

RED PALM MITE, A POTENTIAL THREAT TO THE COCONUT INDUSTRY

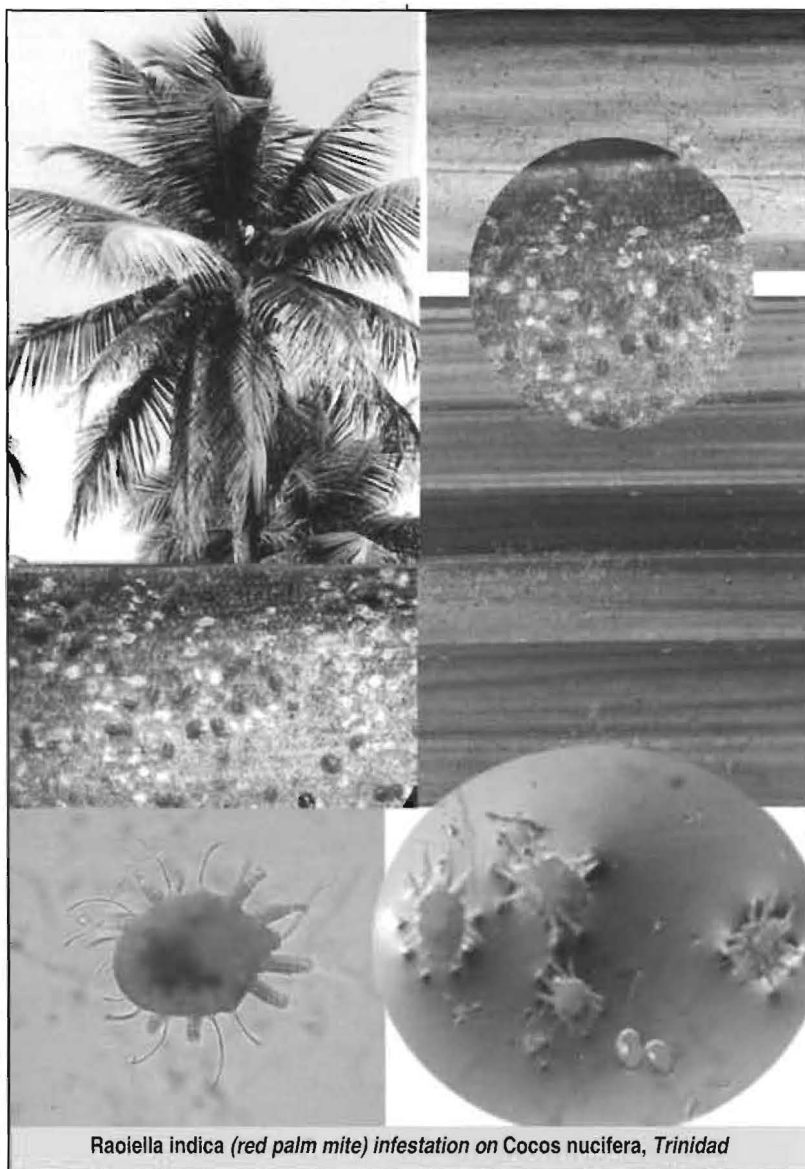
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Preamble

“A tiny microscopic insect pest called Red Palm Mite (RPM) attacks the coconut trees in Trinidad and Tobago. Coconut trees play an integral role in the tourism industry of our country. It is a serious threat to the coconut plantations particularly along the coastal line, in Trinidad and Tobago. Coconut growers are looking for urgent deal. We are afraid that if we do not eradicate the pest, in a few years time there will be no trees left on the coast”.

The representatives from Trinidad and Tobago brought up this matter in one of the open forum/discussions in the 44th APCC COCOTECH Meeting held in Samui, Thailand on 5-9 July 2010. By raising the matter of RPM pest attack in the meeting delegate expected to open the problem for attention of all the technical expertise and also to explore the scientific and doable measures to bring this tiny insect red palm mite under control. Further, he stated that the infestation of RPM causing a severe damage to the industry and the insect is also spreading to nearby countries. The Asian and the Pacific Coconut Community (APCC), Jakarta organizes the COCOTECH Meeting (Technical Panel) in every two years as one of its major activities to address the new technological developments, new research findings, machinery developments, hybrid coconut varieties, specifically the pest and disease out breaks and threats in the coconut industry.

