

# SEASONAL ABUNDANCE AND POPULATION DYNAMICS OF THE *SCIRTOTHRIPS DORSALIS* AND *APHIS GOSSYPHII* ON CHILLI

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**Abstract:** The experiment was conducted during *rabi-summer* season 2010-11 at Mango orchard, Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G). The thrips, *Scirtothrips dorsalis* and aphid, *Aphis gossypii* were recorded as major insect pests in chilli crop. The infestation of thrips began in the first week of February (5<sup>th</sup> Standard Meteorological Week) and reached to its peak in 3<sup>rd</sup> week of March. (12<sup>th</sup> SMW), that of aphid began in the first week of February (5<sup>th</sup> SMW) and reached its peak in the 2<sup>nd</sup> week of February (6<sup>th</sup> SMW). The abiotic factors of the environment i.e. evening relative humidity had significant negative correlation with the population of thrips. The aphid population was negatively correlated to minimum temperature and positively influenced by morning relative humidity.

**Keyword:** Population dynamics, Chilli thrips, Aphid

## INTRODUCTION

Chilli is one of the important cash crops grown in almost all parts of the country. It is widely grown in the tropics and subtropics and also under glass houses in temperate regions. The plants are very sensitive to excessive rainfall, water lodging and frost. The ideal condition of its cultivation is well drained loamy soil rich in organic matter but can also be grown in much type of soils. It is commonly used as condiments, the pungency in chilli is due to a substance “Capsaicin”. It contains high amount of vitamin A, C, E, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> and Oleoresin. Oleoresin is used in pain balm, vapours etc. (Kumar *et al.*, 2005).

India is the largest producer of chilli. Chilli production level is however around 1.1 million tonnes annually. It is cultivated in all states and union territories of the country. The productivity is higher in the states of Andhra Pradesh and Tamil Nadu where chilli is grown under irrigated conditions than in Maharashtra and Karnataka, where the crop is raised mainly under rain fed situations.

Chilli is grown in all part of Chhattisgarh during rainy, spring and summer season. In this state the chilli production was 109908 metric tonnes from an area of 9187.25 hectares with average productivity of 11.97 metric tonnes per hectare in the year 2008-09 (Anonymous, 2010).

It is most imperative to know the current insect pest scenario of chilli crop. Seasonal abundance study on the prevalent and new emergent insect pests, in relation to change in abiotic and biotic factors and their influence on the population fluctuation of harmful insect pests like thrips, (*Scirtothrips dorsalis*); aphid, (*Aphis gossypii*) which are the important pests of chilli (Baloch *et al.*, 1994).

In India 20 insect pests are known to infest chilli crop, which affect the crop both quantitatively and

qualitatively. *Scirtothrips dorsalis* Hood known as “chilli thrips” is one of the limitations for higher production of chilli crop and the losses in the yield of green chillies, from 60.5 to 74.3 per cent (Patel and Gupta, 1998).

The climatic factors play substantial role in the biology of any pest, of which temperature is the most crucial abiotic factor influencing the life of any organism. It is rather difficult to find a direct relationship between any single climatic factor and pest activity because the impact of weather elements on pest is usually confounded (Benerji, 1972). However temperature, sunshine, rainfall, relative humidity and wind speed are the chief weather parameters that largely direct the activity of insects. The present work includes the study of the population dynamics of the thrips and aphid with a view to provide sound base to the IPM strategy.

## MATERIAL AND METHOD

The experiment was conducted during *rabi-summer* season 2010-11 at mango orchard, Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G). The general climate is hot with mid winter followed by monsoon period of about four to five months. It receives an average rainfall of 1000-1350 mm per annum mostly concentrated during June to September with occasional showers in winter. The maximum temperature goes to high as 46<sup>o</sup>C during the summer month and minimum as low as 6<sup>o</sup>C during the winter. The atmospheric humidity is high from June to October.

The population dynamics of chilli thrips and aphid was studied for which an experiment was laid out in uniformly sized plots measuring of 10m x 5m replicated 4 times. Variety Pusa jwala was grown untreated plots at 45x45 cm row to row & plant to plant spacing during *rabi-summer* 2010-2011. Five

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plants per plot were selected randomly and tagged to record the population of insect pests during the experimental period. Observations were recorded for initiation of pest incidence and the peak period of infestation, later, the influence of abiotic factors of the environment on the pest population was studied. Population of chilli thrips and aphid were recorded after 30 days of transplanting at weekly intervals from 5 tagged plants selected at random during morning hours between 7.30 to 9.30 am, when most of the insect pests are less active.

#### Statistical analysis of data

Population data of chilli thrips and aphid thus obtained were subjected to statistical analysis to find out the influence of a biotic factor on population computing the coefficient. The calculated t-value obtained was compared with the tabulated t-value at 5 per cent level of significance.

