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Short Communications

Bionomics of Tobacco Stem Borer (*Gnorimoschema heliopa* Low)*

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Bidi tobacco is an important cash crop of Gujarat State. It is mainly cultivated in Kaira, Baroda and Ahmedabad districts. Such an important crop is attacked by several insect pests right from nursery to the storage. Of the various pests attacking bidi tobacco, stem borer is an important pest. The larva bores into the midrib and reaches the stem at ground level and prepares a gall. Due to the feeding of the larva on internal tissues of the gall the plant remains stunted and gives out numerous small leaves with broomy appearence figure. 1A., Patel, Patel and Patel (1959) reported the general life history of this insect. An attempt has been made here to study the detailed biology of stem borer.

Initial culture of tobacco stem borer was obtained by collecting large number of naturally infested stems and leaves from the fields of Bidi Toabcco Research Station. The infested stems and leaves were dissected to get the pupae. The pupae were sexed and kept in separate plastic bowls for adult emergence.

Fig. 1. A. Infested plant. B. Healthy plant.

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The biology was studied by pairing freshly emerged male and female months by introducing them in a glass chimney. Tobacco seedling grown in a plastic bowl was provided for oviposition and for resting of the moths. Top end of chimney was covered with an iron disc having a fine wire mesh at the centre. Five per cent honey solution placed in a polythene screw cap was provided as food. The number of eggs laid were counted and transferred to a fresh tobacco leaf with the help of a fine camel hair brush. The petiole of the leaf was wrapped with cotton wool to keep the leaf turgid. This was continued till the death of male and female moths. The pre-oviposition, oviposition, post-oviposition periods and longevity of adult were also recorded. Daily observations were taken on hatching of the eggs for the purpose of working out incubation period.

To study the number and duration of larval instars and the duration of pre-pupal and pupal stages, the larvae on hatching were reared on the fresh tobacco leaves upto third instar in petridishes. Then they were transferred to fresh tobacco stem cuttings. The leaves and stem cuttings were replaced as and when required. Measurements on head width and size of larva were taken everyday in the morning and the number of moults was recorded. The duration of larval, pre-pupal and pupal periods were also recorded.

Description of various stages

The egg: (Fig. II-1). The eggs are generally laid singly. They are oblong and bluntly rounded at both ends. Freshly laid eggs are yellowish in colour. The length of the eggs varied from 0·40 to 0·54 mm with an average of 0·47 mm. Breadth varied from 0·27 to 0·34 mm with an average of 0·33 mm.

The First instar larva: (Fig. II-2). The first instar larva is very active, tiny and delicate. It is whitish yellow in colour with brown head. The body is cylindrical in shape and slightly tapering at posterior end. The body is covered with deep brown hairs. The larva measures 1·00 to 2·34 mm with an average of 1·36 mm in length and in breadth it varied from 0·13 to 0·27 mm with an average of 0·16 mm. The head width is 0·27 mm.

Full grown larva (Fig. II-3): It is more strongly built. The four joints of the legs can be clearly seen. The prolegs are bluntly projected. It measures from 5·36 to 12·1 mm with an average of 8·23 mm and in breadth it varied from 0·67 to 2·00 mm with an average of 1·17 mm. The headwidth is 0·87 mm.

Pre-pupa and cocoon formation: After four larval moults fully developed larva reaches a quiscent stage or prepupal diapause. Before undergoing pre-pupation, it prepares a circular hole in the stem, covered with transparent papery membrane for exit of the future adult. The cocoon is cottony white in colour. Its average measurements are 9·70 mm and 2·67 mm in length and breadth respectively.

