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Seasonal incidence of sucking pests of chilli (*Capsicum annum* L.) and their natural enemies

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Abstract

The investigation was carried out at Dharwad during *kharif* 2017. The population of thrips, mites and aphids were recorded during study. Thrips activity commenced in fourth week of July, aphids activity started in second week of August, while, mites incidence commenced during first week of August. The peak activity of thrips was registered during last week of August (4.20/leaf) whereas, mites was reached peak during September third week (3.72/leaf). Further, aphids reached peak (2.48/leaf) during October last week. Thrips shown significant positive correlation with maximum temperature and non-significant negative correlation with rainfall, minimum temperature, maximum relative humidity and minimum relative humidity. Mites exhibited negative correlation with maximum temperature while, the correlation was positive with minimum temperature, rainfall, minimum relative humidity and positively significant with maximum relative humidity. Whereas, none of the weather parameters showed significant impact on aphid population.

Keywords: Thrips, mites, aphids, correlation

1. Introduction

Chilli (*Capsicum annum* L.) is most widely used and universal spice of India belongs to family Solanaceae. Chilli is renowned for its immense nutritive and medicinal properties. The main purposeful properties of chilli are pungency, antioxidant activity, vitamin C and natural pigments^[10]. India's total production of dry chilli was 2096 million tonnes from an area of 0.84 million ha with a productivity of 2495 kg per ha and in Karnataka it is grown over an area of 1.02 lakh ha and production of 1032 lakh tonnes and productivity of 1011 kg per ha^[11].

Even though chilli has superior export potentialities apart from huge domestic requirement, a number of limiting factors has been ascribed for its low productivity. Among them, the insect and non-insect pests that attack chilli at different crop growth stages are important. Thrips (*Scirtothrips dorsalis* Hood), whiteflies (*Bemesia tabaci* Genn.), aphids (*Aphis gossypii* Glover, *Myzus persicae* Sulzer), and mites (*Polyphagotarsonemus latus* Banks) and fruit borers viz., *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius) are accountable for substantial yield loss^[4].

The study on the influence of various factors responsible for population fluctuation on a particular crop might help in the prediction of its incidence in the particular area and further, it will be helpful for successful pest management^[16].

Due to variation in the agro-climatic conditions of different regions, insect show varying trends in their incidence and extent of damage to the crop. The studies on seasonal incidence of chilli insect pests were lacking under the Dharwad conditions of Karnataka. Hence, an attempt was made regarding seasonal incidence of sucking pests of chilli.

2. Material and methods

The experiment was carried out at the Main Agricultural Research Station (MARS), University of Agricultural Sciences (UAS), Dharwad. In order to study the seasonal incidence of insect pests of chilli, the variety Byadagi Dabbi was used. Thirty days old seedlings were transplanted in the main field with a spacing of 60 cm × 60 cm in six *gunta* area replicated into four quadrates of 1.5 *guntas* each.

The crop was raised as per the recommended package of practices of UAS, Dharwad except for plant protection measures. The whole experimental plot was divided into four equal quadrates and from each quadrate 10 plants was selected randomly and tagged. Further, detailed observations were made at standard weekly interval on the incidence of major insect pests and occurrence of natural enemies at different crop growth stages.

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The population of thrips, mites and aphids were recorded by using 10X magnifying hand lens from three leaves per plant one each from the upper, middle, and lower position on 10 selected plants from each quadrat. Thus, the data obtained was expressed as per leaf. Natural enemies viz., coccinellids and spiders were also counted on the whole plant basis when encountered during data recording for the insect pests of chilli.

2.1 Correlation studies

To determine the effect of various weather parameters on fluctuation of insect pests of chilli, the weekly meteorological data was collected from Department of Agricultural Meteorology, College of Agriculture, Dharwad. The data were subjected to statistical analysis and correlation coefficient was worked out by using SPSS software.

