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Effect of Abiotic factors on the Population of Thrips (*Scirtothrips dorsalis*) in Chilli Crop

Anil Nautiyal[1], R.S. Meena[2*], Rahul Saini[3] and Ananya Nautiyal[4]

[1]Research Scholar, Banaras Hindu University, Varansi, (Uttar Pradesh), India.
[2]Assistant Professor, Banaras Hindu University, Varansi, (Uttar Pradesh), India.
[3]Research Scholar, CCS Haryana Agricultural University, Hisar, (Haryana), India.
[4]Research Scholar, G.B. Pant University of Agriculture and Technology, Pantnagar, (Uttarakhand), India.

(Corresponding author: R.S. Meena)*
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ABSTRACT: Chilli is one of the most important vegetable crop that belongs to the Solanaceae family. It is one of the major crop that has suffered a lot due to insect and pest incidence. Chilli thrips are the exotic invasive pests of utmost importance. This pest damages all plant parts, feeds on young leaves, buds and fruits, destroying it physically and acts as a vector for viral diseases. The present study was conducted to check the pattern of various weather parameters during the crop growing season and its influence on the incidence of thrips population on the crop. It was recorded that the population of thrips started rising from 35th SMW and reached to a maximum at 45th SMW then started declining. It was also recorded that the thrips population was non-significant and positively correlated with maximum and minimum temperature, and the value recorded was 0.11 and 0.211, respectively. However, for weather parameters like rainfall relative humidity at morning time, negative and non-significant correlation was observed i.e., -0.165 and -0.398 respectively. The only negative and significant correlation was observed for relative humidity in the evening, i.e. -0.587. The present study evaluated the pattern of thrips growth and development with various weather parameters. The study will help in devising the pest management strategies to reduce the infestation of this pest in the crop.

Keywords: *Scirtothrips dorsalis*, Thrips, Weather, Parameters, Chilli Pest.

INTRODUCTION

Chilli (*Capsicum annum*) is a widely cultivated vegetable crop among the solanaceous group of crops and ranks as the third most important crop followed by potato and tomato. Its centre of origin is believed to be Tropical America. Capsicum is derived from the Greek word "*Kapsimo*", which means "bite". Christopher Columbus from Europe called them "peppers" as it resembled white and black peppers of genus *Piper*. In the genus Capsicum, approximately 31 species were there, but only five species are in domestic use, the rest are wild, and the domestic one is *C. annum C. baccatum, C. chinensis, C. fruitescens and C. pubescens* (Moscone, 2007). In chilli, huge losses have been reported during different growth periods by pests and diseases. Likewise, other economic and commercial crop, chilli also suffered damages at various stage of crop growth, due to occurrence of many disease and pest infestation. Likewise, other economic and commercial crop, chilli also suffered damages at various stage of crop growth, due to occurrence of many disease and pest infestation. It was reported that in India, around 39 genera belonging to 51 species of insect-pests to are associated with this crop and causes severe damage to the crop. Of all the pests, thrips (*Scirtothrips dorsalis* Hood), aphids (*Aphis gossypii* Glover), jassids (*Amarasca bigutulla bigutulla* Ishida) and fruit borers (*Helicoverpa armigera* Heliar, *Spodoptera litura* Fabricius) are of immense importance in terms of economic damages to the crop (Jadhav, 2004). Out of these pests, thrips cause considerable losses to the crop by physically damaging the plant and transmitting the viral disease to the crop. Adults are pale yellow in color and size is less than 1.5mm, has head is wider than thorax and have dark spot on dorsal side of abdomen (Vierbergen, 2010). The activity of *S. dorsalis* begins from onset of month of September and remains persisted in with the crop up to second week of January (Panickar, 2000). Both nymph and adult causes damage to the crop by scrapping of leaf epidermal Layer and sucking the sap, which leads to the stunting of crop, buds and flower and Curling of leaves occurs at high incidence (Sanap, 1987).

MATERIAL AND METHOD

A. Experimental site

The experiment was conducted at Vegetable Research Farm of Institute of Agriculture Science in Banaras Hindu University, Varanasi during 2020-2021. The research area is located at a longitude of 82.98°E and a latitude of 25°N. The climate in this region is

subtropical, with temperature extremes throughout the year. The average annual rainfall is around 1130 mm of which more than eighty percent received during monsoon period (June-September). The soil of the research farm was sandy loam to clay, with a nitrogen deficiency and moderate phosphorus and potassium levels.

B. Experimental setup and Field Preparation

Experiment was conducted on a plot of 100 square meter to assess the seasonal abundance of major insect pests of chilli. No insecticide was spray on this plot to create unprotected condition. The field was well prepared before sowing. It was ploughed twice with disc harrow followed by levelling with planker. Well rotten FYM @ 300 quintal/hectare was incorporated in soil after second ploughing to maintain availability of micro nutrients.

