

**STUDIES ON BIOLOGY OF *HENOSEPILOCHNA*  
*VIGINTIOCTOPUNCTATA* (FAB.) ON BITTER GOURD****R. Shanmugapriyan<sup>\*1</sup>, K. M. Remia<sup>2</sup> and V. Dhanalakshmi<sup>3</sup>**<sup>1</sup>\*Lucine Agro Tech India Pvt. Ltd., Coimbatore, Tamilnadu, India.<sup>2</sup>MES Mampad College, Mampad, Malappuram, Kerala, India.<sup>3</sup>N.G.M College, Pollachi, Coimbatore, Tamilnadu, India.Article Received on  
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Ltd., Coimbatore,  
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Spotted beetle, *Henosepilachna vigintioctopunctata* (Fab.) (Coleoptera: Coccinellidae) is one of the major pest on bitter gourd, *Momordica charantia* in South India. An experiment was conducted to study the biology of Epilachna beetle on bitter gourd under laboratory condition. Oviposition, fecundity, larval development, adult emergence and longevity of this pest had been recorded. The average fecundity rate was 284.79 numbers. Eggs hatched within 3 to 4 days. The larval development extended up to 11.99 days. The larvae pass through four moults with an average period of 3.25, 2.98, 2.55 and 3.22 days for

first, second, third and fourth instar, respectively. Adult emergence appeared between 4 to 7 days. The beetles took 19 to 21 days to develop from egg to adult. The longevity of male and females of epilachna beetle was 44.39 and 52.68 days, respectively.

**KEYWORDS:** *Henosepilachna vigintioctopunctata*, *Momordica charantia*, Oviposition, Fecundity, Incubation, Instars, Adult emergence, Longevity.

**INTRODUCTION**

Coccinellid beetles are agriculturally important, many of them are beneficial, preying upon destructive insects such as aphids, chrysomelids, coccids and aleyrodidae, and however, some are harmful pests of agricultural crops. Phytophagous coccinellids have been grouped in the subfamily Epilachninae. Redtenbacher (1843) was the first person to draw the attention epilachnae for their phytophagous habits. Lefroy (1909), Fletcher (1914), Subramaniam (1924) and Krishnamurthi (1932) had reported *Epilachna vigintioctopunctata* as a very common pest found feeding on solanaceous and cucurbitaceous plants in various parts of

India. *H. vigintioctopunctata* is one of the most destructive pests extensively found all over India and in other countries (Anam *et. al.*, 2006; Rahman *et. al.*, 2008). *Henosepilachna* beetle causes considerable economic loss to many crops including brinjal depending on place and season for variations of prevailing environmental conditions (Rajagopal and Trivedi, 1989; Bhagat and Munshi, 2004; Islam *et. al.*, 2011). Kapur (1950) first studied the biology and external morphology of the larvae of epilachna in India. He also described nine species of the genus Epilachna.

Besides, the pest is also recorded from cucurbitaceous and medicinal solanaceous plants (Mandal, 1971; Mohanasundaram and Uthamaswamy, 1973; Azam *et. al.*, 1974; Mathur and Srivastava, 1964; Mitra and Biswas, 2002; Venkatesh, 2006; Manjoo and Swaminathan, 2007). The phytophagous epilachna species have been recorded as pests of cultivated crops from time to time in Tamilnadu (Mohansundaram and Uthamasamy, 1973). The bionomics of *E. vigintioctopunctata* was studied on different host plants by Lakshmanlal and Mishra (1984) and Shanmugapriyan (2004) on *E. vigintioctopunctata* on bitter gourd. A study was conducted to record the life history of *H. vigintioctopunctata* (Fab.) on bitter gourd *Momordica charantia* under laboratory condition.

