

Biology of maize stem borer, *Chilo partellus* (Swinhoe) Crambidae: Lepidoptera

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SUMMARY

The biology of maize stem borer was studied under laboratory conditions during *Khariif* 2007 at College of Agriculture Navile, Shimoga, revealed that the stem borer completed its life cycle in 30 to 69 days. The incubation period ranged from 3 to 6 days. The larval stage passed through six instars. The mean duration of I, II, III, IV, V and VI instar was 4.80 ± 0.78 , 4.40 ± 1.89 , 5.30 ± 1.88 , 5.90 ± 2.28 , 6.10 ± 2.37 and 8.30 ± 2.21 days, respectively. The total larval period ranged from 20 to 51 days. The pre-mating and mating period occupied 9.15 ± 1.40 and 5.04 ± 0.70 hours, respectively, oviposition period occupied 4.2 ± 0.63 days. The stem borer had the fecundity rate of 262-657 eggs. The adult male and female lived for 3 to 8 days and 3 to 7 days with a mean of 6.20 ± 1.75 and 5.00 ± 1.49 days, respectively.

Key words :

Biology, Maize stem borer, Fecundity, Oviposition, Incubation period

Maize or corn (*Zea mays* Linn.) is one of the important cereal crops of the world, cultivated for food, fodder and for raw material in many industries. In many parts of the world, stem borer is an important pest of maize which possesses serious problem in the successful cultivation of maize in India. Newly hatched larvae feed on the leaves making pinholes and leaf windowing. They bore down inside the plant whorl and feed. While feeding in the plant whorl, they kill the central shoot, which later on dries up causing dead heart resulting total loss of the crop. Harris (1990) reviewed the literature, related to the biology of *Chilo partellus* in Indian conditions. Nesbitt *et al.* (1979) and Lwande *et al.* (1993). Scanty information is available on stem borer of maize. Keeping this point in view, the effective management the present studies were under taken at College of Agriculture Navile, Shimoga.

MATERIALS AND METHODS

A laboratory experiment was conducted to study the biology of *C. partellus* on maize (Kanchan hybrid – 517) genotype. The infested materials were collected from the field used for developing pure culture of the stem borer in the laboratory condition. Newly emerged male and female moths obtained from the mass culture were released in a plastic container along with circular pieces of leaves for

oviposition. Larvae hatched from these eggs were used for further studies.

Larval study:

Twenty five larvae were released individually on maize leaves in Petriplates. For the newly hatched I instar neonates, leaf bits were provided for feeding and later on stem pieces of maize were given. Every day stem pieces were replaced with fresh food. Observations were made twice a day (12 hrs. interval) to record the incubation, larval and pupal periods separately on maize. Male and female adults emerged on maize were allowed to mate separately and confined on leaf bits in Petriplates for egg laying. The eggs laid on maize were kept separately to record the incubation period. Morphological and morphometric characters of different stages in the life-cycle of the insect reared on maize were recorded.

Longevity:

Separate sets of ten pairs of moths were kept to record the adult longevity, pre-mating period, mating period, oviposition period and fecundity. Honey (10%) was provided as adult food. Adult longevity of both male and female moths with and without food (10% honey) was recorded separately. For this, ten pairs of male and female moths were released separately into

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Petriplates. Further, the pre-mating and mating periods were recorded for each pair.

Fecundity and oviposition:

Fecundity and oviposition periods of the moths reared on maize were recorded with and without food by releasing ten each of mated female moths individually in Petri plates, for which maize leaf bits were provided. The duration required for oviposition and the total number of eggs laid by each female in a day and its life span was recorded.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

Egg:

Egg laying was observed on all parts of the plants namely, leaf (both on dorsal and ventral surface), leaf sheath and in the central whorl of the growing maize. The eggs were creamy white, flat, oval and scale like in appearance. Eggs became yellowish after two days and turned to yellowish brown on the third day. The eggs measured 0.75 to 1.25 mm in length with an average of 0.95 ± 0.16 mm. The incubation period lasted for 3 to 6 days (Table 1).

Ist Instar larva:

The newly hatched larva was slender, tiny, active and dirty white with a large dark brown head. Body of the larva was covered with number of short hairs. The length of the first instar larva varied from 1.50 to 3.00 mm with an average of 2.06 ± 0.46 mm. The duration of the first instar lasted for four to six days with an average of 4.8 ± 0.78 days.

IInd Instar larva:

Second instar larva was translucent and dirty white. Head and prothorax were dark brown in colour. The length of the second instar ranged from 3.00 to 5 mm with an average of 3.65 ± 8.0 mm. Second instar was completed in two to seven days with an average of 4.4 ± 1.89 days.

IIIrd Instar larva:

The colour of the third instar larva was dull white. The body was elongated with brown head. The length of the larva ranged from 5.50 to 10.50 with an average of 7.67 ± 1.79 . The duration of the third instar ranged from three to eight days.

