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)

Cybrids inherit resistance via transfer of organelle genes

Proposal Title

Characterization of canker resistance in citrus plants created by 'Somatic Cybridization' without citrus transformation

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
4/8/11	Citrus Research and Development Foundation	Conventional Citrus Breeding

REPORT UPDATE (500 words; summarize your accomplishments)

A comparative study of two susceptible hosts, Duncan grapefruit (DG, Citrus paradisi), and Rough lemon (RL, C. jambhiri) and two resistant species of kumquat (Fortunella spp.), 'Meiwa' and 'Nagami has been conducted to evaluate the basis for resistance to Xanthomonas citri subsp. citri (Xcc). The type of resistance occurring in kumquats is a hypersensitive response (HR) that develops within 48-72 h. This is based on the phenotype of the lesion, histological changes at the cellular level of infected tissue and early expression of genes related to programmed cell death (PCD). In kumquats but not in DG, several genes linked to PCD (lipoxygenase, glutathione transferase, metacapcase, acid chitinase and peroxidases) are expressed at 4 h post-inoculation (pi) with Xcc at 108 cfu/ml. Later at 24 h, additional genes related to plant defense (e.g. betaglucanase) are highly expressed in kumquats but less so in DG and RL and their activity continues to increase up to 48 h pi. Additional sets of genes related to PCD and the host pathogen interaction will be investigated this coming year. A cybrid is an asymmetric hybrid that contains the nucleus of one parent in combination with the mitochondrion and/or chloroplast of the cytoplasm donor parent. Twenty cybrids of highly susceptible Red grapefruit (RG) and the more tolerant Valencia orange (VO, C. sinensis) as the cytoplasm donor, were screened for their susceptibility to Xcc. Tolerance inherited from VO appeared to be quantitative based on an intermediate lesion phenotype in selected cybrids. In contrast to the callus-like lesions typical for susceptible RG, lesions were more necrotic for VO and the cybrids. This lesion phenotype indicated cell death arrested the proliferation of Xcc. Populations of Xcc at 14 days post inoculation in cybrids (7.2 Log cfu), were similar to VO (7.6 Log cfu) and one log unit lower than RG (8.4 Log cfu). Expression of genes related to host pathogen interaction in VO and cybrids differed from RG. The contrasting pattern suggested a differential interaction of genes from the nucleus with the mitochondria and chloroplast genes from the cytoplasm donor. Mitochondria and chloroplasts have a central role in stress and PCD signaling. The response of cybrids to Xcc confirms inheritance of resistance from VO may be expressed at different levels depending on whether mitochondrial and/or chloroplast genomes are transferred in the cybridization process. Field trials with several Ruby red grapefruit cybrids planted in canker-affected locations on the east coast were showing less foliar disease incidence than the adjacent Red grapefruit trees, but were severely damaged by freezes. Additional material has been planted out in canker prone locations. Production of cybrids lines using a new callus line of Meiwa kumquat as the cytoplasmic donor is underway in the Grosser lab. The resultant cybrids will be evaluated for inheritance of HR resistance using the same approaches

PI First Name James

PI Last Name Graham

Email jhg@crec.ifas.ufl.edu

Phone 863-956-1151

Organization Citrus Research and Education Center

Contract Number 78062

Project Duration (years) 3 *Year of Project* 2

Total Funds (current year) $98,045.00

SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.