## MATERIALS AND METHOD

The experimental insect *Henosepilachna vigintioctopunctata* (Fab.) was collected from the bitter gourd field. Grubs and adults were reared on the leaves of bitter gourd, *Momordica charantia* in transparent plastic jars and maintained under laboratory condition at  $28\pm 2^{\circ}\text{C}$ . To avoid drying of leaves, leaf stalks were dipped in glass tubes with water and plugged with cotton. Adults copulated and laid eggs in batches on the leaves. The egg masses were removed from the leaves without any damage along with a small bit of leaves on which they were attached and placed in a petridish (9.0 cm) lined with moistened thin cotton layer to avoid desiccation of eggs. Newly hatched young ones were transferred into nylon plastic basin. The basin was covered with muslin cloth and tied with elastic band. This culture is maintained and considered as stock culture for the study of the biology of epilachna beetle.

Immediately after egg laying, the egg laid leaves were placed in a petridish (9.0 cm) lined with moistened thin layer of cotton to record incubation period. After hatching, the young larvae were transferred into pre marked nylon plastic basin (40 cm dia X 8.8 cm). Fresh and healthy leaves of host plant was given to the larvae every day at 24 hours interval and uneaten leaves along with faeces were removed, without harming any disturbance to the

larvae. They were checked regularly until pupation to record the larval duration with number of instars. Pupae were kept in the respective plastic basin without causing any disturbance until the adult emergence to register pupal period. After adult emergence, the adults were maintained until death to record fecundity and longevity of adults. There were ten replications, each having twenty five freshly hatched grubs for studying time taken in each larval instars, pupation, fecundity rate and longevity of adults and averages were calculated.

## RESULTS AND DISCUSSION

Both the grubs and adults of *H. vigintioctopunctata* (Fab.) found feed on leaves, flowers buds, flowers and fruits (Fig. 2 & 3). The experimental data on the biology of on bitter gourd is presented in Table - 1.

### Oviposition and Fecundity

Adult beetles laid eggs on the leaves in clusters (Fig. 1). The average number of egg laid by the epilachna beetle was 284.79. The number of egg laid by the females at a time on *Momodica dioca* was 16 to 40 (Deshmukh *et. al.*, 2012) and *M. charantia* was 5 to 45 (Tayed and Simon, 2013). A female *E. dodecastigma* laid  $260 \pm 20.15$  eggs on an average in bitter gourd during summer (Hossain *et. al.*, 2008). The mean number of eggs laid by *E. vigintioctopunctata* was  $114.80 \pm 1.54$  (Ramandeeep and Mavi, 2005). Araujo and Almedia (2004) recorded the average eggs of 24.45. Vipin and Saravanan (2011) found the fecundity of  $562 \pm 76.16$  numbers. Venkatesha (2006) under Bangalore conditions recorded the fecundity of  $287.64 \pm 33.38$  numbers. The fecundity rate was  $114.80 \pm 52.88$  numbers (Kaur and Mavi, 2005). Deshmukh *et. al.*, (2012) found the eggs in clusters of 16 to 40.



