



# BIOLOGY OF BRINJAL SHOOT AND FRUIT BORER, *LEUCINODES ORBONALIS* (GUENEE) (PYRALIDAE : LEPIDOPTERA) IN KARAİKAL DISTRICT (U.T.) OF PUDUCHERRY

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## Abstract

Biology of the brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guenee) was studied during October - and November 2016 under laboratory condition. Mating of adult moths were observed on the same day of emergence or a day after emergence. Female moths started to lay eggs on the same day of mating or a day after mating. During October - and November 2016, the average pre-oviposition period of  $1.52 \pm 0.37$  and  $1.62 \pm 0.28$  days, post oviposition period of  $0.78 \pm 0.30$  and  $0.89 \pm 0.27$ , oviposition period of  $3.44 \pm 0.19$  and  $3.68 \pm 0.35$ , fecundity of  $185.10 \pm 24.08$  and  $190.20 \pm 36.45$  eggs/female, incubation period of  $4.29 \pm 0.92$  and  $4.79 \pm 1.33$  days, larval period of  $12.42 \pm 1.16$  and  $12.86 \pm 1.08$  days were recorded. The pupal period of female and male were  $8.12 \pm 0.64$ ,  $8.52 \pm 0.44$  days and  $7.54 \pm 0.48$ ,  $7.78 \pm 0.70$ , respectively, in both the months. During October - and November 2016, the male average developmental period was recorded to be  $20.94 \pm 3.27$  and  $22.68 \pm 3.19$  days, where as the female average developmental period was observed to be  $23.94 \pm 3.06$  and  $24.26 \pm 2.94$  days, respectively. The male and female longevity period were  $2.56 \pm 0.24$ ,  $2.60 \pm 0.41$  days and  $3.68 \pm 0.45$ ,  $3.84 \pm 0.49$  days, respectively, in both the months.

**Key words :** *Leucinodes orbonalis*, biology, egg, larva, pupa, adult.

## Introduction

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics. The name brinjal is popular in Indian subcontinent and is derived from Arabic and Sanskrit, whereas the name eggplant has been derived from the shape of the fruit of some varieties, which are white and resemble in shape to chicken eggs hence called as eggplant and it is also called aubergines (French word) in Europe. In the world, brinjal occupies an area of 1.72 M ha with a production of 43.17 MT and an average productivity of 25 MT per ha (FAOSTAT, 2011). Brinjal occupies an area of 7.04 lakh ha with an annual production of 12,634,000 MT in India.

In Tamil Nadu alone, it is grown in an area of 8740 hectares with a production of 65,200 metric tonnes during 2006-08 (Indiastat, 2008). In the Union Territory of Puducherry, it is cultivated in an area of 102 hectares with a production of 1962 tonnes. In Karaikal alone, brinjal is cultivated in an area of 4 hectares with a production of

52 tonnes (Anonymous, 2003). Brinjal crop is attacked by a wide array of insects and non-insect pests that cause considerable quantitative and qualitative loss to the crop during different stages of its growth. The yield losses due to the damage by *L. Orbonalis* was reported to be as high as 70 – 92 per cent (Krishnaiah and Vijay, 1975; Nair, 1986; Eswara Reddy and Srinivas, 2004). The biological activities of *L. Orbonalis* are very peak during *Rabi* season, since brinjal is cultivated as a major vegetable crop in Karaikal and adjacent district of Tamil Nadu. Hence, the present investigation was attempted to find out the pre-oviposition, post oviposition and oviposition period, fecundity, incubation, larval period, pupation period and adult longevity of *L. Orbonalis* on brinjal in the laboratory conditions during October -and November 2016.

## Materials and methods

The natural infested brinjal fruits with larvae of *L. orbonalis* collected from the brinjal field of Western farm, PAJANCOA and RI, Karaikal were placed separately

