# Studies on seasonal incidence of sucking pests as influenced by abiotic factor on brinjal

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**Abstract**

Seasonal incidence of sucking pests on brinjal study was carried out school of agricultural sciences, Kalasalingam academy of Research and Education farm field to gather information on the bio-diversity of pests and their natural enemies prevalent in brinjal eco-system, roving surveys were undertaken in the brinjal growing field to record the pests and their natural enemies prevalent in the fields of brinjal ecosystem. Ten plants were selected at random and observed for the incidence of pests and their natural enemies at regular interval starting from transplanting to harvest (fortnight interval). Incidence of pests and their natural enemies of brinjal were correlated with weather parameters.

**Keywords:** seasonal incidence, sucking pests, brinjal, kalasalingam academy and research and education farm field

## Introduction

Brinjal or egg plant, *Solanum melongena* L. is an important vegetable crop grown in India and other parts of the world. It is cultivated round the year in almost all the states of India. The crop is extensively damaged by insect pests and diseases apart from other constraints. Several factors are responsible for the low productivity of aubergine. These include biotic factors as insect pests and pathogens. The most extensive pest of this vegetableis brinjal shoot and fruit borer (*Lucinodes orbonalis* Guenee) which reduces the yield and inflicts colossal loss in production. The losses caused by pest vary from season to season because moderate temperature and high humidity favor the population build-up of brinjal shoot and fruit borer (Shukla and Khatri, 2010), (Bhushan *et al*., 2011) [5, 3].

The yield loss caused by this pest has been estimated up to 67%. At vegetative phase, Aphid (*Aphis gossypii* Glover), Brown leaf hopper (Cestius phycitis Distant),Thrips (*Thrips tabaci* Lindermann) white fly (*Bemisia tabaci* Gennadius) and Two spotted spider mite (*Tetranychus urticae* Koch)suck the cell sap and prohibit the normal crop growth. Beside direct damage, the sucking pests acts as vector for virus borne diseases. Secondary infestations by certain microorganisms may cause further deterioration of the fruits (Islam and Kairm, 1991) and make them ultimately unfit for human consumption. Among the major constraints in economic cultivation of brinjal, pest infestation causes heavy losses. Chemical control is widely used means of managing insect pests in brinjal. Repeated use of broad spectrum synthetic chemicals also result in environmental contamination bioaccumulation and bio magnification of toxic residues and disturbance in ecological balance. Hence, there is an urgent need to look alternates and safer method. Use of resistant varieties is recognized as an important tool in bio intensive pest management system. The morphological and physical characteristics of plants and fruits are associated with attraction, feeding and oviposition of the insect pests. Keeping in view the economic importance of brinjal crop in daily use, where use of insecticides is not desirable, the present investigation has been undertaken to evolve an eco- friendly management strategy against sucking pest of brinjal.

## Materials and Methods

Seasonal incidence of sucking pests on brinjal study was carried out school of agricultural sciences, Kalasalingam academy of Research Education farm field to gather information on the bio-diversity of pests and their natural enemies prevalent in brinjal eco-system, Roving surveys were undertaken in the brinjal growing field to record the pests and their natural enemies prevalent in the fields of brinjal ecosystem. Ten plants were selected at random and observed for the incidence of pests and their natural enemies at regular interval starting from transplanting to harvest (fortnight interval). Incidence of pests and their natural enemies of brinjal were correlated with weather parameters.

## Results and Discussion

### 1. Seasonal Incidence of aphids (*Aphis gossypii* Glover) as influenced by weather factors in eggplant ecosystem (April'2018 –March'2019)

In order to study the seasonal incidence of aphids in brinjal ecosystem, field with uniform aged plants were selected at Algapuri farm and KARE farm field at Virudhu nagar district during April 2018 to March 2019. The influence of weather factors on population fluctuation of aphids was recorded at weekly intervals in fixed location. The study revealed that the occurrence of aphids was noticed throughout the study period. Initially the population of aphid was low followed by a steady rise, crossing its threshold level from 8 th standard week (3 rd week of February) and gradually increased as the summer progressed and reached its first peak during 21 st standard week (4 th week of May) recording 3.69 /leaf. Further, the aphid population showed the increasing rate of multiplication gradually which reached its second peak during 28 th standard week (2 nd week of July) recording 5.56 /leaf. Subsequently there was a fluctuation in aphid population from 39 th standard week (fourth week of September) to 52 nd standard week (4 th week of December) and the minimum population could be observed during 47 th -50 th standard week (2 nd week of December) with 1.00 / leaf. During the study period, two peaks were recorded, first peak during 7 th standard week (2 nd week of February) and second peak coinciding 13 th standard week (3 rd week of March). The results also revealed that there was a lot of oscillation in aphids population from 39 th to 52 nd standard week because of erratic distribution of rainfall by which increasing and decreasing trends of aphid population was observed.

