Lethal Yellowing of Coconut Palm ‘*Candidatus* Phytoplasma palmae’

Hosts: Coconut palm (*Cocos nucifera*) and many other kinds of palms, such as *Adonidia merrillii*, *Borassus flabellifer*, *Caryota mitis*, *Caryota rumphiana*, *Chelyocarpus chuco*, *Corypha elata*, *Dictyosperma album*, *Dypsis cabadae*, *Hyophorbe verschaffeltii*, *Pandanus utilis*, *Phoenix* spp., *Pritchardia* spp., *Syagrus schizophylla*, *Trachycarpus fortunei*, *Veitchia arecina*, and *Veitchia merrillii*.

Disease common name: Lethal yellowing of coconut palm.

Pathogen: ‘*Candidatus* Phytoplasma palmae’.

Disease Cycle

Inoculum: The pathogen is found in infected plants; insects, such as leafhoppers, also carry the pathogen.

Transmission: The leafhopper *Myndus crudus* was identified as the vector in the Caribbean region. In West Africa, *Myndus adiopodoumeensis* is suspected to be a vector. In Florida, the disease has spread from the city of Miami to Palm Beach, a distance of about 128 km in 3 years. In Jamaica, the disease required about 60 years to move from the west to the east end of the island, a distance of approximately 238 km.

Infection: Phloem-feeding insects introduce the pathogen into phloem cells, which then become the main site of colonization.

Symptoms and signs: Lethal yellowing can be confused with other problems of coconut palms, such as fungal bud rot, nutritional disorders, insect damage, and nematodes. Moreover, symptoms of lethal yellowing vary among palm genera. On coconut palm, the first symptoms appear on mature, nut-bearing plants, characterized by premature drop or shelling of most or all nuts. Aborted nuts (Fig. 1) eventually turn brown to black and have a water-soaked appearance at the calyx end. Newly opened inflorescences become necrotic (Fig. 2) and totally black when mature. Male flowers abscise from spikelets and no fruit is set. At a later stage, yellowing of foliage begins with the lowermost leaves and progresses upward (Figs. 3 and 4) to eventually affect all leaves in the crown, causing a blightlike or characteristic “flag” appearance (Figs. 5 and 6). Fronds that become yellow then turn brown, hang downward, and die (Figs. 6 and 7). Trees may die within 3–6 months (Fig. 8) after the first appearance of these symptoms. In palms other than coconut, early symptoms are similar. Fruits are shed prematurely and new inflorescences tend to become dark, necrotic, dry, and gnarled. Leaf symptoms vary. For example, in *Corypha elata*, *Pritchardia* spp., *Syagrus schizophylla*, *Trachycarpus fortunei*, *Dictyosperma album*, and *Hyophorbe verschaffeltii*, the leaves turn yellow, beginning with the lowest fronds, and a flag leaf may develop. The leaves eventually turn brown, die, and may fall or cling to the palm. In *Veitchia merrillii*, *Borassus flabellifer*, *Caryota mitis*, and *Phoenix* spp., necrosis begins along the leaflet margins as a brownish stain.

Survival: The pathogen survives in phloem tissues of its many hosts.

Disease Management

Resistant coconut varieties and hybrids are essential for disease control. Malayan dwarf palm and certain other palms are resistant or immune to lethal yellowing. Sanitation practices, such as removing and burning diseased palms as soon as symptoms appear, help to delay disease spread. Insecticidal sprays to reduce vector populations have not effectively reduced

disease spread. Injections of infected trees with solutions of tetracycline antibiotics were reported to be effective and economically feasible in landscape plantings but are too expensive for commercial coconut production.

Reference

Elliott, M. L., Broschat, T. K., Uchida, J. Y., and Simone, G. W., eds. 2004. Compendium of Ornamental Palm Diseases and Disorders. American Phytopathological Society, St. Paul, MN.

Figure 1. Necrotic inflorescence and aborted nuts. (Courtesy W. Sinclair)

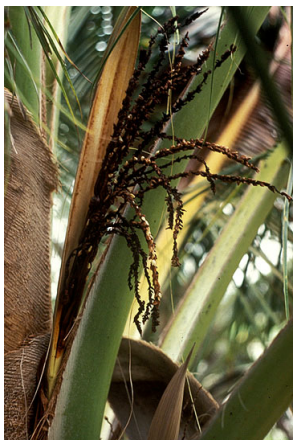

Figure 2. Necrosis of newly opened inflorescence. (Courtesy M. Davis)

Figure 3. Yellow spear leaf in center of a palm. (Courtesy W. Sinclair)

Figure 4. Older yellow leaves are followed by younger ones turning yellow near center of crown. (Courtesy W. Sinclair)

Figure 5. Chlorosis of fronds. (Courtesy A. Martinez)

Figure 6. Severely diseased palms with yellowing of leaves and desiccation. (Courtesy M. Shurtleff)

Figure 7. Advanced stage of lethal yellowing with yellow and dehiscing fronds. (Courtesy M. Davis)

Figure 8. Historical image of early outbreak of lethal yellowing of palms in Florida. (Courtesy M. Shurtleff)