BIOLOGY OF SLUG CATERPILLAR, *Parasa lepida* (LEPIDOPTERA: LIMACODIDAE) ON MANGO

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ABSTRACT

The study on biology of slug caterpillar, parasa lepida (Cramer) on mango was carried out in the laboratory of Department of Agricultural Entomology, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during the month of June-July 2015. The temperature and relative humidity during the course of study period was 30.22^{o}C and 65.87 per cent, respectively. The study revealed that the average diameter of freshly laid egg was 0.5 ± 0.02 mm. The average incubation period was 3.47 ± 0.68 days under laboratory condition, with an average hatching percentage of 81.40. The larvae of P. lepida passes through seven instars. The average length of first, second, third, fourth, fifth, sixth and seventh larval instars were 3.00 ± 0.69 mm, 5.50 ± 0.51 mm, 8.07 ± 0.58 mm, 10.20 ± 0.66 mm, 13.50 ± 0.78 mm, 16.87 ± 1.07 mm and 20.07 ± 1.05 mm, respectively. While, the average breadth of first, second, third, fourth, fifth, sixth and seventh larval instars were 0.48 ± 0.01 mm, 0.70 ± 0.02 mm, 2.75 ± 0.04 mm, 3.19 ± 0.03 mm, 4.91 ± 0.03 mm, 5.90 ± 0.13 mm and 6.08 ± 0.36 mm, respectively. The average duration of first, second, third, fourth, fifth, sixth and seventh larval instars were 2.43 ± 0.50 days, 3.33 ± 0.48 days, 4.53 ± 0.51 days, 5.36 ± 0.49 days, 5.60 ± 0.67 days, 7.30 ± 0.79 days and 5.77 ± 0.73 days, respectively. The average length and breadth of pre-pupa was 13.77 ± 0.86 mm and 8.60 ± 0.89 mm, respectively. The average duration of pre-pupal stage was 1.43 ±0.50 days. The average length and breadth of male pupa was 12.87 ± 0.82 mm and 6.00 ± 0.74 mm respectively. While, it was, 16.00 ± 0.83 mm and 9.03 ± 0.93 mm, respectively in case of female average duration of pupa was 29.33 ± 1.32 days. The average length of male was 12.50 ± 0.51 mm and breadth with expanded wing was 34.80 ± 0.48 mm, while the average length of female was 14.50 ± 0.51 mm and the breadth with expanded wing was 37.47 ± 0.90 mm. The average duration of male and female was 3.25 ± 0.79 days and 6.45 ± 1.32 days, respectively.

KEY WORDS: Biology, slug caterpillar, Parasa lepida, instar

INTRODUCTION

Mango (*Mangifera indica* L.) is the National fruit of India. Mango truly a "King" of fruits has been cultivated for about 4,000 years and its production and consumption has gradually increased as its popularity has grown (Baddi *et al*., 2015). The mango which belongs to family *Anacardiceae* is an important tropical and sub tropical fruit crop. Among the fruits of universal important, mango is one of the top, because of its sweet fragrance, attractive colour, high palatability, taste and quality being rich in sugar, vitamins, and minerals. There is a regular attack of different insect pests on mango trees in nature and about 150 species of insect pests have been reported on it. But, hardly half a dozen pest species

having major important (Butani, 1974; David and Ramamurthy, 2012). Amongst the different insect pests attacking mango, the population of slug caterpillar (*P. lepida*) was found increasing in our region day by day. The larvae of slug caterpillar is the destructive stage of this insect. The larvae of *Parasa lepida* observed on young leaves of mango and causing severe damage. The leaves of younger plant damaged up to 52.6 per cent in mango (Kapoor *et al.,* 1985).

MATERIAL AND METHODS

The initial culture of slug caterpillar was established in the laboratory of Department of Agricultural Entomology, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar by collecting the larvae from mango orchard of Horticultural Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Fresh leaves of mango was provided daily in each Petri dish as a food for the larvae. Grown up larvae were transferred into the rearing glass jar. After pupation, the pupae were kept in the jar till the adults emerged. A pair of newly emerged male and female was confined in a glass chimney cage prepared by placing a chimney on blotting paper in Petri dish. Five per cent honey solution was provided as a food to the adults by dipping a piece of sponge in the solution. The sponge was changed daily. The leaves, muslin cloth and chimney was observed every morning for egg laying, if any. The eggs were transferred on fresh leaves with the help of a fine camel hair brush. The eggs were kept in separate Petri dish and used to maintain a pure culture of the pest.

