POPULATION DYNAMICS OF MITES, *Tetranychus urticae* KOCH ON BRINJAL IN RELATION TO WEATHER PARAMETERS

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ABSTRACT

An experiment was conducted to study the population dynamics of Tetranychus urticae Koch on brinjal in relation to weather parameters under field condition at College Agronomy Farm, Navsari Agricultural University, Navsari during kharif-rabi 2014-15. The incidence of mite was recorded after 1 week of transplanting i.e. from 3rd week of July (29th standard week). The incidence was observed in the field up to 4th week of October (42nd standard week) and it was in the range of 2.92 (3rd week of July) to 40.56 (3rd week of September) with an average of 19.27 per 4 cm2 leaf area. The mite population reached to the first peak (13.40 per 4 cm2 leaf area) during 2nd week of August and the highest peak (40.56 per 4 cm2 leaf area) during 3rd week of September. The correlation studies revealed that population of mite had significant positive correlation with minimum temperature (0.476*), morning relative humidity (0.621**), evening relative humidity (0.461*) and mean relative humidity (0.515*). The mite population had negative correlation with bright sunshine hours, maximum temperature, rainfall and wind speed, whereas positive correlation with mean temperature, but the results were non-significant.

KEY WORDS: Brinjal, mite, population dynamics, Tetranychus urticae, weather parameters

INTRODUCTION

Brinjal (*Solanum melongena* Linnaeus) is known as a "King of vegetables" grown throughout tropical, sub-tropical and warm temperate areas of the world. In world, the production of brinjal is about 4.9 crore Metric Tonnes (MT). India is the second largest producer of brinjal after China (Anonynous, 2014). In India, the crop is cultivated in about 7.2 lakh hectares with a production of 134 lakh MT. In India, it is cultivated mainly in West Bengal, Orissa, Bihar and Gujarat. In Gujarat, the total area under brinjal cultivation is 0.72 lakh hectares with annual production of 13.4 lakh MT (Anonymous, 2014).

Brinjal crop suffers severely due to the attack of various insect pests, which reduced its yield and quality of fruits. In India, about 44 pests have been reported to attack brinjal (Lal, 1975). Patel *et al.* (1970) recorded 16 pest species attacking brinjal crop in Gujarat. Of which, shoot and fruit borer, *Leucinodes orbonalis* Guenee; jassid, *Amrasca biguttula biguttula* (Ishida); whitefly, *Bemisia tabaci* Gennadius; aphid,

Aphis gossypii Glover and mites, *Tetranychus urticae* Koch are the major and important insect pests. Of these, red spider mite, *T. urticae* poses serious threat as a major pest next to shoot and fruit borer to the cultivation of brinjal (Basu and Pramanik, 1968). The reduction in yield due to mite infestation was up to 14 per cent at Bangalore and 31 per cent at Varanasi (Anonymous, 1996). Patil and Nandihali (2008) estimated the yield losses in the range of 12.18 to 32.21 per cent due to infestation of mite at Dharwad. Palanisamy and Chelliah (1987) noticed the reduction of 28.00 per cent fruit yield due to spider mite infestation in brinjal. On an average 16.16 per cent yield loss in brinjal due to *T. urticae* was noticed in India (Anonymous, 2007).

Both nymphs and adults of mites suck the sap usually from the lower surface of leaves producing small white specks, which gradually dry and drop off. Infested plant become yellowish, wilted and droop rapidly particularly during dry periods. The dense web produced by spider mite often covers the plant where dust particles adhere in windy weather which in turn affects the physiological activity of the plant, making it stunted. The entire plant becomes yellowish giving poor unhealthy look. Infested leaves wither and eventually fall off. In severe infestation, it webs profusely and may form a thick sheath of webbing that covers the entire plant (Butani and Mittal, 1992).

The basic information on population dynamic is necessary before deciding the strategy for management of any insect pest. Limited work has been done on population dynamics of mite, *T. urticae* on brinjal in relation to weather parameters. Hence, the present investigation was carried out.

MATERIALS AND METHODS

In order to study the population dynamics and impact of weather parameters on incidence of mite, *T. urticae* on brinjal, a field experiment was conducted at College Agronomy Farm, Navsari Agricultural University, Bharuch during *kharif-rabi* season of 2014-15. Brinjal cv. Jambli (Pant bahar) was transplanted during 15th July in a plot size of 20 x 10 m in spacing of 90 x 60 cm. and raised successfully by adopting recommended agronomical practices. The population dynamics of *T. urticae* was studied on the basis of population of mites. For recording observations, 25 plants were selected randomly from the whole experimental plot. The observations on mite population was recorded from 2 x 2 cm^2 area of three leaves (upper, middle and lower) of same selected plants. The observations were recorded at weekly interval starting from one week after transplanting till to the harvest of the crop. The whole experimental plot was kept free from insecticidal application. To find out the specific impact of different weather parameters on mites in brinjal, the data on mite population per leaf recorded in the experimental plot of population dynamics were correlated with the different meteorological parameters by standard statistical procedure (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Population dynamics