The Centre for Agriculture and Bio Science Interaction, Trinidad & Tobago reported that not only the coconut, Bananas, Heliconias



Raoiella indica (red palm mite) infestation on *Cocos nucifera*, Trinidad

and Ginger Lilies plants have also been affected by the Mite. RPM is a tiny insect pest barely visible with the naked eye; feeds on the leaves of the coconut tree, cause a severe damage to the coconut plantations. As a result, the coconut trees cannot produce healthy nuts ensuing severe reduction in nut production.

Experience on Coconut Eriophyd Mite Infestation

Likewise, the APCC countries namely Sri Lanka and India experienced an attack of tiny coconut eriophyd mite *Aceria gurreronis* in the coconut plantations. In Sri Lanka, this mite infestation was initially reported in 1997 in the Kalpitiya peninsula of the Puttlam District. Coconut Research Institute (CRI), Sri Lanka implemented various research programmes to control the pest, including development of biological

control methods to control the pest. Similarly, the pest made its first appearance in 1998 in Amballor panchayat in Ernakulam district in Kerala, India and subsequently spread into Tamil Nadu, Karnataka and southern part of Andrapradesh. So far *Aceria guerreronis* Keifer (*Eriophyes guerreronis* (Keifer)) is the only species of eriophyid mite considered as a serious pest of coconuts.

Coconut mite, *Aceria guerreronis* Keifer, was first observed in Mexico in 1965 as a minor pest and later, it has reported from the other countries namely Anguilla, Bahamas, Benin, Brazil, Cameroon, Colombia, Côte d'Ivoire, Cuba, Dominica, Dominican Republic, Gambia, Grenada, Guadeloupe, Haiti, India, Jamaica, Martinique, Mexico, Nigeria, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Sao Tome and Principe, Sri Lanka, Tanzania, Togo, Trinidad and Tobago, USA (Florida) and Venezuela.

Considering the seriousness of the eriophyid mite infestation, the APCC Secretariat implemented a four year (2004-2007) Coconut Integrated Pest Management Project with the funding support of the Common Fund for Commodities (CFC). The Project was co-financed by the Department for International Development (DFID) Plant Protection Programme of the UK. The IGOOF of the Food and Agriculture Organization (FAO) served as the Supervisory Body of the project. The one of the main objectives this project was to find out controlling measures for eriophyid mite. The study sites Sri Lanka, India and Tanzania were selected due to the existing severity and devastating nature of the insect pest. The APCC acted as the Project Executing Agency (PEA),

The Asian and Pacific region contributes about 90% of the total world coconut production while the total global coconut production is around 61.16 billion nuts. More than 140 countries consume the fresh coconut and coconut products. The RPM will be a new possible pest in the Asian region. Therefore, it will be useful to have prior understanding about behavior pattern of this insect, favorable condition for multiplication, biological control agents and symptoms of the infested coconut plants. The aim of this article is to provide supplementary information on the red palm mite, infestation, symptoms, distribution, product losses and possible control measures.

Symptoms

The leaflet "red palm mite alert" issued by the Department of Agriculture and Consumer services, Florida, USA and the many other publications have clearly documented the symptoms of RPM infestation. According to the reports RPM establishes its colonies on the under surface of leaves, usually along the midrib. Red palm mites stick their sucking snouts into the stomata of leaves and feed directly from deep within the leaf. This action causes mechanical damage to the stomata so that they are no longer able to close and the leaf desiccates. The affected leaves



turn yellow, then brown and hang against the trunk of the tree.

Symptoms are easily confused with lethal yellowing. The difference is the visible red dots on the undersides of the leaves. Shaking the leaf over a white piece of paper is an easy test. If red dots appear on the paper, prove the presence of red palm mite. Therefore, infected coconut leaflets start as small yellow spots on the abaxial leaflet and later develops into larger, chlorotic spots. Heavy infestation as dense colonies along the midrib of the green coconut leaflet turn from a bright green to a pale green, then yellow and finally a copper-brown. The symptoms caused by a heavy infestation of the red palm mite could be confused with nutritional deficiencies or possibly lethal yellowing, or an unrelated disease of coconut palms. The Young coconut palms are more susceptible to the insect damage and the eggs are deposited in colonies ranging in number from 110 to 330. Mites are located in groups ranging in number from 20 to 300 individuals

Generally, the members of the family Tenuipalpidae, feed on plant parts. These members (tenuipalps) are obligate plant parasites and several species damage plants seriously. The insects are having stylet-like mouthparts (a stylophore) similar to that of spider mites (Tetranychidae). These mouthparts are long and U-shaped. Whip like chelicerae are used to pierce plant tissues.