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in an enamel tray with a size of 38 cm length, 30 cm width, and 6 cm height, under laboratory conditions. The larvae were then transferred to another clean enamel tray of the same size containing chips of fresh brinjal fruits every day, till pupation. The pupae thus collected from each tray were kept separately in petriplates which were placed in a mud pot for the emergence of adult moths. The size of the mud pot was 9.5 cm length, 10 cm diameter, used in the study. About 1/4<sup>th</sup> of mud pot was filled with sand that was wet with water to have relative humidity inside the mud pot. The petriplate with pupae was placed over the wet sand of the mud pot and mouth of the mud pot was covered with a black coloured cloth which was tightly secured with thread. Cotton swab dipped in 10 per cent honey solution containing a few drops of vitamin mixture (Health OK) was provided as food for the adults. The moths were allowed to lay eggs on the black coloured cloth. After laying eggs the black coloured cloth was removed and placed in a petriplate which was kept in a cage for the emergence of larvae. The neonate larvae from the surface of the egg cloth were removed and transferred to chips of brinjal fresh fruit kept in the enamel tray to maintain homogenous population of stock culture of *L. orbonalis*. Biology was studied during October and November 2016 (Rabi 2016). Five pairs of adult moths from the stock culture were released in a mud pot covered with black coloured cloth which was placed in a cage. They were allowed to copulate and oviposit on the black cloth as a substrate. The black cloth was then removed and placed in a petriplate which was kept inside the cage and then observation was made for hatching the neonate larvae to calculate the incubation period. The larvae immediately after hatching were transferred to chips of tender brinjal fruits placed in petriplates which were kept in the cage. Daily fresh chips of tender fruits were replaced and the larval period was monitored continuously. Observation was easier when the larvae were allowed to feed the chips of tender fruits by tunneling, because they could be easily located. Chips of brinjal fruits were changed twice a day to prevent rotting and development of mold upto second instar. From third instar onwards chips of brinjal fruit were changed once in a day. Observation were made daily in the morning as well as in the evening. The duration of each of the stages, moulting, emergence and longevity were recorded. The male and female moths were sorted out on basis of morphological characters *viz.*, stout, pointed, up curved and larger sized abdomen. The weather parameters *viz.*, maximum and minimum temperature and relative humidity of the laboratory were recorded during the study to observe the influence on the growth.

## Results and Discussion

### Pre-oviposition, post oviposition, periods and fecundity

During the month of October the pre-oviposition period ranged from 1.0 - 2.0 days with a mean  $1.52 \pm 0.37$  of days, post-oviposition period ranged from 0.70 - 0.90 days with a mean of  $0.78 \pm 0.30$  days and the oviposition period ranged from 3.0 - 4.0 days with a mean of  $3.44 \pm 0.19$  days and the fecundity ranged from 88 - 235 eggs with a mean of  $185.10 \pm 24.08$  eggs (table 1). Similarly, during November 2016, the pre-oviposition period ranged from 1.0 - 2.0 days with a mean of  $1.62 \pm 0.28$  days, post-oviposition period ranged from 0.80 - 0.90 days with a mean of  $0.89 \pm 0.27$  days and the oviposition period ranged from 3.0 - 4.0 days with a mean of  $3.44 \pm 0.19$  days and the fecundity ranged from 78 - 240 eggs with a mean of  $190.20 \pm 36.45$  eggs, respectively. The present results are in consonance with that of Singh and Singh (2001), Jat *et al.* (2003) and Harit and Shukla (2005), who reported that the female laid eggs ranged from 150-168.80 with on an average of 166.27.

### Incubation period

The incubation period varied from 4.0 to 5.0 days with an average of  $4.29 \pm 0.92$  and 3- 4 days with an average of  $4.79 \pm 1.33$  days during both the months. These findings are supported by Singh and Singh (2001); Jat *et al.* (2003) and Pal *et al.* (2003) who had also found the same results.

### Larval period

The duration of first instar larvae lasted for 1.0 - 2.0 days with a mean of  $1.39 \pm 0.57$  days during October. Similarly, during November, the duration of first instar larvae varied from 1.0 - 2.0 days with a mean of  $1.52 \pm 0.88$  days. The second instar larvae were larger than first instar larvae and slightly dark in colour. The duration of second instar larvae lasted for 1.0 - 2.0 days with a mean of  $1.82 \pm 0.14$  days and 1.0 - 2.0 days with an average of  $1.88 \pm 0.12$  days respectively, during October and November 2016. During October and November 2016, the duration of third instar larvae of *L. orbonalis* lasted for 2.0 - 3.0 days with a mean of  $2.55 \pm 1.80$  days and 2.0-3.0 days with an average of  $2.60 \pm 1.89$  days, respectively, During October 2016, the duration of fourth instar larvae lasted for 2.0 - 3.0 days with a mean of  $2.84 \pm 1.17$ . Similarly, during November, the duration of fourth instar larvae varied from 2.0 - 3.0 days with a mean of  $2.87 \pm 1.19$  days. The duration of fifth instar larvae lasted for 3.0 - 4.0 days with a mean of  $3.73 \pm 1.43$  days. Similarly, in the month of November 2016, the fifth instar larvae

