

## STUDIES ON THE BIOLOGY AND CONTROL OF THE RICE LEAF ROLLER *Cnaphalocrocis medinalis* GUEN\*

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The rice leaf roller *Cnaphalocrocis medinalis* (Pyralidae, Lepidoptera) has been usually ranked as a minor pest of paddy in India. Consequent on the introduction of high yielding strains of rice and the related changes in the erstwhile pattern of rice cultivation involving continuous and overlapping cropping and repeated application of insecticides this pest has assumed serious proportions in Kerala. Abraham (1958) gave a brief account of the insect's biology with mention of some insecticidal control measures. Since no full information is available on its biology, the studies presented in this paper were undertaken covering the biology, bionomics and relative efficacy of some newer insecticides in controlling the caterpillars.

### Material and Methods

The eggs obtained from gravid female moths, collected from the field, were used for the biology studies. Rearings for this purpose were done of single caterpillars on rice seedlings planted in specimen tubes and enclosed within glass chimneys (Pl. I, Fig. 1).

Nine insecticides, all of proprietary formulations in their field doses as detailed in Table 2, were used for evaluation against the caterpillars. The insecticide sprays were applied with an atomiser on paddy plants in pots on which fifth instar caterpillars had been released 24 hours earlier at the rate of ten larvae per pot. Each pot received 3 ml of the spray fluid and each treatment had three replications. The mortalities were counted 24 and 48 hours after spraying. Unsprayed plants served as control.

### Results and Discussion

The eggs are laid singly on leaf surface. The egg (Pl. I, Fig. 2) is oval, 0.3 to 0.4 mm broad, cream coloured when laid and turning blackish as development proceeds. Incubation period lasts for about 4 days.

The newly hatched larva is light cream in colour with a black conspicuous head. It starts feeding on the green matter of the leaf surface making a shelter subsequently by rolling the leaves or by bringing together adjacent leaves. The larva undergoes 6 instars, the duration of the six successive instars being 3, 3.5, 3.8, 4 and 5.4 days (average) respectively during October to March. The total larval life lasts for 22.8 days on an average.

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The full grown larva (Pl. I, Fig. 3 A, B) is about 16.5 mm long and 1.7 mm across the thorax. It is green in colour with the head and prothoracic shield brown. On the body surface are present setae borne on sclerotised plates. The arrangements of the plates and setae are presented in Plate II, Figures 1 to 9. The first and second segments have similar chaetotaxy. The abdominal segments 3 to 8 also show similar arrangements of setae and body plates. The crochet is composed of 35 to 40 hooks arranged in a biordinal pennelipse.

Pupation takes place within the leaf shelter. The pupa (Pl. I, Fig. 4) is elongate and fusiform, measuring 9.7 mm in length and 1.5 mm in width. The cremaster spines are six in number. The adult (Pl. III) is a straw coloured, delicate moth with black wavy lines across both the wings. The male is distinguished from the female by the darker and more conspicuous nature of the black cross lines on the wings, and the darker costal margin and absence of the middle cross line on the fore wing. Further, the fore legs of the male have stouter tibia than those of the female and they are tipped with thick black hairs.

The larva feeds by scraping the green matter of the leaves remaining sheltered either within leaf folds or within webbed-up leaves. The nature of the fold depends on the age of the crop. In seedlings and young plants 3 to 4 leaves of adjacent plants are webbed together longitudinally to form a tubular shelter. In the grown-up plants folds are made out of single leaves and they may be longitudinal or transverse. When longitudinal folds are made the folding starts from the tip and gradually extends downwards. Only grown up larva prepares a transverse fold. In the earhead stage the caterpillar may make a shelter by webbing together the bootleaf and the earhead.

As a result of the larvae scraping the green matter of the leaves the leaves turn white in colour and dry up subsequently. Several leaves are damaged in this way by a single caterpillar. When the infestation is high the plants become weakened due to loss of chlorophyll. When the plants are attacked in the bootleaf stage the grains do not get fully filled up.

Table I gives the effect of different strains of paddy on the development of *C. medinalis*. It may be observed that the larval duration of the insect varied when reared on different strains of paddy; it was significantly more on the high yielding

**Table 1**

Effect of different strains of paddy on the development of *C. medinalis*

Paddy strain	Larval period (days)	Pupal period (days)	Adult longevity (days)	Total life cycle (days)
IR 8	22-25	6-8	5-10	32-37
Culture 28	22-24	7-8	7-11	33-36
Taichung Native 1	19-21	6-8	5-12	29-33
Kuttichirayadi	18-20	7-8	4-10	30-32

varieties IR8 and Culture 28 than on Taichung Native 1 and Kuttichirayadi. The total life cycle was also found to have similar relationships.

