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Reaction of Breeding Lines/Cultivars of Rice Against Brown Spot and Blast under Field Condition

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Abstract: Twenty nine different genotypes/advanced breeding lines and four cultivars/checks viz., BR 11, BR 22, BR 25 and BRRI dhan 38 of rice were selected for the study to examine and screen out the advanced hybrid lines, which are resistant/tolerant to brown spot and blast disease. One accession showed resistant (R) reaction in T. aman season and twenty-nine cultivars showed moderately resistant (MR) reaction in boro season to brown spot. Thirteen accessions were found as moderately resistant (MR) in T. aman season and three breeding lines/genotypes were found to be highly resistant (HR) and five were resistant (R) in boro season to blast. So, these lines/cultivars may be used as breeding materials and cultivated for rice production.

Key words: Reaction, breeding lines, cultivars, brown spot, blast, rice, field

INTRODUCTION

Rice (*Oryza stiva*) is the principal food crop of Bangladesh, feeding almost hundred percent of its population. Bangladesh ranks third among the rice producing countries of the world though yield is relatively low[1]. This country is still deficit in production of food grains. In Bangladesh, rice is grown in three seasons viz., Aus, Aman and Boro. Among these, Aman (including transplanted and broadcast) comprises major areas[2] and boro comes next. Among the many causes of low yield of rice in Bangladesh disease and pest play a major role, sometimes leading to disastrous consequences[3]. Ironically the tropical and subtropical climate that favours the production of rice is also favourable for its disease development. Out of 31 diseases of rice 10 are considered as major diseases among which brown spot and blast cause substantial loss to rice both in quality and quantity in the present ecosystem in Bangladesh.

The brown spot disease caused by *Drechslera oryzae* has a worldwide distribution and it has been reported in all rice growing countries in Asia, America and Africa (CMI Distribution Map, 1992). The disease may weaken the seedling and older plants. Bedi and Gill[4] determined the loss of grain weight as 4.58-29.1%. The most dramatic aspect of the disease so far recorded was that it was considered to be major factor contributing to the Bengal famine of 1942, the losses then was amounting to 50-90%[5]. Rice blast is one of the most widely distributed diseases. Blast caused by *Pyricularia oryzae* is often limiting factor in rice production[6]. In Bangladesh, the disease affects the Boro (November-June) and the T. Aman (June-December) when the environmental is favourable for its development[7]. Epidemic of both leaf and neck blast at seedling-tillering stage and milk-mature stage, respectively have been recurring every three or four years in Bangladesh[8]. The disease resistant hybrid variety of rice is needed in Bangladesh. So, the present study was undertaken to examine and screen out the advanced hybrid lines for using as breeding materials and for rice cultivation which are resistant/tolerant to the diseases.

MATERIALS AND METHODS

The experiment was carried out at the field laboratory of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh during two seasons on 1999-2000. Twenty nine different genotypes/advanced breeding lines and four cultivars/checks viz., BR 11, BR 22, BR 25 and BRRI dhan 38 of rice were selected for the study. Seeds were collected from Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh. The genotypes/cultivars were used as treatments. The experiment was conducted in Randomized Completely Block Design (RCBD) with three replications. The total quantity of TSP (N_2), MP (P_2O_5), Gypsum and Zinc

