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Impact of Meteorlogical Parameters on Population Build up of Red Spider Mite in okra, *Abelmoschus esculentus* L. under North Bhiar condition

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ABSTRACT

Experiments were conducted to study the effect of meteorological parameters on population build up of red spider mite, *T. telarius* in okra at Pusa, Bhiar during summer seasons of 2000 and 2001. Results indicated that the activity of theinsect showed non-significant negative correlation with maximum temperature and positive correlation with minimum temperature. Morning and afternoon relative humidity showed a significant positive association with the activity of mites. Regression analysis explained 78-85 per cent variability due to meterorological parameters in the population of red spider mite.

Key words: Okra, red spider mite, weather parameter.

Red spider mite, Tetranychus telarius Linnaeus is one of the most important pests among the various insect pests of okra, grown in different parts of India. Lall and Dutta (1959) reported 36.8-83.2 per-cent loss in okra yield due to spider mite. The population density of the pest and its natural enemies change during the course of crop growth. Relationship between the pest population and weather parameters needs to be worked out in order to understand biometerorological interaction. This would enable an ecological manoeuvring by bringing about changes in the crop geometry and cropping system, which may have economically relevant impact on pest population. In the present investigation an effort was made to study the impact of meterorological factors on population build up of the pest.

Materials and Methods

Field experiments were conducted during summer in 2000 and 2001 at the University Apiary, Rajendra Agricultural University, Pusa, Samastipur, Bihar to find out the incidence of red spider mite in relation to different weather parameters in okra variety, Pusa Sawani. Seeds were sown at the rate of 15 kg/ha on 16th February, 2000 and 2001 in summer seasons. Expeiments were replicated three times having a plot size of 3m x2m with a plant spacing 30cm x 30cm. All the recommended agronomical practices were followed in raising the crop. Observations on the pest activity were recorded after 60 days of sowing at weeky intervals till the crop attained maturity. Red spider mite nymphs as well as adult population were observed from three leaves consisting one each at the basal, middle and top portion of the plant in an area of 6.25 cm^2 per leaf with the help of hand lens (10 x). Both the spider mite nymphs and adults were counted on ventral surface of leaves in the early morning (7 to 9 A.M.), the time during which the mites were generally found inactive. The population was counted on 5 randomly selected tagged plants in each of the replicates and average population per leaf of 6.25 cm^2 area was estimated.

The weekly meteorological data on temperature, relative humidity and rainfall were obtained from the Agro-meteorological observatory, Pusa. The influence of key meteorological parameters on the pest incidence was worked out through simple correlation studies (Gomez and Gomez, 1984). Multiple regression equations were also developed.

Table 1. Weekly average weather parameters and red spider mite population on summer sown okra

Standard meteorological weeks	2000						2001					
	Spider mite population per 6.25 cm^2 per leaf	Mean max. temp. (°C)	Mean min. temp. (°C)	Mean RH (%) 7.00 hrs.	Mean RH (%) 14.00 hrs.	Rainfall (mm)	Red spider mite population per 6.25 cm^2 per leaf	Mean max. temp. (°C)	Mean min. temp. (°C)	Mean RH (%) 7.00 hrs.	Mean RH (%) 14.00 hrs.	Rainfall (mm)
15	8.54	35.0	22.4	83	49	21.0	7.16	34.5	19.8	73	31	6.0
16	17.23	45.2	22.7	86	51	18.0	15.24	37.0	27.5	67	38	0.0
17	13.75	34.9	23.9	81	53	0.0	44.45	32.9	23.1	77	59	80.0
18	22.42	43.7	25.6	77	45	0.0	16.50	31.5	23.8	84	57	27.0
19	30.26	38.8	25.5	85	59	58.0	30.25	33.2	24.8	85	53	50.0
20	42.50	31.5	24.5	86	69	74.6	48.51	35.0	24.7	85	53	50.0
21	54.65	32.5	24.7	87	69	41.0	56.32	32.4	25.5	86	65	38.5
22	36.43	34.1	26.3	87	71	116.0	38.44	33.1	25.6	85	67	12.5
23	48.74	34.8	25.8	90	69	94.0	50.63	34.1	27.1	82	59	11.0
24	35.16	32.4	26.1	91	77	112.0	37.72	32.0	26.0	92	75	213.5
25	49.45	34.3	22.0	84	69	13.7	52.35	33.8	23.1	86	68	24.0