Table 2 shows that out of nine insecticides tried, seven gave the best result with complete mortality of the larva in 48 hours. Parathion which ranked next gave 96.7 percent mortality and DDT the next best gave 86.7 percent mortality in the same period. None of the other insecticides including endrin and BHC which were widely used for paddy pest control gave any significant effect.

Table 2  
Percent mortality of larvae of *C. medianlis* caused by different insecticides

Insecticide and dose (percent)	Percent mortality in	
	24 hours	48 hours
DDT 0.2	40	86.7
Parathion 0.04	56.7	96.7
Endrin 0.04	13.3	23.3
Sevin 0.2	96.7	100.0
Dichlorvos 0.1	3.3	6.7
Phosphamidon 0.04	6.7	13.3
Dimethoate 0.05	6.7	26.7
Endosulphan 0.05	6.7	23.3
BHC 0.2	23.3	36.7
Control	6.0	18.9

#### Summary

The female of *Cnaphalocrocis medinalis* Guen., the rice leaf roller, laid eggs in groups or singly on leaves. Egg, larval and pupal period lasted for 4, 23.2 and 7.4 days respectively on an average. Larvae caused injury to rice leaves, by scraping their green matter and constructing shelters by folding or webbing together the leaves. The larvae took significantly more time on leaves of IR8 (23.6 days) and Culture 28 (23 days) than on Taichung Native 1 (20.1 days) and Kuttichirayadi (19.1 days) for its development.

A pot experiment showed that sevin 0.2%, parathion 0.04% and DDT 0.2% sprays gave 100, 96.7 and 86.7 percent mortality of the caterpillars, respectively, in 48 hours after treatment. Sprays of endrin 0.04 percent, dichlorvos 0.1 percent, phosphamidon 0.04 percent, dimethoate 0.05 percent, endosulfan 0.05 percent and BHC 0.2 percent gave mortalities below 30 percent only in the same period.

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#### Reference

- Abraham, E. V. 1958. The rice Leaf Roller *Cnaphalocrocis medinalis* Guen. and its control. *Madras Agric. J.* 45: 273-275

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PLATE I  
Biology of *Cnaphalocrocis medinalis*

