Int.J.Curr.Microbiol.App.Sci (2020) *9*(6): 2637-2642

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 6 (2020)**
Journal homepage: http://www.ijcmas.com

EXCELLENT PUBLISHERS

Original Research Article https://doi.org/10.20546/ijcmas.2020.906.320

Correlation of Weather Factors on the Incidence of Epilachna Beetle *Henosepilachna septima* Dieke and its Natural Enemy

M. M. Mawtham[1*], C. Gailce Leo Justin[2], S. Sheeba Joyce Roseleen[2] and M. Chandrasekaran[3]

[1]Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore – 641 003, India
[2]Department of Plant Protection, Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirappalli 620 027, India
[3]Department of Plant Protection, Horticultural College and Research Institute (Women) Tamil Nadu Agricultural University, Tiruchirappalli 620 027, India

**Corresponding author*

Keywords

Epilachna beetle, egg parasitoid, leaf and flower damage, weather parameters

Article Info

Accepted:
20 May 2020
Available Online:
10 June 2020

A B S T R A C T

The epilachna beetle (*Henosepilachna septima* Dieke) is one of the serious pests on cucurbits. The grubs and adults feed throughout the crop stages and results in skeletonising the leaves. The seasonal incidence of epilachna beetle and their natural enemy *Quadrastichus ovulorum* (Ferriere) was carried out during *kharif* and *rabi*, 2017-19. Field experiments were conducted in farmer's field at Ellamanam village, Tiruchirappalli district. The incidence of epilachna beetle was found maximum from 40th SMW to 46th SMW (Standard Meteorological Week). The population of epilachna beetle was positively correlated with maximum temperature and wind direction and negatively correlated with minimum temperature, rainfall, relative humidity and wind speed. The egg parasitisation of epilachna beetle was found minimum and maximum during 45th SMW (33.33%) and 40th SMW (48.44%), respectively. The egg parasitisation was negatively correlated with maximum temperature, minimum temperature, rainfall, wind speed and positively associated with relative humidity. The minimum damage of leaves (1.11 %) and flower (4.44 %) followed by maximum damage in 46th (28.89 %) and 39th (16.67 %) SMW.

Introduction

Bitter gourd (*Momordica charantia* L.) (Cucurbitaceae: 2n = 2x = 22) is the most important tropical and sub-tropical vegetable among the cucurbitaceous crops which occupies a predominant place in Indian vegetables and cultivated throughout the world (Rai *et al.*, 2008).

The epilachna beetle (*Henosepilachna septima* Dieke) is a serious pest on vegetables in India and distributed throughout the country and causes considerable damage to cucurbitaceous, solanaceous and leguminous crops (Islam *et al.*, 2011). The grubs and adults feed voraciously by scrapping the leaf chlorophyll and leads to lamina skeletonization.

The epilachna beetle causes upto 80 per cent loss depending on the season and environmental condition (Rajagopal and Trivedi, 1989). It is necessary to have basic information on the pest incidence about to with concerning weather parameters which in turn help us in determining the appropriate time of action and suitable management methods to be adopted. Keeping this in view, the present study made an attempt to record the occurrence of epilachna beetle in relation to various abiotic factors involved in an effective and economical management.

Materials and Methods

Bitter gourd seeds (East west F_1hybrid) were sown in farmer's field for two season *viz*. third week of July 2018 (*kharif*) and last week of December 2018 (*rabi*) at Elamanam village, Tiruchirappalli District, Tamil Nadu, India in a plot area of 24 m × 4 m (96 m^2) with 0.6 m × 2.0 m spacing. All the recommended package of practices was adopted as per the TNAU crop production guide except plant protection measures. The experimental plot was divided into three subplots of 8 m × 4 m to record the observations.

The incidence of epilachna beetle (*H. septima*) was recorded on three randomly selected leaves *viz.*, from top, middle and bottom of labelled plants. The observed data was correlated with abiotic factors like maximum and minimum temperature, rainfall, relative humidity and wind speed. The total number of eggs and parasitised eggs of epilachna beetle were counted in ten randomly labelled plants of each replication at weekly intervals on bitter gourd. The insect pests and their natural enemies collected during *kharif* (2018) were sent to the National Research Centre for Banana (NRCB), Tiruchirappalli district, Tamil Nadu for species identification.

