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POPULATION DYNAMICS OF SUCKING PESTS AND THEIR CORRELATION WITH WEATHER PARAMETERS IN CHILLI, *CAPSICUM ANNUM* L. CROP

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ABSTRACT
Results revealed that the incidence of thrips (*Scirthothrips dorsalis* Hood), whiteflies (*Bemisia tabaci* Genn), aphids (*Aphis gossypii* Glover) and mites (*Polyphagotarsonemus latus* Banks) were appeared on the chilli crop soon after transplanting, while the aphid appeared little late during both the years. The peak population of thrips (14.5 and 14.7/ 3 leaves/ plant) was recorded in the first week of October, while the whitefly and aphid attained their peak in first and second week of September during 2006-07 (6.9 whiteflies/ 3leaves /plant and 9.0 aphids/ 3leaves/ plant) and during 2007-08 (6.7 whiteflies/ 3 leaves/ plant and 9.3 aphid/ 3 leaves/ plant), respectively. The mite population reached to its peak in the second week of September (9.2 and 9.0 mites/ 3 leaves/ plant) during both the years. Correlation coefficient values worked out for sucking pests incidence and weather parameters revealed that maximum temperature had positive correlation with thrips population, while negative with mite population. In case of aphid and whitefly, all the abiotic parameters were non-significant at 5 per cent level.

INTRODUCTION

Chilli (*Capsicum annum* L.) is one of the important vegetable and condiments crop having immense commercial dietary and therapeutic values and grown throughout the year. It is cultivated throughout the country in about 7.67 lac hectares with annual production of 12.30 lac tonnes and average productivity of 1600 kg ha^{-1} (Anonymous, 2010). In Rajasthan, it is cultivated in an area of 13,812 hectares with the production of 13,649 tonnes and productivity of 988 kg/ha (Vital statistics, 2009-10). In the state of Rajasthan, the productivity of chilli is 988 kg which low as compared to other states and average productivity of the country.The various factors are responsible for low yield of chilli, among which, insect and mite pests are of prime importance which significantly affects both the quality and production of chilli. The yield losses range from 50-90 per cent due to insect pests of chilli (Nelson and Natrajan, 1994 and Kumar, 1995). Thrips (*Scirthothrips 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 (Hosmani, 1993). The damage due to mites and thrips together had been estimated to the tune of 50 per cent (Kandasamy *et al.,* 1990). 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. Available scientific literature shows that not much information is available especially on population dynamics and influence of various environmental factors on the fluctuation of sucking pests on chilli crop in semi arid region conditions of Rajasthan. Hence a region oriented study on sucking pests population dynamics would give an idea about peak period of their activity and may be helpful in developing pest management strategy.

MATERIALS AND METHODS

In order to study the population dynamics of thrips (*Scirthothrips dorsalis* Hood), whiteflies (*Bemisia tabaci* Genn), aphids (*Aphis gossypii* Glover) and mites (*Polypha gotarsonemus latus* Banks) in field, the chilli variety "Pusa Jwala" which recommended for this region was used for the experiment, transplanting was done after 45 days *i.e.* on 15th July in the laid out fields at the spacing of 45 cm x 60 cm. The experiment was conducted at Rajasthan College of Agriculture Farm, Maharana Pratap University of Agriculture and Technology, Udaipur during *kharif* season of 2006-07 and 2007-08. To study seasonal incidence of sucking pests of chilli were done by counting the population of insect pests on five randomly selected plants in three plots of 4.5 m x 3.0 m were maintained without employing any plant protection measures. The observation of sucking pests was recorded at weekly intervals during morning hours between 6:30 AM to 8:30 AM. The population of thrips and whiteflies (nymphs and adults) were recorded from three leaves one each from the upper, middle and lower position on five randomly selected plants. The numerical count method described by Heathcote

Table1: Incidence of major insect and mite pests of chilli crop during 2006-07 and 2007-08

