



SEASONAL INCIDENCE AND INJURIOUS STATUS OF *RAOIELLA INDICA* (HIRST) (ACARI: TENUIPALPIDAE) ON ARECANUT PALMS OF KOZHIKODE DISTRICT OF KERALA

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**ABSTRACT:** Areca nut (*Areca catechu* L.) is an important cash crop in India and it is susceptible to infestation by an array of insect and non insect pests, of which mites, especially species like *Raoiella indica* induces heavy infestation on palms of the nursery stage as well as and young palms. *R. indica*, the so called Red palm mite (RPM) is an important sucking pest on young areca nut palms during hot dry weather. This polyphagous mite spreads rapidly through the Neotropical region where the mite damages economically and ecologically important plants. In the present study, field sampling of RPM was conducted monthly, from March, 2013 to August, 2013 on areca palms cultivated in the Kozhikode district of North Kerala, India to study its incidence, distribution pattern and injurious status on areca palms. Significantly higher population densities of RPM could be recorded on areca palm, attaining peak population during April / May. High population of RPM was observed on the bottom frond leaf than the middle and top leaves.

**Keywords:** *Raoiella indica*, *Areca catechu*, Incidence, RPM, Injurious status, Kozhikode district.

## INTRODUCTION

Red palm mite (RPM) was originally described from Coimbatore, India, on coconut [1] and subsequently from various localities in the Old World including India, Middle East, Mauritius and Reunion. It was first reported in the New World in 2004, in Martinique [2] and more recently, reported in the northern state of Roraima in Brazil [3] and Mexico [4]. The adverse effect of *R. indica* on coconut production in the Caribbean islands was estimated to cause over 50% reduction in yield [5]. RPM was the first mite species in which feeding was observed through the stomata of its host plants [6] and this specialized feeding habit would probably interfere with the photosynthesis and respiration processes of its host plants. Trees grown in conditions of poor drainage and low mineral and organic matter were particularly affected [7,8] with RPM and plants grown in well irrigated areas tend to have low mite infestation [9]. The areca nut palm is the source of common chewing nut and hence is popularly known as the betel nut. In India, it is extensively used by large sections of people and is very much linked with religious practices. India is the largest producer of areca nut and at the same time forms the largest consumer also. Major states cultivating this crop are Karnataka (40%), Kerala (25%), Assam (20%), Tamil Nadu, Meghalaya and West Bengal and it forms a major source of income along with other agricultural crops. However, the farmers encountered considerable crop losses intermittently, owing to lack of knowledge on the bionomics, relative distribution pattern, ecological aspects, natural enemies of the pest etc. An array of insect and non- insect pests were known to infest all parts of the palm, such as stem, leaves, inflorescence, roots and nuts in one or other stage of the crop growth. As many as 102 insect and non-insect pests were reported to be associated with areca palm [10]. Of these, mites are the serious pests, mainly in young areca plantations, and active infestation of leaves occurred after the onset of hot weather [11]. Both nymphs and adults colonize the lower surface of palm leaves and feed by de-sapping, which in turn would lead to the formation of yellowish speckles and bronzing in later stages, ultimately drying up of the leaves.

## MATERIALS AND METHODS

In the present study, observation on the seasonal incidence and injurious status of RPM was made, covering two consecutive seasons, during March, 2013 and August, 2013. Field sampling of the mite was carried out from areca plantations in Kozhikode districts of North Kerala where palms belonging to six to seven years of age group were cultivated in separate gardens.

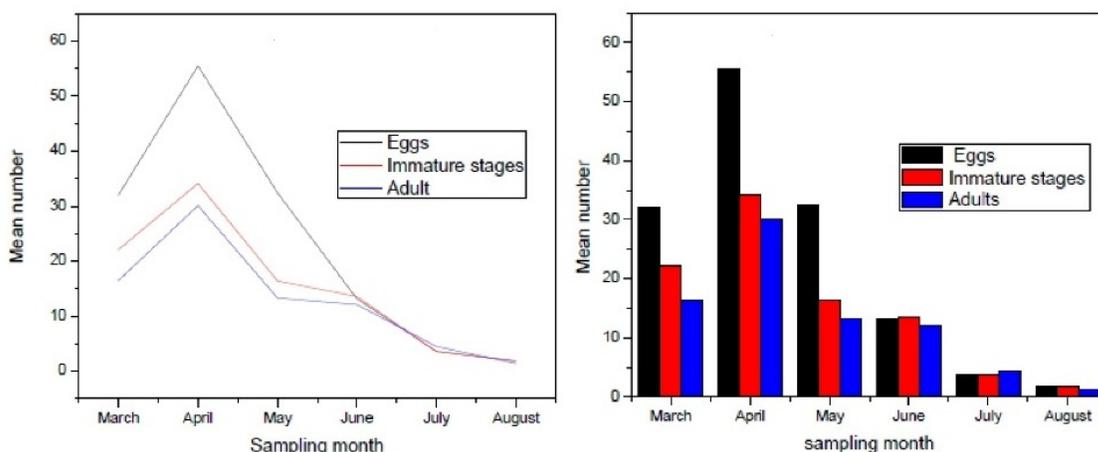
During the study period, field surveys were undertaken twice in a month in order to obtain temporal data for the study. In each garden, ten young palms, not taller than 3 metres were selected randomly and three fronds were sampled (bottom, middle and top). On each frond, five leaflets were removed from the region close to the rachis. Leaflets were transported to the laboratory for subsequent microscopic observation for recording the presence of various life stages of *R. indica*. The number of different life stages of the mite present on the leaflets was counted under a Stereo Zoom microscope at fortnightly intervals. The injurious status of the mite was analysed through repeated field studies by collecting mite infested and uninfested (control) leaves and recording damage symptoms.