The data on mite population presented in Table 1 and graphically depicted in Figure 1 revealed that the incidence of mite was recorded after one week of transplanting i.e. from 3rd week of July (29th standard week). The incidence was observed in the field up to 4th week of October (42nd standard week) and it was in the range of 2.92 (3rd week of July) to 40.56 (3rd week of September) with an average of 19.27

per 4 cm^2 leaf area. The infestation disappeared then after till to the removal of crop. The mite population was gradually increased during 3rd week of July to 2nd week of August and reached to first peak (13.40 per 4 cm^2 leaf area) in 32nd standard week. The population declined slightly (12.88 per 4 cm^2 leaf area) in the next week during 3rd week of August. Thereafter, the population increased gradually and reached to the highest peak (40.56 per 4 cm^2) during 3rd week of September. The mite population gradually decreased then after and escaped from the field in the month of November.

The study on population dynamics on *T. urticae* on different crops was carried out by various researchers, but on brinjal it was scanty. Kumar and Sharma (1993) noticed higher incidence of mites during May in okra. According to Patel *et al.* (1993), mites reached at peak during May-June in okra. Rai *et al*. (1999) reported the peak activity of mite during May in okra in Gujarat. Kapoor *et al.* (2000) observed the higher incidence of mites during last two weeks of August in okra. Gulati (2004) noticed the peak activity of mites during month of June and October in okra. Chundawat *et al.* (2006) reported that the population level of *T. cinnabarinus* was zero up to 18th standard week (40 DAT) in brinjal. Patil and Nandihali (2008) noticed the incidence of red spider mite up to 125 DAT in brinjal at Dharwad. Monica *et al*. (2014) at Pusa Bihar noticed the peak activity of mite during month of June-July in brinjal.

In present investigation, mite population was appeared from 3rd week of July and noticed up to the last week of October. The activity of pest was higher during last week of August to first week of September. Thus, above reports of Kapoor *et al.* (2000) and Gulati (2004) are strongly in accordance with present investigation. The population of mites remained up to the 4th week of October in present study. Thus, the report of Patil and Nandihali (2008) is more or less corroborating present findings. However, the reports of Kumar and Sharma (1993), Patel *et al.* (1993), Rai *et al*. (1999), Chundawat *et al.* (2006) and Monica *et al*. (2014) are not tally with present findings might be due to different location, sowing time and climatic condition.

Correlation study

The results on correlation between mite population and different weather parameters (Table 2) revealed that out of 9 weather parameters [Bright Sunshine Hours (BSS), Maximum Temperature (MaxT), Minimum Temperature (MinT), Mean Temperature (MeT), Morning Relative Humidity (MoRH), Evening Relative Humidity (EvRH), Mean Relative Humidity (MeRH), Rainfall (RF) and Wind Speed (WS)], the population of mite had significant positive correlation with MinT, MoRH, EvRH and MeRH with correlation coefficient (r) value of 0.476*, 0.621**, 0.461* and 0.515*, respectively. The mite population had negative correlation with BSS, MaxT, RF and WS but the result was non-significant. Similarly, mite population had positive correlation with MeT but the result was non-significant, indicating the negligible role of these weather parameters on incidence of mite population. The correlation between weather parameters and mites incidence was reported by various research workers.

Shaikh (1999) reported negative correlation between mite population and temperature, whereas positive correlation between mite population and relative humidity in

okra. Bhagat and Singh (1999) concluded that rainfall was the major factor which contributed to the low population of two spotted spider mite on brinjal. Kapoor *et al.* (2000) noticed the higher mite population in okra, when maximum and minimum temperatures were higher. According to Prasad and Singh (2003), low rainfall and humidity as well as high temperature enhanced the activity of mite in okra. Mandal *et al*. (2006) reported that the activity of the red spider mite 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. Chinniah *et al.* (2007 and 2009) found positive correlation between maximum temperature and mite population in okra, whereas the relative humidity and rainfall had significant negative correlation with mite population. They also reported that minimum temperature, wind velocity and sunshine hours had no significant effect on the population dynamics of two spotted spider mite. Kanika and Monika (2013) noticed positive significant relation between temperature and mites population in brinjal, while non-significant positive relationship was obtained between total amount of rainfall and population of mites. Monica *et al*. (2014) reported that maximum temperature maintained highly positive correlation and relative humidity recorded at 0700 hrs showed significant negative correlation effect on mite population in brinjal. The relative humidity recorded at 1400 hrs and rainfall showed negative and a non significant effect on the mite population.

