

Estimation of the number and duration of larval instars of top shoot borer, *Scirpophaga excerptalis* Walker (Pyralidae : Lepidoptera) with some observations on their feeding habit

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ABSTRACT

The sugarcane top shoot borer, *Scirpophaga excerptalis* Walker was estimated to have five larval instars. The total duration of larval stage varied from 22 to 32 days. Mean durations of 1st, 2nd, 3rd, 4th and 5th instars were estimated in days as 8.5, 4.5, 5.0, 6.5 and 2.5 respectively. Only 5th instar larvae were found to damage the growing point of the cane, 23 to 27 days after infestation. Damage symptoms appeared in the infested cane 6 to 7 days after infestation.

INTRODUCTION

Top shoot borer, *Scirpophaga excerptalis* Walker is a serious pest of sugarcane in Bangladesh (Hazarika, 1952; Ahmad, 1962; Katir and Khan, 1973). Various aspects of its biology, feeding habit and field life cycles have been studied in some details by a number of authors (Haque and Agarwala, 1955; Kalra and Sidhu, 1965; Gupta, 1959; Butani, 1961; Rahman and Kabir, 1970; Rahman *et al*, 1979; Singh *et al*, 1980). But information on the number and duration of larval instars of *S. excerptalis* is surprisingly lacking.

It is reported (Kalra and Sidhu, 1965) that the borer larvae enters into the growing point by tunneling down through the spindle of folded leaves. And the damage caused by the pest consists mainly in killing the growing point of the cane, which results in the cessation of the plant growth. But the larval instar at which the growing point is killed and the time taken by a larva to reach the growing point are not known.

In the present paper the number of larval instars and their durations of development have been estimated by using Dyar's Law of larval growth (Dyar, 1890). Observations were also made to determine (i) the length of time a larva takes after its infestation to kill the growing point, (ii) the larval instar at which the growing point is killed and (iii) the time of appearance of damage symptoms after the infestation.

MATERIALS AND METHODS

Large numbers of egg masses of *S. Excerptalis* were collected from the field and kept in the laboratory till the larvae hatched. Potted sugarcane saplings (10-week old) of variety Co. 1158 were infested by the newly hatched larvae. Two to three larvae were released on each sapling to ensure its infestation by a larvae. Next day the saplings were transferred to and kept in the open till the experiment terminated. The saplings were watered regularly. Three to four infested plants were sampled daily following the day of release of the larvae. The sampled plants were dissected open and the larvae collected were preserved date-wise in 70% alcohol. At the time of dissection it was noted whether a larvae entered into the growing point; if entered, the larvae was preserved separately after proper labelling. This process of daily sampling was carried on till all the larvae developed into pupae. At the time of sampling it was also noted whether the damage symptoms were apparent.

The experiment was done during the months of April and May when the daily mean air temperatures ranged from 26 to 32°C.

Widths of head capsules of the preserved larvae were measured at 30-magnification under a microscope.

RESULTS AND DISCUSSION

(a) Larval instars and their durations

The data on the widths of head capsules of the larvae are plotted in the form of frequency distribution in Fig 1. In the frequency distribution of larval head widths five peaks are evident, each of which may be taken to represent a larval instar (Nishida and Torii, 1970). The mean and range of head widths in mm of each larval instar, as shown in Fig 1 are given below.

Instar	Range of head widths	Mean
I	0.251—0.400	0.322
II	0.451—0.550	0.479
III	0.701—0.900	0.806
IV	1.051—1.300	1.183
V	1.351—1.600	1.485

The range of time intervals at which moulting occurred is also shown in Fig 1. The mid-points of these ranges of time intervals may be taken as the mean time of moulting. And accordingly the length of time (mean and range) in days after infestation, at which a moult occurred may be derived from Fig 1 as follows :

Moult	Range of moulting (days)	Mean (mid-point of range)
I	7—10	8.5
II	9—17	13.0
III	15—21	18.0
IV	22—27	24.5
V	22—32	27.0

