PEST ADVISORY LEAFLET NO. 38

Plant Protection Service
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COCONUT SCALE INSECT

Coconut scale insect *Aspidiotus destructor* Signoret (Hemiptera: Dispididae) (CSI) is recorded in tropical and subtropical regions worldwide and is present in nearly all countries where coconuts are grown. It is also known as armoured scale, transparent scale, bourbon scale, bourbon aspidiotus, and sometimes called red flies because of the abundance of male flies during late afternoons in case of severe outbreaks.

CSI infests stems, branches, leaf-petioles, leaves and fruits of their host plants. It is found mostly on the undersides of leaves. During severe outbreaks, scale insects completely cover the underside of leaves and defoliate and even kill their host plants.

After accidental introduction to some Pacific islands, CSI became a very serious pest of coconuts until the initiation of biological control, following which, almost invariably, its pest status in many countries has been greatly reduced. Recently it has spread to new areas and in the absence of natural enemies it has become a serious pest.

DISTRIBUTION IN THE PACIFIC REGION

The following countries in the region record the presence of the CSI.

American Samoa, Fiji Islands, French Polynesia, Guam, Marshall Islands, Federated States of Micronesia, New Caledonia, Northern Mariana Islands, Papua New Guinea, Samoa, Solomon Islands, Tuvalu, Vanuatu, Wallis and Futuna, Tokelau.

HOST RANGE AND PEST STATUS

CSI is a highly polyphagous diaspid scale. Although it is most notable on coconuts, it is a well known pest of tropical crops belonging to many families.

CSI hosts are typically perennial species and include many species of fruit trees, such as avocado, breadfruit, mango, guava and papaya. Other major hosts are cocoa, cassava, cotton, kava, oil palm, papaya, rubber, sugarcane and tea. It also attacks a range of ornamental plants including roses.

Coconut is its preferred host. CSI is found mainly on the underside of leaves, but frond stalks, flower clusters and young fruit can also be attacked.During heavy infestations they attack the upper side of coconut leaves as well. Attack on fruits causes shrivelling of nuts leading to premature nut fall. Young coconut trees aged 10-15 years are most vulnerable to CSI damage.

On bananas, the scale attacks the whole plant: leaf, leaf petioles and psuedo-stems, causing stunting of the plants. Infested fruit are deformed and unmarketable. Severe attacks can kill the plants.

Damage to fruit trees causes leaf fall, stunting and dieback of the plants. Scale presence on fruit cause blemishes, and fruits are deformed and unmarketable.

Shrubs such as roses can be severely affected by CSI attacks causing stunting that may lead to secondary infections and finally collapse of the plant.

Figure 1: Coconut Scale Insect on coconut leaf

The scales suck sap from the plant and inject toxins from its salivary glands.

A secondary effect of the CSI is development of sooty mould on plant surfaces, especially on leaves, which stops photosynthesis. A sweet excretion attracts ants, which scare away the natural enemies of the scale and assist in spread of crawlers.

CSI is known to attack the following plant species:
Annona muricata (soursop), *Artocarpus altilis* (breadfruit), *Camellia sinensis* (tea), *Capsicum* spp., *Cassia* spp. (sennas), *Ceiba pentandra* (kapok), *Cocos nucifera* (coconut), *Carica papaya* (pawpaw), *Cinnamomum zeylanicum* (cinnamon), *Citrus* spp., *Colocasia esculenta* (taro), *Cucumissativus* (cucumber), *Dioscorea* spp. (yam), *Elaeis guineensis* (oil palm), *Eucalyptus deglupta, Eugenia, Euphorbia* (spurges), *Ficus carica* (fig), *Hevea brasiliensis* (rubber), *Hibiscus* (rosemallows), *Myristica fragrans* (nutmeg), *Lycopersicon esculentum* (tomato), *Plumeria* (frangipani), *Mangifera indica* (mango), *Musa* spp. (banana), *Pandanus* (pandanus), *Passiflora edulis* (Passionfruit), *Persea americana* (avocado), *Rhizophora, Piper nigrum* (black pepper), *Piper methysticum* (kava), *Prunus persica* (peach), *Raphanus* (radish), *Psidium guajava* (guava), *Saccharum officinarum* (sugarcane), *Solanum nigrum* (nightshade), *Spondias purpurea, Syzygium aromaticum* (clove), *Tamarindus indica* (tamarind), *Theobroma cacao* (cocoa), *Vitis vinifera* (grapevine), *Xanthosoma sagittifolium* (yautia (yellow)), *Zingiber officinale* (ginger), *Vigna unguiculata* (cowpea).