But the coconut eriophyid mite, *A. guerreronis* localized in the floral bracts and the tender portions of the nut lets covered by the perianth, a few weeks to 7-8 months after fertilization of the female flower. This mite suck the sap from the soft or meristematic tissues, develop

scars on the surface of the nuts. The appearance of elongated white lines below the perianth is the initial symptoms of the infestation.

Within a short time these feeding marks appear as pale yellow triangular patches below the perianth, which gradually turns brownish in colour and subsequently the injury leads to longitudinal fissures on the nut surface. Mostly, the senile and the young coconut plants are vulnerable to these insects' attacks.

Coconut mite is the common name used for both the Red palm mite, *Raoiella indica* Hirst, and Eryopide mite *Aceria gurreronis*. In the scientific classification, two insects are belonging to two different groups. Genus *Raoiella* belongs to the order Trobidiformes, Family Tenuipalpidae and commonly called "flat mites" or "false spider mites". They are reddish, slow moving, and normally feed near the midrib or veins on the underside of leaves. Several species, among them *Raoiella indica*, are important crop pests. Red Palm Mite has been recognized as rapidly spreading, high risk invasive species with the potential of causing serious economic damage.

The Coconut eriophyid mite, genus *Aceria* belongs to the Order: Prostigmata, and Family Eriophyidae, commonly known as coconut mites. Insects come under this family is an important plant parasites, causes disorders by sucking the plant juice and commonly known as gall mites. About 3,600 species have been described. They are tiny, microscopic mites and are yellow to pinkish white to purplish in color. The mites are worm like, and have only two pairs of legs. Wind is the primary method of dispersal. This group associates a wide range of plants, and several

are major pest species causing substantial economic damage to crops.

RPM Distribution and Associated Plants

Initial research reports indicate that the area of origin of the mites could be around Papua New Guinea, Malaysia or Indonesia and also may have been naturalised in places such as India for a long time. In 2007, Florida Agriculture Commissioner, Department of Agriculture and Consumer Services announced in their press release about the detection of the red palm mite on a coconut palm at a medical facility in Palm Beach Gardens in Palm Beach County. It was the first confirmed report of this serious plant pest in the United States. In the announcement Commissioner Bronson has stated that they are disappointed to find the red palm mite in Florida. "We have been surveying for the pest for over a year because of its growing prevalence in the Caribbean over the last few years."

The announcement also highlighted that the Red palm mite is not only a pest of coconut but also a pest of areca palm, and date palms in the Middle East. The pest is probably widespread in tropical and subtropical regions throughout the Eastern Hemisphere.

In the literature, it has been clearly indicated that the infestation of Red Palm Mite has initially been noted in Martinique in 2004, subsequently it has been spread towards the northern region up to Florida Peninsular and towards the southern region like Brazil. Today, it's in the entire this region.

Fortunately, the red palm mite has not yet been reported as pest in the APCC member countries

coconut plantations. Report of the United States Department of Agriculture (USDA), Research Service (2006), indicated the presence of RPM particularly associated with the plants of family Palmacea in India, Malaysia, Philippines and Sri Lanka. The red palm mite has been found in Egypt, India, Iran, Israel, Mauritius, Oman, Pakistan, Philippines, Reunion, Saudi Arabia, Sudan, Thailand, United Arab Emirates and is probably widespread in tropical and subtropical regions throughout the Eastern Hemisphere. In 2004, the red palm mite invaded in Martinique and more recently, in Dominica. In 2006, it has been found in Puerto Rico. Guadeloupe, and Saint Martin, Kane et al., 2005 reported that the incidence of RPM in Dominica, Etienne and Fletchmann, (2006) in the islands of Trinidad and Tobago, Kane and Ochoa (2006) reported widespread distribution of *R. indica* throughout St. Lucia coconuts, observing that most of the lower leaves had high infestations ranging from 20-300 individuals.

Generally, the spider mites are not harmful pest of plants under normal climatic and growth conditions. There are number of common names for RPM such as coconut red mite, red date palm mite, leaflet false spider mite, frond crimson mite, or scarlet mite, depend on the association plants. But the RPM has become an important pest of date palms and other palm species, as well as a pest of bananas, beans, and durian in different parts of the world. Likewise, RPM has been reported as a serious pest of coconuts in many countries in the tropics of the Eastern and Western hemispheres.

