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Performance of Breeding Lines/Cultivars of Rice Against Bacterial Leaf Blight and Sheath Rot under Field Condition

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Abstract: Twenty nine different genotypes/advanced breeding lines and four cultivars/checks viz. BR11, BR22, BR25 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 BLB and sheath rot. Three accessions (22, 68, 157) showed resistant reaction in T. aman season and six accession (22, 54, 58, 68, 139, 157) showed highly resistant (HR) reaction and four entries (37, 62, 75, 128) were resistant to BLB in Boro season. One accession (58) showed resistant in T. aman season and three (59, BR11, BRRI dhan 38) were found highly resistant and one accession (54) showed resistant reaction to sheath rot in Boro season. So, these lines/varieties may be used as breeding material and cultivated for rice production.

Key words: Performance, breeding lines, cultivars, bacterial leaf blight, sheath rot, rice, field

Introduction

Rice is the most important cereal crop and also staple food of different nations of the world including Bangladesh, Bangladesh ranks third among the rice producing countries of the world though yield is relatively low (Candler, 1980). Bangladesh 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 (Anonymous, 1989) and boro comes next. Among many causes of low yield of the rice in Bangladesh disease and pest play a major role, sometimes leading to disastrous consequences (Fakir, 1982). 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 bacterial leaf blight (BLB) and sheath rot cause substantial loss to rice both in quality and quantity in the present ecosystem in Bangladesh.

Bacterial leaf blights of rice caused by *Xanthomonas campestris* pv. *oryzae* occurs in tropical Asia as a vascular wilt in the early stage of crop growth as a leaf blight in the later stage i.e. at about flowering (Ou, 1972). The disease also attacks leaves, leaf sheaths and grains of rice plants. Horino (1986) reported that the occurrence of BLB seemed to enhance the symptom

development of sheath blight and stem rot. In this way, the disease plays a vital role in reducing the rice yield. It is a systemic disease and may cause on an average 20-30% yield loss (Ou, 1985) depending on the severity of infection. Srivasta and Kapoor (1982) obtained 6-37% yield loss against 1-9 infection grade. On the otherhand, sheath rot was first described by Sawada (1922) from Taiwan and the causal fungus was named ***Acrocylindrium oryzae*** Sawada. Chen (1957) reported 3-20% damage and it may sometimes be as much as 85% in Taiwan. The disease resistant hybrid variety of rice is needed in Bangladesh. So, this 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 conducted at the field laboratory of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh during two seasons (T. aman and Boro) on 1999-2000. Twenty nine different genotypes/advanced breeding lines and four cultivars/checks viz. BR11, BR22, BR25 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 carried out in randomized completely block design (RCBD). The total quantity of TSP (N_2), MP (P_2O_5), gypsum and zinc sulphate were applied during land preparation @ 100, 70, 60, 10 $kgha^{-1}$, respectively. Urea (N_2) 180 $kgha^{-1}$was applied in three installments. (Anonymous, 1999). Thirty-days-old seedlings were transplanted. The severity or leaf area diseased of BLB and sheath rot was recorded following IRRI recommended grading scale (Standard Evaluation System for Rice, 1980). Data were statistically analyzed and comparisons among the individual treatments were tested by Duncan's new multiple range test (DMRT) according to Zaman ***et al.*** (1982).

Results and Discussion

In T. aman season, percent LAD ranged between 0.33-38% (Table 1) was in t. Aman season. The highest LAD percent was observed in the accession no. 212 and it was 38% (grade 7). The lowest LAD was found in accession no. 68 and it was 0.33% which was followed by accession no. 22 and 157. In same variety similar result was found by Amin (1995) and that was 14.99%. He also found 9-60% LAD by BLB in different varieties. Three accessions showed resistant (R) reaction. The result has similarly with the results of Kaushal ***et al.*** (1998). Fourteen accessions showed moderately resistant (MR) and 15 moderately susceptible (MS) reaction which was similar result of Cheema ***et al.*** (1998) and one accession showed susceptible (S) reaction to BLB. In this season, 13 entries showed better performance over all checks. On the other hand, in boro season, percent LAD ranged between 0.00-29.15% disease intensity was between 0-7. The highest percent LAD was observed in accession no. 212 and it was 29.15%. The accession nos. 22, 54, 58, 68, 139 and 157 showed highly resistant reaction (HR) and no BLB disease incidence (grade 0) was found (Table 1). Four entries were resistant (R) which was a similar result of Kaushal ***et al.*** (1998) and Cheema ***et al.*** (1998), 14 were found to be moderately resistant (MR), eight showed moderately susceptible (MS) and one showed susceptible (S) reaction. Sahu and Parida (1997)