3. Results

3.1 Thrips, *Scirtothrips dorsalis* Hood

Thrips appeared in a week after transplanting of the chilli crop and the population varied from 1.43 to 4.20 per leaf. The peak activity (4.20/leaf) was noticed during 35th standard meteorological week (SMW) (August last week) while the lowest (1.43/leaf) during first week of August (31st SMW)

(Table 1). The peak incidence of thrips was observed from August to September which might be due to prolonged dry period and deficit of rainfall in July and August months which favoured the buildup of thrips population.

The correlation between the thrips population and weather parameters showed that highly significant positive association with maximum temperature ($r = 0.55^*$) and non-significant negative correlation with minimum temperature ($r = -0.40$), rainfall ($r = -0.34$), maximum relative humidity (-0.43) and minimum relative humidity ($r = -0.04$) (Table 2).

3.2 Mites, *Polyphagotarsonemus latus* Banks

The seasonal mite population ranged from 0.37 to 3.72 per leaf. The maximum population (3.72/leaf) was recorded during third week of September (38th SMW) and least population was noticed (0.37/leaf) during first week of August (32nd SMW) (Table 1).

The mite population had negative correlation with maximum temperature

($r = -0.11$) whereas, the correlation was positive with minimum temperature ($r = 0.25$), rainfall ($r = 0.42$), maximum relative humidity (0.51^*) and minimum relative humidity ($r = 0.40$) (Table 2).

Table 1: Seasonal incidence of sucking pests of chilli during *kharif* 2017

Standard meteorological week (SMW)	Date and month	Thrips/leaf	Mites/leaf	Aphids/leaf	Coccinellids/ Plant	Spiders/ plant
30	23 - 29 Jul	0	0	0	0	0
31	30 Jul - 5 Aug	1.43	0	0	0.12	0.15
32	6 - 12 Aug	1.81	0.37	0	0.15	0.22
33	13 - 19 Aug	2.66	0.43	0.29	0.30	0.12
34	20 - 26 Aug	3.98	1.31	0.34	0.37	0.27
35	27 Aug - 2 Sep	4.20	2.07	0.38	0.75	0.45
36	3 - 9 Sep	2.57	2.18	0.61	0.60	0.60
37	10 - 16 Sep	1.75	2.32	0.71	0.72	0.85
38	17 - 23 Sep	1.71	3.72	0.91	0.87	1.12
39	24 - 30 Sep	1.08	3.64	0.96	1.25	1.25
40	1 - 7 Oct	1.55	3.06	1.11	1.42	1.37
41	8 - 14 Oct	1.68	3.17	1.32	1.62	1.42
42	15 - 21 Oct	1.61	3.15	1.38	1.80	1.35
43	22 - 28 Oct	2.60	2.48	2.17	2.02	1.22
44	29 Oct - 4 Nov	2.91	2.67	2.48	1.67	1.35
45	5 - 11 Nov	2.74	2.41	1.98	1.52	1.17
46	12 - 18 Nov	2.72	2.27	1.59	1.10	1.02
47	19 - 25 Nov	1.79	1.92	1.21	0.85	0.92
48	26 Nov - 2 Dec	2.04	1.87	1.12	0.72	0.55

3.3 Aphids, *Myzus persicae* Sulzer

The population of aphids initiated in second week August (33rd SMW) and its density ranged from 0.29 to 2.48 per leaf. The maximum population occurred in fourth week of October (44th SMW) while lowest being recorded in second week of August (33rd SMW) (Table 1).

The aphids showed positive correlation with maximum temperature ($r = 0.15$) while negatively correlated with minimum temperature ($r = -0.28$), rainfall ($r = -0.08$), maximum relative humidity ($r = -0.09$) and minimum relative humidity ($r = 0.05$) (Table 2).

