

Florida growers learn about greening and pests in BRAZIL

By Steve Futch

In April and July, the Extension Service conducted two seven-day international trips to enhance Florida citrus growers' knowledge about citrus production in Brazil. Growers participating in the trips represented management or ownership of almost 30 percent of Florida citrus acreage. Representatives of several grower associations also made the trips.

The trips were organized and led by Steve Futch and Julia Beretta, both located at the Citrus Research and Education Center in Lake Alfred. Each tour departed Miami with a direct, eight-hour flight to the city of São Paulo. The entire week was spent in the state of São Paulo, which is the world's largest citrus producing region and contains 80 to 90 percent of the total citrus acreage in Brazil.

During the week in Brazil, the Florida growers visited many groves and production locations within an area of 50 miles from Araraquara and Limeira, both major citrus producing areas. While Florida growers are willing to discuss their pests and diseases, it is informative to observe how growers in other countries are battling these pests as well as those that are currently not in Florida.

The main purpose of the trip was to gain a better understanding of greening and practices to control the Asian citrus psyllid (*Diaphorina citri*), the vector of greening. An equally important part of the trip was to learn about pests and diseases not currently found in Florida. While greening or *Huanglongbing* (HLB) was first confirmed in Brazil in June 2004, it has spread to more than 125 counties within the state of São Paulo in three short years. In an effort to slow the spread of greening, growers reportedly have removed more than 600,000 trees in 2006 and 2007.

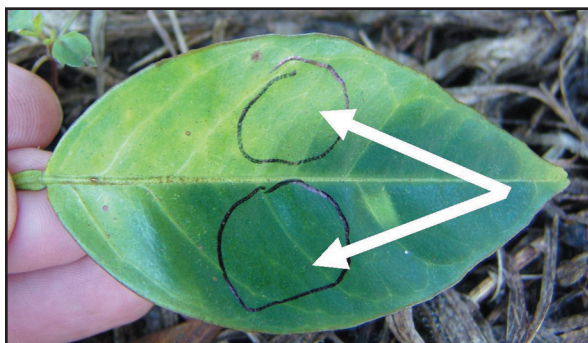
As in Florida, greening symptoms on young trees in Brazil are noted by the blotchy appearance of the leaves, yellow veins and shoots, leaf drop, branch decline, and ultimately tree decline and death. In mature trees, growers observe yellow shoots in the upper and then into the mid canopy of the tree,

leaf mottling (diffused asymmetrical chlorosis), yellow veins, leaf drop, lopsided fruit, aborted seeds, stained veins beneath the calyx, fruit drop, and tree decline.

One method frequently used by growers to more easily confirm visual greening symptoms in a leaf is the "pen" method. This simple method marks circles on opposite sides of the mid vein of the leaf (Fig. 1, photo of leaf with circle) to make comparisons of the leaf area. If the pattern is different, then the leaf symptoms are most likely greening. If the pattern is the same, then it is not greening. Additionally, these symptoms appear the same on the underside of the leaf, making inspection of both sides of the leaf extremely important.

While the time from infection to visible symptoms is not fully understood, it is estimated that symptoms may be seen in the tree anywhere from three to 15 months after infection. Season also impacts the ability to see the visible symptoms within the tree. Greening is easier to detect in the fall and winter periods than in the spring and summer. However, growers are able to detect greening year round in positive trees.

All Brazilian growers we visited indicated that greening is a major threat to the citrus industry, both in Brazil and Florida, as well as other regions of the world that produce citrus. Greening will certainly increase the production costs due to additional sprays to control the vector, decrease productivity from loss of trees, and require extra labor for inspection and tree removal, and additional training for the work force.



"Pen" method to determine greening.

VECTOR CONTROL

Controlling the vector (psyllid) is an essential component of managing greening. Most growers monitor new flushes for the presence of psyllid adults or nymphs. Depending on the level of greening in a given area, the grower may elect to spray when psyllids are detected or may spray when 3 percent or more of the plants in a given block are infected with either adults or nymphal stages of psyllids. Yellow sticky card traps are used only on a limited basis

as these traps do not provide information on early infestations.