**2. Seasonal Incidence of brown leaf hopper (*Cestius phycitis* Distant) as influenced by weather factors in eggplant ecosystem (April'2018 –March'2019)**

During the first season *i.e* first week of (January to June -2015) the brown leaf hopper population raised up to 9 th standard week (4 th week of February) and sudden decline was noticed since 10 th standard week to 15 th standard week again it was maximum during 16 th standard week maintained up to 23 rd standard week. The lowest population was observed during 48 th standard week (4 th week of November) then population slightly went up by 52 nd standard week (8.13/leaf).

**3. Seasonal Incidence of thrips (*Thrips tabaci* Lindermann) as influenced by weather factors in eggplant ecosystem (April'2018 –March'2019)**

The incidence of *Thrips tabaci* varied from 1.25 to 9.86/ leaf and it was maximum (9.86/leaf) during 30 th standard week (4 th week of July) and minimum (1.33/leaf) during 52 nd standard week (4 th week of December). Over all incidences was more during 29 th to 35 th standard week (3 rd week of July to 4 th week of August).Thrips population showed significant positive correlation with maximum and minimum temperature and wind velocity while a positive correlation was observed with morning and evening relative humidity and significant negative correlation with rainfall. The preferred habitat of thrips was the underside of the leaves it is likely that the direct action of raindrop afford significant control. Significant positive correlation of leaf hopper and whitefly with temperature in brinjal agro ecosystem.

The incidence of thrips was also recorded from third week of August to last week of December. High incidence of thrips on brinjal crop was 35 th standard week (9.81/leaf) no significant effect of abiotic factors on the population dynamics of these pests. The incidence was noticed during Dec. with peak infestation during July 1 st week to august 4 th week. The thrips damage was positively correlated with both maximum and minimum temperatures, where as rainfall and wind velocity had a negative impact.

**4. Seasonal Incidence and population dynamics of whitefly (*Bemisia tabaci* Genn) as influenced by weather factors in eggplant ecosystem (April'2018 –March'2019)**

Abiotic factors play a crucial important role in eco-friendly pest control. However, its population was found increased in hotter a months and declined during monsoon periods. The same trend was confirmed in the present study, the population was found increasing during the months of April to July on brinjal. The buildup was found to below during August-November and very prominently recorded from December to March but, declined in monsoon season due to intermittent precipitation.

**5. Seasonal Incidence and population dynamics of TSSM (*T. urticae* Koch) as influenced by weather factors in eggplant ecosystem (April'2018 –March'2019)**

To study the seasonal incidence of two spotted spider mite, *Tetranychus urticae* Koch in brinjal ecosystem, the brinjal field with uniform aged plants was selected at Alagapuri, block of srivilliputhur virudhunagar district during April'2018 – March'2019. The influence of weather factors on population fluctuation of *T. urticae* was recorded at weekly intervals in fixed locations. The present investigation revealed that the occurrence of TSSM (*T. urticae* Koch) was prevalent throughout the study period except during 48th (1st week of December) to 50th (3rd week of December). The mite population started crossing its threshold level from 4th (4th week of January) standard week and the population started increasing gradually as the summer progressed and reached its first peak during the 13th (1st week of May) which recorded 19.83mites/cm 2 /leaf. The mite population declined as the second peak coincided during the 28th (2nd week of July) standard week with 5.56 mites/ cm 2 /leaf. The sharp decline in mite population was noticed from 31st (4th week of July) standard week and thereafter the population started shooting up gradually during 35th (4th week of August) standard week and again started declining from 39th (4th week of September). The maximum mite population of 19.86mites/cm 2 / leaf was recorded during 35th (4th week of August) standard week where as the minimum mite population of 3.26 mites/ cm 2/ /leaf was observed during 32nd (2nd week of August) standard week.

