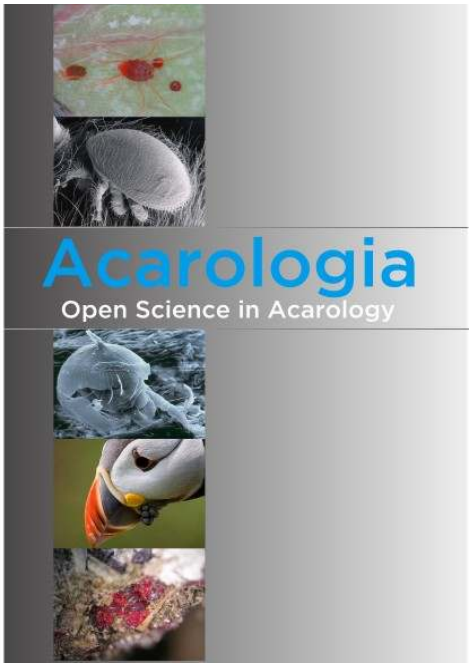

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INTRATREE VARIATION IN THE DISTRIBUTION OF THE TEA RED SPIDER MITE *OLIGONYCHUS COFFEAE* (NIETNER)

BY

B. BANERJEE *

SUMMARY

A marked variation exists in the distribution of the red spider mite *Oligonychus coffeae* (Nietner) in the upper, middle and lower zones of both shaded and unshaded teas. In the shaded tea, upper zone has the highest mite population, and this is followed by middle and lower zones. In unshaded tea middle zone has the highest mite population and the upper zone the least. All the three zones of shaded tea have less mites than the corresponding zones of unshaded tea. Leaf temperature and light penetration within the bushes appear to regulate the distribution of mites.

RÉSUMÉ

Une variation sensible existe dans la distribution du Tetranyque *Oligonychus coffeae* dans les zones supérieure, moyenne et inférieure des plantations de thé ombragées ou non. Dans les plantations ombragées, la zone supérieure a les populations les plus fortes puis la zone moyenne et enfin la zone basse. Dans les plantations non ombragées, c'est la zone moyenne qui a les populations les plus élevées et la zone supérieure les populations les plus faibles. Dans les plantations ombragées, les trois zones ont un nombre d'Acariens inférieur aux zones correspondantes des plantations non ombragées. La température des feuilles et la pénétration de la lumière dans les théiers sont responsables de la distribution des Acariens.

INTRODUCTION

The red spider mite, *Oligonychus coffeae* (Nietner), is a serious pest of tea in north-East India and causes considerable economic loss (DAS, 1959 ; BANERJEE, 1966, 1971). It has frequently been observed that inspite of repeated spraying this mite quickly reinfests tea bushes, sometimes even before the residual actions of the acaricides are completely over. In some areas weeds were found to be the alternate hosts of the mite and possible sources of infestations : but the recurrence of the mite in weed free areas led to the present investigation on its distribution with in the bushes. It was thought possible that the infested pockets might exist within the bushes and that spraying of top hamper alone was not sufficient to kill the mite populations within the bushes.

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Material and method

Mite counts were made during April to November 1967 on mature (25 years old) ' Assam ' type of annual pruned tea bushes. The period of sampling coincided with the main growing and flushing period of the bushes : they were pruned in December and sufficient foliage did not appear till March next year. Some of the bushes were shaded by *Albizzia odoratissima* trees, while others were unshaded.

The bushes were 90 cm in height and for sampling they were divided into three vertical zones (upper, middle and lower), each approximately 30 cm in depth. Preliminary studies showed absence of any relationship between mite numbers, leaf age and leaf area (Banerjee, 1967 *b*). Therefore at weekly intervals ten leaves were drawn at random from each of the three zones of one unshaded and one shaded tea bush.

In order to keep the intervals between the samples comparable, mite counts were made on the same day of the weeks. The mite density is expressed as the number of mites per unit area, i.e. one sq. cm. of the upper leaf surface (Briggs and Avery, 1968).