The damage inflicted by epilachna beetle was calculated according to Bhowmik and Saha (2017)

Results and Discussion

In *kharif*, epilachna beetle grub and adult was maximum in 43rd and 41st SMW (0.63 and 0.53 no./3 leaves/plant) (Table 1 and Fig. 1). In *rabi*, epilachna beetle grub and adult was found maximum in 10th SMW (0.60 and 0.53 no. /3 leaves/plant) and 0.03 no. /3 leaves/plant for 3rd SMW. According to Tushar *et al.*, (2014), the grub and adults recorded peak during the last week of March and the third week of April.

The epilachna beetle caused noticeable losses in leaf and flowers whereas leaf damage was recorded from 35th SMW to 47th SMW and flower damage was observed on 39th SMW (Table 2). The epilachna beetle egg was maximum on 38th SMW (68.00 no./3 leaves/plant). Nevertheless, Qamar *et al.*, (2019) reported that epilachna beetle eggs maximum during September month. The parasitised eggs of epilachna beetle was observed on 38th SMW (35.29%) with a minimum and maximum parasitization in 45th SMW (33.33 %) and 41st SMW (48.44 %), respectively. According to Jamwal *et al.*, (2017), egg parasitisation reached maximum (22.64 %) in August (34th SMW) and minimum (4.14 %) in November (47th SMW). Results were also found similar to the findings of Tushar *et al.*, (2014). The population of grubs and adults of epilachna beetle showed a positive correlation to maximum temperature and negative correlation to minimum temperature, rainfall, relative humidity and wind speed (Table 3). The multiple linear regression analysis of pest population to weather parameters influenced 43-47 per cent of epilachna beetle grub and 49-72 per cent of epilachna beetle adult population.

Table.1 Seasonal incidence of epilachna beetle on bitter gourd (*kharif and rabi*, 2018-19)

Month (*kharif*)	SMW 2018	Epilachna beetle**		Month (*rabi*)	SMW 2018-19	Epilachna beetle**	
		Grubs*	Adults*			Grubs*	Adults*
Aug.	35	0.10	0.07	**Dec**	52	0.00	0.00
Sep.	36	0.30	0.33	**Jan**	1	0.00	0.00
	37	0.10	0.00		2	0.10	0.00
	38	0.33	0.37		3	0.13	0.03
	39	0.30	0.23		4	0.20	0.17
Oct.	40	0.00	0.00	**Feb**	5	0.33	0.13
	41	0.50	0.53		6	0.47	0.20
	42	0.37	0.40		7	0.43	0.33
	43	0.63	0.50		8	0.50	0.47
Nov.	44	0.20	0.17	**Mar**	9	0.60	0.50
	45	0.13	0.13		10	0.60	0.53
	46	0.47	0.53		11	0.40	0.43
	47	0.13	0.17		12	0.30	0.30

SMW-Standard Meteorological Week, *Insects/plant/3 leaves (no.), **Mean of three replications

Table.2 Assessment of leaf and flower damage on bitter gourd by epilachna beetle and its egg parasitisation

SMW 2018	Epilachna beetle damage*		Total eggs (no.)	Parasitised eggs (no.)	Egg parasitisation (%)
	Leaf (%)	Flower (%)			
35	1.11	0.00	0.00	0.00	0.00
36	3.33	0.00	0.00	0.00	0.00
37	1.11	0.00	0.00	0.00	0.00
38	6.67	0.00	68.00	24.00	35.29
39	3.33	4.44	33.00	12.00	36.36
40	0.00	0.00	0.00	0.00	0.00
41	12.22	8.89	64.00	31.00	48.44
42	8.89	4.44	55.00	22.00	40.00
43	15.56	10.00	35.00	15.00	42.86
44	10.00	6.67	12.00	0.00	0.00
45	6.67	5.56	15.00	5.00	33.33
46	28.89	16.67	0.00	0.00	0.00
47	5.56	3.33	0.00	0.00	0.00

SMW-Standard Meteorological Week, *Mean of three replications

Table.3 Correlation and regression analysis of weather parameters on the incidence of epilachna beetle and their natural enemies in bitter gourd (*kharif and rabi*, 2018-19)

