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Biology of Brinjal Shoot and Fruit Borer L*eucinodes orbonalis* (Guen.)

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A B S T R A C T

The study on the biology of shoot and fruit borer wascarried out in the Research Laboratory of Department of Entomology, College of Agriculture, R.V.S.K.V.V., Gwalior (M.P.) India, *Kharif* during 2018-19. White creamy eggs were laid single in bunches which were oval to elongate in shape. The incubation period of the brinjal shoot and fruit borer on brinjal food varied from 4-6 days with a mean duration of 4.95 ± 0.60 days. Whitish to dark pinkish larva period through instar to became full grown the average larval period varied from 10 to 13 days with a mean duration of 11.25 ± 0.95 days in brinjal food part. under laboratory condition. Pinkish to dark brown pupa took place an average of 7.18 ± 0.74days and pupal period varied from 6 to 8days become an adult. The adult moths were small in size with whitish wings the adult longevity varies from 4.0 to 5.5 days during experiment, with an averageof 4.92 ± 0.54days thus, the total life cycle completed period from 24 to 29 days with a mean duration of 27.08 ± 1.52 days in brinjal food. The male and female ratio varied from 1 to 2during experiment, with an average ratio of 1:2under laboratory conditions.

Introduction

The biology of brinjal shoot and fruit borer *Leucinodes orbonalis* Guen. The study of biology of an insect provides the growth rate statistics, which can be used as a predictive basis of pest control. The biological activities of *L. orbonalis* are at their peak during the summer at around 35^0 C. Hence, the pre-oviposition, oviposition, fecundity, incubation, larval period, pupal period and adult longevity of *L. orbonalis* on brinjal in the laboratory conditions at 35^0C temperature and relative humidity 90%, during 2018-19. Bindu *et al.*, (2015) studied the biology and measurement of the different life stages of *L.orbonalis* and revealed that the incubation period was 3.8 ± 0.84 days. The total larval period were 16.2 ± 1.48 days. The pre-oviposition was found 1.81 ± 0.21 days and the oviposition period was 2.55 ± 0.42 days. The mean pupal period was 8.6 ± 0.89 days, measured 12.34 ± 1.67 mm length and 4.40 ± 0.47 mm in breadth. The mean adult male moth longevity was 4.2 ± 0.84, recorded 13.54 ± 2.12 mm in length and 2.98 ± 0.38 mm in breadth with wingspan of 20.55 ± 1.41 mm. The mean lifespan of female moth of *L.*

orbonalis was observed 5.8 ± 0, measured 14.53 ± 1.23 mm in length, 4.41 ± 1.33 mm in breadth and wingspan of 23.41 ± 1.45 mm. The duration of total life cycle varied 35.2± 1.72 days. Singla *et al.,* (2018), studied the biology of brinjal shoot and fruit borer, *Leucinodes orbonalis*, on brinjal variety Punjab Sadabahar. The different parameters of biology viz. incubation period, larval period, pupal period, oviposition, fecundity, adult longevity and sex ratio were studied during different months i.e. June, August and October. The results revealed that there was significant difference in duration of all the biological parameters during three different seasons and minimum duration of incubation period (3.19 days), larval period (11.31 days), pupal period (7.11 days) was observed during August when mean temperature and relative humidity was 29.5^{o}C and 79.25 percent, respectively. The total life span was observed to be short during August followed by June and October.

Materials and Methods

The study on the biology of shoot and fruit borer was carried out in the Research Laboratory of Department of Entomology, College of Agriculture, R.V.S.K.V.V., Gwalior (M.P.) India. The larvae were collected in large number from the infested shoots and fruits in experimental field. These larvae were kept separately in clean glass tubes size (3''×1"). The fresh fruits of brinjal were cut and small pieces were provided daily in the glass tubes to serve as a food for developing larvae. The pieces of brinjal fruits were changed daily to avoid any fungal and microbial pathogenic growth. The mouth of each glass tubes were plugged with cotton. In view of trouble-free pupation, the folded and grooved paper was placed in each Petridish when larvae turned to 5thinstars. The freshly formed pupae was collected and transferred to a glass jar (size 360 mm × 150 mm) covered with muslin cloth for adult emergence. The male and female moths were collected from the jar, separately and transferred in pair to other glass jar and covered with muslin cloth. A cotton piece soaked in 5 percent honey solution was provided in jar by hanging through the muslin cloth with the help of thread to feed the adults. A tender twig of the brinjal in a 50 ml beaker having water was placed inside the glass jar for egg laying. The eggs received from these female moths were counted and left as such in glass jars, as many of the eggs were found to attach with the wall of the jars. The newly hatched larvae were transferred in petrdishes with the help of soft camel hair-brush and were provided with very soft slices of brinjal. From the second instars, larvae were feed with the slice of brinjal, which were changed daily. The growth and development of *L. orbonalis* Guen. Was noted every day till adult emergence. Eggs deposited on glass chimneys were care fully removed with the help of fine camel hair brush. Incubation period of each egg was also recorded. Following observation were recorded on larvae just after their hatching. In one petridish larvae of first instarwere kept along with soft leaves and tender buds of brinjal. For second and third instar larvae of *Leucinodes orbonalis*s oft fruits of brinjal were provided. From hatching to initiation of pupation was taken as larval period. When the larvae pupated inside the petridish it waskept undisturbed for its cycle completion. And when the adult emerged out from it then the adult were separated out. The period required from the pupal formation till the eclosion of adult stage was counted as the pupal period. For study of the longevity of adults, the newly emerged moths were kept in glass chimneys and ten percent sugar solution was provided as food. From eclosion of adult to the death period required was counted as longevity of adult. Based on the visual characters like variation in abdomen with projections in the female and the bigger size of the female than

that of male, the insect were separated sex wise for sex ratio.