S. No.	St. Week	Thrips / 3 leaves		Whiteflies/ 3leaves		Aphids/ 3 leaves		Mites/ 3 leaves	
		2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
1	29	0.00	0.00	1.60	1.40	0.00	0.00	0.00	0.00
2	30	1.30	1.00	3.00	3.20	0.00	0.00	1.30	1.10
3	31	2.10	2.40	4.50	4.30	0.00	0.00	1.90	1.80
4	32	3.20	3.50	4.80	4.60	2.90	0.00	2.60	2.80
5	33	4.10	4.40	4.90	5.00	6.30	3.10	3.90	1.10
6	34	4.90	5.70	5.50	5.20	7.20	6.50	6.20	5.90
7	35	4.70	5.40	6.30	5.50	8.10	7.30	7.10	7.10
8	36	4.50	5.10	6.90	6.30	9.00	8.20	8.00	7.80
9	37	5.60	6.40	5.90	6.70	3.60	9.30	9.20	9.00
10	38	6.10	6.90	4.70	5.60	3.80	3.00	3.10	3.30
11	39	8.60	9.10	5.40	4.60	4.70	3.20	3.30	3.50
12	40	14.50	14.70	5.80	5.20	3.70	4.10	4.20	4.40
13	41	11.00	11.40	4.60	5.70	3.80	3.10	3.20	3.40
14	42	11.90	12.20	5.10	4.40	2.60	3.20	3.30	3.50
15	43	12.30	12.80	4.10	4.80	3.70	2.10	2.20	2.40
16	44	10.70	10.50	4.50	3.90	1.50	3.10	3.20	3.50
17	45	11.20	11.10	3.90	4.20	1.30	1.20	2.50	2.70
18	46	8.50	7.90	2.60	3.80	0.00	1.10	2.00	2.20
19	47	8.70	8.20	2.10	2.30	0.00	0.00	1.30	1.20
20	48	7.50	7.00	1.10	1.20	0.00	0.00	1.10	1.00

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

Insect Pests	Year	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)
		Maximum	Minimum	Mean	Maximum	Minimum	Mean	
Thrips	2006-07	0.7130*	-0.3100	-0.1560	-0.6870*	-0.6660*	-0.7000*	-0.4200
	2007-08	0.4994*	-0.6278*	-0.5052*	-0.5772*	-0.6978*	-0.6685*	-0.5533*
Whitefly	2006-07	0.0440	0.4200	0.4360	0.3180	0.3084	0.3243	0.2933
	2007-08	0.1098	0.4047	0.4636	0.4114	0.3482	0.3727	0.0816
Aphid	2006-07	-0.1880	0.2240	0.1850	0.4070	0.2990	0.3440	0.3860
	2007-08	-0.2491	0.3341	0.2741	0.5010*	0.3716	0.4175	0.1810
Mite	2006-07	-0.2599	0.6220*	0.5733*	0.5075*	0.3181	0.3883	0.2812
	2007-08	-0.2438	0.3667	0.3104	0.5311*	0.4144	0.4568	0.2091

*Significant at 5 per cent level

(1972) was used to record the population of aphid. The population was counted only on three leaves as per the method suggested by Satpathy (1973). The aphid population was expressed on per plant basis. The density of *P. latus* (eggs and mobile stages) was recorded under stereo binocular microscope on 2 × 2cm leaf bit area.

The weekly meteorological data on temperature, relative humidity and rain fall were recorded during the experimental period. Correlation was worked out between insect pest population and abiotic factors.

RESULTS AND DISCUSSION

The data presented in Table 1 on the sucking pests population of chilli revealed that thrips, aphid, whitefly and mite were of regular occurrence and caused considerable damage to the crop.

The infestation of thrips, *Scirtothrips dorsalis* Hood was initiated in the fourth week of July (30th meteorological week) and remained continue up to fourth week of November (48th meteorological week) during both the years. The 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. Thereafter the population declined gradually and reached up to 7.5 and 7.0 thrips/3 leaves /plant in last week of November (48th meteorological week). The data on correlation between meteorological factors and thrips population (Table 2) revealed that the population exhibited a positive correlation with maximum temperature while the correlation was negative with minimum and mean temperature, maximum, minimum and mean relative humidity and average rainfall. The findings confirmed the results obtained by Patel (1992) who reported negative correlation between thrips population, rainfall and temperature, similar results were also obtained by Panicker (2000) who observed that the activity of thrips on chilli from first week of September which continued up to second week of January. The pest showed negative correlation with minimum temperature, vapour pressure and relative humidity. The present findings also supported by Bhede *et al.* (2008) who 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. Thus present findings are in conformity with the above research workers.

