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BIOLOGY OF SESAME LEAF WEBBER *ANTIGASTRA CATALAUNALIS* DUPONCHEL

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ABSTRACT

Biology of the sesame leaf webber *Antigastra catalaunalis* Duponchel was studied in the laboratory on leaves of variety G. TIL-3. The length and width of egg, body of each larval instar, pupae and adults were measured. The incubation period was 2.38± 0.54 days. There were five larval instars and length of larva increased from 1.91–9.53 mm with total larval period of 10.50± 1.43 days. Pupal period lasted for 6 days and adult longevity was 6-7 days. The sex ratio was found to be 1: 1 and males were comparatively smaller than females. The total lifecycle occupied 26.5± 7.78 days.

Key words: Sesame, *Antigastra catalaunalis*, biology, morphometrics, egg, larva, instars, pupa, adult, duration, feeding behaviour, growth index, sex ratio

Sesamum indicum L. commonly known as sesame or til is an ancient oilseed crop grown in India, and India is the second largest producer of sesame seed (Anon, 2019). This crop is attacked by several insect pests at various stages of growth (Biswas et al., 2001). Amongst them, sesame leaf webber *Antigastra catalaunalis* Duponchel is a serious pest. This pest infests from seedling emergence to crop maturity (Suliman et al., 2004), feeds on the tender foliage by webbing top leaves and also bores into the shoots and pods (Sharma and Reddy, 1983; Sankaranarayanan and Nadarajan, 2005; Saravanaraman et al., 2016). As sesame leaf webber feeds concealed within leaves and capsules, suitable management strategy using chemicals or biological agents is vital (Kumar and Goel, 1997). Efficient methods for controlling pests requires knowledge in biology of the pests. The present study explores the biology and morphometrics of *A. catalaunalis*.

MATERIALS AND METHODS

The larvae of *A. catalaunalis* were collected from the unsprayed sesame crop grown in agronomy field, Anand Agricultural University, Anand, Gujarat. The larvae were mass reared in the laboratory of Department of Agricultural Entomology on leaves of sesame variety G. TIL-3. The larvae were reared individually in round plastic vials providing fresh and tender leaves for early instars and buds, flowers and capsules to later instars. Pupae were transferred to separate rearing cage for adult emergence. Adults emerging out from pupae were separated by examining morphological characters and then, released in separate rearing cage for mating and egg laying. Cages were provided with cotton swabs dipped in 5% honey solution as food for the adults. Sesame plant with young leaves was placed in the cage for egg laying. Freshly laid eggs were counted and placed on fresh sesame leaves with a moist soft camel hair brush. Observations of incubation period and hatching %, measurement and duration of larval instars, prepupal and pupal stages were taken. The growth index was worked out by dividing the % adult emerged by the larval and pupal developmental periods (Ahirwar et al., 2010). The moths were kept under constant watch for studying the fecundity, preoviposition, oviposition and postoviposition periods. Tender parts of the sesame plant were examined under microscope and number of eggs laid was counted daily till death of female. To study the longevity of individual, freshly emerged male and female moths were released in separate rearing cages and covered with a fine muslin cloth. Few preserved specimens were observed under stereozoom microscope to study their external morphology. To study the variation in size between male and female, 20 adults of each sex were measured. Length was measured from head to tip of abdomen and breadth with expanded wings using mm scale. The sex ratio under laboratory condition was determined from laboratory reared culture by counting the number of males/ female. All life stages were studied for their colour, shape, size, length, breadth and measured with Magnus-Pro software.

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RESULTS AND DISCUSSION

It was observed that eggs were conical in shape and laid singly along the midrib and veins of the lower leaf surface and on tender plant parts. Freshly laid eggs were cream coloured and turned white prior to hatching. The newly hatched larvae were semi translucent caterpillars with reddish brown head capsule. Colour of the head capsule remained brown but body colour changed to whitish yellow in second instar. Third instar larvae were pale green with black head capsule. Brownish black setae and tubercles were found on the abdomen of the larva. Fourth instar larvae were similar to third instar except, setae and tubercles turned dark black and became prominent. There were three tubercles on each side of the mid dorsal line of each segment. Fifth instar larvae which fed on leaves and other vegetative parts were dark green, whereas larvae which fed on flowers and capsules were slightly pink. Prominent mid dorsal line was noticed from thorax till the end of abdomen. Freshly formed pupae were soft, slender and green. Males were slender and long, whereas females were comparatively broader and shorter. Pupae turned brown before eclosion of the adult. Adult was small, delicate moth with brick red forewings bearing veins and hind wings were pale yellow and slightly transparent with brownish red markings on them in both the sexes. Males were small with slender abdomen and females were comparatively bigger with broad abdomen. More or less similar observations of larval morphology were observed earlier (Kumar and Goel, 1994; Ahirwar et al., 2010; Choudhary, 2017; Pandey et al., 2018; Athya and Panday, 2020; Choudhary et al., 2020).

