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Seasonal occurrence of two spotted spider mite, *Tetranychus urticae* Koch infesting okra

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Abstract

A field experiment was carried out to study the occurrence pattern of two-spotted spider mite infesting okra during *summer* and *kharif*, 2021 along with the role of weather parameters on the seasonal occurrence. During the study, occurrence of the two spotted spider mite, *T. urticae* on okra crop were observed from February to May. The occurrence of *T. urticae* started during 1st week of April (14th SMW) during *summer*, 2021. Initially, its population was low (0.63 mites/1 cm²) which was gradually increased and attend a maximum level during the 3rd week of May (20th SMW) (17.9 mites/1 cm² leaf area). Then after, it was in decreasing trend and disappeared from 4th week of May due to heavy rain and thunder storm. Correlation studies between mite population with various weather parameters were found that the evapotranspiration (0.840**) had highly significant positive and morning relative humidity (-0.660*) had significant negative correlation with mite population.

Keywords: Seasonal occurrence, okra, *Tetranychus urticae*, weather parameters, correlation

Introduction

Okra is an important vegetable crop attacked by various pests including major non insect pest, two spotted spider mites, *Tetranychus urticae* Koch. It is a polyphagous mite adapted to feed on a vast variety of hosts and is widely distributed. It leads to an economic yield reduction in crops depending on cropping seasons and agro- climatic conditions. Once it is established in an area, it is hard to get rid of it due to its high fecundity, dispersal techniques, short life cycles, rapid development of resistance to acaricides and adaptability to various ecological conditions. Hence, the present study was carried, to work out the seasonal occurrence of *T. urticae* with relation to different weather parameters which provide a prediction to know the most favorable condition for buildup of mite population which is helpful in developing pest management strategies.

Materials and Methods

The study on seasonal occurrence of two spotted spider mite, *T. urticae* in okra was conducted at Entomology farm of B. A. College of Agriculture, AAU, Anand for *summer* – *kharif* season, 2021. For this purpose, the crop okra (GAO-5) was grown at distance of 45 x 30 cm during *summer* and 60 x 30 cm during *kharif*. Furthermore, the field was dividing into 6 equal size quadrates (*summer*: 1.8 x 9.0 m and *kharif*: 2.4 x 9.0 m). From each quadrate, five plants were selected randomly and tagged for recording the mite(s) population. Three leaves (top, middle and bottom region of the plant) were selected from each tagged plant and brought to the laboratory, each leaf 1 cm² was observed under stereo zoom microscope for recording the mite(s) population. Observation was taken at weekly interval starting from two week of germination till the harvest of crop. The mean number of mite/1 cm² was worked out at the end of each observation. All the recommended agronomical practices were followed for growing the healthy crop.

Different weather parameters *viz.*, maximum temperature, minimum temperature, morning and evening relative humidity, bright sunshine hours, wind speed, morning and evening vapour pressure, rainfall, evapotranspiration, *etc.* recorded at agricultural meteorological observatory, Anand Agricultural University, Anand was used to work out correlation with mite population in okra grown during *summer* and *kharif* season.

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The correlation was worked out by using (SPSS software) standard statistical technique (Steel and Torrie, 1980) [10].

Results and Discussion

A study on seasonal occurrence of *T. urticae* on okra var. GAO - 5 was conducted at the Entomology farm, Anand Agricultural University, Anand during summer, 2021-22. The observations on number of mites per 1 cm² of leaf area were recorded at weekly interval starting from germination and continued till maturity of the crop.

The activity of two spotted spider mite, *T. urticae* (Summer-2021)

Data on seasonal occurrence of *T. urticae* on okra crop are presented in Table 1. Occurrence of the two spotted spider mite, *T. urticae* on okra crop was observed from last week of February to last week of May. Data indicated that the mite first appeared

during 1st week of April (14th SMW) during 2021. Initially, its population was low (0.63 mites/1 cm² leaf area), which was gradually increased in its numbers and attained the peak during the third week of May (20th SMW) (17.9 mites/1 cm² leaf area). Then after, it was in decreasing trend and disappeared from 4th week of May due to heavy rain and thunder storm.

The present investigations were more or less in agreement with Sangavi (2020) [9] who reported peak population (15.80 mites/2 cm²) of mite during last week of may i.e., 4th week of May. In contrast to above findings, Patel and Ghetiya (2015) [7] reported peak population of mite in 4th week of July (17.8 mites/ cm²). Some variation may be attributed due to changes in ecological conditions. The two spotted spider mite, *T. urticae* being a polyphagous sucking pest attacking number of host crops and it fluctuated more or less throughout the year. Its occurrence and abundance may vary from region to another and even crop to crop in a given locality.

