Pest Alert

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Red palm mite *Raoiella indica* Hirst (Acari: Tenuipalpidae)

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INTRODUCTION: Red palm mite, *Raoiella indica* Hirst (Acari: Tenuipalpidae), is a pest of coconut, areca palm, and date palms in Egypt, India, Iran, Israel, Mauritius, Oman, Pakistan, Philippines, Reunion, Saudi Arabia, Sri Lanka, Sudan, Thailand, United Arab Emerits and is probably widespread in tropical and subtropical regions throughout the Eastern Hemisphere. The first Western Hemisphere report of the red palm mite was in 2004 from the eastern Caribbean island of Martinique (Flechtmann and Etienne 2004, 2005). The mite was confirmed on the islands of Saint Lucia and Dominica in 2005 (Kane *et al*, 2005). In 2006 the mite was reported as established in the Domincian Republic, Guadeloupe, Puerto Rico, Saint Martin and Trinidad-Tobago (Anonymous 2006, Etianne & Flechtmann 2006, Rodrigues *et al* 2007). In 2007 the US Virgin Islands, Granada, Haiti and Jamaica have been added to the list of islands and countries infested with the red palm mite. Gutiérrez *et al* (2007) recently reported the red palm mite from the state of Sucre in Venezuela, SA. In all instances, this mite has established itself on various palms (Palmae), with significant outbreaks on coconut palms, *Cocos nucifera* L. In addition, significant infestations have been observed on banana and plantain species (*Musa* spp., Musaceae) on most islands with additional infestations observed on heliconias (Heliconiaceae), gingers (Zingiberaceae), bird of paradise (Strelitziaceae) and screw pine (Pandanaceae) (Table 1). The explosive appearance of the red palm mite in the Caribbean Region is a serious pest risk for the subtropical areas of the United States, tropical Central and South America, and the entire Caribbean Region.

After ravaging coconut palm in the Caribbean Region for approximately five years, the red palm mite was discovered in Palm Beach Gardens, Palm Beach County, Florida, on November 29, 2007 by Alfred Levy, USDA, and verified by DPI on December 3, 2007. The red palm mite find in Florida is a FLORIDA STATE RECORD & US CONTINENTAL RECORD. As of April 1, 2009 the red palm mite is known from 386 sites in five Florida counties (155 in Broward, 1 in Martin, 4 in Monroe, 74 in Miami-Dade, 154 in Palm Beach Co.). The red palm mite is known to feed on 42 palm species in the Caribbean Region and Florida. As of April 1, 2009, we have recorded red palm mites actively feeding and reproducing on 23 palm species, banana (*Musa* sp.), ginger (*Alpina purpurata*), and a heliconia.

DESCRIPTION: The red palm mite is bright red with long spatulate body setae and a droplet of liquid at the tip of most body setae in living specimens. All life stages, including the eggs, are red, and adult females often exhibit black patches across their backs. The red palm mite can be distinguished from most spider mites (Tetranychidae) by the red color (including legs), long spatulate setae, flattened bodies, droplets on dorsal body setae and absence of the webbing associated with many spider mites.

Eggs - Eggs are smooth and 0.12 mm long by 0.09 mm wide. Each egg is attached to the lower leaf surface by a long slender stipe, that is about twice as long as the egg.

Immatures - Larvae are smaller (0.18-0.20 mm long) than nymphs (0.18-0.25 mm long) and have only three pairs of legs. Nymphal stages are slightly smaller than adults, have a smooth integument and dorsal setae are not set on tubercles. The dorsal and lateral setae of the nymphs are distinctly shorter than the adults.

Adults - Adult females are about 0.32 mm long and often exhibit dark patches on their body. Males are smaller than females with a distinctly triangular body. Dorsal setae in both sexes arise from tubercles of the dorsal integument.

Eggs are deposited in groups on the underside of leaves and in established colonies they are usually located around the perimeter. The length of the egg stage ranges from 6-9 days. Development time from egg to adult ranges from 23 – 28 days in the female and 20 – 22 in the male. The adult female can live for approximately 30 days and lay 28 to 38 eggs. The male lives for about 26.5 days (Nageshachandra & Channabasavanna 1984). Studies on seasonal fluctuation in the population of *R. indica* indicated that rainfall and high relative humidity negatively affected mite populations, while temperature and hours of sunshine showed a positive correlation (Nageshachandra & Channabasavanna 1984).