Figure: 1

Eggs of *H. vigintioctopunctata*

An Egg

Table - 1. Biology of *H. vigintioctopunctata* on bitter gourd

No. of Eggs	Incubation Period (Days)	Larval Period (Days)					Adult Emergence (Days)	Total period from egg to adult (Days)	Longevity (Days)	
		1 <sup>st</sup> Instar	2 <sup>nd</sup> Instar	3 <sup>rd</sup> Instar	4 <sup>th</sup> Instar	Total Larval Period			Male	Female
277.30	3.55	3.35	2.80	2.55	3.40	12.10	5.25	20.90	44.25	52.60
289.30	3.40	3.20	2.95	2.35	3.35	11.85	4.40	19.65	44.90	53.20
286.95	3.65	3.10	2.80	2.55	3.30	11.75	4.50	19.90	45.40	50.15
286.35	3.55	3.15	3.00	2.65	3.20	12.00	5.25	20.80	44.60	51.50
285.65	3.60	3.20	2.75	2.55	3.15	11.65	5.30	20.55	44.35	53.30
282.95	3.70	3.35	3.00	2.50	3.45	12.30	5.20	21.20	43.50	53.35
282.10	3.55	3.30	3.05	2.80	3.20	12.35	5.25	21.15	43.75	52.15
285.10	3.45	3.15	2.95	2.85	3.15	12.10	5.15	20.70	43.90	52.90
283.30	3.60	3.30	3.00	2.75	3.20	12.25	5.10	20.95	43.85	53.15
286.25	3.30	3.35	3.05	2.55	3.25	12.20	5.20	20.70	44.10	53.00
286.35	3.75	3.40	2.90	2.40	3.20	11.90	5.15	20.80	45.20	52.85
285.20	3.50	3.20	2.95	2.70	3.15	12.00	5.35	20.85	43.90	52.75
286.55	3.65	3.40	3.05	2.40	3.20	12.05	5.25	20.95	44.35	52.80
282.50	3.60	3.35	3.10	2.45	3.30	12.20	5.25	21.05	44.65	52.35
282.20	3.45	3.20	3.05	2.50	3.20	11.95	5.05	20.45	43.95	52.90
288.95	3.40	3.25	2.85	2.40	3.10	11.60	5.00	20.00	44.65	52.35
279.65	3.70	3.20	3.10	2.55	3.20	12.05	5.30	21.05	45.40	53.25
282.35	3.45	3.15	3.05	2.50	3.25	11.95	5.00	20.40	44.80	53.20
288.05	3.60	3.10	3.05	2.55	3.10	11.80	5.15	20.55	43.55	52.70
288.65	3.65	3.20	3.10	2.40	3.05	11.75	5.10	20.50	44.80	53.15
<b>284.79</b>	<b>3.56</b>	<b>3.25</b>	<b>2.98</b>	<b>2.55</b>	<b>3.22</b>	<b>11.99</b>	<b>5.11</b>	<b>20.66</b>	<b>44.39</b>	<b>52.68</b>

Values mean of 20 individuals.

### Egg

Eggs are yellow in colour, spindle shaped found attached in clusters on the underside of the leaves found in clusters. They are 1.3 mm in length and 0.5 mm in breadth. (Fig. 1). The eggs hatch within 3 to 4 days. The mean incubation period was 3.56 days. This confirms the findings of Lakshmanlal and Misra (1984). Mathur and Srivastava (1964) reported that incubation period varied from 3 to 8 days on *D. stromonium*, *D. metel*, *D. innoxia*, *S. aviculare*, *S. surrattensis*, *S. nigrum* and *W. somnifera*. The incubation period of *E. dodecastigma* from 3 to 5 days in summer and 6 to 8 days in winter (Datta, 1966). Araujo and Almedia (2004) reported that the incubation period was 7.14 days. The egg hatched within  $5.20 \pm 0.87$  days (Ramandeep and Mavi, 2005). Moreover, Hossain *et. al.*, (2008) recorded the incubation period of *E. dodecastigma* was  $4.30 \pm 0.13$  days on bitter gourd during summer. Austin (1925) observed the incubation period of 3 to 5 days on solanaceous plants and 5 to 7 days on cucurbitaceous plants. Statistically longest incubation period was recorded in bitter

gourd ( $4.19 \pm 0.23$  days) and yard long bean ( $3.15 \pm 0.32$  days) (Hossain *et al.*, 2009). The incubation period of *H. vigintioctopunctata* on *W. somnifera* was  $4.75 \pm 0.24$  days (Vipin and Saravanan, 2011). But Temperley (1928) reported that the incubation period remains constant at 4 days.

