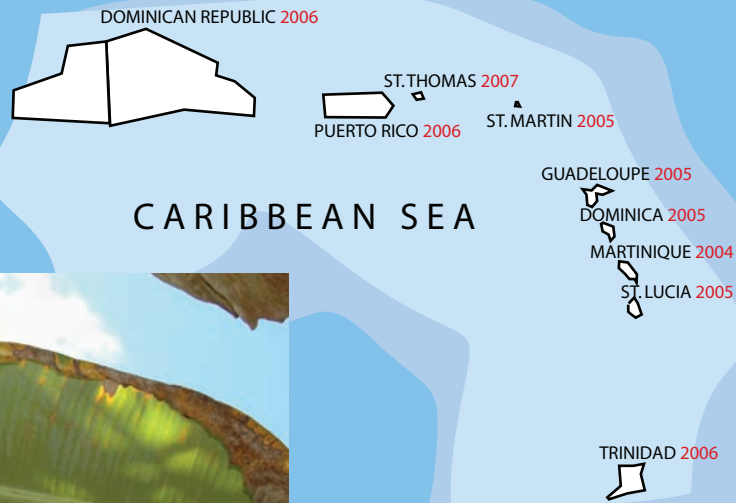


A Tiny Menace Island-Hops the Caribbean

RED MITE REPORTED



AMY RODA (D798-3)

Destructive mite threatens region's palms and perhaps bananas

The discolored areas on the underside of this banana leaf are where red palm mites have caused damage to the plant.

USDA scientists have joined a multi-national effort to stop a tiny mite that may create big problems in and near this hemisphere's Tropics.

Researchers at the Department's Agricultural Research Service (ARS) and at the Animal and Plant Health Inspection Service (APHIS)—are targeting the red palm mite, *Raoiella indica*. This pest rides the wind and was known for attacking coconut palms in the Eastern Hemisphere's tropical and subtropical regions.

"That's changed now," says entomologist Ronald Ochoa, a world-renowned mite expert at ARS's Systematic Entomology Laboratory (SEL). "The red palm mite has been found in the Caribbean region—in St. Lucia, Dominica, Guadeloupe, Martinique, St. Martin, the Dominican Republic, and Trinidad. And very recently, it was reported for the first time on U.S. soil, in Puerto Rico and in St. Thomas.

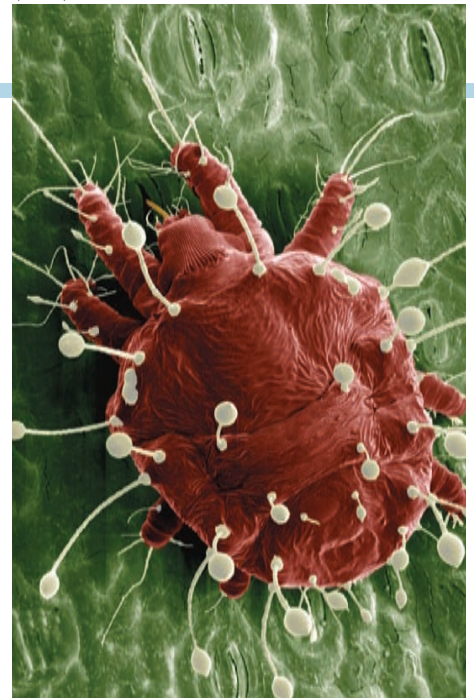
"It's spreading quickly and in great numbers. In fact, this invasion represents the biggest mite explosion ever observed in the Americas."

Ochoa explains that *R. indica*, which was first described in India in 1924, is a significant pest in the Philippines, Mauritius, and Egypt. It's also been spotted in Pakistan, Israel, and Sudan. "It causes serious leaf damage, ruining the ornamental value of palms," says Ochoa. "A grower in Trinidad indicated that he anticipates a 50-percent loss in coconut production on his property."

First identified in the Western Hemisphere 3 years ago on Martinique, the mite's calling cards include yellow spots or totally discolored palm leaves as well as reddish-brown areas indicating mite clusters.

