

# Coconut Scale *Aspidiotus destructor* Signoret (Insecta: Hemiptera: Diaspididae)<sup>1</sup>

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## Introduction

Coconut scale, *Aspidiotus destructor* Signoret (Hemiptera: Diaspididae), is a pest in over 60 plant families and is found globally in tropical and subtropical areas (Davidson and Miller 1990; Ben-Dov 2014). This armored scale was described by Signoret in 1869 and appears to be native to South Asia but has spread around the world, mainly on infested coconut and banana (UK CAB International 1966). The insect feeds on plant sap from leaves, stems and fruits, causing yellowing, tissue distortion and die back. The coconut scale is a pest of concern on coconut and other perennial crops due to its relatively short life cycle of around 35 days and multiple overlapping generations per year. Coconut scale is known to be dispersed by birds, bats and insects as well as wind (Taylor 1935).

## Synonymy

Other scientific names:

- *Aspidiotus cocotis* Newstead (1893)
- *Aspidiotus lataniae* Green (1896)
- *Aspidiotus transparens* Green (1890)
- *Aspidiotus translucens* Cockerell and Robinson (1915)
- *Aspidiotus watanabei* Takagi (1969)
- *Temnaspidotus destructor* (Signoret) Borchsenius

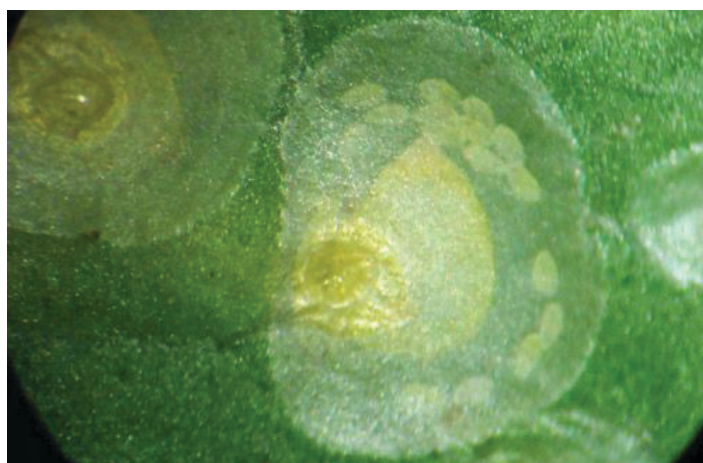


Figure 1. Adult female coconut scale, *Aspidiotus destructor* Signoret, showing eggs under cover.

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Other common names:

- bourbon scale
- bourbon aspidiotus
- transparent scale

## Distribution

Coconut scale has been recorded worldwide in tropical and subtropical areas, including China, Southeast Asia, India, Pakistan, Russia, Brazil, Central America and Caribbean, the Pacific Islands, Africa, and North America (UK CAB International 1966; Bennett and Alam 1985; Tao 1999;

1. This document is EENY622, one of a series of the Department of Entomology and Nematology, UF/IFAS Extension. Original publication date March 2015. Revised May 2021 and December 2024. Visit the EDIS website at <https://edis.ifas.ufl.edu> for the currently supported version of this publication.

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Claps et al. 2001). Coconut scale is present in nearly all coconut growing countries of the world. In the United States, coconut scale has been recorded in Connecticut, Florida, Georgia, Hawaii, Pennsylvania, and Puerto Rico (Nakahara 1982; Heu 2002). In more northern regions, it is found only in greenhouses or other enclosed areas (Danzig and Pellizzari 1998).

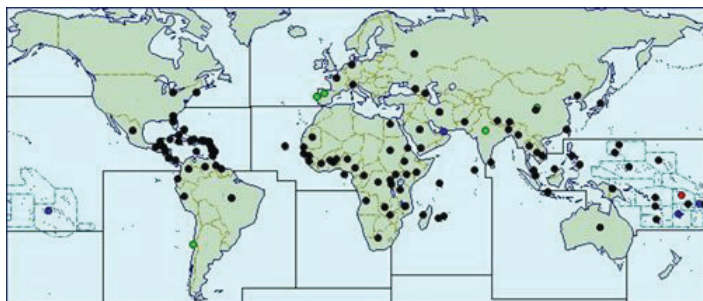


Figure 2. Distribution map for *Aspidiotus destructor*.