Weather parameters	*kharif*					*rabi*	
	Grub	**Adult**	**Leaf**	**Flower**	**Egg parasitisation**	**Grub**	**Adult**
Max. Temperature	0.047	0.039	-0.281	-0.413	-0.081	0.371	0.593*
Min. Temperature	-0.296	-0.299	-0.589*	-0.738**	-0.237	0.489	0.464
Rainfall	-0.645*	-0.651*	-0.484	-0.418	-0.425	-	-
Relative Humidity	-0.091	-0.079	0.171	0.355	0.166	-0.274	-0.473
Wind Speed	-0.189	-0.199	-0.441	-0.593	-0.279	0.232	0.473
Wind Direction	0.100	0.093	-0.105	-0.291	-0.030	-0.00	0.194
Regression equation	$Y= 0.169+0.040X_1 -0.046X_2- 0.043X_3 0.001X_4 - 0.082X_5+ 0.002X_6$	$Y= -0.283- 0.004X_1+ 0.048X_2- 0.052X_3 - 0.006X_4- 0.158X_5 +0.003X_6$	$Y= 173.46- 1.180X_1- 3.512X_2- 0.521X_3- 0.590X_4- 4.289X_5 +0.092X_6$	$Y= 83.07 + 0.408X_1- 3.461X_2- 0.418X_3- 0.131X_4- 1.396X_5 +0.041X_6$	$Y= -714.14 + 11.161X_1+5.187 X_2-6.469X_3 + 2.746 X_4 - 8.134 X_5 + 0.460X_6$	$Y= -1.251- 0.027X_1 +0.072X_2 +0.007X_4+0.029X_5 - 0.002X_6$	$Y= 1.804 +0.001X_1 + 0.048X_2 + 0.006 X_4 + 0.049X_5 - 0.001X_6$
R^2	0.67	0.72	0.76	0.79	0.61	0.43	0.49

*Significant at 5% level, **Significant at 1% level; X_1-Maximum temperature; X_2-Minimum temperature; X_3-Rainfall; X_4-Relative humidity; X_5-Wind speed; X_6-Wind direction; Y= Number of insect pests, R^2=Coefficient of determination

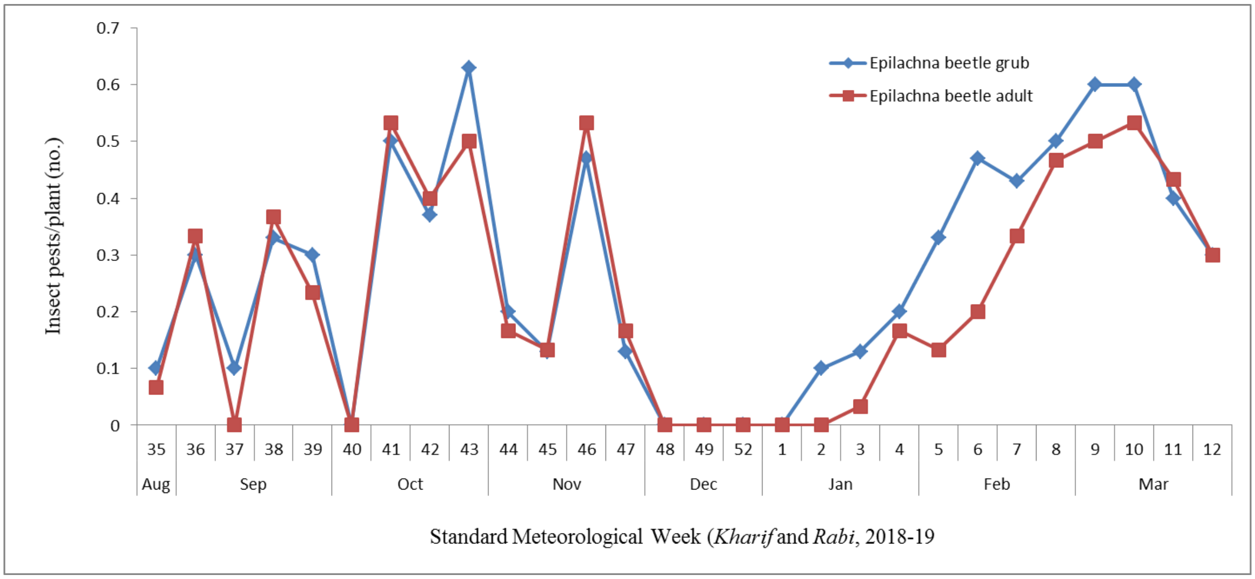

Fig.1 Seasonal incidence of epilachna beetle in bitter gourd (*kharif and rabi*, 2018-19)

