APHIS Factsheet

Plant Protection and Quarantine

March 2007

Citrus Greening: Questions and Answers

Q. What is citrus greening?
A. Citrus greening, also known as huanglongbing (HLB) or yellow dragon disease, is one of the most serious citrus diseases in the world. It is a bacterial disease that greatly reduces production, destroys the economic value of fruit, and can kill trees. It has significantly reduced citrus production in Asia, Africa, the Arabian Peninsula, and Brazil. Once infected, there is no cure for a tree with citrus greening disease. In areas of the world where citrus greening is endemic, citrus trees decline and die within a few years. The disease specifically attacks citrus plants and presents no threat to humans or animals.

Q. Has citrus greening been detected in the United States?
A. Yes. In September 2005, scientists from the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) confirmed the first U.S. detection of citrus greening on samples of pummelo leaves and fruit. The samples were collected, tested, and submitted to APHIS by the Florida Department of Agriculture and Consumer Services. Since that time, citrus greening has spread through much of southern Florida.

Q. How is citrus greening spread?
A. Citrus greening is primarily spread by two species of psyllid insects: the Asian citrus psyllid and the African citrus psyllid. The Asian citrus psyllid, which has been detected in the United States, bears the scientific name *Diaphorina citri* Kuwayama and is widely distributed in southern Asia and parts of Mexico and Brazil. The African citrus psyllid has not been found in the United States.

Both species of insect vectors transport the citrus greening pathogen from infected trees to healthy trees as they feed on the plant. A psyllid must be infected to spread the disease. Citrus greening can also be transmitted by grafting diseased budwood. Although citrus greening is bacterial, the disease is not spread by wind or rain or through contact with contaminated personnel and tools.

Q. How many forms of citrus greening disease are there?
A. There are three forms of citrus greening disease: Asian, African, and American. The American form was most recently identified in Brazil. Only the Asian form of the disease has been found in the United States.

Q. What is the origin of citrus greening?
A. Farmers in southern China first noted the presence of this disease in the late 1800s.

Q. How did citrus greening and the Asian psyllid enter the United States?
A. The exact pathway responsible for introducing citrus greening and the Asian citrus psyllid into the United States has not been determined. Frequent travel, increased tourism, and immigration have increased the risk of importing exotic plant pathogens into the United States. The smuggling of infected plant material for propagation may also be responsible for the U.S. introduction of the disease.

Q. What are the symptoms of citrus greening?
A. The most characteristic foliage symptoms of citrus greening are the blotchy mottling of leaves and leaf yellowing that may appear on a single shoot or branch. The disease may also cause small, narrow leaves and short stems that give plant growth a bunched appearance. Other symptoms include twig dieback, poor flowering, and stunted growth. Fruit from diseased trees is small and often misshapen. Typically, some green color remains even on ripe fruit. Affected fruit tastes bitter, medicinal, and sour. Seeds usually abort, and fruit set (formation) is poor.

Symptoms vary according to time of infection, stage of the disease, tree species, and tree maturity. Citrus greening can initially be difficult to diagnose because it remains latent for some time before expressing itself. New foliage on infected trees may display symptoms that can be misdiagnosed as signs of mineral (zinc or manganese) deficiency with yellow venation.

Q. How long does it take before symptoms of citrus greening appear?
A. Citrus plants affected by citrus greening may not show symptoms for some time. On average, latency persists for approximately 2 years. As the pathogen moves within the tree, whole branches and eventually the entire tree may progressively turn yellow.

Q. How widespread is the Asian citrus psyllid in the United States?

A. In 1998, the Asian citrus psyllid was first detected in the United States in Palm Beach County, FL. By September 2000, the pest had spread to 31 counties in Florida. The insect is believed to have spread within Florida on an ornamental landscape plant known as *Murraya paniculata* (common names include orange jasmine or jessimine, mock orange). It is a preferred host of the Asian citrus psyllid. The Asian citrus psyllid and one of its parasites are also present in the Rio Grande Valley of Texas, but the disease has not yet been detected there.

