CITRUS ADVANCED TECHNOLOGY PROGRAM

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

SELECT PERIOD March 2013

Quarterly Report Final

Proposal Title

In-field solar heat treatment of HLB-infected orange trees for inoculum reduction

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
4/23/13	Citrus Research and Development Foundation	Infection Consequences

REPORT UPDATE (500 words-It is not necessary in this public report to disclose your institution's proprietary information or intellectual property.)

A new, rugged, heating tunnel prototype that incorporates two infrared radiant heaters and four fans was built. The heating and air circulation system has been integrated with an adjustable temperature control switch for automatic control of the temperature.
As mentioned in our early report there was a lack of repeatability of live bacteria PCR analyses due to both intrinsic variability in the leaves and experimental variability due to the large number of steps required for DNA extraction procedures. Therefore, to assess the effect of the 2012 heating treatments on tree health at the time of fruit harvest, i.e. April 2013, we assessed overall appearance of the trees, and determined fruit yield and juice quality. We also determined the number of new shoots, new leaves and the mean leaf surface area in selected portions of treated and control trees. The main findings are summarized below.

Qualitative observations: The trees that were treated in 2012 were those that showed the most prominent symptoms of all the trees in this research project. The trees treated in July of 2012 reached a temperature of at least 45 °C for at least 4 h. In April 2013, the treated trees looked healthier than the surrounding, untreated trees that now show severe symptoms. This suggests that the thermal treatment was effective in mitigating the progress of the disease. Because of cold weather, trees treated in September of 2012 did not reach 45 °C for as long as those treated in July of 2012. Trees treated in September of 2012 did not appear to be as healthy as the trees treated in July, but appeared healthier than trees that were infected and were untreated (symptomatic control). Overall, asymptomatic (healthy control) trees looked healthier than treated or untreated trees. A large amount of fruit drop was observed for all trees.

Quantitative results: Data from the April 2013 harvest showed that the average fruit yield for the healthy control trees was 217 lb/tree. Trees treated in July yielded an average of 200 lb/tree. Symptomatic control trees had a mean yield of 162 lb/tree. Although yield variability was high, (standard deviations in the order of 50 lb) these results suggest that treated trees had a yield close to that of healthy trees.Healthy control trees had the same mean soluble solids content (SSC) of 12.0 °Brix as trees that were treated in 2012. In contrast, untreated symptomatic control and trees that had a mild heat treatment had a mean SSC of 11.3 and 11.0 °Brix, respectively.

Mean new leaf surface area of healthy trees (16.6 cm2) was slightly greater than that of treated trees (13.4 cm2). In contrast, the mean surface area of new leaves from untreated trees (7.6 cm2) was considerably smaller (about one half) than that of healthy or treated trees. This suggests that symptomatic trees suffering stress conditions might have slower canopy foliage development compared to healthy trees. Also, thermally treated trees have good health/vigor compared to symptomatic control trees. Primarily, it was observed that healthy trees have well-developed medium to dense foliage from past seasons; whereas, symptomatic control trees have thin foliage. The number of new shoots in a 0.5 x 0.5 m frame was on average 30 for healthy control trees, 56 for untreated symptomatic controls, and 42 for treated trees.

In conclusion, results from 2012 experiments suggest that thermal treatment is effective in mitigating the effects of HLB. It is anticipated that the use of fans and electric heaters will result in more uniform and faster tree treatments.

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