### RESULT AND DISCUSSION

The data on intensity and population fluctuation of thrips and aphid along with prevailing weather condition of crop season was recorded. Chilli crop variety "Pusa Jwala" was sown on 16 November during *rabi-summer* season 2010-2011, to study population dynamics on chilli crop. The thrips (*Scirtothrips dorsalis*) and aphid (*Aphis gossypii*) were found from seedling to reproductive stage of the crop.

#### Thrips – *Scirtothrips dorsalis* (Thysanoptera: Thripidae)

Periodical observation on the thrips incidence showed that the first appearance of thrips population was started from first week of February (5<sup>th</sup> SMW). Initially there were 1.05 thrips per plant and was reached maximum of 279.55 thrips per plant in the third week of March (12<sup>th</sup> SMW). The thrips population was recorded during the entire growth

period, the minimum population of thrips (4.75) was recorded in fourth week of May (22<sup>th</sup> SMW).

The Correlation between population of thrips and temperature was found negatively non-significant with maximum and minimum temperature at 5% level with 'r' values as -0.041 and -0.150, respectively. The peak activity of the thrips was recorded during third week of March, which was associated with average maximum temperature of 37 °C and minimum temperature of 14 °C .

The Correlation between population of thrips and average relative humidity morning was found to be negatively non-significant at 5% level with 'r' value -0.116 while it was negatively significant with evening relative humidity with 'r' value -0.492. The peak activity of the thrips was recorded during third week of March, which was associated with average morning relative humidity of 59% and average evening relative humidity of 24 per cent.

The correlation coefficient between population of thrips and total rainfall was worked out negatively correlated  $r = (-) 0.040$  but non-significant at 5% level. The peak activity of the thrips was observed during third week of March, which was associated with 0.40 mm rainfall.

The present finding are in conformity with earlier worker, Ettouradjou (2003) who reported that during *rabi-summer* (2002-2003), activity of thrips on chilli recorded throughout the crop season i.e. January to June. The peak activity of chilli thrips was more pronounced during March to May.

Our findings are in agreement with those of Panickar and Patel (2001) they reported that maximum temperature had negative effect on thrips population. While the present findings are in disagreement with the findings of Varadharajan and Veeravel (1995), they reported that maximum temperature had positive effect on thrips population but Shukla (2006), reported the population trend of *S.dorsalis* in chilli crop indicated not strong correlation with temperature and relative humidity.

**Table 1.** Pest succession of major insect pest of chilli and meteorological data during (2010-2011)

Date	SMW	Thrips pop./plant	Aphid pop./plant	Temperature(°C)		Rainfall (mm)	Relative humidity (%)	
				Max.	Min.		Morning	Evening
01.02.2011	5	1.05	15.15	29.9	14	0.00	82	35
08.02.2011	6	4.85	94.90	31.4	13.1	0.00	83	27
15.02.2011	7	48.25	38.30	32.1	16.8	0.00	74	31
22.02.2011	8	45.25	8.00	27.1	15.7	12.20	84	51
28.02.2011	9	25.65	38.60	32	16.5	0.00	81	30
04.03.2011	10	34.65	33.45	35	19.2	0.00	76	30
08.03.2011	11	102.65	2.75	34.6	16.6	0.00	68	20
15.03.2011	12	279.55	2.90	37	21.2	0.4	59	24
23.03.2011	13	124.85	9.70	37.6	19.3	0.00	62	11

<b>29.03.2011</b>	14	58.30	9.00	37.3	21	0.00	56	18
<b>05.04.2011</b>	15	48.45	7.60	36.9	22.1	23.8	72	31
<b>12.04.2011</b>	16	47.25	5.85	36.8	23.6	51.2	76	39
<b>19.04.2011</b>	17	35.30	4.30	20	13.1	0.00	42	13
<b>25.04.2011</b>	18	9.20	4.10	40.3	26	0.00	57	22
<b>03.05.2011</b>	19	6.80	4.05	41	23	0.00	77	12
<b>10.05.2011</b>	20	6.60	3.75	41.77	26.51	2.77	59	20
<b>17.05.2011</b>	21	5.95	3.20	41.9	27.22	2.65	52	23
<b>24.05.2011</b>	22	4.75	2.98	41.9	28.05	0.00	53	24

