

## BIOLOGY AND BIONOMICS OF INSECT PESTS OF CINNAMON\*

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### ABSTRACT

The major pests affecting cinnamon include *Chilusa clytie* L., *Sorolopha archimedi* Meyr., *Acrocercops* sp. near *telestis* Meyr., *Popillia complanata* Newm., and *Singhala helleri* Ohs. The minor pests are *Sauris* sp., *Ceroplastes rubens* Mask., *Apoderus scitulus* Walker, and *Oecophylla smaragdina* F. The nature and extent of damage and biology and seasonal abundance of these pests are discussed.

### INTRODUCTION

Cinnamon, *Cinnamomum zeylanicum* Breyn (Lauraceae), is one of the important tree spices. Though a hardy tree, cinnamon plant is attacked by a variety of insect pests. These pests are responsible for considerable reduction in the yield of cinnamon bark, the economic product, and for reducing also the quality of the produce.

Very little information is available on the insect pests affecting this crop. Ayyar (1940) reported a jumping bug, (*Pauropsylla depressa* C.), the nymphs and adults of which produced galls on leaves and shoots of cinnamon. Mani (1973) recorded five species of insects and mites causing leaf galls and one insect producing inflorescence galls. To bridge the lacunae in our knowledge, a project on the biology and bionomics of the insect pests affecting cinnamon crop was initiated in 1974. The results achieved so far from these studies are reported in this paper.

The major pests include cinnamon butterfly, shoot and leaf webber, leaf miner, chafer beetle, and leaf beetle, while pests of minor importance are semilooper, scales, leaf tip twisting weevil, red ants, leaf and shoot gall forming insects, and mites. Brief descriptions on the nature and extent of damage by these pests and their life history are given.

#### 1. Cinnamon butterfly, *Chilusa clytie* L. (Lepidoptera: Papilionidae)

This is the most destructive pest of cinnamon. It is widely distributed in all the cinnamon growing tracts of India. This pest begins to appear from December onwards when the trees put forth new flushes. The pest is present in the field upto June. It also attacks wild species of cinnamon, and has also been reported on other plants like *Alseodaphne semecarpifolia*, *Litsaea sebifera*, *Machilus gamblei*, and *Phoebe lanceolata* (Beeson, 1941).

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The butterfly usually lays eggs singly on the upper and lower surfaces of young leaves, petioles and even on tender shoots. Eggs are small, round, smooth and pale-yellow, and measure 1 mm in diameter. The incubation period lasts for 3-4 days. The caterpillar stage, comprising five instars, is completed in 11-17 days. Newly hatched caterpillar is more or less cylindrical, slightly green with one pale-yellow dorsal line, and irregular whitish stripes. It measures  $2.0 \times 0.5$  mm. When full grown, the caterpillar is pale yellow with dark stripes on the sides of the body, and measures  $25 \times 7$  mm. The prepupal stage lasts for one day. It becomes sluggish before pupation and makes a rough silken padding and a girdle on the stem by two silken supports anteriorly and posteriorly. The pupa is grey in colour with two longitudinal black markings, which are anteriorly broad and posteriorly tapering. The pupal period lasts for 11-13 days. The longevity of the adult is only 3 days in the laboratory. The butterflies are black in colour with white irregular spots on the outer margins of the fore and hind wings and measure  $95 \times 25$  mm with wings expanded (Fig. 1). The sex ratio is 1.0:1.5 (male:female). The total life cycle lasts for 24-36 days.

The first instar caterpillar, soon after hatching, feeds on its own egg shell and then starts feeding on the lamina of the freshly emerged leaves, whereas the subsequent instars feed on the tender leaves voraciously either from their margins or centres (Fig. 2). Only the mid-ribs with portions of the veins are left behind in badly infested leaves. Infestation by this pest may adversely affect the normal growth of the plant.

The eggs collected from the field were found to be heavily parasitised by *Telenomus remus* Nixon (Hymenoptera: Scelionidae). The number of parasites that emerged from a single egg varied from 5 to 8. More than 50% of the eggs collected from the field during December and January were parasitised

by *T. remus*. The pest and parasite populations declined with the onset of south-west monsoon.

Laboratory studies showed that the entomogenous bacterium *Enterobacter cloacae* isolated from *Udaspes folus* Cram. produced septicaemia in cinnamon leaf caterpillars when the inoculum was applied to leaves as a spray (Radhakrishnan Nair *et al.*, 1974).

