2-2-3-HR2	555	532
25	BR14527	BR9844-7-4-1-2-4-2/BRRi dhan70/ BR9844-7-4-1-2-4-2	500	400

26	BR13943	BRI dhan90/BRI dhan70// BRI dhan90	512	452
Sub Total			5791	4277
<b>F<sub>5</sub></b>				
1	BR13304	BR8850-24-6-7-3/IR9669-pp823-1	102	92
2	BR13305	BR8536-27-2-1-2/Aftab-5	115	102
3	BR13306	BR8536-27-2-1-2/BR8493-3-5-1(Com)	130	125
4	BR13307	BR8493-3-5-1(Com)/BR9178-7-2-4-4	16	15
5	BR13308	BR8535-2-1-2/Noyonmoni-1	52	48
6	BR13309	Noyonmoni-2/BR8535-2-1-2	85	80
7	BR13310	BR8887-26-8-2-3/Dudulata	140	135
8	BR13311	BR8887-26-8-2-3/Kataribhog	60	55
9	BR13312	BR9584-6-3-5-3/Kataribhog	42	40
10	BR13313	BR9593-5-1-1-1/Krishnobhog	40	40
11	BR13314	IR9669-pp823-1/Chinigura	62	60
12	BR13315	Krishnobhog/BR8536-27-2-1-2	32	30
13	BR14188	BR8493-3-5-1-P1/ Pusa Basmati	187	180
14	BR14189	BR9178-7-2-4-4/Pusa Basmati	335	312
15	BR14191	BR9178-7-2-4-4/Indian Basmati	237	230
16	BR14192	DR-6/ BR8493-3-5-1-P1	59	58
17	BR14193	BR8862-29-1-5-1-3/BR9178-7-2-4-4-P1	103	100
18	BR14194	SwarnaKatari (Poba)/BR9178-7-2-4-4	237	232
19	BR14195	BR9178-7-2-4-4/ SwarnaKatari (Poba)	60	55
Sub Total			2094	1989
<b>Grand Total</b>			<b>56863</b>	<b>36963</b>

DS: 12/07/2023

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

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, 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:** A total of 1,962 fixed advanced lines from 28 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 152 lines were selected from 1,962 progenies from 28 crosses (Table 7A.4) 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.

**Table 7A.4: List of superior fixed lines selected from LST populations, Development of Premium Quality Rice, T. Aman 2023-24**

SN	BR No.	Cross combinations	Line grown	Line selected
1	BR12806	BR8536-12-8-3-2-2/BRI dhan34	25	6
2	BR12807	BR8297-1-1-2-HR7/BR9582-10-6-1-2	32	7
3	BR12808	BR8297-1-1-2-HR7/NMKP102-3-2-1-1	171	25
4	BR12809	BR8493-4-1-2-1(Com)/Kalizira	28	0

5	BR12810	BR8493-4-1-2-1(Com)/Krishnobhog	25	1
6	BR12811	BR8493-4-2-1-1(Com)/Kalizira	13	0
7	BR12812	BR8850-10-3-3/BR8234-1-3-1-7-HR21	34	7
8	BR12813	BR8850-10-3-3/Krishnobhog	48	0
9	BR12814	BR9593-19-1-2-1/Kalizira	106	0
10	BR12815	BR9593-5-1-1-2/Krishnobhog	40	0
11	BR12816	BR9593-5-1-1-2/NMKP102-3-2-1-1	41	1
12	BR12817	Radhunipagal/ BR8535-2-1-2	34	1
13	BR12818	Radhunipagal/ /NMKP102-3-2-1-1	13	0
14	BR12819	Sakhorkhana/BR8515-28-1-1-3-HR3(Com)	37	1
15	BR13722	BRRi dhan80/BRRi dhan90	25	13
16	BR13723	BRRi dhan80/BR8536-27-2-1-2	14	6
17	BR13736	BR9126-15-3-4-1/BRRi dhan90	21	7
18	BR13942	BRRi dhan90/ BRRi dhan75	100	9
19	BR13943	BRRi dhan90/ BRRi dhan70	23	4
20	BR14183	BR9178-7-2-4-4-P1/ BR8528-2-2-3-HR2	121	6
21	BR14187	Pusa Basmati/ BR8493-3-5-1-P1	150	6
22	BR14188	BR8493-3-5-1-P1/ Pusa Basmati	149	5
23	BR14189	BR9178-7-2-4-4/Pusa Basmati	242	12
24	BR14191	BR9178-7-2-4-4/Indian Basmati	149	6
25	BR14192	DR-6/ BR8493-3-5-1-P1	51	14
26	BR14193	BR8862-29-1-5-1-3/BR9178-7-2-4-4-P1	96	3
27	BR14194	SwarnaKatari (Poba)/BR9178-7-2-4-4	136	8
28	BR14195	BR9178-7-2-4-4/ SwarnaKatari (Poba)	38	4
Total			1962	152

DS: 12/07/2023

DT: 06/08/2023

#### Experiment 7A.5: Preliminary Yield Trial PYT (PYT- PQR), Development of Premium Quality Rice, T. Aman 2023-24

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, 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 eight fixed lines 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 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 four genotypes were selected out of eight 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 4.59 t/ha yields with a duration of 131 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 3.47 t/ha to 4.59 t/ha whereas that of the growth duration was 131 days to 136 days. The heritability obtained for plant height, growth duration and yield were 97%, 98% and 82%, respectively, indicating a high level of precision in this experiment (Table 7A.5).

**Table 7A.5: Performance of selected genotypes in Preliminary Yield Trial PYT (PYT- PQR), Development of Premium Quality Rice, T. Aman 2023-24**

SN	Designation	PH (cm)	TN	GD (Days)	Yield (t/ha)
1	BR9053-16-3-4-1	129	9	131	4.59
2	BR10812-8-4-3-2-P2*	132	10	133	4.23
3	BR10813-75-20-10-12*	119	8	136	3.81
4	BR11806-8-5-3-3-4-P3	135	9	133	3.47
5	BRRi dhan34 (Ck)*	129	10	132	2.77

6	BRRRI dhan90 (Ck)*	102	9	120	3.89
7	BRRRI dhan70 (Ck)*	136	10	125	3.36
<b>P value</b>		<b>****</b>	<b>NS</b>	<b>****</b>	<b>**</b>
<b>Heritability (%)</b>		<b>97</b>	<b>39</b>	<b>98</b>	<b>82</b>
<b>LSD</b>		<b>5.19</b>	<b>2.04</b>	<b>2.57</b>	<b>1.2</b>

DS: 10/07/2023

DT: 01/08/2023

#### Experiment 7A.6: Advanced Yield Trial (AYT-PQR), Development of Premium Quality Rice, T. Aman 2023-24

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, 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:** Fourteen genotypes along with four 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 seven genotypes were selected out of fourteen genotypes based on phenotypic acceptance, plant type, grain type, presence/absence of aroma, and higher yield. The genotype BR8845-18-8-45-4-11 produced 5 t/ha yield with growth duration of 127 days. The yield of selected genotypes ranged from 3.75 to 5 t/ha. The heritability obtained for the plant height, growth duration, and yield were 96%, 99% and 68%, respectively, indicating a high level of precision in this experiment (Table 7A.6).

**Table 7A.6: Performance of selected genotypes in AYT (AYT-PQR), Development of Premium Quality Rice, T. Aman 2023-24**

SN	Designation	PH (cm)	GD (Days)	Yield (t/ha)
1	BR10824-5-6-4-1*	128	127	3.8
2	BR9126-15-3-4-1*	135	137	3.75
3	BR9178-7-2-4-4-P1	135	138	4.19
4	BR11224-7-9-4-3-P2	122	129	4.86
5	BR8845-18-8-45-4-11*	127	129	5
6	BR8845-18-8-45-4-6*	127	128	4.69
7	BR8845-21-1-10-3-1*	127	131	3.79
8	BRRRI dhan34 (Ck)	122	138	3.2
9	BRRRI dhan90 (Ck)	105	118	4.33
10	BRRRI dhan70 (Ck)	128	125	4.21
11	BRRRI dhan80 (Ck)	126	131	4.82
<b>P value</b>		<b>****</b>	<b>****</b>	<b>*</b>
<b>H2(%)</b>		<b>96</b>	<b>99</b>	<b>68</b>
<b>LSD</b>		<b>5.82</b>	<b>1.61</b>	<b>1.66</b>

DS: 09/07/2023

DT: 02/08/2023

#### Experiment 7A.7: Advanced Yield Trial\_Special (AYT\_Special-PQR), Development of Premium Quality Rice, T. Aman 2023-24

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin, 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:** Seven genotypes along with one check 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 seven genotypes were selected out of seven genotypes based on phenotypic acceptance, plant type, grain type, photosensitivity, and higher yield. The genotype BR8493-3-5-1-P1 produced significantly higher yield (4.79 t/ha) than the check variety BRRI dhan34 followed by the genotype BR9590-45-1-3-2-P2 (4.39 t/ha) (Table 7A.7). The yield of the selected genotypes was ranged from 3.85 t/ha to 4.79 t/ha. The heritability obtained for the plant height, growth duration and yield were 100%, 99% and 92%, respectively, indicating high level of precision in this experiment (Table 7A.7).

**Table 7A.7: Performance of selected genotypes in AYT\_Special, (AYT\_Special-PQR), Development of Premium Quality Rice, T. Aman 2023-24**

SN	Designation	PH (cm)	TN	GD (Days)	Yield(t/ha)
1	BR9178-7-2-4-4-P2	138	10	134	3.85
2	BR10824-5-6-4-1*	142	11	133	3.92
3	BR8493-12-7-4-P1*	119	11	139	3.9
4	BR9580-30-2-1-1*	132	8	135	3.86
5	BR8493-3-5-1-P1**	119	9	141	4.79
6	BR9590-45-1-3-2-P2	118	10	139	4.39
7	Dudshail	143	7	141	3.87
8	BRRI dhan34 (Ck)	122	8	138	3.2
<b>P value</b>		<b>****</b>	<b>****</b>	<b>****</b>	<b>**</b>
<b>H2(%)</b>		<b>100</b>	<b>98</b>	<b>99</b>	<b>92</b>
<b>LSD</b>		<b>0.69</b>	<b>0.53</b>	<b>1.27</b>	<b>0.3</b>

DS: 09/07/2023

DT: 02/08/2023

## **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:** Dr. Md. Abdul Kader

### **Experiment 7B.1: Hybridization**

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

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

**Materials and Methods:** Twenty-three 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 Zn SO<sub>4</sub>) 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 897 F<sub>1</sub> seeds were obtained from 27 single crosses to develop premium quality rice. Additionally, three with three crosses of heat tolerance rice was made

(Table 7B.1). These were recorded and labeled properly. The F<sub>1</sub> 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 2023-24**

SN	Cross combinations	Characteristics	No. of seeds
1	BRRRI dhan104/BR10648-12-1-3-4-1	High yield, LS, aroma	55
2	BRRRI dhan107/BR11978-4R-260	High yield, LS	15
3	BR10648-12-1-3-4-1/BR11973-4R-450	High yield, LS, high ER	14
4	BR11970-4R-542/BR11973-4R-450	High yield, LS, high ER	12
5	BR10648-12-1-3-4-1/BRRRI dhan107	High yield, LS, high ER	14
6	Bangabandhu dhan100/BR10648-12-1-3-4-1	High yield, LS, high ER	28
7	BRRRI dhan107/BR(Path)12452-BC3-42-22-11-4	High ER, blast resistant	62
8	BRRRI dhan104/BR(Path)12452-BC6-53-21-11	High ER, aroma, blast resistant	35
9	BR10648-12-1-3-4-1/BR11968-4R-474	High ER	95
10	BR11970-4R-542/BR11972-4R-151	High ER, aroma	10
11	BR11966-4R-421/BR11965-4R-1	High yield, high ER	25
12	BR11974-4R-543/BR11979-4R-256	High yield, high ER	6
13	BR11978-4R-260/BR11967-4R-206	High yield, high ER	20
14	BRRRI dhan107/Indian Basmati	High yield, high ER	132
15	BR11978-4R-260/BR(Path)12452-BC3-42-22-11-4	High ER, blast resistant	4
16	BR10648-12-1-3-4-1/BR(Path)12452-BC6-53-21-11	High ER, blast resistant	28
17	BR11970-4R-542/BR12454-BC2-69-97-39-5-44	High ER, blast resistant	200
18	BR11966-4R-421/BR12454-BC2-75-32-31-39-7	High ER, blast resistant	18
19	ACI dhan2 (I-0075)/BRRRI dhan90	Small grain, aroma	65
20	ACI dhan2 (I-0075)/BRRRI dhan104	LS grain, aroma	8
21	ACI dhan2 (I-0075)/BRRRI dhan90	Small grain, aroma	17
22	BRRRI dhan90/BRRRI dhan107	LS grain, aroma	15
23	BRRRI dhan90/ACI dhan2 (I-0075)	Small grain, aroma	45
24	BRRRI dhan90/ACI dhan2 (I-0075)	Small grain, aroma	30
<b>Heat tolerance</b>			
25	BR11732-5R-11/IR112N177	RLR+ Heat	55
26	BR11789-5R-55/IR12N177	Drought+ Heat	59
27	BR12312-5R-195/N22	RLR+ Heat	10
<b>Total</b>			<b>897</b>

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

### Experiment 7B.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** To confirm the crosses as true hybrid.

**Materials and methods:** Forty-four crosses along with their respective parents were grown in the net house of Plant Breeding Division, BRRRI 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:** Forty-four F<sub>1</sub>s crosses were selected and confirmed as true hybrid (Table 7B.2).

**Table 7B.2. List of confirmed F<sub>1</sub>'s, Development of Premium Quality Rice (PQR), Boro 2023-24**

SN	BR. No.	Reg.	Cross combination	Characteristics
1	BR16041		BR10645-6-4-8-1-2/ BR8862-29-1-5-1-3	high yield, LS, aroma
2	BR16042		BR10646-3-2-2-4-3/ BR8862-29-1-5-1-3	high yield, LS, aroma
3	BR16043		BR10646-3-2-2-4-4/ BR8862-29-1-5-1-3	high yield, LS, aroma
4	BR16044		BR10646-3-2-2-4-4/ Tepi Boro	high yield, LS, high ER
5	BR16045		BR10646-3-3-3-1-4/ BR8862-29-1-5-1-3	high yield, LS, aroma
6	BR16046		BR10646-3-3-3-1-4/ Basmati370	high yield, LS, high ER
7	BR16047		BR10646-3-3-3-1-4/ Pusa basmati	high yield, LS, high ER
8	BR15374		BR8862-29-1-5-1-3/ Tepi Boro	high yield, LS, high ER

SN	BR. No.	Reg.	Cross combination	Characteristics
9	BR16048		BR9930-2-3-2-2/ BR8862-29-1-5-1-3	high yield, LS, aroma
10	BR16049		BRRRI dhan88/ BR8862-29-1-5-1-3	high yield, LS, high ER
11	BR16050		Koushik-Hili/ BR8862-29-1-5-1-3	high yield, LS, high ER
12	BR16051		Lomba Zira (Tanor)/ BR8862-29-1-5-1-3	high yield, LS, aroma
13	BR16052		Lomba Zira (Tanor)/ Basmati370	high yield, LS, high ER
14	BR16053		Lomba Zira (Tanor)/ Pusa basmati	high yield, LS, high ER
15	BR16054		Lomba Zira (Tanor)/ Tepi Boro	high yield, LS, high ER
16	BR16055		Miniket, Ballobpur/ BR8862-29-1-5-1-3	high yield, LS, aroma
17	BR16056		Miniket, Ballobpur/ Basmati370	high yield, LS, high ER
18	BR16057		Miniket, Ballobpur/ Pusa basmati	high yield, LS, high ER
19	BR16058		Miniket, Ballobpur/ Tepi Boro	high yield, LS, high ER
20	BR16059		Zira, Nachol/ BR8862-29-1-5-1-3	high yield, LS, aroma
21	BR16060		Zira, Nachol/ Basmati370	high yield, LS, high ER
22	BR16061		Zira, Nachol/ Pusa basmati	high yield, LS, high ER
23	BR16062		Zira, Nachol/ Tepi Boro	high yield, LS, high ER
24	BR16063		Rata Boro/ Bangabandh dhan100// Bangabandhu dhan100	high yield, LS, high ER
25	BR16064		BRRRI dhan102/ Basmati (4488)	high yield, LS, aroma
26	BR16065		BRRRI dhan102/ Basmati 370 (4489)	high yield, LS, aroma
27	BR16066		BRRRI dhan102/ Basmati 37 (4491)	high yield, LS, aroma
28	BR16067		BRRRI dhan102/ Basmati 406 (4508)	high yield, LS, aroma
29	BR16068		BRRRI dhan89/ Basmati (4488)	high yield, LS, aroma
30	BR16082		BRRRI dhan89/ Basmati 370 (4489)	high yield, LS, aroma
31	BR16069		BRRRI dhan89/ Basmati 37 (4491)	high yield, LS, aroma
32	BR16070		BRRRI dhan89/ Basmati 406 (4508)	high yield, LS, aroma
33	BR16071		BRRRI dhan92/ Basmati (4488)	high yield, LS, aroma
34	BR16072		BRRRI dhan92/ Basmati 370 (4489)	high yield, LS, aroma
35	BR16073		BRRRI dhan92/ Basmati 37 (4491)	high yield, LS, aroma
36	BR16074		BRRRI dhan88/ Basmati (4488)	high yield, LS, aroma
37	BR16075		BRRRI dhan88/ Basmati 370 (4489)	high yield, LS, aroma
38	BR16076		BRRRI dhan88/ Basmati 37 (4491)	high yield, LS, aroma
39	BR16077		BRRRI dhan88/ Basmati 406 (4508)	high yield, LS, aroma
40	BR16078		BR8862-29-1-5-1-3/ IR64-pi9 NILS	high yield, LS, aroma
41	BR16079		Lomba Zira (Tanor)/ IR64-pi9 NILS	high yield, LS, aroma
42	BR16080		Miniket, Ballobpur/ IR64-pi9 NILS	high yield, LS, aroma
43	BR16081		BRRRI dhan102/ IR64-pi9 NILS	high yield, LS, Zinc, aroma
44	BR16082		BRRRI dhan89/ Basmati 370 (4489)	high yield, LS, aroma

### Experiment 7B.3: RGA/FRGA nursery

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Advancement of generation for high yielding genotypes.

**Materials and Methods:** In total 25,705 progenies from F<sub>2</sub> to F<sub>4</sub> generations were grown in RGA screen house and FRGA field of BRRRI, 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.

**Result and Discussion:** Total 21,940 progenies were harvested from F<sub>2</sub> to F<sub>4</sub> 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 2023-24**

SN	BR cross	Parentage	Progenies transplanted	No. of progenies harvested
<b>F<sub>2</sub> population</b>				
1	BR15358	Basmati (TH)/ Basmati TAPL-90 (2517)	400	320
2	BR15359	Basmati (TH)/ BR10337-2-3-1-5-B2	400	330
3	BR15360	BR10335-2-3-1-10-B2/ Indian Basmati	400	330
4	BR15361	BR10335-2-3-1-5-B2/ Indian Basmati	400	350
5	BR15362	BR10646-3-2-2-2-2/ Indian Basmati	400	360
6	BR15363	BR10646-3-2-2-2-2/ DA26	400	340
7	BR15364	BR10646-3-2-2-3-1/ Indian Basmati	400	350

SN	BR cross	Parentage	Progenies transplanted	No. of progenies harvested
8	BR15365	BR10646-3-2-2-4-4/ Indian Basmati	400	320
9	BR15356	BR10646-3-3-3-1-2/ BR10646-3-2-2-2-2	400	330
10	BR15367	BR10646-3-3-3-1-2/ Indian Basmati	400	330
11	BR15368	BR8862-29-1-5-1-3/ Basmati TAPL-90 (2517)	400	350
12	BR15369	BR8862-29-1-5-1-3/ Indian Basmati	400	320
13	BR15370	BR8862-29-1-6-1-3/ BR10335-2-3-1-10-B2	400	300
14	BR15371	BR8862-29-1-6-1-3/ BR10337-2-3-1-5-B2	400	320
15	BR15372	BR8862-29-1-6-1-3/ BR10646-3-2-2-2-2	400	300
16	BR15373	BR8862-29-1-6-1-3/ BR10646-3-2-2-4-4	400	350
17	BR15374	BR8862-29-1-6-1-3/ Tepi Boro	400	360
18	BR15375	BR9930-2-3-2-2/ Indian Basmati	400	340
19	BR15376	BR9930-2-3-3-1/ Indian Basmati	400	350
20	BR15377	DA26/ Indian Basmati	400	340
21	BR15378	Rata Boro/ Bangabandhu dhan100	400	345
<b>Sub-total</b>			<b>8,400</b>	<b>7,035</b>
<b>F<sub>3</sub> population</b>				
1	BR14766	Swarna Katari (Tanor)/ Basmati-107 (4501)	400	350
2	BR14767	Swarna Katari (Tanor)/ Basmati Pardnr442 (4497)	380	320
3	BR14768	Miniket (Ballobpur)/ BR8862-29-1-5-1-3	400	350
4	BR14769	Miniket (Ballobpur)/ Indian Basmati	390	340
5	BR14770	Subollata (Jhenaidah)/ BR8862-29-1-5-1-3	400	350
6	BR14771	BR8526-38-2-1-HR1/ Lata Balam	390	340
7	BR14772	BR9930-2-3-2-2/ Basmati TAPL-90 (2517)	370	320
8	BR14773	BR9930-2-3-3-1/ Basmati Nanot 439 (4496)	390	340
9	BR14774	BR8862-29-1-5-1-3/ BRRi dhan50	385	350
10	BR14775	Lata Balam/ IR64-pi9 NILS	395	340
11	BR14776	Bashful/ IR64-pi9 NILS	380	320
12	BR14777	BR9930-2-3-2-2/ Basmati Pardnr442 (4497)	395	320
13	BR14778	BR9930-2-3-3-1/ Basmati-433 (4509)	400	350
14	BR14779	BR10322-23-1-2-4 / Lata Balam	400	330
15	BR14780	BR10322-23-6-3-7-B2/ Gochi	385	330
16	BR14781	BR8862-29-1-5-1-3/ Gochi	390	340
17	BR14782	BR8526-38-2-1-HR1/ Gochi	395	345
18	BR14783	Subollata (Jhenaidah)/ IR64-pi9 NILS	380	350
19	BR14784	BR8862-29-1-5-1-3/ Lafa	375	320
20	BR14785	BR8526-38-2-1-HR1/ Lafa	400	340
21	BR14786	BR9930-2-3-3-1/ Lafa	395	350
22	BR14787	BR8526-38-2-1-HR1/ Pusa Basmati	385	320
23	BR14788	BR8862-29-1-5-1-3/ Pusa Basmati	395	335
24	BR14789	Subollata (Jhenaidah)/ Indian Basmati	400	350
<b>Sub-total</b>			<b>9,375</b>	<b>8,100</b>
<b>F<sub>4</sub> population</b>				
1	14196	BR8995-2-5-5-2-1/ Bashful	200	190
2	14197	BR9937-22-3-2-3/ Pusha Basmati	420	350
3	14198	BR8526-38-2-1-HR1/ IR64-pi9 NILS	420	350
4	14199	Habu Balam/ BR9713-63-5-2-2	450	350
5	14200	BR9937-22-3-2-3/ DR-6	420	370
6	14201	BR9930-2-2-4-1/ DR-6	400	355
7	14202	BR9937-22-3-2-3/ Sonamukhi	480	400
8	14203	BRRi dhan81/ Bashful	485	400
9	14204	DR-6/ Habu Balam	490	400
10	14205	DR-6/Bashful	485	420
11	14206	BR8862-29-1-5-1-3/ Tapi Boro	350	300
12	14207	BR9930-2-2-4-1/ Sonamukhi	480	420
13	14208	BR9207-45-2-2/ IR64-pi9 NILS	485	450
14	14209	BR8590-5-2-5-2-1/ Rata Boro	490	450
15	14210	Super Basmati/ BR9937-22-3-2-3	485	420
16	14211	Basmati Sufaid 187/ BR9930-2-2-4-1	480	400
17	14212	Indian Basmati/ BR8526-38-2-1-HR1	490	400
18	14213	USPi9/BR9207-45-2-2	420	380
<b>Sub-total</b>			<b>7,930</b>	<b>6,805</b>
<b>Grand-total</b>			<b>25,705</b>	<b>21,940</b>

#### 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:** R R Majumder

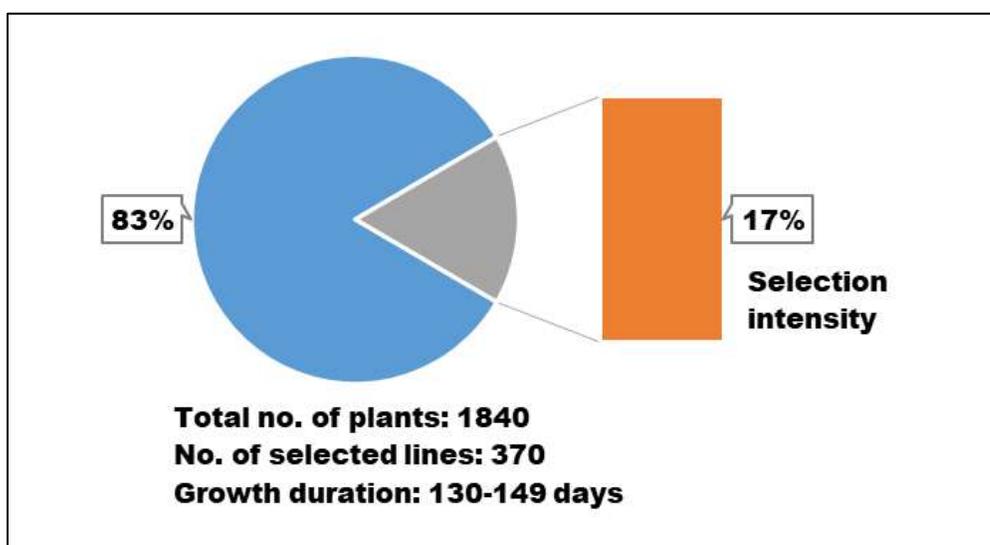
**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**Materials and Methods:** A total of 1,840 advance breeding lines (**Table 7B.4a**) 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.

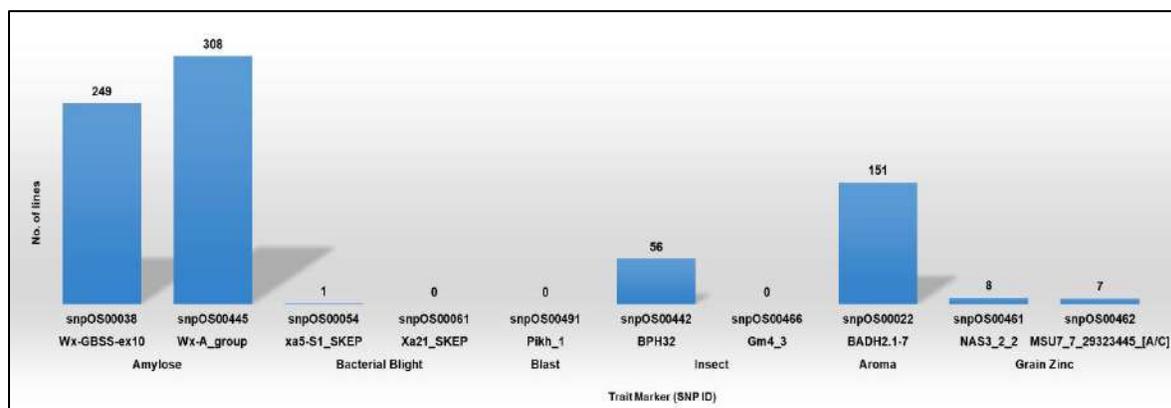
**Results and Discussion:** In total, 370 lines were selected based on uniformity, plant height, growth duration, long slender grain type and lodging tolerance (**Table 7B.4a**). The selection intensity of the genotypes is 17% (**Fig. 7B.4b**). Agronomic performances will be observed of the lines in the following Boro season. Trait genotyping for aroma, amylose, zinc content, diseases and insect was completed for the selected genotypes. Most of the materials were found having high amylose trait, with 181 materials with aroma trait. A few materials had grain zinc, one material showed BB resistance trait and none of the materials has insect resistance trait (**Fig. 7B.4c**). The list of different combination of traits in respect to the cross no. is presented in the **Table 7B.4d**.

**Table 7B.4a: List of materials for Line Stage Testing (LST) Trial, Development of Premium Quality Rice (PQR), Boro 2023-24**

SN	Parentage	No of progenies transplanted	No of plant selected
1	BRRI dhan50/ BR8862-29-1-5-1-3	470	94
2	BRRI dhan63/ BR8862-29-1-5-1-3	450	89
3	BR8862-29-1-5-1-3/ Shampakatari (Shingra-Natore)	460	72
4	BR7372-18-2-1-HR1-HR6/ Shampakatari (Shingra-Natore)	460	115
<b>Total</b>		<b>1,840</b>	<b>370</b>



**Fig. 7B.4b. Selection intensity of the genotypes of LST, PQR, Boro 2023-24**



**Fig. 7B.4c. Trait marker profile of the genotypes of LST, PQR, Boro 2023-24**

**Table 7B.4d. List of trait marker combination of the crosses of Line Stage Testing (LST) Trial, Development of Premium Quality Rice (PQR), Boro 2023-24**

SN	BR#	Parentage	Trait combination	No. of lines
1	BR13256	BRR1 dhan50/ BR8862-29-1-5-1-3	<i>Wx-A</i>	1
	BR13256		<i>Wx-A+BP32</i>	2
	BR13256		<i>Wx-10+Wx-A</i>	4
	BR13256		<i>Wx-10+Wx-A+fg1</i>	85
2	BR13257	BRR1 dhan63/ BR8862-29-1-5-1-3	<i>Wx-10+Wx-A+ BP32+NAS3_2+NAS3</i>	1
	BR13257		<i>Wx-10+Wx-A+fg1</i>	3
	BR13257		<i>Wx-10+Wx-A+ BP32</i>	5
	BR13257		<i>Wx-A</i>	5
	BR13257		<i>Wx-10+Wx-A</i>	35
	BR13257		<i>Wx-A+BP32</i>	37
3	BR13258	BR8862-29-1-5-1-3/ Shampakatari (Shingra-Natore)	<i>Wx-A</i>	1
	BR13258		<i>Wx-A+ xa5</i>	1
	BR13258		<i>fg1</i>	3
	BR13258		<i>Wx-A+BP32</i>	9
	BR13258		<i>Wx-10+Wx-A+fg1</i>	14
	BR13258		<i>Wx-10+Wx-A</i>	39
4	BR13259	BR7372-18-2-1-HR1-HR6/ Shampakatari (Shingra-Natore)	<i>NAS3_2</i>	1
	BR13259		<i>Wx-10+Wx-A+ BP32</i>	2
	BR13259		<i>Wx-10+Wx-A+ NAS3_2+NAS3</i>	3
	BR13259		<i>Wx-A+NAS3_2+ NAS3</i>	3
	BR13259		<i>fg1</i>	18
	BR13259		<i>Wx-10+Wx-A+fg1</i>	22
	BR13259		<i>Wx-10+Wx-A</i>	35
<b>Total</b>				<b>329</b>

**Experiment 7B.5: Observational Yield Trial (OYT)**

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

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

**Materials and methods:** Three hundred eleven genotypes in four OYTs along with BRR1 dhan28 BRR1 dhan63, BRR1 dhan81, BRR1 dhan102, BRR1 dhan104 and BRR1 dhan107 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 3.3 m × 3 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:** A total of 48 materials were selected from four OYTs. From OYT#1, 19 genotypes out of 80, from OYT#2, 06 genotypes out of 74, in OYT#3, 02 genotypes out of 20 and from OYT#4 (Standard Boro), 14 genotypes out of 137 were selected based on their yield performances and grain type as compared to check varieties (Table 7B.5).

**Table 7B.5: Performances of selected genotypes in Observational Yield Trial (OYT), PQR, Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				
				Gazipur	Rangpur	Rajshahi	GY_BLUE	pBLUP
<b>OYT#1</b>								
1	BR12582-4R-151	111	139	7.07	8.26	7.76	7.70	7.26
2	BR12582-4R-187	107	144	7.08	8.03	8.74	7.95	7.38
3	BR12582-4R-238	110	141	8.7	7.74	8.60	8.34	7.55
4	BR12582-4R-245	103	143	7.14	8.09	8.35	7.86	7.34
5	BR12582-4R-253	104	139	7.65	8.44	7.45	7.84	7.33
6	BR12582-4R-261	104	139	5.69	9.41	8.80	7.97	7.38
7	BR12582-4R-280	107	140	5.8	9.37	7.83	7.66	7.25
8	BR12582-4R-281	107	142	6.62	8.84	8.20	7.88	7.35

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				
				Gazipur	Rangpur	Rajshahi	GY_ BLUE	pBLUP
9	BR12582-4R-294	106	140	6.87	8.04	8.22	7.71	7.27
10	BR12582-4R-304	102	138	7.62	7.98	7.44	7.67	7.25
11	BR12582-4R-75	105	146	7.18	7.73	8.85	7.91	7.36
12	BR12582-4R-83	106	141	7.12	9.44	7.20	7.92	7.36
13	BR12582-4R-85	95	138	6.07	6.98	9.57	7.54	7.19
14	BR12583-4R-197	111	145	7.16	8.66	7.95	7.92	7.36
15	BR12584-4R-68	106	146	6.48	9.11	7.84	7.81	7.31
16	BR12585-4R-6	93	142	7.51	8.39	6.71	7.53	7.19
17	BR12586-4R-48	105	150	7.54	7.6	7.63	7.59	7.21
18	BR12587-4R-167	105	151	7.21	7.87	9.06	8.05	7.42
19	BR12587-4R-257	106	145	7.05	8.81	9.86	8.58	7.65
20	BRR1 dhan104 (Ck)	103	150	6.11	7.34	7.48	6.97	6.94
21	BRR1 dhan107 (Ck)	109	149	6.18	7.14	7.86	7.06	6.98
22	BRR1 dhan81 (Ck)	102	144	6.30	7.21	7.17	6.89	6.91
LSD (0.05)		7.42	9.92	0.346	1.506	0.447	1.468	
h <sup>2</sup> b		0.63	0.72	0.99		0.98	0.44	
<b>OYT#2</b>								
1	BR12582-4R-9	104	141	8.77	7.16	6.59	7.51	6.75
2	BR12583-4R-32	126	154	8.52	7.19	7.05	7.59	6.77
3	BR12583-4R-6	102	148	7.09	9.91	7.10	8.03	6.90
4	BR12584-4R-14	115	148	6.63	9.66	6.62	7.63	6.79
5	BR12584-4R-52	119	150	7.62	9.11	5.74	7.49	6.74
6	BR12585-4R-43	99	142	5.60	8.99	8.68	7.76	6.82
7	BRR1 dhan102 (Ck)	103	149	6.97	6.38	8.12	7.16	6.65
8	BRR1 dhan104 (Ck)	100	148	6.53	7.54	7.12	7.06	6.62
9	BRR1 dhan107 (Ck)	108	151	6.73	7.19	7.53	7.15	6.64
LSD (0.05)		8.24	7.41	0.18	4.69	1.53	1.56	
h <sup>2</sup> b		0.85	0.65	1.00		0.93	0.29	
<b>OYT#3</b>								
1	BR12585-4R-59	99	144	6.54	8.15	7.75	7.48	7.09
2	BR12587-4R-201	103	144	5.84	9.09	7.78	7.57	7.13
3	BRR1 dhan102 (Ck)	104	150	7.03	7.24	8.40	7.55	7.12
4	BRR1 dhan104 (Ck)	100	145	6.70	7.13	7.38	7.07	6.89
5	BRR1 dhan107 (Ck)	109	148	6.76	7.35	7.80	7.30	7.00
LSD (0.05)		28.4	8.80	0.24	1.18	0.15	1.24	
h <sup>2</sup> b		0.24	0.74	0.99	0.90	0.99	0.48	
<b>OYT#4 (Standard Boro)</b>								
1	IR 146426-7-7-B	109	130	6.57	-	-	6.57	6.51
2	IR 146426-8-4-B	109	135	6.64	-	-	6.64	6.60
3	IR 146426-8-5-B	102	134	6.65	-	-	6.65	6.60
4	IR 146428-9-2-B	81	133	6.59	-	-	6.59	6.53
5	IR 146428-9-8-B	112	130	6.64	-	-	6.64	6.59
6	IR 146430-10-3-B	95	134	6.69	-	-	6.69	6.64
7	IR 146434-3-4-B	98	134	7.20	-	-	7.20	7.11
8	IR 146435-1-9-B	93	130	6.63	-	-	6.63	6.56
9	IR 146439-11-9-B	105	136	7.75	-	-	7.75	7.66
10	IR 146440-11-5-B	89	132	7.80	-	-	7.80	7.69
11	IR 146441-12-3-B	102	157	6.56	-	-	6.56	6.50
12	IR 146442-11-6-B	88	132	7.21	-	-	7.21	7.14
13	IR 146443-11-8-B	75	136	7.13	-	-	7.13	7.07
14	IR 146443-9-2-B	106	129	7.06	-	-	7.06	6.98
15	BRR1 dhan28	97	130	6.10	-	-	6.10	6.05
16	BRR1 dhan63 (Ck)	82	134	6.39	-	-	6.39	6.37
17	BRR1 dhan81 (Ck)	94	136	6.10	-	-	6.10	6.08
18	BRR1 dhan107 (Ck)	111	159	6.10	-	-	6.10	6.08
LSD (0.05)		2.425	7.966	0.529	-	-	0.529	
h <sup>2</sup> b		0.998	0.883	0.982	-	-	0.982	

OYT#1: Gazipur: D/S: 18/12/2023, D/T: 23/01/2024 Rangpur: D/S: 18/12/2023, D/T: 01/02/2024 Rajshahi: D/S: 14/12/2023, D/T: 24/01/2024

OYT#2: Gazipur: D/S: 18/12/2023, D/T: 29/01/2024 Rangpur: D/S: 21/12/2023, D/T: 01/02/2024 Rajshahi: D/S: 14/12/2023, D/T: 24/01/2024

OYT#3: Gazipur: D/S: 18/12/2023, D/T: 26/01/2024 Rangpur: D/S: 21/12/2023, D/T: 03/02/2024 Rajshahi: D/S: 17/12/2023, D/T: 25/01/2024

OYT#4: Gazipur: D/S: 19/12/2023, D/T: 31/01/2024

## Experiment 7B.6: Advanced Yield Trial (AYT)

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Advance yield evaluation of advanced lines compared to standard checks.

**Materials and methods:** One hundred fifty-three genotypes were evaluated in three AYT<sub>s</sub> along with BRR1 dhan81, BRR1 dhan102, BRR1 dhan104 and BRR1 dhan107 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 × 4 rows. Fertilizer 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:** A total of 14 materials were selected from three AYT<sub>s</sub>. From AYT#1, six genotypes out of 84, from AYT#2, eight genotypes out of 53 and from AYT#3, none of the genotypes out of 16 genotypes were selected based on their yield performances and grain type as compared to check varieties (**Table 7B.5**).

**Table 7B.6: Performances of genotypes in Advanced Yield Trial (AYT), PQR, Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				
				Gazipur	Rangpur	Rajshahi	GY_BLUE	pBLUP
<b>AYT#1</b>								
1	BR11965-4R-1	112	142	5.40	5.87	5.84	5.70	5.92
2	BR11965-4R-278	100	141	6.77	7.15	7.40	7.11	6.96
3	BR11965-4R-345	106	142	6.89	6.55	7.26	6.90	6.81
4	BR11965-4R-45	107	141	6.02	5.98	6.30	6.10	6.22
5	BR11965-4R-46	108	145	6.27	5.18	6.27	5.91	6.07
6	BR11965-4R-73	105	140	7.25	6.18	7.75	7.06	6.93
7	BR11965-4R-75*	101	143	7.26	6.61	8.38	7.41	7.19
8	BR11966-4R-107	105	143	5.92	6.37	6.69	6.33	6.38
9	BR11966-4R-138	113	141	6.58	5.99	7.37	6.65	6.62
10	BR11966-4R-245	115	144	5.05	5.28	4.55	4.96	5.37
11	BR11966-4R-262*	116	144	7.27	7.05	9.03	7.78	7.47
12	BR11966-4R-313*	118	143	7.42	6.61	8.51	7.51	7.27
13	BR11966-4R-344*	104	144	7.35	6.31	9.03	7.56	7.30
14	BR11966-4R-349	112	144	7.03	6.24	7.49	6.92	6.82
15	BR11966-4R-41	114	141	7.28	6.50	6.83	6.87	6.79
16	BR11966-4R-421	110	143	7.55	6.61	7.06	7.07	6.94
17	BR11966-4R-471	108	140	6.04	4.90	5.38	5.44	5.73
18	BR11966-4R-522	108	144	7.73	6.52	6.87	7.04	6.92
19	BR11966-4R-528	102	143	6.97	5.77	6.78	6.50	6.52
20	BR11966-4R-94	108	141	6.88	6.81	8.01	7.23	7.06
21	BR11967-4R-206	119	141	6.26	6.77	6.55	6.52	6.53
22	BR11967-4R-347	124	143	6.08	5.68	6.34	6.03	6.16
23	BR11967-4R-61	118	140	5.03	5.01	5.43	5.16	5.51
24	BR11968-4R-1	109	142	7.13	7.09	7.39	7.20	7.04
25	BR11968-4R-122	110	140	6.45	6.91	6.97	6.78	6.72
26	BR11968-4R-154	118	142	6.83	6.77	7.75	7.12	6.97
27	BR11968-4R-162	98	146	6.04	6.79	7.47	6.77	6.71
28	BR11968-4R-324	111	140	7.40	7.17	6.68	7.08	6.95
29	BR11968-4R-411	109	143	6.29	6.46	8.34	7.03	6.91
30	BR11968-4R-86	109	143	6.32	6.56	6.86	6.58	6.57
31	BR11970-4R-118	108	145	6.66	5.71	6.84	6.40	6.44
32	BR11970-4R-141	110	146	6.10	5.42	6.47	5.99	6.14
33	BR11970-4R-164	129	141	6.80	5.67	4.87	5.78	5.98
34	BR11970-4R-373	107	144	6.72	5.92	6.53	6.39	6.43
35	BR11970-4R-384	110	145	6.42	5.90	6.41	6.24	6.32
36	BR11970-4R-385	108	143	5.63	5.62	5.97	5.74	5.95
37	BR11970-4R-403	110	145	6.66	6.28	6.71	6.55	6.55
38	BR11970-4R-404	102	148	6.44	6.32	7.23	6.66	6.64
39	BR11970-4R-456	108	145	7.27	6.00	6.28	6.51	6.52
40	BR11970-4R-460	108	144	6.67	6.29	6.85	6.60	6.59
41	BR11970-4R-542	107	141	6.80	6.92	7.20	6.97	6.86
42	BR11970-4R-607	110	146	6.22	6.10	7.16	6.49	6.51
43	BR11970-4R-642	108	145	6.50	6.22	6.92	6.54	6.55
44	BR11970-4R-649	108	144	6.90	5.91	7.41	6.74	6.69
45	BR11970-4R-662	108	146	6.47	6.28	6.91	6.56	6.56
46	BR11970-4R-99	108	135	6.53	6.12	6.13	6.26	6.33
47	BR11971-4R-111	104	147	5.93	6.89	6.80	6.54	6.54
48	BR11971-4R-114	107	144	5.89	6.02	6.99	6.30	6.36
49	BR11972-4R-11	102	144	7.06	5.67	6.98	6.57	6.56

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)			GY_ BLUE	pBLUP
				Gazipur	Rangpur	Rajshahi		
50	BR11972-4R-127	104	140	6.77	6.98	6.87	6.88	6.79
51	BR11972-4R-41*	103	141	6.40	6.48	7.54	6.81	6.74
52	BR11973-4R-103	125	140	5.73	5.25	6.19	5.72	5.94
53	BR11973-4R-115	121	145	7.27	6.61	7.04	6.98	6.87
54	BR11973-4R-153	108	146	7.62	6.42	7.46	7.17	7.01
55	BR11973-4R-176	109	141	6.01	6.66	7.00	6.55	6.55
56	BR11973-4R-196	124	145	6.93	5.82	8.36	7.04	6.91
57	BR11973-4R-210	113	143	7.36	6.94	6.50	6.93	6.83
58	BR11973-4R-224*	112	144	6.92	6.48	8.55	7.32	7.12
59	BR11973-4R-250	121	148	6.85	5.74	5.58	6.05	6.18
60	BR11973-4R-252	116	143	7.76	5.92	7.65	7.11	6.97
61	BR11973-4R-309*	128	144	7.72	6.98	7.49	7.40	7.18
62	BR11973-4R-316	108	145	5.52	5.94	4.92	5.46	5.74
63	BR11973-4R-330	120	146	7.01	6.26	8.03	7.10	6.96
64	BR11973-4R-344	123	144	7.37	6.63	7.44	7.15	6.99
65	BR11973-4R-356	124	146	6.13	6.09	7.74	6.65	6.63
66	BR11973-4R-523	126	143	7.68	6.38	6.03	6.70	6.66
67	BR11973-4R-562	122	144	6.94	6.72	7.50	7.05	6.92
68	BR11973-4R-572	103	148	6.82	5.35	7.15	6.44	6.47
69	BR11973-4R-583	122	142	6.25	6.03	6.41	6.23	6.31
70	BR11973-4R-599	109	150	5.16	5.03	6.68	5.62	5.86
71	BR11974-4R-133	129	151	6.98	5.38	7.54	6.63	6.61
72	BR11974-4R-25	132	142	5.89	5.23	6.05	5.72	5.94
73	BR11974-4R-543	104	142	6.00	5.83	6.73	6.18	6.28
74	BR11974-4R-559	103	146	6.81	5.51	6.22	6.18	6.28
75	BR11978-4R-101	104	140	6.28	6.01	5.16	5.82	6.01
76	BR11978-4R-201	100	141	5.34	6.02	6.93	6.10	6.21
77	BR11978-4R-260	105	142	5.92	6.27	7.39	6.53	6.53
78	BR11978-4R-374	102	145	6.63	6.37	7.33	6.77	6.72
79	BR11978-4R-42	97	139	5.92	5.18	6.00	5.70	5.92
80	BR11978-4R-86	104	139	5.64	5.68	5.82	5.71	5.93
81	BR11979-4R-202	100	141	6.31	6.53	7.11	6.65	6.62
82	BR11980-4R-454	114	145	5.89	5.13	5.66	5.56	5.81
83	BR11980-4R-498	128	144	6.29	6.33	6.03	6.22	6.30
84	BR11980-4R-635	123	146	6.35	5.85	6.73	6.31	6.37
85	BRR1 dhan102 (Ck)	110	149	7.25	6.99	8.27	7.50	7.26
86	BRR1 dhan104 (Ck)	104	146	6.18	7.02	7.29	6.83	6.76
87	BRR1 dhan107 (Ck)	107	148	6.84	6.75	7.22	6.94	6.84
88	BRR1 dhan81 (Ck)	103	140	5.87	6.63	7.09	6.53	6.54
LSD (0.05)		5.10	7.17	0.57	0.55	1.02	0.70	
h <sup>2</sup> b		0.93	0.71	0.82	0.78	0.67	0.74	
<b>AYT#2</b>								
1	BR11966-4R-294	116	145	5.67	6.05	6.45	6.06	6.18
2	BR11966-4R-372	113	140	5.90	6.34	6.59	6.28	6.34
3	BR11966-4R-402	107	143	5.92	6.82	8.04	6.93	6.81
4	BR11966-4R-405	120	150	7.05	6.40	8.19	7.21	7.03
5	BR11966-4R-406*	115	146	7.56	7.09	7.88	7.51	7.24
6	BR11966-4R-420	123	150	5.38	6.50	5.63	5.83	6.02
7	BR11966-4R-439*	127	142	7.04	6.30	8.88	7.40	7.16
8	BR11966-4R-451	115	150	5.01	6.44	6.77	6.07	6.19
9	BR11966-4R-468*	127	152	7.54	6.70	8.68	7.64	7.33
10	BR11966-4R-479	135	148	6.07	6.90	6.60	6.52	6.52
11	BR11966-4R-491	110	146	6.46	6.77	7.74	6.99	6.86
12	BR11968-4R-144	113	146	5.64	6.22	6.07	5.97	6.12
13	BR11968-4R-224	117	144	6.03	7.05	7.62	6.90	6.79
14	BR11968-4R-311	93	143	5.90	6.34	8.66	6.97	6.85
15	BR11968-4R-403	100	146	5.63	5.65	6.32	5.87	6.04
16	BR11968-4R-432	104	143	5.89	6.75	6.81	6.49	6.49
17	BR11968-4R-474	106	141	5.57	5.31	6.68	5.86	6.03
18	BR11969-4R-301	101	148	5.77	6.01	6.01	5.93	6.09
19	BR11970-4R-111	109	147	4.71	5.82	6.54	5.69	5.92
20	BR11970-4R-145	106	144	5.83	6.07	7.22	6.37	6.41
21	BR11970-4R-419	106	143	5.06	6.15	7.08	6.10	6.21
22	BR11970-4R-432	111	149	5.26	5.78	5.83	5.62	5.86
23	BR11970-4R-603	110	146	5.81	5.56	6.60	5.99	6.13
24	BR11970-4R-647	105	147	4.97	5.84	6.13	5.65	5.88
25	BR11970-4R-654	109	145	5.80	5.28	7.53	6.20	6.29
26	BR11970-4R-663	107	146	7.23	5.64	5.77	6.22	6.30
27	BR11971-4R-1*	96	142	6.53	6.61	8.76	7.30	7.09
28	BR11971-4R-129	109	145	6.68	6.22	7.60	6.83	6.75
29	BR11971-4R-212	116	153	6.56	6.19	7.67	6.81	6.73

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				
				Gazipur	Rangpur	Rajshahi	GY_ BLUE	pBLUP
30	BR11971-4R-217	108	145	6.82	5.87	7.41	6.70	6.65
31	BR11971-4R-219	110	147	6.13	6.00	7.48	6.54	6.53
32	BR11971-4R-228*	113	141	7.03	7.01	7.57	7.20	7.02
33	BR11971-4R-234	117	143	6.30	7.08	6.61	6.66	6.62
34	BR11971-4R-251	130	148	4.88	5.91	7.00	5.93	6.09
35	BR11971-4R-282	113	143	6.09	6.33	7.54	6.65	6.62
36	BR11972-4R-87	110	148	4.97	6.07	7.72	6.25	6.33
37	BR11973-4R-129	120	151	6.73	6.46	7.88	7.02	6.88
38	BR11973-4R-203	144	143	4.64	5.33	3.98	4.65	5.16
39	BR11973-4R-213	124	144	6.24	6.57	7.34	6.71	6.66
40	BR11973-4R-363*	103	143	6.72	6.46	8.52	7.23	7.04
41	BR11973-4R-365	108	145	5.74	5.77	7.58	6.36	6.41
42	BR11973-4R-450	122	145	6.82	6.71	6.82	6.78	6.71
43	BR11973-4R-532	118	143	6.36	6.43	6.92	6.57	6.56
44	BR11973-4R-85	113	146	5.45	6.34	6.70	6.16	6.26
45	BR11978-4R-112*	100	146	6.94	6.71	8.07	7.24	7.04
46	BR11978-4R-213	100	145	6.88	6.23	8.25	7.12	6.95
47	BR11978-4R-25	108	142	6.08	6.05	7.39	6.51	6.51
48	BR11978-4R-308	106	141	4.92	5.99	7.54	6.15	6.25
49	BR11978-4R-51	111	149	5.48	5.83	5.96	5.76	5.96
50	BR11980-4R-139*	117	146	7.56	6.78	8.47	7.60	7.31
51	BR11980-4R-3	119	149	7.07	6.12	7.12	6.77	6.70
52	BR11980-4R-471	118	148	6.43	6.10	6.77	6.43	6.45
53	BR11980-4R-575	119	148	5.19	5.82	7.01	6.00	6.14
54	BRR1 dhan104 (Ck)	105	144	6.58	6.57	8.05	7.07	6.92
55	BRR1 dhan107 (Ck)	110	146	6.52	6.84	7.82	7.06	6.91
LSD (0.05)		5.76	9.19	0.93	0.48	0.87	0.91	
h <sup>2</sup> b		0.92	0.74	0.74	0.73	0.77	0.73	
<b>AYT#3</b>								
1	BR11966-4R-578	113	147	5.33	7.06	6.95	6.45	6.49
2	BR11971-4R-200	104	145	6.77	7.21	6.20	6.73	6.65
3	BR11972-4R-151	109	142	6.11	6.18	6.34	6.21	6.35
4	BR11973-4R-186	104	147	5.09	5.26	6.81	5.72	6.06
5	BR11973-4R-369	114	146	5.76	8.08	7.00	6.95	6.78
6	BR11973-4R-488	116	150	6.81	7.34	7.31	7.15	6.90
7	BR11973-4R-535	106	146	6.01	5.57	6.12	5.90	6.17
8	BR11973-4R-75	117	146	5.32	5.36	6.56	5.75	6.08
9	BR11973-4R-92	111	149	5.14	6.24	6.29	5.89	6.16
10	BR11978-4R-136	114	145	5.19	7.24	7.16	6.53	6.53
11	BR11978-4R-45	113	150	6.83	7.50	5.52	6.62	6.59
12	BR11978-4R-69	114	150	6.41	5.80	7.36	6.52	6.53
13	BR11978-4R-92	111	150	7.59	6.77	7.57	7.31	6.99
14	BR11979-4R-256	105	141	6.64	6.57	6.00	6.40	6.46
15	BR11979-4R-73	107	151	4.72	6.42	6.68	5.94	6.19
16	BR11980-4R-370	120	148	5.93	6.06	6.76	6.25	6.37
17	BRR1 dhan102 (Ck)	108	149	7.35	7.91	8.02	7.76	7.26
18	BRR1 dhan104 (Ck)	104	144	6.84	6.58	7.82	7.08	6.86
19	BRR1 dhan107 (Ck)	107	147	6.74	6.94	7.74	7.14	6.89
LSD (0.05)		6.87	6.15	0.71	0.68	0.73	0.82	
h <sup>2</sup> b		0.83	0.85	0.92	0.93	0.88	0.59	

\*Selected for RYT

AYT#1: Gazipur: D/S: 14/12/2023, D/T: 23/01/2024 Rangpur: D/S: 22/12/2023, D/T: 04/02/2024 Rajshahi: D/S: 18/12/2023, D/T: 22/01/2024

AYT#2: Gazipur: D/S: 17/12/2023, D/T: 25/01/2024 Rangpur: D/S: 22/12/2023, D/T: 06/02/2024 Rajshahi: D/S: 12/12/2023, D/T: 24/01/2024

AYT#3: Gazipur: D/S: 17/12/2023, D/T: 23/01/2024 Rangpur: D/S: 22/12/2023, D/T: 31/01/2024 Rajshahi: D/S: 23/12/2023, D/T: 22/01/2024

### Experiment 7B.7: Regional High yield Trial (RYT)

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**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:** Twenty-one genotypes under three RYT were evaluated at eight locations of BRR1 HQ and R/S along with BRR1 dhan58, BRR1 dhan81, BRR1 dhan102, BRR1

dhan104 and BRR1 dhan107 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. Fertilizer 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:** Only two genotypes were selected from AYT#3 as compared to check varieties based on their specific and general adaptability in eight regional stations of BRR1 (**Table 7B.7a**) and advanced for ALART in next Boro season. Grain quality parameter of the tested lines is shown in **Table 7B.7b**.

**Table 7B.7a. Performances of genotypes in Regional Yield Trial (RYT#1), PQR, Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)									
				Gaz	Kus	Nao	Par	Raj	Ran	Sat	Cum	BLUE	pBLUP
<b>RYT#1</b>													
1	BR11359-4R-24	111	143	7.47	7.03	6.77	5.63	6.94	6.93	8.26	3.87	6.38	6.33
2	BR11359-4R-341	108	143	6.78	5.82	5.40	6.69	5.59	6.77	8.22	3.47	5.79	6.03
3	BR11361-4R-149	103	144	7.60	6.60	7.00	6.71	7.17	7.09	7.32	3.40	6.51	6.40
4	BR11366-4R-133	125	145	6.56	6.36	5.93	7.16	6.11	6.27	7.38	4.66	6.15	6.21
5	BR11366-4R-179	128	145	6.60	6.70	6.29	5.79	6.43	6.76	8.13	5.13	6.24	6.26
6	BR11371-4R-522	110	144	7.45	6.78	6.65	7.12	6.82	6.46	8.55	3.64	6.42	6.35
7	BRR1 dhan104 (Ck)	99	149	7.09	6.58	7.18	6.76	7.37	6.71	6.84	4.10	6.54	6.41
8	BRR1 dhan107 (Ck)	105	147	7.01	7.14	7.23	6.83	7.35	6.33	6.86	3.59	6.49	6.39
9	BRR1 dhan81 (Ck)	100	143	7.03	6.38	6.20	6.30	6.33	6.60	7.30	3.11	5.99	6.13
	LSD (0.05)	5.51	8.60	0.37	0.35	0.26	0.31	0.26	0.72	0.61	0.50	0.86	
	h <sup>2</sup> b	0.98	0.63	0.81	0.74	0.96	0.92	0.95		0.77	0.84	0.52	
<b>RYT#2</b>													
1	BR11359-4R-11	109	147	7.41	7.21	6.19	5.89	6.41	6.39	7.06	4.25	6.35	6.37
2	BR11359-4R-169	112	147	8.39	7.19	7.10	4.19	7.48	6.79	8.13	4.46	6.72	6.60
3	BR11359-4R-250	112	147	6.44	6.16	6.21	5.88	6.40	5.78	5.64	4.10	5.83	6.04
4	BR11361-4R-154	104	146	7.90	7.60	7.19	5.99	7.42	6.52	6.77	5.12	6.81	6.66
5	BR11363-4R-20	113	147	4.80	6.39	7.01	5.80	7.36	6.22	6.40	4.24	6.03	6.17
6	BRR1 dhan58 (Ck)	102	148	7.12	7.07	7.30	6.28	7.51	7.48	8.20	4.35	6.91	6.73
7	BRR1 dhan104 (Ck)	102	149	6.00	6.82	7.32	6.49	7.44	6.97	6.48	3.68	6.40	6.40
8	BRR1 dhan107 (Ck)	107	151	6.34	7.51	7.27	6.47	7.35	5.90	5.09	3.99	6.24	6.30
	LSD (0.05)	2.50	5.28	0.43	0.46	0.16	0.25	0.21	0.26	0.43	0.47	0.79	
	h <sup>2</sup> b	0.95	0.87	0.96	0.79	0.96	0.97	0.95	0.96	0.96	0.81	0.63	
<b>RYT#3</b>													
1	BR11359-4R-181*	117	151	5.19	7.46	7.14	7.01	7.62	7.36	6.63	4.63	6.63	6.33
2	BR11359-4R-211	122	152	5.12	6.64	7.13	6.95	7.62	6.23	6.95	3.87	6.32	6.23
3	BR11359-4R-260	111	151	5.43	5.96	6.57	6.88	7.51	5.70	7.38	4.45	6.23	6.21
4	BR11359-4R-263	121	151	5.25	6.71	6.40	5.97	6.82	4.63	7.29	4.53	5.95	6.12
5	BR11359-4R-275	118	154	5.37	6.72	7.01	6.79	7.58	6.62	5.61	3.75	6.18	6.19
6	BR11359-4R-279*	119	150	5.77	8.05	6.82	6.87	7.79	6.89	7.22	3.65	6.63	6.33
7	BR11359-4R-288	111	152	4.38	7.50	6.48	7.34	7.06	6.54	5.92	4.58	6.23	6.21
8	BR11359-4R-304	115	152	5.53	7.47	6.22	5.28	7.04	5.95	6.54	4.61	6.08	6.16
9	BR11359-4R-351	113	154	3.66	7.56	6.51	6.64	6.43	5.89	6.70	4.47	5.98	6.13
10	BR11359-4R-373	111	152	4.23	6.09	5.38	6.84	6.04	6.00	6.70	4.67	5.74	6.05
11	BRR1 dhan102 (Ck)	107	153	5.07	7.54	7.51	6.82	7.66	6.65	5.38	4.52	6.39	6.26
12	BRR1 dhan104 (Ck)	103	150	4.29	6.69	7.13	6.86	7.45	6.82	4.87	4.39	6.06	6.15
13	BRR1 dhan107 (Ck)	108	152	4.62	7.68	7.23	6.98	7.31	5.99	5.09	4.13	6.13	6.18
	LSD (0.05)	3.90	6.97	0.77	0.63	0.25	0.23	0.22	0.35	0.59	0.46	0.82	
	h <sup>2</sup> b	0.94	0.74	0.68	0.70	0.96	0.95	0.96	0.93	0.93	0.58	0.32	

\*Selected genotypes; Gaz- Gazipur, Kus- Kushtia, Nao-Naogaon, Par- Parbotipur, Raj- Rajshahi, Ran-Rangpur, Sat- Satkhira, Cum- Cumilla

**Table 7B.7b: Physico-chemical properties of the genotypes of Regional Yield Trial (RYT), PQR, Boro 2023-24**

SN	Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (mm)	Milled Rice breadth (mm)	L-B ratio	Size & Shape	1000 grain weight (g)	Amylose (%)	Protein (%)	ER	IR
1	BR11359-4R-24	68	53	6.7	2.1	3.2	LS	22.3	25.3	7.3	1.3	5.0
2	BR11359-4R-341	69	56	6.3	2.0	3.1	LS	22.2	23.9	8.4	1.3	4.6
3	BR11361-4R-149	67	45	7.4	2.0	3.7	LS	26.5	23.4	8.5	1.4	3.6

SN	Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (mm)	Milled Rice breadth (mm)	L-B ratio	Size & Shape	1000 grain weight (g)	Amylose (%)	Protein (%)	ER	IR
4	BR11366-4R-133	68	50	5.5	2.1	2.6	MB	21.1	24.7	7.6	1.5	4.8
5	BR11366-4R-179	68	52	5.6	2.0	2.8	MB	22.2	24.7	8.3	1.6	4.0
6	BR11371-4R-522	66	46	7.0	1.8	3.9	LS	23.8	25.3	7.0	1.4	4.7
7	BRR1 dhan81 (Ck)	71	40	6.7	1.8	3.8	LS	21.6	26.1	7.4	1.7	5.3
8	BRR1 dhan104 (Ck)	66	49	7.2	1.7	4.2	LS	24.0	26.3	8.5	1.3	4.0
9	BRR1 dhan107 (Ck)	70	56	7.9	1.7	4.5	ELS	27.4	27.1	8.6	1.4	3.9
<b>RYT#2</b>												
1	BR11359-4R-11	66	49	6.8	1.8	3.8	LS	19.4	26.5	7.6	1.4	4.0
2	BR11359-4R-169	68	45	6.8	2.1	3.3	LS	25.1	25.6	7.3	1.4	4.3
3	BR11359-4R-250	67	36	7.3	1.9	3.9	LS	22.4	24.0	7.7	1.4	4.7
4	BR11361-4R-154	68	53	7.5	2.1	3.6	LS	27.1	22.8	6.9	1.3	5.0
5	BR11363-4R-20	69	42	5.5	2.0	2.7	MB	19.0	25.3	7.5	1.7	5.3
6	BRR1 dhan58 (Ck)	71	60	6.0	2.0	2.9	MB	22.9	26.8	7.2	1.6	3.7
7	BRR1 dhan104 (Ck)	66	49	7.2	1.7	4.2	LS	24.0	26.3	8.5	1.3	4.0
8	BRR1 dhan107 (Ck)	70	56	7.9	1.7	4.5	ELS	27.4	27.1	8.6	1.4	3.9
<b>RYT#3</b>												
1	BR11359-4R-181	69	55	6.7	1.9	3.5	LS	23.7	25.3	7.0	1.4	4.5
2	BR11359-4R-211	69	58	6.1	1.9	3.2	LS	22.7	26.5	6.5	1.6	4.3
3	BR11359-4R-260	69	49	6.2	1.9	3.2	LS	21.4	26.3	7.7	1.5	4.6
4	BR11359-4R-263	70	58	6.4	1.9	3.4	LS	22.4	26.0	7.7	1.5	5.5
5	BR11359-4R-275	70	43	5.7	2.0	2.9	MB	22.5	25.6	7.1	1.6	6.0
6	BR11359-4R-279	68	59	6.4	1.9	3.4	LS	21.8	23.6	6.7	1.4	4.0
7	BR11359-4R-288	71	59	6.4	1.9	3.4	LS	22.7	25.3	7.0	1.5	5.2
8	BR11359-4R-304	69	47	6.3	1.9	3.3	LS	22.9	25.7	7.3	1.5	4.7
9	BR11359-4R-351	69	50	6.2	1.9	3.3	LS	22.1	26.9	6.9	1.6	4.3
10	BR11359-4R-373	69	49	6.3	2.0	3.2	LS	22.8	25.0	7.5	1.5	4.7
11	BRR1 dhan102 (Ck)	68	58	6.2	1.7	3.6	LS	22.5	25.8	7.0	1.4	4.3
12	BRR1 dhan104 (Ck)	66	49	7.2	1.7	4.2	LS	24	26.3	8.5	1.3	4.0
13	BRR1 dhan107 (Ck)	70	56	7.9	1.7	4.5	ELS	27.4	27.1	8.6	1.4	3.9

### Experiment 7B.8: Advanced Line Adaptive Research Trial (ALART)

**Principal Investigator:** R R Majumder

**Co-Investigators:** M A Kader, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Evaluation of specific and general adaptability of the genotypes under on farm condition.

**Materials and methods:** Five genotypes along with BRR1 dhan104, BRR1 dhan107 and BINA dhan25 as standard checks were evaluated at ten locations of Bangladesh. Thirty-five to forty days old seedlings were transplanted @ 2-3 seedlings at a spacing of 20 cm × 20 cm and the field layout will be RCB design with three replications. The plot size will be 5 m × 20 rows. Fertilizers doses and management were done same as experiment no. 7B.1. Crop management such as weeding, irrigation etc. will be done in time. Insects, diseases and other pests will be controlled properly.

**Results and Discussion:** None of the genotypes were selected from ALART as compared to check varieties based on their specific and general adaptability under on farm condition (Table 7B.8a). Grain quality parameter of the tested lines is shown in Table 7B.8b.

**Table 7B.8a: Performance of the genotypes of Advanced Line Adaptive Research Trial (ALART), PQR, Boro 2023-24**

SN	Designation	Plant Growth		Grain yield (t/ha)											
		height (cm)	duration (days)	Sadar, Kushtia	Sadar, Cumilla	Poba, Rajshahi	Mitha pukur, Rangpur	Kamar Siraj ganj	Sadar, Gopal ganj	Baniachang, Habi ganj	Sonagazi, Feni	Bhanga, Farid pur	BRR1, Mean HQ		
1	BR10645-6-4-8-1-2	106	153	6.16	7.14	6.59	7.58	6.58	7.21	6.10	4.91	9.68	6.74	6.87	
2	BR10646-3-2-2-4-3	112	145	5.39	6.88	5.53	7.47	6.83	6.52	6.39	5.93	7.83	6.18	6.50	

3	BR10648-12-1-3-4-1	106	149	5.30	5.80	5.29	6.36	6.45	6.12	5.80	5.14	8.04	5.94	6.02	
4	Zira, Nachol	102	151	5.96	6.31	6.41	6.58	7.96	6.46	3.87	5.31	8.57	7.35	6.48	
5	Katari, Shibganj	108	154	5.47	6.73	6.53	5.44	6.45	6.63	5.78	5.92	7.98	6.86	6.38	
6	BRRIdhan104 (Ck)	99	154	6.79	6.90	6.52	6.67	7.05	6.83	6.29	6.50	8.24	7.54	6.93	
7	BRRIdhan107 (Ck)	105	155	5.47	7.07	5.91	7.33	7.67	7.42	7.56	6.35	7.72	7.28	6.98	
8	BINA dhan25 Ck)	128	154	6.52	6.75	5.87	7.76	8.07	6.91	4.53	5.68	6.73	7.28	6.61	
LSD (0.05)		1.67	0.33							0.49					
CV		4.26	0.58							6.28					

**Table 7B.8b: Physico-chemical properties of the genotypes in Advanced Line Adaptive Research Trial (ALART), PQR, Boro 2023-24**

SN	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	Chalki ness (%)
1	BR10645-6-4-8-1-2	70	57	6.5	2	3.3	LS	25.7	19.4	8.1	1.5	3.9	72
2	BR10646-3-2-2-4-3	70	56	6.3	1.9	3.3	LS	25	19.4	8.1	1.5	4.8	71
3	BR10648-12-1-3-4-1	69	61	6.3	1.9	3.4	LS	25.4	18.3	8	1.7	4.5	81
4	Zira, Nachol	70	61	6.1	2	3.1	LS	25.4	17.8	7.7	1.4	4.3	50
5	Katari, Shibganj	62	60	4.9	1.8	2.8	SB	25	13.5	8.1	2	5	64
6	BRRIdhan63 (Ck)	70	47	6.6	1.8	3.7	LS	26.1	19.6	8.7	1.4	4.7	78
7	BRRIdhan81 (Ck)	69	43	6.7	2	3.4	LS	25.6	19.4	9	1.4	4.7	81

**Experiment 7B.9: G×E interaction of Basmati rice on physico-chemical and cooking properties**

**Principal Investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**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 BRRIdhan63, BRRIdhan81, BRRIdhan104, BRRIdhan107, Rata Boro and Tepi Boro, 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. Fertilizer 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:** Gazipur; Barishal; Cumilla; Rangpur Metro, Dharsona; Dinajpur, Birganj; Panchagarh Boda; Gopalganj; Habiganj; Kushtia; Kushtia, Alamdanga; Rajshahi R/S; Rajshahi, Naoga and Satkhira and Sonagazi

**Results and Discussion:** The yield performance of the Basmati type genotypes were ranged from 3.45-5.02 t/ha. The check varieties were performed better along with lines. Pure line selection can be made for the line having high yield performance over the locations. The lines having good physico-chemical properties can be considered as a good character for the Basmati rice and those lines can be utilized in the hybridization program to have good grain and plant type. The Basmati type genotype which yielded better with combination of good physical properties in any location can be recommended to cultivate Basmati type genotypes in Bangladesh.

**Table 7B.9: Performance of Basmati genotypes on physico-chemical properties in G × E interaction of PQR (Basmati type), PQR, Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)												BLUE		pBLUP	
				Gazi pur	Bari shal	Cumilla	Rangpur Metro Dharsona	Dinajpur Birganj	Pancha garh, Boda	Gopal ganj	Habi ganj	Kush tia	Kushtia, Alam danga	Raj shahi	Rajshahi Naoga	Sat khira	Sona gazi		
1	Basmati-433 (4509)	128	143	5.22	3.76	3.25	5.39	4.43	4.44	2.65	3.76	4.46	5.13	4.63	2.26	4.30	4.31		
2	Basmati (1230)	148	147	5.93	4.22	3.92	6.12	6.79	3.88	2.75	5.30	4.22	4.33	6.48	3.92	4.66	2.91	4.67	4.62
3	Basmati (.4754)	132	142	4.28	3.24	3.42	4.92	4.59	3.97	3.60	5.29	3.24	3.25	5.44	5.15	5.21	1.75	4.07	4.11
4	Basmati (4488)	151	145	4.31		3.53	5.12	5.57	1.27	4.06	4.80	-	-	3.66	3.46		1.68	3.55	3.72
5	Basmati (6614)	132	141	5.23	4.00	3.77	5.44	5.41	4.33	3.34	4.41	4.00	-	4.83	4.74		2.10	4.19	4.22
6	Basmati (D) (3928)	131	142	4.59		3.49	4.37	2.97	1.92	2.66	4.38	-	3.60	4.03	5.35	4.55	2.12	3.45	3.61
7	Basmati (N13) (4493)	104	154	3.78	3.26	-	-	-	-	4.18	4.60	3.26	-	5.51	4.78		1.35	4.29	4.31
8	Basmati 107 (4501)	141	145	5.21	3.04	3.73	5.17	6.08	5.78	4.10	4.21	3.04	2.91	-	-	5.37	1.73	4.18	4.20
9	Basmati 37 (4491)	106	141	5.57	-	-	4.80	5.12	4.56	3.52	-	-	-	-	-	-	-	4.19	4.26
10	Basmati 370 (4489)	93	138	6.04	-	-	-	-	-	3.48	-	-	-	-	-	-	-	4.55	4.43
11	Basmati 370 (4494)	133	139	5.08	3.22	4.12	4.61	4.64	5.75	3.70	4.66	3.22	3.72	4.60	5.32		2.23	4.37	4.37
12	Basmati 377 (4507)	144	140	5.05	2.88	3.29	4.56	4.23	4.50	4.03	4.60	2.88	3.05	3.97	5.74	4.42	1.95	3.89	3.97
13	Basmati 406 (4508)	139	140	5.08	2.49	4.42	4.78	4.73	3.86	3.66	4.39	2.49	2.95	3.45	-	-	1.13	3.77	3.89
14	Basmati Nanot 439 (4496)	140	142	6.08	2.31	4.97	3.93	4.04	4.31		5.11	2.31	2.94	3.73	5.33	-	1.49	4.06	4.12
15	Basmati Pardnr442 (4497)	101	140	6.18	3.84	3.86	5.86	4.42	5.09	3.74	5.47	3.84	5.60	7.32	5.39	6.53		5.02	4.90
16	Basmati Sufaid 187	143	140	5.47	2.95	3.98	5.51	5.00	4.03	3.67	5.29	2.95	3.44	3.05	5.25	5.09	2.21	4.22	4.24
17	Basmati TAPL-90 (2517)	145	141	5.33	-	-	5.35	2.28	1.81	3.89	6.22	-	-	2.78	-	-	2.45	3.65	3.83
18	Indian Basmati	106	145	5.34	4.18	4.31	4.80	4.18	4.13	4.58	4.61	4.18	4.40	6.66	4.01	5.49	3.06	4.46	4.44
19	Pusha Basmati	109	145	4.53	4.36		5.81	6.31	5.85	3.07	5.97	4.36	4.27	3.78	4.81	6.86	2.13	4.82	4.74
20	Super basmati	103	142	5.44	3.33	3.66	5.00	3.54	2.94	3.04		3.33	3.13	5.06	4.41		1.22	3.78	3.90
21	BRRIdhan104 (Ck)	96	141	5.46	5.18	3.95	5.82	6.83	5.05	5.68	5.70	5.18	6.21	6.68	4.16	6.46	1.58	5.17	5.03
22	BRRIdhan107 (Ck)	103	143	5.62	3.76	4.18	6.58	5.46	5.15	5.52	5.97	3.76	6.55	6.79	4.72	4.68	1.41	5.04	4.92
23	BRRIdhan63 (Ck)	89	147	5.22	5.03	5.26	5.46	5.10	4.91	3.58	5.16	5.03	5.49	6.64	5.03	6.15	2.20	5.07	4.95
24	BRRIdhan81 (Ck)	92	142	5.85	5.16	3.64	5.78	7.02	6.41	4.90	5.99	5.16	5.72	7.99	5.37	7.29	1.45	5.52	5.32
25	Rata Boro (Ck)	153	138	5.17	2.71		4.95	5.04	5.02	3.96	5.00	2.71	3.81	5.12	3.84	4.22		4.12	4.16
26	Tepi Boro (Ck)	144	139	4.87	3.20	4.24	6.00	2.81	4.10	6.10	4.45	3.20	3.23	4.02	5.63	6.62	3.23	4.42	4.41
LSD (0.05) h2b		7.78	3.77	0.89	0.453	0.372	0.752	0.891	0.918	0.337	0.588	0.459	0.766	1.269	0.891	0.270	1.270	0.703	
		0.98	0.93	0.59	0.93	0.88	0.67	0.59	0.90	0.97	0.80	0.93	0.90	0.89	0.59	0.98		0.83	

## PROJECT 8: DEVELOPMENT OF RICE VARIETIES FOR FAVORABLE BORO ECOSYSTEM

General objective: Development of improved genotypes with high yield potential ( $\geq 8.0$  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

**Specific objectives:** To create variations for the development of new high yielding genotypes with acceptable grain quality.

**Materials and Method:** Thirty-three varieties/lines (**Table 8.1a**) were grown in the hybridization block of the 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  $\times$  20 cm spacing. Fertilizer management was done at the rate of 260:100:120: 110:11 kg Urea, TSP, MP, Gypsum and ZnSO<sub>4</sub>/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<sub>4</sub> 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-seven crosses were made (**Table 8.1b**) using 33 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 rice varieties for favorable Boro environment during 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)	GEBV-Yield	Trait of inheritance
1	BR10317-5R-25	156	98	7.26	6.60	<i>Wx(a), Wx-10, chalk5</i>
2	BR10604-5R-58	148	101	5.81	6.56	<i>wx(b), SCT1</i>
3	BR11303-5R-156	151	104.2	7.47	6.67	<i>Wx(a), Pbl, Wx-10, chalk5</i>
4	BR11315-5R-17	-	-	-	-	<i>Wx(a), PSST6</i>
5	BR11318-5R-106	161	98.92	7.93	6.81	<i>Wx(a), Wx-10, chalk5</i>
6	BR11607-4R-72	157	94	5.9	-	<i>Wx-A, Xa21, xa13, xa5, qHTSH4.1</i>
7	BR11640-5R-86	145	95.67	6.77	6.88	<i>Wx(a), SCT1</i>
8	BR11894-R-R-R-R-329	145	94	6.3	7.04	<i>Wx-A, GS3, ColdVeg</i>
9	BR12096-4R-124-1	157	118	7.6	-	<i>Wx-A, Xa21, xa13, xa5</i>
10	BR12096-4R-25-1	155	100	6.9	-	<i>Wx-A, Xa21, xa13, xa5</i>
11	BR12416-6R-219	155	121.4	6.84	6.15	<i>Wx(a), Wx.10, Pbl, Pita, Pi9, xa5, xa13, Xa21</i>
12	BR12419-6R-102	151	118.6	8.91	6.35	<i>Wx(a), Wx.10</i>
13	BR12421-4R-171	157	92	5.66	-	-
14	BR12423-6R-38	151	101.3	6.95	6.23	<i>Wx(a), Wx.10, SCT1</i>
15	BR12454-BC2-69-97-39-5-44	160	109	7.5	-	<i>Wx-A, Pi9</i>
16	BR12509-5R-45	154	109.5	7.18	6.39	<i>Wx(a), Wx.10, SCT1, BPH32</i>

17	BR12512-5R-78	151	92.94	6.31	6.31	<i>Wx(a), Wx.10, SCT1</i>
18	BR12517-5R-57	151	109	7.5	6.23	<i>Wx-A, GS3, BPH32, TSV1</i>
19	BR12524-5R-56	146	99.41	8.04	6.27	<i>Wx(a), Wx.10, SCT1, Pbl, BPH32, Pita</i>
20	BR12527-5R-1	150	102	6.59	6.28	<i>Wx(a), Wx.10, SCT1</i>
21	BR12557-5R-105	149	112.4	7.67	6.24	<i>Wx(a), Wx.10, Pi9</i>
22	BR12567-5R-91	155	95.56	7.16	6.27	<i>Wx(a), Wx.10, SCT1, Cold1.jap, Pbl</i>
23	BR13113-4R-116	135	-	9.70	-	<i>Dense and long panicle</i>
24	BR13113-4R-86	-	-	-	-	
25	BR9945-5R-21	157	109.2	4.8	5.78	<i>Wx(a)</i>
26	Fatema dhan1	171	106	4.4	-	<i>Dense and long panicle</i>
27	Fatema dhan2	171	106	4.4	-	<i>Dense and long panicle</i>
28	Fatema dhan3	171	106	4.4	-	<i>Dense and long panicle</i>
29	IR126952-29-82-206-12-8	-	-	-	-	<i>bph17, bph32, Pi9</i>
30	IR18A1398	152	105.5	8.41	-	<i>Wx(a), Wx.10</i>
31	IR20X1002: IRRI 154-Pi9+Hd9 (N22)				-	<i>Wx(a), Wx.10, Pi9, Xa5</i>
32	IR64EMF3				-	<i>EMF3</i>
33	SVIN109	146	103.7	6.77	-	<i>Wx(a), Wx.10, SCT1, Xa21</i>

**Table 8.1b List of crosses made for the development of rice varieties for favorable Boro environment during 2023-24.**

SL	Cross	Objectives/Gene of inheritance	No of seed	Type of seed
<b>Forward breeding</b>				
1	BR12096-4R-124-1/BR12096-4R-	<i>Wx(a), Wx.10, xa5, xa13, Xa21</i>	90	F1
2	BR12419-6R-102/BR12096-4R-124-	<i>Wx(a), Wx.10, xa5, xa13, Xa21</i>	155	F1
3	BR12520-5R-67/BR12524-5R-56	<i>Wx(a), Wx.10,</i>	40	F1
4	BR12512-5R-78/BR12557-5R-105	<i>Wx(a), Wx.10, Pi9, SCT1</i>	20	F1
5	IR18A1398/BR12557-5R-105	<i>Wx(a), Wx.10, Pi9</i>	85	F1
6	BR12419-6R-102/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx(a), Wx.10, Pi9, Xa5</i>	130	F1
7	IR18A1398/BR12416-6R-219	<i>Wx(a), Wx.10, Pbl, Pita, Pi9, xa5, xa13,</i>	60	F1
8	BR12509-5R-45/BR12096-4R-25-1	<i>Wx(a), Wx.10, xa5, xa13,</i>	95	F1
9	BR12509-5R-45/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx(a), Wx.10, Pi9, Xa5, SCT1, BPH32</i>	105	F1
10	BR12517-5R-57/BR11607-4R-72	<i>Wx(a), Wx.10, xa5, xa13, Xa21, Pbl, Pita</i>	70	F1
11	BR12423-6R-38/BR11607-4R-72	<i>Wx(a), Wx.10, xa5, xa13, Xa21, SCT1</i>	85	F1
12	BR12512-5R-78/BR12567-5R-91	<i>Wx(a), Wx.10, SCT1, Cold1.jap, Pbl</i>	85	F1
13	BR12557-5R-105/BR12567-5R-91	<i>Wx(a), Wx.10, SCT1, Cold1.jap, Pbl, Pi9</i>	150	F1
14	SVIN109/BR12421-4R-171	<i>Wx(a), Wx.10, SCT1, Xa21</i>	175	F1
15	BR12527-5R-1/BR12524-5R-56	<i>Wx(a), Wx.10,</i>	40	F1
16	BR12567-5R-91/BR12524-5R-56	<i>Wx(a), Wx.10,</i>	120	F1
17	BR12419-6R-102/BR11894-R-R-R-	<i>Wx(a), Wx.10, SCT1</i>	100	F1
18	IR18A1398/BR11894-R-R-R-R-169	<i>Wx(a), Wx.10, Ctb</i>	130	F1
19	BR12524-5R-56/BR12454- BC2-69-97-39-5-44	<i>Wx(a), Wx.10, SCT1, Pbl, BPH32, Pita, Wx-A, Pi9</i>	60	F1
20	BR11303-5R-156/IR64EMF3	<i>Wx(a), Wx.10, EMF3</i>	70	F1
21	BR12454-BC2-69-97-39-5-44/BR12524-5R-56	<i>Wx(a), Wx.10, SCT1, Pbl, BPH32, Pita, Pi9</i>	110	F1
22	BR12520-5R-67/BR12527-5R-1	<i>Wx(a), Wx.10, SCT1, BPH32, Pbl, xa13</i>	110	F1
23	IR18A1398/BR12567-5R-91	<i>Wx(a), Wx.10, SCT1, Cold1.jap, Pbl</i>	130	F1
24	BR11318-5R-106/BR11607-4R-72	<i>xa5, xa13, Xa21</i>	160	F1
25	BR10604-5R-58/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Pi9, xa5, TSB1</i>	110	F1
26	BR13113-4R-63/Fatema dhan1	long and dense panicle	30	F1
27	BR13113-4R-116/Fatema dhan2	long and dense panicle	50	F1

28	BR13113-4R-86/Fatema dhan23	long and dense panicle	70	F1
29	BR12096-4R-124-1/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx(a), Wx.10, Pi9, xa5, xa13, Xa21</i>	40	F1

### Experiment 8.2: Hybridity test and confirmation of F<sub>1</sub>

Principal investigator: P S Biswas

Co-Investigators: M anisuzzaman

**Specific objectives:** To confirm the crosses as true F<sub>1</sub>s and use of the selected F<sub>1</sub>s to produce F<sub>2</sub> seeds or use in making different types of crosses.

**Materials and Methods:** A total of 23 crosses [16 crosses for forward breeding (FB) and seven for line augmentation (LA)] 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. The recipient parents of the crosses for LA were separately grown in six staggers to synchronize flowering with the F<sub>1</sub> plants. Fertilizer management was done following the protocol described in Experiment 8.1. Leaf samples were collected from each of the plants of F<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>s. QC genotyping was performed using 10 QC SNPs at Intertek, Australia. Trait genotyping with target trait SNPs were performed for the LA crosses. All genotyping results were analyzed using Flapjack.

**Results and Discussion:** The plants with heterozygous alleles at two or more QC SNP loci were declared as true F<sub>1</sub> in the case of FB crosses. A total of 16 crosses were identified as true F<sub>1</sub>. Seeds of these F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity stage, F<sub>2</sub> seeds of all selected plants were harvested individually. Then they were dried, cleaned and preserved in cold room for proper storage (Table 8.2a). In the case of line augmentation, 6-8 plants with heterozygous alleles at the target loci (e.g., Pi9, xa5, xa13, Xa21, bph17, BPH32, etc) were selected for making backcrosses with the respective recipient parents. All seven crosses were found true hybrid for the target trait marker and used making backcrosses (Table 8.2b).

**Table 8.2a List of crosses confirmed for the development of rice varieties for favorable Boro environment during 2023-24**

SL	BR No.	Parentage	Objectives/segregated genes
1	BR15948	BR12419-6R-102/IR18A1398	<i>Wx.a, Wx.10, Pbl, TSV1,</i>
2	BR15949	IR18A1398/BR12520-5R-75	<i>Wx.a, Wx.10, Pbl, TSV1, SCT1, BPH32</i>
3	BR15951	BR12520-5R-67/BR12567-5R-91	<i>Wx.a, Wx.10, Pbl, SCT1, BPH32, xa13,</i>
4	BR15952	BR12520-5R-67/BR12520-5R-75	<i>Wx.a, Wx.10, Pbl, TSV1, SCT1, BPH32, xa13</i>
5	BR15953	BR12527-5R-1/BR12524-5R-56	<i>Wx.a, Wx.10, Pbl, SCT1, BPH32, Pita</i>
6	BR15954	BR12567-5R-91/BR12524-5R-56	<i>Wx.a, Wx.10, Pbl, SCT1, BPH32, Pita, Cold1.jap,</i>
7	BR15956	BR12096-4R-124-1/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx.a, Wx.10, xa5, xa13, Xa21, Pi9</i>
8	BR15957	BR12419-6R-102/BR12567-5R-91	<i>Wx.a, Wx.10, Pbl, TSV1, SCT1, Cold1.jap</i>
9	BR15967	BR12557-5R-105/BR12524-5R-56	<i>Wx.a, Wx.10, Pbl, SCT1, BPH32, Pita, Pi9</i>
10	BR15969	BR10604-5R-58/IR126952-29-82-206-12-	<i>Wx.a, Wx.10, SCT1, BPH17, BPH32, Pita,</i>
11	BR15100	BR11894-R-R-R-110/BR8333-2-3-1-3	<i>Wx.a, TSV1, chalk5</i>
12	BR15102	BR11894-R-R-R-270/BR11896-5R-28	<i>Wx.a, Wx.10, TSV1</i>
13	BR15103	BR11894-R-R-R-270/GSR IR1-17-D6-Y1-D1-11	<i>Wx.a, Wx.10, TSV1</i>
14	BR15123	BR9945-5R-21/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx.A, Wx.10, xa5, Pi9</i>
15	BR15115	BR11640-5R-86/BR11607-4R-72	<i>Wx.a, Wx.10, SCT1, BPH32, Pita, ptr, xa5, xa13, Xa21</i>
16	BR15125	BR10604-5R-58/IR20X1002: IRRI 154-Pi9+Hd9 (N22)	<i>Wx.10, SCT1, BPH32, Pita, Ptr, Pi9, xa5</i>

**Table 8.2b List backcrosses made for line augmentation for the development of rice varieties for favorable Boro environment during 2023-24**

SL	Cross	Objectives/Gene of inheritance	No of seed	Type of seed
1	BR11315-5R-17*2/IR126952-29-82-206-12-8	Pi9, bph17, BHP32,xa5	275	BC1F1
2	BR9945-5R-21*2/IR126952-29-82-206-12-8	Pi9, bph17, BHP32,xa5	405	BC1F1
3	BR11640-5R-86*2/IR126952-29-82-206-12-8	Pi9, bph17, BHP32,xa5	185	BC1F1
4	BR10317-5R-25*2/BR11607-4R-72	xa5, xa13, Xa21	50	BC1F1
5	BR10604-5R-58*2/IR126952-29-82-206-12-8	Pi9, bph17, BHP32,xa5	55	BC1F1
6	BR9945-5R-21*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	Pi9, Hd9, xa5	195	BC1F1
7	BR10604-5R-58*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	Pi9, Hd9, xa5	190	BC1F1

**Experiment 8.3: Advancing segregating progenies in RGA nurseries**

Principal investigator: PS Biswas

Co-Investigators: M Anisuzzaman and KM Iftekharuddaula

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

**Materials and Method:** A total of 37,277 individual segregating progenies of 153 crosses comprising 3,977 progenies of 19 F<sub>2</sub>, 7,949 progenies of 31 F<sub>3</sub>, 5,058 progenies of 18 F<sub>4</sub>, 10,674 progenies of 39 F<sub>5</sub> populations and 6,018 progenies of 32 F<sub>6</sub> populations, 2203 progenies of 7 BC<sub>1</sub>F<sub>2</sub>, 1065 progenies of 5 BC<sub>1</sub>F<sub>4</sub>, 333 progenies of 2 BC<sub>2</sub>F<sub>2</sub>, 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 50°C for breaking dormancy and the same method was repeated to initiate next cycle of RGA immediately.

**Results and Discussion:** In total 28,528 individual progenies of 153 crosses of different generations were harvested (Table 8.3).

