European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Data sheets on quarantine pests
Fiches informatives sur les organismes de quarantaine

Rhynchophorus palmarum

Identity

Name: *Rhynchophorus palmarum* (Linnaeus 1758)
Synonyms: *Calandra palmarum* (Linnaeus) 1801, *Cordyle barbirostris* Thunberg 1797, *Cordyle palmarum* (Linnaeus) 1797, *Curculio palmarum* Linnaeus 1758, *Rhynchophorus cycadis* Erichson 1847, *Rhynchophorus depressus* Chevrolet 1880, *Rhynchophorus languinosus* Chevrolet 1880
Taxonomic position: *Insecta*: *Coleoptera*: *Curculionidae*
Common names: palm weevil, palm-marrow weevil, South American palm weevil (English); charançon du palmier (French); casanga, gorgojo cigarrón, gorgojo cigarrón del cocotero, gorgojo prieto de la palma, gualpa mayate prieto del cocotero, picudo de la palma de coco, picudo del cocotero, picudo negro de la palma (Spanish); neotropischer Palmen-Rüssler (German); broca-do-olho-do-coqueiro (Portuguese)
EPPO code: RHYCPA
Phytosanitary categorization: EPPO A1 action list no. 332

Hosts

R. palmarum has been reported on 35 plant species of 12 different families, but is found predominantly on *Arecaceae* (Esser & Meredith, 1987; Griffith, 1987; Wattanapongsiri, 1966; Jaffé & Sánchez, 1990; Sánchez & Cerda, 1993). It has only been reported as a pest on palms and on sugarcane (Arango & Rizo, 1977; Restrepo *et al*., 1982). When reported on other plants, *R. palmarum* was feeding on ripe fruits, but was not causing economic damage.

The main hosts are *Cocos nucifera*, *Elaeis guineensis*, *Euterpe edulis*, *Metroxylon sagu*, *Phoenix canariensis*, *Phoenix dactylifera*, *Saccharum officinarum*. Non-significant hosts (adult feeding only) are *Ananas comosus*, *Annona reticulata*, *Artocarpus altilis*, *Carica papaya*, *Citrus* spp., *Mangifera indica*, *Musa* spp., *Persea americana*, *Psidium guajava*, *Theobroma cacao*.

Geographical distribution

As reported by Wattanapongsiri (1966), the genus *Rhynchophorus* has an extensive worldwide distribution, but is concentrated in the tropics.

North America: Mexico
Caribbean and Central America: Belize, Costa Rica, Cuba, Dominica, El Salvador, Grenada, Guadeloupe, Guatemala, Honduras, Martinique, Nicaragua, Panama, Puerto Rico, St Vincent, Trinidad and Tobago
South America: Argentina, Bolivia, Brazil (Alagoas, Amazonas, Bahia, Matto Grosso do Sul, Minas Gerais, Pará, Sergipe), Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Surinam, Uruguay, Venezuela
EU: absent
Distribution map: See CABI/EPPO (1969)

Biology

R. palmarum is common in virgin forests and in agroecosystems exploiting oil palms. The altitudinal range is from sea level up to 1200 m (Jaffé & Sánchez, 1990). Studies on the biology of this species are reported in Wilson (1963), Nadarajan (1988), Sánchez *et al*. (1993) and Hagley (1965). The larvae of *R. palmarum* feed exclusively on live vegetative tissue. Under laboratory conditions (20–35°C and 62–92% relative humidity), a female may lay an average of 245 ± 155 eggs during a period of 30.7 ± 14.3 days. The incubation period is 3.2 ± 0.93 days and the larvae have between six and 10 instars over a period of 52.0 ± 10.0 days. The prepupal stage lasts 4–17 days, during which the larvae make a cocoon using vegetative fibres. The pupal metamorphosis period lasts for 8–23 days and the adults remain in the cocoon for 7.8 ± 3.4 days before emerging. Adult males may live for 44.7 ± 17.2 days and females for 40.7 ± 15.5 days. Hagley (1965) reported that a single female may lay up to 718 eggs, whereas Sánchez *et al*. (1993) reported a maximal oviposition of 697 eggs. Nadarajan (1988) and Sánchez *et al*. (1993) studied the biology of the insect using alternative rearing methods with artificial diets, and the behaviour of the insect including courtship, mating and oviposition in the laboratory. They indicated that the females deposit their eggs into holes in the plant made by the rostrum (normally when the surface of the plant tissue presents some damage, near or on the internodal area of the palm trunk next to the crown). Eggs are then oviposited individually in randomly distributed holes. The egg rests in a vertical position in the hole which is sealed by the female with a brown waxy secretion. The adults are active during the day showing a bimodal daily activity cycle. Hagley (1965) reported major activity peaks between 7 and 11, and 17 and 19 h. Sánchez & Jaffé (1993) observed flight activity in the field, confirming the binomial nature of the activity cycle, in which adults fly only with sunlight, but avoiding the hottest hours at noon and the early afternoon. Field observations showed that adults may fly at velocities of 6.01 m s^{-1} (Hagley, 1965). When using attractive odours a distinct chemotropic and anemotropic behaviour is evident (Sánchez & Jaffé, 1993). Studies on the population dynamics of this species in Central America are reported by Chinchilla (1988), showing that the maximum adult population occurs during the dry season. Similar results were obtained by Schuiling & Van Dinther (1981) in Brazil.

