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STUDIES ON BIOLOGY AND BIOMETRY OF EPILACHNA BEETLE, *EPILACHNA VIGINTIOCTOPUNCTATA* FABRICIUS (COCCINELLIDAE: COLEOPTERA) ON BRINJAL IN WEST BENGAL, INDIA

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ABSTRACT
Studies on the biology of Epilachna beetle, *Epilachna vigintioctopunctata* revealed that the incubation period was 3.2 ± 0.84 days. The total larval period was 20.8 ± 3.35 days. The mean pupal period was 3.8 ± 0.84 days, measured 12.34±1.67 mm length and 4.40±0.47 mm in breadth. The mean adult male beetle longevity was 33.6 ± 2.70 days, recorded 5.93 ± 0.54 mm in length and 4.35 ± 0.34 mm in breadth. The mean lifespan of female beetle of *E. vigintioctopunctata* was observed 38.4 ± 1.52 days, measured 6.87± 0.59 mm in length, 5.23 ±0.63 mm in breadth. The duration of total life cycle varied 62.4 ± 7.13 days. The mean fecundity was recorded as 55.8 ± 7.73 eggs / female, the size eggs of Epilachna beetle was recorded as 1.05±0.24 mm in length and 0.41±0.08 mm in breadth. The body measurements of *E. vigintioctopunctata* of the life stages revealed that the adult female is slightly larger than male.

INTRODUCTION

Eggplant is a perennial but grown commercially as an annual crop by small and marginal farmers in India. Eggplant is infested by a dozen of insect pest species, among which the most serious and destructive one is the *Epilachna vigintioctopunctata* Fab. The spotted leaf beetle or hadda beetle, *Epilachna vigintioctopunctata* Fab. (syn. *Henosepilachna vigintioctopunctata* Fab.), is the key-pest of the solanaceous and cucurbitaceous plants (Anam *et al.*, 2006; Islam *et al.*, 2011). Population of hadda beetle was found active from 3rd week of August to 4th week of October, the population was low in beginning which continuously increased up to 3rd week of October (Kumar and Singh, 2014). Due to its infestation, considerable economic loss is occurring during every crop season, adversely affecting both quality and quantity of crop output. The grub and adult feeds on the leaves, retarding the plant growth,which leads to 60% loss of fruit production (Mall *et al.*, 1992). *Epilachna vingintioctopunctata* lays yellow cigar- shaped eggs, mostly on the underside of leaves, in batches of 5-40 each. A single female can lay up to 400 eggs in her lifetime. The eggs hatch in 5, 3.3 and 2.9 days at 25, 30 and 35ºC, respectively, and full-grown in 17.8, 8.7 and 7.1 days at 25, 30 and 35ÚC, respectively. The pupal stage lasts 13.4, 6.7 and 5.1 days at 25, 30 and 35ºC, respectively (Atwal and Dhaliwal, 2005). Deshmukh *et al.* (2012) observed that the eggs were spindle shaped and 1.3 mm in length and 0.6 mm in breadth. The newly hatched larva / grub were dull blackish-green coloured and was 1.6 mm in length. The whole body was covered dorsally with small bristles. It was 6-7 mm in length, yellow and quiescent (no feeding) stage. Adults were oval in outline and 1-2 cm in length. Males are slightly smaller than females. So, it is easy to manage the pest population with the help of local resource and skills as well as to avoid poisonous chemicals if we understand the nature and behaviour of different stages of its life cycle. It was thought essential to study the biology and physical measurements of this dreaded pest of brinjal.

MATERIALS AND METHODS

Biology of epilachna beetle

The biology of epilachna beetle were studied in the laboratory at BCKV, Kalayani,West Bengal during 2013-2014. The test insects were obtained from separate cultures raised from a single pairs of Epilachna beetle on leaves of brinjal for eggs laying in the laboratory. The mouth of the glass jar was tightened with cotton plug and kept at room temperature. Freshly laid eggs were kept in glass jar for hatching. The newly hatched grubs were reared individually to record observation on development of each instar of the grub and pupal period.

Observations were taken on the development of insect that is number of eggs laid by adult female, larval and pupal period of the insects were recorded. The male beetles were distinguished from the female by abdominal character, by presence of cut in the sub genital plate. The number of eggs laid by each female during life time wasobserved to study the fecundity recorded. Observations on incubation period, larval duration, pupal duration and total development period (egg to adult) were made.

Physical parameters of different stages of *E. vigintiocto punctata*

The length and breadth of eggs, different instars of larva, pupa and adult were measured by using a stereoscopic binocular microscope, fitted with an ocular micrometer calibrated with a stage micrometer during the developmental period and of *E. vigintioctopunctata*.

