Florida Citrus Advanced Technology Program

QUARTERLY & FINAL REPORTS: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

Instructions Complete the fields based on your project specs. When finished, save the form to your local disk using a unique name. Then, go to **http://research.fcprac.com**, and log in with your user name and password using Researcher Login in the lower left. Find this project title and click on **Submit a Report**. Update your profile information if needed, then upload this report as directed.

2009-2010 REPORT	CATEGORY (drop-down)	TODAY'S DATE (m/d/yr)
◉ *Quarterly Report* ○ *Annual Report* ○ *Final*	Management	1/15/10

WHAT IS THE "HEADLINE" FOR THIS REPORT (e.g. a one-sentence "newspaper headline" describing what you accomplished)

Foliar feeding of specific nutrients that change in HLB-infected trees may be a viable method for sustaining tree health.

TITLE and CONTACT INFORMATION

Proposal Title Using physical and chemical property changes of citrus leaves as early indicators of HLB infection and the effects of added plant nutrients

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Organization CREC	*Total Direct Funds (current year)* $164,631

REPORT UPDATE (650 words; provide details about your headline)

Objective 1: We conducted tests with nutrient analyses of leaf samples collected from HLB-infected and healthy trees to establish relationships that could be used for (early) diagnosis of HLB. Starch accumulation in symptomatic leaves can significantly alter the interpretation of nutrient status when diagnosed on a dry weight concentration basis. When corrected for starch accumulation by using specific leaf area, Ca, Mg and B are consistently lower and K is higher in HLB-infected trees compared to healthy trees under the same fertilization program. These changes exist in both symptomatic and asymptomatic leaves from infected trees. Similarly, separation between asymptomatic healthy leaves and asymptomatic infected leaves could be achieved using the Diagnosis and Recommendation Integrated System (DRIS), particularly when assessing the Dry Mass Index (DMI) generated by the method. DMI integrates the imbalances caused by nutrient losses and starch accumulation in HLB-infected leaves, thus could indicate infection early on despite the absence of visible symptoms. We are currently sampling leaves from trees infected with other diseases (CTV, blight, phytophthora) to determine if these changes are HLB-specific and can be used as a diagnostic method. Due to stress-related abscission of HLB-symptomatic leaves from the exterior of infected canopies for much of the year, we are often forced to sample symptomatic leaves from within the canopy and asymptomatic leaves from the outside. We tested the effect of this unavoidable sampling position difference on the measured leaf nutrients analyzed in healthy trees and found no significant differences in 11 elements measured.
Objective 2: Two field studies have been established to evaluate the effects of various foliar nutrient applications on the expression of HLB in infected trees by evaluating tree nutrient status, growth, yield and visual tree appearance through photographic documentation. The first of these trials is in a heavily infected mature Hamlin grove in south Florida. Since the initiation of the project the trees in this study have received four foliar applications of one of nine different treatments. Untreated trees serve as controls. The trees were harvested in December 2009. The second study is in a young (3-5 years old) commercial Valencia grove in Haines City. Treatments in this study have been underway for approximately 4 months and include fertigation in addition to foliar nutrient sprays. Our initial efforts at this site have been to demonstrate the ability to raise the levels of specific nutrients involved in plant defenses within trees. Since treatments began, B levels have been successfully raised to near toxic levels within infected and healthy trees using both foliar and fertigation applied B. This has demonstrated that good nutrient uptake can be achieved through the treatment methods in a relatively short period of time. Analysis of the large quantity of these studies have generated is still being analyzed as of the writing of this report. As soon as the analyses are complete information will be passed along to the Florida citrus community.
Objective 3: A hydroponics system has been constructed in an HLB approved greenhouse at the CREC. Hamlin trees grown from rooted cuttings were purchased from a commercial nursery and are currently being established in the hydroponics system. Once the plants have made the transition from soil to hydroponics culture half of them will be inoculated with HLB by grafting material from greenhouse-grown trees with known HLB infections. All of the plants will be maintained with a complete nutrient solution until HLB symptoms develop on the inoculated trees. Previous experience with greenhouse graft inoculation indicates that this will take about 90 days. At that time, healthy and infected trees will be subjected to various changes in the nutrient solution composition. Based on the data from objective 1, the levels of Ca, Mg, and B and combinations of these three nutrients will be changed to determine plant response with and without HLB. Trees remaining in complete nutrient solution will serve as controls. This experiment will allow us to begin to separate nutrient and HLB effects on plant growth and understand the interaction of nutrition and HLB infection.

Data from this project has been the basis for two Citrus Industry magazine articles in 2009. In addition, the data has been presented at Citrus Expo, the Florida State Horticultural Society conference and at six different regional grower meetings. An EDIS document about the general effects of plant nutrition on disease tolerance is being written.