**Table 8.3 Segregating progenies of different generations advanced in the RGA nurseries for the Development of Favorable Boro Rice (FBR) during 2023-24.**

SL	BR number	Parentage	No. of plants grown	No of plants Harvested
<b>F2 Generation</b>				
1	BR15654	IR18A1398/BR12096-4R-124	216	216
2	BR15655	BR12520-5R-75/BR12509-5R-45	208	85
3	BR15656	BR12509-5R-45/BR (path)12452- BC3-42-22-11-4	324	228
4	BR15657	BR12557-5R-105/BR12096-4R-25-1	216	115
5	BR15658	BR12517-5R-57/BR(path)12452- BC3-42-22-11-4	160	151
6	BR15659	BR12559-5R-30/BR12096-4R-25-1	8	8
7	BR15660	BR12559-5R-30/BR12416-6R-219	50	13
8	BR15661	BR12096-4R-25-1/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	384	200
9	BR15662	BR12517-5R-57/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	432	382
10	BR15663	BR12517-5R-57/BR12416-6R-219	481	460

11	BR15664	BR12423-6R-38/BR12416-6R-219	296	282
12	BR15665	BR12512-5R-78/TP16199	80	25
13	BR14879	BR10317-5R-25/BR11607-4R-72	50	4
14	BR15116	BR10604-5R-58/BR11607-4R-72 (50. BR15116)	138	130
15	BR15671	BR11315-5R-17/IR126952-29-82-206-12-8	141	19
16	BR15672	BR9945-5R-21/IR126952-29-82-206-12-8	292	14
17	BR15673	BR11640-5R-86/IR126952-29-82-206-12-8	201	15
18	BR15691	BR12517-5R-57/BR11607-4R-72	120	113
19	BR15692	SVIN109/BR12421-4R-171	180	160
		<b>Sub Total</b>	<b>3977</b>	<b>2620</b>
	<b>F3 Generation</b>			
1	BR14601-R	BR11318-5R-18/BR8938-194-3-4-1-1-P2-HR3	390	207
2	BR14616-R	BRR1 dhan88/BRR1 dhan89	240	222
3	BR14620-R	BIN dhan14/BR11723-4R-172	290	205
4	BR14647-R	BR8899-14-4-1-2-2-1/IR19X1001: IRR1 154-Cold1	250	205
5	BR14658-R	BR12266-44-11-32-5-1-1-HR10-B/IR64EMF3	55	38
6	BR15091-R	BR11636-5R-194/BR11894-R-R-R-270	265	161
7	BR15092-R	BR11660-5R-254/BR11894-5R-77	144	188
8	BR15093-R	BR11660-5R-254/BR11894-R-R-R-110	355	414
9	BR15094-R	BR11660-5R-254/BR11894-R-R-R-270	204	213
10	BR15095-R	BR11660-5R-254/BR11894-R-R-R-299	378	244
11	BR15096-R	BR11660-5R-254/GSR IR1-17-D6-Y1-D1-11	330	198
12	BR15097-R	BR11887-5R-368/BR11894-R-R-R-11	366	288
13	BR15098-R	BR11887-5R-368/BR11894-R-R-R-270	350	208
14	BR15099-R	BR11894-R-R-R-110/BR11894-R-R-R-299	366	237
15	BR15104-R	BR11894-R-R-R-270/BR8333-2-3-1-3	340	41
16	BR15105-R	BR11894-R-R-R-299/BR11896-5R-28	107	110
17	BR15106-R	BR11636-5R-194/BRR1 dhan100	215	124
18	BR15107-R	BR11660-5R-254/BRR1 dhan100	350	183
19	BR15108-R	BR11887-5R-368/BRR1 dhan100	240	149
20	BR15109-R	BR11894-5R-77/BRR1 dhan100	349	224
21	BR15110-R	BR11894-R-R-R-110/BRR1 dhan100	295	160
22	BR15111-R	BR11894-R-R-R-270/BRR1 dhan100	236	79
23	BR15112-R	BR11894-R-R-R-299/BRR1 dhan100	187	34
24	BR15113-R	BR11315-5R-17/BR11607-4R-72	98	17
25	BR15114-R	BR9945-5R-21/BR11607-4R-72	29	29
26	BR15116-R	BR10604-5R-58/BR11607-4R-72	330	176
27	BR15118-R	BR11315-5R-17 (long)/BR12421-4R-171	300	200
28	BR15119-R	BR10604-5R-58/BR12421-4R-171	350	190
29	BR15120-R	BRR1 dhan89/HRB-190-23-17-B-5	337	122
30	BR15122-R	BR11315-5R-17/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	170	14
31	BR15117-R	BR11894-R-R-R-329/BR12421-4R-171	33	30
		<b>Sub Total</b>	<b>7949</b>	<b>4910</b>
	<b>F4 Generation</b>			
1	BR14630-2R	BR11712-4R-227/IR20X1003:IRRI154-Pi35	300	267
2	BR14631-2R	BR11712-4R-227/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	369	251
3	BR14639-2R	BR10317-5R-25/BR11315-5R-17	180	125
4	BR14645-2R	BR8899-14-4-1-2-2-1/IR20X1003:IRRI154-Pi35	372	204
5	BR14646-2R	BR8899-14-4-1-2-2-1/IR20X1005:IRRI 154-	213	168
6	BR14649-2R	BR8899-14-4-1-2-2-1/IR64EMF3	381	367
7	BR14848-2R	BR11318-5R-106/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	246	246
8	BR14849-2R	BR11660-5R-254/BR11887-5R-368	342	312
9	BR14850-2R	BR11894-5R-77/BR11894-R-R-R-213	165	243
10	BR14851-2R	BR11894-5R-77/BR11896-5R-28	177	164
11	BR14852-2R	BR11894-R-R-R-110/BR11896-5R-28	297	292
12	BR14853-2R	BR11894-R-R-R-110/GSR IR1-17-D6-Y1-D1-11	300	261
13	BR14855-2R	BR11894-R-R-R-169/BRR1 dhan 29-CS3-28-16-10-6-	348	330

14	BR14856-2R	BR12421-4R-171/BRRI dhan 29-CS3-28-16-10-6-	252	252
15	BR14857-2R	BR11894-R-R-R-329/BR11894-R-R-R-169	303	493
16	BR14858-2R	BR8899-14-4-1-2-2-1/HRB-190-23-17-B-5	225	230
17	BR14878-2R	BR10317-5R-25/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	297	321
18	BR14666-2R	BR11303-5R-156/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	291	291
		<b>Sub Total</b>	<b>5058</b>	<b>4817</b>
	<b>F5 Generation</b>			
1	BR14597-3R	BR10317-5R-25/BR11303-5R-156	510	510
2	BR14598-3R	BR11303-5R-156/BR11723-4R-172	480	350
3	BR14599-3R	BR11303-5R-19/BR11723-4R-172	411	357
4	BR14600-3R	BR11303-5R-19/IR107995-B-BRG-BRG-2-1	420	420
5	BR14601-3R	BR11318-5R-18/BR8938-194-3-4-1-1-P2-HR3	153	153
6	BR14602-3R	BR11318-5R-18/BR8631-12-3-5-P2	336	336
7	BR14603-3R	BR11330-5R-29/BR11342-5R-5	501	501
8	BR14604-3R	BR11330-5R-29/BR8899-14-4-1-2-2-1	459	239
9	BR14605-3R	BRRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Habj)/BR9943-26-2-3-6	180	180
10	BR14607-3R	BRRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Habj)/BR8912-12-6-1-1-1-1	240	240
11	BR14608-3R	BRRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Habj)/IR99285-1-1-1-P2	183	183
12	BR14609-3R	BR11607-4R-72/BR9943-26-2-3-6	378	227
13	BR14610-3R	BR11607-4R-72/IR64-Pi9	471	509
14	BR14611-3R	BR11723-4R-172/BR8912-12-6-1-1-1-1	477	419
15	BR14612-3R	BR11723-4R-172/BR8631-12-3-5-P2	396	468
16	BR14613-3R	BR8631-12-3-5-P2/IR172244	420	420
17	BR14614-3R	IR107995-B-BRG-BRG-2-1/BIN dhan17	303	474
18	BR14615-3R	TP26717/IR96925-B-B-B-B-61	204	302
19	BR14616-3R	BRRRI dhan88/BRRRI dhan89	114	128
20	BR14617-3R	BU dhan2/BR11723-4R-172	96	58
21	BR14618-3R	BU dhan2/BRRRI dhan81	90	90
22	BR14619-3R	BR11303-5R-156/BR11868-5R-59	270	270
23	BR14620-3R	BIN dhan14/BR11723-4R-172	75	93
24	BR14621-3R	BR12266-44-11-32-5-1-1-HR10-B/BINA dhan14	90	94
25	BR14622-3R	BIN dhan14/BR11712-4R-227	303	259
26	BR14630-3R	BR11712-4R-227/IR20X1003:IRRI154-Pi35	111	102
27	BR14631-3R	BR11712-4R-227/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	174	174
28	BR14634-3R	BR11712-4R-227/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	195	232
29	BR14635-3R	BR11712-4R-227/IR64EMF3	219	251
30	BR14636-3R	BR10317-5R-25/IR20X1003:IRRI154-Pi35	267	291
31	BR14640-3R	BR10317-5R-25/IR64EMF3	78	95
32	BR14642-3R	BR11303-5R-156/IR20X1005: IRRI 154-Pi54(Ttp)+Pi35	186	208
33	BR14650-3R	BR11318-5R-106/IR20X1003:IRRI154-Pi35	180	121
34	BR14652-3R	BR11318-5R-106/BR11315-5R-17	183	167
35	BR14653-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1003:IRRI154-	375	196
36	BR14654-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1005:IRRI	291	281
37	BR14657-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1002:IRRI	303	351
38	BR14266-3R	BR9651-15-2-1-3/BR11000-5R-2	474	519
39	BR14661-3R	IR126952-29-82-206-12-8/BR10317-5R-25	78	72
		<b>Sub Total</b>	<b>10674</b>	<b>10340</b>
	<b>F6 Generation</b>			
1	BR14215-4R	BR10317-5R-25/BR11303-5R-116	201	200
2	BR14216-4R	BR10317-5R-25/BR11318-5R-106	258	269
3	BR14218-4R	BR10318-5R-1/BR8899-14-4-1-2-2-1	333	252
4	BR14221-4R	BR11303-5R-19/BR8899-14-4-1-2-2-1	222	174
5	BR14222-4R	BR11303-5R-19/BR11388-4R-17	84	70
6	BR14223-4R	BR11318-5R-106/BR8899-14-4-1-2-2-1	225	133

7	BR14225-4R	BR11318-5R-18/BR8912-12-6-1-1-1-1	258	188
8	BR14226-4R	BR11318-5R-18/IR99285-1-1-1-P2	303	253
9	BR14227-4R	BR11318-5R-18/BR11388-4R-17	282	193
10	BR14229-4R	BR11342-5R-5/BR11607-4R-72	306	229
11	BR14231-4R	BRR1 dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Habj)/BR8631-12-3-5-P2	177	99
12	BR14232-4R	BR9942-1-2-1-1-B2/BR9943-26-2-3-6	168	102
13	BR14233-4R	BR9942-1-2-1-1-B2/IR172244	258	150
14	BR14234-4R	BR9942-1-2-1-1-B2/IR64-Pi9	234	184
15	BR14236-4R	BR8912-12-6-1-1-1-1/IR172244	279	271
16	BR14237-4R	IR99285-1-1-1-P2/IR107995-B-BRG-BRG-2-1	324	267
17	BR14238-4R	BIN dhan17/IR172244	243	115
18	BR14239-4R	BR11607-4R-72/IR172244	252	205
19	BR14240-4R	BR10317-5R-25/IR126952-28-94-31-B	30	27
20	BR14241-4R	BR11303-5R-156/IR126952-28-94-31-B	102	99
21	BR14242-4R	BR11318-5R-106/IR126952-28-94-31-B	39	39
22	BR14244-4R	BR10317-5R-25/BR11868-5R-59	105	97
23	BR14245-4R	BR10589-5R-39/BR11868-5R-59	42	25
24	BR14246-4R	BR11303-5R-116/BR11868-5R-59	222	109
25	BR14247-4R	IR16L1172/IR96925-B-B-B-B-61	150	145
26	BR14249-4R	HR(Pth)-10/BR7812-19-1-6-1-P2	153	127
27	BR14252-4R	BR11001-5R-37/TP26717	99	93
28	BR14257-4R	BR11303-5R-19/BR11868-5R-59	117	98
29	BR14258-4R	BR10317-5R-25/IR172244	261	257
30	BR14259-4R	BR11303-5R-156/IR172244	162	160
31	BR14261-4R	BR8899-14-4-1-2-2-1/IR172244	69	68
32	BR14265-4R	BR12266-44-11-32-5-1-1-HR10-B/BR11723-4R-172	60	60
		<b>Sub Total</b>	<b>6018</b>	<b>4758</b>
	<b>BC1F2 Generation</b>			
1	BR15675-BC1	BR11315-5R-17*2/IR20X1002:IRRI 154-Pi9+Hd9	435	103
2	BR15676-BC1	BR11640-5R-86*2/IR20X1002:IRRI 154-Pi9+Hd9	562	264
3	BR15677-BC1	BR11315-5R-17*2/BR11607-4R-72 (47. 15113)	515	93
4	BR15678-BC1	BR9945-5R-21*2/BR11607-4R-72 (48. BR15114)	62	16
5	BR15679-BC1	BR10604-5R-58*2/IR20X1002:IRRI 154-Pi9+Hd9	263	125
6	BR15693-BC1	BR11318-5R-106*2/BR11607-4R-72	242	32
7	BR15694-BC1	BR10604-5R-58*2/BR11607-4R-72 (50. BR15116)	124	52
		<b>Sub Total</b>	<b>2203</b>	<b>658</b>
	<b>BC1F4 Generation</b>			
1	BR14869-BC1-2R	BR11318-5R-156*2/IR20X1002:IRRI 154-Pi9+Hd9	117	117
2	BR14870-BC1-2R	BR11318-5R-106*2/IR20X1002:IRRI 154-Pi9+Hd9	93	93
3	BR14873-BC1-2R	IR126952-29-82-206-12-8/BR10317-5R-25*2	306	306
4	BR14874-BC1-2R	BR11318-5R-18*2/IR126952-29-82-206-12-8	279	279
5	BR14659-BC1-2R	BR11303-5R-156*2/BR11607-4R-72	270	270
		<b>Sub Total</b>	<b>1065</b>	<b>1065</b>
	<b>BC2F2 Generation</b>			
1	BR14871-BC1-2R	BR11303-5R-156*3/BR11607-4R-72	126	126
2	BR14872-BC1-2R	BR8899-14-4-1-2-2-1*3/BR11607-4R-72	207	207
		<b>Sub Total</b>	<b>333</b>	<b>333</b>
		<b>Grand Total</b>	<b>37,277</b>	<b>28,528</b>

#### Experiment 8.4: Line Stage Testing (LST)

Principal investigator: PS Biswas

Co-Investigators: M Anisuzzaman and KM Iftekharuddaula

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

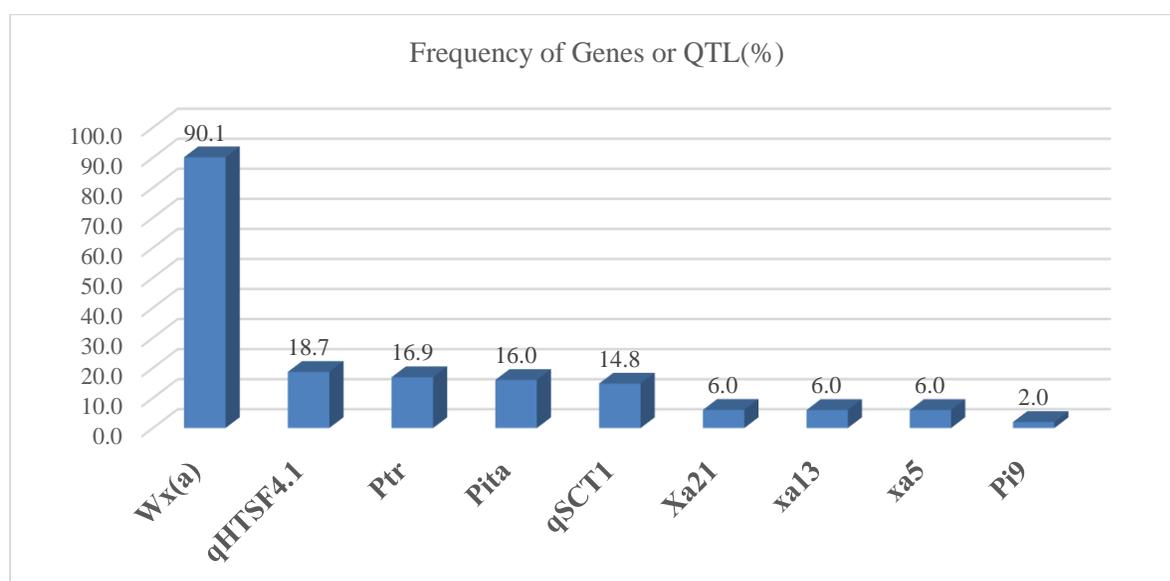
**Materials and Method:** Total 4,537 progenies from 42 crosses were grown in Boro season in 12-hills single-row plots using systematic arrangement design. Thirty-five-day-old single seedling was transplanted at 20 cm × 20 cm in the plots. Fertilizer management was done following the protocol described 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 598 LST lines (Table 8.4) were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape. 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) all 598 lines were selected for yield testing. The genotypic profiles showed that around 90% of lines had favourable alleles for high amylose specific markers *Wx(a)*, 22 lines (2%) had blast resistant gene *Pi9* and 17% had *Ptr* (*Pita2*) genes, 16% had *Pita* genes, 15% had heat tolerant gene *qHTSF4.1*, 6% had BLB resistant genes (*xa5*, *xa13* and *Xa21*).

**Table 8.4 List of breeding lines selected from the LST conducted for the Development of Favorable Rice (FBR) during 2023-24.**

Sl	Cross name	Parentage	No. of lines grown	No. of lines selected	Gene inheritance
1	BR13983	WNXIN-P10/BR11663(1323)-29-8	71	14	<i>Wx-10, Wx-a</i>
2	BR13984	WNXIN-P10/BR11000-5R-2	21	3	<i>Wx-10, Wx-a</i>
3	BR13985	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	98	17	<i>Wx-a, SCT1_1, SCT1_2</i>
4	BR13986	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	79	15	<i>Wx-a, SCT1_1, SCT1_2</i>
5	BR13987	HR(Pth)-10/IR16L1172	25	4	<i>Wx-a, SCT1</i>
6	BR13989	BR9943-40-3-2/BR11000-5R-2	80	8	<i>Wx-10, Wx-a, xa5, Xa21</i>
7	BR13991	BR9943-24-3-3/BR11000-5R-31	59	11	<i>Wx-10, Wx-a</i>
8	BR13992	BR9651-15-2-1-3/TP26717	164	19	<i>DTY3.2, Wx-a, Pi33, Xa7, DTY2.1, RF4, AG1, AG3, DTY1.1</i>
9	BR13995	BR8910-B-6-3-CS1-5-CS2-P3-1-1/IR96925-B-B-B-B-61	187	45	<i>Pi-ta, Bph17</i>
10	BR14215	BR10317-5R-25/BR11303-5R-116	150	5	<i>Wx-a, Wx-b, Wx-10, GS3</i>
11	BR14218	BR10318-5R-1/BR8899-14-4-1-2-2-1	269	59	<i>Wx-a, Wx-b, Wx-10, GS3</i>
12	BR14221	BR11303-5R-19/BR8899-14-4-1-2-2-1	176	9	<i>Wx-a, Wx-b, Wx-10, GS3</i>
13	BR14222	BR11303-5R-19/BR11388-4R-17	18	3	<i>Wx-a, Wx-b, Wx-10, GS3</i>
14	BR14223	BR11318-5R-106/BR8899-14-4-1-2-2-1	98	8	<i>Wx-a, Wx-b, Wx-10, GS3</i>
15	BR14225	BR11318-5R-18/BR8912-12-6-1-1-1-1	110	14	<i>Wx-a, Wx-b, Wx-10, NAS3</i>
16	BR14226	BR11318-5R-18/IR99285-1-1-1-P2	237	54	<i>Wx-a, Wx-b, Wx-10, NAS3</i>
17	BR14227	BR11318-5R-18/BR11388-4R-17	234	18	<i>Wx-a, Wx-b, Wx-10, NAS3, SCT1</i>
18	BR14229	BR11342-5R-5/BR11607-4R-72	81	12	<i>Wx-a, Wx-b, Wx-10, GS3, Pi-ta</i>
19	BR14231	BRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-P8(Habj)/BR8631-12-3-5-P2	108	31	<i>Wx-a, Wx-b, Wx-10</i>
20	BR14232	BR9942-1-2-1-1-B2/BR9943-26-2-3-6	29	4	<i>Xa21</i>
21	BR14233	BR9942-1-2-1-1-B2/IR172244	68	14	<i>Wx-a, Wx-b, Xa21, SCT1, Pi-ta</i>
22	BR14234	BR9942-1-2-1-1-B2/IR64-Pi9	68	22	<i>Xa21, Pi9</i>
23	BR14236	BR8912-12-6-1-1-1-1/IR172244	69	13	<i>Wx-a, Wx-b, Wx-10</i>

24	BR14237	IR99285-1-1-1-P2/IR107995-B-BRG-BRG-2-1	207	21	<i>Wx-a, Wx-b, Wx-10</i>
25	BR14238	BINA dhan17/IR172244	70	13	<i>Wx-a, Wx-b, Wx-10, SCT1, Pita</i>
26	BR14239	BR11607-4R-72/IR172244	164	11	<i>Wx-a, Wx-b, xa5, xa13, Xa21, SCT1</i>
27	BR14241	BR11303-5R-156/IR126952-28-94-31-B	57	4	<i>Wx-a, Wx-b, Wx-10, GS3</i>
28	BR14242	BR11318-5R-106/IR126952-28-94-31-B	49	14	<i>Wx-a, Wx-b, Wx-10, NAS3, BADH2</i>
29	BR14244	BR10317-5R-25/BR11868-5R-59	37	7	<i>Wx-a, Wx-b, Wx-10, GS3</i>
30	BR14247	IR16L1172/IR96925-B-B-B-B-61	150	2	<i>SCT1, Wx-a</i>
31	BR14249	HR(Path)-10/BR7812-19-1-6-1-P2	219	3	<i>Pi-ta, SCT1, BPH32, Wx-a, Pi9</i>
32	BR14252	BR11001-5R-37/TP26717	31	5	<i>Wx-a, Pi33, Pi-ta, xa5, SCT1, BPH32</i>
33	BR14257	BR11303-5R-19/BR11868-5R-59	70	2	<i>Wx-a, Wx-b, Wx-10, GS3</i>
34	BR14258	BR10317-5R-25/IR172244	102	1	<i>Wx-a, Wx-b, Wx-10, GS3</i>
35	BR14259	BR11303-5R-156/IR172244	61	8	<i>Wx-a, Wx-b, Wx-10, GS3</i>
36	BR14261	BR8899-14-4-1-2-2-1/IR172244	38	4	<i>Wx-a, Wx-b, Wx-10, GS3, SCT1</i>
37	BR14265	BR12266-44-11-32-5-1-1-HR10-B/BR11723-4R-172	39	2	<i>Wx-a, Wx-b, Wx-10, SCT1, Pita</i>
38	BR14659	BR11303-5R-156*2/BR11607-4R-72	136	22	<i>Wx.a, Wx.10, xa5, xa13, Xa21, Chalk5,</i>
39	BR14870	BR11318-5R-106*2/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	121	17	<i>Wx.a, Wx.10, chalk5, Pi9</i>
40	BR14871	BR11303-5R-156*3/BR11607-4R-72	51	2	<i>Wx.a, Wx.10, xa5, xa13, Xa21</i>
41	BR14872	BR8899-14-4-1-2-2-1*3/BR11607-4R-72	167	47	<i>Wx.a, Wx.10, xa5, xa13, Xa21, GS3, SCT1</i>
42	BR14874	BR11318-5R-18*2/IR126952-29-82-206-12-8	75	11	<i>Wx.a, Wx.10, Pi9, NAS3</i>



**Fig. 8.1** Genotyping profile of the fixed breeding lines selected from LST for the development of Favorable Boro Rice during Boro 2023-24

#### Experiment 8.5: Observational Yield Trial (OYT-FBC)

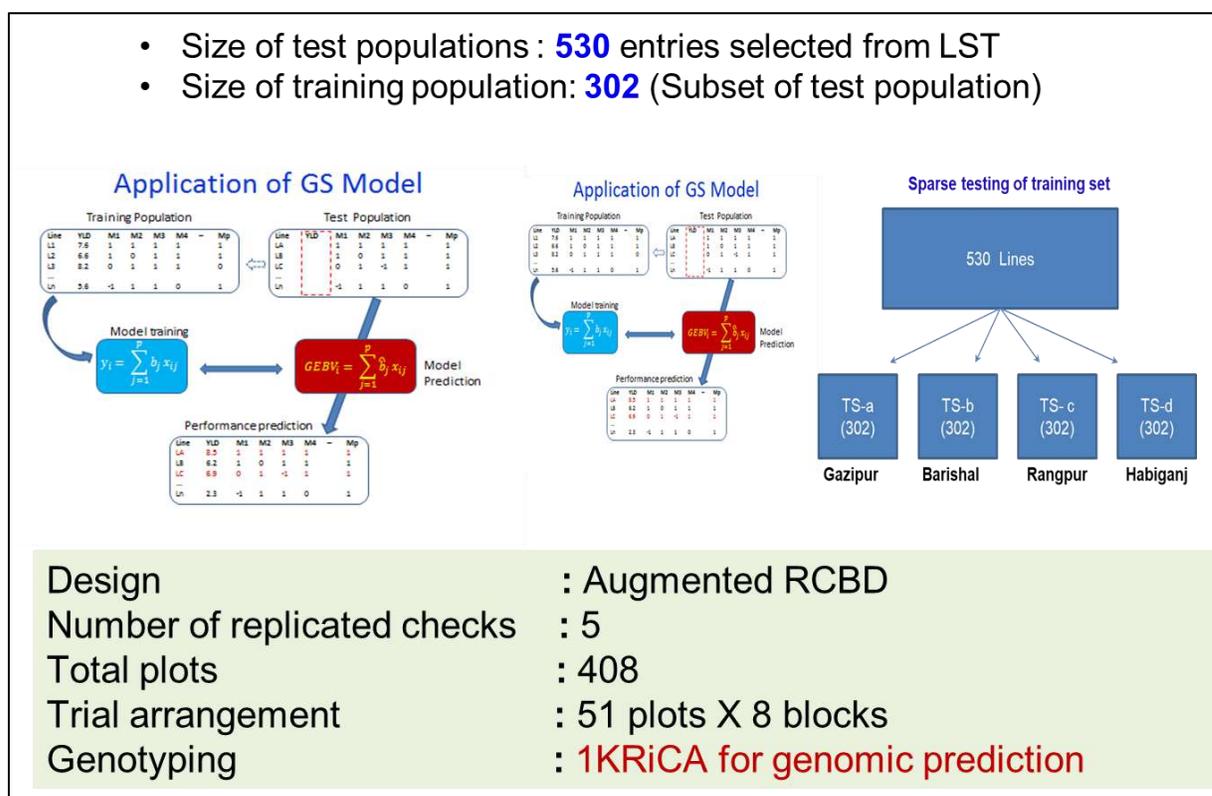
Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), T Shaha (Barishal), MR Hassan (Rangpur), MMB Afzal and M A Syed (Habiganj)

**Specific objective:** Selection of superior lines with desired agronomic characters.

**Materials and Methods:** A total of 530 genotypes were evaluated at four locations (Gazipur, Barishal, Rangpur, and Habiganj) following sparse model of genomic selection (Fig. 8.1). A

total of 302 genotypes, in which around 40% of the total genotypes were tested at each of four sites as training population. In this trial, BRR1 dhan28, BRR1 dhan29, BRR1 dhan88, BRR1 dhan89, BRR1 dhan92 and Bangabandhu dhan100 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.



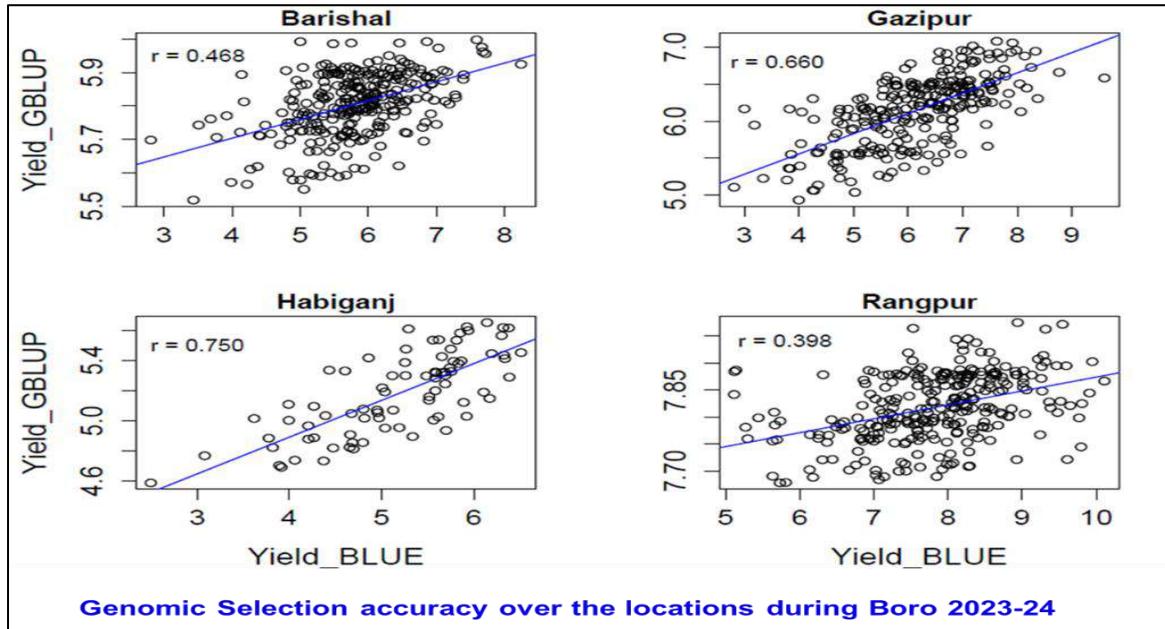
**Fig 8.1 Sparse testing 530 breeding lines at four locations during Boro 2023-24 for genomic selection**

Green leaf tissues from all 530 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 -800C 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, 530 breeding lines showed a wide range of variation in growth duration starting from 128 days to 155 days with 3.0 –9.7 t/ha yield over the locations. However, the training population of 302 breeding lines (a subset of 530) tested at four locations showed variable yield performance. Among all, 302 the lines tested at Barishal had a range of yield between 2.8-8.2 t/ha with growth duration of 98-147 days, 302 breeding lines yielded 3.0-9.6t/ha with 128 – 160 days growth duration at Gazipur, the 89 breeding lines tested at Habiganj yielded 3.1-6.5 t/ha and 301 breeding lines tested at Rangpur yielded 5.1-10.1 t/ha with 144 -162 days growth duration. The trial heritability ranged from 27.4% to 97.5% across the four locations. The wide variation in heritability might be due to the inconsistent performance of the breeding lines at different trial sites.

The prediction accuracy ( $r^2$ ) derived from correlation between the predicted yield and observed yield of the tested breeding lines within each training population ranged from 0.398 to 0.750 (Fig 8.2) across four sites. The predicted yield of 530 lines in Barishal ranged from 5.6-6.0 t/ha, while it was between 5.0 t/ha to 7.1 t/ha at Gazipur, 4.5 t/ha to 5.8 t/ha at Habiganj and 7.7 t/ha to 7.9 t/ha at Rangpur. Considering higher predicted yield at all four sites and observed yield (BLUE) over the check varieties, 30 breeding lines were selected for further trial (Table 8.5a).



**Fig. 8.2 Accuracy of genomic prediction performed for the 530 breeding lines tested in OYT-FBC conducted at four locations during Boro 2023-24.**

**Table 8.5a List of selected breeding lines from OYT-FBC conducted for the Development of Favorable Rice (FBR) during 2023-24.**

SL	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)					Predicted Yield (t/ha)				
				Bari shal	Gazi pur	Habi ganj	Rang pur	Ave	Bari shal	Gazi pur	Habi ganj	Rang pur	Ave
1	BR13983-3R-166	138	110	-	-	-	9.5	7.9	5.8	6.5	4.7	7.8	6.2
2	BR13983-3R-26	130	106	-	7.5	-	-	7.7	5.7	6.4	4.8	7.8	6.2
3	BR13983-3R-29	137	114	-	7.1	-	-	7.3	5.7	6.4	4.9	7.8	6.2
4	BR13983-3R-58	148	99	7.2	-	-	-	7.6	-	-	-	-	-
5	BR13983-3R-61	128	107	-	7.4	-	-	7.6	5.7	6.2	4.8	7.8	6.1
6	BR13983-3R-75	138	110	-	7.8	-	-	8.0	5.7	6.4	4.9	7.8	6.2
7	BR13983-3R-99	136	105	6.4	8.0	-	8.7	7.4	5.8	6.5	5.0	7.8	6.3
8	BR13985-2R-109	142	110	5.2	7.3	-	8.1	6.5	5.6	6.9	5.3	7.8	6.4
9	BR13985-2R-60	138	107	5.1	7.2	-	8.1	6.4	5.6	7.0	5.2	7.8	6.4
10	BR13985-2R-61	140	115	5.6	7.6	-	8.1	6.7	5.6	7.1	5.3	7.8	6.4
11	BR13985-3R-148	142	108	-	7.9	-	-	8.0	5.6	6.9	4.9	7.8	6.3
12	BR13985-3R-31	140	108	5.1	7.0	5.5	9.4	6.8	5.6	7.0	5.1	7.8	6.4
13	BR13985-3R-35	130	115	-	7.5	-	-	7.6	5.7	6.9	5.1	7.8	6.4
14	BR13988-3R-124	152	110	7.7	-	-	-	8.1	5.9	6.2	5.5	7.9	6.4
15	BR13988-3R-251	138	111	-	8.2	-	-	8.3	5.9	6.4	5.5	7.8	6.4
16	BR13989-3R-115	148	112	7.2	-	-	-	7.6	5.9	6.3	5.3	7.8	6.3
17	BR13990-2R-35	140	108	5.5	7.0	5.3	9.3	6.7	5.9	6.2	5.4	7.9	6.4
18	BR13990-2R-36	144	113	6.6	NA	5.8	10.1	7.4	5.9	6.5	5.4	7.8	6.4
19	BR13990-2R-7	138	111	7.7	6.6	-	8.9	7.4	5.9	6.3	5.2	7.9	6.3
20	BR13990-3R-73	133	97	-	9.6	-	-	9.7	5.9	6.6	5.4	7.8	6.4
21	BR13995-2R-46	151	97	8.2	6.1	-	8.0	7.1	5.9	5.6	4.9	7.9	6.1
22	BR13995-3R-25	138	109	7.6	-	-	-	8.0	6.0	6.0	5.0	7.8	6.2
23	BR13996-3R-156	144	107	6.4	6.1	-	9.3	6.9	5.9	5.6	5.3	7.9	6.2

24 BR13997-2R-86	140	112	5.6	NA	6.4	8.7	6.9	5.7	7.1	5.3	7.8	6.5
25 BR13997-3R-6	133	94	5.8	8.3	-	-	7.4	5.7	6.9	5.3	7.8	6.4
26 BR13998-3R-129	144	110	-	-	-	9.6	8.0	5.9	5.9	5.7	7.9	6.3
27 BR13998-3R-249	150	104	-	7.5	-	-	7.6	5.9	5.7	5.7	7.9	6.3
28 BR13998-3R-284	146	115	-	-	-	9.5	7.9	5.9	5.4	5.5	7.9	6.1
29 BR14007-3R-129	144	111	-	-	-	8.9	7.3	5.8	5.8	5.4	7.9	6.2
30 BR14007-3R-78	147	96	-	7.4	-	-	7.6	5.6	6.5	5.1	7.8	6.2
BRRi dhan100	139	109	5.5	6.5	5.4	7.7	6.2	5.8	6.0	5.5	7.9	6.3
BRRi dhan28	140	109	5.9	6.7	5.0	6.5	6.0	5.8	7.0	5.0	7.8	6.4
BRRi dhan29	153	108	5.5	6.1	6.3	7.3	6.3	5.9	5.6	5.7	7.9	6.3
BRRi dhan88	140	104	5.6	6.5	-	6.9	6.0	5.8	6.5	5.3	7.8	6.4
BRRi dhan89	151	111	5.9	6.2	6.5	8.2	6.7	5.9	5.5	5.7	7.9	6.3
BRRi dhan92	155	111	5.6	5.4	5.9	8.2	6.3	5.9	5.6	5.5	7.9	6.2
H2B	57.1	54.3	27.4	36.8	97.5	32.6	0					
LSD	10.7	13.0	1.3	1.9	2.1	1.8	1.8					

Nineteen out of 30 selected lines showed average yield of 6.4 – 9.7 t/ha with growth duration of 128 -139 days, nine breeding lines produced 6.9-8.0 t/ha yield with 144-150 days growth duration and two breeding lines showed 7.1-8.1 t/ha yield with 151-152 days growth duration. The check variety BRRi dhan28 yielded 6 t/ha with 140 days growth duration, BRRi dhan89 yielded 6.7t/ha with growth duration and BRRi dhan92 yielded 6.3 t/ha with 155 days growth duration (Table 8.5b).

**Table 8.5b. Summary performance the breeding lines selected from OYT-FBC conducted during Boro 2023-24**

Breeding lines	Yield (t/ha)	Growth duration (days)	Remarks
19 SD lines	6.4 – 9.7	128-139	BRRi dhan28 (6.0 t/ha, 140 d) BRRi dhan88 (6.0 t/ha, 140 d)
9 MD lines	6.9 – 8.0	144 - 150	BRRi dhan89 (6.7 t/ha, 151 d) Bangabandhu dhan100 (6.2 t/ha, 139 d)
2 LD lines	7.1 – 8.1	151 - 152	BRRi dhan89 (6.7 t/ha, 151 d) BRRi dhan92 (6.3 t/ha, 155 d)

#### Experiment 8.6: Observational Yield Trial (OYT-AGGRiNet)

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MR Hassan (Rajshahi), M A Syed (Habiganj), AKM Shalahuddin (Cumilla)

**Specific objective:** Selection of superior lines with desired agronomic characters.

**Materials and Methods:** A total of 168 genotypes were evaluated at three locations (Habiganj, Cumilla, and Rajshahi) following row-column design with two replications. In this trial, BRRi dhan88, BRRi dhan89, and BRRi dhan92 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.

**Results and Discussion:** In the trial, 165 breeding lines showed a wide range of variation in growth duration starting from 129 days to 141 days with 5.7-9.34 t/ha yield over the locations. At Cumilla, breeding lines had a range of yield between 4.17-7.51 t/ha with growth duration of 125-139 days, breeding lines yielded 0.33-5.64 t/ha with 122-146 days growth duration at Habiganj, and breeding lines yielded 6.07-10.47 t/ha at Rajshahi (Table 8.6).

**Table 8.6 Yield performances of the selected breeding lines from OYT-AGGRiNet trials conducted during Boro 2023-24**

Sl	Designation	Growth duration (days)				Yield (t/h)			
		Cumi lla	Habig anj	Rajsh ahi	Across sites	Cu mill	Habig anj	Rajsh ahi	Across sites
1	IR22MD1637	128	135	144	136	4.78	2.46	9.14	8.16
2	IR20X1015	131	132	144	136	6.03	-	9.53	8.04
3	IR22MD3737	129	133	142	135	6.15	3.88	9.18	7.91
4	IR22MD4057	131	129	146	135	6.39	2.55	9.31	7.91
5	IR22MD2048	130	130	144	135	7.2	2.33	8.07	7.85
6	IR22MD2234	129	130	149	136	5.57	3.76	9.24	7.40
7	IR22MD2015	130	135	140	135	6.03	3.12	9.99	7.24
8	IR22MD1319	133	125	142	133	5.86	3.28	9.59	7.13
9	IR22MD1618	128	130	139	132	6.45	-	9.24	7.09
10	IR22MD3929	134	131	143	136	6.09	3.05	10.43	7.06
11	IR22MD1405	128	136	141	135	6.9	2.00	7.84	7.01
12	BRI dhan88	133	130	139	134	5.52	2.13	7.11	6.31
13	BRI dhan89	139	139	146	141	5.98	3.27	10.47	6.65
14	BRI dhan92	138	124	147	146	6.35	3.26	9.17	7.11
Range (N = 168)		125- 139	122- 146	124- 150	129- 141	4.17 -	0.33 - 5.64	6.07- 10.47	5.70-9.34
LSD (0.05)		1.38	5.18	3.04	3.20	0.30	1.049	0.375	0.55

**Experiment 8.7: Advanced Yield trial**

Principal investigator: P S Biswas

Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MMB Afzal, M A Syed (Habiganj), AKM Shalahuddin (Cumilla)

**Specific objective:** Initial evaluation for yield potential in a replicated trial.

**Materials and Method:** A total of 39 genotypes in AYT-1, 25 genotypes in AYT-2 and 33 genotypes in AYT-3 were evaluated at three locations (Gazipur, Habiganj, and Cumilla) along with standard check varieties BRI dhan28 and BRI dhan88, 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:** In AYT-1, the trial heritability for yield ranged from 77% to 81% across the three locations but it was only 35% over the location. This might be due to inconsistent performance of the breeding lines at different trial sites (**Table 8.7a**). The check varieties BRI dhan28 and BRI dhan88 yielded 5.8 t/ha with 142 days growth duration and 5.7 t/ha with 148 days growth duration, respectively. In this trial, 3 breeding lines were selected for further evaluation as they showed 6.4 -6.5 t/ha grain yield potentiality with 144- 153 days growth duration.

**Table 8.7a: Agronomic performance of the selected entries from 39 breeding lines tested in FBR\_AYT-1 at three locations during Boro 2023-24**

SL	Designation	GD (days)	PH (cm)	Yield (t/ha)			Average
				Cumilla	Gazipur	Habiganj	
1	BR13418-5R-18	153	114	6.2	6.3	7.1	6.5
2	BR13137-5R-107	149	117	4.1	6.6	8.6	6.4
3	BR13141-5R-22	144	112	5.9	6.9	6.4	6.4

BRRi dhan28 (Ck)	142	4.7	6.9	5.9	5.8	5.8
BRRi dhan88 (Ck)	148	4.4	6.7	5.4	5.7	5.7
Range (N=39)	140-156	97-128	3.1-6.4	2.6-7.5	3.8-8.6	3.6-6.6
LSD	8.2	7.9	0.6	0.5	0.9	0.6
H2B (%)	82.0	73.0	79.0	81.0	77.0	35.0

D/S: 28.12.23 (Cumilla); 02.12.2023 (Gazipur); 20.11.23 (Habiganj)

D/T: 01.02.24 (Cumilla); 11.01.24 (Gazipur); 31.12.24 (Habiganj)

**In AYT-2**, the trial heritability for yield ranged from 61.7% to 88.9% across the three locations but it was only 56% over the location (**Table 8.7b**). The check varieties BRRi dhan58, BRRi dhan88, and BRRi dhan102 yielded 5.3 t/ha with 153 days growth duration, 5.7 t/ha with 146 days growth duration, and 4.9 t/ha with 156 days growth duration, respectively. In this trial, 3 breeding lines were selected for further evaluation as they showed 5.8-6.6 t/ha grain yield potentiality with 151-160 days growth duration.

**Table 8.7b: Agronomic performance of the selected entries from 25 breeding lines tested in FBR\_AYT-2 at three locations Boro 2023-24**

SL	Designation	GD (days)	PH (cm)	Yield (t/ha)			Average
				Cumilla	Gazipur	Habiganj	
1	IR19A8188	152	115	5.3	6.3	6.8	6.6
2	IR19A8263	160	131	3.9	5.4	7.2	6.3
3	IR19A8986	151	100	3.0	4.7	6.9	5.8
	BRRi dhan58 (Ck)	153	110	4.0	5.2	5.5	5.3
	BRRi dhan88 (Ck)	146	101	3.3	5.8	5.5	5.7
	BRRi dhan102 (Ck)	156	93	4.4	4.7	5.2	4.9
	Range (N=25)	144-163	84-132	2.4-6.1	4.2-6.3	3.9-7.2	3.5-6.6
	LSD	4.4	12.3	0.6	0.6	0.4	0.5
	H2B (%)	90.0	91.1	88.9	71.9	61.7	56.0

D/S: 02.12.2023 (Gazipur); 28.12.2023 (Cumilla); 22.11.2023 (Habiganj)

D/T: 11.01.2024 (Gazipur); 01.02.2024 (Cumilla); 07.01.2024 (Habiganj)

**In AYT-3**, the trial heritability for yield ranged from 73.8% to 87.3% across the three locations but it was only 62.7% over the location. This might be due to inconsistent performance of the breeding lines at different trial sites (**Table 8.7c**). The check varieties BRRi dhan67, BRRi dhan88, and BRRi dhan102 yielded 4.9 t/ha with 146 days growth duration, 4.5 t/ha with 140 days growth duration, and 5.0 t/ha with 146 days growth duration, respectively. In this trial, 7 breeding lines were selected for further evaluation as they showed 5.9-6.7 t/ha grain yield potentiality with 140-148 days growth duration.

**Table 8.7c: Agronomic performance of the selected entries from 33 breeding lines tested in FBR\_AYT-3 at three locations Boro 2023-24**

SL	Designation	GD (days)	PH (cm)	Yield (t/ha)			Average
				Cumilla	Gazipur	Habiganj	
1	BR13136-5R-139	145	99	6.3	7.3	6.6	6.7
2	BR13136-5R-165	144	107	6.3	6.4	6.8	6.5
3	BR13418-5R-21	145	101	6.4	6.6	5.5	6.2
4	BR13418-5R-58	141	99	5.2	6.1	6.3	5.9
5	BR13418-5R-20	142	110	5.1	7.0	5.5	5.9
6	SVIN109	145	110	6.2	6.9	4.5	5.9
7	IR12A173	148	114	6.0	6.7	-	5.9
8	BRRi dhan67	146	113	3.9	7.0	3.8	4.9
9	BRRi dhan88	140	96	4.0	6.2	3.1	4.5
10	BRRi dhan102	146	121	4.6	6.3	4.1	5.0
	Range (N=33)	137-157	94-126	2.6-6.4	3.5-7.3	2.0-6.8	3.1-6.9
	LSD	4.5	9.6	0.59	0.69	0.42	0.56
	H2b (%)	91.3	86.1	82.1	87.3	73.8	62.7

D/S: 29.12.2023 (Cumilla); 02.12.2023 (Gazipur); 22.11.2024 (Habiganj)

D/T: 03.02.2024 (Cumilla); 11.01.2024 (Gazipur); 31.12.2024 (Habiganj)

### Experiment 8.8: Regional Yield Trial (RYT)

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 MA Rahman (Kushtia), M R Islam and AKM Shahlahuddin (Cumilla), MR Islam and MF Islam (Rajshahi), MM Rashid and MA Syed (Habiganj), T Shaha (Barishal)

**Specific Objectives:** Evaluation of genotypes for specific and general adaptability across multiple trial sites of Bangladesh

**Materials and Methods:** A total of 10 entries including BRRi dhan88 and BRRi dhan96 as check varieties under RYT-SD, 12 entries including BRRi dhan58, BRRi dhan89, and BRRi dhan102 as check varieties under RYT-MD, 14 entries including BRRi dhan58, BRRi han88, BRRi dhan89, and BRRi dhan102 as check varieties under RYT-SMD and 6 entries including BRRi dhan104 and BRRi dhan63 as check varieties under RYT-ELS were evaluated at BRRi-Gazipur, Barishal, Satkhira, 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:** In RYT-SD, the trial heritability for yield ranged from 39.3% to 93.4% among the sites but the heritability over the site was 76.3% (Table 8.8a). The highest yield was observed at Sonagazi (6.1-8.1 t/ha) followed by Rajshahi site (6.3-7.9 t/ha) whereas the lowest yield was found at Kushtia (5.3-6.4 t/ha). The check varieties, BRRi dhan88 and BRRi dhan96 yielded 6.3 t/ha and 6.1 t/ha with 147 days and 145 days growth duration, respectively. Two breeding lines BR12574-5R-168, and BR1574-5R-52 showed yield advantage over the check varieties and were selected for further evaluation.

**Table 8.8a: Agronomic performances of the genotypes tested in RYT-SD during Boro 2023-24**

Designation	PH (cm)	DM (day)	Yield (t/ha)										Avg.
			L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	
BR12208-4R-278	152	94	5.4	7.4	6.8	5.1	6.0	6.1	6.9	6.5	6.0	7.9	6.4
BR12520-5R-67	141	102	4.7	6.6	6.9	5.8	5.5	-	-	6.7	6.6	7.9	6.3
<b>BR12574-5R-168</b>	<b>147</b>	<b>118</b>	<b>5.5</b>	<b>6.9</b>	<b>6.5</b>	<b>5.7</b>	<b>6.4</b>	<b>6.7</b>	<b>7.9</b>	<b>6.6</b>	<b>6.0</b>	<b>7.8</b>	<b>6.6</b>
<b>BR12574-5R-52</b>	<b>148</b>	<b>112</b>	<b>6.0</b>	<b>7.8</b>	<b>6.6</b>	<b>6.0</b>	<b>5.3</b>	<b>7.2</b>	<b>7.2</b>	<b>7.1</b>	<b>6.5</b>	<b>7.4</b>	<b>6.7</b>
BR12667-4R-86	150	101	5.1	6.0	5.9	5.3	5.7	5.8	6.3	6.3	6.8	6.9	5.9
BR12671-4R-95	157	120	6.1	7.3	7.1	4.5	5.7	6.1	7.1	7.3	5.6	8.1	6.6
BR12676-4R-392	148	98	5.2	6.7	6.0	4.8	6.4	5.7	6.6	6.5	6.4	7.1	5.7
BR12682-4R-50	153	115	5.5	7.0	7.1	5.7	6.2	6.7	7.5	7.0	5.6	6.4	6.5
BRRi dhan88	147	92	5.6	7.3	6.4	5.2	6.1	6.3	7.2	6.6	5.9	6.1	6.3
BRRi dhan96	145	88	5.2	6.6	6.5	5.0	6.1	6.5	6.3	7.1	5.9	6.5	6.1
Range (N=8)	88-120	141-157	4.7-6.1	6.0-7.8	5.0-7.1	5.4-7.2	5.8-7.0	5.3-6.4	6.3-7.9	6.3-7.3	5.6-6.8	6.1-8.1	5.2-6.9
LSD (0.05)	1.19	5.24	0.5	0.3	0.5	0.5	0.3	0.4	0.3	0.5	0.3	0.6	0.5
H <sup>2</sup> b (%)	63.4	97.2	85.7	89.4	72.2	76.1	93.4	85.6	91.8	39.3	86.1	89.2	76.3

Note: **Bold** font entries are selected

L1=Barishal, L2=Bhanga, L3=Cumilla, L4=Gazipur, L5=Habiganj, L6=Kushtia, L7=Rajshahi, L8=Rangpur, L9= Satkhira, L10=Sonagazi, Avg.= Average

D/S: 30.11.23 (L1); 20.11.23 (L2); 21.11.23 (L3); 26.11.23 (L4); 11.11.23 (L5); 12.12.23 (L6); 04.12.23 (L7); 05.12.23 (L8); 03.12.23 (L9); 29.11.23 (L10)

D/T: 08.01.24 (L1); 28.12.24 (L2); 28.12.23 (L3); 02.02.24 (L4); 24.12.24 (L5); 17.01.24 (L6); 12.01.24 (L7); 19.01.24 (L8); 06.01.24 (L9); 09.01.24 (L10)

**In RYT-MD**, the trial heritability for yield ranged from 42.5% to 94.1% among the sites but the heritability over the site was 63.8% (Table 8.8b). The highest yield was observed at Rangpur (6.3-7.9 t/ha) followed by Rajshahi site (6.2-7.9 t/ha) whereas the lowest yield was found at Gazipur (4.8-6.5 t/ha). The check varieties, BRRi dhan102, BRRi dhan58, and BRRi dhan89 yielded 6.6 t/ha, 6.4 t/ha, and 7.0 t/ha with 153 days, 151 days, and 156 days growth duration, respectively. Three breeding lines BR11894-5R-260, BR12508-5R-5, and BR12517-5R-57 showed 0.6 t/ha yield advantage and similar growth duration to BRRi dhan58 were selected for further evaluation.

**Table 8.8b: Agronomic performances of the genotypes tested in RYT-MD during Boro 2023-24**

Designation	PH (cm)	DM (day)	Yield (t/ha)										
			L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	AVE
BR11318-5R-148	155	110	6.0	6.8	7.4	5.8	6.3	6.5	6.2	6.9	7.5	7.7	6.7
<b>BR11894-5R-260</b>	<b>151</b>	<b>110</b>	<b>5.7</b>	<b>7.5</b>	<b>7.2</b>	<b>6.5</b>	<b>7.2</b>	<b>6.7</b>	<b>7.4</b>	<b>6.3</b>	<b>7.1</b>	<b>7.1</b>	<b>7.0</b>
BR12423-6R-38	151	105	5.8	7.1	6.8	5.7	6.7	6.6	6.8	6.9	6.7	6.5	6.5
<b>BR12508-5R-5</b>	<b>150</b>	<b>102</b>	<b>6.3</b>	<b>7.4</b>	<b>6.5</b>	<b>6.5</b>	<b>7.9</b>	<b>7.0</b>	<b>7.7</b>	<b>6.8</b>	<b>6.6</b>	<b>6.7</b>	<b>7.0</b>
BR12514-5R-27	151	106	5.1	6.2	5.6	4.8	7.5	6	6.2	6.4	7.2	6.9	6.1
BR12514-5R-97	149	92	5.9	7.4	6.9	5.9	6.9	6.2	7.9	6.6	7.5	7.7	6.8
<b>BR12517-5R-57</b>	<b>150</b>	<b>107</b>	<b>6.6</b>	<b>7.3</b>	<b>5.5</b>	<b>6.2</b>	<b>7.3</b>	<b>7.2</b>	<b>7.7</b>	<b>6.6</b>	<b>7.0</b>	<b>6.6</b>	<b>7.0</b>
BR12520-5R-11	149	105	5.9	7.4	5.5	6.3	-	6.7	7.8	6.6	6.6	7.3	6.8
IR18A1398	158	109	6.5	6.9	7.5	5.8	6.0	6.8	6.9	6.7	7.7	6.7	6.7
BRRi dhan102	153	110	5.9	7.2	7.1	4.8	6.4	6.9	7.4	7.8	7.1	6.9	6.6
BRRi dhan58	151	100	5.9	7.4	6.5	5.1	6.7	7.1	7.1	6.1	6	6.8	6.4
BRRi dhan89	156	109	6.5	7.3	6.9	5.7	6.8	6.8	8	6.1	7.6	7.1	7.0
Entry Range (N=9)	92- 110	139- 158	5.1- 6.6	6.2- 7.5	5.5- 7.5	4.8- 6.5	6.0- 7.9	6.0- 7.2	6.2- 7.9	6.3- 7.9	6.6- 7.7	6.5- 7.7	6.1- 7.0
LSD (0.05)	4.44	3.04	0.2	0.2	0.2	0.4	0.2	0.2	0.2	12.5	0.2	0.3	0.2
H <sup>2</sup> b (%)	91.5	94.1	92.4	86.5	93.2	74.6	88.5	69.6	94.1	84.5	82.3	42.5	63.8

Note: **Bold** font entries are selected

\*PH=Average Plant height, DM= Average Days to maturity, BLUE=Best Linear Unbiased Estimation

L1= Barishal, L2= Bhanga, L3= Cumilla, L4= Gazipur, L5= Habiganj, L6= Kushtia, L7= Rajshahi, L8= Rangpur, L9= Satkhira, L10= Sonagazi, Av= Average

D/S: 08.12.23 (L1); 26.11.23 (L2); 24.11.23 (L3); 24.11.23 (L4); 15.11.23 (L5); 14.12.23 (L6); 04.12.23 (L7); 05.12.23 (L8); 03.12.23 (L9); 14.12.23 (L10)

D/T: 17.01.24 (L1); 03.01.24 (L2); 09.01.24 (L3); 02.01.24 (L4); 28.12.24 (L5); 25.01.24 (L6); 12.01.24 (L7); 16.01.24 (L8); 06.01.24 (L9); 17.01.24 (L10)

**In RYT-SMD**, the trial heritability for yield ranged from 64.8% to 93.2% among the sites but the heritability over the site was 77.5% (Table 8.8c). The highest yield was observed at Rajshahi (6.6-8.6 t/ha) followed by Rangpur site (6.0-8.6 t/ha) whereas the lowest yield was found at Sonagazi (2.0-6.6 t/ha). The check varieties, BRRi dhan102, BRRi dhan58, BRRi dhan88, and BRRi dhan89 yielded 6.4 t/ha, 6.3 t/ha, 6.0 t/ha, and 6.8 t/ha with 152 days, 152 days, 145 days, and 154 days growth duration, respectively. The breeding line BR11894-R-R-R-329 produced similar grain yield and growth duration to BRRi dhan88 was selected for further evaluation.

**Table 8.8c: Agronomic performances of the genotypes tested in RYT-SMD during Boro 2023-24**

Designation	DM (day)	PH (cm)	Yield (t/ha)										
			L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Avg.
BR11894-R-R-R-R-	151	108	5.7	7.6	7.2	6.3	6.8	6.1	7.4	6.7	6.3	6.6	6.7
BR11894-R-R-R-R-	146	104	5.0	5.9	6.1	6.1	6.4	5.6	7.1	7.3	5.3	2.0	5.5

BR11894-R-R-R-R-	147	102	5.1	7.0	7.2	6.1	6.5	6.7	7.4	7.3	5.0	4.9	6.2
BR11894-R-R-R-R-	147	103	5.4	6.4	6.5	5.7	6.3	6.2	7.5	7.8	6.0	5.7	6.2
<b>BR11894-R-R-R-R-</b>	<b>146</b>	<b>104</b>	<b>5.1</b>	<b>6.7</b>	<b>6.5</b>	<b>6.5</b>	<b>6.5</b>	<b>6.1</b>	<b>6.7</b>	<b>6.7</b>	<b>6.1</b>	<b>4.9</b>	<b>6.1</b>
BR13027-BC1-3R-77	150	107	6.6	7.1	7.5	6.1	6.9	6.0	7.7	-	6.7	6.6	6.8
IR17A2875	146	103	5.3	6.7	6.2	6.3	6.8	6.9	7.2	8.6	5.4	5.9	6.3
IR17A2922	150	108	5.3	6.5	6.5	6.2	7.0	6.0	7.6	6.1	5.3	6.2	6.3
IR18A2427	150	108	5.1	5.4	7.1	5.4	7.3	-	-	6.4	4.6	5.8	5.9
IR19A7068	147	97	5.4	6.5	-	3.5	6.3	5.5	-	7.4	5.2	4.4	5.6
BRR1 dhan102	152	113	5.7	6.7	7.1	6.0	6.2	6.8	7.4	6.0	6.0	5.7	6.4
BRR1 dhan58	152	100	6.1	7.1	6.4	5.8	6.5	6.7	6.6	6.8	6.5	5.3	6.3
BRR1 dhan88	145	91	5.7	6.7	6.6	5.9	6.4	5.7	7.2	6.0	5.7	4.2	6.0
BRR1 dhan89	154	110	6.5	6.9	6.8	6.8	6.5	7.2	8.0	6.3	6.2	6.7	6.8
Range (N=9)	91-113	145-154	5.0-6.6	5.4-7.1	6.1-7.5	3.5-6.8	6.2-7.3	5.5-7.2	6.6-8.6	6.0-8.6	5.2-6.7	2.0-6.6	5.5-6.8
LSD (0.05)	1.49	0.53	0.4	0.4	0.4	0.6	0.4	0.6	0.3	0.6	0.4	0.6	0.5
H <sup>2</sup> b (%)	93.2	89.3	89.6	88.7	79.2	81.8	64.8	73.2	79.1	92.4	87.5	93.2	77.5

Note: **Bold** font entries are selected

L1=Barishal, L2=Bhanga, L3=Cumilla, L4=Gazipur, L5=Habiganj, L6=Kushtia, L7=Rajshahi, L8=Rangpur, L9= Satkhira, L10=Sonagazi, Avg.= Average

D/S: 30.11.23 (L1); 20.11.23 (L2); 21.11.23 (L3); 26.11.23 (L4); 11.11.23 (L5); 12.12.23 (L6); 04.12.23 (L7); 05.12.23 (L8); 03.12.23 (L9); 29.11.23 (L10)

D/T: 08.01.24 (L1); 28.12.24 (L2); 28.12.23 (L3); 02.02.24 (L4); 24.12.24 (L5); 17.01.24 (L6); 12.01.24 (L7); 19.01.24 (L8); 06.01.24 (L9), 09.01.24 (L10)

In **RYT-ELS**, the trial heritability for yield ranged from 45.6% to 96.3% among the sites but the heritability over the site was 73.1% (Table 8.8d). The highest yield was observed at Rajshahi (6.6-8.6 t/ha) followed by Rangpur site (6.0-8.6 t/ha) whereas the lowest yield was found at Sonagazi (2.0-6.6 t/ha). The check varieties, BRR1 dhan104 and BRR1 dhan63 yielded 5.9 t/ha and 5.9 t/ha with 152 days and 147 days growth duration, respectively. The breeding line BR7528-2R-19-16-RIL-55 showed 0.5 t/ha grain yield advantage and growth duration similar to BRR1 dhan104 was selected for further evaluation.

**Table 8.8d: Agronomic performances of the genotypes tested in RYT-ELS during Boro 2023-24**

Designation	Growth duration (day)	Plant height (cm)	Yield (t/ha)										
			L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Avg.
BR7528-2R-19-16-RIL-52	153	106	5	7	6.4	4.3	5.5	6.9	6.6	7	6.8	5.8	6.1
BR7528-2R-19-16-RIL-55	152	104	4.8	6.2	6.7	4.8	6.6	6.5	6.9	6.7	7.2	6	6.4
BR7528-2R-19-16-RIL-59	150	104	5.2	6.9	7.1	4.6	6.8	6.2	6.5	6	7.4	6.5	6.2
BR9945-5R-21	149	108	5.2	7.3	6.2	5.2	6.7	6.1	5.5	6.2	7.4	6	6.2
BRR1 dhan104	152	101	5.4	6.9	6.7	4.9	6.4	6.6	6.8	6.3	6.6	5.2	5.9
BRR1 dhan63 (Ck)	147	87	5.6	7.2	5.9	4.5	6.3	6.3	6	6.1	7.2	3.9	5.9
LSD (0.05)	4.1	3.9	0.3	0.4	0.4	0.4	0.3	0.3	0.2	0.5	0.3	0.7	0.6
H <sup>2</sup> b (%)	95.3	97.4	62.0	76.2	72.3	45.6	92.4	91.1	96.3	68.2	76.6	87.4	73.1

L1= Barisal, L2= Bhanga, L3= Cumilla, L4= Gazipur, L5= Habiganj, L6= Kushtia, L7= Rajshahi, L8= Satkhira, L9= Rangpur, L10= Sonagazi, Av= Average

D/S: 30.11.23 (L1); 20.11.23 (L2); 21.11.23 (L3); 26.11.23 (L4); 11.11.23 (L5); 12.12.23 (L6); 04.12.23 (L7); 05.12.23 (L8); 03.12.23 (L9); 29.11.23 (L10)

D/T: 08.01.24 (L1); 28.12.24 (L2); 28.12.23 (L3); 02.02.24 (L4); 24.12.24 (L5); 17.01.24 (L6); 12.01.24 (L7); 19.01.24 (L8); 06.01.24 (L9), 09.01.24 (L10)

## 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

**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:** Twenty-one 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 ZnSO<sub>4</sub>/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<sub>4</sub> were applied at final land preparation. Leaf samples were collected from all 24 plants of each parent for QC genotyping with 10 SNP panels. 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 1512 plants samples of 21 parents were genotyped with 10 QC SNPs. The plants with unique profiles for all 10 SNPs were declared as true plants of that parent. The true plants were used in making crosses. A total of 9 single crosses were made using 12 true parents (**Table 9.1b**). Mature F<sub>1</sub> seeds were harvested, sun-dried, and stored separately in paper bags with proper labelling.

**Table 9.1b. List of crosses made for the development of cold tolerant rice (CTR) during Boro 2023-24**

SL	Cross	Objectives/Gene of inheritance	No of seed	Type of seed
1	BR12520-5R-67/TP16199	<i>Wx(a), Wx.10, qPSST3, qPSST7,</i>	30	F1
2	BR12520-5R-67/BR11894-R-R-R-R-169	<i>Wx(a), Wx.10, Ctb, SCT1, BPH32, Pb1, xa13</i>	20	F1
3	BR12557-5R-105/TP16199	<i>Wx(a), qPSST3, qPSST7, qPSST9, Pi9</i>	55	F1
4	BRR1 dhan81/Rata Boro	<i>Xa21, Wx(a), SCT1, Pi33, chalk5</i>	80	F1
5	BRR1 dhan81/Bhutan	<i>Wx(a), Wx-10, SCT1, TSV1, Xa21, SCT1,</i>	140	F1
6	BR11887-5R-368/IR83222-F11-173	<i>qPSST3, qPSST7, qPSST9</i>	150	F1
7	BR11894-R-R-R-299/IR83222-F11-	<i>qPSST3, qPSST7, qPSST9</i>	40	F1
8	BRR1 dhan100/IR83222-F11-173	<i>qPSST3, qPSST7, qPSST9</i>	40	F1
9	BR11303-5R-156/Rata Boro	<i>Wx(a), Pb1, Wx-10, chalk5</i>	40	F1

### Experiment 9.2: Hybridity test and confirmation of true F<sub>1</sub>

Principal investigator: P S Biswas

Co-Investigator: M Anisuzzaman

**Specific objectives:** To isolate true F<sub>1</sub>s and use in line augmentation (backcrossing) and/or selfing to produce F<sub>2</sub> seeds.

**Materials and Methods:** Thirty-nine crosses including 26 single crosses and 13 backcrosses were grown along with their parents in the backcrossing nursery using single seedling/hill at 25 cm × 20 cm spacing in 8-hilled 1-3 rows plots. The recipient parents of the crosses were

separately grown in six staggers to synchronize flowering with the F<sub>1</sub> plants. Fertilizer management was done following the protocol described in Experiment 9.1. Leaf samples from 4136 plants were collected from each of the plants from F<sub>1</sub> and parents for trait genotyping to determine true F<sub>1</sub> for the target trait SNPs (SCT1, qPSST3, qPSST6, qPSST7, qPSST, etc). Trait genotyping was performed using 20 trait SNPs at Intertek, Australia. Genotyping results were analysed using a genotyping data analytical tool called Flapjack.

**Results and Discussion:** The crosses showing heterozygous SNP loci in any sample F<sub>1</sub> plant for the target trait SNPs were considered as true F<sub>1</sub>. The analysis of genotyping data identified 2-5 true F<sub>1</sub> plants from 37 crosses out of 39 crosses. At maturity, seeds were collected only from true F<sub>1</sub> plants. **Table 9.2a** shows the list of confirmed crosses and genes segregating in them. A total of 22 backcrosses (**Table 9.2b**) were made for augmentation of 16 elite breeding lines/varieties with seedling and reproductive stage cold tolerance using selected F<sub>1</sub> plants heterozygous for the target SNP marker loci as the pollen parents. At maturity, backcross seeds were collected, dried and preserved. F<sub>2</sub> seeds of all the selected F<sub>1</sub> plants were also harvested individually, dried, cleaned, and preserved in the cold room.

**Table 9.2a. List of crosses confirmed for the development cold tolerant rice during Boro 2023-24**

SL	BR No.	Parentage	Objectives/segregated genes
		Single cross	
1	BR15958	BR12419-6R-102/TP16199	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
2	BR15959	BR12419-6R-102/IR83222-F11-173	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
3	BR15960	BR12419-6R-102/BR11894-R-R-R-169	<i>Wx.a, Wx.10, Pb1, TSV1, Ctb</i>
4	BR15961	BR12419-6R-102/BR11894-R-R-R-329	<i>Wx.a, Wx.10, Vegetative stage cold tolerance</i>
5	BR15962	BR12512-5R-78/IR83222-F11-173	<i>Wx.a, Wx.10, SCT1, qPSST3, qPSST7,</i>
6	BR15963	BR12512-5R-78/BR11894-R-R-R-169	<i>Wx.a, Wx.10, SCT1, Ctb</i>
7	BR15965	IR18A1398/BR11894-R-R-R-169	<i>Wx.a, Wx.10, Vegetative stage cold tolerance</i>
8	BR15966	BR12520-5R-67/IR83222-F11-173	<i>Wx.a, Wx.10, Pb1, SCT1, BPH32, xa13,</i>
9	BR15968	BR11712-4R-218/BR12524-5R-56	<i>Wx.a, Wx.10, Pb1, SCT1, BPH32, Pita, dense</i>
10	BR14625	BR11303-5R-156/Rata Boro	<i>Wx.a, Wx.10, Pb1, chalk5, qPSST3, qPSST7,</i>
11	BR15970	BR11894-R-R-R-270/TP16199	<i>Wx.a, Wx.10, TSV1, qPSST3, qPSST7,</i>
12	BR15971	BR11894-R-R-R-299/TP16199	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
13	BR15972	BRR1 dhan100/TP16199	<i>Wx.a, Wx.10, TSV1, qPSST3, qPSST7,</i>
14	BR15973	BR11894-R-R-R-110/Rata Boro	<i>Wx.a, Wx.10, TSV1, qPSST3, qPSST7,</i>
15	BR15974	BR11894-R-R-R-270/Rata Boro	<i>Wx.a, Wx.10, TSV1, qPSST3, qPSST7,</i>
16	BR15975	BR11894-R-R-R-299/Rata Boro	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
17	BR15976	BR11636-5R-194/Rata Boro	<i>Wx.a, Wx.b, SCT1, qPSST3, qPSST7,</i>
18	BR15977	BR11660-5R-254/Rata Boro	<i>Wx.a, Wx.b, Wx.10, Pita, qPSST3, qPSST7,</i>
19	BR15978	BR11887-5R-368/Rata Boro	<i>Wx.a, Wx.b, Wx.10, Pita, qPSST3, qPSST7,</i>
20	BR15979	BRR1 dhan81/Rata Boro	<i>Wx.a, SCT1, Xa21, Pi33, qPSST3, qPSST7,</i>
21	BR14865	BRR1 dhan81/Bhutan	<i>Wx.a, SCT1, TSV1, Xa21, Pi33,</i>
22	BR15127	BR11660-5R-254/IR83222-F11-173	<i>Wx.a, Wx.10, Pita, qPSST3, qPSST7, qPSST9</i>
23	BR11643	BRR1 dhan28/Bhutan	<i>Wx-a, Wx-10, SCT1, TSV1</i>
24	BR14627	BR11318-5R-106/Rata Boro	<i>Wx-a, Wx-10, chalk5, Ptr, Pb1, qPSST3,</i>
25	BR15980	BR11318-5R-106*3/IR83222-F11-173	<i>Wx-a, Wx-10, chalk5, QPSST3, QPSST7,</i>
26	BR15699	BR11712-4R-227*3/Rata Boro	<i>Wx-10, Pita, qSCT1, qPPST3, qPSST7,</i>
27	BR15783	BR11318-5R-106*3/Rata Boro	<i>Wx-10, Pb1, qPSST3, qPSST7, qPSST9</i>
28	BR15981	BR11894-R-R-R-110*3/IR83222-F11-173	<i>Wx-a, TSV1, qPSST3, qPSST7, qPSST9, Pb1</i>
29	BR15982	BR11894-R-R-R-270*3/IR83222-F11-173	<i>Wx-a, Wx-10, TSV1, qPSST3, qPSST7,</i>
30	BR15983	BRR1 dhan100*3/IR83222-F11-173	<i>Wx-a, qPSST3, qPSST7, qPSST9</i>
31	BR15695	BR11894-R-R-R-270*2/IR83222-F11-173	<i>Wx-a, Wx-10, TSV1, qPSST3, qPSST7, qPSST9, Pita, qSCT1, BPH32, Pb1</i>
32	BR15984	BR11894-R-R-R-299*2/IR83222-F11-173	<i>Wx-a, Wx-10, TSV1, qPSST3, qPSST7, qPSST9</i>
33	BR15696	BRR1 dhan100*2/IR83222-F11-173	<i>Wx-10, qPSST3, qPSST7, qPSST9</i>
34	BR15697	BRR1 dhan67*2/Bhutan	<i>Wx-10, qPSST3, qPSST7, qPSST9</i>
35	BR15698	BRR1 dhan100*2/Bhutan	<i>Wx-10, qPSST3, qPSST7, qPSST9</i>
36	BR15985	BR11636-5R-194*3/IR83222-F11-173	<i>Wx-a, Wx-b, SCT1, qPSST3, qPSST7, qPSST9</i>

**Table 9.2b. List of backcrosses made for line augmentation for the development of cold tolerant rice (CTR) during Boro 2023-24**

SL	Cross	Objectives/Gene of inheritance	No of seed	Type of seed
1	BR11712-4R-218*2/IR83222-F11-173 (BR15670-3,12)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	190	BC1F1
2	BR11660-5R-254*3/IR83222-F11-173 (BR15681-2,8,9,21,25,40)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	300	BC2F1
3	BR11303-5R-156*2/Rata Boro (BR14625-1)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	25	BC1F1
4	BR11894-R-R-R-270*3/IR83222-F11-173 (BR15695-3,8,19)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	98	BC2F1
5	BR11894-R-R-R-299*3/IR83222-F11-173 (BR15984-1,3)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	77	BC2F1
6	BRR1 dhan100*2/IR83222-F11-173 (57. BR15132-9,19,25)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	185	BC1F1
7	BR11712-4R-227*3/Rata Boro (67. BR15183-3)	<i>qPSST3, qPSST7, qPSST9, Wx-a</i>	150	BC2F1
8	BR11318-5R-106*3/Rata Boro (69. BR15185-18,55)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	55	BC2F1
9	BR12419-6R-102*2/TP16199 (BR15958-1,2,24,37)	<i>SCT1, qPSST3, qPSST7, qPSST9</i>	175	BC2F1
10	BR12419-6R-102*2/IR83222-F11-173 (BR15959-19,38,39,110)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	203	BC1F1
11	BR12520-5R-67*2/IR83222-F11-173 (BR15966-5,38)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	110	BC1F1
12	BR11894-R-R-R-110*2/Rata Boro (BR15973-19,39,43)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	156	BC1F1
13	BR11894-R-R-R-270*2/Rata Boro (BR15974-11)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	85	BC1F1
14	BR11894-R-R-R-299*2/Rata Boro (BR15975-4)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	20	BC1F1
15	BR11636-5R-194*2/Rata Boro (BR15976-21)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	22	BC1F1
16	BR11887-5R-368*2/Rata Boro (BR15978-3,24)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	95	BC1F1
17	BRR1 dhan81*2/Rata Boro (BR15979-12)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	42	BC1F1
18	BRR1 dhan81*2/Bhutan (BR14865-7)	<i>SCT1, qPSST3, qPSST7, qPSST9, qPSST6</i>	20	BC1F1
19	BRR1 dhan28*2/Bhutan (BR11643-1,2)	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	90	BC1F1
20	BR11318-5R-106*2/Rata Boro (BR14627-2)	<i>qPSST3, qPSST7, qPSST9, qPSST6</i>	60	BC1F1
21	BRR1 dhan67*2/Bhutan	<i>Wx(a), Ctb</i>	190	BC1F1
22	BRR1 dhan100*2/Bhutan	<i>SCT1, qPSST3, qPSST7, qPSST9, Wx-a</i>	300	BC2F1

### Experiment 9.3: Advancing segregating progenies in RGA nurseries

Principal investigator: P S Biswas

Co-Investigator: M anisuzzaman and KM Iftekharuddaula

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

**Materials and Methods:** In total 35,732 segregating progenies comprising 3,444 F<sub>2</sub> progenies of 10 crosses, 2,560 F<sub>3</sub> progenies of 9 crosses, 7,718 F<sub>4</sub> progenies of 33 crosses, 11,907 F<sub>5</sub>

progenies of 46 crosses, 6,144 F<sub>6</sub> progenies of 33 crosses, 1,376 BC<sub>1</sub>F<sub>2</sub> progenies of 7 crosses, 2,689 BC<sub>2</sub>F<sub>2</sub> progenies of 9 crosses, 894 BC<sub>1</sub>F<sub>4</sub> progenies of 3 crosses and 333 BC<sub>2</sub>F<sub>4</sub> progenies of 2 crosses were advanced in greenhouse and field RGA nursery. Sowing of seeds at both greenhouse and field RGA nurseries was staggered into two batches to ease management. The first batch was seeded on October 10 and 2nd batch was seeded on December 20. At maturity of the crop of each stagger, a single panicle was harvested from each bunch grown from a single panicle of previous generation. Populations were grown in fields 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 5 cm apart to sow seeds. Fertilizer management is being done using 130:50:55:6 Kg Urea, TSP, MOP, Gypsum and ZnSO<sub>4</sub>/ha. Half of urea and MOP, and all other fertilizers were applied at final land preparation. Rest of the fertilizers were applied at 50 days after seeding. At maturity of the crop, a single panicle was collected from each hill. The harvested panicle was dried immediately and subjected to 50°C for three days for breaking dormancy to initiate next cycle of RGA.

**Results and Discussion:** A total of 30,373 progenies comprising 1531 progenies from 10 F<sub>2</sub> population, 1743 progenies from 9 F<sub>3</sub> population, 7395 progenies from 33 F<sub>4</sub> population, 12525 progenies from 46 F<sub>5</sub> population, 4883 progenies from 33 F<sub>6</sub> population, 1162 progenies from 7 BC<sub>1</sub>F<sub>2</sub> population, 830 progenies from 3 BC<sub>1</sub>F<sub>4</sub> population and 1637 progenies from 9 BC<sub>2</sub>F<sub>2</sub> population were harvested from 35,732 progenies comprising 2444 F<sub>2</sub>, 2560 F<sub>3</sub>, 7718 F<sub>4</sub>, 11907 F<sub>5</sub>, 6144 F<sub>6</sub>, 1376 BC<sub>1</sub>F<sub>2</sub>, 894 BC<sub>1</sub>F<sub>4</sub> and 2689 BC<sub>2</sub>F<sub>2</sub> for advancing in the next generation (Table 9.3).

**Table 9.3. List of segregating progenies of different generations grown in the RGA nurseries for the Development of Cold Tolerant Rice (CTR) during Boro 2023-24**

SL	BR number	Parentage	No. of plants grown	No of plants Harvested
<b>F<sub>2</sub> Generation</b>				
1	BR15666	IR18A1398/TP16199	400	140
2	BR15667	BR12527-5R-1/BR11894-R-R-R-169	520	347
3	BR15668	BR12416-6R-219/BR12567-5R-91	90	63
4	BR15669	BR12416-6R-219/BR12524-5R-56	432	342
5	BR14625	BR11303-5R-156/Rata Boro	168	135
6	BR15131	BR11894-R-R-R-299/IR83222-F11-173 (56. BR15131)	38	38
7	BR15132	BRR1 dhan100/IR83222-F11-173 (57. BR15132)	372	200
8	BR15133	BRR1 dhan67/Bhutan (59. BR15133)	300	250
9	BR15670	BR11712-4R-218/IR83222-F11-173	16	16
10	BR15674	BR11894-5R-77/TP16199	108	0
		<b>Sub Total</b>	<b>2444</b>	<b>1531</b>
<b>F<sub>3</sub> Generation</b>				
1	BR14641-R	BR11303-5R-156/IR20X1003:IRRI154-Pi35	340	262
2	BR14650-R	BR11318-5R-106/IR20X1003:IRRI154-Pi35	325	287
3	BR14656-R	BR12266-44-11-32-5-1-1-HR10-B/BR11315-5R-17	395	395
4	BR14657-R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1002:IRRI 154-	300	168
5	BR14664-R	BR11318-5R-106/IR83222-F11-173	270	48
6	BR15089-R	BR11318-5R-106/BR11607-4R-72	335	265
7	BR15090-R	BR11318-5R-106/IR64EMF3	205	129
8	BR15121-R	BR11723-4R-172/BR11894-R-R-R-169	165	88
9	BR15134-R	BRR1 dhan100/Bhutan	225	101
		<b>Sub Total</b>	<b>2560</b>	<b>1743</b>
<b>F<sub>4</sub> Generation</b>				
1	BR14630-2R	BR11712-4R-227/IR20X1003:IRRI154-Pi35	300	267
2	BR14631-2R	BR11712-4R-227/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	369	251

3	BR14632-2R	BR10317-5R-25/IR19X1001: IRR1 154-Cold1	402	267
4	BR14639-2R	BR10317-5R-25/BR11315-5R-17	180	125
5	BR14643-2R	BR11303-5R-156/IR19X1001: IRR1 154-Cold1	399	372
6	BR14645-2R	BR8899-14-4-1-2-2-1/IR20X1003:IRRI154-Pi35	372	204
7	BR14646-2R	BR8899-14-4-1-2-2-1/IR20X1005:IRRI 154-	213	168
8	BR14649-2R	BR8899-14-4-1-2-2-1/IR64EMF3	381	367
9	BR14264-2R	BR8899-14-4-1-2-2-1/IR83222-F11-173	51	50
10	BR14651-2R	BR11318-5R-106/IR19X1001: IRR1 154-Cold1	336	336
11	BR14848-2R	BR11318-5R-106/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	246	246
12	BR14849-2R	BR11660-5R-254/BR11887-5R-368	342	312
13	BR14850-2R	BR11894-5R-77/BR11894-R-R-R-213	165	243
14	BR14851-2R	BR11894-5R-77/BR11896-5R-28	177	164
15	BR14852-2R	BR11894-R-R-R-110/BR11896-5R-28	297	292
16	BR14853-2R	BR11894-R-R-R-110/GSR IR1-17-D6-Y1-D1-11	300	261
17	BR14854-2R	BR11894-R-R-R-169/BRR1 dhan67	291	291
18	BR14855-2R	BR11894-R-R-R-169/BRR1 dhan 29-CS3-28-16-10-6-HR6(com)-HR1(Gaz)-P8(Habj)	348	330
19	BR14856-2R	BR12421-4R-171/BRR1 dhan29-CS3-28-16-10-6-HR6(com)-HR1(Gaz)-P8(Habj)	252	252
20	BR14857-2R	BR11894-R-R-R-329/BR11894-R-R-R-169	303	493
21	BR14858-2R	BR8899-14-4-1-2-2-1/HRB-190-23-17-B-5	225	230
22	BR14859-2R	BR11894-5R-77/IR83222-F11-173	345	345
23	BR14860-2R	BR11636-5R-194/TP16199	225	370
24	BR14861-2R	BR11887-5R-368/TP16199	75	86
25	BR14862-2R	IR83222-F11-173/TP16199	114	116
26	BR14863-2R	BRR1 dhan74/Bhutan	81	73
27	BR14864-2R	BRR1 dhan84/Bhutan	66	66
28	BR14867-2R	BRR1 dhan98/Bhutan	231	231
29	BR14263-2R	BR11318-5R-106/IR83222-F11-173	360	315
30	BR14623-2R	BR11712-4R-227/Rata Boro	42	42
31	BR14624-2R	BR10317-5R-25/Rata Boro	51	51
32	BR14625-2R	BR11303-5R-156/Rata Boro	50	50
33	BR14627-2R	BR11318-5R-106/Rata Boro	129	129
		<b>Sub Total</b>	<b>7718</b>	<b>7395</b>
	<b>F<sub>5</sub> Generation</b>			
1	BR14597-3R	BR10317-5R-25/BR11303-5R-156	510	510
2	BR14598-3R	BR11303-5R-156/BR11723-4R-172	480	350
3	BR14599-3R	BR11303-5R-19/BR11723-4R-172	411	357
4	BR14600-3R	BR11303-5R-19/IR107995-B-BRG-BRG-2-1	420	420
5	BR14601-3R	BR11318-5R-18/BR8938-194-3-4-1-1-P2-HR3	153	153
6	BR14602-3R	BR11318-5R-18/BR8631-12-3-5-P2	336	336
7	BR14603-3R	BR11330-5R-29/BR11342-5R-5	501	501
8	BR14604-3R	BR11330-5R-29/BR8899-14-4-1-2-2-1	459	239
9	BR14605-3R	BRR1 dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-	180	180
10	BR14607-3R	BRR1 dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-	240	240
11	BR14608-3R	BRR1 dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-	183	183
12	BR14609-3R	BR11607-4R-72/BR9943-26-2-3-6	378	227
13	BR14610-3R	BR11607-4R-72/IR64-Pi9	471	509
14	BR14611-3R	BR11723-4R-172/BR8912-12-6-1-1-1-1	477	419
15	BR14612-3R	BR11723-4R-172/BR8631-12-3-5-P2	396	468
16	BR14613-3R	BR8631-12-3-5-P2/IR172244	420	420
17	BR14614-3R	IR107995-B-BRG-BRG-2-1/BIN dhan17	303	474
18	BR14615-3R	TP26717/IR96925-B-B-B-B-61	204	302
19	BR14616-3R	BRR1 dhan88/BRR1 dhan89	114	128
20	BR14617-3R	BU dhan2/BR11723-4R-172	96	58
21	BR14618-3R	BU dhan2/BRR1 dhan81	90	90
22	BR14619-3R	BR11303-5R-156/BR11868-5R-59	270	270

23	BR14620-3R	BIN dhan14/BR11723-4R-172	75	93
24	BR14621-3R	BR12266-44-11-32-5-1-1-HR10-B/BINA dhan14	90	94
25	BR14622-3R	BIN dhan14/BR11712-4R-227	303	259
26	BR14630-3R	BR11712-4R-227/IR20X1003:IRRI154-Pi35	111	102
27	BR14631-3R	BR11712-4R-227/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	174	174
28	BR14632-3R	BR11712-4R-227/IR19X1001: IRRI 154-Cold1	147	169
29	BR14634-3R	BR11712-4R-227/IR20X1002:IRRI 154-Pi9+Hd9 (N22)	195	232
30	BR14635-3R	BR11712-4R-227/IR64EMF3	219	251
31`	BR14636-3R	BR10317-5R-25/IR20X1003:IRRI154-Pi35	267	291
32	BR14638-3R	BR10317-5R-25/IR19X1001: IRRI 154-Cold1	147	43
33	BR14640-3R	BR10317-5R-25/IR64EMF3	78	95
34	BR14642-3R	BR11303-5R-156/IR20X1005:IRRI 154-Pi54(Ttp)+Pi35	186	208
35	BR14643-3R	BR11303-5R-156/IR19X1001: IRRI 154-Cold1	159	185
36	BR14650-3R	BR11318-5R-106/IR20X1003:IRRI154-Pi35	180	121
37	BR14651-3R	BR11318-5R-106/IR19X1001: IRRI 154-Cold1	159	170
38	BR14652-3R	BR11318-5R-106/BR11315-5R-17	183	167
39	BR14653-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1003:IRRI154-	375	196
40	BR14654-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1005:IRRI 154-	291	281
41	BR14655-3R	BR12266-44-11-32-5-1-1-HR10-B/IR19X1001: IRRI 154-	60	60
42	BR14657-3R	BR12266-44-11-32-5-1-1-HR10-B/IR20X1002:IRRI 154-	303	351
43	BR14266-3R	BR9651-15-2-1-3/BR11000-5R-2	474	519
44	BR14254-3R	BRRRI dhan88/BR8909-B-12-2-CS1-4-CS2-P2-3-2	390	387
45	BR14661-3R	IR126952-29-82-206-12-8/BR10317-5R-25	78	72
46	BR14663-3R	BR10317-5R-25/IR83222-F11-173	171	171
		<b>Sub Total</b>	<b>11907</b>	<b>11525</b>
	<b>F<sub>6</sub> Generation</b>			
1	BR14215-4R	BR10317-5R-25/BR11303-5R-116	201	200
2	BR14216-4R	BR10317-5R-25/BR11318-5R-106	258	269
3	BR14218-4R	BR10318-5R-1/BR8899-14-4-1-2-2-1	333	252
4	BR14221-4R	BR11303-5R-19/BR8899-14-4-1-2-2-1	222	174
5	BR14222-4R	BR11303-5R-19/BR11388-4R-17	84	70
6	BR14223-4R	BR11318-5R-106/BR8899-14-4-1-2-2-1	225	133
7	BR14225-4R	BR11318-5R-18/BR8912-12-6-1-1-1-1	258	188
8	BR14226-4R	BR11318-5R-18/IR99285-1-1-1-P2	303	253
9	BR14227-4R	BR11318-5R-18/BR11388-4R-17	282	193
10	BR14229-4R	BR11342-5R-5/BR11607-4R-72	306	229
11	BR14231-4R	BRRRI dhan29-SC3-28-16-10-6-HR6(Com)-HR1(Gaz)-	177	99
12	BR14232-4R	BR9942-1-2-1-1-B2/BR9943-26-2-3-6	168	102
13	BR14233-4R	BR9942-1-2-1-1-B2/IR172244	258	150
14	BR14234-4R	BR9942-1-2-1-1-B2/IR64-Pi9	234	184
15	BR14236-4R	BR8912-12-6-1-1-1-1/IR172244	279	271
16	BR14237-4R	IR99285-1-1-1-P2/IR107995-B-BRG-BRG-2-1	324	267
17	BR14238-4R	BIN dhan17/IR172244	243	115
18	BR14239-4R	BR11607-4R-72/IR172244	252	205
19	BR14240-4R	BR10317-5R-25/IR126952-28-94-31-B	30	27
20	BR14241-4R	BR11303-5R-156/IR126952-28-94-31-B	102	99
21	BR14242-4R	BR11318-5R-106/IR126952-28-94-31-B	39	39
22	BR14244-4R	BR10317-5R-25/BR11868-5R-59	105	97
23	BR14245-4R	BR10589-5R-39/BR11868-5R-59	42	25
24	BR14246-4R	BR11303-5R-116/BR11868-5R-59	222	109
25	BR14247-4R	IR16L1172/IR96925-B-B-B-B-61	150	145
26	BR14249-4R	HR(Pth)-10/BR7812-19-1-6-1-P2	153	127
27	BR14252-4R	BR11001-5R-37/TP26717	99	93
28	BR14257-4R	BR11303-5R-19/BR11868-5R-59	117	98
29	BR14258-4R	BR10317-5R-25/IR172244	261	257
30	BR14259-4R	BR11303-5R-156/IR172244	162	160
31	BR14261-4R	BR8899-14-4-1-2-2-1/IR172244	69	68

32	BR14264-4R	BR8899-14-4-1-2-2-1/IR83222-F11-173	126	125
33	BR14265-4R	BR12266-44-11-32-5-1-1-HR10-B/BR11723-4R-172	60	60
		<b>Sub Total</b>	<b>6144</b>	<b>4883</b>
	<b>BC<sub>1</sub>F<sub>2</sub> Generation</b>			
1	BR14876-	BR11318-5R-106*2/IR83222-F11-173	64	64
2	BR15183-	BR11712-4R-227*2/Rata Boro	62	57
3	BR15185-	BR11318-5R-106*2/Rata Boro	263	188
4	BR15681-	BR11660-5R-254*2/IR83222-F11-173	210	150
5	BR15683-	BR11894-R-R-R-110*2/IR83222-F11-173	630	628
6	BR15695-	BR11894-R-R-R-270*2/IR83222-F11-173	36	26
7	BR15696-	BRR1 dhan100*2/IR83222-F11-173	111	49
		<b>Sub Total</b>	<b>1376</b>	<b>1162</b>
	<b>BC<sub>1</sub>F<sub>4</sub> Generation</b>			
1	BR14875-	BR10317-5R-25*2/IR83222-F11-173	267	220
2	BR14876-	BR11318-5R-106*2/IR83222-F11-173	225	208
3	BR14877-	BR8899-14-4-1-2-2-1*2/IR83222-F11-173	402	402
		<b>Sub Total</b>	<b>894</b>	<b>830</b>
	<b>BC<sub>2</sub>F<sub>2</sub> Generation</b>			
1	BR15684-	BR11894-5R-77*3/IR83222-F11-173	350	319
2	BR15685-	BR11636-5R-194*3/TP16199	37	25
3	BR15686-	BRR1 dhan 74*3/Bhutan	524	275
4	BR15687-	BRR1 dhan84*3/Bhutan	218	127
5	BR15688-	BRR1 dhan 97*3/Bhutan	308	129
6	BR15689-	BRR1 dhan 98*3/Bhutan	180	141
7	BR15690-	BR10317-5R-25*3/Rata Boro	444	-
8	BR15699-	BR11712-4R-227*3/Rata Boro	320	288
9	BR15783-	BR11318-5R-106*3/Rata Boro	308	-
		<b>Sub Total</b>	<b>2689</b>	<b>1637</b>
		<b>Grand Total</b>	<b>35732</b>	<b>30373</b>

#### Experiment 9.4: Evaluation of fixed lines in the Line Stage Testing (LST) Trial

Principal investigator: PS Biswas

Co-Investigators: M Anisuzzaman and KM Iftekharuddaula

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

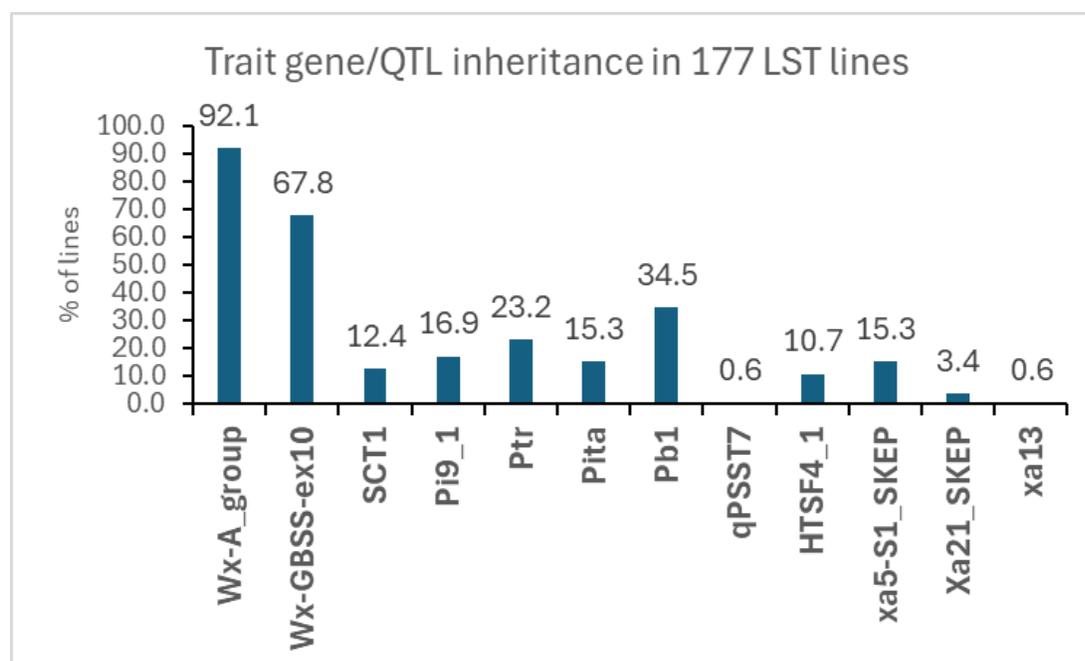
**Materials and Methods:** Total 1,178 progenies from 11 crosses were grown in 12-hills single-row plots using systematic arrangement design. Thirty-five-day-old single seedling was transplanted at 20 cm × 20 cm in the plots using single seedling per hill. Fertilizer management was done at the rate of 260:100:120: 110:11 kg Urea, TSP, MP, Gypsum and ZnSO<sub>4</sub>/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<sub>4</sub> were applied at final land preparation. 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 177 uniform lines based on flowering, plant height, grain size and shape were isolated from 1272 lines tested in LST and used in genotyping for QTL fingerprinting (Table 9.4). The genotyping results show that out of 177 lines 92.1% had Wx-a, 67.8% had Wx-10, 12.4% had seedling stage cold tolerant QTL (*qSCT1*), 0.6% had reproductive stage cold tolerant QTL (*qPSST7*), 16.9% had Pi9, 23.2% had Ptr (*Pita2*), 15.3%

had Pita, 34.5% had Pb1, 10.7% had heat tolerance QTL (qHTSF4.1), 15.3% had xa5 and 2.3% had Xa21 alleles (Fig. 9.4).

