



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, BRRI dhan 29 and BRRI 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 (BRRI, 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, BRRI dhan 29, BRRI dhan 30, BRRI dhan 31, BRRI dhan 32, BRRI dhan 34, BRRI dhan

37, BRRI dhan 38, BRRI dhan 39, BRRI dhan 40, BRRI 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, BRRI dhan 29 and BRRI dhan 31 constantly offered lower level of damage percentage in all crop growth stages. So, considering damaged percentage Pajam, BR22, BRRI

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 |
| BRRRI dhan 29 | 2.493 f-i | 10.280 j | 14.010 jk |
| BRRRI dhan 30 | 2.000 ij | 10.607 ij | 12.43 k |
| BRRRI dhan 31 | 3.300 c | 13.930 gh | 18.157 i |
| BRRRI dhan 32 | 3.200 cd | 12.143 g-j | 15.509 j |
| BRRRI dhan 34 | 2.733 c-g | 16.900 f | 19.330 hi |
| BRRRI dhan 37 | 3.067 c-f | 24.760 c | 26.687de |
| BRRRI dhan 38 | 3.167 c-e | 23.233 cd | 27.280 cd |
| BRRRI dhan 39 | 3.867 b | 27.677 ab | 29.490 bc |
| BRRRI dhan 40 | 2.733 c-g | 19.400 ef | 20.983gh |
| BRRRI 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, BRRRI dhan 39, Sonarbangla were susceptible and Pajam, Binashail, Anamika, BRRRI 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, BRRRI dhan 37, BRRRI dhan 34, BRRRI dhan 40 showed less susceptible reaction. Pajam, Binadhan-6, BRRRI dhan 29, BRRRI dhan 30, BRRRI 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 BRRRI dhan 38 showed least grasshopper infection followed by Pajam, BRRRI dhan 41, BINA dhan-6, BRRRI dhan 39 and BR4. On

the other hand, Binashail, BRRRI dhan 30, BRRRI dhan 31 and BRRRI 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. BRRRI dhan 29 was less susceptible. For GLH among these varieties, Anamika, BR3, Sonarbangla and BINA dhan -4 were highly susceptible while BRRRI dhan 34, BRRRI dhan 37, BRRRI dhan 40, BRRRI dhan 29, BRRRI 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>BRRRI dhan 39> Sonarbangla. For GLH, the susceptibility order as BR3> BRRRI dhan 34, BR11; BRRRI dhan 41> BR4> BRRRI dhan 38; BR22>BRRRI dhan 32, Binadhan-4, BRRRI dhan 39, BRRRI 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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