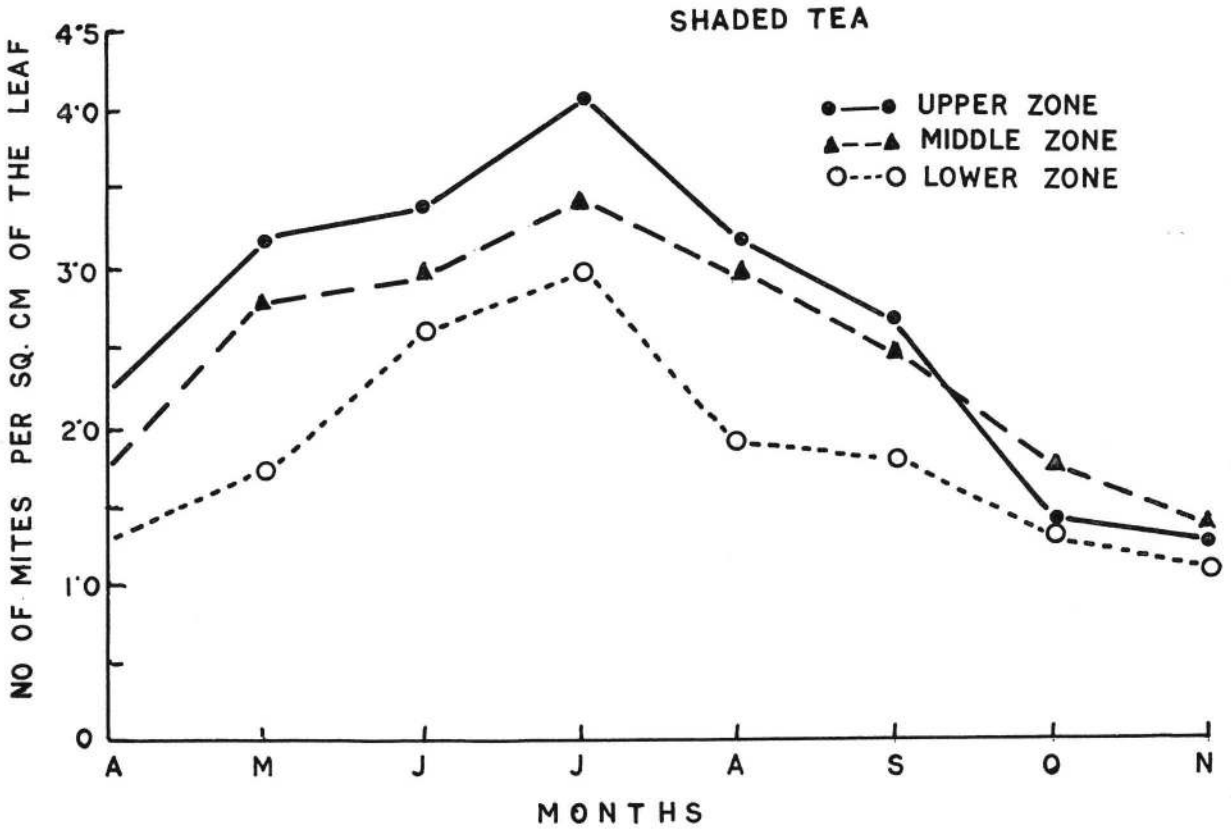

Fig. 1 : Distribution of *Oligonychus coffeae* (Nietner) in upper, middle and lower zones of shaded tea plants.

Results

The distribution of the mites in different zones of shaded and unshaded tea bushes is shown in Figs 1 and 2. The general order of intensity of mite incidence in shaded tea was, upper zone >

middle zone > lower zone and that of unshaded tea was, middle zone > lower zone > upper zone with the exception that during October-November middle zone of shaded tea has more mites than upper zone and in July lower zone of unshaded has more mite than middle zone.