Ochoa and fellow SEL entomologist Ethan Kane were amazed by the sheer

(D799-2)



The red palm mite, *Raoiella indica*, an invasive species in the Caribbean, may threaten several important palms found in the southern United States. Photo by Eric Erbe; digital colorization by Chris Pooley. (Magnified about 300x.)



numbers of mites they saw during visits to affected islands. “I’ve never seen anything like it,” says Ochoa. “In Trinidad, we estimated there were 30 to 100 million mites per palm!”

Troubling Observations

Ochoa and Kane have seen other ominous signs. “For one, it has spread to other exotic and ornamental palms,” says Ochoa. “And on Dominica, it’s attacking banana plants. In Trinidad, it was observed on *Heliconia*. Overall, we’re talking about a potentially devastating economic impact.”

Another worrisome aspect is the mite’s ability to disperse via the wind.

“There’s no question that hurricanes or human activity will eventually spread *R. indica* to tropical and subtropical regions throughout the Americas,” says Ochoa. The palm trees that are symbolic of tropical climes, as well as the multimillion-dollar palm-nursery industry, are at risk.

Scientists have gained some traction against the red palm mite, thanks in great measure to the observations and actions of local authorities in the affected Caribbean countries.

In 2004, officials with St. Lucia’s Ministry of Agriculture, Forestry, and Fisheries noticed an arthropod they suspected of inducing lethal yellowing disease on coconut palms. They sent samples in alcohol to SEL’s research facility in Beltsville, Maryland, where Ochoa and Kane identified the pest as *R. indica*. Later, they looked at live specimens with Eric Erbe, a botanist at the Electron Microscopy Unit of ARS’s Soybean Genomics Laboratory, also in Beltsville. There, the mite was studied using low-temperature scanning electron microscopy (LTSEM).

“This technology,” says Kane, “provides an unparalleled ability to explore not only the physical features of the mite, but also the manner in which it interacts with its environment. Amazingly, this marked the first time that the red palm mite had been studied to this extent.

“We found that the red palm mite appears to feed on tissue layers deep within the leaves. It doesn’t feed on the epidermal cells, as some plant-feeding mites do, but likely on the mesophyll tissues of the leaf. The implications of this type of feeding are clearly reflected in the symptoms shown by infested plants.”

With Help Comes Hope

Ultimately, officials in St. Lucia and with Dominica’s Department of Agriculture were brought into the effort to find solutions to help control and contain the mite, as was APHIS’s Caribbean Area Safeguarding Program. APHIS is funding the ongoing studies.

Also contacted were two more ARS facilities in Beltsville.

At the Bee Research Laboratory, entomologist Jay Evans isolated and sequenced a piece of the red palm mite’s DNA. “This is useful because we can collect potential predators and look for red palm mite DNA in their gut,” says Ochoa. “Then we know they’re eating them.”

Finding natural predators of the mite has proven to be a challenge. “For each predator we find on a particular plant, we see 40 to 400 red palm mites,” says Ochoa. “There’s no way the predators can eat them all.”

