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Evaluation of Some Rice Varieties Against Rice Stem Borer (*Tryporyza incertulas*)

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Abstract: Eight rice varieties JP-5, Swat-1, Swat-2, Dilrosh-97, Basmati-385, KS-282, Gomal-6 and Gomal-7 were screened for their resistance against rice stem borer. Percentage of dead hearts and white heads were recorded 38 and 67 days after transplanting. None of the tested varieties were free from the attack of rice stem borer. However, variety KS-282 was found as resistant while Gomal-6 and Gomal-7 showed moderate resistance. Basmati-385, Swat-2 was proved moderate susceptible varieties. Swat-1, JP-5 and Dilrosh-97 were found the susceptible varieties under the agro ecological conditions of Dera Ismail Khan.

Key words: Varieties, stem borer, *Tryporyza incertulas*, resistance

Introduction

Insect pests are one of major factor responsible for low yield of rice crop. As many as 54 different species of insect pests have been reported attacking the rice crop (Inayatullah *et. al.*, 1986). It has been estimated that each year the insect pests alone caused about 25-30% losses in yield (Ashraf *et. al.*, 1986).

Besides, other insect pests of rice, stem borers are the most serious ones, which take heavy toll of the crop. About 20 species of borers damage rice plant but only two of them (*Tryporyza incertulas* Walker and *Tryporyza innotata* Walker) are the most important (Nazir *et. al.*, 1994). In South East Asia the average estimated yield loss due to *Tryporyza incertulas* and *Tryporyza innotata* were about 17% (Islam, 1990). Integrated pest management IPM practices can combat the pest very effectively. Natural resistance against insect pest is one of the very important components of IPM. The resistance phenomena can be of non-preference, variety potential of high yield, and presence of antibiotic chemicals in the variety. Knowledge of resistance level of a variety is also very important for planning a crop and breeding. In the present studies some of the cultivated varieties were evaluated for their resistance under the natural infestation conditions.

Mahar and Bhatti (1985) evaluated the levels of resistance to *Scirpophaga incertulas* (in terms of the numbers of dead hearts and whiteheads) in 44 rice cultivars, screened in Pakistan in 1983-84. Only IR13639-34, BG276-5 and DR83 were moderately resistant. Most varieties had a higher score of whiteheads than dead hearts.

Marwat *et al.* (1985) screened 37 rice cultivars or lines and a local cultivar (Basmati-370), against the pyralid *Tryporyza* spp. (*Scirpophaga* spp.). Only 13 of the 38 cultivars achieved maturity, and were evaluated on the basis of the percent dead hearts, whiteheads and infected tillers. Basmati-370 proved the least and IR-198007-21-2-2 the most resistant. Basmati-370 exhibited 52.8% dead hearts, 71.3% whiteheads and 99.9% infected tillers, compared to IR-198007-21-2-2 which showed 6.2, 9.4 and 66.2%, respectively.

Balasubramanian *et al.* (1986); Rosh and Syed (1986); Vega and Heinrichs (1986); Ahmed (1987); Kulkarni *et al.* (1987); Marwat and Baloch (1988) also screened different varieties in the different parts of the world. They reported that rice varieties do respond the insect attack and resistance level vary from variety to variety.

Akram *et al.* (1994) reported that Pakhal is resistant to stem borer (*Chilo suppressalis)* and leaffolder (*Cnaphalocrocis medinalis*). Head rice recovery is 58.8% for Pakhal compared with 55.2% for JP-5.

Materials and Methods

Studies were conducted under the agro climatic conditions of Dera Ismail Khan during Kharif 1999. The experiment was laid out in the randomized complete block design (RCBD). The seed of eight varieties namely JP-5, Swat-2, Swat-1, Dilrosh-97, Basmati-385, KS-282, Gomal-6, Gomal-7 were sown in the 2nd week of April. Forty days old nursery was transplanted in plots each measuring 3x6m^2. Both row to row and plant to plant distances was kept 25cm. The treatments were replicated thrice. The varieties were tested for their level of resistance to the natural population/incidence of rice stem borer. The crop was left insecticides free throughout the cropping season. Ten plants were randomly selected from each plot for dead heart and white head data, while adult preference

was monitored by examining the whole plot and number of dead hearts, number of white heads, adult Preference for resting, adult Preference for Egg laying were investigated.

Dead heart and white head data were recorded by using following formula (Marwat *et. al.* 1985)

$$\text{Dead heart \%age} = \frac{\text{No. of dead hearts}}{\text{Total number of tillers}} \times 100$$

$$\text{White head \%age} = \frac{\text{No. of white heads} \times 100}{\text{Total no. of tillers with panicles}} \times 100$$

The data were analyzed using MSTAT-C software and the means were compared by using Least Significant Differences test (LSD).

Results

Percent dead hearts: All but one varieties tested showed a non-significant difference in dead hearts percentage and ranged between 0.43 to 1.86. Swat-2 which has significantly maximum dead hearts (6.55) ($P<0.05$). Variety Gomal-7 has least dead hearts followed by Basmati-385 (0.68) and KS-282 (0.87) Table 1. Dead heart percentage is considered a poor indicator for stem borer infestation in the agro climatic conditions of Dera Ismail Khan but some susceptible varieties could react.

