

Performance of susceptibility of twenty rice varieties to different insect pests

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Abstract: Susceptibility of twenty rice genotypes to different insect pests was determined in Aman season during August to November, 2003 at the Bangladesh Agricultural University (BAU), Mymensingh. Seven different species of rice pests viz. Leaf folder, Green leafhopper, White backed plant hopper, Grasshopper, Rice bug, Rice hairy caterpillar and Brown plant hopper were present during the study period. Among the twenty rice varieties BR3 was most susceptible and Pajam was moderately susceptible to all the observed insects. Considering damage percentage, BR3 and Sonarbangla were most susceptible varieties; while Pajam, BR22, BRRRI dhan 29 and BRRRI dhan 31 were less susceptible and the varieties Binashail, BR4 and BR11 were found as moderately susceptible.

Introduction

Food shortage in developing countries is aggravated by rapid population growth. Among the major cereal crops, rice is the primary staple and central crop to Bangladesh's economy and agriculture, accounting for nearly 18% of the Gross Domestic Product (GDP) and providing 70% of an average citizen's total caloric intake (BBS, 2001). The average rice yield in Bangladesh is only 2.28 t/ha (BBS, 2001). In Bangladesh, 175 species of insect pests have been identified on rice (BRRRI, 1985). Among the pest species, several were considered as minor pests which have recently become major pests (Pathak and Pawar, 1982). The estimated annual loss of rice in Bangladesh due to insect pest and diseases amount to 1.2 to 2.0 million tons (Siddique, 1992). To cope with the increasing demand for rice, IPM is a key element in the development and implementation of effective rice insect management strategies. IPM program has a significant impact on minimizing the adverse effect of insecticides and increasing the profitability of rice production. Because of its unique advantage host plant resistance is sought after as a key tactic in the integrated control of rice insect pests in developing countries. Resistant varieties are being successfully utilized in reducing the damage caused by various insect pests and diseases of rice (Khush, 1977). As no detailed information is available in Bangladesh on the role of resistant varieties as a potential control method, the present research was undertaken to judge the performance of twenty rice varieties against pest infestation at different growth stages of rice.

Materials and Methods

Experiment was carried out in T-aman season during August to November, 2003 to determine susceptibility of different rice varieties to various insect pests. The field experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications taking twenty rice varieties viz. BR3, BR4, BR11, BR22, BRRRI dhan 29, BRRRI dhan 30, BRRRI dhan 31, BRRRI dhan 32, BRRRI dhan 34, BRRRI dhan 37, BRRRI dhan 38, BRRRI dhan 39, BRRRI dhan 40, BRRRI dhan 41, BINA dhan-4, BINA dhan-6, Binashil,

Anamika, Sonarbangla and Pajam. The test varieties were grown following the standard method of cultivation. No pesticide was used in the experimental fields and no other plant protection measure was applied. Insect samples were collected in two ways viz. by sweeping nets and by observing tillers. In case of sweeping five complete sweeps were made per plot diagonally. After each sweeping samples were collected, identified and counted. In case of tiller observation, five hills per plot (Plot size 3m X 1.6m) were selected randomly. After hill selection, no. of total tiller and damaged tiller were counted to find out the damage percentage as follows: Damage percentage = (Total number of infected tiller / Total no of tiller) X 100. Data were recorded in three crop growth stages viz. early vegetative stage, late vegetative stage and reproductive stage. The data were analyzed using the statistical package MSTAT program. Analysis of Variance (ANOVA) of the results on various insect pests was calculated. The significant means were compared by Duncan's New Multiple Range Test (Duncan, 1955).

Results and Discussion

Damage by insect pests in different rice varieties:

The percentage of damage in different rice varieties at different plant growth stage is presented in Table 1. The result revealed that damage percentage varied significantly with different crop growth stages. An increase in the level of damage percentage existed with the increase of the age of the rice plants. Pattern of damage percentage varied with different varieties. Among the twenty rice varieties BR3 showed a gradual increase in the level of damage. In all the crop growth stages, the variety offered highest level of damage percentage. But in case of Sonarbangla, the damage level was the highest in early vegetative stage and reproductive stage. Varieties Pajam, BR22, BRRRI dhan 29 and BRRRI dhan 31 constantly offered lower level of damage percentage in all crop growth stages. So, considering damaged percentage Pajam, BR22, BRRRI dhan 29 and BRRRI dhan 31 were less susceptible than other varieties followed by Binashail, BR4 and BR11 were moderate one.

