

Homeowner Fact Sheet: Citrus Canker¹

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Citrus canker is caused by the bacterial pathogen *Xanthomonas citri* subsp. *citri* (synonym: *X. axonopodis* pv. *citri*). It is a serious disease of all citrus cultivars and some citrus relatives, but is not harmful to humans and other animals. The bacterium enters the tissues of citrus trees through wounds and natural openings called stomata, but it does not travel through the tree to become systemic. The bacterium survives in warm moist conditions and requires a host to survive in a natural environment.

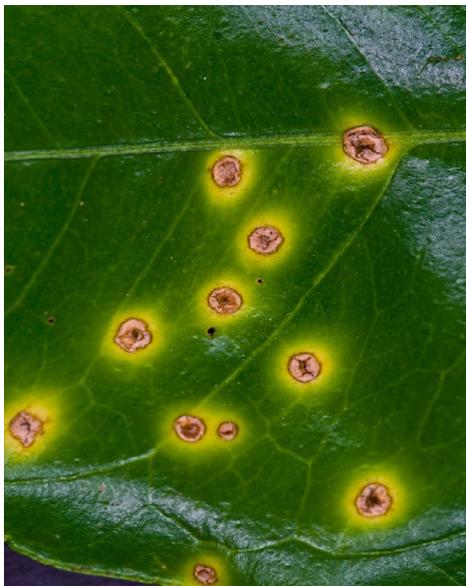


Figure 1. Round, blister-like lesions on leaves with water-soaked margins and yellow halos.

Citrus canker is an introduced disease in Florida and is very economically damaging to the commercial industry. The disease is not present in all of the tropical and subtropical citrus-producing regions where citrus canker would be problematic, so export restrictions on fruit with citrus canker are very strict. This disease is of concern to homeowners also, not only because of its economic effects on the commercial industry, but because it is highly contagious and the majority of infected fruit on a severely affected tree may drop off the tree prematurely.

The History

The first introduction of citrus canker in Florida was in 1910 on trifoliolate rootstock seedlings imported from Japan. The disease spread around the Gulf Coast from Texas to Florida and further north to South Carolina. It was most likely moved on infested plant material. A quarantine was imposed in 1915 and a vigorous eradication program was instituted, from which the disease was declared eradicated in 1933. A second introduction occurred in 1986 when citrus canker was found on residential citrus in the Tampa Bay area of west-central Florida. It was later found in nearby commercial citrus groves. This outbreak of citrus canker was officially declared eradicated in 1994.

The most recent outbreak of citrus canker was discovered in September 1995 on residential citrus near the Miami International Airport in Miami-Dade County. Despite an

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attempted third eradication of the disease, the hurricanes of 2004-2005 spread the disease from 10 counties to 25 where the disease is present today. During the initial eradication process, 2.1 million commercial and dooryard trees were destroyed by 2003. In January 2006, the eradication program ended because the disease became so widespread that it was no longer feasible to continue the eradication efforts. As a result, the citrus industry is now learning to live with and manage citrus canker while continuing to produce quality fruit.



Figure 2. Round, raised blister-like lesions with water-soaked margins.



Figure 3. Twig lesions with an inset of some blister-like lesions at a higher magnification.

The Symptoms

All aboveground tissues of citrus are susceptible to canker. Symptoms appear most often on the fruit, leaves, and twigs of infected plants (Figs. 1-7). Leaf and fruit symptoms typically start as small, blister-like lesions that expand as

they age (Figs. 1-3). Lesions usually become apparent about 7 to 14 days after infection under the optimal conditions of the temperature range of 68-86°F (20-30°C), but can take as long as 60 days in cool dry weather. As leaf lesions age, they turn gray to tan brown with an oily margin, usually surrounded by a yellow halo. The center of the lesion becomes raised and corky and is visible on both sides of the leaf. Leaf tissue in old lesions may die and fall out, leaving the appearance of shot holes. Severe infection of the foliage can cause defoliation of trees. Twig infections resemble those on fruit. The lesions are raised with a corky appearance. The lesion margin, like on leaves, has an oily appearance, but there is no yellow halo on twigs. The lesions on twigs and branches can persist for several years, with live bacteria within, if they do not kill the limb. On fruit, the lesions are discrete and scab-like or corky, often with a yellow halo. Severely blemished fruit can drop prematurely, leading to reduced yields. The internal quality of mature fruit with lesions is unaffected and is still edible and usable for juice.