The choice of materials used to control the psyllids is largely based upon the age of the tree, with young trees receiving applications of systemic materials and or foliar sprays while mature trees are sprayed with foliar products. In groves where greening is present within the property or located nearby, growers may apply up to 12 to 18 applications of various pesticides per year.

INSPECTION

Inspection is a major task to control greening within a grove. One large grower reported that when inspecting the trees for greening by walking through the grove, the average number of plants surveyed per worker per day was approximately 500, with the inspectors finding some 20 percent positive trees. On the other hand, when performing inspection using a tractor traveling at 2.5 miles per hour with an elevated platform (Fig. 2, picture of platform system), the inspection rate in trees per day increased to 1,100 per person and the effectiveness of finding greening positive trees increased to 50 percent to 70 percent. Since visual inspection is not perfect and the disease can remain undetected in the tree due to lack of visual symptoms, multiple inspections per year are required. Many of the better operations are conducting at least four inspections annually to assure early detection of positive trees.

A quality inspection is essential to the success of suppressing greening within a grove. Inspectors must be checked to verify efficiency via a quality control program. To aid in the motivation of inspectors and to assure quality inspections are being maintained, a worker bonus and cross inspection programs are conducted.

REMOVAL OF POSITIVE TREES

In most cases, when a greening positive tree is found, it is re-inspected the same day by a supervisor. The supervisor reconfirms the symptoms, and if the tree is indeed found positive for greening, they will have it removed within the same day. Tree removal is made by cutting the tree off at the ground with a saw. The stump is treated with herbicide materials to assure that the stump does not resprout. If the stump resprouts, those sprouts would be positive for greening as well.

In cases where a large number of symptomatic trees are found within a given block, the entire block may be removed. In some cases, greening was reported to be as low as 15 percent to trigger block removal, whereas in other cases, a much higher number was given. Regardless of the number of positive trees, growers are removing the highly



Scouting from an elevated platform.

infected blocks and replanting other crops like sugarcane.

During our visit, the importance of understanding the impact that neighboring citrus properties have on the ability to control psyllids and greening on a nearby property was stressed. A negligent neighbor, one that does not control psyllids, may act as a source of both psyllids and greening that may impact your property.

HEALTHY YOUNG TREE PROGRAM

In Brazil, the citrus industry was confronted with citrus variegated chlorosis (CVC) back in the late 1990s. CVC is vectored by sharpshooters. In an effort to minimize the spread of CVC, the nursery industry adopted rules to require that all nursery

trees be grown in screen houses. These same screen houses also provide for the exclusion of psyllids and minimize the risk of nursery trees being infected with greening.

Currently, some 509 citrus nurseries produce new trees to maintain an adequate supply of trees for the production region. The screen houses have a number of requirements and must be 13 feet (4 meters) high, with concrete benches, and water from deep well sources to minimize root diseases. Many of these requirements are also incorporated into Florida's new nursery requirements to assure healthy plants for future plantings.

OTHER PESTS

As if greening is not enough for the Brazilian citrus grower, other pests include canker, CVC, black spot, post bloom fruit drop (PFD), leprosis, sudden death and citrus leafminer. To remain profitable, Brazilian growers have developed new management practices and programs for these diseases. Florida growers must be aware of these and other diseases as entry into our state is always possible. Early detection would provide the greatest opportunity to minimize their spread within our industry.

In summary, one Brazilian grower stated that "controlling greening must be a rational, not an emotional process." If you do nothing to control greening and its vector, the future of the grove is known and you will be out of the citrus business within a few years once greening is well established in your grove. While we do not have all the answers to controlling greening and its vector effectively, decisions must be selected that provide the highest probability of success and the future profitability of the citrus venture.

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