Table 1 Percentage of damage caused by insect pests in different varieties of rice at different crop growth stages:

Rice Variety	Percentage of damage of different growth stage		
	Early vegetative stage	Late vegetative stage	Reproductive stage
BR3	4.86 a	28.02 ab	30.95 a
BR4	2.633 d-h	14.227 g	15.649 ab
BR11	2.567 e-i	12.757 g-j	15.497 j
BR22	2.667 d-h	11.187 h-j	14.377 j
BRR1 dhan 29	2.493 f-i	10.280 j	14.010 jk
BRR1 dhan 30	2.000 ij	10.607 ij	12.43 k
BRR1 dhan 31	3.300 c	13.930 gh	18.157 i
BRR1 dhan 32	3.200 cd	12.143 g-j	15.509 j
BRR1 dhan 34	2.733 c-g	16.900 f	19.330 hi
BRR1 dhan 37	3.067 c-f	24.760 c	26.687de
BRR1 dhan 38	3.167 c-e	23.233 cd	27.280 cd
BRR1 dhan 39	3.867 b	27.677 ab	29.490 bc
BRR1 dhan 40	2.733 c-g	19.400 ef	20.983gh
BRR1 dhan 41	2.100 h-j	19.970 e	22.083 fg
BINA dhan-4	3.000 c-f	21.100 de	24.360 ef
BINA dhan-6	3.033 c-f	23.270 cd	26.690 de
Binashail	1.600 j	13.433 g-i	15.647 j
Anamika	3.100 c-f	25.327 bc	28.773 b-d
Sonarbangla	5.000 a	22.017 a	32.593 a
Pajam	2.200 g-i	12.227 g-j	14.010 jk
Level of significance	**	**	**
CV (%)	10.55	8.66	6.66

Performance of rice varieties in early vegetative stage of rice:

Table-2 has presented the number of insect pests in early vegetative stage of rice. In this stage the number of Leaf folder, GLH, WBPH, Grasshopper varied significantly among different rice varieties. But rice Bug, RHC and BPH were found in very small number and for this reason the data on these insects have not been analyzed. The result revealed that among the twenty rice varieties BR3 showed susceptible reaction for almost all observed insect pests while the Pajam showed apparent resistant reaction than others. In case of leaf folder BR3, BRR1 dhan 39, Sonarbangla were susceptible and Pajam, Binashail, Anamika, BRR1 dhan 29 were less susceptible. In early vegetative stage for GLH, among twenty rice varieties BR3 and BR11 were highly susceptible, BR22, BR4, Binashail were moderately susceptible, BRR1 dhan 37, BRR1 dhan 34, BRR1 dhan 40 showed less susceptible reaction. Pajam, Binadhan-6, BRR1 dhan 29, BRR1 dhan 30, BRR1 dhan 38 showed less susceptible reaction while reminders showed moderate reaction. In case of WBPH all varieties showed susceptible reaction except the varieties Pajam, BR22, Binashail and BR11. Among the twenty varieties BRR1 dhan 38 showed least grasshopper infection followed by Pajam, BRR1 dhan 41, BINA dhan-6, BRR1 dhan 39 and BR4. On the other hand, Binashail, BRR1 dhan 30, BRR1 dhan

31 and BRR1 dhan 34 were highly susceptible for grasshopper.

Performance of rice varieties in late vegetative stage of rice:

Table-3 has presented the number of insect pests in late vegetative stage of rice. Among the twenty rice varieties BR3 were susceptible to leaf folder, GLH, WBPH and grasshopper infestation. Pajam showed less susceptible reaction to grasshopper and a moderately susceptible reaction to leaf folder and GLH. Considering individual insect pest the result showed that BR3, BR dhan 39, Sonarbangla were susceptible to leaf folder and Binashail. BRR1 dhan 29 was less susceptible. For GLH among these varieties, Anamika, BR3, Sonarbangla and BINA dhan -4 were highly susceptible while BRR1 dhan 34, BRR1 dhan 37, BRR1 dhan 40, BRR1 dhan 29, BRR1 dhan 30 and Pajam were less susceptible than others. For WBPH among these twenty rice varieties showed a susceptible reaction except BR11, BR22 and Binashail. For Grasshopper most of the varieties were less susceptible.

Performance of rice varieties in reproductive stage of rice:

The result revealed that in the reproductive stage BR3 was most susceptible to leaf folder following an order BR3>BRR1 dhan 39> Sonarbangla. For GLH, the susceptibility order as BR3> BRR1 dhan 34, BR11; BRR1 dhan 41> BR4> BRR1 dhan 38; BR22>BRR1 dhan 32, Binadhan-4, BRR1 dhan 39, BRR1 dhan 30, Binashail. For WBPH, almost all varieties showed susceptible reaction (Table -4).