The results also revealed that there was a lot of fluctuation in mite population from 39 th (5 th week of September) to 52 nd (3 rd week to 4 th week of December) standard week because of erratic distribution of rainfall by which increasing and decreasing trends of mite population could be observed.

**Table 1:** Correlation matrix: Effect of weather parameters on sucking pests population in eggplant ecosystem (April' 2018-March ' 2019)

| Population | Correlation | Temperature ($^0$C) | | Relative Humidity (%) | | Rainfall | Wind velocity |
|---|---|---|---|---|---|---|---|
| | | Maximum | Minimum | Morning | Evening | | |
| *Aphis gossypii* | R | 0.0979** | 0.0033** | -0.0926** | -0.0641 | -0.1751 | 0.0097* |
| | Y=a+bX | 0.04 | -0.07 | -0.05 | 0.02 | 0.10 | -0.27 |
| | P value | 0.77 | 0.75 | 0.39 | 0.70 | 0.23 | 0.49 |
| *Cestius phycitis* | R | 0.1390** | 0.2344** | -0.1539** | -0.0944 | -0.0387 | 0.1192* |
| | Y=a+bX | 0.097 | -0.190 | 0.025 | 0.038 | -0.007 | -0.194 |
| | P value | 0.48 | 0.29 | 0.58 | 0.42 | 0.91 | 0.53 |
| *Thrips tabaci* | R | 0.2847** | 0.0542** | -0.1688** | 0.2694 | -0.0206 | 0.2946* |
| | Y=a+bX | 0.31 | 0.11 | 0.01 | -0.07 | -0.03 | -0.52 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | P value | 0.00 | 0.45 | 0.63 | 0.08 | 0.57 | 0.05 |
| *Bemisia tabaci* | R | 0.1842** | 0.0423** | -0.1549** | -0.1112 | -0.1034 | 0.1224* |
| | Y=a+bX | -0.117 | 0.06 | 0.04 | -0.02 | -0.03 | -0.04 |
| | P value | 0.39 | 0.72 | 0.38 | 0.55 | 0.64 | 0.88 |
| *Tetranychus urticae* | r | 0.0911** | 0.2285** | -0.4738** | -0.1631 | -0.0075 | 0.2535* |
| | Y=a+bX | -0.16 | 0.24 | -0.25 | 0.08 | -0.02 | 0.36 |
| | P value | 0.54 | 0.48 | 0.00 | 0.39 | 0.83 | 0.55 |

