Indian J. Agric. Res., 35 (3) : 149 - 154, 2001

BIOLOGY AND SEASONAL FLUCTUATION OF *HENOSEPILACHNA VIGINTIOCTOPUNCTATA* FABR. ON BRINJAL UNDER TERAI REGION OF WEST BENGAL

Sunil Kumar Ghosh and S.K. Senapati

Dept. of Agril Entomology
Bidhan Chandra Krishi Viswavidyalaya
North Bengal Campus, Pundibari, Cooch Behar - 736 165, India

ABSTRACT

Epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.), in Terai region was found active from April to middle of October and highest population was recorded (8.14 beetle/plant) during middle of September. Population of epilachna beetle showed significant positive correlation with average temperature, relative humidity and weekly rainfall. Duration of life cycle was shortest (26.74 days) in June-July and longest (33.52 days) in September-October, but heighest fecundity (272.32 eggs) was recorded during March-April. Life cycle was significantly and negatively correlated with temperature and relative humidity but fecundity was positively correlated with temperature and relative humidity. High temperature and humidity during July to September lowered down the duration of life cycle and increased fecundity leading into rapid multiplication of pest resulting higher population level and thereby crop loss during the period.

INTRODUCTION

Epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) (Family : Coccinellidae, Order : Coleoptera) is very important pest in Asia that commonly attack solanaceous plants (Rajagopal and Trivedi, 1989). It is a polyphagous pest, having a wide host range, with brinjal as the most preferred one. Both the grub and adult of the pest scrap the green matter of leaf in a characteristic manner and skeletonize the leaves. The affected leaves drop prematurely resulting in retardation of the plant growth and thereby reduce the bearing of the plants.

Population of the pest varies from region to region but peak activity is generally recorded in July-August (Rajagopal and Trivedi, 1989). High temperature and low relative humidity coupled with scarcity of food plants had an adverse effect on fecundity, egg hatchibility and newly hatched larvae (Grewal, 1988).

In Terai region of West Bengal *H. vigintioctopunctata* is an important pest of brinjal particularly on summer crop (Ghosh, 1999). Biology and population fluctuation of the pest, its relation to prevailing weather conditions were studied to identify the important biological characters and ecological influence for manipulation in future pest management programme.

MATERIAL AND METHODS

Studies were conducted from 1996 to 1998 in the instructional farm and research laboratory, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, located at Pundibari, Cooch Behar.

I. Seasonal incidence of *Henosepilachna vigintioctopunctata* (Fabr.): Brinjal variety, Pusa Purple Long was raised round the year during 1996-1998 with recommended fertilizers (130 : 65 : 65 NPK/ha) and cultural practices in 4.8m x 4.5m plots replicated six times without any plant protection measures.

Observations on the pest population was recorded at 7 days interval on 5 randomly selected plants from each replicated plots as number of grub/beetle per plant basis through out the year in different years. Data thus obtained throughout the year over two years studied were presented graphically with improtant weather parameters namely, temperature, rela-

tive humidity and rainfall. Correlation co-efficient (r) was worked out between incidence of epilachna beetle and important weather parameters namely, temperature, relative humidity and rainfall during the period to find out influence of weather on population fluctuation.

II. Biology of *Henosepilachna vigintioctopunctata* (Fabr.): Newly emerged beetles were collected from the brinjal field and were kept in glass jars in pairs of male - female with a brinjal twig plugged with water soaked cotton swab. Eggs laid by female beetle in side the jar were counted. The preoviposition period, oviposition period and longevity of adults were recorded.

The egg masses were observed daily until they hatched. The first instar grubs immediately after hatching were taken out and transferred to separate glass jars and fresh leaves were provided for their feeding regularly. The grubs were allowed to pupate. The durations of different life stages, egg, larva, pupa, adult and life cycle were recorded. The study was done for four seasons *viz.* rainy, autumn, dewey and spring. The average duration of different stages of life cycle for the four seasons were calculated. Correlation co-efficient (r) was worked out between the duration of different life stages, life cycle and fecundity with important weather parameters namely, temperature and relative humidity under laboratory conditions.

RESULTS AND DISCUSSION

I.Incidence of *H. vigintioctopunctata* Fabr. : Epilachna beetle was found active through out the year. Extent of damage and incidence of the pest was varied over the two year and studied (Fig.-1 & 2). In 1997, the level of peak population was reached 6.34 beetles/plant during early September (33rd standard week) (Fig.-1) while in 1998 it was 11.50 beetles/plant during last week of July (28th standard week) (Fig.-2). This might be due to relatively stable weather and low temperature gradient in 1998 favoured higher level of incidence as compared to 1997.

