

Citrus black spot: lessons from Brazil

Citrus black spot (CBS), caused by *Guignardia citricarpa*, is a fruit-spotting disease that was first discovered in Valencia orange plantings located approximately five miles south of Immokalee in March during a citrus health response plan, multi-pest survey. Visibly infected citrus is located in a grouping within approximately three miles. Infection is light in all areas except for a core area where infection is moderate. An additional infected planting (a single symptomatic tree) has been subsequently discovered 14 miles northeast in Hendry County along a fruit-hauling corridor.

The risk of introduction and spread of CBS to new, unaffected citrus-producing areas within Florida is a concern for other domestic and foreign citrus-producing areas attempting to remain free of the disease. Areas within one mile of the current delimited disease area are now quarantined, and all fruit from these quarantined areas are required to go to local juice-processing plants and are excluded from entering the fresh-fruit market. Other citrus-producing states and foreign trading partners are focused on the potential risk that fresh fruit from



Figure 1. Symptoms of CBS vary, depending on the severity of the disease and time of the season when the fruit are infected. From left to right are symptoms of hard spot, freckle spot, false melanose on green fruit and cracked spot, which occurs on rust mite-damaged fruit.

The spread of citrus black spot and its management in Brazil

By Jim Graham

Florida could act as a pathway for *G. citricarpa* to reach their areas and are reluctant to import fresh fruit from CBS-affected areas.

ERADICATION NOT LIKELY

Eradication of CBS from Florida is probably not feasible. This is because latent infections in leaves on the tree are difficult to detect, and it is highly likely that the disease is present in a larger area than is currently delimited by a survey of trees with symptomatic fruit. Because symptoms occur pri-

marily on mature fruit, it will be difficult to assess the situation statewide until fruit mature in late 2010 and through the spring and early summer of 2011. Nevertheless, alternative sur-

vey and detection protocols should be employed to the extent possible for limiting further spread of the pathogen within the state.

FOUND IN BRAZIL IN 1992

CBS is present in citrus-producing areas in Asia, Oceania, Africa and South America. CBS was reported in southeastern Brazil in São Paulo state in 1992, but has since spread to several new areas in São Paulo and to the citrus-production area in the adjacent state of Parana. Disease spread has occurred primarily through movement of inoculum in the form of leaves and stems with harvesting operations. Monitoring the disease in each state is necessary in order to establish the areas where CBS does not yet occur.

Fruit of all sweet orange varieties grown in Brazil are highly susceptible. Several types of CBS symptoms may occur on severely affected trees (Figure 1). The most common symptom is hard-spot: necrotic, round lesions up to 5 mm in diameter surrounded by a black margin. The spots affect the outer peel, but not the internal quality of the fruit. Diseased fruit are unacceptable for fresh market, but can be used for processing. The CBS lesions most proximal to the fruit stem induce premature fruit drop (Figure 2, page 7), and if not properly controlled, the disease may cause up to 50 percent reduction in yield. Defoliation due to tree declines such as citrus blight exacerbates fruit symptom expression due to tree stress and increased light exposure of the fruit (Figure 3, page 8).

Highest losses due to fruit drop occur for Valencia because the fruit is on the tree for the greatest duration. This



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is because the longer the fruit remain on the tree, the more exposure to infection by ascospores produced from the dead leaves on the canopy floor and from the conidia produced from pycnidia that form on stems and fruit on the tree.

MANAGEMENT OF CBS

Grove management of CBS is based on cultural practices to minimize the inoculum potential of leaf litter and the pycnidiaspores on fruits and stems. To protect fruit under Brazilian conditions, carefully-timed sprays of copper and strobilurins begin two weeks after petal fall and continue until autumn. Sprays are timed at 28-day intervals for copper and at 42-day intervals for strobilurins. In general, the first two sprays are copper, followed by strobilurins alone or as mixtures with a half rate of copper. Strobilurins have some systemic activity so they are targeted during the period of high fruit susceptibility and warmest, most rainy conditions favorable for infection.

In order to more effectively control the inoculum on stems as well as protect fruit, a higher volume of sprays is used: 200 to 375 gallons, depending on



Figure 2. Valencia fruit with hard-spot lesions located near the stem are most prone to premature fruit drop.

tree size and inoculum pressure. This spray volume is substantially higher than that used for control of insects, mites and other fungal diseases.

Cultural methods include the use of disease-free nursery stock, grass mulching of the grove floor, removal of fallen leaves and skirting the tree to remove low-hanging fruit. Highest losses due to premature fruit drop occur when fruit is held on the trees past peak maturity, so timely harvesting is critical to minimize the major cause of disease loss.

Although young trees do not begin

to show symptoms until two to three years after fruit bearing begins, protective copper sprays are applied to prevent buildup of inoculum. This is particularly necessary in the areas where conducive climate and rainfall occur, such as at higher elevation areas in southern São Paulo, and hotter, drier areas in the north where drought-induced defoliation is more common on non-irrigated trees.

Protective sprays and cultural management place CBS among the highest grove costs of any pest or disease in southern Brazil, including HLB. The risk for waiting until inoculum builds to the

level at which fruit drop occurs is significant because several seasons of control measures are required to bring the inoculum back under control.

HARVESTING ISSUES

Even though the best option is to prevent inoculum from spreading into groves, CBS has gradually been introduced into new areas of São Paulo and Parana due to movement of harvesting vehicles and equipment that harbor leaf debris and stems. The best management practice is exclusion of harvesting trucks and picking sacks until after

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they have been thoroughly cleaned of debris and disinfected. This cleaning operation should occur at the processing plant or packinghouse, not in the vicinity of citrus groves.

Another fundamental hygiene practice is to tarp the loaded trucks to prevent escape of debris from trailers in transit back to the plant. The discovery of an outbreak of CBS along a fruit-hauling corridor in Florida is evidence of this risk. Henceforth, a good practice is to scout for fruit symptoms low in the canopy of the sunny side of declining trees in groves bordering roads and areas where harvesting equipment is unloaded.

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Figure 3. Severe defoliation of a Valencia orange tree affected by citrus blight has increased susceptibility to CBS due to elevated stress and light exposure of the fruit.

Black spot quarantine issued

The U.S. Department of Agriculture issued a citrus black spot (CBS) federal quarantine order Oct. 14, almost seven months after the disease was found in groves near Immokalee.

Florida Citrus Mutual prepared the

following brief summary of the order:

- A quarantine has been established for areas within an eight-mile radius of a CBS find. The two-tiered plan establishes quarantine areas (one mile from detection) and regulated areas (an additional seven miles outside of the quarantine area).
- Fresh-fruit shipments must meet certain conditions including packinghouse inspections and compliance agreements, disinfecting process protocols and transport in tarped vehicles.
- Fruit from within the quarantine areas is only eligible for movement to non-commercial citrus-producing states east of the Mississippi River.
- Fruit from a regulated area is eligible for movement to states other than commercial citrus-producing states.
- Fresh fruit outside the quarantine and regulated areas may be shipped with no restrictions.

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