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# COMPARATIVE FIELD INCIDENCE AND BIOLOGY OF *CNAPHALOCROCIS MEDINALIS* (GN.) ON DIFFERENT RICE VARIETIES / CULTIVARS

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The data on larval population of *Cnapha/ocrocis. medinalis* and its damage to rice leaves of different rice varieties! cultivars revealed that Basmati 370 and Basmati 385 had the lowest (2:4) larvae per hill. The longest larval and pupal period (23.7 days and 6.2 days) was on Basmati 385 and Basmati 370 respectively. The growth index of *C. medinalis* was the lowest (3.15) on Basmati 370.
Key words: field incidence. leaffolder, varietal resistance

## INTRODUcnON

The success of rice crop, among other things. depends upon effective plant protection measures. The insecticides are mainly relied on for this purpose. Overdependence on insecticides is not a sound and long lasting pest control strategy as it resulted in insecticide resistance in insects, outbreak of secondary pests and human and animal hazards (Pinhero et al., 1988). One of the most desirable ways to reduce dependence on insecticides in agriculture is to plant insect-resistant varieties of the crops. Hence. situation demands that extensive research be undertaken on varietal resistance because it has remained ignored in the past. However. now it has assumed great importance in the Integrated Pest Management.

Realizing the importance of varietal resistance in insect control strategies. the screening of rice varieties against *Cnaphalocrocis medinalils* showed that it preferred fine grain scented varieties over short and medium duration non-aromatic varieties (Dhaliwal et al.. 1979; Malik et al., 1985). Natural infestation by *C. medinalis* had positive relation with leaf width. plant height and leaf length as reported by Majumdar et al. (1986); Xue et al: (1987); 'Shrivastava (1989); Pandhya et al. (1995); Islam and Karim (1996,1997)

Insects possess intimate and subtle relationship with their host·plants. therefore. even minor changes in physical or chemical attributes of the plants can profoundly affect their suitability to insect pests. Studies indicated that fewer eggs. low larval survival (Medina and Taylor. (1986). less pupal weight and low adult emergence of *C. medinolis* were observed on the resistant rice varieties (Khan et al.. 1989); Abenes and Khan (1990) but no information is available on the plant biochemistry rendering these effects. Significant role of resistance in Insect Pest Management leads to the present investigation i.e. to find out relative resistance of the commercial varieties and cultivars against C. *medinalis.* The parameters fOT present studies were such observations as larval population, leaf damage, larval and pupal duration and survival and oyipositional preference under field and semi-natural conditions.

## EXPERIMENTALPROCEDURE

The experiment was conducted in two phases. The three varieties (Basmati 385, Basmati 370 and Basmati 385-1) and 7 advanced lines (No. 43175. PK-3729-14. No. 1053-32, IR-6-87-2. PK~3320-31-2, IR=6-87-25-7. PK-3385-13-3-2) were chosen for investigation of relative resistance to rice leaffolder. (*'. medinalis* (Gn.).

Phase 1 (Field studi~s): For studying field incidence of rice leaffolder on the test varieties / oultivars, seeds of these were procured from the Rice Research Instt.. Kala Shah Kaku, Sheikhupura and sown in Experimental Area. Department of Agri. Entomology. University of Agriculture, Faisalabl!d. Forty days old seedlings of these varieties / cultivars were transplanted in mid July. Two seedlings per hole were transplanted at 25 x 25 cm spacing of plants of each variety / cultivar in 4 repeats. All the standard agronomic practices for sowing the nursery. seed bed preparation and transplanting of seedlings were followed. The experimental field was never allowed to dry up to 23 days after transplantation. Larval population of *C. medinalis* and leaves damaged by it were recorded from randomly selected 10 hills per variety / cultivar per replication.

The observations were taken at weekly intervals till the last week of ocrober when leaves started to turn brown. In final observation all the hills' in a plot of each variety / cultivar in each replication were observed for total number of leaves and number of leaves damaged by leaffolder larvae. Percent leaf damage was thus calculated using International Standard Evaluation System for the rice:

| Leaves damaged (%) | Score |
|---|---|
| 1-10 | 1 |
| 11-20 | 2 |
| 21-30 ' | 3 |
| 36-50 | 4 |
| 51-100 | 5 |

Phase U (Studies under semi-natural | conditions): The above Stated varieties / cultivars were also studied under semi-natural conditions in field cages. For this purpose nursery of these varieties / cultivars was sown in, early June in the experimental area of Agri. Entomology Department and was transplanted in the earthen pots with 40 days old seedling in each, of the four pots of one variety. These were watered daily till the completion of the experiment. To observe varietal preference for oviposition. a large population of field collected adults of leaffolder was released freely on 40 potted. plants in a field cage. The number of eggs laid on each potted plant was recorded after, 5 days of initial release of leaffolder moth and thus average number of eggs laid per plant per variety was calculated. ' The newly hatched first instar larvae reared in laboratory were used for artificial infestation of rice plants. For this purpose 4 potted plants of each variety were covered with tripod bars wrapped in muslin cloth. One larva of first instar per tiller was released. Observations were taken daily for percentage larval and pupal survival on each variety / cultivar. The number of eggs laid per female was also recorded on each variety and also the duration oflarval and pupal stages was recorded. The whole experiment was run under CRD and data were analyzed using ANOVA and LSD test.