### Larva/Grubs

The newly hatched grubs are 1 to 1.2 mm long and 0.2 to 0.25 mm broad and yellow in colour. The larva showed elongate - elliptical shape. Body was covered with branched bristles. They remain close to the egg shell for 2 to 4 hours. (Fig. 4). The young grubs showed surface feeding only. They consumed soft surface tissues of leaves between veins. The time taken for first instar grubs are 3 to 4 days with an average of 3.25 days. This observation corroborates with the earlier findings of Temperley (1928). He found that the larval period as ranging between 3 and 6 days. The larval period of *H. vigintioctopunctata* ranged from 36 to 6 days on *D. stromonium*. Lakshmanlal and Misra, (1984) registered the larval period as fluctuating between 4 to 6 days. The first instar larvae of Epilachna beetle required 4 to 6 days (Kapur, 1950; Rajagopal and Trivedi, 1989). Araujo and Almedia (2004) found that the average time taken for first instar grub was 5.88 days. In Ludiana, Ramandeep and Mavi (2005) reported that the first instar was lasted for  $2.20 \pm 0.40$  days on aubergins cultivar Punjab barasti during February 2001 to February 2002. The first instar larvae of *E. dodecastigma* on bitter melon required  $2.25 \pm 0.13$  days to enter into second instar during summer.



Figure: 2

Affected Plant

Affected Fruit

**Figure: 3 Affected Bud****Affected Flower**

The second instar grubs measures about 3.0 mm long and 0.45 mm wide (Fig. 4). An average time taken for the second instar grubs to moult into third instar was 2.98 days. The second instar stage lasts between 2 to 4 days. This is in conformity with the earlier findings of Lakshmanlal and Misra (1984). They found that the second instar larval stage was ranged from 2 to 4 days on *D. stromanium*. Ramandeep and Mavi (2005) reported that the larval period lasts for  $3.60 \pm 0.66$  days on aubergins in Ludiana. The second instar requires attaining third instar stage of *E. dodecastigma* on bitter melon in summer (Hossain *et. al.*, 2008). Kapur (1950) found the larval period ranging from 2 to 3 days. Temperley (1928) and Rajagopal and Trivedi (1989) reported that the larval period of leaf eating ladybird beetles varied from 3 to 7 days and from 4 to 6 days, respectively.

**Figure: 4****1<sup>st</sup> Larval Instar****2<sup>nd</sup> Larval Instar****3<sup>rd</sup> Larval Instar****4<sup>th</sup> Larval Instar**

In the present study, the time taken for the third instar grubs of *H. vigintioctopunctata* varied from 2 to 5 days with an average of 2.55 days. This is in conformity with the observations of Lakshmanlal and Misra (1984). They recorded the larval period for 2 to 5 days. The extended

larval period was noticed by Temperly (1928), Kapur (1950) and Rajagopal and Trivedi (1989). Araujo and Almedia (2004) observed the average larval period of 5.88 days for *E. vigintioctopunctata* on *Lycopersicum esculantum*. The period of third larval instar was  $5.70 \pm 0.46$  days on aubergins cultivar Punjab barsati in Ludiana (Ramandeep and Mavi, 2005). The third instar period of *E. dodecastigma* occupies  $2.25 \pm 0.15$  days on bitter gourd during summer (Hossain *et. al.*, 2008).

The fourth instar grubs measure about 8.0 mm long and 4.0 mm wide. The hairs found on their body were comparatively longer than the first, second and third instars larvae. According to growth and development of there was gradual increase in feeding rate. The fourth instar completed within 3 to 5 days with an average of 3.22 days. This finding correlates with the findings of Lakshmanlal and Misra (1984). They found that the larval period ranged between 4 to 7 days. Ramandeep and Mavi (2005) noted that the larval period of *E. vigintioctopunctata* was  $4.10 \pm 0.54$  days on aubergins cultivar. Hossain *et. al.*, (2008) recorded the larval period as  $3.25 \pm 0.12$  days. The larval period was extended to an average of 9.81 days in *Lycopersicum esculantum* (Araujo and Almedia, 2004). During 1928, Temperley registered the fourth instar larval period as 6 to 8 days. Rajagopal and Trivedi (1989) also recorded the larval period as 5 to 8 days.

