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Seasonal Distribution Pattern of Spider Mites (Acari: Tetranychidae) Infesting Bamboos in Malappuram, Kerala

KEYWORDS: Spider mite, Tetranychidae, Seasonal fluctuation

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ABSTRACT *Spider mites belonging to the family Tetranychidae are highly polyphagous in nature and live on the undersides of leaves in colonies, being protected by the silken webs and inducing damage by puncturing the leaf tissue and sucking the plant sap. A study on the seasonal fluctuation in the population density of these mites on bamboos (Bambusa bambos (L.) Voss and Bambusa vulgaris var. striata) was carried out in the Calicut University Campus from November, 2012 to October, 2013 in the Malappuram district of Kerala. Results of the study indicated that the spider mite population was generally high on B. vulgaris var. striata when compared to that of B. bambos. The average number of the spider mites present per leaf of B. vulgaris var. striata was 7 where as it was 5.89 on B. bambos. The effects of temperature, relative humidity and rainfall on these mites were also studied.*

INTRODUCTION

Spider mites are one of the common pests of bamboos and these mites live in colonies under sheet of webbing on the underside of leaves. Feeding activity of these mites results in the development of chlorotic spots at the feeding sites, which often extend to the upper surface also. Prolonged, heavy infestations lead to yellowing or bronzing of the foliage and premature leaf drop similar to drought stress. Feeding, reproduction and development occur chiefly under dense webbing which also protects them from adverse environmental condition as well as from natural enemies (Saito, 1983).

Population density, depending on the number of individuals and the area occupied by them, represents not only a valid statistical parameter of abundance, but also an element of the biotic environment (Begon et al., 1989). Density is one of the factors regulating population abundance in arthropods (Green et al., 2002). In the present paper, seasonal fluctuations and population density of spider mites have been discussed, based on data collected during one year period of November, 2012 to October, 2013, on two species of bamboo viz. *Bambusa vulgaris var. striata* also known as Golden Bamboo, or Buddha's Belly Bamboo and *Bambusa bambos (L.) Voss* or Indian Thorny Bamboo growing in the Calicut University Campus of the Malappuram Dt. of Kerala.

MATERIALS AND METHODS

Samples of mite infested leaves were collected randomly from the bamboo plants at periodic intervals and transported to the laboratory in polythene bags for microscopic observation. Quantitative assessment of population density of individual mite species was made following Per Leaf Counting method. The leaf samples of each plant were immersed for 5-7 minutes in a petriplate containing 70% alcohol. The leaves were thoroughly washed in 70% alcohol to extract the entire mite population from the leaf surface. The mite specimens thus extracted from the leaves in to the petriplate were then examined under the stereo zoom microscope. In order to study the population density of individual species of mite, the numbers of different life stages viz. the eggs, nymphal stages and adults, were counted separately for each species.

RESULTS

Population density of spider mites on bamboo leaves

The population density of spider mite on bamboo leaves from 2012 to 2013 was expressed as average number of mites present per leaf as shown in Fig. 1. The average number of the spider mites present per leaf was 7 on *B. vulgaris var. striata* where as it was 5.89 on *B. bambos*. In general, the maximum population density of the species was contributed by the eggs, followed by the immatures. Adults showed the lowest density. The leaves of *B. vulgaris var. striata* showed more number of eggs and nymphs of spider mites rather than the adult individuals. Contrary to this, the leaves of *B. bambos* disclosed more number of adult spider mites than their eggs and immature stages.

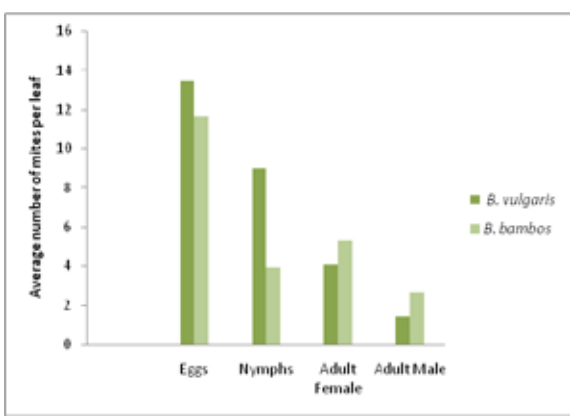

Fig 1: The average number of mites per leaf of *B. vulgaris var. striata* and *B. bambos* during 2012-2013.