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Sulphate were applied during land preparation at the rate of 100, 70, 60, 10 kg ha^{-1}, respectively. Urea (N_2) 180 kg ha^{-1} was applied in three installments[9]. Thirty-day-old seedlings were transplanted. The severity or leaf area diseased of Brown spot and Blast were recorded following IRRI recommended grading scale[10]. Data were statistically analyzed and comparisons among the individual treatments were tested by Duncan's New Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Reactions of different genotypes/cultivars to brown spot disease of rice in two seasons are presented in Table 1. In T. aman season LAD (%) ranged between 0.80-8.13% and disease severity was between 1-4. The highest (8.13%) LAD (%) that was found in the accession number 22 and 62 was followed by accession numbers 25. The lowest LAD (%) was found in the accession number 139 (0.80%). Out of 33 cultivars, one accession showed resistant (R) reaction, 29 accessions were found to be moderately resistant (MR) and three were moderately susceptible (MS) to brown spot. Such type of disease reaction was found by many workers like Upadhyay *et al.*[11] and Prasad *et al.*[12]. Upadhyay *et al.*[11] reported that 18 genotypes showed moderate levels of resistance to Brown spot and blast diseases. The results of present study enjoys the support of the works done by Saifulla *et al.*[13] and Shi *et al.*[14] also found variations amongst test lines. In this season, 10 accessions showed better performance over all checks use in this season. In boro season, the highest LAD (%) was found in the accession number 107 (8.42% and disease intensity was 4). The lowest LAD (%) was observed in the cultivar BRRI dhan 29 followed by accession numbers 39, 52, 54, 75 and 128. Twenty-nine cultivars showed moderately resistant (MR) and four cultivars were found to be moderately susceptible (MS) to brown spot. Same type of result was observed by Raj *et al.*[15]. Eighteen accessions showed better performance over checks BR 14 and BINA 6 used in this season.

Reactions of different genotypes/cultivars to blast disease of rice in two seasons are presented in Table 2. In T. aman season, LAD ranged between 1.11-8.30% at 3-5

Table 1: Variation in % leaf area diseased (LAD) and disease reactions caused by brown spot pathogen in different genotypes of F_5 generation and checks of two seasons

T. aman season			Boro season		
Accession no.	LAD (%)	Disease reaction	Accession no.	LAD (%)	Disease reaction
22	8.13a	MS	22	4.27d-e	MR
25	8.07a	MS	25	6.80c	MS
37	5.20bc	MR	37	2.17g-j	MR
39	2.17ghi	MR	39	1.17ij	MR
48	3.47c-h	MR	48	2.95e-h	MR
52	3.97b-g	MR	52	1.20ij	MR
54	3.20d-h	MR	54	1.33ij	MR
57	4.73bcd	MR	57	1.67g-j	MR
58	3.93b-g	MR	58	1.77g-j	MR
59	2.17ghi	MR	59	3.02efg	MR
61	4.17b-f	MR	61	2.97e-h	MR
62	8.13a	MS	62	5.10d	MR
63	2.33f-l	MR	63	2.20g-j	MR
64	4.33b-e	MR	64	1.50hij	MR
66	3.53b-h	MR	66	1.53g-j	MR
67	4.63bcd	MR	67	6.47c	MS
68	5.07bcd	MR	68	2.33g-j	MR
74	2.53e-l	MR	74	1.53g-j	MR
75	3.13d-h	MR	75	1.27ij	MR
90	2.14ghi	MR	90	2.87e-h	MR
98	5.40b	MR	98	2.53f-I	MR
102	3.23d-h	MR	102	2.19g-j	MR
107	3.20d-h	MR	107	8.42a	MS
128	2.00hi	MR	128	1.20ij	MR
139	0.80i	R	139	4.10de	MR
157	4.23b-f	MR	157	1.60g-j	MR
182	4.33b-e	MR	182	3.93def	MR
191	3.67b-h	MR	191	2.33d-j	MR
212	3.67b-h	MR	212	2.60f-j	MR
BR 11	3.43c-h	MR	BR 14	2.67f-I	MR
BR 22	3.20d-h	MR	BRRI dhan 28	6.53b	MS
BRRI dhan 38	3.50b-h	MR	BRRI dhan 29	1.00j	MR
BR 25	3.67b-h	MR	BINA 6	2.53f-j	MR
LSD (p=0.01)	1.60	-	LSD (p=0.05)	1.23	-

Table 2: Variation in % sheath area diseased (SAD) and disease reactions caused by blast pathogen in different genotypes of F_5 generation and checks of two seasons