**Significant at 5% Probability

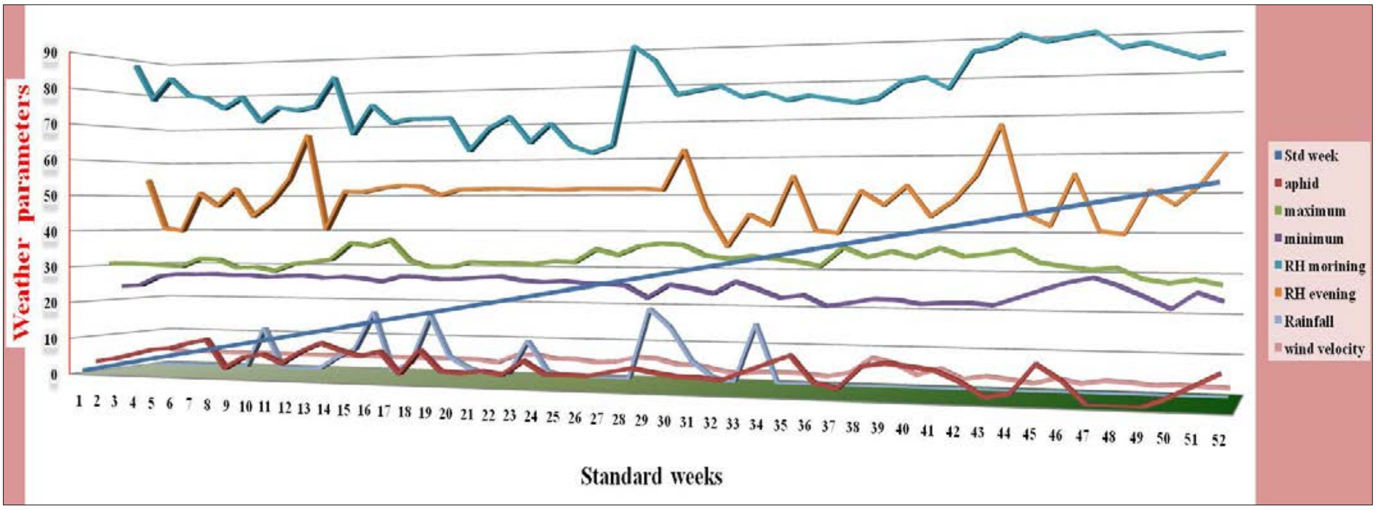


**Fig l:** Seasonal incidence of aphid as influenced by abiotic factor on brinjal

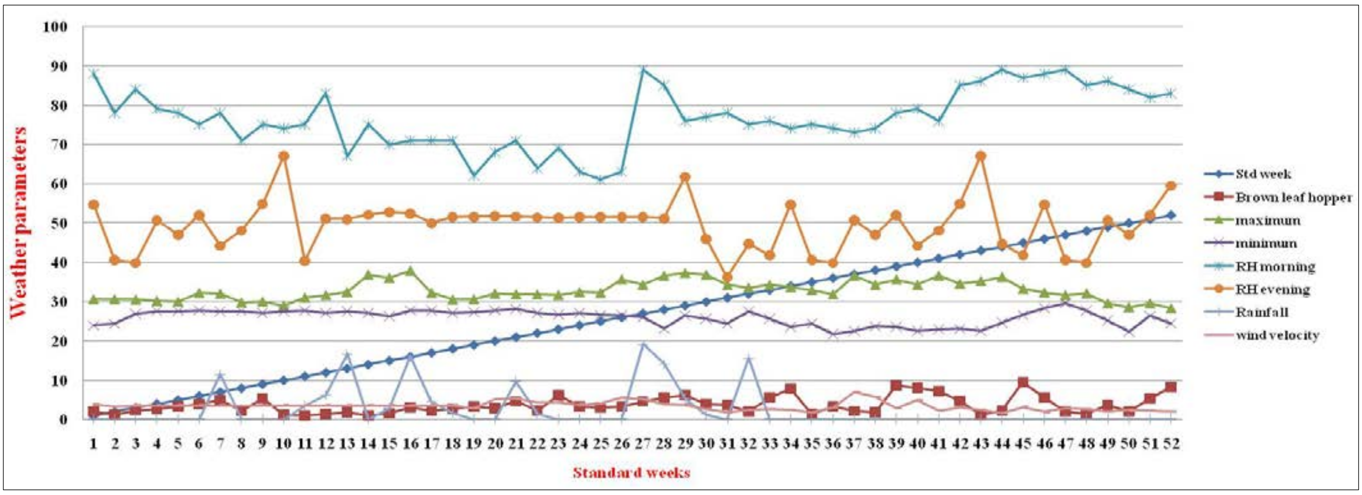


**Fig 2:** Seasonal incidence of brown leahopperas influenced by abiotic factor on brinjal

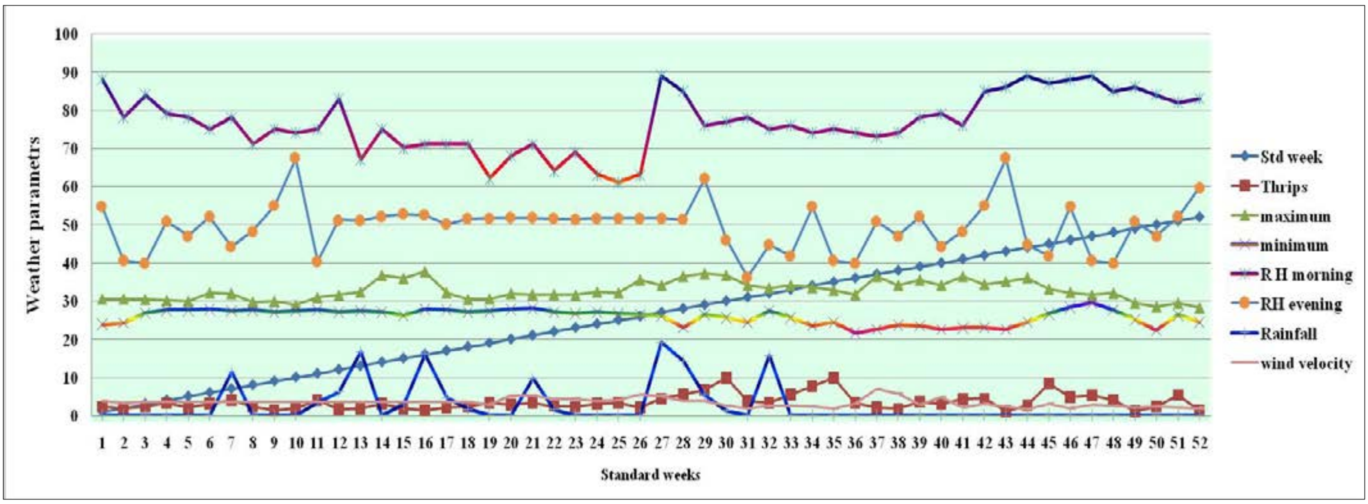


**Fig 3:** Seasonal incidence of thrips as influenced by abiotic factor on brinjal

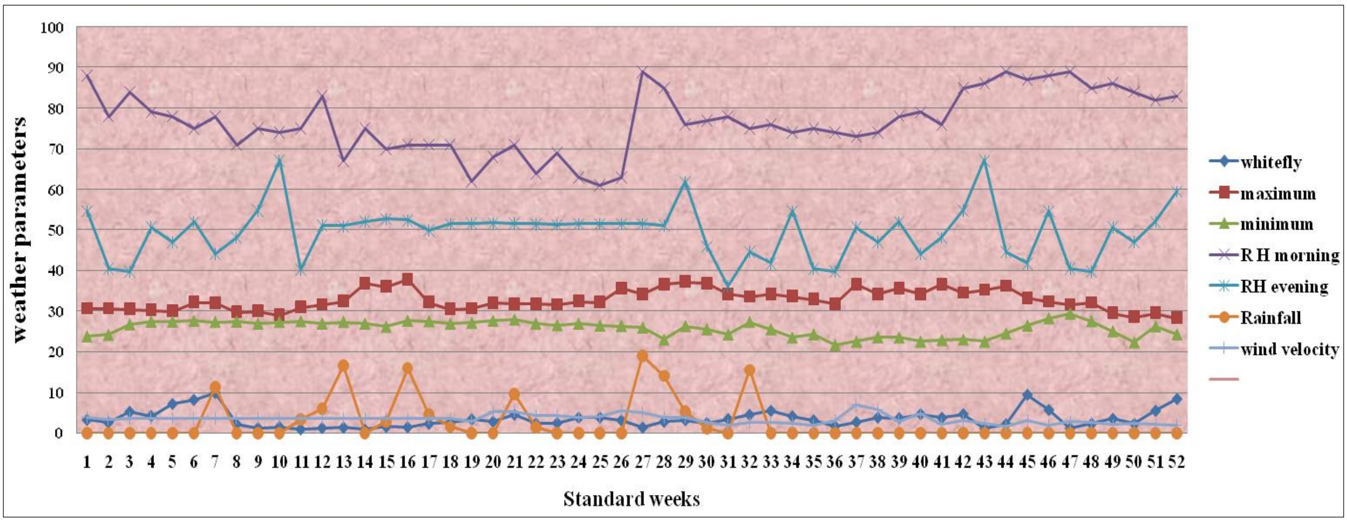


**Fig 4:** Seasonal incidence of whitefly as influenced by abiotic factor on brinjal

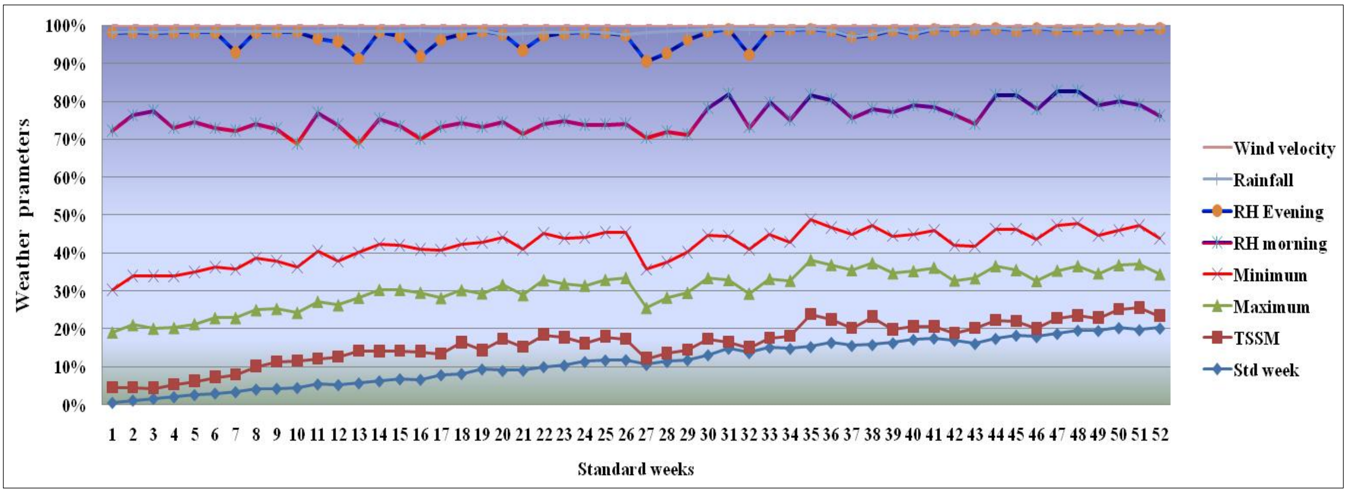


**Fig 5:** Seasonal incidence of two spottd spidermite as influenced by abiotic factor on brinjal

## Discussion

Subrata Chatterjee *et al.*, 2018 [1] adovocated that leaf hopper no significant correlation was observed in both the May and July sow crops, but highest leaf hopper population was recorded in 44th and 49th standard week (SW) respectively. Aphid population was observed highest in 35 th SW for May sown brinjal and for July sown brinjal the peak population was recorded on 51 st SW. Aphid was found to be negatively correlated with temperature when it is sown in July. The white fly population reached its peak in 35 th and 49 th SW respectively for May and July sown crops and found to be negatively correlated with