SYMPTOMS: The red palm mite establishes colonies on the under sides of leaves, usually along the midrib, where they feed on cellular contents of the leaves accessed through the leaf stomata. Feeding mites, especially at high mite densities, cause localized yellowing of the leaves followed by tissue necrosis. Symptoms on coconut leaflets start as small yellow spots on the abaxial leaflet surface, this develops into larger, chlorotic spots (Rodrigues *et al* 2007). Rodrigues *et al* (2007) described heavy infestation as dense colonies along the midrib of the coconut leaflet and the green leaves 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, an unrelated disease of coconut palms.

IDENTIFICATION: Red palm mite adults, especially the females, are usually visible with the naked eye. They are found on the undersides of leaves, in groups of a few individuals to hundreds. In early infestations there is usually only one to a few females with eggs usually deposited in a circle. In older colonies most of the eggs are around the perimeter and white exuvial remains (cast skins) makeup the inner portion of the colony. The exuvial remains are often more numerous than living mites in very productive populations. All life stages are red and most have droplets of an unknown liquid at the tips of the dorsal body setae. These droplets are most visable on the adults. Adult females are the largest mites in a colony and usually have black dorsal patches. Males use their first pair of legs to attach to the posterior of female deutonymphs and in an active colony there are almost always males and female deutonymphs in tandum. No other species in the Tetranychoidea are known to have this type of courtship behavior.

DISPERSAL: Transport of infested plants or plant material appears to be the major mode of dispersal for this mite in the Caribbean region. Red palm mites have been found on seed coconuts destined for Florida. In addition, handicrafts (hats, bowls, etc.) fashioned from coconut leaves and sold to tourists on many Caribbean islands infested with the red palm mite have been found to harbor live mites and viable eggs. Under natural conditions, the red palm mite disperses on the wind along with most other plant feeding mites, so a strong tropical storm or hurricane could also distribute the red palm mite over a wide area.

HOSTS: The red palm mite has been recorded from 32 palm species (Palmae), but in infested islands of the Caribbean region, the mite also feeds on banana (Musaceae), heliconias, gingers and a few other moncots (Table 1). All palm species should be considered potential hosts for this mite until we have more data on the range of hosts in the Caribbean region. With red palm mite populations reaching the millions of mites per coconut palm the impact of this mite could be devastating.

CONTROL: Chemical control of the RPM will be difficult outside of the nursery environment because the use of acaricides on most palms is impractical because of the size of most palms planted in the landscape. The long term plans are to find biological control agents that will keep the RPM in check. Some of the possible biological control agents that have been useful in the Eastern Hemisphere include predatory mites (Phytoseiidae), predatory beetles (Chrysomelidae), lacewings (Chrysopidae) and other mite predators.

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Fig 1. *Raoiella indica* (red palm mite) infestation on *Cocos nucifera*, Trinidad.
Photo credit: F. Hosein, Ministry of Agriculture, Land & Marine Resources, Trinidad & Tobago

Fig 2. *Raoiella indica* (red palm mite) infestation on *Musa* sp., Trinidad.
Photo credit: F. Hosein, Ministry of Agriculture, Land & Marine Resources, Trinidad & Tobago

CARIBBEAN HOST LIST: (updated 12-May 2009.)

Table 1. A list of reported hosts for the red palm mite in the Caribbean region.

Family		Scientific Name	Common Name(s)
Palmae	*	*Acoelorraphe wrightii* (Griseb. & H.A. Wendl.) H.A. Wendl ex. Becc.	Everglades palm, paurotis palm
Palmae	FL	*Adonidia merilli* (Becc.) Becc. (=*Veitchia* H. A. Wendl.)	Manila palm, Christmas palm
Palmae		*Areca catechu*	betel nut palm
Palmae		*Areca* spp.	
Palmae	FL	*Aiphanes caryotifolia* (H.B.K.) H.A. Wendl.	Coyure palm, ruffle palm, spine palm
Palmae		*Aiphanes* spp. Willd.	Multiple crown palm
Palmae	FL	*Archontophoenix alexandrae* (F. Muell.) (H.A. Wendl. & Drude)	Alexander palm, king palm
Palmae	*	*Bactris plumeriana* Mart.	oco macaco, prickly pole
Palmae	FL	*Beccariophoenix madagascariensis* Jum. & H. Perrier	giant windowpane palm
Palmae		*Bismarkia nobilis* Hildebr. & H.A. Wendl.	Bismarck palm
Palmae	FL	*Butia capitata* (Mart) Becc.	pindo palm, jelly palm
Palmae		*Caryota mitis* Lour.	fishtail palm
Palmae		*Chamaedorea* spp. Willd.	chamaedorea palm
Palmae	FL	*Coccothrinax miraguama* (H.B.K.) Becc.	Miraguama palm
Palmae	FL	*Cocos nucifera* L.	coconut palm
Palmae	FL	*Corypha umbraculifera* L.	Talipot palm
Palmae		*Dictyosperma album* (Bory) H.A. Wendl. & Drude ex Scheff	princess palm, hurricane palm
Palmae		*Dypsis decaryi* (Jum.) Beentje & J. Dransf.	triangle palm
Palmae		*Dypsis lutescens* (H.A. Wendl.) Beentje & J. Dransf. (=*Chrysalidocarpus lutescens* H.A. Wendl)	areca palm, golden cane palm, butterfly palm
Palmae		*Elaeis guineensis* Jacq.	African oil palm
Palmae		*Licuala grandis* H.A. Wendl.	licuala palm, ruffled fan palm
Palmae	FL	*Livistona chinensis* (Jacq.) R. Br. ex Mart.	Chinese fan palm
Palmae	FL	*Phoenix canariensis* Hort. ex. Chabaud	Canary Islands date palm
Palmae	FL	*Phoenix dactylifera* L.	date palm
Palmae	FL	*Phoenix reclinata* Jacq.	Senegal date palm
Palmae	FL	*Phoenix roebelenii* O'Brien	pygmy date palm, roebeleinii palm

