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Short Communication

Population buildup of red spider mite, *Oligonychus coffeae* N. in tea

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Abstract

The present investigations entitled "Population buildup of red spider mite, *Oligonychus coffeae* N. in tea" were undertaken from May, 2022 to April, 2023 at Palampur, Himachal Pradesh in conventionally managed tea plantations and organic tea plantations. The mite population was maximum in conventional farming system (5.22 to 19.26/ per leaf) as compared to organic farming system (2.57 to 6.72). The peaks of activity were observed during May and October. Leaf infestation was more in conventional (61 - 99 %) as compared to organic farming system (39 - 82%). Infestation index was also observed highest in conventional tea plantations as compared to organic tea plantations. Population was at its minimum during December - February. Correlation studies revealed that the mite population was positively correlated with temperature (max. & min.) and sun - shine hours, but negatively correlated with relative humidity and rainfall.

Key words: *Oligonychus coffeae*, tea, seasonal incidence

Tea, *Camellia sinensis* (L.) is a perennial plantation crop which is cultivated in more than 50 countries all over the world (Idris *et al.* 2020). India is the second largest tea producer and tea is grown on an area of about 5.79 lakh ha in India (Babu 2021) with production of 1.35 million metric tonne (PIB, Ministry of Commerce and Industry 2023). Tea production has been hampered by numerous constraints, among which insect and mite pests are considered the most damaging factors (Yang *et al.* 2022). Globally, over 1031 insect and mite pest's species have been recorded to be associated with tea (Hazarika 2009). *Oligonychus coffeae* is an economically important mite pest of agricultural and ornamental crops (Haque *et al.* 2007). The severe infestation of *O. coffeae* could cause 17 - 46 per cent of crop loss because of its year - round presence (Bharathi *et al.* 2022).

The observations on build-up of phytophagous tea mite complex population were recorded at Palampur in University tea garden Lat: 32.1067^{0}N; Long: 76.5517^{0}E (organic tea plantation) and Rajpur Lat: 32.086^{0}N; Long: 76.5344^{0}E (conventionally managed tea plantation) during second week of every month, throughout the year starting from May 2022. One hundred leaves from upper, middle and lower canopy of ten randomly selected tea bushes were collected in a polyethylene bag and brought to laboratory for microscopic examination. The motile stages of the mites were counted under stereo - zoom microscope. Based on the total number of leaves observed (100 leaves), per cent leaf infestation was worked out as follow:

$$\text{Leaf infestation \%} = \frac{\text{Number of leaves with mites}}{\text{Total number of leaves observed}} \times 100$$

Based on the mite population count and leaf infestation, infestation index was determined as suggested by Bhalla and Verma (1991) with slight modifications.

$$\text{Infestation index} = \frac{\text{Mean mite population} \times \text{per cent leaf infestation}}{100}$$

Also, a relationship between mite population and abiotic weather factors namely, mean of monthly temperature (^{0}C), relative humidity (%), sun shine (hrs) and cumulative monthly rainfall (mm) was worked out. For this, daily meteorological data were procured from the Agro - meteorology section of the

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Population buildup of *Oligonychus coffeae* on tea at Palampur in conventional and organic tea plantation was recorded from May 2022 to April 2023 and findings have been presented in Table 1 and the effect of abiotic factors on its buildup was assessed. Observations recorded on population build-up of *O coffee* revealed them to differ significantly in conventional and organic tea plantations, with the mite population being higher in conventional farming system (Table 1). Observations initiated during May 2022 revealed the corresponding population levels of 19.26 and 6.72 mites / leaf in conventional and organic tea plantations. A declining trend in population under both the farming systems was observed up to August 2022 with the population levels of 7.29 and 2.57 mites / leaf in respective farming systems. During September 2022 rise in population took place and second peak of population was evident during October 2022 with the corresponding population levels of 13.42 and 5.49 mites / leaf. Thereafter, the population declined and reached the minimum levels in February 2023 with the population count of 5.22 and 2.63 mites / leaf in conventional and organic tea plantation systems, which increased to 14.45 and 6.26 mites / leaf during April 2023.

Leaf infestation in tea by red spider mite varied from 61 - 99 per cent in conventional and 39 - 82 per cent in organic farming systems with the peak of leaf infestation occurring during June and May, 2022 in respective farming systems. Based on the mite population and leaf infestation, infestation index was worked out and is presented in Fig 1. It was observed that the value of the infestation index was maximum in June 2022 in conventional (18.71) and during May 2022 in organic (5.51) farming systems. Thereafter, a decline was set in and a peak was evident during October 2022 with the corresponding values of 11.68 and 3.07.

