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First report of *Raoiella indica* (Acari: Tenuipalpidae) in southeastern Brazil

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The red palm mite, *Raoiella indica* Hirst (Acari: Tenuipalpidae), has been reported to cause major losses to coconut, *Cocos nucifera* L. (Arecales: Arecaceae), in the Caribbean area (Castillo 2008). Since its description in 1924 from southern India (Hirst 1924), the distribution of the red palm mite remained restricted to the Old World until 2004, when it was found damaging coconut on the Caribbean island of Martinique (Flechtmann & Etienne 2004). The red palm mite subsequently spread quickly throughout the topical New World, reaching the southern section of North America and northern section of South America (Carrillo et al. 2011). In recently invaded areas of the Americas, *R. indica* has greatly extended its host range and is currently recorded on 91 host plant species in 6 families (Carrillo et al. 2012).

In South America, the red palm mite was first reported from Venezuela in 2007 (Vásquez et al. 2008), alerting Brazilian researchers to the risk it posed to Brazil. Due to the potential impact of this mite, it was added in 2007 by the Brazilian Ministry of Agriculture to the list of quarantine pests. An extensive survey was initiated in 2007 in Roraima, a Brazilian state bordering Venezuela, but *R. indica* was not found. However, in July 2009, the red palm mite was found in samples of coconut and banana leaves from the urban area of Boa Vista, the capital of Roraima (Navia et al. 2011).

In an attempt to prevent the spread of the red palm mite to other states, the Brazilian Ministry of Agriculture adopted quarantine measures prohibiting the movement of bananas and other host plants from areas in Roraima, where the red palm mite was established, to the neighboring state of Amazonas. This measure failed to prevent the spread of the red palm mite over the following 2 yr to the urban area of Manaus, where it was collected from *C. nucifera*, *Veitchia merrillii* (Becc.) H. E. Moore (Arecales: Arecaceae) and *Caryota mitis* Lour. (Arecales: Arecaceae) (Rodrigues & Antony 2011). Because of its occurrence in Roraima and Amazonas states, the status of the red palm mite was changed in 2013 from quarantine pest that is absent to quarantine pest of restricted distribution in Brazil, allowing other states to adopt measures to prevent its entry.

In May 2015, casual examination of leaflets of *Phoenix roebelenii* O'Brien (Arecales: Arecaceae) in a public garden of the urban area of Dracena (21.483589°S, 51.533147°W), in the western region of the state of São Paulo, southeastern Brazil, and of leaflets of *C. nucifera* and *Rhapis excelsa* (Thunb.) A. Henry (Arecales: Arecaceae), from a private property (21.464086°S, 51.549114°W) in the outskirts of Dracena, showed the presence of mites similar to *R. indica*. On both properties, the plants had been established in the ground for a long time. Mite samples were collected in 70% ethanol, and representatives were slide-mounted in Hoyer's medium for examination with phase contrast microscopy. Voucher specimens were deposited in the Mite Reference collection at the Acarology Laboratory, Departamento de Entomologia e Acarologia, Escola Superior de Agricultura "Luiz de Queiroz," Universidade de São Paulo, in Piracicaba, São Paulo, Brazil.

Leaflets examined showed typical symptoms of attack by the red palm mite, characterized by severe yellowing of the leaflets, especially those of coconut plantlets (Fig. 1). All red palm mite developmental stages and numerous exuviae were found on the 3 hosts (Fig. 2A–D), suggesting that this mite may have been in Dracena for some time. A memorandum documenting the red palm mite was sent to the Plant Health Service of the Brazilian Ministry of Agriculture, at São Paulo, on 1 Jun 2015 to prompt the adoption of appropriate measures.

Finding the red palm mite in Dracena, about 2,300 km from the next nearest known occurrence in Brazil, represents a major expansion in distribution. In an estimate of the potential geographic distribution of the red palm mite in South America, Amaro & Morais (2013) concluded that the environmental conditions of Dracena (CEPAGRI 2015) makes it only marginally suitable to support the red palm mite. The great distance and the presence of the Amazon forest between Dracena and Manaus suggests that spread of the red palm mite via natural dispersion to São Paulo is unlikely, and that the red palm mite reached the state of São Paulo by transportation of host plants, probably coconut or ornamental Arecaceae.

Based on these observations and the extent of trade and traffic between São Paulo and northeastern Brazil, it seems that the arrival of *R. indica* to that region is imminent. Because the prevailing climatic conditions of low rainfall and high temperature are favorable for the development of the red palm mite (Nagesha-Chandra & Channabasavanna 1983; Taylor et al. 2012), introduction of the red palm mite to northeastern Brazil, which is the major regional producer of coconuts,

