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SEASONAL INCIDENCE OF *TETRANYCHUS URTICAE* KOCH ON BRINJAL UNDER PROTECTED CULTIVATION

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ABSTRACT

The two-spotted spider mite *Tetranychus urticae* Koch is a key pest of many vegetable crops under protected cultivation. The seasonal incidence of two-spotted spider mite on brinjal in four seasons was studied under protected cultivation in 2020 and 2021. Two peaks were observed in mite population during the period of investigation. First peak was observed from mid-September i.e. during 38th and 39th SMW (5.4 to 5.6 mites/ 2 cm leaf area) to first fort night of October i.e. 40th, 41st and 42nd SMW (5.0 to 5.4 mites/ 2 cm leaf area), in 2020. Second peak was observed during April i.e. 15th, 17th and 18th SMW (5.0 to 5.8 mites/ 2 cm leaf area) to May i.e. 20th, 21st and 22nd SMW (5.0 to 6.0 mites/ 2 cm leaf area) in 2021. The multiple correlation coefficients between the population and abiotic factors were worked out from July 2020 to June 2021. The active stages were found significantly positively correlated with maximum temperature and non-significantly positively correlated with minimum temperature. The morning relative humidity was non-significantly negatively correlated with the population of eggs and significantly negatively correlated with active stages.

Key words: Abiotic factors, brinjal, correlation coefficient, mites, population, protected cultivation, seasonal abundance, *Tetranychus urticae*, two-spotted spider mite, vegetable

Brinjal is one of the most common vegetable grown throughout the country. It is reported to have been cultivated on an area of 730 thousand ha throughout India in 2018 (Anonymous, 2018). Near about 20 species of insect and mite-pests have been reported to infest brinjal in India (Latif et al., 2009). In present scenario, two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychideae) is proved to be a key pest of brinjal and causes considerable damage in various other solanaceous crops such as tomato, capsicum and cucumber under protected cultivation. *T. urticae* is a worldwide pest causing serious damage in vegetable, ornamental and fruit crops. Mites suck plant sap resulting in loss of chlorophyll and accumulation of dust on woven webs which interferes with photosynthesis resulting in a significant loss of yield. The management of mites by chemical control overweigh the other management methods. However, the indiscriminate and excessive use of chemical pesticides has caused several problems viz. resistance development against insecticides/acaricides, resurgence, destruction of natural enemies, environmental degradation and chemical residue (Kumar et al., 2013). Seeing the major negative consequences of attack by *T. urticae,* there is a need to study the seasonal abundance of *T. urticae* on brinjal under protected cultivation in different seasons and its relationship with abiotic factors. In Punjab, four crops are grown in February, April, August and November. No systematic work on the seasonal incidence of *T. urticae* and its relationship with temperature and relative humidity was carried out on brinjal under protected cultivation in Punjab, so the present research was planned with the objective to study seasonal incidence and fluctuations of mite population species by abiotic factors.

MATERIALS AND METHODS

Brinjal hybrid (PBHR-42) was transplanted at Entomological Research Farm, Punjab Agricultural University, Ludhiana (30°53.59N, 75°48.37E) as per the Package of Practices for cultivation of vegetable crops. Four crops of brinjal were transplanted; first in July (29.07.2020), second in November (27.11.2020), third in February (25.02.2021) and fourth in April (28.04.2021). The observations were made starting 15 days after transplanting and continuing until the crop was harvested at weekly intervals. Population counts of eggs and active stages of mites/2 cm leaf area were recorded from randomly chosen five plants per plot which have three leaves in the top, middle, and bottom of the canopy. The leaf samples were brought to the laboratory and checked under stereo zoom binocular microscope (Carl Zeiss Discovery V 8). The different stages of mite (eggs and active stages) were recorded

separately. The population data of *T. urticae* was also correlated to the weather parameters i.e. mean maximum and minimum temperature, maximum and minimum relative humidity at weekly intervals during crop season. Multiple correlation was worked out between mite population and abiotic parameters and analyzed using the SPSS software (p=0.05, 0.01).

RESULTS AND DISCUSSION

The study analysed the seasonal incidence of phytophagous mite belonging to family Tetranychidae, two-spotted spider mite, *T. urticae*. It was observed that the population of *T. urticae* occurred on brinjal throughout the period of investigation with first peak of *T. urticae* population was observed in April i.e. 18th standard meteorological week (SMW) and in May 21st SMW in 2021. The second peak in population of active stages during mid-September i.e. during 38th and 39th SMW to first fortnight of October i.e. 40th, 41st and 42nd SMW in 2020. However, maximum population of eggs of *T. urticae* was observed in October (8.0 to 11.60 eggs/ 2 cm leaf area) followed by September (6.4 to 9.4 eggs/ 2 cm leaf area), May (6.0 to 7.60 eggs/ 2 cm leaf area) and April (5.8 to 6.8 eggs/ 2 cm leaf area) (Fig. 1, 2). During 38th (SMW), the maximum, minimum temperature, morning relative humidity (MRH) and evening relative humidity (ERH) were