## RESULTS

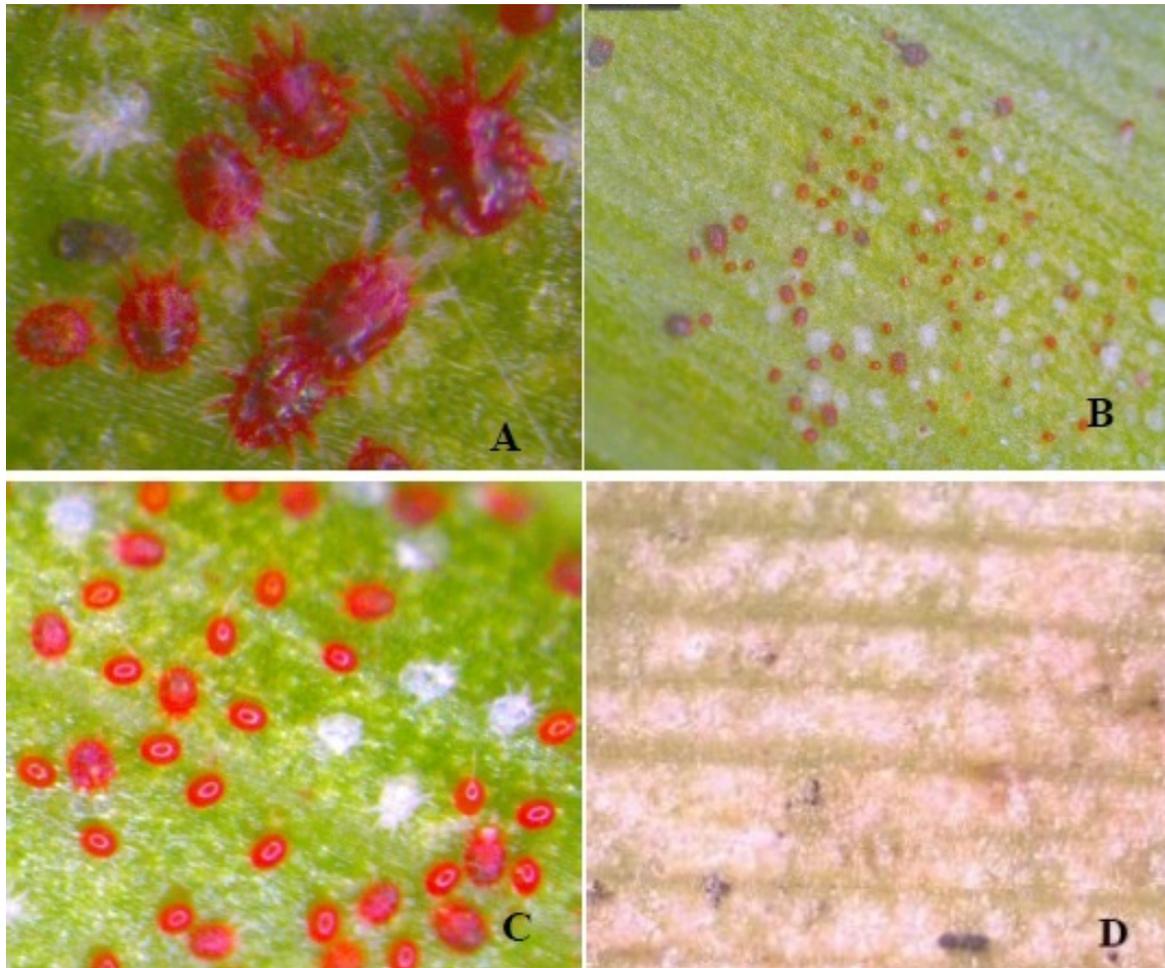
Results of the present study clearly revealed the seasonal incidence and injurious status of *R. indica* on area palms cultivated the Kozhikode district of North Kerala. Population build up of the mite was found initiated during March to April period of the year 2013, in the field in which a rise in temperature was experienced (Table 1, Fig. 1). The mite population attained the peak level in April and subsequently showed a decline from the last week of May and this declining trend was continued till August, 2013. During the study, the lowest population density of the mite could be recorded during July and August, 2013. The population density of the mite was high during the first week of March and continued up to the first week of May with the peak formation in April- May. A decline in population could be observed from June onwards. The number of mites was found to vary with respect to the leaflets of individual leaf frond. High degree of mite incidence was noted on the bottom frond leaflet when compared to the top and middle frond leaflets. Very low population density of the mite could be recorded during the monsoon season (Table1). In all examined cases, infestation of RPM was found confined to the lower surface of leaflets and often the number of mites recovered from a single leaflet ranged from 50 – 100, during April, at which easy detection of the mites was possible in the field, even with unaided eyes. All the life stages the mite were predominantly red in colour, while the adult females often exhibited dark coloured areas on the body. Feeding activity of large numbers of the various life stages of the mite imparted the development of localised yellow colouration to the leaf lamina. On progressive feeding, these yellow patches coalesced to form bronze coloured areas, thereby leading to the drying up of leaves (Figs. 2 A - D). Field collected leaf fronds often disclosed the presence of predatory mites also and the taxonomic identity showed that they belonged to the family Phytoseiidae.