**Table 9.4: List of breeding lines selected from the LST conducted for the Development of Cold Tolerant Rice (CTR) during 2023-24.**

Sl	Cross name	Parentage	No. of lines grown	No. of lines selected	Gene inheritance
1	BR13985	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	98	17	<i>Wx-a, SCT1_1, SCT1_2,</i>
2	BR13986	IR16L1172/BR8910-B-6-3-CS1-5-CS2-P3-1-1	79	15	<i>Wx-a, SCT1_1, SCT1_2,</i>
3	BR13995	BR8910-B-6-3-CS1-5-CS2-P3-1-1/IR96925-B-B-B-B-61	187	45	<i>Pi-ta, SCT1_1, SCT1_2, Bph17_1, Bph17_3, Bph17_2</i>
4	BR14624	BR10317-5R-25/Rata Boro	66	3	<i>Wx-a, Wx-10, chalk5, qPSST3, qPSST7, qPSST9</i>
5	BR14625	BR11303-5R-156/Rata Boro	50	3	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
6	BR14628	BR12266-44-11-32-5-1-1-HR10-B/Rata Boro	73	9	<i>Wx.a, Wx.10, qPSST3, qPSST7, qPSST9</i>
7	BR14875	BR10317-5R-25*2/IR83222-F11-173	139	9	<i>Wx-a, Wx-b, Wx-10, GS3, qPSST3, qPSST7, qPSST9</i>
8	BR14876	BR11318-5R-106*2/IR83222-F11-173	131	15	<i>Wx-a, Wx-10, chalk5, qPSST3, qPSST7, qPSST9</i>
9	BR14877	BR8899-14-4-1-2-2-1*2/IR83222-F11-173	355	61	<i>Wx-a, Wx-b, Wx-10, GS3, SCT1, qPSST3, qPSST7, qPSST9</i>
		<b>Total</b>	<b>1272</b>	<b>177</b>	



**Fig.9.4: Frequencies of favorable alleles in the LST-CTR selected during Boro 2023-24**

**Experiment 9.5: Evaluation of breeding lines in the Observational Yield Trial under Cold stress and non-stress field condition**

Principal investigator: P S Biswas

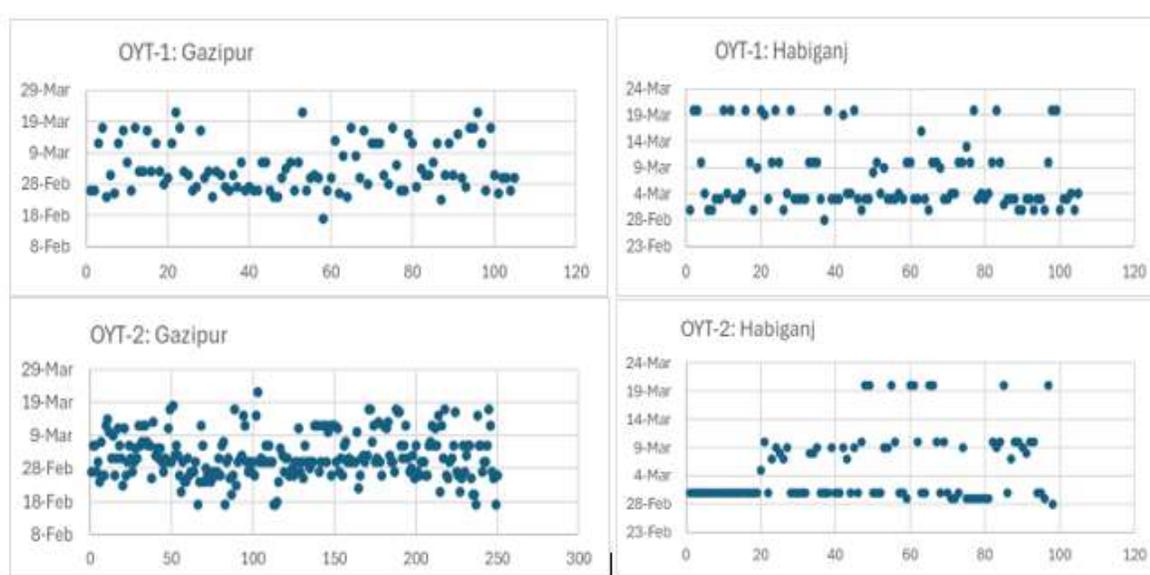
Co-Investigators: M Anisuzzaman (Gazipur) and MA Syed (Habiganj)

**Specific objective:** Selection of superior and cold tolerant lines under natural cold condition.

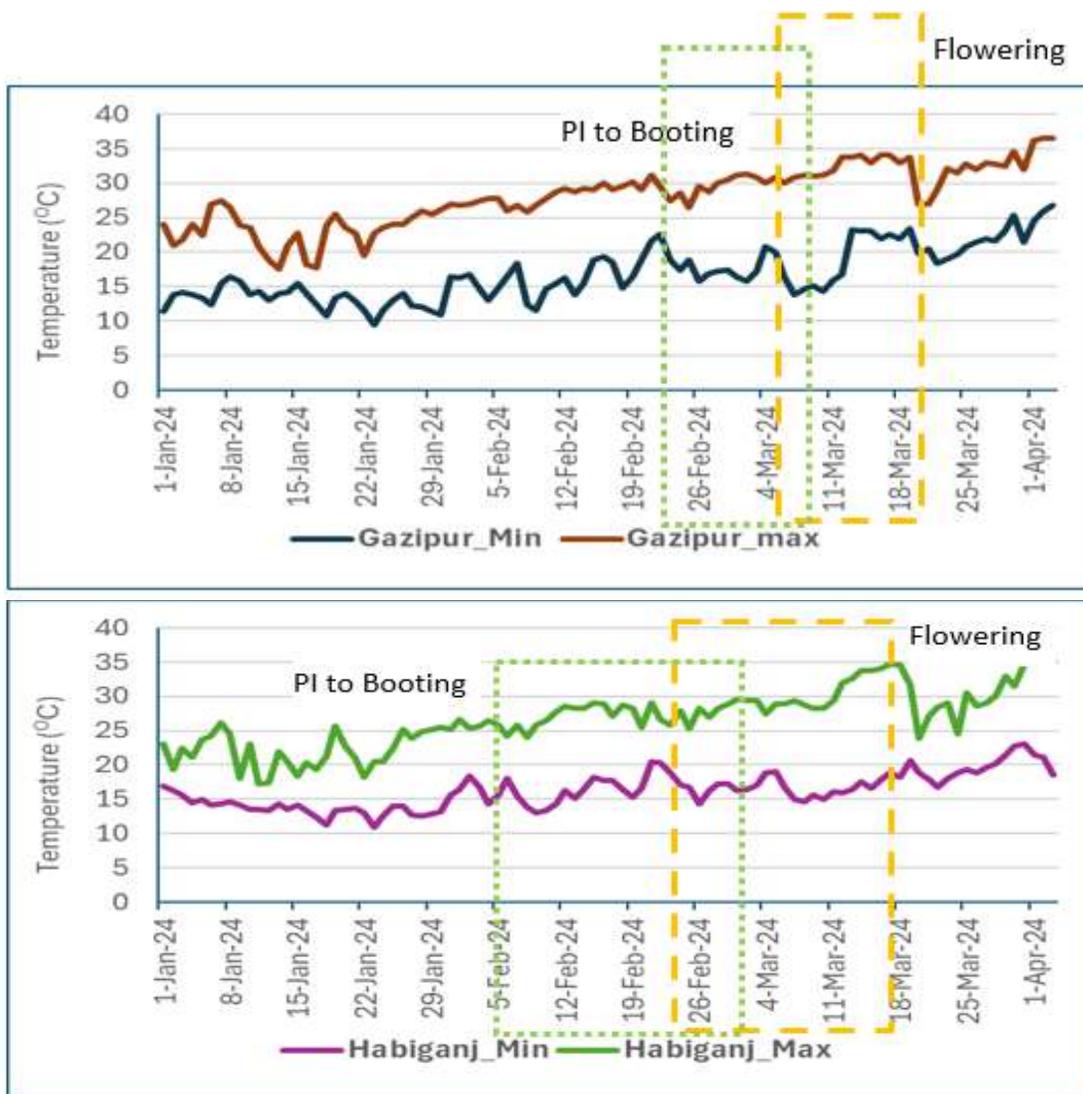
**Materials and Methods:** A total 224 (OYT-1) and 250 (OYT-2) breeding lines were evaluated at two locations (Gazipur and Habiganj) with two sowing staggers (22-23 October and another in 20 November) following Row-Column design with two replications. BRRI dhan28, BRRI dhan67, BRRI dhan88 and BRRI dhan89 were used as standard check varieties. In addition, a set of 96 IIRI bred breeding lines were evaluated in OYT-3 at BRRI Habiganj under natural

low temperature. Sowing of seeds in the 22-23 October was done to allow the booting stage of the crop to be exposed to low temperatures 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. Leaf samples were collected from single plant of each entry for genotyping with 1k-RiCA SNP set. Fertilizer management was done @ 260:100:120:110:11 kg Urea, TSP, MP, Gypsum and ZnSO<sub>4</sub>/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 50 DAT. Total amounts of TSP, ½ MP, Gypsum and ZnSO<sub>4</sub> was applied at final land preparation. Rest of half MP was applied at the 2<sup>nd</sup> top-dress of Urea. Crop management such as weeding, irrigation etc. was done in time. Disease-insect and other pests were controlled when necessary. Data on days to flowering and maturity, plot yield, lodging and disease and insect infestation were recorded. Plot yield was recorded from the whole plot and moisture content (MC) in the grain was recorded using a moisture meter. Grain yield (g/plot) was estimated from plot yield adjusted with 14% MC. Yield reduction was estimated from the yield difference between non-stress plot and cold stress plot as the percentage of non-stress plot. Also, maximum and minimum temperatures were collected throughout the growth stages of the crop.

**Results and discussion:** Majority of the breeding lines grown from October sowing in OYT-1 and OYT-2 flowered between 18 Feb to 9 March in Gazipur and 1 March to 10 March in Habiganj (**Fig 9.5a b**). Therefore, the PI to booting stage of the lines was between 3<sup>rd</sup> week January to 2<sup>nd</sup> week of February at Gazipur and 1<sup>st</sup> to 2<sup>nd</sup> week of February at Habiganj. The maximum and minimum temperature during this period were 17.8<sup>o</sup>C – 30<sup>o</sup>C and 9.5<sup>o</sup>C – 22.6<sup>o</sup>C in Gazipur. In Habiganj, the maximum and minimum temperature during PI to booting stage were 24.1<sup>o</sup>C – 28.9<sup>o</sup>C and 13<sup>o</sup>C – 20.4<sup>o</sup>C. The average daily temperature below 20<sup>o</sup>C with maximum temperature 19.5<sup>o</sup>C – 25.5<sup>o</sup>C was observed from 15-30 January 2024 at Gazipur, while at Habiganj, the average daily temperature below 20<sup>o</sup>C with maximum temperature ranging from 24.1<sup>o</sup>C – 26.4<sup>o</sup>C was observed from 4-10 February 2024 (**Fig. 9.5b**). The above findings suggests that the entries which flowered during 15-25 February at Gazipur and 1-10 March at Habiganj were exposed to natural low temperature below 20<sup>o</sup>C at PI to booting stage and PI stage, respectively. Moderate level of cold stress (21<sup>o</sup>C-22<sup>o</sup>C) also affected the entries that flowered during last week of February to 1<sup>st</sup> of March at PI stage at Gazipur.



**Fig. 9.5a** Dot plot showing flowering window of the breeding tested in OYT-1 under early sown cold stress batch during Boro 2023-24



**Fig. 9.5b: Maximum and minimum temperature during Boro 2023-24 at Gazipur (Top) and Habiganj (Bottom).**

The breeding lines tested in OYT-1 with October showed wide variation in yield reduction both in Gazipur (1.19-86.92%) and Habiganj (0.14-100%) compared to regular sowing in November indicating the cold susceptible lines were suffered from varying levels of cold stress during PI to booting stage at both locations resulting yield loss (**Table 9.5a**). The yield reduction with the cold tolerant check variety Hbj.B.VI was remarkably low (23.7%) compared to cold susceptible BRRi dhan28 (46.8%) and even to the moderately cold tolerant variety BRRi dhan67 (42.1%). Considering yield under cold stress compared to BRRi dhan67 (3.6 t/ha, 158 days), a total of eight breeding lines showing 20.8-65% higher yield with 160-165 days growth duration were selected (**Table 9.5b**). Besides, seven breeding lines (146-153 days) showing 17.0 – 31.7% yield advantage over BRRi dhan67 (5.5 t/ha, 150 days) under regular non-stress were also selected for further evaluation (**Table 9.5c**).

**Table 9.5a: Effect of cold stress on yield, plant height and days to heading traits of 224 breeding lines/varieties tested in OYT-1 during Boro 2023-24**

Designation	Plant height reduction (cm)		Heading delay (days)		Yield reduction (%)	
	Gaz	Hab	Gaz	Hab	Gaz	Hab
Test entries (N = 224)	7.04-46.84	0.09-54.9	1-33	1-27	1.19-86.92	0.14-100
BRRi dhan28 (Ck)	24.9	25.8	16	17	48.6	46.8
BRRi dhan67 (Ck)	32.2	17.5	14	17.5	42.3	42.1
BRRi dhan89 (Ck)	21.1	7.0	12	25	13.1	18.7
Hbj.B.VI (Tol ck.)	15.9	18.6	20.6	9.5	22.5	23.7

**Table 9.5b: List of selected breeding lines from OYT-1 conducted under natural cold stress condition during Boro 2023-24**

S	Designation	Growth duration	Plant height (cm)	Yield (t/ha)		Average
				Gazipur	Habiganj	
1	BR13985-2R-37	164	92	6.35	5.55	5.95
2	BR13986-2R-1	166	105	3.86	7.27	5.57
3	BR13986-2R-93	164	109	4.11	7.62	5.87
4	BR13988-2R-	165	95	5.51	5.55	5.53
5	BR13990-2R-57	167	87	5.11	6.27	5.69
6	BR13995-2R-26	160	79	7.54	-	7.54
7	BR13996-2R-10	167	90	6.05	5.39	5.72
8	BR14006-2R-94	160	96	5.20	5.84	5.52
	Bhutan	175	152	1.45	-	1.45
	BRRRI dhan28	155	81	3.14	2.89	3.02
	BRRRI dhan67	160	87	3.36	5.78	4.57
	BRRRI dhan89	172	91	5.72	7.43	6.58
	Hbj. B.VI	167	106	0.87	0.70	0.79
	Range (N=224)	148-175	67-152	0.62-7.54	0.14-7.62	0.51-7.54
	LSD	7.78	14.09	1.22	1.56	1.24
	H2B (%)	63.2	86	77.12	80.1	77.8

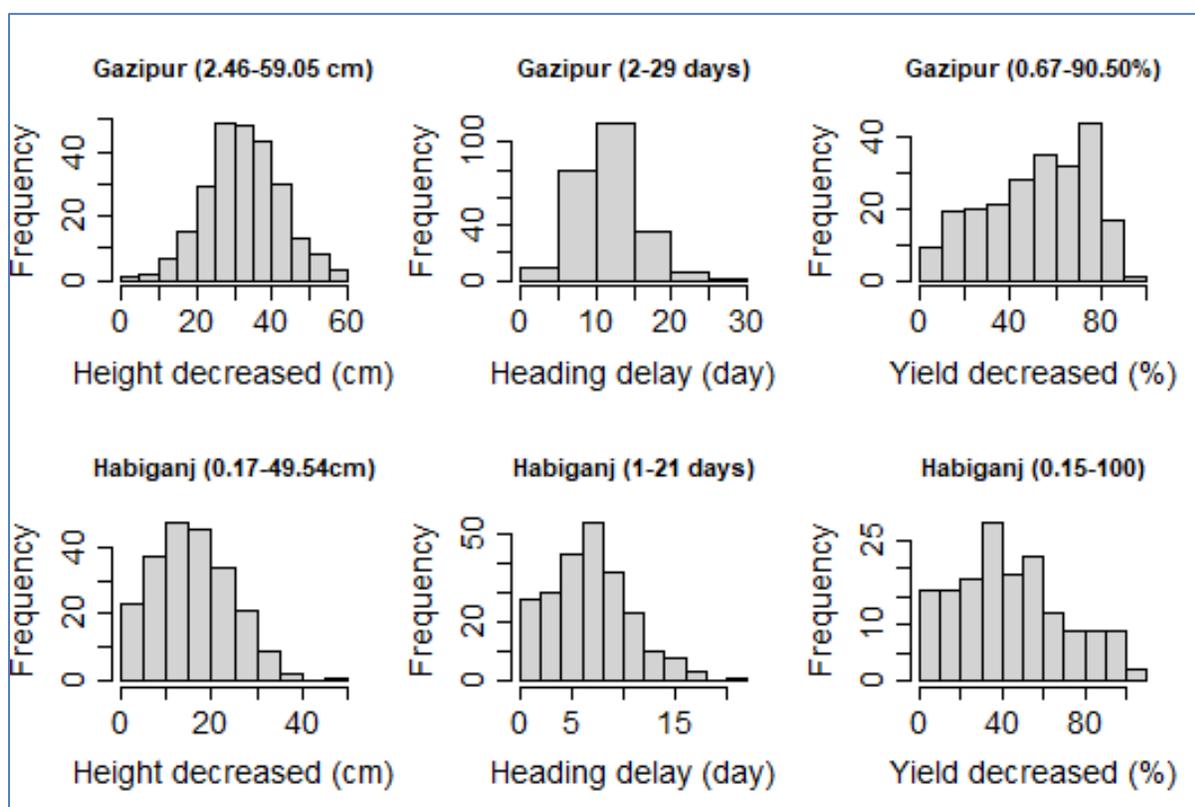
**Table 9.5c: List of selected breeding lines from OYT-1 conducted under non- stress condition during Boro 2023-24**

S	Designation	Growth duration	Plant height (cm)	Yield (t/ha)		Average
				Gazipur	Habiganj	
1	BR13712-3R-119	147	106	4.75	8.77	6.76
2	BR13987-2R-28	149	107	6.14	8.25	7.20
3	BR13987-2R-53	153	99	5.84	7.65	6.75
4	BR13989-2R-12	152	101	5.76	7.03	6.40
5	BR13995-2R-26	146	104	6.00	8.37	7.19
6	BR13997-2R-86	152	108	6.91	5.98	6.45
7	BR14001-2R-19	146	110	6.65	6.48	6.56
	BRRRI dhan28	145	102	4.81	5.43	5.12
	BRRRI dhan67	150	110	6.74	4.19	5.47
	BRRRI dhan89	157	106	4.13	6.28	5.21
	Hbj. B.VI	149	116	3.90	5.98	4.94
	Bhutan	145	128	3.91	6.64	5.27
	Range (N=250)	142-162	90-121	2.16-7.35	3.46-8.77	3.91-7.20
	LSD	10.60	12.88	1.53	2.16	1.90
	H2B (%)	23.5	-	35.6	-	0.11

In the OYT-2 under October sowing, yield reduction of 250 breeding lines compared to regular batch of November sowing at Gazipur was 0.67-90.5% and 0.15-100% at Habiganj site (**Table 9.5d**). The susceptible variety BRRRI dhan28 had yield reduction of 31.1% and cold tolerant check Hbj.B.VI had only 15.4 % yield reduction. **Fig. 9.5c** shows the reduction pattern of plant height and yield and heading delays of 250 lines/varieties under cold stress condition compared to the regular non-stress field condition. Considering yield under cold stress compared to BRRRI dhan67 (3.1 t/ha, 159 days), a total 24 breeding lines showing 21.8-133% higher yield with 151-156 days growth duration were selected (**Table 9.5e**). Besides, eight breeding lines with 145-150 days growth duration showing 17.8 – 42.0% yield advantage over BRRRI dhan67 (5.3 t/ha, 146 days) under regular non-stress were also selected for further evaluation (**Table 9.5f**).

**Table 9.5d: Reduction pattern of plant height, growth durations and yield of 250 breeding lines/varieties under cold stress compared to non-stress conditions in OYT-2 conducted Boro 2023-24**

Designation	Plant height reduction (cm)		Heading delay (days)		Yield reduction (%)	
	Gaz	Hab	Gaz	Hab	Gaz	Hab
Test entries	2.46-59.05	0.17-49.54	2-29	1-21	0.67-90.5	0.15-100
BRI dhan28	31.9	12	19	17	66.3	31.1
BRI dhan67	34.8	16	13	14	45.7	30.5
BRI dhan89	21.3	20	3	7	32.9	14.0
Hbj.B.VI	25.7	3	29	15	35.3	15.4



**Fig.9.5c: Reduction pattern of plant height, growth durations and yield of 250 breeding lines/varieties under cold stress compared to non-stress condition in OYT-2 conducted Boro 2023-24**

**Table 9.5e: Performance of the selected breeding lines from OYT-2 conducted under cold stress during Boro2023-24**

Breeding lines	Yield (t/ha)	Growth duration (days)	Remarks
All 250	0.3 – 7.16	149 - 171	BRI dhan28 (2.15 t/ha, 155 d) BRI dhan67 (3.07 t/ha, 159 d) BRI dhan89 (4.82 t/ha, 163 d) Hbj.B.VI (2.16 t/ha, 168 d) Mineashahi (2.46 t/ha, 155 d)
24 MD lines	3.74 – 7.16	151-156	21.8-133% yield advantage over the medium check variety BRI dhan67

**Table 9.5f: Performance of the selected short and medium duration breeding lines from OYT-2 conducted under non- stress condition during Boro 2023-24**

Sl	Designation	Growth duration	Plant height	Yield (t/ha)		Average
				Gazipur	Habiganj	
1	BR13152-5R-3	146	108	6.9	7.2	7.0
2	BR13152-5R-	145	112	4.8	7.8	6.3
3	BR13152-5R-	146	97	7.4	6.9	7.2

4	BR13152-5R-	145	114	7.1	8.0	7.6
5	BR13152-5R-	145	104	6.2	8.1	7.2
6	BR13152-5R-57	145	110	6.0	7.4	6.7
7	BR13152-5R-	150	104	6.6	6.6	6.6
8	BR13152-5R-	146	105	6.0	7.4	6.7
	BRRRI dhan28	146	103	4.7	3.7	4.2
	BRRRI dhan67	146	110	5.6	5.0	5.3
	BRRRI dhan81	145	102	3.2	6.3	4.7
	BRRRI dhan89	160	108	3.6	7.4	5.5
	Hbj. B.VI	145	129	4.4	6.5	5.5
	Mineasahi	157	-	4.8	-	5.0
	Range (N=250)	140-163	75-135	1.3-7.4	1.6-8.2	1.4-7.6
	LSD	8.29	14.31	1.22	2.09	1.35
	H2B (%)	70.9	72.4	61.3	39.9	46.4

In OYT-3, the breeding lines varied in yield from 0.01 t/ha to 5.43 t/ha with growth duration ranging from 155 days to 184 days (**Table 9.5g**). Considering yield of the of the check varieties, BRRRI dhan67 and BRRRI dhan88, two breeding lines showing 4.25 t/ha and 5.05 t/ha yield with growth duration of 166 days and 165 days, respectively selected for further evaluation.

**Table 9.5g: Performance of the selected short and medium-duration breeding lines from OYT-3 conducted under non-stress conditions during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)
1	IR 139688:8-2-1 RGA-1 RGA-1-B	165	104	5.05
2	IR 139688:12-4-1 RGA-1 RGA-1-	166	110	4.25
	BRRRI dhan28	161	100	4.16
	BRRRI dhan67	165	111	3.48
	BRRRI dhan88	161	81	3.57
	Hbj.B.VI	166	129	1.88
	Range (N= 96)	155-184	77-144	0.01-5.43
	LSD (0.05)	6.40	20.4	1.03
	H2B (%)	73.7	68.4	87.1

### **Experiment 9.6: Evaluation of breeding lines in the Advanced Yield Trial (AYT) under natural condition of Haor environment**

Principal investigator: P S Biswas

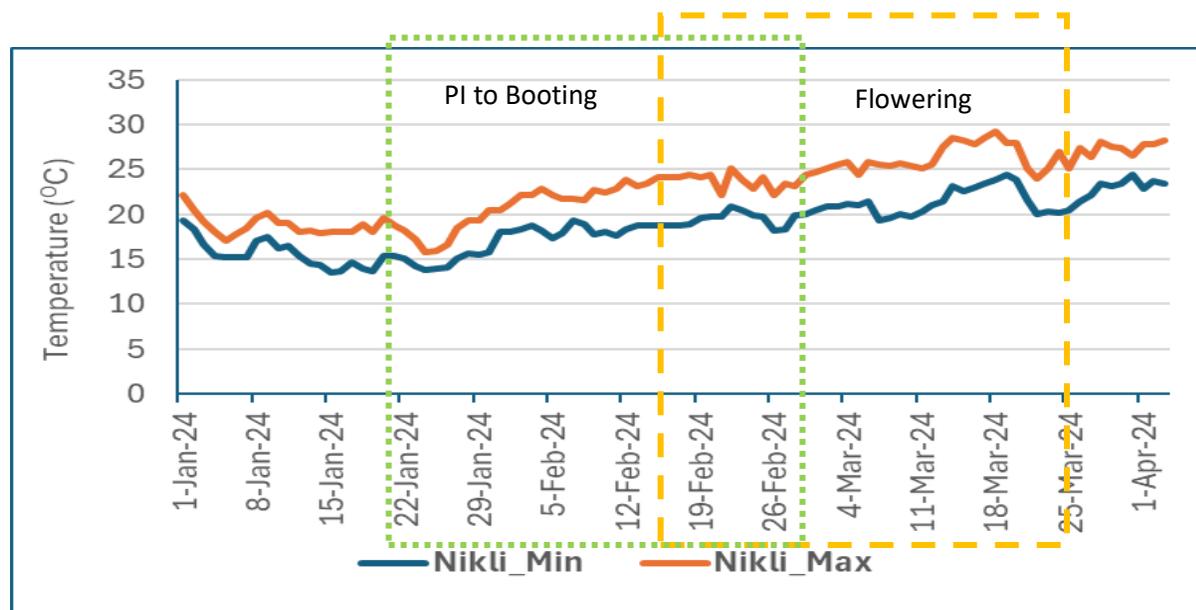
Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MA Syed (Habiganj)

**Specific objective:** Evaluation of breeding lines for yield potential in multi-locations in replicated trials.

**Materials and Methods:** In total, 136 breeding lines were evaluated at three locations (Habiganj, Nikli, and Tahirpur) along with four standard check varieties BRRRI dhan28, BRRRI dhan67, BRRRI dhan81 and BRRRI dhan89 under two sowing staggers (Early sowing (CS): 23-30 October and Regular sowing (NS): 18-22 November) in three AYT trials. The same set of materials were also evaluated under regular sowing in 1<sup>st</sup> week of December at Gazipur. Thirty-five-day-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 in a Row-Column design with two replications. Fertilizer management was done @ 260:100:120: 110:11 kg Urea, TSP, MP, Gypsum and ZnSO<sub>4</sub>/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 50 DAT. Total amounts of TSP, ½ MP, Gypsum and ZnSO<sub>4</sub> was applied at final land preparation. Rest of half MP was applied at the 2<sup>nd</sup> top-dress of Urea. Crop management such as weeding, irrigation etc. was done in time. Disease-insect and other pests were controlled when necessary. Data on plant height, days to flowering and maturity, yield, lodging and disease and insect infestation were recorded. Plot yield was recorded from the whole plot and

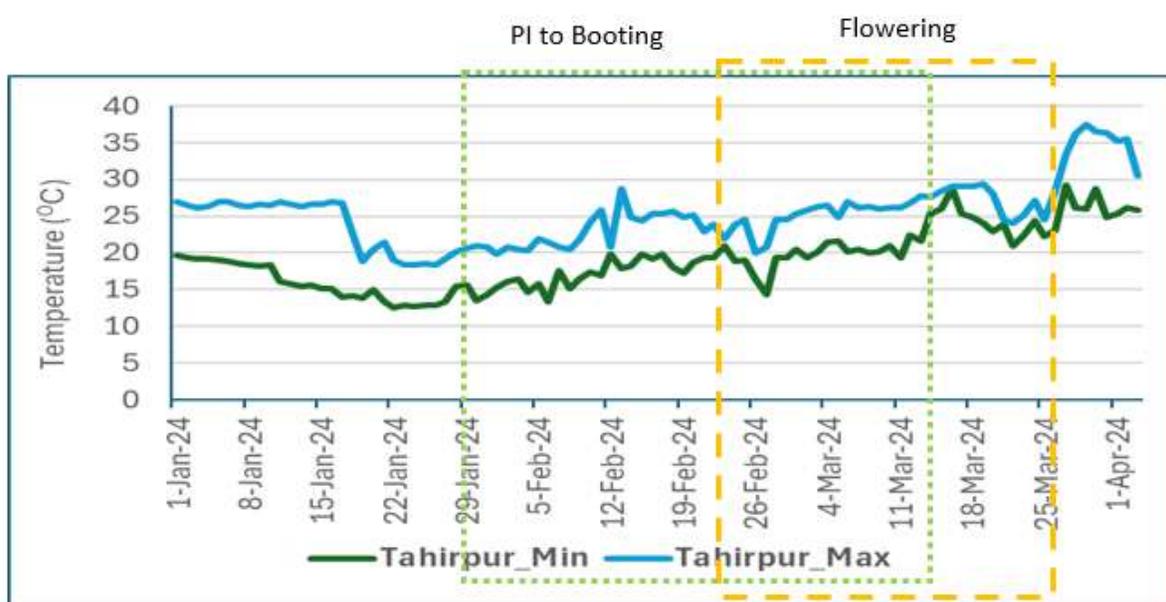
moisture content (MC) in the grain was recorded using a moisture meter. Grain yield (t/ha) was estimated from plot yield adjusted with 14% MC.

**Results and Discussion:** At Nikli site, all the breeding lines in AYT-1\_CS, AYT-2\_CS and AYT-3\_CS flowered in between 15 February 2024 and 25 March 2024 (**Fig. 9.6a**). Figure show that the average temperature during 20 January to 6 February was in between 17.5<sup>0</sup>C – 19.85<sup>0</sup>C with maximum daily temperature of 19.6<sup>0</sup>C-22.9<sup>0</sup>C and from 7 February to 29 February, the average temperature was 20.25<sup>0</sup>C-21.85<sup>0</sup>C with maximum temperature of 21.6<sup>0</sup>C-25.2<sup>0</sup>C, which suggests that majority of the materials experienced severe to moderate level of cold shock during PI to booting stage at Nikli site.



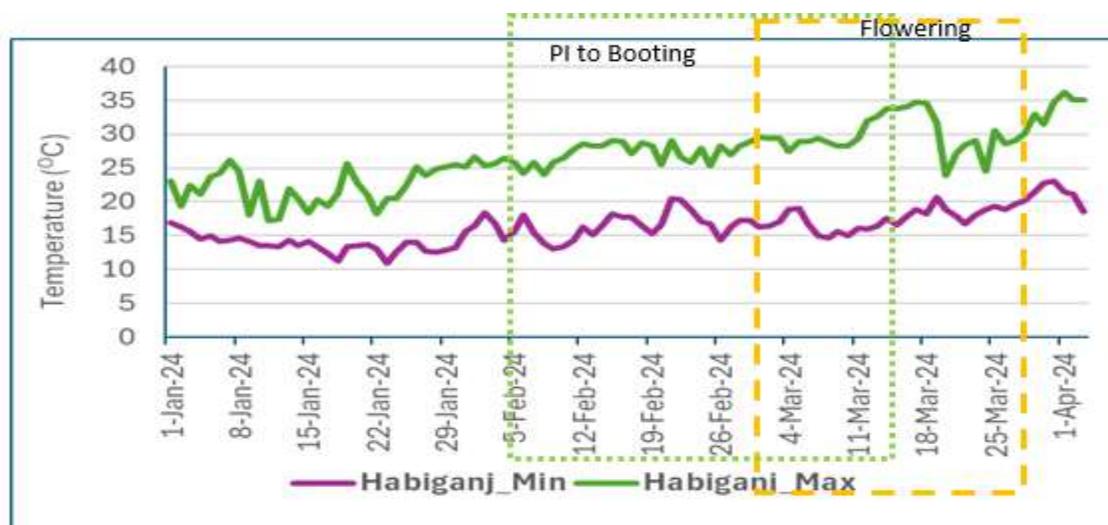
**Fig. 9.6a:** Maximum and minimum temperature at Nikli during Boro 2023-24. Green dotted box represents PI to booting stage and orange dotted box represents flowering stage of 136 breeding tested in this site.

At Tahirpur site, from 18 January to 9 February, the average temperature during 20 January to 6 February was in between 15.8<sup>0</sup>C – 19.15<sup>0</sup>C with maximum daily temperature of 18.3<sup>0</sup>C-22.4<sup>0</sup>C and from 10 February to 27 February, the average temperature ranged between 17.5<sup>0</sup>C – 22.25<sup>0</sup>C with maximum daily temperature of 20<sup>0</sup>C-25<sup>0</sup>C. At sites, the breeding lines in three AYT trials flowered in between 20 February to 23 March (**Fig. 9.6b**). This result suggests that the breeding lines with short to medium duration experienced severe stress at PI stage and moderate level of cold stress at booting stage.



**Fig. 9.6b:** Maximum and minimum temperature at Tahirpur during Boro 2023-24. Green dotted box represents PI to booting stage and orange dotted box represents flowering stage of 136 breeding tested in this site.

At Habiganj site, from 1<sup>st</sup> February to 13 February, the average temperature prevailed between 19.4<sup>o</sup>C – 22.35<sup>o</sup>C with maximum daily temperature of 24.1<sup>o</sup>C-27.7<sup>o</sup>C. At this site, all the breeding lines tested in three AYT trials flowered in between 1 March to 27 March (**Fig 9.6c**). These results indicated that the temperature regime during reproductive at Habiganj was relatively higher than other sites and breeding lines with short to medium duration suffered with moderate cold stress.



**Fig. 9.6c Maximum and minimum temperature at Habiganj during Boro 2023-24. Green dotted box represents PI to booting stage and orange dotted box represents flowering stage of 136 breeding tested in this site.**

Fourteen breeding lines/varieties grown under early sowing (21-23 October) in the AYT-1 showed 148-159 days growth duration, 76-99 cm plant and 1.3-3.9 t/ha yield over three locations (**Table 9.6a**), while these lines when grown in regular time (i.e. 15-20 November) showed 146-158 days growth duration, 94-113 cm plant height and 5.03-7.33 t/ha yield (**Table 9.6b**). The check varieties BRRi dhan28, BRRi dhan67, BRRi dhan88 and BRRi dhan89 produced respectively 1.3 t/ha, 2.2 t/ha, 1.8 t/ha, and 3.9 t/ha with growth duration of 148 days, 157 days, 149 days, and 159 days in early sowing batch while in regular batch these check varieties produced 5.44 t/ha, 6.17 t/ha, 6.03 t/ha, and 6.83 t/ha, respectively with 149 days, 155 days, 148 days, and 157 days growth duration. Two breeding lines, BR11894-R-R-R-R-228 (153 days) and BR13027-BC1-3R-109 (149 days) showing 96.1-266.4%, and 79.1-234.6% yield advantage respectively over BRRi dhan67 (2.2 t/ha, 157 days) and BRRi dhan88 (1.8 t/ha, 149 days) with 149-153 days growth duration, were selected from CS batch (**Table 9.6a**). While the breeding line BR13027-BC1-3R-109 yielding 7.3 t/ha yield (21.6% higher than BRRi dhan88) with 151 days growth duration (**Table 9.6b**) was selected from regular sowing (NS) batch for further evaluation.

**Table 9.6a: Yield performance of the AYT-1\_CS breeding lines under early sowing time (21-23 October) in three haor locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)			
				Habiganj	Nikli	Tahirpur	Average
1	BR11894-R-R-R-R-228*	153 (149-160)	88	5.3	2.4	0.6	2.8
2	BR13026-BC1-3R-6	155 (149-162)	91	3.9	0.7	0.5	1.7
3	BR13027-BC1-3R-109*	149 (146-158)	88	5.0	2.8	-	3.1
4	BR13027-BC1-3R-127	151 (142-158)	84	2.7	2.4	0.2	1.8
5	BR13027-BC1-3R-25	150 (146-156)	90	3.6	1.6	0.3	1.8
6	IR17A1779	159 (161-164)	90	4.4	2.8	-	2.7
7	IR17A2917	155	99	3.5	-	-	1.7
8	IR17A2945	152 (153-159)	86	4.1	1.4	-	1.9
9	IR17A2946	159 (158-166)	87	4.8	3.7	-	3.5
10	IR19A2553	151 (143-159)	81	2.4	-	-	1.9
11	BRRi dhan28	148 (148-156)	82	3.5	0.8	-	1.3
12	BRRi dhan67	157 (149-163)	91	4.7	1.6	0.1	2.2

13	BRR1 dhan88	149 (144-157)	76	3.7	1.4	0.3	1.8
14	BRR1 dhan89	159 (146-173)	92	5.2	5.6	0.8	3.9
	Range	148-159	76-99	2.4-5.3	0.7-5.6	0.1-0.8	1.7-3.9
	LSD	9.68	9.13	1.74	1.62	0.30	2.27
	H2B (%)	59.56	47.13	56.4	77.6	99.99	51.78

\* Selected

D/S: 23.10.2023(Nikli);28.10.2023(Tahirpur); 24.10.2023(Habiganj)

D/T: 27.11.2023(Nikli);30.11.2023(Tahirpur);05.12.2023(Habiganj)

**Table 9.6b: Yield performance of the AYT-1\_NS breeding lines under regular sowing time (15-20 November) in four locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)				
				Gazipur	Habiganj	Nikli	Tahirpur	Average
1	BR11894-R-R-R-228	150 (144-153)	107	5.48	6.39	4.49	5.92	5.57
2	BR13026-BC1-3R-6	152 (151-155)	111	5.98	6.66	6.90	5.86	6.35
3	BR13027-BC1-3R-109*	151 (149-156)	112	5.84	7.42	7.43	8.62	7.33
4	BR13027-BC1-3R-127	154 (151-157)	98	4.77	5.97	6.04	-	5.64
5	BR13027-BC1-3R-25	152 (148-155)	111	6.12	6.12	6.14	6.67	6.26
6	IR17A1779	146 (144-148)	95	5.23	7.35	4.65	5.54	5.69
7	IR17A2917	158 (155-166)	114	4.90	6.39	5.60	6.62	5.88
8	IR17A2945	151 (147-155)	104	4.34	4.18	6.41	-	5.03
9	IR17A2946	153 (150-155)	103	5.44	4.95	4.62	5.12	5.03
10	IR19A2553	150 (145-156)	100	4.15	6.79	5.56	6.01	5.63
11	BRR1 dhan28	149 (147-153)	105	5.86	5.63	5.52	4.76	5.44
12	BRR1 dhan67	155 (149-165)	111	6.32	6.06	6.47	5.84	6.17
13	BRR1 dhan88	148 (144-151)	94	4.67	6.12	7.28	6.05	6.03
14	BRR1 dhan89	157 (153-160)	113	5.63	7.68	6.36	7.66	6.83
	Range	146-158	94-113	4.34-6.32	4.18-7.68	4.49-7.43	4.76-8.62	5.03-7.33
	LSD	3.626	6.99132	1.47	0.89	1.80	0.84	0.84
	H2B (%)	86.7	85.1	33.3	90.7	50.7	90.7	63.7

\* Selected

D/S: 20.11.2023(Nikli);19.11.2023(Tahirpur);20.11.2023(Habiganj);02.12.203 (Gazipur)

D/T: 25.12.2023(Nikli);24.12.2023(Tahirpur);31.12.2023(Habiganj); 11.01.2024 (Gazipur)

In the AYT-2, 32 breeding lines/varieties grown under early sowing (21-23 October) showed 148-164 days growth duration, 79.6-118.4 cm plant and 0.7-4.2 t/ha yield over three locations (**Table 9.6c**), while these lines when grown in regular time (i.e. 15-20 November) showed 145-157 days growth duration, 94.4-125.5 cm plant height and 4.6-7.8 t/ha yield (**Table 9.6d**). The check varieties BRR1 dhan28, BRR1 dhan67 and BRR1 dhan89 produced respectively 1.9 t/ha, 2.2 t/ha and 4.1 t/ha with growth duration of 154 days, 157 days and 163 days in early sowing batch while in regular batch these check varieties produced 5.6 t/ha, 6.1 t/ha and 6.4 t/ha, respectively with 147 days, 155 days and 154 days growth duration. Six breeding lines from early sowing batch showing at 26.1 % to 120% yield advantage (with 149-154 days days growth duration) over the check varieties of contemporary growth duration (**Table 9.6c**) and two breeding lines (BR12421-4R-171 and BR13027-BC1-3R-51) having 6.5-6.6 t/ha yield and 145-148 days growth duration (**Table 9.6d**) from regular sowing batch were selected.

**Table 9.6c: Yield performance of the AYT-2\_CS breeding lines under early sowing time (21-23 October) in three haor locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)			
				Habiganj	Nikli	Tahirpur	Average
1	BR12421-4R-171*	149 (142-158)	79.6	5.8	2.6	0.0	2.8
2	BR12421-4R-43	148 (142-156)	94.7	4.8	1.7	0.0	2.2
3	BR12552-3R-208	154 (149-156)	84.6	4.8	0.6	0.0	1.4
4	BR12570-5R-146-1*	154 (147-163)	91.5	6.6	2.2	1.5	3.4

5	BR12570-5R-150-3	156 (147-162)	118.4	9.9	2.5	0.1	4.1
6	BR13026-BC1-3R-151	151 (145-161)	93.2	0.9	1.1	0.0	0.7
7	BR13026-BC1-3R-188	150 (147-155)	82.1	4.2	1.7	0.0	2.0
8	BR13026-BC1-3R-197	164 (154-174)	100.5	3.9	4.8	1.7	3.5
9	BR13026-BC1-3R-29	160 (143-190)	90.6	3.1	1.1	0.0	1.4
10	BR13026-BC1-3R-41	164 (160-170)	115.9	5.7	4.9	1.9	4.2
11	BR13026-BC1-3R-58	155 (148-170)	86.6	5.7	0.5	0.1	1.4
12	BR13026-BC1-3R-92	159 (150-175)	101.3	2.3	2.2	0.5	1.7
13	BR13027-BC1-3R-1	161 (151-178)	89.8	5.6	1.9	1.5	3.0
14	BR13027-BC1-3R-102	152 (145-162)	90.1	9.5	1.7	1.3	4.2
15	BR13027-BC1-3R-108*	151 (145-160)	91.0	6.4	2.3	0.1	2.9
16	BR13027-BC1-3R-123	158 (152-168)	100.3	5.1	3.6	0.8	3.2
17	BR13027-BC1-3R-127	163 (152-176)	87.3	4.4	2.1	0.7	2.4
18	BR13027-BC1-3R-13	157 (152-163)	92.7	3.7	1.8	0.2	1.9
19	BR13027-BC1-3R-164*	148 (142-160)	85.9	4.4	2.4	0.4	2.4
20	BR13027-BC1-3R-18	154 (148-160)	89.0	4.4	1.7	0.0	2.0
21	BR13027-BC1-3R-180	149 (143-160)	85.5	4.7	1.3	0.0	2.0
22	BR13027-BC1-3R-212	156 (153-163)	87.8	6.3	3.9	0.0	3.4
23	BR13027-BC1-3R-24	149 (145-156)	83.7	4.6	1.2	0.1	2.0
24	BR13027-BC1-3R-51	150 (145-156)	87.9	4.6	0.9	0.0	1.6
25	BR13027-BC1-3R-52*	150 (142-156)	86.7	4.6	3.5	0.0	2.9
26	BR13027-BC1-3R-58	150 (141-163)	86.0	4.9	1.4	0.1	2.1
27	BR13027-BC1-3R-67	157 (154-163)	103.5	3.2	1.7	0.9	1.9
28	BR13027-BC1-3R-76	160 (151-163)	88.4	3.2	3.1	0.0	2.7
29	BR13027-BC1-3R-96	150 (146-157)	85.5	1.0	1.6	0.0	0.9
30	BRR1 dhan28	154 (146-168)	81.4	4.5	1.2	0.0	1.9
31	BRR1 dhan67	157 (153-162)	94.0	3.9	2.7	0.0	2.2
32	BRR1 dhan89	163 (152-172)	92.3	6.0	5.8	0.5	4.1
Range		148-164	79.6-118.4	0.9-9.9	0.5-5.8	0-1.9	0.7-4.2
LSD		11.6	11.8	2.7	1.1	1.4	2.9
H2B (%)		67.9	81.7	82.93	86.91	76.7	44.5

\* Selected

D/S: 24.10.2023(Nikli);28.10.2023(Tahirpur);24.10.2023(Habiganj)

D/T: 28.11.2023(Nikli);02.12.2023(Tahirpur);05.12.2023(Habiganj)

**Table 9.6d: Yield performance of the AYT-2\_NS breeding lines under regular sowing time (15-20 November) in four locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)				
				Gazipur	Habiganj	Nikli	Tahirpur	Average
1	BR12421-4R-171*	145 (143-147)	94.4	5.7	6.6	6.6	7.1	6.5
2	BR12421-4R-43	148 (146-149)	117.1	5.0	5.6	5.6	4.5	5.2
3	BR12552-3R-208	150 (146-153)	105.1	5.7	6.6	5.8	6.5	6.1
4	BR12570-5R-146-1	150 (147-153)	106.7	5.3	6.1	5.8	7.0	6.0
5	BR12570-5R-150-3	153 (150-155)	121.9	4.2	4.5	5.6	4.9	4.8
6	BR13026-BC1-3R-151*	146 (143-149)	109.0	5.9	5.1	5.1	6.8	5.7
7	BR13026-BC1-3R-188	146 (144-147)	105.3	6.8	5.7	7.3	6.3	6.5
8	BR13026-BC1-3R-197	15 (147-153)	108.0	6.3	6.1	6.1	6.4	6.2
9	BR13026-BC1-3R-29	149 (148-151)	116.9	6.5	6.3	6.1	5.8	6.2
10	BR13026-BC1-3R-41	157 (153-164)	125.5	4.9	3.8	4.4	5.8	4.8
11	BR13026-BC1-3R-58	149 (148-152)	103.5	6.2	5.9	5.6	6.2	6.0
12	BR13026-BC1-3R-92	153 (149-160)	118.9	5.3	5.4	5.1	4.8	5.1
13	BR13027-BC1-3R-1	147 (144-149)	111.9	5.9	5.4	4.0	4.3	4.9
14	BR13027-BC1-3R-102	150 (147-157)	107.8	3.8	6.7	7.0	7.8	6.3
15	BR13027-BC1-3R-108	148 (146-150)	102.2	4.7	5.9	6.8	6.3	5.9
16	BR13027-BC1-3R-123	149 (146-153)	107.6	6.5	6.2	6.4	6.3	6.3

17	BR13027-BC1-3R-127	155 (153-158)	103.0	4.3	5.4	6.2	4.8	5.2
18	BR13027-BC1-3R-13	152 (146-155)	109.6	6.1	5.9	5.6	5.7	5.8
19	BR13027-BC1-3R-164	148 (146-148)	98.2	4.8	5.1	6.0	5.3	5.3
20	BR13027-BC1-3R-18	149 (147-150)	109.1	6.8	7.0	6.3	5.3	6.3
21	BR13027-BC1-3R-180	148 (145-150)	107.4	6.1	6.0	6.2	5.7	6.0
22	BR13027-BC1-3R-212	156 (154-158)	103.8	3.8	6.0	6.0	6.2	5.5
23	BR13027-BC1-3R-24	150 (148-153)	109.8	5.3	6.1	7.1	7.5	6.5
24	BR13027-BC1-3R-51	153 (147-160)	106.5	7.8	5.6	6.2	6.7	6.6
25	BR13027-BC1-3R-52	148 (147-151)	105.9	5.3	5.6	6.1	5.2	5.6
26	BR13027-BC1-3R-58	148 (145-152)	104.3	6.1	6.4	5.9	6.2	6.2
27	BR13027-BC1-3R-67	153 (147-159)	117.6	4.6	4.5	4.6	4.6	4.6
28	BR13027-BC1-3R-76	153 (148-159)	104.0	5.5	5.9	5.7	5.7	5.7
29	BR13027-BC1-3R-96	148 (147-150)	112.6	5.0	6.2	6.7	6.6	6.1
30	BRR1 dhan28	147 (145-149)	104.2	5.4	6.1	5.6	5.4	5.6
31	BRR1 dhan67	155 (150-163)	114.2	6.1	5.4	6.5	6.3	6.1
32	BRR1 dhan89	154 (149-162)	108.2	6.2	5.4	6.5	7.5	6.4
Range		145-157	94.4-125.5	3.8-7.8	3.8-7.0	4.0-7.3	4.3-7.8	4.6-7.8
LSD		3.1	7.3	0.96	0.92	0.73	0.99	0.68
H2B (%)		79.7	84.3	76.7	65.1	86.5	74.5	66.0

\* Selected

D/S: 20.11.2023(Nikli); 19.11.2023(Tahirpur); 22.12.2023(Habiganj); 02.12.2023 (Gazipur)

D/T: 27.12.2023(Nikli); 26.12.2023(Tahirpur); 07.01.2024(Habiganj); 11.01.2024 (Gazipur)

In the AYT-3, 41 breeding lines/varieties grown under early sowing (21-23 October) showed 148-171 days growth duration, 53-124 cm plant and 0.99-5.91 t/ha yield over three locations (**Table 9.6e**), while these lines when grown in regular time (i.e. 15-20 November) showed 141-161 days growth duration, 99-134 cm plant height and 4.32-7.35 t/ha yield (**Table 9.6f**). The check varieties BRR1 dhan67, BRR1 dhan88 and BRR1 dhan89 produced respectively 2.51 t/ha, 2.36 t/ha and 4.69 t/ha with growth duration of 156 days, 151 days and 166 days in early sowing batch while in regular batch these check varieties produced 6.64 t/ha, 5.54 t/ha and 6.13 t/ha, respectively with 154 days, 148 days and 157 days growth duration. Four medium-duration breeding lines (157-158 days growth duration) showing 38.42 – 81.5% (3.27-4.29 t/ha) higher yield over BRR1 dhan67 (2.52 t/ha yield with 156 days growth duration) with from early sowing batch (**Table 9.6e**) and seven short to medium short duration (148-152 days) breeding lines showing 13.5-32.6% (6.29-7.35 t/ha) higher yield over the contemporary check variety BRR1 dhan88 (5.54 t/ha yield with 148 days growth duration) and BRR1 dhan67 (6.64 t/ha yield with 154 days growth duration) (**Table 9.6f**) from regular sowing batch were selected.

**Table 9.6e: Yield performance of the AYT-3\_CS breeding lines under early sowing time (21-23 October) in three haor locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)			
				Habiganj	Nikli	Tahirpur	Average
1	BR12552-3R-149	162 (153-170)	87	3.74	4.09	3.93	3.92
2	BR12552-3R-179	166 (163-171)	124	6.72	5.87	5.12	5.91
3	BR12552-3R-182	170 (166-173)	120	4.77	6.90	5.55	5.74
4	BR12552-3R-229	166 (162-172)	105	5.52	4.69	5.71	5.31
5	BR12570-5R-107-2	153 (150-158)	74	-	1.13	-	0.99
6	BR12570-5R-110-2	151 (148-155)	79	-	2.42	1.63	2.64
7	BR12570-5R-177-3	170 (163-174)	114	5.63	5.49	4.72	5.28
8	BR12570-5R-189-1	166 (161-169)	118	5.51	5.33	3.42	4.75
9	BR12570-5R-189-2	158 (153-166)	113	4.36	4.44	1.66	3.49
10	BR12570-5R-189-3	164 (160-172)	97	5.50	3.41	3.65	4.19
11	BR12570-5R-202-1	163 (160-169)	100	4.70	7.41	3.09	5.06
12	BR12570-5R-204-1	165 (159-171)	99	5.00	2.87	0.53	2.80

13	BR12570-5R-204-3	168 (160-172)	114	6.19	4.76	2.56	4.50
14	BR12570-5R-33-2*	158 (152-164)	92	6.13	3.33	3.40	4.29
15	BR12570-5R-37-1	170 (163-175)	116	4.99	4.11	4.92	4.67
16	BR12570-5R-44-3	162 (153-167)	102	-	3.33	0.16	2.36
17	BR12570-5R-66-3	166 (157-172)	100	6.58	5.26	2.07	4.64
18	BR13026-BC1-3R-1	168 (158-173)	100	6.44	4.83	1.90	4.39
19	BR13026-BC1-3R-194	149 (144-158)	82	1.75	1.69	-	1.12
20	BR13026-BC1-3R-209*	157 (153-163)	100	5.70	2.93	1.24	3.29
21	BR13026-BC1-3R-3	168 (163-172)	118	-	2.83	1.18	2.62
22	BR13026-BC1-3R-36	149 (144-158)	85	3.87	1.42	0.05	1.78
23	BR13026-BC1-3R-53	168 (162-175)	109	5.10	4.76	4.18	4.68
24	BR13026-BC1-3R-8	152 (148-157)	75	-	1.27	-0.17	1.17
25	BR13027-BC1-3R-108*	157 (153-163)	94	5.84	2.96	1.01	3.27
26	BR13027-BC1-3R-119	162 (157-165)	98	2.65	3.49	-	2.47
27	BR13027-BC1-3R-121	148 (144-151)	88	-	1.98	0.88	2.05
28	BR13027-BC1-3R-128	157 (153-161)	100	-	2.50	1.66	2.69
29	BR13027-BC1-3R-136	151 (146-159)	84	3.03	0.63	-	1.23
30	BR13027-BC1-3R-138	148 (141-153)	53	-	0.41	2.44	2.04
31	BR13027-BC1-3R-139	155 (151-161)	83	4.88	2.88	0.08	2.61
32	BR13027-BC1-3R-149*	157 (151-163)	98	5.64	3.29	1.24	3.39
33	BR13027-BC1-3R-181	171 (162-176)	111	4.81	5.35	5.83	5.33
34	BR13027-BC1-3R-198	151 (148-155)	84	-	0.84	0.07	1.07
35	BR13027-BC1-3R-21	153 (149-158)	86	3.50	2.27	0.94	2.24
36	BR13027-BC1-3R-40	171	97	-	2.96	-	2.99
37	BR13027-BC1-3R-51	159 (155-163)	91	5.52	1.76	-	3.04
38	BR13027-BC1-3R-76	157 (153-164)	100	4.82	1.27	-	2.44
39	BRR1 dhan67	156 (151-159)	98	4.74	1.49	-	2.51
40	BRR1 dhan88	151 (146-159)	75	4.36	1.25	1.48	2.36
41	BRR1 dhan89	166 (160-176)	95	6.69	4.86	2.51	4.69
Range		148-171	53-124	1.75-6.72	0.41-7.41	0.17-5.83	0.99-5.91
LSD		7.57	13.50	2.09	1.23	1.74	1.98
H2B (%)		87.28	86.66	43.94	89.36	89.05	76.93

\* Selected

D/S: 24.10.2023(Nikli);29.10.2023 (Tahirpur); 24.10.2023(Habiganj)

D/T: 29.11.2023(Nikli);08.12.2023 (Tahirpur); 05.12.2023(Habiganj)

**Table 9.6f: Yield performance of the AYT-3\_NS breeding lines under regular sowing time (15-20 November) in four locations during Boro 2023-24**

Sl	Designation	Growth duration (days)	Plant height (cm)	Yield (t/ha)				
				Gazipur	Habiganj	Nikli	Tahirpur	Average
1	BR12552-3R-149	156 (149-163)	99	5.34	5.58	6.42	5.70	5.76
2	BR12552-3R-179	159 (150-163)	134	5.72	5.52	4.88	6.72	5.71
3	BR12552-3R-182	161 (157-164)	131	5.82	6.00	6.32	6.06	6.05
4	BR12552-3R-229	160 (155-163)	128	4.78	5.40	4.16	7.31	5.41
5	BR12570-5R-107-2	153 (147-160)	103	5.77	6.23	6.21	5.50	5.93
6	BR12570-5R-110-2	155 (151-159)	100	6.22	6.81	6.41	6.79	6.56
7	BR12570-5R-177-3	160 (158-163)	123	5.07	5.15	5.72	5.93	5.47
8	BR12570-5R-189-1	157 (151-163)	123	5.04	5.57	4.60	5.38	5.15
9	BR12570-5R-189-2	157 (155-157)	111	5.07	5.17	5.87	6.41	5.63
10	BR12570-5R-189-3	157 (155-160)	111	4.56	5.97	6.11	6.83	5.87
11	BR12570-5R-202-1	155 (153-160)	115	4.05	5.97	5.16	6.45	5.22
12	BR12570-5R-204-1	159 (156-163)	124	4.55	3.62	6.55	6.45	5.06
13	BR12570-5R-204-3	158 (154-161)	129	5.23	5.60	4.69	5.92	5.36
14	BR12570-5R-33-2	157 (152-164)	109	4.42	5.13	5.52	6.59	5.42
15	BR12570-5R-37-1	160 (155-164)	123	4.90	5.36	4.87	7.07	5.55

16	BR12570-5R-44-3	154 (152-156)	108	3.55	6.04	6.43	6.02	5.51
17	BR12570-5R-66-3	157 (152-159)	113	5.20	6.92	6.95	7.43	6.62
18	BR13026-BC1-3R-1	159 (156-162)	120	3.28	2.67	5.96	5.35	4.32
19	BR13026-BC1-3R-194*	148 (144-151)	109	6.76	6.24	6.36	6.21	6.39
20	BR13026-BC1-3R-209	152 (149-154)	113	6.18	6.77	5.62	6.98	6.39
21	BR13026-BC1-3R-3	161 (157-165)	129	4.37	5.96	6.79	8.41	6.38
22	BR13026-BC1-3R-36	148 (145-151)	104	5.19	5.99	6.49	5.52	5.80
23	BR13026-BC1-3R-53	154 (146-156)	102	3.01	5.99	6.06	5.52	4.77
24	BR13026-BC1-3R-8	153 (152-154)	102	4.07	6.39	5.43	4.85	5.19
25	BR13027-BC1-3R-108*	152 (148-155)	103	7.44	6.64	6.78	8.54	7.35
26	BR13027-BC1-3R-119	155 (152-158)	106	3.71	7.74	6.83	6.48	6.19
27	BR13027-BC1-3R-121	153 (151-156)	108	4.79	7.45	7.58	7.76	6.90
28	BR13027-BC1-3R-128	154 (150-157)	117	5.19	6.29	5.55	5.11	5.53
29	BR13027-BC1-3R-136	154 (153-155)	105	3.93	5.09	5.65	4.96	4.91
30	BR13027-BC1-3R-138	147 (146-149)	106	6.27	6.55	5.75	5.81	6.09
31	BR13027-BC1-3R-139*	148 (146-150)	104	6.42	6.05	6.98	5.93	6.34
32	BR13027-BC1-3R-149	151 (144-155)	112	6.97	5.52	6.39	6.84	6.43
33	BR13027-BC1-3R-181	157 (148-163)	121	3.51	4.84	6.23	5.64	5.05
34	BR13027-BC1-3R-198*	149 (146-151)	112	6.16	6.21	6.31	6.49	6.29
35	BR13027-BC1-3R-21*	151 (149-152)	113	5.61	7.13	7.09	8.93	7.19
36	BR13027-BC1-3R-40	153 (151-155)	107	4.54	5.18	5.73	8.93	5.31
37	BR13027-BC1-3R-51*	152 (150-154)	106	6.54	7.59	6.94	7.87	7.23
38	BR13027-BC1-3R-76*	152 (147-159)	104	6.62	7.08	6.70	7.96	7.09
39	BRR1 dhan67	154 (149-160)	114	6.52	6.53	6.88	6.62	6.64
40	BRR1 dhan88	148 (144-150)	97	5.09	5.67	6.15	5.25	5.54
41	BRR1 dhan89	157 (154-159)	111	5.92	5.91	6.28	6.41	6.13
Range		147-161	99-134	3.01-7.44	2.67-7.74	4.16-7.58	4.85-8.54	4.32-7.35
LSD		3.45	7.57	1.16	1.20	0.80	1.08	0.90
H2B (%)		84.50	89.54	75.33	68.48	79.64	77.20	71.16

\* Selected

D/S: 22.11.2023(Nikli); 19.11.2023(Tahirpur); 22.11.2023(Habiganj); 02.12.2023 (Gazipur)

D/T: 28.12.2023(Nikli); 28.12.2022(Tahirpur); 31.12.2022(Habiganj); 11.01.2024 (Gazipur)

### **Experiment 9.7: 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

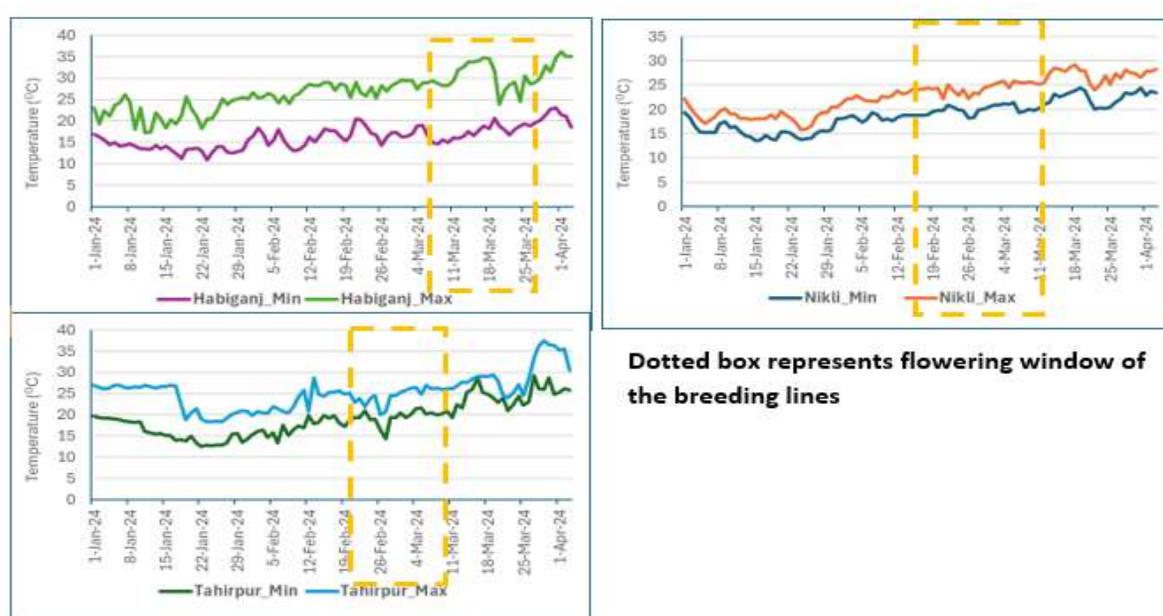
Co-Investigators: M Anisuzzaman, KM Iftekharuddaula (Gazipur), MA Syed (Habiganj)

**Specific objective:** Evaluation of breeding lines for yield potential in multi-locations in replicated trials.

**Materials and Methods:** In total, nine genotypes were evaluated at four sites in Habiganj, three sites in Nikli and three sites in Tahirpur along with three standard check varieties, BRR1 dhan28, BRR1 dhan67 and BRR1 dhan89 at cold stress under three sowing intervals (CS1: sowing on 23-27 October, CS2: sowing on 2-5 November and NS: sowing during 19-23 November conditions. The same set of materials were also evaluated under non-stress condition in Gazipur. 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. The trials were conducted with three replications following RCB design. Fertilizer management was done @ 260:100:120: 110:11 kg Urea, TSP, MP, Gypsum and ZnSO<sub>4</sub>/ha. Urea was applied in three equal splits at 15 days after transplanting (DAT), 30 DAT and 50 DAT. Total amounts of TSP, ½ MP, Gypsum and ZnSO<sub>4</sub> was applied at final land preparation. Rest of half MP was applied at the 2<sup>nd</sup> top-dress of Urea. Crop management such as weeding, irrigation etc. was done in time. Disease-insect and other pests were controlled when necessary. Data on plant height,

days to flowering and maturity, yield, lodging and disease and insect infestation were recorded. Plot yield was recorded from the whole plot and moisture content (MC) in the grain was recorded using a moisture meter. Grain yield (t/ha) was estimated from plot yield adjusted with 14% MC. Yield reduction was estimated from the yield difference between non-stress plot and cold stress plot as the percentage of non-stress plot. The maximum and minimum temperature data of each of the sites was recorded using digital max-min thermometer.

**Results and Discussion:** Fig 9.7a shows that the average temperature during 20 January to 6 February was in between 17.5<sup>0</sup>C – 19.85<sup>0</sup>C with maximum daily temperature of 19.6<sup>0</sup>C-22.9<sup>0</sup>C and from 7 February to 29 February, the average temperature was 20.25<sup>0</sup>C-21.85<sup>0</sup>C with maximum temperature of 21.6<sup>0</sup>C-25.2<sup>0</sup>C. The breeding tested under CS1 condition flowered in between 15 February 2024 to 10 March 2024, which suggests that most the lines materials experienced severe to moderate level of cold shock during PI to booting stage at Nikli site.



**Fig 9.7a. The maximum, minimum, and average temperature at the project sites and the flowering window of the breeding lines tested in RYT during Boro 2023-24.**

At Tahirpur site, from 18 January to 9 February, the average temperature during 20 January to 6 February was in between 15.8<sup>0</sup>C – 19.15<sup>0</sup>C with maximum daily temperature of 18.3<sup>0</sup>C-22.4<sup>0</sup>C and from 10 February to 27 February, the average temperature ranged between 17.5<sup>0</sup>C – 22.25<sup>0</sup>C with maximum daily temperature of 20<sup>0</sup>C-25<sup>0</sup>C. The breeding tested under CS condition flowered from 20 February to 10 March, indicated that breeding lines experienced moderate level of cold shock during PI to booting stage at this site. At Habiganj site, from 1<sup>st</sup> February to 13 February, the average temperature prevailed between 19.4<sup>0</sup>C – 22.35<sup>0</sup>C with maximum daily temperature of 24.1<sup>0</sup>C-27.7<sup>0</sup>C. The breeding lines flowered from 6 March to 26 March, which indicated moderate cold shock during PI stage and slight or no cold stress during booting stage.

In the CS1 batch, the nine breeding lines showed growth duration of 143-172 days at Nikli sites, 144-167 days at Tahirpur sites and 154-179 days at Habiganj sites (Table 9.7a). In the CS2 batch, the breeding lines had growth duration of 144-168 days at Nikli sites, 153-169 days at Tahirpur and 154-176 days at Habiganj sites (Table 9.7b). On the other hand, in NS batch they showed growth duration ranging from 147 days to 163 days at Nikli sites, 142 days to 167 days at Tahirpur and 144 days to 167 days in Habiganj sites (Table 9.7c).

**Table 9.7a: Growth duration of the breeding lines tested under early sowing time (23-27 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2023-24**

Designation	Growth duration (days)										
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Average
BR11894-R-R-R-R-152	168	168	167	164	144	149	162	144	152	152	157

Designation	Growth duration (days)										Average
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	
BR11894-R-R-R-R-59	160	167	162	174	164	151	155	-	-	152	159
BR11894-R-R-R-R-72	162	161	171	162	144	147	155	146	155	154	156
BR13026-BC1-3R-10	173	179	176	161	-	150	162	150	-	156	162
BR13027-BC1-3R-14	165	162	170	157	-	147	158	144	148	154	155
IR18A1859	159	-	-	154	151	-	155	-	-	-	153
IR19A1473	171	177	179	172	-	167	172	158	162	167	169
IR19A4821	162	-	-	161	155	154	167	-	151	157	160
IR19A5712	162	-	165	165	-	-	160	151	-	-	158
BRRI dhan28	162	161	163	162	-	143	146	-	151	-	153
BRRI dhan67	174	174	171	165	154	154	163	-	-	159	162
BRRI dhan89	164	170	179	171	156	164	171	153	157	162	165
LSD (0.05)	6.82	1.84	4.17	10.15	4.37	3.45	6.76	2.78	3.56	2.36	5.0
H2B (%)	66.7	98.6	90.3	39.3	93.4	96.5	82.9	96.8	89.2	96.8	92.3

D/S:23.10.2023 (Nikli); 27.10.2023 (Tahirpur); 25.10.2024 (Habiganj)  
D/T: 23-26 Nov 2023 (Nikli); 25-29 Nov 2023 (Tahirpur); 10-15 Dec 2023 (Habiganj)

**Table 9.7b: Growth duration of the breeding lines tested under early sowing time (5 November) in three haor locations in Regional Yield Trial (RYT-CS2) during Boro 2023-24**

Designation	Growth duration (days)										Average
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	
BR11894-R-R-R-R-152	164	166	164	162	159	157	160	160	157	161	161
BR11894-R-R-R-R-59	174	NA	175	159	160	159	161	154	159	159	163
BR11894-R-R-R-R-72	162	165	164	158	156	156	158	160	158	159	160
BR13026-BC1-3R-10	161	169	163	163	157	156	160	159	157	158	160
BR13027-BC1-3R-14	157	164	165	162	156	157	157	158	157	159	159
IR181859	154	165	161	158	147	147	151	153	153	164	155
IR191473	172	176	172	176	168	166	166	169	167	163	170
IR194821	161	159	161	159	156	154	159	162	160	160	159
IR195712	165	168	163	162	160	159	160	162	160	165	162
BRRI dhan28	162	173	163	175	147	144	153	154	162	162	159
BRRI dhan67	165	170	163	162	161	159	163	161	152	165	162
BRRI dhan89	171	173	174	171	163	161	164	164	161	160	166
LSD (0.05)	9.66	5.17	5.27	2.37	2.23	2.59	3.06	3.63	2.51	4.33	3.19
H2B (%)	39.3	71.1	75.7	96.2	96.5	95.9	86.5	94.7	89.1	83.5	90.1

D/S: 02.11.2023(Nikli); 05.11.2023(Tahirpur); 05.11.2023(Habiganj)  
D/T:04-06 Dec 2023(Nikli), 06-11 Dec 2023(Tahirpur); 16-20 Dec 2023(Habiganj)

**Table 9.7c: 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 2023-24**

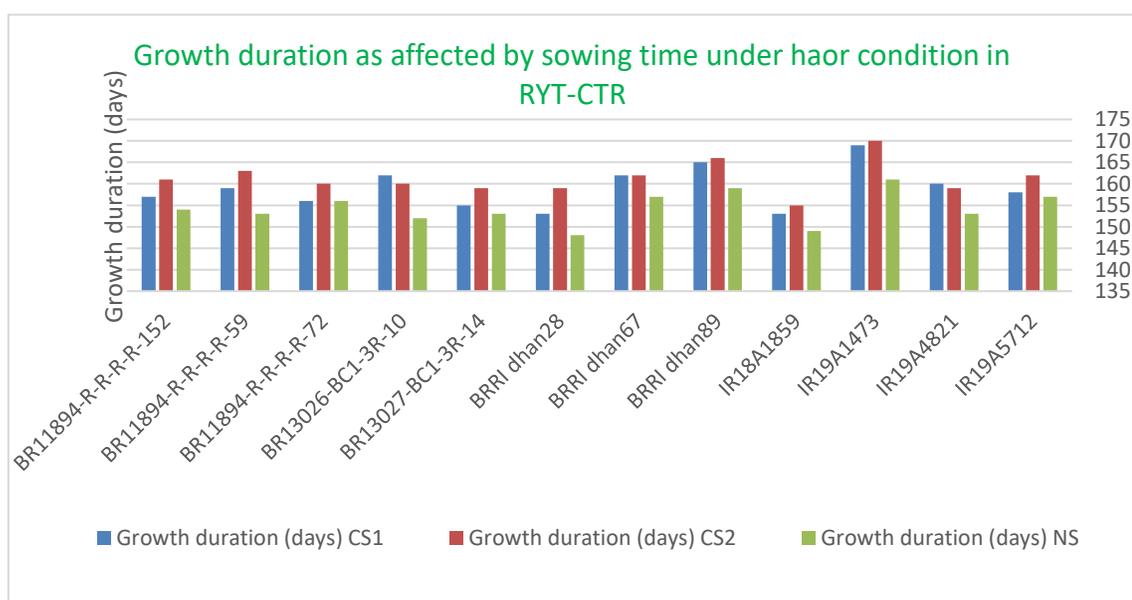
Designation	Growth duration (days)										Average
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	
BR11894-R-R-R-R-152	151	-	157	157	152	156	159	148	153	152	154
BR11894-R-R-R-R-59	-	151	147	159	158	-	161	-	-	151	153
BR11894-R-R-R-R-72	157	-	159	158	154	156	160	148	154	155	156
BR13026-BC1-3R-10	152	152	157	153	152	152	156	145	152	153	152
BR13027-BC1-3R-14	147	156	159	155	152	154	158	147	151	152	153
IR181859	148	-	144	149	149	151	153	144	149	150	149
IR191473	162	164	159	159	161	162	163	156	167	161	161
IR194821	149	153	155	149	154	153	-	148	154	156	153
IR195712	155	164	159	159	153	154	159	148	157	157	157
BRRI dhan28	147	152	141	156	147	149	148	142	149	150	148
BRRI dhan67	153	168	159	152	157	160	162	148	158	157	157
BRRI dhan89	161	167	161	159	159	158	161	150	158	156	159

LSD (0.05)	5.07	2.92	3.29	5.88	2.46	1.47	2.21	1.72	0.92	1.71	3.0
H2B (%)	84.17	97.95	95.51	44.74	93.26	97.09	96.09	94.52	99.92	95.57	95

D/S: 19.11.2023(Nikli); 19.11.2023(Tahirpur); 23.11.2023(Habiganj)

D/T: 23-26 Dec 2023(Nikli); 21-23 Dec 2023(Tahirpur); 25 Dec 2023 – 3 January 2024(Habiganj)

**Fig.9.7b** shows the response of sowing time on growth duration of the entries including check varieties. BR11894-R-R-R-R-72 and IR19A5712 showed almost similar growth duration in case of CS1 batch and NS and batch. While, BR11894-R-R-R-R-59, BR13026-BC1-3R-10, BRR1 dhan28, IR18A1859 and IR19A4821 showed greatly variable growth duration between the showing time. It indicated that days to heading of BR11894-R-R-R-R-72 and IR19A5712 was less affected by the low temperature, while the cold stress batches of BR11894-R-R-R-R-59, BR13026-BC1-3R-10, BRR1 dhan28, IR18A1859 and IR19A4821 were greatly affected by the low temperature during vegetative stage causing delayed heading.



**Fig 9.7b: Barplot showing the effect of temperature modulated by sowing time on growth duration of the test breeding lines/varieties at three locations in haor areas during Boro 2023-24**

Plant height of the breeding lines and the check varieties varied across the sowing time. The variety BRR1 dhan28 showed 61-99 cm with an average of 80 cm plant height under CS1 batch (**Table 9.7d**), 84-114 cm with an average value of 97 cm in CS2 (**Table 9.7e**) and 93-121 cm with an average value of 106 cm in NS batch (**Table 9.7f**). The breeding line BR11894-R-R-R-R-152, BR11894-R-R-R-R-59 and BR11894-R-R-R-R-72, BR13026-BC1-3R-10, BR13027-BC1-3R-14, IR18A1859, IR19A1473, IR19A4821 and IR19A5712 had plant height 102 cm (90-119 cm), 91 cm (87-105 cm), 100 cm (84-116 cm), 104 cm (73-140 cm), 93 cm (77-119 cm), 77 cm (71-89 cm), 90 cm (73-109 cm), 92 cm (83 – 102 cm) and 89 cm (83-113 cm). respectively in CS1 batch. In NS batch, these lines were 110 cm (104-125 cm), 100 cm (87-105 cm), 109 cm (99-126 cm), 107 cm (92-130 cm), 100 cm (91-122 cm), 87 cm (72-117 cm), 98 cm (84-117 cm), 94 cm (82-108 cm) and 95 cm (82-113 cm), respectively.

**Table 9.7d: Plant height of the breeding lines tested under early sowing time (25-28 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2023-24**

Designation	Plant height (cm)										
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Avg
BR11894-R-R-R-R-152	119	110	100	113	90	92	101	97	101	97	102
BR11894-R-R-R-R-59	105	97	87	105	83	86	92	-	-	89	91
BR11894-R-R-R-R-72	116	114	100	119	84	89	87	95	95	96	100
BR13026-BC1-3R-10	140	130	118	117	-	73	78	97	-	93	104

BR13027-BC1-3R-14	119	107	102	103	-	77	83	83	85	84	93
IR18A1859	88	-	-	89	71	-	72	-	-	-	77
IR19A1473	109	102	94	106	-	82	83	73	84	89	90
IR19A4821	88	-	-	99	88	102	89	-	83	83	92
IR19A5712	108	-	92	113	-	-	68	83	-	-	89
BRR1 dhan28	99	95	90	88	-	61	77	-	76	-	80
BRR1 dhan67	117	111	104	113	84	84	92	-	-	98	99
BRR1 dhan89	114	107	99	111	80	82	90	86	86	85	94
LSD (0.05)	8.29	11.25	7.17	5.76	11.74	8.48	10.13	6.07	6.44	5.58	8.61
H2B (%)	95.5	80.2	90.2	93.4	35.7	89.6	71.0	92.6	87.4	90.3	91.5

D/S: 23.10.2023 (Nikli); 27.10.2023 (Tahirpur); 25.10.2024 (Habiganj)

D/T: 23-26 Nov 2023 (Nikli); 25-29 Nov 2023 (Tahirpur); 10-15 Dec 2023 (Habiganj)

**Table 9.7e Plant height of the breeding lines tested under early sowing time (05 November) in three haor locations in Regional Yield Trial (RYT-CS2) during Boro 2023-24**

Designation	Plant height (cm)											
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Ave	
BR11894-R-R-R-R-152	113	125	105	114	110	106	106	106	109	104	110	
BR11894-R-R-R-R-59	105	NA	122	89	103	100	104	86	94	87	100	
BR11894-R-R-R-R-72	119	126	114	107	107	102	102	99	106	109	109	
BR13026-BC1-3R-10	117	130	125	99	103	92	94	95	105	106	107	
BR13027-BC1-3R-14	103	122	117	98	100	91	93	88	96	96	100	
IR18A1859	89	91	117	98	85	72	65	83	80	88	87	
IR19A1473	106	112	108	117	95	88	84	87	94	90	98	
IR19A4821	99	95	108	100	94	82	85	90	94	89	94	
IR19A5712	113	105	100	106	87	82	82	86	89	93	95	
BRR1 dhan28	88	105	114	108	93	84	90	92	96	96	97	
BRR1 dhan67	113	118	112	99	101	100	95	98	98	97	103	
BRR1 dhan89	111	111	106	107	99	96	91	92	95	94	100	
LSD (0.05)	5.43	10.54	23.11	13.94	6.10	5.04	7.51	5.90	4.45	1.72	6.41	
H2B (%)	93.4	76.6	64.5	56.9	83.3	93.4	89.4	86.1	93.4	98.4	90.9	

D/S: 02.11.2023(Nikli); 05.11.2023(Tahirpur); 05.11.2023(Habiganj)

D/T: 04-06 Dec 2023(Nikli), 06-11 Dec 2023(Tahirpur); 16-20 Dec 2023(Habiganj)

**Table 9.7f: Plant height of the breeding lines tested under regular sowing time (15-20 November) in three haor locations in Regional Yield Trial (RYT-NS) during Boro 2023-24**

Designation	Plant height (cm)											
	Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Ave	
BR11894-R-R-R-R-152	123	-	120	98	120	120	113	105	113	191	122	
BR11894-R-R-R-R-59	-	108	110	110	117	-	104	-	-	105	108	
BR11894-R-R-R-R-72	118	-	118	105	124	114	110	105	173	107	119	
BR13026-BC1-3R-10	112	110	107	112	112	115	112	103	113	189	119	
BR13027-BC1-3R-14	115	114	113	119	114	115	111	95	109	106	111	
IR18A1859	102	-	109	119	103	90	85	82	83	86	95	
IR19A1473	123	102	107	126	107	104	102	90	103	104	107	
IR19A4821	102	118	98	105	115	99	-	89	97	108	103	
IR19A5712	115	97	101	98	103	100	102	85	99	102	100	
BRR1 dhan28	112	101	121	117	109	104	104	93	101	100	106	
BRR1 dhan67	129	115	106	106	112	116	101	97	109	100	109	
BRR1 dhan89	121	109	103	113	113	111	102	88	103	100	106	
LSD (0.05)	9.45	15.74	11.49	12.45	6.82	4.68	5.43	5.39	37.00	60.92	9.40	
H2B (%)	73.2	44.7	39.0	53.3	78.7	93.4	87.3	90.2	40.2	44.7	70.3	

D/S: 19.11.2023(Nikli); 19.11.2023(Tahirpur); 23.11.2023(Habiganj)

D/T: 23-26 Dec 2023(Nikli); 21-23 Dec 2023(Tahirpur); 25 Dec 2023 – 3 January 2024(Habiganj)

In the case grain yield at CS1 batch, BR11894-R-R-R-R-152 yielded the highest at Hab2, Nikli3, Tah1 and Tah2 locations. BR11894-R-R-R-R-59 yield the highest at Nikli1, second highest at Hab1 and Tah3 and third highest at Nikli2. (Table 9.7g). However, over the 10 locations, the test breeding lines yielded 2.1 t/ha to 3.4 t/ha with growth duration of 153-169 days, while the check variety BRRi dhan28 yielded 1.6 t/ha with 153 days, BRRi dhan67 yielded 2.2 t/ha with 162 days and BRRi dhan89 yielded 3.3 t/ha with 165 days growth duration in CS1 batch. The breeding line BR11894-R-R-R-R-152 yielded the highest over the locations. While in the NS condition, this breeding lines yielded 4.8 t/ha to 6.1 t/ha with growth duration of 149-161 days (Table 9.7i). The highest yield (6.1 t/ha) was obtained with BR11894-R-R-R-R-72 having a growth duration of 156 days, while the check variety BRRi dhan28 yielded 4.7 t/ha with 148 days growth duration. However, BR13027-BC1-3R-14 in the CS2 batch, which was shown on 5th November yielded 5.26 t/ha with a growth duration of 159 days (Table 9.7h). Among the breeding lines IR18A1859 showed the lowest yield across the sites in CS1 and CS2 batch (Table 9.7j). The yield reduction (%) among the test breeding lines in CS1 batch compared to NS batch ranged from 33.3% (IR11894-R-R-R-R-152) to 58.6% (BR13027-BC1-3R-14), while the growth duration increased from 0 day (BR11894-R-R-R-R-72) to 10 days (BR13026-BC1-3R-10) (Table 9.7k). The yield reduction in CS2 batch compared to control ranged from 3.9-51.0% with a growth duration increment of 4-10 days. Out of 9 genotypes, one genotype (BR11894-R-R-R-R-59) sowing lodging tolerance, higher rate of seed set and 29.5% higher yield over the moderately cold tolerant BRRi dhan67 under cold stress condition was selected for further evaluation.

**Table 9.7g: Yield of the breeding lines tested under early sowing time (23-27 October) in three haor locations in Regional Yield Trial (RYT-CS1) during Boro 2023-24**

Designation	Growth duration (days)	Grain yield (t/ha)										
		Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Average
BR11894-R-R-R-R-152	157	5.2	6.2	4.1	5.2	0.3	3.9	5.5	0.5	2.4	0.7	3.4
BR11894-R-R-R-R-59	159	5.3	3.6	3.6	3.8	1.3	3.5	3.8	-	-	1.6	2.8
BR11894-R-R-R-R-72	156	5.8	5.0	4.1	5.7	0.5	2.3	3.1	0.2	2.0	0.9	3.0
BR13026-BC1-3R-10	162	4.9	3.1	4.6	5.3	-	0.4	3.2	0.3	-	0.1	2.3
BR13027-BC1-3R-14	155	5.2	4.6	4.0	5.6	-	0.2	3.3	0.1	0.4	0.3	2.4
IR18A1859	153	4.5	-	-	4.5	0.5	-	2.2	-	-	-	2.1
IR19A1473	169	5.7	3.8	4.3	4.7	-	1.9	4.7	0.2	0.7	1.1	2.8
IR19A4821	160	4.1	-	-	4.4	0.4	4.5	3.3	-	0.7	1.0	2.7
IR19A5712	158	5.3	-	4.2	5.0	-	-	1.5	0.3	-	-	2.4
BRRi dhan28	153	4.5	2.2	3.7	3.8	-	0.3	2.0	-	1.3	-	1.6
BRRi dhan67	162	4.8	3.6	4.5	4.7	0.4	0.6	2.8	-	-	-	2.2
BRRi dhan89	165	5.3	5.2	3.8	5.0	1.2	3.2	4.9	0.5	2.1	2.1	3.3
LSD (0.05)	5.0	0.74	0.92	0.76	0.65	0.33	0.80	1.20	0.43	0.49	0.33	1.30
H2B (%)	92.3	52.1	89.1	24.2	70.7	88.1	95.8	87.2	0	93.4	95.9	76.5

**Table 9.7h: Yield of the breeding lines tested under early sowing time (05 November) in three haor locations in Regional Yield Trial (RYT-CS2) during Boro 2023-24**

Designation	Growth duration (days)	Grain yield (t/ha)										
		Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Average
BR11894-R-R-R-R-152	161	5.18	4.49	4.37	3.72	5.68	6.29	5.74	4.36	6.46	2.84	4.91
BR11894-R-R-R-R-59	163	3.85	NA	3.27	4.88	4.17	6.18	6.00	2.32	5.68	5.78	4.66
BR11894-R-R-R-R-72	160	5.67	4.48	4.91	4.91	5.03	5.47	5.58	2.69	5.51	6.33	5.06

BR13026-BC1-3R-10	160	5.29	3.78	4.34	3.78	3.54	3.08	4.48	0.45	5.37	4.69	3.88
BR13027-BC1-3R-14	159	5.55	4.65	5.49	5.55	4.50	5.54	5.65	1.49	6.59	7.58	5.26
BRR1 dhan28	155	3.78	3.81	3.32	5.61	2.46	2.67	4.31	0.27	3.11	3.27	3.26
BRR1 dhan67	170	4.71	2.88	4.19	4.54	4.95	5.41	4.87	2.64	6.75	5.56	4.65
BRR1 dhan89	159	4.99	4.89	4.73	5.54	5.29	5.44	5.47	3.15	7.09	6.65	5.32
IR18A1859	162	4.52	2.82	3.60	3.47	0.58	0.66	1.92	0.79	2.57	3.08	2.40
IR19A1473	159	4.71	5.01	4.27	4.55	4.01	5.49	5.52	3.01	5.85	5.18	4.76
IR19A4821	162	4.42	4.01	3.24	5.27	4.23	3.96	2.99	1.34	5.10	5.75	4.03
IR19A5712	166	4.99	4.19	4.57	5.08	1.05	1.75	4.26	0.98	3.68	4.01	3.46
LSD (0.05)	3.19	0.61	0.76	0.69	0.74	0.57	0.47	0.61	0.88	0.92	0.94	0.784
H2B (%)	90.1	70.7	88.6	71.9	79.7	96.7	98.4	93.9	87.1	93.7	90.8	89.8

**Table 9.7i 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 2023-24**

Designation	Growth duration (days)	Grain yield (t/ha)										
		Hab1	Hab2	Hab3	Hab4	Nik1	Nik2	Nik3	Tah1	Tah2	Tah3	Average
BR11894-R-R-R-R-152	154	4.6	-	3.9	3.8	6.3	6.1	4.0	7.7	4.9	2.8	4.8
BR11894-R-R-R-R-59	153	-	5.0	4.9	4.3	5.9	-	5.7	-	-	5.9	5.7
BR11894-R-R-R-R-72	156	5.9	-	4.2	4.3	6.3	7.0	5.7	7.6	7.2	7.6	6.1
BR13026-BC1-3R-10	152	4.7	4.9	4.5	3.7	5.5	5.9	5.3	6.7	5.6	5.9	5.3
BR13027-BC1-3R-14	153	4.6	4.3	4.2	4.5	6.2	6.4	5.7	8.1	6.8	6.7	5.8
IR18A1859	149	4.4	-	4.6	3.7	5.5	5.2	5.7	6.0	4.6	5.3	4.9
IR19A1473	161	5.2	4.7	3.9	4.4	6.1	6.7	6.7	7.8	6.4	5.2	5.7
IR19A4821	153	5.1	4.4	4.5	3.7	5.8	6.2	-	6.2	6.4	5.8	5.4
IR19A5712	157	5.4	5.1	4.7	5.0	5.4	6.1	6.7	6.2	6.5	6.1	5.7
BRR1 dhan28	148	5.8	3.8	4.2	4.1	5.6	5.9	5.6	4.7	4.6	2.7	4.7
BRR1 dhan67	157	5.3	4.6	2.1	4.3	5.9	6.7	5.9	7.0	6.2	6.0	5.4
BRR1 dhan89	159	4.7	4.9	3.5	4.5	6.3	6.5	5.9	7.3	6.8	6.0	5.6
LSD (0.05)	2.5	0.71	0.49	0.86	0.69	0.29	0.22	0.69	0.57	0.53	0.47	0.71
H2B (%)	94.6	69.9	79.4	41.7	35.7	86.8	95.0	82.6	92.5	91.8	97.6	75.1

**Table 9.7j: 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 2023-24**

Designation	Growth duration (days)			Plant height (cm)			Yield (t/ha)		
	CS1	CS2	NS	CS1	CS2	NS	CS1	CS2	NS
BR11894-R-R-R-R-152	157	161	154	102	110	122	3.4	4.9	5.1
BR11894-R-R-R-R-59	159	163	153	91	100	108	2.8	4.7	5.7
BR11894-R-R-R-R-72	156	160	156	100	109	119	3.0	5.1	6.1
BR13026-BC1-3R-10	162	160	152	104	107	119	2.3	3.9	5.3
BR13027-BC1-3R-14	155	159	153	93	100	111	2.4	5.3	5.8
IR18A1859	153	155	149	77	87	95	2.1	2.4	4.9
IR19A1473	169	170	161	90	98	107	2.8	4.8	5.7
IR19A4821	160	159	153	92	94	103	2.7	4.0	5.4
IR19A5712	158	162	157	89	95	100	2.4	3.5	5.7

BRRi dhan28	153	159	148	80	97	106	1.6	3.3	4.7
BRRi dhan67	162	162	157	99	103	109	2.2	4.6	5.4
BRRi dhan89	165	166	159	94	100	106	3.3	5.3	5.6
Range (lines)	153-169	155-170	149-161	77-104	87-110	95-122	2.1-3.4	2.4-5.3	4.7-6.1
LSD(0.05)	5.5	3.2	2.5	8.6	6.4	9.4	0.9	0.8	0.7
H2B (%)	92.3	90.1	94.6	91.5	90.9	70.3	76.5	89.8	75.1

**Table 9.7k: Changes in plant height, growth duration and yield of rice under cold stress and conditions during Boro 2023-24**

Designation	Growth duration increased (days)		Plant height reduction (cm)		Yield reduction (%)	
	NS-CS1	NS-CS2	NS-CS1	NS-CS2	NS-CS1	NS-CS2
BR11894-R-R-R-R-152	3.0	7.0	20.0	12.0	33.3	3.9
BR11894-R-R-R-R-59	6.0	10.0	17.0	8.0	50.9	17.5
BR11894-R-R-R-R-72	0.0	4.0	19.0	10.0	50.8	16.4
BR13026-BC1-3R-10	10.0	8.0	15.0	12.0	56.6	26.4
BR13027-BC1-3R-14	2.0	6.0	18.0	11.0	58.6	8.6
IR18A1859	4.0	6.0	18.0	8.0	57.1	51.0
IR19A1473	8.0	9.0	17.0	9.0	50.9	15.8
IR19A4821	7.0	6.0	11.0	9.0	50.0	25.9
IR19A5712	1.0	5.0	11.0	5.0	57.9	38.6
BRRi dhan28	5.0	11.0	26.0	9.0	67.3	32.7
BRRi dhan67	5.0	5.0	10.0	6.0	59.3	14.8
BRRi dhan89	6.0	7.0	12.0	6.0	41.1	5.4
Range (Lines)	0.0 – 10.0	4 -10.0	11.0 – 20.0	5.0 – 12.0	33.3-58.6	3.9-51.0

## PROJECT 10: 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.a: Hybridization

**Principal Investigator:** Sharmistha Ghosal

**Co-Investigators:** S Maniruzzaman, M M Yasmin 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 26 genotypes were used for crossing (Table 10a.1a). Pigmented genotypes with antioxidant properties 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. 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 anthesis panicles of the male parent by dusting pollens on the emasculated panicle of the female parent.

