Journal of Plantation Crops 9 (2) : 119–123 December, 1981

BIOLOGY OF *DICHOCROCIS PUNCTIFERALIS* GUEN. ON TURMERIC*

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ABSTRACT

Dichocrocis punctiferalis Guen. is a polyphagous pest with twenty two species of alternate host plants. Moths have punctilious requirements for egg laying in captivity and it was found that an ambient temperature of 22°C – 31°C and relative humidity in the range of 50–90% were favourable for oviposition. Out of the five larval instars, 4th and 5th were voracious feeders. The life cycle was completed in 33–52 days under laboratory conditions. Seven saprophytic dipteran flies were found associated with the shoot borer. Among the predators and parasites, the dermapteran *Euborellia stali* (Dohrn.) and the mermithid nematode have some significant role in controlling the shoot borer population in the field.

INTRODUCTION

Dichocrocis punctiferalis Guen. is an important polyphagous pest with 22 alternate hosts recorded on cash crops, fruit crops and wild trees (Jacob, 1980). David, Narayanaswamy and Murugesan (1964) while working on bionomics of the pest on castor capsules reported that moths did not lay eggs under captivity. The pest causes dead hearts by feeding on the growing tissues of ginger and turmeric and it attacks both shoots and capsules of cardamom. In view of its importance on these crops, work was initiated and its biology and some of the biotic factors on turmeric were studied, and reported in this paper.

MATERIALS AND METHODS

These studies were carried out during three crop seasons from 1978 to 1981. During September – November period temperature in the laboratory ranged from 30°C to 33°C and relative humidity from 60% to 90% (day and night). At the same time, in the open air during day, temperature ranged from 29°C to 32.5°C and the relative humidity from 50% to 65%. The night temperature and relative humidity in the open air during above period ranged from 22°C to 24°C and 85% to 90% respectively.

Large numbers of pupae and grown up caterpillars were collected from field and reared in the laboratory. The caterpillars were fed with pseudostems of turmeric until pupation. Young turmeric plants with 4-5 leaves, raised in polythene bags (15cm × 10cm) were placed in large round glass jars (volume 0.032 cu. m.) and covered with muslin cloth over the jars and fastened with elastic bands. Freshly emerged

* *Contribution No. 202 of CPCRI, Kasaragod.*

male and virgin female moths were collected and released in the jars containing diluted honey as food. Jars with lesser volume (0.012 cu. m.) was also prepared as described above. These two types of jars with moths were kept inside and outside the laboratory. When eggs were laid, plants containing them were carefully removed and observed. The newly hatched first instar caterpillars were transferred to bits of turmeric pseudostems kept in petri dishes. Fresh pseudostem bits were replaced every two or three days depending upon the feeding rate.

RESULTS AND DISCUSSION

Egg laying

Moths did not lay eggs under laboratory conditions. However they laid eggs freely on growing shoots, petiole, muslin cloth and sides of large glass jars when kept outside the laboratory. Moths in smaller jars did not lay eggs even outside the laboratory. When honey was provided as food, moths laid approximately 30 - 60 eggs. The fecundity of the moths reduced drastically in the absence of honey and number of eggs varied from 0 to a maximum of 10. From these it was inferred that proper roominess, temperature, relative humidity and food are important requirements for oviposition. Pre-ovipositional period was 4-7 days and male moths died soon after mating.

Life history

The freshly laid eggs were elliptically umbonate shaped, pitted on surface and creamy white in colour. The colour of the egg gradually became pink and a black dot appeared on it before hatching. The incubation period was 3-4 days. The freshly hatched first instar caterpillars were transparent to light pink in colour with minute setae and a black head. It moved around for sometime on the lamina or petiole before ate its way into the core or heart of the plant through midrib, petiole and pseudostem. At the end of each instar, the head capsule with exuviae came out of the tunnel along with excreta and frass. There were five larval instars (Fig. 1).