**Table 2.** Coefficient of correlation among chilli thrips and weather parameters

SMW	Thrips pop./plant	Temperature °C		Rainfall (mm)	Relative humidity (%)	
		Max.	Min.		Morning	Evening
5	1.05	29.9	14	0	82	35
6	4.85	31.4	13.1	0	83	27
7	48.25	32.1	16.8	0	74	31
8	45.25	27.1	15.7	12.2	84	51
9	25.65	32	16.5	0	81	30
10	34.65	35	19.2	0	76	30
11	102.65	34.6	16.6	0	68	20
12	279.55	37	21.2	0.4	59	24
13	124.85	37.6	19.3	0	62	11
14	58.3	37.3	21	0	56	18
15	48.45	36.9	22.1	23.8	72	31
16	47.25	36.8	23.6	51.2	76	39
17	35.3	20	13.1	0	42	13
18	9.2	40.3	26	0	57	22
19	6.8	41	23	0	77	12
20	6.6	41.77	26.51	2.77	58.71	19.57
21	5.95	41.9	27.22	2.65	51.85	23.28
22	4.75	41.9	28.05	0	53.28	23.85
<b>CD at 5% level</b>		<b>-0.041</b>	<b>-0.150</b>	<b>-0.040</b>	<b>-0.116</b>	<b>-0.492*</b>

Note: \*, Significant at 5% level

**Table 3.** Coefficient of correlation among aphid and weather parameters

SMW	Aphid pop./plant	Temperature °C		Rainfall (mm)	Relative humidity (%)	
		Max	Min		Morning	Evening
5	15.15	29.90	14.00	0.00	82	35
6	94.90	31.40	13.10	0.00	83	27
7	38.30	32.10	16.80	0.00	74	31
8	8.00	27.10	15.70	12.2	84	51
9	38.60	32.00	16.50	0.00	81	30
10	33.45	35.00	19.20	0.00	76	30
11	2.75	34.60	16.60	0.00	68	20
12	2.90	37.00	21.20	0.40	59	24
13	9.70	37.60	19.30	0.00	62	11
14	9.00	37.30	21.00	0.00	56	18
15	7.60	36.90	22.10	23.80	72	31
16	5.85	36.80	23.60	51.20	76	39
17	4.30	20.00	13.10	0.00	42	13
18	4.10	40.30	26.00	0.00	57	22
19	4.05	41.00	23.00	0.00	77	12

20	3.75	41.77	26.51	2.77	59	20
21	3.20	41.90	27.22	2.65	52	23
22	2.98	41.90	28.05	0.00	53	24
<b>CD at 5% level</b>		<b>-0.288</b>	<b>-0.518*</b>	<b>-0.174</b>	<b>0.517*</b>	<b>0.185</b>

Note: \*, Significant at 5% level

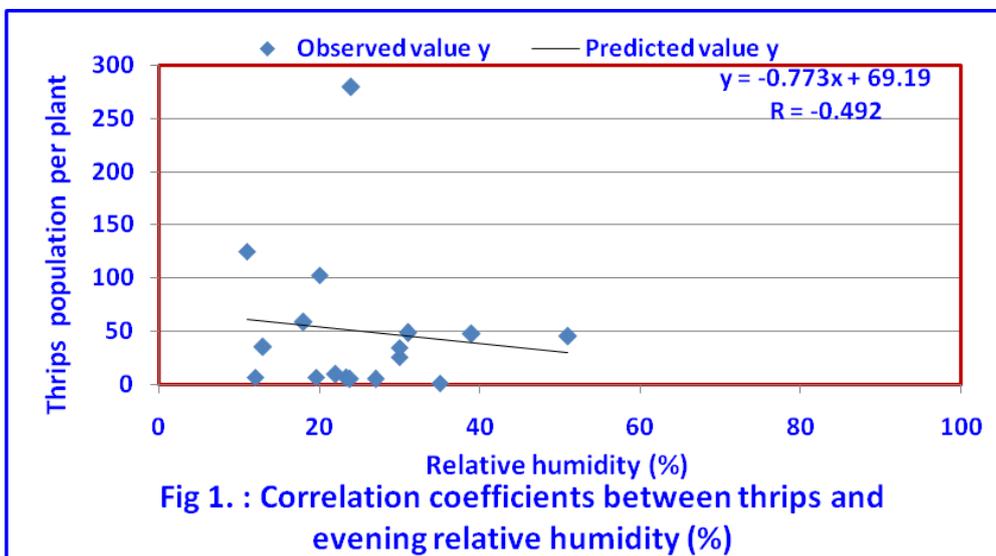


Fig 1. : Correlation coefficients between thrips and evening relative humidity (%)