TABLE 1. — Incidence of *Oligonychus coffeae* (Nietner) in different zones of annual pruned shaded and unshaded tea. At or above critical level i.e. 3-4 mites/sq. cm (+) : Below critical level (—).

Month	Shaded tea			Unshaded tea		
	Upper zone	Middle zone	Lower zone	Upper zone	Middle zone	Lower zone
April	—	—	—	—	+	+
May	+	—	—	—	+	+
June	+	+	—	+	+	+
July	+	+	+	+	+	+
August	+	+	—	+	+	+
September	—	—	—	—	+	+
October	—	—	—	—	—	—
November	—	—	—	—	—	—

Table 1 shows that between May and August mite populations in shaded tea were at or above the critical level of 3-4 mites/sq. cm, in the upper and middle zones, and in the lower zone only in July. In contrast, mites were at critical level in the middle and lower zones of unshaded tea throughout the flushing period (April-September) and in the upper zone only during June-August. These results therefore show that in shaded tea red spider incidence stays below the critical level for a greater part of the year than comparable unshaded tea and the difference is particularly noticeable between the zones.

Mites in different zones of both shaded and unshaded tea started increasing in numbers from April, reaching their peaks between June and August. Their numbers declined in September-October, reaching the lowest point in November. Inspite of this time trend, a difference in mite numbers was maintained between the zones of both shaded and unshaded tea.

DISCUSSION

PIELOU (1960) has demonstrated that *Panonychus ulmi* (Koch) tends to stay aggregated on certain parts of host plants and HERBERT (1965) noticed intratree variation in the distribution of the brown mite *Briobia arboria* M. & A. on leaves and woody parts of apple trees. OSKABE (1967) has stated that *Tetranychus kanzawai* Kishida undergoes a seasonal change in habitats on tea in Japan. Present study on *Oligonychus coffeae* shows a difinite gradient in the distribution of the mite on the foliage of both shaded and unshaded tea. The difference in distribution exists between and within shaded and unshaded teas at different months of the year. Because of this uneven distribution, it is possible that mites from the middle and lower zones reinfest the upper zone once the effects of chemicals are over. This is particularly noticeable in dense bushes, where the spray fluid fails to penetrate deep into the bushes. The reinfestation may be quicker in unshaded tea because of the initially high numbers of mites present in the lower zones.