Seasonal fluctuation of population density of spider mites

Table 1 shows the pattern of seasonal fluctuation of population density of the spider mite on *B. vulgaris var. striata* and *B. bambos*. As shown in the table, the mite population showed a gradual increase from November, 2012 to May, 2013 and then exhibited a drastic decline in June-July, 2013. From August onwards, the mite population density followed an increasing trend.

The number of mites present on both species of bamboos was found positively correlated to the increase in temperature (r = 0.79 for *B. bambos* and r = 0.83 for *B. vulgaris var. striata*). A weak negative correlation was found between relative humidity and mite population density on both *B. vulgaris var. striata* (r = -0.29) and *B. bambos* (r = -0.16).

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Table 1: Effect of Temperature and Relative Humidity on the number of mites on the leaves of *B. bambos* and *B. vulgaris var. striata*

Year	Season	Mean Temperature	Relative Humidity Mean	Number of Mites per leaf	
		(°C)	(%)	B. bambos	B. vulgaris
2012	Nov	29.6	71	7	14
	Dec	29.4	71.5	13	19
2013	Jan	29.2	69.5	23	33
	Feb	31.2	76.5	28	46
	Mar	31.4	73	49	52
	Apr	31.1	86	64	63
	May	31.35	81	80	80
	Jun	29.95	96	2	2
	Jul	27.2	84	3	4
	Aug	27.7	90	4	7
	Sep	28.1	85.5	5	6
	Oct	28.2	82	5	10

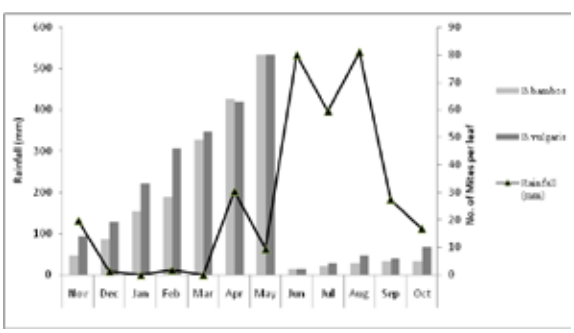

Fig 2: Effect of Rainfall on the number of mites in the leaves of *B. bambos* and *B. vulgaris var. striata*

Fig 2 depicts the effect of rainfall on mite population on the two bamboos. As the rainfall increased, the population of mites showed decreasing trend in both bamboo (r = -0.44 for *B. bambos* and r = -0.55 for *B. vulgaris var. striata*).

DISCUSSION:

Bamboo spider mites initially infest leaves along the midvein or edge of the leaf where a linear depression is typically found. This depression provides the proper nest building site (Saito, 1995). All life stages of these mites exist beneath a single web nest. This dense webbing is the main reason that these mites are difficult to control. These mites pierce individual plant cells on the underside of the leaf and suck out the cell contents causing the discoloration on the upper leaf surface (Evans, 1992). Leaf damage can impair photosynthesis and reduce plant vigor.

Seasonal changes in diversity and density of arthropods in tropical regions have been correlated with alterations in local environmental factors like temperature, rainfall and relative humidity (Klein et al., 2002; Philpott et al., 2006; Teodoro et al., 2008). A significant increase in spider mite population was observed with an increase in temperature during the present survey, thereby supporting the earlier findings of Stavrinides et al., 2010. Despite this, the mite population was not found significantly influenced by an increase in relative humidity. Boudreaux (1958) suggested that an increase in relative humidity would ensure a check in the population build up of spider mites. Though the hatching process was not found affected, the survival of newly emerged nymphs was found adversely affected by the moist atmosphere. The decrease in spider mite population observed during June and July, 2013 may be attributed to the impact of rainfall occurred during the monsoon season. Rainfall would probably lead to the washing of all the life stages of the mite from the leaf surface. Heavy rains generally exert a washing effect (Yaninek et al. 1989) on plant mites, including the spider mites, leading to a decline in their population. This is supported by the earlier findings of Onzo et al. (2005) and Hanna et al. (2005) who also reported that the abundance of mites would be decreased in periods of high rainfall. Rainfall patterns can also affect soil moisture levels, which are known to influence spider mite population levels.

Weather parameters, affect the spider mite population directly through physiological and mechanical ways and also indirectly through host quality changes (Knapp et al. 2006). After a sharp decline of population in June, a gradual increasing trend could be observed subsequently. Probably, this increasing trend would suggest the ability of the mites to get acclimatized with the less favorable weather conditions and gradually resuming multiplication after an initial decrease in numbers (Oomen, 1982).

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