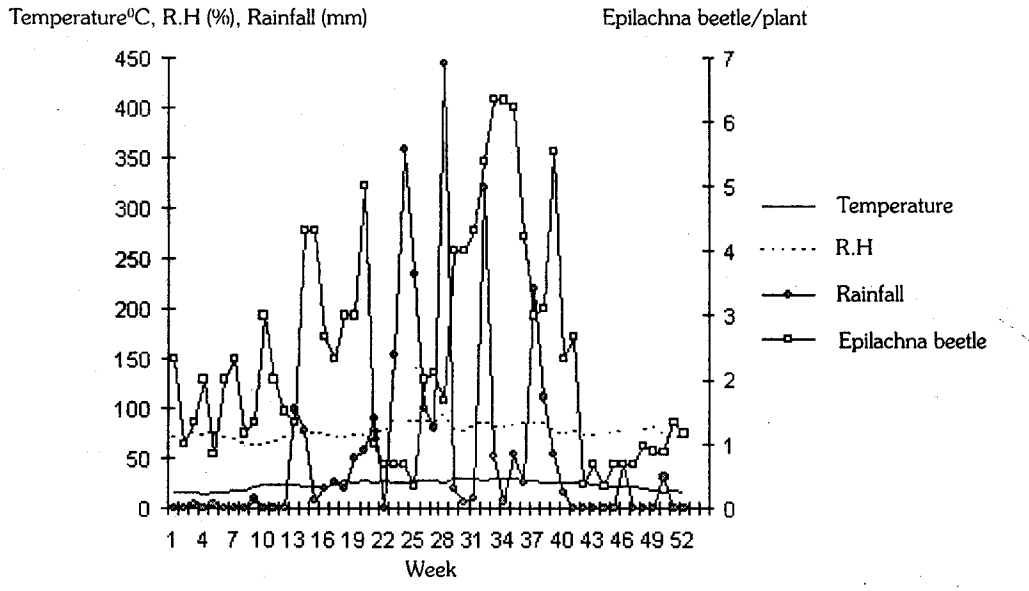

Fig. 1. Incidence of epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) population as influenced by temperature, relative humidity and rainfall in 1997.

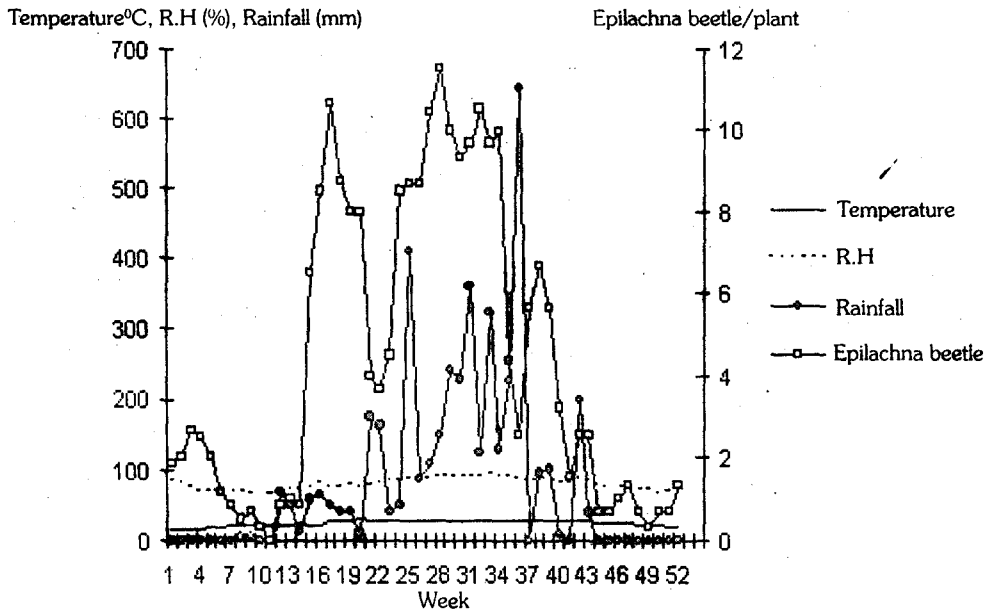

Fig. 2. Incidence of epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) population as influenced by temperature, relative humidity and rainfall in 1998.

