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Influence of weather parameters on the seasonal incidence of chilli thrips, *Scirtothrips dorsalis* Hood

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Abstract

The field experiment was conducted during *Kharif* 2014 on seasonal incidence of chilli thrips (*Scirtothrips dorsalis* Hood) and its natural enemies. The results revealed that the higher population of thrips and coccinillids was recorded in the range of 11.27 to 14.93 thrips per 6 leaves per plant and 0.40 to 0.53 coccinillids per plant, respectively during 2nd week of October to 1st week of November. However, peak activity of thrips (14.93 per 6 leaves per plant) and cocinillids (0.53 per plant) was observed during the 4th week of October (44th MW) and 1st week of November (45th MW). Then gradually declined in population up to last week of December (52nd MW). All the weather parameters i.e. temperatures (maximum and minimum), relative humidity (morning and evening) and rainfall were correlated negatively with the incidence of thrips population and abundance of coccinellids except maximum temperature showed positive correlation with coccinellids.

Keywords: *Chilli, Scirtothrips dorsalis, seasonal incidence, weather parameters.*

Introduction

Chilli (*Capsicum annuum* L.) is an important crop not only because of its economic importance, but also due to nutritional and medicinal value of its fruits. Chilli is the excellent source of colours and antioxidants compounds, a wide spectrum of antioxidant and capsaicinods are present in chilli fruits. It is used as vegetables, spices, condiments, sauce, pickles and medicines. Among the various factors responsible for low yield of chilli, the insect pests are of prime importance. As many as, 55 insect and non-insect pests have been recorded to infest this crop. Of these, thrips (*Scirtothrips dorsalis* Hood) is considered the most destructive pest in Maharashtra (Day *et al.*, 2001). Both nymph and adult of thrips
rasp on terminal auxiliary tender shoots and suck the oozing cell sap from tender leaves, growing shoots, flowers and fruits. Attacked leaves curl upward and exhibit the characteristics of leaf curl symptoms. The economic yield loss was noticed to the extent of 11 to 32 per cent (quantitative) and 88 per cent (qualitative) in chilli. The crop loss caused by thrips (*S. dorsalis*) reported to range from 30 to 50 per cent (Kandyaswamy *et al.*, 1990 and Ahmed *et al.*, 1987). The prevalence and build up of this pest is mostly governed by weather parameters like temperature, relative humidity, rainfall and sunshine hours For effective pest management of thrips, study on the influence of the various factors responsible for population fluctuation on a particular crop might assist in prediction of its occurrence in a given area. Thus, the knowledge of the influence of weather parameters on chilli will help to develop a forecasting system and to implement timely plant protection measures. Therefore, the present investigation was undertaken on incidence of thrips on chilli.

Materials and Methods

Field experiment was conducted on incidence of chilli thrips and occurrence of its natural enemies during *Kharif* of 2014 at the Research Farm of Department of Agricultural Entomology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri-413 722 (Maharashtra state). The seedling of chilli variety "Phule Jyoti" was transplanted after two months in the experimental non-replicated three plots having a size 4.20 m X 3.60 m of each plot with 45 X 60 cm spacing. The crop was raised under normal recommended of practices and left for natural infestation of desired pest. No plant protection measures were taken throughout the crop season. Observations on population of thrips and coccinellids were recorded at weekly interval in the morning hours starting from transplanting on 5 randomly selected plants from each plot. The population of thrips was counted on number of nymphs and adults per 6 leaves per plant (2 leaves from each top, middle and bottom part) and coccinellids was recorded on per plant from each plot. The weather parameters *viz.*, temperature (^{0}C), relative humidity (%) and rainfall (mm) in different standard weeks during the crop season were recorded at meteorological centre, MPKV, Rahuri. The relationship between the thrips and coccinellids with weather parameters was worked out.

Results and Discussion

The data presented in Table 1 and predicted in Fig.1, revealed that the pest population increased gradually after transplanting of chilli seedling at vegetative and flowering stage of the crop. The average number of thrips population ranged from 0.0 to 14.93 thrips/6 leaves/plant during the period from 32nd to 52nd MW. The minimum number of thrips was recorded in the month of August which may be due to high rainfall. Then the population gradually increased up to the 4th week of October (44th MW) and reached its peak (14.93 thrips/6 leaves/plant). At the time of peak level of infestation of thrips, the maximum and minimum temperature, morning and evening relative humidity and rainfall were recorded 32.0 and 14.0°C, 55.7 and 36.1% and 0.00 mm, respectively. Thereafter the infestation of thrips gradually decreased in 3rd week of November (47th MW) and again increased in the 4th week of November i.e. 48th MW and reached to 12.60 thrips. Then the population declined gradually and remained up to 4.93 thrips in last week of December (52nd MW). These present findings on incidence of thrips, *S. dorsalis* are in close agreement with the results of Raizada (1965) who reported the abundance of *S. dorsalis* on chilli during July to September was low, but the severe incidence of *S. dorsalis* was observed during October. Similarly, Ningappa (1972) recorded the population of chilli thrips, at its peak during October, and thereafter gradually declined from November onwards reaching the lowest level in May. The infestation of thrips started from 1st week after transplanting i.e. last week of August and remained in field till to the crop maturity (3rd week of February) in the range of 0.50 to 10.54 with an average of 4.37 thrips/twig (Barot *et al.*, 2012). Meena *et al.* (2013) reported infestation of *S. dorsalis* was initiated in the 4th week of July (30th MW) and remained up to 4th week of November (48th MW). The thrips population increased gradually and touched its peak with a mean of 14.5 and 14.7 thrips/3 leaves/plant during 2006-07 and 2007-08 respectively, in the 1st week of October. Thereafter, the population declined gradually and reached up to 7.5 and 7.0 thrips in last week of November (48th MW).

