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*	Management	2/26/10

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

Evaluation of efficacy and risk for resistance of chemicals for control citrus canker in grapefruit and Hamlin is completed.

TITLE and CONTACT INFORMATION

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

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Organization UF, Citrus Research and Education Center	*Total Direct Funds (current year)* $129,021

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

Objective 1: Sprays of copper (Cu) formulations, containing copper hydroxide (Kocide, Champ, Kentan, Badge) or copper sulfate (Cuprofix), were moderately to highly effective for control of canker on fruit of susceptible Ruby red grapefruit and Hamlin orange in the lack of high disease pressure due to early and late season wind-blown rain storms in 2009. A chelated Cu (Magna-Bon, copper pentahydrate) at a 50% lower rate of Cu per application than standard Cu formulations performed as well for reducing fruit disease incidence for grapefruit or canker-induced fruit drop for Hamlin. Early season infection and fruit drop of grapefruit and Hamlin was minimal because April was relatively dry and Cu treatments were initiated before significant rainfall occurred in May. Cumulative fruit drop due to early season infection of untreated Hamlin amounted to about 5%. Five sprays of Cu formulations reduced the incidence fruit drop due to canker by about 40-50% to 2.5% cumulative fruit loss. Objective 2: In Marsh grapefruit, canker control increased with number of Cu sprays from 3 to 11 (April to October), canker infection and copper burn occurred after rains commenced in July. In August, fruit were growing most rapidly which would produce a thinning of fruit cuticle and an increase in the rate that new stomates open due to more rapid expansion of the fruit surface. Season-long copper spray also gave the best control of late season scab and melanose on fruit. In Hamlin, sprays beyond mid-July provided additional canker control of fruit drop confirming that late season lesions do not cause fruit drop like early season lesions.

Objective 3: In two grapefruit trials, Firewall (streptomycin[Sm]) applied alone or in combination with a reduced rate of Kocide 3000 in July and early August gave equivalent control on grapefruit to Kocide alone. The adjuvant, Polymer Delivery System (PDS) did not increase the residual activity of Cu on grapefruit or control efficacy of Cu. The residual activity of Cu on fruit was not affected by Kocide rate but decreased with time after application due to increase in fruit surface area over 21 days. This result supports the recommendation for use of 21 day interval Cu sprays for adequate canker control and explains the reduced efficacy of 28-day interval sprays.

Objective 4: The Cu resistance gene was identified as CopL on a plasmid from a resistant Xanthomonas citri subsp. citri (Xcc) strain from Argentina that was exposed long-term to Cu for canker control. The identical resistance gene sequence was found in Xanthomonas spp. causing bacterial spot in tomato and pepper. Primers constructed based on the gene sequence were used to screen the remaining Cu resistant strains of Xcc from Argentina and Cu resistant strains of X. alfalfae. pv citrumelonis from Florida citrus nurseries with citrus bacterial spot. All strains screened thus far contain the CopL resistance gene. In addition, a non-pathogenic strain of Xanthomonas isolated from a citrus grove was found to be Cu resistant and may represent a pre-existing source of risk in citrus groves for horizontal transfer of CopL into Xcc. Cu and Sm resistance were monitored in Xcc and epiphytic bacterial populations on grapefruit trees sprayed with Cu or Sm every 21 days for two growing seasons (22 sprays total). Each season Cu and Sm sprays increased the ratio of epiphytic bacterial population with tolerance to these chemicals. Overall, the Sm resistant bacterial populations were proportionally lower than Cu tolerant bacterial population. No resistance to either Cu or Sm was verified in Xcc or epiphytic populations after two years of season long sprays.

Objective 5: In 2009, canker management talks were given at county extension and other meetings. Updated 2010 canker management recommendations have been published in the Florida Citrus Pest Management Guide and Citrus Industry Magazine. Oral presentations have been made to the Florida Citrus Production Managers and at Florida Citrus Show.