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*	Other	3/26/10

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

Summary of large-scale sampling in 2009 for effect of HLB on orange juice flavor and chemical signatures in leaves

TITLE and CONTACT INFORMATION

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

Principal Investigator Elizabeth Baldwin	*PI Last Name*
Email Liz.Baldwin@ars.usda.gov	*FDACS Contract Number* Baldwin-e-5
Phone 863-293-4133 x120	*Project Duration (years)* 2 *Year of Project* 2009
Organization USDA-ARS Citrus & Subtropical Products Lab	*Total Direct Funds (current year)* $147,567

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

This study was conducted to see if differences could be found for juice from healthy versus HLB oranges, representing larger sample sizes (15+ trees/sample), which would better represent the commercial situation. In 2009, there were 2 Hamlin and 2 Valencia harvests for healthy and HLB asymptomatic (AS) and symptomatic (S) samples. 500 fruit/sample were juiced using a JBT extractor and pasteurized. Sensory analyses was done using "difference from control" (DFC) tests and trained descriptive (TD) panel. For chemical analyses, titratable acidity (TA), ºBrix and % oil were determined by the processor. Individual sugars and acids (HPLC), aroma and flavor (electonic nose and tongue, GC-MS and GC-olfactometry) and leaf analyses (LC-MS) were performed by USDA-ARS and UF. Results for the DFC tests showed no difference between healthy and HLB-AS fruit juice for the first Hamlin and both Valencia harvests, but did show a difference for the last Hamlin harvest for HLB-AS juice (taste), and HLB-S juice (taste and smell). Quality data showed that HLB-S juice was sometimes lower in ºBrix, higher in TA, lower in ratio and higher in oil content. TD sensory analysis showed differences for HLB-AS and HLB-S juices from healthy juice for smell and taste, especially for HLB-S juice and for taste. Results for other chemical analyses showed that sugars were often lower and acids and bitter liminoids higher in HLB juices compared to healthy controls. The electronic nose (e-nose) and tongue (e-tongue) studies showed that the e-nose differentiated between healthy, HLB-AS and HLB-S samples based on volatiles, as well as between samples from different harvest dates. The e-tongue also separated samples based on non-volatile compounds. For GC-olfactometry (GC-O), early season HLB-S fruit had less overall aroma intensity than control (healthy). However, in more mature fruit there was little difference in overall intensity. The samples were also analyzed by GC-MS to identify and confirm the GCO data. The data showed that the vast majority of aroma active volatiles were very similar between HLB-S and control juices. However, a few volatiles were found either exclusively or at higher aroma intensity in certain sample types. In the case of Valencia juices, 2-methylbutanol (minty, green) and decanal (citrus, fatty) were found primarily in HLB pasteurized juices. ß-myrcene (geranium, earthy, grass) and octen-3-one, 1 (mushroom, metallic) were identified in both HLB and control unpasteurized juices, but with a higher intensities in HLB juice. For leaf analyses, 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 as well as several of the polar hydroxycinnamates. Several flavone glycosides occur at lower concentrations in HLB leaves than in healthy leaves. The main flavanone, hesperidin, does not appear to be affected by HLB, but in several cases, HLB leaves contained higher limonin glucoside levels than controls. To conclude, there were minimal if any differences in flavor between healthy and HLB-AS juice for DFC tests with the large sample size, so the average consumer would not be able to tell a difference. Trained panelists picked up more differences in TD analysis, mostly for taste and mostly between healthy controls and HLB-S juice. The GC-O study found generally less aroma intensity in HLB-S fruit juice. There was variation, however, by season, with later season Valencia fruit showing less difference in flavor. Chemically, there were differences in ºBrix, TA, individual sugars, individual acids, as well as the bitter compounds limonin and nomilin. Generally HLB juice, especially HLB-S, was lower in sugar, sometimes higher in acids, generally higher in limonin and nomilin. The latter two compounds, however, were generally below reported tastes thresholds. This data confirms earlier studies that flavor problems are more likely to come from HLB-S fruit juice. For the second year, thresholds for HLB off-flavored juice will be established in normal juice as well as for HLB off-flavored compounds, which will be identified.