In case of *natural enemies i.e.* coccinellids, the *abundance* of coccinellid was observed with infestation of thrips after transplanting of the chilli crop in 2nd week of August (33rd MW). Coccinellid population was ranged from 0.0 to 0.53 coccinellid/plant during 32nd to 52nd MW. There was

Table 1. Seasonal incidence of thrips and coccinellids on chilli in relation to weather parameters

Met. Week	Date of observation	No. of thirps per 6 leaves per plant	No. of Coccinellids per plant	Weather parameters				
				Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
				Maximum	Minimum	Morning	Evening	
32	02/08/2014	0.00	0.00	30.5	21.9	72.4	57.0	1.6
33	9/08/2014	1.21	0.07	31.8	21.9	70.6	50.6	34.0
34	16/08/2014	2.46	0.20	32.7	22.6	78.9	51.3	44.4
35	23/08/2014	0.68	0.00	28.6	21.8	81.6	72.4	129.9
36	01/09/2014	1.02	0.13	29.2	22.2	75.0	66.3	15.8
37	08/09/2014	1.40	0.07	30.7	21.0	70.9	56.9	0.0
38	15/09/2014	1.40	0.07	31.9	21.0	71.4	51.6	4.0
39	22/09/2014	3.80	0.27	33.6	20.3	70.4	40.7	0.0
40	29/09/2014	4.14	0.27	34.1	22.2	70.1	40.1	0.0
41	06/10/2014	5.80	0.27	30.0	19.6	64.0	33.0	7.4
42	13/10/2014	12.47	0.46	33.7	21.0	72.1	43.6	13.4
43	20/10/2014	12.27	0.40	29.4	16.1	72.6	57.0	1.0
44	27/10/2014	14.93	0.40	32.0	14.0	55.7	36.1	0.0
45	03/11/2014	11.67	0.53	31.8	15.9	57.6	37.4	0.0
46	10/11/2014	9.06	0.27	29.7	20.1	80.7	63.1	96.2
47	17/11/2014	8.80	0.20	20.1	15.3	69.4	41.0	0.0
48	24/11/2014	12.60	0.20	29.6	12.1	56.9	29.6	0.0
49	01/12/2014	11.20	0.27	29.1	10.9	55.0	32.0	0.0
50	08/12/2014	9.67	0.27	29.2	14.6	67.0	47.0	0.0
51	15/12/2014	7.46	0.13	25.7	17.5	52.0	34.0	0.00
52	22/12/2014	4.93	0.00	27.2	18.2	56.0	37.0	0.00

Table 2. Correlation coefficient (r) of chilli thrips and coccinellids with weather parameters

Weather parameters	Thrips	Coccinellids
Maximum temperature	-0.104	0.29
Minimum temperature	-0.79**	-0.40*
Morning relative humidity	-0.52**	-0.21
Evening relative humidity	-0.54**	-0.37*
Rainfall	-0.27	-0.25