Table 2: Correlation between key abiotic factors and insect and mite pests population on chilli

Sucking pests	Maximum temperature	Minimum temperature	Rainfall	Maximum relative humidity	Minimum relative humidity
Thrips	0.55*	-0.40	-0.34	-0.43	-0.04
Mites	-0.11	0.25	0.42	0.51*	0.40
Aphids	0.15	-0.28	-0.08	-0.09	-0.05

*Correlation is significant at the 0.05 level

3.4 Natural enemies

The coccinellids were present throughout the season with varying intensity from 0.12 to 2.02 per plant. The population reached its peak during fourth week of October (2.02/plant) and found minimum in last week of July (31st SMW). The spider density ranged between 0.12 and 1.42 per plant. The highest population of spiders was recorded in second week of October (41st SMW) and lowest population being noticed at August second week (33rd SMW) (Table 1).

4. Discussion

4.1 Thrips, *S. dorsalis*

The present findings are supported by Hosamani (2007) [7] who recorded the peak activity of thrips (2.95/leaf) during 35th SMW (August last week) in Raichur. However, Rajput *et al.* (2017) [12] noticed the peak population of thrips during the third week of September (9.50 thrips/3 leaves). The variation in the peak activity registered might be due to change in climatic condition and change in the sowing dates.

The correlation studies are in line with Vanisree *et al.* (2011) [18] who reported that, thrips shown significant positive correlation with maximum temperature while, negatively correlated with rainfall and evening relative humidity. Similarly, Asma and Hanumantharaya (2015) [2] and Barot *et al.* (2012) [3] revealed that, thrips had significant positive correlation with maximum temperature. Further, Meena *et al.* (2013) [9] and Pathipati *et al.* (2014) [11] also reported that, the thrips population had positive correlation with maximum temperature and negative correlation with minimum temperature, morning and evening relative humidity and rainfall.

4.2 Mites, *P. latus*

The peak population of mites recorded during September which might be due to congenial climatic conditions (maximum relative humidity) prevailed during this period. The present findings are in conformity with Rajput *et al.* (2017) [12] who observed the peak population of mites during the third week of September (6.54 mite/3 leaves). Further, Meena *et al.* (2013) [9] recorded the highest mite population during second week of September (9.2 mites/3 leaves/plant). Similar studies on correlation by Meena *et al.* (2013) [9] indicated that, the mite population exhibited a negative correlation with maximum temperature while, the correlation was positive with minimum temperature, maximum and minimum relative humidity and average rainfall. Similarly, Roopa and Ashok Kumar (2014) [13] observed a negative relationship of mites with maximum temperature ($r = -0.48$) and positive correlation with relative humidity ($r = 0.23$) and rainfall ($r = 0.13$). Kaur (2014) [8] opined that, mites exhibited significant positive correlation with minimum temperature and rainfall while a significant negative correlation is found with maximum temperature, RH and sunshine hours.

4.3 Aphids, *M. persicae*

The present findings are supported by Roopa and Ashok Kumar (2014) [13] who observed the peak population of aphids during fourth week of October (2.21 aphids/3 leaves/plant). The correlation studies by Meena *et al.* (2013) and Rajput *et al.* (2017) [9, 12] also reported non-significant correlation between aphids and all the weather parameters. The variation in response of aphids to various abiotic factors might be due to the meager population encountered during the studies.

4.4 Natural enemies

Sajjan (2014) [15] recorded the peak population of coccinellids during first week of November and spider population during last week of October at Dharwad on brinjal. However, on chilli Dhulabhai (2015) [6] recorded the highest population of coccinellids (0.99/plant) during fourth week of December while, the maximum spider population (4.11/plant) during third week of December. The variation in the incidence of peak activity might be due to the availability of prey or their abundance.

5. Conclusions

The activity of thrips was highest during August last week (35th SMW) with 4.20 per leaf, the occurrence of mites was maximum at third week of September (39th SMW) with 3.72 per leaf. The highest population of aphids was recorded during last week of October (43rd SMW) with 2.48 per leaf.

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