HLB is here to stay

By L.W. "Pete" Timmer

By now, most growers have realized that the trees affected by HLB (huanglongbing or greening) are not likely to recover and probably will continue to decline. The current situation in the industry has become very difficult, and most growers are in a quandary about how to move forward.

WHAT HAPPENED?

The Asian citrus psyllid (ACP) was first found in Florida in 1998. HLB was initially discovered in 2005 in South Florida, but probably had been here a long time prior, and by 2005 had spread at least as far north as West Palm Beach, mostly in residential plantings. Thus, from the outset, eradication of the disease was deemed impossible.

The three-pronged approach was recommended initially by many researchers and Extension agents — disease-free nursery trees, effective ACP control and removal of all symptomatic trees.

After many meetings and discussion of workable solutions, the Florida Department of Agriculture and Consumer Services implemented a state statute requiring that all nursery trees had to be produced under screen and that other measures be taken to keep the disease from being introduced with nursery stock. As of January 2008, all nursery trees had to be produced in screen houses requiring significant changes and expense for the nursery industry. Since I know of no cases where the disease has been introduced into a planting via infected stock, that leg was established and has been highly successful. Nursery growers deserve a lot of credit for completely transforming their industry and making the capital expenditures necessary to provide growers with disease-free trees.

After discovery of the disease, a great deal of emphasis was placed on ACP control. New insecticides were registered and better application methods developed. Low-volume applications allowed rapid treatment of large areas that were effective for ACP control, and soil-applied materials provided excellent control on young trees. These were rapidly adopted by growers, and ACP populations are much lower now than they were at the time HLB was first found.

Initially, I don't think anyone realized the distances that ACP could disperse and what strong fliers these tiny insects are. Thus, infective insects could carry the causal bacterium long distances under their own power or even longer distances when carried on wind. Another thing that few appreciated was the level of ACP control necessary to reduce spread of the disease. Even when growers thought they were doing an effective job of control, the disease continued to spread. ACP proved to be an insect that was easy to kill, but hard to control at the level necessary to reduce spread of disease.

Removal of infected trees proved to be a much harder sell. Much of the diagnosis was based on visual symptoms, and the blotchy mottle symptom proved to be a reliable indicator of infection. In addition, polymerase chain reaction, a molecular method, was used and U.S. Sugar/Southern Gardens provided a free service to growers to verify infection. Infected trees showing only a few branches with blotchy mottle symptoms can live and be highly productive for probably five years, so few growers were willing to remove trees that had good crop loads. Some growers with low infection rates followed that practice for several years and a few still do.

Others that were unwilling to remove trees or growers with high infection rates opted or were forced to try to live with the disease and tried to survive with only intensive insecticide programs. Nutritional programs were suggested and promoted to improve tree condition. These sprays made trees look better, but there never was any scientific evidence that they increased the longevity and productivity of the trees. Hundreds of growers have tried all of the variations of nutritional sprays. Most have failed dismally, and now trees are declining in spite of their best efforts.

Statewide, HLB progress followed a standard, sigmoidal or S-shaped curve, typical of this type of disease. Initial progress seemed slow with low incidence the first few years. Mike Irey of U.S. Sugar estimated incidence at 0.2 percent in 2006, 1.1 percent in 2007, and 3.5 percent in 2008, which didn't seem too bad. But, then the disease entered the logarithmic phase and

Removal of HLB infected trees has been a hard sell for growers. In 2011, cost of removal by a tree grinder was $4.50 to $5.50 per tree.

HLB-infected trees with only a few branches with blotchy mottle symptoms —a reliable indicator of HLB infection — can live and be highly productive for probably five years.

disease incidence doubled every year with 9.9 percent in 2009, 21.7 percent in 2010 and 43.3 percent in 2011. Assuming it doubled again, there was nearly 80 percent infection by 2012 and is probably now approaching 100 percent since incidence tends to plateau at high levels.

Intense insecticide applications probably reduced disease spread considerably, but obviously they were not sufficient even when pursued rigorously. Those growers who removed trees initially but later abandoned tree removal delayed the onset of the logarithmic phase and thus benefited by a few more years of productivity. The initial estimate that trees would remain productive for about five years after infection seems to be borne out by experience.

So, I would expect that the progress of tree decline would follow that of the infection curve by five years. If there was 80 percent infection in 2012, I expect that 80 percent of the trees will have declined by 2017. Observations of trees statewide would seem to support that prediction. Many trees have already declined to the point that no magical treatment is going to bring the trees back. Even treatments like heat or antibiotics, which purportedly kill the causal bacterium, are unlikely to reverse the situation of these trees since roots of badly affected trees are so seriously damaged that the tree would have to renew most of the root system as well as much of the canopy.

In addition, cost of production increased substantially. According to Ron Muraro's figures for processing oranges in Central Florida, care costs increased from $757 to $985 per acre in 2004–05 to $1476 to $1681 in the 2011–12 season. Spray costs increased from $228 to $419 in the same time period. In addition, enhanced nutritional programs added an average of $266 per acre. Many growers spent and continue to spend much more. Fruit prices have increased, but not enough to compensate for the increased production costs.

PREDICTIONS

In an article in *Citrus Industry* in January 2010, I made some predictions for five years in the future that most people thought were excessively pessimistic. We're getting close to that five years, so let's see how those came out:

• Most trees affected by HLB in South Florida have declined, been pushed or abandoned.

Certainly true, but many groves on the East Coast and in Central Florida have serious decline problems as well.

• Early attempts to replant failed.

Unfortunately most of the young trees planted in the last five years will not form productive, economically viable groves.