## 2. Shoot and leaf webber, *Sorolopha archimedis* Meyr. (Lepidoptera: Tortricidae)

This is another destructive pest of cinnamon. The pest is abundant in the field during August. The adult is grey with dark black spots on the fore wings and measures  $15 \times 7$  mm with wings expanded. A gravid female lays 20-30 eggs singly on the newly emerged leaves. The eggs are round, creamy-white, and measure 0.5 mm in diameter. The incubation period is 3-4 days. The pale-green caterpillars web the tender leaves and shoot together with silken threads, remain inside, and feed on them. The larvae are very active and sensitive even to the slightest disturbance. Larval period with different instars is completed in 10 days. When full grown the caterpillar becomes brownish-black, makes a silken cocoon, and undergoes pupation inside the webbed leaves. The pupal period lasts for 6-7 days. The longevity of adult is 3-4 days in the laboratory. In severe cases of infestation, most of the leaves are rolled up and eaten by the caterpillars. The continuous infestation of this pest on young plants results in reducing their normal growth.

## 3. Leaf miner *Acrocercops* sp. near *telestis* Meyr. (Lepidoptera: Gracillariidae)

The adults are tiny greyish-yellow moths with narrow, long, fringed wings. The anterior portion of body remains in an elevated manner in the resting posture.

The small pale caterpillars mine into the tender leaves. The infested leaves present a

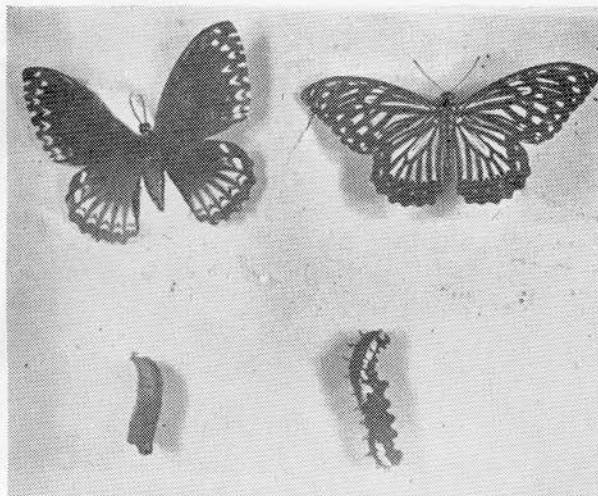


Fig. 1. Cinnamon butterfly *Chilasa clytie* adults.



Fig. 3. Cinnamon leaves damaged by caterpillars of leaf miner *Acrocercops* sp.

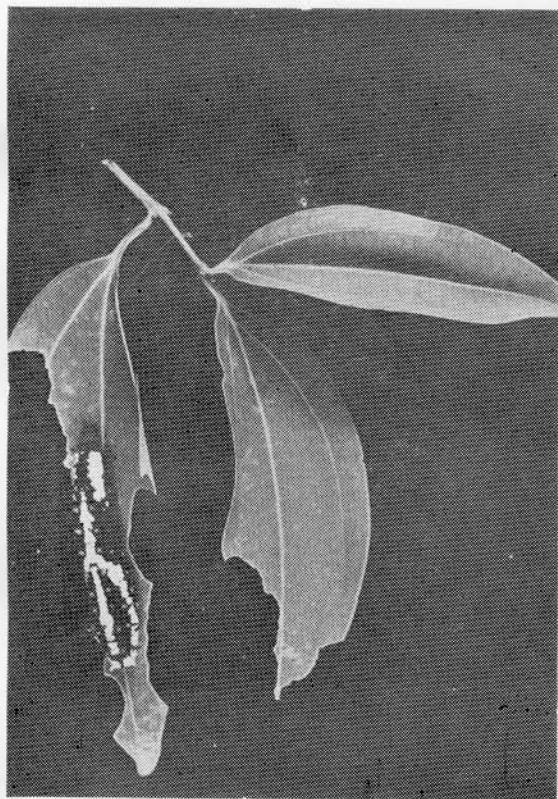


Fig. 2. *C. clytie* caterpillar feeding on Cinnamon leaves.



Fig. 4. The Reduvild bug *Synanus collaris* predaceous on the leaf beetle *Singhala helleri*.

sort of crinkled or distorted appearance. Finally, the affected portions of the leaves get dried up and holes are formed in the lamina. Infested leaf shows a peculiar type of blisters of irregular shape and size lodging tiny caterpillars inside (Fig. 3). The caterpillars make linear and tortuous mines which end in blotches. Fully grown caterpillars have normally red or pinkish colour just prior to pupation. On a single leaf 6-25 such infested areas are observed with caterpillars inside. When full grown, the caterpillars, come out of the infested area and form a cocoon in the folded leaves and pupate inside. The pupal period lasts for 7 days. The pest is abundant in the field during the south-west monsoon period.

4. Chafer beetle, **Popillia complanata** Newman (Coleoptera: Scarabaeidae: Rutelinae).

The adults measure 15×6 mm. They are bright brown in colour with head and thorax metallic green and elytra brown. The beetles feed at night and hide under the cinnamon leaves or in grasses on the ground during day time. This has been recorded on other crop plants like cashew, mango, and rose also (Sreeramulu *et al.*, 1975). The pest is most abundant in the field during July and August.