**Table 1:** Biology of brinjal shoot and fruit borer, *L. orbonalis* during Rabi 2016 (October and November 2016).

Life stages	Number observed	October, 2016		November, 2016		Average of two generations
		Duration (days) Mean $\pm$ SD	Range (days)	Duration (Days) Mean $\pm$ SD	Range (Days)	
<b>Egg</b>	20	4.29 $\pm$ 0.92	4.0-5.0	4.79 $\pm$ 1.33	3-4	4.54
<b>Larval stages</b>						
I <sup>st</sup> instar	20	1.39 $\pm$ 0.57	1.0-2.0	1.52 $\pm$ 0.88	1.0-2.0	1.43
II <sup>nd</sup> instar	20	1.82 $\pm$ 0.14	1.0-2.0	1.88 $\pm$ 0.12	1.0-2.0	1.82
III <sup>rd</sup> instar	20	2.55 $\pm$ 1.80	2.0-3.0	2.60 $\pm$ 1.89	2.0-3.0	2.57
IV <sup>th</sup> instar	20	2.84 $\pm$ 1.17	2.0-3.0	2.87 $\pm$ 1.19	2.0-3.0	2.85
V <sup>th</sup> instar	20	3.73 $\pm$ 1.43	3.0-4.0	3.83 $\pm$ 1.44	3.0-4.0	3.78
<b>Total larval period</b>	20	12.42 $\pm$ 1.16	12.0-14.0	12.86 $\pm$ 1.08	12.0-14.0	12.64
<b>Pupa</b>						
Male	10	7.54 $\pm$ 0.48	7.0-8.0	7.78 $\pm$ 0.70	7.0-8.0	7.66
Female	10	8.12 $\pm$ 0.64	8.0-9.0	8.52 $\pm$ 0.44	8.0-9.0	8.32
Pre oviposition period	10	1.52 $\pm$ 0.37	1.0-2.0	1.62 $\pm$ 0.28	1.0-2.0	1.57
Post oviposition period	10	0.78 $\pm$ 0.30	0.70-0.90	0.89 $\pm$ 0.27	0.80-0.90	0.83
Oviposition period	10	3.44 $\pm$ 0.19	3.0-4.0	3.68 $\pm$ 0.35	3.0-4.0	3.59
<b>Adult longevity in days</b>						
Male	10	2.56 $\pm$ 0.24	2.0-3.0	2.60 $\pm$ 0.41	2.0-3.0	2.58
Female	10	3.68 $\pm$ 0.45	3.0-6.0	3.84 $\pm$ 0.49	3.0-5.0	3.76
<b>Total life cycle</b>						
Male	10	20.94 $\pm$ 3.27	20.0-28.0	22.68 $\pm$ 3.19	20.0-28.0	21.81
Female	10	23.94 $\pm$ 3.06	18.0-30.0	24.26 $\pm$ 2.94	19.0-30.0	24.10
		<b>Number</b>		<b>Number</b>		
Fecundity (eggs)	10	185.10 $\pm$ 24.08	88-235	190.20 $\pm$ 36.45	78-240	187.65

period varied for 3.0- 4.0 days with a mean of 3.83  $\pm$  1.44 days. The larval period was on an average of 12.42  $\pm$  1.16 days (ranged 12.0 - 14.0 days) and there were 5 larval instars. Singh and Singh (2001), Jat *et al.* (2003) and Pal *et al.* (2003) reported the similar trend, however Saxena (1965) and Allam and Krishnamurthy (1982), who recorded 6 larval instars.

### Pupal period

During October and November 2016, the pupal period of female lasted from 8.0 - 9.0 days and 8.0 - 9.0 days with an average of 8.12  $\pm$  0.64 and 8.52  $\pm$  0.44 days, respectively. During October and November 2016, the pupal period of male lasted from 7.0 to 8.0 days and 7.0 to 8.0 days with an average 7.54  $\pm$  0.48 and 7.78  $\pm$  0.70 days, respectively. Similar results on pupal period were reported by Pal *et al.* (2003).

### Adult

During October and November 2017, the total development period of female varied from 18.0 to 30.0 days and 19.0 to 30.0 days with a mean 23.94  $\pm$  3.06 and

24.26  $\pm$  2.94 days respectively. The total development period of male varied from 20.0 to 28.0 days and 20.0 to 28.0 days with a mean 20.94  $\pm$  3.27 and 22.68  $\pm$  3.19 days, respectively.

### Longevity of adult

During October and November, the longevity of male was varied from 2.0 - 3.0 days and 2.0 -3.0 days with a mean 2.56  $\pm$  0.24 and 2.60  $\pm$  0.41 days, respectively. The longevity of female was varied from 3.0 - 6.0 days and 3.0 - 5.0 days with a mean 3.68  $\pm$  0.45 and 3.84  $\pm$  0.49 days, respectively.

### Duration of life cycle

The average duration of *L. orbonalis* from egg to adult emergence on brinjal during October and November in case of male and female was 21.81 and 24.10 days, respectively. Singh and Singh (2001) and Jat *et al.* (2003) observed similar results on biology of *L. orbonalis* under laboratory conditions.

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