temperature and rainfall. Finally, the mealy bug peak population was recorded at in 43 rd and 34 th SW respectively for May and July sown crop and mealy bugs are positively correlated with temperature and relative humidity.

Preeti shrivastava 2016 [6] reported that *A. gossypii* was first recorded in the second week of December, 50st standard week (*i.e.* 10th to 16th December, 2015). The activity of the pest continued from 50th standard week (*i.e.* 10th to 16th December, 2015) to 15th standard week in second week of April (*i.e.* 9th to 15th April, 2016). The peak activity of the pest was noticed during 9th standard week *i.e.*, last week of February (*i.e.* 26th February to 4th March, 2016). Further, wind velocity, sunshine hours, morning and evening vapor pressure and evaporation 3.3 km/hrs, 8.5 per hrs, 10.7 mm, 11 mm and 2.8 mm respectively and zero rainfall were recorded in 7 days. After 10th standard week there was a decline in the aphid population and it was available up to 15th standard week *ie*., the second week of April (*i.e.* 9th to 15th April, 2016). These findings fall in line with our findings.

The incidence of leafhopper was noticed throughout the year except during August. Maximum population of leafhopper was recorded to be 19.20 per three leaves during May second fortnight 18.33, 16.01, 13.24, 12.23, 10.77, 13.38 and 15.92 per three leaves Bindu *et al*., 2017 [2].

The first appearance of thrips was observed when the crop was two-weeks old *i.e.,* during the 31st standard week. The population increased steadily and touched its peak during first week of October with a mean of 14.1 thrips per leaf *i.e.*, during the 40th standard week. After which the pest density remained more or less same. From the 47th standard week *i.e.,* during third week of November; the population started declining gradually and this result fall in line with the findings of Shafia Zainab, (2016) [4].

Preeti Srivastava 2016 [6] also unveiled that *B. tabaci* was first recorded in the third week of December, 51st (SW) (*i.e*. 17th to 23rd December, 2015). The activity of the pest continued from 3rd week of December (51st SW) to last week of April (18th SW) (till harvesting). The peak activity of the pest was observed (21.33 whiteflies/ 6 leaves) during 10th SW, first week of March (*i.e*. 5th to 11th March, 2016).

Premalatha *et al.* (2016) [7] also vouched that the population of TSSM had a significant positive correlation with maximum and minimum temperatures and a significant negative correlation with rainfall and relative humidity in tomato ecosystem.

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