

Taking available tools to the grove

The quest for long-term solutions to HLB is well underway. Technology like CRISPR is being developed to introduce tolerance or resistance to HLB. Conventional breeding also is seeking rootstocks and varieties that can resist the disease. In the meantime, growers are reminded to utilize available tools that help trees remain productive in an HLB environment.

During the August Citrus & Specialty Crop Expo at the Florida State Fairgrounds in Tampa, University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) researchers outlined treatments that can be used now in groves as longer-term solutions to HLB are sought. Here's a recap of those tools.

TRUNK INJECTION

Last year, growers were given the regulatory clearance to use new trunk-injection treatments of oxytetracycline (OTC), which delivers disease therapy directly into the tree's vascular system. Field studies leading to the approval documented yield increases of 30% or more along with consistent improvements in juice Brix, fruit color and fruit size.

According to OTC product labels, the interval between injections and harvest needs to be at least 180 days. For early varieties, this means that injections need to be performed early in the year. Several factors need to be considered for the best results. For example, uptake and distribution of injected OTC is best when the trees are well watered and metabolically



The timing of trunk injections can affect fruit size and juice Brix.

active. Therefore, injecting during dry periods should be avoided. Injections should also be avoided during the main flushing period. Young flush is very sensitive, and leaf deformations may occur after injection. For OTC to be taken up and distributed effectively, it is best to inject when most leaves are fully expanded.

For late-season varieties, injections can be performed from spring to summer. Field studies have shown that fall injections may also be beneficial. More studies are in progress to further explore the benefits and risks. There have been concerns regarding phytotoxicity (such as leaf yellowing or bronzing) occurring during hotter times of the year. In field trials, OTC has been successfully injected during cooler and hotter months. However, the month of injection can influence the fruit size and juice Brix.

"We found that in Valencia, earlier

injections (spring to early summer) increased the fruit size more than later injections (late summer to fall)," noted Ute Albrecht, UF/IFAS associate professor of plant physiology. "However, the juice Brix was usually higher after late injections compared to early injections when fruit were harvested by March.

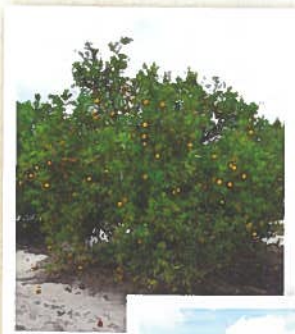
"Our studies have shown that the best way to protect young trees is by using individual protective covers (IPCs). IPCs not only protect trees from psyllids, but they also improve the tree physiology through shading and other effects, resulting in enhanced photosynthesis and rapid growth," Albrecht noted. "Although trees will become infected after IPC removal, their vigor will enable them to tolerate future infection better. They will then also have a trunk size that is suitable for injection. Injecting very young trees may cause more harm than benefit. More studies are in progress to fine-tune best practices for OTC injections."

PLANT GROWTH REGULATORS

There are five classic groups of plant growth regulators (PGRs): auxins, gibberellins, cytokinins, abscisic acid and ethylene. Gibberellic acid (GA) has been found to be effective in improving growth of HLB-affected trees.

GA is recommended to be applied in summer and early fall for enhanced vegetative growth. If the goal is to reduce flowering, then GA should be applied in late November to December.

Citrus Fix (2,4-D) should be applied around the color break stage to reduce fruit drop. Cytokinins are



Photos courtesy of UF/IFAS



Note the differences in canopy density, fruit drop and fruit color of untreated (top) and gibberellic acid-treated (bottom) Valencia trees. The treated tree has more fruit but is difficult to see due to the green color.

best suited to be applied during spring and summer flush. When trees are not flushing, their effect may be limited.

“There are several trials underway to evaluate the efficacy of PGRs such as GA, auxin (2,4-D), and cytokinins alone and in combination to improve productivity of HLB-affected trees,” noted Tripti Vashisth, UF/IFAS associate professor of horticultural sciences. “Some of the promising results have been seen when cytokinin is applied in spring (March–May) followed by GA application in June–September. The combination of GA and cytokinin was found to increase the yield by 25% in Hamlin.

“We have been finding higher efficacy of GA in reducing fruit drop in Hamlin as compared to Valencia. Three applications of GA from July through October about 45 days apart have been found to be effective in reducing drop and improving tree growth. We have also seen that the GA plus 2,4-D combination is effective in reducing preharvest fruit drop in Hamlin when applied around/before color break stage. The 2,4-D application has been found effective in reducing preharvest fruit drop only when drop is a significant problem. About 20% of fruit drop is natural, and PGR application in such cases may not be economical. However, repeated application of the GA and

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Brassinosteroids used after removal of individual protective covers can prolong tree health.

2,4-D are recommended as they limit the fruit drop signal in plants before it becomes a problem.”

IPCS AND BRASSINOSTEROIDS

Brassinosteroids (Brs) are approved for commercial use in Florida citrus. Treatments delay HLB progression in newly planted trees, and psyllid colonization and egg deposition are reduced in new flushes. Rust mite incidence is reduced as well. In mature Hamlin and Valencia trees, application of Brs can advance internal maturation by almost one month.

“We have been able to determine that a dosage of 6.2 fluid ounces of homobrassinolide 0.1% in 100 gallons of water is able to produce these results,” noted Fernando Alferez, UF/IFAS assistant professor of citrus horticulture. “In young trees, we are applying the treatment as a protection against HLB once per month, although we have some early indications that applying once every six weeks may be sufficient. In mature fruit-bearing trees, we have seen that one single application in early December may be enough to increase sugar content in Hamlin. In Valencia, this single application should be performed in late February or early March, although we still need to gather more information. These data need to be confirmed this coming season, and

ideally for one more season, given current interseasonal variability.”

Brs can be combined with protective measures already being adopted by growers, such as IPCs. These mesh bags efficiently protect newly planted citrus trees from HLB infection and provide a clear advantage to the trees in the first couple of fruit-production seasons.

“Last year, we started trials combining monthly brassinosteroid treatments on trees previously covered by IPCs. We already found that treatment with brassinosteroids prevented HLB infection six months after IPC removal, with most of the trees still testing negative for HLB. In contrast, upon IPC removal, 80% of the trees grown without treatment were HLB-infected in this time,” Alferez said. “After brassinosteroid treatment, trees are flushing more profusely, flushing started earlier and was more synchronized, and trunks are thicker in diameter. Also, trees are setting about 30% more fruit in the first season. In addition, we found less psyllids per flush. Our data so far suggests that a strategy using IPCs for the first two years followed by brassinosteroid treatment may prolong tree health and increase fruit yield and quality.” 🍊

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