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	3/12/10

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

Final Hamlin harvest data presented and differences in "marker" chemical compounds in leaves

TITLE and CONTACT INFORMATION

Proposal Title Effects of HLB on quality of orange juice and identification of HLB-induced chemical signature in fruit juice and leaves

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Organization USDA-ARS Citrus & Subtropical Prod Lab	*Total Direct Funds (current year)* $147,567

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

For the first year (2009) of research on healthy, asymptomatic and symptomatic HLB commercially-processed juice samples (healthy, HLB-AS and HLB-S, respectively) from two Valencia and two Hamlin harvests (15+ trees/sample), previous reports were given on sugar, acid, Brix, titratable acidity, ratio, and oil content as well as sensory perception of flavor for the first three of four harvests. The results for these three harvests showed that there were minimal differences between juice from healthy and HLB trees for HLB-AS fruit but that there were differences for HLB-S fruit, both chemically and in terms of sensory perception (difference from control tests) except for the bitter compounds limonin and nomilin. These compounds were higher in both HLB-AS and HLB-S juice compared to healthy, but the differences were much greater for HLB-S fruit for January Hamlin and April but not June Valencia. Trained panels detected more differences in some descriptors between healthy and HLB-AS and especially HLB-S juice. Generally, juice from later season fruit showed less differences due to HLB. Now we have data for the final December Hamlin harvest where the difference from control test did show differences between healthy and HLB-AS juice for taste this time, and even greater differences for HLB-S juice for taste and smell. The chemical data, which explained the sensory, showed that the healthy juice had the highest Brix (10.44) and ratio (26.1), while the HLB juice had lower Brix (9.12 and 9.91 for HLB-AS and HLB-S, respectively) and ratio (19.2 and 22.5) higher acid (0.44 and 0.48% titratable acidity, TA) than control juice (0.40% TA) with the biggest differences for HLB-S juice. Oil content ran between 0.17 – 0.24%, being slightly higher in HLB-S fruit juice.

Previously we had sent 2008 and 2009 samples for e-nose and e-tongue analyses off site, and had good e-tongue but not good e-nose separation (since our e-nose temporarily out of commission). Interestingly, our repaired e-nose could differentiate between all the 2009 Hamlin and Valencia harvests and between healthy, HLB-AS and HLB-S juice within each harvest based on juice volatiles. So this means that both the e-nose and e-tongue show promise for distinguishing between healthy, HLB-AS and HLB-S juice based on volatile and non-volatile compounds, respectively.

Finally, several harvests of Hamlin and Valencia leaves have been analyzed for phytochemical content to look for HLB disease chemical markers. The analysis by HPLC-UV-MS allows for detection and quantification by UV absorbance, and by select ion mass detection. A tremendous amount of chromatographic and MS data has been collected, but only a small portion of it has been thoroughly processed. Thus far, the data has consistently shown that the alkaloid exhibiting a mass fragment at 188 amu and the compound, feruloyl putrescine, occur at much higher concentrations in HLB affected leaves compared to healthy control leaves. Several of the polar hydroxycinnamates occur at higher concentrations in HLB affected leaves compared to control leaves as well. Differences were also observed in the levels of several mid-polar hydroxycinnamtes in the HLB and control leaves, but these differences have not been thoroughly analyzed. Several flavone glycosides occur at lower concentrations in HLB than in healthy leaves. The main flavanone, hesperidin, does not appear to be affected by HLB, however. In several cases, the HLB leaves contained higher limonin glucoside levels than control leaves, but levels of the limonoid aglycones have been too low for detection. The polymethoxylated flavones do not seem to be consistently affected by HLB, although further analysis is in progress. The differences in the chemical compositions of control and HLB affected leaves are being further investigated by a LECO time of flight mass spectrometer with enhanced peak convolution and detection capabilities.