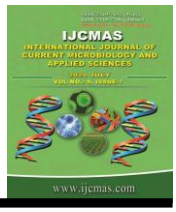
Int.J.Curr.Microbiol.App.Sci (2020) *9*(7): 397-402

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 7 (2020)**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2020.907.044

Role of Weather Parameters on Population Build Up of Minor Insect Pests of Brinjal

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Keywords

Weather Parameter, Population Build Up, Minor Insect Pests of Brinjal,

Article Info

Accepted:
05 June 2020
Available Online:
10 July 2020

A B S T R A C T

An experiment was carried out during *rabi* seasons of 2017-18 at the farmer's field, Allengmora, Jorhat to study the effect of weather parameters on population buildup of some minor insect pests of brinjal which could also play an important role for yield reduction of brinjal. Significant positive correlation of aphid, *Aphis gossypii* Glover(r= 0.662) and leafhopper, *Amrasca biguttula biguttul* Ishida (r= 0.560) was observed with maximum temperature. Therefore, in this context, the incidence of minor insect pests cannot be ignored for maximize the yield of brinjal crops. The different meteorological parameters, however did not show any positive significant effect against flea beetle, *Monolepta signata* Olivier on the population buildup of the pest during the present study.

Introduction

Brinjal (*Solanum melongena* L.) is a nutrient rich solanaceous vegetable cultivated throughout India. In India fromarea and production perspective, it is being cultivated approx. 7.30 lakhs hectare and produces 12.8 million metric tonnes (Anon, 2018). However, reduction on gain yield is due to the different types insect pests associated with brinjal crop (Borah *et al.*, 2016 and Borkakati *et al.*, 2019a) and of course conservation of natural enemies can maintain the harmful pest under economic threshold level (Borkakati *et al.*, 2019b). Amongst insect pests though brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee is the major pests, but some other minor pests are also associated with brinjal crop viz., aphid, *Aphis gossypii* Glover; leaf hopper, *Amrasca biguttula biguttul* Ishida and flea beetle, *Monolepta signata* Olivier. (Isahaque, 1979; Dhankar, 1988; Regupathy *et al.*, 1997 and Borkakati *et al.*, 2018) and these minoe insects are also

equally important for reduction of crop yield of brinjal. However, it has been observed that a congenial atmospheric condition in any crop ecosystem always plays a dominant role in population fluctuation of insect pests irrespective of major or minor one (Begam *et al.,* 2016; Pradhan *et al.,* 2020).

Nevertheless, transgenic brinjal may be an alternate option for pests management similar to the future crucifers with Cry endotoxin gene (Shelton *et al.,* 2009), but one cannot nullify the attack of other pests. In this context, due attention should be poid by the minor insect pest besides *L. orbonalis* in relation to meteorological parameters of the crop situation. Therefore, present study was undertaken mainly to focus on the effect of weather parameters on population buildup of minor insect pests of brinjal.

Materials and Methods

The experimental site is situated at 26°756′ latitude and 94°209E′ longitude at an altitude of 86.6m above mean sea level. Field experiment was executed during *rabi* seasons of 2017-18 at the farmer's field, Allengmora, Jorhat under AICRP on Biological Control of Crop Pests and Weeds. For this purpose, a field with 500 m^2 was cultivated by following package of practice of AAU, Jorhat except plant protection with Bio-intensive IPM module (Anonymous, 2014).

The data of insect pests were recorded from five randomly selected plants from 5 spot of 100 m^2 area and observations were recorded at weekly interval based on visual count and using sweeping net. Observation on the population of sucking insect pests, aphids and leafhopper (both nymph and adult) were recorded on three leaves, one each from top, middle and bottom canopy of the five plants selected randomly in each plot (Koushik *et al.,* 2014). Data o sucking pests were recorded as insect per leave basis, whereas the flea beetles were recorded as insect per plant basis. Meteorological data were collected from Department of Meteorology, Assam Agricultural University, Jorhat as the experimental field is situated approximately 15 km from AAU, Jorhat.

Results and Discussion

Incidence of *Aphis gossypii*

The activity (Table1 & 2) of *A. gossypii* was recorded from the last week of September 2017 up to first week of January 2018 during the present investigation. The first incidence of *A. gossypii* was recorded on 28th of September 2017. Afterwards, the variation in population was observed at weekly intervals during experimental study. During early stages of the crop, the activity of aphid was high and afterwards the activity of the pest was found to be declined.