DAMAGE SYMPTOMS

On leaves, *A. destructor* causes scales with yellow spots developing where the crawlers have settled and grown into adults. Entire leaves may turn yellow to brown and fall. Sooty mould may develop. The bright yellow colour of affected coconut palms is clearly visible from a great distance. In extreme cases, the leaves dry out, entire fronds drop off and the crown dies. Heavy infestation results in stunting of new leaves, reduction of crop yield or complete crop failure. Infested coconut fronds exhibit yellow areas on the upper surface, formed by numerous yellow spots each marking the position of the coconut scale on the under surface.

DESCRIPTION, BIOLOGY AND ECOLOGY

The life cycle of *A. destructor* typically lasts 32 to 35 days. The larvae (crawlers) and adult males are the only mobile stages of the scale. The first-instar crawlers leave the maternal scale and begin feeding by inserting 'feeding tubes' on the affected part of the plant surface. The crawlers of both sexes are mobile. They can move only to a limited distance on the affected plant. They mostly depend on other agents - wind, birds, other animals, ants, etc. - for dispersal. Heavy rains wash off the crawlers from their hosts.

The eggs are yellow and very small. They are laid underneath the scale around the body of the female. The female deposits 20-50 eggs over a period of few days. Incubation takes 7 to 8 days. After hatching, the nymphs crawl out and colonise the plant surfaces.

The first-instar crawlers are about 1mm in length, yellowish-brown, oval and translucent. Second-instar females are stationary and secrete a translucent wax cover. The second-instar males are smaller than the females. They group together, secrete a filamentous waxy material and become immobile. The male pre-pupal and pupal stages are spent under the scale produced by the second-instar stage.

The females have two nymph stages. The males have four, two feeding, a pre-pupal and a pupal stage.

The scale cover of the adult female is oval to circular, 1.5-2.0 mm across, flat, thin and translucent. The pale yellow exuviae are more or less central on the scale. Inside the scale the yellow adult female measures 0.6-1.1 mm across. Adult males are more reddish than females, but much smaller and more oval. The male has one pair of wings and is motile.

CONTROL MEASURES

CSI can be easily be re-introduced, even if it is successfully controlled on the primary host crop, because of its wide host range.

Phytosanitary Measures

CSI is spread by people moving infested plants or plant parts. Quarantine border surveillance should be strict on the movement of planting material to avoid spread of scale.

Figure 2: Larvae of predatory ladybird beetle *Telsimia nitida*

Cultural Control

CSI can be eradicated from new areas by destroying infested plants and plant parts. The scale, however, is known to establish very quickly because of its wide host range and is therefore difficult to eradicate. Healthy plants in well-drained soils are seldom seriously infested. Weak and neglected plantations are particularly susceptible to damage by *A. destructor*.

Biological Control

Biological control of the pest is the long term solution. In the countries where the scale is present, the pest population is controlled by introducing natural enemies. In recent years introduction of natural enemies has controlled the pest in Tuvalu and on the island of Rotuma in Fiji.

However, biological control takes time to establish and become effective and occasionally there are pest outbreaks due to imbalance or loss of natural enemies. This imbalance or loss of natural enemies occurs due to natural causes such as droughts,, cyclones, etc. In such cases introduction of new stocks of the natural enemy may be necessary.

Natural enemies of other scale insects may adapt to feeding on *A. destructor* as it colonises new areas. The scale is attacked by a few specific and a large number of non-specific parasitoids and predators.

Predators rather than the parasitoids play a significant role in limiting CSI populations (Waterhouse and Norris, 1987). The most common are the coccinellid beetles, *Chilocorus* spp., *Cryptognatha nodiceps*, *Pseudoscymnus anomalus* , *Rhyzobius* spp. and *Telsimia nitida*. Parasitoids are not very well studied and known, but *Aphytis* spp. and *Encarsia* spp. do contribute significantly in maintaining of CSI populations in the field.

An early example of biological control of CSI was obtained by the introduction of *C. nodiceps* (Coleoptera: Coccinellidae) from Trinidad into Fiji in 1928 (Kamath, 1979). *C. nodiceps* has since been introduced to a number of Pacific Island countries and territories. The other predatory coccinellids, *Chilocorus nigritus, C.circumdata, P. anamolus* and *T. nitida* have also been successfully introduced and established in many of the Pacific Islands.

Figure 3: Adult beetle of predatory ladybird *Telsimia nitida*

To cater for occasional peak demands from Pacific islands for CSI natural enemies, the predators are reared under laboratory conditions at SPC Plant Protection Sevice in Fiji and field released where necessary.

Chemical Control

The use of chemicals is not usually recommneded as a pest control method, especially on coconuts. Pesticides can also kill the natural enemies present in the field. There are, however, a number of insecticides which could be used on affected plants and young establishing coconut plants.

Chemical control may specifically be effective in maintaining scale population in coconut and other nurseries. Some of the recommended insecticides are diazinon, chlorpyrifos, methidathion and white-oils. When using chemicals all safety precautions must be taken as stated on the labels of the products.

REFERENCE

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