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*	Genetics	1/18/10

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

Transgenic Disease Resistance Vigorously Pursued, as Other Long-term Efforts Yield New Varieties for Florida Growers

TITLE and CONTACT INFORMATION

Proposal Title Surviving HLB and canker: genetic strategies for improved scion and rootstock varieties

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Phone 8639561151	*Project Duration (years)* 3 *Year of Project* 1
Organization UF-CREC	*Total Direct Funds (current year)* 840,045.60

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

Transgenic citrus trees (900 containing 15 constructs with potential for resistance to HLB/canker) were planted at 2 field locations with severe pressure. Gene constructs have been prepared for new transformation experiments, including lima b, a "consumer-friendly" sister to lima a which has shown promise against HLB. At least 1500 new transformations with various new constructs and promoters, mostly using sweet orange selections, have been produced for greenhouse tests against HLB/canker; many of these should be field planted in fall 2010. We have verified 4 tissue-specific promoters that target gene expression only to phloem against Las. Testing of previously produced transgenics continues, with several showing either delayed, reduced or no symptoms following HLB-inoculation. Transgenic Carrizo plants were produced with insecticidal genes; preliminary feeding tests showed the snowdrop lectin gene killed aphids and psyllids. Several transgenic and hybrid plants have been identified with tolerance to canker and citrus scab. New disease resistance genes were cloned from grape and tested in tobacco for efficacy; preliminary results identified two potential candidates for citrus. A newly developed plant-derived anthocyanin marker allows visual selection of transformants, and will be tested in citrus, an alternative to non-host plant markers used in most genetic transformations. Our Agilent microarray was tested with salicylic acid-treated grapefruit and 2 labeling protocols; results confirmed the array's value for disease resistance research. Comparisons of sugar and starch metabolism in HLB-infected and healthy plants revealed that starch, sucrose, and glucose accumulated in infected leaves, maltose decreased and fructose levels were unchanged; studies are underway comparing activity of cell-wall bound invertase, a critical enzyme involved in sucrose metabolism and plant defenses. Using the iTRAQ technique, proteomic analysis was used to compare healthy and HLB-diseased mature leaves of sweet orange; 19 proteins were differentially expressed, out of which 9 proteins involved in stress and defense responses were highly up-regulated. Previously, microarray experiments highlighted canker defensive genes in kumquat; real-time PCR confirmed roles of one kumquat R-gene, two kinases, and one transcription factor, new targets for transformation. Cybrid grapefruit plants were produced with kumquat, and preliminary results show that some behave like kumquat in challenges. New DNA samples from a genetic population are being genotyped to contribute to the ICGC sequencing project. Hybrid plants have been produced for rootstock improvement from the previous season, and new crosses made 2009 are growing off. Previous work to develop rootstocks tolerant of or resistant to other maladies (such as CTV, blight, Phytophthora, Diaprepes, calcareous soils, etc.) continues, as we collected data from replicated trials and plantings. 15,000 trees were propagated from > 100 advanced UF-CREC rootstock selections, mostly for a 40-acre planting density/open hydroponic system trial located in Indiantown. The remaining trees will go to other PD/OHS trials to evaluate their potential value in closely-spaced groves under intensive cultural management; planting to be complete in Spring 2010. > 200 candidate rootstock hybrid seedlings were selected following a screen for Phytophthora tolerance /hi-pH soil adaptation. New pummelo-grapefruit seedless hybrids were created, and others available were found to be more tolerant of canker than grapefruit. New grapefruit-type candidates have been found this season, with selection based on fruit quality attributes. Sugar Belle, UF's 1st fresh release, was licensed to NVDMC, and first crops of Sugar Belle fruit were successfully marketed. Six new seedling orange selections were approved for release by IFAS, as unpatented and unlicensed varieties, 5 of which are early maturing with attributes superior to Earlygold, and another with reported canker tolerance. Finally, our first UF-bred orange cultivars, Valquarius and N7-3, are being licensed currently; these will provide 6-8 week early and later maturing Valencia quality fruit.