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CITRUS GREENING

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Huanglongbing (HLB)—also known as citrus greening—is a critical threat to citrus production worldwide. This devastating bacterial disease affects the production and juice quality of citrus fruits and the overall health of chronically infected trees. Huanglongbing is thought to have originated in Asia, where the disease was first described in the early 1900s. In addition to the mainland US and citrus-growing countries in Asia, HLB—or its related African greening disease—occurs in several countries in Africa, South America, and the Caribbean islands. In August 2005, it was first reported in the US in southern Florida and officially documented in Hidalgo County, Texas, in January 2012.

CAUSE

In US citrus-producing states, HLB is consistently associated with the bacterium '*Candidatus* Liberibacter asiaticus' (CLas), which is vectored by the Asian citrus psyllid (ACP; *Diaphorina citri*). The adult ACP is a small insect—3 to 4 mm long—that often rests at a 45-degree angle on citrus foliage (Fig. 1). Its nymphs (immature forms) are typically yellow-orange and secrete a waxy substance when feeding on new growth (Figs. 2 and 3). Asian citrus psyllid feeding damage can cause "rabbit-ear" symptoms in leaves (Fig. 4).

The nymphs can also acquire and spread the pathogen. The bacterium can spread by grafting infected and healthy plant materials onto each other or by the ACPs while they are feeding.

Figure 1. Adult ACPs sitting at a 45-degree angle and feeding on citrus leaves.
Photo courtesy of Sheila McBride

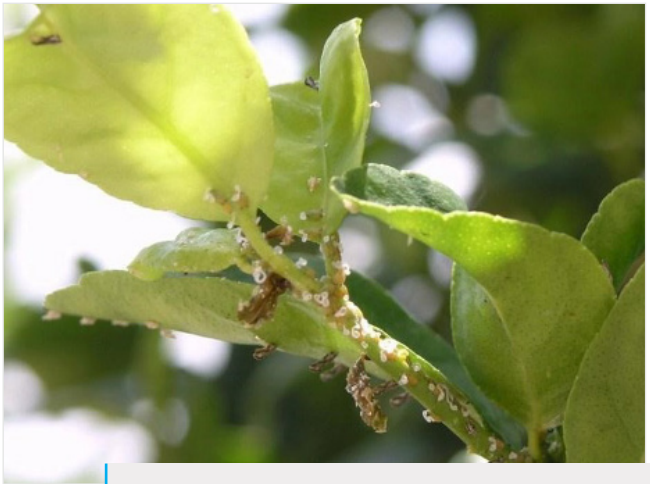

Figure 2. Feeding ACP nymphs exuding waxy tubes.
Photo courtesy of Sheila McBride

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Figure 3. Close-up of ACP nymphs feeding on new growth.
Photo courtesy of Sheila McBride

Figure 4. "Rabbit-ear" symptoms on citrus leaves.
Photo courtesy of Sheila McBride

SYMPTOMS

Diagnostic symptoms of HLB include blotchy, mottled leaves in various shades of yellow and green (Fig. 5).

Mineral deficiencies such as calcium, iron, manganese, magnesium, and zinc can cause similar symptoms, but they are usually symmetrical on both sides of the leaf midrib. Huanglongbing symptoms are asymmetrical, and the veins of the mottled leaves may become raised and have a corky appearance (Fig. 6). The disease also deforms the fruit and inhibits ripening so that the fruit remains green at maturity. It may also be stunted and lopsided (Fig. 7). In severe cases, the tree can die back, and premature fruit drops may occur.

