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COMPARITIVE STUDY OF SEASONAL BIOLOGY OF HADDA BEETLE, *EPILACHNA VIGINTIOCTOPUNCTATA* (FABR.) (COLEOPTERA: COCCINELLIDAE): A SERIOUS INSECT PEST OF EGG PLANT, *SOLANUM MELONGENA* L.

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KEYWORDS

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ABSTRACT

The Studies conducted in two different seasons once during November-December and another during March- April of 2013-14 at Department of Agricultural Entomology, BCKV, Mohanpur, and West Bengal .The premating period, preoviposition period, oviposition period, incubation period, larval period, prepupal period, pupal period and adult longevity were 5.40, 20.30, 22.60, 5.07, 15.10, 1.55, 4.60, 61.25 and 64.70 days, respectively during November – December; and 4.22, 18.11, 34.00, 3.28, 13.20, 1.75, 3.30, 63.09 and 64.44 days, respectively during March- April. The average fecundity was 290.00 eggs per female during November –December and 382.80 eggs per female during March –April were recorded under laboratory conditions (27 ± 1°C, 60-70% RH).The different parameters of biology of *E. vigintioctopunctata* recorded during the two seasons shows that the climatic condition prevailed during March – April was more favourable for the multiplication of insect.

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INTRODUCTION

The subfamily Epilachninae (Coccinellidae: Coleoptera) contains phytophagous beetles representing about one sixth of coccinellids. Most epilachnines belong to the world wide genus *Epilachna* that contains about 500 described species. In India, this subfamily is represented by 74 species of which 29 have been recorded from West Bengal. In India, the *Epilachna* beetle is present in higher hills and in plains of Jammu and Kashmir, Punjab, Himachal Pradesh, Uttar Pradesh, Karnataka and West Bengal and also in the plains (Shankar *et al.*, 2010). The Haddabeetle, *Epilachna vigintioctopunctata* is generally considered as polyphagous. Pandey and Shankar (1975); Mandal and Mandal, 2003 considered it as oligophagus on the plants belonging to the family Solanaceae. Both the adults and grubs feed on the leaves by scraping the surface, resulting in characteristic lace like appearance of the leaves. In case of severe infestation bark of shoots, petioles of leaves and even the skin of the fruits are scraped by them. Damage symptoms include white skeletonization of leaves (Plate 1) which is whitish initially but gradually turn brown, yellowing and premature dropping of leaves; stunting and even drying of the plants, flower dropping and yield loss.

In view of the importance of the pest, The objectives of the current study on detailed biology of the pest was made in the laboratory as adequate knowledge on the biology of the pest is an essential prerequisite in the study of population dynamics of the pest.

MATERIALS AND METHODS

Fifty last instar grubs were collected from the field, reared in the laboratory at 27 ± 1°C, 60-70% RH on brinjal leaves. The pupae were collected and kept in small vials separately for adult emergence. After emergence the males and females were separated by examining them under a stereo microscope based on the description given by Gupta and kumar, 1982. Ten pairs of adults were then placed separately in glass containers with brinjal leaves, base plugged with cotton swab soaked in water for feeding and egg laying. The pre mating, pre- oviposition andoviposition period was recorded. The numbers of eggs laid by the adults were recorded. After egg laying, ten egg masses were kept separately in petriplates for hatching. After hatching, twenty grubs were released individually in petriplates with moderately old brinjal leaves, base plugged with cotton swab soaked in water, for as food. The grubs were inspected daily for moulting the duration different larval stages, pre pupal and pupal stages were recorded.

The data obtained during the present investigation were subjected to standard statistical procedures to calculate out average % and standard deviation.