**Results:** A total of 34 crosses were made in T Aman season. A total of 5,462 F<sub>1</sub> seeds were produced (Table 10a.1b). The naked F<sub>1</sub> seeds were threshed, labeled, cleaned, dried and preserved properly.

**Table10a.1a: Parents List for Development of Antioxidant Enriched Rice, T. Aman 2023-24**

SL No	Designation	Traits
1	China70(Acc.7170)-GRS1	High antioxidant
2	Black Rice (Acc 4968)	High antioxidant
3	BR12839-4R-106	High antioxidant and high yield
4	BR12839-4R-34-1	High antioxidant and high yield
5	BR12839-4R-157-2	High antioxidant and high yield
6	BR12838-4R-89-1*	High antioxidant, aromatic and high yield
7	BR12836-4R-312*	High antioxidant, aromatic and high yield
8	BR12839-4R-185*	High antioxidant, aromatic and high yield
9	BR12839-4R-76	High antioxidant and high yield
10	BR12839-4R-137	High antioxidant and high yield
11	BR12836-4R-18*	High antioxidant, aromatic and high yield
12	Black Rice -10 (GQN)	High antioxidant
13	Black Rice -11 (GQN)	High antioxidant
14	Ja Hua	High yield
15	BRR1 dhan103	High yield
16	BRR1 dhan89	High yield
17	BR11712-4R-218	High yield
18	BR11712-4R-227	High yield
19	BR9674-8-15-3-28-P3 (Zn)	High zinc and high yield
20	BR10571-15-6-8-5 (Zn)	High zinc and high yield
21	BRR1 43R	High yield and good architecture
22	BRR1 45R	High yield and good architecture
23	BRR1 47R	High yield and good architecture
24	Barsha dhan	High yield and good architecture
25	ACI dhan1	Aromatic and high yielding
26	BRAC dhan2	Aromatic and high yielding

DS: 07/07/2023-21/7/2023      DT: 07/08/2023-21/08/2023

**Table 10a.1b: List of crosses made for development of antioxidant enriched rice, T. Aman 2023-24**

SL No	Cross combination	Average Parental yield	No of Seeds
1	Ja Hua/BR12839-4R-106	6.0	185
2	Ja Hua/BR12839-4R-34-1	6.0	111
3	Ja Hua/BR12836-4R-312*	6.0	342
4	Ja Hua/BR12839-4R-185*	7.0	153
5	BRR1 dhan103/BR12836-4R-312*	7.0	88
6	BRR1 dhan103/BR12839-4R-106	6.0	100
7	BRR1 dhan89/Black Rice -10 (GQN)	6.3	158
8	BRR1 dhan89/Black Rice -11 (GQN)	6.5	162
9	BR11712-4R-218/BR12839-4R-185*	6.5	122
10	BR11712-4R-218/BR12836-4R-18*	6.0	286
11	BR11712-4R-218/BR12839-4R-137	6.6	125
12	Ja Hua/BR12839-4R-106	6.4	119
13	Ja Hua/BR12839-4R-34-1	6.0	249
14	Ja Hua/BR12836-4R-312*	6.0	123
15	Ja Hua/BR12839-4R-185*	6.5	150
16	BRR1 dhan103/BR12836-4R-312*	6.0	100

17	BRRI dhan103/BR12839-4R-106	6.3	158
18	BR11712-4R-227/BR12839-4R-157-2	6.0	185
19	BR11712-4R-227/BR12839-4R-34-1	6.0	111
20	BR9674-8-15-3-28-P3 (Zn)/China70(Acc.7170)-GRS1	6.0	342
21	BR9674-8-15-3-28-P3 (Zn)/Black Rice (Acc 4968)	7.0	153
22	BR9674-8-15-3-28-P3 (Zn)/BR12839-4R-185*	7.0	88
23	BR10571-15-6-8-5 (Zn)/BR12836-4R-18*	6.0	100
24	BR10571-15-6-8-5 (Zn)/BR12839-4R-137	6.3	158
25	BRRI 43R/BR12839-4R-76	6.5	162
26	BRRI 45R/BR12839-4R-34-1	6.5	122
27	BRRI 47R/BR12839-4R-34-1	6.0	286
28	Barsha dhan/BR12839-4R-34-1	6.6	125
29	ACI dhan1/BR12838-4R-89-1*	6.4	119
30	ACI dhan1/BR12839-4R-185*	6.0	249
31	BR11712-4R-227/BR12839-4R-76	6.0	123
32	Barsha dhan/ BR12839-4R-89-1	6.5	150
33	Barsha dhan/ BR12839-4R-157-2	6.0	100
34	Barsha dhan/ BR12839-4R-106	6.3	158
<b>Total</b>			<b>5462</b>

### Experiment 10a.2: Confirmation of F1s

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objective:** Confirmation of F1s as true crosses and selection of promising ones.

**Materials and methods:** A total of 31 single crosses along with their respective parents were grown. F1 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 F1 population. Crop management were done as described in Experiment 10a.1. The leaf samples were collected from each of the 12 plants from each cross and respective parents for QC genotyping to determine true F1. QC genotyping were performed using 10 SNPs QC panel at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F1s were selected. The F2 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 10a.2).

**Table 10a.2: List of confirmed F<sub>1</sub>, through QC SNP panel, Development of Antioxidant Enriched Rice, T. Aman 2023-24**

SL No	Cross combination	Objectives
1	BR1137-5R-140/ Black Rice (Acc 4968)	High yield with pigmentation
2	BR1137-5R-140 / BR12836-4R-312*	High yield with pigmentation
3	IR18A1398/ BR12839-4R-51*-	High yield with pigmentation
4	BR11712-4R-227/ Black Rice -10 (GQN)	High yield with pigmentation
5	BR11712-4R-227/ Black Rice -11 (GQN)	High yield with pigmentation
6	BR9674-1-1-5-1P3 (Zn)/ BR12836-4R-312*	High yield with pigmentation
7	BR9674-1-1-5-1P3 (Zn)/ BR12839-4R-51*-	High yield with pigmentation
8	BR9674-8-15-3-28-P3 (Zn)/ BR12839-4R-138-4	High yield with pigmentation
9	BR9674-8-15-3-28-P3 (Zn)/ BR12839-4R-73	High yield with pigmentation
10	BR9674-8-15-3-28-P3 (Zn)/ BR12835-4R-142	High yield with pigmentation
11	BR11315-5R-17-52/ BR12836-4R-312*	High yield with pigmentation
12	BRRI 45R/ BR12836-4R-18	High yield with pigmentation
13	BRRI 47R/ BR12839-4R-157-2	High yield with pigmentation
14	IR19L1046/BR12839-4R-157-2	High yield with pigmentation
15	BRRI dhan89/ BR12839-4R-157-2	High yield with pigmentation
16	BRRI dhan89/ BR12836-4R-312*	High yield with pigmentation
17	BR10571-15-6-8-5 (Zn)/ BR12839-4R-157-2	High yield with pigmentation

18	BR10571-15-6-8-5 (Zn)/ BR12836-4R-312*	High yield with pigmentation
19	BR10571-15-6-8-5 (Zn)/ BR12835-4R-142	High yield with pigmentation
20	BR 11-9-11-4-5B/ BR12836-4R-63	High yield with pigmentation
21	Purple rice/ BR12839-4R-21	High yield with pigmentation
22	BR12835-4R-142/ BR11712-4R-227	High yield with pigmentation
23	BR12835-4R-142/BR12835-4R-218	High yield with pigmentation
24	BRR1 dhan80/Black Rice-09 (GQN)	High yield with pigmentation
25	BRR1 dhan87/ Black Rice Nepal	High yield with pigmentation
26	BRR1 dhan87/ Black Rice-09 (GQN)	High yield with pigmentation
27	BRR1 dhan87/ Black Rice-08 (GQN)	High yield with pigmentation
28	BRR1 dhan87/ Black Rice-07(GQN)	High yield with pigmentation
29	BRR1 dhan80/ Black Rice-08 (GQN)	High yield with pigmentation
30	BRR1 dhan80/ Black Rice-07(GQN)	High yield with pigmentation
31	BRR1 dhan70/ Black Rice-07(GQN)	High yield with pigmentation

DS: 07/07/2023

DT: 07/08/2023

### Experiment 10a.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 six F2, twenty-three F3, eight F4 and four F5 populations were grown (Table 10a.3). 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. 10a.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 16, 081 progenies from 41 crosses (5011 progenies of six F2 crosses, 8252 progenies of twenty-three F3 crosses, 2038 progenies of eight F4 crosses and 780 progenies of four F5 crosses) were advanced through RGA (Table 10a.3). The harvested panicles were labeled, dried and preserved properly.

**Table 10.3: List of F2, F3, F4 and F5 populations advanced through RGA, Development of Antioxidant Enriched Rice, T. Aman 2023-24**

SL. No.	BR Reg.	Parentage	Progenies grown	Progenies harvested
<b>F<sub>2</sub></b>				
1	BR15336	BR9674-1-1-5-1P3/BR12839-4R-93	1100	700
2	BR15337	IR17A1694/BR12839-4R-90-1	1100	712
3	BR15339	BR12839-4R-90-1/BRR1 dhan87	1100	705
4	BR15340	BR12839-4R-93/BRR1 dhan87	1100	716
5	BR15342	BR12839-4R-157/ BRR1 dhan90	1100	1090
6	BR15347	BR12839-4R-157/ BRR1 dhan87	1100	1088
<b>Sub Total</b>			<b>6600</b>	<b>5011</b>
<b>F<sub>3</sub></b>				
1	BR14902	Pusa Basmati/Black rice (Sylhet)*	500	432
2	BR14903	FBR-376/Black rice (Sylhet)*	300	280
3	BR14904	Nania/Black rice (Sylhet)*	300	288
4	BR14905	IR99285-1-1-1-P2 (Zn)/Black rice (Sylhet)*	200	236
5	BR14906	BR11716-4R-172/Black rice (Sylhet)*	300	284
6	BR14908	BR9930-2-3-2-2 (PQR Boro)/Black rice (Sylhet)*	300	280
7	BR14910	Nania/Black Rice (Acc.8096)	500	488
8	BR14912	BR11716-4R-172/Black Rice (Acc.8096)	300	200
9	BR14913	BR11712-4R-227/Black Rice (Acc.8096)	300	152
10	BR14916	BR8862-29-1-5-1-5/ Black Rice (Acc.8096)	300	240

11	BR14919	BRRRI dhan90/ China70 (Acc.7170)	300	188
12	BR14920	BRRRI dhan92/ China70 (Acc.7170)	300	282
13	BR14921	BRRRI dhan50/China70 (Acc.7170)	300	180
14	BR14922	IRRI 154 frg1/ China70 (Acc.7170)	300	232
15	BR14923	IR99285-1-1-1- P2/China70 (Acc.7170)	300	300
16	BR14925	China70 (Acc.7170)/ BR11716-14-172	1500	900
17	BR14926	China70 (Acc.7170)/ FBR-376	300	270
18	BR14927	China70 (Acc.7170)/ BR11712-4R-227	1500	1180
19	BR14928	Black rice Sylhet/ BRRRI dhan90	300	280
20	BR14929	BR8862-29-1-5-1-3/ Black rice (Sylhet)	300	300
21	BR14930	IRRI 154 frg1/Black rice (Indonesia)	300	280
22	BR14932	BR11712-4R-227/ Black rice (Indonesia)	1000	800
23	BR14934	Begunidhan/Black rice (Sylhet)	300	180
<b>Sub Total</b>			<b>10300</b>	<b>8252</b>
<b>F<sub>4</sub></b>				
1	BR14563	BRRRI dhan90/Black rice (PKSF)	300	280
2	BR14564	BRRRI dhan99/PadiBungi	300	180
3	BR14565	BRRRI dhan100/Padichelam	300	284
4	BR14567	BRH11-9-11-45B-HR3/Black rice (Sylhet)*	500	250
5	BR14568	Ja Hua/Black rice (Sylhet)*	500	300
6	BR14571	BRRRI dhan90/ Black rice (Sylhet)*	300	284
7	BR14572	BR8882-30-2-5-2/ Black rice (Sylhet)*	300	280
8	BR14574	BRRRI dhan81/ Black rice (Sylhet)*	200	180
<b>Sub Total</b>			<b>2700</b>	<b>2038.00</b>
<b>F<sub>5</sub></b>				
1	BR13940	BRRRI dhan100/Black Rice (Japanese)	250	219
2	BR13941	Black Rice (Japanese)/BRRRI dhan100	250	218
3	BR13944	Black rice (sylhet)/BRRRI dhan70	250	109
4	BR13945	BRRRI dhan90/Black rice(aroma)	250	234
<b>Sub Total</b>			<b>1000.00</b>	<b>780</b>
<b>Grand Total</b>			<b>20,600</b>	<b>16,081</b>

DS: 01/07/2023

#### Experiment 10.4: 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 291 fixed pigmented advanced lines from four 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. 10a.1. Crop management was done as recommended for modern rice cultivation practices.

**Results and discussion:** In T Aman, 44 fixed lines from 291 fixed lines were selected from 04 crosses of LST (Table 10a.4) based on phenotypic acceptance, uniformity in flowering, plant height, grain size and shape, lodging tolerance and pigmentation and presence higher predicted yield.

**Table 10a.4: List of LST grown, Antioxidant Enriched Rice, T. Aman 2023-24**

SN	BR No.	Parentage	Lines grown	Lines harvested
1	BR13751	Purple rice (cum)/Black rice	123	18
2	BR13753	Purple rice (kochoa)/Black rice	20	3
3	BR13754	BRRRI dhan87/ Black rice	42	12
4	BR13755	BRRRI dhan87/Black rice(nepal)	106	11
<b>Total</b>			<b>291</b>	<b>44</b>

DS: 10/07/2023

DT: 12/08/2023

**Experiment 10a.5: Observational Yield Trial #1 (OYT#1), Development of Antioxidant Enriched Rice, T. Aman 2023-24**

**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 32 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 18a.1. Crop management was done as and when necessary.

**Results and discussion:** A total of 10 genotypes were selected out of 32 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 4.96 to 5.66 t/ha with a growth duration of 118 to 134 days. The highest yielding genotype, BR12839-4R-138-2 gives 5.66 t/ha yields with duration of 125 days followed by the genotype BR12839-4R-193 having a yield of 5.59 t/ha (Table 10a.5). The heritability obtained for the plant height, growth duration and yield were 98%, 59% and 99%, respectively, indicating high level of precision in this experiment (Table 10a.5).

**Table 10a.5: Performance of the genotypes of Observational Yield Trial#1, Development of Antioxidant Enriched Rice, T Aman 2023-24**

Entry	Designation	GD_days	PH (cm)	TN	Yld (t/ha)
1	BR12839-4R-125-4ah	123	127	8	4.38
2	BR12838-4R-126-1a	122	123	12	4.25
3	<b>BR12839-4R-103a</b>	134	119	12	5.40
4	BR12839-4R-90-2	123	135	10	4.81
5	<b>BR12839-4R-92-1</b>	118	123	11	4.96
6	<b>BR12839-4R-79</b>	119	126	8	4.96
7	<b>BR12839-4R-95-1</b>	124	130	10	5.04
8	<b>BR12837-5R-15</b>	121	118	14	5.42
9	BR12837-5R-27	125	124	10	4.71
10	BR12837-5R-31	128	125	11	3.68
11	BR12837-5R-35	124	130	7	3.37
12	<b>BR12837-5R-37</b>	122	133	8	5.28
13	BR12837-5R-37	123	128	10	4.41
14	BR12837-5R-40	126	128	12	4.55
15	BR12837-5R-41	119	129	12	4.05
16	BR12837-5R-43	126	113	11	2.89
17	BR12837-5R-55	126	120	12	4.52
18	<b>BR12837-5R-62</b>	120	122	7	5.45
19	<b>BR12839-4R-138-2</b>	125	125	10	5.66
20	BR12839-4R-138-1	124	131	11	3.72
21	BR12839-4R-152	125	125	9	4.02
22	BR12839-4R-153-1	124	123	10	3.33
23	BR12839-4R-160	123	125	11	4.64
24	BR12839-4R-176	124	115	10	<b>4.15</b>
25	BR12839-4R-181	122	120	9	4.00
26	<b>BR12839-4R-193</b>	128	123	9	5.59
27	BR12839-4R-117-1*	124	135	9	3.19
28	<b>BR12839-4R-117-2*</b>	122	116	8	5.26
29	BR12839-4R-141-1*	120	119	8	2.70
30	BR12836-4R-152*	128	124	11	2.84

31	BR12839-4R-117*	124	111	11	4.08
32	BR12820-4R-42*	124	135	7	<b>3.85</b>
33	BRR1 dhan49 (Ck)	134	141	8	3.83
34	BRR1 dhan87 (Ck)	126	139	10	5.12
	P value	**	**	NS	*
	LSD (0.05)	1.51	10.90		0.27
	H2 (%)	98	59	84	99

DS: 15/07/2023

DT: 05/08/2023

### Experiment 10a.6: Observational Yield Trial # 2 (OYT#2), Development of Antioxidant Enriched Rice, T Aman 2023-24

**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 10a.1. Crop management was done as and when necessary.

**Results and discussion:** A total of seven genotypes were selected out of 34 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 4.9 to 5.02 t/ha with a growth duration of 120 to 126 days. The highest yielding genotype was BR13316-5R-2 (5.02 t/ha) with duration of 120 days followed by the genotype BR12833-5R-9-1 giving 4.79 t/ha yield (Table 10a.6). The heritability obtained for the plant height, growth duration and yield were 92%, 87% and 96%, respectively, indicating high level of precision in this experiment (Table 10a.6).

**Table 10a.6: Performance of the selected genotypes of Observational Yield Trial#2 (OYT#2) Development of Antioxidant Enriched Rice, T Aman 2023-24**

Entry.No.	Designation	GD_days	PH (cm)	TN	Yld (t/ha)
1	BR12837-5R-65	114	127	7	4.04
2	BR12837-5R-95	117	110	9	3.16
3	BR12837-5R-89	117	123	7	4.15
4	BR12837-5R-92-1	125	125	9	4.48
5	<b>BR12837-5R-92-2</b>	124	110	9	4.59
6	BR12833-5R-5	119	114	9	4.09
7	<b>BR12833-5R-9-1(white)</b>	125	133	9	4.79
8	BR12833-5R-9-2(white)	126	125	9	2.71
9	BR12833-5R-10-1(white)	127	126	10	4.31
10	BR12833-5R-10-2(white)	125	125	8	2.34
11	BR12833-5R-10-3(white)	124	143	10	3.42
12	BR12833-5R-16	120	128	7	4.34
13	BR12833-5R-17 (white)	117	127	12	4.10
14	BR12833-5R-18 (white)	125	124	8	3.64
15	BR12834-5R-3	124	119	9	2.13
16	BR12835-5R-3	124	122	7	2.71
17	<b>BR13316-5R-1</b>	121	126	8	4.52
18	<b>BR13316-5R-2</b>	120	135	8	5.02
19	<b>BR13316-5R-2-1</b>	124	129	9	4.63
20	BR13316-5R-3	124	128	9	4.10
21	BR13316-5R-3-1	122	128	8	3.33

22	BR13316-5R-5	124	128	8	4.17
23	BR13316-5R-5-1	127	136	10	3.99
24	<b>BR12839-4R-175</b>	123	138	8	4.49
25	BR12836-4R-35	125	116	10	4.10
26	<b>BR12836-4R-110-1</b>	128	127	9	4.58
27	BR12836-4R-110-2	117	134	8	3.26
28	BR12836-4R-194-2	124	138	10	2.80
29	BR12836-4R-149-3	113	129	9	3.49
30	BR12836-4R-250-1	118	127	8	4.08
31	BR12836-4R-250-2	125	132	8	2.49
32	BR12836-4R-310	127	132	9	3.90
33	BR12838-4R-95	124	135	7	4.30
34	BR12839-4R-149-1	125	128	10	3.83
35	BRR1 dhan49 (Ck)	132	128	9	4.23
36	BRR1 dhan87 (Ck)	126	134	10	4.90
	P value	*	NS	NS	*
	LSD (0.05)	3.50			0.40
	H2 (%)	92	87	81	96

DS: 15/07/2023

DT: 05/08/2023

### Experiment 10a.7: Advanced Yield Trial # 1 (AYT#1\_Aromatic), Development of Antioxidant Enriched Rice, T Aman 2023-24

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objective:** Advanced evaluation of aromatic black rice genotypes for higher yield potentials with intense black pigmentation.

**Materials and Methods:** A total of 13 advanced black rice genotypes with along with two 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 10a.1. Crop management was done as and when necessary.

**Results and discussion:** Nine genotypes were selected out of thirteen genotypes. The genotype BR12839-4R-124-2-P1a\_Bold produced highest yield of 4.82 t/ha with a duration of 125 days followed by the genotype BR12839-4R-124-2-P1a\_49 type giving a yield of 4.11 t/ha yield with 124 days growth duration (Table 10a.7). The yield range of all-other selected genotypes was 4.16 to 4.82 t/ha. The heritability obtained for the plant height, growth duration and yield were 85%, 98% and 74%, respectively, indicating high level of precision in this experiment (Table 10a.7).

**Table 10a.7: Advanced Yield Trial #1 (AYT#1\_Aromatic), Development of Antioxidant Enriched Rice, T Aman, 2023-24**

SL	Designation	PH	TN	GD	Yield (t/ha)
1	<b>BR12839-4R-124-2-P1a_Bold</b>	119	8	125	4.82
2	<b>BR12839-4R-124-2-P1a_49 type</b>	125	10	124	4.11
3	<b>BR12839-4R-124-3a</b>	121	8	123	3.81
4	<b>BR12836-4R-362a</b>	115	9	126	4.37
5	BR12838-4R-46a	122	9	124	2.7
6	BR12838-4R-5a	121	9	128	2.63
7	BR12836-4R-32a	124	11	125	3.05
8	<b>BR12839-4R-8a</b>	121	9	120	3.84
9	BR12836-4R-18a	123	8	127	3.27
10	<b>BR12839-4R-185a</b>	121	8	124	4.27
11	<b>BR12839-4R-185-2a</b>	125	9	124	4.62
12	<b>BR12838-4R-57-1a</b>	133	10	118	3.9
13	<b>BR12835-4R-142a</b>	127	9	120	4.28
14	BRR1 dhan70 (Ck)	141	10	127	3.09

15	BRRi dhan80 (Ck)	134	9	128	4.16
	<b>P value</b>	<b>***</b>	<b>*</b>	<b>****</b>	<b>**</b>
	<b>H2 (%)</b>	<b>85</b>	<b>58</b>	<b>98</b>	<b>74</b>
	<b>LSD</b>	<b>7.27</b>	<b>1.65</b>	<b>1.08</b>	<b>0.96</b>

DS: 15/07/2023

DT: 01/08/2023

### Experiment 10a.8: Advanced Yield Trial #2 (AYT#2\_Medium duration), Development of Antioxidant Enriched Rice, T Aman, 2023-24

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objective:** Advanced evaluation of non-aromatic black rice genotypes with higher antioxidant (C3G) content and higher yield potentials.

**Materials and Methods:** A total of 13 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 10a.1. Crop management was done as and when necessary.

**Results and discussion:** A total of six genotypes were selected out of 13 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, antioxidant (C3G) content and higher yield. The genotypes BR12837-5R-57 gave highest yield of 4.34 t/ha followed by the genotype BR12839-4R-1 having 4.38 t/ha yield. The growth duration of these two genotypes were 124 days and 121 days respectively. The antioxidant content of these two genotypes were also highest which were 479mg/kg and 459mg/kg, respectively (Table 10a.8). The heritability obtained for the plant height, growth duration and yield were 75%, 98% and 37%, respectively, indicating medium to high level of precision in this experiment (Table 10a.8).

**Table 10a.8: Performance of the selected genotypes of Advanced Yield Trial#2, Development of Antioxidant Enriched Rice, T Aman 2023-24**

SL	Designation	PH	TN	GD	Yield (t/ha)
1	<b>BR12837-5R-57</b>	124	9	140	2.39
2	BR12837-5R-66-2	124	10	133	2.16
3	BR12839-4R-95-1	121	9	130	1.82
4	BR12839-4R-86-1	127	9	129	2.08
5	<b>BR12839-4R-1</b>	121	8	128	2.93
6	BR12839-4R-157-2	131	10	132	1.85
7	<b>BR12839-4R-5-2</b>	122	10	133	2.32
8	BR12839-4R-93	122	10	128	2.10
9	BR12839-4R-47-1	122	9	130	2.38
10	BR12839-4R-138-4	126	9	132	2.30
11	<b>BR12839-4R-78-1</b>	129	9	133	2.69
12	<b>BR12839-4R-21</b>	129	8	131	2.64
13	<b>BR12839-4R-73</b>	119	9	121	2.35
14	BRRi dhan49	137	9	134	2.93
15	BRRi dhan87	142	9	135	3.46
	<b>P value</b>	<b>**</b>	<b>NS</b>	<b>****</b>	<b>NS</b>
	<b>H2(%)</b>	<b>75</b>	<b>0</b>	<b>98</b>	<b>37</b>
	<b>LSD</b>	<b>8.78</b>	<b>2.02</b>	<b>1.51</b>	<b>0.96</b>

DS: 10/07/2023

DT: 01/08/2023

### Experiment 10a.9: Regional Yield Trial (RYT#1\_Aromatic), Development of Antioxidant Enriched Rice, T Aman 2023-24

**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:** Five breeding lines and two check varieties were evaluated in RCB design with three replications (Table 10a.9). 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. 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<sub>4</sub>/ha. Urea was applied in three splits at 15, 30 and 45 days after transplanting (before PI stage). Total amount of P, K, Gypsum and ZnSO<sub>4</sub> were applied at final land preparation. Weeding, pest control measures and other cultural practices were done as and when necessary.

**Results and discussion:** Three genotypes were selected out of five genotypes based on higher yield and higher antioxidant (C3G) content. The genotype BR12836-4R-312 gave highest average yield of 4.12 t/ha with a duration of 123 days followed by the genotype BR12839-4R-124-2 which produced 4.11 t/ha yield. Both of the selected genotypes have higher C3G content i.e., 268 and 209 mg/kg respectively. (Table 10a.9). The all-other selected genotypes possessed aroma. The heritability obtained for the yield was ranged from 79%, to 99% indicating high level of precision in this experiment (Table 10a.9).

**Table 10a.9: Performance of the selected genotypes of Regional Yield Trial (RYT#1\_Aromatic), Development of Antioxidant Enriched Rice, T Aman 2023-24**

Designation	GD (Days)	PH (cm)	Yld_G az	Yld_C umi	Yld._S iraj	Yld._B ari	Yld._ Raj	Yld._R ang	Yld._ Kush	Yld_ Ave
BR12836-4R-63	132	121	5.52	4.28	3.0	2.47	3.71	3.98	3.45	3.78
BR12836-4R-312	123	114	5.51	4.75	3.3	2.74	3.77	4.40	4.36	4.12
BR12839-4R-124-2	124	117	5.66	5.35	4.1	2.67	3.44	3.90	3.72	4.11
BR12839-4R-51	123	113	5.10	5.13	3.9	2.52	3.37	4.16	4.42	4.09
BR12838-4R-89-1	125	117	5.08	5.17	1.9	2.75	3.46	3.90	3.93	3.74
BRR1 dhan34 (Ck)	144	138	3.83	4.26	2.0	2.87	1.29	2.52	2.73	2.79
BRR1 dhan70 (Ck)	128	135	4.37	4.61	2.5	3.41	4.46	4.00	4.55	3.98
<b>P Value</b>	***	***	***	**	***	**	***	***	***	***
<b>H<sup>2</sup> (%)</b>	<b>99</b>	<b>98</b>	<b>94</b>	<b>79</b>	<b>93</b>	<b>86</b>	<b>97</b>	<b>92</b>	92	98
<b>LSD</b>	1.9	1.31	0.47	0.55	0.65	0.32	0.48	0.47	0.52	0.18

**Experiment 10a.10: Regional Yield Trial (RYT#2\_Non-Aromatic), Development of Antioxidant Enriched Rice, T Aman 2023-24**

**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:** Seven breeding lines and two check variety were evaluated in RCB design with three replications (Table 10a.10). 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 the recommended dose according to agro-ecological zone. In general, the dose was 260 kg Urea, 100 TSP, 120 MP, 110 Gypsum, 11 kg ZnSO<sub>4</sub>/ha. Urea was applied in three splits at 15, 30 and 45 days after transplanting (before PI stage). Total amount of P, K, Gypsum and ZnSO<sub>4</sub> were applied at final land preparation. Weeding, pest control measures and other cultural practices were done as and when necessary.

**Results and discussion:** Three genotypes were selected out of seven genotypes based on higher yield and higher antioxidant (C3G) content. The selected genotype BR12839-4R-106

gave the highest average yield of 4.76 t/ha with a duration of 131 days having the highest antioxidant content which was 244 mg/kg (Table 10a.10).

**Table 10a.10: Regional Yield Trial (RYT#2\_Non-Aromatic), Development of Antioxidant Enriched Rice, T Aman 2023-24**

Designation	GD (Days)	PH (cm)	Grain yield (t/ha)							
			Gaz	Cumi	Siraj	Raj	Rang	Kush	Bari	Avg.
BR12839-4R-106	131	127	5.46	6.33	4.31	4.53	5.23	4.36	3.11	4.76
BR12839-4R-34-1	127	118	3.69	5.96	4.75	4.33	3.73	4.22	3.40	4.30
BR12839-4R-76	120	115	5.71	5.10	4.04	4.10	3.82	3.57	3.05	4.20
BR12839-4R-137	122	118	3.42	6.14	4.05	5.61	3.85	5.47	4.10	4.66
BR12839-4R-86-1	126	124	3.73	5.47	3.63	3.87	3.55	4.32	3.17	3.96
BR12839-4R-90-1	128	121	5.53	4.56	3.48	3.80	4.36	5.52	3.76	4.45
BR12839-4R-72	113	104	3.19	5.08	2.38	3.56	3.32	2.77		3.38
BRR1 dhan87	124	130	4.36	5.76	5.29	5.69	5.01	5.75	4.07	5.14
BRR1 dhan49	130	115	4.18	5.64	5.28	5.23	5.45	5.22	3.96	4.99
P Value	***	***	*	***	***	***	***	***	***	***
H2(%)	96	98	50	88	91	98	95	92	95	98
LSD	3.20	3.17	0.73	0.54	0.77	0.29	0.49	0.77	0.27	0.19

### Experiment 10b.1: Hybridization

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin 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 17 genotypes were used for crossing (Table 10b.1.1). 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 260 kg Urea, 100 kg TSP, 120 kg MP, 110 kg Gypsum, 11 kg ZnSO<sub>4</sub>/ha in Boro season 2023-24. 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 Boro 2023-24 season. A total of 429 F1 seeds were produced (Table 10b.1.2). The naked F1 seeds were threshed, labeled, cleaned, dried and preserved properly.

**Table 10b.1.1: List of parents grown for hybridization, development of antioxidant-enriched rice, boro 2023-24**

Serial No	Parent (Designation)	P. BLUP for grain yield (t/ha)
1	Black Rice-10 (GQN)	7.40
2	Black Rice-11 (GQN)	7.15
3	BR11318-5R-63	7.00
4	BR11318-5R-84	6.85

5	BR11607-4R-72	6.75
6	BR12520-5R-67	6.75
7	BR12838-4R-89-1a	6.65
8	BR12839-4R-106	6.65
9	BR12839-4R-137	6.60
10	BR12839-4R-157-2	6.50
11	BR12839-4R-34-1	6.45
12	BR12839-4R-5-2	6.25
13	BRR1 43R	6.25
14	BRR1 45R	6.25
15	BRR1 dhan102	6.25
16	BRR1 dhan108	6.25
17	BRR1 dhan89	6.20

**Table 10b.1.2: List of crosses made, development of anti-oxidant enriched rice, Boro 2023-24**

SL No.	Cross Combinations	No of F1's seed
1	BRR1 dhan89/BR12839-4R-106	5
2	BRR1 dhan108/BR12839-4R-106	15
3	BRR1 dhan102/BR12839-4R-106	35
4	BRR1 dhan89/BR12839-4R-34-1	7
5	BRR1 dhan108/BR12839-4R-34-1	0
6	BRR1 dhan89/BR12839-4R-157-2	15
7	BRR1 dhan108/BR12839-4R-5-2	12
8	BRR1 43R/BR12839-4R-106	20
9	BRR1 45R/BR12839-4R-106	7
10	BRR1 43R/BR12839-4R-106	7
11	BR11607-4R-72/BR12839-4R-106	0
12	BR11318-5R-63/BR12839-4R-106	15
13	BRR1 dhan102/BR12839-4R-34-1	40
14	BR11318-5R-84/BR12839-4R-34-1	0
15	BR12520-5R-67/BR12839-4R-34-1	6
16	BRR1 dhan89/BR12839-4R-5-2	7
17	BRR1 dhan108/BR12839-4R-5-2	0
18	BRR1 dhan89/BR12838-4R-89-1a	15
19	BRR1 dhan108/BR12838-4R-89-1a	25
20	BRR1 dhan102/BR12839-4R-5-2	50
21	BR11318-5R-84/BR12839-4R-5-2	7
22	BR12520-5R-67/BR12839-4R-5-2	0
23	BRR1 dhan89/BR12839-4R-137	12
24	BRR1 43R/BR12839-4R-34-1	25
25	BRR1 45R/BR12839-4R-34-1	0
26	BRR1 43R/BR12839-4R-34-1	0
27	BR11607-4R-72/BR12839-4R-34-1	0
28	BR11318-5R-63/BR12839-4R-34-1	25
29	BRR1 dhan102/BR12839-4R-5-2	0
30	BRR1 dhan102/BR12838-4R-89-1a	30
31	BR11318-5R-84/BR12839-4R-5-2	7
32	BR12520-5R-67/BR12839-4R-5-2	0
33	BR11318-5R-84/BR12839-4R-5-2	20
34	BR12520-5R-67/BR12838-4R-89-1a	0
35	BRR1 dhan89/Black Rice-10 (GQN)	20
36	BRR1 dhan108/Black Rice-10 (GQN)	0
37	BRR1 dhan89/Black Rice-11 (GQN)	2
38	BRR1 dhan108/Black Rice-11 (GQN)	0
		429

DS: 15/12/2023

DT: 10/01/2024

DS: 19/12/2023-06/01/2024

DT: 19/01/2024-05/02/2024

## Experiment 10b.2: Confirmation of F1s

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Confirmation of F1s as true crosses and selection of promising ones.

**Materials and methods:** A total of 38 single crosses along with their respective parents were grown in Boro 2023-24 season. F<sub>1</sub> 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<sub>1</sub> population. Crop management were done as described in Experiment 1. The leaf samples were collected from each of the 10 plants from each cross and respective parents for QC genotyping to determine true F<sub>1</sub>. 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<sub>1</sub>s were selected. The F<sub>2</sub> seeds obtained from each cross were labeled, cleaned, dried and preserved properly.

**Results:** Among the 38 single crosses, a total of 28 crosses were confirmed and selected as true hybrids (Table 10b.2).

**Table 10b.2: List of confirmed and selected F1s as true hybrids, Development of Antioxidant Enriched Rice, Boro 2023-24**

SL No.	Cross combination	No of F1 Seed were grown	Progenies to be grown
1	Ja Hua/BR12839-4R-106	185	1050
2	Ja Hua/BR12839-4R-34-1	111	1050
3	Ja Hua/BR12836-4R-312*	342	1050
4	Ja Hua/BR12839-4R-185*	153	1050
5	BRR1 dhan103/BR12836-4R-312*	88	1050
6	BRR1 dhan103/BR12839-4R-106	100	1050
7	BRR1 dhan89/Black Rice -10 (GQN)	158	1050
8	BRR1 dhan89/Black Rice -11 (GQN)	162	1050
9	BR11712-4R-218/BR12839-4R-185*	122	1050
10	BR11712-4R-218/BR12836-4R-18*	286	1050
11	BR11712-4R-218/BR12839-4R-137	125	1050
12	BR11712-4R-227/BR12839-4R-157-2	185	1050
13	BR11712-4R-227/BR12839-4R-34-1	111	1050
14	BR9674-8-15-3-28-P3 (Zn)/China70(Acc.7170)-GRS1	342	1050
15	BR9674-8-15-3-28-P3 (Zn)/Black Rice (Acc 4968)	153	1050
16	BR9674-8-15-3-28-P3 (Zn)/BR12839-4R-185*	88	1050
17	BR10571-15-6-8-5 (Zn)/BR12836-4R-18*	100	1050
18	BR10571-15-6-8-5 (Zn)/BR12839-4R-137	158	1050
19	BRR1 43R/BR12839-4R-76	162	1050
20	BRR1 45R/BR12839-4R-34-1	122	1050
21	BRR1 47R/BR12839-4R-34-1	286	1050
22	Barsha dhan/BR12839-4R-34-1	125	1050
23	ACI dhan1/BR12838-4R-89-1*	119	1050
24	ACI dhan1/BR12839-4R-185*	249	1050
25	BR11712-4R-227/BR12839-4R-76	123	1050
26	Barsha dhan/ BR12839-4R-89-1	150	1050
27	Barsha dhan/ BR12839-4R-157-2	100	1050
28	Barsha dhan/ BR12839-4R-106	158	1050

**DS: 06/01/2024**

**DT: 05/02/2024**

### Experiment 10b.3: Rapid Generation Advance (RGA)

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin 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 Boro 2023-24 season, 23 F<sub>2</sub>, six F<sub>3</sub>, 23 F<sub>4</sub> and eight F<sub>5</sub> populations were grown (Table 10b.3). Single seed of each progeny 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. 10b.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 Boro 2023-24 season, panicles of 39,335 progenies from 60 crosses (23,872 progenies of 23 F<sub>2</sub> crosses, 5,011 progenies of six F<sub>3</sub> crosses, 8,252 progenies of 23 F<sub>4</sub> crosses and 2,200 progenies of eight F<sub>5</sub> crosses) were advanced through RGA (Table 10.3a and b). Among the advanced 39,335 progenies, panicles of 28,661 progenies from 60 crosses (18122 progenies of twenty-three F<sub>2</sub> crosses, 2720 progenies of six F<sub>3</sub> crosses, 6235 progenies of 23 F<sub>4</sub> crosses and 1584 progenies of eight F<sub>5</sub> crosses) were harvested for next generation (Table 10b.3.1 and 10b.3.2). The harvested panicles were labeled, dried and preserved properly.

**Table 10b.3.1:** RGA Summary, Antioxidant enriched rice, Boro 2023-24

Generation	No. of crosses	Progenies grown	Progenies harvested
F <sub>2</sub>	23	23872	18122
F <sub>3</sub>	6	5011	2720
F <sub>4</sub>	23	8252	6235
F <sub>5</sub>	8	2,200	1584
<b>Total</b>	<b>60</b>	<b>39335</b>	<b>28661</b>

**Table 10b.3.2:** List of F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub>, and F<sub>5</sub> populations advanced through RGA, Development of Antioxidant Enriched Rice, Boro 2023-24

SL	BR Reg. No	Parentage	No. of progenies	
			Grown	Harvested
<b>Boro 2023-24</b>				
<b>F<sub>2</sub> Population</b>				
1	BR15730	BR1137-5R-140/ Black Rice (Acc 4968)	1338	1088
2	BR15731	BR1137-5R-140 / BR12836-4R-312*	1134	884
3	BR15732	IR18A1398/ BR12839-4R-51*-	1066	816
4	BR15733	BR11712-4R-227/ Black Rice -10 (GQN)	998	748
5	BR15734	BR11712-4R-227/ Black Rice -11 (GQN)	726	476
6	BR15735	BR9674-1-1-5-1P3 (Zn)/ BR12836-4R-312*	1134	884
7	BR15736	BR9674-1-1-5-1P3 (Zn)/ BR12839-4R-51*-	1202	952
8	BR15737	BR9674-8-15-3-28-P3 (Zn)/ BR12839-4R-138-4	998	748
9	BR15738	BR9674-8-15-3-28-P3 (Zn)/ BR12839-4R-73	930	680
10	BR15739	BR9674-8-15-3-28-P3 (Zn)/ BR12835-4R-142	1066	816
11	BR15740	BR11315-5R-17-52/ BR12836-4R-312*	1066	816
12	BR15741	BRR1 45R/ BR12836-4R-18	998	748
13	BR15742	BRR1 47R/ BR12839-4R-157-2	998	748
14	BR15743	IR19L1046/BR12839-4R-157-2	998	748
15	BR15744	BRR1 dhan89/ BR12839-4R-157-2	930	680

SL	BR Reg. No	Parentage	No. of progenies	
			Grown	Harvested
16	BR15745	BRRRI dhan89/ BR12836-4R-312*	964	714
17	BR15746	BR10571-15-6-8-5 (Zn)/ BR12839-4R-157-2	998	748
18	BR15747	BR10571-15-6-8-5 (Zn)/ BR12836-4R-312*	1066	816
19	BR15748	BR10571-15-6-8-5 (Zn)/ BR12835-4R-142	1066	816
20	BR15749	BR 11-9-11-4-5B/ BR12836-4R-63	1134	884
21	BR15750	Purple rice/ BR12839-4R-21	1066	816
22	BR15751	BR12835-4R-142/ BR11712-4R-227	998	748
23	BR15752	BR12835-4R-142/BR12835-4R-218	998	748
<b>Total</b>			<b>23872</b>	<b>18122</b>
<b>F<sub>3</sub> Population</b>				
1	BR15336	BR9674-1-1-5-1P3/BR12839-4R-93	700	476
2	BR15337	IR17A1694/BR12839-4R-90-1	712	476
3	BR15339	BR12839-4R-90-1/BRRRI dhan87	705	306
4	BR15340	BR12839-4R-93/BRRRI dhan87	716	442
5	BR15342	BR12839-4R-157/ BRRRI dhan90	1090	442
6	BR15347	BR12839-4R-157/ BRRRI dhan87	1088	578
<b>Total</b>			<b>5011</b>	<b>2720</b>
<b>F<sub>4</sub> generation</b>				
1	BR14902	Pusa Basmati/Black rice (Sylhet)*	432	408
2	BR14903	FBR-376/Black rice (Sylhet)*	280	102
3	BR14904	Nania/Black rice (Sylhet)*	288	272
4	BR14905	IR99285-1-1-1-P2 (Zn)/Black rice (Sylhet)*	236	170
5	BR14906	BR11716-4R-172/Black rice (Sylhet)*	284	170
6	BR14908	BR9930-2-3-2-2 (PQR Boro)/Black rice (Sylhet)*	280	340
7	BR14910	Nania/Black Rice (Acc.8096)	488	374
8	BR14912	BR11716-4R-172/Black Rice (Acc.8096)	200	170
9	BR14913	BR11712-4R-227/Black Rice (Acc.8096)	152	102
10	BR14916	BR8862-29-1-5-1-5/ Black Rice (Acc.8096)	240	136
11	BR14919	BRRRI dhan90/ China70 (Acc.7170)	188	136
12	BR14920	BRRRI dhan92/ China70 (Acc.7170)	282	170
13	BR14921	BRRRI dhan50/China70 (Acc.7170)	180	102
14	BR14922	IRRI 154 frg1/ China70 (Acc.7170)	232	149
15	BR14923	IR99285-1-1-1- P2/China70 (Acc.7170)	300	238
16	BR14925	China70 (Acc.7170)/ BR11716-14-172	900	714
17	BR14926	China70 (Acc.7170)/ FBR-376	270	204
18	BR14927	China70 (Acc.7170)/ BR11712-4R-227	1180	782
19	BR14928	Black rice Sylhet/ BRRRI dhan90	280	306
20	BR14929	BR8862-29-1-5-1-3/ Black rice (Sylhet)	300	408
21	BR14930	IRRI 154 frg1/Black rice (Indonesia)	280	340
22	BR14932	BR11712-4R-227/ Black rice (Indonesia)	800	306
23	BR14934	Begunidhan/Black rice (Sylhet)	180	136
<b>Total</b>			<b>8252</b>	<b>6235</b>
<b>F<sub>5</sub> generation</b>				
1	BR14563	BRRRI dhan90/Black rice (PKSF)	300	
2	BR14564	BRRRI dhan99/PadiBungi	300	250
3	BR14565	BRRRI dhan100/Padichelam	300	216
4	BR14567	BRH11-9-11-45B-HR3/Black rice (Sylhet)*	500	310
5	BR14568	Ja Hua/Black rice (Sylhet)*	500	310
6	BR14571	BRRRI dhan90/ Black rice (Sylhet)*	200	178
7	BR14572	BR8882-30-2-5-2/ Black rice (Sylhet)*	200	164
8	BR14574	BRRRI dhan81/ Black rice (Sylhet)*	200	156
<b>Total</b>			<b>2,200</b>	<b>1584</b>
<b>Grand total</b>			<b>39335</b>	<b>28661</b>

DS: 17/12/2024

#### Experiment 10b.4: Line Stage Testing (LST)

Principal Investigator: S Maniruzzaman

Co-Investigators: Anisar Rahman, M M Yasmin 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 the Boro 2023-24 season, 1350 fixed lines from nine 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. 10b.1. Crop management was done as recommended for modern rice cultivation practices.

**Results and discussion:** In Boro 2023-24 season, 153 fixed lines from 1350 fixed lines were selected from 9 crosses of LST (Table 10b.4) based on phenotypic acceptance, uniformity in flowering, plant height, grain size and shape, lodging tolerance and pigmentation and presence higher predicted yield.

**Table 10b.4:** List of superior fixed lines selected from LST populations, Antioxidant enriched rice, Boro, 2023-24

SN	BR No.	Parentage	No. of genetically fixed lines	
			Grown	Selected
1	BR13751	Aftab-5/Purple rice (Cum)	160	18
2	BR13753	Purple rice (Cum)/Aftab-5	160	4
3	BR13754	Purple rice (Cum)/BR8536-2-1-1-3	170	12
4	BR13755	Purple rice (Kochoa)/JessoBalam	180	11
5	BR13940	Purple rice (Sylhet)/BR8536-27-2-1-2	185	50
6	BR13941	BRRi dhan81/Black rice (GRS-1)	170	37
7	BR13944	Black rice (Nepal)/BRRi dhan81	140	10
8	BR13945	Black rice (Nepal)/BRRi dhan28	100	9
9	BR12837	BRRi dhan81/Black rice (Nepal)	180	1
10	BR12839			1
<b>Total</b>			<b>1,682</b>	<b>153</b>

DS: 20/12/2023

DT: 31/01/2024

**Experiment 10b.5: Observational Yield Trial #1 (OYT#1), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin 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 45 genetically fixed black rice genotypes along with three checks were evaluated in Augmented RCB design with two blocks. Thirty days old seedlings were transplanted at 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 10b.1. Crop management was done as and when necessary.

**Results and discussion:** A total of 23 genotypes were selected out of 45 genotypes based on homogeneity in the flowering, phenotypic acceptance (PAcp), agronomic traits, grain quality, presence/absence of aroma, black pigmentation, and higher grain yield potential. The yield ranged from 2.04 to 6.33 t/ha with a growth duration of 135 to 164 days. The highest yield was found in BR13751-5R-50 which gave 6.33 t/ha yields with 135 days growth durations followed by the genotype BR13754-5R-21 having a grain yield of 6.26 t/ha (Table 10b.5). The heritability obtained for the plant height, growth duration and yield were 95%, 91% and 92%, respectively, indicating high level of precision in this experiment (Table 10b.5).

**Table 10b.5: Performance of the top 45 selected genotypes of Observational Yield Trial (OYT#1), Development of Antioxidant Enriched Rice, Boro 2023-24**

SL.No.	Designation	Growth duration (days)	Days to flowering (50%)	Plant height (cm)	Effective Tiller	Grain yield (t/ha)
1	BR13751-5R-1	164	134	115	13	2.04
2	BR13751-5R-2	154	124	119	12	4.72
3	BR13751-5R-4	137	107	123	12	0.40
4	BR13751-5R-7	141	111	115	11	0.40
5	BR13751-5R-15	150	120	130	14	2.10
6	BR13751-5R-16	148	118	119	17	2.47
7	BR13751-5R-27	143	113	124	9	3.59
8	BR13751-5R-32	145	115	115	12	5.75
9	BR13751-5R-50	135	105	129	15	6.33
10	BR13751-5R-52	160	130	119	11	2.95
11	BR13751-5R-61	148	118	121	11	2.16
12	BR13751-5R-66	144	114	122	8	5.71
13	BR13751-5R-75	147	117	133	12	4.79
14	BR13751-5R-76	146	116	115	10	4.54
15	BR13751-5R-77	146	116	124	12	6.05
16	BR13751-5R-93	137	107	115	14	4.09
17	BR13751-5R-94	143	113	124	11	5.39
18	BR13751-5R-103	148	118	121	7	4.45
19	BR13753-5R-3	155	125	122	10	5.61
20	BR13753-5R-6	144	114	124	13	3.75
21	BR13753-5R-13	148	118	118	12	3.94
22	BR13754-5R-3	154	124	124	14	5.12
23	BR13754-5R-3-1	145	115	125	10	2.24
24	BR13754-5R-5	150	120	130	14	4.9
25	BR13754-5R-8	153	123	121	9	6.12
26	BR13754-5R-10	156	126	127	8	5.98
27	BR13754-5R-13	156	126	132	12	5.83
28	BR13754-5R-16	148	118	125	11	4.77
29	BR13754-5R-18	153	123	121	11	3.93
30	BR13754-5R-21	150	120	134	12	6.26
31	BR13754-5R-24	154	124	138	12	5.97
32	BR13754-5R-32	150	120	114	12	5.52
33	BR13754-5R-42	149	119	121	11	6.16
34	BR13755-5R-1	135	105	94	8	6.11
35	BR13755-5R-2	158	128	124	14	5.44
36	BR13755-5R-6	153	123	129	14	5.49
37	BR13755-5R-13	158	128	119	12	5.63
38	BR13755-5R-14	150	120	125	10	4.62
39	BR13755-5R-23	152	122	125	14	5.56
40	BR13755-5R-27	146	116	126	9	6.12
41	BR13755-5R-28	150	120	121	17	5.17
42	BR13755-5R-31	155	125	125	12	5.01
43	BR13755-5R-49	153	123	122	9	4.48
44	BR13755-5R-67	156	126	131	10	5.13
45	BR13753-5R-11	156	126	127	9	4.76
CK1	BRRi dhan84	139	109	127	12	6.95
CK2	BRRi dhan89	151	121	131	13	4.93
CK3	BRRi dhan88	140	110	102	12	6.01
	<b>CV</b>	<b>4.518</b>	<b>5.661</b>	<b>6.576</b>	<b>18.920</b>	<b>32.837</b>
	<b>LSD (0.05)</b>	<b>5.673</b>	<b>4.080</b>	<b>4.578</b>	<b>4.158</b>	<b>0.587</b>
	<b>H2b</b>	<b>0.91</b>	<b>0.91</b>	<b>0.95</b>	<b>0.1</b>	<b>0.920</b>

DS: 24/12/2023

DT: 28/01/2024

**Experiment 10b.6: Preliminary Yield Trial #1 (PYT#1\_Short duration), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Preliminary evaluation of pigmented rice genotypes for shorter growth duration and higher yield potentials with higher nutraceutical value than the standard check varieties.

**Materials and Methods:** A total of 23 fixed lines 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 single seedling/hill. The plot size was 4 m × 6 rows. Fertilizers were applied as described in experiment 10b.1. Crop management was done as and when necessary.

**Results and discussion:** A total of nine genotypes were selected out of 23 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-193 gave 5.98 t/ha yields with duration of 148 days followed by the genotypes BR12837-5R-41 and BR12839-4R-153-1 both giving 5.97 t/ha yield (Table 10b.6). The heritability obtained for the plant height, growth duration and yield were 76%, 96% and 48%, respectively, indicating medium to high level of precision in this experiment (Table 10b.6).

**Table 10b.6:** Performance of the selected genotypes of Preliminary Yield Trial#1 (PYT#1\_Short duration) Development of Antioxidant Enriched Rice, Boro 2023-24

SL No.	Designation	Growth duration (Days)	Days to Flowering (50%)	Plant Height (cm)	Effective Tiller	Grain yield (t/ha)
1	BR12838-4R-126-1a	154	124	118	13	4.41
2	BR12839-4R-103a	159	129	119	13	4.90
3	BR12839-4R-92-1	151	121	121	13	5.48
4	BR12839-4R-79	148	118	118	17	3.52
5	BR12839-4R-95-1	144	114	119	14	5.46
6	BR12837-5R-15	159	129	124	12	4.83
7	BR12837-5R-27	155	125	125	14	5.21
8	BR12837-5R-31	150	120	122	11	1.91
9	BR12837-5R-37	158	128	121	13	5.27
10	BR12837-5R-41	153	123	118	12	5.97
11	BR12837-5R-43	159	129	114	14	4.02
12	BR12837-5R-55	154	124	117	14	4.40
13	BR12837-5R-62	156	126	127	13	4.48
14	BR12839-4R-138-2	145	115	125	11	2.39
15	BR12839-4R-138-1	146	116	122	14	4.83
16	BR12839-4R-153-1	155	125	119	14	5.97
17	BR12839-4R-160	146	116	120	10	5.51
18	BR12839-4R-176	149	119	118	12	5.20
19	BR12839-4R-193	148	118	117	12	5.98
20	BR12839-4R-117-2*	159	129	122	12	4.33
21	BR12839-4R-141-1*	158	128	130	15	3.82
22	BR12836-4R-152*	149	119	122	12	5.49
23	BR12839-4R-117*	158	128	124	13	4.65
24	BRRi dhan84 (Ck)	137	107	126	10	6.62
25	BRRi dhan89 (Ck)	150	120	120	15	5.69
	<b>CV</b>	<b>3.81</b>	<b>4.75</b>	<b>3.46</b>	<b>16.05</b>	<b>28.50</b>
	<b>LSD (0.05)</b>	<b>0.92</b>	<b>0.92</b>	<b>5.04</b>	<b>3.31</b>	<b>2.19</b>
	<b>H2b</b>	<b>0.96</b>	<b>0.95</b>	<b>0.76</b>	<b>0.43</b>	<b>0.48</b>

DS: 24/12/2023

DT: 28/01/2024

**Experiment 10b.7: Preliminary Yield Trial #2 (PYT#2\_Medium duration), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Preliminary evaluation of pigmented/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 18 black rice genotypes along with two checks were evaluated in 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 10b.1. Crop management was done as and when necessary.

**Results and discussion:** A total of 12 genotypes were selected out of 18 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 BR12833-5R-16 producing 6.76 t/ha yield with a growth duration of 141 days followed by the genotype BR12837-5R-92-1 having 6.21 t/ha yield (Table 10b.7). The heritability obtained for the plant height, growth duration and yield were 94%, 98% and 26%, respectively, indicating medium to high level of precision in this experiment (Table 10b.7).

**Table 10b.7:** Performance of selected genotypes in Preliminary Yield Trial PYT#2 (MD), Development of Antioxidant Enriched Rice, Boro 2023-24

SL No.	Designation	Growth duration (days)	Days to flowering (%)	Plant height (cm)	Effective tiller	Grain yield (t/ha)
1	BR12837-5R-95	156	126	123	9	5.41
2	BR12837-5R-89	152	122	121	13	4.78
3	BR12837-5R-92-1	154	124	112	11	6.21
4	BR12837-5R-92-2	155	125	110	11	5.85
5	BR12833-5R-9-1(white)	144	114	138	12	5.89
6	BR12833-5R-10-1(white)	146	116	125	13	4.49
7	BR12833-5R-10-2(white)	150	120	141	8	5.47
8	BR12833-5R-16	141	111	120	13	6.76
9	BR12833-5R-17 (white)	146	116	114	10	4.32
10	BR13316-5R-1	150	120	147	12	4.51
11	BR13316-5R-2	158	128	128	12	4.56
12	BR13316-5R-2-1	154	124	131	10	5.90
13	BR12839-4R-175	144	114	116	11	5.36
14	BR12836-4R-35	145	115	120	12	5.56
15	BR12836-4R-110-1	146	116	120	11	5.59
16	BR12836-4R-250-1	146	116	125	12	5.76
17	BR12836-4R-250-2	150	120	122	12	5.34
18	BR12838-4R-95	151	121	121	13	4.31
19	BRR1 dhan58 (Ck)	145	115	119	13	6.17
20	BRR1 dhan89 (Ck)	152	122	124	11	5.29
	<b>CV (%)</b>	<b>3.10</b>	<b>3.89</b>	<b>7.68</b>	<b>17.42</b>	<b>17.43</b>
	<b>LSD (0.05)</b>	<b>0.76</b>	<b>0.76</b>	<b>6.31</b>	<b>3.87</b>	<b>1.65</b>
	<b>H2b</b>	<b>0.98</b>	<b>0.98</b>	<b>0.94</b>	<b>0.0</b>	<b>0.26</b>

**DS:** 24/12/2023

**DT:** 28/01/2024

**Experiment 10b.8: Advanced Yield Trial # 1 (AYT#1\_medium duration), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Advanced evaluation of medium duration pigmented/ black rice genotypes for higher yield potentials with intense black pigmentation.

**Materials and Methods:** Eight advanced pigmented/black rice genotypes with along with two 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 10b.1. Crop management was done as and when necessary.

**Results and discussion:** Three genotypes were selected out of eight genotypes were selected. The genotype BR12838-4R-5a produced highest yield of 6.92 t/ha with a duration of 141 followed by the genotype BR12839-4R-124-2-P1a\_Bold giving a yield of 5.81 t/ha yield with 151 days growth duration (Table 10b.8). The yield ranges of all-other selected genotypes were 3.34 to 5.5 t/ha. The heritability obtained for the plant height, growth duration and yield were 93%, 97% and 57%, respectively, indicating medium to high level of precision in this experiment (Table 10b.8).

**Table 10b.8:** Performance of the selected genotypes of Advanced Yield Trial#1 (AYT#1), Development of Antioxidant Enriched Rice, Boro 2023-24

SL No.	Designation	Growth duration (days)	Days to flowering (50%)	Plant height (cm)	Effective Tiller	Grain yield (t/ha)
1	BR12839-4R-124-2-P1a_Bold	151	121	115	15	5.81
2	BR12839-4R-124-2-P1a_49 type	152	122	124	15	5.29
3	BR12839-4R-124-3a	151	121	126	14	5.06
4	BR12838-4R-5a	141	111	109	15	6.92
5	BR12839-4R-185a	152	122	126	14	5.50
6	BR12839-4R-185-2a	152	122	122	16	4.41
7	BR12838-4R-57-1a	151	121	127	15	3.34
8	BR128-4R-142a	153	123	129	13	4.36
9	BRR1 dhan104 (Ck)	144	114	111	14	7.09
10	BRR1 dhan107 (Ck)	148	118	121	15	5.30
	<b>CV (%)</b>	<b>2.53</b>	<b>3.16</b>	<b>5.91</b>	<b>23.49</b>	<b>25.46</b>
	<b>LSD (0.05)</b>	<b>0.67</b>	<b>0.67</b>	<b>5.26</b>	<b>4.19</b>	<b>2.08</b>
	<b>H2b</b>	<b>0.97</b>	<b>0.98</b>	<b>0.93</b>	<b>0.0</b>	<b>0.57</b>

DS: 24/12/2023

DT: 25/01/2024

**Experiment 10b.9: Advanced Yield Trial #2 (AYT#2\_Medium duration), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Advanced evaluation of medium-duration pigmented/black rice genotypes with higher yield potentials.

**Materials and Methods:** A total of 12 aromatic pigmented/black rice genotypes with two 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 4 m × 8 rows. Fertilizers were applied as described in experiment 10b.1. Crop management was done as and when necessary.

**Results and discussion:** Nine genotypes were selected out of 12 genotypes based on homogeneity in the population, phenotypic acceptance, plant type, grain type, higher yield. The genotype BR12839-4R-93 gave highest yield of 6.3 t/ha followed by the genotype BR12837-5R-57 having 6.22 t/ha yield. The growth duration of these two genotypes were 117 days and 128 days, respectively. These two genotypes were selected for RYT in the next season. The yield ranges of other selected genotypes were 4.61 t/ha to 6.18t/ha (Table 10b.9).

The heritability obtained for the plant height, growth duration and yield were 60%, 98% and 77%, respectively, indicating high level of precision in this experiment (Table 10b.9).

**Table 10b.9** Performance of the selected genotypes of Advanced Yield Trial#2, Development of Antioxidant Enriched Rice, Boro 2023-24

SL No.	Designation	Growth duration (days)	Days to flowering (50%)	Plant height (cm)	Effective Tiller	Grain yield (t/ha)
1	BR12837-5R-57	128	158	125	14	6.22
2	BR12837-5R-66-2	116	146	117	14	3.84
3	BR12839-4R-95-1	114	144	102	16	4.61
4	BR12839-4R-86-1	118	148	124	14	4.31
5	BR12839-4R-157-2	117	147	119	13	5.33
6	BR12839-4R-5-2	117	147	115	16	6.18
7	BR12839-4R-93	117	147	110	15	6.30
8	BR12839-4R-47-1	118	148	119	13	5.35
9	BR12839-4R-138-4	115	145	125	14	5.92
10	BR12839-4R-78-1	118	148	114	14	5.48
11	BR12839-4R-21	118	148	122	11	5.18
12	BR12839-4R-73	117	147	119	12	4.26
13	BRR1 dhan88	116	146	108	14	5.55
14	BRR1 dhan89	117	147	131	16	4.56
	<b>CV (%)</b>	<b>2.69</b>	<b>2.14</b>	<b>7.71</b>	<b>13.87</b>	<b>16.77</b>
	<b>LSD (0.05)</b>	<b>1.28</b>	<b>1.28</b>	<b>13.31</b>	<b>3.67</b>	<b>1.06</b>
	<b>H2b</b>	<b>0.98</b>	<b>0.98</b>	<b>0.6</b>	<b>0.08</b>	<b>0.77</b>

DS: 24/12/2023

DT: 25/01/2024

**Experiment 10b.10: Advanced Yield Special (AYT Special), Development of Antioxidant Enriched Rice, Boro 2023-24**

**Principal Investigator:** S Maniruzzaman

**Co-Investigators:** Anisar Rahman, M M Yasmin and K M Iftekharuddaula

**Specific objective:** Advanced evaluation of medium-duration black rice genotypes with higher yield potentials.

**Materials and Methods:** A total of 13 aromatic black rice genotypes 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 4 m × 8 rows. Fertilizers were applied as described in experiment 10b.1. Crop management was done as and when necessary.

**Results and discussion:** The genotype BR12838-4R-89-1 gave highest yield of 6.63 t/ha followed by the genotype BR12839-4R-137 having 6.51 t/ha yield. The growth duration of these two genotypes were 139 days and 142 days respectively. The yield range of other genotypes were 4.07 t/ha to 5.82 t/ha (Table 10b.10). The heritability obtained for the plant height, growth duration and yield were 95%, 98% and 26%, respectively, indicating medium to high level of precision in this experiment (Table 10b.10).

**Table 10b.10:** Performance of the selected genotypes of Advanced Yield Special, Development of Antioxidant Enriched Rice, Boro 2023-24

SL No.	Designation	Growth duration (days)	Days to flowering (50%)	Plant height (cm)	Effective Tiller	Grain yield (t/ha)
1	BR12839-4R-157-2	152	122	127	12	4.52
2	BR12839-4R-5-2	148	118	129	16	5.67
3	BR12839-4R-137	142	112	106	16	6.51
4	BR12839-4R-106	148	118	127	15	5.68
5	BR12839-4R-34-1	146	116	119	14	5.82
6	BR12839-4R-76	149	119	122	13	5.71
7	BR12839-4R-86-1	152	122	128	13	4.07

8	BR12839-4R-72	137	107	100	14	5.60
9	BR12836-4R-63	148	118	116	16	4.94
10	BR12836-4R-312	150	120	115	14	5.68
11	BR12839-4R-124-2	152	122	122	13	5.35
12	BR12839-4R-51	152	122	123	14	5.34
13	BR12838-4R-89-1	139	109	121	17	6.63
	<b>CV (%)</b>	3.33	4.18	7.28	15.70	18.59
	<b>LSD (0.05)</b>	1.80	1.80	5.10	4.31	2.06
	<b>H2b</b>	0.98	0.98	0.95	0.04	0.26

DS: 24/12/2023

DT: 25/01/2024

## 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 ( $Zn \geq 24$  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:** Dr. Md. Abdul Kader

### Experiment 11.1: Hybridization

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** Development of new genotypes with high zinc content along with resistance to submergence, drought, salinity, cold, major insect pests and diseases, and acceptable grain quality.

**Materials and methods:** Twenty-six parents in T. Aman and twenty-six parents in Boro season were grown in four staggers at an interval of seven days to synchronize flowering for cross combinations. Twenty-five-day-old in T. Aman and thirty-day-old seedlings were transplanted in the hybridization block. Single seedling was transplanted at a spacing of 20 cm  $\times$  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  $ZnSO_4$ ) kg NPKSZn/ha were applied in the trial in T. Aman season. In Boro season, fertilizers @ 138 (300 kg Urea): 20 (100 kg TSP): 83 (165 kg MP): 20 (112 kg Gypsum): 4 (11 kg  $ZnSO_4$ ) 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. Labelling of the glycine bag was done 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:** Nineteen single crosses were made in T. Aman and 4,437 seeds were produced, while in Boro season twenty-two single crosses with 1,718 seeds 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 made, Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

SN	Cross Combination	Characteristics	No. of seeds
1	BR11664-3R-2-3/BR7833-11-1-3-1-2-B1	High yield and high zinc	400
2	BR11665-3R-10-4/BR8441-46-4-2-8	High yield and high zinc	320
3	BR11672-3R-3-1/BR7881-62-2-3-7-P3	High yield and high zinc	240
4	BR11672-3R-3-4/BR7879-17-2-4-HR3-P1	High yield and high zinc	120
5	BR11140-4-5-4-3/BR10537-7-2-1-3-2	High yield and high zinc	260
6	BR11142-13-4-4-3/BR10542-4-2-1-2-1	High yield and high zinc	110
7	BR11151-1-6-2-4/BR7833-11-1-3-1-2-B1	High yield and high zinc	100
8	BR11140-4-4-2-6/BR8441-46-4-2-8	High yield and high zinc	300
9	BR11143-5-3-3-4/BR7881-62-2-3-7-P3	High yield and high zinc	247

SN	Cross Combination	Characteristics	No. of seeds
10	BR11153-5-1-1-1/BR7879-17-2-4-HR3-P1	High yield and high zinc	310
11	BR10854-4-1-1-2-8/BR10535-5-1-2-4-1	High yield and high zinc	260
12	BR10855-3-2-5-2-5/BR10537-7-2-1-3-2	High yield and high zinc	320
13	BR10863-8-3-5-3-2/BR10542-4-2-1-2-1	High yield and high zinc	160
14	BR11176-16-7-4-4-2/BR7879-17-2-4-HR3-P1	High yield and high zinc	240
15	BR11664-3R-2-3/BR8441-46-4-2-8	High yield and high zinc	315
16	BR11665-3R-10-4/BR7881-62-2-3-7-P3	High yield and high zinc	154
17	BR11672-3R-3-1/BR7879-17-2-4-HR3-P1	High yield and high zinc	210
18	BR11672-3R-3-4/BR10535-5-1-2-4-1	High yield and high zinc	215
19	BR11140-4-5-4-3/BR10535-5-1-2-4-1	High yield and high zinc	156
<b>Total</b>			<b>4,437</b>

**Table 11.1b: List of crosses made, Development of Zinc enriched rice (ZER), Boro 2023-24**

SN	Cross combination	Characteristics	No. of F <sub>1</sub> seeds
1	BR11406-8-6-1-3/BR9674-3-12-2-2-P1	High yield and high zinc	55
2	BR10570-29-7-3-2/BR8419-8-2-1-4-1-3-8-5	High yield and high zinc	34
3	BR12041-45-3-3/BR7840-54-3-4-3	High yield and high zinc	38
4	BR10571-15-6-8-5/BR7881-62-2-3-7-P3	High yield and high zinc	52
5	BR11401-8-3-1-1/BR7881-62-2-3-7-P3	High yield and high zinc	144
6	BR10572-2-7-1-4/BR7881-62-2-3-7-P3	High yield and high zinc	35
7	BR11401-1-2-4-1/BR7879-17-2-4-HR3-P1	High yield and high zinc	242
8	BR12041-8-4-3/BR9674-1-1-5-1-P3	High yield and high zinc	22
9	BR12038-65-2-1/NSIC158 (BVE, Aman)	High yield and high zinc	132
10	BR12041-6-1-3/BR10580-4-3-3-2	High yield and high zinc	190
11	BR10552-1-1-4-6/BR8441-46-4-2-8	High yield and high zinc	15
12	BR10572-2-7-1-4/BR8441-46-4-2-8	High yield and high zinc	50
13	BR12041-45-3-3/BR8441-46-4-2-8	High yield and high zinc	95
14	BR11401-1-2-4-1/BR8441-46-4-2-8	High yield and high zinc	45
15	BR11406-8-6-1-3/BR8441-46-4-2-8	High yield and high zinc	39
16	BR9674-1-4-1-3-P1/BR7833-11-1-3-1-2-B1	High yield and high zinc	21
17	BR12041-45-3-3/BR7833-11-1-3-1-2-B1	High yield and high zinc	52
18	BR11401-1-2-4-1/BR7833-11-1-3-1-2-B1	High yield and high zinc	120
19	BR11406-8-6-1-3/BR7833-11-1-3-1-2-B1	High yield and high zinc	56
20	BR12038-36-5-2/BR7833-11-1-3-1-2-B1	High yield and high zinc	220
21	BR12038-65-2-1/BR7840-54-3-4-3	High yield and high zinc	56
22	BR12038-65-2-1/T27A (IRR)	High yield and high zinc	5
<b>Total</b>			<b>1,718</b>

### Experiment 11.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** To confirm the crosses as true F<sub>1</sub>s and use of the selected F<sub>1</sub>s to produce F<sub>2</sub> seeds and use making different types of crosses.

**Materials and methods:** Twenty and fifteen single crosses were grown in T. Aman and Boro season, respectively. The F<sub>1</sub> seeds along with their parents were germinated in petri dish and sown on puddled soil in earthen pots. Twenty-five-day-old to thirty-day-old seedlings were transplanted at 20 cm × 20 cm in the net house along with respective parents. Fertilizer and crop management were done as the experiment 11.2. From flowering to maturity stage, the F<sub>1</sub> plants of each cross were compared with their respective parents for different phenotypic traits to identify true F<sub>1</sub>s.

**Results and discussion:** A total of sixteen and fourteen crosses in T. Aman and Boro season, respectively, were selected and confirmed as true F<sub>1</sub> comparing with their parents (Table 11.2a and 11.2b) and registered in the BR cross register.

**Table 11.2a: List of crosses confirmed, Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

SN	BR Reg. No.	Crosses	Characteristics
1	BR15595	BR11144-6-1-1-3/ BR7833-11-1-3-1-2-B1	High yield, high zinc
2	BR15596	BR11144-6-1-1-3/ BR10537-7-2-1-3-2	High yield, high zinc
3	BR15597	BR11146-1-4-2-3/ BR10537-7-2-1-3-2	High yield, high zinc
4	BR15599	BR11146-1-4-2-4/ BR10542-4-2-1-2-1	High yield, high zinc
5	BR15600	BR11146-1-4-4-6/ BR8441-46-4-2-8	High yield, high zinc
6	BR15601	BR11146-1-4-4-6/ BR10542-4-2-1-2-1	High yield, high zinc
7	BR15602	BR11148-1-3-2-4/ BR10537-7-2-1-3-2	High yield, high zinc
8	BR15603	BR11148-1-3-2-4/ BR11742-6R-27	High yield, high zinc
9	BR15604	BR11148-1-3-6-5/ BR7833-11-1-3-1-2-B1	High yield, high zinc
10	BR15605	BR11151-1-4-2-6/ BR11742-6R-27	High yield, high zinc
11	BR15606	BR11153-1-2-2-5/ BR10542-4-2-1-2-1	High yield, high zinc
12	BR15607	BR11174-1-2-3-5/ BR7833-11-1-3-1-2-B1	High yield, high zinc
13	BR15609	BR12004-6R-56/ BR10537-7-2-1-3-2	High yield, high zinc
14	BR15610	BR12004-6R-56/ BR11742-6R-27	High yield, high zinc
15	BR15611	BR12022-6R-40/ BR8441-46-4-2-8	High yield, high zinc
16	BR15612	BR12022-6R-40/ BR10537-7-2-1-3-2	High yield, high zinc

**Table 11.2b: List of crosses confirmed, Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	BR Reg. No.	Crosses	Characteristics
1	16083	BR9674-1-4-1-3-P1 / BR8419-8-2-1-4-1-3-8-5	High yield, high zinc
2	16084	BR9674-7-3-2-1-P2 / BR7840-54-3-4-3	High yield, high zinc
3	16085	BR9674-7-3-2-1-P2 / BR7833-11-1-3-1-2-B1	High yield, high zinc
4	16086	BR9674-3-9-2-1-P3 / BR8441-46-4-2-8	High yield, high zinc
5	16087	BR9674-7-3-2-2-P2 / BR8419-8-2-1-4-1-3-8-5	High yield, high zinc
6	16088	BR9674-7-3-2-2-P2 / BR7879-17-2-4-HR3-P1	High yield, high zinc
7	16089	BR10571-15-6-8-5 / BR10580-4-3-3-2	High yield, high zinc
8	16090	BR10575-1-2-1-4 / BR8419-8-2-1-4-1-3-8-5	High yield, high zinc
9	16091	BR10576-16-2-4-2 / BR7833-11-1-3-1-2-B1	High yield, high zinc
10	16092	BR11894-4R-169/ BR7833-11-1-3-1-2-B1	High yield, high zinc
11	16094	IR16F1063/ BR7881-62-2-3-7-P3	High yield, high zinc
12	16095	IR16F1063/ BR8441-46-4-2-8	High yield, high zinc
13	16096	BR11714-4R-148/ BR7840-54-3-4-3	High yield, high zinc
14	16097	BR11714-4R-75/ BR8419-8-2-1-4-1-3-8-5	High yield, high zinc

### Experiment 11.3: Advancing segregating progenies in FRGA nurseries

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

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

**Materials and Methods:** A total of 88,945 individual segregating progenies were grown during the reporting period. Among them, 34,995 progenies of 121 crosses of F<sub>2</sub>-F<sub>5</sub> generations from T. Aman and 53,950 progenies of 156 crosses F<sub>2</sub>-F<sub>5</sub> generations from Boro season were grown at Gazipur under field RGA condition. Twenty-five-day-old seedlings were transplanted at a spacing of 5 cm × 5 cm using single seedling per hill in the field. Minimal number of fertilizers were applied and crop management were done as in experiment 11.2. Thinning of tillers was practiced in maximum tillering stage. At maturity, single mature tiller was harvested from each plant under field condition.

**Results and discussion:** A total of 78,192 individual segregating progenies were harvested during the reporting period. Among these, 29,463 progenies of 121 crosses were harvested in T. Aman and 48,729 progenies of 156 crosses were harvested in Boro season from F<sub>2</sub> to F<sub>5</sub> 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 2023-24**

SN	BR Reg. No.	Parentage	No. of progenies transplanted	No. of progenies harvested
<b>F<sub>2</sub> generation</b>				
1	BR15028	BR10005-25-8-4-7-20 /BR10537-7-2-1-3-2	400	300
2	BR15029	BR10005-25-8-4-7-20 /BR7833-11-1-3-1-2-B1	400	300
3	BR15030	BR10005-25-8-4-7-20 /BR8441-46-4-2-8	400	300
4	BR15031	BR10022-2-8-9-5-22 /BR10535-5-1-2-4-1	400	300
5	BR15032	BR10022-2-8-9-5-22 /BR7833-11-1-3-1-2-B1	400	300
6	BR15033	BR10022-2-8-9-5-22 /BR7881-62-2-3-7-P3	400	300
7	BR15034	BR10471-1-2-3-24-4 /BR10537-7-2-1-3-2	400	300
8	BR15035	BR10471-1-2-3-24-4 /BR10542-4-2-1-2-1	400	300
9	BR15036	BR10471-1-2-3-24-4 /BR7881-62-2-3-7-P3	400	300
10	BR15037	BR10475-1-2-3-5-5 /BR10537-7-2-1-3-2	400	300
11	BR15038	BR10475-1-2-3-5-5 /BR7833-11-1-3-1-2-B1	400	300
12	BR15039	BR10475-1-2-3-5-5 /BR7881-62-2-3-7-P3	400	300
13	BR15040	BR10480-1-2-3-1-3 /BR10542-4-2-1-2-1	400	300
14	BR15043	BR10480-1-2-3-7-2 /BR10537-7-2-1-3-2	400	300
15	BR15045	BR10480-1-2-3-7-2 /BR7881-62-2-3-7-P3	400	300
16	BR15046	BR10490-1-2-3-11-3 /BR10535-5-1-2-4-1	400	300
17	BR15047	BR10490-1-2-3-11-3 /BR10542-4-2-1-2-1	400	300
18	BR15048	BR10490-1-2-3-11-3 /BR8441-46-4-2-8	400	300
19	BR15049	BR10490-1-2-3-8-7 /BR10537-7-2-1-3-2	400	300
20	BR15051	BR10490-1-2-3-8-7 /BR7881-62-2-3-7-P3	400	300
21	BR15053	BR10492-1-2-3-1-1 /BR7881-62-2-3-7-P3	400	300
22	BR15054	BR10492-1-2-3-7-5 /BR10537-7-2-1-3-2	400	300
23	BR15055	BR10492-1-2-3-7-5 /BR10542-4-2-1-2-1	400	300
24	BR15056	BR10492-1-2-3-7-5 /BR7881-62-2-3-7-P3	400	300
25	BR15057	BR10493-1-2-3-21-7 /BR10542-4-2-1-2-1	400	300
26	BR15058	BR10493-1-2-3-21-7 /BR7879-17-2-4-HR3-P1	400	300
27	BR15059	BR10493-1-2-3-21-7 /BR8441-46-4-2-8	400	300
28	BR15060	BR10538-2-1-2-3-2 /BR10535-5-1-2-4-1	400	300
29	BR15062	BR10538-2-1-2-3-2 /BR7881-62-2-3-7-P3	400	300
30	BR15063	BR10540-4-1-2-4-1 /BR10537-7-2-1-3-2	400	300
31	BR15065	BR10540-4-1-2-4-1 /BR8441-46-4-2-8	400	300
32	BR15066	BR9674-1-1-5-2-P4 /BR10537-7-2-1-3-2	400	300
33	BR15067	BR9674-1-1-5-2-P4 /BR10542-4-2-1-2-1	400	300
34	BR15068	BR9674-1-1-5-2-P4 /BR7833-11-1-3-1-2-B1	400	300
35	BR15069	BRR1 dhan97 /BR10535-5-1-2-4-1	400	300
36	BR15072	BRR1 dhan99 /BR10537-7-2-1-3-2	400	300
37	BR15074	IR101791-10-1-4-3-2-4 /BR7833-11-1-3-1-2-B1	400	300
38	BR15075	IR101791-10-1-4-3-2-4 /BR7881-62-2-3-7-P3	400	300
39	BR15076	IR101791-10-1-4-3-2-4 /BR8441-46-4-2-8	400	300
40	BR15077	IR126952-41-148-38-9-60-B /BR10535-5-1-2-4-1	400	300
41	BR15078	IR126952-41-148-38-9-60-B /BR10537-7-2-1-3-2	400	300
42	BR15080	IR126952-41-148-38-9-60-B /BR7881-62-2-3-7-P3	400	300
43	BR15081	IR16F1148 /BR10537-7-2-1-3-2	400	300
44	BR15082	IR16F1148 /BR10542-4-2-1-2-1	400	300
45	BR15084	IR16F1148 /BR7881-62-2-3-7-P3	400	300
<b>Total</b>			<b>18,000</b>	<b>13,500</b>
<b>F<sub>3</sub> generation</b>				
1	BR14391	BR10001-94-2-B / BR7879-17-2-4-HR3-P1	238	236
2	BR14392	BR10001-94-2-B / BR7840-34-4-2-2	216	212
3	BR14393	BR10001-94-2-B / BR7528-2R-19-HR16-9-3-P7-2-2	273	266
4	BR14394	BR10001-94-2-B / BR8444-37-2-3-1-1-B3	143	129
5	BR14395	BR9868-19-40-3-B / IR99641-115-2-3	230	120
6	BR14396	BR9868-19-40-3-B / BR7833-11-1-3-1-2-B1	258	247
7	BR14401	BR8442-12-1-3-1-B5 / BR7833-11-1-3-1-2-B2	294	283
8	BR14402	BR8442-12-1-3-1-B5 / BR8441-46-4-2-8	265	255
9	BR14403	BR8442-12-1-3-1-B5 / IR101760-48-1	165	125
10	BR14406	BR7528-2R-HR16-2-24-1 / BR7833-11-1-3-1-2-B1	338	302

SN	BR Reg. No.	Parentage	No. of progenies transplanted	No. of progenies harvested
11	BR14407	BR7528-2R-HR16-2-24-1/ BR7833-11-1-3-1-2-B2	256	246
12	BR14408	BR10534-2-3-2-1-1/ BR7833-11-1-3-1-2-B1	378	315
13	BR14409	BR10534-2-3-2-1-1/ IR101760-48-1	265	258
14	BR14410	BR10534-2-3-2-1-1/ BR7528-2R-19-HR16-9-3-P7-2-2	319	305
15	BR14412	BR10534-2-3-2-1-1/ BR8444-37-2-3-1-1-B3	268	262
16	BR14413	BR10535-5-1-2-2-1/ BR8441-46-4-2-8	252	245
17	BR14414	BR10535-5-1-2-2-1/ BR7833-11-1-3-1-2-B2	378	370
18	BR14416	BR10535-5-1-2-2-1/ BR7840-34-4-2-2	356	320
19	BR14417	BR10535-5-1-2-2-1/ BR7833-11-1-3-1-2-B1	267	248
20	BR14418	HHZ5-DT20-DT2-DT1/ IR17A1080	258	250
21	BR14419	HHZ5-DT20-DT2-DT1/ IR101760-48-1	400	350
22	BR14420	HHZ5-DT20-DT2-DT1/ BR7833-11-1-3-1-2-B2	400	370
23	BR14421	HHZ5-DT20-DT2-DT1/ BR7881-62-2-3-7-P3	213	200
24	BR14428	BR8548-8-22-5-15/ BR8441-46-4-2-8	171	165
25	BR14429	BR8548-8-22-5-15/ BR7879-17-2-4-HR3-P1	141	141
26	BR14430	BR9158-19-9-6-50-2-HR1/ BR8444-37-2-3-1-1-B3	226	225
27	BR14431	BR9158-19-9-6-50-2-HR1/ IR99641-115-2-3	195	195
28	BR14432	IR13F441/ BR7879-17-2-4-HR3-P1	265	250
29	BR14435	IR13F441/ IR101760-48-1	253	248
30	BR14436	BR7528-2R-HR16-2-24-1/ IR17A1211	345	338
31	BR14437	BR7528-2R-HR16-2-24-1/ IR17A1080	271	268
<b>Total</b>			<b>8,297</b>	<b>7,744</b>
<b>F4 generation</b>				
1	BR13837	BRR1 dhan71/ BR9674-1-1-5-4-P4	240	200
2	BR13838	BRR1 dhan73 / BR7528-2R-19-HR16-E5-136-1	246	200
3	BR13839	BRR1 dhan79 / BR9674-1-1-5-4-P4	180	175
4	BR13840	BRR1 dhan80/ BR7528-2R-19-HR16-E5-136-1	173	172
5	BR13841	BRR1 dhan84/ BR9674-1-1-5-4-P4	245	200
6	BR13842	BR7528-2R-HR16-2-24-1/ BRR1 dhan43	228	225
7	BR13843	BR8442-12-1-3-1-B1/ BRR1 dhan42	218	216
8	BR13844	IR101760-48-1 / BRR1 dhan43	236	200
9	BR13845	IR99641-115-2-3/ BR9674-1-1-5-4-P4	230	225
10	BR13846	BRR1 dhan89/ BR 7881-62-2-3-7-P3	240	200
11	BR13847	BRR1 dhan80/ BR9674-1-1-5-4-P4	245	200
12	BR13848	BRR1 dhan84/ BR 7528-2R-19-HR16-E5-136-1	228	227
13	BR13849	BRR1 dhan87/ BR9674-1-1-5-4-P4	248	200
14	BR13850	BR8444-37-2-3-1-1-B3/ BR9674-1-1-5-4-P4	230	225
15	BR13851	IR101760-48-1/ BRR1 dhan42	258	220
16	BR13852	BRR1 dhan80/ BR7528-2R-19-HR16-9-3-P7-2-2	250	200
17	BR13853	BRR1 dhan87/ BR 7528-2R-19-HR16-E5-136-1	240	240
18	BR13854	BRR1 dhan89/ BR9674-1-1-5-4-P4	235	200
<b>Total</b>			<b>4,170</b>	<b>3725</b>
<b>F5 Generation</b>				
1	BR13263	BRR1 dhan71/BR7833-11-1-3-1-2-B1	185	183
2	BR13264	BRR1 dhan71/ BR7833-11-1-3-1-2-B2	196	192
3	BR13265	BRR1 dhan71/BR8441-46-4-2-8	188	187
4	BR13266	BRR1 dhan71/ BR 7881-62-2-3-7-P3	136	136
5	BR13267	BRR1 dhan71/BR 7879-17-2-4-HR3-P1	200	197
6	BR13268	BRR1 dhan71/BR7528-2R-19-HR16-9-3-P7-2-2	144	144
7	BR13269	BRR1 dhan73/BR7833-11-1-3-1-2-B1	195	194
8	BR13270	BRR1 dhan73/BR7833-11-1-3-1-2-B2	148	148
9	BR13271	BRR1 dhan73/BR8441-46-4-2-8	177	175
10	BR13272	BRR1 dhan73/ BR 7881-62-2-3-7-P3	153	152
11	BR13273	BRR1 dhan73/BR 7879-17-2-4-HR3-P1	115	115
12	BR13274	BRR1 dhan73/BR7840-34-4-2-2	173	171
13	BR13275	BRR1 dhan73/BR7528-2R-19-HR16-9-3-P7-2-2	150	150
14	BR13276	BRR1 dhan79/BR7833-11-1-3-1-2-B1	182	180
15	BR13277	BRR1 dhan79/BR7833-11-1-3-1-2-B2	175	175
16	BR13278	BRR1 dhan79/BR 7881-62-2-3-7-P3	136	136
17	BR13279	BRR1 dhan79/BR 7879-17-2-4-HR3-P1	154	153
18	BR13281	BRR1 dhan80/ BR 7881-62-2-3-7-P3	154	154

SN	BR Reg. No.	Parentage	No. of progenies transplanted	No. of progenies harvested
19	BR13282	BRR1 dhan84/BR 7879-17-2-4-HR3-P1	167	165
20	BR13283	BR7528-2R-HR16-2-24-1/BR7528-2R-19-HR16-9-3-P7-2-2	138	138
21	BR13284	BR8410-16-4-17-9-1/BR7833-11-1-3-1-2-B1	148	147
22	BR13285	BR8410-16-4-17-9-1/BR7833-11-1-3-1-2-B2	172	169
23	BR13286	BR8410-16-4-17-9-1/BR8441-46-4-2-8	172	170
24	BR13287	BR8444-37-2-3-1-1-B3/BR8441-46-4-2-8	200	198
25	BR13288	BRR1 dhan79/BR8444-37-2-3-1-1-B3	200	200
26	BR13289	BRR1 dhan84/BR7833-11-1-3-1-2-B2	200	195
27	BR13290	BR7528-2R-16-2-24-1/BR7833-11-1-3-1-2-B1	170	170
<b>Total</b>			<b>4,528</b>	<b>4,494</b>
<b>Grand Total</b>			<b>34,995</b>	<b>29,463</b>

**Table 11.3b: List of segregating progenies harvested from field RGA nurseries, Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	BR Reg. No.	Parentage	No. of progenies transplanted	No. of progenies harvested
<b>F<sub>2</sub> generation</b>				
1	BR15385	BR9674-8-15-3-28-P3/ T27A	400	100
2	BR15386	BR9674-3-9-2-1-P3/BR8441-46-4-2-8	400	150
3	BR15387	BR9674-3-9-2-1-P3/ NSIC158	400	-
4	BR15388	BR9674-7-3-2-2-P1/ BR10580-4-3-3-2	400	300
5	BR15389	BR9674-7-3-2-2-P1/ BR7881-62-2-3-7-P3	400	200
6	BR15390	BR9674-7-3-2-2-P1/ NSIC158	400	200
7	BR15391	BR11716-4R-105/ BR7879-17-2-4-HR3-P1	400	250
8	BR15393	BR11716-4R-105/ T27A	400	180
9	BR15394	BR11712-4R-227/ BR8419-8-2-1-4-1-3-8-5	400	400
10	BR15395	BR11712-4R-227/ NSIC158	400	-
11	BR15396	BR11712-4R-227/ BR7879-17-2-4-HR3-P1	400	400
<b>Total</b>			<b>4,400</b>	<b>2,180</b>
<b>F<sub>3</sub> generation</b>				
1	BR14790	BR8912-12-6-1-1-1-1/BR9674-3-12-2-2-P1 BR8912-12-6-1-1-1-1/BR8419-8-2-1-4-1-3-8-5	350 360	338
2	BR14791	8-5		341
3	BR14792	BR8912-12-6-1-1-1-1/BR7840-54-3-4-3	390	369
4	BR14793	BR8912-12-6-1-1-1-1/BR7881-62-2-3-7-P3	340	100
5	BR14794	BR8912-12-6-1-1-1-1/BR8441-46-4-2-8 BR8912-12-6-1-1-1-1/BR7833-11-1-3-1-2-	400 350	378
6	BR14795	B1		336
7	BR14796	IR105837-8-95-2-1 /BR8419-8-2-1-4-1-3-8-5	350	338
8	BR14797	IR105837-8-95-2-1 /BR7840-54-3-4-3	380	360
9	BR14798	IR105837-8-95-2-1 /BR7881-62-2-3-7-P3	330	315
10	BR14799	IR105837-8-95-2-1 /BR8441-46-4-2-8	400	378
11	BR14800	BRR1 dhan102 /BR9674-3-12-2-2-P1	400	380
12	BR14801	BRR1 dhan102 /BR8419-8-2-1-4-1-3-8-5	380	341
13	BR14802	BRR1 dhan102 /BR7840-54-3-4-3	360	336
14	BR14803	BRR1 dhan102 /BR7881-62-2-3-7-P3	400	379
15	BR14804	BRR1 dhan102 /BR8441-46-4-2-8	390	370
16	BR14805	BRR1 dhan102 /BR7833-11-1-3-1-2-B1	400	378
17	BR14806	BRR1 dhan100/BR9674-3-12-2-2-P1	330	314
18	BR14807	BRR1 dhan100/BR7840-54-3-4-3	390	365
19	BR14808	BRR1 dhan100/BR7881-62-2-3-7-P3	400	382
20	BR14809	BRR1 dhan100/BR7833-11-1-3-1-2-B1	380	360
21	BR14810	IR101791-10-1-4-3-2-4/BR7881-62-2-3-7-P3	300	286
22	BR14811	BRR1 dhan97/BR9674-3-12-2-2-P1	400	377
23	BR14812	BRR1 dhan97/BR8441-46-4-2-8	400	380
24	BR14813	BRR1 dhan97/BR7833-11-1-3-1-2-B1	380	362
25	BR14814	BRR1 dhan99/BR9674-3-12-2-2-P1	350	330
26	BR14815	BRR1 dhan99/BR8419-8-2-1-4-1-3-8-5	350	331
27	BR14816	BRR1 dhan99/BR7840-54-3-4-3	380	359
28	BR14817	BRR1 dhan99/BR7881-62-2-3-7-P3	300	278
29	BR14818	BRR1 dhan99/BR7879-17-2-4-HR3-P1	340	321
30	BR14819	BRR1 dhan99/BR7833-11-1-3-1-2-B1	400	379
31	BR14820	BRR1 dhan81/BR8441-46-4-2-8	330	311
32	BR14821	BRR1 dhan81/BR7833-11-1-3-1-2-B1	400	380
33	BR14822	BRR1 dhan88/BR9674-3-12-2-2-P1	400	378
34	BR14823	BRR1 dhan88/BR8441-46-4-2-8	300	286
35	BR14824	BRR1 dhan89/BR7840-54-3-4-3	390	377

<b>SN</b>	<b>BR Reg. No.</b>	<b>Parentage</b>	<b>No. of progenies transplanted</b>	<b>No. of progenies harvested</b>
36	BR14825	BRR1 dhan89/BR7881-62-2-3-7-P3	350	330
37	BR14826	BRR1 dhan89/BR8441-46-4-2-8	340	319
38	BR14827	BRR1 dhan89/BR7833-11-1-3-1-2-B1	350	332
39	BR14828	BRR1 dhan92/BR9674-3-12-2-2-P1	400	380
40	BR14829	BRR1 dhan92/BR8419-8-2-1-4-1-3-8-5	380	360
41	BR14830	BRR1 dhan92/BR8441-46-4-2-8	370	352
42	BR14831	BRR1 dhan92/BR7833-11-1-3-1-2-B1	400	378
43	BR14832	BRR1 dhan96/BR9674-3-12-2-2-P1	400	380
44	BR14833	BRR1 dhan96/BR8419-8-2-1-4-1-3-8-5	390	376
45	BR14834	BRR1 dhan96/BR7840-54-3-4-3	400	380
46	BR14835	BRR1 dhan96/BR7879-17-2-4-HR3-P1	300	282
47	BR14836	BRR1 dhan96/BR8441-46-4-2-8	390	370
48	BR14837	BRR1 dhan96/BR7833-11-1-3-1-2-B1	340	320
49	BR14838	IR64-pi9 NILS /BR9674-3-12-2-2-P1	400	382
50	BR14839	IR64-pi9 NILS /BR8419-8-2-1-4-1-3-8-5	380	360
51	BR14840	IR64-pi9 NILS /BR7881-62-2-3-7-P3	320	298
52	BR14841	7 FBR-336/BR9674-3-12-2-2-P1	390	372
53	BR14842	7 FBR-355 /BR9674-3-12-2-2-P1	330	312
54	BR14843	7 FBR-355 /BR8419-8-2-1-4-1-3-8-5	350	331
55	BR14844	7 FBR-355 /BR7840-54-3-4-3	380	360
56	BR14845	7 FBR-355 /BR7881-62-2-3-7-P3	400	382
57	BR14846	7 FBR-355 /BR8441-46-4-2-8	400	379
58	BR14847	7 FBR-355 /BR7833-11-1-3-1-2-B1	300	280
		<b>Total</b>	<b>21,360</b>	<b>20,008</b>
<b>F4 generation</b>				
1	BR14106	BRR1 dhan88/BR9966-12-5-6-3-2	350	330
2	BR14107	BRR1 dhan88/BRR1 dhan100	380	362
3	BR14108	BRR1 dhan88/BR7881-62-2-3-7-P3	340	320
4	BR14109	BRR1 dhan88/BR7879-17-2-4-HR3-P1	350	331
5	BR14110	BRR1 dhan88/BR7840-54-3-4-3	400	380
6	BR14111	BRR1 dhan89/IR105837-8-95-2-1	400	382
7	BR14112	BRR1 dhan89/IR99285-1-1-1-P1	390	378
8	BR14113	BRR1 dhan89/BRR1 dhan102	330	313
9	BR14114	BRR1 dhan89/BR9966-12-5-6-3-2	350	337
10	BR14115	BRR1 dhan67/BR9966-12-5-6-3-2	420	387
11	BR14116	BRR1 dhan67/BRR1 dhan100	350	330
12	BR14117	BRR1 dhan67/BRR1 dhan102	430	409
13	BR14118	BRR1 dhan67/IR99285-1-1-1-P1	450	423
14	BR14119	BRR1 dhan67/IR105837-8-95-2-1	380	358
15	BR14120	IR83484-3-B-7-1-1-1/BR9966-12-5-6-3-2	400	380
16	BR14121	IR83484-3-B-7-1-1-1/BRR1 dhan102	380	363
17	BR14122	IR83484-3-B-7-1-1-1/IR99285-1-1-1-P1	400	381
18	BR14123	IR83484-3-B-7-1-1-1/IR105837-8-95-2-1	300	284
19	BR14124	IR83484-3-B-7-1-1-1/BR8912-12-6-1-1-1-1	340	320
20	BR14125	IR83484-3-B-7-1-1-1/BRR1 dhan100	380	363
21	BR14126	BRR1 dhan92/BR7840-54-3-4-3	400	382
22	BR14127	BRR1 dhan92/BR7881-62-2-3-7-P3	300	285
23	BR14128	BRR1 dhan92/BR7879-17-2-4-HR3-P1	300	280
24	BR14129	BRR1 dhan92/IR105837-8-95-2-1	280	262
25	BR14130	BRR1 dhan92/IR99285-1-1-1-P1	300	285
26	BR14131	BRR1 dhan92/BRR1 dhan102	350	330
27	BR14132	BRR1 dhan92/BR9966-12-5-6-3-2	400	380
28	BR14133	Rata Boro/BR9966-12-5-6-3-2	390	376
29	BR14134	Rata Boro/BRR1 dhan102	330	310
30	BR14135	Rata Boro/IR99285-1-1-1-P1	300	282
31	BR14137	BRR1 dhan81/BR9966-12-5-6-3-2	300	279
32	BR14138	BRR1 dhan81/BRR1 dhan100	300	280
33	BR14139	BRR1 dhan81/BRR1 dhan102	340	318
34	BR14140	BRR1 dhan81/IR99285-1-1-1-P1	360	340
35	BR14141	BRR1 dhan81/IR105837-8-95-2-1	300	260
36	BR14142	BRR1 dhan100/BR9966-12-5-6-3-2	300	280
37	BR14143	BRR1 dhan100/BR7840-54-3-4-3	260	250
38	BR14144	BRR1 dhan100/BR7881-62-2-3-7-P3	300	290
39	BR14145	BRR1 dhan100/BR7879-17-2-4-HR3-P1	300	282
40	BR14146	BRR1 dhan102/BR7840-54-3-4-3	400	350
41	BR14147	BRR1 dhan102/BR7881-62-2-3-7-P3	340	320
42	BR14148	BRR1 dhan102/BR7879-17-2-4-HR3-P1	400	380
43	BR14149	BRR1 dhan102/IR105837-8-95-2-1	440	378
44	BR14150	BRR1 dhan102/Rata Boro	400	385
45	BR14151	BR9966-12-5-6-3-2/BR7881-62-2-3-7-P3	400	380
46	BR14152	BR9966-12-5-6-3-2/BR7879-17-2-4-HR3-P1	450	410

SN	BR Reg. No.	Parentage	No. of progenies transplanted	No. of progenies harvested
47	BR14153	BR9966-12-5-6-3-2/BR7840-54-3-4-3	400	380
48	BR14154	IR105837-8-95-2-1/IR99285-1-1-1-P1	350	330
49	BR14155	IR105837-8-95-2-1/BRR1 dhan102	340	340
<b>Total</b>			<b>17,550</b>	<b>16,535</b>
<b>F<sub>5</sub> generation</b>				
1	BR13570	BRR1 dhan81/ BR7879-17-2-4-HR3-P1	300	287
2	BR13571	BRR1 dhan81/ BR7881-62-2-3-7-P3	250	250
3	BR13572	BRR1 dhan81/ BRR1 dhan43	200	200
4	BR13573	BRR1 dhan81/ BRR1 dhan42	330	320
5	BR13574	BRR1 dhan81/ BR7840-54-3-4-3	300	290
6	BR13575	BRR1 dhan89/ BR7879-17-2-4-HR3-P1	350	335
7	BR13576	BRR1 dhan89/ BR7881-62-2-3-7-P3	380	370
8	BR13577	BRR1 dhan89/ BRR1 dhan43	250	250
9	BR13578	BRR1 dhan89/ BRR1 dhan42	350	335
10	BR13579	BRR1 dhan89/ BR7840-54-3-4-3	240	225
11	BR13580	BRR1 dhan67/ BRR1 dhan42	200	200
12	BR13581	BRR1 dhan67/ BR7840-54-3-4-3	250	250
13	BR13582	BRR1 dhan67/ BRR1 dhan43	300	300
14	BR13583	IR83484-3-B-7-1-1-1(salt)/ BRR1 dhan43	250	150
15	BR13584	IR83484-3-B-7-1-1-1(salt)/ BRR1 dhan42	380	365
16	BR13585	IR87870-6-1-1-1-1-B (salt)/ BRR1 dhan43	300	285
		IR87870-6-1-1-1-1-B (salt)/ BR7879-17-2-4-	150	
17	BR13586	HR3-P1		150
18	BR13588	BRR1 dhan102/ BR7881-62-2-3-7-P3	300	290
19	BR13589	BRR1 dhan102/ BRR1 dhan42	330	325
		BR8912-12-6-1-1-1-1/ BR7879-17-2-4-HR3-	300	
20	BR13590	P1		285
21	BR13591	BR8912-12-6-1-1-1-1/ BRR1 dhan43	300	282
22	BR13592	IR105837-8-83-1-1/ BR7840-54-3-4-3	390	377
23	BR13593	IR105837-8-83-1-1/BR7881-62-2-3-7-P3	250	235
24	BR13594	IR105837-8-95-2-1/ BRR1 dhan42	240	210
25	BR13595	IR105837-8-95-2-1/ BR7881-62-2-3-7-P3	200	200
26	BR13596	BR8634-23-1-1-BHA-2/ BR7840-54-3-4-3	300	300
27	BR13598	IR105837-8-95-2-1/ BRR1 dhan43	200	200
28	BR13599	BR8634-23-1-1-BHA-5/ BRR1 dhan42	300	290
		BR8634-23-1-1-BHA-5/ BR7879-17-2-4-	350	
29	BR13600	HR3-P1		300
30	BR13601	Rata Boro/ BR7879-17-2-4-HR3-P1	200	180
31	BR13604	BRR1 dhan42/ Rata Boro	150	150
32	BR13605	BR 7879-17-2-4-HR3-P1/ Rata Boro	300	300
33	BR13606	IR100722-B-B-B-1-1/ BRR1 dhan42	340	220
34	BR13607	IR100722-B-B-B-1-1/ BRR1 dhan43	300	275
		IR100722-B-B-B-1-1/ BR 7879-17-2-4-HR3-	250	
35	BR13608	P1		205
36	BR13609	IR100722-B-B-B-1-1/ BR 7881-62-2-3-7-P3	240	230
37	BR13610	BR8631-12-3-6-P3/BRR1 dhan42	240	225
38	BR13611	BR8631-12-3-6-P3/BRR1 dhan43	380	365
<b>Total</b>			<b>10,640</b>	<b>10,006</b>
<b>Grand Total</b>			<b>53,950</b>	<b>48,729</b>

#### Experiment 11.4: Line Stage Testing (LST)

**Principal investigator:** MA Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

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

**Materials and Method:** Total 6,207 progenies from 37 crosses were grown in T. Aman season and in Boro season 6,530 progenies from 24 crosses were grown in a 2.6 m single-row plot with a spacing of 20 cm × 20 cm in the field using systematic arrangement pattern. Thirty to 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 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.

