

## Biology of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guen.) in Raichur district of Karnataka



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### SUMMARY

A laboratory experiment was conducted during the year 2009-10 to study the biology of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. The studies revealed that it completed its total life cycle in 36.27 days. Mating took place on the same or next day after emergence. The pre-oviposition, oviposition, incubation, larval and pupal periods were found to be 1.20, 1.90, 3.66, 15.72 and 9.66 days, respectively. Female laid 160 eggs. There were five instars. The longevity of male and female was 3.0 and 5.20 days.

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### Key words :

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Brinjal or eggplant (*Solanum melongena* L.) is one of the most important vegetable crops of Raichur district of Karnataka. This crop is vulnerable to the attack of many insect pests. Among which shoot and fruit borer, *Leucinodes orbonalis* Guenee, is the most destructive pest. Fruit and shoot borer (SFB) larvae bore into tender shoots and fruits, retarding plant growth and causing fruit damage as high as 92% and reduction in yield up to 60% by adversely affecting both quality and quantity of crop output and making the fruits unmarketable and unfit for human consumption (Mall *et al.*, 1992). Biology of this pest been studied earlier by Singh and Singh (2001), Harit and Shukla (2005) and Patial *et al.* (2007). Biology of pest is very important for the management point of view, So far no life cycle studies have been conducted and an attempt was made to work out the biology of *L.orbonalis* in Raichur district, Karnataka under house conditions which will help in managing this pest in a better way.

### MATERIALS AND METHODS

The present investigation was carried

during 2009 -10 under laboratory conditions. The rearing was carried under ambient conditions (*i.e.*, 27°C and 65-70% RH) according to AVRDC method (AVRDC, 1999). Diets commonly used for rearing polyphagous insect, *Helicoverpa armigera* were used for rearing eggplant fruit and shoot borer supplemented with eggplant fruit powder with the addition of 1 part of dried eggplant fruit powder to every 10 parts of diet mixture. To prepare the eggplant fruit powder, young tender eggplant fruits were collected, washed thoroughly with tap water, and sliced thinly (2–3 mm). Slices were dried in an oven at 60°C for 48–72 hours. The dried slices were grinded to a very fine powder, and refrigerated in tightly sealed containers. 20 g agar was added to 1 liter distilled water in a stainless steel container and thoroughly mixed. Boiling was continued until the agar has dissolved and the solution has become clear. Solution was allowed to cool to 55°C. 190 g of the selected diet was combined with 19 g of dried eggplant fruit powder, and poured the mixture into a large blender. Added the cooled (55°C) agar solution, and bended the mixture thoroughly for about a

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minute. Poured the diet into storage containers and refrigerator until needed.

### Insect mating and oviposition:

A mating and oviposition chamber was constructed from 15 cm diameter, 30 cm long, open acrylic cylinder. The inner surface of the cylinder was first lined with rough purple paper and then with a single layer of 16-mesh nylon netting, and placed it vertically in a Petri dish or other suitable container which was also lined with the same purple paper and nylon netting. A four-week-old potted eggplant seedling was placed inside the cylinder. The soil in the pot was covered with aluminum foil and a cotton swab dipped in dilute honey in a small (3–5 cm diameter) was placed in Petri dish next to the seedling. Two (preferably three) pairs of freshly emerged eggplant fruit and shoot borer adults were released inside the chamber. The top was covered with purple paper and nylon net secured with an elastic band. Oviposition chamber was placed in a room or incubator at 26–30°C. After four days (and daily thereafter) we looked for eggs on both the nylon netting and purple paper.

### Rearing larvae:

The larvae of *L. orbonalis* were reared at room temperature of 30°C under laboratory condition. Prepared rearing diet was placed in 9 cm diameter plastic cups. The nylon netting or purple paper were cut into small pieces containing a total of about 30 eggs were placed in each plastic cup. Cups were covered with rough tissue paper, and lids snapped on top. Neonate larvae readily migrate and feed on the diet. When larvae reach the third instar, two larvae were removed and placed each onto fresh diet in 30 ml cups; the containers were closed with the tissue paper-lined lids. After one week, the larvae were again transferred to containers with fresh diet. When the larvae are ready to pupate, they will crawl onto the tissue paper lining the lid. Pupae was collected from the lid and placed in a petri dish in a cage. Adults generally emerge after 8–10 days. To feed the adults, cotton soaked in 5% honey solution was also kept in the jars. The observations were made on incubation, pre-oviposition, oviposition, larval and pupal periods, longevity of male and female.