Twenty five eggs were examined under microscope to study their colour, shape and size. The diameter of the eggs was measured with the help of occular and stage micrometer. To study the incubation period and hatching percentage of eggs, freshly laid eggs were observed under microscope daily in the morning and evening till they hatched.

With a view to determine the number and duration of different larval instars and total larval period, the newly emerged larvae (first instar) was placed individually in Petri dish (15 cm diameter x 1.5 cm height) with the help of fine camel hair brush and tender and uninfested fresh mango leaves were kept inside the Petri dish as a food. For determining the number of larval instars, the size of individual larva was observed daily. The larvae in each instar was studied for their colour, shape and size. Observations on number of instars, duration of each instar and total larval period was recorded separately. Measurement of first instar larvae was taken under microscope with the help of stage and occular micrometer. While, the length and breadth of the remaining instars was measured with millimeter scale. The total larval period was calculated from the date of hatching of egg to the pre-pupal stage.

The pre-pupal stage was observed critically under the microscope for their colour, shape and size. The size of pre-pupa was measured using millimeter scale. The pupa was studied for their colour, shape, size and duration. The length and breadth of pupa was measured by using occular and stage micrometer. The pupal period was considered from the date of formation of pupa to the date of adult emergence. The size of the adults with wing expansion was measured using millimeter scale. The duration of adults was also worked out.

RESULTS AND DISCUSSION

The eggs were round in shape and pale yellowish in colour (Plate 1). The female lay about 10 to 50 eggs in masses on the lower surface of mature leaf. The data presented in Table 1 indicated that the diameter of freshly laid egg was 0.4 to 0.6 mm (Av. 0.5 ± 0.02 mm). The incubation period of *P. lepida* varied from 2 to 4 days with an average of 3.47 ± 0.68 days (Table 2).

The hatching percentage of eggs of *P. lepida* were varied from 64.00 to 95.00 per cent (Av. 81.40 per cent) when reared at

an average temperature of 30.22 ± 1.60°C and 65.87 ± 2.00 per cent relative humidity.

The larvae of *P. lepida* passed through seven instars. The newly emerged first instar larva of *P. lepida* was yellowish with greenish in colour and small spiky setae were found on the body (Plate 1). Small parallel green line was observed on the dorso lateral surface of the body The length and breadth of first instar larva varied from 2 to 4 mm (Av.3.00 ± 0.69 mm) and 0.47 to 0.49 mm (Av. 0.48 ± 0.01 mm), respectively (Table 1). The first instar larval period ranged from 2 to 3 days (Av. 2.43 ± 0.50 days) (Table 2).

The newly moulted second instar larva of *P. lepida* was light green creamy in colour with parallel white strips on dorsal surface having numerous stinging setae on whole body (Plate 1). The second instar larva feeds on the lower surface of mature leaves. The length and breadth of second instar larva of *P. lepida* varied from 5 to 6 mm (Av. 5.50 ± 0.51 mm) and 0.60 to 0.74 mm (Av. 0.70 ± 0.02 mm), respectively (Table 1). The second instar larval period of slug caterpillar was 3 to 4 days (Av. 3.33 ± 0.48 days) (Table 2).

The third instar larva was bright green in colour and it was active and voracious feeder. The larva possess poisonous bristle like hairs on the body (Plate 1). Touch of larva to the human body may cause allergic effect. The length and breadth of third instar larva was 7 to 9 mm (Av. 8.07 ± 0.58 mm) and 2.68 to 2.82 mm (Av. 2.75 ± 0.04 mm), respectively (Table 1). The third instar larval period was 4 to 5 days (Av. 4.53 ± 0.51 days) (Table 2).

The fourth instar larva was rapacious and greenish in colour having white lines on the body. It defoliate the leaves of the mango tree. The fourth instar having bristle bearing out growth on the outer surface of the body (Plate 1). The length and breadth of fourth instar larva was 9 to 11 mm (Av. 10.20 ± 0.66 mm) and 3.12 to 3.25 mm (Av. 3.19 ± 0.03 mm), respectively (Table 1). The fourth instar larval period (Table 2) was 5 to 6 days (Av. 5.36 ± 0.49 days).

The fifth instar larva having attractive look and light green in colour. Larva had well developed self-defense mechanism with four rows of spiny red scoli on anterior and posterior body, which can cause irritation and pain on skin of human body (Plate 1). The length and breadth of fifth instar larva was 12 to 14 mm (Av. 13.50 ± 0.78 mm) and 4.85 to 4.98 mm (Av. 4.91 ± 0.03 mm), respectively (Table 1). The fifth instar larval period (Table 2) was 5 to 7 days (Av. 5.60 ± 0.67 days).