Table 1: Variation in% leaf area diseased (LAD) and disease reactions caused by BLB 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	0.67hi	R	22	0.00k	HR
25	10.33d	MS	25	3.34g	MR
37	4.33f	MR	37	0.57j	R
39	17.00bc	MS	39	10.67b	MS
48	9.33d	MS	48	6.13de	MS
52	8.33d	MS	52	4.20f	MR
54	2.67fg	MR	54	0.00k	HR
57	4.30f	MR	57	2.17hi	MR
58	2.00fg	MR	58	0.00k	HR
59	3.00fg	MR	59	2.64h	MR
61	3.30fg	MR	61	1.48i	MR
62	2.60fg	MR	62	0.88j	R
63	3.60fg	MR	63	1.00ij	MR
64	7.00de	MS	64	5.00e	MR
66	4.80f	MR	66	1.13ij	MR
67	8.17d	MS	67	7.60d	MS
68	0.33i	R	68	0.00k	HR
74	12.00d	MS	74	6.07d	MS
75	2.40fg	MR	75	0.67j	R
90	12.00cd	MS	90	9.25c	MS
98	6.40e	MS	98	1.17ij	MR
102	2.60fg	MR	102	1.92i	MR
107	16.67bc	MS	107	10.40b	MS
128	2.90fg	MR	128	0.82j	R
139	2.60fg	MR	139	0.00k	HR
157	0.67hi	R	157	0.00k	HR
182	19.00b	MS	182	9.00c	MS
191	13.00cd	MS	191	3.73fg	MR
212	38.00a	S	212	29.15a	S
BR11	15.67c	MS	BR14	3.40g	MR
BR22	3.67fg	MR	BRRIdhan28	4.33f	MR
BRRIdhan38	7.00de	MS	BRRIdhan29	6.17de	MS
BR25	6.67de	MS	BINA6	1.50i	MR
LSD (P=0.01)	6.127	--	LSD (P=0.05)	1.318	--

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

found six lines were moderately resistant. They also conducted such type of work under natural infestation and these results significantly support his findings. Nineteen accessions showed better performance over checks BR14, BRRI dhan 29 and BRRI dhan 28, and 14 accessions over BINA dhan 6.

In t. Aman season, percent sheath area diseased (SAD) was ranged from 0.67-24% (Table 2). The highest percent SAD was found in the accession number 68 while the lowest SAD

Table 2: Variation in% sheath area diseased (SAD) and disease reactions caused by sheath rot 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	9.67b-g	MS	22	10.73de	MS
25	7.60b-g	MS	25	2.40kl	MR
37	11.33b-g	MS	37	5.59hij	MS
39	11.01b-g	MS	39	4.03ik	MR
48	14.49a-d	MS	48	13.38c	MS
52	13.20b-e	MS	52	11.50d	MS
54	2.23fg	MR	54	0.37mn	R
57	9.83b-g	MS	57	6.09hi	MS
58	0.67g	R	58	1.37lmn	MR
59	2.00fg	MR	59	0.00n	HR
61	3.57efg	MR	61	10.12def	MS
62	8.99b-g	MS	62	10.74de	MS
63	12.68b-f	MS	63	23.50a	MS
64	4.03d-g	MR	64	13.30c	MS
66	6.30c-g	MS	66	6.36hi	MS
67	12.50b-f	MS	67	17.67b	MS
68	24.00a	MS	68	18.33b	MS
74	9.93b-g	MS	74	2.19klm	MR
75	17.32ab	MS	75	10.36de	MS
90	14.40a-e	MS	90	4.66ij	MR
98	13.47b-e	MS	98	5.30hij	MR
102	15.43abc	MS	102	14.54c	MS
107	13.27b-e	MS	107	10.67de	MS
128	6.00c-g	MS	128	2.60kl	MR
139	9.40b-g	MS	139	7.27gh	MS
157	5.33c-g	MR	157	1.17lmn	MR
182	12.20b-f	MS	182	11.67d	MS
191	13.07b-e	MS	191	8.33fg	MS
212	8.60b-g	MS	212	7.01gh	MS
BR11	4.50d-g	MR	BR14	0.00n	HR
BR22	7.67b-g	MS	BRRIdhan28	8.82efg	MS
BRRIdhan38	7.77b-g	MS	BRRIdhan29	0.00n	HR
BR25	6.28c-g	MS	BINA6	1.51lmn	MR
LSD (p=0.01)	8.931	--	LSD (p=0.05)	1.773	--

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

was found in accession no. 58. One accession showed resistant (R), six were moderately resistant (MR) and 26 accessions were found to be moderately susceptible (MS) reaction. Seven accessions showed better performance over checks BR22, BRRI dhan 38 and BR25. In case of boro season, percent SAD ranged from 0.00-23.50% of 0-5 disease severity scale. The 0.00% SAD was observed in the accession number 59 followed by BR14 and BRRI dhan 29. The highest SAD was observed in the accession number 63 (23.50%). Out of 33 accessions, three were found highly resistant

(HR), one accession showed resistant (R), nine were found to be moderately resistant (MR) and 20 accessions were found moderately susceptible (MS) to sheath rot disease. Sahu and Parida (1997) reported that 60 rice-breeding lines were screened for resistance to sheath rot and BLB at Central Research Station of Orissa University of Agriculture and Technology, India, during wet seasons of 1994 and 1995. The outbreak and scoring of diseases were recorded under natural infestation. The extent of panicle infection by sheath rot varied between 0.00-21.87% and the disease intensity between 1-5. Three lines were highly resistant, 18 were moderately resistant and 33 were moderately susceptible to sheath rot. Six lines were moderately resistant to both sheath rot and BLB. Sixteen accessions showed better performance over check BRRI dhan 28 whereas only four accessions showed better performance over BINA 6.

It is concluded that three accessions (22, 68, 157) showed resistant (R) reaction in t. Aman season, and six accession (22, 54, 58, 68, 139, 157) showed highly resistant (HR) reaction and four entries (37, 62, 75, 128) were resistant (R) to BLB in Boro season. One accession (58) showed resistant (R) in t. Aman season and three (59, BR11, BRRI dhan 38) were found highly resistant (HR) and one accession (54) showed resistant (R) reaction to sheath rot in Boro season. So, these lines/varieties may be used as breeding material and cultivated for rice production.

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