C. Transplanting

Nursery of chilli variety Arka Kanchan was established at IAS BHU Varanasi's vegetable research farm. On 5 September, 30 days after planting, the seedling was transplanted to the main field at a spacing of 60 × 45cm. To protect the crop from soil-borne diseases, the seedlings were treated with carbendazim @ 0.1 percent solution. After transplanting, a light irrigation was applied.

D. Intercultural Operations

At the time of transplanting, half dose of N, *i.e.* 55kg, along with 75kg P, 60 kg K was applied as basal dose. At 55 days following transplanting, the remaining half dosage of nitrogen, *i.e.* 55kg, was given. Weeding was done twice on 25th and 50th days after translplanting. Earthing up was also done to provide support to the plants. First irrigation was given after transplanting and after that at an interval of 15 days on the basis of moisture availability.

E. Sampling and data analysis

Weekly observation of insect pests of chilli was taken from the first appearance till the maturity of crop. Nymph and adults of pest like thrips was critically examined on the flower, pod and leaves using a 10X magnifying glass. The population of observed insects was noted. Weekly observation of different weather parameters, such as rainfall (mm), maximum temperature (°C), minimum temperature (°C), morning relative humidity (%), and evening relative humidity (%), were obtained from the meteorological unit, located at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi and are shown in Table 1 (Fig. 1). The correlation between insect population and weather parameters was obtained using SPSS software.

Table 1: Weekly meterological observation during experimental period from September (2020) to January (2021).

Months Date	Week	Rainfall (mm)	Temperature (C°)		Relative humidity (%)	
			Maximum	Minimum	Morning	Evening
September	Second	6	31.7	23.5	90	73
	Third	30.5	31.9	22	92	86
	Fourth	55	33.3	24.3	87	74
October	First	26	32.2	23.7	91	73
	Second	0	33.6	24.5	88	65
	Third	32.4	34.1	24.4	90	59
November	First	0	29.6	13.9	90	48
	Second	0	25	18.1	89	54
	Third	13.2	26.3	12.5	91	48
	Fourth	0	26.3	11.1	92	43
December	First	0	27.7	12	93	53
	Second	3.6	23.9	14.8	93	64
	Third	0	20.8	7.5	91	59
January	First	0	25.4	12.3	90	54
	Second	0	21.7	13	92	59
	Third	0	19.4	8.1	95	65
	Fourth	0	17.5	9.2	95	71

Fig. 2. Initial Leaf curling in chilli.

RESULTS AND DISCUSSION

A field experiment was conducted at Vegetable Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, to study the seasonal incidence of major insect pest in chilli. This has been estimated by finding the affinity between the pest incidence and different weather parameters by using correlation coefficient.

Infestation of chilli crop by the thrips were observed from time of transplanting till the crop attained maturity and was correlated with the different weather parameters like temperature, relative humidity and

rainfall (Fig. 2). From the collected data it was evident that the incidence of thrips in the crop started 15 days after transplanting i.e. 38th SMW and during this stage, the average mean population per leaf was 0.25. The corresponding average rainfall, maximum and minimum temperature, relative humidity at morning and evening were 55 mm, 33.3 and 24.3°C and 87 and 74 percent, respectively. The population of thrips reached its peak *i.e.* 4.84 thrips per leaf were observed at 45th standard week and the corresponding average of highest and lowest in temperature and relative humidity at morning and evening hours were 25 and 18.1°C, 89 and 54 %, respectively.

Table 2: Population Dynamics of major insect pest of chilli in relations to different weathers parameters during 2020-2021.

Months date	Week	Rainfall (mm)	Temp (°C)		Relative humidity (%)		Mean no. of thrips/ three leaves
			Max.	Min.	Morning	Evening	
September	second	6	31.7	23.5	90	73	0
	third	30.5	31.9	22	92	86	0
	fourth	55	33.3	24.3	87	74	0.75
October	first	26	32.2	23.7	91	73	3.36
	second	0	33.6	24.5	88	65	7.2
	third	32.4	34.1	24.4	90	59	6.03
	fourth	0	30.3	16.6	78	40	8.02
November	first	0	29.6	13.9	90	48	11.76
	second	0	25	18.1	89	54	14.52
	third	13.2	26.3	12.5	91	48	8.94
	fourth	0	26.3	11.1	92	43	6.06
December	first	0	27.7	12	93	53	3.06
	second	3.6	23.9	14.8	93	64	1.92
	third	0	20.5	7.5	91	59	0.96
	fourth	0	20.8	7.8	94	49	0.87
January	first	0	25.4	12.3	90	54	0.72
	second	0	21.7	13	92	59	0.3
	Third	0	19.4	8.1	95	65	0.24
	fourth	0	17.5	9.2	95	71	0

Table 3: Correlation coefficient of insect pest population on chilli with prevailing weather parameters during 2020-21.