These results were in conformity to Raghuraman and Veeravel (1999) who reported that epilachna beetle infestation had a significant positive correlation to maximum atmospheric temperature. Bhowmik and Saha (2017) described that relative humidity and rainfall had negative correlation to epilachna beetle population. But in contrast, Kalaiyarasi *et al.,* (2017) reported rainfall, high relative humidity and high temperature favoured epilachna beetle population. The leaf and flower damage were highly significant with a negative correlation to the minimum temperature (-0.589 and 0.738) and wind speed of flower damage (-0.593). The maximum temperature (-0.281 and -0.413), rainfall (-0.484 and -0.418), wind direction (-0.105 and -0.291) and wind speed of leaf damage (-0.441) were negatively correlated with leaf and flower damage of epilachna beetle.

The egg parasitisation was negatively correlated to maximum temperature (-0.081), minimum temperature (-0.237), rainfall (-0.425), wind speed (-0.279) and wind direction (-0.030). The relative humidity was positively associated with egg parasitisation (0.166). The regression analysis showed the influence of weather parameters on epilachna beetle damage in leaf (76.00 %) and flower (79.00%) , and its egg parasitisation by 61 per cent. These results were also in conformity with the findings of Barma and Jha (2013).

References

Barma, P., and Jha, S. 2013. Insect and non-insect pests infesting pointed gourd (*Trichosanthes dioica* Roxb.) in West Bengal. Bioscan. 8: 537-43.

Bhowmik, S., and Suvadip, S. 2017. Study on the pest complex of bottle gourd in the gangetic plains of West Bengal. Journal of Entomology and Zoology Studies. 5 (2): 725-727.

Islam, K., Saiful I. K., and Zennat, F. 2011. Control of *Epilachna vigintioctopuntata* Fab. (Coleoptera: Coccinellidae) using some indigenous plant extracts. Journal of Life and Earth Science. 6: 75-80.

Jamwal, Vishav, V S., Hafeez, A., and Ashutosh, S., Devinder, S. 2017. Seasonal abundance of *Henosepilachna vigintioctopunctata* (Fab.) on *Solanum melongena L*. and natural occurrence of its two hymenopteran parasitoids. Brazilian Archives of Biology and

Technology. 60.

Kalaiyarasi, L., Livingstone, A.R., and Madhanagopal, R. 2017. Effect of weather parameters on the incidence of different life stages of a serious pest *H. vigintioctopunctata* (Fab.) on Brinjal in Chennai locality, India. Journal of Entomology and Zoology Studies. 5: 1520-1525.

Muntaha, Q, Masarrat, H., and Uzma, M. 2019. Seasonal incidence of hymenopteran parasitoids of *Henosepilachna* spp. Journal of Entomology and Zoology Studies. 7(4): 19-26

Raghuraman, M., and Veeravel, R. 1999. Influence of Abiotic Factors on The incidence of Spotted Leaf Beetle *Henosepilachna vigintioctopunctata* (F.) in Brinjal. Pest Management In Horticultural Ecosystems. 5 (1): 1-12.

Rai, M., Pandey, S., Kumar, S., and Pitrat, M. 2008. Cucurbit research in India: a retrospect. Cucurbitaceae 2008, Proceedings of the IXth EUCARPIA meeting on genetics and breeding of Cucurbitaceae (Pitrat M, ed.), INRA, Avignon (France).

Rajagopal, D., and Trivedi, T.P. 1989. Status, bioecology and management of Epilachna beetle, *Epilachna vigintioctopunctata* (Fab.) (Coleoptera: Coccinellidae) on potato in India: A review. International Journal of Pest Management. 35 (4): 410-413.

Tushar, M.G., Laishana, D.L., and Jha, S. 2014. Seasonal incidence of Epilachna beetle (*Henosepilachna septima* Dieke) in relation to weather parameters on pointed gourd (*Tricosanthes dioica* Roxb.). Journal of Crop and Weed. 10(2): 430-432.

How to cite this article:

Mawtham. M. M., C. Gailce Leo Justin, S. Sheeba Joyce Roseleen and Chandrasekaran. M. 2020. Correlation of Weather Factors on the Incidence of Epilachna Beetle *Henosepilachna septima* Dieke and its Natural Enemy. *Int.J.Curr.Microbiol.App.Sci.* 9(06): 2637-2642.
doi: https://doi.org/10.20546/ijcmas.2020.906.320