

Biology of the Pea Leaf Roller, *Nacoleia vulgalis* Guence. (Lepidoptera: Pyralidae)*

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Received for publication April 10, 1964

Pulses play a major role in human and animal nutrition and soil fertility. A wide variety of pulses are grown in Kerala covering an area of about 1.09 lakhs of acres.

Pulse crops are subject to attack by a number of insect pests which damage the various parts of the plants. Among the various leaf-feeding insects, a pyralid caterpillar, *Nacoleia vulgalis* Guence. has been observed to be of major importance in Kerala in recent years. Lefroy (1909) recorded it as a common pest of pulses and described its larval habits and food plants and Fletcher (1914) noted it as a pest of lucerne, green gram and horsegram in the plains of South India. Apart from these no other information is available on this pest. The present paper embodies the results of studies made on the biology and behaviour of this insect.

For these studies the eggs, caterpillars and pupae were collected from the field on cowpea, blackgram, greengram and horsegram, and reared in hurricane chimneys

and specimen tubes in the laboratory. To study the life history the insect was reared on seedlings of green gram grown in specimen tubes and in pots.

Mating and Oviposition

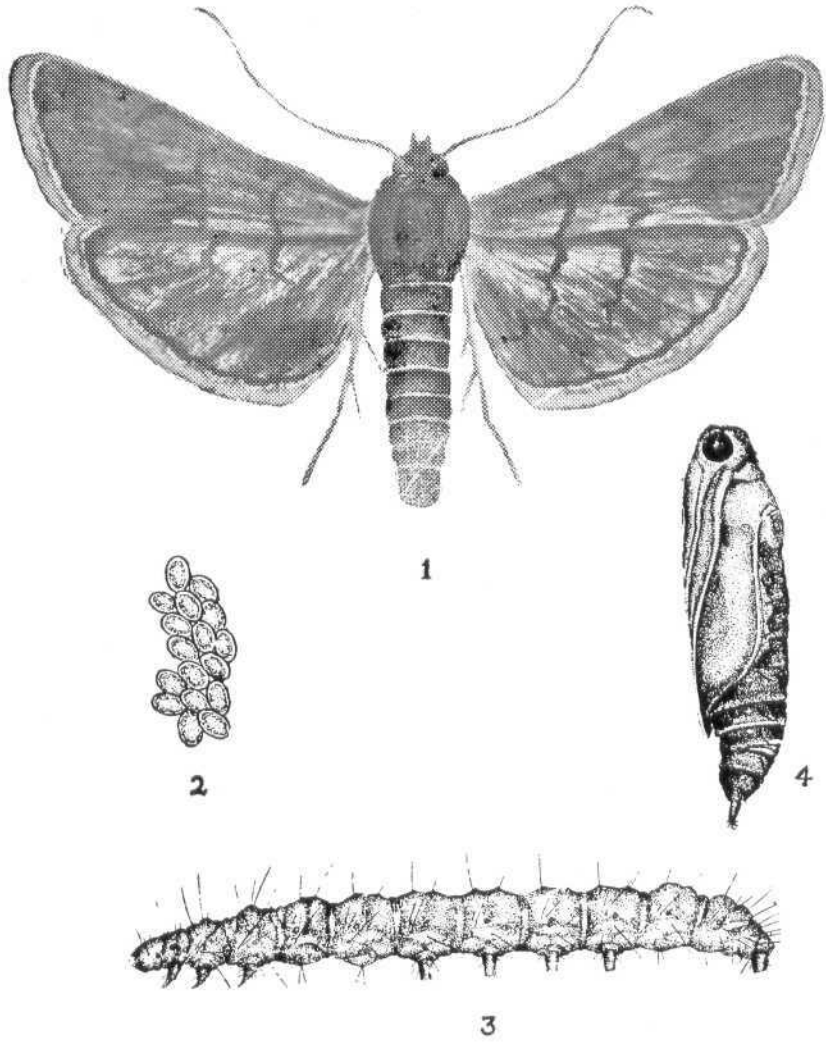
Mating takes place at night, 24 hours after the emergence of the adults, each copulation lasting 10 — 15 minutes. Oviposition commences in a day after mating. Eggs are laid on the tender leaves of host plants, usually on the under surface, in straight rows of 10 to 15 eggs each or in irregular clusters without any definite arrangement or even scattered singly. The number of eggs laid by a female moth varies from 433 to 688, the average being 542, laid during a period of 5 - - 6 days. The number of eggs laid per day by a female moth varies from 19 to 234.

Egg (Fig. 2)

The eggs are cream coloured, flat, oval and scale-like arranged like the scales of fish, measuring 0.6 mm in length and 0.45mm

* Part of the Thesis submitted by the senior author to the University of Kerala in partial fulfilment of the requirements for the M. Sc. (Agri) degree, 1963

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Figs 1—4. 1. *Nacoleia vulgalis* Guence. Adult 2. Egg 3. Larva 4. Pupa

in width. Chorion is thick, leathery and translucent with the surface thrown into longitudinal folds conspicuous in the centre. The egg period lasts for 4.1 days on an average.