**Results and Discussion:** A total of 363 lines were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape (**Table 11.4a**) in T. Aman season. The selected lines showed a wide range of variation in plant height and growth duration. The growth duration of the selected lines was started from 112-148 days and the selection intensity was found 6% (**Fig. 11.4a**). The trait marker profile of the genotypes of LST is presented in **Fig. 11.4b**. The most of the selected materials from LST contained genes of high amylose and high zinc and some of the materials also showed drought tolerance QTLs. Some of the lines also showed gall midge and bacterial blight resistance. The list of QTL combinations of the BR cross families is presented in **Table 11.4b**. All the RGA derived fixed lines of the cross families were selected for initial yield evaluation.

In Boro Season, 532 lines were harvested based on visual observation on homogeneity in flowering, plant height and grain size and shape (**Table 11.4c**). The selected lines showed a wide range of variation in plant height and growth duration. The growth duration of the selected lines was started from 134-166 days and the selection intensity was found 8.14% (**Fig. 11.4c**). The trait marker profile of the genotypes of LST is presented in **Fig. 11.4d**. The most of the selected materials from LST contained genes of high amylose and high zinc and some of the materials also showed genes of aroma. Some of the lines also showed gall midge and BPH32 resistance genes. The list of QTL combinations of the BR cross families are presented in **Table 11.4d**. All the RGA derived fixed lines of the cross families were selected for initial yield evaluation.

**Table 11.4a: List of selected genotypes of Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

SN	BR Reg. No	Parentage	No. of progenies transplanted	No. of plants harvested
1	BR12686	BRR1 dhan39/BR7528-2R-16-2-24-1	182	13
2	BR12687	BRR1 dhan39/BR8410-16-4-17-9-1	130	7
3	BR12688	BRR1 dhan39/BR7833-11-1-3-1-2-B1	168	11
4	BR12689	BRR1 dhan39/BR8441-46-4-2-8	190	17
5	BR12690	BRR1 dhan39/BR7881-62-2-3-7-P3	108	10
6	BR12691	BRR1 dhan39/BR7879-17-2-4-HR3-P1	149	16
7	BR12693	BRR1 dhan49/BR8410-16-4-17-9-1	144	8
8	BR12695	BRR1 dhan49/BR8441-46-4-2-8	140	5
9	BR12696	BRR1 dhan49/BR7881-62-2-3-7-P3	175	12
10	BR12697	BRR1 dhan49/BR7879-17-2-4-HR3-P1	139	4
11	BR12698	BRR1 dhan49/BR7840-34-4-2-2	180	13
12	BR12699	BRR1 dhan52/BR7528-2R-HR16-2-24-1	169	12
13	BR12700	BRR1 dhan52/BR8410-16-4-17-9-1	128	11
14	BR12701	BRR1 dhan52/BR7833-11-1-3-1-2-B1	158	9
15	BR12702	BRR1 dhan52/BR8441-46-4-2-8	152	8
16	BR12703	BRR1 dhan52/BR7881-62-2-3-7-P3	146	7
17	BR12704	BRR1 dhan52/BR7879-17-2-4-HR3-P1	160	16
18	BR12705	BRR1 dhan52/BR7840-34-4-2-2	200	10
19	BR12708	BRR1 dhan62/BR7840-34-4-2-2	200	12
20	BR12709	BRR1 dhan63/BR7528-2R-HR16-2-24-1	154	14
21	BR12710	BRR1 dhan63/BR8410-16-4-17-9-1	175	11
22	BR12711	BRR1 dhan63/BR7833-11-1-3-1-2-B1	175	8
23	BR12712	BRR1 dhan63/BR8441-46-4-2-8	130	6
24	BR12713	BRR1 dhan63/BR7881-62-2-3-7-P3	168	6
25	BR12714	BRR1 dhan63/BR7879-17-2-4-HR3-P1	183	3
26	BR12715	BRR1 dhan63/BR7840-34-4-2-2	195	6
27	BR12716	BRR1 dhan66/BR7528-2R-HR16-2-24-1	200	24
28	BR12717	BRR1 dhan66/BR8410-16-4-17-9-1	198	7
29	BR12719	BRR1 dhan66/BR8441-46-4-2-8	154	8
30	BR12720	BRR1 dhan66/BR7881-62-2-3-7-P3	193	7
31	BR12722	BRR1 dhan66/BR7840-34-4-2-2	200	5
32	BR12723	BRR1 dhan71/BR7528-2R-HR16-2-24-1	140	6
33	BR12724	BRR1 dhan71/BR8410-16-4-17-9-1	200	9
34	BR12725	BRR1 dhan71/BR7833-11-1-3-1-2-B1	180	4
35	BR12726	BRR1 dhan71/BR8441-46-4-2-8	144	14
36	BR12728	BRR1 dhan71/BR7840-34-4-2-2	200	4
37	BR12729	BRR1 dhan57/BR7879-17-2-4-HR3-P1	200	20
<b>Total</b>			<b>6,207</b>	<b>363</b>

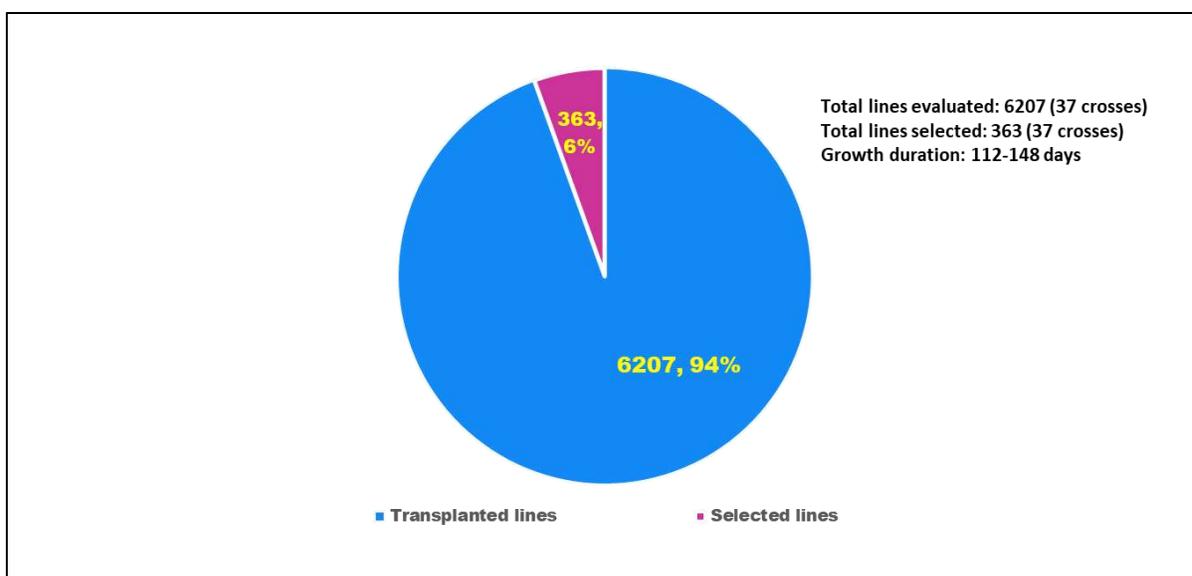


Fig. 11.4a: Selection intensity genotypes of LST, ZER, T. Aman 2023-24

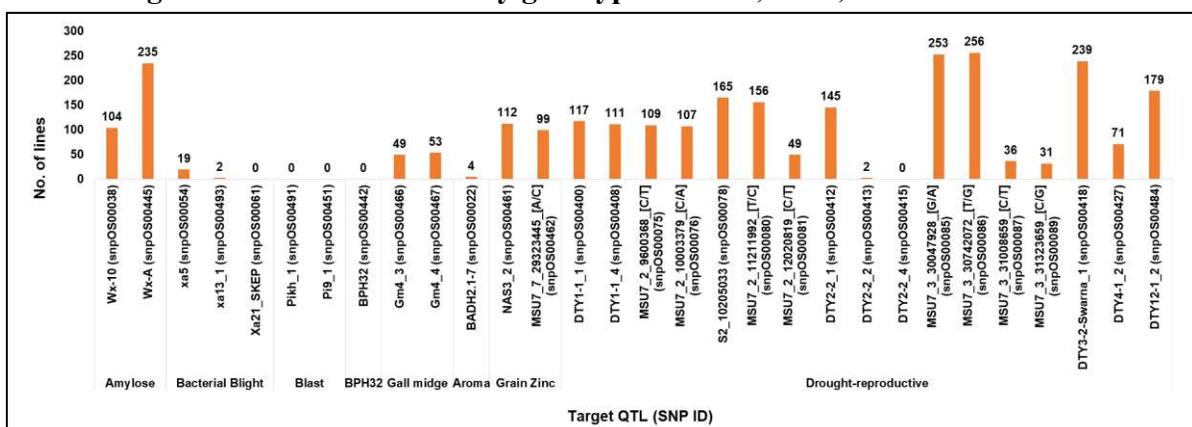


Fig. 11.4b: Trait marker profile of genotypes of LST, ZER, T. Aman 2023-24

Table 11.4.b. List of trait marker combination of the crosses of Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), T. Aman 2023-24

SN Designation	Genotypic data	No. of lines
1 BR12686	MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	2
	qDTY1-1_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
	Wx-10+ Wx-A+ qDTY1-1_1+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	4
	Wx-A+ qDTY1-1_1+ qDTY1-1_4+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
2 BR12687	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+ Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ S2_10205033+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ qDTY3-2-Swarna_1	1
	Wx-10+ Wx-A+ qDTY1-1_1+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ MSU7_3_31008659_[C/T]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
3 BR12688	Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
	Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	2
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
	Wx-A+ MSU7_3_31008659_[C/T]+ qDTY12-1_2	1
	Wx-A+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	3	
4 BR12689	MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1

SN	Designation	Genotypic data	No. of lines
		Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY12-1_2	2
		Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	8
		Wx-10+ Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ qDTY12-1_2	1
		Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
5	BR12690	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	2
		qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	4
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	4
	BR12691	MSU7_3_30047928_[G/A]	1
		MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	4
		qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	6
		xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
6	BR12693	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY3-2-Swarna_1+ Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	2
7	BR12695	MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]	1
		MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
		Wx-10+ Wx-A+ Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2	1
8	BR12696	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+	6
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
9	BR12697	qDTY3-2-Swarna_1+ qDTY12-1_2	1
		S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+	1
		xa5+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
10	BR12698	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Gm4_3+ Gm4_4+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Gm4_3+ Gm4_4+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		MSU7_2_9600368_[C/T]+ qDTY12-1_2	1
		NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	1
		Wx-10+ Wx-A+ Gm4_3+ Gm4_4+ S2_10205033+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_2_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	1
		Wx-10+ Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		Wx-10+ Wx-A+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ TATAT:TATAT+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ TATAT:TATAT+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	1
		Wx-A+ qDTY2-2_1+ qDTY2-2_2+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+	1
		Wx-A+ xa5+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	1
11	BR12699	NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY12-1_2	1
		qDTY2-2_1+ qDTY3-2-Swarna_1	2
		Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		Wx-A+ xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		xa5+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	2
12	BR12700	NAS3_2+ MSU7_7_29323445_[A/C]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		NAS3_2+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2	1
		qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2	1
		S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
		Wx-10+ Wx-A+ NAS3_2+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		Wx-10+ Wx-A+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
		Wx-10+ Wx-A+ xa13_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1

SN Designation	Genotypic data	No. of lines
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
13 BR12701	MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	1
	NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-10+ Wx-A+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	Wx-10+ Wx-A+ xa13_1+ TATAT:TATAT+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ NAS3_2+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
	Wx-A+ NAS3_2+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
14 BR12702	MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	NAS3_2+ MSU7_7_29323445_[A/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
	qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
15 BR12703	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+ Gm4_3+ Gm4_4+ NAS3_2+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-10+ Wx-A+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ Gm4_3+ Gm4_4+ NAS3_2+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ Gm4_3+ Gm4_4+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ qDTY1-1_1+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
16 BR12704	MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	1
	NAS3_2+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	1
	qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY12-1_2	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	1
	Wx-A+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	1
	Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
17 BR12705	S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1	2
	Wx-10+ Wx-A+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ qDTY1-1_4+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	5
18 BR12708	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2	1
	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY4-1_2+ qDTY12-1_2	7
	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY12-1_2	1
	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY4-1_2+ qDTY12-1_2	1
	Gm4_3+ Gm4_4+ NAS3_2+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY4-1_2+ qDTY12-1_2	1
	Wx-10+ Wx-A+MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
19 BR12709	Gm4_3+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_2_12020819_[C/T]+ qDTY2-2_1+ MSU7_3_31008659_[C/T]+ MSU7_3_31323659_[C/G]+ qDTY4-1_2+ qDTY12-1_2	5
	MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	4
	Wx-10+ Wx-A+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
20 BR12710	qDTY2-2_1+ qDTY3-2-Swarna_1	1
	S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1	1
	S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	5
	Wx-10+ Wx-A+ Gm4_4+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ qDTY3-2-Swarna_1	1
	Wx-10+ Wx-A+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY3-2-Swarna_1	2





SN Designation	Genotypic data	No. of lines
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ MSU7_2_9600368_[C/T]+ MSU7_3_30047928_[G/A]	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY12-1_2	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	2
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1+ qDTY4-1_2+ qDTY12-1_2	2
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ NAS3_2+ MSU7_7_29323445_[A/C]+ qDTY1-1_1+ qDTY1-1_4+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	2
	Wx-A+ NAS3_2+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
	Wx-A+ qDTY1-1_1+ qDTY1-1_4+ MSU7_2_9600368_[C/T]+ MSU7_2_10003379_[C/A]+ S2_10205033+ MSU7_2_11211992_[T/C]+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY3-2-Swarna_1	1
	Wx-A+ qDTY1-1_1+ qDTY1-1_4+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY4-1_2	1
	Wx-A+ qDTY2-2_1+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]	1
	Wx-A+ MSU7_3_30047928_[G/A]+ MSU7_3_30742072_[T/G]+ qDTY12-1_2	1
<b>Total</b>		<b>355</b>

**Table 11.4c: List of selected genotypes of Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	BR Reg. No	Parentage	No. of progenies transplanted	No. of progenies harvested
1	BR13060	BRR1 dhan28/BR8258-7-1-5-2B4	300	19
2	BR13061	BRR1 dhan29/BR7833-19-2-3-5-P1	300	23
3	BR13062	BRR1 dhan42/BR7840-54-3-4-3	280	15
4	BR12027	BRR1 dhan50/BR7879-17-2-4-HR3-P1	300	13
5	BR13064	BRR1 dhan60/BR7528-2R-19-16-RIL-51	300	6
6	BR13065	BRR1 dhan63/BR7881-62-3-7-P3	270	10
7	BR13066	BRR1 dhan81/BR7879-17-2-4-HR3-P1	300	23
8	BR13067	BR7879-17-2-4-HR3-P1/BR7528-2R-19-16-RIL-51	250	8
9	BR13068	BRR1 dhan43/BR7879-17-2-4-HR3-P1	300	14
10	BR13069	BRR1 dhan63/BR8258-7-1-5-2B4	280	40
11	BR13070	BRR1 dhan81/BR7840-54-3-4-3	230	18
12	BR13071	BRR1 dhan28/BR7528-2R-19-16-RIL-51	300	23
13	BR13072	BRR1 dhan28/IR95132-12-8-6-8-GBS	300	23
14	BR13073	BRR1 dhan28/IR99676-17-1-1	300	30
15	BR13074	BRR1 dhan42/IR99676-17-1-1	280	54
16	BR13075	BRR1 dhan42/IR95132-12-8-6-8-GBS	300	24
17	BR13076	BRR1 dhan42/BR7528-2R-19-16-RIL-51	300	21
18	BR13077	BRR1 dhan42/BR8258-7-1-5-2B4	250	37
19	BR13078	BRR1 dhan43/IR99676-17-1-1	280	27
20	BR13079	BRR1 dhan43/IR95132-12-8-6-8-GBS	300	20
21	BR13080	BRR1 dhan43/BR7528-2R-19-16-RIL-51	230	21
22	BR13081	BRR1 dhan60/BR8258-7-1-5-2B4	300	10
23	BR13082	BRR1 dhan81/IR99676-17-1-1	280	26
24	BR13083	BRR1 dhan81/IR95132-12-8-6-8-GBS	300	27
<b>Total</b>			<b>6530</b>	<b>532</b>

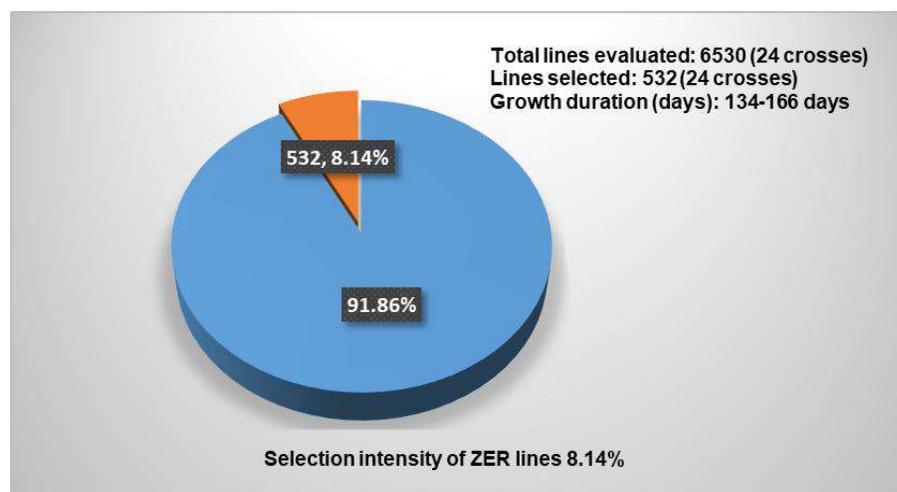


Fig. 11.4c: Selection intensity genotypes of LST, ZER, Boro 2023-24

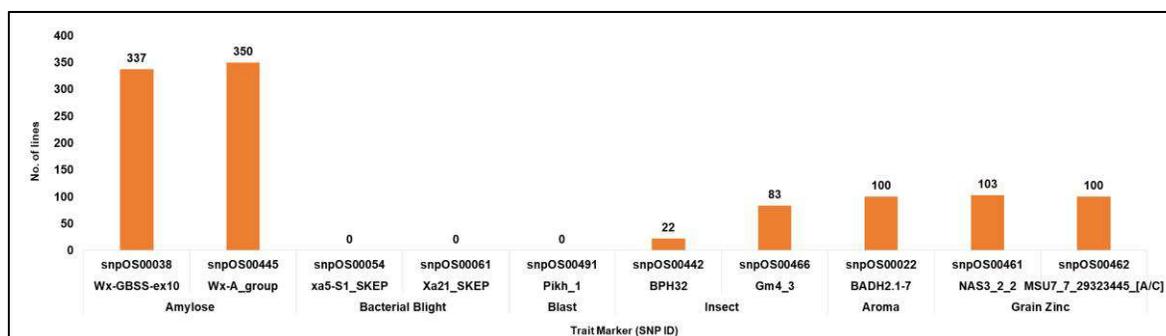


Fig. 11.4d: Trait marker profile of genotypes of LST, ZER, Boro 2023-24

Table 11.4.d. List of trait marker combination of the crosses of Line Stage Testing (LST) Trial, Development of Zinc Enriched Rice (ZER), Boro 2023-24

SN	BR	Genotypic data	No. of lines
1	BR13060	<i>Wx-A</i>	1
		<i>Wx-10+Wx-A</i>	9
		<i>Wx-10</i>	1
2	BR13061	<i>Wx-10+Wx-A+qGm4(t)+fgr-1</i>	6
		<i>qGm4(t)+fgr-1</i>	14
		<i>qGm4(t)</i>	1
		<i>Wx-10+Wx-A</i>	1
3	BR13062	<i>Wx-10+Wx-A+fgr-1+NAS3_2+NAS3</i>	2
		<i>NAS3</i>	1
		<i>fgr-1</i>	3
		<i>NAS3_2+NAS3</i>	4
		<i>fgr-1+NAS3_2+NAS3</i>	4
4	BR12027	<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	3
		<i>Wx-10+Wx-A+qGm4(t)</i>	6
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	2
		<i>Wx-10+Wx-A+qGm4(t)+fgr-1</i>	1
		<i>Wx-10+Wx-A+fgr-1</i>	1
5	BR13064	<i>Wx-10+Wx-A+fgr-1+NAS3_2</i>	1
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	1
		<i>fgr-1</i>	2
		<i>Wx-10+Wx-A+BPH32+qGm4(t)+fgr-1</i>	1
6	BR13065	<i>Wx-10+Wx-A+fgr-1</i>	1
		<i>Wx-10+Wx-A</i>	3
7	BR13066	<i>Wx-10+Wx-A+qGm4(t)</i>	12
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	4
		<i>Wx-10+Wx-A+BPH32+qGm4(t)</i>	3
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2</i>	1
		<i>Wx-10+Wx-A+BPH32+qGm4(t)+NAS3_2+NAS3</i>	2
		<i>Wx-10+Wx-A</i>	1
8	BR13067	<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	4
		<i>qGm4(t)+NAS3_2+NAS3</i>	4
9	BR13068	<i>Wx-10+Wx-A+BPH32+qGm4(t)+NAS3_2+NAS3</i>	1
		<i>Wx-A</i>	1
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	6
		<i>Wx-10+Wx-A</i>	4
10	BR13069	<i>Wx-10+Wx-A+qGm4(t)</i>	2
		<i>fgr-1</i>	2
		<i>Wx-10+Wx-A</i>	6
		<i>Wx-10+Wx-A+qGm4(t)</i>	3
		<i>qGm4(t)</i>	1

SN	BR Registrans	Genotypic data	No. of lines
		<i>Wx-A+fgi-1</i>	1
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	1
11	BR13070	<i>Wx-10+Wx-A+fgi-1</i>	3
		<i>fgi-1</i>	5
		<i>Wx-10+Wx-A</i>	1
12	BR13071	<i>Wx-10+Wx-A</i>	7
		<i>Wx-10+Wx-A+BPH32</i>	1
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	2
		<i>Wx-10+Wx-A+qGm4(t)</i>	4
		<i>NAS3_2+NAS3</i>	2
13	BR13072	<i>Wx-10+Wx-A</i>	17
		<i>Wx-A</i>	2
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	1
14	BR13073	<i>Wx-10+Wx-A</i>	60
15	BR13074	<i>fgi-1</i>	22
		<i>Wx-10+Wx-A+fgi-1</i>	19
		<i>fgi-1+NAS3_2+NAS3</i>	7
		<i>Wx-10+Wx-A</i>	1
		<i>Wx-10+Wx-A+fgi-1+NAS3_2+NAS3</i>	5
16	BR13075	<i>Wx-10+Wx-A</i>	21
		<i>Wx-A</i>	1
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	1
17	BR13076	<i>Wx-10+Wx-A</i>	9
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	8
		<i>NAS3_2+NAS3</i>	2
18	BR13077	<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	16
		<i>NAS3_2+NAS3</i>	3
		<i>Wx-10+Wx-A+qGm4(t)+NAS3_2+NAS3</i>	2
		<i>Wx-10+Wx-A</i>	8
		<i>Wx-10+Wx-A+BPH32</i>	1
19	BR13078	<i>Wx-10+Wx-A</i>	26
		<i>Wx-10+Wx-A+BPH32+</i>	1
20	BR13079	<i>Wx-10+Wx-A</i>	11
		<i>Wx-A</i>	5
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	2
		<i>NAS3_2+NAS3</i>	2
21	BR13080	<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	4
		<i>Wx-10+Wx-A</i>	11
22	BR13081	<i>Wx-A</i>	1
		<i>Wx-10+Wx-A</i>	2
		<i>NAS3_2</i>	2
		<i>Wx-10+Wx-A+NAS3_2+NAS3</i>	1
23	BR13082	<i>Wx-10+Wx-A</i>	21
		<i>Wx-10+Wx-A+BPH32</i>	1
24	BR13083	<i>BPH32+NAS3_2+NAS3</i>	1
		<i>Wx-10+Wx-A</i>	9
		<i>BPH32</i>	10
		<i>Wx-A</i>	2
<b>Total</b>			<b>473</b>

### Experiment 11.5: Observational Yield Trial (OYT)

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**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 220 phenotypically fixed genotypes were evaluated along with five standard check varieties BRR1 dhan49, BRR1 dhan62, BRR1 dhan72, BRR1 dhan75 and BRR1 dhan87 in T. Aman season; and in Boro season 471 phenotypically fixed genotypes were evaluated in OYT#1 (GD: 135-150 days) and OYT#2 (GD: 150-170 days). In OYT#1, 183 lines were evaluated along with BRR1 dhan96 and Bangabandhu dhan100 and in OYT#2, 288 lines were evaluated along with BRR1 dhan74 and BRR1 dhan92. Twenty-five-day-old seedlings in T. Aman and thirty-day-old seedlings in Boro season were transplanted in 5.4 m × 4 rows plot using single seedling at a spacing of 20 cm × 15 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 and discussion:** In T. Aman, a total of 56 genotypes out of 220 genotypes were selected based on their grain yield performances and grain type in comparison to check varieties. (Table 11.5a). In Boro, 18 genotypes from OYT#1 and 32 genotypes from OYT#2 were selected from 471 genotypes based on grain yield performances and grain type in comparison to check varieties. (Table 11.5b).

**Table 11.5a: List of selected materials from Observational Yield Trial (OYT), Development of Zinc Enriched Rice (ZER), T. Aman, 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)
1	BR11665-3R-4	135	134	7.609
2	BR11665-3R-27	136	133	6.99
3	BR11665-3R-56	137	132	7.069
4	BR11666-3R-9	143	133	7.367
5	BR11666-3R-14	139	142	6.858
6	BR11666-3R-36	134	124	7.251
7	BR11666-3R-53	133	116	6.839
8	BR11666-3R-74	132	129	7.706
9	BR11667-3R-5	136	124	6.769
10	BR11669-3R-68	137	123	7.529
11	BR11669-3R-137	140	122	6.784
12	BR11669-3R-178	142	122	6.705
13	BR11669-3R-5	141	120	6.893
14	BR11669-3R-17	137	124	6.869
15	BR11669-3R-54	120	136	7.093
16	BR11669-3R-106	141	132	7.659
17	BR11672-3R-24	135	128	7.056
18	BR11672-3R-45	134	140	7.158
19	BR11673-3R-3	132	128	6.757
20	BR11673-3R-21	138	122	6.715
21	BR11679-3R-10	132	128	6.911
22	BR11679-3R-35	135	134	6.746
23	BR12143-3R-11	136	139	6.784
24	BR12143-3R-29	122	133	7.44
25	BR12143-3R-68	117	130	7.376
26	BR12145-3R-8	130	132	7.013
27	BR12145-3R-82	133	108	7.721
28	BR12145-3R-105	124	123	7.342
29	BR12145-3R-127	125	139	6.895
30	BR12145-3R-139	124	134	7.224
31	BR12145-3R-153	131	127	7.115
32	BR12145-3R-171	131	129	7.381
33	BR12145-3R-187	124	136	6.809
34	BR12145-3R-201	124	125	7.716
35	BR12145-3R-214	133	131	6.996
36	BR12145-3R-232	123	125	6.854
37	BR12145-3R-246	124	125	6.816
38	BR12145-3R-263	129	130	7.572
39	BR12145-3R-271	125	121	7.141
40	BR12145-3R-280	123	124	6.769
41	BR12145-3R-292	140	134	6.981
42	BR12145-3R-300	131	139	6.855
43	BR12145-3R-33	134	131	6.926
44	BR12145-3R-48	124	123	6.787
45	BR12146-3R-7	124	131	7.355
46	BR12146-3R-20	116	137	7.472
47	BR12146-3R-49	124	124	7.441
48	BR12146-3R-73	117	121	6.739
49	BR12146-3R-92	120	138	6.769
50	BR12146-3R-136	127	137	7.579
51	BR12146-3R-183	115	125	7.199
52	BR12146-3R-205	119	143	7.629
53	BR12147-3R-228	96	117	6.787
54	BR12149-3R-241	119	106	6.847
55	BR12152-3R-264	115	111	7.477
56	BR12153-3R-278	116	121	6.806
57	BRR1 dhan49 (Ck)	136	107	5.793
58	BRR1 dhan62 (Ck)	102	98	5.757
59	BRR1 dhan72 (Ck)	133	120	6.08
60	BRR1 dhan75 (Ck)	114	107	5.825
61	BRR1 dhan87 (Ck)	125	124	5.945
	LSD (0.05)	9.15	10.07	0.828

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)
	h <sup>2</sup> b	0.77	0.76	0.32

D/S: 24/06/2023 D/T: 19/07/2023

**Table 11.5b: List of selected materials from Observational Yield Trial (OYT), Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zn (mg/kg)
<b>OYT#1</b>					
1	BR11423-4R-65	126	153	8.353	25.0
2	BR12031-4R-217	132	160	8.005	26.0
3	BR11420-4R-30	122	157	8.431	31.5
4	BR11423-4R-18	126	152	8.520	19.0
5	BR11423-4R-196	135	150	8.596	18.5
6	BR12026-4R-627	113	147	8.210	19.0
7	BR12035-4R-1	119	147	8.184	30.5
8	BR11423-4R-190	127	147	8.041	28.5
9	BR11431-4R-28	136	154	8.481	28.0
10	BR11431-4R-38	134	151	8.194	19.0
11	BR11431-4R-227	127	151	8.077	21.0
12	BR12026-4R-131	113	150	8.036	23.5
13	BR12026-4R-142	112	146	8.365	21.5
14	BR12038-4R-154	114	150	8.242	18.5
15	BR12038-4R-302	126	150	8.231	21.0
16	BR12038-4R-386	132	149	9.129	22.0
17	BR12038-4R-403	111	146	8.238	23.0
18	BR11423-4R-153	128	149	8.365	24.5
19	BRRi dhan96 (Ck)	103	149	5.538	18.5
20	Bangabandhu dhan100 (Ck)	111	146	7.414	25.0
	LSD (0.05)	14.629	11.128	1.199	
	h <sup>2</sup> b	0.37	0.27	0.63	
<b>OYT#2</b>					
1	BR11423-4R-136	131	160	7.942	25.0
2	BR11431-4R-172	121	152	8.169	22.5
3	BR11433-4R-25	125	157	9.543	21.5
4	BR11433-4R-119	131	152	8.957	20.0
5	BR12025-4R-134	123	153	8.347	21.5
6	BR12025-4R-175	126	153	7.882	14.5
7	BR12027-4R-26	125	154	7.820	21.5
8	BR12027-4R-118	137	158	9.445	22.5
9	BR12027-4R-151	129	156	8.176	25.0
10	BR12027-4R-156	117	148	8.111	20.0
11	BR12036-4R-51	120	145	7.913	25.0
12	BR12036-4R-200	119	148	8.331	25.5
13	BR12036-4R-203	132	148	8.110	24.5
14	BR12036-4R-541	155	153	7.802	27.5
15	BR12038-4R-108	135	149	7.868	23.5
16	BR12038-4R-420	134	148	8.402	23.5
17	BR11423-4R-155	124	146	7.965	22.0
18	BR11423-4R-158	125	152	7.906	25.5
19	BR11437-4R-56	118	155	7.948	28.5
20	BR12025-4R-26	121	154	8.113	20.5
21	BR12028-4R-27	117	156	7.864	20.5
22	BR12028-4R-237	116	156	8.156	21.0
23	BR12031-4R-96	128	151	8.268	22.5
24	BR12031-4R-222	130	158	8.104	22.5
25	BR12038-4R-121	124	148	8.278	19.0
26	BR11423-4R-178	141	146	8.513	26.5
27	BR12027-4R-169	138	159	8.206	25.5
28	BR12031-4R-3	122	158	7.889	25.5
29	BR12031-4R-179	115	158	8.063	26.5
30	BR12036-4R-184	140	146	7.860	28.5
31	BR12036-4R-460	121	146	7.907	29.5
32	BR12025-4R-264	107	156	7.924	19.5
33	BRRi dhan74 (Ck)	107	149	7.720	24.2
34	BRRi dhan92 (Ck)	115	159	7.445	20.5
	LSD (0.05)	11.248	5.716	1.166	
	h <sup>2</sup> b	0.69	0.60	0.52	

OYT#1: D/S: 05/12/2023 D/T: 12/01/2024 OYT#2: D/S: 08/12/2023 D/T: 14/01/2024

## Experiment 11.6: Preliminary Yield Trial (PYT)

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** Evaluation of initial yield potential in a replicated trial.

**Materials and methods:** A total of 15 entries in PYT were evaluated in T. Aman season 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. The 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, seven genotypes were selected from PYT based on better grain yield and other agronomic performances (Table 11.6).

**Table 11.6: Yield performances of the genotypes of Preliminary Yield Trial (PYT), Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Grain type
1	BR11664-3-2-1	147	139	6.032	22.2	LB
2	BR11664-3-2-3*	133	140	6.603	23.5	LS
3	BR11665-3-10-2	132	133	6.014	23.6	LS
4	BR11665-3-10-4	140	131	5.762	21.4	MB
5	BR11665-3-5-2*	122	121	6.554	19.7	MB
6	BR11666-3-6-2*	110	138	6.557	22	LB
7	BR11672-3-13-1*	140	131	6.562	24.5	MB
8	BR11672-3-3-1	142	125	5.437	23.9	MB
9	BR11672-3-3-2*	136	125	6.644	25.3	LB
10	BR11672-3-3-4	134	119	5.591	24.8	LS
11	BR11672-3-6-3*	129	124	6.205	22.1	LS
12	BR11675-3-9-1*	137	118	6.337	20.2	LS
13	BR12145-3-19	141	134	5.604	18.5	MB
14	BR12145-3-25	117	138	6.151	19.3	LS
15	BR12145-3-5	128	115	6.037	22.8	MB
16	BRR1 dhan49 (Ck)	108	132	5.668	17.4	MS
17	BRR1 dhan62 (Ck)	95	101	5.495	19.2	MB
18	BRR1 dhan72 (Ck)	121	127	5.523	23.4	MB
19	BRR1 dhan75 (Ck)	106	115	5.666	18.5	LS
20	BRR1 dhan87 (Ck)	124	126	5.712	18.5	LS
	LSD (0.05)	2.03	1.93	0.612		
	h <sup>2</sup> b	0.99	0.97	0.21		

\*Selected genotypes D/S: 23/06/2023 D/T: 20/07/2023

## Experiment 11.7: Secondary Yield Trial (SYT)

**Principal Investigator:** M A Kader

**Co-investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific Objectives:** Secondary evaluation of promising breeding lines in replicated trial.

**Materials and methods:** A total of eight genotypes in T. Aman and 11 genotypes in Boro season were transplanted 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 and discussion:** In T. Aman, two genotypes were selected (Table 11.7a). In Boro season, three 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 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Amylose (%)	Grain type
1	BR11140-4-4-2-6	113	134	6.088	21.6	24.6	MB
2	BR11140-4-5-4-3	123	120	5.827	22.6	27.3	LB
3	BR11142-13-4-4-3	123	124	5.994	22.4	23.8	MB
4	BR11143-5-3-3-4	126	137	5.517	21.7	24.5	LS
5	BR11151-1-6-2-4*	109	116	6.517	23.4	25.4	MB
6	BR11153-1-2-2-5*	133	134	6.238	5.712	LS	25.0
7	BR11153-5-1-1-1	134	127	5.294	5.628	LS	23.3
8	BR11174-1-2-3-5	143	140	5.837	26.9	24.5	LB
9	BRR1 dhan49 (Ck)	114	135	5.911	16.4	24.9	MB
10	BRR1 dhan62 (Ck)	98	105	5.703	19.4	25.7	LS
11	BRR1 dhan72 (Ck)	120	127	5.820	22.4	27.2	LB
12	BRR1 dhan75 (Ck)	106	114	5.598	18.5	26.4	LS
13	BRR1 dhan87 (Ck)	125	125	5.901	18.5	26.6	LS
LSD (0.05)		3.91	1.46	0.730			
h <sup>2</sup> b		0.92	0.98	0.00			

\*Selected genotypes D/S: 2/06/2023 D/T: 19/07/2023

**Table 11.7b: Yield performance of the genotypes in Secondary Yield Trial (SYT), Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Zinc (mg/kg)	Amylose %	Grain type
1	BR11401-1-2-4-1*	115	148	8.421	20.2	26.2	MB
2	BR11401-8-3-1-1*	104	149	8.521	22.3	23.3	MB
3	BR11406-8-6-1-3	127	158	7.488	19.2	23.4	MB
4	BR12035-24-2-2	113	145	6.857	24.6	-	-
5	BR12038-36-5-2	131	154	6.976	24.7	26.8	MB
6	BR12038-65-2-1*	105	147	8.057	26.0	25.4	MB
7	BR12041-16-6-2	127	147	7.315	22.8	23.2	LS
8	BR12041-17-5-1	114	148	7.190	22.5	26.8	LS
9	BR12041-34-1-3	117	144	7.643	24.2	21.5	MB
10	BR12041-6-1-3	126	147	6.903	23.5	26.1	LS
11	BR12041-8-4-3	127	151	7.424	24.2	27.6	LS
12	Bangabandhu dhan100 (Ck)	107	144	7.046	25.5	26.8	MB
13	BRR1 dhan28 (Ck)	107	144	7.215	17.8	26.3	MS
14	BRR1 dhan74 (Ck)	101	145	7.200	24.5	25.6	MB
15	BRR1 dhan89 (Ck)	111	156	7.385	19.5	28.5	LB
LSD (0.05)		7.080	1.686	0.474			
h <sup>2</sup> b		0.88	0.97	0.79			

\*Selected genotypes D/S: 01/12/2023 D/T: 09/01/2024

### 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:** Four genotypes in T. Aman and six 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 three 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 Barishal, BRRI Sirajganj, BRRI Satkhira, BRRI Bhanga and BRRI Rajshahi

**Results and discussion:** None of the entries were selected for Advanced Line Adaptive Research Trial (ALART) from both in T. Aman and Boro season (**Table 11.8a** and **Table**

11.8c). Grain quality data for the genotypes of RYT from T. Aman and Boro seasons are presented in Table 11.8b and 11.8d.

**Table 11.8a: Yield performance of the genotypes in Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

SN	Designation	Plant Growth		Grain Yield (t/ha)								Zn (mg/kg)	
		height (cm)	duration (days)	Gazi pur	Bari shal	Cumi lla	Raj shahi	Sat khira	Kush tia	Shiraj ganj	BLUE		BLUP
1	BR10854-4-1-1-2-8	102	103	6.022	3.588	5.563	5.208	3.298	5.034	5.592	4.928	5.13	30.9
2	BR10855-3-2-5-2-5	108	99	6.194	3.693	6.006	4.867	4.225	5.044	4.281	5.320	5.32	23.2
3	BR10863-8-3-5-3-2	95	98	6.365	3.865	6.160	5.134	3.788	5.341	4.631	5.434	5.37	27.3
4	BR11176-16-7-4-4-2	113	101	6.080	3.789	6.119	4.603	2.944	5.145	4.575	4.903	5.11	35.0
5	BRR1 dhan49 (Ck)	88	101	6.331	4.057	5.749	5.280	4.167	5.421	5.138	5.397	5.35	16.4
6	BRR1 dhan72 (Ck)	95	98	6.353	3.966	5.848	5.162	4.933	5.547	5.691	5.606	5.46	22.4
7	BRR1 dhan87 (Ck)	100	96	6.281	3.666	5.799	5.455	5.051	5.692	5.460	5.667	5.49	18.5
8	BRR1 dhan93 (Ck)	98	103	6.270	3.590	5.766	5.027	3.966	5.369	4.519	5.248	5.28	
LSD (0.05)		10.95	3.96	0.342	0.315	0.393	0.232	0.156	0.250	0.422	1.020		
h <sup>2</sup> b		0.80	0.56	0.24	0.36	0.38	0.64	0.96	0.65	0.72	0.19		

**Table 11.8b: Physico-chemical properties of the genotypes of Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), T. Aman 2023-24**

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (L) (mm)	Milled Rice breadth (B) (mm)	L-B ratio	Size & Shape	Appearance	Amylose (%)	Protein (%)	ER	IR
BR10854-4-1-1-2-8	65.6	48.5	5.8	2.0	2.9	MB	V. good	26.5	8.1	1.5	4.6
BR10855-3-2-5-2-5	64.4	56.2	5.4	1.9	2.8	MB	Good	26.8	7.2	1.5	4.6
BR10863-8-3-5-3-2	68.2	58.6	5.2	1.8	2.8	MB	Good	26.5	7.4	1.6	4.6
BR11176-16-7-4-4-2	62.8	42.7	6.9	2.0	3.4	LS	Good	27	8.0	1.5	4.3
BRR1 dhan49 (Ck)	67.3	59.6	5.5	2.0	2.7	MB	Good	24.7	8.7	1.4	3.6
BRR1 dhan72 (Ck)	68.7	56.7	6.5	2.5	2.6	LB	Good	26	8.9	1.4	3.3
BRR1 dhan87 (Ck)	67.9	52.9	6.3	2.0	3.1	LS	Good	27	7.0	1.3	3
BRR1 dhan93 (Ck)	68.6	63.5	5.1	2.0	2.5	MB	Good	26.1	7.5	1.6	3.4

**Table 11.8c: Yield performance of the genotypes in Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), Boro 2023-24**

SN	Designation	Plant Growth		Grain Yield (t/ha)										
		Height (cm)	duration (days)	Rang pur	Cum illa	Bari shal	Sat khira	Raj shai	Siraj ganj	Kush tia	Bhan ga gazi	Sona gazi	Gazi pur	BLUE
1	BR10552-1-1-3-4	119	152	7.762	5.338	4.828	6.391	7.100	6.394	6.852	7.446	4.039	6.423	6.504
2	BR10552-1-1-4-6	111	148	6.945	5.145	5.821	7.038	8.007	5.849	7.272	7.537	2.866	7.237	6.761
3	BR10570-29-7-3-2	99	150	7.442	4.433	5.711	6.431	7.080	4.427	6.526	7.138	6.747	7.805	6.333
4	BR10571-15-6-8-5	97	149	6.447	5.593	6.772	7.637	7.535	6.465	7.821	7.44	6.055	7.263	6.997
5	BR10572-2-7-1-4	116	153	8.375	4.909	4.933	5.916	6.993	5.043	6.711	7.028	5.972	6.999	6.323
6	BR9674-1-4-1-3-P1	111	155	7.254	5.829	4.825	5.481	7.461	5.952	6.268	7.206	4.704	5.256	6.170
7	BRR1 dhan74 (Ck)	99	144	7.680	5.566	6.864	7.895	7.191	6.222	7.444	7.282	7.861	7.493	7.071
8	BRR1 dhan89 (Ck)	109	153	7.778	4.986	6.235	5.290	7.957	6.703	7.898	8.205	7.088	7.632	6.965
9	Bangabandhu dhan100 (Ck)	108	145	N/A	4.345	5.972	6.788	7.242	6.049	6.695	7.419	6.743	7.117	6.550
LSD (0.05)		3.822	5.188	0.261	0.430	0.455	0.888	0.244	0.348	0.546	0.197	0.430	0.769	0.663
h <sup>2</sup> b		0.96	0.94	0.95	0.88	0.91	0.92	0.89	0.95	0.80	0.91	0.98	0.74	0.65

None of the entries were selected

**Table 11.8d: Physico-chemical properties of the genotypes of Regional Yield Trial (RYT), Development of Zinc Enriched Rice (ZER), Boro 2023-24**

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (L) (mm)	Milled Rice breadth (B) (mm)	L-B ratio	1000 grain wt (g)	Size & Shape	Amylose (%)	Protein (%)	Zinc (mg/kg)	ER	IR
BR10552-1-1-3-4	69	47	6.1	1.9	3.2	23.8	LS	17.7	7.5	21.9	1.4	3.7
BR10552-1-1-4-6	69	43	6.6	2.1	3.2	26.3	LS	17.4	7.2	23.8	1.3	3.5
BR10570-29-7-3-2	70	51	5.8	1.7	3.4	18.5	MS	17.2	7.6	25.0	1.3	4.7
BR10571-15-6-8-5	70	56	5.5	1.9	2.9	18.8	MB	21.8	7.0	23.1	1.4	3.7
BR10572-2-7-1-4	70	44	6.6	1.9	3.6	25.1	LS	20.9	7.3	23.3	1.4	3.6
BR9674-1-4-1-3-P1	69	32	5.2	2.2	2.4	19.4	MB	25.8	7.5	23.5	1.4	3.4
BRR1 dhan74 (Ck)	70	22	6.4	2.5	2.6	30.6	LB	25.8	8.4	24.5	1.5	3.4

Designation	Milling outturn (%)	Head rice yield (%)	Milled Rice length (L) (mm)	Milled Rice breadth (B) (mm)	L-B ratio	1000 grain wt (g)	Size & Shape	Amylos e (%)	Protei n (%)	Zin c (mg / kg)	ER	IR
BRRRI dhan89 (Ck)	69	62	6.1	2.2	2.8	23.3	LB	26.9	7.0	19.5	1.4	3.9
Bangabandhu dhan100 (Ck)	68	66	5.5	1.8	3.0	18.2	MB	26.2	7.8	25.5	1.5	3.1

## 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:** N Jahan 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:** Eighteen parents including donors for gall midge (GM) and brown plant hopper (BPH) resistance were grown in T. Aman 2023-24, and 20 parents for GM, GLH, WBPH and BPH were used for crossing in Boro 2023-24 in three sets at BRRRI 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 BRRRI Gazipur (**Table 12.1**). Thirty to 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:** Eighteen crosses for forward breeding, three F<sub>1</sub> crosses for Line Augmentation, three backcrosses (BC<sub>1</sub>F<sub>1</sub>) and six crosses for pre-breeding were made in T. Aman, and 19 crosses for forward breeding, two crosses for pre-breeding, three F<sub>1</sub> crosses for Line Augmentation and two top crosses were made in Boro season. Mature F<sub>1</sub> 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 2023-24**

Sl#	Cross combination	Trait of interest	No. of F <sub>1</sub> seeds
<b>T. Aman 2023-24</b>			
<b>Forward breeding</b>			
1	BR 12193-5 R-54/IR101791-10-1-4-3-2-4	<i>bph18, bph32, xa5, Xa21, Wx-A_group</i>	94
2	BR 12216-5 R-31/BR 11035-4 R -101	<i>bph17, bph21, bph32, Wx-A_group</i>	71
3	BR12193-4R-54/IR107136-7-1-2-1	<i>bph17, bph18, Gm4, W-A_group</i>	21
4	BR 12216-5 R-31/IR107736-7-1-2-1	<i>bph32, Gm4_3, Gm4_4, xa5, Wx-A_group,</i>	94
5	BR 12193-5 R-54/IR126952-41-148-38-9-60-B	<i>bph17, bph21, Wx-A_group</i>	59
6	BR13486-4R-94/BR13106-4R-10	<i>bph32, Wx-A_group</i>	7

7	BR 11035-4 R -101/IR126952-41-148-38-9-60-B	<i>bph17, bph32, Gm4, xa5, xa13, Xa21, Wx-A_group</i>	7
8	BR 11035-4 R -101/BR 11052-4 R -234	<i>bph17, bph21, Wx-A_group</i>	80
9	BR11716-4R-102/BR12193-4R-54	<i>bph9, Bph17_all, Wx-A_group</i>	116
10	BR13094-4R-123/BR13097-4R-105	<i>bph32, Gm4, Wx-A_group</i>	69
11	BR 13094-4 R-123/IR107736-7-1-2-1	<i>bph9, bph17, bph18, Gm4, W-A_group</i>	57
12	BR 13094-4 R-123/BR 12193-5 R-54	<i>bph9, bph17, bph32, Gm4, W-A_group</i>	52
13	BR 13094-4 R-123/IR101791-10-1-4-3-2-4	<i>bph9, bph32, Wx-A_group</i>	25
14	BR 11052-4 R -234/IR126952-41-148-38-9-60-B	<i>bph17, bph32, Gm4, Pi-ta, xa5, Xa21, Waxy-A, Chalk5</i>	78
15	BR 13088-4 R-423/BR 12216-5 R-31	<i>bph17, bph32, Wx-A_group</i>	56
16	BR 13088-4 R-423/BR 11035-4 R -101	<i>bph9, Gm4_3, Gm4_4, Wx-A_group,</i>	6
17	BR13088-4R-423/IR1017791-10-1-4-3-2-4	<i>bph17, bph21, bph32,</i>	6
18	BR13088-4R-423/BR11716-4R-102	<i>bph17, bph32, Wx-A_group</i>	9
<b>Line Augmentation (F<sub>1</sub>)</b>			
1	BR 13094-4 R-123/IR126952-29-82-206-12-3	<i>bph32, Gm4_3, Gm4_4, Wx-A_group</i>	63
2	BR 13088-4R-423/IR126952-29-82-206-12-3	<i>bph9, bph17, bph32, Gm4, W-A_group</i>	44
<b>Backcross (BC<sub>1</sub>F<sub>1</sub>)</b>			
1	BR12180-4R-17*2/LT489	<i>bph, Wx-A_group</i>	56
2	BR12671-4R-73*2/LT489	<i>bph, Wx-A_group, Gm4</i>	20
3	BR12208-4R-402*2/LT489	<i>bph32, Wx-A_group</i>	24
<b>Pre-Breeding (BC<sub>2</sub>F<sub>1</sub>)</b>			
1	BR12193-4R-54/LT489	<i>bph9, bph17_all, bph32, Wx-A_group</i>	70
2	BR13097-4R-105/LT489	<i>bph32, Gm4, Wx-A_group</i>	63
3	BR12193-4R-54/Fatema dhan	<i>bph9, bph17_all, Wx-A_group</i>	24
4	Fatema dhan/BR13088-4R-423	<i>bph32, Wx-A_group</i>	60
5	Fatema dhan/IR126952-41-148-38-9-60-B	<i>bph17, bph21, Wx-A_group</i>	66
6	Fatema dhan/IR126952-29-82-206-12-3	<i>bph17, bph21, Wx-A_group</i>	101
<b>Boro 2023-24</b>			
<b>Forward Breeding</b>			
1	BR13104-4R-80/BR12208-4R-278	<i>bph32, Wx-A_Group</i>	52
2	BR11715-4R-186/D (R)6	<i>bph32, Wx-A_Group</i>	15
3	BR11715-4R-186/BR12685-4R-122	<i>bph9, Wx-A_group</i>	84
4	BR12685-4R-122/BR11715-4R-186	<i>bph9, Wx-A_group</i>	83
5	BR12279-4R-10/D (R)6	<i>bph32, Wx-A_Group</i>	11
6	BR13219-4R-382/IR107736-7-1-2-1	<i>bph17, bph18, bph32, xa5, Xa21, Wx_A_group</i>	18
7	IR107736-7-1-2-1/BR11712-4R-172	<i>bph18 (BPH score-5), xa5, Xa21</i>	44
8	BR12671-4R-253/BR11716-4R-105	<i>bph32, Wx_A_group</i>	14
9	IR101791-10-1-4-3-2-4/BR13219-4R-382	<i>bph17, bph32, bph21, Wx_A_group</i>	70
10	IR101791-10-1-4-3-2-4/BR11715-4R-186	<i>bph17, bph21 (BPH score-3)</i>	22
11	BR13217-4R-135/IR107736-7-1-2-1	<i>bph17, bph18, bph32, xa5, Xa21, Wx_A_group</i>	7
12	BR12715-4R-105/BRRI dhan92	<i>bph32, Wx_A_group</i>	13
13	BR12685-4R-122/BR11716-4R-105	<i>bph9, Wx-A_group</i>	12
14	BR13467-4R-216/IR64	<i>WBPH</i>	120
15	BR13467-4R-139/IR64	<i>WBPH</i>	150
16	BR13479-4R-93/IR64	<i>WBPH</i>	80
17	BR13467-4R-139/BR6	<i>GLH</i>	96
18	BR13479-4R-93/BR6	<i>GLH</i>	76
19	BR13460-4R-276/BR6	<i>GLH</i>	124
<b>Pre Breeding</b>			
1	BR12279-4R-10/Fatema dhan	<i>bph32, Wx_A_group</i>	6
2	BR12672-4R-261/Fatema dhan	<i>bph32, Wx_A_group</i>	8
<b>Line Augmentation (F<sub>1</sub>)</b>			
1	BR11715-4R-105/IR126952-29-82-206-12-3	<i>bph17, bph32, xa5, Pi9, Wx-A_group</i>	14

2	BR13219-4R-382/IR126952-29-82-206-12-3	<i>bph17, bph32, xa5, Pi9, Wx-A_group</i>	9
3	BR12685-4R-122/IR126952-29-82-206-12-3	<i>bph9, bph17, bph32, xa5, Pi9, Wx-A_group</i>	28
<b>Top Cross</b>			
1	BR11052-4R-234/IR126952-41-148-38-9-60-B//BR12208-4R-402	<i>bph17, bph32, xa5, Xa21, Pi9, Wx-A_group</i>	64
2	BR13098-4R-123/IR126952-29-82-206-12-3//BR12208-4R-402	<i>bph9, bph17, bph32, xa5, Pi9, Wx-A_group</i>	60

## Experiment 12.2: F<sub>1</sub> confirmation

**Principal Investigator:** M R A Sarker

**Co Investigators:** N Jahan, 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<sub>1</sub>'s is shown in **Table 12.2**. The F<sub>1</sub> 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<sub>1</sub> and respective parents for QC genotyping to determine true F<sub>1</sub>s. 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:** Twenty-seven and 21 crosses were confirmed through F<sub>1</sub> 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<sub>2</sub> seeds were collected and preserved. These confirmed F<sub>1</sub>s' were registered into BRRI cross list with BR number (**Table 12.2**).

**Table 12.2: List of confirmed F<sub>1</sub>s, Development of Insect Resistant Rice (IRR), T. Aman and Boro 2023-24**

SN	BR cross	Cross combination	Trait of Interest (ToI)
<b>T. Aman 2023-24</b>			
1	BR15919	BR12685-4R-122/BR12208-5R-402	<i>bph9, bph32, Wx-A_group</i>
2	BR15920	BR12671-4R-73/BR12685-4R-122	<i>bph9, Gm4_3, Gm4_4, Wx-A_group</i>
3	BR15921	BR12180-4R-17/BR12208-4R-402	<i>bph32, Wx-A_group</i>
4	BR15922	BR12676-4R-308/BR12208-4R-402	<i>bph9, bph17, bph32, Gm4, W-A_group</i>
5	BR15923	BR12671-4R-73/BR12279-4R-11	<i>bph32, Gm4_3, Gm4_4, Wx-A_group</i>
6	BR15924	BR12676-4R-302/IR10179-10-1-4-3-2-4	<i>bph9, bph17, bph21, W-A_group</i>
7	BR15925	BR12279-5R-11/BR11593-5R-70	<i>bph32, Gm4_3, Gm4_4, xa5, Wx-A_group</i>
8	BR15926	BR12671-4R-73/IR10179-10-1-4-3-2-4	<i>bph32, bph17, bph21, Gm4_3, Gm4_4, Wx-A_group</i>
9	BR15927	BR12180-4R-17/IR126952-29-82-206-12-3	<i>bph32, bph17, bph21, Gm4_3, Gm4_4, Wx-A_group</i>
10	BR15928	BR12685-4R-122/IR107736-7-1-2-1	<i>bph9, bph18, xa5, Xa21, Wx-A_group</i>
11	BR15929	BR11949-4R-137/IR101791-10-1-4-3-2-4	<i>bph17, bph21, Wx-A_group</i>
12	BR15930	BR12180-4R-17/IR101791-10-1-4-3-2-4	<i>bph17, bph21, Wx-A_group</i>
13	BR15931	BR11593-5R-70/IR126952-29-82-206-12-3	<i>bph17, bph32, Gm4, xa5, xa13, Xa21, Wx-A_group</i>

14	BR15932	BR12208-5R-402/IR126952-29-82-206-12-3	<i>bph17, bph32, Gm4, xa5, xa13, Xa21, Wx-A_group</i>
15	BR15933	BR12208-4R-402/IR101791-10-1-4-2-3-4	<i>bph17, bph21, bph32, Wx-A_group</i>
16	BR15934	BR12671-4R-73/IR126952-29-82-206-12-3	<i>bph17, bph32, Gm4, xa5, xa13, Xa21, Wx-A_group</i>
17	BR15935	BR12676-4R-302/BR12279-4R-11	<i>bph9, bph17, bph32, Gm4, W-A_group</i>
18	BR15936	BR12208-4R-402/IR107736-7-1-2-1	<i>bph18, bph32, xa5, Xa21, Wx-A_group</i>
19	BR15937	BR12671-4R-73/BR12208-4R-402	<i>bph17, bph21, bph32, Wx-A_group</i>
20	BR15938	BR12208-4R-402/BRRI dhan89	<i>bph32, Wx-A_group</i>
21	BR15939	BR12180-4R-17/LT489	<i>bph, Gm4, Wx-A_group, MS grain</i>
22	BR15940	BR12671-4R-73/LT489	<i>bph, Gm4, Wx-A_group, MS grain</i>
23	BR15941	BR12208-4R-402/LT489	<i>bph, Gm4, Wx-A_group, MS grain</i>
24	BR15942	BR12180-4R-17/IR107736-7-1-2-1	<i>bph18, xa5, Xa21, Wx-A_group</i>
25	BR15943	BR12208-4R-402/BRRI dhan29	<i>bph32, Wx-A_group</i>
26	BR15944	BR12676-4R-302/IR107736-7-1-2-1	<i>bph9, bph17, bph18, Gm4, W-A_group</i>
27	BR15945	BRAC dhan-2/BR12208-4R-402	<i>bph, Wx-A_group, MS grain</i>
<b>Boro 2023-24</b>			
1	BR16116	BR 12193-5 R-54/IR101791-10-1-4-3-2-4	<i>bph18, bph32, xa5, Xa21, Wx-A_group</i>
2	BR16119	BR 12216-5 R-31/IR107736-7-1-2-1	<i>bph32, Gm4_3, Gm4_4, xa5, Wx-A_group</i>
3	BR16120	BR 12193-5 R-54/IR126952-41-148-38-9-60-B	<i>bph17, bph21, Wx-A_group</i>
4	BR16122	BR 11035-4 R -101/BR 11052-4 R -234	<i>bph17, bph21, Wx-A_group</i>
5	BR16123	BR11716-4R-102/BR12193-4R-54	<i>bph9, bph17_all, Wx-A_group</i>
6	BR16124	BR13094-4R-123/BR13097-4R-105	<i>bph32, Gm4, Wx-A_group</i>
7	BR16125	BR 13094-4 R-123/IR107736-7-1-2-1	<i>bph9, bph17, bph18, Gm4, W-A_group</i>
8	BR16126	BR 13094-4 R-123/BR 12193-5 R-54	<i>bph9, bph17, bph32, Gm4, W-A_group</i>
9	BR16127	BR 13094-4 R-123/IR101791-10-1-4-3-2-4	<i>bph9, bph32, Wx-A_group</i>
10	BR16128	BR 11052-4 R -234/IR126952-41-148-38-9-60-B	<i>bph17, bph32, Gm4, Pi-ta, xa5, Xa21, Waxy-A, Chalk5</i>
11	BR16129	BR 13088-4 R-423/BR 12216-5 R-31	<i>bph17, bph32, Wx-A_group</i>
12	BR16131	BR13088-4R-423/IR101791-10-1-4-3-2-4	<i>bph17, bph21, bph32</i>
13	BR16132	BR13088-4R-423/BR11716-4R-102	<i>bph17, bph32, Wx-A_group</i>
14	BR16133	BR 13094-4 R-123/IR126952-29-82-206-12-3	<i>Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A</i>
15	BR16134	BR 13088-4R-423/IR126952-29-82-206-12-3	<i>Bph17_all, Bph32, Gm4, Pi9, xa5, Waxy-A</i>
16	BR16135	BR12193-4R-54/LT489	<i>bph9, bph17_all, bph32, Wx-A_group</i>
17	BR16137	BR12193-4R-54/Fatema dhan	<i>bph9, bph17_all, Wx-A_group</i>
18	BR16138	Fatema dhan/BR13088-4R-423	<i>bph32, Wx-A_group</i>
19	BR16139	Fatema dhan/IR126952-41-148-38-9-60-B	<i>bph17, bph21, Wx-A_group</i>
20	BR16140	Fatema dhan/IR126952-29-82-206-12-3	<i>bph17, bph21, Wx-A_group</i>
21	BR16143	BR12208-4R-402*2/LT489	<i>bph32, Wx-A_group</i>

### Experiment 12.3: Field Rapid Generation Advance (FRGA)

**Principal Investigator:** M R A Sarker

**Co-investigators:** N Jahan, 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 102 (T. Aman) and 104 (Boro) crosses were grown involving F<sub>2</sub>, F<sub>3</sub> and F<sub>4</sub> population in field following SSD method of breeding at BIRRI 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<sub>5</sub> 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<sup>o</sup> C for five days to break dormancy for initiating next cycle of RGA immediately.

**Results and Discussion:** In total 21,849 (T. Aman) and 20,525 (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 2023-24**

Sl#	BR Reg. #	Cross combination	No. of progenies transplanted	No. of progenies harvested
<b>F<sub>2</sub> generation</b>				
1	BR15143	BR11296-4R-215/IR107736-7-1-2-1	1250	300
2	BR15144	IR107736-7-1-2-1/BR11044-4R-279	1250	300
3	BR15145	BR11039-4R-165/IR101791-10-1-4-3-2-4	1250	300
4	BR15146	BR11295-4R-221/IR126952-41-148-38-9-60-B	1250	300
5	BR15147	BR11295-4R-221/IR107736-7-1-2-1	1250	300
6	BR15148	BR11302-4R-75/BR11052-4R-273	1250	300
7	BR15149	IR101791-10-1-4-3-2-4/BR11044-4R-279	1250	300
8	BR15150	BR12177-5R-308/IR126952-29-82-206-12-8	1250	300
9	BR15151	BR11723-4R-172/IR101791-10-1-4-3-2-4	1250	300
10	BR15152	BIRRI dhan87/BR12177-4R-108	1250	300
11	BR15153	BIRRI dhan87/BR12180-4R-12	1250	300
12	BR15154	BIRRI dhan99/BR11921-4R-227	1250	300
13	BR15155	BR13093-4R-5/BR10162-4R-17	1250	300
14	BR15156	BIRRI dhan87/BR12177-4R-171	1250	300
15	BR15157	BIRRI dhan87/BR12180-4R-14	1250	300
16	BR15158	BR 11948-4 R-129/BR 11949-4 R-258	1250	300
17	BR15159	BR 11593-5 R-55/IR107736-7-1-2-1	1250	300
18	BR15160	BR 11941-4 R-441/IR 126952-29-12-103-8-2	1250	300
19	BR15161	BR11388-4R-45 / BR9891-19-2-2-8	1250	300
20	BR15162	BR 11941-4 R-123/IR 126952-29-12-103-8-2	1250	300
21	BR15163	BR 11386-4 R-325/IR107736-7-1-2-1	1250	300
22	BR15164	BR 11593-5 R-55/IR101791-10-1-4-3-2-4	1250	300
23	BR15165	BR11593-5R-57 / BR11386-4R-325	1250	300
24	BR15166	BR 11942-4 R-134/BR 11949-4 R-39	1250	300
25	BR15167	BR 11941-4 R-123/IR107736-7-1-2-1	1250	300
26	BR15168	BR8340-5-6-1 / IR107995-B-BRGA-BRGA-2-1	1250	300
27	BR15169	BR 11302-4 R-75/IR 126952-29-82-206-12-3	1250	300
28	BR15170	BR 11949-4 R-39/BR 9891-18-5-2-7	1250	300
29	BR15171	BR 11948-4 R-129/IR107736-7-1-2-1	1250	300
30	BR15172	BR 11941-4 R-123/IR101791-10-1-4-3-2-4	1250	300
31	BR15173	BIRRI dhan92/LT489	1250	300
32	BR15174	Sunamukhi/DR-6	1250	300
33	BR15175	BR11388-4R-17/BIRRI dhan99	1250	300
34	BR15176	BR11296-4R-215*2/IR126952-29-82-206-12-8	1250	300

35	BR15177	BR11302-4R-75*2/IR126952-29-82-206-12-8	1250	300
36	BR15178	BR11723-4R-172*2/IR126952-29-82-206-12-8	1250	300
37	BR15179	BR11039-4R-162*2/ IR126952-29-82-206-12-8	1250	300
38	BR15180	D (R)6*2/Rathuhenathi	700	300
39	BR15181	BRRRI dhan87*2/ Rathuhenathi	700	300
40	BR15182	D (R)6*2/Babawee	700	300
Sub-total			48350	12000
<b>F<sub>3</sub> generation</b>				
1	BR14740	BR9667-54-2-2-97*2/Fatema dhan	350	210
2	BR14741	BR11593-5R-54/BR11386-4R-325	350	234
3	BR14742	BR9669-23-3-2-23/IR107995-B-BRGA-BRGA-2-1	350	180
4	BR14743	BR12208-5R-1/BR8340-5-6-1	350	222
5	BR14744	IR108007-B-BRLA-BRLA-25-1/BR11386-4R-287	350	195
6	BR14745	BR11591-5R-12/LT489	350	120
7	BR14746	BR11588-5R-1/LT489	350	168
8	BR14747	BR11723-4R-172/IR126952-41-148-38-9-60-B	350	168
9	BR14748	BR12180-5R-1/IR126952-41-148-38-9-60-B	350	108
10	BR14750	D (R)- 6/IR126952-29-82-206-12-8	350	177
11	BR14751	BR12177-5R-94/IR126952-29-82-206-12-8	350	160
12	BR14752	BR11723-4R-172/IR126952-29-82-206-12-8	350	170
13	BR14753	BRRRI dhan93/BR11052-4R-273	350	234
14	BR14754	BR10762-4R-17/BR11035-4R-101	350	220
15	BR14755	BR12177-5R-94/IR101791-10-1-4-3-2-4	350	180
16	BR14756	BR12208-4R-352/IR101791-10-1-4-3-2-4	350	210
17	BR14757	BR12177-5R-17/IR101791-10-1-4-3-2-4	350	204
18	BR14758	BR111716-4R-120/IR101791-10-1-4-3-2-4	350	150
19	BR14759	BR10/IR101791-10-1-4-3-2-4	350	175
20	BR14760	BR12177-5R-1/IR126952-29-82-206-12-8	350	210
Sub-total			7000	3695
<b>F<sub>4</sub> generation</b>				
1	BR14267	BRRRI dhan75*2/ARC5984	222	102
2	BR14268	BR9880-27-4-1-18/SVIN350	126	120
3	BR14269	BR9881-24-2-2-25/BR8441-46-4-2-8	196	135
4	BR14270	BRRRI dhan87/IR126952-41-148-38-1-52-B	193	105
5	BR14271	BR9881-24-2-2-25/SVIN350	184	120
6	BR14272	BR9880-27-4-1-18/SVIN357	126	125
7	BR14273	BR9881-24-2-2-25/IR126952-443-12-47-4-8-B	123	105
8	BR14274	BRRRI dhan75*2/Jamai Binni	105	70
9	BR14275	BR9880-2-2-2-1/WANXIAN7777-P10	84	60
10	BR14276	BR9880-27-4-1-18/IR126952-41-148-38-9-44-B	63	62
11	BR14277	IR126953-624-22-18-8-1-B/SVIN357	147	145
12	BR14278	BR9880-2-2-2-1/SVIN350	120	110
13	BR14279	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	129	120
14	BR14280	BR9880-27-4-1-18/BR9942-1-2-1-1-B1	123	120
15	BR14281	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	135	126
16	BR14282	BR9880-27-4-1-18/SVIN351	126	120
17	BR14283	BRRRI dhan87*2/ARC5984	147	130
18	BR14284	BR9881-24-2-2-25/SVIN350	111	93
19	BR14285	BR12231-5R-128/BRRRI dhan49	90	90
20	BR14286	BR9888-1-2-2-5/SVIN266	228	130
21	BR14287	BRRRI dhan87/LT489	159	150
Sub-total			3157	2338
<b>F<sub>5</sub> generation</b>				
1	BR14009	BR9880-27-4-1-18 / IR126952-41-148-38-2-49-B	186	170
2	BR14010	BR9667-54-2-2-97 / Fatema dhan	198	190
3	BR14011	BR9880-27-4-1-18 / D (R)-6	279	250
4	BR14012	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	219	215
5	BR14014	BR10698-12-1-5 / IR126952-41-148-38-2-49-B	195	180
6	BR14015	BR9669-23-3-2-23 / IR126953-524-22-18-8-1-B	219	190
7	BR14016	BR9669-21-2-1-19 / IR12652-29-12-475-14-3	255	253
8	BR14017	BR9669-15-3-2-31 / D (R)-6	234	210
9	BR14018	BR9669-21-2-1-19 / IR08N210	207	150
10	BR14019	BRRRI dhan29 / LT 489	183	170
11	BR14021	Sunamukhi / LT 489	75	70
12	BR14022	BR8340-5-6-1 / LT 489	132	110
13	BR14023	BR9880-27-4-1-18 / IR126952-41-125-24-4-2-B	324	290
14	BR14024	BR10698-12-1-5 / IR08N210	174	150

15	BR14025	BR8340-5-6-1 / Fatema dhan	372	340
16	BR14026	BR9669-15-3-2-31 / IR08N210	150	140
17	BR14027	BRRRI dhan75*2 / Fatema dhan	228	228
18	BR14028	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	150	130
19	BR14029	BR9669-23-3-2-23 / WANXIAN7777-P10	153	150
20	BR14069	D (R)-6 / BR8340-5-6-1	183	170
21	BR14070	Fatema dhan / BR8338-34-4-3*2	66	60
Sub-total			4182	3816
<b>Grand Total</b>			<b>62689</b>	<b>21849</b>

**Table 12.3.2: List of segregating population advanced in Field Rapid Generation Advance (FRGA), Development of Insect Resistant Rice (IRR), Boro 2023-24**

Sl#	BR Reg. #	Cross combination	No. of progenies transplanted	No. of progenies harvested
<b>F<sub>2</sub> generation</b>				
1	BR15618	BR 12180-5 R-62/BR 12208-5 R-227	1000	300
2	BR15619	BR 12193-5 R-63/BR 11295-4 R -100	1000	300
3	BR15620	BR 12177-5 R-156/BR 11035-4 R -101	1000	300
4	BR15621	BR 11448-4 R -129/ IR101791-10-1-4-3-2-4	1000	300
5	BR15622	BR 11295-4 R -100/IR101791-10-1-4-3-2-4	1000	300
6	BR15623	BR 12177-5 R-156/IR126952-29-82-206-12-3	1000	300
7	BR15624	BR 12480-5 R-62/IR126952-29-82-206-12-3	1000	300
8	BR15625	IRBPHN-SVIN013-18/IR107736-7-1-2-1	1000	300
9	BR15626	BR 11035-4 R -101/IR101791-10-1-4-3-2-4	1000	300
10	BR15627	BR 12208-5 R-65 /IR101791-10-1-4-3-2-4	1000	300
11	BR15628	BR 12208-5 R-65 /IR107736-7-1-2-1	1000	300
12	BR15629	BR 12208-5 R-65 / IR126952-29-12-103-8-2	1000	300
13	BR15630	BR11712-4R-218/BR11921-4R-135	1000	300
14	BR15631	BR11948-4 R-129 /IR107736-7-1-2-1	1000	300
15	BR15632	BR12193-4 R-63/IRBPHN-SVIN013-18	1000	300
16	BR15633	BR11948-4 R-129 / IR126952-29-12-103-8-2	1000	300
17	BR15634	BR11948-4 R-129 /BR11246-4R-215	1000	300
18	BR15635	DR-6*2/Rathuhenathi	1000	600
19	BR15636	BRRRI dhan92/BR12177-4 R-11	1000	300
20	BR15637	BRRRI dhan89/BR11910-4 R-94	1000	300
21	BR15638	BRRRI dhna92/BR12177-4 R-156	1000	300
22	BR15639	BRRRI dhan89/BR11723-4 R-172	1000	300
Sub-total			22000	6900
<b>F<sub>3</sub> Generation</b>				
1	BR15619	BR 12193-5 R-63/BR 11295-4 R -100	300	220
2	BR15144	IR107736-7-1-2-1/BR11044-4R-279	300	160
3	BR15145	BR11039-4R-165/IR101791-10-1-4-3-2-4	300	235
4	BR15146	BR11295-4R-221/IR126952-41-148-38-9-60-B	300	220
5	BR15147	BR11295-4R-221/IR107736-7-1-2-1	300	160
6	BR15148	BR11302-4R-75/BR11052-4R-273	300	175
7	BR15149	IR101791-10-1-4-3-2-4/BR11044-4R-279	300	180
8	BR15150	BR12177-5R-308/IR126952-29-82-206-12-8	300	150
9	BR15151	BR11723-4R-172/IR101791-10-1-4-3-2-4	300	220
10	BR15152	BRRRI dhan87/BR12177-4R-108	300	270
11	BR15153	BRRRI dhan87/BR12180-4R-12	300	190
12	BR15154	BRRRI dhan99/BR11921-4R-227	300	210
13	BR15155	BR13093-4R-5/BR10162-4R-17	300	210
14	BR15156	BRRRI dhan87/BR12177-4R-171	300	200
15	BR15157	BRRRI dhan87/BR12180-4R-14	300	210
16	BR15158	BR 11948-4 R-129/BR 11949-4 R-258	300	260
17	BR15159	BR 11593-5 R-55/IR107736-7-1-2-1	300	290
18	BR15160	BR 11941-4 R-441/IR 126952-29-12-103-8-2	300	280
19	BR15161	BR11388-4R-45 / BR9891-19-2-2-8	300	190
20	BR15162	BR 11941-4 R-123/IR 126952-29-12-103-8-2	300	170
21	BR15163	BR 11386-4 R-325/IR107736-7-1-2-1	300	210
22	BR15164	BR 11593-5 R-55/IR101791-10-1-4-3-2-4	300	240
23	BR15165	BR11593-5R-57 / BR11386-4R-325	300	175
24	BR15166	BR 11942-4 R-134/BR 11949-4 R-39	300	220
25	BR15167	BR 11941-4 R-123/IR107736-7-1-2-1	300	200
26	BR15168	BR8340-5-6-1 / IR107995-B-BRGA-BRGA-2-1	300	260
27	BR15169	BR 11302-4 R-75/IR 126952-29-82-206-12-3	300	211

28	BR15170	BR 11949-4 R-39/BR 9891-18-5-2-7	300	220
29	BR15171	BR 11948-4 R-129/IR107736-7-1-2-1	300	260
30	BR15172	BR 11941-4 R-123/IR101791-10-1-4-3-2-4	300	180
31	BR15173	BRRRI dhan92/LT489	300	150
32	BR15174	Sunamukhi/DR-6	300	190
33	BR15175	BR11388-4R-17/BRRRI dhan99	300	160
34	BR15176	BR11296-4R-215*2/IR126952-29-82-206-12-8	300	250
35	BR15177	BR11302-4R-75*2/IR126952-29-82-206-12-8	300	270
36	BR15178	BR11723-4R-172*2/IR126952-29-82-206-12-8	300	180
37	BR15179	BR11039-4R-162*2/ IR126952-29-82-206-12-8	300	190
38	BR15180	D (R)6*2/Rathuhenathi	300	180
39	BR15181	BRRRI dhan87*2/ Rathuhenathi	300	170
40	BR15182	D (R)6*2/Babawee	300	210
Sub-total			12000	8326
<b>F<sub>4</sub> generation</b>				
1	BR14740	BR9667-54-2-2-97*2/Fatema dhan	220	190
2	BR14741	BR11593-5R-54/BR11386-4R-325	160	220
3	BR14742	BR9669-23-3-2-23/IR107995-B-BRGA-BRGA-2-1	235	160
4	BR14743	BR12208-5R-1/BR8340-5-6-1	220	208
5	BR14744	IR108007-B-BRLA-BRLA-25-1/BR11386-4R-287	160	140
6	BR14745	BR11591-5R-12/LT489	175	120
7	BR14746	BR11588-5R-1/LT489	180	150
8	BR14747	BR11723-4R-172/IR126952-41-148-38-9-60-B	150	160
9	BR14748	BR12180-5R-1/IR126952-41-148-38-9-60-B	220	103
10	BR14750	D (R)- 6/IR126952-29-82-206-12-8	270	170
11	BR14751	BR12177-5R-94/IR126952-29-82-206-12-8	190	140
12	BR14752	BR11723-4R-172/IR126952-29-82-206-12-8	210	160
13	BR14753	BRRRI dhan93/BR11052-4R-273	210	190
14	BR14754	BR10762-4R-17/BR11035-4R-101	200	195
15	BR14755	BR12177-5R-94/IR101791-10-1-4-3-2-4	210	180
16	BR14756	BR12208-4R-352/IR101791-10-1-4-3-2-4	260	170
17	BR14757	BR12177-5R-17/IR101791-10-1-4-3-2-4	290	120
18	BR14758	BR111716-4R-120/IR101791-10-1-4-3-2-4	280	135
19	BR14759	BR10/IR101791-10-1-4-3-2-4	190	171
20	BR14760	BR12177-5R-1/IR126952-29-82-206-12-8	170	185
Sub-total			3695	3267
<b>F<sub>5</sub> generation</b>				
1	BR14267	BRRRI dhan75*2/ARC5984	120	120
2	BR14268	BR9880-27-4-1-18/SVIN350	120	54
3	BR14269	BR9881-24-2-2-25/BR8441-46-4-2-8	135	132
4	BR14270	BRRRI dhan87/IR126952-41-148-38-1-52-B	195	192
5	BR14271	BR9881-24-2-2-25/SVIN350	120	108
6	BR14272	BR9880-27-4-1-18/SVIN357	125	90
7	BR14273	BR9881-24-2-2-25/IR126952-443-12-47-4-8-B	135	134
8	BR14274	BRRRI dhan75*2/Jamai Binni	70	36
9	BR14275	BR9880-2-2-2-1/WANXIAN7777-P10	62	62
10	BR14276	BR9880-27-4-1-18/IR126952-41-148-38-9-44-B	62	56
11	BR14277	IR126953-624-22-18-8-1-B/SVIN357	165	158
12	BR14278	BR9880-2-2-2-1/SVIN350	110	102
13	BR14279	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	120	48
14	BR14280	BR9880-27-4-1-18/BR9942-1-2-1-1-B1	120	104
15	BR14281	BR9888-1-2-2-5/IR126953-624-22-18-8-1-B	126	90
16	BR14282	BR9880-27-4-1-18/SVIN351	120	76
17	BR14283	BRRRI dhan87*2/ARC5984	130	90
18	BR14284	BR9881-24-2-2-25/SVIN350	113	110
19	BR14285	BR12231-5R-128/BRRRI dhan49	90	86
20	BR14286	BR9888-1-2-2-5/SVIN266	130	88
21	BR14287	BRRRI dhan87/LT489	150	96
Sub-total			2338	2032
<b>Grand Total</b>			<b>40033</b>	<b>20525</b>

#### Experiment 12.4: Line Stage Testing (LST)

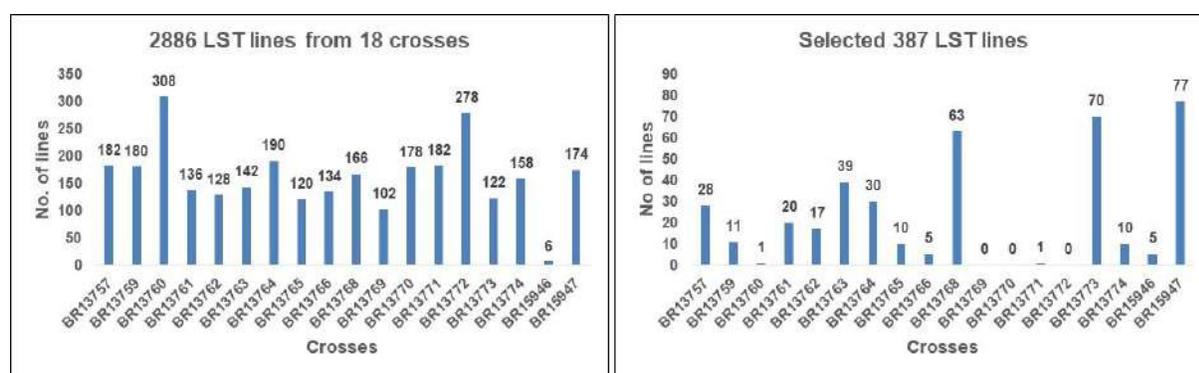
**Principal Investigator:** M R A Sarker

**Co-investigators:** N Jahan, Ribed F Disha and M A Rahman

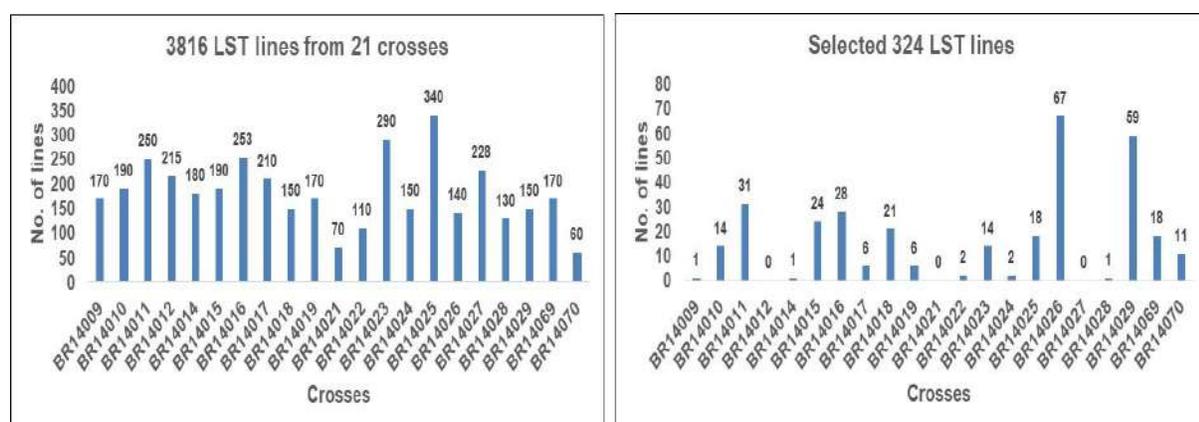
**Specific Objective:** Evaluation of FRGA derived advanced lines for uniformity and desirable agronomic characters.

