BIOLOGY OF SUGARCANE EARLY SHOOT BORER, *Chilo infuscatellus* SNELLEN (CRAMBIDAE: LEPIDOPTERA) IN SOUTH GUJARAT CONDITION

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ABSTRACT

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: 2.1.

KEY WORDS: Biology, Chilo infuscatellus, Sugarcane

INTRODUCTION

Sugarcane is an important commercial cash crop grown in India, supporting the second large agro-based industry. Gujarat occupies an area of 208 thousand hectares with an average productivity of 81.0 t/ha (Anonymous, 2009). More than a dozen pests were recorded as major pests in sugarcane. Among these, borers are one of the major groups having wide distribution. In South Gujarat, early shoot borer, *Chilo infuscatellus* Snellen and top shoot borer, *Scirpophaga excerptalis* Walker attack sugarcane at germination and tillering stage of crop growth and cause severe loss. Among the five borers, early shoot borer is a key pest in South Gujarat, India. According to Avasthy and Tiwari (1986), the early shoot borer causing economic loss up to 60 per cent. The pest infesting rainfed sugarcane crop severely taking a toll of over 70 per cent shoots (Prasad Rao *et al*., 1991). In view to develop of an effective management strategy, it was felt necessary to study the biology of sugarcane early shoot borer to know the weak link and behavior of insect.

MATERIALS AND METHODS

The biology of sugarcane early shoot borer, *C. infuscatellus* was studied in the Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India during 2009. Large number of larvae were collected from sugarcane field of Regional Sugarcane Research Station and brought to the laboratory for the further multiplication. They were reared in the glass jars. All the larval instars were reared with fresh soft cane setts (6 to 8 cm length). Larva was inserted into the cavity made on one

side of the cane, on the next day larva come out from the other end by feeding internal content. The same procedure was followed until the formation of pupa. Pupae obtained were kept in separate petri-dish (one pupa in one petri-dish) for adult emergence. Females were slightly bigger than the male moths. Antennae were lamellate and flat in male and filiform in female. Based on that marks of identification, the newly emerged male and female moth from the pupae were released in pairs, in glass jars in which cotton swabs were dipped in to 2 per cent sugar solution was kept as a source of food. Sugarcane plantlet was kept in a glass jar for enhancing oviposition by female moth. The female laid eggs on lower/upper surface of leaves of plantlet and this plantlet was carefully transferred in hatching jar. The plantlet was watered as and when required. The open end of hatching jar was covered with muslin cloth tied with rubber ring. Duration of different stages of early shoot borer was recorded based on variation in size of the body, morphological features along with moulted skin. Fecundity was documented by releasing 25 pairs of male and female moth in 25 glass jars with sugarcane plantlet for oviposition. Plantlet was replaced daily until the death of adults in view to record the average egg laying capacity of a female.

RESULTS AND DISCUSSION

The female laid 2 to 4 over lapping eggs rows parallel to midrib. The freshly laid eggs were transparent initially, later on turn to creamy white in colour and chorion colourless and transparent. The empty egg cells were conspicuous white, remain attached to the leaf. The eggs were oval and flattened dorsoventrally. An individual egg was measured and incubation period calculated (Table 1 and 2). The incubation period varied from 4 to 6 days with an average of 4.76 $\pm$ 0.66 days. The hatching percentage of egg of *C. infuscatellus* varied from 83.33 to 100 per cent with an average of 89.73 $\pm$ 2.99 per cent.

The sugarcane shoot borer larvae were moulted four time and pass through five instars. The freshly hatched larva was minute and dirty grey with black head. The black dots were present on abdominal tubercles. First instar larvae wandered for a few hours and reached the base of the stem by crawling or hanging by a silken thread. After forming spinnerets, the larvae dispersed with help of wind to surrounding plants. The second instar larva was showed dirty white in colour with black head and prominent dark lines on dorsal portion. The third instar larva was more distinct as compared to that of the second instar larva and having dark brown head. The fourth instar larva was found dirty white in colour with dark brown head. The abdominal segments were larger than third instar larva. The five violet stripes were observed on body of larvae. One on dorsal surface, one pair each on the sub dorsal and lateral surface of the body. The black spots were also observed on the tubercles, which were present on eight abdominal segments. The fifth instar larva was dirty white in colour with dark brown head with five violet stripes up to second thoracic to eight abdominal segment. The crochets on the prolegs were arranged in the form of incomplete circle which open towards outside. The body measured from 23.82 to 24.15 mm in length with an average of 24.02 $\pm$ 0.10 mm and the width 3.46 to 4.50 mm with an average of 3.56 $\pm$ 0.21 mm. The total larval period ranged from 19 to 24 days with an average of 21.36 $\pm$ 1.32 days (Table 1 and 2). Gupta (1940) reported that

the larval period lasted for 16 to 30 days in field and 21 days under laboratory condition.