The larva (Fig. 3)

The eggs hatch during the early hours of the day and the tiny caterpillar emerges through a longitudinal slit which is latero-terminal in position. Soon after hatching the caterpillars are active, wander about in all directions for the first two to three hours and then congregate near the base of the tender leaves on the lower surface in between the veins. Then they start nibbling at the green tissues of the leaves. After about a day, they disperse in all directions. Then the individuals web neighbouring lea-

flets together with minute white silken threads, thus constructing a flimsy shelter and feed on the green tissues. In the second instar, the caterpillars twist and roll the terminal portions of the leaves into small cones and remain inside feeding on the green matter of the leaves. In subsequent instars the caterpillar webs together a number of leaves and feed from within voraciously, leaving only the main veins. After eating away a portion of one fold, the caterpillar leaves the fold and constructs another.

The caterpillar grows feeding on the leaves, undergoes 5 instars and becomes full-grown in 4 days. Details of the measurements and duration of the different instars are given in Table I. The full-grown

TABLE I

Average measurements and duration of different instars of *N. vulgalis* Gn.

Instar	Length (mm)	Width of head shield (mm.)	Width of 5th abd. segment (mm.)	Duration (days)
I	1.55	0.20	0.25	3.1
II	3.00	0.40	0.45	2.1
III	6.50	0.60	0.60	2.1
IV	9.00	0.80	1.00	2.3
V	15.00	1.40	2.00	4 4

caterpillar is yellowish green in colour with the head brown and prothoracic shield yellowish brown, the latter bearing one longitudinal dumbel-shaped black spot on

either side and a raised pinnaculum-like area bearing a horse-shoe-shaped brownish chitinisation along the posterior margin. The body is covered with sparse tubercular hairs.

The pupa (Fig. 4)

When full-grown the caterpillar stops feeding, becomes sluggish and moves to darker places. It rolls a fresh leaf, constructs a thin, delicate, fluffy whitish cocoon inside the roll and remains within the cocoon quiescent before turning itself into the pupa. The pupa just after moulting is pale greenish or creamy white in colour and turns brown subsequently. It measures 1.1 cm in length and 3 mm in breadth. The pupal period lasts on an average 5.3 days.

Adult (Fig. 1)

The adult moth has been described by Hampson (1876). The general body colour is yellowish brown. The female moth is slightly bigger than the male moth, measuring 1 cm long and 2 cm broad across the stretched wings and the male 0.9 cm and 1.8 cm respectively.

The total period of life cycle from egg to adult occupies 22 — 25 days, the average being 23.4 days.

Longevity of adults

Under laboratory conditions, fed on diluted honey, unmated males and females survive on an average for 5.6 days and 6 days respectively, while the mated moths survive for 5.5 and 7.25 days respectively.

Sex ratio

Studies have shown that there is a preponderance of females over males in the ratio of 3:2.

Seasonal occurrence

The pest is seasonal in occurrence and is usually present in abundance during September to January although it may be present in the field throughout the year.

Food plants

Lefroy (1909) recorded this insect on lucerne, soybean and *Phaseolus radiatus* and Fletcher (1914) also noted it on lucerne, greengram and blackgram. In the present studies it has been found attacking blackgram (*Phaseolus mungu* L.), green gram (*P. radiatus*), horse gram (*Dolichos biflorus* L.), cow pea (*Vigna catieng* E), red gram (*Cajanus indicus* S.), *Calapagonium muconoides*, a cover crop of rubber plantations and *Moghania macrophylla*, a host plant of the lac insect. Of these, blackgram and horse gram appeared to be the most favoured host plants. During the off season of pulse crops, the pest migrates to the cover crop *Calapagonium muconoides* which continues to be in the field throughout the year. The pest is seen attacking the host plants throughout the growth period of the crop. On red gram and *Moghania macrophylla* the attack is rare.

Nature and extent of damage

The damage to the crops is caused by the caterpillars feeding on the leaves. In the younger stages, the caterpillars feed in groups on the green matter at the lower base of the leaves, leaving the upper epidermis intact and the infected portions look like white papery patches and these leaves gradually dry up. In the seedling stages this damage seriously affects the health and vigour of the plants. In the later stages, the caterpillars roll the individual leaves or web a number of leaves together and feed from within, skeletonising whole leaves.

Status as a pest

Lefroy (1909) recorded *Nacoleia vulgalis* Gn. as a common pest of pulses while Fletcher (1914) mentioned it as a minor pest.

In recent years this pest has been observed as a very common pest of cultivated pulses in Kerala. Very often the damage caused is serious, especially in the case of young crops. Young plants, if attacked, remain stunted and very often get killed. Attack in the later stages of the crop causes a general deterioration of the crop. On the whole *N. vulgalis* Gn. can be considered as an important pest of pulses, if not a major one.

Natural enemies

The larvae were found attacked in the field by *Cardiochiles fulvus* Cam. (Braconidae), *Xanthopimpla punctator* L. (Ichneumonidae) and a Tachinid fly (unidentified).

Acknowledgement

The authors are thankful to Dr. C.K.N. Nair, Principal and Additional Director of Agriculture (Research), Agricultural College and Research Institute, Vellayani, for providing necessary facilities for the work and to Dr. M. R. G. K. Nair, Professor of Entomology, for his helpful suggestions in the execution of this work and for correction of the manuscript.

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