Citrus Greening

Candidatus Liberibacter

Text and images from FDACS Pest Alert, Susan Halbert, DPI

Asian citrus psyllid adult and nymph

Yellow shoots and defoliation caused by citrus greening infection.

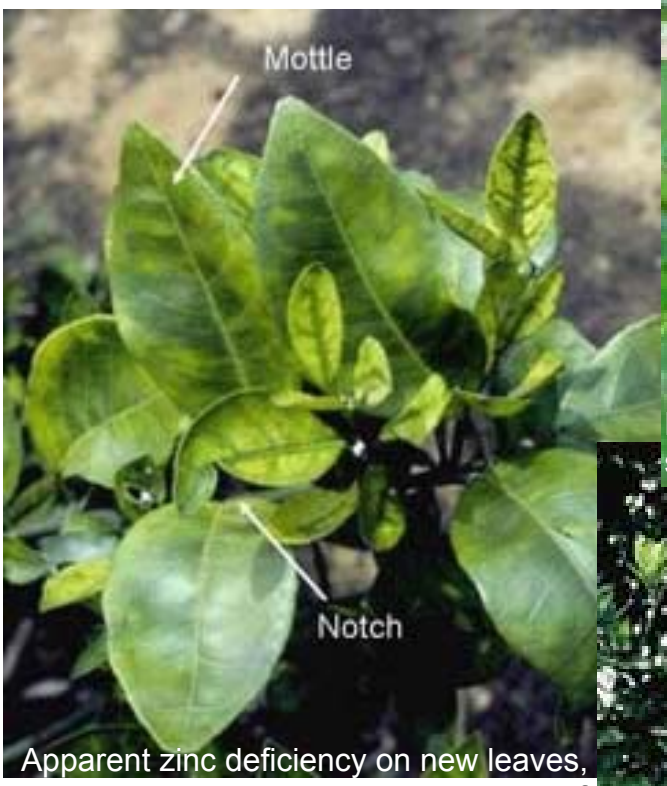
Citrus greening disease or huanglongbing (yellow dragon disease) may be the most serious citrus disease in the world. It is the major limiting factor for citrus production in parts of Asia and Africa. In areas where the disease is endemic, citrus trees may live for 5-8 years and never produce usable fruit (Roistacher 1996). At the time of this writing, citrus greening disease is widespread in Asia, Africa, and the Saudi Arabian Peninsula. It was reported in July 2004 in São Paulo State, Brazil (Coletta-Filho *et al.* 2004) and in south Miami-Dade County in Florida in August 2005. Citrus greening has not been found in Australia, or the Mediterranean citrus production regions.

Origin PATHOGEN: Citrus greening disease is caused by phloem-limited bacteria in the genus *Candidatus* Liberibacter. Three species are described, including *Candidatus* Liberibacter asiaticus, *Candidatus* Liberibacter africanus, and *Candidatus* Liberibacter americanus (Texeira *et al.* 2005). VECTORS: The most common vector species, *Diaphorina citri* Kuwayama, the Asian citrus psyllid, was found for the first time in the USA in Palm Beach County in June 1998, and has since colonized peninsular Florida. Most long distance spread of the vector occurred as a result of movement of *Murraya paniculata* (L.) Jack (orange-jasmine), a popular ornamental and a preferred host of *D. citri*. The other reported vector is the African citrus psyllid, *Trioza erytreae* (del Guercio).

Host Range Citrus greening infects most citrus species, hybrids, cultivars, and some citrus relatives. It severely affects most sweet oranges, mandarins, and mandarin hybrids, as well as some citrus relatives such as *Atalantia*, *Balsamocitrus*, *Calodendrum*, *ClausenaFortunella*, *Microcitrus*, *Murraya*, *Poncirus*, *Severinia*, *Swinglea*, *Toddalia*, and *Triphasia* (Halbert and Manjunath 2004). There is disagreement in the literature about the status of *Murraya paniculata* as a host for citrus greening pathogens. It is a host in Brazil but not in Taiwan

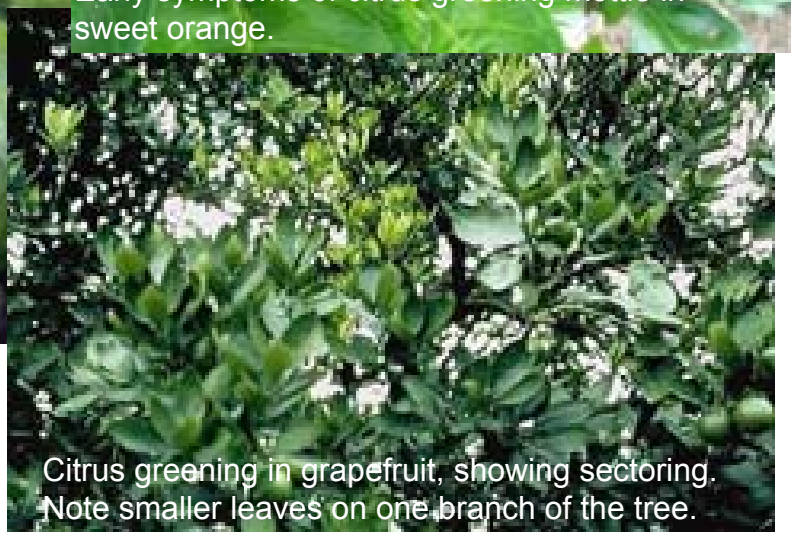
Transmission

Citrus greening pathogens are transmitted by insect vectors in the family Psyllidae. They also can be transmitted by grafting, by dodder, and possibly by seed. Even though the pathogens are bacteria, the disease does not spread by casual contamination of personnel and tools or by wind and rain.



Apparent zinc deficiency on new leaves, mottle on older leaves, and notched leaf from Asian citrus psyllid feeding.

Early symptoms of citrus greening mottle in sweet orange.



Citrus greening in grapefruit, showing sectoring. Note smaller leaves on one branch of the tree.

Symptoms and Identification

The disease often can be recognized in the field by foliar and fruit symptoms. Early symptoms of citrus greening disease are small yellow leaves on one limb or section of the tree canopy. The most diagnostic symptoms of citrus greening are leaf mottling that often ignores the leaf veins. The newest leaves may show symptoms resembling zinc deficiency, while older leaves have the characteristic greening mottle. Other symptoms are yellow shoots, twig die-back, poor flowering, and stunting. Fruit is small, poorly colored, and/or lopsided. Fruit taste is bitter, medicinal, and sour. Seeds usually abort, and fruit set is poor. Symptoms vary according to cultivar, tree maturity, time of infection, stage of disease, and other abiotic or biotic agents that affect the tree. Chronically infected trees are sparsely foliated and display extensive twig or limb dieback. Although symptoms can provide strong clues to the presence of citrus greening disease, final confirmation by molecular diagnostic tools is needed for regulatory purposes.

Monitoring and Management Recommendations

There is no place in the world where citrus greening is well established that it is under completely successful management. The best management programs are integrated, making use of regulatory measures to ensure completely clean planting stock, cultural practices to ensure timely removal of infected plants, and chemical and biological control of psyllid vectors.