Controlled-release fertilizer boosts health of HLB trees (part 2)

By Pete Spyke, Joby Sherrod and Jude Grosser

Part 1 of this article, published in the April 2017 issue of *Citrus Industry* magazine, provided some background information on controlled-release fertilizer (CRF) along with a discussion of practical applications in citrus production. This article, part 2, includes summaries of observations from several case studies in which CRF has been applied for a number of years.

100-PERCENT CRF PROGRAMS

Case Study 1: Arapaho Citrus Management, Inc. Home Grove (Pete Spyke)

After losing the existing grove in the citrus canker eradication program, a small 2-acre planting was established at the Arapaho Citrus Management office in Fort Pierce to test new varieties and evaluate production practices in the post-HLB era. HLB and greasy spot are prevalent in the area, and psyllid pressure is high due to neighboring untreated groves. After a few years of efforts to grow trees with intensive foliar programs and other methods, the trees were declining due to HLB.

The concept of CRF use was emerging, so the decision was to apply only CRF to evaluate the effectiveness of this practice alone on different varieties. Subsequently, the trees have received two to three applications per year of Everris Citriblen 18-6-11 six-month product, and no foliar sprays of any kind have been applied for over four years. It should be noted that in Citriblen, only nitrogen (N), phosphorus (P) and potassium (K) are coated. All minor elements are conventional soluble materials. However, there are no minor element deficiencies showing on most of the trees in the Arapaho office demonstration trial.

Weeds in the rows are controlled with glyphosate, irrigation is supplied with a drip system, imidacloprid applications have continued where appropriate, and the middles are mowed.

After a couple of years of transition, in some varieties, no HLB visual symptoms are apparent, and the trees are growing very well and producing good crops of wholesome fruit. There is very little premature fruit drop or other effects of HLB. Since no psyllid control sprays have been applied, *Tamarixia radiata* have been released, and biological control of psyllids is apparently sufficient in spite of heavy adult psyllid populations.

The varieties that have performed the best under this program are those

Short-Term Focus Areas

By Harold Browning

Growers facing the continued impacts of HLB report the need for immediate relief in the form of stabilized productivity from existing trees. While we know that some of the more sustainable solutions are farther out in time, recent committee and board discussions have focused on what the Citrus Research and Development Foundation (CRDF) can do to meet the short-term needs. Here are a few of the areas that emerged from the discussions:

- Improved application strategies for bactericides are needed. Impact from current bactericides may be limited most by delivering the materials into phloem and throughout infected plants. CRDF has approved several projects to look at improved application through testing of alternative adjuvant compounds, use of laser-assisted leaf application and exploration methods to measure absorption of bactericides applied under different circumstances. Plans include next-phase study of how trunk applications might be used for more effective delivery of bactericides. Testing of additional bactericide candidates continues, but delivery of new materials might pose the same delivery challenges faced with current materials.
- Asian citrus psyllid (ACP) management concerns grow as higher ACP populations are experienced. CRDF has invited follow-up proposals on several aspects of this situation, including the need to monitor for the possible emergence of pesticide-specific resistance in ACP populations. Ongoing work is expanding to more monitoring locations, as well as best methods to track ACP susceptibility to pesticides currently in use.
- Nutrition and irrigation combinations continue to be tested by growers around the state, and CRDF is reviewing completed work to determine if there are testable questions that could be addressed with next-phase, field-research projects. While considerable nutrition work has been completed, additional studies can be invited to address specific questions.
- Grower experience with management of tree health in the presence of HLB may provide clues on combinations of programs that lead to local "success." The components vary widely, as do rates of application, timing and formulations of materials applied through a range of delivery systems. Prior efforts at CRDF to organize evaluation of these programs has been met with challenges, but we are again working on plans to understand what individual growers are doing that may be leading to better-than-expected performance, and common denominators among these cases. While this may lead to testable questions, sharing information about management tools that are being deployed may have more immediate value.
- Coordination of all aspects of work underway to identify and deliver plant germplasm to aid in HLB management remains a short- and long-term priority. CRDF has recently approved a project to look at natural variation among plants in commercial plantings.