• Disease incidence in Central Florida much higher; growers extremely worried.

This was a gross underestimate.

• Production dropped to <100 million boxes.

We're not that low this last season (June estimate was 104.3 million boxes), but I don't think anyone thinks we'll be above that mark next season.

• Plantings in South Florida with aggressive control surviving, but control is difficult due to high inoculum in surrounding areas.

There are a few left, but for the most part, maintaining disease-free groves has been extremely difficult in the current environment.

• Nutritional and other treatments have not proven sustainable.

A few devotees still seem to think they are working, but they certainly haven't saved the industry as evidenced by the continued decline in production across the state.

• Attempts being made to replant some large areas after removal of all citrus in the vicinity.

We're finally seeing some effort being made to accomplish this, but it remains to be seen how successful it will be. Most new plantings are in situations where success is unlikely.

• Better information available for psyllid control; management programs have improved greatly; fewer sprays needed for psyllid management.

Certainly better information is available, but what we have learned is that more stringent control is needed, and I doubt that many are successful with fewer sprays.

• Area-wide programs seem to be working; scouting more mechanized and efficient and well-trained crews widely available, but inspections are still done visually.

The citrus health management areas (CHMAs) are in place in many locations. Some seem to be operating effectively, but none addresses inoculum removal. Scouting to remove infected trees is essentially gone. To be successful in the future, growers will need to do that.

• Genetically engineered cultivars being planted experimentally, but still not approved and are unproven.

Certainly true. We have been hearing "in another five years" for a long time. Maybe in another five years, but not something that should be counted on for the immediate future of the industry.

• Prices for processed and fresh fruit excellent; HLB damage in Brazil and other areas reducing supplies.

Certainly true with regard to availability, but prices are not where I expected they would be. Maybe I just don't understand economics.

• Grapefruit supplies also low; prices good

Same applies here.

SO, WHAT DO WE DO NOW?

Back to square one. No magical cures for HLB have appeared. Most everyone was hoping and depending on the silver bullet rather than facing the situation and using the best available methods. Research has taught us a lot about ACP management, and we have learned much about detection and spread of the bacterium in the plant and in groves. We know a lot more than we did in 2005, but the management strategy remains the

same. Transgenic citrus and resistant rootstocks are possible treatments in the foreseeable future, but are not immediately available and, even if they were, would require extensive replanting and capital investment to turn over the current tree inventory.

Growers need to do something now: disease-free nursery stock, aggressive ACP control and removal of infected trees. But, it is obvious that won't work in many situations. You have to have large contiguous blocks well-separated from sources of inoculum. Frequent aerial applications of insecticides to the borders of large groves have reduced re-invasion of HLB in Brazil and could work here too. All that may be feasible for large growers, but is tougher for small growers. The only solution for small growers is to plant adjacent to a large grower with an aggressive control program. Or, form CHMAs with other growers and adopt a stringent control program in contiguous blocks that includes removal of infected trees.

Inoculum, inoculum, inoculum — failure to remove infected trees has resulted in our current situation. Even the best ACP control programs won't be 100 percent effective. Theoretically, a single infective psyllid can kill a tree. No amount of spraying can kill them all or prevent all disease spread, as we have seen. So, the only way to be successful is to remove infected trees as fast as they can be found in addition to aggressive psyllid control.

In the current situation, the inoculum is overwhelming. With many groves in serious decline, growers are discontinuing spray programs, thus increasing the number of infective psyllids. While groves that are in severe decline from HLB are not as favorable for high rates of psyllid reproduction as recently infected groves, most of the psyllids produced will be infective. Those groves do not provide an environment that is favorable for ACP, and the psyllids will be seeking greener pastures. Lush, new plantings are attractive targets, making HLB control in new groves even more difficult. Thus, it is essential to start reducing inoculum, not only in the grove, but also in the surrounding areas. Incentives need to be provided for growers who are abandoning groves to remove all of the trees immediately.

The other important issue is the density of new plantings. One possibility is to plant at very high density and remove infected trees without replacement assuming that the space will be occupied by adjacent trees. That is a good option except that nursery trees are expensive, and the capital costs to get started will be high. This may be an option if the risk of infection is relatively high.

An alternative would be to plant at lower density and replant as infected trees are removed. If risk of infection is relatively low in a given situation, this is a viable option. A number of studies of plant densities are underway. Unfortunately, in many of those, infected trees are not being removed. If infection rates are high, those plantings will fail regardless of the spacing. **You can't live with HLB in the grove.** I know of no economically viable industry of sweet orange in the world where infected trees are allowed to remain in the grove.

CONCLUSION

The Florida citrus industry has survived some very damaging events. The freezes of the 1980s and the hurricanes of the 2000s caused drastic losses. The tristeza epidemic resulted in the loss of all of the trees on sour orange rootstock and about a third of the groves had to be replaced over a period of 10 to 15 years. But, in those cases, trees could be replanted and expected to mature and produce a viable crop in a few years. None of these disasters required a basic restructuring of the industry and no major change in operations. There have been many changes in the industry since its beginning, but the basic structure has remained the same from the outset.

Now it is time to start over again. If you look at my predictions for 20 years in the future in my January 2010 *Citrus Industry* article, you´ll see that they are quite optimistic. Eventually we will have resistant varieties and new generation methods for dealing with the disease and the vector. But, we can't just sit around and wait for those to be developed as we have for the last few years. The industry is capable of restructuring and moving ahead, but it will take grit, determination and lots of money. But, there will be rewards for those who undertake the effort. I don´t think we´ll be without Florida orange juice, grapefruit and tangerines in 20 years.

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