Growth 'Index (G.1.) was calculated using the following fonnula:

$$G.I = \frac{\text{Percentage larval survival}}{\text{Mean larval growth period (in days)}}$$

## RESULTS AND DISCUSSION

Weekly. larval population and leaf damage per hill on different varieties / cultivars at different times starting from 6th week after transplantation is given in Table 1. Before6th week, C *medina/is* was negligible in the observation plots. Basmati 370 had the lowest larval population (0.6, 1.3 and 1.70 per hill) and leaf damage (1.2. 1.8 and 2.3%) at 6, 7 and 8 weeks after transplantation respectively. Basmati 370 had non-significant difference with PK-3385-13-3-2 at 9. 10 and 11 weeks after transplantation. JR-6-87-25-7 had the highest larval population (2.7. 4.0, 5.0, 9.9,10.5, 13.7. 15.4and 19.4 larval per hill) and leaf damage (3.8,5.5, 7.5. 11.2, 12.2, 18.6,21.9 and 23.0 %) respectively at 6; 7, 8, 9, 10, 11. 12 and 13 weeks after transplantation. These results were in contradiction to those of Dhaliwal et al. (1979) who stated that tine grain scented varieties were preferred over short and medium duration non-aromatic varieties. This indicates that the cultivars and Basmati varieties in. the present investigation are genetically not much different from each other. On the basis' of leaf damage at week 13. PK-3385-13-3-2. No. 1053-32. Basmati-385-1. PK-332o-31-2 Basmati 370, PK-3385-13-J-2 and Basmati 385-1 were designated as resistant and IR-6-87-25-7 as susceptible.

Khan et al. (1989) reported that Basmati 370 and Basmati 198 were scored as susceptible varieties respectively with 21.47 and 20.92% leaf damage while Basmati 385 was scored as resistant with 10.34% leaf damage at week 13 after transplantation. However, in the present investigation, Basmati 385 and Basmati 370 were statistically similar at week 13 after transplantation in respect of leaf damage. The variation in these results may be due to varietal performance in different agro-ecological zones and presence of other rice varieties / cultivars found around. The difference may also account for the nutritional status of soils in the observation plots in these two cases.

Biology of leaffolder on different varieties / cultivars is given in Table 2. The longest larval duration (23.7 days) was on Basmati 385-1 followed by PK-3320-31-2 (23.0 days) with non-significant difference between the two. The shortest larval duration (18.2) was on No. 1053-32 and it was statistically at par with No. 43175. Basmati 370, PK-3385-13-3-2 and PK-33729-14 with *18.5, 18.5.* 18.5 and 19.0 days respectively, The lowest. larval survival *(58.3%)* was on Basmati 370 and it waS statistically identical with Basmati 385 (66.6%). Basmati 370 had the longest (8.2 days) pupal duration. The minimum growth index (3.15) was on Basmati 370. These results are in confonnity with Medina and Taylor (1986), Khan et al., (1989) and Abenes and Khan (1990) who indicated that the scented varieties were resistant to leaffolder, C. *medinalis.*

The present studies indicated that Basmati 370 was resistant to C. *medina/is* but Khan et al. (1989) found that the same variety was heavily infested and preferred by leaffolder. They found that leaffolder laid maximum (248.33) number of eggs per hill on Basmati 370. Preference for egg laying in this case could be due to moisture condition, of. plant and prevalent weather.

The growth index (Thble2) of different varieties was calculated to further support the scoring for resistant and susceptible varieties because higher the growth index more susceptible the variety. The highest growth index (5)0) pertained to IR-6-87-25-7 followed by No. 43175 (4.36) and the lowest *(3.15)* was for Basmati 370.