Both the grubs and adults cause damage. The grubs feed on the roots of cinnamon plant and the adults on tender foliage. In severe cases, most of the young leaves are eaten away by these beetles.

Eggs are laid in the soil near the root zone. They are oval, white, and measure 2.0×1.5 mm. The incubation period lasts for 5 days. The newly emerged grubs are white and measure 2.5×1.0 mm. The young grubs start feeding on roots. The grub period lasts for 10 days. The pupation takes place in the soil in earthen cocoons. The pupal period lasts for 15 days.

5. Leaf beetle, **Singhala helleri** Ohs. (Coleoptera: Scarabaeidae: Rutelinae).

This beetle also causes serious damage to cinnamon. The beetles congregate in groups of 3-15 and feed on the leaves. They are slow fliers. When disturbed, they fall to the ground, start burrowing in the soil, and hide there. They are brown to dark-brown in colour and measure 8×5 mm. The beetle causes damage by feeding on foliage, while the immature stages (grubs) feed on the roots. The adult beetles generally feed by making irregular holes on new leaves. The peak period of infestation is August-October.

The eggs are laid in the soil. They are round, white, and measure 1 mm in diameter. The eggs of *S. helleri* are smaller than those of *P. complanata*.

A Reduviid bug *Sycanus collaris* (Fabr.), predacious on adults of *S. helleri* was recorded. It has black wings and measures 20×5 mm (male) and 25×7 mm (female) (Fig. 4). A gravid female lays about 103-115 eggs in a patch. The eggs are subcylindrical, dark-brown, and measure 3.0×0.5 mm. The incubation period lasts for 11 days at a temperature range of 27-30°C and relative humidity of 85-95%. Nymphal period comprising five instars (17, 11, 10, 15, and 24 days, respectively) lasts for 77 days. The longevity of the adult is 15 days in the laboratory. The total life cycle takes for 103 days.

6. Semilooper, **Sauris** sp. (Lepidoptera: Geometridae)

The adult moth is blackish-grey in colour and measures 25×15 mm with wings expanded. The eggs are laid singly on the margin of leaves. They are cylindrical, creamy-white and measure 2.0×0.1 mm. On a single leaf 2-5 eggs have been noticed. Incubation period lasts for 3 days, larval period 10-15 days, and pupal period 7 days.

The first instar caterpillars, soon after hatching, start feeding on young shoots and leaves. These caterpillars feed generally

from margins of the leaves and gradually consume the whole leaf. The newly hatched caterpillars are green in colour and measure  $3 \times 1$  mm, while full grown ones measure  $25-30$  mm  $\times$   $2.3$  mm.

7. Leaf scale *Ceroplastes rubens* Mask. (Homoptera:Coccidae).

The scale also causes damage to cinnamon to some extent. They are usually seen on midribs, though sometimes, they are observed on the entire lamina. They suck the sap from the leaves, and the infested leaves become black. As a result of severe infestation by these scales, the whole plant turns sooty. The growth of the plant may be adversely affected.

8. Leaf tip twisting weevil, *Apoderus scitulus* Wlk. (Coleoptera: Attelabidae).

The adult is a reddish-brown weevil and measures  $4.7$  mm  $\times$   $2.7$  mm. The weevils twist the cinnamon leaves into rolls and lay the eggs singly. Eggs are white, oval, and measure  $2.0 \times 1.5$  mm. The entire life cycle is completed in the "leaf twist" itself.

9. Red ant *Oecophylla smaragdina* (F) (Hymenoptera:Formicidae).

A group of red ants sometimes makes nest by twining together the leaves of cinnamon plants. These destroy the leaves and often become a nuisance, particularly at the time of harvest. They move about in long trains all over the branches and also are responsible for dispersal of different kinds of noxious scales and mealybugs from plant to plant. The presence of the ants is also annoying as they sting people severely.

10. Leaf and shoot galls.

Gall producing insects and mites also damage cinnamon leaves, shoots, and occasionally the inflorescences. Mani (1973) recorded leaf galls caused by *Eriophyes doctersi* Nalepa and *Eriophyes* sp. (Acarina:

Eriophyidae) and an unknown Psyllidae, and inflorescence galls produced by an unknown Itonidae.

Other insect pests observed on cinnamon plants are *Euproctis fraterna* Moore (Lepidoptera: Lymantriidae), *Dasychira mendosa* Swinh. (Lepidoptera: Lymantriidae), *Mylloceris subfasciatus* Guer. (Coleoptera: Curculionidae), *Semiothisa* sp. (Lepidoptera: Geometridae), and *Selepa celtis* Moore (Lepidoptera: Noctuidae). Prem Kumar *et al.* (1976) observed the berry weevil *Alcides morio* (Coleoptera: Curculionidae), the grubs of which feed on the inner contents of berries and render them hollow. The intensity of infestation of cinnamon berries by *A. morio* goes upto 60%

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