Credits: UK CAB International 1966, Bennett and Alam 1985, Tao 1999, Claps et al. 2001

## Description

Coconut scale resembles other armored scales in that the body is protected by a waxy cover. Infestations may be noted by the formation of closely packed colonies composed of what resemble miniature fried eggs. Females develop through two nymphal stages, while males have an additional non-feeding pre-pupal stage (four immature stages). Positive identification of coconut scales requires that adult females be slide mounted and the diagnostic characters observed at high magnification.

## Eggs

Freshly laid eggs are smooth, elongate and whitish, becoming pale yellow over time. Eggs are laid under the scale cover around the body of the female. Mean length and width of eggs are 0.22 mm (0.009 in) and 0.09 mm (0.004 in), respectively (Salahud din et al. 2015).

## First Instar Nymphs

Newly hatched nymphs (also called crawlers) are free-moving and recognized by the presence of legs, antennae, and a pair of bristles at the tip of abdomen. Crawlers are light green to yellowish brown, translucent and somewhat oblong, with an average length and width of 0.23 mm (0.009 in) and 0.11 mm (0.004 in), respectively (Salahud din et al. 2015).

## Second Instar Female

Females remain pale yellow, circular and somewhat transparent in the second instar, which lasts for 8–10 days.

Female nymphs are 0.6–1.1 mm (0.02–0.04 in) long (Williams and Watson 1988).

## Male Nymphs

Development of male characteristics starts in the middle of the second instar. Male covers become reddish brown and more elliptical in shape, and then transform in stages into the pre-pupal, pupal and adult stages. The second instar lasts for 5–8 days for males (Williams and Watson 1988). The male pre-pupal and pupal stages are spent under the scale produced by the second instar.

## Adult Females

Adult female coconut scales have a circular or broadly oval cover that is 1.5–2.0 mm ( $\sim\frac{1}{16}$  in) in diameter. The cover is flat and translucent with a subcentral pale exuviae. Bodies of slide-mounted specimens are 0.7–1.2 mm (0.03–0.05 in) in length with a pyriform and membranous body. Diagnostic characteristics include three pairs of lobes with no indication of a fourth pair; plates long, flat and fringed; and with sclerotization on the dorsum of the pygidium (Williams and Watson 1988).

## Adult Males

Adult male coconut scales are small, two-winged, reddish, gnat-like insects with eyes, antennae, three pairs of legs and long appendages. Adult males do not feed and are short lived.



Figure 3. Coconut scale, *Aspidiotus destructor* Signoret, showing eggs, nymphs and exuviae, and adult female with cover removed.

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## Life Cycle

Adult females lay 28–65 eggs in concentric circles under the scale cover over a period of 11–13 days and may produce 3 or 4 consecutive batches in their lifetime (Taylor 1935). Crawlers may emerge while the female has already started laying the next batch of eggs (personal observation). The crawlers move over the leaf surface for 2–48 hours to find



a feeding site (Taylor 1935; Waterhouse and Norris 1987). After settling, females remain sessile throughout their development; adult males undergo a pseudo-pupation, develop a pair of wings and can disperse by flying to find mates (Ghauri 1962). Females release pheromones through their anus to attract males (Moreno 1972). Sexual reproduction is influenced by food availability, but typically the sex ratio is 1:1 (male: female); although both male and female colonies have been observed (Ahmad and Ghani 1972; Taylor 1935).

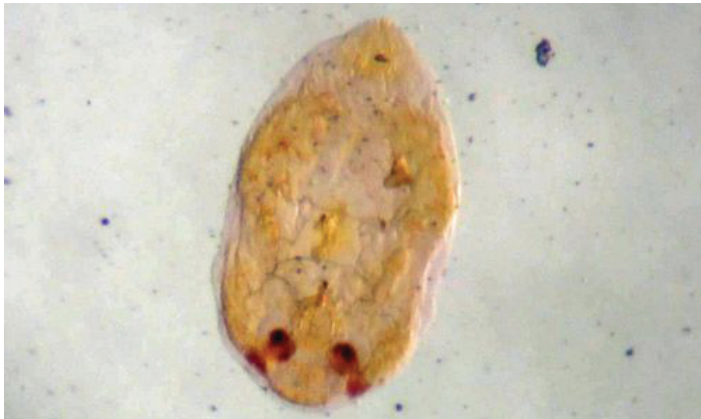


Figure 4. Coconut scale, *Aspidiotus destructor* Signoret, male pupa removed from cover.

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Figure 5. Adult female coconut scale, *Aspidiotus destructor* Signoret, removed from cover.