Correlation of *O. coffeae* with abiotic factors

The relationship deduced between mite population and different environmental factors presented in Table 2 revealed that a positive correlation with the maximum and minimum temperature and sun - shine hrs was evident. However, it was significant with maximum temperature (r = 0.6131, P = 0.05) in conventional tea plantations only. Whereas, it showed negative relationship with rainfall and relative humidity, being significant in organic tea plantations with relative humidity (r=-0.6012).There exists a positive relationship between mite population and temperature and sunshine hrs. Whereas, the population was affected negatively by rainfall and relative humidity. These findings are in conformity to the findings of Dantanarayana and Ranaweera (1972), Choudhary *et al.* (2006), Ahmad *et al.* (2012),

Table 1. Population buildup of *Oligonychus coffeae* in tea at Palampur in conventional and organic farming systems

Month of observation	Conventional tea plantation		Organic tea plantation	
	Mite population ± SE / leaf	Leaf infestation (%)	Mite population ± SE / leaf	Leaf infestation (%)
May 2022	19.26 ± 1.73	95	6.72 ± 0.86	82
June 2022	18.90 ± 1.50	99	6.37 ± 0.99	70
July 2022	8.05 ± 1.14	78	2.68 ± 0.68	41
August 2022	7.29 ± 1.23	68	2.57 ± 0.67	41
September 2022	12.26 ± 1.33	86	3.03 ± 0.82	39
October 2022	13.42 ± 1.51	87	5.49 ± 1.08	56
November 2022	7.00 ± 0.96	76	4.09 ± 0.84	54
December 2022	5.22 ± 1.05	67	2.45 ± 0.60	41
January 2023	5.73 ± 1.03	63	2.98 ± 0.70	46
February 2023	5.22 ± 0.10	61	2.63 ± 0.73	45
March 2023	11.37 ± 1.54	83	4.61 ± 0.89	58
April 2023	14.45 ± 1.83	84	6.26 ± 0.83	57
P = (0.05), Independent t-test		Significant		

