



## Biology of Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guen. under Allahabad conditions

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### ABSTRACT

A laboratory experiment was conducted to study the biology and morphometrics of brinjal fruit and shoot borer at the Department of Plant Protection, Allahabad Agricultural Institute-Deemed University, Allahabad. The average incubation period of egg was 4.3 days, larva passed through five instars and total larval and pupal periods were 12.33 and 69.24 days. The pupation took place in the glass jars, soil, muslin cloth, sometimes inside the fruits and on the leaves of the plants. The adult male and female longevity were 1.82 and 3.12 days, with a total live period of 25-34 days. The pre oviposition, oviposition and post oviposition periods were 7.4 hours, 2.43 and 1.26 days respectively. The mean duration from egg to adult stage was 25.87 days. There is variability in the levels of fecundity with an average of 174 eggs/female. Morphometric data for all the stages of the instar were also recorded and presented.

**Key words:** Biology of *Leucinodes orbonalis*, Brinjal, Morphometrics.

Brinjal (*Solanum melongena* Linn. Family: Solanaceae), a Native of India is one of the Principle vegetable crop grown in all the South East Asian countries. In India, it is adopted to a wide range of climatic conditions and cultivated in 4.96 lakh hectares with a production of 78.81 lakh tones. Brinjal is infested by a number of insect pests namely aphids, leafhoppers, hudda beetle and fruit and shoot borer contributing losses both qualitatively and quantitatively. Among these the shoot and fruit borer, *Leucinodes orbonalis* Guen. is a regular and most serious pest of brinjal. The larva bore into the petiole and midrib of large leaves of young growing shoots in the initial stages of the crop growth and in later stages they bore into flower buds and fruits and feed inside making them unfit for consumption. The loss in fruit yield, reported from various parts of the country varies from 18.8 % to 80% (Krishnaiah, 1980, 1981 ; Gambhiri, 1994 ; Dhankar *et al.*, 1997 and Krishnaiah and Vijay, 1975). The pest caused fruit infestation up to 40.25% at Santhal Paraganas (Singh, 2000) and 42.19% at Pantnagar (Sharma and Chibber, 1999). The information regarding the biology of any pest is very essential in designing the pest management programmes, such vital information on this pest is lacking in Allahabad conditions, and hence the present study was undertaken.

### MATERIAL AND METHODS

The biology of brinjal shoot and fruit borer was studied during February and April 2006 in the

laboratory of Department of Plant Protection. During the study the weather conditions prevailed in the laboratory were, maximum temperature 28°C to 37°C, Minimum temperature 12°C to 20°C, and relative humidity 57 to 77 %. Damaged brinjal fruits were collected from brinjal local variety 'Neelam long' field for establishing the laboratory culture of brinjal fruit and shoot borer. The larvae were kept in separate rearing jars., fed on fresh pieces of brinjal fruits and changed daily to avoid the fungal growth. The pupae from the rearing jars were collected and kept in specimen jars for the adult emergence. The male and female moths collected from above specimen jars were separated and transferred in pairs to oviposition cages and covered with muslin cloth. The emerging adults were provided with 5% honey solution soaked in cotton swab. A tender twig of brinjal in a small 50 ml beaker having water was placed inside the specimen jar for the egg laying. The newly hatched larvae were kept in petri dishes with the help of soft hair brush and were provided petals of brinjal flowers and very soft slices of the brinjal. The incubation period, duration of each larval instar, pupal period and adult longevity etc., were recorded. Preoviposition, oviposition, post oviposition periods and fecundity were also recorded. Morphometric data for all stages of the insect were recorded. The recorded data were subjected to statistical analysis for computing the mean and standard deviation

## RESULTS AND DISCUSSION

The larvae in the field conditions bored into the petiole of leaves and young shoots making them drooped. In the later stages when the fruits are formed larvae bored into the fruits and feed on the internal contents making them unfit for consumption. Infested fruits are seen with holes plugged with excreta. The morphological characters of each stage of the insect are presented here under.

### A) Egg

The eggs were laid singly or in batches of 2-4 near the veins on the under surface of the leaves. The freshly laid eggs were oval or some what elongated in shape and creamy white in colour which changed to orange with a prominent black spot before hatching. The incubation period ranged from 4-5 days with a mean of 4.30 days, confirming the findings of Mehto *et al.*, (1983) and Suresh *et al.*, (1996). The length and breadth of the egg were 0.81 mm and 0.51 mm respectively (Table No.3). Similar observations on morphological characteristics of the eggs were also reported by Jat *et al.* (2003), Mehto *et al.* (1983).