Bain & Fedon (1951) determined that *R. palmarum* is the most important vector of the nematode *Rhadinaphelenchus cocophilus*, which causes red-ring disease of coconut. The contamination of healthy plants with red-ring disease occurs only if insect vectors are present. The nematode is an obligate parasite distributed in all tissues of the plant. Red-ring disease has reached epiphytotic levels in the past (Griffith, 1968).

Detection and identification

Symptoms

The external symptoms on infested palms are a progressive yellowing of the foliar area, destruction of the emerging leaf and necrosis in the flowers. Leaves start to dry in ascending order in the crown; the apical leaf bends and eventually drops. However, these external symptoms are not sufficient for clear identification. Internally, the galleries and damage to leaf-stems produced by the larvae are easily detected in heavily infested plants. Pupae and old larvae are frequently found when inspecting the crown of infested plants. Affected plant tissue turns foul, producing strong characteristic odours. *Dynamis borassi*, a sympatric and morphologically similar looking weevil, may cause similar damage.

R. palmarum primarily attacks the apical region of palm crowns, and larvae remain inside the galleries they build. Thus, the pest can only be detected when damaged plants start to die, or by using pheromone-baited traps (Jaffé *et al.*, 1993; Chinchilla & Öhlschlager, 1992, 1993; Sánchez & Jaffé, 1993).

Morphology

The eggs, larvae and pupae are described by Wattanapongsiri (1966).

Eggs

Located individually 1–2 mm inside soft plant tissue, near the apical area of the palm, protected by a brown waxy secretion. The eggs are 2.5 × 1 mm in size, white and with rounded extremes. Old eggs often show undulatory movements of the emerging larvae, which show their darker cephalic coloration through the chorion of the egg.

Larvae

The larvae have no legs and are initially 3–4 mm long. They possess sclerotized mouth parts with strong mandibles. The larvae are cannibalistic. Their body is slightly curved ventrally and may reach 5–6 cm in length. Their colour is cream white. Prepupae become darker and before pupating they migrate to the periphery of their gallery in the trunk, floral rachis or leave stem.

Pupae

Exarate and light brown. The abdomen continuously makes undulatory movements when perturbed. Pupae inhabit a cylindrical-ovoid closed cocoon 7–9 cm long and 3–4 cm in diameter, built with plant fibres organized in a spiral configuration.

Adults

Adult *R. palmarum* have a black, hard cuticle and possess the characteristic elytra of Coleoptera, protecting the abdomen when closed. They measure 4–5 cm in length and are approximately 1.4 cm wide, weighing 1.6–2 g. The head is small and round with a characteristic long, ventrally curved rostrum. Adults show sexual dimorphism; males have a conspicuous batch of hairs on the antero-central dorsal region of the rostrum.

Pathways for movement

The pest can spread over long distances with movement of infected plants for planting of palms. Short distance spread is possible with adult flights.

Pest significance

Economic impact

Countries reporting the largest damage to crops in palm plantations include Central America (Costa Rica), Colombia, Venezuela and Brazil. Since the beginning of this century, *R. palmarum* has been reported as one of the most important pests on commercial palm plantations, mainly of *Cocos nucifera* and *Elaeis guineensis* (Griffith, 1968, 1970; Dean, 1979; Fenwick, 1967; Sánchez & Cerda, 1993) and on ornamental palms. The larvae feed on the growing tissue in the crown of the palm, often destroying the apical growth area and causing eventual death of the palm. Economic damage depends on the palm species and on the number of larvae infesting the plant. Fenwick (1967) and Griffith (1968) reported that populations of 30 larvae are sufficient to cause the death of an adult coconut palm.