In the present study, the average time taken to complete the larval period was 11.99 days. The larval period of *H. vigintioctopunctata* ranged from 9 to 17 days on bitter gourd. This observation correlates with the earlier research work down by Mallikarjuna Rao and Azam (1973). They found that the larval period varied from 11 to 17 days on potato. The larvae of *E. dodecastigma* completed four instars within  $11.30 \pm 0.48$  days on bitter gourd in summer (Hossain *et. al.*, 2008). Ramandeep and Mavi (2005) studied the biology of *E. vigintioctopunctata* on aubergins cultivar Punjab barsati and found that the larval period existed for 15.6 days. The total larval period was observed to be 15 days on brinjal (Qumar *et. al.*, 2009; Verma and Anandhi, 2008). Khan (1997) studied the life table and growth of *E. dodecastigma* in different host plants and observed that the total larval duration on sweet gourd, tomato, brinjal, water melon, ridge gourd and kakrol was  $11.25 \pm 0.14$ ,  $11.0 \pm 0.08$ ,  $9.75 \pm 0.0$ ,  $9.5 \pm 0.08$  and  $10.0 \pm 0.08$  and  $9.75 \pm 0.0$  days, respectively. Ahmed and Alam (1960) found the larval duration of *E. dodecastigma* were 10 to 15 days.

### Pupa

Pupation initiated by the adherence of the posterior part of the full grown larva to the branch or leaf. They drew out the larval skin from the anterior to the posterior end exposing the thorax and part of abdomen and cover the posterior portion under the wrinkled hairy skin. The pupa measures 4.5 to 5.0 mm long and 3.5 mm to 3.9 mm broad (Fig. 5). The pupal period lasts for 4 to 7 days with an average of 5.11 days. This observation corroborates with the findings of Ramandeep and Mavi (2005). They found the mean pupal period was  $4.10 \pm 0.54$  days. Hossain *et. al.*, (2008) recorded the pre-pupal and pupal stages lasted for  $1.0 \pm 0.0$  and  $4.7 \pm 0.2$  days, respectively. The pupal duration of *E. dodecastigma* varied from 3 to 8 days and 4 to 8 days during summer and winter, respectively. This confirms the findings of Mathur and Srivastava (1964). However, Rajagopal and Trivedi (1989) observed that the pupal period of *H. vigintioctopunctata* varied from 4 to 6 days. Temperley (1928) reported that the insect remains in the pupal in the pupal stage for 4 days.