These project areas will be the primary focus for research and delivery from CRDF in the coming year. Short-term stability of infected trees has been an evasive goal, but efforts must continue.

Harold Browning is Chief Operations Officer of CRDF. The foundation is charged with funding citrus research and getting the results of that research to use in the grove.

CRDF Grower Dollars at work for you

Column sponsored by the Citrus Research and Development Foundation

Arapaho Home Grove Valencia/Swingle trees in summer (above) and fall (right) of 2016. No foliar sprays of any kind have been applied in four years.

that have resistance to greasy spot and are less affected by HLB. Navel, Valencia, Temple, Page, Nova, Minneola, Dancy, Persian lime and Meyer lemon are all growing very well. Other varieties that show intermediate response, probably due to higher susceptibility to greasy spot and greater effects of HLB, include Ortanique, W. Murcott, Early Pride and Kishu. In this intermediate group, the trees have been slower to respond, but are showing signs of recovery as well.

Grapefruit, Bearss and Lisbon lemons, Shasta Gold and Shiranui, on the other hand, have not tolerated the program very well. These varieties are typically more affected by HLB, and are more sensitive to greasy spot, which probably explains their inability to grow well under the no-spray program. Provisions for better disease control in this group would be required in a commercial CRF program.

Grapefruit varieties in particular are growing very poorly, as would be expected under a no-spray program. Based on the results with other varieties, CRF could be beneficial in a grapefruit program, but intensive foliar sprays to control canker, greasy spot and HLB will apparently also be necessary.

Small videos and example CRF-based fertilizer programs can be seen on the Arapaho Citrus website (www.arapahocitrus.com).

Case Study 2: St. Helena Project [Citrus Research and Education Center (CREC), Jude Grosser and Orie Lee]

The St. Helena project is a 20-acre rootstock trial, featuring Valquarius and Vernia orange scions, made possible by Florida Citrus Hall of Fame grower Orie Lee. Approximately 80 different rootstocks are being evaluated in randomized, replicated four-tree plots. Twelve acres of the trial will be 9 years old in April, and trees are now nearly 100-percent HLB-infected. Trees have been grown with 100-percent Harrell's CRF products their entire life, with some foliar nutritionals included in the psyllid control program, under heavy "bad neighbor" psyllid/HLB pressure.

The Harrell's CRF formulas have been improved over the course of the trial, and now include Tiger-Sul manganese (Mn), iron (Fe), zinc (Zn) and boron (B). Tree health and yields have been reasonably good throughout the life of the trial, except that in 2015, there was a significant yield drop across the whole trial on all rootstocks. We attributed this to

The Haines City Hughes Post Office Block, as of September 2016.

a horticultural mistake. Tree canopies had grown down to the ground and application of the CRF using a Killebrew fertilizer spreader was missing the microjet zone target because the fertilizer was bouncing off of the dense tree canopies back into the grove middles. Trees were then skirted before the 2016 CRF applications, and tree health and yields are showing a significant rebound this year.

This demonstrated the importance of getting the fertilizer in the right place, directly over the primary root systems in the microjet wetting zone. A "turkey tail" on dry fertilizer spreaders will help concentrate the material within the drip line of the trees, and low obstructive canopies should be skirted if possible.

Projected yields at optimal tree spacings per rootstock based on actual yield and fruit quality data from the St. Helena field indicate that after seven years, more than 20 scion/rootstock combinations could have produced a cumulative yield of 8,000 to 12,700 pounds solids/acre. Trees on commercial rootstocks that performed poorly in the early years of the trial due to HLB are now showing a significant recovery, especially trees on Swingle.