Table 1: Seasonal occurrence of two spotted spider mite, *T. urticae* on okra (Summer, 2021)

Month and Week	SMW	No. of mites/1 cm ² leaf area	Temp. (C°)		RH (%)		BSS (hrs)	WS (km/hr)	EP (mm)	VP		
			Max.	Min.	RH1	RH2				VP1	VP2	
February 2021	IV	9	00.00	34.4	15.2	84.0	27.0	10.2	4.9	4.3	11.9	10.3
March	I	10	00.00	35.8	16.6	85.0	29.0	9.7	5.7	4.9	13.3	12.1
	II	11	00.00	36.4	18.1	75.0	30.0	8.8	6.1	5.7	12.8	12.9
	III	12	00.00	36.5	20.0	77.0	36.0	8.8	6.4	6.1	14.3	15.5
	IV	13	00.00	38.1	19.8	74.0	27.0	9.6	7.7	6.4	14.6	12.6
April	I	14	00.63	38.3	22.3	83.0	29.0	9.6	7.4	7.7	18.9	13.8
	II	15	03.10	39.4	21.9	73.0	25.0	9.5	8.4	7.4	16.1	12.9
	III	16	06.90	38.5	23.8	69.0	31.0	10.0	8.4	8.4	17.4	15.0
	IV	17	10.85	39.3	24.0	73.0	38.0	9.5	8.5	8.4	18.8	19.8
May	I	18	15.11	32.8	26.1	69.0	31.0	9.0	8.7	8.5	19.3	15.8
	II	19	16.67	39.6	26.3	71.0	33.0	10.4	9.3	8.7	20.1	16.3
	III	20	17.90	35.6	25.8	77.0	54.0	4.8	7.1	9.3	20.7	19.7
	IV	21	05.43	35.7	27.0	85.0	52.0	10.3	6.3	7.1	23.7	21.5
	V	22	03.70	36.3	27.5	84.0	51.0	9.9	7.7	6.3	24.4	21.8

Max T: Maximum Temperature	Min T: Minimum Temperature	RH1: Morning Relative Humidity	RH2: Evening Relative Humidity	WS: Wind Speed
BSS: Bright Sunshine Hour	EP: Evapotranspiration	VP1: Morning Vapour Pressure	VP2: Evening Vapour Pressure	SMW: Standard Meteorological Week

Correlation with weather parameters

Correlation coefficient (r) values between two spotted spider mite, *T. urticae* population on okra crop and various weather parameters were calculated and presented in Table 2.

Data indicated that the weather factors influenced differently (either positively or negatively) on two spotted spider mite, *T. urticae* incidence, and it influenced significantly or non-significantly. There was positive association between maximum

temperature (r = 0.045) and minimum temperature (r = 0.613) and mite density on okra crop. It indicated that both the abiotic factors influenced in same way on the mite population. Above findings were in close conformity with those of Ghosh (2013) [2], Kumar and Singh (2020) [5] and Sangavi (2020) [9] who reported that mite population had non-significant positive correlation with temperature and maximum relative humidity.

Table 2: Correlation coefficient (r) between weather parameters and population of mite, *T. urticae* infesting okra (Summer, 2021-22) (n = 10)

Weather Parameters	Correlation co-efficient (r)
Bright Sunshine Hours, hrday-1 (BSS)	0.198
Maximum Temperature, °C (MaxT)	0.045
Minimum Temperature, °C (MinT)	0.613
Morning Relative Humidity, % (RH ₁)	-0.660*
Evening Relative Humidity, % (RH ₂)	-0.126
Morning Vapour Pressure, mm of Hg (VP ₁)	0.328
Evening Vapour Pressure, mm of Hg (VP ₂)	0.192
Wind Speed, kmhr-1 (WS)	0.068
Evapotranspiration, mm (EP)	0.840**