Percent white heads: Most of the upland rice varieties could not perform as good as indigenous varieties. Significantly highest white head percentage was observed in varieties JP-5 (86.63) and Swat-1 (66.03) Table 1. Varieties Swat-2 and Dilrosh-97 with 37.69 and 48.21 white head percentage respectively proved to be significantly better varieties than the aforesaid two varieties. However varieties Gomal-6 (18.09), KS-282 (17.33) and Gomal-7 (26.26) were significantly better varieties. Basmati-385 proved to have moderate percentage of white heads (52.14). It was also observed that Basmati variety reach to heading stage about 25 days later than rest of the varieties. The upland rice varieties also showed stress symptoms during their growing period especially the variety JP-5 that had twisted leaf blade due to hot weather throughout their season.

Adult Preference for Resting I and II: The population-I data depict that variety preference for resting is significant Table 2. Though through 25 days of transplanting, adult population was as much to get any infer. Data shows that only variety JP-5 has 0.67 adults resting, while non-of other variety has any adult to sit on. However after 67 days, varieties could not show any significant variation for adult resting. Although data-II is non-significant but figure shows that variety Basmati-385 has maximum adult (5.00) followed by KS-282 (3.33). Variety Gomal-6 and Gomal-7 and JP-5 have equally number of adults while variety Swat-I has no adult population.

Although non-significant, but the figure proved that adult do not chose to sit on the upland rice varieties which were showing stress symptoms and in comparison the insect liked the leafy lush green tall variety Basmati followed by the KS-282 which is also a bushy and lush green color variety.

Adult Preference for Egg Laying: The adult preference for egg lying (egg mass infestation) of eight rice varieties shows a significant difference among the varieties. The least significant difference (LSD) test proved that variety JP-5 and Basmati-385 had the significantly highest number of egg masses i.e. 14.67 and 16.67 respectively. The rest of the six varieties showed no statically difference among them. Although few number of adults were observed to sit on variety JP-5 but significantly higher egg masses infestation could be due to some volatile chemicals omitted during night which attracted female to lay eggs. The un-explainable phenomenon needs to be further investigated.

Table 1: Means (n=3) percent dead hearts and percent white heads in different rice varieties

S.No	Varieties	% dead hearts	% white heads
1	JP-5	1.86B	86.63A
2	Swat-2	6.55A	37.69CD
3	Swat-1	1.48B	66.03AB
4	Dilrosh-97	1.63B	48.21BC
5	Basmati-385	0.68B	52.14BC
6	KS-282	0.87B	17.33D
7	Gomal-6	1.03B	18.09D
8	Gomal-7	0.43B	26.26

Table 2: Means (n=3) percent adult population I, adult population II and percent egg infestation in different rice varieties

S. No	Varieties	% adult population -I	% adult population -II^{NS}	% Egg infestation
1	JP-5	0.66 A	2.33	14.67 A
2	Swat-2	0.00 B	0.66	3.66 B
3	Swat-1	0.00 B	0.00	0.00 B
4	Dilrosh-97	0.00 B	1.66	4.67 B
5	Basmati-385	0.00 B	5.00	16.66 A
6	KS-282	0.00 B	3.33	3.00 B
7	Gomal-6	0.00 B	2.33	3.33 B
8	Gomal-7	0.00 B	2.33	3.33 B

Means followed by the same letters are non-significantly different at 5% level of probability using LSD test, NS= Non-significant

Discussion

The varietal evaluation was conducted with the intention to test and compare the upland varieties with that of indigenous varieties. The dead heart data could not perform well as stem borer indicator. This is because yellow stem borer is predominant specie and relatively low population in the beginning of the rice-growing season may have restricted the insect to low dead hearts infestation. The results also showed that varieties introduced could not performed well under the agro climatic conditions of D.I.Khan. Variety JP-5 showed wilting due to high temperature and did not produced tillers, other varieties Swat-1, Swat-2 and Dilrosh-97 also showed heat stress symptoms, produced fewer tillers and were very susceptible to the stem borers. So far as the indigenous cultivars are concerned, Variety KS-282 performed very well against the stem borer infestation, followed by the candidate varieties, Gomal-6 and Gomal-7. Mahar and Bhatti (1985) Yang *et al.* (1985), Balasubramanian *et al.* (1986) evaluated various rice cultivars, dead hearts and white heads as infestation indicators. Results can not be compared as they used different cultivars and in varying environmental conditions. However Marwat *et al.* (1985) Basmati variety is very susceptible. Which is in accordance with our findings.

Adult population was recorded twice in the growing season. First population data showed occurrence of adult moths on JP-5 variety only while second observation showed (though non-significant) on variety Basmati 385 is the most preferred variety due to its lush green color and higher plant stature. Low adult population data right in the beginning of the season also support the reason quoted above for the poor indicator of stem borer infestation.

Egg mass infestation data revealed that highest masses were observed on variety JP-5 and Basmati-385. Though not many adults were observed on the variety JP-5. The higher egg masses could be due to the reason that the adults could find better hiding place in the twisted leaves and resulted in more egg laying. Higher egg masses on Basmati 385 are clearly due to the higher resting adults. No reference in the available literature was found on these aspects of the studies. So results may need further investigations as well.

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