However, the peak period of activity was recorded during second week of November 2017 with 4.24 aphid/leaf when the maximum and minimum temperature, average relative humidity and bright sunshine hours during the period of maximum activity of aphid were 29.3°C, 15.1°C, 79.95% and 8.6, respectively.

The pest remained active throughout the year with a fluctuating population which was ranged from 0.41 to 4.24 aphid/leaf. The reduction of pest from second week of November might be due to variation in weather parameters and predatory action by coccinellids and spiders. From the present findings, it was clearly indicated that, the population of *A. gossypii* was increased with increasing in maximum temperature. However, the finding of present investigation was in conformity with Mall *et al.,* (1992), according to whom the peak population of 6.86 aphid/leaf on brinjal was recorded during

the first week of November where as Bharadiya and Patel (2005), from Gujarat also recorded peak activity of aphids during third week of November. But the present findings were not conformity with Borah and Saikia (2017) from Assam who recorded the maximum activity of aphids during February and March.

The correlation (Table3) studies of the aphid population with different meteorological parameters indicated a significant positive correlation with maximum temperature (r= 0.662). Although, minimum temperature (r= 0.468), total rainfall (r= 0.180) and bright sunshine hours (r= 0.327) showed positive effect but they were not significantly associated with the population buildup of the aphid. However, average relative humidity (r= -0.372) had no significant effect on the population buildup of the pest during the period of present investigation. Prasad and Logiswarans (1997) also recorded a positive association with maximum temperature and negative association with rainfall and minimum temperature. The present correlation studies of aphid population with meteorological parameters however in conformity with Borah and Saikia (2017) and according to them aphids population showed significant positive association with maximum and minimum temperature. Further, they also found that aphid showed a negative significant association with average relative humidity. But Chandrakumar *et al.,* (2008) recorded a negative correlation with both maximum and minimum temperature, respectively.

Incidence of *Amrasca biguttula biguttula*

The incidence (Table1 &2) of *A. biguttula biguttula* was observed on brinjal from first week of October 2017. However, the first incidence of the pest was recorded on 5th October 2017 and remained active throughout the season with a fluctuating population of 0.49 to 3.62 adult/ leaf. Earlier workers also recorded the activity of pest throughout the cropping period (Mall *et al.,* 1992; Chandrakumar *et al.,* 2008 and Borah and Saikia, 2017).

During present study, the initial population of pest was 1.68 adult/leaf and it was gradually increased up to third week of October and reached its peak during second week of November 2017 with 3.62 adult/leaf. During the maximum activity period of *A. biguttula biguttula,* the maximum and minimum temperature, average relative humidity and bright sunshine hours were recorded as 29.3°C, 15.1°C, 79.95% and 8.6, respectively with no rainfall during the peak period of activity of the pest during 2017-18.

However, the maximum activity of leafhopper was found during December as reported by Chandrakumar *et al.,* (2008) and Indirakumar *et al.,* (2009), respectively. From the present findings, it was found that low or no rainfall favored the population buildup of leafhopper.

When the different meteorological parameters were correlated (Table.3) with the population buildup of *A. biguttula biguttula,* it was observed that maximum temperature (r= 0.560) showed a significant positive correlation whereas minimum temperature (r= 0.414), total rainfall (r = 0.087) and bright sunshine hour (r = 0.296) also showed a non-significant positive correlation with leaf hopper population whereas average relative humidity (r= -0.331) showed a negative association with leafhopper. It was also indicated negative correlation with maximum and minimum temperature and positive correlation with rainfall as reported by a Chandrakumar *et al.,* (2008) and Indirakumar *et al.,* (2016), respectively. Prasad and Logiswaram (1997) also reported significant positive association with maximum

temperature and negative association with rainfall. However, Borah and Saikia (2017) reported that, the population of leafhopper had a positive impact with both maximum and minimum temperature while average relative humidity and total rainfall showed negative association with leafhopper.