The whitefly, *Bemisia tabaci* Genn. appeared in the third week of July (29th meteorological week) and continue up to fourth week of November (48th meteorological week).The population increased gradually and touched its peak with mean population of 6.9 whiteflies / 3leaves /plant in first week of September (36th meteorological week) during 2006-07 while, the population of whitefly touched its peak with 6.7 whiteflies/

3 leaves /plant in the second week of September (37th meteorological week) during 2007-08. Thereafter, the population decline gradually and reached up to 1.1 and 1.2 whiteflies/3 leaves /plant. The population exhibited positive correlation with maximum, minimum and mean temperature, maximum, minimum and mean relative humidity during both the study years (Table 2). The findings confirmed with the results obtained by Shanab and Awad-Allah (1982) who reported that the whitefly on tomato on appeared in May and reached to its peak during July to October. He also reported that the higher temperature declined the pest incidence, whereas scattered rain and high relative humidity favoured the population build up. However Farman *et al*. (2004) observed that the whitefly infestation started on brinjal in mid of May and reached to its peak in July. While, Bharadia and Patel (2005) reported maximum population of whitefly in the fourth week of October. This might be due to variable climatic conditions of that particular region and time of cultivation that particular crop.

The infestation of aphid commenced in the second week of August (32nd meteorological week) during 2006-07 and in the third week of August (33rd meteorological week) during 2007-08 and was on the crop up to first week of November (45th meteorological week) and in second week of November (46th meteorological week) during 2007-08.The population increased gradually and touched its peak with mean population of 9.0 aphids /3 leaves /plan in first week of September (36th meteorological week) in the first year. During second study year the population of aphid touch its peak with mean population of 9.3 aphids /3 leaves/plant) in the second week of September (37th meteorological week). Thereafter, the population declined gradually and reached up to 1.3 and 1.1 aphids /3 leaves/ plant during 2006-07 and 2007-08. The population exhibited a negative correlation with maximum temperature while, the correlation was positive with minimum and mean temperature, maximum, minimum and mean relative humidity and average rainfall during 2006-07 and 2007-08, respectively (Table 2). The present findings are confirmed with earlier workers of Butani (1970) who reported the appearance of aphid from July to till harvest. Similar results were also found by Venzon *et al*. (2006) who reported that the sucking and Lepidopterous pests were major pests of chilli and the infestation occurred on crop throughout the crop season.

The mite population persist throughout the crop season from fourth week of July (30th meteorological week) and was continue upto fourth week of November (48th meteorological week).The population increased gradually and touched its peak with mean population of 9.2 and 9 mites /3 leaves /plant in the second week of September (37th meteorological week) during 2006-07 and 2007-08, respectively. Thereafter, the population decline gradually and reached up to 1.1 and 1 mites /3 leaves /plant in the last week of November. In the present investigation, it was found that mite appeared in the fourth week of July during both study years. The population exhibited a negative correlation with maximum temperature while, the correlation was positive with minimum and mean temperature, maximum, minimum and mean relative humidity and average rain fall during 2006-07 and 2007-08 (Table 2). The present findings concord with the findings of Patil and Nandihalli (2009) who reported that the yellow mite population showed negative correlation with morning and evening humidity, rainfall and age of crop. Chaven *et al*. (2003) reported significant and positive correlation between temperature and mite population, while relative humidity and rainfall showed negative correlation with the pest, similar results were also obtained by Bhede *et al*. (2008) who observed that the correlation of minimum temperature, morning and evening relative humidity with mite population was negative and non significant. Results of present investigation clearly indicates that maximum population of mite was noted during second week of September where in the rainfall was nil with moderate level of humidity.

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