**Materials and Method:** Total 2886 advanced breeding lines (**Table 12.4.1**) from 18 families for BPH and GM were grown at BIRRI Gazipur during T. Aman 2023-24. BIRRI dhan33 (for gall midge) and T27A (for BPH) were used as resistant checks and BIRRI dhan49 and BR3 used as susceptible checks. Three thousand eight hundred sixteen F<sub>5:6</sub> lines (**Table 12.4.2**) from 21 families for BPH were grown at BIRRI Gazipur during Boro 2023-24. 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 387 lines were selected out of 2886 lines derived from 18 different crosses during T. Aman 2023-24 (**Fig. 12.4.1a; Table 12.4.1**). Total 324 out of 3816 lines comprising 21 different crosses were selected in Boro 2023-24 (**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.



**Fig. 12.4.1a** Frequency distribution of LST lines, 2886 lines from 18 crosses, and finally selected based on phenotypic characters and trait marker (387 lines from 15 crosses) during T. Aman 2023-24



**Fig. 12.4.1b** Frequency distribution of LST lines, 3816 lines from 21 crosses, and finally selected based on phenotypic characters (324 lines from 18 crosses) during Boro 2023-24

**Table 12.4.1: List of fixed lines identified from Line Stage Testing (LST), Development of Insect Resistant Rice (IRR), T. Aman 2023-24**

SL#	Designation	Cross Combination	No. of genotype evaluated	No. of genotype selected
1	BR13757-4R	BR9880-36-4-2-33 / SVIN049	182	28
2	BR13759-4R	BR9881-24-2-2-25*2 /ARC11704	180	11
3	BR13760-4R	BIRRI dhan75 /SVIN013	308	1
4	BR13761-4R	BIRRI dhan49 / IR126942-29-12-415-8-2	136	20
5	BR13762-4R	BR7528-B-AK-BHA / BIRRI dhan89	128	17
6	BR13763-4R	BIRRI dhan75 / SVIN049	142	39
7	BR13764-4R	BIRRI dhan39 /BR11723-4R-48	190	30

8	BR13765-4R	BR7528-B-AK-BHA/ BR11716-4R-108	120	10
9	BR13766-4R	D(R)-6 / ARC11704	134	5
10	BR13768-4R	BRRRI dhan79 / ARC11704	166	63
11	BR13769-4R	BRRRI dhan29 / BR7528-B-AK-BHA	102	0
12	BR13770-4R	BRRRI dhan87 / BR11715-4R-105	178	0
13	BR13771-4R	BR7528-B-AK-BHA / BR11712 -4R-123	182	1
14	BR13772-4R	BR9880-24-2-1-14 / SVIN049	278	0
15	BR13773-4R	BRRRI dhan49 / IR126952-29-12-475-8-2	122	70
16	BR13774-4R	IR126952-29-12-475-8-2 / BRRRI dhan49	158	10
17	BR15946-4R	BRRRI dhan89/IR107736-7-1-2-1	6	5
18	BR15947-4R	BRRRI dhan87/IR107736-7-1-2-1	174	77
Total			2886	387

**Table 12.4.2: List of fixed lines identified from Line Stage Testing (LST), Development of Insect Resistant Rice (IRR), Boro 2023-24**

Sl#	Desination	Cross Combination	No. of genotype evaluated	No. of genotype selected
1	BR14009-4R	BR9880-27-4-1-18 / IR126952-41-148-38-2-49-B	170	1
2	BR14010-4R	BR9667-54-2-2-97 / Fatema dhan	190	14
3	BR14011-4R	BR9880-27-4-1-18 / D (R)-6	250	31
4	BR14012-4R	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	215	0
5	BR14014-4R	BR10698-12-1-5 / IR126952-41-148-38-2-49-B	180	1
6	BR14015-4R	BR9669-23-3-2-23 / IR126953-524-22-18-8-1-B	190	24
7	BR14016-4R	BR9669-21-2-1-19 / IR12652-29-12-475-14-3	253	28
8	BR14017-4R	BR9669-15-3-2-31 / D (R)-6	210	6
9	BR14018-4R	BR9669-21-2-1-19 / IR08N210	150	21
10	BR14019-4R	BRRRI dhan29 / LT 489	170	6
11	BR14021-4R	Sunamukhi / LT 489	70	0
12	BR14022-4R	BR8340-5-6-1 / LT 489	110	2
13	BR14023-4R	BR9880-27-4-1-18 / IR126952-41-125-24-4-2-B	290	14
14	BR14024-4R	BR10698-12-1-5 / IR08N210	150	2
15	BR14025-4R	BR8340-5-6-1 / Fatema dhan	340	18
16	BR14026-4R	BR9669-15-3-2-31 / IR08N210	140	67
17	BR14027-4R	BRRRI dhan75*2 / Fatema dhan	228	0
18	BR14028-4R	BR9880-27-4-1-18 / IR126952-443-83-68-9-23-B	130	1
19	BR14029-4R	BR9669-23-3-2-23 / WANXIAN7777-P10	150	59
20	BR14069-4R	D (R)-6 / BR8340-5-6-1	170	18
21	BR14070-4R	Fatema dhan / BR8338-34-4-3*2	60	11
<b>Total</b>			<b>3816</b>	<b>324</b>

### Experiment 12.5: Observational Yield Trial (OYT)

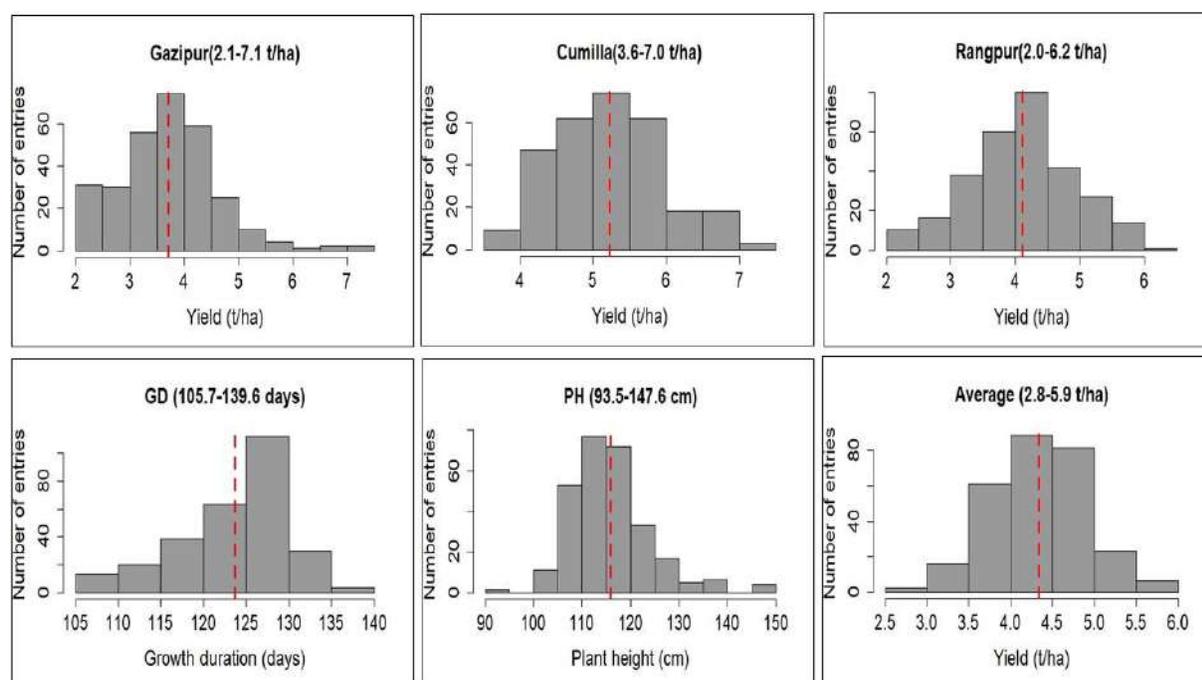
**Principal Investigator:** M R A Sarker

**Co-investigators:** H Khatun, N Jahan, Ribed F Disha & M A Rahman (BRRRI Gazipur), M R Islam, A K M Salauddin (BRRRI R/S, Cumilla) and M R Hasan & M A Rahman (BRRRI R/S, Rangpur)

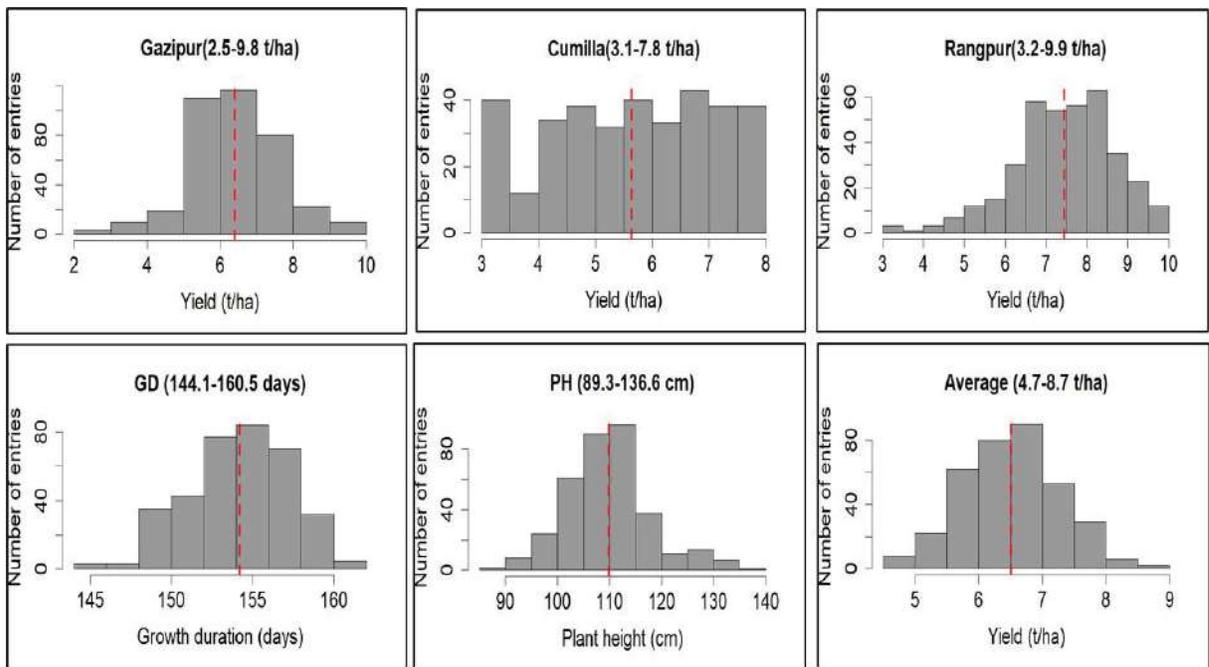
**Specific objectives:** Selection of homozygous breeding lines with desirable grain quality having high yield and resistant to Brown Plant hopper (BPH) and Gall Midge (GM).

**Materials and Method:** Total 276 and 348 advanced breeding lines for BPH and GM were grown at three locations of BIRRI Gazipur, Rangpur and Cumilla during T. Aman and Boro Seasons, respectively. BIRRI dhan33 (for gall midge) was used as resistant checks and BIRRI dhan49 & BIRRI dhan87 used as standard checks for T. Aman season. T27A was used as resistant check for BPH and BR3, BIRRI dhan88 & BIRRI 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 2.1-7.1 t/ha in Gazipur, 3.6-7.0 t/ha in Cumilla and 2.0-6.2 t/ha in Rangpur (**Fig. 12.5.1**). The average yield ranged from 2.8-5.9 t/ha with the average of 106-140 days growth duration. Eighty-one genotypes from 276 genotypes were selected for further evaluation, as they showed higher yield over the respective check varieties (**Table 12.5.1**). Among OYT genotypes, one entry BR12208-5R-343 showed moderately resistant reaction (score 3), and 15 entries BR13503-4R-134, BR13507-4R-178, BR13509-4R-143, BR13510-4R-21, BR13510-4R-79, BR13510-4R-90, BR13510-4R-98, BR13510-4R-108, BR13510-4R-121, BR13510-4R-150, BR13516-4R-120, BR13518b-4R-20, BR13518b-4R-54, BR13518b-4R-63 and BR12676-4R-432 showed moderately susceptible reaction (score 5) against BPH (**Table 12.5.1**). In Boro season, yield of the advanced breeding lines ranged from 2.5-9.8 t/ha in Gazipur, 3.1-7.8 t/ha in Cumilla and 3.2-9.9 t/ha in Rangpur (**Fig. 12.5.2**). The average yield ranged from 4.7-8.7 t/ha with the average of 144-161 days growth duration. Out of 348 genotypes, 72 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. Among OYT genotypes, one entry BR13482-4R-202 showed moderately resistant reaction (score 3), and ten entries BR13466-4R-10, BR13466-4R-42, BR13467-4R-208, BR13471-4R-88, BR13472-4R-1, BR13472-4R-6, BR13472-4R-124, BR13480-4R-29, BR13482-4R-54 and BR13482-4R-115 showed moderately susceptible reaction (score 5) against BPH artificial screening at Entomology Division, BIRRI in Boro season (**Table 12.5.2**).



**Fig. 12.5.1** Histogram showing average growth duration, plant height and yield performance of 276 genotypes tested in OYT at three locations during T. Aman 2023-24



**Fig. 12.5.2 Histogram showing average growth duration, plant height and yield performance of 348 genotypes tested in OYT at three locations during Boro 2023-24**

**Table 12.5.1: Agronomic performance of the genotypes selected from observational yield trial (OYT), Development of Insect Resistant Rice (IRR), T. Aman 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha)					BPH Score
				Gaz	Cum	Ran	BLUE	BLUP	
1	BR13503-4R-1	127	114	4.1	5.6	4.4	4.7	4.47	9
2	BR13503-4R-11	121	113	5.2	5.7	NA	5.3	4.63	7
3	BR13503-4R-64	122	109	4.0	4.7	5.7	4.8	4.52	9
4	BR13503-4R-105	122	112	4.2	7.0	3.8	5.0	4.59	9
5	BR13503-4R-132	134	118	3.6	5.4	5.3	4.8	4.50	9
6	BR13503-4R-134	121	115	2.3	4.6	3.6	3.5	4.00	5
7	BR13503-4R-142	116	111	4.6	5.5	4.3	4.8	4.51	9
8	BR13503-4R-146	130	127	6.1	6.4	5.1	5.9	4.93	9
9	BR13503-4R-191	130	120	4.2	6.9	4.8	5.3	4.71	9
10	BR13503-4R-199	123	116	3.7	5.6	4.5	4.6	4.44	9
11	BR13506-4R-150	130	119	4.5	6.3	4.5	5.1	4.64	9
12	BR13506-4R-174	130	119	5.2	6.1	5.9	5.7	4.89	7
13	BR13506-4R-183	127	114	5.2	5.8	4.8	5.3	4.71	9
14	BR13506-4R-184	129	122	4.1	5.0	5.7	4.9	4.57	-
15	BR13507-4R-8	126	111	4.6	4.9	5.2	4.9	4.55	7
16	BR13507-4R-9	130	110	4.8	5.9	5.7	5.5	4.79	9
17	BR13507-4R-17	131	109	3.7	5.9	4.6	4.7	4.48	7
18	BR13507-4R-50	125	110	5.1	5.8	4.1	5.0	4.59	7
19	BR13507-4R-58	130	112	4.1	5.5	4.6	4.8	4.50	7
20	BR13507-4R-76	130	112	4.2	6.9	3.6	4.9	4.56	7
21	BR13507-4R-81	126	110	4.5	6.4	5.0	5.3	4.71	7
22	BR13507-4R-96	128	113	3.5	6.5	5.3	5.1	4.63	7
23	BR13507-4R-110	128	108	4.3	6.0	4.7	5.0	4.59	7
24	BR13507-4R-113	126	109	4.0	5.8	4.6	4.8	4.52	7
25	BR13507-4R-136	125	109	4.8	5.1	4.2	4.7	4.47	9
26	BR13507-4R-168	128	110	4.8	6.3	4.1	5.1	4.62	9
27	BR13507-4R-178	128	109	4.5	6.6	4.5	5.2	4.68	5
28	BR13509-4R-143	128	138	4.1	4.6	4.7	4.5	4.40	5
29	BR13510-4R-1	128	126	3.6	5.6	5.2	4.8	4.52	7
30	BR13510-4R-17	128	113	4.5	5.0	4.6	4.7	4.48	7
31	BR13510-4R-21	126	115	4.0	5.7	4.0	4.5	4.40	5
32	BR13510-4R-29	125	122	4.7	5.6	4.7	5.0	4.60	9
33	BR13510-4R-32	129	123	3.2	6.6	5.6	5.1	4.65	9

34	BR13510-4R-33	128	117	4.2	5.4	4.6	4.7	4.49	7
35	BR13510-4R-41	127	118	6.0	5.1	3.6	4.9	4.56	7
36	BR13510-4R-43	125	122	5.4	5.8	5.4	5.5	4.79	7
37	BR13510-4R-47	128	126	4.0	6.2	5.2	5.1	4.64	7
38	BR13510-4R-69	129	118	4.7	5.0	4.4	4.7	4.48	7
39	BR13510-4R-79	128	109	4.1	5.7	4.7	4.8	4.53	<b>5</b>
40	BR13510-4R-88	126	118	4.5	4.3	5.2	4.7	4.46	7
41	BR13510-4R-90	128	117	3.4	5.8	4.9	4.7	4.50	<b>5</b>
42	BR13510-4R-98	128	111	4.0	5.6	3.9	4.5	4.40	<b>5</b>
43	BR13510-4R-108	133	108	3.6	5.1	5.4	4.7	4.50	<b>5</b>
44	BR13510-4R-109	130	116	4.7	5.3	5.3	5.1	4.63	7
45	BR13510-4R-110	130	117	3.2	6.8	4.9	5.0	4.58	7
46	BR13510-4R-111	128	118	4.3	5.7	5.4	5.1	4.65	7
47	BR13510-4R-118	130	122	4.8	6.4	4.5	5.2	4.69	7
48	BR13510-4R-121	127	109	3.4	5.0	3.9	4.1	4.20	<b>5</b>
49	BR13510-4R-124	130	117	4.5	5.4	3.7	4.6	4.42	7
50	BR13510-4R-131	127	114	4.1	6.8	5.1	5.3	4.72	9
51	BR13510-4R-139	127	120	4.8	4.7	4.9	4.8	4.52	7
52	BR13510-4R-140	122	130	3.6	6.8	4.5	5.0	4.59	7
53	BR13510-4R-141	131	117	3.4	5.8	5.8	5.0	4.60	7
54	BR13510-4R-142	128	118	5.9	4.9	4.9	5.2	4.68	7
55	BR13510-4R-150	120	118	4.0	4.7	4.6	4.4	4.40	<b>5</b>
56	BR13510-4R-153	127	119	5.7	4.2	4.4	4.8	4.50	9
57	BR13510-4R-176	130	113	3.0	6.7	5.5	5.1	4.63	7
58	BR13513-4R-88	130	131	4.1	7.0	3.7	4.9	4.57	7
59	BR13514-4R-12	132	136	6.0	6.7	3.3	5.4	4.74	7
60	BR13516-4R-120	119	123	3.8	6.6	3.2	4.5	4.40	<b>5</b>
61	BR13518b-4R-1	119	124	5.6	4.1	4.6	4.8	4.50	9
62	BR13518b-4R-20	124	115	4.1	5.4	2.8	4.1	4.20	<b>5</b>
63	BR13518b-4R-48	125	126	4.3	5.8	4.7	4.9	4.56	7
64	BR13518b-4R-54	124	124	2.4	5.3	3.3	3.7	4.10	<b>5</b>
65	BR13518b-4R-63	125	118	3.2	5.7	4.4	4.5	4.40	<b>5</b>
66	BR13518b-4R-111	120	128	3.6	4.4	6.2	4.8	4.50	7
67	BR13518b-4R-119	122	130	4.8	5.9	5.0	5.2	4.69	7
68	BR13518b-4R-170	125	121	4.6	4.9	4.7	4.7	4.49	9
69	BR12676-4R-401	125	103	3.7	6.8	4.0	4.8	4.52	9
70	BR12677-4R-64	110	118	4.2	6.8	NA	5.3	4.64	9
71	BR12676-4R-432	116	102	3.9	3.7	3.4	3.7	4.10	<b>5</b>
72	BR12676-4R-183	122	112	4.1	5.1	4.7	4.8	4.45	9
73	BR12685-4R-72	108	114	4.7	5.3	5.6	5.2	4.67	9
74	BR12676-4R-302	111	109	3.8	5.3	5.4	4.8	4.52	7
75	BR12208-5R-343	110	108	6.1	5.7	5.2	5.7	4.86	<b>3</b>
76	BR12679-4R-160	111	105	5.1	5.0	5.5	5.2	4.67	7
77	BR12679-4R-62	111	102	5.0	6.8	5.7	5.8	4.93	7
78	BR12679-4R-111	110	103	4.6	4.9	4.8	4.8	4.50	7
79	BR12676-4R-288	125	109	4.7	5.4	4.5	4.9	4.55	7
80	BR12685-4R-26	122	118	4.5	5.2	4.1	4.6	4.45	9
81	BR12676-4R-253	118	113	3.9	6.1	4.2	4.7	4.50	7
	BRR1 dhan33 (Ck)	113	110	3.7	4.4	4.5	4.2	4.28	
	BRR1 dhan49 (Ck)	129	107	3.6	5.7	4.3	4.5	4.41	
	BRR1 dhan87 (Ck)	125	125	3.6	5.8	4.4	4.6	4.44	
	LSD (0.05)	13.5	5.6	0.7	0.6	0.9	1.1		
	Heritability (%)	42.4	65.2	70.8	94.8	95.6	18.8		

**Table 12.5.2: Agronomic performance of the selected genotypes from observational yield trial (OYT), Development of Insect Resistant Rice (IRR), Boro 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha)				BPH Score
				Gaz	Cum	Ran	BLUE	
1	BR13466-4R-10	155	129	5.2	6.2	9.0	6.8	5
2	BR13466-4R-28	155	132	7.4	7.5	8.5	7.8	7
3	BR13466-4R-36	155	128	8.0	6.2	8.3	7.5	7
4	BR13466-4R-42	158	123	5.0	6.1	8.7	6.6	5
5	BR13466-4R-61	153	125	9.7	7.5	8.5	8.6	7
6	BR13466-4R-75	157	110	9.3	3.9	9.1	7.4	9
7	BR13466-4R-197	155	129	6.0	7.5	8.8	7.4	7
8	BR13466-4R-201	154	131	5.7	7.1	10.0	7.6	9
9	BR13466-4R-219	152	108	7.5	6.5	8.9	7.7	9
10	BR13466-4R-225	156	116	6.0	7.6	8.3	7.3	9
11	BR13466-4R-235	154	116	7.6	5.8	8.8	7.4	9
12	BR13466-4R-253	155	121	8.4	7.1	7.1	7.5	9
13	BR13466-4R-255	155	123	6.8	6.2	9.3	7.4	9
14	BR13466-4R-263	155	137	7.1	6.4	9.0	7.5	7
15	BR13467-4R-21	149	105	8.2	NA	8.1	7.7	9
16	BR13467-4R-47	150	109	7.9	6.6	9.3	7.9	9
17	BR13467-4R-49	155	108	5.8	7.7	9.0	7.5	9
18	BR13467-4R-107	157	105	7.7	7.6	8.9	8.0	9
19	BR13467-4R-108	153	111	7.8	5.5	9.8	7.7	9
20	BR13467-4R-114	149	90	5.5	7.4	9.6	7.5	9
21	BR13467-4R-137	150	98	7.2	7.2	8.1	7.5	9
22	BR13467-4R-152	153	99	6.8	7.4	8.3	7.5	9
23	BR13467-4R-163	151	105	7.5	7.4	8.9	7.9	9
24	BR13467-4R-208	153	102	5.0	4.7	8.4	6.0	5
25	BR13467-4R-218	154	110	8.8	7.7	5.4	7.3	9
26	BR13467-4R-275	147	101	6.9	5.7	8.6	7.1	7
27	BR13467-4R-276	149	105	8.9	7.5	8.1	8.2	9
28	BR13467-4R-338	150	110	9.8	7.3	8.9	8.7	7
29	BR13467-4R-346	156	107	9.9	6.7	8.9	8.5	9
30	BR13468-4R-164	152	113	7.1	6.7	8.2	7.3	9
31	BR13468-4R-254	152	115	7.7	6.7	9.8	8.1	7
32	BR13470-4R-182	158	110	6.9	7.7	8.7	7.8	9
33	BR13471-4R-88	154	112	6.4	5.8	8.8	7.0	5
34	BR13471-4R-89	156	118	7.5	7.7	7.7	7.6	7
35	BR13472-4R-1	156	108	7.3	6.3	9.2	7.6	5
36	BR13472-4R-6	158	113	7.4	5.0	5.3	5.9	5
37	BR13472-4R-124	155	113	7.0	6.9	8.3	7.4	5
38	BR13473-4R-66	157	102	6.0	6.7	9.5	7.4	7
39	BR13473-4R-109	154	104	8.0	7.7	7.1	7.6	7
40	BR13473-4R-239	156	105	7.7	7.0	8.3	7.7	7
41	BR13473-4R-246	154	104	6.8	7.5	8.1	7.4	7
42	BR13473-4R-282	158	99	7.0	6.9	7.9	7.3	7
43	BR13476-4R-33	152	113	7.0	7.7	8.5	7.7	7
44	BR13476-4R-98	156	112	7.8	7.6	7.8	7.7	9
45	BR13476-4R-100	154	110	7.9	7.0	7.6	7.5	9
46	BR13477-4R-138	152	118	9.5	5.3	8.9	7.9	9
47	BR13478-4R-45	149	120	6.3	7.5	8.0	7.3	7
48	BR13479-4R-1	154	114	6.6	7.4	8.1	7.4	7
49	BR13479-4R-14	154	99	6.9	7.8	7.7	7.5	7
50	BR13480-4R-29	150	107	7.4	6.8	6.9	7.0	5
51	BR13481-4R-51	154	109	8.3	6.4	9.0	7.9	7
52	BR13481-4R-52	152	98	7.6	6.6	8.2	7.5	9
53	BR13481-4R-157	149	98	7.7	7.6	7.9	7.8	9

54	BR13481-4R-268	156	115	7.4	7.8	7.2	7.5	9
55	BR13481-4R-269	160	108	6.7	6.4	6.6	6.6	7
56	BR13481-4R-270	154	113	6.9	4.9	7.8	6.5	9
57	BR13482-4R-51	154	122	7.2	6.2	6.6	6.7	7
58	BR13482-4R-54	152	112	7.2	7.0	6.0	6.7	5
59	BR13482-4R-115	157	115	7.8	3.1	6.8	5.9	5
60	BR13482-4R-120	149	103	7.5	NA	8.3	7.5	7
61	BR13482-4R-152	154	119	7.9	7.0	8.3	7.7	7
62	BR13482-4R-162	159	110	7.0	6.7	8.4	7.4	9
63	BR13482-4R-202	154	112	5.8	7.6	9.4	7.6	3
64	BR13483-4R-303	154	114	6.8	7.7	9.3	7.9	9
65	BR13483-4R-322	153	105	6.5	6.8	8.7	7.3	9
66	BR13486-4R-64	156	103	6.8	6.4	8.9	7.3	7
67	BR13486-4R-210	157	109	7.3	7.2	8.6	7.7	7
68	BR13487-4R-62	157	117	9.0	5.9	7.1	7.3	7
69	BR13487-4R-162	157	102	6.1	NA	9.8	7.5	9
70	BR13488-4R-16	154	128	8.1	NA	9.2	8.2	7
71	BR13488-4R-45	154	119	7.8	6.8	8.6	7.7	7
72	BR13488-4R-48	155	118	9.8	6.5	8.3	8.2	9
	BRR1 dhan88 (Ck)	146	95	6.0	6.3	7.8	6.7	
	BRR1 dhan89 (Ck)	156	112	6.8	7.0	8.2	7.3	
	BR3 (S. Ck)	159	92	5.6	5.1	7.3	6.0	
	T27A (R. Ck)	144	132	5.3	5.5	4.3	5.0	
	LSD (0.05)	6.6	11.5	1.2	1.1	1.3	1.7	
	Heritability (%)	31.1	47.7	86.8	46.6	78.8		

## Experiment 12.6: Preliminary Yield Trial (PYT)

**Principal Investigator:** M R A Sarker

**Co-investigators:** H Khatun, N Jahan, Ribed F Disha & M A Rahman (BRR1 Gazipur), M R Hasan & M A Rahman (BRR1 R/S, Rangpur) and M R Islam, A K M Salauddin (BRR1 R/S, Cumilla)

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

**Materials and Method:** Total 49 genotypes comprising PYT were evaluated at three locations of BRR1 Gazipur, Rangpur and Cumilla in T. Aman 2023-24 against GM and BPH along with BRR1 dhan33 (resistant check for GM), BRR1 dhan49 (susceptible check) and BRR1 dhan87 (Standard checks). Total 84 advanced breeding lines for BPH were grown at three locations of BRR1, Gazipur, Rangpur and Cumilla during Boro 2023-24. BRR1 dhan88, BRR1 dhan89 and BRR1 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 3.1-6.7 t/ha at Gazipur, 3.8-7.3 t/ha at Cumilla, and 2.8-5.1 t/ha at Rangpur (**Fig. 12.6.1**). The average plant height ranged from 101-131 cm. The average yield ranged from 3.6-5.4 t/ha with the average of 109-133 days. Forteen genotypes from 49 genotypes were selected compared to check varieties for further evaluation (**Table 12.6.1**). In Boro season, yield of the advanced breeding lines ranged from 5.3-9.8 t/ha in Gazipur, 3.3-7.9 t/ha in Cumilla and 5.4-9.9 t/ha in Rangpur (**Fig. 12.6.2**). The average plant height ranged from 91-128 cm. The average yield ranged from 5.8-8.8 t/ha with the average of 148-168 days growth duration. Twenty-four genotypes were selected compared to the respective check varieties for further evaluation

(Table 12.6.2). Selection was done based on flowering uniformity, phenotypic acceptability, growth duration, yield and pest infestation under field condition.

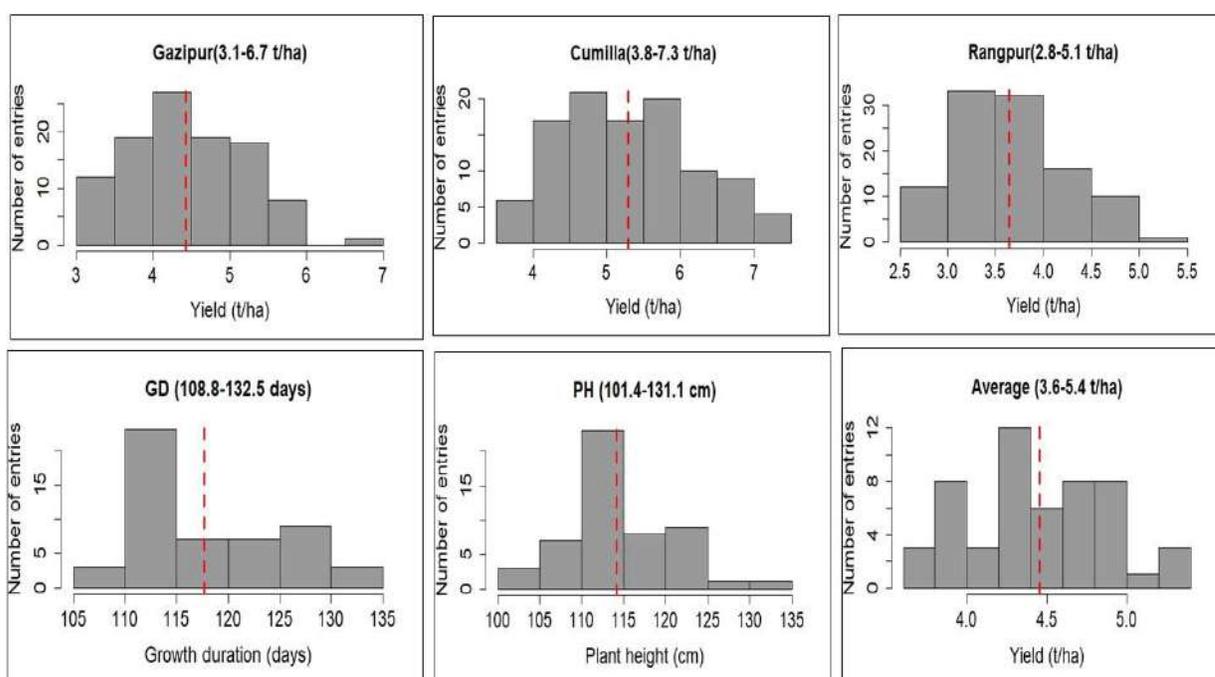


Fig. 12.6.1 Histogram showing average growth duration, plant height and yield performance of 49 genotypes tested in PYT at three locations during T. Aman 2023-24

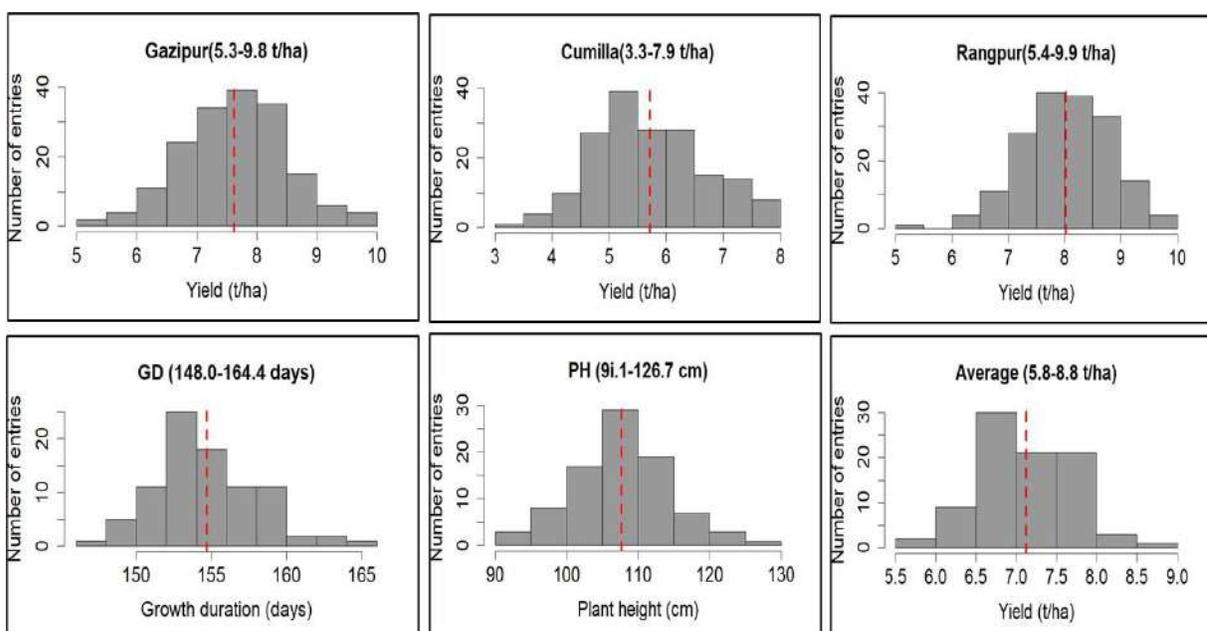


Fig. 12.6.2 Histogram showing average growth duration, plant height and yield performance of 84 genotypes tested in PYT at three locations during Boro 2023-24

Table 12.6.1: Performance of selected genotypes from PYT, Development of Insect Resistant Rice (IRR), T. Aman 2023-24

Sl#	Designation	GD (day)	PH (cm)	Yield (t/ha)					Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE	BLUP	
1	BR 13094-4 R-162	111	112	4.8	5.5	4.6	5.0	4.57	<i>Bph32, Wx-A_group</i>
2	BR 13094-4 R-241	110	112	5.7	4.3	4.0	4.9	4.51	<i>Bph32, Wx-A_group</i>
3	BR 13094-4 R-251	113	113	5.2	6.2	4.5	5.3	4.64	<i>Bph32, Wx-A_group</i>
4	BR 13096-4 R-46	122	120	4.1	5.6	4.8	4.9	4.54	<i>Bph32, Wx-A_group</i>
5	BR 13096-4 R-72	113	109	4.5	6.1	4.1	4.9	4.55	<i>Bph32, Wx-A_group</i>
6	BR 13096-4 R-86	118	111	5.2	6.0	3.1	4.8	4.53	<i>Bph32, Wx-A_group</i>
7	BR 13096-4 R-102	127	114	4.9	7.0	4.0	5.3	4.64	<i>Bph32, Wx-A_group</i>
8	BR 13096-4 R-110	112	111	4.8	5.8	4.3	4.9	4.56	<i>Bph32, Wx-A_group</i>
9	BR 13096-4 R-199	120	112	5.4	6.7	4.0	5.4	4.65	<i>Bph32, Wx-A_group</i>
10	BR 13099-4 R-166	126	131	4.5	6.9	3.4	4.9	4.56	<i>Wx-A_group, Gm4_4</i>

11	BR 13100-4 R-255	116	111	4.8	6.0	3.4	4.9	4.51	<i>Bph17_all, Bph32, Gm4_3, Gm4_4</i>
12	BR 12213-5 R-81	127	119	4.7	5.5	4.6	4.9	4.56	
13	BR 12213-5 R-175	124	122	5.3	6.4	3.4	5.0	4.58	
14	BR 12213-5 R-272	124	124	6.4	4.7	3.6	4.9	4.55	
	BRRi dhan33 (Ck)	115	122	4.0	4.4	3.6	4.0		
	BRRi dhan49 (Ck)	130	111	4.3	5.7	3.3	4.5		
	BRRi dhan87 (Ck)	125	126	4.0	5.9	3.2	4.4		
	LSD (0.05)	5.3	11.2	0.6	0.6	0.5	1.1		
	Heritability (%)	73.6	51.1	71.6	78.4	63.9	18.6		

**Table 12.6.3: Performance of selected genotypes from PYT, Development of Insect Resistant Rice (IRR), Boro 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha)				BPH Score (SES)	Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE		
1	BR 13219-4 R-38	154	100	8.3	6.9	7.6	7.6	7	Bph32, Waxy_A group
2	BR 13219-4 R-85	153	105	9.0	6.2	8.1	7.8	7	Bph32, Waxy_A group
3	BR 13219-4 R-96	153	108	8.5	6.2	8.1	7.6	7	Bph32, Waxy_A group, Gm4
4	BR 13219-4 R-167	154	108	8.3	5.9	8.2	7.5	7	Waxy_A group
5	BR 13219-4 R-244	153	102	8.2	6.6	8.4	7.7	7	Bph32, Waxy_A group
6	BR 13219-4 R-252	150	103	8.4	7.1	7.4	7.6	7	Bph32, Waxy_A group
7	BR 13219-4 R-287	151	103	8.3	6.5	8.5	7.8	7	Bph32, Waxy_A group
8	BR 13219-4 R-339	153	110	9.4	6.8	7.0	7.8	7	Bph32, Waxy_A group, Gm4
9	BR 13219-4 R-366	153	112	9.5	5.9	8.3	7.9	7	Bph32, Waxy_A group, Gm4
10	BR 13224-4 R-54	152	115	8.1	5.9	8.8	7.6	7	Bph32, Waxy_A group
11	BR 13224-4 R-79	148	115	8.2	6.1	8.7	7.7	9	Bph32, Waxy_A group
12	BR 13224-4 R-101	153	103	7.7	6.5	8.7	7.7	9	Waxy_A group
13	BR 12668-4 R-34	156	99	8.4	5.1	9.4	7.6	7	
14	BR 12668-4 R-163	154	107	8.9	7.3	6.5	7.6	7	
15	BR 12671-4 R-138	154	112	8.1	7.6	8.9	8.2	7	
16	BR 12671-4 R-312	153	108	9.4	7.6	9.4	8.8	9	
17	BR 12671-4 R-328	158	106	8.3	7.6	8.3	8.1	7	
18	BR 12671-4 R-531	155	106	7.2	7.6	7.8	7.5	7	
19	BR 12672-4 R-197	154	112	7.0	7.4	8.4	7.6	7	
20	BR 12672-4 R-205	156	109	7.6	7.6	7.7	7.6	7	
21	BR 12672-4 R-261	153	115	8.7	7.2	9.5	8.5	7	
22	BR 12676-4 R-393	153	108	7.5	7.5	7.8	7.6	-	
23	BR 12678-4 R-187	159	107	7.9	4.8	8.7	7.1	5	
24	BR 12685-4 R-251	154	107	7.9	6.2	9.4	7.8	5	
	BRRi dhan88 (Ck)	149	95	7.6	6.5	8.4	7.5	7	
	BRRi dhan89 (Ck)	157	112	7.5	6.5	8.7	7.6	9	
	BRRi dhan92 (Ck)	161	111	7.3	6.3	8.9	7.5	9	
	LSD (0.05)	7.6	8.0	0.6	0.6	0.6	1.5		
	Heritability (%)	62.4	70.9	76.1	83.8	65.1	17.5		

### Experiment 12.7: Advanced Yield Trial (AYT)

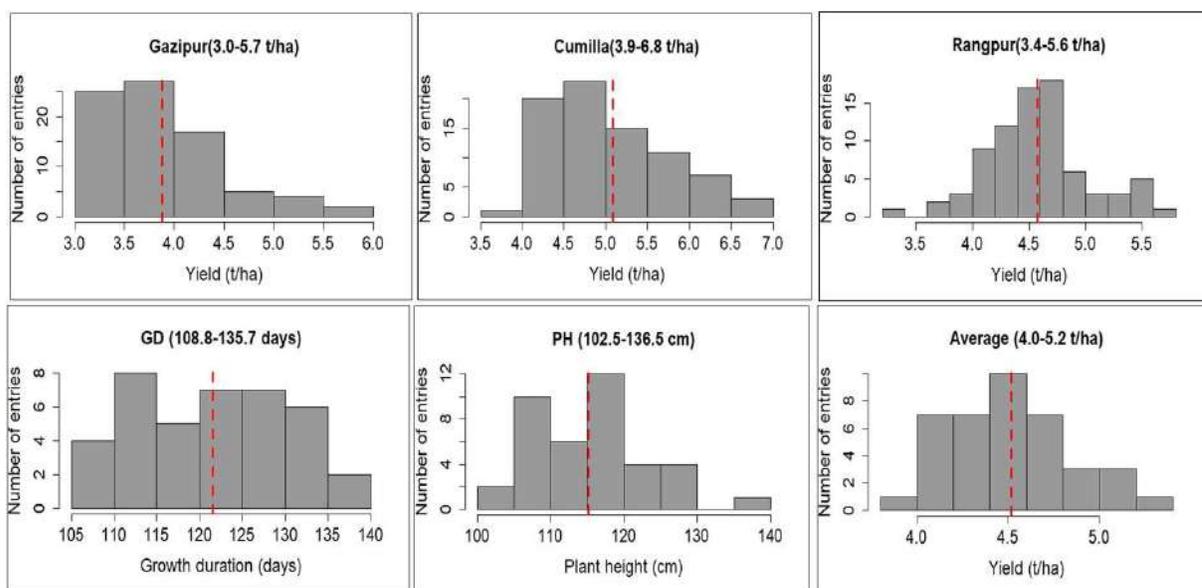
**Principal Investigator:** M R A Sarker

**Co-investigators:** H Khatun, N Jahan, R F Disha & M A Rahman (BRRi Gazipur), M R Islam, A K M Salauddin (BRRi R/S, Cumilla) and M R Hasan & M A Rahman (BRRi R/S, Rangpur)

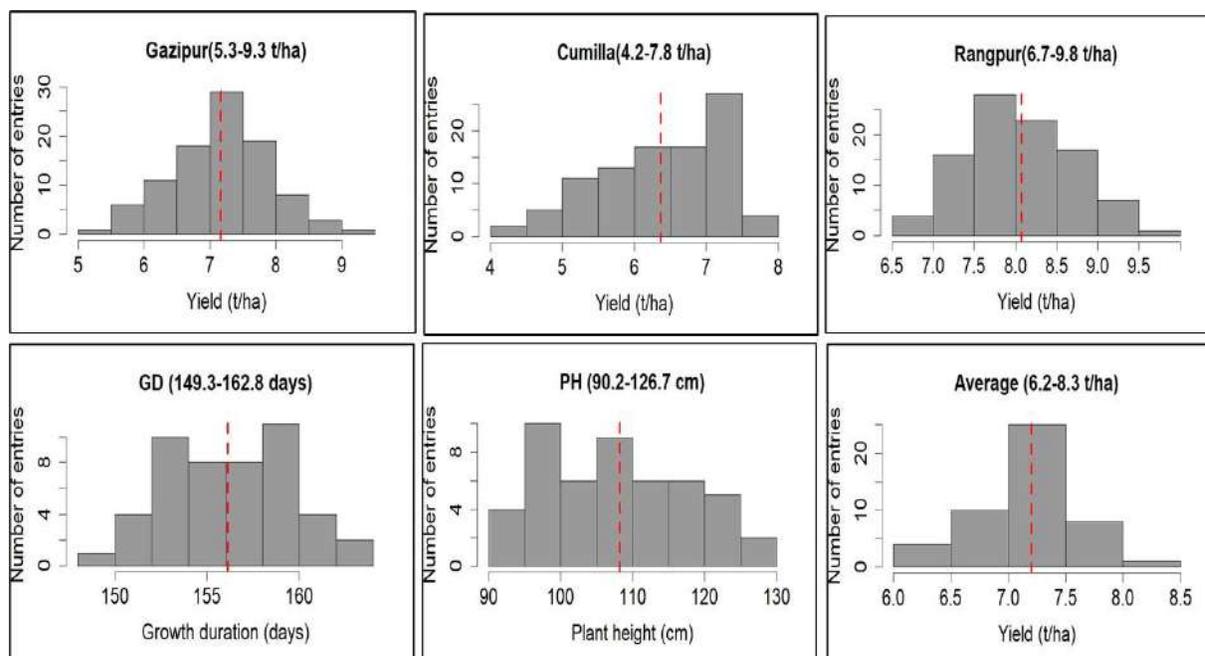
**Specific objective:** Confirmatory yield evaluation and selection of desirable lines compared to standard checks.

**Materials and Method:** Thirty-six genotypes were evaluated at three locations of BRRRI Gazipur, BRRRI R/S Rangpur and BRRRI R/S Cumilla in T. Aman season against GM and BPH along with BRRRI dhan33 (resistant check for GM), BRRRI dhan49 (susceptible check), BRRRI dhan75 and BRRRI dhan87 (Standard check). Total 45 genotypes were evaluated at three locations of BRRRI Gazipur, BRRRI R/S Cumilla and BRRRI R/S Rangpur against BPH along with the checks BRRRI dhan88, BRRRI dhan89 and BRRRI 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 3.0-5.7 t/ha in Gazipur, 3.9-6.8 t/ha in Cumilla and 3.4-5.6 t/ha in Rangpur (**Fig. 12.7.1**). The average plant height ranged from 108.8-135.7 cm. The average yield ranged from 4.0-5.2 t/ha with the average of 103-137 days growth duration. Eleven genotypes from 36 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 5.3-9.3 t/ha in Gazipur, 4.2-7.8 t/ha in Cumilla and 6.7-9.8 t/ha in Rangpur (**Fig. 12.7.2**). The average plant height ranged from 90-127 cm. The average yield ranged from 6.2-8.3 t/ha with average 149-163 days growth duration. Out of 45 genotypes, 15 were selected for further evaluation, as they showed higher yield over the respective check varieties (**Table 12.7.2**).



**Fig. 12.7.1** Histogram showing average growth duration, plant height and yield performance of 36 genotypes tested in AYT at three locations during T. Aman 2023-24



**Fig. 12.7.2 Histogram showing average growth duration, plant height and yield performance of 45 genotypes tested in AYT at three locations during Boro 2023-24**

**Table 12.7.1: Performance of selected genotypes from AYT, Development of Insect Resistant Rice (IRR), T. Aman 2023-24**

Sl #	Designation	GD (days)	PH (cm)	Yield (t/ha)				BPH Score (SES)	Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE		
1	BR 12208-5 R-2	121	120	5.4	5.2	5.1	5.2	9	<i>Bph32, Wx-A_group</i>
2	BR 12208-5 R-55	113	103	4.8	5.8	4.5	5.0	7	<i>Bph32, Wx-A_group</i>
3	BR 12216-5 R-28	128	103	5.1	5.6	4.6	5.1	7	<i>Bph17, Wx-A_group</i>
4	BR 12229-5 R-162	120	120	4.5	5.7	4.8	5.0	7	<i>Bph32, Gm4</i>
5	BR 11296-4 R -74	121	114	3.7	4.8	4.2	4.2	5	<i>Bph32, Wx-A_group</i>
6	BR 11044-4 R -47	114	113	3.7	4.4	4.4	4.2	5	<i>Bph17_all, Gm4, Wx-A_group</i>
7	BR 11295-4 R -387	129	119	3.4	4.8	4.2	4.1	5	<i>Bph32, Gm4</i>
8	BR 11052-4 R -234	127	112	4.3	6.3	4.8	5.1	7	<i>Bph17_all, Bph32, Wx-A_group</i>
9	IRBPHN-SVIN013-18	119	124	3.9	6.5	4.4	4.9	7	<i>Bph17_all, Bph32</i>
10	BR 11040-4 R -137	116	127	3.7	4.8	4.0	4.2	5	<i>Bph32, Wx-A_group</i>
11	BR 11033-4 R -33	123	126	5.4	4.5	5.3	5.1	7	<i>Gm4, Wx-A_group</i>
	BRRi dhan33 (Ck)	117	107	3.6	4.4	4.6	4.2	9	
	BRRi dhan75 (Ck)	112	108	3.8	5.5	4.6	4.6	7	
	BRRi dhan49 (Ck)	130	110	3.5	5.7	4.7	4.6	7	
	BRRi dhan87 (Ck)	124	129	3.5	6.0	4.7	4.7	7	
	LSD (0.05)	5.1	13.1	0.4	0.7	0.5	0.9		
	Heritability (%)	79.0	59.5	80.7	54.7	47.0	13.6		

**Table 12.7.2: Performance of selected genotypes from AYT, Development of Insect Resistant Rice (IRR), Boro 2023-24**

Sl#	Designation	GD (days)	PH (cm)	Yield (t/ha)				BPH Score (SES)	Trait of Interest (ToI)
				Gaz	Cum	Ran	BLUE		
1	BR 12669-4 R-161	149	109	7.5	6.6	8.2	7.5	9	<i>Bph17_all, Wx-A_Group</i>
2	BR 12670-4 R-20	153	116	7.6	7.5	7.7	7.6	9	<i>Wx-A_Group</i>
3	BR 12671-4 R-154	155	119	7.6	7.5	8.4	7.8	9	<i>Gm4, Wx-A_group</i>
4	BR 12679-4 R-6	157	116	9.1	7.0	8.8	8.3	7	<i>Gm4, Wx-A_group, fgr-1, BAHD1</i>
5	BR 12679-4 R-63	159	99	7.5	6.8	8.0	7.4	7	<i>Gm4, Wx-A_group, fgr-1, BAHD1</i>
6	BR 12679-4 R-67	158	117	7.8	7.0	8.6	7.8	9	<i>Gm4, Wx-A_group</i>
7	BR 12679-4 R-70	155	103	7.4	7.2	8.5	7.7	-	<i>Gm4, Wx-A_group</i>
8	BR 12679-4 R-173	157	104	7.4	6.8	8.3	7.5	7	<i>Gm4, Wx-A_group, fgr-1, BAHD1</i>
9	BR 12685-4 R-159	158	120	7.3	7.1	7.9	7.4	7	<i>Wx-A_group</i>
10	BR 12208-5 R-31	153	99	7.3	7.1	8.3	7.6	9	<i>Bph32, Wx-A_Group</i>
11	BR 12208-5 R-107	153	98	7.4	7.5	7.4	7.4	9	<i>Bph32, Wx-A_Group</i>
12	BR 12208-5 R-403	153	98	8.5	7.2	8.3	8.0	9	<i>Bph32, Wx-A_Group</i>
13	BR 12208-5 R-274	152	126	8.3	5.2	8.8	7.4	9	
14	BR 12208-5 R-394	153	99	7.4	6.9	8.2	7.5	7	<i>Bph32, Wx-A_Group</i>
15	BR 12208-5 R-402	155	98	8.2	6.4	7.7	7.4	9	
	BRRi dhan88 (Ck)	150	94	7.6	6.6	7.7	7.3	9	
	BRRi dhan89 (Ck)	160	109	7.5	7.0	8.7	7.7	9	
	BRRi dhan92 (Ck)	163	110	7.2	7.1	9.0	7.8	7	
	LSD (0.05)	8.8	4.5	0.6	0.5	0.6	1.1		
	Heritability (%)	66.6	85.6	74.8	81.9	66.8	14.0		

## PROJECT 13: DEVELOPMENT OF DISEASE RESISTANT RICE

**General Objective:** Development of genotypes resistant to bacterial blight (BB), blast, and rice tungro virus (RTV).

**Project Leader:** Dr. Mahmuda Khatun

### Experiment 13.1: Hybridization

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma & 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 BB & blast resistant genotype development was conducted in both T. Aman and Boro season. Seeding was done in the earthen pot at three dates with an interval of 7 days to synchronize flowering times between male and female parents. Twenty-five-day-old seedling in the T. Aman season and forty-day-old seedlings for Boro season were transplanted in a 5.4 m × 2 rows plot with a 20 × 20 cm spacing. Single seedling was used for transplanting. Fertilizers @120 (261 kg Urea): 19 (95 kg TSP): 60 (120 kg MP): 20 (111 kg Gypsum): 4 (11 kg ZnSO<sub>4</sub>) kg NPKSZn/ha were applied. 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:** Thirty-one crosses for bacterial blight (BB), blast, tungro, false smut, and bakanae were made in T. Aman and 6468 F<sub>1</sub> seeds were collected (**Table 13.1**). Thirty-three crosses for bacterial blight (BB), blast, tungro, sheath blight, false smut, and bakanae were made in Boro2023-24 and 5343 F<sub>1</sub> seeds were collected (**Table 13.2**). High yield, BB, blast, tungro, false smut, sheath blight, and bakanae resistance with drought tolerance, lodging tolerance, and low water requirement were emphasized in the crossing program (**Table 13.1 & Table 13.2**).

**Table 13.1. List of the crosses made, development of disease resistant rice (BB, blast, RTV, false smut, bakanae), T. Aman2023-24**

SN	BR No.	Designation	No. of F <sub>1</sub> seeds	Remarks
<b>Backcross (BB &amp; Blast), 2023-24</b>				
1	BR15987	BR11864-5R-99*3/IRRI154-Pi9	59	Blast resistance
2	BR15988	BR9138-4-4-5-5-P3-HR3-HR5*2 /BR12442-4R-49	359	BB resistance
3	BR14987	BR11603-4R-49*2/BR11607-4R-192	476	BB resistance
4	BR15989	BR11603-4R-155*2/BR11607-4R-192	65	BB resistance
5	BR15993	BR11867-5R-442*2/BR12454-BC2-56-81-27-3-30	289	BB & Blast res
6	BR15994	BRRI dhan102*2/BR12454-BC2-71-91-6-23-26	224	Blast resistance
<b>Single cross (BB, blast, RTV)</b>				
7	BR15996	BR11869-5R-47/BR11986-4R-123	210	BB resistance
8	BR15997	BR11874-5R-109/BR(Path)13800-BC3-8-11	260	Blast resistance
9	BR15998	BR12098-4R-127/BR11607-4R-192	264	BB resistance
10	BR15999	BR11987-4R-156 /BR(Path)13800-BC3-109-10	275	Blast resistance
11	BR16000	BR11986-4R-123/ BR12098-4R-117	225	BB resistance
12	BR16001	BR12098-4R-117 /BR9942-1-2-1-2-B2	205	BB resistance
13	BR16002	BR12098-4R-71/BR11987-4R-156	133	BB resistance
14	BR16003	BR11869-5R-72/BR12450-4R-24	180	Blast resistance
15	BR16004	BRRI dhan103 /IRRI154-Pi9	389	Blast resistance
16	BR16005	BRRI dhan104 /BR13169-4R-229	163	BB resistance
17	BR16006	BRRI dhan106/BR12450-4R-24	180	
18	BR16007	BR12424-5R-46/BR11603-4R-49	222	BB resistance
19	BR16008	BR12606-4R-327/BR(Path)13800-BC3-8-11	96	Blast resistance
20	BR16009	BR11601-14-4-1/BR12450-4R-24	333	Blast resistance
21	BR16010	BR11867-5R-119/BR13157-4R-265	192	BB resistance

22	BR16011	BR11866-5R-277/BR12424-5R-46	201	BB resistance
23	BR16012	BR11866-5R-73/BR12424-5R-46	57	BB resistance
24	BR16013	BR13157-4R-261/BR11607-4R-192	280	BB resistance
25	BR16014	BR13157-4R-265 /IRRI154- <i>Pi9</i>	52	Blast resistance
26	BR16016	BR11868-5R-23 /BR(Path)13800-BC3-109-10	124	Blast resistance
27	BR16021	BRRi dhan98 /BR(Path)13800-BC3-8-11	27	Blast resistance
28	BR16022	BRRi dhan101/BR12450-4R-24	325	Blast resistance
29	BR16023	BR11866-5R-73 /BR12450-4R-24	248	Blast resistance
30	BR16024	BR10397-3-2-1-1-8 /BR11987-4R-156	165	BB resistance
31	BR16025	BRRi dhan104/BR(Path)13800-BC3-8-11	190	Blast resistance
<b>Total</b>			<b>6468</b>	

**Table 13.2. List of the crosses made, development of disease resistant rice (BB, blast, RTV, false smut, and bakanae), Boro2023-24**

SN	Designation	No of seeds	Remarks
<b>Single cross, BB</b>			
1	BR11864-5R-99/BR9138-4-4-5-5-P3-HR3-HR5	13	BB resistance
2	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49	147	BB resistance
3	BR12442-4R-49/BR11603-4R-77	169	BB resistance
4	BR11603-4R-77/BR11603-4R-49	186	BB resistance
5	BR11603-4R-49/BR11607-4R-192	212	BB resistance
6	BR11603-4R-155/BR11607-4R-192	84	BB resistance
7	BR12603-4R-170/BR12599-4R-14	7	BB resistance
8	BR12603-4R-151/BR12113-5R-109	28	BB resistance
9	BR12109-4R-10/BR12087-5R-155	200	BB resistance
10	BR12087-5R-155/BR12090-5R-91	88	BB resistance
11	BR12090-5R-91/BR12087-5R-196	258	BB resistance
12	BR12091-4R-97/BR12088-5R-230	7	BB resistance
13	BRRi dhan92/BR12101-5R-76	250	BB resistance
14	BR11723-4R-172/BR12091-4R-99	181	BB resistance
15	BR11867-5R-442/BR12454-BC2-56-81-27-3-30	155	Blast resistance
16	BR11867-5R-103/7 FBR-364	32	BB resistance
17	BR11867-5R-87/BR12454-BC2-69-97-39-5-44	117	Blast resistance
18	BRRi dhan102/BR12454-BC2-71-91-6-23-26	167	Blast resistance
19	BRR dhan98/BR12454-BC2-75-32-31-39-7	63	Blast resistance
20	BR11867-5R-442/Gota IRRi	190	BB resistance
21	7 FBR-376/BR11867-5R-103	125	BB resistance
22	BR12091-4R-99/BRRi dhan101	75	BB resistance
23	BR11607-4R-72/BR12450-4R-24	213	Blast resistance
24	BR12109-4R-10/BR12101-5R-76	72	BB resistance
25	7 FBR-376/ BRRi dhan101	335	BB resistance
26	BR12599-4R-14/ BR8781-16-1-3-P2	134	BB resistance
<b>Backcross</b>			
27	BR9138-4-4-5-5-P3-HR3-HR5*2/BR11607-4R-72	130	BB resistance
28	BR11864-5R-99*2/IRRI154-Pi9	261	Blast resistance
29	BRAC dhan2*3/BR12450-4R-24	191	Blast resistance
30	BR11723-4R-12*3/ BR12450-4R-24	349	Blast resistance
31	7 FBR-222*3/ IRRI154-Pi9	80	Blast resistance
32	BR11723-4R-12*3/ IRBL9-W	382	Blast resistance
33	BR12442-4R-49*3/ IR64-EMF <sub>3</sub>	442	Blast resistance
<b>Total</b>			<b>5343</b>

### Experiment 13.2: Confirmation of F<sub>1</sub>

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma and J Ferdousy

**Specific Objectives:** To confirm the crosses as true F<sub>1</sub>s

**Materials and Methods:** The experiment was conducted in BRRi Gazipur in both T. Aman and Boro season. F<sub>1</sub> 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 and

forty-day-old seedlings for Boro 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<sub>1</sub> population. The cross-confirmation was done by careful observation of plant characters. F<sub>1</sub>'s confirmation was done by both quality check (QC) genotyping and observation techniques. Leaf samples were collected from each of the plants from F<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>. 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 F<sub>1</sub>'s was selected and used for backcross and multiple crosses. The application of fertilizer & crop management was done as described in experiment 1.

**Results and Discussion:** Thirty-seven for BB, blast, tungro, false smut, & bakanae were confirmed in T. Aman2023-24 (**Table 13.3**) and thirty-one for BB, blast, tungro, false smut, & bakanae were confirmed in Boro2023-24 (**Table 13.4**). Seeds of these selected F<sub>1</sub> plants were self to produce F<sub>2</sub> seeds. At maturity, the F<sub>2</sub> seeds of all selected plants were harvested individually, dried, cleaned and preserved in the cold room. Targeted BB, blast and RTV resistance gene(s) was confirmed by *SNP*-based-trait genotyping in Intertek, Australia.

**Table 13.3. List of F<sub>1</sub>s confirmed, development of disease resistant rice, T. Aman 2023-24**

SNN	BR No.	Parentage	Plant Number	Progeni
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	BR15507	BRRi dhan99 / BR11867-5R-103	P#1,3,6-8	500
8	BR15508	BR11723-4R-12/BRRi dhan101	P#1,2,4,6-8	500
9	BR15509	BR9138-4-4-5-5-P3-HR3-HR5 / BR11607-4R-72	P#1,3,6,8	500
10	BR15510	BR11864-5R-99 / IRRi154-Pi9	P#1,2,3, 4,6	500
11	BR15511	Bangabandhu dhan100 / BR8781-16-1-3-P2	P#1-7	500
12	BR15512	BRRi dhan87/ BR8781-16-1-3-P2	P#1,3,4,6-8	500
13	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#2	500
14	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#10	500
15	BR15513	BR9006-40-2-3-1*3/ BR11607-4R-72	P#16	500
16	BR15514	BR9830-53-3-5-2*3/ BR11607-4R-72	P#1-2,4,6-9,10-12	500
17	BR15516	BR11867-4R-371*3/ IR64-EMF3	P#1-7,13,16,18	500
18	BR15517	BR9006-40-2-3-1*3/ IRRi154-Pi9	P#19,22,28,31,32	500
19	BR15518	BR8781-16-1-3-P2*3/ IRRi154-Pi9	P#4,5,21,28,41	500
20	BR15518	BR8781-16-1-3-P2*3/ IRRi154-Pi9	P#9,10,20,37	500
21	BR15519	BR11723-4R-12*3/ IR64-Pi9	P#2,10,14,16,18,20, 31,35,39	500
22	BR15521	7 FBR-222*3/ IRBLta2-Pi(RL)-T(RL)	P#2	500
23	BR15521	7 FBR-222*3/ IRBLta2-Pi(RL)-T(RL)	P#6	500
24	BR15528	7 FBR-222*2/ IRRi154-Pi9	P#2,4,7,11,17,18,22,26, 27,30-32,34,35	500
25	BR15528	7 FBR-222*2/ IRRi154-Pi9	P#28,29	500
26	BR15529	BR11723-4R-12*2/ IRBL9-W (Pi9)	P#1,3,5,8,12,13,18,22,2 6,31	500
27	BR15529	BR11723-4R-12*2/ IRBL9-W (Pi9)	P#6,14	500
28	BR15530	BR11607-4R-72 //BRRi dhan70*2 / IRRi154-Pi9	P#3,11-14,16,20,21,25, 29-34,36	500
29	BR15530	BR11607-4R-72 //BRRi dhan70*2 / IRRi154-Pi9	P#7,19,27	500
30	BR15531	BR11607-4R-72// BRAC dhan2 / IRRi154-Pi9	P#2,3,5-11,13,14,16-18, 20-23,25-30	500
31	BR15531	BR11607-4R-72// BRAC dhan2 / IRRi154-Pi9	P#6	500
32	BR15532	BR11723-4R-172*3/IR64-EMF3	P#1,2,4	500
33	BR15533	BRRi dhan80*3/ IRRi154-Pi9	P#1, 3-7,9- 11,13,15,18,19,23	500
34	BR15534	BR11723-4R-12*3/ IRRi154-Pi9	P#1-10	500
35	BR15535	BRRi dhan70*3/ IRRi154-Pi9	P#1,3-20	500
36	BR15536	BR11607-4R-72//BR11723-4R-12*2 /IRRI154-Pi9	P#1-20	500
37	BR15537	BR12442-4R-49*2/ IR64-EMF3	P#1-6	500
<b>Total</b>				<b>18500</b>

**Table 13.4. List of the crosses made, development of disease resistant rice (BB, blast, RTV, false smut, bakanae), Boro2023-24**

SN	BR No.	Designation	Remarks	Progenies
<b>T Aus (BB &amp; Blast), 2023-24</b>				
1	BR15987	BR11864-5R-99*3/IRRI154-Pi9	Blast resistance	500
2	BR15988	BR9138-4-4-5-5-P3-HR3-HR5*2 /BR12442-4R-49	BB resistance	500
3	BR14987	BR11603-4R-49*2/BR11607-4R-192	BB resistance	500
4	BR15989	BR11603-4R-155*2/BR11607-4R-192	BB resistance	500
5	BR15993	BR11867-5R-442*2/BR12454-BC2-56-81-27-3-30	BB & Blast res	500
6	BR15994	BRRRI dhan102*2/BR12454-BC2-71-91-6-23-26	Blast resistance	500
<b>Single cross (BB, blast, RTV)</b>				<b>3000</b>
7	BR15996	BR11869-5R-47/BR11986-4R-123	BB resistance	500
8	BR15997	BR11874-5R-109/BR(Path)13800-BC3-8-11	Blast resistance	500
9	BR15998	BR12098-4R-127/BR11607-4R-192	BB resistance	500
10	BR15999	BR11987-4R-156 /BR(Path)13800-BC3-109-10	Blast resistance	500
11	BR16000	BR11986-4R-123/ BR12098-4R-117	BB resistance	500
12	BR16001	BR12098-4R-117 /BR9942-1-2-1-2-B2	BB resistance	500
13	BR16002	BR12098-4R-71/BR11987-4R-156	BB resistance	500
14	BR16003	BR11869-5R-72/BR12450-4R-24	Blast resistance	500
15	BR16004	BRRRI dhan103 /IRRI154- <i>Pi9</i>	Blast resistance	500
16	BR16005	BRRRI dhan104 /BR13169-4R-229	BB resistance	500
17	BR16006	BRRRI dhan106/BR12450-4R-24		500
18	BR16007	BR12424-5R-46/BR11603-4R-49	BB resistance	500
19	BR16008	BR12606-4R-327/BR(Path)13800-BC3-8-11	Blast resistance	500
20	BR16009	BR11601-14-4-1/BR12450-4R-24	Blast resistance	500
21	BR16010	BR11867-5R-119/BR13157-4R-265	BB resistance	500
22	BR16011	BR11866-5R-277/BR12424-5R-46	BB resistance	500
23	BR16012	BR11866-5R-73/BR12424-5R-46	BB resistance	500
24	BR16013	BR13157-4R-261/BR11607-4R-192	BB resistance	500
25	BR16014	BR13157-4R-265 /IRRI154- <i>Pi9</i>	Blast resistance	500
26	BR16016	BR11868-5R-23 /BR(Path)13800-BC3-109-10	Blast resistance	500
27	BR16021	BRRRI dhan98 /BR(Path)13800-BC3-8-11	Blast resistance	500
28	BR16022	BRRRI dhan101/BR12450-4R-24	Blast resistance	500
29	BR16023	BR11866-5R-73 /BR12450-4R-24	Blast resistance	500
30	BR16024	BR10397-3-2-1-1-8 /BR11987-4R-156	BB resistance	500
31	BR16025	BRRRI dhan104/BR(Path)13800-BC3-8-11	Blast resistance	500
<b>Total</b>				<b>15500</b>

### Experiment 13.3: Field RGA nursery

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma & J Ferdousy

**Specific Objective:** To rapid advancement of segregating population for shortening breeding cycle.

**Materials and Methods:** The experiment was conducted in BRRRI, Gazipur. The progenies of 87 crosses for BB and 26 crosses for blast were grown in Boro and T. Aman seasons. Around 500 progenies of F<sub>2</sub> generation for each cross of BB and blast were grown in field RGA (**Table 13.5**). The F<sub>2</sub>-F<sub>4</sub> 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 the direct seeded method, panicle was placed directly in the raised bed with 6 strips per bed at 8 × 8 cm spacing. At 15 days after seeding, water stress was imposed and continued up to flowering. At maturity, a single panicle was harvested from each plant of each cross. The harvested seed was dried and subjected to 50<sup>0</sup>C for dormancy breaking to initiate the next cycle of RGA immediately.

**BB:** A total of 44,100 progenies of 87 crosses consisting of 22,200 progenies of 37 crosses for F<sub>2</sub>, 9,500 progenies of 19 crosses for F<sub>3</sub>, 12,400 progenies of 31 crosses for F<sub>4</sub> generations were grown in the FRGA nursery (**Table 13.5**).

**Blast:** A total of 14,700 progenies of 26 crosses consisting of 10,200 of 17 crosses for F<sub>2</sub>, 4,500 of 09 crosses for F<sub>4</sub> generations were grown in the FRGA nursery (**Table 13.5**).

**Results and Discussion:** A total of 44,100 BB resistance progenies of 87 crosses consisting of 22,200 progenies of 37 crosses for F<sub>2</sub>, 9,500 progenies of 19 crosses for F<sub>3</sub>, 12,400 of 31 crosses for F<sub>4</sub> generations were grown in the FRGA nursery. A total of 14,700 blast resistance progenies of 26 crosses consisting of 10,200 of 17 crosses for F<sub>2</sub>, 4,500 of 09 crosses for F<sub>4</sub> generations were grown in the FRGA nursery (**Table 13.5**).

**Table 13.5. RGA Nursery, development of disease resistant rice for BB & Blast resistance, Boro2023-24**

SN	BR No.	Parentage	Imp. Features	Progenies
<b>F<sub>2</sub>, T Aus (BB)</b>				
1	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>xa5,xa13,Xa21, Pita, Pi9, TSV1</i> )	BB & Blast res	600
2	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>xa5,xa13,Xa21</i> )	BB resistance	600
3	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21, xa13</i> )	BB resistance	600
4	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Xa21,xa5</i> )	BB resistance	600
5	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>xa5, xa13, Pi9, TSV1</i> )	BB & Blast res	600
6	BR14994-R	BR9006-40-2-3-1*2/ BR11607-4R-72 ( <i>Pi9, Pita</i> )	Blast resistance	600
7	BR14995-R	BR9830-53-3-5-2*2/ BR11607-4R-72( <i>Xa21, xa13</i> )	BB resistance	600
8	BR14679-R	BR11723-4R-172/IR64-EMF3 ( <i>qHTSF4.1</i> )	BB resistance	600
9	BR14681-R	BR11723-4R-12/N22 ( <i>qHTSF4.1</i> )	BB resistance	600
10	BR14996-R	BR11867-4R-371*2/ IR64-EMF3 ( <i>Xa21</i> )	BB resistance	600
11	BR14997-R	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21,xa5</i> )	BB resistance	600
12	BR14997-R	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>xa5,xa13,Xa21</i> )	BB resistance	600
13	BR14997-R	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21,xa5,fgf</i> )	BB resistance	600
14	BR14997-R	BR9006-40-2-3-1*3/ BR11868-5R-23 ( <i>Xa21, qHTSF4.1</i> )	BB resistance	600
15	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>xa5,xa13,Xa21, fgf</i> )	BB resistance	600
16	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>xa5,xa13,Xa21,Pi9, Pita,Pb1</i> )	BB resistance	600
17	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>xa5,xa13,Xa21</i> )	BB resistance	600
18	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21,xa13</i> )	BB resistance	600
19	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>Xa21,xa5</i> )	BB resistance	600
20	BR14998-R	BR9829-78-1-2-1*3/ BR11607-4R-192 ( <i>xa5,xa13,Xa21</i> )	BB resistance	600
21	BR15008-R	BR12121-4R-53/ BR9138-4-4-5-5-P3-HR3-HR5( <i>xa5,Xa21,qHTSF4.1</i> )	BB resistance	600
22	BR15009-R	BR11723-4R-12/IR12N177 ( <i>xa5,Pita,qHTSF4.1</i> )	BB resistance	600
23	BR15010-R	7 FBR-222/ BR11603-4R-49 ( <i>xa5,Xa21, fgf</i> )	BB resistance	600
24	BR15011-R	BR9138-4-4-5-5-P3-HR3-HR5/BR12442-4R-49 ( <i>Xa21</i> )	BB resistance	600
25	BR15012-R	BR11723-4R-12/ BR12442-4R-49 ( <i>Xa21,qHTSF4.1,fgf</i> )	BB resistance	600
26	BR15013-R	BR12442-4R-49/ IR64-EMF3( <i>xa5,xa13,Xa21, qHTSF4.1,fgf</i> )	BB resistance	600
27	BR15013-R	BR12442-4R-49/ IR64-EMF3( <i>Xa21,qHTSF4.1,fgf</i> )	BB resistance	600
28	BR15014-R	BR12121-4R-53/ IR12N177 ( <i>xa5,Pita,qHTSF4.1</i> )	BB resistance	600

29	BR15015-R	BR11723-4R-12/N22// BR11867-4R-371/ IR64-EMF3 ( <i>xa5,xa13,Xa21, Pi9</i> )	BB & Blast resistance	600
30	BR15015-R	<i>Xa21,xa5, qHTSF4.1</i>	BB resistance	600
31	BR15015-R	<i>Xa21,xa5,Pita,Pi9</i>	BB & Blast res	600
32	BR15016-R	BR8781-16-1-3-P2/ BR12442-4R-49 ( <i>Xa21,qHTSF4.1,fgf</i> )	BB resistance	600
33	BR15023-R	BRR1 dhan71*3/ IR127152-3-22-2-1-B ( <i>xa5,xa13,Xa21</i> )	BB resistance	600
34	BR15023-R	BRR1 dhan71*3/ IR127152-3-22-2-1-B ( <i>Xa21, xa5</i> )	BB resistance	600
35	BR15024-R	BR9829-78-1-2-1*3/ IR127152-3-22-2-1-B ( <i>Xa21,xa13</i> )	BB resistance	600
36	BR15025-R	BRR1 dhan99*3/ IR127152-3-22-2-1-B	BB resistance	600
37	BR15025-R	BRR1 dhan99*3/ IR127152-3-22-2-1-B	BB resistance	600
<b>Total</b>				<b>22,200</b>

SN	BR No.	Designation	Progenies	
<b>F<sub>3</sub>, T. Aus (BB)</b>				
1	BR14674-2R	BR9006-40-2-3-1/ BR11607-4R-72	BB resistance	500
2	BR14675-2R	BR9830-53-3-5-2/ BR11607-4R-72	BB resistance	500
3	BR14676-2R	BR9011-25-4-1-3/ BR11723-4R-172	BB resistance	500
4	BR14677-2R	BR9830-53-3-5-2/ BR11723-4R-172	BB resistance	500
5	BR14678-2R	BR9829-78-1-2-1/ BR11723-4R-12	BB resistance	500
6	BR14679-2R	BR11723-4R-172/IR64-EMF <sub>3</sub>	BB resistance	500
7	BR14680-2R	7 FBR-376/ BR11723-4R-172	BB resistance	500
8	BR14681-2R	BR11723-4R-12/N22	BB resistance	500
9	BR14682-2R	7 FBR-222/ BR11723-4R-12	BB resistance	500
10	BR14683-2R	BR11868-5R-2/BRBa-1-4-9	BB resistance	500
11	BR14684-2R	BR11868-5R-2/7 FBR-376	BB resistance	500
12	BR14685-2R	BR11867-4R-371/ IR64-EMF <sub>3</sub>	BB resistance	500
13	BR14686-2R	BR9006-40-2-3-1*2/ BR11868-5R-23	BB resistance	500
14	BR14687-2R	BR9006-40-2-3-1/ BR11868-5R-23// BR11723-4R-172	BB resistance	500
15	BR14688-2R	BR9829-78-1-2-1*2/ BR11607-4R-192	BB resistance	500
16	BR14689-2R	BR9829-78-1-3-2*2/ BR11868-5R-23	BB resistance	500
17	BR14690-2R	BR9829-78-1-3-2/ BR11868-5R-23// BR11723-4R-12	BB resistance	500
18	BR14691-2R	BR11600-4R-230/N22//BR11723-4R-172	BB resistance	500
19	BR14692-2R	BR11868-5R-23/N22// BR11723-4R-172	BB resistance	500
<b>Total</b>				<b>9500</b>

SN	BR No.	Cross combination	Imp. Features	Progenies
<b>F<sub>4</sub>, Bacterial Blight (BB)</b>				
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/ BRR1 dhan43	BB, Earliness	400
8	BR14319-3R	7 FBR-416/ BR9651-15-2-1-4	Earliness	400
9	BR14321-3R	BRR1 dhan92/ IR99853-B-B-B-460	BB, High temp. tol	400
10	BR14327-3R	BRR1 dhan98/ BR11102-4R-247	Earliness	400
11	BR14329-3R	BRR1 dhan99/ BR11102-4R-247	Earliness	400
12	BR14332-3R	BRR1 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	BRR1 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
			<b>Total</b>	<b>12400</b>
<b>F<sub>2</sub>, Blast</b>			<b>Imp. Features</b>	<b>Progenies</b>
1	BR14999-R	BRRI dhan80*2/ IRR154-Pi9 ( <i>xa5, Pi9, TSV1</i> )	Blast resistance	600
2	BR15000-R	BR9006-40-2-3-1*2/ IRR154-Pi9 ( <i>xa5, xa13, Pi9</i> )	Blast resistance	600
3	BR15000-R	BR9006-40-2-3-1*2/ IRR154-Pi9 ( <i>Xa21, qHTSF4.1</i> )	Blast resistance	600
4	BR15001-R	BR8781-16-1-3-P2*2/ IRR154-Pi9 ( <i>xa5, Pi9</i> )	Blast resistance	600
5	BR15001-R	BR8781-16-1-3-P2*2/ IRR154-Pi9 ( <i>Pi9, frg, qHTSF, TSV1</i> )	Blast resistance	600
6	BR15003-R	BRRI dhan70*2/ IRR154-Pi9 ( <i>xa5, Pi9, Pita, TSV1, fgr</i> )	Blast resistance	600
7	BR15004-R	BR11723-4R-12*2/ IR64-Pi9 ( <i>qHTSF</i> )	Blast resistance	600
8	BR15005-R	BRBa-1-4-9*2/ IR64-Pi9 ( <i>TSV1</i> )	Blast resistance	600
9	BR15006-R	7 FBR-222*2/ IRBLta2-Pi(RL)-T(RL) ( <i>Pi9, Pita</i> )	Blast resistance	600
10	BR15007-R	BRRI dhan87*3/ IRBL9-W (RL) ( <i>Pi9, TSV1, qHTSF4.1</i> )	Blast resistance	600
11	BR15018-R	BRAC dhan2/ IRR154-Pi9 ( <i>xa5, TSV1, Pi9, fgr</i> )	Blast resistance	600
12	BR15019-R	BRAC dhan2/ BR12450-4R-24-1 ( <i>Pita, Pi9, fgr</i> )	Blast resistance	600
13	BR15021-R	7 FBR-222/ IRR154-Pi9 ( <i>xa5, TSV1, Pi9, Pita</i> )	Blast resistance	600
14	BR15022-R	BR12121-4R-53/ IRBL9-W ( <i>Pita, Pi9, qHTSF4.1</i> )	Blast resistance	600
15	BR15026-R	Kataribhog/ IRBL9-W(RL) ( <i>Pi9, qHTSF4.1</i> )	Blast resistance	600
16	BR15027-R	Khasa (Cumilla)/IR64-Pi9*2 ( <i>Pita, xa5, Pi9, fgr</i> )	Blast resistance	600
17	BR14701-R	BRRI dhan87*2/ IRBL9-W (RL) ( <i>qHTSF4.1, Pi9</i> )	Blast resistance	600
			<b>Total</b>	<b>10,200</b>
<b>F<sub>4</sub>, Blast</b>			<b>Imp. Features</b>	<b>Progenies</b>
1	BR14693-2R	BRRI dhan80*2/ IRR154-Pi9 ( <i>Pi9</i> )	Blast res	500
2	BR14694-2R	BR9006-40-2-3-1/ IRR154-Pi9 ( <i>TSV1</i> )	Blast res	500
3	BR14695-2R	BR8781-16-1-3-P2/ IRR154-Pi9 ( <i>TSV1</i> )	Blast res	500
4	BR14696-2R	BR11723-4R-12/ IRR154-Pi9	Blast res	500
5	BR14697-2R	BRRI dhan70/ IRR154-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
			<b>Total</b>	<b>4500</b>

### Experiment 13.4: Line Stage Testing (LST)

**Principal Investigator:** M Khatun

**Co-Investigator:** S K Debsharma & J Ferdousy

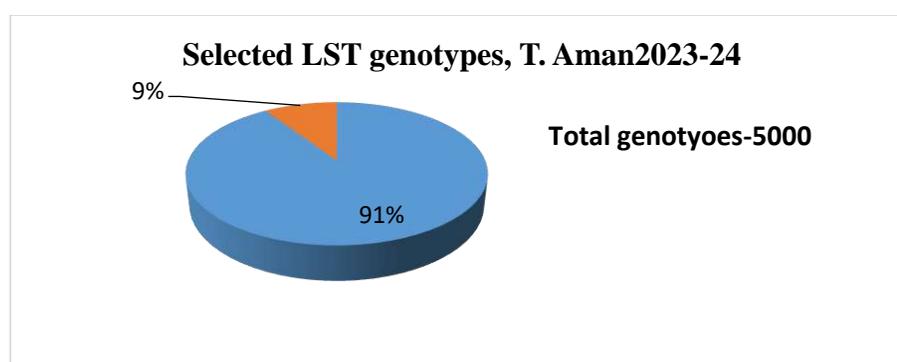
**Specific Objective:** Isolation of homogeneous breeding lines with improved plant type, disease-free, and short duration.

**Materials and Methods:** In the Line Stage Testing, near isogenic lines (NILs) are evaluated along with resistance check, and genotypes are selected based on their agronomic acceptance. 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 @ a single seedling per hill. The application of fertilizer & crop management was done as described in experiment 1.

**Results and Discussion:** In the T. Aman2023-24 season, five hundred seventeen lines were selected from 5000 NILs based on identical flowering, grain type, phenotypic acceptability, and trait genotyping (Table 13.6 and Fig. 13.1 & 13.2). Seven hundred forty lines out of 6654 lines were selected based on identical flowering, grain type, phenotypic acceptability, and trait genotyping in the Boro2023-24 season (Table 13.7 and Fig. 13.3). High selection pressure was applied in LST, in both T. Aman and Boro season based on visual selection.

**Table 13.6 List of materials for Line Stage Testing (LST), development of disease resistant rice for BB, T. Aman2023-24**

F <sub>6</sub> , Bacterial blight (BB)			Imp. Features	Progenies
1	BR13636-4R	Nania/BR8548-8-22-5-15	BB res.	250
2	BR13639-4R	BRRRI dhan79/ BR9942-1-2-1-1-B2	"	250
3	BR13640-4R	BRRRI dhan72/BR9942-1-2-1-1-B2	"	200
4	BR13641-4R	BRRRI dhan71/ BR8548-8-22-5-15	"	250
5	BR13969-4R	BRRRI dhan72*2/BR9942-1-2-1-1-B2	<i>Xa21, Waxa, b,10, Pb1</i>	300
6	BR13970-4R	BRRRI dhan87*2/BR9942-1-2-1-1-B2		300
7	BR13971-4R	BRRRI 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	BRRRI dhan87/ BR10397-3-2-1-1-8		250
11	BR13976-4R	BRRRI 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	BRRRI 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	BRRRI dhan70*2/ IRBL9-W(RL)	Blast res.	300
17	BR13661-4R	BRRRI dahn87/IRBL9-W(RL)	"	200
18	BR13662-4R	BRRRI dahn87/Mineasahi	"	100
19	BR13664-4R	BRRRI dhan80/IRBL9-W(RL)	"	250
20	BR14341-3R	BRRRI dhan87*2/ IRBL9-W (RL)	Blast res	300
<b>Total</b>				<b>5000</b>



**Fig. 13.1. Frequency distribution of LST lines in T. Aman2023-24**

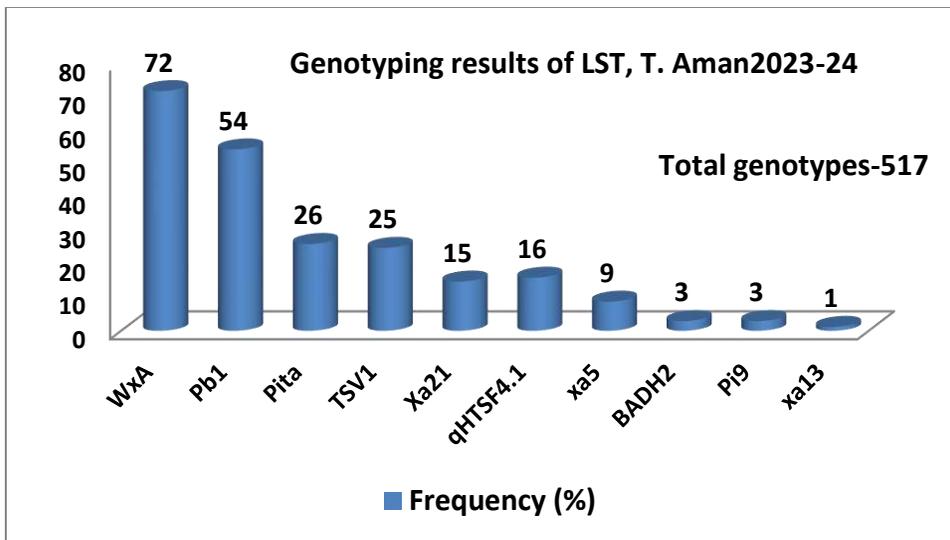
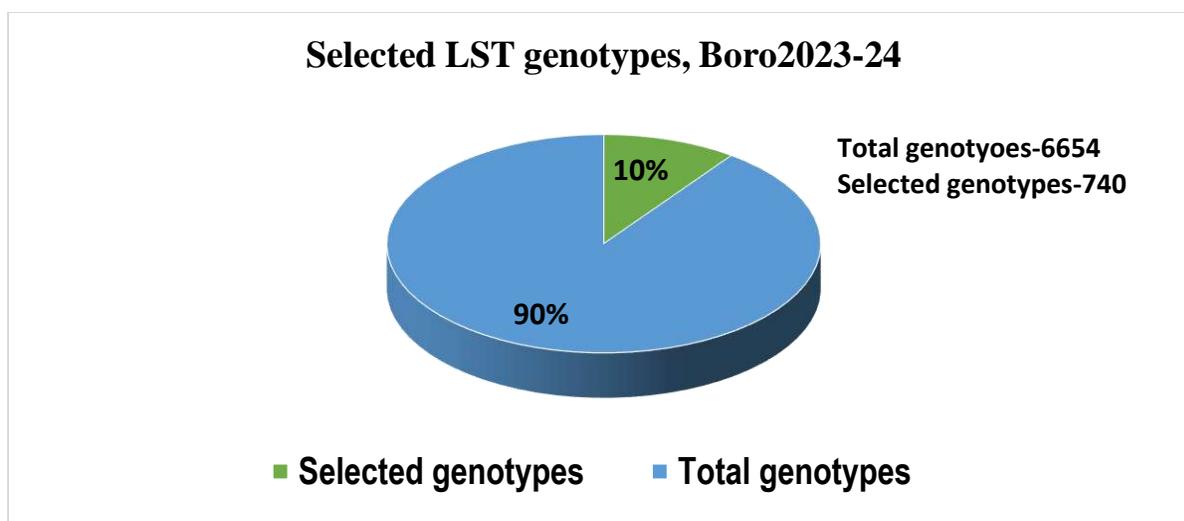


Fig. 13.2. Trait marker profiles showing favorable alleles for different key target traits of the selected LST lines, T. Aman2023-24

Table 13.7. List of materials for Line Stage Testing (LST), development of disease resistant rice for BB, Boro2023-24

F <sub>6</sub> , Bacterial Blight (BB), T. Aus			Imp. Features	Progenies
1	BR13959-4R	HHZ15-DT7-SAL4-SAL1/ BR9942-1-2-1-1-B2	"	300
2	BR14319-4R	7 FBR-416/ BR9651-15-2-1-4	Earliness	300
3	BR14321-4R	BRR1 dhan92/ IR99853-B-B-B-460	BB, High temp. tol	362
4	BR14329-4R	BRR1 dhan99/ BR11102-4R-247	Earliness	339
5	BR14317-4R	7 FBR-416/ BR11868-5R-59	BB res	342
6	BR14318-4R	7 FBR-400/ BR11868-5R-89	BB res	300
7	BR14320-4R	BR11600-4R-230/ BR11607-4R-153	BB res	270
8	BR14322-4R	BRR1 dhan89/ BR11607-4R-192	BB, High temp. tol	274
9	BR14323-4R	BR11600-4R-140/ BR11607-4R-153	BB res	196
10	BR14324-4R	BR11604-4R-84/ BR11600-4R-230	BB res	190
11	BR14325-4R	BR11723-4R-12/ BR11868-5R-89	BB res	196
12	BR14326-4R	BR11723-4R-172/ BR11607-4R-192	BB, High temp. tol	200
13	BR14328-4R	BRR1 dhan99/ BR11103-4R-97	BB res	195
14	BR14331-4R	7 FBR-400/ BR11103-4R-97	BB res	200
15	BR14333-4R	BRR1 dhan98/ IR64-Pi9	Blast res	200
16	BR14336-4R	BR11723-4R-172/ USPi9	Earliness	200
<b>Blast</b>				
17	BR13980-4R	HHZ15-DT7-SAL4-SAL1*2/US-Pi9	Lodging tol	150
18	BR13981-4R	BRR1 dhan89*2/NERICA-L-19	"	150
19	BR13982-4R	7 FBR-336*2/ US (Pi9)	"	150
20	BR14334-4R	BRR1 dhan99/ IR64-Pi9		150
21	BR14335-4R	BR11723-4R-12/ USPi9	Blast res	150
22	BR14998-2R (3BB+Pi9)	BR9829-78-1-2-1*3/ BR11607-4R-192 (3 genes, Pi9, Pita, Ptb1)		150
23	BR15000-2R (Pi9)	BR9006-40-2-3-1*2/ IRR1154-Pi9 (xa5, xa13, Pi9)		150
24	BR15001-2R (Pi9+frg+qHTSF)	BR8781-16-1-3-P2*2/ IRR1154-Pi9 (Pi9, frg, qHTSF4.1, TSV1)		150
<b>F<sub>5</sub>, Bacterial Blight (BB)</b>				
25	BR13643-4R	BR9636-8-6-10-2/BR9943-35-2-1-2-B2	lodging tol	200
26	BR13644-4R	BR8548-8-22-5-15/BR9651-15-4-3-2	Lodging tol	195
27	BR13972-4R	BRR1 dhan75/BR9942-1-2-1-1-B2	"	200
28	BR13977-4R	7 FBR-190/ BR9636-8-6-10-2-3	"	200
29	BR14343-3R	BRR1 dhan71*2/ IR127152-3-22-2-1-B	BB res	195
30	BR15023-R	BRR1 dhan71*3/ IR127152-3-22-2-1-B	BB res	200
31	BR15025-R	BRR1 dhan99*3/ IR127152-3-22-2-1-B	"	200
<b>Total</b>				<b>6654</b>



**Fig 13.3. Frequency distribution of LST lines in Boro 2023-24**

### Experiment 13.5: Observational Yield Trial (OYT)

**Principal Investigator:** M Khatun

**Co-Investigators:** S K Debsharma, J Ferdousy (Plant Breeding), M A I Khan (Plant Pathology), M A Rahman & M R Hasan (Rangpur), M R Islam, S Abedin, M F Islam (Rajshahi), A K M Shalahuddin, N Jahan, and M R Islam (Cumilla)

**Specific Objective:** Selection of homogeneous breeding lines with acceptable grain quality having high yield with good plant type and resistance to BB.