Plants to Monitor

Indicator plants reduce the time spent in monitoring the mite

infestation. As long as these plants stay pest-free, there is likely no need for other plants to be checked. If pests are found on the indicator plants, then other plants over a wider area should be inspected.

The scientists have identified some indicator plants for early detection of the RPM mites in the vicinity. The marigolds plants are good indicator plant for mites. Palms, Easter lily, dieffenbachia, and citrus also indicator plants for spider mites. Planting them in the yard helps to find a problem early.

Many vegetable plants such as tomatoes, squash, eggplant, beans and cucumbers frequently have mite problems. A wide range of landscape plants including plumeria are potential magnets. The mites prefer the plants grows where air circulation is limited.

Control Measures

Correct identification of mite pests is essential because monitoring and treatment methods must be tailored to a particular species. Once a problem species is identified, then information about its life cycle can be used to pinpoint when treatments will have the greatest effect and what preventative measures would be most effective.

Chemical control

Chemical control is not recommended particularly the broad spectrum insecticides due to negative impacts on beneficial insects (biological control agents) that keep spider mites in naturally control. Therefore, usages of common pesticides have become limited and fewer publications are available listing the insecticides to control spider mites. Chemical control is difficult and expensive when the coconut trees are tall. However,

chemical control is recommended when the RPM population is high and the damage is severe. Chemical application recommends for palm nurseries.

From efficacy trials conducted in Jamaica, it has been reported that five reduced-risk pesticides could be used in the suppression of the pest. These include abamectin, soybean oil, sulphur, insecticidal soap and spiromesifen, and the conventional insecticide diafenthiuron. The application of azadirachtin 0.0004% or neem oil garlic soap emulsion or root feeding with azadirachtin 5% (7.5ml+7.5 ml water) along with nutrient management, had given medium/high level effectiveness in control of eriophyid mite population in India, Tanzania and Sri Lanka.

Natural Enemies

The invasive arthropods are more serious pests in their new environment than in their original place because the availability of smaller amount of natural enemies to suppress their population. Predators are important as bio-control agents. The researchers have noted several natural enemies for RPM in India, Mauritius and Egypt.

The phytoseiid mite, *Amblyseius channabasavanni* and lady beetle, *Stethorus keralicus* Kapur (Coleoptera: Coccinellidae) are considered as the most important predatory species on red palm mite. The researchers have also reported that the female insects of *A. channabasavanni* effectively consumed the eggs and females of red palm mites. In India, the highest field population of predators was reported during May to June when *R. indica* populations were at their peak. Another report says that the predator *S. keralicus* feed throughout the year on *R. indica* infested in the coconut and areca palms in India. The *Amblyseius*

longispinus (Acari: Phytoseiidae), *Stethorus parcepunctatus* and Jauravia sp. (Coleoptera: Coccinellidae) and *Stethorus tetranychii* Kapur are also important biological control agents of red palm mites.

In Mauritius, the *Typhlodromus caudatus* Chant (*Amblyseius caudatus* Berlese) reported as the principal predator of *R. indica* in coconut plantations. Nymphs and adults of this phytoseiid consume an average of 10.6 eggs per day and a total of 493 eggs during their active life cycle.

Reports from the Caribbean region also reported the natural enemies preying on *R. indica* such as *Amblyseius largoensis* (Phytoseiidae), *Armscirus taurus* (Kraemer) (Cunaxidae) and *Telsimia ephippiger* Chapin (Coccinellidae: Coleoptera).

Entomopathogens *Hirsutella* spp., *Hirsutella thompsoni* are important as biological control agents of Red palm mites. However, *Hirsutella thompsoni* is a prominent bio control agent of coconut eriophyid mite in Sri Lanka. Field application by spraying the fungus solution has shown high level acceptance in effectiveness, adoption and environmental sustainability. *Hirtusella* spp are not harmful to the predatory mite *Neoseiulus baraki*. In Sri Lanka *Hirsutella thompsonii* isolate H-2 has shown promising reduction of the pest population up to 1.5 months. Spray of 2% neem oil garlic soap mixture has also shown the convincing results in reducing the mite population.

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The data and pictures are through the courtesy of www.doacs.state.fl.us, en.wikipedia.org, www.sel.barc.usda.gov, www.sel.barc.usda.gov; www.moa.gov.jm