Thus, above reports of Shaikh (1999) for positive correlation between mites and relative humidity; Bhagat and Singh (1999) and Prasad and Singh (2003) for adverse effect of rainfall on mites; Kapoor *et al.* (2000) for positive correlation with minimum temperature; Mandal *et al*. (2006) for negative correlation with maximum temperature and positive correlation with minimum temperature, morning and afternoon relative humidity; Chinniah *et al.* (2007 and 2009) for negative correlation with rainfall and Kanika and Monika (2013) for positive significant relation between temperature and mites population are strongly supporting present findings. However, the report of Monica *et al*. (2014) differed from present results, might be due to difference in crop seasons, location and ecosystem.

CONCLUSION

From, the results, it can be seen that the incidence of mite was in the range of 2.92 to 40.56 per 4 cm^2 area of leaf with an average of 19.27 during the cropping period. The mite population reached to first peak (13.40 per 4 cm^2 leaf area) during 2nd week of August and the highest peak (40.56 per 4 cm^2 leaf area) during 3rd week of September. The correlation studies revealed that population of mite had significant positive correlation with minimum temperature, morning relative humidity, evening relative humidity and mean relative humidity. The mite population had negative correlation with bright sunshine hours, maximum temperature, rainfall and wind speed, whereas positive correlation with mean temperature, but the results were non-significant.

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Table 1: Population dynamics of mite, *T. urticae* in brinjal

Months and Weeks		Weeks After Transplanting	Standard Week	Number of Mite/4 cm^2 Leaf Area
July	**III**	1	29	2.92
	IV	2	30	5.88
August	**I**	3	31	9.76
	II	4	32	13.40
	III	5	33	12.88
	IV	6	34	22.08
September	**I**	7	35	28.96
	II	8	36	32.16
	III	9	37	40.56
	IV	10	38	35.76
October	**I**	11	39	30.20
	II	12	40	15.12
	III	13	41	11.80
	IV	14	42	8.36
November	**I**	15	43	-
	II	16	44	-
	III	17	45	-
Mean		-	-	**19.27**

Table 2: Relationship between weather parameters and population of *T. urticae* in brinjal

Weather Parameters	Correlation Co-efficient (r)
Bright Sunshine Hours, hrday-1 (BSS)	-0.284
Maximum Temperature, ^{0}C (MaxT)	-0.302
Minimum Temperature,^{0}C (MinT)	0.476*
Mean Temperature, ^{0}C (MeT)	0.064
Morning Relative Humidity, %(MoRH)	0.621**
Evening Relative Humidity, % (EvRH)	0.461*
Mean Relative Humidity, % (MeRH)	0.515*
Rainfall, mm/day (RF)	-0.085
Wind Speed, kmhr-1 (WS)	-0.114

**** Significant at 0.05% level of significance***
***** Significant at 0.01% level of significance***

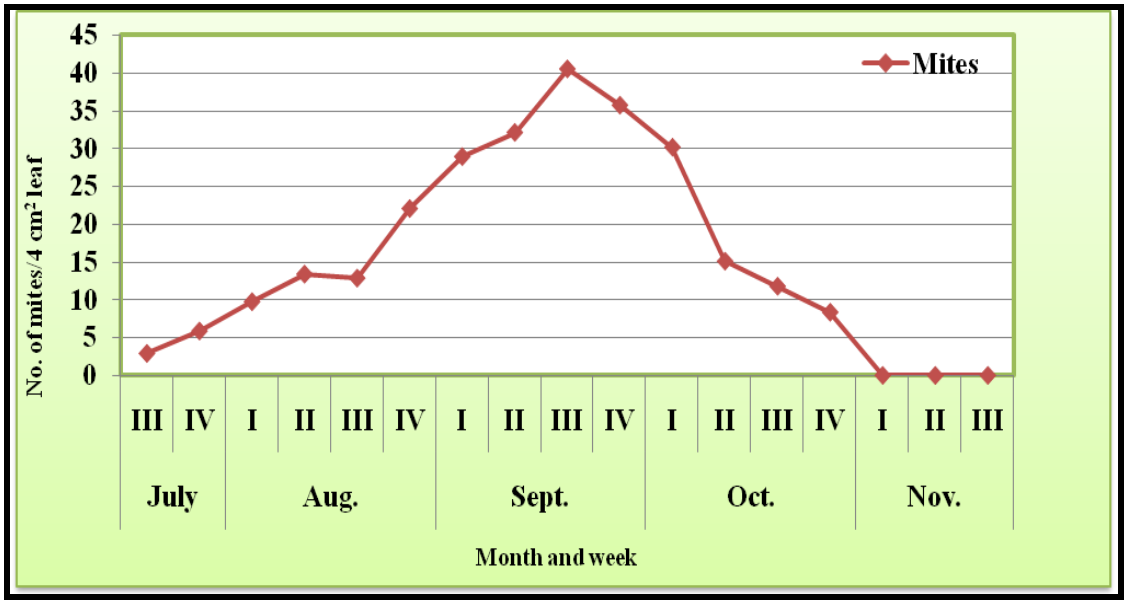

Figure 1: Population dynamics of T. urticae in brinjal

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