Sixth instar larva having craptic colouration pattern with protaberances and sting spines on their dorsal body surface. The larva had ability to blend in natural environment (Plate 1). The length and breadth of sixth instar larva was 15 to 18 mm (Av. 16.87 ± 1.07 mm) and 5.65 to 6.18 mm (Av. 5.90 ± 0.13 mm), respectively (Table 1). The sixth instar larval period was 7 to 9 days (Av. 7.30 ± 0.79 days) (Table 2).

Seventh instar larva was tremendous and grassy in colour. The larva has unusual locomotory habit. The larva use their abdominal sucker appendages in the movement and they secrete semifluid silk, which enhance to the substrate contact (Plate 1). The length and breadth of seventh instar larva was 18 to 21 mm (Av. 20.07 ± 1.05 mm) and 5.4 to 6.5 mm (Av. 6.08 ± 0.36 mm), respectively (Table 1). The seventh instar larval period was 4 to 6 days (Av. 5.77 ± 0.73 days) (Table 2). The result incorporated in Table 2 revealed that the total larval period of *P. lepida* ranged from 30 to 40 days (Av. 33.86 ± 4.31 days).

Before pre-pupation, the larva became sluggish and stop feeding. At this stage body colour of larva was changed into light green. The pre-pupa covered with silken material and black colour spots observed on the anterior and posterior side of the pre-pupal stage (Plate 1). The pre-pupa was flat at ventral side and the length

and breadth of pre-pupa varied from 13 to 15 mm (13.77 ± 0.86 mm) and 7 to 10 mm (8.60 ±0.89 mm), respectively (Table 1). From Table 2, it can be seen that the pre-pupal period of *P. lepida* ranged from 1 to 2 days (1.43 ± 0.50 days).

The pupa was very hard and formed in chocolate brown shell like silken cocoon. Lateron, it converted into dark ash colour. Larva forms round oval shaped cocoon which was flat at ventral side. Pupa of slug caterpillar was found in the field, which was attached to the stem or on the leaf. The cocoons have a circular line at the front side and the pupa pushed off the circular cap and protrudes from the cocoon just before the moth emergence. The female pupa was slight bigger than male pupa (Plate 1). From the Table 1, it can be seen that the length and breadth of male pupa varied from 12 to 14 mm (Av. 12.87 ± 0.82 mm) and 5 to 7 mm (Av. 6.00 ± 0.74 mm), respectively. While, the female pupa varied from 15 to 17 mm (Av. 16.00 ± 0.83 mm) and 8 to 10 mm (Av. 9.03 ± 0.93 mm) in length and breadth, respectively. From the Table 2, it can be seen that the pupal period of *P. lepida* ranged from 28 to 32 days (Av. 29.33 ± 1.32 days).

The adult moths (male and female) of *P. lepida* were green and brownish in colour with black compound eyes. The sexual differentiation was observed by antennal character. The female and male possessed setaceous and pectinate antennae, respectively. The thorax and abdomen were greenish with dark golden colour and covered with dense brownish scale. The fore wings in both the sexes were broader than hind wings. The fore wings were green with olive brown in colour, while the hind wings were creamish in colour and brownish colour hairs present on the legs in both the sex. In the female, the tip of abdomen was divided into narrow streaks (Plate 1), while in male, the tip of abdomen was short and tapering as compared to the female.

The length of male varied from 12 to 13 mm (Av. 12.50 ± 0.51 mm) and breadth with wing expansion varied from 34 to 36 mm (Av. 34.80 ± 0.48 mm), while the length of female ranged from 14 to 15 mm (Av.14.50 ± 0.51 mm) and the breadth with wing expansion varied from 37 to 38 mm (Av.37.47 ± 0.90 mm) (Table 1). The longevity of male and female were 2 to 4 days (Av. 3.25 ± 0.79 days) and 5 to 8 days (Av. 6.45 ± 1.32 days), respectively (Table 2).

