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Performance of Different Genotypes/Cultivars to Blast Disease of Rice in Boro and T. Aman Crop in Bangladesh

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Abstract: Twenty-eight bred restored lines and four standard checks were screening for resistance to blast disease of rice during the T. aman and boro season. The breakout and severity of per cent leaf area diseased were recorded under natural infection. On the basis of disease intensity, three were highly resistant, 12 resistant, 16 were moderately resistant and 1 was moderately susceptible at T. aman season and at boro season 3 line s were found to be highly resistant, 8 resistant, 17 moderately resistant and 4 were moderately susceptible. Wide range of variation was observed regarding resistance among the entries. Variations were also found on the basis of season. Considering both seasons, the accession numbers 56, 57, 64, 66, 71 and 73 showed comparatively better performance against above mentioned rice disease.

Key words: Performance, genotypes/cultivars, blast, disease, rice

Introduction

Rice is the most important cereal crop and also staple food of the Bangladeshi population. The climate and geographical conditions of Bangladesh are favorable for year-round rice production during Aus, Aman and Boro seasons. But the average yield of rice is very low in Bangladesh (2.47 t ha^{-1}) compared to 6-8 t ha^{-1} in Australia, Korea, Japan and Spain (Anonymous, 1995). There are many causes of low yield of rice in Bangladesh. Diseases and pest are considered as major constrains for rice production (Fakir, 1982). Tropical and subtropical climate that favors rice production. These are also favourable for its disease development. Among the major diseases, blast cause substantial loss in quality and quantity of rice. In Bangladesh blast affects boro and T. aman rice when the environment is favorable for its development (Shahjahan *et al*., 1986b). Epidemics of leaf and neck blast have been reoccurring a 3-4 years cycle in Bangladesh (Shahjahan *et al*., 1991) Considering the above facts, disease resistant varieties/lines are needed in Bangladesh. So, the experiment was undertaken to know the severity of the disease and to find out the resistance varieties/lines of rice.

Materials and Methods

The experiments were conducted at the field laboratory of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh, during T. aman and Boro season. Twenty-eight different genotypes/advanced breeding lines and four HYVs (BR29, BR28, BR14 and BINA-6) were selected for this study. Seeds were collected from Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh. The accession no. variety no. along with their sources are given below:

Accession no.	Designation	Sources
48R	Ayaja R	IRRI
49R	IR13155-60-3-1-3R	"
50R	IR29723-143-3-2-1R	"
51R	IR43342-10-1-1-3-3R	"
52R	IR56381-139-2-2R	"
53R	IR58082-126-1-2R	"
54R	IR58110-144-2-2-2R	"
55R	IR59624-34-2-2R	"
56R	IR59669-93-1-3R	"
57R	IR59682-132-1-1-2R	"
58R	IR60913-43-3-3-2-2R	"
59R	IR60997-16-2-3-2-2R	"
60R	IR62037-12-1-2-2-2R	"
61R	IR62037-129-2-3-3-3R	"
62R	IR62171-122-3-2-3-3R	"
63R	IR63870-123-2-2-2-2R	"
64R	IR63870-3-2-3-3R	"
65R	IR63877-43-2-1-3-1R	"
66R	IR63883-41-3-2-2-2R	"
67R	IR64683-87-2-2-3-3R	"
68R	IR65489H-AC2-2R	"
69R	IR68926-61-1R	"
70R	IR68926-61-2R	"
71R	BR-736-20-3-1R	BRRI
72R	IR54404R	"
73R	IR21567R	"
74R	IR44675R	"
75R	BR-168-2B-283R	"
BRRI dhan 29	Check	"
BRRI dhan 28	Check	"
BINA-6	Check	BINA
BR14	Check	BRRI

Seeds of genotype was presoaked separately in tap water for 24 h and then excess water was drained out and the seeds were incubated for 48 h for sprouting. Seedbed was prepared in a medium low land of field laboratory of the Genetics and Plant Breeding Department. The soil was puddled with the country plough. The previously sprouted seeds were sown on individual stripes in the seedbed on 1st July, 1999. Irrigation was applied to the growing seedbed as and when required until the day before transplanting. Soil of the main land was opened by tractor. The land was ploughed and cross-ploughed several times until the soil was brought to a good tilth. All the weeds and stubble were removed from the field. Soil was kept exposed to natural weathering for 15 days before the land was finally prepared for transplanting. Fertilizer urea, TSP (triple super phosphate), MP (muriate of potash), gypsum and zinc sulphate were applied as per recommendation of BRRI (Modern rice cultivation, 1999). The following doses of fertilizers were applied to the plots. Urea (N_2) 180 kg ha^{-1}, TSP (P_2O_5) 100 kg ha^{-1}, MP (K_2O) 70 kg ha^{-1}, gypsum (S) 60 kg ha^{-1} and zinc sulphate (Zn) 10 kg ha^{-1}. The experiment was concluded in a randomized completely block design (RCBD). Thirty-day-seedlings were transplanted. Gap filling was done within 10 days of transplanting. Weeding was done before application of urea fertilizer. The field was irrigated to maintain 5-6 cm depth of water in each plot throughout growing season. No fungicide and bactericide were applied to the growing crops to encourage development of the disease under natural condition. Leaf area diseased (LAD) were recorded at panicle initiation stage, milk stage. Ten infected plants in each plot were selected randomly for recording the percent leaf area diseased and the selected plants were tagged. Leaf area diseased of the disease in T. aman and boro season was recorded following IRRI recommended grading scale (Standard Evaluation System for Rice, 1980). The severity of the symptoms of different diseases developed on genotypes/plants under natural condition. The data collected on the severity or leaf area diseased of the disease was subjected to the appropriate statistical analysis to determine the level of significance. The differences of the percent leaf area diseased among the rice genotypes/accessions were tested using LSD and DMRT test. The mean values of each genotype/accession were used for interpretation and discussion.

