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	6/20/10

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

Drip fertigation increases citrus nutrient efficiency by 10x and water efficiency by 4x in the first year

TITLE and CONTACT INFORMATION

Proposal Title Intensively managed citrus production systems for early high yields and vegetative flush control in the presence of greening and canker diseases

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Organization University of Florida - CREC	*Total Direct Funds (current year)* $225,180

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

During the first year of growth under the ACPS, trees grew larger and needed less water and nutrients than under conventional cultural practices in the Auburndale Ridge experiment. Trees grown with drip OH received only 0.4x the water and 0.17x the nitrogen amounts compared to conventionally grown trees at the same planting density of 218 trees per acre. Even at the high density of 363 trees per acre, the drip OH method required only 0.67x the water and 0.28x the nitrogen of the conventionally grown trees. Canopy height and volume growth was consistently improved by ACPS, with the drip OH treatment at 363 trees per acre growing 2.74x more canopy volume than under conventional practices. Because fruit yield is strongly correlated to canopy volume, the improvement of 2.74x in canopy growth per acre bodes well for achieving an economic yield in half the time and/or twice the yield at a given age. In fact the trees in drip OH treatments have already set a crop of fruit in their second year, suggesting that juvenility traits may also disappear more quickly with ACPS. By 17.5 months age, the drip OH tree heights averaged 4.5 feet, well on their way to reaching 6 feet by year 3, which was the original objective of the ACPS experiment. It is noteworthy that only 0.8 to 1.3% of the soil surface area is wetted by the drippers in the ACPS to reduce water losses by evaporation.

For comparing water or nutrient efficiencies, we divided tree canopy volume produced in year 1 by the amount of water or nitrogen applied in the same year. Efficiencies for the drip OH method were impressive, ranging from 4x more efficient for water, to nearly 10x more efficient for nitrogen, compared to the conventional practice. The microsprinkler OH method operating at a frequency of about every 2 to 3 days was intermediate in water and nitrogen efficiency (1.64x and 4.45x, respectively) at the standard 218 trees per acre density.

The benefits of ACPS in conserving renewable and nonrenewable input resources in the first year are self-evident. In general, gains of efficiency in any production system leads to conservation of resources, reduction of pollution and byproducts (environmental protection), lower energy requirements from fossil fuels and other nonrenewable sources, and hence a dramatic reduction in carbon footprint.

Historically we know from the citrus nitrogen BMP studies that the most important factors which regulate nitrate leaching to groundwater on the Ridge soils are the fertilizer rate and the vigor and productivity of the crop. We installed vacuum lysimeters in each of the main treatments in the Auburndale experiment to sample soil water leached to below five feet. The sampled water was analyzed for nitrate-N concentrations after major leaching events from rain or freeze protection. The results illustrate the strong reduction of nitrate concentrations in soil leachates destined for the groundwater when nutrient and water efficiencies are improved by ACPS. The lowest nitrate concentrations were measured in the drip OH lysimeters, where levels remained below 2 ppm for most of the samples except for the one taken immediately after the January freezes (5.92 ppm). In contrast for the conventional treatment nearly half of the samples were above 10 ppm nitrate-N, with a maximum of 26.5 ppm. The microsprinkler OH lysimeters showed intermediate nitrate concentrations as expected. Nitrate leaching was therefore inversely proportional to the nutrient efficiencies, which in turn were determined by fertilizer application rates and tree growth rates.