CITRUS ADVANCED TECHNOLOGY PROGRAM

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

▶ INSTRUCTIONS

(●) *Quarterly Report* ( ) *Annual Report* ( ) *Final*

Required: What is the "headline" for this report (e.g. a one-sentence "newspaper headline" describing what you accomplished)

Combating symptom development in HLB-infected fruit

Proposal Title

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

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
10/29/10	Citrus Research and Development Foundation	Infection Consequences

REPORT UPDATE (500 words; summarize your accomplishments)

Physiological changes in HLB fruit: Global gene expression in HLB-infected fruit tissues was evaluated using an Affymetrix array containing 30,279 Citrus spp. ESTs. Flavedo (FF), vascular tissue (VT), and juice vesicle (JV) tissue of symptomatic (SY), asymptomatic (AS) and healthy (H) fruit harvested from sweet orange 'Hamlin' and 'Valencia' cultivars was investigated. Transcriptional profiles indicated the number of genes impacted by HLB was highest in FF and VT and least in JV. In 'Hamlin', over 860 genes were changed in SYVT and SYFF compared with H tissues. In 'Valencia', fewer genes were changed in SYVT and SYFF, but approximately 50% additional genes (397 genes) were changed in SYJV compared with 'Hamlin'. As in SY tissues, ASVT and ASFF were strongly impacted and had similar gene changes in 'Valencia'. However, only 28 genes were altered in ASJV compared with HJV. The top five gene groups with high numbers of changes included transporters, carbohydrate metabolism, genetic information processes, phytohormone metabolism and defense responses. Highest titer of the HLB bacterium was found specifically located in SYVT. Gene changes in SYVT were associated with host-pathogen interaction and seed abortion, and those in SYJV with fruit size, juice sac maturity and morphology, and juice quality. Similar to SY fruit, girdled fruit were small and could abscise prematurely. Comparison of gene expression between HLB-infected and girdled treatments is ongoing to differentiate HLB-mediated gene changes from those of girdling-related carbohydrate loss. We studied carbohydrate and phytohormone changes in HLB affected fruit to explain symptom development since 1) carbohydrate shortage has been linked to fruit growth arrest and eventually abscission and 2) hormonal signals regulate, at least partially, fruit set and development. SY, AS and H fruit were harvested from 'Valencia' trees (Citrus sinensis L. Osbeck) infected (SY and AS) or not (H) with the HLB pathogen, as verified by PCR. Mature SY fruit weighed less, had lower °Brix, were smaller, had more aborted seeds, and were greener than AS or H fruit. Starch and sucrose contents were lower in SY mature fruit flavedo compared with H and AS. SY and AS fruit harvested 7 and 12 months after full bloom produced significantly less ethylene than H fruit. Indole-3-acetic acid (IAA) and abscisic acid (ABA) contents in flavedo removed from the stylar-end, middle section, or stem-end of fruit, generally were higher in SY fruit than in AS and H. Flavedo excised from the misshapen area of SY fruit had significantly higher IAA content when compared with the normal-sized area of the same fruit on the opposite side. This increase corresponded to an increase in hypodermal cell area in S fruit flavedo. Overall, these data reveal an imbalance of carbohydrate and hormonal status in fruit from HLB-infected trees and suggest a role of such changes in fruit symptom development. Extension and education: The effects on Huanglongbing on Florida Orange Juice brochure by Danyluk, Spann, Rouseff, Goodrich Schneider, and Sims has been submitted to EDIS for publication and was distributed to all attendees at the 2010 International Citrus and Beverage Conference (ICBC) in Clearwater Beach, Florida. An educational display was also created and displayed at the 2010 ICBC meeting. ICBC is an annual meeting with an average attendance of 350 individuals from the citrus industry.

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Total Funds (current year) $179,153.00

SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.