**Materials and Methods:** In this experiment, genotypes which were selected from previous season LST were evaluated along with standard check in both T. Aman and Boro season. Twenty-five-day-old seedlings for T. Aman and thirty-five-day-old seedlings for Boro season were transplanted at a spacing of 20 cm × 20 cm. The plot size was 5.4 m × 5 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:** Ninety NILs are evaluated at four locations (Gazipur, Cumilla, Rangpur, and Rajshahi) in T. Aman2023-24 season along with standard check BRR1 dhan49, BRR1 dhan87, BRR1 dhan75, and IRBB60. From this trial 4 lines were selected based on yield, growth duration, BB score (1-3), and amylose (%) which will be evaluated in Advanced Yield Trial (AYT) in the next season. The average plant height of the materials varied from 105-188 cm and the growth duration was about 105 to 128 days. The genotypes BR12900-4R-101, BR12896-4R-124, BR13631-3R-195, and BR12898-4R-82 were the top yielder materials presented in **Table 13.8**.

In Boro2023-24, 20 genotypes were selected out of 384 based on growth duration, yield, BB score (1-3), and amylose (%). The average plant height of the materials varied from 90-140 cm and the growth duration was about 143 to 160 days. The yield range of different locations is shown in boxplot (**Fig 13.4**). The genotypes BR13618-4R-249, BR13624-4R-89, BR13618-4R-5, BR13645-4R-172, BR13645-4R-164, BR13618-4R-268, and BR13618-4R-170 were the top yielder materials presented in **Table 13.9**.

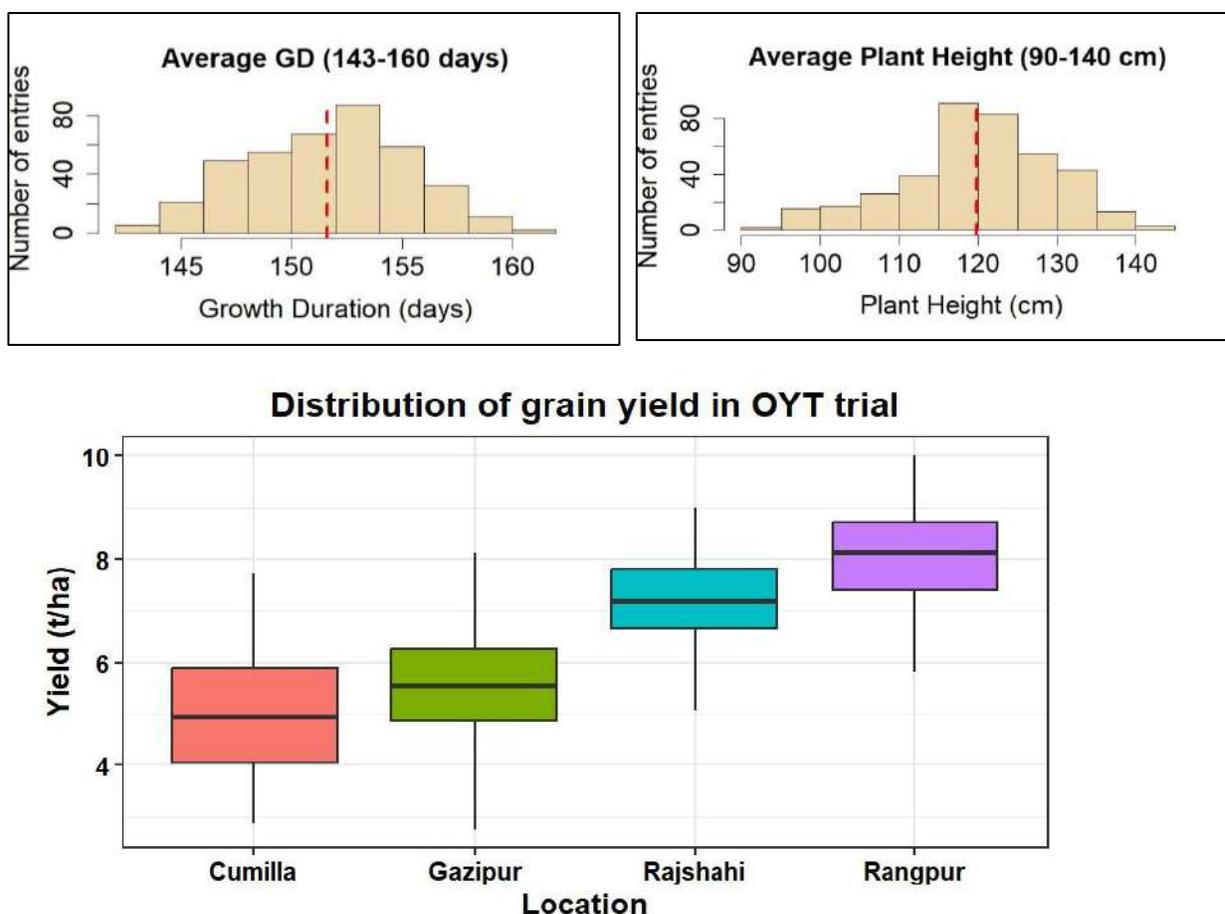
**Table 13.8. Performance of the top 20 advanced lines in the observational trial (OYT), development of BB resistance, T. Aman2023-24**

SN	Designation	DM (day)	PH (cm)	Different locations (t/ha)				
				Gazi	Cumi	Raj	Rang	Avg.
*1	BR12900-4R-101	121	117	5.58	-	5.86	6.39	5.94
*2	BR12896-4R-124	124	129	5.63	6.77	4.30	6.73	5.86
*3	BR13631-3R-195	119	119	5.11	-	3.86	7.67	5.72
*4	BR12898-4R-82	117	112	4.35	6.35	4.05	7.49	5.56
5	BR12896-4R-239	119	127	7.05	5.84	4.22	4.18	5.32
6	BR12907-4R-114	117	122	2.79	4.85	7.42	6.22	5.32

7	BR12896-4R-225	126	120	4.97	5.79	5.79	4.64	5.30
8	BR12906-4R-284	116	124	5.40	6.54	4.47	4.44	5.22
9	BR12902-4R-256	121	133	4.21	7.38	4.31	4.97	5.22
10	BR13630-3R-1	116	127	4.53	4.81	4.42	6.88	5.16
11	BR12913-4R-3	116	122	3.83	6.73	3.47	6.55	5.15
12	BR13631-3R-38	120	113	4.74	6.93	3.60	5.20	5.11
13	BR12902-4R-127	119	118	4.61	4.16	4.33	7.35	5.11
14	BR12903-4R-2	123	126	5.55	6.38	3.37	5.05	5.09
15	BR12907-4R-71	119	125	6.05	6.42	4.05	3.82	5.09
16	BR12896-4R-53	122	127	5.58	5.76	5.12	3.84	5.07
17	BR12900-4R-4	118	125	4.79	7.16	4.77	3.52	5.06
18	BR12896-4R-140	118	121	4.80	6.80	2.48	6.13	5.05
19	BR12896-4R-178	126	118	5.07	5.10	4.95	4.99	5.03
20	BR12907-4R-278	119	130	5.36	5.12	4.73	4.47	4.92
21	BRRRI dhan49 (Ck.)	128	105	4.77	5.71	4.51	5.40	5.10
22	BRRRI dhan87 (Ck.)	125	119	3.22	5.98	3.57	6.04	4.70
13	BRRRI dhan75 (Ck.)	118	116	3.98	5.44	2.97	5.64	4.51
24	IRBB60 (Ck.)	118	107	3.63	4.43	3.08	4.17	3.83
	LSD	7.33	17.58	1.32	0.97	0.85	1.08	1.44
	H2b	0.46	0.25	0.65	0.86	0.97	0.82	0.89

**Table 13.9. Performance of the top 20 advanced lines in the observational trial (OYT), development of BB resistance, Boro2023-24**

SN	Designation	DM (day)	PH (cm)	Different locations (t/ha)				
				Gaz	Cumi	Raj	Rang	Avg.
*1	BR13618-4R-249	156	125		7.53	8.92	8.81	8.13
*2	BR13624-4R-89	150	130	7.57	7.51	8.50	8.79	8.09
*3	BR13618-4R-5	153	109	6.84	7.39	8.41	9.67	8.08
*4	BR13645-4R-172	146	121	8.81	5.79	8.02	9.26	7.97
*5	BR13645-4R-164	145	108	6.08	7.27	8.34	9.63	7.83
*6	BR13618-4R-268	152	117	7.45	6.42	8.02	9.20	7.77
*7	BR13618-4R-170	158	118		7.47	7.75	8.95	7.77
8	BR13618-4R-239	155	120	6.98	7.28	7.95	7.97	7.55
9	BR13628-4R-2	146	125	6.66	7.33	6.92	9.23	7.53
10	BR13645-4R-102	147	108	7.44	6.01	8.37	8.28	7.52
11	BR13645-4R-205	147	118	6.85	6.17	8.35	8.66	7.51
12	BR13618-4R-335	153	108	6.07	7.71	7.42	8.82	7.51
13	BR13614-5R-347	154	123	5.65	7.68	8.30	8.30	7.48
14	BR13614-5R-215	153	119	5.87	7.61	7.08	9.34	7.48
15	BR13638-4R-138	146	117	6.29	5.91	8.04	9.56	7.45
16	BR13645-4R-45	148	120	7.31	5.81	8.44	8.23	7.45
17	BR13627-4R-187	152	121	5.50	6.73	8.17	9.26	7.42
18	BR13645-4R-16	148	107		5.41	8.21	9.48	7.41
19	BR13629-4R-178	152	109	5.77	6.58	8.14	9.10	7.40
20	BR13627-4R-46	154	132	6.97	6.04	7.91	8.67	7.39
21	BRRRI dhan88 (Sus. & Std. Ck.)	144	100	4.48	6.28	7.68	8.23	6.67
22	BRRRI dhan89 (Sus. & Std. Ck.)	156	116	5.73	6.04	8.30	8.79	7.22
13	BRRRI dhan92 (Sus. & Std. Ck.)	157	118	5.39	6.22	7.80	8.93	7.08
24	BRRRI dhan101 (Res.Ck.)	150	117	5.35	6.50	7.40	8.04	6.82
	LSD	6.29	11.9	1.26	1.52	0.85	1.57	1.67
	H2b	0.48	0.42	0.89	0.46	0.66	0.81	0.20



**Fig. 13.4.** Histogram and Boxplot showing yield performance of 384 entries tested in OYT at four locations during Boro2023-24

#### Experiment 13.6: Advanced Yield Trial (AYT)

**Principal Investigator:** M Khatun

**Co-Investigators:** S K Debsharma J Ferdousy (Plant Breeding), M A I Khan (Plant Pathology), M A Rahman & M M R Dewan (Kushtia), S Abedin, M F Islam (Rajshahi)

**Specific Objective:** Initial yield evaluation and selection of desirable lines as compared with standard checks in on-station conditions.

**Materials and Methods:** The experiment was evaluated at four locations BRRI Gazipur, Kushtia, Rangpur, and Rajshahi. The selected line from OYT trials were evaluated along with the standard checks under development of BB resistance. The twenty-five-day-old seedlings for T. Aman and thirty-five-day-old seedlings for Boro season were transplanted at a spacing of 20 cm × 20 cm. The plot size was 5.4 m × 5 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:** Single genotype was selected out of 11 based on BB score and grain yield compared to the check varieties in T. Aman season AYT#1 trial (**Table 13.10**). The genotype GSR IR1-DQ140-R2-Y1 was selected for better grain yield and resistance to BB with similar growth duration to the check variety BRRI dhan75 (**Table 13.10**). The average plant height of the materials varied from 106-133 cm, and the growth duration was about 118 to 135 days.

Twelve genotypes were selected out of 46 based on BB score and grain yield compared to the check varieties in Boro season AYT#1 trial. The genotypes BR13189-4R-60, BR13189-4R-90, and BR12911-4R-388 were selected for better grain yield and resistance to BB with similar growth duration to the check varieties BRRI dhan88 and BRRI dhan101 (**Table 13.11**). The average plant height of the materials varied from 90-130 cm, and the growth duration was about 138 to 155 days. The yield range of different locations is shown in the boxplot (**Fig. 13.5**).

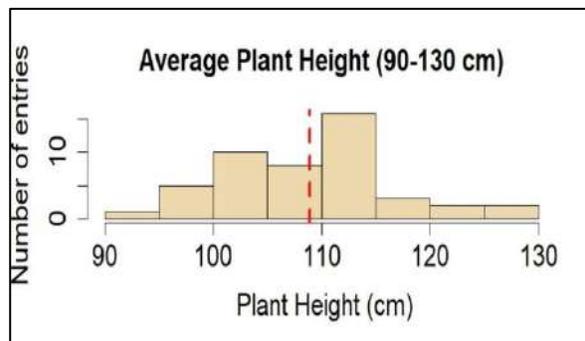
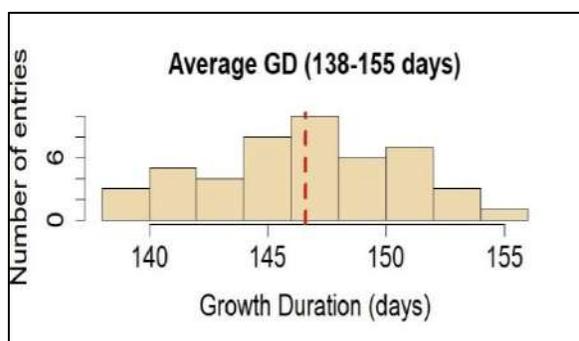
In AYT#2, nine genotypes were selected out of 48 based on BB score and grain yield compared to the check varieties. The genotypes BR13186-4R-28, BR13186-4R-22, BR13186-4R-196, and BR13180-4R-150 were selected for better grain yield and resistance to BB with similar growth duration to the check varieties BRRRI dhan89 and BRRRI dhan92 (Table 13.12). The average plant height of the materials varied from 103-150 cm, and the growth duration was about 148 to 160 days. The yield range of different locations is shown in the boxplot (Fig. 13.6).

**Table 13.10. Grain yield and agronomic parameters of AYT#1, Trait development resistant to BB, T. Aman2023-24**

SN	Designation	GD (days)	PH (cm)	Gazi	Cumi	Raj	Rang	Yield (t/ha)	Targeted BB res genes
*1	GSR IRI-DQ140-R2-Y1	118	114	4.63	6.37	6.10	4.96	5.51	<i>Xa4, Xa21</i>
2	BR11110-3R-61	131	125	4.36	6.24	5.64	4.69	5.23	<i>Xa4, Xa21</i>
3	BR11871-5R-127	119	118	4.16	4.59	7.14	4.62	5.13	<i>Xa4, Xa21</i>
4	BR12098-4R-127	118	133	3.92	6.55	5.62	3.86	4.99	<i>Xa4, Xa21</i>
5	BR11993-4R-1-1	130	126	4.79	5.78	4.44	4.91	4.98	<i>Xa4, Xa21</i>
6	BR11603-4R-118	118	108	3.21	6.28	6.53	3.06	4.77	<i>Xa4, Xa21</i>
7	BR10393-4-1-1-2-1	135	120	4.40	4.81	3.94	3.23	4.09	<i>Xa4, Xa21</i>
8	BR11127-4R-31	126	114	3.19	4.67	5.32	3.02	4.05	<i>Xa4, Xa21</i>
9	BR11127-4R-147	125	118	3.17	5.46	4.58	2.89	4.03	<i>Xa4, Xa21</i>
10	BR11127-4R-12	125	114	2.94	4.79	4.38	3.01	3.78	<i>Xa4, Xa21</i>
11	SV0811	126	114	3.61			3.12	3.37	<i>Xa4, Xa21</i>
	BRRRI dhan87 (Ck.)	126	126	4.17	6.04	6.15	3.94	5.07	-
	BRRRI dhan75 (Ck.)	115	106	4.33	5.36	5.60	4.36	4.91	-
	BRRRI dhan49 (Ck.)	129	107	3.73	5.68	5.46	4.16	4.75	-
	LSD	7.85	12.45	3.31	4.48	4.82	4.06	4.17	
	H2b	0.52	0.31	0.77	0.47	0.38	0.92	1.06	

**Table 13.11. Grain yield and agronomic parameters of the top ten short duration entries, AYT#1, Trait development resistant to BB, Boro2023-24**

SN	Designation	GD (days)	PH (cm)	Gazi	Kush	Raj	Yield (t/ha)	BB score (art.)*	Targeted BB res genes
*1	BR13189-4R-60	146	110	8.19	7.97	8.26	8.14	3	<i>Wxa,Pb1,xa13</i>
*2	BR13189-4R-90	148	113	8.45	7.49	8.08	8.01	5	<i>Wxa,Pb1</i>
*3	BR12911-4R-388	146	105	8.73	7.17	7.78	7.89	5	<i>Wxa,pita,pb1</i>
4	BR13189-4R-30	144	111	8.31	7.34	7.66	7.77	1	<i>Wxa,TSV1</i>
5	BR12909-4R-120	156	96	7.47	7.23	8.55	7.75	5	<i>Pita,Pb1</i>
6	BR12904-4R-132	151	113	8.51	6.48	8.08	7.69	1	<i>Xa21,xa5</i>
7	BR12904-4R-233	150	113	8.65	-	7.14	7.65	5	<i>Xa21,xa,5, TSV1</i>
8	BR13189-4R-8	146	165	8.07	-	7.79	7.59	1	<i>Wxa,Pb1,xa13</i>
9	BR13185-4R-97	152	129	7.50	-	8.22	7.53	5	<i>Pita,Pb1</i>
10	BR13188-4R-304	151	112	6.92	7.18	8.36	7.49	3	<i>Xa21,pita,pb1</i>
	BRRRI dhan88 (Sus Ck.)	142	94	7.29	5.69	7.53	6.90	7	-
	BRRRI dhan101 (Std Ck.)	150	111	7.23	6.89	8.12	7.41	7	<i>Xa4,Xa7,Xa21</i>
	LSD	4.21	12.52	1.02	0.88	0.64	1.48		
	H2b	0.67	0.43	0.55	0.67	0.86	0.92		



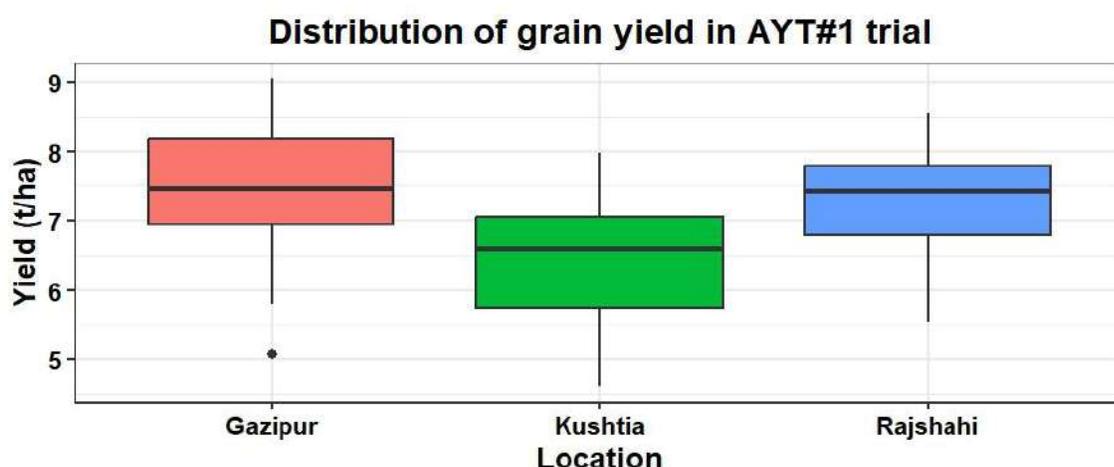


Fig. 13.5. Histogram and Boxplot showing yield performance of 12 entries tested in AYT#1 at three locations during Boro2023-24

Table 13.12. Grain yield and agronomic parameters of the top nine long-duration entries, AYT#2, Trait development resistant to BB, Boro2023-24

SN	Designation	GD (days)	PH (cm)	Gazi	Kush	Raj	Yield (t/ha)	BB Score (art.)	Trait/gene of interest
*1	BR13186-4R-28	154	127	9.24	6.53	8.07	7.95	1	<i>Pita, Pb1, Xa21</i>
*2	BR13186-4R-22	157	138	9.06	6.30	8.20	7.85	1	<i>Pita, Pb1, Xa21</i>
*3	BR13186-4R-196	153	121	8.70	-	8.17	7.76	5	<i>Pita, Pb1</i>
*4	BR13180-4R-150	152	153	9.70	5.58	7.87	7.72	5	<i>Xa21, Pb1</i>
5	BR13186-4R-90	152	123	8.24	6.25	8.18	7.56	3	<i>Pita, Pb1, Xa21</i>
6	BR13186-4R-49	152	111	8.17	6.22	8.25	7.55	5	<i>Pita, xa5</i>
7	BR13174-4R-396	153	148	9.00	5.90	7.72	7.54	1	<i>Xa21, TSV1</i>
8	BR13183-4R-20	158	125	8.18	6.15	8.22	7.52	5	<i>Pita, xa5</i>
9	BR13180-4R-147	157	127	8.22	5.92	8.23	7.46	1	<i>Xa21, TSV1</i>
10	BRR1 dhan89	155	114	8.31	6.49	8.37	7.73	9	-
11	BRR1 dhan92	160	125	7.40	6.89	8.15	7.48	1	-
LSD		5.60	7.6	0.49	1.07	0.54	1.29		
H2b		0.30	0.12	0.89	0.59	0.90	0.16		

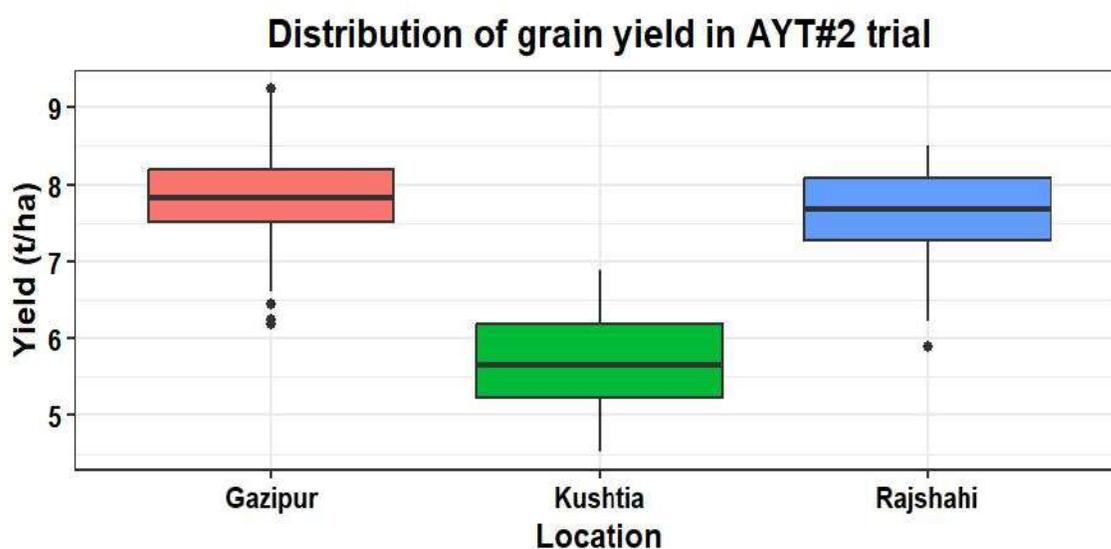
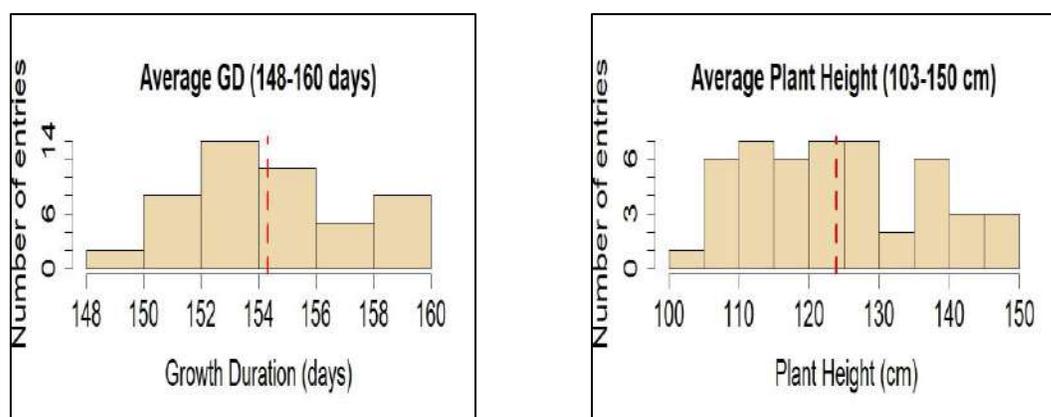


Fig. 13.6. Histogram and Boxplot showing yield performance of 9 entries (long duration) tested in AYT#2 at three locations during Boro2023-24

## Experiment 13.7: Regional Yield Trial (RYT)

**Principal Investigator:** M Khatun

**Co-Investigators:** S K Debsharma, J Ferdousy (Plant Breeding), M A I Khan (Plant Pathology), and others from regional station scientists

**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 six different locations such as BRRI Gazipur, Rangpur, Rajshahi, Cumilla, Habiganj, and Kushtia. The selected materials from AYT were evaluated in RYT trial for both T. Aman and Boro season along with the standard checks under the development of BB resistance. Twenty-five-day-old seedlings for T. Aman and forty-day-old seedlings for Boro were transplanted at a spacing of 20 cm × 15 cm. The plot size was 5.4 m × 10 rows. Two to three seedlings were 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:** In the T. Aman2023-24 season, the total RYT experiment was divided into two parts i.e., RYT#1 and RYT#FS. From RYT#1, genotype BR11869-5R-47 was selected from six materials on grain yield, growth duration, resistance to BB and grain qualities compared to the check varieties and having almost 0.2 t/ha higher yield than BRRI dhan87 and ability to resist bacterial blight (**Table 13.13**). From RYT#FS, the genotypes BR(Path)13804-BC3-4, BR(Path)13804-BC3-14, and BR(Path)13804-BC3-16 were selected from nine lines on grain yield, growth duration, resistance to BB, and grain qualities compared to the check varieties and having higher or almost same yield of BRRI dhan87 and ability to resist bacterial blight (**Table 13.14**).

In Boro2023-24 season RYT#1, three genotypes BR11866-5R-277, BR11867-5R-331, and BR11869-5R-148 were selected from 14 materials on grain yield, growth duration, resistance to BB, and grain qualities compared to the check varieties (**Table 13.15**).

**Table 13.13. Grain yield and agronomic parameters of the entries, RYT#1, development of BB resistant rice, T. Aman2023-24**

SN	Designation	DM (days)	PH (cm)	Yield (t/ha)							
				Cum i	Gazi	Kush	Raj	Rang	Sat	Sona	Avg.
1	BR11986-4R-123	123	109	6.20	4.30	5.54	5.68	4.79	3.45	5.07	5.01
2	BR12098-4R-117	125	138	5.16	5.12	6.00	5.16	4.28	2.95	5.57	4.89
3	BR12098-4R-71	117	131	5.57	4.57	6.23	4.61	2.92	3.17	4.91	4.57
4	BR12442-4R-49	118	110	5.88	5.08	5.68	4.70	5.30	3.61	5.26	5.07
*5	BR11869-5R-47	130	127	5.71	5.25	5.88	5.54	6.04	4.35	5.17	5.42
6	BR11869-5R-72	133	126	5.60	4.69	5.17	4.75	4.56	3.43	5.25	4.78
	BRRI dhan75	112	107	5.15	5.48	5.39	5.43	5.04	3.38	4.20	4.87
	BRRI dhan87	125	127	5.73	5.09	5.73	5.59	5.62	3.89	5.19	5.26
	IRBB60	115	100	4.06	4.03	4.71	4.92	4.73	3.37	3.41	4.18
	LSD	2.45	4.03	0.39	0.45	0.33	0.20	1.80	0.40	0.36	0.62
	H2b	0.84	0.65	0.75	0.69	0.70	0.83	0.69	0.47	0.78	0.30

**Table 13.14. Grain yield and agronomic parameters of the entries, RYT#FS, development of BB resistant rice, T. Aman2023-24**

SN	Designation	DM (days)	PH (cm)	Yield (t/ha)							
				Cumi	Gazi	Hab	Kush	Rang	Raj	Sat	Avg
*1	BR(Path)13804-BC3-4	120	114	5.80	4.65	5.16	5.23	5.16	4.60	4.60	5.56
2	BR(Path)13804-BC3-9	117	121	5.49	4.22	3.26	4.91	3.26	4.87	4.41	4.33
3	BR(Path)13804-BC3-13	119	110	4.96	4.18	3.77	5.01	3.77	5.69	4.25	4.86
*4	BR(Path)13804-BC3-14	119	113	5.47	3.58	4.29	5.30	4.29	5.07	5.04	5.80
*5	BR(Path)13804-BC3-16	120	120	6.00	4.22	4.70	5.74	4.70	5.52	4.63	5.47
6	BR(Path)13804-BC3-18	116	123	5.68	4.58	4.44	4.87	4.44	4.29	4.18	4.87
7	BR(Path)13804-BC3-20	116	111	5.72	4.82	5.13	5.38	5.13	5.76	4.47	5.29
8	BR(Path)13804-BC3-21	118	112	5.09	4.48	4.04	5.65	4.04	4.17	4.68	4.52
9	BR(Path)13804-BC3-134-21-1	113	116	4.79	4.78	4.49	4.23	4.49	4.36	3.97	4.68
	BRRI dhan49 (Ck.)	132	107	5.28	4.40	5.14	5.58	5.14	5.31	3.97	5.49

BRRi dhan87 (Ck.)	125	128	5.45	3.43	4.07	5.79	4.07	5.75	4.59	5.43
LSD	1.60	2.11	0.39	0.77	0.34	0.28	0.34	0.25	0.49	0.43
H2b	0.80	0.62	0.45	0.41	0.84	0.79	0.84	0.95	0.20	0.56

**Table 13.15. Grain yield and agronomic parameters of the entries, RYT#1, development of BB resistant rice, Boro2023-24**

SN	Designation	DM (days)	PH (cm)	Yield (t/ha)							
				Cum	Gazi	Hab	Kush	Raj	Rang	Sat	Avg.
*1	BR11866-5R-277	155	102	6.54	6.11	6.05	7.24	7.88	7.91	6.81	6.93
2	BR11867-5R-118	153	105	4.72	7.44	6.49	6.59	7.42	7.64	6.67	6.71
3	BR11867-5R-119	154	101	5.86	6.38	6.10	6.18	7.42	7.14	6.50	6.51
*4	BR11867-5R-331	157	111	6.33	6.59	5.64	6.23	7.83	8.43	6.68	6.82
5	BR11869-5R-148	147	106	7.03	7.61	5.25	5.93	7.78	7.21	5.33	6.59
*6	BR12437-4R-164	153	99	5.77	7.25	6.76	6.54	7.10	7.14	6.57	6.73
7	BR12437-4R-109	154	104	6.54	5.75	6.06	7.03	7.54	6.96	5.82	6.53
8	BR12125-6R-6	149	97	6.45	5.93	5.49	6.24	7.28	6.44	5.89	6.25
9	BR12125-6R-79	150	96	5.45	5.66	6.76	6.76	7.26	7.99	6.16	6.58
10	BR12125-6R-149	151	112	5.73	5.33	4.88	7.39	6.42	7.70	5.60	6.15
11	BR12450-4R-24	155	111	6.79	5.66	5.04	6.39	6.77	6.09	6.18	6.13
12	BR12450-4R-108	154	105	6.62	5.92	5.90	6.59	7.20	7.22	5.73	6.45
13	BR13790-5R-216	158	108	5.44	6.33	7.13	6.80	7.37	7.96	6.17	6.74
14	BR13796-5R-102	151	111	6.05	5.78	4.65	5.90	7.19	5.89	4.46	5.70
	BRRi dhan88 (Std. Ck.)	146	96	6.48	6.83	6.41	6.38	7.31	7.19	5.85	6.64
	BRRi dhan89 (Std. Ck.)	156	111	6.06	5.69	7.18	6.81	7.97	8.33	5.66	6.81
	BRRi dhan101 (Res. Ck.)	150	115	6.65	7.74	6.24	6.86	7.39	7.65	6.78	7.04
	LSD	3.46	5.3	0.43	0.88	1.14	0.6	0.32	0.38	0.23	0.65
	H2b	0.50	0.56	0.68	0.61	0.80	0.29	0.58	0.79	0.89	0.12

#### Experiment 13.8: Proposed Variety Trial (PVT), Disease resistance (Blast), Boro2023-24

**Specific Objective:** On-farm evaluation of proposed genotype by the NSB team for recommendation to release as a new variety.

**Materials and Methods:** The experiment was evaluated at ten locations under Seed Certification Agency (SCA). Two advanced lines along with the standard check BRRi dhan89 and BRRi dhan88 were evaluated under two different PVT trials (**Table 13.16 & 13.19**) under the development of blast resistance rice. Thirty-five to forty-day-old seedlings were transplanted at a spacing of 20 cm × 20 cm. The plot size was 5.4 m × 20 rows. Two to three seedlings were 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:** In PVT#LD, the blast resistance genotype BR12454-BC2-69-97-39-5-44 and the check variety BRRi dhan89 yielded an average of 7.76 and 7.69 t/ha, respectively, in all sites with a comparable duration (149 days) of the check variety (**Table 13.16**). Despite having a 27% amylose content, the grain quality and chemical characteristics are also satisfactory (**Table 13.17 & 13.18**).

In PVT#SD, the BB resistance genotype BR(Path)13784-BC3-63-6-4-HR6 and the check variety BRRi dhan88 yielded an average of 7.64 and 7.26 t/ha, respectively, in all sites with a comparable duration (134 days) of the check variety (**Table 13.19**). Despite having a 25.9% amylose content, the grain quality and chemical characteristics are also satisfactory (**Table 13.20 & 13.21**).

**Table 13.16. Grain yield and agronomic parameters of the entries, PVT#LD, Disease resistance (Blast), Boro2023-24**

SN	Region	Trial Locations	Growth duration (days)		Yield (t/ha)	
			Proposed Variety (BR12454(Path)- BC2-69-97-39-5-44)	Check Variety (BRRi dhan89)	Proposed Variety (BR12454(Path)- BC2-69-97-39-5-44)	Check Variety (BRRi dhan89)
1	Dhaka	BRRi, Gazipur	148	147	6.73	7.06
2		BINA, Mymensingh	149	147	7.91	7.85

3	Faridpur	BRRI, Faridpur	165	165	7.35	7.14
4	Jashore	Sadar Jashore	147	148	8.39	8.07
5	Chattogram	Sadar Feni	144	145	10.23	9.16
6		Laksham, Cumilla	134	135	6.07	5.79
7	Bogura	Bogura Sadar	139	139	7.49	8.19
8	Rajshahi	Paba, Rajshahi	147	151	6.42	7.14
9	Rangpur	BRRI, Rangpur	165	161	8.98	8.09
10	Dinajpur	Sadar, Dinajpur	149	150	7.99	8.28
<b>Mean</b>			149	149	7.76	7.69

**Table 13.17. Physical properties of the proposed Blast resistance line (BR12454(Path)-BC2-69-97-39-5-44) in Boro season**

SN	Designation	Milling outturn (%)	Head rice yield (%)	Milled rice Length (L) Mm	Milled rice Breadth (B) mm	L/B ratio	Size & shape	Thousand Grain Weight (g)	Appearance
1	BR12454(Path)-BC2-69-97-39-5-44	69.0	65.0	5.0	2.0	2.5	MB	17.4	Good
2	BRRI dhan89 (Ck.)	70.0	61.7	5.7	2.0	2.8	MB	24.8	Good

**Table 13.18. Chemical and cooking properties of the proposed Blast resistance line (BR12454(Path)-BC2-69-97-39-5-44) in Boro season**

SN	Designation	Amylose (%)	Protein (%)	Cooking time (min)	Elongation Ratio (ER)	Imbibition Ratio (IR)	Alkali Spreading Value
1	BR12454(Path)-BC2-69-97-39-5-44	27.0	7.7	18.0	1.4	4.3	4.1
2	BRRI dhan89 (Ck.)	27.5	7.5	19.30	1.4	3.5	4.3

**Table 13.19. Yield and agronomic performance of the promising material (BR(Path)13784-BC3-63-6-4-HR6) in Proposed Variety Trial (PVT#SD), Boro 2023-24**

SN	Region	Trial Locations	Growth duration (Days)		Yield (t/ha)	
			Proposed Variety (BR(Path)13784-BC3-63-6-4-HR6)	Check Variety (BRRI dhan88)	Proposed Variety (BR(Path)13784-BC3-63-6-4-HR6)	Check Variety (BRRI dhan88)
1	Dhaka	BRRI, Gazipur	129	132	6.96	6.72
2		BINA, Mymensingh	137	139	7.04	6.67
3	Faridpur	BRRI, Faridpur	147	149	7.39	6.95
4	Jashore	Sadar Jashore	128	128	6.86	7.35
5	Chattogram	Sadar Feni	133	133	9.14	8.19
6		Laksham, Cumilla	124	124	6.22	6.34
7	Bogura	Bogura Sadar	129	129	7.57	6.95
8	Rajshahi	Paba, Rajshahi	131	131	7.88	6.61
9	Rangpur	BRRI, Rangpur	148	150	9.81	8.83
10	Dinajpur	Sadar, Dinajpur	140	147	7.54	8.08
<b>Mean</b>			134	136	7.64	7.26

**Table 13.20. Physical properties of the proposed BB resistance line (BR(Path)13784-BC3-63-6-4-HR6) in Boro season**

SN	Designation	Milling outturn (%)	Head rice yield (%)	Milled rice Length (L) mm	Milled rice Breadth (B) mm	L/B ratio	Size & shape	Thousand Grain Weight (g)	Appearance
1	BR(Path)13784-BC3-63-6-4-HR6	72.4	59.9	6.6	2.1	3.1	LS	23.7	Good
2	BRRI dhan88 (Ck.)	71.5	66.4	6.2	2.0	3.1	LS	22.9	Good

**Table 13.21. Chemical and cooking properties of the proposed BB resistance line in Boro season**

SN	Designation	Amylose (%)	Protein (%)	Cooking time (min)	Elongation Ratio (ER)	Imbibition Ratio (IR)	Alkali Spreading Value	Chalkiness
1	BR(Path)13784-BC3-63-6-4-HR6	25.9	8.5	18.0	1.4	2.9	4.9	Wb5
2	BRRI dhan88(Ck.)	26.3	9.8	17.30	1.3	4.5	4.8	Wb1

**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: S Ghosal**

**Co-investigator: M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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:** Frothy-one parents (**Table 14.1**) 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 1,737 F<sub>1</sub> seeds were obtained from 44 crosses (**Table 1.2**). These were recorded and labeled properly. The F<sub>1</sub> seeds were sun-dried and stored in a cool and dry place.

**Table 14.1: List of Parents for hybridization to be grown, Submergence & Medium Stagnant Water Tolerance Breeding, T. Aman 2023-24**

SL.	Parents	Yield (t/ha)	Traits
1	SV1179	5.9	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-op</i> , <i>Chalk5</i> , <i>Xa4</i> , <i>GS3</i>
2	IR15F1886	6.5	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-int</i> , <i>Wx-op</i> , <i>Waxy</i> , <i>Xa4</i> , <i>xa5</i> , <i>Pita2</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>Gn1a</i>

3	IR13F582	6.5	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-op</i> , <i>Wx-int</i> , <i>BPH17</i> , <i>Pita2</i> , <i>GS3</i> , <i>Saltol</i> , <i>qAG1</i> , <i>qAG3</i> , <i>Xa4</i>
4	IR19A1862	6.0	All <i>Sub1</i> , <i>Wx-A</i> , <i>WX-int</i> , <i>Pita2</i> , <i>Gn1a</i> , <i>Xa5</i>
5	IR15F1869	5.5	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-int</i> , <i>Xa4</i> , <i>Pita2</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>GS3</i>
6	IR16F1081	5.5	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-int</i> , <i>Wx-op</i> , <i>Xa4</i> , <i>Xa21</i> , <i>Xa26</i> , <i>Pi33</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>GS3</i> , <i>qDTY1.1</i> , <i>qDTY2.2</i> , <i>qDTY3.2</i> , <i>qDTY4.1</i>
7	IR18T1340	5.9	All <i>Sub1</i> , <i>AG1</i> , <i>AG3</i> , <i>Wx-A</i> , <i>Wx-10</i> , <i>Wx-op</i> , <i>Waxy</i> , <i>Pita2</i> , <i>Xa4</i> , <i>Chalk5</i> , <i>GS3</i>
8	BR10212-10-4-1	5.5	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-NB</i> , <i>Xa4</i> , <i>Hd1</i> , <i>pi33</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>Gn1a</i>
9	IR13F652-1-P3	5.8	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-int</i> , <i>Xa4</i> , <i>Pi54</i> , <i>Pita2</i> , <i>GS3</i>
10	BR10212-4-3-1	6.6	All <i>Sub1</i> , <i>Wx-A</i> , <i>Xa4</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>GS3</i>
11	BR12154-5R-219	5.9	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-NB</i> , <i>Xa4</i> , <i>DTH8</i> , <i>Chalk5</i> , <i>Gn1a</i> , <i>GS3</i>
12	BR12506-5R-93	5.7	All <i>Sub1</i> , <i>Wx-A</i> , <i>Wx-10</i> , <i>Chalk5</i> , <i>Xa4</i> , <i>DTH8</i> , <i>Gn1a</i>
13	IR15F1887	5.5	<i>Sub1</i> , No <i>Wx</i>
14	IR19L1051	7.2	<i>SCT1</i> , <i>SCT2</i> , <i>SCT4</i> , <i>fgr-1</i> , <i>NAS3</i> , <i>Wx-int</i> , <i>Wx-op</i> , <i>Waxy</i> , <i>Hd1</i> , <i>qXa4</i>
15	BRR1 dhan101		
16	BRR1 dhan103	6.5	
17	BRR1 dhan89		
18	BRR1 dhan95	5.6	
19	BINA dhan17	6.8	
20	Thailand Pajam	5.5	
21	BR11693-5R-15-P2	6.2	
22	BRH15-24-7B		
23	BR10571-15-6-8-5		
24	BR9674-8-15-3-28-P3		
25	BR11712-4R-227		
26	Ja Hua		
27	BRH13-5-12-2-2B		
28	BRH18-9-4-2-3B		
29	BR11315-5R-17-52		
30	BRR1 43R		
31	BRR1 45R		
32	BRR1 47R		
33	Barsha dhan		
34	ACI dhan1		
35	BRAC dhan2		
36	BR9942-1-2-1-1-B1		
37	BR11607-4R-72		
38	BR12154-5R-219-PS1		
39	IR93339129-B-7-7-B-B-B-16		<i>Sub1</i> , <i>Wx-A</i> , <i>Wx-op</i> , <i>GNP1</i> , <i>GS3</i> , <i>Chalk5</i> , <i>qSCT1</i> , <i>Saltol</i> , <i>qDTY1.1</i> , <i>qDTY2.2</i>
40	IR 126968-B-23-2-1-3		
41	IR 122310:7-5-6		

**Table 14.2: List of cross combination, Submergence and Medium Stagnant Water Tolerance Breeding, T. Aman 2023-24**

SL No.	Cross Combination	Number of Seeds	Traits
1	BRR dhan103/BR12506-5R-93	40	<i>Sub1</i> , <i>Wx-A</i>
2	BRR dhan103/SV1179	10	<i>Sub1</i> , <i>Wx-A</i>
3	BRR dhan103/ IR13F582	80	<i>Sub1</i> , <i>Wx-A</i>
4	BRR dhan103/ BR12154-5R-219	40	<i>Sub1</i> , <i>Wx-A</i>
5	BRR dhan89/IR13F582	20	<i>Sub1</i> , <i>Wx-A</i>
6	BRR dhan89/IR16F1081	25	<i>Sub1</i> , <i>Wx-A</i>
7	BRR dhan95/IR13F652-1-P3	30	<i>Sub1</i> , <i>Wx-A</i>
8	BRR dhan95/IR18T1340	50	<i>Sub1</i> , <i>Wx-A</i>
9	BINA dhan17/IR18T1340	30	<i>Sub1</i> , <i>Wx-A</i>
10	BINA dhan17/IR15F1886	25	<i>Sub1</i> , <i>Wx-A</i>
11	IR19L1051/BR12506-5R-93	120	<i>Sub1</i> , <i>Wx-A</i>

SL No.	Cross Combination	Number of Seeds	Traits
12	IR19L1051/BR10212-10-4-1	100	<i>Sub1, Wx-A</i>
13	Thailand Pajam/SV1179	60	<i>Sub1, Wx-A</i>
14	Thailand Pajam/IR13F582	150	<i>Sub1, Wx-A</i>
15	Thailand Pajam/IR13F652-1-P3	15	<i>Sub1, Wx-A</i>
16	Thailand Pajam/BR10212-4-3-1	20	<i>Sub1, Wx-A</i>
17	Thailand Pajam/IR16F1081	160	<i>Sub1, Wx-A</i>
18	BR11693-5R-15-P2/IR15F1869	5	<i>Sub1, Wx-A</i>
19	BR11693-5R-15-P2/IR13F582	25	<i>Sub1, Wx-A</i>
20	BR11693-5R-15-P2/IR15F1887	10	<i>Sub1, Wx-A</i>
21	BRH15-24-7B/IR15F1869	2	<i>Sub1, Wx-A</i>
22	BRRI dhan103/IR13F652-1-P3	80	<i>Sub1, Wx-A</i>
23	BR11712-4R-227/IR16F1081	30	<i>Sub1, Wx-A</i>
24	Ja Hua/BR12506-5R-93	4	<i>Sub1, Wx-A</i>
25	Ja Hua/IR 122310:7-5-6	20	<i>Sub1, Wx-A</i>
26	BRH13-5-12-2-2B/IR13F582	30	<i>Sub1, Wx-A</i>
27	BRH18-9-4-2-3B/IR93339129-B-7-7-B-B-B-16	30	<i>Sub1, Wx-A</i>
28	BRRI 43R/IR93339129-B-7-7-B-B-B-16	15	<i>Sub1, Wx-A</i>
29	BRRI 43R/IR15F1886	40	<i>Sub1, Wx-A</i>
30	BRRI 45R/IR19A1862	20	<i>Sub1, Wx-A</i>
31	BRRI 45R/IR 122310:7-5-6	80	<i>Sub1, Wx-A</i>
32	BRRI 47R/SV1179	51	<i>Sub1, Wx-A</i>
33	BRRI 47R/IR13F582	15	<i>Sub1, Wx-A</i>
34	Barsha dhan/SV1179	25	<i>Sub1, Wx-A</i>
35	Barsha dhan/IR15F1869	15	<i>Sub1, Wx-A</i>
36	ACI dhan1/IR93339129-B-7-7-B-B-B-16	10	<i>Sub1, Wx-A</i>
37	ACI dhan1/IR126968-B-23-2-1-3	50	<i>Sub1, Wx-A</i>
38	BRAC dhan2/IR18T1340	20	<i>Sub1, Wx-A</i>
39	BR9942-1-2-1-1-B1/SV1179	10	<i>Sub1, Wx-A</i>
40	BR9942-1-2-1-1-B1/IR13F582	10	<i>Sub1, Wx-A</i>
41	BR11607-4R-72/IR15F1886	60	<i>Sub1, Wx-A</i>
42	BR11607-4R-72/IR19A1862	25	<i>Sub1, Wx-A</i>
43	BINA dhan17/BR10212-10-4-1	70	<i>Sub1, Wx-A</i>
44	BRRI dhan89/IR13F652-1-P3	10	<i>Sub1, Wx-A</i>
<b>Total</b>		<b>1737</b>	

DS: 15/07/2023-21/07/2023

DT: 15/08/2023-21/08/2023

## Experiment 14.2: F<sub>1</sub> Confirmation through hybridity test

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharuddaula

**Specific objective:** Confirmation of F<sub>1</sub>s as true crosses and selection of promising ones.

**Materials and methods:** A total of 37 single crosses along with their respective parents were grown. F<sub>1</sub> 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 seedlings at a spacing of 20 cm x 20 cm. Respective parental seedlings were transplanted on both sides of each F<sub>1</sub> population. Crop management was done as described in experiment 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<sub>1</sub>. QC genotyping was performed using 10 SNPs QC panel at Intertek, Australia. Genotyping results were analyzed using a genotyping data analytical tool called Flapjack. After confirmation, promising F<sub>1</sub>s were selected.

**Results and discussion:** Based on QC profile of the test F<sub>1</sub>s, 35 crosses out of 37 crosses were confirmed and selected as true F<sub>1</sub>. Seeds of these selected F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity, F<sub>2</sub> seeds of all selected plants were harvested individually, dried, cleaned, and preserved in cold room (**Table 14.3**).

**Table 14.3: List of confirmed F<sub>1</sub>s, Submergence and Medium Stagnant Water Tolerance Breeding, T. Aman 2023-24**

SN	Crosses	Predicted mean yield (BLUP) (t/ha)	Seed amount	Objectives/Trait of interest
1	BRR dhan103/BR12506-5R-93	6.6	50	Sub1, Wx-A
2	BRR dhan103/SV1179	6.4	30	Sub1, Wx-A
3	BRR dhan103/ IR13F582	6.5	30	Sub1, Wx-A
4	BRR dhan103/ BR12154-5R-219	6.7	90	Sub1, Wx-A
5	BRR dhan89/IR13F582	6.4	50	Sub1, Wx-A
6	BRR dhan95/IR18T1340	6.5	56	Sub1, Wx-A
7	BINA dhan17/IR18T1340	6.6	25	Sub1, Wx-A
8	BINA dhan17/IR15F1886	6.7	155	Sub1, Wx-A
9	IR19L1051/BR12506-5R-93	6.7	130	Sub1, Wx-A
10	IR19L1051/BR10212-10-4-1	6.2	120	Sub1, Wx-A
11	Thailand Pajam/SV1179	5.9	70	Sub1, Wx-A
12	Thailand Pajam/IR13F582	6.3	40	Sub1, Wx-A
13	Thailand Pajam/IR13F652-1-P3	6.3	80	Sub1, Wx-A
14	Thailand Pajam/BR10212-4-3-1	6.4	30	Sub1, Wx-A
15	Thailand Pajam/IR16F1081	5.9	150	Sub1, Wx-A
16	BR11693-5R-15-P2/IR15F1869	5.7	40	Sub1, Wx-A
17	BR11693-5R-15-P2/IR13F582	5.9	150	Sub1, Wx-A
18	BR11712-4R-227/IR16F1081	6.3	60	Sub1, Wx-A
19	Ja Hua/BR12506-5R-93	6.4	50	Sub1, Wx-A
20	Ja Hua/IR 122310:7-5-6	5.8	136	Sub1, Wx-A
21	BRH13-5-12-2-2B/IR13F582	6.5	140	Sub1, Wx-A
22	BRH18-9-4-2-3B/IR93339129-B-7-7-B-B-B-16	6.3	125	Sub1, Wx-A
23	BRR1 43R/IR93339129-B-7-7-B-B-B-16	6.2	110	Sub1, Wx-A
24	BRR1 43R/IR15F1886	6.0	60	Sub1, Wx-A
25	BRR1 45R/IR19A1862	6.1	80	Sub1, Wx-A
26	BRR1 45R/IR 122310:7-5-6	6.2	62	Sub1, Wx-A
27	BRR1 47R/SV1179	6.6	20	Sub1, Wx-A
28	BRR1 47R/IR13F582	5.9	45	Sub1, Wx-A
29	Barsha dhan/SV1179	6.0	26	Sub1, Wx-A
30	Barsha dhan/IR15F1869	5.9	90	Sub1, Wx-A
31	ACI dhan1/IR93339129-B-7-7-B-B-B-16	6.1	35	Sub1, Wx-A
32	BR9942-1-2-1-1-B1/SV1179	5.8	50	Sub1, Wx-A
33	BR9942-1-2-1-1-B1/IR13F582	6.0	50	Sub1, Wx-A
34	BR11607-4R-72/IR15F1886	6.6	20	Sub1, Wx-A
35	BR11607-4R-72/IR19A1862	6.2	110	Sub1, Wx-A
36	BINA dhan17/BR12154-5R-219	6.3	125	Sub1, Wx-A
37	BINA dhan17/BR10212-10-4-1	6.5	110	Sub1, Wx-A
<b>Total F<sub>1</sub> Seeds</b>			<b>28,00</b>	

DS: 25/07/2023

DT: 14/08/2023

### Experiment 14.3: Rapid Generation Advance (RGA)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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 21,447 progenies of 12 F<sub>2</sub>, 22 F<sub>3</sub>, 27 F<sub>4</sub>, 9 F<sub>5</sub> and 10 F<sub>6</sub> populations were grown in Boro 2023-2024 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. 1.1. 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:** In submergence tolerance rice breeding program, 17376 progenies from 78 crosses in Boro 2023-24 comprising F<sub>2</sub> to F<sub>5</sub> generation were speedily advanced through FRGA technique (Table 14.4 & 14.5).

**Table 14.4: RGA Summary, Submergence tolerance breeding, T. Aman 2023-24**

Generation	No. of crosses	Progenies grown	Progenies harvested
F <sub>2</sub>	10	5,650	4,524
F <sub>3</sub>	34	8,051	6,472
F <sub>4</sub>	27	2,525	2,152
F <sub>5</sub>	22	5,910	4,796
Total	78	21,447	17,376

**Table 14.5: List of F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub>, and F<sub>5</sub> populations advanced through RGA, Submergence and Medium Stagnant Water Tolerance Breeding, T. Aman 2023-24**

SN	BR No.	Cross combinations	Objectives	No. of progenies		%Recovery
				Grown	Harvested	
<b>F<sub>2</sub> population</b>						
1	BR15224	BRR1 dhan98/IR16F1148-LS	<i>Sub1, Wx-A</i>	450	360	80
2	BR15225	BR12208-5R-352-P1/IR16F1148	<i>Sub1, Wx-A</i>	700	600	86
3	BR15226	BR12208-5R-352-P1/BR11693-5R-274	<i>Sub1, Wx-A</i>	650	540	83
4	BR15227	BR12208-5R-352-P2/IR16F1148	<i>Sub1, Wx-A</i>	700	540	77
5	BR15228	BR12208-5R-352-P2/BR11693-5R-274	<i>Sub1, Wx-A</i>	550	468	85
6	BR15229	BRH13-1-9-7B/IR16F1148	<i>Sub1, Wx-A</i>	500	380	76
7	BR15230	BRH11-9-11-45B-HR3/IR16F1148	<i>Sub1, Wx-A</i>	550	440	80
8	BR15231	BRH10-1-14-2-6B/IR16F1148	<i>Sub1, Wx-A</i>	450	360	80
9	BR15232	BRH13-2-4-7-2B/IR16F1148	<i>Sub1, Wx-A</i>	600	460	77
10	BR13357	BRR1 dhan75/BRR1 dhan79	<i>Sub1, Wx-A</i>	500	376	75
<b>Sub Total</b>				<b>5,650</b>	<b>4,524</b>	<b>80</b>
<b>F<sub>3</sub> population</b>						
1	BR14453	BR11802-11-3-1/IR13F441		194	180	93
2	BR14454	BR9590-45-1-3-2-P2/ IR13F441		100	40	40
3	BR14455	BR11224-9-9-4-4/IR13F441		150	120	80
4	BR14456	BRR1 dhan67/IR100842-B-B RGA-B RGA-B RGA-9		100	92	92
5	BR14457	BRR1 dhan67/BINA dhan11		283	280	99
6	BR14458	BRR1 dhan71/BR10212-7-5-2		270	180	67
7	BR14459	BRR1 dhan71/IR16F1019		380	360	95
8	BR14460	BRR1 dhan99/IR16F1148-LB		300	180	60
9	BR14461	BRR1 dhan100/IR16F1148-LB		150	120	80
10	BR14462	JaHua/IR13F441		250	180	72
11	BR14463	JaHua/IR16F1019		250	220	88
12	BR14464	JaHua/IR16F1148-LS		462	320	69
13	BR14465	JaHua /IR16F1148-LB		200	160	80
14	BR14466	BRH13-1-9-7B/ IR16F1148-LB		310	300	97
15	BR14467	BR11723-4R-172/BINA dhan11		265	160	60
16	BR14468	BR11723-4R-172/IR16F1148-LB		157	120	76
17	BR14469	BR11723-4R-172/BR10211-1-2-4		184	160	87
18	BR14470	BR11716-4R-105/BR10211-1-2-4		150	120	80
19	BR14471	BR11716-4R-105/BR10211-1-1-1-PS1		180	120	67
20	BR14472	BR11716-4R-102/IR16F1019		164	120	73
21	BR14473	BR11712-4R-227/BINA dhan11		230	220	96
22	BR14474	BR11712-4R-227/ IR16F1148-LS		310	240	77
23	BR14475	BR11712-4R-227/BR10211-1-2-4		200	160	80
24	BR14476	BR12180-5R-1/IR13F441		172	120	70

SN	BR No.	Cross combinations	Objectives	No. of progenies		%Recovery
				Grown	Harvested	
25	BR14477	BR12180-5R-3/IR13F441		180	120	67
26	BR14478	BR9674-2-9-10-1-P5/IR16F1148-LS		255	240	94
27	BR14479	BR9674-2-9-10-1-P5/IR16F1148-LB		200	152	76
28	BR14480	BR10571-15-6-5-3/IR16F1148-LS		320	300	94
29	BR14481	BR10571-15-6-8-3/IR16F1148-LB		140	120	86
30	BR14482	Fatema dhan/IR16F1148-LB		176	120	68
31	BR14483	Fatema dhan/IR16F1148-LS		150	120	80
32	BR14484	Fatema dhan/BINA dhan11		200	180	90
33	BR13361	BRR1 dhan87/IR 97383-88-B-B//BRR1 dhan87		230	200	87
34	BR13378	Guti Swarna/BRR1 dhan52///Guti Swarna		100	80	80
<b>Sub Total</b>				<b>7,362</b>	<b>5,904</b>	<b>80</b>
<b>F<sub>4</sub> population</b>						
1	BR13878	BRR1 dhan94/BR9158-19-9-6-50-2-HR1	<i>Sub1, Wx-A</i>	160	116	73
2	BR13880	BRR1 dhan94/IR13F441	<i>Sub1, Wx-A</i>	310	300	97
3	BR13884	BRR1 dhan95/IR13F441	<i>Sub1, Wx-A</i>	250	240	96
4	BR13886	BRR1 dhan87/BR 9158-19-9-6-50-2-HR1	<i>Sub1, Wx-A</i>	245	220	90
5	BR13888	IR16F1148/BR11196-5R-38	<i>Sub1, Wx-A</i>	200	160	80
6	BR13891	Guti Swarna/BR 9158-19-9-6-50-2-HR1	<i>Sub1, Wx-A</i>	180	140	78
7	BR13892	Guti Swarna/IR13F441	<i>Sub1, Wx-A</i>	200	120	60
8	BR13894	BR9880-2-2-2-1/BRR1 dhan79	<i>Sub1, Wx-A</i>	150	120	80
9	BR13901	IR09A228/BRR1 dhan79	<i>Sub1, Wx-A</i>	200	176	88
10	BR13904	IR16A2332/BRR1 dhan79	<i>Sub1, Wx-A</i>	200	180	90
11	BR14159	BRH11-9-11-4B-HR3/ IR13F441	<i>Sub1, Wx-A</i>	220	180	82
12	BR14160	BRH11-7-17-10B/ IR13F441	<i>Sub1, Wx-A</i>	210	200	95
<b>Sub Total</b>				<b>2,525</b>	<b>2,152</b>	<b>85</b>
<b>F<sub>5</sub> population</b>						
1	BR13876	BRR1 dhan94/BR11185-5R-467-5	<i>Sub1, Wx-A</i>	200	160	80
2	BR13877	BRR1 dhan94/BR11196-5R-38	<i>Sub1, Wx-A</i>	300	240	80
3	BR13882	BRR1 dhan95/BR11185-5R-569-3	<i>Sub1, Wx-A</i>	380	360	95
4	BR13883	BRR1 dhan95/BR11196-5R-611	<i>Sub1, Wx-A</i>	200	160	80
5	BR13885	BRR1 dhan95/IR127165-1-12-13-1-B	<i>Sub1, Wx-A</i>	350	300	86
6	BR13889	IR16F1019//BR11196-5R-38	<i>Sub1, Wx-A</i>	200	172	86
7	BR13890	Guti Swarna/BR9158-3-2-2-14-3	<i>Sub1, Wx-A</i>	280	200	71
8	BR13896	BR9942-1-2-1-1-B1/BR11185-5R-569-3	<i>Sub1, Wx-A</i>	400	300	75
9	BR13897	IR 127152-3-22-3-1-B/BR7833-11-1-3-1-2-B1	<i>Sub1, Wx-A</i>	200	120	60
10	BR13898	IR 127165-1-12-13-1-B/BR7833-11-1-3-1-2-B1	<i>Sub1, Wx-A</i>	250	200	80
11	BR13899	IR09A228/BR11196-5R-38	<i>Sub1, Wx-A</i>	200	184	92
12	BR13900	IR09A228/BR11185-5R-467-5	<i>Sub1, Wx-A</i>	200	160	80
13	BR13902	IR16A2332/BR11196-5R-38	<i>Sub1, Wx-A</i>	300	280	93
14	BR13903	IR16A2332/BR11185-5R-467-5	<i>Sub1, Wx-A</i>	200	180	90
15	BR14156	BR8899-17-1-1-1-1-1/ IR16F1148	<i>Sub1, Wx-A</i>	200	180	90
16	BR14157	BR8899-17-1-1-1-1-1/ IR16F1019	<i>Sub1, Wx-A</i>	300	280	93
17	BR14158	BRH13-1-9-7B/ Binadhan-11	<i>Sub1, Wx-A</i>	300	220	73
18	BR14161	BR10-1-14-2-6B/ IR13F441	<i>Sub1, Wx-A</i>	250	200	80
19	BR14162	CN6/ IR16F1019	<i>Sub1, Wx-A</i>	300	240	80
20	BR14163	CN6/ IR16F1148	<i>Sub1, Wx-A</i>	300	220	73
21	BR13361	BC <sub>2</sub> F <sub>1</sub> of BR13361/ BRR1 dhan87	<i>Sub1, Wx-A</i>	300	240	80
22	BR13378	BC <sub>2</sub> F <sub>1</sub> of BR13378/ Guti Swarna	<i>Sub1, Wx-A</i>	300	200	67
<b>Sub Total</b>				<b>5,910</b>	<b>4,796</b>	<b>81</b>
<b>Grand Total</b>				<b>21,447</b>	<b>17,376</b>	<b>82</b>

DS: 22/06/2023

#### Experiment 14.4: Line Stage Testing (LST)

Principal Investigator: S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharuddaula

**Specific objectives:** Selection of uniform genotypes in terms of uniformity in flowering, plant height, acceptable plant type, grain size-shape amylose content with key target traits especially submergence tolerant.

**Materials and Methods:** In total 2,287 lines from 26 crosses were transplanted in 12-hills single-row plots using systematic arrangement with respective parents and eight 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 246 lines were selected from 2,287 progenies of twenty-six 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 14.6**. Among the genotyped lines all four alleles of *Sub1* gene were present 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 was found in 98% lines, *Wx-10* and *Wx-A-NB* found in 66% and 45% line of LST populations, which indicated that medium to high amylose genes were abundant in the populations.

**Table 14.6. LST grown in T. Aman 2023-24; Submergence Tolerant Rice Breeding**

SL	BR Number	Crosses	Transplanting Line	Selecte d Line
1	BR13353	BR7528-2R-HR16-2-24-1/IR16F1063	81	18
2	BR13359	BRRi dhan75/BR9158-19-9-6-50-2-HR1	73	9
3	BR13363	BRRi dhan87/BR9791-1-31-4-2-B1	37	5
4	BR13364	BRRi dhan87/BRRi dhan79	91	31
5	BR13365	BRRi dhan87/BR9158-19-9-6-50-2-HR1	86	12
6	BR13366	BR-RS(Raj)-PL4-B/BRRi dhan79	58	6
7	BR13367	BR-RS(Raj)-PL4-B/ Binadhan-12	53	23
8	BR13368	BR-RS(Raj)-PL4-B/BR9175-9-1-3-20-3	173	33
9	BR13371	BR-SF(Rang)-PL1-B/BR9158-19-9-6-50-2-HR1	94	5
10	BR13372	IR 97383-88-B-B/IR13F441	56	1
11	BR13373	IR 97383-88-B-B/BR9158-19-9-6-50-2-HR1	70	7
12	BR13377	Guti Swarna/BRRi dhan79	197	4
13	BR13354	BR7528-2R-HR16-2-24-1/IR 127152-3-22-2-1-B	48	4
14	BR13355	BRRi dhan71/IR 127152-3-22-2-1-B	68	7
15	BR13356	BRRi dhan71/Binadhan-11	63	17
16	BR13360	BRRi dhan87/IR14F468	86	2
17	BR13361	BRRi dhan87/IR 97383-88-B-B	51	6
18	BR13362	BRRi dhan87/R16F1063	50	16
19	BR13369	BR-SF(Rang)-PL1-B/IR 127152-3-22-2-1-B	48	14
20	BR13370	BR-SF(Rang)-PL1-B/IR14F468	76	5
21	BR12951	BR9158-19-9-6-50 /IR13F582	115	1
22	BR12953	BRRi dhan79/WANXIAN7777-P10	149	4
23	BR12961	Binadhan-12/DR (6)	172	7
24	BR12962	BRRi dhan87/BRRi dhan79	100	7
25	BR12963	Binadhan-11/Binadhan-12	70	1
26	BR12965	BRRi dhan51/BRRi dhan73//IR16F1036	122	1
<b>Total</b>			<b>2287</b>	<b>246</b>

DS: 24/06/2023

DT: 17/07/2023

#### Experiment 14.5. Observational Yield Trial (OYT)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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 25 advanced lines with five checks were evaluated in the Augmented RCB design. The trial was conducted in three locations, one in a controlled submergence tank and another under rainfed conditions in Gazipur and Rangpur. 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 25 genotypes out of 44 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 BR12920-5R-4 gave the highest yield (7.01 t/ha) in stress conditions with 92% survivability and on average yielded 6.21 t/ha followed by the genotype BR12504-5R-158 produced 6.81 t/ha under controlled stress and on average 5.65 t/ha with 92% survivability. The other selected genotypes gave yields ranging from 5.75 t/ha to 7.01 t/ha under controlled stress conditions. The growth duration of the test entries ranged from 123 to 138 days (Table 14.7).

**Table 14.7. Performance of the selected entries of OYT, Submergence, and water stagnation tolerant rice, T. Aman 2023-24**

SN	Designation	PH (cm)	GD (Days)	St	Yield			Sur (%)	Pacp	Trait markers
					NS Gaz	NS Rang	Pooled NS			
1	BR12484-5R-44	158	138	5.83	3.89	7.98	5.94	88	6	<i>Sub1, Wx-A, Wx-10, Gn1a, qDTY3.2, qDTY12.1</i>
2	BR12504-5R-158	151	135	6.81	7.12	4.75	5.94	62	6	<i>Sub1, Wx-A, Wx-NB, Gn1a, GS3, qDTY3.2</i>
3	BR12504-5R-23	145	136	6.03	5.70	8.17	6.94	67	7	<i>Sub1, Wx-A, Wx-NB, GS3, qDTY3.2</i>
4	BR12504-5R-14	158	134	4.11	6.89	7.24	7.06	81	7	<i>Sub1, Wx-A, DTY1.1, qDTY3.2</i>
5	BR12504-5R-18	138	137	3.77	7.51	8.36	7.94	32	8	<i>Sub1, Wx-A, Wx-10, GS3, DTY1.1, qDTY2.2, qDTY3.2, qDTY12.1</i>
6	BR12504-5R-44	139	139	4.36	6.51	3.62	5.06	23	5	<i>Sub1, Wx-A, Wx-NB, GS3, qDTY3.2</i>
7	BR12504-5R-45	149	134	5.29	4.70	3.43	4.06	40	4	<i>Sub1, Wx-A, Wx-NB, GS3, qDTY3.2</i>
8	BR12504-5R-60	152	127	5.59	5.99	7.14	6.56	78	7	<i>Sub1, Wx-A, Wx-10, GS3, qDTY3.2</i>
9	BR12504-5R-69	146	140	7.01	4.89	5.24	5.06	77	5	<i>Sub1, Wx-A, Wx-NB, GS3, qDTY3.2</i>

SN	Designation	PH (cm)	GD (Days)	St	Yield			Sur (%)	Pacp	Trait markers
					NS Gaz	NS Rang	Pooled NS			
10	BR12950-5R-140	123	124	4.93	6.18	8.95	7.56	90	8	<i>Sub1, Wx-A, Wx-int, GS3, qDTY12.1</i>
11	BR12504-5R-217	133	130	6.18	3.70	6.17	4.94	88	5	<i>Sub1, Wx-A, Wx-10, GS3, qDTY3.2,</i>
12	BR12505-5R-9	136	134	4.02	5.60	3.52	4.56	54	5	<i>Sub1, Wx-A, Wx-NB, qDTY3.2</i>
13	BR12505-5R-20	138	132	5.53	5.32	4.56	4.94	42	5	<i>Sub1, Wx-A, Wx-NB, GS3, qDTY3.2,</i>
14	BR12505-5R-26	136	136	5.02	3.51	4.36	3.94	48	4	<i>qDTY12.1</i> <i>Sub1, Wx-A, Wx-NB, Gn1a, GS3, qDTY3.2,</i>
15	BR12949-5R-66	141	137	3.55	9.12	6.75	7.94	38	8	<i>qDTY12.1</i> <i>Sub1, Xa21, Wx-A, Wx-10, GS3,</i>
16	BR12950-5R-24	128	123	4.46	2.89	3.24	3.06	86	3	<i>qDTY3.2</i> <i>Sub1, Wx-A, Wx-int, Gn1a, GS3,</i>
17	BR12950-5R-120	176	124	11.04	3.80	3.33	3.56	85	4	<i>qDTY12.1</i> <i>Sub1, GS3, qDTY2.2,</i>
18	BR12950-5R-122	148	124	4.88	3.32	2.56	2.94	86	3	<i>qDTY12.1</i> <i>Sub1, Wx-int, Gn1a, GS3, qDTY2.2</i>
19	BR12950-5R-124	151	123	6.53	6.51	3.62	5.06	92	5	<i>Sub1, Wx-A, Wx-int, Gn1a, GS3, qDTY2.2,</i>
20	BR12918-5R-59	149	137	5.15	5.51	6.36	5.94	95	6	<i>Sub1, Wx-A, Wx-NB, qDTY2.2, qDTY3.2</i>
21	BR12920-5R-4	137	134	7.01	5.51	6.36	5.94	92	6	<i>Sub1, Xa21, Wx-A, Wx-NB, GS3,</i>
22	BR12928-5R-32	134	135	15.05	5.99	7.14	6.56	85	7	<i>qDTY3.2</i> <i>Sub1, Wx-A, Wx-10, Gn1a, qDTY2.2,</i>
23	BR12966-5R-1	130	136	4.69	4.60	6.27	5.44	86	5	<i>qDTY3.2</i> <i>Sub1, Wx-A, Wx-10, qDTY2.2, qDTY3.2</i>
24	BR12966-5R-81	139	132	5.75	6.89	7.24	7.06	98	7	<i>Sub1, Wx-A, Wx-NB, qDTY3.2</i>
25	BR12966-5R-103	141	131	6.37	5.12	2.75	3.94	94	4	<i>Sub1, Wx-A, Wx-NB</i>
26	BRR1 dhan87 (Ck)	140	126	NA	5.17	5.83	5.50	0	5	<i>Wx-A, Wx-10, Xa4, DTH8, GS3, Chalk5, Gn1a</i>
27	BRR1 dhan95 (Ck)	137	132	NA	5.11	4.89	5.00	1	5	-
28	BRR1 dhan79 (Ck)	125	131	4.83	7.06	5.94	6.50	91	6	<i>all Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a</i>
29	IR16F1148 (Ck)	124	126	5.48	3.55	4.80	4.18	99	4	<i>Sub1, Wx-A, Wx-int, GS3</i>
30	IR 42 (Ck)	131	124	5.17	7.96	5.04	6.50	98	7	-
	<b>LSD</b>	<b>24.39</b>	<b>7.23</b>	<b>1.59</b>	<b>1.29</b>	<b>1.94</b>	<b>1.92</b>	<b>1.90</b>	<b>1.23</b>	-
	<b>H2(%)</b>	<b>22</b>	<b>79</b>	<b>95</b>	<b>87</b>	<b>47</b>	<b>36</b>	<b>92</b>	<b>27</b>	-

DS: 10/07/2023

DT: 02/08/2023

St - Stress, NS - Nonstress, Gaz - Gazipur. Rang - Rangpur

#### Experiment 14.6: Preliminary Yield Trial (PYT#1)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharuddaula

**Specific objective:** Preliminary evaluation of promising submergence tolerant breeding lines in replicated trials under controlled submerged conditions, flood-prone farmers' fields as well as under rainfed conditions.

**Materials and Methods:** In total, 32 entries with four checks were evaluated in this trial. The trial was conducted in four locations, one in a controlled submergence tank (Rangpur), two under rainfed conditions in Gazipur and Rangpur and another one in flood prone farmers' field at Lalmonirhat. Same methodologies were followed as experiment 14.5. **Results and**

**discussion:** Both the trials under farmers' field conditions received a moderate to high level of submergence stress (31 days at Kurigram and 41 days at Lalmonirhat with a water depth of 75-120 cm at the vegetative stage). A total of 16 genotypes were selected based on the stressed and non-stressed performance of the trials. Among all entries, the genotype BR12506-5R-83 produced the highest yield (5.8 t/ha) under controlled conditions where four checks BRRIdhan79, BRRIdhan95, BINA dhan11, and IR16F1148 yielded lower. The growth duration of tested entries was ranged from 114 to 157 days. The heritability obtained from plant height, growth duration, survivability, and grain yield varied from 11% to 82%, indicating the high precision of this experiment (Table 14.8).

**Table 14.8. Performance of the entries of PYT#1, Submergence and water stagnation tolerant rice, T. Aman 2023-24**

S N	Designat ion	PH (cm)	GD (Da ys)	Yield						Sur. (%)	Pac p	Trait markers
				H S	St. S	St. Pool ed	NS Ga z	NS Ra ng	NS Pool ed			
1	BR12487 -5R-60	130	133	2. 91	4.4 7	3.69	3.8 8	3.5 7	3.76	51	5	<i>Sub1, Wx-A, Wx-10, Chalk5, Pita2, Xa4, DTH8, Gn1a</i>
2	BR12487 -5R-88	133	138	1. 83	1.2 4	1.53	4.8 6	3.9 2	4.16	47	5	<i>Sub1, Wx-A, Wx-10, Chalk5, Xa4, Xa7, Gn1a</i>
3	BR12489 -5R-39	134	148	2. 90	4.3 7	3.63	4.1 2	3.4 5	3.80	52	5	<i>All Sub1, Wx-A, Wx-10, Chalk5, Alk, Xa4, Xa7, Gn1a</i>
4	BR12489 -5R-63	130	151	2. 68	4.1 0	3.39	4.4 6	3.3 7	3.88	51	5	<i>Sub1, Pi54, Chalk5, Alk, Xa4, Gn1a</i>
5	BR12489 -5R-166	134	145	2. 88	3.4 8	3.18	4.4 6	3.5 6	3.93	51	5	<i>Sub1, Wx-A, Wx-10, Chalk5, ALk, Xa4, Xa7, Gn1a</i>
6	BR12490 -5R-110	134	157	2. 92	4.7 0	3.81	3.3 3	2.4 5	3.27	52	5	<i>Sub1, Wx-A, Wx-10, Chalk5, Gn1a</i>
7	BR12490 -5R-175	136	145	2. 54	2.2 8	2.41	4.2 4	3.6 7	3.90	50	5	<i>Sub1, Wx-A, Wx-NB, Chalk5, Gn1a</i>
8	BR12506 -5R-62	136	148	2. 52	2.8 7	2.69	4.7 0	3.6 2	4.02	48	5	<i>Sub1, Wx-A, Wx-10, Chalk5, Xa4, DTH8, Gn1a</i>
9	BR12506 -5R-93	129	114	3. 12	5.2 2	4.17	3.9 6	3.1 4	3.66	51	5	<i>All Sub1, Wx-A, Wx-10, Chalk5, Xa4, Gn1a</i>
10	BR10211 -30-2-1-5	132	153	2. 54	2.4 7	2.50	4.5 8	3.3 8	3.92	49	5	<i>Sub1, Xa13, Wx-A, Wx-int, GS3, qDTY12.1</i>
11	BR10212 -16-1-1	132	149	2. 65	3.9 9	3.32	4.6 6	3.7 3	4.04	51	5	<i>Sub1, Wx-A, Wx-int, Xa4, DTH8, Gn1a, GS3</i>
12	BR12506 -5R-174	134	141	2. 92	5.7 5	4.33	5.0 6	3.9 0	4.21	51	5	<i>Sub1, Wx-A, Wx-10, qDTY3.2</i>
13	BR12502 -5R-76	128	137	2. 21	2.2 8	2.25	4.4 6	3.8 4	4.02	47	5	<i>All Sub1, Wx-int, Chalk5, Xa4, Xa7, DTH8</i>
14	BR12506 -5R-83	129	121	2. 84	5.8 0	4.32	4.3 8	3.3 2	3.84	48	5	<i>All Sub1, Wx-A_group, Chalk5, Xa4, DTH8, Gn1a</i>
15	BR12162 -5R-350	130	145	2. 18	1.3 6	1.77	5.0 6	3.9 2	4.22	46	5	<i>Sub1, SCT3, AG3, qXa4, Pi33, Wx-op, Wx-A, NAS3</i>
16	BR12489 -5R-32	136	142	2. 87	4.7 7	3.82	4.4 8	4.1 2	4.11	50	5	<i>All Sub1, Wx-A_group, Wx-GBSS-ex10, Xa7, DTH8, Gn1a</i>
17	IR16F11 48 (Ck)	128	128	2. 89	4.8 3	3.86	4.6 4	3.1 7	3.87	51	5	<i>Sub1, Wx-A, Wx-int, GS3</i>
18	BINA dhan11 (Ck)	126	117	2. 74	4.1 8	3.46	4.5 6	3.2 0	3.86	50	5	<i>Sub1, Wx-A, Wx-int, Gn1a</i>
19	BRRIdhan79 (Ck)	130	117	2. 60	3.5 9	3.10	4.5 6	3.2 3	3.87	50	5	<i>All Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a</i>
20	BRRIdhan95 (Ck)	132	134	1. 94	0.6 5	1.29	4.1 1	3.1 2	3.70	46	6	-
<b>LSD</b>		<b>16.29</b>	<b>21.7</b>	<b>2.</b>	<b>2.0</b>	<b>2.89</b>	<b>1.4</b>	<b>1.5</b>	<b>1.40</b>	<b>29</b>	<b>3</b>	-
			<b>8</b>	<b>11</b>	<b>9</b>		<b>3</b>	<b>4</b>				

S N	Designat ion	PH (cm)	GD (Da ys)	Yield						Sur. (%)	Pac p	Trait markers
				H S	St.	St. Pool ed	NS Ga z	NS Ra ng	NS Pool ed			
	H2(%)	41	51	34	82	39	47	42	44	11	39	-

DS: 10/07/2023

DT: 26/07/2023

St - Stress, HS –Hotspot, NS - Nonstress, Gaz - Gazipur. Rang - Rangpur

#### Experiment 14.7: Preliminary Yield Trial (PYT#2)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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, 27 entries with three checks were evaluated in this trial. Same methodologies were followed as experiment 14.5. **Results and discussion:** Both the trials under farmers' field condition were received a low to moderate level of submergence stress (31 days at Kurigram and 41 days Lalmonirhat with a water depth 75-120 cm at vegetative stage). A total 12 genotypes were selected based on the performances of the genotype under stress and non stress conditions. Among all entries, the genotype SV1586 produced highest yield (5.7 t/ha) under controlled condition than the three checks BRRIdhan79 and BRRIdhan95, BINA dhan11. The growth duration of tested entries was ranged from 122 to 128 days. The heritability obtained from plant height, growth duration, survivability and grain yield were varied from 0.24 to 0.89 indicating high precision of this experiment (Table 14.9).

**Table 14.9. Performance of the entries of PYT#2, Submergence and water stagnation tolerant rice, T. Aman 2023-24**

SN	Designation	PH (cm)	GD (Days)	Yield						Sur. (%)	Pacp	Trait markers
				HS	St.	St. Pooled	NS Gaz	NS Rang	NS Pooled			
1	IR20LT2385	131	126	2.54	5.24	4.16	3.75	3.75	3.99	82	5	All Sub1, x13
2	IR20LT1998	129	124	2.89	5.21	4.54	2.93	3.07	3.77	79	5	All Sub1, Wx - A. Wx-10
3	SV1582	130	124	2.46	4.18	3.43	3.48	3.53	3.19	79	5	All Sub1, Wx-A
4	SV1598	129	125	2.65	5.35	4.35	1.88	2.21	2.82	75	4	All Sub1, Wx- A. Wx-10
5	SV1599	130	124	2.34	4.22	3.31	4.2	4.13	4.83	73	5	All Sub1, Wx- A. Wx-10
6	SV0866	127	128	2.67	3.93	3.52	3.92	3.9	3.98	72	6	All Sub1, Wx-A
7	SV1566	129	124	2.09	4.16	2.99	3.17	3.27	3.6	74	6	All Sub1, Wx-A
8	SV1586	129	123	2.55	5.66	4.42	0.6	NA	2.5	78	5	All Sub1, Wx-A
9	SV1570	130	123	2.15	4.72	3.4	2.75	2.92	3.8	71	6	All Sub1, Wx-A
10	IR19A8108	129	123	1.79	1.88	0.91	4.14	4.07	4.44	28	6	-
11	IR19A8537	128	125	2.32	3.86	3.03	3.82	3.81	4.33	56	6	-
12	IR19A8541	130	125	2.33	4.9	3.72	3.51	3.56	3.62	71	4	-
13	BINA dhan11 (Ck)	129	122	2.56	4.72	3.96	3.22	3.32	4.51	66	5	Sub1, Wx-A, Wx-int, GS3
14	BRRIdhan79 (Ck)	129	127	2.21	4.7	3.46	3.27	3.35	3.77	73	6	Sub1, Wx-A, Wx-NB, Gnl1a
15	BRRIdhan87 (Ck)	130	125	NA	NA	NA	3.46	3.52	4.14	38	8	Wx-A, Wx-10, GS3, Gnl1a
	LSD (%)	20.93	13	2.12	2.41	1.56	1.66	27.55	1.2	22.88	2.43	
	H2B	0.24	0.27	0.81	0.66	0.89	0.8	0.65	0.38	0.7	0.78	

DS: 10/07/2023

DT: 02/08/2023

St - Stress, HS –Hotspot, NS - Nonstress, Gaz - Gazipur. Rang - Rangpur

#### Experiment 14.8: Advanced Yield Trial#1 (AYT\_Early)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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 26 entries along with four checks were evaluated in RCB design with two replications. Same methodologies were followed as experiment 14.5.

**Results and discussion:** Both the trials under farmers' field conditions were received a low to moderate level of submergence (31 days at Kurigram and 41 days at Lalmonirhat with a water depth 75-120 cm at the vegetative stage). Based on the performances of the genotype under stress and non stress conditions, a total of eighteen genotypes were selected based on the higher survivability and higher yield. The genotype IR15A4029 produced the highest yield of 6.17 t/ha followed by IR19A1862 (5.24 t/ha) and BR12162-5R-350-3 (5.15 t/ha) under controlled stress condition with the 60%, 84% and 86% survivability, respectively. The heritability obtained for survivability (tank), plant height, growth duration, grain yield (rainfed), yield (tank) was 69%, 93%, 97%, 42% and 42%, indicating high level of precision of this experiment (Table 14.10).

**Table 14.10. Performance of the selected entries of AYT Early, Submergence and water stagnation tolerant rice, T. Aman 2023-24**

SN	Designation	PH (cm)	GD (days)	Yield						Sur (%)	Pa cp	Trait markers
				HS	St.	St. Pooled	NS Gaz	RS Rang	NS Pooled			
1	BR12162-5R-350-1-P1	119	153	3.09	4.81	3.91	5.38	2.67	3.58	76	4	<i>Sub1, Wx-A, Pita2, GS3, Gnl1a</i>
2	BR12162-5R-350-3	121	145	2.74	5.15	3.86	4.61	3.13	3.67	86	4	<i>Sub1, Wx-A, Xa4, DTH8, Chalk5, Gnl1a, GS3</i>
3	BR11692-5R-345	118	147	2.79	4.94	3.84	5.5	3.84	3.82	76	3	<i>Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gnl1a</i>
4	IR16F1081	119	141	2.97	3.56	3.62	4.78	3.54	3.69	87	5	<i>Sub1, Wx-A, Wx-int, GS3</i>
5	IR19A1862	117	143	3.61	5.24	4.18	5.64	3.47	3.75	84	3	<i>Sub1, Wx-A, WX-int, Pita2, Gnl1a, Xa5</i>
6	IR18T1275	123	146	2.64	5.02	3.8	4.38	3.04	3.65	83	4	<i>Sub1, Wx-A, Wx-int, GS3, qDTY2.2, qDTY3.2, qDTY12.1</i>
7	IR19A1473	108	144	3.08	4.47	3.84	5.73	3.14	3.75	85	5	<i>Sub1, Wx-A, Wx-int, Wx-op, Pita2, GS3, Xa4, Xa5, Gnl1a</i>
8	IR14T156	114	142	2.99	4.9	3.9	4.81	3.19	3.7	80	4	<i>Sub1, Wx-A, Wx-NB, GS3, Pi33, Pi54, pita2</i>
9	IR14T156-P1	108	152	2.02	5.03	3.59	4.84	3.7	3.58	85	5	<i>Sub1, Wx-A, Wx-int, GS3, Pi33</i>
10	IR15A4029	103	153	3.9	6.17	4.46	4.98	2.95	4	60	3	<i>Sub1, Wx-A, Wx-10, pita2, GS3, Gnl1a</i>
11	IR18T1340	100	152	3.05	4.9	3.92	5.21	2.55	3.56	85	5	<i>Sub1, Wx-A, Wx-10, pita2, GS3</i>
12	IR16F1033	101	144	2.93	4.18	3.73	4.72	3.16	3.76	84	4	<i>Sub1, Wx-A, Wx-int, GS3 xa5, Pita2</i>
13	IR15F1745	135	153	3.87	5.44	4.3	4.32	3.13	3.86	88	3	<i>Sub1, Wx-A, Wx-NB, Pita2, GS3, Gnl1a</i>
14	IR16F1065	120	144	2.46	5.28	3.79	5.01	3.66	3.76	81	5	<i>Sub1, Wx-A, Wx-NB, Pita2, GS3, Gnl1a</i>
15	IR15F1869	114	143	4.02	5.27	4.32	4.66	3.52	3.94	85	3	<i>Sub1, Wx-A, Wx-int, GS3, Pita2</i>
16	IR16F1063	118	140	2.76	4.45	3.73	5.41	3.18	3.67	89	5	<i>Sub1, Wx-op, Wx-A, Waxy, SCT, Saltol, qAG3, Xa4, Pi33</i>
17	IR16F1063-P1	114	140	2.86	4.22	3.72	4.89	3.16	3.66	86	5	<i>Sub1, Wx-op, Wx-A, Waxy, SCT, Saltol, qAG3, Xa4, GS3, Pi33</i>
18	SVIN147_W S20-FP-15	112	142	2.9	5.11	3.91	4.66	3.22	3.72	83	3	<i>Sub1, Wx-A, Wx-int, GS3, Pita2</i>

SN	Designation	PH (cm)	GD (days)	Yield						Sur (%)	Pa cp	Trait markers
				HS	St.	St. Poole d	NS Gaz	NS Rang	NS Poole d			
19	BINA dhan11 (Ck)	109	133	2.31	3.88	3.46	4.81	2.83	3.55	70	5	<i>Sub1, Wx-A, Wx-int, GS3</i>
20	BRRRI dhan79 (Ck)	107	149	3.59	5.97	4.32	5.27	3.21	4	88	6	<i>Sub1, Wx-A, Wx-NB, Gn1a</i>
21	BRRRI dhan71 (Ck)	1	0	NA	0.36	NA	5.35	3.29	3.14	15	7	<i>Wx-A, Wx-int</i>
22	BRRRI dhan87 (Ck)	1	0	NA	0.36	NA	5.27	3.65	3.23	10	8	<i>Wx-A, Wx-10, GS3, Gn1a</i>
<b>LSD (%)</b>		<b>7.95</b>	<b>4.28</b>	<b>1.99</b>	<b>1.27</b>	<b>1.79</b>	<b>1.24</b>	<b>1.43</b>	<b>1.24</b>	<b>40.08</b>	<b>2.2</b>	
<b>H2b</b>		<b>0.93</b>	<b>0.97</b>	<b>0.53</b>	<b>0.8</b>	<b>0.42</b>	<b>0.57</b>	<b>0.51</b>	<b>0.42</b>	<b>9</b>	<b>83</b>	

DS: 10/07/2023

DT: 28/08/2023

St - Stress, HS –Hotspot, NS - Nonstress, Gaz - Gazipur. Rang – Rangpur

#### Experiment 14.9: Advanced Yield Trial#2 (AYT#2\_Late)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharruddaula

**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, 30 entries with three checks were evaluated in RCB design with two replications. Same methodologies were followed as experiment 14.5.

**Results and discussion:** Both the trials under farmers' field condition were received a low to moderate level of submergence (31days at Kurigram and 41 days at Lalmonirhat with a water depth 75-100 cm at the vegetative stage). Based on the performances of the genotype under stress and non stress conditions, a total of 17 genotypes were selected considering higher survivability and higher yield. The genotype IR16F1201 produced the highest yield of 6.41 t/ha with 81% survivability in controlled condition followed by the genotype BR9793-13-2-1(5.35 t/ha) with 80% survivability. The yield range of other selected genotypes were 5.02 t/ha to 6.41 t/ha under controlled submergence condition, 2.68 t/ha to 3.62 t/ha under farmers' field condition and 3.88 to 4.63 t/ha under rainfed conditions. The heritability of all observed parameters was ranged from 0.31 to 0.83, indicating moderate to high level of precision of this experiment (Table 14.11).