**Table.1. Seasonal incidence of *R. indica* on Arecanut palms in Kozhikode district.**

Sampling Period	Mean number of different life stages of <i>R. indica</i> mites/ leaflet								
	Bottom frond			Middle frond			Top frond		
	Egg	Immature stages	Adult	Egg	Immature stages	Adult	Egg	Immature stages	Adult
March 2013	34.8	20.4	14.7	31.2	23.4	20.7	30	22.5	14.1
April 2013	57	36	28.2	52.8	33	31.8	56.7	33.3	30.3
May 2013	34.8	21.6	11.7	29.7	18.6	14.1	32.7	9	14.1
June 2013	14.1	14.1	9.6	11.7	12.6	14.7	13.8	14.1	12
July 2013	4.2	3.6	5.4	2.7	2.4	3.6	3.9	4.8	4.5
August 2013	1.8	1.5	1.5	1.2	1.2	1.2	2.7	2.7	1.5



**Figure 1. Seasonal incidence of *R. indica* on Arecanut palms in Kozhikode district.**



**Figure. 2. A- Adults (females and male) of *Raoiella indica* on areca leaf, B- Infested leaf lamina with *R. indica* colony, C- Eggs & immature stages of *R. indica*, D – Heavily infested leaf**

## DISCUSSION

Areca palms are widely cultivated throughout Kerala and the present observation forms the first report on the incidence of Red Palm Mite on areca nut in Kozhikkode district. The results of the present study enabled to record infestation by *R. indica* as one of the major problems in the arecanut plantations of Kozhikkode district of North Kerala. Temperature is a main abiotic factor for poikilothermic insects [12] and changes in surrounding temperature regimes would certainly influence the development rates, voltinism and survival of insects and subsequently act upon size, density and genetic composition of populations, as well as the extent of host plant exploitation [13]. In the present study also, temperature and relative humidity of the habitat were found to exert a profound influence in determining the population size of the red palm mite. Rainfall, generally exert a negative impact on their population density of insects and mite pests of various crops through mechanical action. Pallini *et al.* [14] recorded a lowest rate of incidence by *Oligonychus ilicis* in rainy season. Similarly, Reis *et al.* [15] also observed a decrease in the phytoseiid predatory mite population on citrus as a function of rainfall. In the present study also, rainfall was found to cause a decline in mite population, as the number of mites encountered during monsoon season was comparatively low. Probably, the decrease in population density of the mite would be a reflection of the washing effect of rain on the various life stages of the mite. Apart from this, the mite population would also be checked in the field by the predatory mites which were seen associated with the RPM, on areca leaves.

## CONCLUSION

The results of the study enabled to record *R. indica* as one of the major mite species infesting arecanut palm of Kozhikkode district of Kerala. The population density of RPM was found greatly influenced by both biotic and abiotic factors prevailing in the surrounding environment. The mite population appeared very low during monsoon season, which would be a reflection of the washing effect of frequent rains.

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