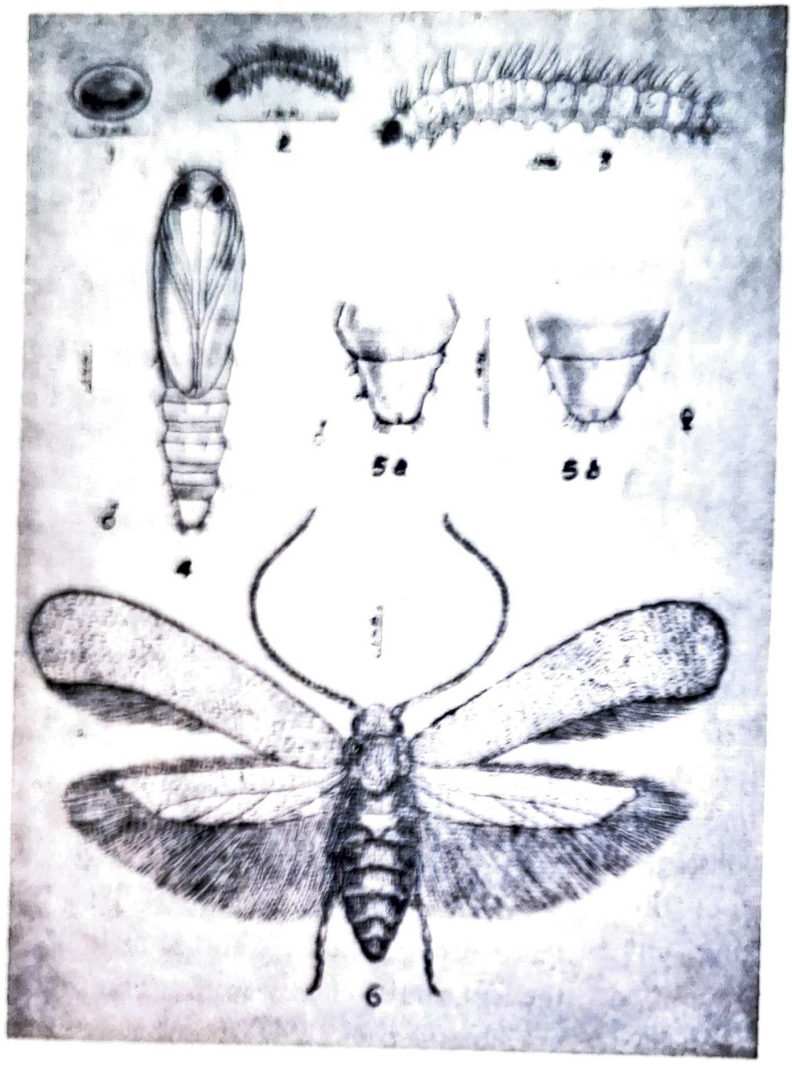

Fig. 2.

1. Egg
2. First instar larva
3. Full grown larva
4. Pupa
5. Sex differences
   (a) Male pupa
   (b) Female pupa
6. Adult moth

The pupa: (Fig. II-4): The pupa is obtect. The abdomen of male pupa is pointed, whereas, in case of female it is bluntly rounded. Compound eyes and wing pads are prominent. Antennal pads are also recognized just above the compound eyes. The colour of the pupa of both the sexes is dark brown. The average length and breadth of male and female pupae are 6·42 mm and 6·78 respectively.

Sex differences: Sexing of male and female can be done by examining the distance between the genital and anal apertures at pupal stage. The distance between the genital and anal apertures in case of male pupa is less while in case of female pupa it is more (Fig. II-5 a and b).

The adult: (Fig. II-6): The adult is a small straw coloured moth. The head is conspicuous with black compound eyes and antennae. Thorax and abdomen are covered with light brown scales. The forewings are straw coloured with hairs on apical margin, hind wings are memberaneous in nature. The tip of the abdomen is covered with a tuft of hairs. Legs are covered with yellowish white scales. Females are slightly bigger than the males.

The average length and width (wings expanded) for males and females were 4·85 mm and 15·24 mm and 6·45 mm and 16·66 mm respectively.

Incubation period: At a laboratory temperature of 29·2°C the incubation period varied from 3 to 10 days with an average of 5·00 days. While the incubation period at constant temperatures of 27°C, 30°C and 32°C varied from 5 to 8, 4 to 8 and 4 to 6 days with an average of 6·00, 6·00, and 5·00 days respectively. The optimum temperature required for shortest incubation period and maximum hatching was 32°C.

Duration of larval stages: The duration of larval period varied from 15 to 26 days at an average temperature of 25·5°C. The average durations of first, second, third, fourth and fifth instar larve were 3·6, 3·9, 4·3, 3·7 and 4·3 days respectively. The average durations of pre-pupal and pupal periods at an average laboratory temperature of 25·5°C were 2·4 and 13·4 days respectively.

Duration of adult stage: Female of *G. heliopa* lived longer (6·4 days) compared to males (4·5 days). The pre-oviposition, oviposition and post-oviposition periods varied from 0 to 5, 2 to 10 and 0 to 3 days with an average of 1·7, 3·8 and 0·81 days respectively under laboratory conditions at an average temperature of 23·8°C.

Sex ratio: The proportion of males to females under field and laboratory condition were 1:1·23 and 1:1·62 respectively. Thus, females outnumbered males.

Fecundity: The number of eggs laid by the females were studied in 27 different sets. The result showed that the number of eggs laid by a single female varied from 12 to 269 with an average of 108 at an average temperature of 23·8°C.

The egg laying continues for 2 to 10 days and the maximum number of eggs were laid on second, third and fourth day from emergence.

Duration of life-span: At a varying temperature of 23·6 to 32·8°C, the life-span (from hatching of egg to death of the adult) of male varied from 35 to 48 days with an average of 40 days and that of female varied from 36 to 50 days with an average of 42 days. This shows that the female live longer than the males.

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