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Seasonal incidence of red spider mite, *Tetranychus urticae* Koch on brinjal, *Solanum melongena* Linnaeus

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Abstract
The present study entitled, seasonal incidence of red spider mite, *Tetranychus urticae* Koch on brinjal Solanum melongena Linnaeus was carried out during *rabi* 2020-2021. During the seasonal incidence study, mite incidence was noticed in 1st standard metrological week (0.45 mites/ sq.cm/leaf). Highest mites population found in 3rd week of April *i.e.* 16th standard metrological week with 15.44 mite per 1 cm^2 leaf area. Highly significant positive correlation was noticed between incidence of mites and maximum temperature (r = 0.851**) and minimum temperature (r = 0.636**). However, highly significant negative correlation was noticed between mite incidence and morning relative humidity (r = -0.951**) as well as evening relative humidity (r = -0.861**). The correlation coefficient showed significant positive relation between mites population and bright sunshine hours (r = 0.572*) whereas, significant negative correlation was noticed between mite population and rainfall (r = -0.491*).

Keywords: Red spider mite, *Tetranychus urticae* Koch, Brinjal, Seasonal incidence

Introduction
Brinjal (*Solanum melongena* Linnaeus) is an annual vegetable crop belonging to Solanaceae family. It is also known as eggplant, aubergine, garden egg, baingan, ringan, vangi and more names. Brinjal (*S. melongena L.*) is originated in India, where a wide range of wild kinds and land races exist (Thompson and Kelly, 1957) [11]. The edible fruits of brinjal contain 92.7 per cent water, 1.1 per cent protein, 0.02 per cent fat, 0.54 per cent ash and 5.5 per cent carbs (Shanmugavelu, 1989) [9]. Unripe fruits are largely eaten as vegetables in the country due to their nutritious content, which includes minerals like iron, phosphorus, calcium and vitamins such as A, B and C. The fruit is a fantastic cholesterol lowering agent. Brinjal also contains a lot of dietary fiber, which helps to lower the risk of coronary heart disease (Wagner, 2006) [13].
Although brinjal is produced all round year, it is attacked by a variety of insect and non-insect pests from the nursery stage until harvest. It is attacked by 44 pests (Lal, 1975) [4]. Besides these, important insects pests includes shoot and fruit borer, leaf hoppers, stem borer, leaf webber, aphids, whitefly, thrips and non-insect pest such as mites, particularly red spider mites are among the greatest bottlenecks in brinjal productivity (Rizvi, 1996) [8]. Tetranychid mites have been found on brinjal in 25 different species from around the world (Bolland *et al.*, 1998) [1]. A two spotted spider mite *T. urticae* attacking brinjal, is one of the most important arthropod pest that devastates the crop's output. It has now become a severe threat to the cultivation of brinjal, *S. melongena*. Resulting in yield reductions of up to 31%. Due to high reproductive potential and extremely short life cycle, combined with frequent acaricide applications this mite has developed resistance to almost all conventional pesticides in vogue (Chiasson *et al.*, 2004; Van Leeuwen *et al.*, 2005) [2, 12].
In light of the foregoing facts and the scarcity of related knowledge on spider mites on brinjal, the investigation was conducted on seasonal incidence of red spider mite, *Tetranychus urticae* on brinjal *Solanum melongena* Linnaeus.

Materials and Method
Seasonal incidence of red spider mite, *Tetranychus urticae* on brinjal *Solanum melongena* Linnaeus. Was studied at Post Graduate Research Farm, Department of Agril. Entomology, M.P.K.V., Rahuri during *Rabi* season of 2020-21. Brinjal variety Gaurav was sown in 100 m^2 (15.5 m x 6.5 m) plot with the spacing of 60 cm x 45 cm. The crop was raised by following standard recommended agronomical practices except acaricidal spray application.

For recording observations, whole plot was divided into three equal sectors (each of 4.5 m x 4.5 m) and five plants were selected randomly from each sector. Mite population was recorded from three leaves (upper, middle and lower) of each randomly selected and tagged plants in each sector. The mite population was recorded in 1.0 cm^2 (1.0 cm x 1.0 cm) area per leaf using 10x lens. The observations started from first appearance of pest and continued till the harvest of the crop at weekly interval. The whole experimental plot was kept free from pesticide applications. The data on mite population was correlated with different meteorological parameters *viz.* Temperature (maximum and minimum), relative humidity (morning and evening) sunshine hours, and rainfall following standard procedure.

Results and Discussion

The results pertaining to seasonal incidence of red spider mite, *Tetranychus urticae* on brinjal *Solanum melongena* Linnaeus are presented in Table 1 and Fig. 1 and correlation between field incidence of red spider mite, *Tetranychus urticae* on brinjal *Solanum melongena* Linnaeus and weather parameters is presented in Table 2.

Seasonal incidence

It was observed from data that, mite incidence was started in 1st standard metrological week (0.45 mites/ sq.cm/leaf) and lasts upto harvesting of the crop *i.e.* 17th standard metrological week (15.22 mites/ sq.cm/leaf). Mite population ranged from 0.05-15.44 mites/ sq.cm/leaf during the crop growth period.

Minimum population of mites was noticed in the 2nd standard metrological week *i.e.* 2nd week of January and which may be due to the presence of rainfall. Afterwards, population of mites gradually increased upto 11th standard metrological week i.e. 3rd week of March (10.62 mites/ sq.cm/leaf) and reached to its peak (15.44 mites/sq.cm/leaf) during 16th standard metrological week i.e. 3rd week of April. During this period, the maximum and minimum temperature, morning and evening relative humidity, bright sunshine hours and rainfall were 37.7 and 23.5 ºC, 57 and 16%, 9.7 hr. /day and 0.00 mm, respectively.