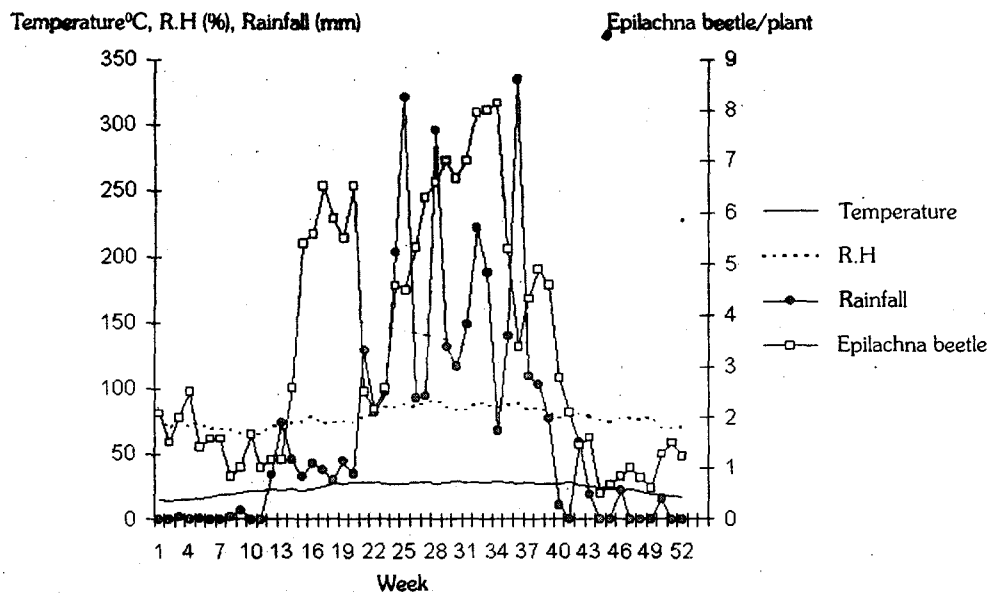

Fig. 3. Incidence of epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) population as influenced by temperature, relative humidity and rainfall (Average of 1997 and 1998).

Analysis of pooled mean data for two years on the incidence of epilachna beetle revealed that low level of population was recorded from January to March and thereafter increased gradually till first half of October. Population again decreased thereafter. Highest average population (8.14 beetle/plant) was reached in middle of September (34th standard week) (Fig.-3) when the average temperature, relative humidity and weekly rainfall were 28.59°C, 85.24% and 67.45 mm. respectively and minimum (0.59 beetle/plant)being recorded in early November (44th standard week) at 24.22°C temperature, 75.92% relative humidity and without any rainfall.

Correlation studies (Table -1)between weekly mean population of epilachna beetle and important weather parameters revealed that population of epilachna beetle showed significant positive correlation with average temperature, average relative humidity and weekly rainfall indicating increase of beetle population with increase of temperature, humidity and weekly rainfall in terai region. It can, therefore, be said that the pest became most active at worm climatic and decreased with the fall of temperature.

High temperature, relative humidity and weekly rainfall as prevailed during July-August favoured activity of epilachna beetle leading into higher population. Although pattern of incidence varied with region, the peak period of activity of the beetle was generally in July-August (Rajagopal and Trivedi, 1989). Suresh *et al.* (1996) reported that the activity of the pest attained peak in the first week of August in Manipur. All these findings are in conformity with the results under present investigation.

II. Biology of ***Henosepilachna vigintioctopunctata*** Fabr. : Under laboratory conditions fecundity, durations of life stages, and life cycle varied widely in different seasons (Table -2). The fecundity was recorded highest (272.32 eggs) during March-April and average being 215.47 eggs. Incubation period ranged from 3.5 days to 4.14 days ; average being 3.87 days. Larval period varied widely with season and average for four generation studied was recorded 13.50 days. The shortest larval duration was recorded (11.78 days) in June-July and longest being 15.56 days in September-October. Pupal period ranged from 5.85 days to 7.05 days and average being 6.52 days. The average preoviposition and oviposition period were 5.92 days and 7.69 days respectively. The average longevity of male beetle was 18.32 days and 23.33 days for female.

Duration of life cycle was recorded minimum (26.74 days) in June-July when maximum temperature ranged from 30.50-32.33°C, minimum being 28.08-30.05°C, mean relative humidity ranged from 65-78%. Longer duration in life cycle was recorded (33.52 days) in September-October when maximum temperature ranged from 26.73-33.62°C, minimum 24.32-29.62°C and mean relative humidity 58-70%. The average duration of life cycle for four generations was 29.82 days.

Pradhan (1969) reported that incubation, grub and pupal stages lasted for 2-4 days, 12-18 days and 3-6 days respectively which is not in conformity with the finding under present investigation, might be due to regional variation as influenced by weather conditions. However, the duration of different stages of life cycle at different places followed a similar trend.