Results and Discussion

Data on biology of Brinjal shoot and fruit borer *Leucinodes orbonalis* (Guen.) were presented in the table 1. The eggs of the borer were creamy white which gradually turned to orange and finally black just before hatching. Oval to elongate eggs were laid singly or in bunches glued to the surface of black paper strip. The incubation period of the brinjal shoot and fruit borer on brinjal food varied from 4-6 days with a mean duration of 4.95±0.60 days. Slight variations in the duration may be due to variation in the host on which the previous generation of the moth was reared which might have contributed this in the next generation. Newly hatched larva was glabrous, dirty white incolour, the body colour of the larva changed from whitish to dark pinkish. The head of the larva was dark brown and had strong mandibles for mastication. The thorax of the larva showed three distinct segments with a pair of well-developed thoracic legs on each segment. The abdomen had 10 segments and five pairs of prolegs. The total duration of the larval period varied from 10 to 13 days with a mean duration of 11.25 ± 0.95 days in brinjal food part.

The pupation took place on surface of the glass jar, covered muslincloth, sometimes inside the fruits or on the leaves of the plants. Initially the colour of the pupa was pinkish which later turned into dark brown. The pupa was object type with blunt anterior end and conical in shape posteriorly, having distinct bodies divisions and a pair of spiracles on each abdominal segment. The pupal period varied from 6 to 8days with a mean duration of7.18 ± 0.74days. The adult moths were small in size with whitish wings, blackish brown head and thorax. The whitish wings have brown and black markings which were broader on the fore wings. Hind wings were dirty white with black dots and angled margin. The abdomen of female was swollen and sees medovate in structure whereas, in the males, it was thinner and cylindrical. The abdominal tip of female stapered and pointed towards the end while, in males it was blunt with some what white hairy structures. Adult longevity varied from 4.0 to 5.5days during experiment, with an average of 4.92 ± 0.54days under laboratory conditions. The total developmental period varied from 24 to 29 days with a mean duration of 27.08 ± 1.52 days in brinjal food.

The mean longevity of female varied from 1 to 2 adult with a mean longevity of 1.40 ± 0.52 day. The mean longevity of the male was 0.80 ± 0.42 days which varied from 0.0 to 1.0 adult. The emerged borer moths of *L. orbonalis* were distinguished based on sexual diamorphism characters. Present study indicated slight dominance of female population. The male and female ratio varied from 0.0 to 1.00 and 1.0 to 2.0during experiment, respectively, with an average ratio of 1:2under laboratory conditions.

These results are in accordance with the observations of Kumar *et al.,* (2011) who reported the mean incubation period of 3.66 days on brinjal. The present findings are also in accordance with the findings of Mehto *et al.,* (1983), and Singh and Singh (2003) who reported incubation periods of 5.4, 4.30 and 5.65 days. Slight variations in the duration may be due to variation in the host on which the previous generation of the moth was reared which might have contributed this in the next generation.The present findings are also in accordance with Jat *et al.,* (2003), Pal *et al.,* (2003), Wankhede *et al.,* (2009), Kumar *et al.,* (2011) and Bindu *et al.,* (2013) who have reported the egg period varied from 3 to 6 days at different laboratory conditions.

Table.1 Biology of brinjal shoot and fruit borer (*Leucinodes orbonalis*) under laboratory condition

Development Stages	Duration (Days)	
	Range	Mean ± S.D.
Incubation period	4.0-6.0	4.95 ± 0.60
Larval period	10.0-13.0	11.25 ± 0.95
Pupal period	6.0-8.0	7.18 ± 0.74
Adult longevity	4.0-5.5	4.92 ± 0.54
Total development period	24.0-29.0	27.08 ± 1.52
Male	0.0-1.0	0.80 ± 0.42
Female	1.0-2.0	1.40 ± 0.52
Sex ratio	01:02	-

Newly hatched larva was glabrous, dirty white in colour, the body colour of the larva changed from whitish to dark pinkish. The larva passed through five instars to become full grown.The total duration of the larval period varied from 10 to 13 days with a mean duration of 11.25±0.95 days in brinjal food part. These results are in accordance with those of Rahman *et al.,* (2006) who reported that the total larval period varied from 12-15 days. These results also showed similarity to the findings of Radha krishore *et al.,* (2010) who reported that the total larval period varied from 15-18 days. The present findings are more or less in conformity with the findings of Onekuto *et al.,* (2013) who reported the total developmental period varied from 26.61 days to 28.57 days with an average of 27.49 days while Mannan *et al.,* (2015) reported that the total developmental period of this pest varied from 17 to 28 days. These results are in accordance with those of Jat *et al.,* (2003) who reported the longevity of male and female as 1.82 days and 3.12 days, respectively but contrary to the findings of Kavitha *et al.,* (2008) who observed that male longevity was 3.50 days while, the female longevity was 5.70 days. Harit and Shukla (2005) who reported that male and female lifespan varied few days 1.5-2.4 and 2.0-3.9 days, 4.0 and 7.5 days, 3.53 and 5.80 days, 3.53 and 5.51 days, respectively. These variations in the duration of life stages may be due to variable food and temperature.

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