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SOME STUDIES ON BIOLOGY, CHEMICAL CONTROL AND VARIETAL PREFERENCE OF RICE LEAF-FOLDER, *CNAPHALOCROCIS MEDINAUS* (Gn.).

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Incubation, larval, pupal periods, male and female longevity in C. medinalis were found to range from 4 to 5, 16 to 21, 6 to 7 and 3 to 7 days, respectively.

For the control of this insect, Lorsban, methyl parathion, Lorsban and Sumithion proved effective and gave 98.49%, 99.63%, 99.07% and 99.53 % mortality at 24, 48, 72 hours and 10 days post-treatment interval, respectively. Regarding varietal resistance, Basmati 370, Bas. 385 and Bas. 198 proved comparatively more susceptible than IR6, IR8 and KS282. The susceptible varieties had more larval population, greater attraction for oviposition by the adult female, shorter larval duration and greater survival of insects fed on them.

INTRODUCTION

Rice leaf-folder, Cnaphalocrocis medinalis (Gn.) is one of the insect pests of rice that has gained importance in the recent years. The damage may go as high as 60 per cent (Ahrnad, 1981). Attempts made in the past to investigate biology, control and varietal resistance indicated that the female laid eggs singly or in groups on rice leaves and mean developmental periods were 4, 23.2 and 7.4 days for eggs, larval and pupal stages, respectively (Rajamma and Das, *1970).* The average duration occupied by 5 to 6 larval instars ranged from 24.40 to 28.63 days subject to changes in temperature and humidity. Female laid 70 to 120 eggs (Vyas et al., *.1981).* The life cycle was generally completed in 25 to 30 days with 4 to 5 generations in a season

(Pradhan and Shahi, 1983). The application of chlordimeform granules, Fentrothion, Phosphamidan, Fenthion, Endosulfan and Dimethoate was found best for controlling rice leaf-folder and latter five were thus recommended (Velurnsay et al., 1978; Ramasubbaiah et al., 1980). The yield losses was 42 and 74 percent as a result of low, medium and heavy infestation of C. medinalis. It was further reported that late varieties were more susceptible to its attack than the early varieties (Chaudhry and Bindra, 1970). Thirty one rice genotypes were screened to identify the source of resistance but no entry was found free from leaf-folder infestation although a number of varieties were given a score of 3 (11 - 20% leaf damage) (Garg, 1984). Leaf width, plant height and leaf length had the greatest positive effect on infestation rate in that order (Majumder et al., 1986). Since very little information on biology, chemical control and varietal resistance is available in Pakistan, present studies were contrived to study these aspects of problem.

MATERIALS AND METHODS

For studying biology of rice leaf-folder, the larvae of the pest were collected from insecticide-free field of Basmati rice varieties and were reared to adult stage for further propagation under semi-natural conditions. Five adults pairs were released each in a separate cage with a rice plant in small pot and covered with plastic sleeves for egg laying by females. These small cages were placed on a table whose legs were dipped in water to avoid inteference by ants. In order to note hatching duration, 20 eggs were placed on a moistened blotting paper in the petri dishes. After hatching, the newly emerged larvae were transferred to rice plants covered with mesh sleeves to record the larval, pupal, adult stages and fecundity.

The experiment for chemical control was conducted at Mal Chak No.67/R.B., District Faisalabad during September, 1985. The experiment was laid out in Complete Randomized Block Design with a plot size of 6 x 10 meter and replicated thrice. Five insecticide viz. Sumithion, Thiodan, M. Parathion and Lorsban each at 1 lit/acre and Denitol 600 ml/acre were applied. An untreated check was also maintained. The larval population was recorded 24 hours before spraying and 24, 48,

72 hours and 10 days after treatment to find out the mortality percentage. The data were statistically analysed.

Six varieties of rice viz., Basmati (Bas) 198, Bas. 370, Bas. 385, IR 6, IR 8, and KS 282 were evaluated for their resistance against leaf-folder at Rice Research Institute, Kala Shah Kaku, Sheikhupura. The experiment was run under Randomized Complete Block Design. Larval population of the pest and leaf damage by leaf-folder were recorded from 5 randomly selected hills of each variety from one replication, starting from 6 weks after transplantation and thereafter, at weekly interval. A final observation was taken 90 days after transplantation. In that observation all the hills were observed for total number of leaves and number of damaged leaves by leaf-folder larvae and damage percentage was rated numerically using Standard Evaluation System for Rice as below:-

% leaves damages	Score
1-10	1
11-20	3
21-35	5
36-50	7
51-100	9

To observe varietal preference for oviposition, a large population of field collected adults of leaf-folder were released freely on 18 potted plants (3 of each variety) in a field cage. The number of eggs laid on each potted plant were recorded after 5 days of initial release of leaf-folder moths and thus average number of eggs laid per plant per variety was calculated. The eggs so obtained were kept on slightly moistened blotting papers and newly hatched 1st instar larvae were transferred to 3 potted plant of each variety covered with mesh sleeves kept in large field cage. Observations were taken daly on larval, pupal duration and survival and fecundity of the pest.

RESUL TS AND DISCUSSION

Eggs

The number of eggs laid by female ranged from 71.6

to 99.6, averaging 82.2 eggs. The incubation period ranged from 4 to 5 days with an average of 4.4 days. The eggs measured 1.021 x 0.59 mm (Table 1).

