

Original Research Article

Biology of Capsule Borer, *Antigastra catalaunalis* (Duponchel) on Sesame

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ABSTRACT

Keywords

Biology, Capsule borer, *Antigastra catalaunalis*, Sesame

Biology of *Antigastra catalaunalis* (Duponchel) on sesame was studied in detail under laboratory condition at Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka. The results revealed that the average period of egg, first, second, third, fourth and fifth larval instar was 3.08 ± 0.55 , 4.48 ± 0.64 , 1.41 ± 0.40 , 1.90 ± 0.44 , 1.05 ± 0.58 and 2.33 ± 0.58 days, respectively and total larval period was 11.17 ± 1.10 days. The pre-oviposition and oviposition periods were found to be 1.33 ± 0.33 and 3.34 ± 0.92 days, respectively. The fecundity varied from 55 to 66 eggs. The average longevity of male and female adults was 6.62 ± 1.20 and 8.75 ± 1.20 days, respectively.

Introduction

Sesame, *Sesamum indicum* Linn., is the oldest oilseed known to man. India is among the top five countries of the world in oilseed production with an estimated 25.5 m tonnes annually. Nine edible oilseeds are cultivated in India and sesame ranks fifth in production, after groundnut, rape seed, soybean and sunflower. India is still the world leader with maximum production (25.8%) and the largest area (29.8%) as well as highest (40%) export. Sesame is grown in an area of 19.01 lakh hectares with a production of 8.10 lakh tonnes and an average yield of 426 kg/ha. In Karnataka it is being grown in 0.60 lakh hectares with a production of 0.30 lakh tonnes with an average yield of 500kg/ha (Anon., 2015). Sesame seed contains 46 to 64 per cent oil, 26.25 per cent protein, high amount of minerals such as calcium, iron, and phosphorus (Gnanasekaran *et al.*, 2010). Sesame is attacked by many insect pests. It is attacked by more than 38 insect pests at various stages of the growth (Rai, 1976) of

which, sesame shoot webber and capsule borer (*Antigastra catalaunalis* [Dup.]) is most serious pest throughout India. Out of 67 insect-pests infesting sesame crop in India, till leaf webber and capsule borer, *Antigastra catalaunalis* (Dup.) is the most detrimental pest infesting the crop at leaf, flower and capsules stage, causing yield loss up to 68.2 per cent (Ahuja., 1990).

Materials and Methods

Studies on the bionomics of capsule borer were carried out in the laboratory at Department of Entomology, University of Agricultural Sciences, Raichur.

Initial culture of capsule borer was collected from the fields such larvae were reared in the laboratory on sesame and were further multiplied in cage under lab condition. The collected larvae were transferred to the cage (20 cm × 20 cm × 25cm) with a wooden base glass top and four sides wire mesh. Leaves and flowers of sesame were given to the

larvae and rearing was continued until emergence of adult moth. This culture was used for the further biology study.

The leaves and flowers were changed daily up to the second instar of larval stage. Thereafter, buds, flower, capsule and leaves were provided as food for the later larval stages. The matured larvae transformed into the pupa inside the bud and sometimes in deep dry soil and kept in glass jars/petri dishes in the lab. Moths emerging from the pupae were released in the cylindrical boxes containing cotton swabs dipped in 20% sugar solution. Sexes were examined by different morphological characters.

Freshly laid eggs were counted and placed on petri dishes with the help of moist soft camel hairbrush. Observation was recorded on their colour, size, shape and incubation period. Duration of each larval instar, body segments and legs were recorded. The morphometric characters *viz.*, width and length of ten eggs and larva were measured. The mating period, ovipositional period, fecundity per female, pre-pupal, pupal period of larvae and longevity of male and females was recorded.

Results and Discussion

Eggs were laid singly and they were minute and conical in shape. Freshly laid eggs were white in colour, which later changed to dark white before hatching. The incubation period of capsule borer egg ranged from 2.50 to 3.60 days. However length and breadth of egg was 0.36 ± 0.01 mm and 0.17 ± 0.03 mm respectively.