Results and Discussion

The % leaf area diseased (LAD) due to fungi were measured using the standard evaluation system for Rice. The percent LAD of the disease in boro and T. aman season are presented in Table 1. In boro season % LAD ranged between 0-6.03 at 0-5 disease intensity in different genotype were observed. Three breeding lines/genotypes were found to be highly resistant (HR), 8 were resistant (R), 17 moderately resistant (MR) and 4 accessions were found to be moderately susceptible (MS) to blast disease of rice in boro season which have been presented in Table 2. In boro season, the lowest % LAD (mean) was observed in the accession number 50 followed by 60 and 72 and it were no disease incidence (o). The highest % LAD found in this season in the accession number 74 (6.03%). Again in T. aman season, the height % LAD (mean) was found in the accession number 64 (4.07%)followed by the BARI dhan29 (3.53) and the lowest was observed in the accession number 63 (0.93%) closely followed by the accession number 74 (0.97%), BR-14 and accession number 67 (1.07%). Among the breeding lines 4 were highly resistant (HR) 12 were resistant (R), 16 were moderately resistant (MR) and only one was moderately susceptible (MS).

Table 1: Variation in % leaf area diseased (LAD) caused by blast pathogen in different genotypes of F_5 generation and checks of 2 seasons

	% LAD by BLB at	
Accession No.	Boro season	T. Aman season
48R	2.71d-h	3.50a-c
49R	0.44ij	2.87a-f
50R	0.00j	1.97e-I
51R	1.50f-j	1.57g-I
52R	3.83c-e	3.50a-c
53R	6.67a	2.07d-I
54R	0.70h-j	2.13d-I
55R	1.93e-j	2.87a-f
56R	1.26f-j	2.40b-g
57R	2.56d-I	1.87f-I
58R	3.26c-f	1.30g-I
59R	0.40ij	2.97a-f
60R	0.00j	1.57g-I
61R	0.97g-j	1.10hi
62R	1.23f-j	2.87a-f
63R	5.00a-c	0.93i
64R	2.30e-I	4.07a
65R	1.10f-j	2.30c-h
66R	1.15f-j	2.87a-f
67R	1.20f-j	1.07i
68R	3.13c-g	2.13d-I
69R	1.97e-j	1.17hi
70R	0.67h-j	1.20ghi
71R	0.33ij	3.10a-e
72R	0.0j	2.07d-I
73R	0.33ij	3.27a-d
74R	6.03ab	0.97i
75R	5.10a-c	2.10d-I
BR14	0.87h-j	1.07i
BRRIdhan 28	4.53b-d	1.63g-I
BRRI dhan 29	6.03ab	3.53ab
BINA-6	2.00e-j	1.57ghi
LSD (p=0.05)	1.864	1.212

Means followed by the same letter in a column are not significantly different at the 1% level for T. aman and 5% level for Boro season by DMRT

Table 2: Performance of different cultivars of rice against blast diseases of rice at T. Aman and Boro season

	BLB	
Ace. No.	T. Aman Season	Boro Season
48R	MR	MR
49R	MR	R
50R	R	HR
51R	R	MR
52R	MR	MR
53R	MR	MS
54R	MR	R
55R	MR	MR
56R	MR	MR
57R	R	MR
58R	R	MR
59R	MR	R
60R	R	HR
61R	R	R
62R	MR	MR
63R	HR	MR
64R	MS	MR
65R	MR	MR
66R	HR	MR
67R	R	MR
68R	MR	MR
69R	R	MR
70R	R	R
71R	MR	R
72R	MR	HR
73R	MR	R
74R	HR	MS
75R	MR	MS
BR14	R	R
BRRI dhan 28	R	MR
BRRI dhan 29	MR	MS
BINA-6	R	MR

HR = Highly resistant R = Resistant
MS = Moderately resistant MS = Moderately susceptible
S = Susceptible HS = Highly susceptible

In T. aman season, out at 32 cultivers, 3 genotypes were highly resistant 12 were resistant, 16 were moderately resistant and 1 was moderately susceptible to blast pathogens. On the other hand the same accession were put on trial at boro season, 3 accession were found highly resistant, 8 resistant, 17 moderately resistant and 4 were moderately susceptible to leaf blast disease. This result enjoys the support of the works done by Koh *et al.,* 1986; Castano, 1982; Deus, 1977; Saifulla *et al.,* 1995; Russo and Tricerri, 1976 also found variations among test lines. A few showed the lowest degree of infection (O), several had a reasonably good degree of resistance but most were highly susceptible as the another worked with huge number of accessions.

Further works will provide the opportunities to find out the resistant/ immune cultivars form the test lines. For screening the varieties and breeding lines against blast, the test materials should be inoculated with the respective pathogen after this natural screening under field condition at optimum stage of plant growth in order to select the best materials against respective diseases.

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