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Biology of early shoot borer, *Chilo infuscatellus* (Snellen) in sugarcane

Poornima V Matti**Abstract**

Studies on biology of the sugarcane Early Shoot Borer, *Chilo infuscatellus* Snellen in laboratory conditions during 2017-18 of ARS, Sankeshwar, Karnataka to know the feeding habit and duration of different development stages, weak link and behavior of insect, which in turn help in its management. ESB larvae were collected from sugarcane Var. Co 86032 and was reared on small cut pieces (7-10 cm) of sugarcane shoots. It revealed that life cycle on sugarcane stalks of Co-86032, ranged from 30.60-33.70 days with an average of 32.30 ± 0.15 days. The female laid eggs in a several masses on the ventral and dorsal surface of leaves close to the midrib. Incubation period of egg ranged from 4.00-4.40 days with an average of 4.20 ± 0.10 days. The larva passed through five instars and total larval period ranged from 16.50-17.70 days with an average of 17.25 ± 0.26 days. Pupation was inside stem in silken cocoon and the pupal duration varied from 6.40-7.00 days with an average of 6.70 ± 0.07 days. Longevity of male moths ranged from 3.40-4.20 days with an average of 3.80 ± 0.04 days whereas, female moths 4.00-5.00 days with an average of 4.50 ± 0.09 days.

Keywords: biology, behavior, *Chilo infuscatellus*, early shoot borer, laboratory, sugarcane

Introduction

Sugarcane is a long duration crop. The global demand for sugar is the primary driver of sugarcane agriculture. Cane accounts for 80% of sugar produced. Sugarcane predominantly grows in the tropical and subtropical regions. The production and productivity of the sugarcane is affected by many factors viz., soil type, selection of variety, fertilizer management, irrigation management and insect pests. Sugar industry is the second largest agro-based industry which comprises of more than 500 sugar mills, next to textiles ^[1]. In India sugarcane occupies an area of 4.51 million ha with annual production of 305.25 million tones and productivity of 67.57 tones per ha, whereas in Haryana, it occupies an area of 0.11 million ha with the production of 8.53 million tones and productivity of 74.21 tonnes per ha ^[2]. Sugarcane is damaged by many insect pests, among early shoot borer is one of the serious pest of peninsular India. In India, 211 species have been recorded, out of which 18 species have attained major pest status ^[3]. Among various insect-pests, termites, borers, pyrilla, whiteflies and bugs etc, attack the crop and causes heavy losses in yield and quantity. Early Shoot Borer, *Chilo infuscatellus* is considered as vital pest in early crop growth stage, which destroys 26-65% of mother shoots and causes losses of cane yield of 22-33%. *Chilo infuscatellus* destroys approximately 60 per cent of the mother shoots, 35 to 43 per cent of tillers and 15.80 to 41.8 per cent reduction in yield which ultimately reduces cane yield ^[4]. In India, this species is widely distributed particularly in sugarcane growing parts of country (Karnataka, Bihar, Haryana, Punjab, Uttar Pradesh, Gujarat and Tamil Nadu).

Biology of the pest is essential to know the feeding habit and duration of different development stages and behavior which in turn help in its management. The information on biology of a pest is a condition precedent to work out its control measures. In view to identify weak link and behavior of insect, it is necessary to study the biology of sugarcane early shoot borer.

Materials and Methods

Field conditions: Deposition of eggs by ESB moth has observed during February - March and slowly it reached peak during April and May, When the average maximum and minimum temperatures ranged from 36.00 to 38.86 °C and 21.85 to 24.00 °C respectively prevailed during both year.

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Insect Rearing

Life cycle studies of the sugarcane ESB, *Chilo infuscatellus* Snellen was carried out in laboratory conditions of ARS, Sankeshwar, Karnataka during 2017-18. In order to study the biology of the ESB, *Chilo infuscatellus* in laboratory conditions, the culture of *Chilo infuscatellus* was raised by collecting larvae from sugarcane Var. Co 86032 and was reared on small cut pieces (7-10 cm) of sugarcane shoots. A slanting cut was given to cut pieces with the help of knife leaving and cut pieces containing larvae were kept in glass jars which were covered with muslin cloth. Fresh food was changed on alternate days. Observations were recorded on oviposition period, larval duration, larval length and width of 1st to 5th instar larvae, pupal duration and length, width of male and female pupa: length of male and female moth.

Statistical Analysis: The data collected during the present studies was statistically analyzed by calculating mean value. The standard deviation was also calculated for all biological parameters.

Results and Discussion

Biology

Egg: The incubation period ranged from 4.00-4.40 days with an average of 4.20 ± 0.10 days. Incubation period ranged from 4 to 6 days with an average of 4.76 days⁵.

Larva

1st instar: Grayish white larvae with black head and larval period of 1st ranged from 2.00-2.30 days with an average of 2.20 ± 0.06 days.

2nd instar: Larva was dirty white in colour with prominent dark stripes on mid dorsal portion and impressions of the stripes were found on the body. Whereas, larval period of 2nd instar was ranged from 3.00-3.20 days with an average of 3.25 ± 0.12 days.