Correlation studies (Table-3) between duration of different life stages, fecundity and life cycle with prevailing weather parameters under laboratory conditions revealed that duration of all the life stages as well as life cycle were significantly and negatively correlated with temperature and relative humidity but the fecundity was non-significantly but positively correlated with temperature and relative humidity indicating high temperature and humidity low-

Table 1. Correlation co-effcient between important weather parameters and incidence of *Henosepilachna vigintioctopunctata* Fabr.

S. No.	Name of the pest	Temparature °C				Relative Humidity (%)			Total
		Maximum	Minimum	Difference	Average	Maximum	Minimum	Average	Rainfall (mm)
1.	Epilachna beetle	0.520*	0.695*	(-)0.708*	0.642*	0.088	0.687*	0.643*	0.549*

*Significant

Table 2. Biology of epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) on brinjal.

Generation	Season	Period	Incubation period (Av. days)	Larval period (Av. days)	Pupal period (Av. days)	Pre-oviposition period (Av. days)	Oviposition period (Av. days)	Post-oviposition period (Av. days)	Adult longivity Total duration of male (Av. days)	Adult longivity Total duration of female (Av. days)	Average fecundity	Duration of life-cycle (Av. days)
I	Rainy	1.6.97 to 13.7.97	3.50	11.78	6.50	4.96	6.37	4.17	14.37	20.60	221.36	6.74
II	Autumn	4.8.97 to 17.9.97	3.88	12.12	5.85	5.67	7.30	5.06	16.95	22.09	272.32	27.52
III	Dewey	7.9.97 to 30.10.97	3.96	15.56	7.05	6.95	8.78	6.87	23.53	27.42	195.36	33.52
IV	Spring	1.3.98 to 23.4.98	4.14	14.56	6.70	6.10	8.30	5.92	18.45	23.23	172.85	31.50
Average			**3.87**	**13.50**	**6.52**	**5.92**	**7.69**	**5.50**	**18.32**	**23.33**	**215.47**	**29.82**

Table 3. Correlation Co-effcient (r) between different stages of life-cycle of epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) and important weather parameters.

Environmental factors	Incubation period (Av. days)	Larval period (Av. days)	Pupal period (Av. days)	Pre-oviposition period (Av. days)	Oviposition period (Av. days)	Male longevity (Av. days)	Female longevity (Av. days)	Average fecundity	Life-cycle (Av. days)
Temp. (max.)	-0.805 (23-33)	-0.963* (22.8-33)	-0.629 (22.7-32.5)	-0.989* (23-32.6)	-0.994* (22-32.7)	-0.962* (21.7-33)	-0.942* (22.1-32.3)	+0.541 (22-32.7)	-0.971* (22.3-32.7)
Temp. (min.)	-0.661 (17.8-29)	-0.883 (17.29.3)	-0.556 (18-28.5)	-0.990* (17.7-29)	-0.927* (17.1-28.4)	-0.993* (18-28.3)	-0.983* (17-29.3)	+0.342 (17.1-28.4)	-0.902 (17.3-29)
Temp. (av.)	-0.746 (21.3-31)	-0.935 (22.3-30.7)	-0.601 (22-30.3)	-1.0* (21-30.7)	-0.973* (21.3-31)	0.986* (21-29.9)	-0.971* (21.4-30.5)	+0.452 (21.3-31)	-0.948* (21.3-30)
[illegible](av.)	-0.798 (60-78)	-0.995* (61-80)	-0.752 (58-78)	-0.929 (56-80)	-974* (62-75)	-0.895 (63-77)	-0.879 (65-76)	+0.733 (62-75)	-0.992* (60-78)

*Significant

Figure in the parenthsis indicate prevailing temperature/humidity range of respective stages of development and life cycle at the time of rearing.

ered down the duration of different life stages, life cycle and increased fecundity. It can, therefore, be said that temperature, relative humidity and rainfall play important role in seasonal fluctuation of pest population. High temperature and high humidity during July to September lowered down the duration of life cycle and increased fecundity leading into rapid multiplication of the pest resulting higher population level and thereby crop loss during the period. Therefore, pest avoidance technique can be adopted through deferred planting to escape the peak period of epilachna infestation as suggested by Raj and Lakshmanan (1980).

ACKNOWLEDGEMENT

The authors are grateful to Adaptive Research Council, Government of West Bengal for providing financial assistance through sponsoring the research project entitled "Investigation on the pest and disease constraints of important vegetable crops and their management under terai region of West Bengal". This work carried out under the project is duly acknowledged.

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