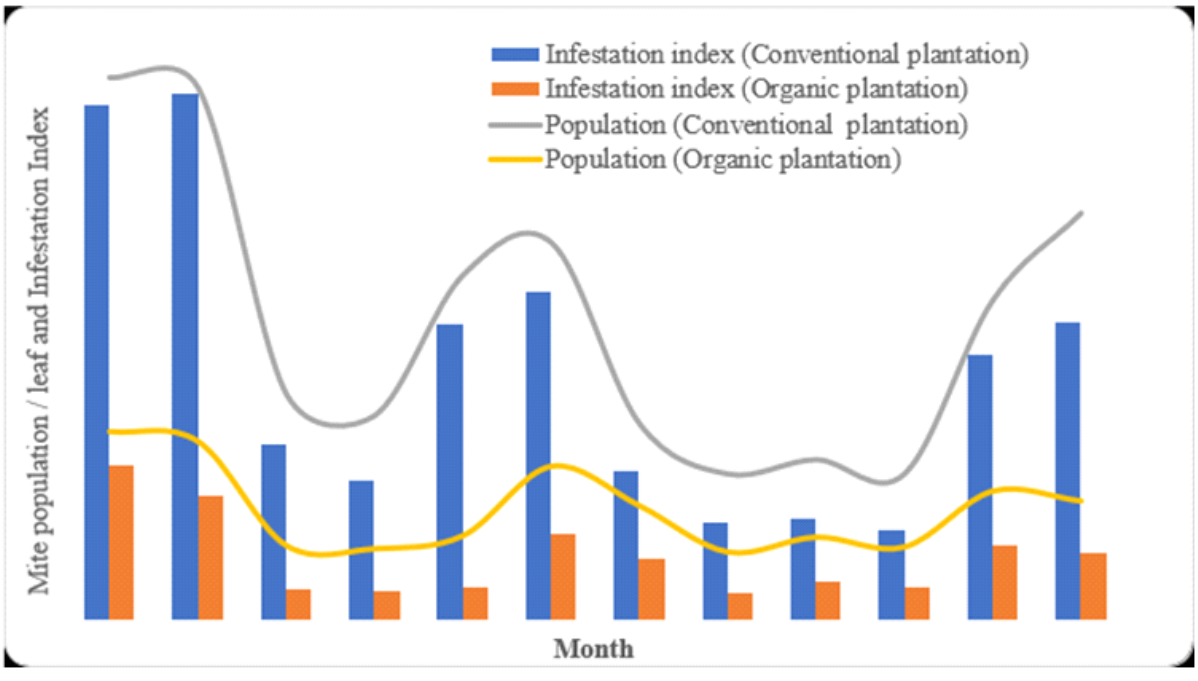

Figure 1: Population buildup of *O. coffeae* in conventional and organic farming systems at Palampur

Table 2. Correlation coefficient (r) between abiotic factors and mean mite population in conventional and organic farming systems

Abiotic factor		Correlation Coefficient (r)	
		Conventional tea plantation	Organic tea plantation
Temperature (°C)	Maximum	0.6131*	0.5072
	Minimum	0.4725	0.2931
Relative humidity (%)	Morning	-0.4647	-0.6012*
	Evening	-0.4564	-0.2837
Rainfall (mm)		-0.0001	-0.3191
Sunshine (hrs)		0.0455	0.3157

* Significant at P = 0.05

Kachhawa and Rahman (2013).

It can be concluded that population buildup of *Oligonychus coffeae* studied under conventional and organic farming system revealed the population to vary from 5.22 to 19.26 and 2.45 to 6.72 in respective farming system at Palampur. The peaks of activity were observed during May and October. Population was at its minimum during December - February. Leaf infestation was more in conventional as compared to organic farming system.Infestation index also revealed its value to be more in conventional farming (3.18 - 18.71%) with the value of 1.00 to 5.51 in organic farming system. The peaks of index occurred during June - October in both the farming systems. The mite population was positively correlated with temperature (maximum & minimum) and sun - shine hrs, but it was related negatively with relative humidity (morning & evening) and rainfall.

Conflict of interest: The authors declare no conflict of interest in this research article.

References

Ahmed M, Mamun MSA, Hoque MM and Chowdhury RS. 2012. Influence of weather parameters on red spider mite-a major pest of tea in Bangladesh. Journal of Science and Technology **19:** 47-53.

Anonymous. 1991. Final report 1988 – 1991. Department of Entomology, Dr YS Parmar University of Horticultural and Forestry, Nauni, Solan, India.

Babu A. 2021. Integrated pest management in tea: recent advances and future challenges Indian Journal of Entomology **83:**133-140.

Bharathi NS, Rabeesh TP, Mahendran P and Sujatha K. 2022. Toxicity of commonly using pesticides against the eggs and adults of *Helopeltis theivora* (Hemiptera: Miridae) and *Oligonychus coffeae* (Acarina: Tetranychidae) in tea. Journal of Entomological Research **46:** 1063-1068.

Choudhury P, Dutta BK and Bhattacharjee PC. 2006. Some ecological factors on population dynamics of red spider mite (*Oligonychus coffeae*, Nietner) and their control in the tea agro-ecosystem of Barak Valley, Assam, India. International Journal of Tea Science **5:** 31-41.

Dantanarayana W and Ranaweera DJW .1972. The effects of rainfall and shade on the occurrence of three mite pests of tea in Ceylon. Annals of Applied Biology **70:** 1-12.

Dinesh K and Sahidur R. 2015. Evolution of meteorological factors on incidence of red spider mite of tea, *Oligonychus coffeae* (Nietner) under the natural conditions of Assam. Asian Journal of Environmental Science **10:** 7-12.

Hazarika LK, Bhuyan M and Hazarika BN. 2009. Insect pests of tea and their management. Annual Review of Entomology **54:** 267-284.

Idris AL, Fan X, Muhammad MH, Guo Y, Guan X and Huang T. 2020. Ecologically controlling insect and mite pests of tea plants with microbial pesticides: a review. Archives of Microbiology **202:** 1275-1284.

PIB Ministry of Commerce & Industry. 2023. Several steps taken to boost the Indian tea industry, to address emerging challenges and to create a global brand https://pib.gov.in

Yang F, Wu Y, Dong F, Tu J, Li X, Dong Y, Hu X and Xie F. 2022. Current status and prospect of entomopathogenic fungi for controlling insect and mite pests in tea plantations. Journal of Applied Entomology **146:** 1041-1051.