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	3/28/10

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

TITLE and CONTACT INFORMATION

Proposal Title Combating symptom development in fruit from Huanglongbing-infected citrus trees: A sensory, metabolite and physiological approach

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Organization UF/IFAS CREC	*Total Direct Funds (current year)* $179,153

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

Sensory impacts and flavor and aroma changes in HLB fruit: We began to coordinate metabolite and gene expression information to evaluate potential targets for mitigating HLB juice changes. The gene expression for metabolic biosynthesis that reflected flavor and aroma compound changes we previously reported are mentioned here. Several genes regulate linalool biosynthesis, such as GGPP synthase, geranyltranstransferase, terpene synthase and S-linalool synthase, were 1.5 to 5-fold up-regulated in symptomatic juice vesicles (SYMJV) compared with healthy juice vesicles (HJV) in 'Hamlin' and 'Valencia'. Naringenin-chalcone synthase expression, which regulates flavanone glycoside synthesis, was 12-fold higher in SYMJV compared with HJV. The lipoxygenase 2 which regulates hexanal biosynthesis was 0.6-fold down regulated in SYMJV compared with HJV. Yield, peel color, fruit size and seed abortion in HLB frut: We worked with cooperators to identify the specificity of the iodine-starch reaction and starch quantification for detection of HLB in flavedo (FF) of 'Valencia' with verified zinc deficiency and water stress. No significant difference in starch accumulation was measured in FF of symptomatic versus healthy fruit. Our previous work showed that healthy FF accumulated starch, but like in roots, progressive starch loss was seen as fruit went from asymptomatic to symptomatic condition. Four starch biosynthetic genes (glucose-1-p adenylytransferase, starch synthase, 1,4-alpha-glucan branching enzyme, and isoamylase) were progressively down-regulated in ASYM and SYM 'Hamlin' and 'Valencia' fruit, but three of four starch degradation genes were up-regulated in HFF. There was only 10% reduction of starch biosynthetic gene expression in immature HFF (that is, green but mature) compared with fully mature HFF, whereas expression of degradation genes was higher in immature HFF compared with mature HFF. To complement work on starch content, we measured sucrose content in flavedo of H, ASYM and SYM Valencia fruit at immature, green mature and full mature stages. SYM and ASYM fruit accumulated less sucrose in flavedo compared with H flavedo. To study the involvement of IAA in the abnormal growth of SYM fruit, we analyzed its content in flavedo removed from misshapen sections and compared with normal shaped sections of the same fruit or healthy fruit. IAA content in normal sections of SYM fruit was similar to that in flavedo from ASYM and healthy fruit, but is significantly higher (2X) in flavedo from the misshape sections of SYM fruit. Our study with 'Valencia' fruit at the green mature stage indicated 10-fold higher fruit drop in HLB-infected trees compared with healthy trees. The fruit detachment force (FDF) was reduced 75% in SYM fruit when compared with healthy fruit. The expression of abscission-induced genes such as 1-aminocyclopropane-1-carboxylate synthase (CsACS1), cellulose-a1 (CsCel-a1), polygalacturonase (CsPG), phospholipaseA2α (CssPLA2α) and PhospholipaseA2β (CsPLA2β) were 17-, 7.4-, 531-, 1.4-, and 1.6-fold induced in SYM fruit abscission zones (SYMFAZ) compared with healthy fruit abscission zones (HFAZ), respectively. There was no difference of FDF between ASYM fruit and healthy fruit. However, expression of CsACS1 and CsCel-a1 were 5-fold increased and CsPG was 150-fold increased in asymptomatic fruit abscission zones (ASYMFAZ) compared with HFAZ. Bacterial titer was higher in SYMFAZ than ASYMFAZ. The titer of bacteria in SYMFAZ was over 2,000 fold higher compared with SYM midribs (including leaf abscission zones). The titer of bacteria was correlated with percentage of fruit drop. These results confirm that abscission is induced prematurely in ASFAZ and SFAZ through induction of abscission cell wall hydrolase genes known to be associated with organ loosening. An additional Hamlin harvest was performed and a Valencia harvest is planned. Analyses of these 2010 harvests and will be available for the next report.