Family		Scientific Name	Common Name(s)
Palmae	FL	*Pritchardia pacifica* B.C. Seem. & H.A. Wendl	Fiji fan palm
Palmae	FL	*Pseudophoenix sargentii* H.A. Wendl. ex Sarg.	buccaneer palm, Sargent's cherry palm
Palmae	*	*Pseudophoenix vinifera* (Mart.) Becc.	cacheo, katié, wine palm
Palmae	FL	*Ptychosperma elegans* (R. Br.) Blume	solitaire palm, Alexander palm
Palmae	FL	*Ptychosperma macarthurii* (H.A. Wendl.) Nichols	Macarthur palm
Palmae	*	*Rhapis excelsa* (Thunb.) A. Henry	lady palm, bamboo palm
Palmae	*	*Roystonea borinquena* O.F. Cook	Puerto Rico royal palm
Palmae		*Roystonea regia* (HBK) O.F. Cook	Florida royal palm
Palmae	FL	*Schippia concolor* Burret	silver pimento palm
Palmae	FL	*Syagrus romanzoffiana* (Cham.) Glassman	queen palm
Palmae	*	*Syagrus schizophyllia* (Mart.) Glassman	arikury palm
Palmae	FL	*Thrinax radiata* Lodd. ex J.A. & J.H. Schultes	Florida thatch palm
Palmae	FL	*Veitcha* spp. H.A. Wendl.	Manila palm
Palmae	*	*Washingtonia filifera* (Lind. ex André) H.A. Wendl.	fan palm
Palmae	FL	*Washingtonia robusta* H.A. Wendl.	Mexican fan palm
Palmae	FL	*Wodyetia bifurcata* A.K. Irvine	foxtail palm
Musaceae	*	*Heliconia bihai* (L.) L.	Macaw flower
Musaceae	*	*Heliconia caribaea* Lam.	wild plantain, Balisier
Musaceae		*Heliconia psittacorum* L. f.	parrot flower
Musaceae		*Heliconia rostrata* Ruiz & Pavon	lobster claw heliconia
Musaceae	FL	*Heliconia* spp.	
Musaceae		*Musa acuminata* Colla	edible banana, plantain
Musaceae		*Musa balbisiana* Colla	wild banana
Musaceae		*Musa coccinea* Andrews (= *Musa uranoscopus* Lour.)	red-flowering banana
Musaceae		*Musa corniculata* Rumph.	red banana
Musaceae	FL	*Musa* spp.	banana, plantain
Musaceae		*Musa x paradisiaca* L. (= *Musa sapientum* L.)	edible banana, plantain
Musaceae		*Ravenala madagascariensis* Sonn.	traveler's tree
Musaceae		*Strelitzia reginae* Alton	bird of paradise, crane flower
Pandanaceae		*Pandanus utilis* Bory	screw pine

Family		Scientific Name	Common Name(s)
Zingiberaceae		*Alpinia purpurata* (Vieill.) K. Schum.	red ginger, jungle king/ queen
Zingiberaceae	FL	*Alpinia zerumbet* (Pers.) B.L. Burtt & R.M. Sm.	shell ginger, pink porcelain lily
Zingiberaceae		*Etlingera elatior* (Jack.) R.M. Sm. (= *Nicolaia elatior* (Jack) Horan.)	red torch ginger

The hosts with an asterisk (*) are from *M. Pellegrano* in press. Confirmed hosts in Florida are marked with “FL”.

More Red Palm Mite Information
(http://www.doacs.state.fl.us/pi/enpp/ento/red_palm_mite.html)