Significant at 5 % level = 0.36* Significant at 1% level = 0.42**

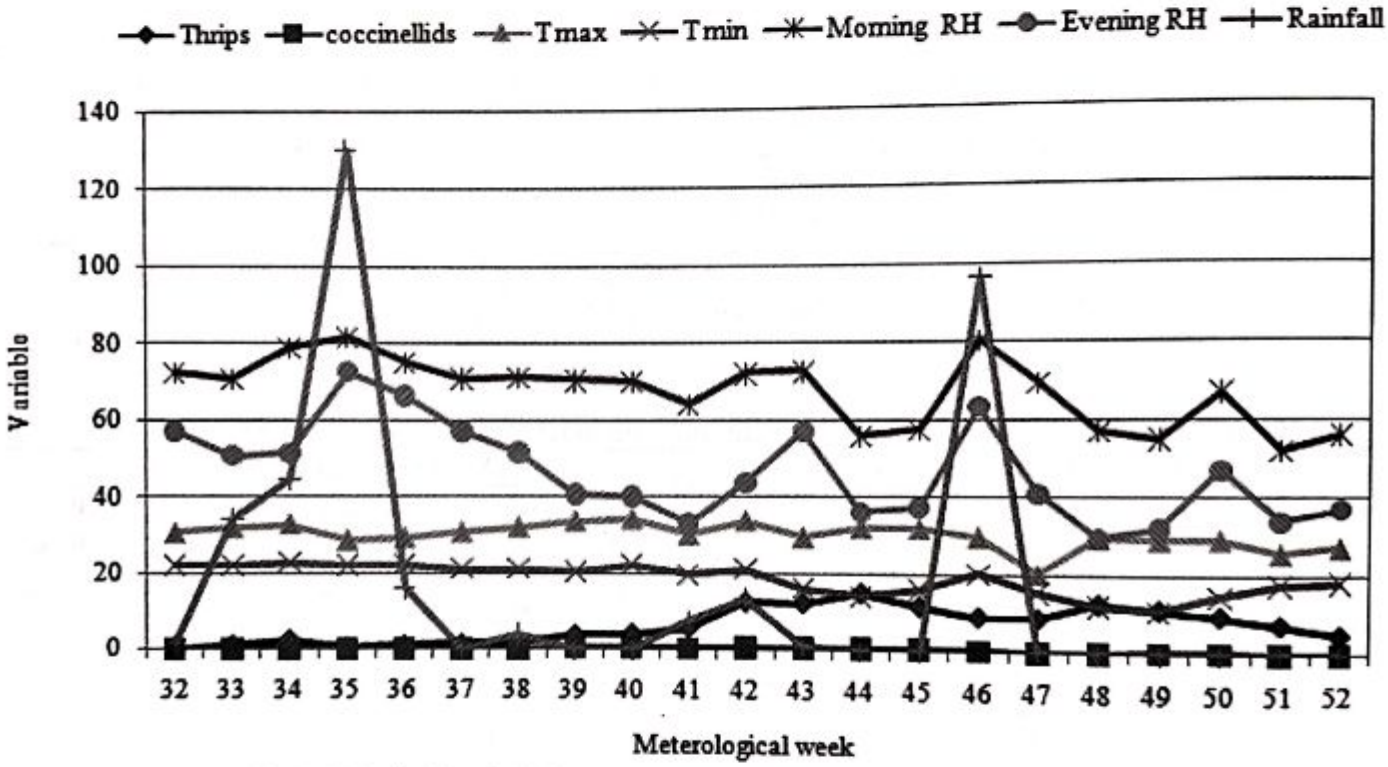

Fig. 1 : Distribution of Thrips and Meteorological data during different weeks

increase in the coccinellid population in 2nd fortnight of September upto 1st week of November. Thereafter, the population gradually declined in till last week of December. The maximum number of coccinellid population (0.53) was recorded in 45th MW i.e. 1st week of November when maximum and minimum temperatures were 31.8 and 15.9°C, relative humidity at morning and evening time were 57.6 and 37.4%, respectively and rainfall recorded 0.0 mm. These present findings are in agreement with the results of Meena and Kanwat (2010) who reported the appearance of coccinellids started from first week of August (1.8 and 1.7 beetles/plant) and reach at maximum in first week of October (6.2 and 6.4 beetles/plant) on okra during *Kharif* 2002 and 2003, respectively.

Correlation of weather parameters with chilli thrips and coccinillids

It is evident from Table 2, that there was negative correlation between infestation of thrips and all the weather parameters (temperature, relative humidity and rainfall). However, the significant negative correlation was observed with thrips incidence and minimum temperature (r = - 0.79), morning (r = -0.51) and evening relative humidity (r = -0.54). Whereas, other parameters *viz.*, maximum temperature (r = - 0.104) and rainfall (-0.24) were non-significant and negatively correlated with thrips population. The results are in agreement with the findings of Hosamani (2006) who reported minimum temperature, evening RH and rainfall were significantly but negatively correlated with thrips population. Similarly, Barot *et al. (2012)* reported the significant negative correlation with minimum temperature, relative humidity (morning, afternoon and mean) and rainfall. Meena *et al.* (2013) exhibited negative correlation with minimum temperature, morning and evening relative humidity and average rainfall. Thrips population had negative correlation with minimum temperature, morning and evening relative humidity and rainfall (Pathipati *et al.*, 2014).

The current observations in respect of maximum temperature are in contrasts with the findings reported by Bhede *et al.* (2008), Patel *et al. (2009) and* Pathipati *et al.* (2014) who reported the significantly positive relationship between maximum temperature and thrips incidence.

As regards the natural enemies, the activity of coccinellids was recorded during the infestation of thrips on chilli crop. The coccinellids population showed positive correlation with maximum temperature (r =0.29). Whereas, coccinellids showed significant negative correlation with minimum temperature (r = -0.40) and evening relative humidity (r = -0.37) and non-significantly negative correlation with morning relative humidity and rainfall. *The present findings are in agreement with the reports* of Meena and Kanwat (2010) who found that the minimum temperature and relative humidity showed significant negative correlation with coccinellids population, whereas maximum temperature had non-significant positive correlation and rainfall had non-significant negative correlation with coccinellids population.

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