### (B) Larva

The newly hatched larvae were dirty white and changed to pinkish in colour within 3 to 4 hours with a prominent dark brown head. The length and width of first instar larva were 1.24 mm and 0.27 mm respectively (Table No.3). The larva after moulting to second instar resembled the first instar except larger size and slightly dark colour. This instar lasted for 2.20 days with length and width of 6.32 mm and 0.81 mm respectively. The third instar larva was much longer and darker than the proceeding instars with length and width 8.24 and 1.68 mm respectively. The fourth instar larva turned slightly pinkish with length and width 13.40 mm and 2.57 mm respectively. The final instar larva was cylindrical in shape, pinkish brown with length and width 18.78 mm and 3.42 mm respectively and took 2 to 4 days for pupation (Table No 1). The total larval period lasted from 9-16 days with an average of 12.33 days. In contrast to this, relatively long larval duration (15-27 days) was reported by Suresh *et al.* (1996).

The larvae passed through five instars and in agreement with the findings of Jat *et al.*, (2003) but in contrast to Allam *et al.*, (1982) who recorded six larval instars, the variation may due changes in the local conditions.

### (C) Pupa

Pupation took place in the glass jars, soil, muslin cloth, sometimes inside the fruits and on

the leaves of the plants. The pupa was dark brown pupa with wide cephalic and narrow end, have eight shape five spines at the posterior end of abdomen with length and width 10.48 mm and 3.42 mm respectively. The pupal period lasted for 7-13 days, which agrees with the findings of Suresh *et al.* (1996) and Jat *et al.* (2003).

### (D) Adult

The moth was white in colour with brown to black spots on the head and thorax. The whitish wings had pinkish brown markings which are bigger on the fore wings. The wing expanse and length of the male and female moth measured 19.20 x 7.29 mm, 21.27 x 8.92 mm, respectively. The male moth lived for 1 to 2 days, while the female moths for 2-5 days. The preoviposition, oviposition and post oviposition periods were found to be 6-10 hours, 2 to 3 and 1-2 days, respectively (Table No.3). The fecundity ranged from 8 to 217 with an average of 174 eggs per female.

The total life cycle of the pest completed in 20-30 days with an average of 25.87 days confirming the findings of Lal and Ahmed (1965); Allam *et al.* (1982) who observed that the life cycle ranged from 14-29 days while Suresh *et al.* (1996) reported that the life cycle varied from 28-44 days at Manipal.

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Table 1. Development period of different stages of brinjal shoot and fruit borer

S.No.	Stages	Duration (days)		Mean $\pm$ S.D.
		Minimum	Maximum	
1	Egg	4	5	4.30 $\pm$ 0.25
2	Larval			
	1 <sup>st</sup> Instar	1	2	1.84 $\pm$ 0.14
	2 <sup>nd</sup> Instar	2	3	2.20 $\pm$ 0.12
	3 <sup>rd</sup> Instar	2	3	2.27 $\pm$ 0.27
	4 <sup>th</sup> Instar	2	4	2.90 $\pm$ 0.43
	5 <sup>th</sup> Instar	2	4	3.12 $\pm$ 0.51
	Total Larval period	9	16	12.33 $\pm$ 0.83
3	Pupa	7	13	9.24 $\pm$ 0.47
4	Adult			
	Male	1	2	1.82 $\pm$ 0.17
	Female	2	5	3.12 $\pm$ 0.53
5	Total period taken from egg to adult	20	34	25.87 $\pm$ 1.23

Table 2. Biological parameters of brinjal shoot and fruit borer

S.No.	Parameter	Duration /Number		Duration (days)
		Minimum	Maximum	
1	Pre-oviposition period ( hours)	6	10	7.40 $\pm$ 0.68
2	Oviposition period (days)	2	3	2.43 $\pm$ 0.37
3	Post-Oviposition period	1	2	1.26 $\pm$ 0.25
4	Fecundity (no. of eggs/female)	8	217	171.74 $\pm$ 17.25

Table 3. Morphometrics of different stages of brinjal shoot and fruit borer

S.No.	Stages	Length (mm)			Width (mm)		
		Minimum	Maximum	Mean $\pm$ S.D.	Minimum	Maximum	Mean $\pm$ S.D.
1	Egg	0.74	0.88	0.81 $\pm$ 0.06	0.42	0.61	0.51 $\pm$ 0.05
2	Larval						
	1st Instar	0.97	1.40	1.24 $\pm$ 0.10	0.21	0.34	0.27 $\pm$ 0.03
	2nd Instar	5.90	6.87	6.32 $\pm$ 0.40	0.68	0.91	0.81 $\pm$ 0.8
	3rd Instar	7.24	9.14	8.24 $\pm$ 0.58	1.42	1.97	1.68 $\pm$ 0.12
	4th Instar	11.87	14.32	13.40 $\pm$ 0.38	1.90	2.86	2.57 $\pm$ 0.17
	5th Instar	16.70	21.21	18.78 $\pm$ 0.57	2.19	3.78	3.42 $\pm$ 0.23
3	Pupa	8.68	11.48	10.48 $\pm$ 0.52	1.82	3.90	3.42 $\pm$ 0.31
4	Adult						
	Male	6.12	7.88	7.29 $\pm$ 0.42	17.43	22.54	19.20 $\pm$ 0.87
	Female	6.80	10.63	8.92 $\pm$ 0.46	17.32	23.74	21.27 $\pm$ 0.92

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