Table-2: Number of insect pests in early vegetative stage of rice

Rice Variety	Leaf folder	GLH	WBPH	Grasshopper	Rice bug	RHC	BPH
BR3	9.000 a	6.333 a	8.667 a	10.000 c-e	-	-	1
BR4	5.667 c-f	6.667 cd	7.000 a-c	5.000 i	-	-	1.333
BR11	5.333 d-g	5.667 b	5.000 c	10.333 b-d	-	-	1
BR22	4.667 e-g	4.667 bc	5.333 bc	9.000 d-g	-	-	-
BRR1 dhan 29	0.323 i	2.333 d-f	8.000 g	8.333 e-h	-	-	1
BRR1 dhan 30	3.333 gh	2.000 ef	8.333 a	12.333 a	-	-	-
BRR1 dhan 31	5.333 d-g	3.333 de	9.000 a	12.000 ab	2	-	-
BRR1 dhan 32	5.000 d-g	3.333 de	9.333 a	9.667 e-f	1	-	-
BRR1 dhan 34	4.333 f-g	0.667 g	7.667 ab	11.667 a-c	-	-	2.333
BRR1 dhan 37	5.667 c-f	0.333 g	9.000 a	10.333 b-d	-	-	1
BRR1 dhan 38	6.000 c-f	2.000 ef	8.333 a	1.000 j	1	-	1
BRR1 dhan 39	8.667ab	3.000 de	8.667 a	4.333 i	-	-	-
BRR1 dhan 40	7.00 b-d	1.333 fg	8.000 a	8.000 f-h	-	-	1
BRR1 dhan 41	6.667c-e	2.667de	8.000 a	3.667 i	1	-	0.66
BINA dhan-4	6.333 c-f	3.000 de	9.333 a	7.333gh	-	-	1.333
BINA dhan-6	5.333 d-g	2.333ef	8.667 a	4.000 i	-	-	1.667
Binashail	0.333 i	3.667 d	5.000 c	12.667 a	-	-	1.667
Anamika	1.667 gi	3.000 de	9.333 a	7.000 h	1	-	-
Sonarbangla	7.667 a-c	2.667de	7.667 ab	7.667gh	-	-	0.33
Pajam	1.333 i	2.333 d-f	5.333 bc	3.333 i	1	-	1.33
Level of significance	**	**	**	**	Data were not analyzed		
CV (%)	22.30	23.44	17.51	12.31			

Grasshopper: 5 sweeps constituted a sample; LF, GLH, Rice bug, RHC, BPH: Pests of 5 hills constituted a sample. LF=Leaf folder, GLH=Green leafhopper, WBPH=White-backed plant hopper, BPH=Brown plant hopper.

Table 3: Number of insect pest in late vegetative stage

Rice Variety	Leaf folder	GLH	WBPH	Grasshopper	Rice bug	RHC	BPH
BR3	11.667 a	9.667 a	10.333 ab	4.000 a	0.333	-	0.333
BR4	6.667 c	4.333 d-f	8.667 a-c	1.000 cd	0.333	-	1.667
BR11	6.667 c	4.667 de	7.00 c	2.000 bc	0.333	-	0.000
BR22	6.333 cd	5.333 d	7.000 c	1.333cd	0.000	-	0.333
BRR1 dhan 29	0.667gh	2.667 fg	10.000 a-c	2.000 bc	0.666	-	0.330
BRR1 dhan 30	4.000 d-f	2.6667 fg	10.000 a-c	2.000 bc	0.000	-	0.000
BRR1 dhan 31	6.667 i	4.333 d-f	11.333 a	1.333cd	0.333	-	0.000
BRR1 dhan 32	6.333 cd	5.667 cd	11.333 a	2.000 b-d	0.666	-	0.000
BRR1 dhan 34	5.667 c-e	1.667 g	9.333 a-c	2.000 cd	0.000	-	0.000
BRR1 dhan 37	8.000 bc	2.000 g	11.333 a	1.333 bc	0.000	-	0.667
BRR1 dhan 38	7.333 c	4.000 d-f	10.333 ab	1.667 d	0.000	-	0.833
BRR1 dhan 39	10.667 a	4.333 d-f	10.333 ab	1.000 cd	0.000	-	0.000
BRR1 dhan 40	7.333 c	2.667 fg	10.000 a-c	2.000 cd	0.333	-	0.333
BRR1 dhan 41	7.000 c	5.000 d	10.000 a-c	0.667cd	0.333	-	2.607
BINA dhan-4	7.000 c	8.333 ab	11.000 a	0.333 cd	0.333	-	0.000
BINA dhan-6	6.000 cd	7.333 bc	10.667 ab	0.000 d	0.333	-	0.667
Binashail	0.333 h	5.667 d	7.667 a-c	3.333 ab	0.333	-	3.667
Anamika	3.667ef	10.000 a	11.000 a	1.000 cd	0.000	-	0.000
Sonarbangla	10.000 a	9.000 ab	9.667 a-c	1.000 cd	0.000	-	0.333
Pajam	2.667 fg	3.000 e-g	8.333 a-c	0.000 d	0.000	-	2.000
Level of significance	**	**	**	**	Data were not analyzed		
CV (%)	20.48	18.92	15.92	72.73			