Results and Discussion

Meteorological parameters and red spider mite population

The mean population of red spider mites varied significantly in different weeks of cropping season in 2000 and 2001. The pest population was observed significantly from 15th standard meteorological week (SMW) and increased progressively with sharp rise and fall at the subsequent interval upto 25th smw (Table 1). The data on the mean population of red spider mite and the prevailing weather factors during the different weeks of the cropping seasons in both the years of study indicated that the minimum population of 8.54 and 7.16 per 6.25 cm^2 leaf area were recorded in 15th SMW (whereas, the maximum of 54.65 and 56.32 per 6.25 cm^2 were observed in 21st SMW) in 2000 and 2001, respectively. Afterwards, gradual decline with sharp rise and fall in population continued and reached its minimum (35.16 and 37.12 per 6.25 cm^2 leaf area) during 24th smw in both the years (Table 1). It may be due to variations in temperature, relative humidity and rainfall during the congenial period of crop growth. The present findings are in close conformity with that of Prasad and Singh (2003) who reported that the mite population started building up on the crop from the second fortnight of March and continued until the first fortnight of July.

Correlation Studies

Correlation coefficients were worked out between population build up of red spider mite and mean weather parameters during preceeding weeks of observations for the data of 2000 and 2001 (Table2).

The fluctuation in red spider mite population showed non-significant negative and positive correlation with the maximum temperature (r = -0.517 and –0.130) and the minimum temprature

Table 2. Correlation coefficients between weather parameters and red spider mite population

Weather parameters	Correlation coefficient with red spider mite population	
	2000	2001
Maximum temperature (°C)	-0.517	-0.130
Minimum temperature (°C)	0.291	0.440
Relative humidity (%) at 0700 hrs	0.536	0.680*
Relative humidity (%) at 1400 hrs	0.805**	0.628*
Rainfall (mm)	0.466	0.104

*Significant at 5%level.

**Significant at 1% level.

Table 3. Multiple regression equations

Year	Regression equation	R^2 value
2000	$Y_1 = -175.995 + 0.744\ X_1 + 2.843\ X_2 - 0.041\ X_3 + 2.080\ X_4 - 0.264\ X_5$	78.24%
2001	$Y_2 = -482.123 + 7.322\ X_1 + 1.178\ X_2 + 2.725\ X_3 + 0.395\ X_4 - 0.111\ X_5$	84.65%

Y_1 and Y_2 – Red spider mite population

X_1 - Maximum temperature (°C)

X_2 - Minimum temperature (°C)

X_3 - Relative humidity (%) at 700 hrs

X_4 - Relative humidity (%) at 1400 hrs

X_5 - Rainfall (mm)

(r = 0.291 and 0.440) during 2000 and 2001, respectively. The present findings are in agreement with that of Prasad and Singh (2003) who observed a significant positive correlation between mite population and temperatures. The population of mites revealed a significant positive association with the morning relative humidity (r = 0.536 and 0.680*) and after noon relative humidity (r = 0.805** am 0.628*) [Table 2]. Rainfall showed non-significant positive correlation (r = 0.446 and 0.104) with the population of mites during both the years of study. The present findings are in conformity with that of Kumar *et al.* (2003) who observed that the mite population showed a non-significant positive correlation with relative humidity and weekly rainfall in French marigold.

The multiple regression analysis revealed that weather parameters contributed for 78.24 and 84.65 per-cent of total variation in the population of mite in 2000 and 2001, respectively.

References

Lall, B.S. and Dutta, C.P. 1959. On the biology of the red spider mite, *Tetranychus telarius* L. *Sci. and Cult.* **25**: 204-205.

Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research (2nd edition) John Wiley and Sons, New York, p.680.

Prasad, R. and Singh, R.N. 2003. Influence of abiotic factors on incidence of *Tetranychus macfarlanii* (Acarina: Tetranychidae) on pumpkin (Cucurbita: Maschata) and its control. *Indian J. Agril. Sci.* **73**: 181-183.

Kumar, S., Prasad, S. and Singh, R.N. 2003. Population trends of two-spotted spider mite (*Tetranychus urticae*) in relation to abiotic factors on French marigold (*Tagetes patula*). *Indian J. Agril. Sci.* **73**(5): 303-304.