The first instar larva has four pairs of prolegs on 6th, 7th, 8th and 9th abdominal segment in addition to three pairs of true thoracic legs. The first instar larval period ranged from 3.80 to 5.10 days. The average length and breadth of first instar larva was 2.02 ± 0.22 mm and

0.32 ± 0.01 mm, respectively. The second instar larva has black dots on the abdomen with a larval period ranging from 1.00 to 1.80 days. The average length and breadth of second instar was 3.83 ± 0.02 and 0.55 ± 0.02 mm, respectively.

The third instar larva had minute brown hair and black dots on the abdomen. All legs and pro-legs changed to brownish white from white colour. The third instar larval period ranged from 1.50 to 2.30 days. The average length and breadth of third instar was 5.86 ± 0.02 and 0.74 ± 0.04 mm, respectively.

The colour of the fourth instar larva changed to green from earlier white/cream. It had minute green setae and two groups of three black segments were laterally present on both sides of the abdomen. The fourth instar larval period ranged from one to two days with the mean of 1.05 ± 0.58 days. The average length and breadth of fourth instar larva was 8.34 ± 0.38 and 1.14 ± 0.05 mm, respectively. The fifth instar larva was bigger in size and dark green in color, one longitudinal line was present dorsally from thorax to the anal segment. The fifth instar larval period ranged from 1.75 to 3.00 days. The average length and breadth of fifth instar was 9.72 ± 0.38 and 1.45 ± 0.05 mm, respectively. The pupal period ranged from 6.50 to 7.80 days. The average length and breadth of pupa was 7.17 ± 0.32 and 1.25 ± 0.35 mm, respectively. The total larval period ranged from 10.07 to 12.30 days. The pre ovipositional period, oviposition period ranged from 1 to 1.6 days and 2.5 to 4.2 days, respectively. The fecundity per female ranged from 55 to 66 eggs.

Adults were stout and medium in size, the colour varied from light reddish brown to dark reddish brown. Fore wings are dark reddish brown having dark reddish veins on the upper sides and a series of black dots

towards the margins. Hind wings are transparent. The sexes are identified by the presence of a large and double segmented tuft on the thorax of female moths. Longevity of adult female was longer which ranged from

7.55 to 10.00 days as compared to male with ranged from 5.40 to 7.80 days. Size of adult female was larger with a length of 8.12 ± 0.12 mm and breadth of 22.77 ± 0.37 mm, respectively.

Table.1 Morphometric measurement of *A. catalaunalis*

Growth stages	Length (mm)		Width (mm)	
	Range	Mean \pm SD	Range	Mean \pm SD
Egg**	0.31 – 0.40	0.36 ± 0.01	0.16 – 0.18	0.17 ± 0.03
Larva*				
1 st instar	1.90 – 2.30	2.02 ± 0.22	0.30 – 0.33	0.32 ± 0.01
2 nd instar	3.80 – 3.85	3.83 ± 0.02	0.53 – 0.57	0.55 ± 0.02
3 rd instar	5.84 – 5.90	5.86 ± 0.02	0.70 – 0.78	0.74 ± 0.04
4 th instar	8.00 – 8.72	8.34 ± 0.38	1.50 – 1.80	1.14 ± 0.05
5 th instar	9.34 – 10.10	9.72 ± 0.38	1.40 – 1.50	1.45 ± 0.05
Pupa*	6.85 – 7.50	7.17 ± 0.32	0.90 – 1.60	1.25 ± 0.35
Adult				
Male	7.78 – 8.10	7.90 ± 0.12	18.20 – 19.80	19.00 ± 0.83
Female	8.00 – 8.30	8.12 ± 0.12	22.4 – 23.14	22.77 ± 0.37