Results of the present finding are in close conformity with Sing *et al.* (2018) [10] who also noticed maximum population of mites in 18th standard metrological week. Similarly, the results of present finding on seasonal incidence of mites are corroborated with the finding of Puttaswamy and Channabasavanna (1983) [6] and gave support to data.

Correlation of mite population with weather parameters

The data pertaining to correlation between incidence of mites and weather parameter is presented in Table 2. Highly significant positive correlation of mite incidence was noticed with maximum temperature (r = 0.851**) and minimum temperature (r = 0.636**). However, highly significant negative correlation was noticed between mite incidence and morning relative humidity (r = -0.951**) as well as evening relative humidity (r = -0.861**). The correlation coefficient showed significant positive relation between mites population and bright sunshine hours (r = 0.572*) whereas, significant negative correlation was noticed between mite population and rainfall (r = -0.491*).

According to Puttaswamy and Channabasavanna (1983) [6], increased mite population was associated with periods of low rainfall, low relative humidity, and high temperature. Only the maximum and minimum temperatures had a positive and significant relationship with the mite population, according to Rajkumar *et al.* (2005) [7], whereas rainfall, morning and evening relative humidity had a negative and significant relationship. The higher mite population was observed on jasmine from March to May, which could be attributed to a lack of rain and dry weather. These results are in conformity with present finding. Temperature and sunshine hours were found to have a significant positive correlation with the mite pest on okra, while relative humidity and rainfall were found to have a negative correlation by Kumar *et al.* (2015) [3]. According to Patel *et al.* (2020) [5], brinjal mites had a significant positive correlation with maximum and minimum temperature, but a significant negative correlation with morning and evening relative humidity. Which is in support of the current findings.

Table 1: Seasonal incidence of red spider mite, *Tetranychus urticae* on brinjal under field condition

S.M.W. 2020-21	Number of mites/sq. cm/leaf	Temperature (^{0}C)		R.H. (%)		Bright Sunshine hour (hr./day)	Rainfall (mm)
		Maximum	Minimum	Morning	Evening		
50	0.00	27.7	18.0	84	47	4.1	0.0
51	0.00	28.1	12.3	88	36	8.0	0.0
52	0.00	27.8	12.9	87	42	8.5	0.0
1	0.45	27.7	17.7	85	44	4.8	0.0
2	0.05	28.2	18.3	91	44	6.1	20.6
3	1.98	30.1	17.0	84	37	8.0	0.0
4	2.30	30.2	14.2	86	34	8.8	0.0
5	4.30	28.5	12.6	81	34	8.3	0.0
6	4.40	28.3	11.1	80	27	9.6	0.0
7	6.30	30.4	15.3	79	31	8.6	0.0
8	1.20	29.2	15.4	85	34	8.9	7.2
9	7.00	33.1	16.4	75	21	9.8	0.0
10	8.90	35.0	15.6	71	20	9.2	0.0
11	10.62	35.9	17.3	70	21	8.7	0.0
12	1.10	33.7	19.4	77	31	7.4	23.4
13	7.40	37.4	18.5	70	14	9.5	0.0
14	9.80	37.8	21.2	68	15	9.5	0.0
15	12.33	37.0	23.8	60	19	7.8	0.0
16	15.44	37.7	23.5	57	16	9.7	0.0
17	15.22	38.4	25.0	50	17	9.4	0.0

***Source*:** Observatory AICRP on water management M.P.K.V., Rahuri

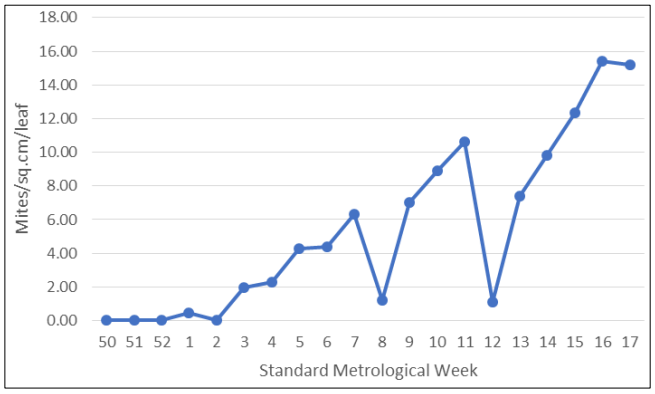

Fig 1: Seasonal incidence of red spider mite, *T. urticae* on brinjal

Table 2: Correlation between field incidence of red spider mite, *Tetranychus urticae* and weather parameters

Sr. No.	Weather parameter	Correlation coefficient
1	Maximum temperature (^{0}C)	0.951**
2	Minimum temperature (^{0}C)	0.636**
3	Morning relative humidity (%)	-0.951**
4	Evening relative humidity (%)	-0.961**
5	Bright sunshine hour (hr/day)	0.572*
6	Rainfall (mm)	-0.491*

*Significant at 5% d.f. (r= 0.482) ** Significant at 1% d.f. (r= 0.606)

Conclusion

The knowledge of seasonal incidence of red spider mite, *Tetranychus urticae* on brinjal *Solanum melongena* Linnaeus can be utilized for effective management these pest in Maharashtra. The mite incidence was started in 1st standard metrological week and lasts upto harvesting of the crop. Highest mites population found in 3rd week of April i.e. 16th standard metrological week. Highly significant positive correlation was noticed between incidence of mites and maximum temperature and minimum temperature. However, highly significant negative correlation was noticed between mite incidence and morning relative humidity as well as evening relative humidity. The correlation coefficient showed significant positive relation between mites population and bright sunshine hours whereas, significant negative correlation was noticed between mite population and rainfall.

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