T. aman season			Boro season		
Accession no.	SAD (%)	Disease reaction	Accession no.	SAD (%)	Disease reaction
22	3.67ab	MS	22	2.64e-f	MS
25	3.17a-e	MS	25	0.37lm	R
37	2.33b-f	MS	37	0.00m	HR
39	1.83c-f	MR	39	1.44h-l	MR
48	3.77ab	MS	48	3.74de	MS
52	2.17b-f	MS	52	7.00a	MS
54	2.33b-f	MS	54	0.07klm	R
57	3.13a-e	MS	57	1.83g-k	MR
58	1.17f	MR	58	1.17i-m	MR
59	2.10b-f	MS	59	2.50e-I	MS
61	1.50ef	MR	61	3.27ef	MS
62	3.17a-e	MS	62	0.37lm	R
63	1.87c-f	MR	63	0.00m	HR
64	1.33f	MR	64	0.93j-m	MR
66	3.13a-e	MS	66	1.23i-m	MR
67	1.11f	MR	67	4.97bcd	MS
68	8.30a	MS	68	2.23 f-j	MS
74	2.57b-f	MS	74	1.10i-m	MR
75	3.17a-e	MS	75	1.15i-m	MR
90	1.33f	MR	90	1.20i-m	MR
98	2.33b-f	MS	98	3.13efg	MS
102	1.33f	MR	102	1.97f-k	MR
107	1.50ef	MR	107	0.67klm	MR
128	3.42a-d	MS	128	0.33lm	R
139	2.40b-f	MS	139	0.00m	HR
157	3.53abc	MS	157	0.33lm	R
182	1.20f	MR	182	6.00b	MS
191	2.33b-f	MS	191	1.92f-k	MR
212	1.33f	MR	212	5.07be	MS
BR 11	1.89c-f	MR	BR 14	0.83j-m	MR
BR 22	3.80ab	MS	BRRI dhan 28	4.53cd	MS
BRRI dhan 38	1.80def	MR	BRRI dhan 29	6.00b	MR
BR 25	2.40b-f	MS	BINA 6	2.00f-k	MS
LSD (p=0.01)	0.38	-	LSD (p=0.05)	1.18	-

Means followed by the same letter(s) in a column are not significantly different at the 1% level for T. Aman and 5% level for Boro season by DMRT
MR=Moderately Resistan, R=Resistant, MS=Moderately Susceptible

grade. The highest LAD (%) was observed in the accession number 68 (8.30%) and the lowest was in accession number 67 (1.11%). Thirteen accessions were found as moderately resistant (MR) and 20 accessions were found to be moderately susceptible (MS) to blast disease. Upadhyay *et al.*[11] reported that 18 genotypes showed moderate levels of resistance to Brown spot and blast diseases. Saifullah and Manjunath[16] reported that numerous rice genotypes were screened for blast diseases. Ten genotypes were found to be highly resistant, seven were moderately resistant. Nine accessions (acc. no. 58, 61, 64, 67, 90, 102, 107, 182 and 212) showed better performance over all checks in this season. In boro season, LAD ranged between 0-7% at 0-5 disease intensity grade. The highest LAD (%) was found in the accession number 52 (7%) and the lowest LAD (%) was observed in the accession number 37 which was followed by 63 and 139 and it's were no disease incidence (0). Three breeding lines/genotypes were found to be highly resistant (HR), five were resistant (R), 12 were moderately resistant (MR) and 13 were found to be moderately susceptible (MS) to blast disease. Karaki[17] studied 848 rice entries to evaluate for resistance to *Pyricularia oryzae* and of these, 13 were resistant to the pathogen. Saifullah *et al.*[13] carried out field screening of 23 rice genotypes which revealed that 19 genotypes were highly resistant and three were resistant to leaf and neck blast caused by *Pyricularia oryzae*. This season, 10 accessions (acc. no. 25, 36, 54, 58, 62, 63, 107, 128, 139 and 157) showed better performance over all checks.

It is concluded that one accession showed resistant (R) reaction in T. aman season and twenty-nine cultivars showed moderately resistant (MR) reaction in boro season to brown spot. Thirteen accessions were found as moderately resistant (MR) in T. aman season and three breeding lines/genotypes were found to be highly

resistant (HR) and five were resistant (R) in boro season blast. So, these lines/cultivars may be used as breeding materials and cultivated for rice production.

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