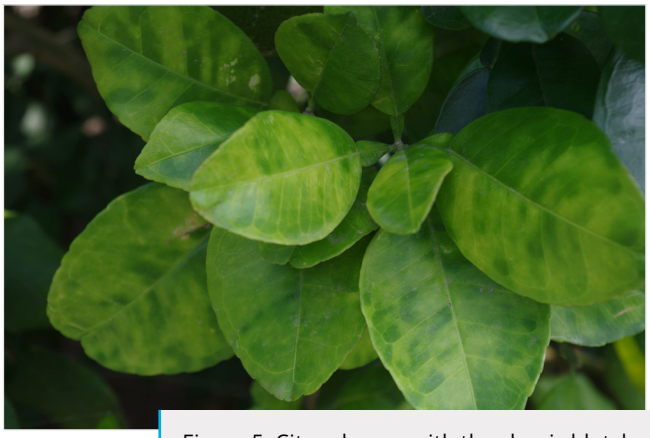

Figure 5. Citrus leaves with the classic blotchy, mottled symptom.
Photo courtesy of Olufemi J. Alabi

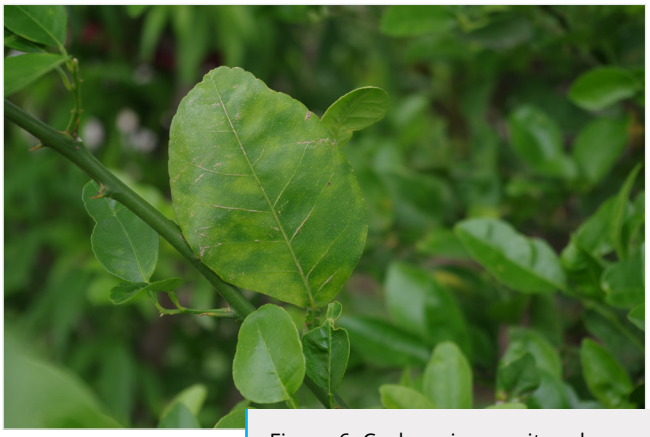

Figure 6. Corky veins on citrus leaves.
Photo courtesy of Olufemi J. Alabi

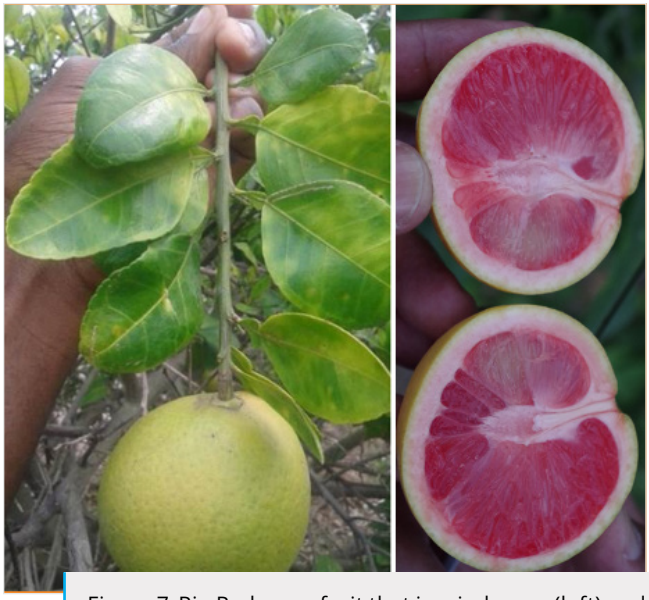

Figure 7. Rio Red grapefruit that is misshapen (left) and lopsided (right) due to citrus greening disease.
Photo courtesy of Olufemi J. Alabi

The smaller fruits do not accumulate sugar and may taste bitter and sour instead of sweet. Orange-brown discoloration can also appear on the stem-end tissue of the fruit, and dieback of twigs and branches may cause foliage loss (Fig. 8). With chronic disease, the fruits may drop before maturity, causing severe yield loss.

Once infected, trees may progressively decline and die. Symptoms on mature trees may not appear for several months or years after the initial infection. This incubation period makes it difficult to diagnose and monitor the progress of the disease. Laboratory tests can confirm the presence of CLas in trees suspected for HLB.