Second instar caterpillar on moulting changed from cream white with a brown head to reddish yellow and to pale green towards the end of the instar. Pale orange to pale brown third instar caterpillar became light pink on moulting. The light brown fourth instar caterpillar with six warts or dark patches in each segment had usually a seta inside each wart. Each segment marked with a pair of spiracles and the thoracic and last abdominal spiracles were larger, black and deeply sclerotised. Fifth instar caterpillar weighing about 75-80 mg excreted on an average 925 mg faecal matter with a range from 500 to 1300 mg for a period of five days. Freshly moulted fifth instar caterpillar was cream white which became light brown when fully grown and reached a maximum length of 26 mm (Table I). The head was brown to black and retractable into a brown prothoracic shield. The legs were brown in colour. By webbing the frass and excreta, a cocoon was spun in the tunnelled pseudostem. The prepupa was cream white, shrunk and stout (Fig. 1) slightly curved backwards and remained

immobile. It moulted through a dorsal break developed and the exuviae rolled down to the anal end in a few seconds. The nascent pupae were cream yellow and 13-15 mm long, but soon sclerotised and became brown to dark brown in colour. The life cycle period (Table I) was found to vary during different seasons in laboratory (33-53 days) and open air conditions (31-43 days). Adult moths were light to deep yellow in colour with small black dots all over the body (Fig. 2) and with a wing span of 18 mm-21 mm.

Seasonal history

At Kasaragod the pest was observed only from late July to August when the turmeric plants have 4-5 leaves. From this period to October, life cycle in the field was completed in 27-30 days. The larval stage during this period was 15-18 days while in November-December it lasted 11-26 days. Accordingly during the winter months, life cycle was also prolonged upto 38 days. This is in agreement with the observation made by Patel and Gangrade (1971). Thus six to seven generations of the pest could be completed on turmeric during a crop season.