Table.2 Developmental period of *A. catalaunalis*

Developmental stages	Range	Mean \pm SD (days)
Pre –oviposition	1.00 – 1.60	1.33 ± 0.33
Oviposition	2.50 – 4.20	3.34 ± 0.92
Egg incubation period **	2.50 – 3.60	3.08 ± 0.55
Duration of larval and pupal stage *		
1 st instar	3.80 – 5.10	4.48 ± 0.64
2 nd instar	1.00 – 1.80	1.41 ± 0.40
3 rd instar	1.50 – 2.30	1.90 ± 0.44
4 th instar	1.00 – 2.00	1.05 ± 0.58
5 th instar	1.75 – 3.00	2.33 ± 0.58
Total	10.07 – 12.30	11.17 ± 1.10
Pupa	6.50 – 7.80	7.12 ± 0.67
Adult longevity (with food)		
Male	5.40-7.80	6.62 ± 1.20
Female	7.55-10.00	8.75 ± 1.20
Total cycle		
Male	21.00-28.00	24.76 ± 3.92
Female	23.00-32.00	27.58 ± 3.92
Fecundity (Number)	55.00-66.00	60.12 ± 6.22

* Average of 20 larvae, pupa and adult

** Average of 20 eggs

The adult male capsule borer length was 7.90 ± 0.12 mm and breadth of 19.00 ± 0.83 mm. The total life cycle of capsule borer from egg to death of the adult in laboratory condition was 24.76 ± 3.92 in male with range of 21 to 28 days and in female it was 27.58 ± 3.92 with a range of 23 to 32 days.

These observation are in agreement with Ahirwar *et al.*, (2010) who reported that the first, second, third, fourth, fifth larval instars and pupal period ranged from 4.00 to 5.50, 1.00 to 2.00, 0.5 to 1.00, 0.82 to 0.91, 2.00 to 3.00 and 3.50 to 13.00 days respectively, where as larval duration ranged from 12.76 to 14.42 days in October to December. The pre-oviposition and oviposition period of capsule borer 0.46 ± 0.03 days and 3.34 ± 0.92 days respectively, with fecundity of 59.16 ± 9.05 eggs per female and adult longevity of female and male as 6.00 to 13.00 days and 4.00 to 9.00 days, respectively and total developmental period of capsule borer was 24.76 days. Similarly, Suliman (2013) recorded larval period of 10.20 days, pupal period of 5 days during September to November and total life cycle of 21.64 days under laboratory condition.

In conclusion, the leaf webber and capsule borer is the most detrimental pest infesting the crop at leaf, flower and capsules stage so it is necessary to study the biology and the total life cycle of capsule borer was ranged from 21 to 32 days, respectively.

References

- Ahirwar, R. M., Banerjee, S. and Gupta, M. P., 2010, Seasonal incidence of insect pests of sesame in relation to abiotic factors. *Ann. Pl. Protec. Sc.*, 17: 351-356.
- Ahuja, D. B., 1990, Assessment of loss in seed yield due to leaf webber and capsule borer (*Antigastra catalaunalis*) in different varieties of sesame (*Sesamum indicum*), *Indian Agric. Sci.*, 61(2): 147-149.
- Anonymous, 2015, (<http://www.indianagristat.com>).
- Gnanasekaran, M., Jebaraj, S., Gunasekaran, M. and Muthuramu, S., 2010, Breeding for seed yield and shoot webber (*Antigastra catalaunalis* Dup.) resistance in sesame (*Sesamum indicum* L.). *Electronic J. Plant Breed.* 1(4): 1270- 1275.
- Suliman, N, H., Nabil, H. H., Bashir., Ameen, M. A. and Yousif, O. H.Asad., 2013, Biology and webbing behaviour of sesame webworm, *Antigastra catalaunalis* (Dup.) (Lepidoptera: Pyraustidae), *Glo. J. Med. Pla. Res.*, 1(2): 210-213.
- Rai, B. K., 1976, Pests of sesamum. *In pests of oilseed crops in India and their control*, Indian council of Agric. Res., New Delhi, pp.120.