**Table 14.11. Performance of the entries of AYT Late, Submergence and water stagnation tolerant rice, T. Aman 2023-24**

S N	Designation	PH (cm)	GD (Days)	Yield						Sur (%)	Pa cp	Trait markers
				HS	St.	St. Poole d	NS Gaz	NS Rang	NS Poole d			
1	IR16F1243	121	142	3.52	5.09	4.5	5.2	2.82	3.91	80	4	<i>Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a</i>
2	IR16F1243-P2	119	141	2.78	4.96	3.83	4.56	3.42	3.91	82	5	<i>Sub1, Wx-A, Gn1a</i>
3	IR16F1097	124	142	3	4.88	3.96	3.92	2.51	3.81	77	4	<i>Sub1, Wx-A, Wx-NB, Pita2, Chalk5, GS3, Gn1a, Xa4</i>
4	IR13F478-3	122	142	2.9	5.02	4.08	4.7	3.4	3.88	70	5	<i>Sub1, Wx-A, Wx-10, Xa4, DTH8, Chalk5, Gn1a, GS3</i>
5	IR15F1869-P3	123	141	3.37	4.94	4.2	4.26	2.51	3.86	83	5	<i>Sub1, Wx-A, Wx-int, Xa4, Pi33, Pita2, GS3</i>

6	IR108042-B-B-B-4-B-B	120	143	3.3	4.94	4.14	4.68	3.18	3.88	85	4	<i>Sub1, Wx-A, Xa4, DTH8, Chalk5, Gn1a</i>
7	BR11196-5R-5	119	142	2.83	4.82	3.75	4.81	2.96	3.82	76	5	<i>Sub1, Wx-A, Wx-int, GS3, qDTY3.2</i>
8	BR11690-5R-289-P1	120	142	3.62	5.08	4.38	4.15	2.79	3.99	74	4	<i>Sub1, Pita2</i>
9	BR12154-5R-219	120	140	2.95	4.83	3.78	4.35	2.65	3.84	78	4	<i>Sub1, Wx-A, Wx-NB, Xa4, DTH8, Chalk5, Gn1a, GS3</i>
10	BR11196-5R-83	116	142	3.01	4.98	3.93	4.49	3.3	3.94	81	5	<i>Sub1, Wx-A, Gn1a, GS3</i>
11	BR11196-5R-38	126	143	2.68	5.16	3.68	3.99	3.4	3.91	72	4	<i>Sub1, Wx-A, Wx-10, GS3, qDTY2.2, qDTY3.2, qDTY12.1</i>
12	BR10212-20-1-3	121	142	3.24	4.9	3.94	4.47	2.4	3.92	81	4	<i>Sub1, Wx-A, Wx-NB, Xa4, DTH8, Gn1a, GS3</i>
13	BR10212-10-4-1	120	141	3.12	4.74	3.74	4.45	3.65	3.81	75	5	<i>Wx-A, Wx-NB, Gn1a, GS3</i>
14	IR13F652-1-P3	115	143	3.43	5.05	4.25	4.4	3.16	3.98	83	4	<i>Sub1, Wx-A, Xa7, Pi54, Pita2, Chalk5</i>
15	IR13F441	118	142	3.45	5.13	4.36	4.22	3.22	4	86	4	<i>Sub1, Wx-op, Wx-A, SCT, Saltol, AG3, GS3, BPH17, Hd3a</i>
16	IR16F1201	120	141	3.1	6.41	3.59	4.42	2.94	4.63	81	5	<i>Sub1, Wx-A, Wx-NB, Xa7, Pita2, Gn1a, GS3</i>
17	BR9793-13-2-1	121	142	3.27	5.35	3.83	4.1	3.39	4.14	80	4	<i>Sub1, Wx-A, Wx-NB, Gn1a, GS3</i>
18	BRRI dhan79 (Ck)	120	142	3.26	4.79	<b>3.99</b>	4.58	2.7	<b>3.78</b>	83	5	<i>Sub1, Wx-A, Wx-NB, Gn1a</i>
19	BRRI dhan52 (Ck)	118	142	2.99	4.78	<b>3.92</b>	4.52	2.69	<b>3.72</b>	80	4	<i>Sub1, Wx-A, Wx-NB, Gn1a</i>
20	BRRI dhan95 (Ck)	0	129	2.51	0	<b>3.52</b>	4.75	3.38	<b>3.24</b>	47	7	-
<b>LSD (0.05)</b>		<b>18.7</b>	<b>7.6</b>	<b>2.18</b>	<b>1.57</b>	<b>2.17</b>	<b>1.3</b>	<b>1.58</b>	<b>1.09</b>	<b>33.5</b>	<b>2.1</b>	
<b>H2b</b>		<b>0.53</b>	<b>0.83</b>	<b>0.31</b>	<b>0.55</b>	<b>0.47</b>	<b>0.46</b>	<b>0.48</b>	<b>0.54</b>	<b>0.65</b>	<b>0.7</b>	

DS: 08/07/2023

DT: 31/08/2023

St - Stress, HS –Hotspot, NS - Nonstress, Gaz - Gazipur. Rang – Rangpur

#### Experiment 14.10: Advanced Yield Trial (AYT Special)

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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, 08 entries with two checks were evaluated in RCB design with two replications. Same methodologies were followed as experiment 14.5.

**Results and discussion:** Both the trials under farmers' field condition were received a low to moderate level of submergence (31days at Kurigram and 41 days at Lalmonirhat with a water depth 75-100 cm at vegetative stage). Based on the performances of the genotype under stress and non-stress conditions, a total of four genotypes were selected considering higher survivability and higher yield. The genotype BR10211-22-9-2\_1-P1 produced the highest yield of 5.42 t/ha with 81% survivability in controlled stress condition followed by the genotype BR9793-13-2-1(5.35 t/ha) with 78% survivability. The yield range of other selected genotypes were 3.79 t/ha to 5.16 t/ha under controlled submergence condition, 2.75 t/ha to 3.51 t/ha under farmers' field condition and 3.19 to 4.17 t/ha at rainfed condition. Under rainfed conditions the yield performance of the entries were lower as the trial of BRRI, Gazipur was affected by

storm. The heritability of all observed parameters was ranged from 0.31 to 0.8, indicating moderate to high level of precision of this experiment (Table 14.12).

**Table 14.12. Performance of the entries of AYT Special, Submergence and water stagnation tolerant rice, T. Aman 2023-24**

SN	Designation	PH (cm)	GD (Days)	Yield						Sur (%)	P Ac
				HS	St.	St. Poole d	NS Gaz	NS Rang	NS Poole d		
1	BR10211-22-9-2_1	180	142	2.98	4.47	3.76	4.2	2.84	3.24	63	5
*2	BR10211-22-9-2_1-P1	136	141	3.51	5.42	4.41	3.55	3.18	3.37	78	5
3	BR10211-22-9-2_1-P2	136	141	2.21	NA	3.37	3.45	3.3	3.49	33	9
4	BR10211-22-9-2_1-P3	138	140	2.71	NA	3.74	4.4	3.21	3.85	43	9
5	BR10211-22-9-2_2-2	130	142	3.16	4.45	3.84	3.6	2.96	3.1	74	6
*6	BR10211-22-9-2_3	131	141	3.01	5.16	4.06	4.3	3.25	3.85	60	4
*7	BR10211-22-9-2_3-2	138	142	2.75	4.72	3.75	3.2	3.17	3.19	64	4
*8	BR10211-22-9-2_4	132	142	2.86	3.79	3.42	4.95	3.25	4.17	74	5
9	BRR1 dhan52 (Ck)	138	140	3.24	6.65	4.77	4.3	3.64	4.38	80	3
10	BRR1 dhan79 (Ck)	130	139	3.94	5.64	4.7	4.9	2.87	3.63	81	7
<b>LSD (0.05)</b>		<b>25.6</b>	<b>8</b>	<b>1.14</b>	<b>1.38</b>	<b>1.41</b>	<b>1.59</b>	<b>1.41</b>	<b>1.25</b>	<b>33.4</b>	<b>3.33</b>
<b>H<sup>2</sup>b</b>		<b>0.41</b>	<b>0.31</b>	<b>0.66</b>	<b>0.8</b>	<b>0.7</b>	<b>0.39</b>	<b>0.37</b>	<b>0.57</b>	<b>0.76</b>	<b>0.45</b>

DS: 08/07/2023

DT: 31/08/2023

\*Selected Genotypes

#### **Experiment 14.11: Participatory Variety Selection (PVS)**

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharuddaula

**Objective:** Regional yield adaptation, evaluation and selection of promising submergence tolerant breeding lines in replicated trial under controlled submerged condition, flood prone farmers' fields condition as well as under rainfed condition with the participation of farmers.

**Materials and Methods:** Eight submergence tolerant high yielding advanced genotypes along with two standard check varieties having submergence tolerance were evaluated under rainfed, controlled on-station and natural flash flooding conditions. The experiment was laid out in RCB design with three replications and conducted in eight locations including two in controlled submergence tank, two in on-station rainfed condition, and four in flash flood prone farmers' fields (Kurigram, Lalmonirhat, Gaibandha, and Rangpur). Same methodologies were followed as experiment 14.5.

**Results and discussion:** Though the trial was conducted in four locations in submergence prone farmer's field in Rangpur, Kurigram and Lalmonirhat, Gaibandha district, there was no flood in one location at Rangpur. The trial at Kurigram was submerged for 31 days, in Lalmonirhat the trial submerged for 41 days and the trial of Gaibandha was submerged for ten days with a water depth of 75-120 cm. Based on the performances of the genotype under stress and non-stress conditions, three genotypes were selected. The genotype IR15F1886 produced significantly higher yield (5.29 t/ha) over both the check BRR1 dhan79 (4.13 t/ha) and BINA dhan11 (2.51 t/ha) with similar growth duration. (Table 14.11). The Survivability of the selected line was 72% under controlled submergence condition and the growth duration was 134 days under rainfed condition. The plant type of the selected genotype was also stronger with medium plant height. The single location heritability of all locations was ranged from 0.3 to 0.9 indicating moderate to high level of acceptance of data accuracy for the traits reported in the table 14.13 for grain yield the pooled heritability under stressed condition was 0.82 being highly acceptable but the pooled heritability under non-stressed condition was 0.11 indicating a lot of G X E interaction and the data accuracy was poor.

**Table 14.13. Performance of the entries of PVS, Submergence and water stagnation tolerant rice, T Aman 2023-24**

S N	Designation	PH (cm)	GD (Days)	Yield				Yield				Sur (%)	Pacp
				L1	L2	L3	L4	St. Pooled	L5	L6	NS Pooled		
*1	IR13F582	130	132	0.9	4.6	1	5	2.96	4.9	3.2	3.97	78	5
*2	IR15F1886	134	127	0.9	5.4	2.9	4.6	3.96	3.7	4.2	5.29	72	3
3	IR13F652-1-PS2	133	124	2.1	5.2	3.1	5.6	3.78	3.9	3.2	3.46	77	3
4	SV1179	130	136	1.3	5.4	3	5.6	3.5	3.9	3.6	3.64	68	5
5	IR93339129-B-7-7-B-B-B-16	133	136	0.6	5.4	3.3	4.8	3.79	3.9	3.2	3.35	68	5
*6	IR103783-B-B-6-2	132	128	1.5	5.4	3.4	5	4.05	4.3	3.2	3.64	68	5
7	BR10211-22-9-2_3	134	142	2.1	4.5	2.5	5.5	3.08	4.7	3.2	3.97	68	5
8	BR11196-5R-445	130	126	0.7	5.2	3.1	4.7	3.57	3.1	3	2.44	68	5
9	BRRI dhan79 (Ck)	129	133	0.5	5	4.1	5.7	3.77	4.7	3.3	4.13	75	3
10	BINA dhan11 (Ck)	122	120	1.2	4.9	1.8	5.1	3.13	4.1	2.7	2.51	68	5
<b>LSD (0.05)</b>		<b>7.09</b>	<b>6.59</b>	<b>0.8</b>	<b>1.1</b>	<b>0.6</b>	<b>1.2</b>	<b>0.73</b>	<b>0.8</b>	<b>3.8</b>	<b>2.44</b>	<b>17.8</b>	<b>2</b>
<b>H2b</b>		<b>0.84</b>	<b>0.9</b>	<b>0.8</b>	<b>0.6</b>	<b>0.8</b>	<b>0.4</b>	<b>0.82</b>	<b>0.8</b>	<b>0.3</b>	<b>0.11</b>	<b>0.13</b>	<b>0.4</b>

\*Selected Genotypes; L1- Kodalkhata, Lalmonirhat, L2- Sadar, Gaibandha, L3- Domdoma, Rangpur, L4- Stress condition L5- BRRI, Gazipur, L6- BRRI, Rangpur, St - Stress, NS - Nonstress

#### **Experiment 14.12: Proposed Variety Trial (PVT)-Submergence tolerance**

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman 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 ten locations of Bangladesh. 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 x 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 were also followed. depending upon AEZ, soil fertility, soil texture, flooding time and crop condition. 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 the water tank:**

The crop was submerged at 20 days after transplanting with 110 cm 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:** The trial was conducted in four flood prone sites of farmer's field in Rangpur, Kurigram and Lalmonirhat, Sirajganj, Sylhet and Jamalpur districts and there was heavy flood in trials site except Sylhet. The line R16F1148 produced significantly higher yield in every location. In natural flooded condition at Dewanganj, Jamalpur the line produced 10.55% higher yield than standard check variety (Table 14.14). On an average, the proposed line produced 5.29 t/ha yield, in contrast, the check variety produced 4.39 t/ha only. The the proposed line produced 20.5% higher yield than the check variety, the line was recommended for Re-PVT due to lesser exposure to natural flood (only in a single site).

**Table 14.14. Performance of the genotype IR16F1148 in PVT (Proposed Variety Trial) in ten locations to be released as a short duration submergence tolerant variety, Submergence and water Stagnation tolerant Rice, T. Aman 2023-24**

SN	Trial Location	Yield(t/ha)			Water depth (cm)	Remarks
		IR16F1148	BINA dhan11 (Ck)	% Yield advantage		
1	BRRI, Gazipur-1	6.61	5.63	17.41	-	Rainfed/ non stress
2	BRRI, Gazipur-2	5.02	3.74	34.22	110	Controlled submergence, 16 days
3	Dewanganj, Jamalpur	5.87	5.31	10.55	145	26 days flood
4	Sadar, Sylhet	3.95	2.82	40.07	-	No flood
5	Ullapara, Sirajganj	5.41	4.65	16.34	70	15 days flood
6	BRRI-Rangpur-1	5.89	5.11	15.26	-	Rainfed/ non stress
7	BRRI-Rangpur-2	4.5	4.02	11.94	100	Controlled submergence, 15 days
8	Kamarjani, Gaibandha	5.1	3.9	30.77	125	21 days flood
9	Jatrapur, Kurigram	-	-	-	147	Damaged due to 31 days flood
10	Mogalhat, Lalmonirhat	-	-	-	157	Damaged due to 45 days flood
	<b>Mean</b>	5.29	4.39	20.5	-	-

#### **Experiment 14.13: Proposed Variety Trial (PVT)-Tidal submergence tolerant**

**Principal Investigator:** S Ghosal

**Co-investigator:** M R Hasan, S Maniruzzaman, M M Yasmin, A Rahman and K M Iftekharuddaula

**Specific objectives:** Evaluation of advanced tidal submergence tolerant breeding line in the real tidal submergence prone environments in the farmers' field with the standard check by NSB team for release as a new variety.

**Materials and methods:** The tidal-submergence tolerant genotype BR9158-19-9-6-50-2-HR1 was evaluated with one tidal-submergence tolerant check variety BRRI dhan44 in PVT at ten locations of Bangladesh. Around 25-30 days old seedlings were transplanted @ 2-3 seedlings per hill at a spacing of 20 x 20 cm. The unit plot size was 20 square meters (4m x 5m; 20 rows @34 hills per row) and the field layout was RCB Design with three replications. 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 tidal 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 were followed depending upon AEZ, soil fertility, soil texture, flooding time and crop condition. Under tidal prone farmers' field condition fertilizer management decisions

had to be taken instantly depending on the natural tidal-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:** The line BR9158-19-9-6-50-2-HR1 produced significantly higher yield in every location. In natural tidal flooded condition at the Barishal region, the line produced 21.0% higher yield than the standard check variety (Table 14.15). On an average, the proposed line produced 5.49 t/ha yield, in contrast, the check variety produced only 4.52 t/ha only.

**Table 14.15. Performance of the genotype BR9158-19-9-6-50-2-HR1 in PVT (Proposed Variety Trial) in ten locations to be released as a tidal submergence tolerant rice variety, T. Aman 2023-24**

SN	Trial Location	Yield(t/ha)		% Yield advantage	Remarks
		BR9158-19-9-6-50-2-HR1	BRR1 dhan44 (Ck)		
1	BRR1-Gazipur	6.32	5.49	15	Rainfed/non-stress
2	Sadar, Gopalganj	4.56	4.03	13	Tidal ecosystem
3	BRR1-Gopalganj	5.29	4.01	32	Rainfed/non-stress
4	BRR1-Sonagazi	4.36	3.94	11	Tidal ecosystem
5	BRR1-Barishal	6.5	5.07	28	Tidal ecosystem
6	Sadar, Barishal	6.19	5.17	20	Tidal ecosystem
7	Sadar, Patuakhali	5.4	4.1	32	Tidal ecosystem
8	Sadar, Barguna	5.9	5.15	15	Tidal ecosystem
9	Nolcity, Jhalokati	4.08	3.13	30	Tidal ecosystem
10	Kawkhali, Pirojpur	6.33	5.2	22	Tidal ecosystem
<b>Mean</b>		5.49	4.52	21	-

## 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:** Md. Abdul Kader

### Experiment 15.1: Hybridization

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** Introgression of drought tolerance gene into high yielding rice genetic background.

**Materials and Method:** Twenty-seven varieties/lines (**Table 15.1a**) were grown in the hybridization block of plant breeding division at three staggerers 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<sub>4</sub>) 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. 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 3,908 seeds were made with 27 true parents (Table 15.1a). Table 15.1b shows the list of crosses made in the season. Mature F<sub>1</sub> seeds were harvested, sun dried and stored separately in paper bags with proper labeling and packaging.

**Table 15.1a. List of parents for crossing, Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)	Special features
1	BR11789-5R-55	108	117	4.39	<i>Wx-10+ qDTY2.1 (5)+qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A</i>
2	BR12313-5R-267	118	125	4.37	<i>qDTY2.1 (1)+qDTY2.1 (5)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A</i>
3	BR11786-5R-114	121	116	4.36	<i>qDTY2.1 (5)+qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4</i>
4	BR13018-4R-116	121	115	4.35	<i>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</i>
5	BR12312-5R-195	122	122	4.35	-
6	BR11788-5R-64	126	118	4.35	<i>Pi-ta+ Wx-10+ 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+ qDTY2.2_1+ BPH32+ Wx-A</i>
7	BR11795-5R-81	116	119	4.35	<i>qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ Gm4_3+ Gm4_4</i>
8	BR11797-5R-67	123	118	4.34	<i>qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_1+ DTY4.1_2+ Wx-A</i>
9	BR13021-4R-18	118	112	4.34	<i>Wx-10+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ Wx-A+ DTY12.1_2</i>
10	BR12316-5R-77	131	111	4.34	<i>qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A</i>
11	BR12307-5R-161	121	117	4.34	<i>qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_4+ Wx-A+ Gm4_4</i>
12	BR12316-5R-27	118	118	4.33	<i>Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ DTY4.1_2+ Wx-A</i>
13	BR13018-4R-31	137	114	4.33	<i>qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ DTY12.1_2</i>
14	BR13017-4R-11	119	111	4.33	<i>Wx-10+ qDTY1.1_1+ qDTY2.2_1+ Wx-A+ Gm4_3+ Gm4_4+ DTY12.1_2</i>
15	BR13021-4R-32	120	111	4.34	<i>Wx-10+ qDTY3.1 (2)+ Wx-A+ DTY12.1_2+</i>
16	BR12314-5R-85	113	119	4.34	<i>Pi-ta+ qDTY2.1 (1)+ qDTY2.1 (2)+ qDTY2.1 (5)+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY3.2_1+ Wx-A+</i>
17	BR13020-4R-35	117	119	4.34	<i>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+</i>
18	BR13018-4R-190	126	112	4.34	<i>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+</i>
19	BR11792-5R-44	133	120	4.33	<i>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+</i>
20	IR 126952-28-55-9-9-53-1-6	120	117	4.27	<i>Pi-ta+qDTY3.1 (3)+qDTY3.1 (4)+qDTY1.1_1+qDTY1.1_4+Wx-A</i>
21	IR 126952-41-58-26-4-12-1-9	129	126	4.25	<i>xa5+qDTY2.1 (1)+qDTY2.1 (2)+qDTY2.1 (4)+qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+BPH17_3+ Wx-A+ Pbl_1+qDTY12.1_2+Pi9_1</i>
22	IR100097-B-B-RGA-B-RGA-8	121	115	4.28	-
23	IR15L1720	126	115	4.28	-
24	IR17L1314	126	112	4.28	-
25	IR127009-B-8-2-1-2	129	117	4.26	-
26	BRR1 dhan66	119	116	4.28	-
27	BRR1 dhan71	129	117	4.25	-

**Table 15.1b: List of crosses made, Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	Cross combination	Average BLUP_GY (t/ha)	Characteristics	No. of seeds
1	BR11789-5R-55/BR12313-5R-267	4.38	Drought tolerance with QTLs	170
2	BR12313-5R-267/BR11786-5R-114	4.36	Drought tolerance with QTLs	100
3	BR11786-5R-114/BR13018-4R-116	4.36	Drought tolerance with QTLs	180
4	BR13018-4R-116/BR12312-5R-195	4.35	Drought tolerance with QTLs	513
5	BR12312-5R-195/BR11788-5R-64	4.35	Drought tolerance with QTLs	150

6	BR11788-5R-64/BR11795-5R-81	4.35	Drought tolerance with QTLs	85
7	BR11795-5R-81/BR11797-5R-67	4.35	Drought tolerance with QTLs	130
8	BR11797-5R-67/BR13021-4R-18	4.34	Drought tolerance with QTLs	160
9	BR13021-4R-18/BR12316-5R-77	4.34	Drought tolerance with QTLs	190
10	BR12316-5R-77/BR13021-4R-32	4.34	Drought tolerance with QTLs	45
11	BR13021-4R-32/BR12314-5R-85	4.34	Drought tolerance with QTLs	180
12	BR12314-5R-85/BR13020-4R-35	4.34	Drought tolerance with QTLs	150
13	BR13020-4R-35/BR13018-4R-190	4.34	Drought tolerance with QTLs	180
14	BR13018-4R-190/BR12307-5R-161	4.34	Drought tolerance with QTLs	90
15	BR12307-5R-161/BR12316-5R-27	4.33	Drought tolerance with QTLs	120
16	BR12316-5R-27/BR13018-4R-31	4.33	Drought tolerance with QTLs	140
17	BR13018-4R-31/BR13017-4R-11	4.33	Drought tolerance with QTLs	160
18	BR13017-4R-11/BR11792-5R-44	4.33	Drought tolerance with QTLs	120
19	BRR1 dhan71/IR100097-B-B-RGA-B-RGA-8	4.33	Drought tolerance with QTLs	75
20	BRR1 dhan71/IR 126952-28-55-9-9-53-1-6	4.33	Drought tolerance with QTLs	310
21	IR127009-B-8-2-1-2/IR100097-B-B-RGA-B-RGA-8	4.29	Drought tolerance with QTLs	90
22	IR17L1314/IR15L1720	4.28	Drought tolerance with QTLs	150
23	BRR1 dhan66/IR100097-B-B-RGA-B-RGA-8	4.28	Drought tolerance with QTLs	150
24	IR127009-B-8-2-1-2/IR 126952-41-58-26-4-12-1-9	4.28	Drought tolerance with QTLs	170
25	IR17L1314/IR100097-B-B-RGA-B-RGA-8	4.28	Drought tolerance with QTLs	100
<b>Total</b>				<b>3,908</b>

## Experiment 15.2: Hybridity test and confirmation of F<sub>1</sub>

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objectives:** Confirmation of the crosses as true F<sub>1</sub>s and use of the selected F<sub>1</sub>s to produce F<sub>2</sub> seeds and use in making different types of crosses.

**Materials and Methods:** A total of 25 crosses were grown along with their parents in the crossing blocks at BRR1 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<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>s. 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<sub>1</sub>. All 25 crosses were identified as true F<sub>1</sub>. Seeds of these F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity stage, F<sub>2</sub> 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<sub>1</sub>s, Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	BR Reg No.	Cross combination	Characteristics
1	BR15570	BRR1 dhan71/ BR12023-6R-111	Drought tolerance, high yield
2	BR15571	BRR1 dhan71/ BR12016-6R-145	Drought tolerance, high yield
3	BR15572	BRR1 dhan87/ BR12023-6R-111	Drought tolerance, high yield
4	BR15573	BRR1 dhan87/ BR11730-6R-26	Drought tolerance, high yield
5	BR15574	BRR1 dhan87/ BR12022-6R-102	Drought tolerance, high yield
6	BR15575	BRR1 dhan87/ BR12016-6R-145	Drought tolerance, high yield
7	BR15576	IR 126952-29-6-197-6-20-B/ BR12016-6R-145	Drought tolerance, high yield
8	BR15577	IR 126952-41-58-26-4-12-5-1/ BR12023-6R-111	Drought tolerance, high yield
9	BR15578	IR 126952-41-58-26-4-12-5-1/ BR12016-6R-145	Drought tolerance, high yield
10	BR15579	IR 126952-28-55-9-9-4-2-7/ BR12023-6R-111	Drought tolerance, high yield
11	BR15580	IR 126952-28-55-9-9-4-2-7/ BR12016-6R-145	Drought tolerance, high yield
12	BR15581	IR 126953:632-AC 32-B-2-4-11-B/ BR12023-6R-111	Drought tolerance, high yield
13	BR15582	IR 126953:632-AC 32-B-2-4-11-B/ BR11730-6R-26	Drought tolerance, high yield
14	BR15583	IR 126953:632-AC 32-B-2-4-11-B/ BR12016-6R-145	Drought tolerance, high yield
15	BR15584	IR 126952-29-65-16-2-10-B/ BR12023-6R-111	Drought tolerance, high yield
16	BR15585	IR 126952-29-65-16-2-10-B/ BR11730-6R-26	Drought tolerance, high yield
17	BR15586	IR 126952-29-65-16-2-10-B/ BR12016-6R-145	Drought tolerance, high yield
18	BR15587	IR 126952-443-12-33-7-53-4-B/ BR12023-6R-111	Drought tolerance, high yield
19	BR15588	IR 126952-443-12-33-7-53-4-B/ BR11730-6R-26	Drought tolerance, high yield
20	BR15589	IR 126952-443-12-33-7-53-4-B/ BR12016-6R-145	Drought tolerance, high yield

SN	BR Reg No.	Cross combination	Characteristics
21	BR15590	IR 126952-28-55-9-10-50-B/ BR12023-6R-111	Drought tolerance, high yield
22	BR15591	IR 126952-28-55-9-10-50-B/ BR11730-6R-26	Drought tolerance, high yield
23	BR15592	IR 126952-28-55-9-10-50-B/ BR12016-6R-145	Drought tolerance, high yield
24	BR15593	BRRRI dhan87/ BR10540-4-1-2-4-1	Drought tolerance, high yield
25	BR15594	IR 126952-28-55-9-10-50-B/ BR10540-4-1-2-4-1	Drought tolerance, high yield

### Experiment 15.3: Advancing segregating progenies in RGA/FRGA nurseries

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objective:** To rapid advancement of segregating population for shortening breeding cycle.

**Materials and Methods:** In total, 10,123 progenies from 33 crosses of F<sub>3</sub> and F<sub>5</sub> generation were grown in RGA/FRGA and 4,930 progenies of 14 crosses were grown in Boro season from F<sub>4</sub> 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. Half doses of the fertilizers were used as used as experiment 15.1. Crop management was done as 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 50°C for breaking dormancy and repeat the same method to initiate next cycle of RGA immediately.

**Results and Discussion:** In total 9,314 individual progenies of 33 crosses from F<sub>3</sub> and F<sub>5</sub> generation were harvested from segregating generations in T. Aman and 4,380 progenies of 14 crosses from F<sub>4</sub> generation were harvested from segregating generations from Boro season (Table 15.3a and Table 15.3b).

**Table 15.3a: List of selected progenies from RGA/FRGA nursery, Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	BR Reg. No.	Cross combinations	No of progenies transplanted	No of progenies harvested
<b>F<sub>3</sub> generation</b>				
1	BR14971	BR10480-1-2-3-7-2 / BRRRI Gene Bank Acc No. 1069	400	350
2	BR14972	BR9674-1-1-5-2-P4 / IR126952-443-83-68-6-6-1-3	400	355
3	BR14973	BR9674-1-1-5-2-P4 / IR126952-41-58-26-4-12-1-21	400	360
4	BR14974	IR16F1148 / IR 126952-28-94-36-10-31-6-1	400	370
5	BR14975	IR16F1148 / IR 126952-28-55-37-2-20-4-B	400	350
6	BR14976	IR16F441 / IR96322-34-223-B	400	300
7	BR14977	BR11607-4R-184 / BRRRI Gene Bank Acc No. 1434	400	350
8	BR14978	BR11607-4R-184 / IR96322-34-223-B-1-1-1	400	350
9	BR14979	BR11604-4R-84 / IR126952-41-148-1-5-9-8-1	400	350
10	BR14980	BR11604-4R-84 / IR96322-34-260-B-5-1-1-4-B	400	365
11	BR14981	BR10538-2-1-2-3-2 / HHZ23-DT16-DT1-DT1	400	360
12	BR14982	BR10539-8-1-3-2-2 / CAMPONI SML	400	350
13	BR14983	BR10539-43-1-1-1-1 / IR126952-443-83-68-6-6-1-3	400	360
14	BR14984	BR10540-4-1-2-4-1 / IR 126952-28-94-36-10-31-6-1	400	360
<b>Total</b>			<b>5,600</b>	<b>4,930</b>
<b>F<sub>5</sub> generation</b>				
1	BR14371	BR9574-9-5-3-1-1/ HHZ23-DT16-DT1-DT1	200	200
2	BR14372	BR9574-9-5-3-1-1/ CAMPONI SML	340	320
3	BR14373	BR9574-9-5-3-1-1/ DRR dhan44	290	290
4	BR14374	BR10001-94-2-B/ CAMPONI SML	130	130
5	BR14375	BR9868-19-40-3-B/ DRR dhan44	350	330
6	BR14376	BR9868-19-40-3-B/ IR96322-34-223-B	200	200
7	BR14377	BR8442-12-1-3-1-B5/ HHZ23-DT16-DT1-DT1	260	250
8	BR14378	BR8442-12-1-3-1-B5/ IR96322-34-223-B	340	340
9	BR14379	HHZ5-DT20-DT2-DT1/ HHZ23-DT16-DT1-DT1	400	380
10	BR14380	HHZ5-DT20-DT2-DT1/ IR96322-34-223-B	450	385
11	BR14381	HHZ12-SAL2-Y3-Y2/ DRR dhan44	240	240
12	BR14382	HHZ12-SAL2-Y3-Y2/ CAMPONI SML	118	118
13	BR14383	BR8548-8-22-5-15/ DRR dhan44	236	235
14	BR14384	BR9158-19-9-6-50-2-HR1/ HHZ23-DT16-DT1-DT1	248	245
15	BR14385	BR9158-19-9-6-50-2-HR1/ CAMPONI SML	116	116
16	BR14386	BR9868-19-40-3-B/ BRRRI Gene Bank Acc No. 1069	220	220
17	BR14387	BR8442-12-1-3-1-B5/ BRRRI Gene Bank Acc No. 1353	85	85
18	BR14388	HHZ12-SAL2-Y3-Y2/ BRRRI Gene Bank Acc No. 1434	180	180

SN	BR Reg. No.	Cross combinations	No of progenies transplanted	No of progenies harvested
19	BR14389	BR9158-19-9-6-50-2-HR1/ BRRIGene Bank Acc No. 1434	120	120
<b>Total</b>			<b>4,523</b>	<b>4,384</b>
<b>Grand Total</b>			<b>10,123</b>	<b>9,314</b>

**Table 15.3b: List of selected progenies from RGA/FRGA nursery, Development of Drought Tolerant Rice, Boro 2023-24**

SN	BR Reg. No.	Cross combinations	No of progenies transplanted	No of progenies harvested
<b>F<sub>4</sub> generation</b>				
1	BR14971	BR10480-1-2-3-7-2/ BRRIGeneBankAccNo1069	350	300
2	BR14972	BR9674-1-1-5-2-P4/ IR126952-443-83-68-6-6-1-3	355	315
3	BR14973	BR9674-1-1-5-2-P4/ IR126952-41-58-26-4-12-1-21	360	320
4	BR14974	IR16F1148/ IR126952-28-94-36-10-31-6-1	370	320
5	BR14975	IR16F1148/ IR126952-28-55-37-2-20-4-B	350	310
6	BR14976	IR16F441/ IR96322-34-223-B	300	280
7	BR14977	BR11607-4R-184/ BRRIGeneBankAccNo1434	350	320
8	BR14978	BR11607-4R-184/ IR96322-34-223-B-1-1-1	350	315
9	BR14979	BR11604-4R-84/ IR126952-41-148-1-5-9-8-1	350	315
10	BR14980	BR11604-4R-84/ IR96322-34-260-B-5-1-1-4-B	365	320
11	BR14981	BR10538-2-1-2-3-2/ HHZ23-DT16-DT1-DT1	360	315
12	BR14982	BR10539-8-1-3-2-2/ CAMPONISML	350	310
13	BR14983	BR10539-43-1-1-1-1/ IR126952-443-83-68-6-6-1-3	360	320
14	BR14984	BR10540-4-1-2-4-1/ IR126952-28-94-36-10-31-6-1	360	320
<b>Total</b>			<b>4,930</b>	<b>4,380</b>

#### Experiment 15.4: Observational Yield Trial (OYT)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Selection of superior lines with desired agronomic characters under natural drought.

**Materials and Methods:** Two hundred and ninety-two along with standard checks were evaluated in two OYTs. In OYT#1, 135 lines (GD: 100-130 days) along with BRRIGeneBankAccNo1069 and BRRIGeneBankAccNo1434 and 157 lines (GD: 131-150 days) along with BRRIGeneBankAccNo1069, BRRIGeneBankAccNo1434 and BRRIGeneBankAccNo1434 were evaluated in OYT#2. Thirty days old seedlings will be transplanted in a 3.3 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), Rangpur (Stress)

**Result and Discussion:** Twenty-five genotypes were found superior from OYT#1 and 18 genotypes were found superior from OYT#2 based on uniformity of plant height, days to flowering, lodging tolerances and insect and disease susceptibility (**Table 15.4**). Grain yield ranged from 5.09-6.52 t/ha in OYT#1 and grain yield ranged from 5.29-6.54 t/ha in OYT#2. During flowering stage drought stress was observed almost all three locations. In Gazipur moderate stress were recorded and Rajshahi recorded with severe drought stress (**Fig 15.4a** and **Fig 15.4b**). No stress was observed in Rangpur.

**Table 15.4: Performance of the selected genotypes of Observational Yield Trial (OYT), Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)	GY (BLUP)	
<b>OYT#1</b>									
1	BR13530-4R-31	114	106	7.48	4.58	4.75	5.60	5.09	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY4.1+ qDTY12.1 Pita+ Waxy_A + Waxy_10</i>

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)	GY (BLUP)	
2	BR13530-4R-39	110	109	7.59	5.88	6.08	6.52	5.34	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ qDTY4.1+ qDTY12.1 qGm4(t)_2 Waxy_A + Waxy_10</i>
3	BR13530-4R-63	119	113	7.28	5.16	3.75	5.40	5.04	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ qDTY4.1+ qDTY12.1 qGm4(t)_1+ qGm4(t)_2 Waxy_A + Waxy_10</i>
4	BR13534-4R-76	122	109	4.61	4.34	7.86	5.60	5.09	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 Waxy_A + Waxy_10 + fgr-1</i>
5	BR13051-4R-24	118	124	7.30	4.32	6.44	6.02	5.21	<i>qDTY2.2-1+ qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ qDTY4.1+ Pita+ qGm4(t)_1+ qGm4(t)_2 Waxy_A</i>
6	BR13051-4R-77	118	123	5.16	5.42	6.26	5.61	5.10	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ BPH32+ Waxy_A + Waxy_10</i>
7	BR13055-4R-210	116	102	4.41	5.97	6.72	5.70	5.12	<i>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</i>
8	BR13056-4R-6	183	126	6.71	5.34	4.44	5.50	5.07	-
9	BR13056-4R-10	119	125	7.55	5.80	4.77	6.04	5.21	<i>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</i>
10	BR13056-4R-26	124	119	6.22	6.67	4.37	5.75	5.13	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY2.1_5+ qDTY3.1_3+ qDTY3.1_4+ Waxy_A</i>
11	BR13056-4R-35	127	126	6.25	6.88	4.74	5.96	5.19	<i>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</i>
12	BR13056-4R-48	124	125	6.24	5.12	6.25	5.87	5.17	<i>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</i>
13	BR13056-4R-52	129	124	6.72	4.99	5.14	5.62	5.10	<i>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</i>
14	BR13057-4R-15	124	130	6.76	6.97	4.25	5.99	5.20	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ qDTY4.1+ qDTY12.1 Waxy_A</i>
15	BR13057-4R-32	108	126	7.62	5.20	3.83	5.55	5.08	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY2.1_5+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ qDTY12.1 Waxy_A Waxy_10</i>
16	BR13057-4R-44	115	126	7.35	5.46	5.74	6.18	5.25	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ Pita+ Waxy_A</i>
17	BR13057-4R-123	118	128	6.28	5.48	4.95	5.57	5.08	<i>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+ qDTY12.1+ Waxy_A</i>
18	BR13057-4R-126	108	127	6.27	5.37	5.02	5.55	5.08	<i>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</i>
19	BR13057-4R-164	110	116	6.00	6.15	4.59	5.58	5.09	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY2.1_5+ qDTY3.1_1+ qDTY3.1_2+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.1_5+ qDTY3.1_6+ qDTY3.1_7+ qDTY3.1_8+ qDTY3.1_9+ qDTY3.1_10+ qDTY3.1_11+ qDTY3.1_12+ qDTY3.1_13+ qDTY3.1_14+ qDTY3.1_15+ qDTY3.1_16+ qDTY3.1_17+ qDTY3.1_18+ qDTY3.1_19+ qDTY3.1_20+ qDTY3.1_21+ qDTY3.1_22+ qDTY3.1_23+ qDTY3.1_24+ qDTY3.1_25+ qDTY3.1_26+ qDTY3.1_27+ qDTY3.1_28+ qDTY3.1_29+ qDTY3.1_30+ qDTY3.1_31+ qDTY3.1_32+ qDTY3.1_33+ qDTY3.1_34+ qDTY3.1_35+ qDTY3.1_36+ qDTY3.1_37+ qDTY3.1_38+ qDTY3.1_39+ qDTY3.1_40+ qDTY3.1_41+ qDTY3.1_42+ qDTY3.1_43+ qDTY3.1_44+ qDTY3.1_45+ qDTY3.1_46+ qDTY3.1_47+ qDTY3.1_48+ qDTY3.1_49+ qDTY3.1_50+ qDTY3.1_51+ qDTY3.1_52+ qDTY3.1_53+ qDTY3.1_54+ qDTY3.1_55+ qDTY3.1_56+ qDTY3.1_57+ qDTY3.1_58+ qDTY3.1_59+ qDTY3.1_60+ qDTY3.1_61+ qDTY3.1_62+ qDTY3.1_63+ qDTY3.1_64+ qDTY3.1_65+ qDTY3.1_66+ qDTY3.1_67+ qDTY3.1_68+ qDTY3.1_69+ qDTY3.1_70+ qDTY3.1_71+ qDTY3.1_72+ qDTY3.1_73+ qDTY3.1_74+ qDTY3.1_75+ qDTY3.1_76+ qDTY3.1_77+ qDTY3.1_78+ qDTY3.1_79+ qDTY3.1_80+ qDTY3.1_81+ qDTY3.1_82+ qDTY3.1_83+ qDTY3.1_84+ qDTY3.1_85+ qDTY3.1_86+ qDTY3.1_87+ qDTY3.1_88+ qDTY3.1_89+ qDTY3.1_90+ qDTY3.1_91+ qDTY3.1_92+ qDTY3.1_93+ qDTY3.1_94+ qDTY3.1_95+ qDTY3.1_96+ qDTY3.1_97+ qDTY3.1_98+ qDTY3.1_99+ qDTY3.1_100</i>

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)	GY (BLUP)	
20	BR13057-4R-222	108	127	6.77	5.70	4.84	5.77	5.14	<i>qDTY3.1_2+ qDTY3.2+ qDTY12.1 Waxy_AWaxy_10</i>
21	BR13058-4R-56	130	105	4.59	7.26	6.70	6.18	5.25	<i>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</i>
22	BR13059-4R-13	140	125	7.02	6.53	4.58	6.04	5.21	<i>qDTY1.1_1+ qDTY1.1_2+ qDTY3.1_3+ qDTY3.1_4+ xa5+ Waxy_A + Waxy_10</i>
23	BR13059-4R-18	125	133	5.73	6.27	4.89	5.63	5.10	<i>qDTY2.1_1+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ qDTY12.1 Waxy_A + Waxy_10</i>
24	BR13059-4R-114	117	109	6.25	5.82	5.93	6.00	5.20	<i>qDTY2.1_1+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ qDTY12.1 Waxy_A + Waxy_10</i>
25	BR13059-4R-188	132	124	6.78	5.70	4.55	5.68	5.11	<i>qDTY2.1_1+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ qDTY12.1 Waxy_A + Waxy_10</i>
26	BRRI dhan71 (Ck)	114	114	5.93	5.17	4.54	5.21	4.99	
27	BRRI dhan87 (Ck)	119	126	5.71	5.71	3.84	5.09	4.95	
	LSD (0.05) h2b	23.8 0.31	9.6 0.83	0.124 1.00	0.742 0.89	1.075 0.87	1.409 0.27		
<b>OYT#2</b>									
1	BR13530-4R-32	130	121	5.71	4.96	5.35	5.34	4.69	<i>qDTY2.2-1+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 qGm4(t)_1+ qGm4(t)_2 Waxy_A + Waxy_10</i>
2	BR13530-4R-35	121	109	7.64	6.03	4.24	5.97	4.69	<i>qDTY2.2-1+ qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ qDTY4.1+ qDTY12.1 qGm4(t)_1+ qGm4(t)_2 Waxy_A</i>
3	BR13530-4R-60	125	120	8.03	5.69	3.14	5.62	4.69	<i>qDTY2.2-1+ qDTY3.1_2+ qDTY3.2+ qDTY12.1 qGm4(t)_1+ qGm4(t)_2 Waxy_A + Waxy_10</i>
4	BR13532-4R-28	119	110	5.32	6.06	4.63	5.34	4.69	<i>qDTY2.1_3+ qDTY2.1_4+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 BPH32+ Waxy_A</i>
5	BR13533-4R-38	137	110	5.69	5.89	4.29	5.29	4.69	<i>qDTY1.1_1+ qDTY1.1_2+ qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ Waxy_A + Waxy_10</i>
6	BR13534-4R-3	121	113	6.7	3.88	5.5	5.36	4.69	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 + Waxy_A + Waxy_10</i>
7	BR13534-4R-13	112	110	6.58	4.54	5.34	5.48	4.69	<i>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+ fgr-1</i>
8	BR13534-4R-41	119	109	4.28	5.65	6.18	5.37	4.69	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 + Waxy_A + Waxy_10 + fgr-1</i>
9	BR13534-4R-92	111	109	5.48	5.38	5.19	5.35	4.69	<i>qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 + Waxy_A + Waxy_10</i>
10	BR13534-4R-100	124	118	6.13	4.31	5.81	5.42	4.69	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 + Waxy_A + Waxy_10</i>
11	BR13534-4R-104	124	112	5.91	4.95	5.09	5.32	4.69	<i>qDTY2.2-1+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 + Waxy_A + Waxy_10</i>
12	BR13534-4R-107	121	115	5.22	5.31	5.41	5.31	4.69	<i>qDTY2.1_1+ qDTY2.1_2+ qDTY2.1_3+ qDTY2.1_4+ qDTY3.1_1+ qDTY3.1_2+</i>

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Genotypic data	
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)		GY (BLUP)
13	BR13058-4R-75	125	110	7.3	4.7	4.62	5.54	4.69	<i>qDTY12.1 Pita+ Waxy_A + Waxy_10</i>
14	BR13058-4R-134	120	110	9.85	5.1	4.66	6.54	4.69	<i>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</i>
15	BR13058-4R-135	134	115	6.43	5.85	5.05	5.78	4.69	<i>qDTY1.1_1+ qDTY1.1_2+ qDTY2.2-1+ qDTY3.1_3+ qDTY3.1_4+ qDTY3.2+ xa5+ Waxy_A</i>
16	BR13059-4R-113	111	112	6.85	6.04	3.93	5.61	4.69	<i>qDTY2.1_5+ qDTY3.1_1+ qGm4(t)_1+ qDTY1.1_2+ qDTY3.1_1+ qDTY3.1_2+ qDTY3.2+ Pita+ Waxy_A + Waxy_10</i>
17	BR13060-4R-65	122	117	6.92	4.58	5.03	5.51	4.69	<i>qDTY1.1_1+ qDTY1.1_2+ qDTY2.2-1+ qDTY3.1_1+ qDTY3.1_2+ qDTY12.1 qGm4(t)_1+ qGm4(t)_2</i>
18	BR13060-4R-126	134	116	5.6	4.6	6.33	5.51	4.69	<i>qDTY1.1_1+ qDTY4.1+ qDTY12.1 Pita+ qGm4(t)_1+ qGm4(t)_2 Waxy_A</i>
19	BRRIdhan71 (Ck)	117	112	5.24	5.89	5.19	5.04	4.69	
20	BRRIdhan93 (Ck)	112	130	5.72	5.51	4.03	5.09	4.69	
21	BRRIdhan56 (Ck)	117	112	4.7	4.66	4.8	4.72	4.69	
	LSD (0.05) h2b	15.5	9.2	1.183	0.663	2.291	1.585		

OYT#1: Gaz: D/S- 06.07.23 D/T- 11.08.23, Raj: D/S- 12.07.23 D/T- 08.08.23, Rang: D/S- 02.07.23 D/T- 02.08.23

OYT#2: Gaz: D/S- 06.07.23 D/T- 12.08.23, Raj: D/S- 12.07.23 D/T- 07.08.23, Rang: D/S- 02.07.23 D/T- 04.08.23

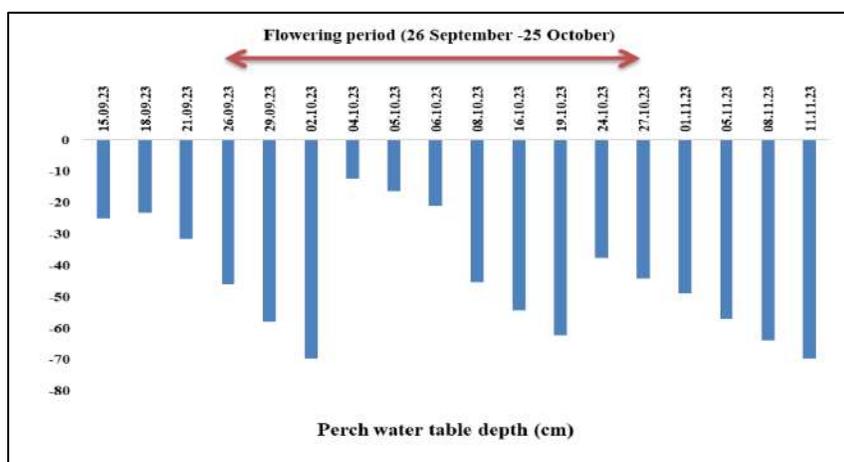


Fig. 15.4a: Perch water tale depth in the experimental field of BRRI Gazipur, T. Aman 2023-24

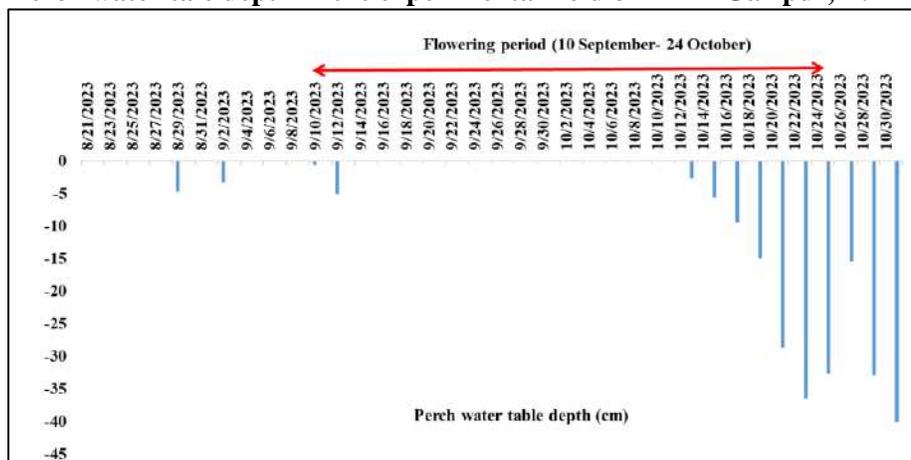


Fig. 15.4b: Perch water tale depth in the experimental field of Rajshahi, T. Aman 2023-24

### Experiment 15.5: Advanced Yield Trial (AYT)

Principal investigator: M A Kader

Co-Investigators: R R Majumder, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Selection of superior lines with desired agronomic characters under natural drought.

**Materials and Methods:** Sixty-seven genotypes along with standard checks were evaluated in two AYT#s. In AYT#1, 32 lines along with BRRI dhan56, BRRI dhan71 and BRRI dhan75 and 35 lines along with BRRI dhan49, BRRI dhan71 and BRRI dhan87 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. The design was Alpha Lattice for AYT#1 and RCBD for AYT#2 in the field. Single seedling will be used for transplanting. Single seedling was used for transplanting. Fertilizers and crop management were done as experiment no. 15.1.

**Location:** Gazipur (Control), Rajshahi (Stress), Rangpur (Stress)

**Result and Discussion:** Five genotypes with grain yield range 5.38– 5.80 t/ha were selected from AYT#1 and seven genotypes with grain yield range 5.38– 5.80 t/ha were selected from AYT#2 based on uniformity of plant height, days to flowering, lodging tolerances and insect and disease susceptibility (Table 15.5). Fig. 15.4a and Fig. 15.4b shows the perch water table depth during the flowering period of the genotypes in Gazipur and Rajshahi, respectively.

**Table 15.5: Performance of the genotypes of Advanced Yield Trial (AYT), Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)	GY (BLUP)	
<b>AYT#1</b>									
1	BR13017-4R-11*	127	115	5.9	5.54	4.91	5.45	4.94	Wx-10+ qDTY1.1_1+ qDTY2.2_1+ Wx-A+ Gm4_3+ Gm4_4+ DTY12.1_2
2	BR13017-4R-28	132	117	5.22	5.3	3.74	4.75	4.94	Wx-10+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ Wx-A+ DTY12.1_2
3	BR13017-4R-85	133	118	4.78	6.2	4.29	5.09	4.94	-
4	BR13018-4R-5	125	117	5.21	5.82	4.34	5.13	4.94	-
5	BR13018-4R-31*	128	114	5.82	5.06	5.25	5.38	4.94	qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A+ DTY12.1_2
6	BR13018-4R-116	125	118	5.65	4.15	4.4	4.73	4.94	-
7	BR13018-4R-117*	124	112	5.7	5.72	4.76	5.39	4.94	-
8	BR13018-4R-190	121	115	5.08	4.13	5.23	4.82	4.94	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	BR13021-4R-17	121	113	4.85	4.8	3.45	4.37	4.94	-
10	BR13021-4R-18	118	115	5.53	5.74	4.77	5.34	4.94	-
11	BR13021-4R-19	121	114	5.36	5.11	3.93	4.8	4.94	-
12	BR13021-4R-21	116	115	5.09	4.45	4.27	4.6	4.94	qDTY2.1 (4)+ qDTY1.1_4+ Wx-A
13	BR13021-4R-32	122	114	5.16	4.5	4.41	4.69	4.94	-
14	BR13023-4R-33*	119	120	5.21	6.31	5.28	5.6	4.94	-
15	BR12306-5R-110	122	112	4.06	4.41	7.08	5.18	4.94	DTY4.1_2+ Wx-A
16	BR12309-5R-21	121	121	6.27	3.91	4.17	4.79	4.94	-
17	BR12316-5R-63	131	117	5.19	5.77	4.84	5.27	4.94	Pi-ta+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
18	BR12316-5R-77	127	118	5.38	5.12	4.42	4.97	4.94	qDTY2.1 (5)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY2.2_1+ qDTY3.2_1+ DTY4.1_2+ Wx-A
19	BR12316-5R-107	131	118	5.83	5.81	3.46	5.03	4.94	-
20	BR11770-5R-71	128	115	4.44	4.22	4.42	4.36	4.94	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
21	BR11790-5R-10	132	121	5.17	5.42	3.12	4.57	4.94	Wx-10+ xa5+ + qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_4+ qDTY2.2_2+ qDTY3.2_1+ BPH32+ Wx-A
22	BR11797-5R-85	120	123	5.36	4	5.13	4.83	4.94	-
23	BR12307-5R-161	128	124	5.01	5.92	4.08	5	4.94	-
24	BR12316-5R-27*	124	119	5.3	5.01	4.51	4.94	4.94	Pi-ta+ qDTY3.1 (3)+ qDTY3.1 (4)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ DTY4.1_2+ Wx-A
25	BR12316-5R-29	128	119	5.46	5.78	4.73	5.33	4.94	qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY1.1_1+ qDTY1.1_4+ qDTY3.2_1+ Wx-A
26	BR11786-5R-114	123	119	4.02	4.12	4.64	4.26	4.94	-
27	BR11787-5R-6	141	120	5.42	4.47	4.32	4.74	4.94	-
28	BR11788-5R-27	124	120	4.59	6.26	5.95	5.6	4.94	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)				Genotypic data	
				Gazi pur	Raj shahi	Rang pur	GY (BLUE)	GY (BLUP)	
29	BR11789-5R-55	124	125	3.28	5.62	4.22	4.37	4.94	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
30	BR11789-5R-84	131	118	5.46	5.91	4.12	5.16	4.94	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
31	BR11790-5R-62	127	118	5.55	5.48	4.56	5.2	4.94	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
32	BR11797-5R-67	124	122	4.31	4.46	4.16	4.31	4.94	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
33	BRR1 dhan56 (Ck)	119	112	5.65	4.31	4.87	4.94	4.94	-
34	BRR1 dhan71 (Ck)	120	122	5.19	5.06	5.37	5.21	4.94	-
35	BRR1 dhan75 (Ck)	114	113	4.94	4.35	4.52	4.6	4.94	-
	LSD (0.05)	10.9	5.6	1.541	0.388	1.202	1.134		
	h2b	0.53	0.81	0.13	0.96	0.66			
<b>AYT#2</b>									
1	BR13020-4R-35	128	125	6.26	6.26	2.86	5.13	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
2	BR12306-5R-14*	119	134	6.79	5.94	4.22	5.65	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
3	BR12306-5R-50	123	124	4.53	6.54	3.84	4.97	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
4	BR11788-5R-64	118	123	3.64	5.38	4.9	4.64	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
5	BR13023-4R-46	121	129	5.53	5.78	4.83	5.38	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
6	BR13024-4R-24*	109	127	6.99	5.58	4.37	5.65	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
7	BR12307-5R-48	119	135	6.4	4.9	3.94	5.08	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
8	BR12307-5R-103	117	128	5.24	5.17	5.07	5.16	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
9	BR12307-5R-109	130	131	5.6	6.6	4.14	5.45	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
10	BR12307-5R-136	123	128	6.1	5.83	4.24	5.39	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
11	BR12307-5R-226*	126	122	5.09	6.83	4.72	5.55	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
12	BR12307-5R-240	119	124	5.19	6.48	4.6	5.43	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
13	BR12308-5R-269	122	126	5.84	5.34	4.62	5.27	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
14	BR12309-5R-38	114	128	4.83	4.92	3.41	4.38	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
15	BR12311-5R-69*	121	127	5.68	6.77	4.44	5.63	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
16	BR12311-5R-174	123	126	5.94	5.25	3.82	5	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
17	BR12312-5R-195	129	126	5.3	5.5	3.65	4.82	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
18	BR12313-5R-44	126	128	5.75	4.46	3.94	4.72	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
19	BR12313-5R-267	121	129	5.59	4.89	4.59	5.02	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
20	BR12314-5R-85	127	132	5.38	5.58	4.6	5.19	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
21	BR12314-5R-180*	117	121	5.86	6.68	4.37	5.64	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
22	BR12315-5R-74	116	118	5.47	4.58	4.53	4.86	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A
23	BR12316-5R-81	117	123	6.84	4.54	4.76	5.38	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)					Genotypic data	
				Gazi pur	Raj shahi pur	Rang pur	GY (BLUE)	GY (BLUP)		
24	BR12316-5R-133*	130	124	4.82	6.52	6.06	5.8	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
25	BR11771-5R-42	118	123	5.41	6.69	4.15	5.42	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
26	BR11771-5R-177	125	124	6.6	5.2	4.6	5.47	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
27	BR11779-5R-101	126	127	4.81	5.25	5.05	5.04	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
28	BR11781-5R-27	123	128	4.78	4.06	4.47	4.44	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
29	BR11781-5R-133	121	126	4.78	5.01	5.51	5.1	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
30	BR11786-5R-124	120	125	5.13	5.36	5.01	5.17	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
31	BR11792-5R-44	129	130	5.12	5.11	5.74	5.33	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
32	BR11795-5R-8	125	121	4.45	5.79	4.31	4.85	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
33	BR11795-5R-51*	126	126	4.9	6.74	4.87	5.5	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
34	BR11795-5R-81	119	126	4.5	4.95	5.22	4.89	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
35	BR11796-5R-34	119	127	4.88	4.78	3.7	4.45	5.17	Wx-10+ qDTY2.1 (1)+ qDTY2.1 (4)+ qDTY3.1 (1)+ qDTY3.1 (2)+ qDTY2.2_1+ qDTY3.2_1+ Wx-A	
36	BRRI dhan71 (Ck)	116	120	6.2	5.15	4.64	5.33	5.17	-	
37	BRRI dhan87 (Ck)	122	127	5.99	5.69	4.58	5.42	5.17	-	
38	BRRI dhan49 (Ck)	111	129	5.75	5.43	3.95	5.04	5.17	-	
	LSD (0.05)	14.2	7.9	1.637	0.416	1.319	1.177			
	h2b	-	0.52	-	0.96	0.41				

\*Selected for further trial

AYT#1: Gaz: D/S- 05.07.23 D/T- 07.08.23, Raj: D/S- 11.07.23 D/T- 06.08.23, Rang: D/S- 02.07.23 D/T- 04.08.23

AYT#2: Gaz: D/S- 05.07.23 D/T- 09.08.23, Raj: D/S- 11.07.23 D/T- 06.08.23, Rang: D/S- 02.07.23 D/T- 04.08.23

## Experiment 15.6: Regional Yield Trial (RYT)

**Principal investigator:** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**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:** Seven 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 5.1 m × 12 rows. The design was RCB with two replications. Fertilizers doses and crop management was done as experiment no. **15.1**.

**Results and Discussion:** Based on grain yield in comparison to check varieties BR12023-6R-111 was selected and advanced to ALART (**Table 15.6a**). The physico-chemical properties of different genotypes are shown in **Table 15.6b**. The performance of the genotypes under controlled drought condition are also shown in **Table 15.6c**. Genetic trend of the genotypes drought tolerance program were studied from 2019 to 2023. The result showed the pBLUP (grain yield) in respect of trial year indicated an annual 94.49 kg/ha equivalent to about 2.43% increase in grain yield per year based on yield of 2019 (**Fig 15.6c**).

**Table 15.6a: Performance of the genotypes of Regional Yield Trial (RYT), Development of Drought Tolerant Rice, T. Aman 2023-24**

SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)									
				Gazi pur	Rang pur	Kuri gram	Nil phamar i	Pab a	Chapai nawabgon j	Nator e	Kush tia	GY_ BLUE	GY_ BLUP
1	BR12023-6R-111	113	107	5.67	4.94	5.42	5.17	5.53	5.53	4.32	5.30	5.24	5.18

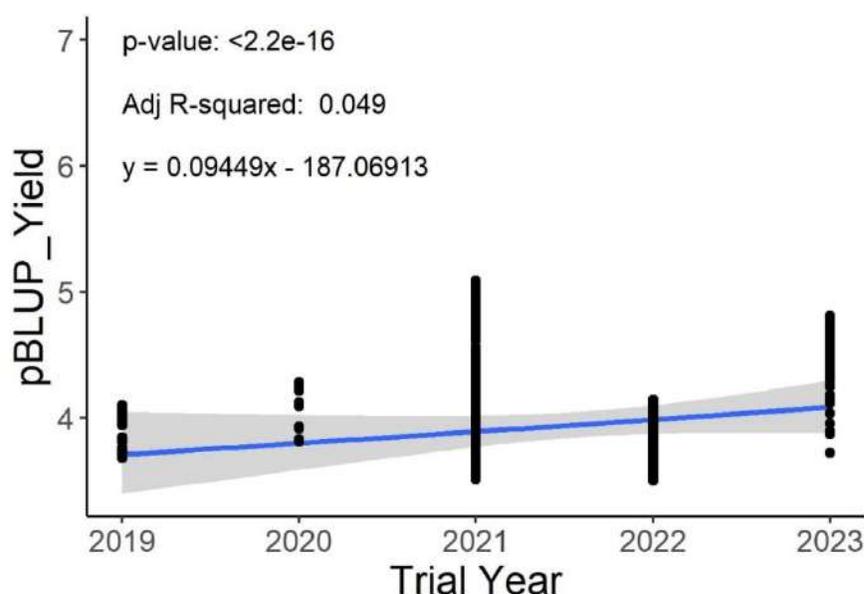
SN	Designation	Plant height (cm)	Growth duration (days)	Grain yield (t/ha)									
				Gazi pur	Rang pur	Kuri gram	Nil phamari	Pab a	Chapai nawabgonji	Natore	Kush tia	GY <sub>BLUE</sub>	GY <sub>BLUP</sub>
2	BR12021-6R-117	129	111	6.80	4.82	5.21	4.41	4.67	4.55	4.30	4.59	4.92	4.90
3	IR15L1720	126	113	5.05	4.72	4.87	3.90	4.99	4.47	4.27	4.38	4.58	4.61
4	IR127009-B-8-2-1-2	122	115	5.22	4.12	4.75	4.74	3.89	3.59	4.15	4.28	4.34	4.41
5	IR17L1314	124	110	5.70	4.22	4.18	4.24	4.33	4.08	4.24	4.48	4.43	4.49
6	IR100097-B-B-RGA-B-RGA-8	116	114	5.25	4.24	5.03	4.39	4.50	4.25	4.51	4.59	4.59	4.62
7	IR17L1360	124	114	4.89	5.05	5.59	5.33	5.32	5.16	4.12	4.99	5.06	5.02
8	BRRIdhan71 (Ck)	122	115	5.97	5.21	4.79	5.02	5.04	5.31	5.23	5.36	5.24	5.18
LSD (0.05)		4.2	2.4	1.414	0.54	0.56	0.125	0.38	0.240	0.466	0.37	0.373	
h2b		0.94	0.91	0.35	0.78	0.79	0.99	0.94	0.98	0.79	0.90	0.95	

**Table 15.7b: Physicochemical properties of the genotypes of Regional Yield Trial (RYT), DTR, T. Aman 2023-24**

Designation	Milling outturn (%)	Head rice recovery (%)	Milled rice length (mm)	Milled rice breadth (mm)	L-B ratio	Size & Shape	Amylose content (%)	1000 grain wt. (g)	Protein content (%)	ER	IR
BR12023-6R-111	70.4	64.1	5.3	2.2	2.4	MB	24.0	20.5	8.5	1.6	4.6
BR12021-6R-117	69.0	61.1	5.8	2.0	2.9	MB	22.0	25.1	7.4	1.5	4.6
IR15L1720	69.4	58.2	5.9	2.1	2.8	MB	24.3	24.1	7.8	1.5	4.5
IR 127009-B-8-2-1-2	70.1	55.6	6.5	1.8	3.6	LS	22.0	24.6	7.9	1.4	4.6
IR17L1314	68.4	58.0	6.7	2.0	3.3	LS	24.0	26.1	8.0	1.5	3.5
IR 10009 7-B-B-RGA-B-RGA-8	69.2	53.2	6.6	1.9	3.4	LS	24.3	23.4	8.2	1.5	4.3
IR17L1360	69.4	48.5	6.4	1.9	3.3	LS	25.2	24.7	7.2	1.5	4.0
BRRIdhan71 (Ck)	67.8	58.8	5.8	2.0	2.8	MB	22.1	23.9	6.9	1.5	3.1

**Table 15.7c: Performance of genotypes of RYT under controlled drought condition, T. Aman 2023-24**

SN	Designation	Grain yield (g/plant)			Filled grain no./plant		%Sterility Under stress condition
		Control	Stress	% Reduction	Control	Stress	
1	BR12023-6R-111	22.85	10.56	53.8	1203	615	41.4
2	BR12021-6R-117	21.04	7.75	63.2	1159	575	41.1
3	IR15L1720	21.01	9.05	56.9	1129	475	36.5
4	IR127009-B-8-2-1-2	24.68	11.09	55.1	1194	627	49.1
5	IR17L1314	23.38	5.69	75.7	1201	290	46.9
6	IR100097-B-B-RGA-B-RGA-8	28.07	9.00	67.9	1411	488	55.2
7	IR17L1360	22.13	14.28	35.5	1080	696	34.2
8	BRRIdhan71 (Ck)	25.49	18.20	28.6	1151	923	17.9
9	IR64 (Ck)	21.23	4.73	77.7	1030	243	61.0



**Fig 15.6c:** Genetic trend of pBLUP (grain yield) in respect of trial year indicated an annual 94.49 kg/ha equivalent to about 2.43% increase in grain yield per year based on yield of 2019

## 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:** S Maniruzzaman

**Co-investigator:** M M Yasmin, A Rahman and K M Iftekharuddaula

**Specific objectives:** To introgress water-use-efficient genes into modern genetic backgrounds with short growth duration and grain quality etc.

**Materials and Methods:** Fourteen 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 were 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 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 anthesized panicles of the male parent by dusting pollens on the emasculated panicle of the female parents.

**Results and discussion:** Totally 272 F<sub>1</sub> seeds were obtained from 21 crosses (**Table 16.1b**). These were recorded and labeled properly. The F<sub>1</sub> 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 2023-24**

SL	Designation	GD (days)	Yield (t/ha)
1	BR11204-5B-224	145	6.6

2	IR93339129-B-7-7-B-B-B-16	150	7.5
3	BR12154-5R-219-PS1	150	7
4	IR 126968-B-23-2-1-3	147	7
5	BRAC dhan2	146	7.3
6	BINA dhan25	144	7.6
7	BRR1 dhan102	150	8.1
8	BRR1 dhan98	140	7.5
9	BINA dhan17	120	6
10	IR16T1356	135	6
11	BR12952-5R-55		
12	BR11692-5R-345		
13	BR12502-5R-76		
14	IR19A1473	152	7.6

**Table 16.1b: List of crosses made, Water Saving and Aerobic Rice Breeding, Boro 2023-24**

SL No	Cross combination	No. of F <sub>1</sub> Seeds
1	BRR1 dhan102/BINA dhan25	10
2	IR93339129-B-7-7-B-B-B-16/BRR1 dhan102	10
3	BRR1 dhan102/BRR1 dhan98	30
4	BRR1 dhan102/BRAC dhan2	4
5	BR12154-5R-219-PS1/BRR1 dhan102	7
6	BRR1 dhan98/BINA dhan25	8
7	IR93339129-B-7-7-B-B-B-16/BRR1 dhan98	5
8	BINA dhan25/BRAC dhan2	35
9	IR93339129-B-7-7-B-B-B-16/BRAC dhan2	3
10	BRR1 dhan98/BRAC dhan2	5
11	BRR1 dhan102/BR11204-5B-224	50
12	IR93339129-B-7-7-B-B-B-16/BR12154-5R-219-PS1	5
13	BR12154-5R-219-PS1/BRR1 dhan98	3
14	BINA dhan17/IR19A1473	25
15	BINA dhan17/ BR12502-5R-76	25
16	IR16T1356/BR12502-5R-76	4
17	IR16T1356/BR11692-5R-345	5
18	BR12952-5R-55/IR19A1473	20
19	BR12952-5R-55/BR11692-5R-345	15
21	BRAC dhan2/BRR1 dhan98	3
<b>Total</b>		<b>272</b>

**DS: 11/12/2023-31/12/2023**

**DT:10/01/2024-30/01/2024**

**Experiment 16.2: Confirmation of F<sub>1</sub>, Water Saving and Aerobic Rice Breeding, Boro 2023-24**

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objectives:** Confirmation of the cross as true F<sub>1</sub>s and use of the selected F<sub>1</sub>s to produce F<sub>2</sub> seeds.

**Materials and Methods:** Under water saving and aerobic rice breeding, a total of 20 single crosses along with their respective parents were grown and under heat and early morning flowering six single crosses along with their respective parents were grown. F<sub>1</sub> 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<sub>4</sub>/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<sub>4</sub> were applied at final land preparation. Leaf samples were collected from each of the 12 plants from each F<sub>1</sub> and parents for QC genotyping to determine true F<sub>1</sub>. 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<sub>1</sub>s, twenty-two, out of twenty-six crosses were confirmed as true F<sub>1</sub>. Seeds of these selected F<sub>1</sub> plants were selfed to produce F<sub>2</sub> seeds. At maturity, F<sub>2</sub> 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<sub>1</sub>, Water Saving and Aerobic Rice Breeding, Boro 2023-24**

SL No.	BR Number	Crosses (Parents)	No of Seed
1	BR15753	BR11710-5B-351/IRRI 249	400
2	BR15754	BR11710-5B-351/IR18R1120	460
3	BR15756	BRRRI dhan101/IR19L1051	560
4	BR15761	Thailand Pajam/BR9674-8-15-3-28-P3	400
5	BR15762	BR11315-5R-17-52/Thailand Pajam	400
6	BR15763	BR10571-15-6-8-5/Thailand Pajam	400
7	BR15765	BR10571-15-6-8-5/IR18R1120	400
8	BR15766	BR10571-15-6-8-5/BRH11-9-11-4-5B	400
9	BR15768	BRH11-9-11-4-5B/BR9674-8-15-3-28-P3	440
10	BR15769	BR11712-4R-227/BRRRI dhan101	440
11	BR15770	BR11712-4R-227/BR10571-15-6-8-5	440
12	BR15772	BRH11-9-11-4-5B/IR18R1120	400
13	BR15776	BRRRI dhan58(T)/IR19L1051	160
14	BR15764	BR10571-15-6-8-5/IR17A1694	440
15	BR15767	BR10571-15-6-8-5/IRRI 154	400
16	BR15774	BR11596-5R-39/BR9674-1-1-5-1-P3	416
Total			6556
<b>Heat and Early Morning Flowering</b>			
1	BR15775	BRRRI dhan58(T)/BR9674-8-15-3-28-P3	400
2	BR15777	BRRRI dhan58(T)/BRRRI dhan28(T) qEMF 3-5	400
3	BR15778	BRRRI dhan58(T)/BRRRI dhan28(T) qEMF 3-6	400
4	BR15779	BRRRI dhan88/BRRRI dhan28(T) qEMF 3-1	440
5	BR15780	BRRRI dhan88/BRRRI dhan28(T) qEMF 3-3	400
6	BR15781	BRRRI dhan88/BRRRI dhan28(T) qEMF 3-5	320
Total			2360

**DS: 18/11/2023**

**DT: 15/12/2023**

**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 19,585 progenies of 53 crosses comprising of 13 F<sub>2</sub>, 14 F<sub>3</sub>, 13F<sub>4</sub> and 13 F<sub>5</sub> populations were grown in Boro 2023-24 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 13,685 progenies comprising 4500 F<sub>2</sub>, 3454 F<sub>3</sub>, 2991 F<sub>4</sub>, and 2900 F<sub>5</sub> 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 100% (Table 16.3).

**Table 16.3: List of F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub> and F<sub>5</sub> populations advanced through FRGA, Water Save and Aerobic Rice Breeding, Boro 2023-24**

<b>F<sub>2</sub></b>					
SL. No.	BR Number	Crosses (Parents)	Progenies Grown	Progenies Harvested	Recovery (%)
1	BR15298	BR8899-14-4-1-2-2-1/Nania	500	400	80
2	BR15299	BRR1 dhan102/Pyree	500	360	72
3	BR15300	BR12208-5R-352-P1/BR11204-5B-224	500	340	68
4	BR15301	BRH11-9-11-4-5B/BR11949-4R-258	500	360	72
5	BR15302	BR11690-5R-98/BR11712-4R-218	500	400	80
6	BR15303	FBR-376/BR11204-5B-224	500	320	64
7	BR15304	BR11204-5B-224/BRH13-2-4-6-4B	500	212	42
8	BR15305	BR12208-5R-352-P1/Nania	500	328	66
9	BR15306	BR12208-5R-352-P2/BRR1 dhan102	500	400	80
10	BR15307	BR11716-4R-105/BR10571-15-6-8-5	500	400	80
11	BR15308	BR12208-5R-352-P1/BRR1 dhan102	500	300	60
12	BR15309	IR17A1694/FBR-376	500	360	72
13	BR15782	BRR1 dhan101/IR19A1472	500	320	64
Sub Total Progenies			6500	4500	69
<b>F<sub>3</sub></b>					
SL.	BR Number	Crosses (Parents)	Progenies Grown	Progenies Harvested	Recovery (%)
1	BR15208	FBR-376/Chiherang Sub1-AG1-AG2	260	225	87
2	BR15209	FBR-376/BR8899-17-1-1-1-1-1	260	175	67
3	BR15210	FBR-376/BRR1 dhan92	500	322	64
4	BR15211	Nania/BRR1 dhan92	500	232	46
5	BR15213	BR11716-4R-102/BRR1 dhan92	392	250	64
5	BR15214	BR12208-5R-352/BRR1 dhan92	200	194	97
7	BR15215	BR9674-1-1-5-2-P4/BRR1 dhan92	260	180	69
8	BR15216	BR12177-5R-169/BR8899-17-1-1-1-1-1	200	148	74
9	BR15217	Fatema dhan/BRR1 dhan92	220	168	76
10	BR15219	Nariya-14/FBR-376	500	200	40
11	BR15220	BR12208-5R-352-P1/FBR-376	580	400	69
12	BR15221	BRH13-1-9-7B/FBR-376	600	440	73
13	BR15222	BRH11-9-11-45B-HR3/Ja Hua	368	240	65
14	BR15223	BR11716-4R-105/ Ja Hua	500	280	56
Sub Total Progenies			5340	3454	65
<b>F<sub>4</sub></b>					
SL	BR	Single Cross	Progenies Grown	Progenies Harvested	Recovery (%)
1	BR14493	BRH13-1-9-7B/Eu Muslema	400	384	96
2	BR14494	BRH11-9-11-45B-HR3/Eu Muslema	300	295	98
3	BR14495	BRH11-7-17-10B/Eu Muslema	400	396	99
4	BR14496	BRH13-1-9-7B/Ja Hua	400	220	55
5	BR14497	BRH11-9-11-45B-HR3/Ja Hua	294	128	44
6	BR14498	BRH11-7-17-10B/Ja Hua	300	260	87
7	BR14499	BR11723-4R-172/Ja Hua	307	200	65
8	BR14500	BR11716-4R-102/Ja Hua	313	128	41
9	BR14501	BR11716-4R-105/Ja Hua	280	140	50

10	BR14502	BR11712-4R-227/Ja Hua	328	160	49
11	BR14503	BR9674-2-9-10-1-P5 /Ja Hua	350	140	40
12	BR14504	CN6/Ja Hua	400	200	50
13	BR14505	CN6/Eu Muslema	348	340	98
Sub Total Progenies			4430	2991	68

<b>F<sub>5</sub></b>					
SL.	BR Number	Crosses	Progenies Grown	Progenies Harvested	Recovery (%)
1	BR14164	BRR1 dhan96/ IR15L1163	300	240	80
2	BR14165	BRR1 dhan96/ IR16L1081	300	200	67
3	BR14166	BRR1 dhan96/ IR16L1172	200	200	100
4	BR14167	BRR1 dhan88/ IR15L1163	200	140	70
5	BR14169	BRR1 dhan88/IR16L1172	252	252	100
6	BR14170	BRR1 dhan92/BRR1 dhan84	220	160	73
7	BR14171	BRR1 dhan92/IR16L1090	250	248	99
8	BR14172	BRR1 dhan92/BR11002-5R-112	258	200	78
9	BR14173	BRR1 dhan92/BR8899-17-1-1-1-1-1	164	160	98
10	BR14174	BRR1 dhan92/IR100740-89-B-2	276	220	80
11	BR14175	BRR1 dhan92/BR11723-4R-172	300	280	93
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 Progenies			3315	2900	87
<b>Grand Total Progenies</b>			<b>19585</b>	<b>13,685</b>	

**DS: 10/11/2023**

#### **Experiment 16.4: Line Stage Testing (LST)**

**Principal Investigator:** Sharmistha Ghosal

**Co-investigator:** 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 water use efficiencies.

**Materials and Methods:** A total of 290 fixed advanced lines 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. 16A.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, and higher predicted yield indicated by key target trait markers.

**Results and discussion:** A total of 40 lines were selected from 290 progenies from four crosses (Table 16A.4) based on phenotypic acceptance, uniformity in flowering, plant height, grain size and shape, lodging tolerance, and tolerance to major disease and insect, and higher predicted yield indicated by key target trait markers.

**Table 16.4: List of superior fixed lines selected from LST populations, Water Saving and Aerobic Rice Breeding, Boro 2023-24**

SI No	Designation	SI No	Designation
1	BR13399-5R-2	21	BR13400-5R-23
2	BR13399-5R-4	22	BR13400-5R-24
3	BR13399-5R-8	23	BR13400-5R-26
4	BR13399-5R-9	24	BR13400-5R-27

5	BR13399-5R-12	25	BR13400-5R-28
6	BR13399-5R-15	26	BR13401-5R-1
7	BR13399-5R-18	27	BR13401-5R-8
8	BR13399-5R-19	28	BR13401-5R-12
9	BR13399-5R-20	29	BR13401-5R-13
10	BR13399-5R-24	30	BR13401-5R-33
11	BR13399-5R-25	31	BR13401-5R-41
12	BR13399-5R-34	32	BR134055R-10
13	BR13399-5R-35	33	BR134055R-11
14	BR13399-5R-38	34	BR134055R-15
15	BR13400-5R-2	35	BR134055R-33
16	BR13400-5R-4	36	BR134055R-39
17	BR13400-5R-6	37	BR134055R-40
18	BR13400-5R-7	38	BR134055R-45
19	BR13400-5R-11	39	BR134055R-47
20	BR13400-5R-16	40	BR134055R-52

DS: 12/11/2023

DT: 18/01/2024

**Experiment 16.5. Preliminary Yield Trial (PYT#1), Water Saving and Aerobic rice Breeding, Boro 2023-24**

**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 13 genotypes along with four 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<sup>2</sup>. 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 13 genotypes, five promising entries were selected based on phenotypic acceptance, growth duration, grain quality, and yield. Among the tested entries, the genotype BR12837-5R-89 gave highest yield (7.22 t/ha). The individual heritability obtained from plant height, growth duration and grain yield were 83%, 99%, and 88% 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 2023-24**

Genotype	50% Flowering	80% Maturity	PH (cm)	Pacp	Yield (t/ha)
BR12833-5R-9-1	138	161	106	8	3.85
BR12833-5R-9-2	139	162	110	7	3.6
BR12833-5R-10-1	141	164	98	7	4.61
BR12833-5R-10-2	148	171	97	7	3.92
BR12833-5R-16	154	177	85	7	4.7
BR12833-5R-18	139	162	118	4	6.44
BR12834-5R-3	132	155	98	4	5.69
BR12837-5R-95	138	161	103	4	6.95
BR12837-5R-3	141	164	102	4	6.44
BR12837-5R-89	126	149	115	6	7.22
BR13316-5R-3	128	151	110	5	5.48

Genotype	50% Flowering	80% Maturity	PH (cm)	Pacp	Yield (t/ha)
BR13316-5R-5	135	158	117	6	5.99
BR13316-5R-6	134	157	113	7	5.39
Thailand Pajam (Ck)	114	137	110	7	5.5
BRR1 dhan88 (Ck)	118	141	86	8	6.75
BRR1 dhan100 (Ck)	124	147	109	7	5.88
BRR1 dhan102 (Ck)	135	158	103	7	6.72
CV	7.37	6.29	9.94	25.4	21.11
LSD	2.1	2.1	10.94	1.84	1.07
H2b	99	99	83	78	88

DS: 15/12/2023

DT: 10/01/2024

### Experiment 16.6. Preliminary Yield Trial (PYT#2), Water Saving and Aerobic Rice Breeding, Boro 2023-24

**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 14 genotypes with four checks were evaluated (Table 16.6) in west bayed BRR1. 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<sup>2</sup>. 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 was followed from one month after transplanting to flowering.

**Results:** A total of five, out of 14, 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 IR14G3964 produced the highest yield (7.75 t/ha) followed by the genotype IR18R1133 a (7.51 t/ha). The yield range of the other selected genotypes was 3.42 t/ha to 7.4 t/ha with a growth duration ranging from 108 to 118 days. The individual heritability obtained from growth duration, plant height, PAcp and yield were 99%, 63%, 91% and 71% 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 2023-24**

Genotype	50% Flowering	80% Maturity	PH (cm)	Pacp	Yield (t/ha)
IR18T1059	140	162	115	3	6.06
IR20X1014	146	168	113	6	5.68
IR19L1045	126	148	111	7	3.42
IR16F1147	135	157	113	3	5.3
IR 126999-B-32-2-1-3	127	149	111	3	6.38
IR 129391-B-35-B-1-1	127	149	108	5	6.6
IR14G3964	126	148	109	7	7.75
IR16L1478	129	151	113	5	7.4
IR17L1415	135	157	116	7	5.16
IR14L345	134	156	118	5	6.38
IR16T1662	145	167	111	7	5.99
IR18R1118 a	146	168	113	7	6.1
IR18R1133 a	131	153	116	6	7.51
IR18R1119 a	143	165	109	6	6.59

BRRi dhan58 (Ck)	127	149	105	7	6.89
BRRi dhan88 (Ck)	118	140	99	5	7.78
BRRi dhan89 (Ck)	136	158	122	5	7.81
BRRi dhan108 (Ck)	128	150	109	5	6
CV	6.05	5.19	5.44	26.89	19.58
LSD	1.72	1.72	8.69	1.19	1.65
H2b	99	99	62	91	71

DS: 15/12/2023

DT: 10/01/2024

### Experiment 16.7. Advanced Yield Trial (AYT), Water Saving and Aerobic Rice Breeding, Boro 2023-24

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objective:** Advanced yield evaluation of advanced breeding lines for their phenotypic acceptability, adaptation under local climatic condition and grain yield potentials under on-station AWD condition.

**Materials and Methods:** Total 15 genotypes with three checks were evaluated (**Table 16.7**) 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<sup>2</sup>. 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 was followed from one month after transplanting to flowering.

**Results:** A total of six, out of 15, 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 IR14L545 produced the highest yield (7.34 t/ha) followed by the genotype BR11710-5B-351-color (6.31 t/ha). The yield ranges of the other selected genotypes were 2.38 t/ha to 6.18 t/ha with a growth duration ranging from 108 to 136 days. The individual heritability obtained from growth duration, plant height, P<sub>acp</sub> and yield were 99%, 87%, 54% and 73% respectively, indicating high level of precision in this experiment (**Table 16.7**).

**Table 16.7: Performance of the entries in Advanced Yield Trial (AYT#WS), Water Saving and Aerobic Rice Breeding, Boro 2023-24**

Genotype	50% Flowering	80% Maturity	PH (cm)	P <sub>acp</sub>	Yield (t/ha)
GSR IR 1-5-S14-S2-Y2	128	151	111	6	3.14
IR 121147-B-B-CMU 11-1-2	129	152	109	3	6.18
GSR IR 1-12-S2-Y3-Y2	140	163	110	3	4.71
IR14L545	128	151	110	6	7.34
BR11690-5R-98-P1	129	152	114	6	5.81
IR18R1078	131	154	109	5	4.01
IR17L1446	130	153	113	5	4.42
IR15A2407	125	148	110	5	6.16
BR12489-5R-119	130	153	123	5	3.6
BR11204-5B-219	126	149	122	6	3.61
BR11710-5B-351	130	153	108	4	4.12
BR11710-5B-351-color	122	145	108	4	6.31
BR12154-5R-219-PS1	148	171	110	4	2.38
IR 126968-B-23-2-1-3	130	153	136	6	6.11
IR16F1148 (Ck)	131	154	108	3	6.35
BRRi dhan88 (Ck)	122	145	103	6	5.98
BRRi dhan100 (Ck)	125	148	120	4	6.06
BRRi dhan102 (Ck)	125	148	99	6	7.71
CV	4.72	4.01	7.99	28.63	32.28
LSD	1.5	1.5	8.37	2.17	1.18
H2b	99	99	87	54	73

DS: 15/12/2023

DT: 10/01/2024

**Experiment 16.8. Advanced Yield Trial\_Special (AYT\_Special), Water Saving and Aerobic Rice Breeding, Boro 2023-24**

**Principal Investigator:** Sharmistha Ghosal

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

**Specific objective:** Advanced yield evaluation of advanced breeding lines for their phenotypic acceptability, adaptation under local climatic condition and grain yield potentials under on-station AWD condition.

**Materials and Methods:** Total two genotypes with two checks were evaluated (**Table 16.8**) 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 5.5 m<sup>2</sup>. 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 was followed from one month after transplanting to flowering.

**Results:** All the genotypes were selected based on phenotypic acceptance, growth duration, grain quality, and higher yield potential. All the selected genotypes were slender with respect to grain type with short to medium growth duration. Among all tested advanced breeding lines, the genotype BR11708-5B-224 produced the highest yield (6.03 t/ha). The individual heritability obtained from growth duration, plant height, Pacp and yield were 89%, 94%, 67% and 84%, respectively, indicating high level of precision in this experiment (**Table 16.8**).

**Table 16.8: Performance of the entries in Advanced Yield Trial\_Special (AYT\_Special), Water Saving and Aerobic Rice Breeding, Boro 2023-24**

Genotype	50% Flowering	80% Maturity	PH (cm)	Pacp	Yield (t/ha)
BR11708-5B-224	121.5	145.5	119.5	4	6.035
IR93339129-B-7-7-B-B-B-16	134	158	124.5	4	5.915
BRRI dhan88 (Ck)	111.5	135.5	97	7	3.405
BRRI dhan58 (Ck)	123	147	104	4	6.15
CV	6.98	5.84	11.17	35.14	23.36
LSD	1.13	1.13	8.93	2.4	0.49
H2b	90	89	94	67	84

**DS:** 15/12/2023

**DT:** 10/01/2024

**PROJECT 17: DEVELOPMENT OF TRANSGENIC HIGH BETA-CAROTENE RICE AND HIGH IRON & ZINC RICE (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 (HIZR).

**Project Leader:** Dr. Md. Abdul 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, T K Hore, U R Shaha and M I H Joy

**Specific objective:** Ingression of 'high iron and zinc gene' into popular varieties/line BR11723-4R-27 (T. Aman), BR11712-4R-93 (Boro), BRRI dhan71 (T. Aman), BRRI dhan81 (Boro), BRRI dhan87 (T. Aman), BRRI dhan89 (Boro), BRRI dhan98 (T. Aman), BRRI dhan103 (T. Aman), BRRI dhan105 (Boro) and BRRI dhan107 (Boro).

**Materials and Methods:** In T. Aman 2023-24, three backcrosses BC<sub>3</sub>F<sub>2</sub> were grown for identifying fixed lines. In Boro 2023-24 season, six BC<sub>3</sub>F<sub>2</sub> plants were grown for identifying fixed lines. Five recipient parents and one donor parents were grown in the hybridization block of BRRI green house at five dates with an interval of seven days to synchronize flowering among male and female parents. 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<sub>4</sub>) kg NPKSZn/ha were applied in the trial in T. Aman season. In Boro season, fertilizers @ 138 (300 kg Urea): 20 (100 kg TSP): 83 (165 kg MP): 20 (112 kg Gypsum): 4 (11 kg Zn SO<sub>4</sub>) 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 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 2023-24 season, leaf samples of BC<sub>3</sub>F<sub>2</sub> plants were collected from three backcrosses for genotyping and six fixed lines (B type) and one hemizygous plant (H type) were found from two backcrossing (**Table 17.1a**). In Boro 2023-24, 129 F<sub>1</sub> seeds were obtained from five crosses (**Table 17.1b**) and a total of 75 BC<sub>1</sub>F<sub>1</sub> seeds were obtained from two backcrosses to develop high iron and zinc enriched rice (**Table 17.1c**). Leaf samples of BC<sub>3</sub>F<sub>2</sub> plants were collected from six lines for genotyping and 20 fixed lines (B type) and 22 hemizygous plants (H type) were found from two backcrossing (**Table 17.1d**). Seed multiplication was done from six B type plants (**Table 17.1e**). These were recorded and labeled properly. The seeds were sun-dried and stored in a cool and dry place.

**Table 17.1a: List of identified progenies from BC<sub>3</sub>F<sub>2</sub>, High Iron and Zinc Rice (HIZR), Healthier Rice, T. Aman 2023-24**

SN	BR Reg. No.	Parentage	No. of B type (Fixed lines) identified	No. of H type (hemizygous) identified
1	15615	BRRRI dhan71*4/ IR 135160 TR-3-B-19	1	1
2	15616	BRRRI dhan89*4/ IR 135160 TR-3-B-19	5	-

**Table 17.1b: List of crosses made, High Iron and Zinc Rice (HIZR), Healthier Rice, Boro 2023-24**

SN	Parentage	No. of F <sub>1</sub> Seeds
1	BR11712-4R-93/ IR 135160 TR-3-B-19	22
2	BRRRI dhan98/ IR 135160 TR-3-B-19	20
3	BRRRI dhan103/ IR 135160 TR-3-B-19	18
4	BRRRI dhan105/ IR 135160 TR-3-B-19	45
5	BRRRI dhan107/ IR 135160 TR-3-B-19	24
<b>Total</b>		<b>129</b>

**Table 17.1c: List of backcrosses (BC<sub>1</sub>F<sub>1</sub>), High Iron and Zinc Rice (HIZR), Healthier Rice, Boro 2023-24**

SN	Parentage	No. of BC <sub>2</sub> F <sub>1</sub> seeds
1	BRRRI dhan81/ IR 135160 TR-3-B-19	20
2	BRRRI dhan87/ IR 135160 TR-3-B-19	55
<b>Total</b>		<b>75</b>

**Table 17.1d: List of identified progenies from BC<sub>3</sub>F<sub>2</sub>, High Iron and Zinc Rice (HIZR), Healthier Rice, Boro 2023-24**

SN	BR#	Parentage	No. of B type (fixed lines) identified	No. of H type (hemizygous) identified
1	BR15616-IRS1030-031-BRRRI dhan89*4-12-19	BRRRI dhan89*4/ IR 135160 TR-3-B-19#19	-	09

2	BR15616-IRS1030-031-BRRI dhan89*4-12-20	BRRI dhan89*4/ IR 135160 TR-3-B-19#20	-	10
3	BR15616-IRS1030-031-BRRI dhan89*4-12-21	BRRI dhan89*4/ IR 135160 TR-3-B-19#21	04	-
4	BR15616-IRS1030-031-BRRI dhan89*4-12-22	BRRI dhan89*4/ IR 135160 TR-3-B-19#22	-	-
5	BR15616-IRS1030-031-BRRI dhan89*4-12-27	BRRI dhan89*4/ IR 135160 TR-3-B-19#27	06	03
6	BR15616-IRS1030-031-BRRI dhan89*4-12-28	BRRI dhan89*4/ IR 135160 TR-3-B-19#28	10	-
<b>Total</b>			<b>20</b>	<b>22</b>

**Table 17.1e: List of seed multiplication (B type), High Iron and Zinc Rice (HIZR), Healthier Rice, Boro 2023-24**

SN	BR#	Parentage
1	BR15615-IRS1030-031-BRRI dhan71*4-14-4	BRRI dhan71/ IR 135160 TR-3-B-19#4
2	BR15616-IRS1030-031-BRRI dhan89*4-12-1	BRRI dhan89/ IR 135160 TR-3-B-19#1
3	BR15616-IRS1030-031-BRRI dhan89*4-12-5	BRRI dhan89/ IR 135160 TR-3-B-19#5
4	BR15616-IRS1030-031-BRRI dhan89*4-12-8	BRRI dhan89/ IR 135160 TR-3-B-19#8
5	BR15616-IRS1030-031-BRRI dhan89*4-12-17	BRRI dhan89/ IR 135160 TR-3-B-19#17
6	BR15616-IRS1030-031-BRRI dhan89*4-12-25	BRRI dhan89/ IR 135160 TR-3-B-19#25

### Experiment 17.2: Introgression of GR2-E trait into Aus, Aman and Boro varieties

**Principal investigator :** M A Kader

**Co-Investigators:** R R Majumder, T K Hore, U R Shaha and M I H Joy

**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 using marker-assisted selection (MAS) procedures.

**Materials and Methods:** In T. Aman 2023-24 season 567 homozygous plants (B type) were grown in the net house for multiplication and selection for Contained Trial (CT). Thirty-five days old seedlings were transplanted at 20 cm × 20 cm spacing using single seedling per hill in the field. Fertilizer management was done as experiment 17.1. Desirable plants 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. 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 2023-24 season, 176 homozygous plants (B type) were selected from 567 plants for multiplication and selection for Contained Trial (CT) (**Table 17.2**). The harvested seeds were sun-dried and stored in a cool and dry place.

**Table 17.2: Fixed lines multiplied for Contained Trial (CT), Development of Vitamin-A enriched rice (GR), Healthier Rice, T. Aman 2023-24**

SN	BR Reg. No.	Parentage	No. of lines	Selected lines
1	BR14668	BRRI dhan48/ IR112060GR2-E:2-7-63-2-96	118	37
2	BR14669	BRRI dhan67/ IR112060GR2-E:2-7-63-2-96	40	17
3	BR14670	BRRI dhan71/ IR112060GR2-E:2-7-63-2-96	81	19
4	BR14671	BRRI dhan84/ IR112060GR2-E:2-7-63-2-96	96	19
5	BR14672	BRRI dhan87/ IR112060GR2-E:2-7-63-2-96	86	35
6	BR14673	BRRI dhan89/ IR112060GR2-E:2-7-63-2-96	146	49
<b>Total</b>			<b>567</b>	<b>176</b>