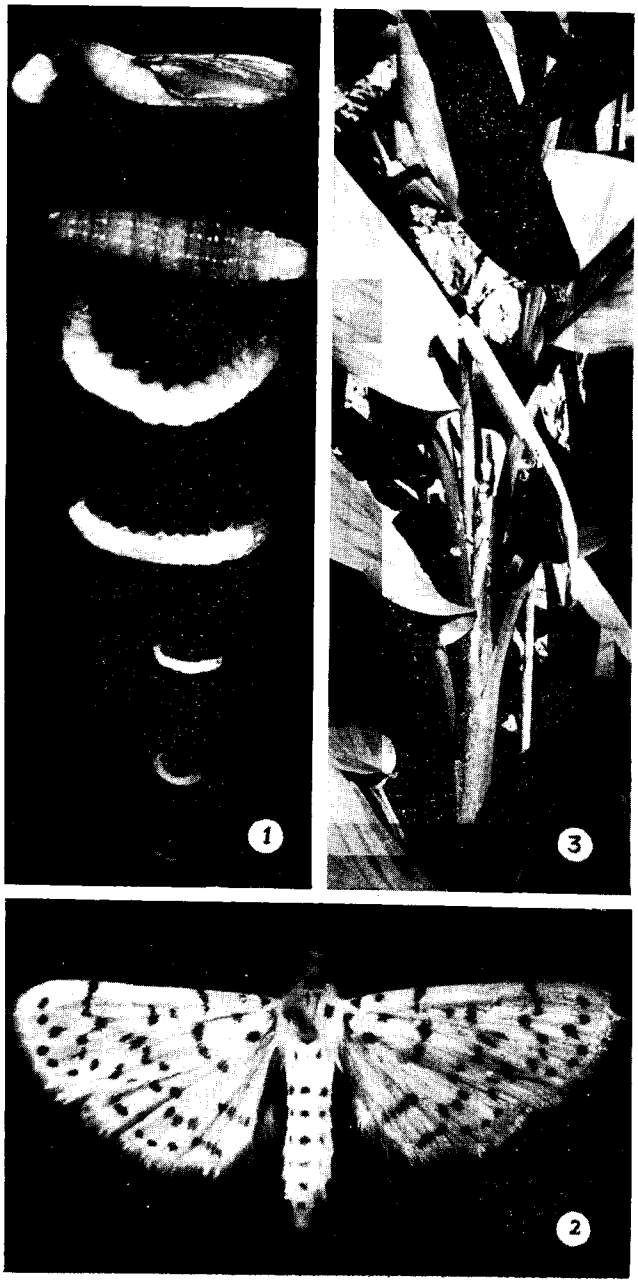
Nature of damage

The caterpillars reached the core or heart of the plant through the pseudostem and tunnelled down to the rhizome. The base of the growing bud was gnawed resulting the dead hearts or withered and dried shoots (Fig.3). On the pseudostems, a few exit holes were seen through which frass and excreta were strewn near the base of the affected plants and this was a clear symptom of

Table I. *Life history of* Dichocrocis punctiferalis *Guen. under laboratory conditions (October to December 1980)*

	I Instar		II Instar		III Instar		IV Instar		V Instar		Prepupa		Pupa
	Length (mm)	Period (days)	Length (mm)	Period (days)	Length (mm)	Period (days)	Length (mm)	Period (days)	Length (mm)	Period (days)	Length (mm)	Period (days)	Period (days)
Mean	3.06	3.06	6.29	4.43	9.83	5.13	13.1	5.36	23.33	10.56	17.33	3.67	9.50
S.E. ($\overline{X}$)	0.46	0.24	0.52	0.49	1.88	1.67	1.65	1.49	2.75	5.01	1.89	0.47	0.5
$X \pm \sigma$	3.06±.12	3.06±.60	6.29±.16	4.43±.13	9.83±.48	5.13±.43	13.1±.44	5.36±.39	23.33±.09	10.56±1.67	17.33±1.08	3.66±.27	9.5±.25
Range	2-4	3-4	5.5-7.5	5-5	7-14	3-7	10-16	3-8	16-26	7-14	16-20	3-4	9-10

FIG. 1. FIVE LARVAL INSTARS, PREPUPA AND PUPA OF *D. PUNCTIFERALIS*.
FIG. 2. ADULT MOTH. FIG. 3. SHOOT BORER AFFECTED PLANT.



shoot borer attack. When aerial growth was retarded towards harvest time, the caterpillars were frequently found feeding on the rhizomes also, leading to poor quality rhizomes. A number of saprophytic dipteran flies live on the excreta and damaged plant tissues and among them the following were identified:

Rivellia basilaris Wiedemann (Platystomatidae)

Poecilotraphera comperei Coq. (Platystomatidae)

Plagiostenoptera sp. (Platystomatidae)

Atherigona sp. (Muscidae)

Anatrichus pygmaeus Loew (Chloropidae)

Desmometopam nigrum Zett (Milichiidae)

Parasites and predators

Following parasites were recorded on the shoot borer.

Mermithid nematode (Nematoda: Mermithidae)

Myosoma sp. (Hymenoptera: Braconidae)

Xanthopimpla australis Kr. (Hymenoptera: Ichneumonidae) *X. australis* was recorded on the shoot borer of cardamom also (Anonymous, 1981).

Following general predators were recorded in turmeric fields feeding on variety of insects including different stages of the shoot borer.

Euborellia stali Dohrn (Dermaptera: Carcinophoridae)

Philodicus sp. (Diptera: Asilidae)

Heligmoneura sp. (Diptera: Asilidae)

Araneus sp. (Spider – Araneae: Argiopidae)

Micaria sp. (Spider – Araneae: Clubionidae)

Thyene sp. (Spider – Araneae: Salticidae)

Among these parasites and Predators, the mermithid nematode and *Euborellia stali* seems to have some significant role in the suppression of the pest in the field.

ACKNOWLEDGEMENTS

The Author is grateful to Dr. N. M. Nayar, Director and Dr. M. C. Nambiar, Project Co-ordinator, AICSCIP, Central Plantation Crops Research Institute for their keen interest in the work. He is also grateful to the Director, Commonwealth Institute of Entomology, London for identification of some of the insects and spiders.

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