RESULTS

The data presented in the Table 1 shows that during November - December period the premating period was 5-6 days, the average being 5.4 days. The female started

1. Mating of Male & Female

2. Eggs in batches

3. Newly Hatched 1st instar grub

4. Second instar grub with exuviae (Microcopic view

5. Fully Developed 2nd Instar

6. Third instar grub

7. Fourth instar grub with exuviae

8. Prepupal non feeding stage

9. Prepupalexuviae

10. Pupal Stage

11. Newly emerged adult

12. Hadda beetle damage on leaves & flowers

egg laying 18-23 days after emergence, the average pre-oviposition period was 20.3 days. Egg laying continued for 19-26 days and the average oviposition period recorded was 22.6 days.

In general the eggs were laid in clusters(Plate.1). The freshly laid individual eggs on the underside of the leaves were stalked, shiny yellow, elongate-oval tapering at top end, pointed distally and clustered vertically with smooth texture, on maturity the

Table 1: Duration of various stages of life cycle and fecundity of *E. vigintictopunctata* (November - December, 2013).

Stages of insect	Range	Av.± S.d.
Pre-mating period	5 - 6	5.40 ± 0.51
Pre-oviposition period	18 - 23	20.30 ± 1.94
Oviposition period	19 - 26	22.60 ± 2.34
Fecundity	271 - 329	290.00 ± 23.45
Adult longevity		
Male	46 - 72	61.25 ± 6.86
Female	48 - 76	64.70 ± 7.46
*Incubation period	4 - 7	5.07 ± 0.47
Duration of Larval instars		
L1	2 - 4	2.95 ± 0.60
L2	2 - 3	2.65 ± 0.49
L3	2 - 4	2.55 ± 0.60
L4	6 - 9	6.95 ± 1.23
Total larval period	13 - 17	15.10 ± 1.02
Pre-pupal period	1 - 2	1.55 ± 0.51
Pupal period	4 - 6	4.60 ± 0.75
Total duration (egg – adult)	25 - 29	26.90 ±1.33

* Incubation period average of 30 observations, remaining average of 20 observations

Table 2: Duration of various stages of life cycle and fecundity of *E. vigintictopunctata* (March-April, 2014)

Stages of insect	Range	Av.± S.d.
Pre-mating period	4 - 5	4.22 ± 0.25
Pre-oviposition period	16 - 22	18.11 ± 2.26
Oviposition period	29 - 40	34.00 ± 3.84
Fecundity	336 - 411	382.80 ± 18.70
Adult longevity		
Male	52 - 72	63.09 ± 6.77
Female	53 - 74	64.44 ± 1.10
*Incubation period	3 - 4	3.28 ± 0.22
Duration of Larval instars		
L1	3 - 4	3.30 ± 0.47
L2	2 - 4	2.75 ± 0.64
L3	2 - 4	2.80 ± 0.52
L4	4 - 5	4.20 ± 0.41
Total larval period	12 - 14	13.20 ± 0.65
Pre-pupal period	1 - 2	1.75 ± 0.40
Pupal period	3 - 4	3.30 ± 0.48
Total duration (egg – adult)	20 - 22	21.45 ± 0.88

* Incubation period average of 30 observations, remaining average of 20 observations

color changed from yellow to light yellow and ultimately to creamy yellow at the time of hatching The eggs were laid in batches of 5 to 61 and a single female laid 271-329 eggs in its lifetime. The average fecundity was 290 eggs per female. The incubation period ranged from 4-7days and the average incubation period was 5.07 days.