RESULTS AND DISCUSSION

Biology of epilachna beetle

The results of present investigation presented in table1 and plate1 revealed that the incubation period ranged from 2 to 4 days with mean duration of 3.2 ± 0.84 days. The duration of first instar larva ranged from 4-6 with a mean of 4.8 ± 0.84 days. The range of second instar period varied from 5-6 days with mean duration 5.6 ± 0.71 days. The third instar larva was 4-5 days ranged with a mean of 4.6 ± 0.55 days. The fourth instar larva was observed 5-7 days ranged with the mean of 6.2 ± 0.84 days. The total larval period ranged from 17 to 25 days with a mean of 20.8 ± 3.35 days. The mean pupal period was 3.8 ± 0.84 days and ranged from 3 to 5 days. The mean adult male beetle longevity was 33.6 ± 2.70 with the range from 30 to 37 days. The mean lifespan of female beetle of *E. vigintioctopunctata* was observed 38.4 ± 1.52 with the range from 36-40 days. The results further showed that the duration of life cycle varied from 52 to 72days with mean duration of 62 ± 7.13 days. The mean fecundity was recorded as 55.8 ± 7.73 eggs/female with a range of 43 to 63 eggs/female.

Table 1: Duration of developmental stages of Epilachna beetle on brinjal during the period December – January, 2013 - 2014

Biological events	Range	Mean± SE
Fecundity (Eggs/female)	43-63	55.8 ± 7.73
Incubation period (days)	2-4	3.2 ± 0.84
Larval period (days)		
Instar-I	4-6	4.8 ± 0.84
Instar-II	5-6	5.6 ± 0.71
Instar-III	4-5	4.6 ± 0.55
Instar-IV	5-7	6.2 ± 0.84
Total larval period (days)	17-25	20.8 ± 3.35
Pupal period (days)	3-5	3.8 ± 0.84
Adult longevity (days)		
Male	30-37	33.6 ± 2.70
Female	36-40	38.4 ± 1.52
Total life cycle (days)	52-72	62.4 ± 7.13

Qamar *et al*. (2009) reported similar observation that a single female of *E. vigintioctopunctata* laid 295 to 320 eggs during the life span. Eggs were yellowish, elongated and cigar shaped, often in groups of 5 to 40. Eggs were hatched into larvae within 3 to 6 days. The fully fed grubs spent 1-2 days in pre-pupal stage. The pupal period lasted for 3-6 days with an average of 4.6±1.01 days. The newly emerged adult was shiny yellow in colour later changed to copper brown colour mottled with black spots. The average longevity of male and female was 57.2 and 60.8 days, respectively.The variation in the duration of life stages may be due to variable foods and temperature as well as relative humidity on which the pest biology was studied.

Similarly, Deshmukh *et al.*, (2012) also recorded that the female lays eggs found in clusters of 16-40. Period of different larval instars was different, however that for different moults was same and it was 1-2 day. The pupa of *Epilachna vigintioctopunctuata* was 7 days .On 7th day of pupation adult (beetle) emerged out and female (22 – 48 days) was more than that of male (11–57 days). The variation in the duration of life stages with the present investigation may be due to food and other factors.

Morphometric parameters of different stages of *E. vigintioctopunctata*

The body measurements of *E. vigintioctopunctata* of the life stages during biology studies, presented in Table 2 revealed that the eggs of Epilachna beetle was cigar shaped, yellow coloured and laid in cluster. The size of egg was recorded as 1.05 mm in length and 0.41 mm in breadth .The first instar larva were brownish yellow in colour, campodeiform in shape. The body length of the first instar was 1.85 mm and 0.88 mm in breadth. The second instar grub were larger in size than first instar one, body tapered anteriorly and posteriorly which gave the larva a spindle shaped appearance, 3.07 mm in length with 1.58 mm in breadth. The third instar which was measured

Table 2: Morphometric parameters of different stages of *E. vigintioctopunctata*

Developmental stages	Length (mm) Range	Mean ± SE	Breadth(mm) Range	Mean ± SE
Egg	0.85-1.45	1.05±0.24	0.31-0.51	0.41±0.08
Larvae				
Instar-I	1.5-2.15	1.85±0.25	0.3 - 1.27	0.88±0.44
Instar-II	2.5-3.48	3.07±0.39	1.35 - 1.9	1.58±0.21
Instar-III	4-4.35	4.21±0.14	1.55 - 2.95	2.15±0.52
Instar-IV	5.14-6.55	5.82±0.52	2.76 - 3.54	3.19±0.35
Pupa	5.45-6.12	5.82±0.34	3.5 - 4.25	3.88±0.34
Adults				
Male	5.15-6.54	5.93±0.54	4.1 - 4.74	4.35±0.34
Female	6.15-7.65	6.87±0.59	4.9 - 6.14	5.23±0.63