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Crawlers are the primary dispersal stage of coconut scale within and between host trees. Coconut scale development depends upon climatic conditions: at a mean temperature of 30°C (86°F) and 65% relative humidity, egg to adult development was 35.5 days for females and 28.5 days for males, with 3 or 4 generations from July to December on mango plants in Pakistan (Salahud din et al. 2015).



Figure 6. Adult male coconut scale, *Aspidiotus destructor* Signoret.

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## Hosts

Ben-Dov (2014) reported several hundred hosts from over 60 plant families. Common perennial hosts include tropical fruits and ornamental plants, including banana, coconut, camellia, guava, mango, palm, papaya, breadfruit, ginger, bird of paradise, sugarcane, ficus, apple, plumeria, avocado, citrus, grape, and palms.

## Economic Importance

Coconut scale is considered a major threat to coconut palms throughout the world. It infests at high densities on the undersurface of coconut leaves, as well as on the frond stalks, flower clusters and young fruit. Coconut scale was accidentally introduced into the Pacific Islands and became a serious pest until the introduction of parasitoids and predators which achieved significant suppression (Waterhouse and Norris 1987). It is also an economic pest of mango in Asia, Africa, and South America (Chua and Wood 1990; Kumari et al. 2014).

This species is reported to preferentially infest older leaves of mango, but it also causes blemishes on the skin of mango fruits which reduces their value. Coconut scale infests fruits of oil palms and banana and reduces fruit quality (Chua and Wood 1990). Coconut scale was first reported in Hawaii in 1968 on papaya, banana, and apple; and remains a pest of concern in that region (Kessing and Mau 2007). Removal of sap from leaves, petioles, peduncles, and fruits leads to discoloration, depressions, and tissue distortions on leaves. Coconut scales may possibly introduce toxins into the plant through their saliva (Waterhouse and Norris 1987).





Figure 7. Mature mango plant infested with coconut scale, *Aspidiotus destructor* Signoret, in Pakistan.

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Figure 10. Upper side of mango leaf infested with coconut scale, *Aspidiotus destructor* Signoret, showing chlorosis.

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Figure 8. Mango twig showing discoloration from coconut scale, *Aspidiotus destructor* Signoret, infestation.

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Figure 9. Underside of mango leaf infested with coconut scale, *Aspidiotus destructor* Signoret.

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## Management

### Biological Control

Over 40 species of parasitoids and predators, and several fungal pathogens, are known to attack coconut scale (Ben-Dov et al. 2014). In the absence of these natural enemies, population explosions of this pest can occur. *Aphytis melinus* DeBach and *Aphytis lingnanensis* Compere (Hymenoptera: Aphelinidae) are the most common parasitoid species controlling the coconut scale populations in Fiji and the Philippines (DeBach 1974; Watson et al. 2015). *Aphytis melinus* and/or another parasitoid, *Comperiella bifasciata* Howard (Hymenoptera: Encyrtidae), were introduced into Hawaii, California, Argentina, and other regions for the control of coconut scale. In Pakistan, *Pakencyrtus pakistanensis* Ahmad (Hymenoptera: Encyrtidae) was reported as an important parasitoid in mango (Ahmad and Ghani, 1972). Coccinellid ladybird beetle predators of coconut scale include *Chilocorus* spp., *Telsimia nitida* Chapin, *Pseudoscymnus anomalus* Chapin, and *Cryptognatha* spp.

### Cultural Control

Pruning and training of fruit trees and proper disposal of infested leaves, branches and twigs will help control scale insects on nursery plants and trees. Excessive use of plant fertilizers contributes to scale outbreaks.

### Chemical Control

Various insecticides are registered for control of armored scales in ornamental and fruit crops. Crawler stages are generally the most susceptible to insecticides. Contact action insecticides, including horticultural oils, become progressively less effective once the scale insects develop their waxy cover. Insect growth regulators may be effective, provided they are applied when the immature stages are present. Location of the insect on the plant, growth stage

of the plant, and solubility of the insecticide influence the effectiveness of systemic insecticides applied for control of armored scales. Several spray applications at 15–20 day intervals may be necessary for complete management of a heavy infestation. The toxicity of insecticides to parasitoids and other beneficial insects should be considered before starting a spray program for scale insects. Since coconut scale is a quarantine pest in many areas, phytosanitary treatment with gamma irradiation has been developed as a potential control measure for this scale (Follet 2006).

### Florida Insect Management Guide for Mango



Figure 11. *Aphytis melanus*, a parasitic wasp, ovipositing on an armored scale.

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