HYBRID CRF/SOLUBLE DRY PROGRAMS

Case Study 3: Haines City Hughes Post Office Block (Jude Grosser)

This 10-acre research block provided to the CREC by the late Jim Hughes consists mostly of 13-year-old Vernia and early Valencia clones on Swingle and some C-35 rootstocks. This block has been 100-percent HLB-infected for several years, and the yield bottomed out two years ago at just 1.25 boxes per tree. Since this time, the block has been on a 50/50 CRF/dry soluble fertilizer program, with micronutrient overdose treatments. Basacote® (all nutrients coated) was applied twice per year (February and July); soluble dry fertilizer was applied four times per year, with an alternating skipped-middle pattern. Micronutrient overdoses were applied to every row by hand.

After just one year, yield increased from 1.25 to 1.5 or two boxes per tree, depending on the micronutrient treatment. Treatments containing overdoses of both Mn and B provided the highest yields. In 2016–17, visible tree health has continued to improve with thicker canopies and larger, darker green leaves. We expect to harvest 2.5 to 3 boxes per tree this year, which would put the grove back into the profitable category. Stay tuned for actual yield results later this spring.

Case Study 4: Topworked Trees at Orie Lee's Alligator Grove (Jude Grosser)

Three totally HLB-compromised, 10-year-old Valencia/Swingle trees, flagged for removal, were topworked in 2012 with OLL sweet oranges and grown back with the Harrell's St. Helena mix. This mix was supplemented with overdoses of Florakote polycoated B and Tiger-Sul Mn (applied every six months), in addition to Orie Lee's standard nutrition

program. All three trees have grown into beautiful, healthy, productive trees. They have produced approximately three boxes per tree of high-quality fruit the past two seasons and have another reasonable crop of two to 2.5 boxes per tree this year, though somewhat reduced by postbloom fruit drop. Canopies remain thick with large, dark-green leaves.

These trees were grown back on, presumably, previously HLB-infected Swingle root systems! Although this spring we detected bacteria in the scion, we were not able to detect any bacteria in the roots. If roots were indeed previously infected, this response suggests that overdoses of certain micronutrients may be suppressing Liberibacter populations in the roots (similar to what we have seen in greenhouse trees). This is another positive example where supplemental CRF is enhancing tree health and productivity.

Case Study 5: Duda Program (Joby Sherrod)

Fifteen years ago, we had a goal of lowering production costs using CRF on mature citrus, which allowed us to reduce the total amount of N applied and reduce the number of ground applications (part of a total program that includes foliar nutrition and psyllid control) to a single application. The dry fertilizer program at the LaBelle grove has since evolved into three annual applications of CRF plus soluble fertilizer "hybrid" blends.

The benefits realized over the years have extended beyond reducing application costs. Mature tree leaf flushes are more uniform than they were. This contributes to better Asian citrus psyllid management. Root mass analysis shows an average of 1.25 grams/20 cores for 2016 compared to a state average of 0.79 grams. Average leaf N is 3 percent and leaf K is 1.9 percent, which has remained stable for years. The grove has experienced very little HLB-induced fruit drop in the past three years and produces larger-than-average fruit size. Year-to-date, early-mid fruit size has averaged 240 fruit/box compared to the statewide average estimate of 310 fruit/box. Yields have been maintained. According to production records, 5-year average, early-mid grove production is equal to the 2008 pre-HLB production, and 5-year average, Valencia production is within 4 percent of 2008.

RECOMMENDATIONS FOR CRF PROGRAMS

Our observations over a number of years indicate clearly that dry fertilizer applications that contain CRF source materials and higher levels of minor elements are more effective than previously recommended programs when trees are infected with HLB. These types of applications can help restore tree health and maintain productive trees in a healthier condition. Use of CRF, then, represents the baseline of a full production program. Other practices to control other pests and diseases and good basic grove management can then be added as necessary.

There's still a lot to learn about CRF. We hope that growers will adopt this practice and report their experiences. Different varieties, rootstocks, soil types and management regimes will no doubt affect the choices that will lead to optimal outcomes. The experiences discussed above, though, create the expectation that it is possible to grow commercial citrus trees that produce good crops of wholesome fruit, profitably.

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