## RESULTS AND DISCUSSION

Studies on the biology shoot and fruit borer were made under laboratory conditions. The details of the results are furnished in Table 1. From the studies it is revealed that mating occurred on the same day or next day after emergence. This is in accordance with the findings of Harit and Shukla (2005). The female moths started laying of eggs on the same day or next day after mating. Similar observation was also noted by Singh and Singh (2001). In the present study, it was observed pre-oviposition and oviposition periods were 1.20 and 1.90 days, respectively. The findings are in conformity with the observations of Navasero and Calilung (1990), who found pre-oviposition and oviposition periods as 1.36 and 2.05 days, respectively. A single female laid 160 eggs in its lifetime. Observation on the fecundity corroborates with the earlier findings of Kavitha *et al.* (2008). They observed 170 eggs laid by a female. The eggs were creamy white in colour and oval in shape. This observation correlates with the findings of Allam *et al.* (1982) and Mathur and Jain (2006). The eggs were laid singly on the lower side of the leaves which coincides with the earlier report of Singh and Singh (2001) and Harit and Shukla (2005). Incubation period of *L. orbonalis* was observed as 3.66 days. This findings are in aggregation with the results of Muthukumaran and Kathirvelu (2007), who observed the incubation period as 3-4, respectively. Five larval instars were recorded in the present study. This findings are in accordance with that of Harit and Shukla (2005) and Patial *et al.* (2007).

In the present study, it was noticed that the first, second, third, fourth and fifth larval instar periods were 3.60, 2.58, 2.90, 3.10 and 3.54 days, respectively. These findings do not agree with the earlier findings of Navasero and Calilung (1990) who had reported that the larval instars periods were 2.19, 2.16, 1.77, 1.80 and 1.36 days, respectively. The differences may be due to tropical climate prevailing in this area. The total larval period observed in the present study was 15.72 days. This is in aggregation with the findings of Singh and Singh (2001), and Muthukumaran and Kathirvelu (2007). They observed the total period as 18.16 and 16.8 days, respectively. The fifth instar larva of *L. orbonalis*, finally pupated in a silk cocoon. Similar observations are reported earlier by Mathur and Jain (2006). The pupation period was found

**Table 1: Duration of different developmental stages of *Leucinodes orbonalis* on *Solanum melongena***

Pre-oviposition period in days	Oviposition period in days	Fecundity eggs in numbers	Incubation in days	Larval instars in days					Total larval period in days	Pupal period in days	Longevity		Total life cycle in days
				I	II	III	IV	V			Male	Female	
1.20	1.90	160	3.66	3.60	2.58	2.90	3.10	3.54	15.72	9.66	3.0	5.20	36.27

to be 9.66 days. Butani and Verma (1976) observed that the pupal period as 7-10 days and Mehto *et al.* (1983) reported as 9-7 days. Adults were emerged from pupa in the morning hours. Longevity of male and female moths was observed as 3.00 and 5.20 days, respectively. This is in accordance with Baang and Corey (1991) who reported as 4 days and Singh and Singh (2001) as 3.53 days.

In the present investigation, average life span of female moth of *L. orbonalis* was 3.70 days. This is more or less in conformity with the findings of Singh and Singh (2001) and Harit and Shukla (2005), who observed the longevity of male as 3.53 days. In the present study, it was recorded a higher longevity of female than male moth. This finding is found in agreement with the observation of Baang and Corey (1991) and Mathur and Jain (2006). The males outnumbered the females and the overall sex ratio was 1.4:1. This is more or less in accordance with the findings of Patial *et al.* (2007), who observed male and female sex ratio as 1.3:1. *L. orbonalis* completed its life cycle in 36.27 days. The present observation supports the earlier findings of Lall and Ahmad (1965) and Singh and Singh (2001) who observed that the total developmental period as 30 and 36.82 days, respectively. The differences observed in the present investigation with earlier findings in the life history of *L. orbonalis* may be due to the changes in the prevailing environmental factors.

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