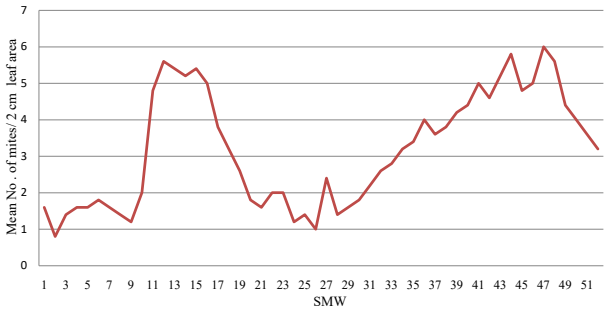

Fig. 1. Seasonal incidence of active stages of *T. urticae* (2020-2021)

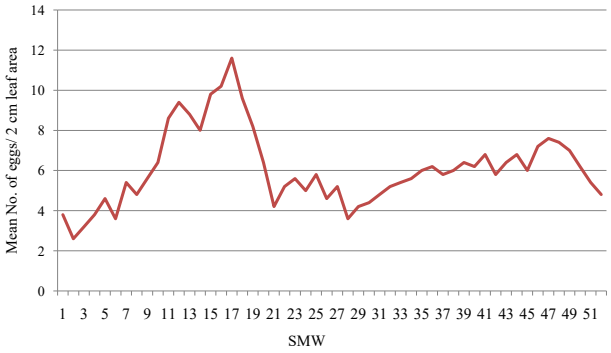

Fig. 2. Seasonal incidence of eggs of *T. urticae* (2020-21)

35.4°C and 25.5°C, 86 and 53%, respectively. During 21st SMW, the maximum and minimum temperature, MRH and ERH was 36.9°C and 21.3°C, 49 and 23%, respectively. The multiple correlation coefficients between the population of active stages and eggs of *T. urticae* with the abiotic factors i.e. maximum and minimum temperature, morning and evening relative humidity, average temperature and average relative humidity were worked out in four brinjal crops from July 2020 to June 2021. The population of eggs and active stages of *T. urticae* was found statistically positively correlated with maximum temperature and non-significantly positively correlated with minimum temperature. The morning RH was non-significantly negatively correlated with the population of eggs and significantly negatively correlated with active stages of *T. urticae*. However, the evening RH was significantly negatively correlated with the population of eggs and active stages of *T. urticae* (Table 1).

Kumar et al. (2013) observed that maximum temperature had positive correlation (r= +0.701) with incidence while relative humidity (r= -0.471) and rainfall (r= -0.398) had a significant negative correlation. Similar results were also reported by Meena et al. (2013) who reported that maximum and minimum temperature had a significant positive correlation with mite incidence. Monica et al. (2014) observed that population of *T. urticae* on brinjal showed significant positive correlation with maximum temperature and significant negative correlation with the relative humidity. However, Shukla et al. (2015) observed that eggs *T. urticae* showed a significant positive correlation with average temperature (r= 0.690) and relative humidity (r= 0.671). Similarly, the mobile stages of *T. urticae* showed significant positive correlation with average temperature (r= 0.678) and relative humidity 51 (r= 0.574). Premlatha et al. (2016) observed that maximum temperature had significant positive correlation (r= 0.603) while relative humidity (r=0.242) had negative correlation with *T. urticae* population in tomato ecosystem. Sonika et al. (2017) reported that peak in *T. urticae* on brinjal was observed at the end of the last week of September i.e., 5.19 and 5.85 mites/ square cm leaf under field and screen house conditions, respectively. The *T. urticae* in brinjal showed positive correlation with maximum and minimum temperature whereas other weather factors viz., morning relative humidity, evening relative humidity and rainfall had negative correlation (Rao et al., 2018). Saloni et al. (2022) reported that *T. urticae* on capsicum showed significantly positive correlation with maximum,

Table 1. Multiple correlation coefficients incidence of *Tetranychus urticae* vs. weather factors

Population	Maximum temp. (°C)	Minimum temp. (°C)	Morning relative humidity (%)	Evening relative humidity (%)	Mean temperature (°C)	Mean humidity (%)
Eggs	0.359**	0.023	-0.114	-0.582**	0.188	-0.430**
Active	0.591**	0.249	-0.575**	-0.660**	0.424**	-0.711**

*significant at p= 0.05; **significant at p=0.01

minimum and mean temperature but negative correlation with morning relative humidity. Kumar et al. (2022) observed that adult *Tetranychus macfarlanei* was negatively correlated with morning relative humidity (-0.304*) and positively correlated with maximum and minimum temperature (0.500** and 0.366*), respectively. Ayyanar et al. (2022) reported that *T. urticae* on brinjal was significantly positively correlated with maximum and minimum temperature while it was significantly negatively correlated with morning and evening relative humidity. Tabasum and Buhroo (2022) reported peak activity of *T. urticae* on brinjal in September in Kashmir.

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AUTHOR CONTRIBUTION STATEMENT

Conceptualization and designing of the research work (PK and MBB); Execution of experiments and data collection (DK); Analysis of data and interpretation (PK and DK); Preparation of manuscript (PK).

CONFLICT OF INTEREST

No conflict of interest.

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