The pupa was obtect type. Newly formed pupa was elongated, slender and yellowish to dark brown in colour. The genital aperture was situated on the ventral side of eighth abdominal segment in the form of slit in female. The genital aperture was situated on the raised oval sclerite with linear depression in the middle of ninth abdominal segment. Generally, one pupa was formed inside the seedling. Pupation took place in stem near the outer most leaf sheath in a silken cocoon. The average size of the male and female pupae was measured and pupal duration was recorded (Table 1 and 2).

The female moth was light straw to brownish in colour without any darker markings on the outer edge of the fore wings and the hind wings were grayish white in colour. The male moth was having light straw to brownish grey colour fore wing with dark marking on the outer edge and grayish white hind wings. The body length and wing expanse of the male and female moths were measured and given in Table 1. Adult longevity of male and female moths was varied from 3 to 4 and 3 to 5 days, respectively. The sex ratio of male to female was found 1: 2.1.

It is also noted from the data that fecundity ranged from 222 to 488 eggs per female. The egg hatching was ranged 89.73 to 100 per cent and total life cycle of the pest from egg to adult was occupied 28.50 to 36.50 days with an average of 32.60 $\pm$ 4.07 days. According to Gupta (1940), the entire life span of *C. infuscatellus* was 32 to 33 days in North India whereas, Sunil Kumar *et al.* (2004) reported that the one life cycle was completed in 31.96 to 32.63 days.

This information is useful to plan the management strategy based on weak link and insect behavior.

CONCLUSION

The female of sugarcane early shoot borer, *Chilo infuscatellus* Snellen laid 222 to 488 eggs in several masses on the ventral/dorsal surface of leaves close to the midrib. The egg period, larval period and pupal duration 4 to 6 days, 19 to 24 days and 6 to 8, respectively. Total life cycle occupied 28.50 to 36.50 days and sex ratio of male to female was found 1: 2.1.

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Table 1: Duration of different development stages of sugarcane early shoot borer, *C. infuscatellus*

Sr. No.	Stage	Duration (days)		
		Minimum	**Maximum**	***Mean ± SD**
1	Incubation period	4.00	6.00	4.76 ± 0.66
2	Larval period			
	I Instar	2.00	3.00	2.60 ± 0.50
	II Instar	3.00	4.00	3.73 ± 0.46
	III Instar	3.00	5.00	4.08 ± 0.64
	IV Instar	4.00	6.00	4.88 ± 0.53
	V Instar	5.00	8.00	6.08 ± 0.76
	Total larval period	19.00	24.00	21.36 ± 1.32
3	Pupal period	6.00	8.00	7.16 ± 0.62
4	Adult longevity			
	Without food			
	a. Male	3.00	4.00	3.32 ± 0.48
	b. Female	3.00	5.00	3.96 ± 0.73
	With food			
	a. Male	3.00	4.00	3.64 ± 0.49
	b. Female	4.00	5.00	4.52 ± 0.51
	Average	3.50	4.50	4.08 ± 0.71
5	Total life cycle	28.50	36.50	32.60 ± 4.07
6	Fecundity (No.)	222.00	488.00	349.08 ± 70.43
7	Per cent hatching	89.73	100.00	83.33 ± 2.99
8	Sex ratio	Male : Female = 1:2.1		

Average of 25 observations; SD: Standard deviation

Table 2: Measurement of life stages of sugarcane early shoot borer, *C. infuscatellus*

Sr. No.	Stage	Length (mm)			Width (mm)		
		Min.	Max.	*Mean ± S.D.	Min.	Max.	*Mean ± S.D.
1	Egg	0.84	0.96	0.91±0.04	0.62	0.69	0.66 ± 0.02
2	Larval						
	I Instar	1.83	1.90	1.86 ± 0.02	0.20	0.24	0.22 ± 0.01
	II Instar	5.17	5.28	5.23 ± 0.03	0.45	0.53	0.49 ± 0.03
	III Instar	11.95	12.12	12.04 ± 0.05	1.92	1.98	1.94 ± 0.02
	IV Instar	16.92	17.20	17.05 ± 0.09	2.82	2.95	2.88 ±0.04
	V Instar	23.82	24.15	24.02 ± 0.10	3.46	4.50	3.56 ± 0.21
3	Pupal	12.48	12.62	12.55 ± 0.04	2.10	2.26	2.19 ± 0.05
4	Adult						
	Male	9.85	9.96	9.90 ± 0.03	21.94	22.10	22.00 ± 0.04
	Female	13.36	13.48	13.41 ± 0.04	25.34	25.42	25.38 ± 0.02

Average of 25 observations; SD: Standard deviation

[MS received: November 14, 2014] *[MS accepted: December 08, 2014]*