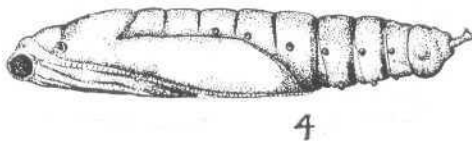
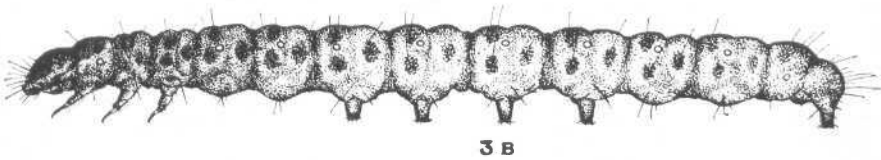
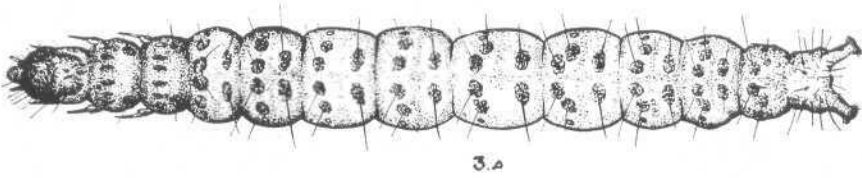
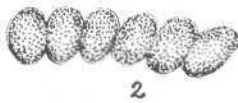
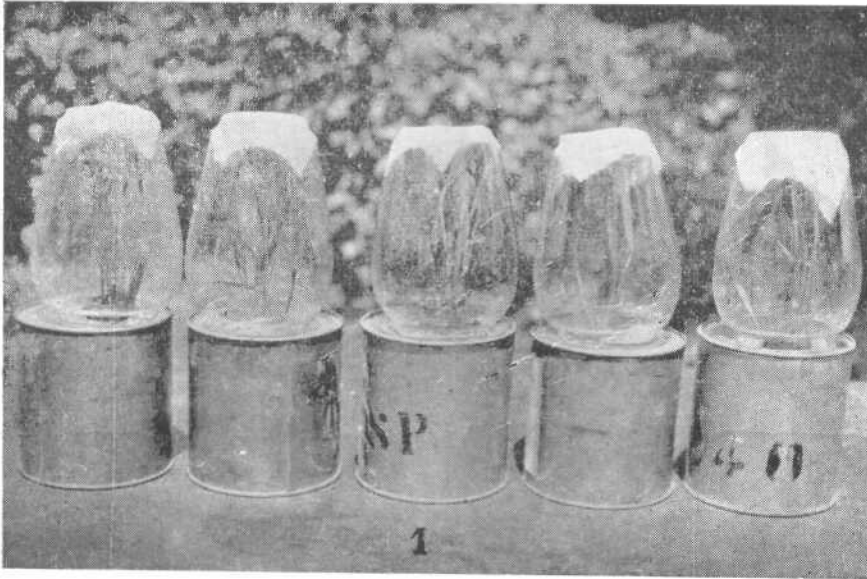
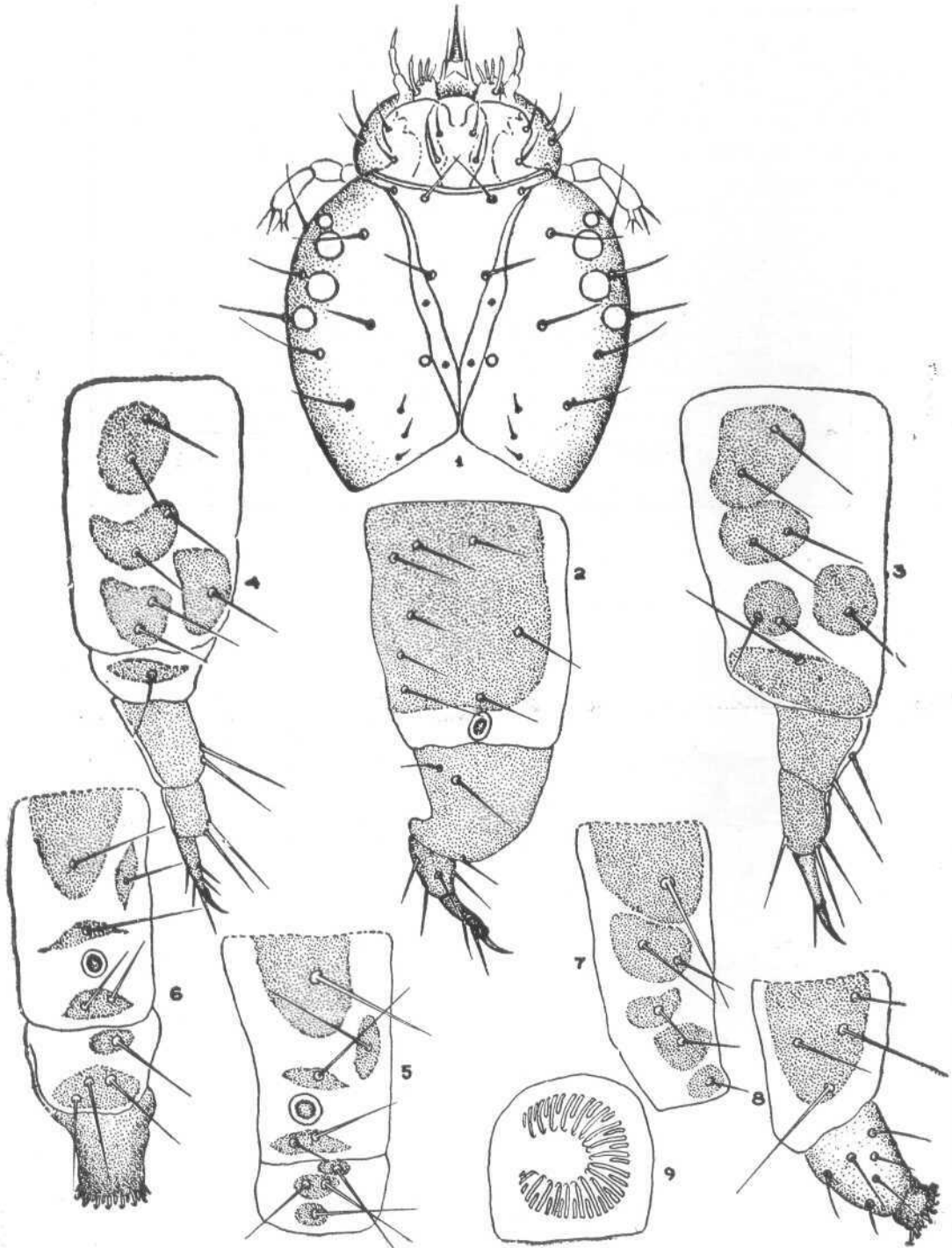