The newly hatched larva / Grub were dull blackish-green coloured .It had appearance of the typical ladybird larva and showed elongate-elliptical shape with moderately long legs. Body was covered with branched bristles (Plate 1). These bristles were yellow coloured in newly hatched grub but later on turned to black. The grub showed surface feeding only. It consumed soft surface tissues of leaves between veins. Total four moults and five larval instars were observed. According to growth and development of grub there was gradual increase in feeding rate. During moulting grubs did not consumed leaves.The larva passed through 4 instars and the duration of different instars was 2-4 days (Average 2.95 days), the 2-3 days (Average 2.65days), and 6-9 days (Average 6.95 days) for 1st, 2nd, 3rd and 4th instar, respectively. The total larval duration was 13-17 days with an average of 15.1days. After the 4th instar the insect passed through a pre-pupal stage that lasted for 1-2 days(Average 1.55 days), followed by a pupal stage which lasted for 4-6 days (Average of 4.6 days).The pupa of *Epilachna vigintioctopunctuata* was oxarate obteel type. The whole body was covered dorsally with small bristles (Plate 1).Pupation took place on the leaf surfaces. The total duration from egg to adult ranged from 25-29 days (Average 26.90 days). The longevity of adult ranged from 46-72 days with an average of 61.25 days in case of male whereas, for female it ranged from 48-76 with an average 64.70 days. Males are slightly smaller than females. Newly emerged beetles were straw or pale yellow coloured later on they become brownish. Seven separate spots were observed on pronotum of male and female. Elytra of both males and females was glossy and twelve and fourteen melanized black spots were observed on each eletra (right and left) of female and male respectively. Very low melanized outlines were appeared around each spot. No melanization of elytral ground was observed. The feeding behavior of adult was same as that showed by larvae.

The data presented in the Table 2 shows that during March - April, the premating period 4 - 5 days with an average of 4.22 days, the pre-oviposition period ranged from 16 - 22 days, the average being 18.11 days. During this season, the oviposition period was quite prolonged which ranged from 29 - 40 days (Average 34 days), during which the females laid 336 - 411 eggs. The average fecundity recorded during this season was 382.8 eggs / female. The incubation period was also shorter, which ranged from 3-4 days, the average being 3.8 days. The duration of 4 larval instars was 3-4 days (Average 3.30), 2.4 (Average 2.75 days), 2- 4 (Average 2.8 days) and 4-5 (Average 4.2 days), respectively. The total duration of larval stage ranged from 12-14 days, the average larval period was 13.2 days. The pre-pupal period ranged from 1- 3days (Average 1.75 days). The pupal period was, however, relatively shorter than previous season which ranged from 3-4 days with an average duration of 3.3 days. The total duration from egg to adult ranged from 20-22 days and the average duration was 21.43 days. The adult longevity ranged from 52 – 72 days with an average of 63.09 days in case of male whereas, for female it ranged from 53 – 74 with an average 64.44 days.

DISCUSSION

The biology of *E. vigintioctopunctata* has earlier been studied by several authors (Gupta and Kumar, 1982; Shanmugapriyan*et al*. 2003; Indu and Chatterjee, 2006; Venkatesha, 2006; SavitaVarma and Anandhi, 2008; Sarvanan and VipinChaudhary, 2011 andTayde and Sabita Simon, 2013). The duration of various stages of life cycle recorded during the present investigation are all most similar to those recorded by them. The oviposition period recorded during the present investigation was however, much shorter than those recorded by Gupta and Kumar (1982) (Average 40.00 days); Sarvanan and VipinChaudhary(2011) (Average 44.5 days). During the present investigation, average oviposition period of 22.60, 34.00 days were recorded during November - December and March - April, respectively. Though the

maximum oviposition period recorded in March - April was 40 days during the present investigation, the observed difference may be attributed to the difference in host plant used by earlier authors (45 - 67 days on ashwagandha, average 40 days on potato). Similar effect of host plants were observed in fecundity too, which was higher in ashwagandha (*Withaniasomnifera*L.) (Gupta and Kumar, 1982; Sarvanan and VipinChaudhary, 2011). Though the fecundity recorded during November - December was similar to those observed by Indu and Chatterjee (2006),SavitaVarma andAnandhi (2008) and VishavVir Singh Jamwal*et al* (2013), it was much higher during March - April. The observed difference in fecundity in two generations of the present investigation might be due to seasonal variation and the climate condition prevailing during March - April appear to be more favourable for the multiplication of insect.