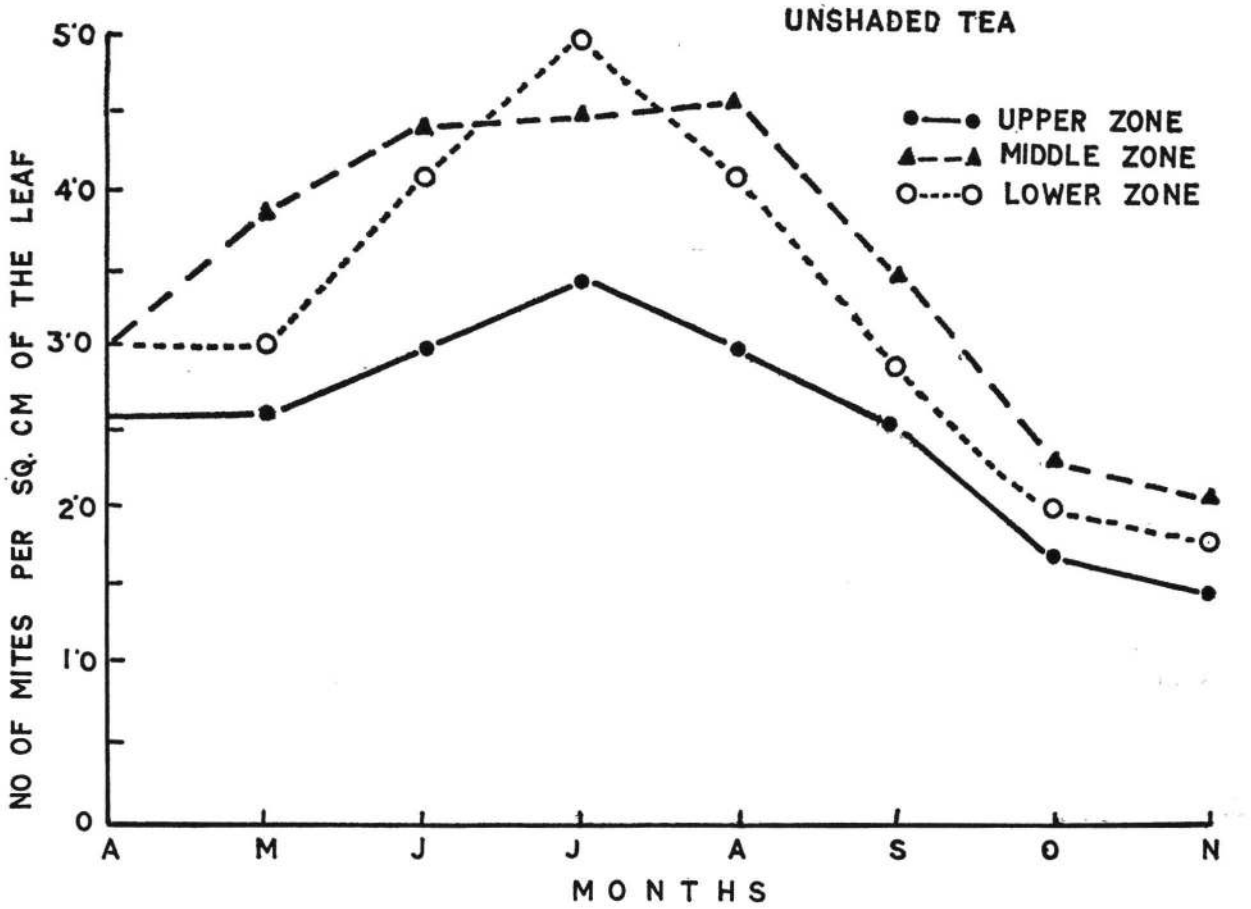

FIG. 2 : Distribution of *Oligonychus coffeae* (Nietner) in upper, middle and lower zones of unshaded tea plants.

A reason for the variation in mite numbers within the bushes is implicit in the leaf temperature vis-a-vis temperature tolerance of *O. coffeae*. HADFIELD (1968) has shown that between ambient temperatures of 30° and 32°C, temperatures of the unshaded tea leaves of the top hamper may reach 40-45°C, while shading causes leaf temperature to drop to the ambient value. The foliage on the upper zone of the bushes also help reducing the leaf temperatures beneath and within the bushes by self-shading. It is also known that 30°C is the critical temperature for *O. coffeae* and that it fails to survive beyond 35°C (DAS and DAS, 1967). Since ambient temperature during a large part of the flushing period of tea in Assam (April-October) remains around 30°C (HADFIELD, 1968), it follows that the resultant high leaf temperature in the upper zone of unshaded tea will prevent rapid build up of mite populations : whereas being free from the effects of high temperature mites will prefer to colonize the upper zone of shade tea. Shade therefore keeps not only the mite numbers below critical level, but also influences their distribution by controlling the leaf temperature.

It is however not clear why some mites should at all be present in the upper zone of unshaded tea. This possibly happens because of the migration of the mites in course of diurnal changes in ambient and the consequent leaf temperatures.

Photosensitivity of *O. coffeae* (BANERJEE, 1967 *a*, 1974 ; BANERJEE and DAS, 1969) suggests that the penetration and distribution of sunlight within the bushes (HADFIELD, 1968) could also influence its distribution, particularly in the middle and lower zones where leaf temperature normally remains below the critical level for the mite. Although in ultimate analysis a number of factors might be involved, *prima facie*, leaf temperature and light penetration appear to be the important factors to regulate mite distribution within the bushes.

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