CONCLUSION

From the study, it can be concluded that the average diameter of freshly laid egg was 0.5 ± 0.02 mm. The average incubation period was 3.47 ± 0.68 days under laboratory condition, with an average hatching percentage of 81.40. The total larval period of *P. lepida* ranged from 30 to 40 days (Av. 33.86 ± 4.31 days). The average length and breadth of pre-pupa was 13.77 ± 0.86 mm and 8.60 ± 0.89 mm, respectively. The average duration of pre-pupal stage was 1.43 ±0.50 days. The average length and breadth of male pupa was 12.87 ± 0.82 mm and 6.00 ± 0.74 mm respectively. While, it was 16.00 ± 0.83 mm and 9.03 ± 0.93 mm, respectively in case of female average duration of pupa was 29.33 ± 1.32 days. The average length of male was 12.50 ± 0.51 mm and breadth with expanded wing was 34.80 ± 0.48 mm, while the average length of female was 14.50 ± 0.51 mm and the breadth with expanded wing was 37.47 ± 0.90 mm. The average duration of male and female was 3.25 ± 0.79 days and 6.45 ± 1.32 days, respectively.

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Table 1: Measurement of different stages of slug caterpillar, *P. lepida*

Sr. No.	Life Stage	Particulars	Measurement (mm)		
			Min.	**Max.**	**Av. ± SD**
1.	**Eggs**	Diameter	0.4	0.6	0.5 ± 0.02
2.	**Larva**				
	I instar	Length	2	4	3.00 ± 0.69
		Breadth	0.47	0.49	0.48 ± 0.01
	II instar	Length	5	6	5.50 ± 0.51
		Breadth	0.60	0.74	0.70 ± 0.02
	III instar	Length	7	9	8.07 ± 0.58
		Breadth	2.68	2.82	2.75 ± 0.04
	IV instar	Length	9	11	10.20 ± 0.66
		Breadth	3.12	3.25	3.19 ± 0.03
	V instar	Length	12	14	13.50 ± 0.78
		Breadth	4.85	4.98	4.91 ± 0.03
	VI instar	Length	15	18	16.87 ± 1.07
		Breadth	5.65	6.18	5.90 ± 0.13
	VII instar	Length	18	21	20.07 ± 1.05
		Breadth	5.4	6.5	6.08 ± 0.36
3.	**Pre-pupa**	Length	13	15	13.77 ± 0.86
		Breadth	7	10	8.60 ± 0.89
4.	**Pupa**				
	Male	Length	12	14	12.87 ± 0.82
		Breadth	5	7	6.00 ± 0.74
	Female	Length	15	17	16.00 ± 0.83
		Breadth	8	10	9.03 ± 0.93
5.	**Adult**				
	Male	Length	12	13	12.50 ± 0.51
		Breadth	34	36	34.80 ± 0.48
	Female	Length	14	15	14.50 ± 0.51
		Breadth	37	38	37.47 ± 0.90

Table 2: Duration of different stages of slug caterpillar, *P. lepida*

Sr. No.	Life Stage	Period (days)		
		Min.	**Max.**	**Mean ± SD**
1.	**Egg**	2	4	3.47 ± 0.68
2.	**Larva**			
	I instar	2	3	2.43 ± 0.50
	II instar	3	4	3.33 ± 0.48
	III instar	4	5	4.53 ± 0.51
	IV instar	5	6	5.36 ± 0.49
	V instar	5	7	5.60 ± 0.67
	VI instar	7	9	7.30 ± 0.79
	VII instar	4	6	5.77 ± 0.73
	Total	30	40	33.86 ± 4.31
3.	**Pre-pupa**	1	2	1.43 ± 0.50
4.	**Pupa**	28	32	29.33 ± 1.32
5.	**Adult**			
	Male	2	4	3.25 ± 0.79
	Female	5	8	6.45 ± 1.32
7.	**Temperature (^{o}C)**	27.7	32.5	30.22 ± 1.60
8.	**Relative Humidity (%)**	55.2	83.5	65.87 ± 2.00

Eggs

First Instar Larva

Second Instar Larva

Third Instar Larva

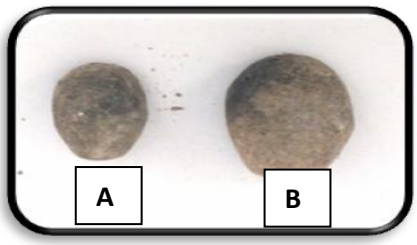
Fourth Instar Larva

Fifth Instar Larva

Sixth Instar Larva

Serventh Instar Larva

Pre-Pupa



Male (A) and Female (B) Pupa

Male (A) and Female (B) Adults

Plate 1: Life cycle of slug caterpillar, P. lepida

[MS received: October 24, 2016] *[MS accepted: December 12, 2016]*