Larva

The duration of Ist, 2nd, 3rd, 4th and 5th instar larvae ranged from 3 to 4, 3 to 4, 4 to 5, 5 to 6, and I to 2 days with an average of 3.5, 3.5, 4.5, 5.1 and 1.6 days, respectively. The total larval period was found to range from 16 to 21 days. These results tally with those of Vyas et al. (1981). The body length of larva was 2.49, 5.07, 7.139, 12.07 and 15.036 mm and its head capsule measured 0.249 x 0.305, 0.52 x 0.71, 0.773 x 0.924, 1.031 x 1.093 and 1.109.x 1.1409 mm (length x width) in the Ist, 2nd. 3rd, 4th and 5th Instar, respectively (Table 1).

PUl?a

Newly formed pura measured 9.162 x 1.819 mm. Pupal stage lasted for 6 to 7 days, averaging 6.4 days (Table 1).

Adult

Body measured 9.985 x 1.5 mm with wing expansion of 17.94 mm. The female lived longer than male. The male and female lived for 3 and 7 days, respectively. The total average life span of adult male and female was 32 and 36 days respectively.

Chemical control

The data recorded 24 hours after spraying revealed (Table 2) that Lorsban gave he highest mortality (98.5%) while lowest was with Denitol (92.6%). After 48 hours of spraying M. Parathion gave the highest mortality (99.6%) which did not differ significantly from Denitol and Thiodan, with 98.7 and 98.7 per cent mortality but differed significantly from Sumithion having 90.3% mortality. All the insecticides were statistically at par in controlling the rice leaf-folder after 72 hours of spraying and 10 days after spraying. All the treatments gave more than 90% mortality of rice leaf-folder after 24 hours to 10 days of spraying (Table 2).

Varietal resistance

a. The data recorded 6 weeks after transplantation showed

Table 1. [illegible]

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			mm			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
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I [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
III [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IV [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Table 2. *Mortality percentage of Co medinalis with different insecticides at different post treatment intervals.*

Insecticide	Post Treatment Intervals			
	24 hours	48 hours	72 hours	10 days
Sumithion	92.73a	90.25b	99.06a	99.53a
Thiodan	96.50a	91.97ab	94.87a	98.29a
Methyl-parathion	97.87a	99.63a	96.25a	99.29a
Lorsban	98.49a	98.96ab	99.07a	99.31a
Denitol	92.56a	98.68ab	95.15a	98.78a
Control	25.28b	28.40c	21.36b	40.35b

that Bas.370 and Bas.385 were significantly different from each other and rest of the varieties were statistically equal with respect to larval population. At 7 weeks after transplantation, difference between Bas. 370 and Bas. 198 was non-significant but these two were significantly different than other varieties which among themselves had non-significant difference. Data at 8 weeks after transplantation revealed that larval population on IR6, IR8, and KS282 was statistically similar but different from rest of the varieties. At 9 weeks after transplantation, Bas. 198, IR8 and KS282 did not differ significantly from one another but were different from IR6 and Bas. 370. At 10 weeks after transplantation, Bas. 198 and Bas. 370, IR8 and Bas.385, IR6 and KS282 were significantly similar with one another but each set differed significantly from each other. IR6, IR8, KS282 and Bas. 385 had statistically similar larval population but different from Bas. 370 and Bas. 198 at 11 weeks after transplantation (Table 3).

Table [illegible]. [illegible]

Varieties	Intervals													Damage rating	
	[illegible] weeks		[illegible] weeks		8 weeks		[illegible] weeks		10 weeks		11 weeks		12 weeks	Final Observation	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	* [illegible]	Score	Designation
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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b. Leaf damage and damage rating

The difference between number of damaged leaves by ~~C. medinalis~~ per hill at 6 and 7 weeks after transplantation was non-significant between Bas, 370 and Bas. *198.* The remain~ng four varieties however, were significantly different from these varieties but were statistically at per among themselves. At 8 weeks after transplantation, maximum leaf damage was recorded on Bas: 370 (7.15 damaged leaves/hill) and it differed significantly from Bas, 198 and other four varieties, thelatter being non-significantly different from one another. The difference between number of leaves damaged was non-significant among IR6, IR8, KS282 but *it* was different from Bas.370, Bas.385 and Bas.198 which had among themselves significant difference in leaf damage at 9 'weeks after transplantation. All the varieties were significantly different from one another at 10 weeks after transplantation. The maximum leaf damage was recorded on Bas. 370 and minimum on Bas. 385. At 11 weeks after transplantation, the same situation as at 9 weeks after transplantation prevailed (Table 3). The data taken in final observation, when applied to Standard Evaluation System for Rice 0-9 scale) gave the scoring: IR6 and Bas. 385 score 1, IR 8 and KS 282 score 3 and Bas. 198 and Bas. 370 score 5 (Table 3), designating 1 for Resistant, 3 for Moderate Resistant and 5 for susceptible. Chaudhry ~~et~~ ~ (1970) observed that late, high tiUering and longer leaves varieties were heavily attacked by £. medinalis.

c. Response of different varieties towards biology' of £. ~~medinalis~~ showed that Bas.370 and Bas. *198* did not *differ* significantly in their preference for oviposition by leaf-folder. IR6 was least preferred. IR6 and IR8 with total *larval* duration 23.67 days and 22.67 days, respectively had non significant difference with each other but *differed* from rest of the varieties. Larval survival was maximum (83.6%) on Bas.198, followed by Bas.370 (82.8%), the two *differed* significantly from rest of the four varieties which among themselves had non-significant differences. The maximum and minimum pupal duration was on IR6 and KS282, respectively. These two were significantly different from each other as well as from other varieties which among themselves had similar pupal duration. All the varieties showed non-significant difference with respect to pupal survival. The maximum no. of eggs per female was laid on Bas. 370 and Bas. *198 (40.22*

and 38.92 eggs/female), respectively. The two halving non-significant difference but showed significant difference from the rest of the varieties. (Table 4).

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