Grasshopper: 5 sweeps constituted a sample; LF, GLH, Rice bug, RHC, BPH: Pests of 5 hills constituted a sample. LF=Leaf folder, GLH=Green leafhopper, WBPH=White-backed plant hopper, BPH=Brown plant hopper.

Table-4: Number of pests in reproductive stage of rice

Rice Variety	Leaf folder	GLH	WBPH	Grasshopper	Rice bug	RHC	BPH
BR3	13.667 a	5.000 a	8.000 ab	9.333 d	0.000 i	0.000 e	0.000
BR4	9.000 d-g	2.333 bc	6.000 b-d	3.667 h	1.333f-h	0.667 de	3.000
BR11	10.667 b-d	2.667 b	4.333 c-e	9.333 d	2.333c-e	0.000 e	0.000
BR22	7.667 f-h	2.000 b-d	4.333 c-e	8.333 e	2.667cd	1.667 bc	0.000
BRR1 dhan 29	1.000 j	1.000 d-f	7.000 ab	8.33 de	1.000gh	1.000 cd	0.000
BRR1 dhan 30	5.333 hi	1.667 b-d	7.000 ab	12.333 a	1.000gh	2.667 a	0.000
BRR1 dhan 31	8.000 e-g	2.667 b	7.667 ab	11.333 b	2.000d-f	3.000 a	0.000
BRR1 dhan 32	8.333 d-g	1.667 b-d	6.333 ab	8.667 de	2.667cd	2.333 ab	0.000
BRR1 dhan 34	7.000 gh	0.000 f	6.333 a-c	10.333 c	0.667hi	2.333 ab	0.000
BRR1 dhan 37	10.333 b-e	0.333 cf	7.333 ab	9.000 de	1.000gh	0.000 c	0.000
BRR1 dhan 38	9.000 d-g	2.000 b-d	6.667 a-c	0.000 j	0.000i	0.000 c	0.000
BRR1 dhan 39	12.333 ab	1.667b -d	7.000 ab	3.000 hi	0.667hi	0.667 be	0.000
BRR1 dhan 40	9.667 c-f	1.333 c-e	6.333 a-c	6.333 f	3.000c	1.667 bc	0.000
BRR1 dhan 41	10.000 b-a	2.667 b	6.000 b-d	2.667 i	5.000a	1.000 cd	6.000
BINA dhan-4	9.000 d-g	1.667 b-d	7.333 ab	6.667 f	4.333b	0.000 e	0.000
BINA dhan-6	8.667 d-g	1.337 c-e	6.667 a-c	2.333 i	0.667hi	1.000 cd	0.000
Binashail	1.000 j	1.667 b-d	3.333 e	11.000bc	1.667e-g	1.667 bc	6.000
Anamika	5.333 hi	1.000 d-f	8.667 a	5.333 g	2.333c-d	0.000 e	0.000
Sonarbangla	11.667 a-c	1.333 c-e	6.667 a-c	6.333	0.000i	1.677 bc	0.000
Pajam	3.667 i	1.333 c-e	3.667 de	2.333 i	0.667hi	0.667 de	4.000
Level of significance CV (%)	** 17.01	** 33.39	** 20.62	** 7.96	** 23.59	** 38.27	Data were not analyzed

Grasshopper: 5 sweeps constituted a sample; LF, GLH, Rice bug, RHC, BPH: Pests of 5 hills constituted a sample. LF=Leaf folder, GLH-Green leafhopper, WBPH=White-backed plant hopper, BPH=Brown plant hopper.

Considering three vegetative stages, the result showed that Rice bug was absent in vegetative stage and occurred in the reproductive stage as it is a pest of rice grain. Tsueda *et al.* (2002) observed peak occurrence of rice bug with the date of heading and of early ripening which might be in agreement with our present findings. Arif (1976) reported that Pajam varieties had

lower infestation rates than high yielding varieties, which might be a support with the present results. Performance of twenty rice varieties varied with the age of the crop. Considering three stages and all observed insect pests among the test varieties BR3 was highly susceptible to most of the pests. On the other hand, Pajam was the less prone to insect attacks.

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