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Population dynamics of sucking pests infesting chilli (*Capsicum annum* L.)

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Abstract
Population dynamics of sucking insect pests of chilli was studied during June to December 2014, at Horticulture farm, RCA, Udaipur. The three pests viz., thrips (*Scirtothrips dorsalis* Hood); whitefly (*Bemisia tabaci* Genn.) and jassids **(***Amrasca biguttula biguttula* Ishida) were recorded. The incidence of whitefly was commenced in last week of July, while the incidence of thrips and jassids commenced in second week of August. Thrips touched the peak during the third week of September (10.2/ 3 leaves). While, whitefly and jassid touched peak in second week of September (6.8 whiteflies and 5.4 jassids/ 3 leaves, respectively). Thrips exhibited a negative correlation with temperature and rainfall, whereas positive correlation with relative humidity. However, the correlation was non-significant. Whitefly exhibited positive and non-significant correlation with temperature, relative humidity and rainfall. While, the correlation between jassid and temperature was positive but with relative humidity and total rainfall, the correlation was negative and non-significant.

Keywords: Chilli, correlation, jassids, population, thrips, whitefly

1. Introduction
Chilli is an important vegetable and condiment crop in India. The two cultivated species (*Capsicum annum* L. and *Capsicum frutescens* L.; family Solanaceae) are raised in the tropics and subtropics with a temperature range of 20-25 °C considered as ideal [1]. India is the largest consumer and exporter of chilli in the world with a production of 1492 MT from an area of 775 thousand ha and productivity 1.9 MT per ha during 2014 [2]. The major chilli growing states are Andhra Pradesh, Maharashtra, Karnataka, Tamilnadu and Rajasthan [3]. A number of factors are responsible for low yield that include adverse climate, poor quality seeds, diseases, insect and mites significantly affects both the quality and production of chilli. The yield losses range from 50-90 per cent due to insect pests of chilli [4, 5]. Thrips (*Scirtothrips dorsalis* Hood), whiteflies (*Bemisia tabaci* Genn), aphids (*Aphis gossypii* Glover) and mites (*Polyphagotarsonemus latus* Banks) are the important sucking pests contributing to decrease in the crop yield [6]. The damage due to mites and thrips together had been estimated to the tune of 50 per cent [7].
Due to variation in the agro climatic conditions of different regions insects show varying trends in their incidence also in nature and extent of damage to the crop. Besides, some known and unknown factors also play a key role in determining the incidence and dominance of a particular pest or pest complex. Therefore, a region oriented study on population dynamics of sucking pests was conducted which would give an idea about peak period of their activity and may be helpful in developing pest management strategies.

2. Material and Methods
The experiment was conducted during *Kharif*, 2014 at Horticulture farm, Rajsthan College of Agriculture to investigate the "Seasonal Incidence of major insect pests of chilli (*C. annum*)" variety Pusa Jwala was transplanted under natural conditions without spraying the insecticides in plot size 5 m x 4.2 m with 45 cm row to row and 30 cm plant to plant spacing. The population of sucking pests viz., thrips (*S. dorsalis*), whitefly (*B. tabaci*), jassid (*A. biguttula biguttula*) were recorded at weekly intervals during morning hours between 7.00 am to 9.00 am on five randomly selected and tagged plants in each plot by using sampling techniques [8], population was counted on three leaves and expressed as number per three leaves.

2.1 Statistical Analysis

The data were subjected to statistical analysis and correlation coefficient was worked out. Simple correlation was worked out between the population of insect pests and abiotic factors by the Karl Pearson's coefficient of correlation formula [9].

$$r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{n}\right]}}$$

Where,

r_{xy} = Simple correlation coefficient

X = Variable *i.e.* abiotic component. (Average temperature, relative humidity and total rainfall)

Y = Variable *i.e.* mean number of insect pests per plant

n = Number of observations.

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2} \sim t_{n-2} \text{ d.f.}$$

The correlation coefficient (r) values were subjected to the test of significance using t-test:

The calculated t-value obtained was compared with tabulated t-value at 5% level of significance.

3. Results and Discussion

The mean population of thrips (*S. dorsalis*); whitefly (*B. tabaci*) and jassids (*A. biguttula biguttula*) are presented in Table 1. During the course of investigation, thrips, whitefly, jassids and fruit borer were recorded as major insect pests of chilli.

Table 1: Population dynamics of major sucking insect pests infesting chilli (*C. annum*) during *kharif*, 2014.

