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)

Evaluation of chemicals for control of citrus canker

Proposal Title

Canker management in Florida citrus groves: chemical control on highly susceptible grapefruit and early orange varieties

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
12/21/11	Citrus Research and Development Foundation	Epidemiology and Cultural Control

REPORT UPDATE (500 words; summarize your accomplishments)

Under Objective 1 (define rates and formulations of copper sprays for more effective control) and Objective 2 (establish the period of fruit susceptibility, residual activity and phytotoxicity of copper) The following has been accepted for publication in the proceedings of the Florida State Horticultural Society: Protection of 'Hamlin' orange fruit from infection by Xanthomonas citri subsp. citri, the cause of citrus canker, is necessary to reduce premature fruit drop. The objective was to evaluate copper formulations for control of fruit infection and drop in 6- to 8 year-old 'Hamlin' trees. Copper sprays were applied at 21-day intervals after fruit reached 0.5 to 1.0 cm (0.25 to 0.50 inches) diameter. The period of susceptibility of fruit to canker infection and fruit drop was established by increasing the number of applications through the fruit growth period. Separate treatments ended at each 21-day interval so that there were four to seven applications per season. In 2008, early season infection occurred during rains before copper sprays commenced in late April. Subsequently, five sprays of copper formulations at rates exceeding 0.5 kg /ha (1.1 lb/acre) metallic copper significantly reduced incidence of lesions on fruit. Early season fruit disease and cumulative fruit drop were highly correlated among copper treatments (r = 0.95). Although a tropical storm in early August promoted disease on fruit late in the season, late season fruit disease and fruit drop were less well correlated (r = 0.78). In 2008 and 2009, additional sprays after the period of early fruit susceptibility did not further reduce canker incidence or fruit drop. In 2009, copper sprays were initiated before significant spring rainfall and the incidence of fruit disease and fruit drop were lower and the correlation of early season fruit disease was less positively correlated with fruit drop (r = 0.52) compared to 2008. In 2010, disease on fruit and premature drop were not significantly different from the untreated checks although fruit disease and early season infection were still significantly correlated (r = 0.70). Overall, there was little difference in efficacy among copper formulations, although control was reduced for treatments with copper sulfate pentahydrate at lower rates of metallic copper. In each season, copper treatments controlled fruit drop by ~50% compared to the untreated check, however as 'Hamlin' trees grew from 6 to 8 years of age, canker incidence dropped due to the development of hedgerows, which reduced windblown rain penetration into the grove. Hence, fewer copper sprays will be necessary after canopy closure promotes an internal windbreak effect. Under Objective 4 (To define risk for development of bacterial resistance to copper and streptomycin in FL citrus groves) the results were submitted and accepted for publication in European Journal of Plant Pathology. Briefly summarized: Copper resistance determinants from a citrus epiphytic strain of Stenotrophomonas maltophilia (Stm) were cloned and expressed in Xcc and other Xanthomonas strains. Copper resistance genes in Xcc were determined to be present on a large (~300 kb) conjugative plasmid. Cu resistance was transferred via conjugation from two copper resistant citrus strains, Xcc and X. alfalfae subsp. citrumelonis (Xac), and two tomato pathogens, X. euvesicatoria (Xe) and X. perforans (Xp), to Xcc. PCR analysis revealed that two CuR strains from citrus, an epiphytic Xanthomonas ssp. and a strain of Stm, harbored homologs of the copper resistance genes found in CuR Xcc. The introduction of copLAB gene cluster from Stm into different xanthomonads conferred copper resistance to sensitive strains of Xcc, Xac, Xe and Xp. Under Objective 5 (rapid transfer improved canker management technology to the Florida citrus industry), the results from Objective 1 were presented at the annual meeting of the of the Florida State Horticultural Society in St. Petersburg.

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Organization Citrus Research and Education Center

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SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.