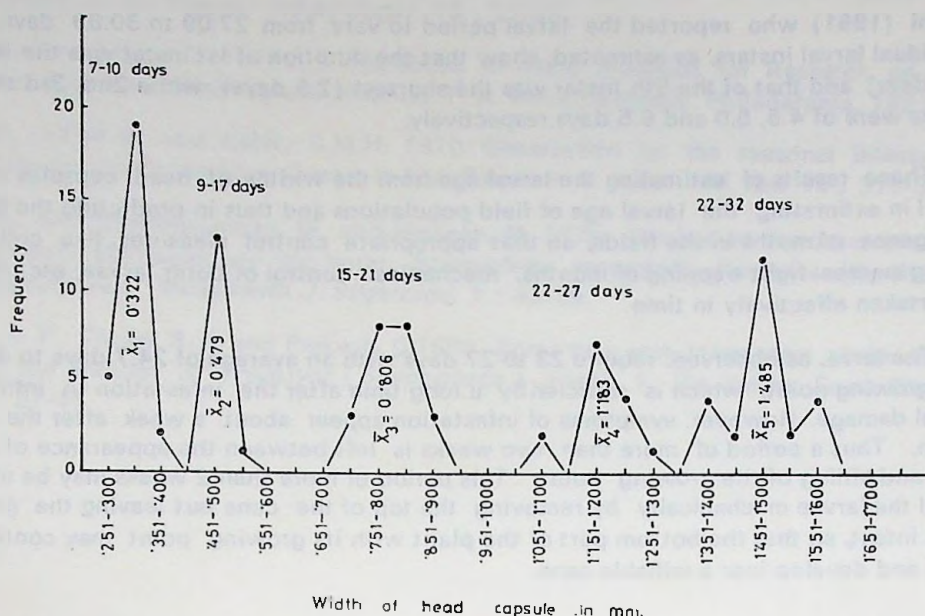


Figure 1. Frequency distribution of the widths of larval head capsule of *S. excerptalis* Walker and the of range of moulting intervals in days after hatching.

The mean duration of each instar in days may be calculated, as in the following, from the difference of the two consecutive mean moulting times shown above :

Instar	Duration
I	8.5
II	4.5 (13.0-8.5)
III	5.0 (18.0-13.0)
IV	6.5 (24.5-18.0)
V	2.5 (27.0-24.5)

(b) Observation on killing of growing point and symptoms of damage

The time taken by a larva after infestation to reach and kill the growing point, as observed, varied from 23 to 27 days with a mean of 24.7 days. The head widths of all the larvae found to destroy the growing point ranged from 1.367 to 1.600 mm which are the head widths of 5th instar larvae as shown Fig 1.

Clearly visible damage symptoms, like mid-rib tunnel, shot holes in the leaf lamina and partly charred 'dead heart' appeared 6 to 7 days after infestation.

From the results stated in the foregoing sections it appears that the larval stage of *S. excerptalis* lasts 22 to 32 days with mean of 27 days which is in close agreement with

Butani (1961) who reported the larval period to vary from 27.09 to 30.69 days. The individual larval instars, as estimated, show that the duration of 1st instar was the longest (8.5 days) and that of the 5th instar was the shortest (2.5 days) while 2nd, 3rd and 4th instars were of 4.5, 5.0 and 6.5 days respectively.

These results of estimating the larval age from the widths of head capsules may be useful in estimating the larval age of field populations and thus in predicting the time of emergence of moths in the fields, so that appropriate control measures, like collection of egg masses light trapping of moths, mechanical control of borer larvae, etc. may be undertaken effectively in time.

The larvae, as observed, require 23 to 27 days with an average of 24.7 days to destroy the growing point, which is sufficiently a long time after the infestation to inflict the actual damage. However, symptoms of infestation appear about a week after the infestation. Thus a period of more than two weeks is left between the appearance of symptoms and killing of the growing point. This period of more than 2 weeks may be utilized to kill the larvae mechanically by removing the top of the cane but leaving the growing point intact, so that the bottom part of the plant with its growing point may continue to grow and develop into a millable cane.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the help of Mr. Jamal Uddin and Mr. Mizanur Raman, Laboratory Assistants in collecting the egg masses and taking care of the experimental plants.

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