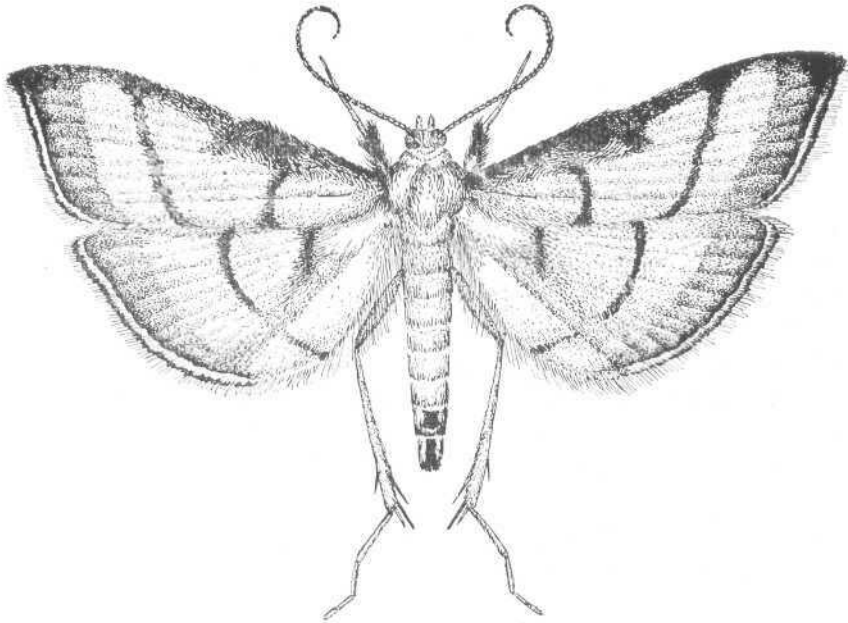
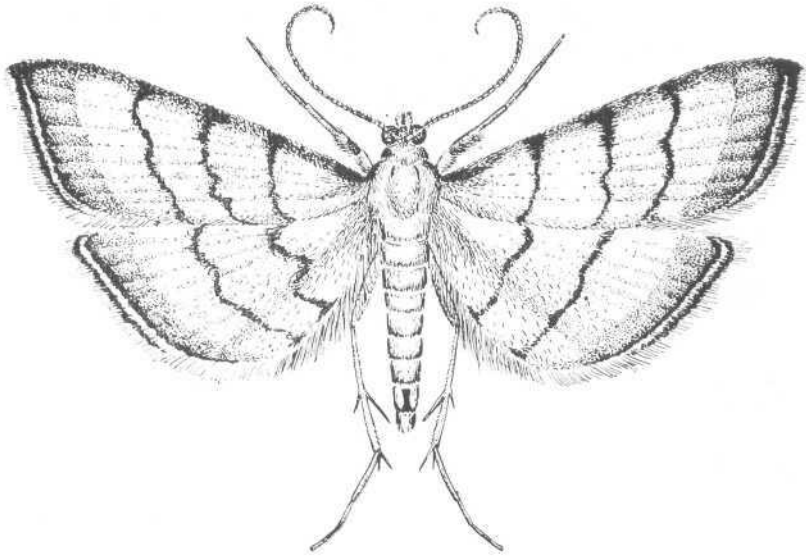
Fig. 1. Rearing cages of *C. medinalis*  
Figs 2 to 4. Life stages of *C. medinalis*  
2. Eggs 3. Fullgrown larvae 3 A. Dorsal view 3 B. Side view 4. Pupa

Biology of *Cnaphalocrocis medinalis*  
PLATE II



Figs. 1 to 9. Chaetotaxy of fullgrown larva of *C. medinalis*

Biology of *Cnaphalocrocis medinalis*  
PLATE III



Female (above) and male (below) moths of *C. medinalis*