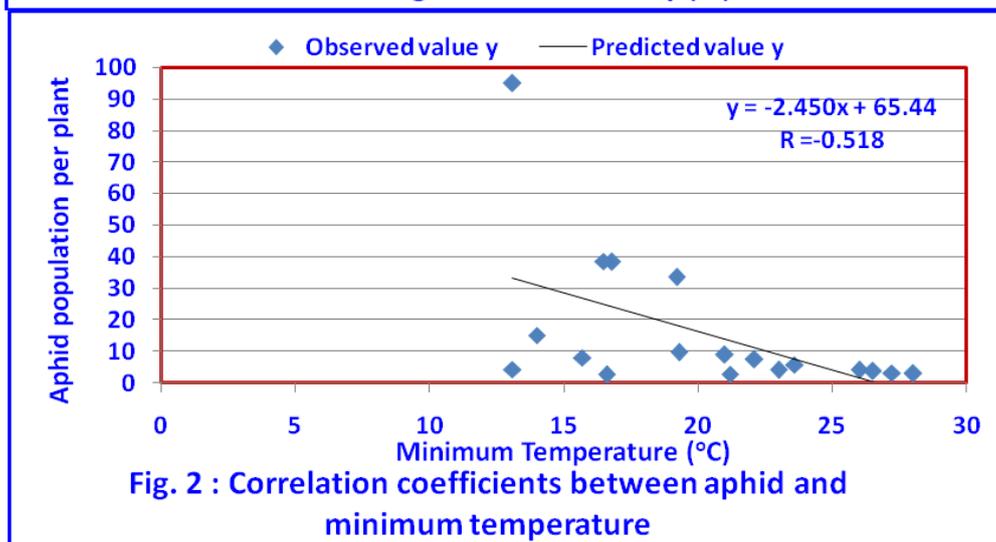


Fig. 2 : Correlation coefficients between aphid and minimum temperature

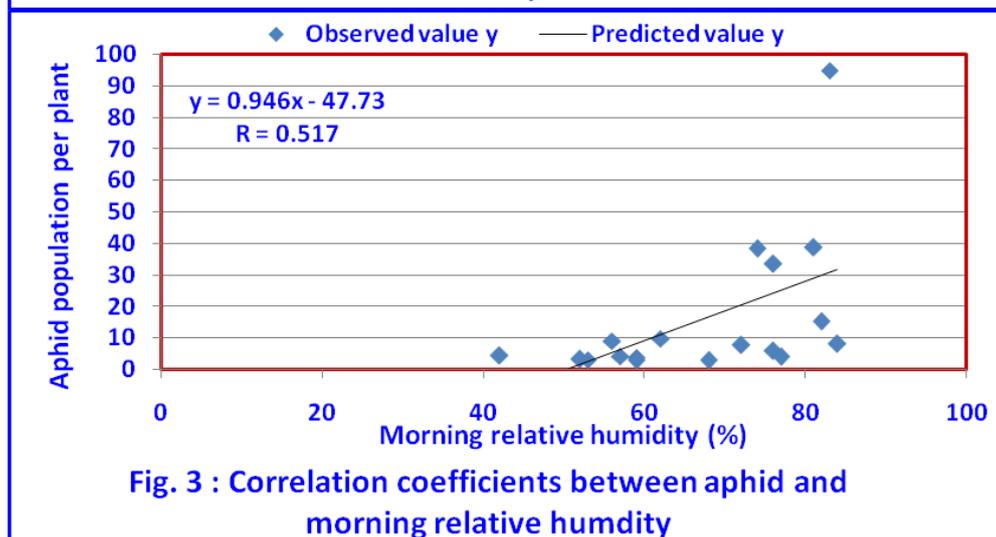


Fig. 3 : Correlation coefficients between aphid and morning relative humidity

**Aphid – *Aphis gossypii* (Hemiptera: Aphidae)**

The next pest appeared was aphid on the crop during the first week of February (5<sup>th</sup> SMW). The pest started its multiplication from 15.15 aphids per plant and reached peak of 94.90 aphid on three leaves per plant in the second week of February (6<sup>th</sup> SMW). There after, there was a gradual decrease in the pest density up to fourth week of May (22<sup>th</sup> SMW).

The correlation between population of aphid and temperature was found negatively non-significant in maximum and negative significant with minimum temperature at 5% level with 'r' values as -0.288 and -0.518, respectively. The peak activity of the aphid was recorded during second week of February, which was associated with average maximum temperature of 31.4 °C and minimum temperature of 13.1 °C.

The correlation between aphid population and average relative humidity was found positive significant in morning and negative non-significant in evening, relative humidity at 5% level with 'r' values as 0.517 and -185, respectively. The peak activity of the aphid was recorded during second week of February, which was associated with average relative humidity of 83% and 27% in morning and evening, respectively.

The correlation coefficient between population of aphid and rainfall was worked out negatively correlated ( $r = (-) 0.174$ ) and non-significant at 5% level. The peak activity of aphid was recorded during second week of February, which was associated with 00.0 mm rainfall.

The present findings on aphid incidence are in conformity with those of Manjunatha *et al.* (2001) who reported that highest aphid population occurred during the first fortnight of February followed by last two weeks of January. Similarly, Saha and Raychaudhari (1995) also recorded maximum aphid population on chilli at pre-flowering stage during January to March.

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