In addition to direct damage, *R. palmarum* causes indirect damage as the vector of *R. cocophilus*. Infected coconut palms 3–10 years old die during the first 2 months after inoculation

(Griffith, 1987). Thurston (1984) and Brathwaite & Siddiqi (1975) reported that infected plants take 23–28 days to show the symptoms of red-ring disease, and die 3–4 months after showing the first symptoms. Esser & Meredith (1987) estimated that several million USD are lost annually due to the association of red-ring disease and *R. palmarum*. They estimated that 800 ha of coconut plantations were abandoned in 1923 due to this disease, and that in Grenada 22% of the coconut palms were infested with red-ring disease. A similar situation seems to be common in other countries in America.

Control

Control strategies have to take into account that *R. palmarum* is a pest in its own right and a vector of *R. cocophilus*. At the moment, the control of red-ring disease is by control of the insect vector as no efficient control of the nematode exists. Chemical control of the insect, although often attempted, is not successful (Hagley, 1963). Cultural control consisting of the burning of affected trees reduces infestation. Chemical killing and drying of infected plants also reduces infestation (Victoria *et al*., 1970; Blair, 1970; Griffith, 1987), as larvae need living plant tissue in order to survive. The use of natural enemies against this pest may be possible, but has yet to be established. Moura *et al*. (1993) suggested that *Paratheresia menezesi* may be used to regulate populations of *R. palmarum*.

The most widely used control methods are based on the capture of adults with traps baited with rotting plant materials, such as palm tissue, pineapple and sugar cane (Griffith, 1987; Dean, 1979; Morin *et al*., 1986; Genty, 1988; Moura *et al*., 1990). Various different types of traps have been proposed in order to attract the insects and kill them in the trap with chemicals (methomyl, triclorfon and pirimifos-ethyl) (Dean, 1979). Yellow traps seem to be more efficient than those of other colours.

The most modern versions of the trap use natural or synthetic aggregation pheromones to help attract the insects. Moura *et al*. (1989) and Rochat *et al*. (1991a) showed that males produce an aggregation pheromone, attracting males and females equally. Rochat *et al*. (1991a,b) identified the pheromone as 2(E)-6-methyl-2-hepten-4-ol, calling it rhynchophorol. It was found that male insects only release the pheromone when feeding. Jaffé *et al*. (1993) showed that it was the smell of the appropriate plant odours, mainly ethyl acetate, that started the release by males of the aggregation pheromone, and that the aggregation pheromone alone only attracts insects up to a certain distance, after which plant odours are required to attract the insect into the trap. Öhlschlager *et al*. (1993) and Chinchilla & Öhlschlager (1992, 1993) evaluated pheromone-baited traps in the field. Various efficient trapping methods have been proposed (Moura *et al*., 1990, 1993; Chinchilla & Öhlschlager, 1992, 1993; Öhlschlager *et al*., 1992a,b; Vera & Orellana, 1988; Jaffé *et al*., 1993; Sánchez & Jaffé, 1993), all based on containers which attract the insect with odours produced by plant tissue (mostly sugarcane) and the aggregation pheromone. The pheromone can be obtained either by commercial synthesis or by filling the trap with males, activating them with ethyl-acetate odours to induce production of the pheromone (Sánchez & Jaffé, 1993). Captured insects can then be killed with insecticide or by other means.

Phytosanitary risk

R. palmarum presents a significant risk to date palms in North Africa, and to ornamental palms planted throughout the Mediterranean region. It may also present some risk to sugarcane, grown in southern Mediterranean countries. There are at present no *Rhynchophorus* spp. attacking palms in the EPPO region, although there have been very limited outbreaks of the introduced *Rhynchophorus ferrugineus*, a similar species from Asia, in Spain, Israel and Jordan, where it is subject to containment measures[1]. Esteban Duran *et al*. (1998) suggest that *R. palmarum* is among the pests that could potentially be introduced to other countries of the EPPO region through imported plants for planting of palms. Though the agent of red-ring disease *R. cocophilus*, which is vectored by *R. palmarum*, presents a risk to tropical countries, where its known hosts oil palm and coconut (Brathwaite & Siddiqi, 1975) are grown, it does not appear to present a direct risk to the EPPO region.

Phytosanitary measures

R. palmarum was added in 2005 to the EPPO A1 action list, and endangered EPPO member countries are thus recommended to regulate it as a quarantine pest. Imported plants for planting of palms should originate in a pest-free area or come from a pest-free place of production.

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[1] *R. ferrugineus* is being evaluated as a potential quarantine pest for the EPPO region and is likely to be added to the EPPO A2 action list shortly.

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