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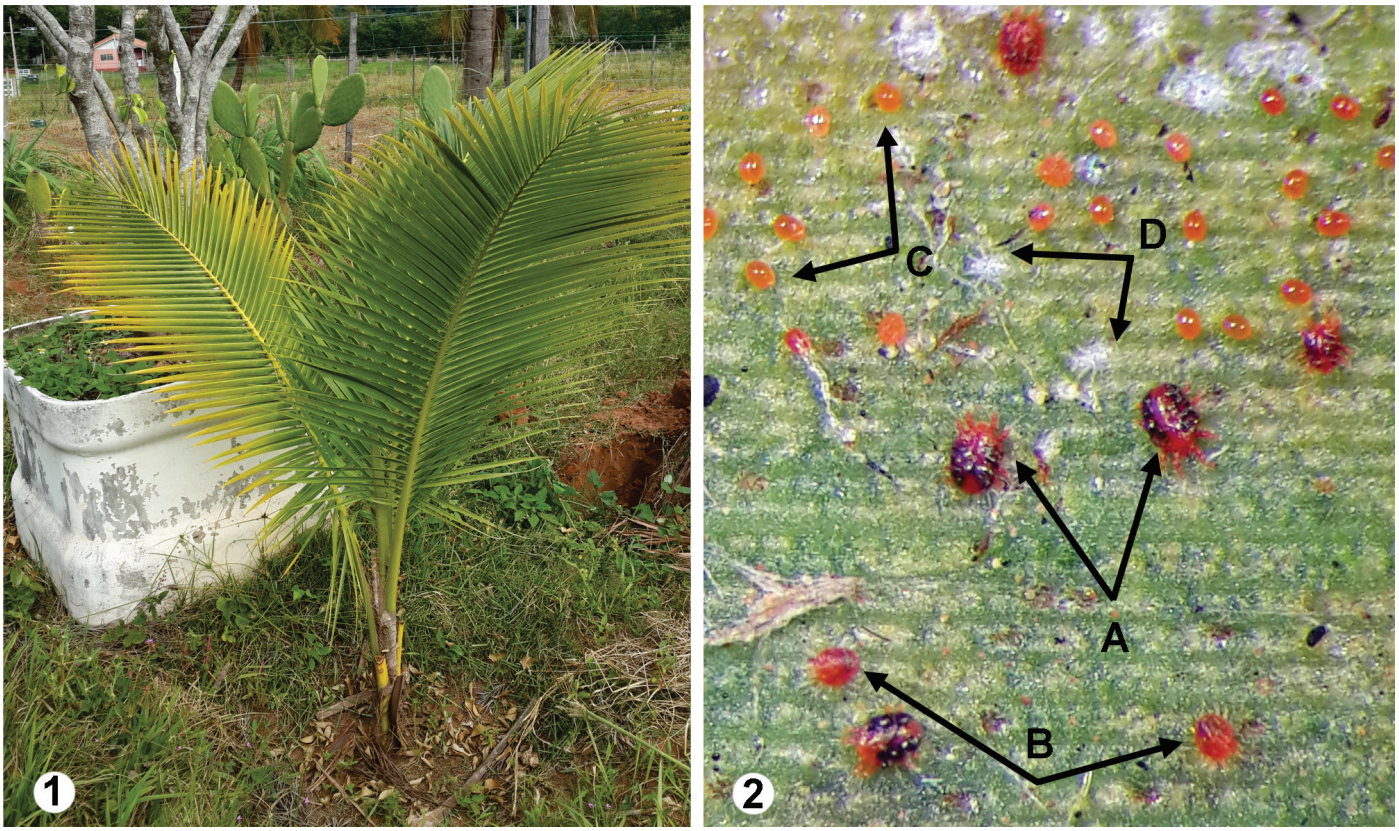

Figs. 1 and 2. The red palm mite, *Raoiella indica*, in Dracena, São Paulo, Brazil. 1. Symptoms on leaves of a coconut plantlet. 2. A, Adult female; B, post-embryonic immature; C, eggs; and D, exuviae.

is likely to significantly impact the coconut industry in the region (Navia et al. 2011; Gondim et al. 2012; Amaro & Morais 2013).

Brazil is the 4th largest coconut producer, after Indonesia, the Philippines, and India (FAO 2013), and the 3 largest producing states in Brazil (Bahia, Ceará, and Sergipe) are located in the northeastern region (IBGE 2010). The arrival of *R. indica* to those states has the potential to cause heavy economic loss and social and cultural disturbance. Thus, efforts should be made to reduce the possibility of the spread of the red palm mite to those states.

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Summary

The red palm mite, *Raoiella indica* Hirst (Acari: Tenuipalpidae), was found for the first time in the urban area of Dracena, state of São Paulo, southeastern Brazil, in May 2015, on *Cocos nucifera* L., *Phoenix roebelenii* O'Brien, and *Rhapis excelsa* (Thunb.) A. Henry (Arecales: Arecaceae). *Raoiella indica* was first reported in Brazil in the state of Roraima, in 2009, and subsequently found in Manaus, Amazonas State, in 2011. Discovery of *R. indica* in Dracena, about 2,300 km southeast of Manaus, represents a major range expansion, suggesting that its arrival in northeastern Brazil is imminent, where hosts and climate conditions are favorable to its development. Coconut is an important crop in this region of Brazil and may incur major loss.

Key Words: Arecaceae; red palm mite; quarantine pest; São Paulo; plant protection

Sumário

O ácaro-vermelho-das-palmeiras, *Raoiella indica* Hirst (Acari: Tenuipalpidae), foi encontrado pela primeira vez na área urbana de Dracena, estado de São Paulo, Sudeste do Brasil, em maio de 2015, em *Cocos nucifera* L., *Phoenix roebelenii* O'Brien e *Rhapis excelsa* (Thunb.) A. Henry (Arecales: Arecaceae). *Raoiella indica* foi relatada pela primeira vez no Brasil no estado de Roraima, em 2009, sendo posteriormente encontrado em Manaus, estado do Amazonas, em 2011. A constatação de *R. indica* em Dracena, aproximadamente 2.300 km a sudeste de Manaus, representa uma importante expansão em sua área de ocorrência, sugerindo que a sua chegada ao Nordeste do Brasil é iminente, onde hospedeiros e condições climáticas são favoráveis ao desenvolvimento de *R. indica*. O coqueiro é uma cultura importante nesta região do Brasil, e poderão incorrer grandes perdas.

Palavras Chave: Arecaceae; ácaro-vermelho-das-palmeiras; praga quarentenária; São Paulo; fitossanidade

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