Figure 8. Healthy citrus tree (left) vs. infected citrus tree (right).
Photo courtesy of Sheila McBride

DISEASE MANAGEMENT

There is no effective cure for citrus greening disease—the best control strategy is prevention. One of the most effective ways to prevent the disease is to avoid moving plants and plant materials from areas under regulatory quarantine or where ACPs or HLB are present (Fig. 9). For the most current information of the citrus greening quarantine in Texas, please visit *https://www.texasagriculture.gov/RegulatoryPrograms/PlantQuality/PestandDiseaseAlerts/CitrusGreening.aspx*.

An integrated pest management approach helps avoid or minimize the impact of the disease:

- Use only certified clean planting stock and monitor plants regularly to detect and control ACPs.
- Look for symptoms and inspect citrus trees often.
- If you suspect HLB, send a sample of the foliage to the appropriate USDA-APHIS certified diagnostic laboratory. For more information about how to submit samples, visit *plantclinic.tamu.edu*.
- Remove and destroy trees that are confirmed positive for the HLB bacterium.

If you find ACPs, chemical control is the most viable option to reduce the incidence and spread of HLB. Several conventional insecticides registered for use against ACPs in Texas include imidacloprid, thiamethoxam, and clothianidin in drench or foliar

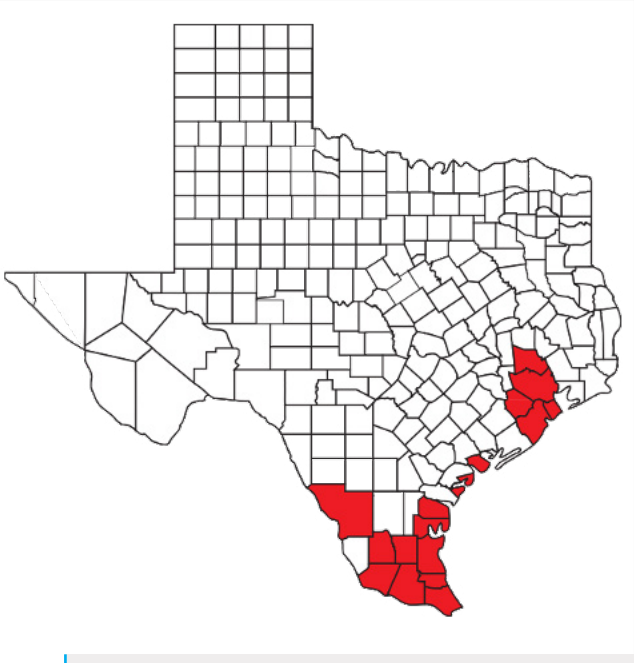

Figure 9. Current quarantined counties: Aransas, Brazoria, Brooks, Calhoun, Cameron, Fort Bend, Galveston, Harris, Hidalgo, Jim Hogg, Kenedy, Kleberg, Montgomery, Nueces, Starr, Webb, Willacy.
Source: Texas Department of Agriculture, 08/2022

applications. Insect growth regulators such as pyriproxyfen target the nymphs and can be rotated into a treatment program to reduce the risk of insecticide resistance. A complete list of registered pesticides is available from your county Extension office. Organic product options for controlling ACPs include the active ingredients spinosad, pyrethrins, and horticultural oils. However, they require more frequent applications and are not as effective as conventional insecticides for reducing psyllid numbers to prevent HLB spread.

Natural enemies of the ACP include the parasitoid wasp (*Tamarixia radiata*), lacewings, and several species of lady beetles, such as the ashy gray lady beetle (*Olla v-nigrum*). Commercial formulations of some species of entomopathogenic fungi such as *Isaria fumosorosea* and *Beauveria bassiana* are also available for biocontrol of the ACP. These insects and fungal biocontrol agents are useful as part of a long-term management strategy, but biological control alone is not a reliable strategy for controlling ACPs.

FOR MORE INFORMATION:

https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/citrus-greening/citrus-greening-hp

https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/citrus/citrus-landing

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