**Table 1. Larval population (LP) of *C. medinalis* and leaf damage (LD) per hill on different varieties at different times after transplantation**

| Varieties | Weeks after transplanting | | | | | | | | | | | | | | Varietal rating on the basis of LP at week 13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | Score | Desig. |
| | LP | LD | LP | LD | LP | LD | LP | LD | LP | LD | LP | LD | LP | LD | LP | LD | | |
| **No. 43175** | 2.2 b | 3.1 b | 3.0 b | 4.6 b | 4.5 b | 6.5 b | 8.1 b | 9.7 b | 9.5 b | 13.0 a | 9.9 b | 13.3 b | 11.2 b | 14.9 b | 7.2 b | 16.2 b | 3 | MR |
| **PK-3729-14** | 1.1 b | 1.7 b | 1.8 d | 2.8 d | 2.6 b | 3.6 d | 3.6 d | 4.1 d | 4.4def | 6.0bcd | 5.5 de | 7.5 de | 6.2 ef | 9.4 d | 3.6 d | 10.2 d | 1 | R |
| **No. 1053-32** | 0.9 e | 1.5 e | 1.6 e | 2.5 e | 2.6 d | 3.6 d | 3.3 d | 3.5 e | 4.9 cd | 6.7 bc | 5.2 be | 7.1def | 6.3 ef | 8.9 e | 3.1 e | 9.7 ef | 1 | R |
| **Basmati 385** | 0.7 f | 1.1 gh | 1.8 ef | 2.5 ef | 2.0 f | 3.0 e | 2.4 e | 3.4 ef | 3.7 fg | 4.9 ef | 4.7 ef | 6.9def | 5.9 fg | 8.4 f | 2.4 f | 9.2 gh | 1 | R |
| **IR-6-87-2** | 1.5 c | 2.1 c | 2.3 c | 3.1 c | 3.3 c | 4.5 c | 4.6 c | 5.8 c | 5.5 c | 6.8 b | 6.9 c | 9.7 c | 8.1 c | 10.7 c | 4.4 c | 11.3 c | 3 | MR |
| **PK-3320-31-2** | 0.7 f | 1.3 fg | 1.7 de | 2.3 cf | 2.2 e | 3.0 e | 2.9 de | 3.7 de | 4.6 de | 5.8cde | 6.1 cd | 7.7 d | 7.3 d | 9.5 d | 3.0 d | 10.1 d | 1 | R |
| **IR-6-87-370** | 0.6 f | 1.2 g | 1.2 g | 1.8 f | 1.7 f | 2.3 g | 2.4 e | 3.3 kf | 3.6 g | 4.4 f | 3.1 f | 4.8 ef | 6.4 e | 8.4 f | 2.4 f | 9.6 fg | 1 | R |
| **IR-6-87-25-7** | 2.7 a | 3.8 a | 4.0 a | 5.5 a | 5.0 a | 7.5 a | 9.9 a | 11.4 a | 10.5 a | 12.2 a | 13.7 a | 18.6 a | 15.4 a | 21.9 a | 9.4 a | 23.0 a | 5 | S |
| **PK-3385-13-3-2** | 0.7 f | 1.0 h | 1.0 h | 1.6 h | 1.7 g | 2.6 f | 2.2 e | 3.0 f | 3.4 g | 4.3 f | 4.7 ef | 6.7 f | 5.7 f | 7.9 f | 2.7 f | 8.6 j | 1 | R |
| **Basmati 385-1** | 0.9 e | 1.4 ef | 1.4 fg | 2.2 f | 2.1 f | 3.0 e | 2.5 e | 3.5 ef | 3.9cfg | 5.2def | 4.9 e | 6.6 f | 6.5 e | 8.2 fg | 2.5 f | 9.0 hi | 1 | R |

Desig. = Designation.

Table 2. Biology of *C medlnfllls* OD differeDt varieties / eultivan and growth iDdes

| Varieties | Larval duration (days) | Larval survival (%) | Pupil duration (days) | Pupal survival (%) | No. of eggs (per bill) | Growth index |
|---|---|---|---|---|---|---|
| No. 43175 | 18,5 c | 87,5 abc | 7.5 c | 88.0 ab | 252.5 a | 4.86 |
| PK-3729-14 | 19.0c | 89,5 ab | 8.0 ab | 88.3 ab | 231.8 b | 4.71 |
| No. 1053-32 | 18.2 c | 81,2 bed | 7.0ed | 87,1 ab | 215.3 c | 4.46 |
| Basmati 385 | 20.2b | 66.6 cf | 7,5 be | 87.S ab | 165.3 f | 3.29 |
| IR-6-87-2 | 20.2b | 8S.4abc | 6.5 de | 84.0 abc | 249.3 a | 4.22 |
| PK-332o-31-2 | 23.0 a | 91,6 a | 6.2 e | 79.5 be | 200.5 d | 3.98 |
| Basmati 370 | 18,5 c | 58,3 f | 8.2 a | 76.9c | 148.5 g | 3,15 |
| IR-6-87-25-7 | 15,5 d | 75.0 be | 8.0 ab | 89,4 a | 258.5 a | 4.23 |
| PK-3385-13-3-2 | 18.5 e | 72.9 de | 7.7 ab | 86,5 ab | 190.3 de | 3.98 |
| Basmati 385-1 | 23.7 a | 79,1 cd | 7.0ed | 89,4 a | 178.5 e | 3,33 |

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