Spread

Citrus canker is a highly contagious plant disease and spreads rapidly over short distances. Wind-driven rain, overhead irrigation, flooding and human movement can spread citrus canker. Environmental factors, such as wind and rain, cannot be controlled; however, spread of citrus canker by humans can be managed by proper decontamination procedures and preventing transportation of infected plant material. **Transport of infected plant material is the primary means of spreading the canker pathogen over longer distances.** To help prevent the spread of citrus canker around Florida and other citrus-producing states, homeowners are required to purchase citrus trees from a certified nursery. All certified trees should have a tag with the registration number of the nursery on them at the time of sale. If you purchase a citrus tree from a mobile vendor or at a flea market, ask to see the vendor's license to ensure that you are purchasing quality trees. Nursery certification can also be verified with the Division of Plant Industries at 1-800-282-5153. By law, homeowners cannot propagate or raise their own citrus trees. No citrus plants or plant parts can be moved out of Florida since the state is still under quarantine for citrus canker. More information can be found at <http://www.freshfromflorida.com/pi/canker/maps.html>. In addition, fruit cannot be shipped out of Florida without a permit. Some packinghouses will pack homeowner fruit for export, but there is no legal requirement for them to accept fruit from homeowners. A list of the packinghouses accepting homeowner fruit can be found at <http://www.fl-dpi.com/canker/pdf/Homeowner%20Fruit%20Packinghouses%2011-05-09.pdf>.



Figure 4. Close-up view of typical fruit lesions. The lesion margins are water soaked with a prominent yellow halo.

To reduce the potential movement of the bacterium from one tree to the next, simple rules of decontamination should be used when handling trees. Spread is most likely to occur when foliage is wet, so if possible, only work with citrus trees when they are dry. People and equipment should be decontaminated each time before handling a new tree. It is advisable to practice personal and equipment decontamination between trees. Hand and arm washing with soap and water, hot or cold, for a minimum of 20 seconds is needed to remove the bacterium from the skin. Additional use of an alcohol-based hand-sanitizer after hand-washing will make personal decontamination more effective. Tools should be decontaminated with a solution of 1 ounce household bleach to 1 gallon of water. To reduce the risk of rusting, tools should be rinsed afterwards. The bleach solution will not be effective if used on dirty equipment and should be made fresh daily because it loses effectiveness quickly. Disease spread can also occur via clothing, so it is best to wash or change clothing between sites and dates of handling citrus trees.

Control Strategies

No cure exists for citrus canker; disease management is the only way to control the disease. Citrus canker management involves the use of the timely applications of copper-containing products and windbreaks to hinder inoculum dispersal. Most infections occur between April and July on oranges and three to four applications of copper-containing materials at 3-week intervals should be sufficient to obtain relatively clean fruit. Grapefruit are susceptible to canker for a much longer period. Copper sprays should begin

when the fruit is $\frac{3}{4}$ inch diameter and continue at 3 week intervals until fully grown in October for best results. Copper does not move from where it was applied, so as fruit grows, the new tissue does not have copper to protect it. Disease control on leaves is not possible because of their rapid growth. Homeowners should be aware that these disease management strategies are not completely reliable, but will minimize the disease on trees. Recommendations for copper-containing products can be obtained through your local garden supply center, master gardener program or county extension office. Windbreaks are not easily planted in the average yard, however if planting a new citrus tree, try to locate the tree in an area that is sheltered from the wind. There are no fully canker resistant cultivars commercially available, but not all citrus cultivars are equally susceptible. Tangerines are tolerant to the disease and Valencia oranges, tangors, tangelos and other mandarin hybrids only become infected under conditions that are optimal for infection and disease spread. Lemons and limes, as well as Navel, Pineapple and Hamlin oranges are moderately susceptible. The cultivars that are the most susceptible to citrus canker are grapefruit, Mexican limes and some early oranges like 'Early Gold'. It is recommended that trees that are less susceptible or tolerant be planted at home.

Further information about citrus canker can be found at <http://www.crec.ifas.ufl.edu/extension/canker/> and <http://www.freshfromflorida.com/pi/canker/>.



Figure 5. Raised, brown canker lesions on fruit with particularly prominent water soaked margins.



Figure 6. Raised, brown canker lesions on leaf.



Figure 7. Fruit drop caused by citrus canker on a 'Hamlin' sweet orange tree.