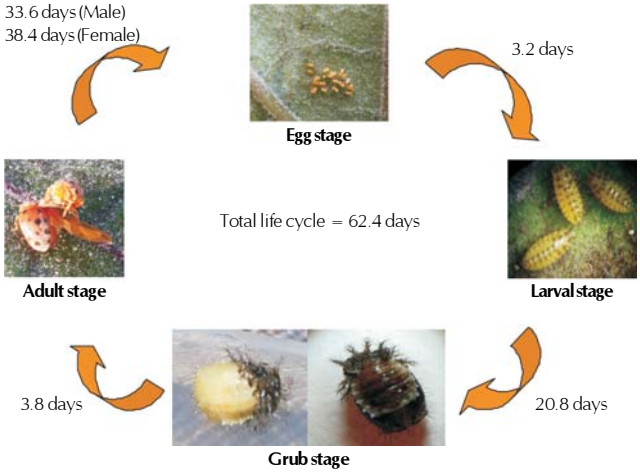

Plate 1: Complete life stages of Epilachna beetle, *Epilachna vigintioctopunctata*

4.21 mm in length and 2.15 mm breadth. The fourth instar larva was bigger than the third instar one. The larvae measured 5.82 mm in length and 3.19 mm breadth. The pupa was shining yellow coloured with brownish marking on its dorsum and matured pupa was dark red in colour. The pupa measured 5.82 mm length and 3.88 mm in breadth. The beetles were oval in shape, elytra dark brown with black spots. The male beetle was recorded 5.93 mm in length and 4.35 mm in breadth. The female beetle was measured 6.87 mm in length and 5.23 mm in breadth. The adult female beetle is larger than male beetle.

Tayde and Simon (2013) supported similar trend that the measurement of the length of eggs varied from 1.28 to 1.61 (1.44 ± 0.12) mm, while the breadth varied from 0.30 to 0.52 (0.41 ± 0.07) mm. Observations on measurement revealed that the average length and breadth of 1st, 2nd, 3rd and 4th instar was 2.09 ± 0.02 mm and 1.12 ± 0.26 mm, 2.99 ± 0.32 mm and 1.43 ± 0.16 mm, 4.16 ± 0.17 and 1.92 ± 0.31 & 6.18 ± 0.37and 3.02 ± 0.34 respectively. The average pupal length was 5.16 ± 0.57 mm and breadth was 2.87 ± 0.40 mm.. The average body length of male was 6.08 ± 0.25 mm and breadth was 4.71 ± 0.43 mm. Whereas, in female length was 7.13 ± 0.49 mm and breadth was 5.41 ± 0.58 mm. Females were bigger in size than males. Similarly, Deshmukh *et al.* (2012) also who described that the eggs were spindle shaped and 1.3 mm in length and 0.6 mm in breadth. The newly hatched grub was dull blackish-green coloured and was 1.6 mm in length. The whole body was covered dorsally with small bristles. It was 6-7 mm in length, yellow and quiescent (no feeding) stage. Adults were oval in outline and 1-2 cm in length. Males are slightly smaller than females. More females than males were found among emerged adults and females lived longer than males (Jamwal *et al.*, 2013).

REFERENCES

Anam, M., Ahmad, M. and Haque, M. A. 2006. Efficacy of neem oil on the biology and food consumption of Epilachna beetle, *Epilachna dodecastigma* (Weid.). *J. Agriculture and Rural Development*. **4(1&2):** 83-88.

Atwal, A. S. and Dhaliwal, G. S. 2005. Agricultural pests of South Asia and their management. *Department of Zoology Entomology, Punjab Agricultural University,* Ludhiana, India. pp. 274-275.

Tayde, A. R. and Simon, S. 2013. Studies on biology and morphometris of hadda beetle, *Epilachna vigintioctopunctata* (Coleoptera: Coccinellidae) a serious pest of bitter gourd, *Momordi cacharantia*, in eastern Uttar Pradesh, India. *International J. Agricultural Science and Research*. **3(4):** 133-138.

Deshmukh, P. S., Chougale, A. K., Shahasane, S. S., Desai, S. S. and Gaikwad, S. G. 2012. Studies on biology of hadda beetle, *Epilachna vigintioctopunctata* (Coleptera: Coccinillidae): A serious pest of wild beeter gourd, *Momordi cadioica .Trends in Life Sciences*. **1(3):** 46-48.

Islam, K., Islam, M. and Ferdousi, Z. 2011. Control of *Epilachna vigintioctopunctata Fab*. (Coleoptera: Coccinellidae) using some indigenous plant extracts. *J. Life Earth Sci*. **6:** 75-80.

Kumar, J. and Singh, S. V. 2014. Pest complex of leaf feeding insect at eggplant (*Solanum melongena* L.) and their relation to meteorological conditions. *The Ecoscan*. Vol. **6:** 253-257.

Mall, N. P., Panday, R. S., Singh, S. V. and Singh, S. K. 1992. Seasonal incidence of insect pests and estimation of the losses caused by shoot and fruit borer on brinjal. *Indian J. Entomol*. Vol. **53:** 241-247.

Qamar, M., Haseeb, M and Sharma, D. K. 2009. Biological and morphometrics of *Henosepilachna vigintioctopunctata* Feb. on Brinjal. *Ann. Pl. Protec. Sci*. **17(2):** 303-306.

Jamwal, V. V. S., Ahmad, H. and Sharma, D. 2013. Host biology interactions of *Epilachna vigintioctopunctata* Fabr. *The Bioscan*. **8(2):** 513-517.