3rd instar: Larva was dirty white in colour with dark black head. Whereas, larval period was ranged from 3.30-3.50 days with an average of 3.50 ± 0.12 days.

4th and 5th instar: Both instars were dirty white in colour with dark brown head and body of 4th instar was measured on an average 16.00mm in length and 3.34 ± 0.06 mm in width, whereas the average length of fifth instar was 23.95 ± 0.07 mm and 3.65 ± 0.05 mm of width. Larval period of 4th instar was ranged from 3.60-3.80 days with an average of 3.70 ± 0.14 days, whereas 5th instar larvae ranged from 4.60- 4.90 days with an average of 4.75 ± 0.11 days.

Fourth instar larva was dirty white in colour with dark brown head. They also reported that the five violet stripes were observed on the body of the larvae. They further reported that the fifth instar was dirty white in colour with dark brown head with five violet up to second thoracic to eighth abdominal segment and crochets on the prolegs were arranged in the form of incomplete circle which open towards outside give support to present investigations^[5].

The present findings on larval instars and duration are in accordance with the findings of Bhavani 2013 who reported that larvae of *C. infuscatellus* passed through four moults with five instars and mean duration of 2.19, 3.21, 3.31, 3.60 and 4.72 days. Larvae of *C. infuscatellus* passed through five instars with a duration of 2.60, 3.73, 4.08, 4.88 and 6.08 days also give support to present findings. The variations in number and duration of larval instars of present investigations and that of earlier workers may be due to different genotypes used as host plant, or due to climatic meteorological variations at time of experimentation⁵.

Pupa: Pupa was oblong type and light to dark brown in colour. Male pupa was measured on an average of 13.40 ± 0.10 mm in length and 2.50 ± 0.13 mm in width. The female pupa was slightly bigger in size and was 17.30 ± 0.08 mm in length and 3.46 ± 0.04 mm in width. The findings are comparable with the approximate length of male pupa 13mm and that of female as 17mm. In laboratory conditions, pupal period was ranged from 6.40- 7.00 days with an average of 6.70 ± 0.07 mm^{7,8}. The results are similar with findings of⁶ who reported the approximate length of male pupa as 13mm and female pupa as 17mm.

Adult: The longevity of male and female moths ranged from 3.40-4.20 days with an average of 3.80 ± 0.04 days and 4.00-5.00 days with an average of 4.50 ± 0.09 days.

Total life cycle: Life history indicated that the ESB, on stalks in laboratory it ranged from 30.60-33.70 days with an average of 32.30 ± 0.15 days.

The present findings are in line with^{8 and 9} reported that the one life cycle was completed in 31.96 to 32.63 days. Investigation carried out during 2009 on biology of sugarcane early shoot borer, *Chilo infuscatellus* Snellen revealed that the female laid eggs in a several masses on the ventral/dorsal surface of leaves close to the midrib. The egg laying capacity was 222 to 488 and incubation period ranged from 4 to 6 days with an average of 4.76 ± 0.66 days. The larva passed through five instars and total larval period ranged from 19 to 24 days with an average of 21.36 ± 1.32 days. Pupation was inside stem in silken cocoon and the pupal duration varied from 6 to 8 days with an average of 7.16 ± 0.62 days. Total life cycle occupied 28.50 to 36.50 days with an average of 32.60 ± 4.07 days. The sex ratio of male to female was found 1: 2.1⁵.

Results on biology of *C. infuscatellus* revealed that incubation period varied from 3 to 5 days. The larvae of *C. infuscatellus* moulted four times and passed through five instars. Total larval duration of *C. infuscatellus* ranged from 18 to 26 days with an average of 22.31 ± 1.16 days. The pupal duration of *C. infuscatellus* female ranged from 4 to 6 days and duration of male pupae varied from 4 to 5 days. Longevity of female moths varied from 3 to 5 days with an average of 4.07 days whereas longevity of male moths ranged from 3 to 4 days with an average of 3.24 days. The total life span of *Chilo infuscatellus* ranged from 29 to 44 days for female and 29 to 42 days for male^[6].

Table 1: Duration of different developmental stages of early shoot borer, *Chilo infuscatellus*

S. No	Stage of the insect	Range (days)	Mean	± SD
1.	Incubation Period	4.00-4.40	4.20	±0.10
2.	Larval period			
a.	I instar	2.00-2.30	2.20	±0.06
	II instar	3.00-3.20	3.25	±0.09
	III instar	3.30-3.50	3.35	±0.12
	IV instar	3.60-3.80	3.70	±0.14
	V instar	4.60-4.90	4.75	±0.11
	Total Larval period	16.50-17.70	17.25	±0.26
3.	Pupal Period	6.40-7.00	6.70	±0.07
4.	Adult longevity			
	Male	3.40-4.20	3.80	±0.04
	Female	4.00-5.00	4.50	±0.09
	Average	3.70-4.60	4.15	±0.06
	Total life cycle	30.60-33.70	32.30	±0.15

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