Q. What does the Asian citrus psyllid look like?

A. Adult Asian citrus psyllids are small (3–4 mm). They have mottled brown wings. Characteristically, they sit at an angle to the shoot or leaf on which they feed. Adults are very active jumping insects and leap when disturbed. Eggs are bright yellow to orange in color and are deposited on newly emerging "feather flush." Nymphs generally are yellowish orange and are always found on new growth. In contrast to the adults, they move slowly and cannot fly. They feed on leaves and stems and can be very difficult to see. However, white, waxy excretions given off by the nymphs often are noticeable. Asian citrus psyllids are most likely to be found on new shoots, and the insect's population increases during periods of active plant growth.

Q. What is APHIS doing to prevent the spread of infected Asian citrus psyllids?

A. APHIS issued a Federal order that requires host plants of the Asian citrus psyllid to be treated prior to being moved from areas where citrus greening occurs. Movement is allowed to any State or U.S. Territory, except: Alabama, American Samoa, Arizona, California, Guam, Hawaii, Louisiana, Northern Mariana Islands, Puerto Rico, Texas, and the U.S. Virgin Islands.

Hosts plants of citrus greening—including all live plants, budwood, and cuttings—are prohibited from being shipped or moved outside of areas quarantined for citrus greening.

These provisions concerning the movement of plants take into account that not all hosts plants for Asian citrus psyllid are also hosts for citrus greening. As written, these provisions serve to limit the movement of potentially infected psyllids on hosts that do not harbor the disease, while prohibiting completely the movement of citrus greening hosts outside of quarantine areas for the protection of other States and those areas of Florida currently unaffected.

Q. What steps are taken when citrus greening is found?

A. In general, the control strategy has been to remove infected trees to prevent the spread of the disease to nearby healthy trees. However, the exact response to outbreaks may vary depending on the specifics of the situation, such as the significance of the infestation and its proximity to commercial citrus production. Psyllid populations must also be reduced as much as possible. Citrus budwood and nursery stock must be kept away from infected areas. Control of citrus greening is difficult if inoculum sources are widespread and area psyllid populations are well established.

Q. Where is citrus greening established in the world?

A. Citrus greening is established in numerous African, Asian, and South American countries, including: Bangladesh, Bhutan, Brazil, Burundi, Cambodia, Cameroon, Central African Republic, China, Comoros, Ethiopia, the French island of Reunion, Hong Kong, India, Indonesia, Japan, Kenya, Laos, Madagascar, Malawi, Malaysia, Mauritius, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Rwanda, Saudi Arabia, Somalia, South Africa, Sri Lanka, Swaziland, Taiwan, Tanzania, Thailand, Vietnam, Yemen, and Zimbabwe.

Citrus greening has not been reported in the citrus-producing regions of Australia, Mexico, or in the countries of Central America or the Mediterranean.

Q. What import restrictions are in place to prevent the introduction of diseased fruit and insect vectors?

A. To protect U.S. plant health, APHIS officials inspect and clear imported plants and seeds at 17 special import inspection facilities located throughout the country at various U.S. airports and seaports. APHIS' activities help ensure that imported plants and seeds are free from plant pests and diseases that are not known to occur in the United States and that could be damaging to either U.S. agriculture or natural resources. APHIS specialists ensure that the plants and seeds comply with Federal import regulations and permitting requirements.

In addition, officials with the Department of Homeland Security's Customs and Border Protection (CBP) work at U.S. ports of entry to inspect fruit and vegetables and intercept agricultural commodities that are infested or have been imported illegally. CBP works closely with APHIS to ensure that only healthy fruits and vegetables from countries free of significant diseases can enter the United States.

Q. What plants are susceptible to citrus greening?

A. Nearly all citrus species and many citrus relatives (e.g., limeberry and trifoliate orange) are susceptible to citrus greening. Sweet orange and mandarin orange are highly susceptible to the disease; sour orange, grapefruit, and lemon are moderately susceptible.

For a complete list of citrus hosts, please visit:
http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus_greening/hosts.shtml

Q. Where should I report suspect disease symptoms or sightings of psyllid insects?
A. To have specimens properly identified, please contact your State department of agriculture or the plant disease diagnosis clinic at your State's land-grant university.

Q. How can I help stop the spread of this disease?
A. Regularly inspect your citrus trees and look for any signs of disease or insects that match the descriptions mentioned above. If you suspect their presence, contact your State agriculture office or extension service to get expert guidance.

Q. Where can I get additional information?
A. For more information on citrus greening—including program updates, factsheets, regulatory actions, control and testing protocols, and links to other sites—please visit:
http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus_greening/index.shtml

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