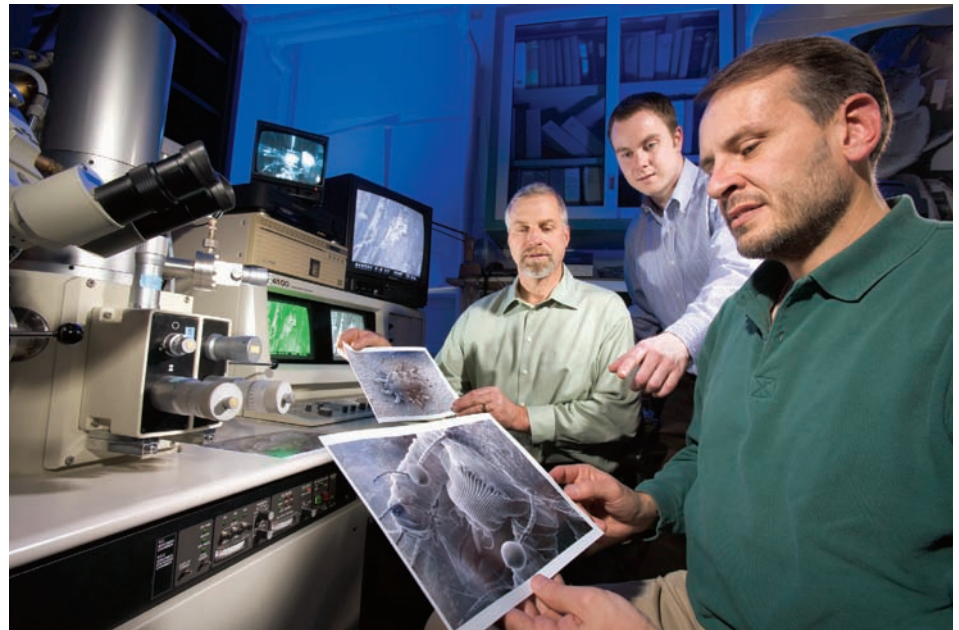
There may be hope in studies focusing on lacewings being conducted at ARS’s Chemicals Affecting Insect Behavior Laboratory. It is there that chemist Kamal Chauhan isolated a catnip-oil compound that attracts lacewings of the insect family Chrysopidae.

(For more information on that work, see the article on page 7 of this issue.)

“Lacewings are a good predator of soft-bodied bugs,” says Chauhan. “The challenge is getting them to stick around and do the job.”

Once researchers define which lacewing species are endemic to the areas at risk in the Caribbean, Chauhan plans to explore whether the technologies he developed could be used to entice those local predators to congregate and help in the efforts to control the red palm mite.

PEGGY GREB (D797-1)



A low-temperature scanning electron microscope was used to produce these detailed images of the red palm mite, *Raioiella indica*. Entomologists Ronald Ochoa (right) and Ethan Kane (middle) and botanist Eric Erbe study the images to learn about the mite’s feeding habits.



The mite's economic impact could be devastating.

The Next Steps

Looking ahead, Kane says the data gathered from the LTSEM study will help researchers solve taxonomic and systematic challenges in identifying the mite in other places.

And officials in Puerto Rico, St. Lucia, and Trinidad—along with scientists Jorge Pena and Marjorie Hoy at the University of Florida, Jose Carlos Rodrigues at the University of Puerto Rico, Cal Welbourn at the Florida Department of Agriculture's Division of Plant Industry, and

APHIS's Amy Roda—will study further chemical and cultural control of the mite and monitor for new hosts.

“Also, it's vital that the affected Caribbean islands be surveyed as soon as possible for this mite, beginning in Trinidad, where it's out of control,” says

Ochoa. “Equally important will be alerting officials in other Caribbean nations and in Florida about what we have learned.”

“Already, the cooperation between the USDA agencies and Caribbean nations has proven fruitful,” adds Russell A. Duncan, head of the APHIS Caribbean Area Safeguarding Program. “Those countries alerted us, giving both ARS and APHIS the chance to help solve the red palm mite problem and to conduct research that will help mitigate risks of a U.S. incursion.

“It's a great example of how a very effective pest-control strategy can begin.”—By **Luis Pons** and **Rosalie Marion Bliss**, ARS.

This research is part of Plant Diseases (#303) and Crop Protection and Quarantine (#304), two ARS National Programs described on the World Wide Web at www.nps.ars.usda.gov.

To reach scientists mentioned in this story, contact Luis Pons, USDA-ARS Information Staff, 5601 Sunnyside Ave., Beltsville, MD 20705-5129; phone (301) 504-1628, fax (301) 504-1486, e-mail luis.pons@ars.usda.gov. ★



ARS entomologist Ronald Ochoa (left) and Farzan Hosein of the Trinidad Ministry of Agriculture, Marine, and Land Resources observe red palm mite populations and plant symptoms caused by the mites.