Incidence of *Monolepta signata*

Trend of incidence (Table1 &2) of *M. signata* was observed from October 2017 onward and remained active up to first week of December 2017 with a fluctuating population ranging from 0.29 to 2.71 adult/plant. Peak population of the insect was recorded on 22nd November with 2.71 adult/plant. In the present investigation, moderately high maximum temperature had been found to be conductive for population buildup of the pest. However, Turnock *et al.,* (1987) reported the effect of temperature on the time of emergence of adults of flea beetle which affected their ability to survive in a proper way. Correlation (Table3) of *M. Signata* population with weather parameters revealed that the parameters like maximum temperature (r= 0.140), minimum temperature (r= 0.055) and bright sunshine hours (r= 0.337) showed a non-significant positive correlation whereas average relative humidity (r= -0.338) and total rainfall (r= -0.127) showed a non-significant negative association with the pest. Moreover, it was observed that all the meteorological factors did not exert any positive significant effect on the population buildup of this pest during the course of investigation. However, the results of correlation coefficient (r) of present study were in agreement with the results of Chen *et al.,* (1991) also who reported high temperature and heavy rainfall with negative correlation of *M. signata* population.

Table.1 Data of meteorological parameters during study period

Period of observation	Temperature (^{o}C)		Average RH (%)	Rainfall (mm)	BSSH (hr)
	Max	Min			
28.09.17-04.10.17	31.8	24.7	87.9	13.8	4.9
05.10.17-11.10.17	34	24.9	82.8	0.2	7.5
12.10.17-18.10.17	32.6	23.9	85.2	7.4	5
19.10.17-25.10.17	28.5	22	90.7	11.4	2.6
26.10.17-01.11.17	28.1	19.5	84.9	1	6.1
02.10.17-08.11.17	29.5	16.6	79.9	0	9.2
09.11.17-15.11.17	29.3	15.1	80	0	8.6
16.11.17-22.11.17	28.5	18.7	82.6	1	4.9
23.11.17-29.11.17	27	15.1	83.8	1.1	6.6
30.11.17-06.12.17	26.1	11.7	82.7	0	7.4
07.12.17-13.12.17	26.3	14.6	83.7	0	4
14.12.17-20.12.17	24.7	13.8	89	0	3
21.12.17-27.12.17	26	11.8	81.7	0	6.6
28.12.17-04.01.18	24.9	11.7	84.6	0.1	5.8

Table.2 Population buildup of insect pests of brinjal during 2017-18

Period of observation	Aphid per leaf (adults/Leaf)	Leaf hopper per leaf (adults/Leaf)	Flea beetle per plant (adults/plant)
28.09.17-04.10.17	1.77	1.68	0
05.10.17-11.10.17	3.50	2.37	0.29
12.10.17-18.10.17	4.22	3.16	0.57
19.10.17-25.10.17	2.16	2.63	1.29
26.10.17-01.11.17	1.86	2.09	1.14
02.10.17-08.11.17	3.25	3.28	1.86
09.11.17-15.11.17	4.24	3.62	2.29
16.11.17-22.11.17	3.74	3.12	2.71
23.11.17-29.11.17	3.05	2.14	1.43
30.11.17-06.12.17	1.79	1.90	0.71
07.12.17-13.12.17	2.06	2.01	0
14.12.17-20.12.17	1.45	1.40	0
21.12.17-27.12.17	0.98	1.21	0
28.12.17-04.01.18	0.41	0.49	0

Table.3 Correlation studies of insect pests and predators of brinjal with the weather parameters during 2017-18

Insect Pests	Maximum temperature (ºC)	Minimum temperature (ºC)	Average Relative Humidity (%)	Total Rainfall (mm)	BSSH (hr)
Aphid per leaf	0.662** y= -5.469+0.279x	0.468	-0.372	0.180	0.327
Leafhopper per leaf	0.560* y= 2.689+0.173x	0.414	-0.331	0.087	0.296
Flea beetle per plant	0.140	0.055	-0.388	-0.127	0.337

** Correlation is significant at 0.01 level
* Correlation is significant at 0.05 level

Significant positive correlation of aphid and leafhopper was observed with maximum temperature. Therefore, the incidence of minor insect pests cannot be ignored for maximize the yield of brinjal crops.

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How to cite this article:

Saikia. D. K., R. N. Borkakati, M. R. Venkatesh and Sinki Barman. 2020. Role of Weather Parameters on Population Build Up of Minor Insect Pests of Brinjal. *Int.J.Curr.Microbiol.App.Sci.* 9(07): 397-402. doi: https://doi.org/10.20546/ijcmas.2020.907.044