Sr.No.	Weather Parameters	*Scirtothrips dorsalis*
1.	Rainfall(mm)	-0.165
2.	Maximum temperature (°C)	0.221
3.	Minimum temperature (°C)	0.11
4.	Morning relative humidity (°C)	-0.398
5.	Evening relative humidity (°C)	-0.587*

*Correlation is significant at P≤0.05

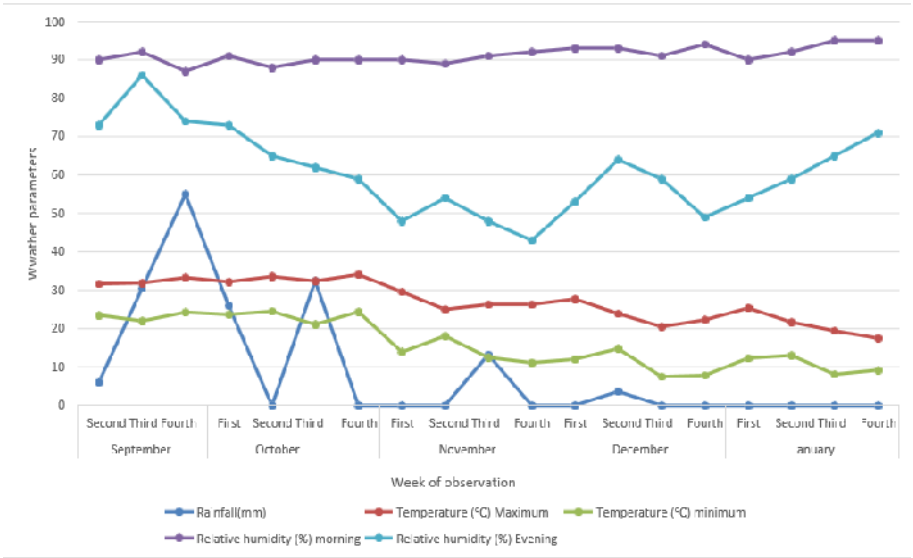

Fig. 1. Different Weather Parameters during crop growing period 2020-21.

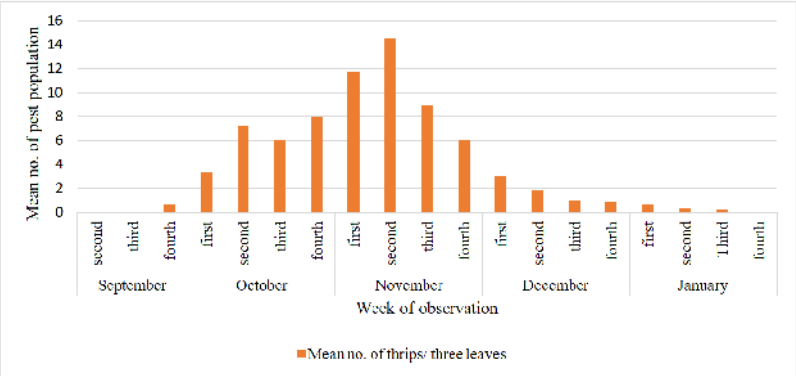

Fig. 3. Seasonal abundance of chilli pest during crop growing period 2020-21.

The pest incidence started declining after the 45th standard week and reached minimum *i.e.* 0.08 mean population per leaf in the 3rd week of January when the highest and lowest temperature was 19.4 and 8.1°C and relative humidity at morning and evening hours were 95 and 65 % receptively (Fig. 3). Saini *et al.* (2017) in their study reported that there was commencement of thrips population after first week of august and it reached its peak at second week of September *viz*. 10.2 insects per 3 leaves. The present studies have shown that, positive and non-significant correlation between thrips population and maximum and minimum temperature whereas negative correlation was observed. In case of other factors like rainfall, morning and evening humidity the correlation was found significant only with evening relative humidity. The results obtained in the present study are enclosed in accordance with Zainab *et al.* (2016), they reported that positive and significant correlation was observed between thrips population and maximum temperature whereas negative correlation was observed with relative humidity and rainfall. Further, Saini *et al.* (2017) reported that there was negative correlation was found with rainfall and temperature and positive for relative humidity.

CONCLUSION

It was observed that the peak population of thrips was recorded at 45th SMW. The population of *S. Dorsalis* were negatively and non-significantly correlated with precipitation and relative humidity at morning hours. But there population were positively and non-significantly correlated with maximum and minimum temperature. However thrips population shows negative and significant correlation with evening relative humidity. Further studies required to develop a model of abiotic factors and thrips population.

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Conflict of Interest. None.

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