The length and breadth of eggs was 0.32± 0.02 mm, 0.12± 0.02 mm, respectively; and hatching was from 79 and 90% (84± 7.95). The length of first, second, third, fourth and fifth instar larva was 1.91± 0.54, 3.76± 1.17, 6.22± 0.23, 7.76± 0.60 and 9.53± 1.05 mm, whereas it was 0.34± 0.12, 0.65± 0.12, 1.11± 0.09, 1.33± 0.07 and 1.55± 0.11 mm in case of breadth, respectively. The length and breadth of prepupa was 8.65± 0.51 mm and 1.65± 0.11 mm, respectively. The length of male and female pupae was 8.36± 0.84 and 9.48± 0.32 mm, respectively and breadth, 1.66± 0.17 and 1.80± 0.18 mm, respectively. The incubation period of egg was 2.38± 0.54 days. The larvae were found to pass through five instars on sesame leaves under laboratory conditions. Duration of first, second, third, fourth and fifth instar instars was 1.50± 0.53, 1.60± 0.5, 2.50± 0.53, 2.70± 0.48 and 2.20± 0.42 days, respectively. Total larval duration was 10-11 days. Duration of the prepupa, male and female pupa, unmated adult female, unmated adult male, preoviposition period, oviposition period and postoviposition period were 2.00± 0.67, 3.40± 0.52, 4.20± 0.63, 7.8± 0.84, 6.6± 0.89, 0.88± 0.08, 3.20± 0.45 and 1.60± 0.55 days, respectively. The total lifecycle of *A. catalaunalis* varied from 21 to 32 days (26.5± 7.78), and egg laying capacity of femal was 53.6± 17.74 eggs. Growth index value under laboratory conditions was 5.24 to 7.42. The sex ratio of male: female was found to be 1: 1 under laboratory conditions and 1: 1.20 under field conditions (Table 1).

Similar to the present study, Ahirwar et al. (2010) reported that the length of freshly laid eggs varied from 0.36± 0.01 x 0.18± 0.003 mm. Length and width of eggs was 0.35 - 0.45 mm and 0.18 - 0.25 mm, respectively (Pandey et al., 2018). Patel (1978) mentioned that the hatching ranged from 86 to 92% and 73.34 - 90.00% was reported by Pandey et al. (2018). Kumar and Goel (1994) also observed similar morphometrics. They observed that the males were smaller than females. Selvanarayanan and Baskaran (2000) observed incubation period as 2.40± 0.49 days. Prepupal period ranging from 0.83 to 1.04 days was reported by Kumar and Goel (1994) and 2 to 8 days by Ahirwar et al. (2010). Pupal period of 4.50± 0.45 days was reported by Selvanarayanan and Baskaran (2000), 4 to 12 days by Ahirwar et al. (2010), 4 to 19 days by Karuppaiah (2014) and 5.25 to 7.25 days (Pandey et al., 2018) Similarly, adult longevity of 5.90± 0.44 days was reported by Selvanarayanan and Baskaran (2000), 4 to 12 days by Ahirwar et al. (2010). Fecundity of 53.00 to 92.00 eggs was observed by Pandey et al. (2018), 30 to 90 eggs and growth index of 3.15 to 7.22 was noticed by Ahirwar et al. (2010). Kumar and Goel (1994) reported that the sex ratio (male: female) under laboratory conditions was 1: 1.34± 0.07 and 1: 1 by Ahirwar et al. (2010).

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Table 1. Biology and lifetable of *A. catalaunalis*

S.No.	Stage	Particulars	Measurement (mm) Min	Max	Mean± SD	Sample size (n)	Period (days) Min	Max	Mean± SD
			Morphometry and duration of stages						
1	Egg	Length	0.28	0.36	0.32± 0.02	50	2	3	2.38± 0.54
		Breadth	0.10	0.15	0.12± 0.02				
2	Larva								
	1st instar	Length	0.98	2.41	1.91± 0.54	50	1	2	1.50± 0.53
		Breadth	0.13	0.47	0.34± 0.12				
	2nd instar	Length	2.55	5.61	3.76± 1.17	47	1	2	1.60± 0.52
		Breadth	0.47	0.81	0.65± 0.12				
	3rd instar	Length	5.73	6.49	6.22± 0.23	47	2	3	2.50± 0.53
		Breadth	0.87	1.21	1.11± 0.09				
	4th instar	Length	6.63	8.48	7.76± 0.60	47	2	3	2.70± 0.48
		Breadth	1.23	1.41	1.33± 0.07				
	5th instar	Length	8.54	12.23	9.53± 1.05	47	3	3	2.20± 0.42
		Breadth	1.41	1.78	1.55± 0.11				
Total larval period							8	13	10.50± 1.43
3	Prepupa	Length	8.04	9.37	8.65± 0.51	40	1	3	2.00± 0.67
		Breadth	1.47	1.76	1.65± 0.11				
4	Pupa								
	Male	Length	7.17	9.78	8.36± 0.84	40	3	4	3.40± 0.52
		Breadth	1.42	1.94	1.66± 0.17				
	Female	Length	9.02	10.02	9.48± 0.32	40	3	5	4.20± 0.63
		Breadth	1.55	2.09	1.80± 0.18				
5	Adult								
	Male	Length	5.78	7.62	6.73± 0.73	20	6	8	6.60± 0.89
	(Wing expanded)		12.16	16.86	14.73± 1.55				
	Female	Length	7.63	9.67	8.72± 0.83	20	7	9	7.80± 0.84
	(Wing expanded)		17.22	19.68	18.36± 0.82				
Total life span							21	32	26.50± 7.78

Life table parameters

Particulars	Min	Max	Mean± S. D.
Fecundity	30	72	53.60± 17.74
Egg hatching (%)	79	90	84.00± 7.95
Growth index	-	-	7.42 to 5.24
Preoviposition	0.75	0.96	0.88± 0.08
Oviposition	3	4	3.20± 0.45
Postoviposition	1	2	1.60± 0.55
Male longevity	6	8	6.60± 0.89
Female longevity	7	9	7.80± 0.84
Sex ratio (male : female) Laboratory	-	-	1 : 1
Sex ratio (male : female) Field	-	-	1 : 1.20

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