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

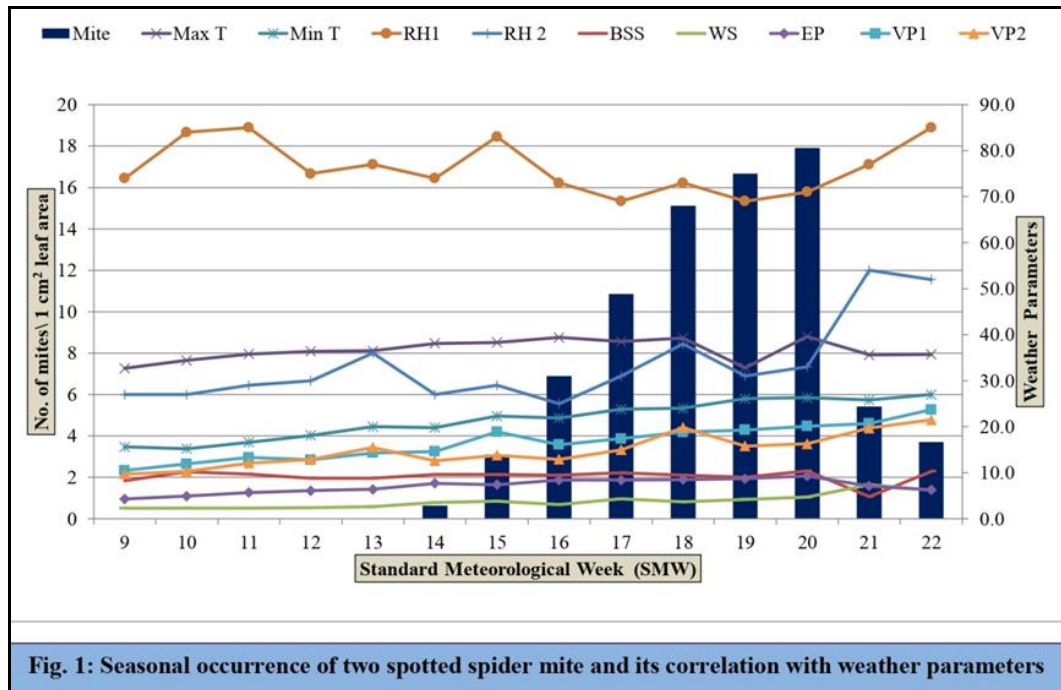
Morning relative humidity ($r=-0.660^*$) and evening relative humidity ($r = -0.126$) exerted significant and non-significant negatively correlate with two spotted spider mite, *T. urticae* population, respectively. This is in accordance with more or less similar results with Kanika *et al.* (2013) [3] and Allam *et al.* (2014) [1] who showed that population of *T. urticae* had significant negative correlation with relative humidity.

Wind speed ($r = 0.068$) had non significant positive correlate with okra mite. These results were confirmed by Patel and Ghetiya (2016) [7] and Kumar *et al.* (2018) [4] who revealed that there was a positive association between mite population wind speed with *T. urticae* population.

Sunshine hours had ($r = 0.198$) non significant positive

relationship with the two spotted spider mite, *T. urticae* incidence on okra crop as it revealed from the correlation coefficient values worked out for the year 2021-22. Present findings were similar with those of Kumar *et al.* (2018) [4], Sangavi (2020) [9] and Putri *et al.* (2021) [8] who showed non-significant positive correlation of sunshine hours with *T. urticae* population.

Morning vapour pressure ($r = 0.328$) and evening vapour pressure ($r = 0.192$) influenced non-significantly positive whereas evapotranspiration ($r = 0.840^{**}$) showed highly positively significant with the population of two spotted spider mite, *T. urticae* on okra. Above findings were confirmed with Kumar *et al.* (2018) [4]



The activity of two spotted spider mite, *T. urticae* (Kharif-2021)

A study on seasonal occurrence of *T. urticae* on okra var. GAO-5 was also carried out at the Entomology farm, Anand Agricultural University, Anand during *kharif*, 2021-22. The observations on number of mites per 1 cm² of leaf area were recorded at weekly interval starting from germination and continued till maturity of the crop. Data indicated that the mite first appeared during 2nd week of October (41st SMW) with 0.45 mites/1 cm² leaf area at the 2nd last week of crop growing stage during 2021 which was gradually increased in its numbers in 3rd week of October (42nd SMW) with 1.57 mites/1 cm² leaf area. Then after, crop was harvested at 4th week of October. Due to mite incidence initiated in very late season only two-week observations were found so that mite population correlation with weather parameters not analyzed.

Conclusion

In *summer*, the incidence of two spotted spider mite started during first week of April (14th SMW) during *summer*, 2021. Initially, its population was low, which was gradually increased in its numbers and attained peak level during last week of May (20th SMW). The population of two spotted spider mite had highly significant positive correlation with evapotranspiration ($r=0.840^{**}$) and had significant negative correlation with morning relative humidity ($r=-0.660^*$). And in *kharif*, the

population first appeared during 2nd week of October (41st SMW) at the 2nd last week of crop growing stage.

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