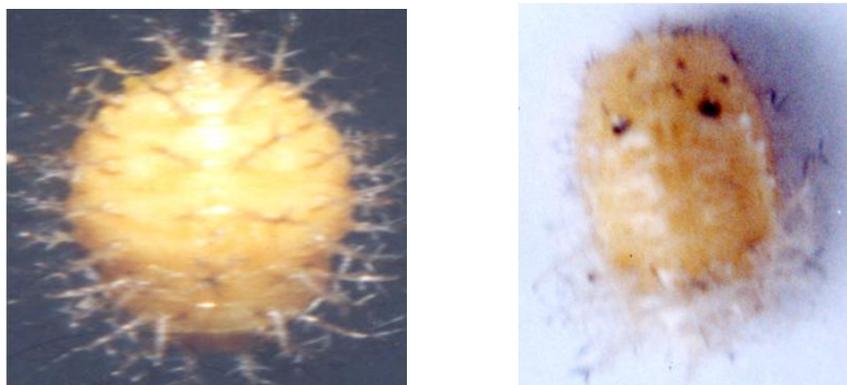


Figure: 5

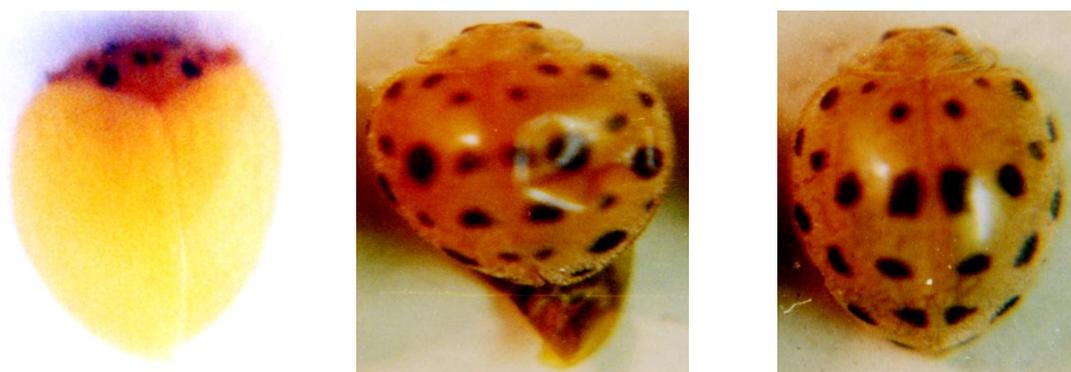
Pre Pupa

Pupa

### Adult

Newly emerged adults are yellowish in colour which later turn into reddish brown colour (Fig. 6). It was oval in outline. The reddish brown beetles have 14 black spots on each elytra. The adult beetle is oval in shape, being broadest in the region behind the head and having end of the abdomen more or less pointed. The ventral surface is flat, while the dorsal surface is convex. The adult beetle started feeding after hardening of elytra. The nature of damage by adult is same as that of grubs; they also found feeding epidermal layers of leaves, flower buds, flower and fruit also. Matting started after 2 to 3 hours after adult emergence. Individual pair copulated several time and single copulation lasted for 2 to 5 minutes. The life cycle of *H. vigintioctopunctata* varied from 19 to 21 days. The average time taken to

complete the life cycle was 20.66 days on bitter gourd. This correlates with the earlier research findings of Lakshmanlal and Misra (1984) and Shanmugapriyan (2004). They registered the life cycle as 22 to 23 days and 21 to 23 days with an average of 22.13 days. Mathur and Srivastava (1964) observed that the life cycle ranged between 26 to 32 days. The time taken for the development from egg to adult emergence was 25 to 45 days. Relatively, Temperley (1928) reported that the life cycle period occupied between 25 to 31 days. The beetle completed its life cycle within  $20.08 \pm 0.24$  days in *Withania somnifera* (L.) (Vipin and Saravanan, 2011).



**Figure: 6**

**Newly Emerged Adult**

**Male**

**Female**

### **Longevity**

The average lifetime of male *H. vigintioctopunctata* was 44.39 days. The female insects lived upto an average of 52.68 days in bitter gourd. The longevities of adults were reported to be male 51.40 for males and 64.80 days for females (Tayde and Simon, 2013),  $29.80 \pm 0.98$  days (Hossain *et. al.*, 2008), male 81.44 and female 97.89 days (Araujo and Almedia, 2004). According to Nakamura *et. al.*, (1988), the mean duration of resident adults of *E. vigintioctopunctata* was 16.5 days for males and 15.2 days for females. The longevity of male was 27 to 108 days (Average  $67.79 \pm 3.85$  days) (Vipin and Saravanan, 2011). The longevity of epilachna beetle was  $35.60 \pm 5.27$  days of yard long bean,  $33.63 \pm 4.92$  days on teasel gourd,  $29.40 \pm 2.88$  days on sponge gourd and  $27.20 \pm 0.94$  days on bitter gourd (Hossain *et. al.*, 2009). The longevity of female (22 to 48 days) was more than that of male (11 to 57 days) (Deshmukh *et. al.*, 2012).

### **CONCLUSION**

The experiment results revealed that there were considerable variations in fecundity rate, larval development period, pupation adult emergence and longevity of adults of *H.*

*vigintioctopunctata* (Fab.). These variations might be due to the experimental time, locality and other environmental factors, suitability of host plant as food and variability in food value.

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