Table 1 : Duration of different life stages of maize stem borer *Chilo partellus* on maize under laboratory conditions

Sr. No.	Stage of insect	Range (Days)	Mean \pm SD
1.	Egg period	3 – 6	4.70 \pm 1.15
2.	Larval duration		
	I instar	4 – 6	4.80 \pm 0.78
	II instar	2 – 7	4.40 \pm 1.89
	III instar	3 – 8	5.30 \pm 1.88
	IV instar	3 – 9	5.9 \pm 2.28
	V instar	3 – 9	6.1 \pm 2.37
	VI instar	5 – 12	8.3 \pm 2.21
3.	Total larval period	20 – 51	38.9 \pm 11.43
4.	Pupa	6 – 12	9 \pm 2.26
5.	Total life cycle (egg to adult emergence)	30 – 69	49.50 \pm 13.5
6.	Adult to longevity		
	With 10% honey		
	Female	3 - 8	6.20 \pm 1.75
	Male	3 - 7	5 \pm 1.49
	Without honey		
	Female	3 – 7	5.5 \pm 1.35
	Male	2 – 7	4.3 \pm 1.88

IVth Instar larva:

The fourth instar larva was comparatively stout and long with translucent white body. Head and prothoracic shield were brown. Length of the larva ranged from 8.60 to 16.00 mm with an average of 12.65 ± 3.02 mm. The duration of the fourth instar ranged from three to nine days with an average of 5.9 ± 2.28 days.

Vth Instar larva:

Fifth instar larva was almost similar to fourth instar, except for its size. The length of larva ranged from 15 – 22.50 mm with an average of 18.65 ± 2.31 mm. The duration of the fifth instar ranged from three to nine days.

VIth Instar larva :

The sixth instar larva was robust and cylindrical. Body was dull white with reddish brown head. Length of the larva ranged from 24.0 to 32.0 mm with an average of 28.45 ± 3.24 . Sixth instar was completed in five to 12 days with an average of 8.3 ± 2.21 days. The total larval duration of the stem borer varied from 20 to 51 days with an average of 38.9 ± 11.43 days. The present findings with respect to larval duration are in agreement with that of Deshpande (1978) and Marulasiddesha (1999).

Pupal studies:

Pupa was oblect type with broad anterior end which

tapered towards posterior end with small spines, black compound eyes. The length of the female pupa varied from 15.50 to 17.80 mm with an average of 16.55 ± 0.79 . The male pupal length ranged from 12.5 to 16.5 mm with an average of 14.67 ± 1.3 mm. The pupal period ranged from six to 12 days with an average of 9 ± 2.26 days. The present findings are in close agreement with Deshpande (1978) who reported that pupal period lasted for 6 to 11 days.

Adult moths:

Adult moths were dirty brown and nocturnal in habit, which hide under stones and dried leaves during day times. Emergence of the adults usually occurred during the evening time. The observations on adult description were in confirmation with Deshpande (1978).

Longevity of the adults was studied by providing cotton dipped in 10 per cent honey solution as food and also without food. The longevity of female moth varied from 3 to 8 days with an average of 6.20 ± 1.75 whereas in case of male it was 3 to 7 days with an average of 5.00 ± 1.49 days. In the absence of food the longevity of female and male moth varied from 3 to 7 days and 2 to 7 days with an average of 5.5 ± 1.35 days and 4.3 ± 1.88 days, respectively.

Premating and mating period:

The pre-mating period and mating period of stem borer moths varied from 8 to 11.40 hours and 4.30 to 6.30 h with an average of 9.15 ± 1.40 hr. and 5.04 ± 0.70 hr., respectively. The moth laid eggs during night, but occasionally also observed during the morning hrs. The duration of egg laying varied from 3 to 5 days with an average of 4.2 ± 0.63 days. In the present study number of egg laid by each female varied from 262 to 657 with an average 412.6 ± 122.17 when 10 per cent honey solution as food. The present findings slightly varied from Deshpande (1978) who reported number of eggs laid per female ranged from 234 to 633 with an average of 359.5 eggs.

The life-cycle of the stem borer (egg to adult emergence) occupied 30 to 69 days with an average of 49.50 ± 13.50 days. The present findings are in agreement with that of Marulasiddesha (1999) who reported life-cycle of the insect occupied 30 to 65 days, whereas,

Table 2 : Reproductive biology of *Chilo partellus*

Sr. No.	Parameter	Range	Mean \pm SD
1.	Pre – mating period (hours)	8.00 – 11.40	9.15 ± 1.40
2.	Mating period (hours)	4.30 – 6.30	5.04 ± 0.70
3.	Oviposition period (days)	3.00 – 5.00	4.2 ± 0.63
4.	Fecundity		
	With honey	262 – 657	412.6 ± 122.17
	Without honey	258 – 512	351.6 ± 83.55

Deshpande (1978) reported life-cycle of insect varied from 34 to 56 days.

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REFERENCES

- Deshpande, V.P.** (1978). Studies on the bionomics of sorghum stem borer, *Chilo partellus* (Swinhoe) and reaction of different sorghum varieties to it. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Bangalore, Karnataka
- Harris, K.M.** (1990). Bioecology of *Chilo* species. *Insect Sci. Applic.*, **11**: 467-477.
- Lwande, W., Gikonnyo, N., Lux, S., Hassanali, A. and Lofqvist, J.** (1993). Periodicity in the frequency of calling and quality of pheromone in volatiles emissions of the spotted stalk borer, *Chilo partellus*. *Bulletin OILB/SROP*, **16**(10): 174.
- Marulasiddesha, K.N.** (1999). Bio-ecology of stem borer, *Chilo partellus* (Swinhoe) and impact of its damage on juice quality of sweet sorghum. M.Sc. (Ag.) Thesis University of Agricultural Sciences, Dharwad, Karnataka
- Nesbitt, B.F., Beevor, P.S., Hall, D.R., Lester, R., Davies, J.C. and Seshureddy, K.V.** (1979). Components of the female sex pheromone of the spotted stalk-borer, *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae) identification and preliminary field trials, *J. Chemical Ecol.*, **5**: 153-156.