The different parameters of biology of *E. vigintioctopunctata* recorded during the two seasons shows that the climatic condition prevailed during March - April was more favourable for the multiplication of insect. During March - April the fecundity was much higher than November - December. On the contrary the duration of various stages of life cycle was much shorter during this period. Climatic conditions play role in build-up of Mite population development as mite population was significantly negatively correlated with rainfall (r = -0.576) (Singh and Singh, 2014). Kumar *et al*. (2014) also reported *Tetranychus ludeni* population to have negative correlation with relative humidity and rainfall on cowpea in Varanasi. With this cases it is clear that abiotic factors play important role in the development of population of hadda beetle that means these factors ultimately influence the biology of *E. vigintioctopunctata*.

REFERENCES

Gupta, J. K. and Kumar, A. 1982. Sexing of 28 spotted epilachnid *Henosepilachnaviginti octopunctata* (F.) and some observations on its fecundity and oviposition. *Current Science*. **51(5):** 251-252.

Indu and Chatterjee, V. C. 2006. Studies on life cycle of the lady beetle. *Annals of Plant Protection Sciences*. **14:** 102-107.

Kumar, D., Raghuraman, M. and Singh, J. 2014. Impact of a bioticfactor on population dynamics of phytophagous mite (Tetranychusludeni Zacher) on cowpea in Eastern Uttar Pradesh.*The Ecoscan*. **8(1&2):** 17-19.

Mandal, A. and Mandal, S. K. 2003. Host plant range of Epilachnine beetles in West Bengal. *Indian J. Ecology*. **30(2):** 252-257.

Pandey, N. D. and Shankar, U. 1975. Studies on the host preference of *H. Viginti octopunctata* Fabr. *Indian J. Entomology*. **33:** 321-334.

Sarvanan, L. and Vipin Chaudhary. 2011. Biology and seasonal incidence of *Henosepilachnaviginti octopunctata* (F.)(Coleoptera: Coccinellidae) on Ashwagandha [*Withaniasomnifera* (L.)Dunal] in charotur region of Gujarat. *Pest Management in Horticultural Ecosystems*. **17(2):** 132-139.

Savita Varma and Anandhi, P. 2008. Assessment of mortality factors, biology and morphometrics of hadda beetle, *Henosepilac hnavigintiocto punctata* (F.) on brinjal. *Annals of Plant Protection Sciences*. **16(1):** 119-123.

Shankar, U., Kumar, D. and Gupta, S. 2010. Integrated pest management in brinjal. *Sher-e-KashmirUniversity of Agricultural Sciences and Technology of Jammu. Technical Bulletin*. **4:** 16.

Shanmugapriyan, R. and Kingsly, S. 2003. Biology of the beetle, *Epilachnaviginti octopunctata* on bittergourd. *J. Ecobiology*. **15(6):** 445-449.

Singh, P. and Singh, R. N. 2014. Interactions of abiotic factors with TetranychusneocaledonicusAndrP and its management by newer acaricides in brinjal ecosystem. *The Ecoscan*. **6(Special issue):** 355- 359.

Tayde, A. R. and Sobita Simon. 2013. Studies on biology and morphometris of Hadda beetle, *Epilachnavigintioctopunctata* (Coleoptera: Coccinellidae) a serious pest of bitter gourd, *Momordicacharantia,* in eastern Uttar Pradesh, India. *International J. Agricultural Science and Research*. **3(4):** 133-137.

Venkatesha,M.G.2006. Seasonal occurrence of *Henosepilachnaviginti octopunctata* (F.)(Coleoptera: Coccinellidae) and its parasitoid on ashwagandha in India. *J. Asia-Pacific Entomology*. **9(3):** 265-268.

Vishav Vir Singh Jamwal, Hafeez Ahmad and Devinder Sharma. **2013.** Host Biology Interactions of *Epilachna Vigintioctopunctata* Fabr. *The Bioscan*. **8(2):** 513-517.