SMW No.	Mean Temperature (°C)	Mean Humidity (%)	Rainfall (mm)	Average number of sucking insect pests on 3 leaves		
				Thrips	Whitefly	Jassids
31	27.00	83.60	109.00	0.00	1.20	0.00
32	25.85	81.30	47.20	2.60	1.60	1.20
33	26.55	72.70	0.20	2.80	2.00	1.40
34	28.15	76.35	40.80	1.80	2.80	2.80
35	27.40	77.35	31.60	3.20	3.60	2.40
36	25.95	82.70	165.20	2.60	3.80	3.60
37	25.05	87.65	94.80	7.80	6.80	5.40
38	26.15	68.05	0.00	10.20	6.00	4.80
39	25.60	64.25	0.00	6.80	5.60	2.60
40	26.95	59.55	0.00	5.40	5.20	5.00
41	26.25	56.50	0.00	4.20	5.20	3.20
42	25.05	54.00	0.00	3.80	3.60	3.60
43	24.90	46.00	0.00	1.60	1.20	2.00
44	24.90	51.60	0.00	2.80	2.40	4.00
45	23.50	54.00	0.00	4.00	1.80	2.60
46	22.50	55.60	11.00	3.40	1.60	1.60
47	20.90	51.60	0.00	2.80	1.20	1.00
Coefficient of correlation (r) for population and mean temperature				-0.019	0.337	0.197
Coefficient of correlation (r) for population and mean relative humidity				0.029	0.245	-0.004
Coefficient of correlation (r) for population and rainfall				-0.221	0.061	-0.014

*Significant at 5% level of significance

3.1 Thrips, *Scirtothrips dorsalis* Hood

The incidence of the thrips commenced in the second week of August (32 SMW) with a mean population of 2.60/ 3 leaves. Population of thrips increased with the growth of the crop until it touched its peak of 10.2 thrips/ 3 leaves in the third week of September (38 SMW), when the prevailing mean atmospheric temperature and relative humidity were 26.15 °C and 68.05%, respectively; thereafter the population decreased gradually. Thrips exhibited negative and non-significant correlation with mean temperature (-0.019) and rainfall (-0.221). The correlation between thrips population and mean relative humidity (0.029) was positive and non-significant. The thrips population showed that the negative correlation with rainfall and temperature [10]. Similar results were reported the highest incidence of thrips in the 40th meteorological week and the population was negative correlated with evening humidity and rainfall and positively correlated with bright sunshine [11].

3.2 Whitefly, *Bemisia tabcai* Genn.

The whitefly initiated from last week of July, (31th SMW) with a mean population of 1.20/3 leaves. The maximum population of whitefly (6.8 whiteflies/ 3 leaves) was recorded during 37th SMW (second week of Sept.), when the mean atmospheric temperature, relative humidity and rainfall were 25.05 °C, 87.65% and 94.80 mm, respectively. The correlation between whitefly population and mean temperature (0.337), mean relative humidity (0.245) and rainfall (0.061) was positive and non-significant. The whitefly infestation started on brinjal in mid of May and reached to its peak in July [12]. While, the maximum population of whitefly in the fourth week of October [13]. This might be due to variable climatic conditions of that particular region and time of cultivation that particular crop.

3.3 Jassid, *Amrasca biguttula biguttula* Ishida

The population of jassid appeared 4th week after transplanting *i.e.* second week of August with a mean population of 1.20/ 3 leaves. Peak population (5.4 jassid/ 3 leaves of plant) was observed during 37th SMW, when the mean atmospheric temperature, relative humidity and rainfall were 25.05 °C, 87.65% and 94.80 mm, respectively. The jassid population had positive and non-significant correlation (0.197) with mean temperature and negative and non-significant

correlation with mean relative humidity (-0.004) and total rainfall (-0.014), respectively. The peak activity of jassid in brinjal in fourth week of July [14]. They also reported that atmospheric temperature and sunshine had a significantly positive correlation with jassid, whereas, the relative humidity and total rainfall had a negative correlation with jassid population. While, the incidence of jassid in brinjal from third week of August to last week of December [15].

4. Conclusion

The present study revealed that whitefly was commenced in last week of July, while the incidence of thrips and jassids commenced in second week of August. Thrips touched the peak during the third week of September (10.2/ 3 leaves). While, whitefly and jassid touched peak in second week of September (6.8 whiteflies and 5.4 jassids/ 3 leaves, respectively). This will help us in scheduling sucking pests management strategies in chilli crop.

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