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)

Alternative antimicrobial agent for citrus protection

Proposal Title

Fixed-Quat: A novel alternative to Cu fungicide/bactericide for preventing citrus canker

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
7/15/15	Citrus Research and Development Foundation	Pathogen/Disease Detection

REPORT UPDATE (500 words; summarize your accomplishments)

Quaternary Ammonium Compounds (Quat) is a powerful antimicrobial agent. However, Quat cannot be directly applied to citrus plants as a film forming fungicide/bactericide as it exhibits severe phytotoxicity and poor rainfastness. This research uses a silica based Quat delivery system (Fixed-Quat). Fixed-Quat material is non-phytotoxic and it demonstrated good rainfastness.

In the previous reporting period, based on the promising feedback from 2014 Citrus Canker Trials, Fixed-Quat A-II nanogel formulation was synthesized. EPA approved ("For Food Use" only) raw materials were used for the synthesis of Fixed-Quat A-II material. In this reporting period, further optimization of Fixed-Quat A-II nanogel was conducted. A new batch of stable Fixed-Quat A-II nanogel was synthesized with Quat concentration of 13,500 ppm (demonstrated industrial feasibility of producing concentrated formulations). For use as sanitizing and flocculating agents EPA requires a maximum quat concentration of 200ppm (end use concentration). Safety of the Fixed-Quat A-II nanogel was evaluated by phytotoxicity studies carried out in a Panasonic Environmental Test Chamber (Model MLR- 352H) which allowed for controlled day/night cycling temperatures, light intensity and humidity to simulate summer weather conditions (biocide application season). The composition and interactions between the components was confirmed using Fourier transform infrared spectroscopy (FTIR). Studies conducted on Vinca sp and Hierloom Tomato revealed no sign of plant injury even as high as 500 ppm Quat for Vinca and 1000 ppm for Tomato. Antimicrobial studies of Fixed-Quat A-II nanogel was conducted against Xanthomonas alfalfae subsp. citrumelonis (Citrus Canker Surrogate), Pseudomonas syringae pv syringae, a gram negative causative agent of bacterial speck in citrus and tomato sp and Clavibacter michiganensis subsp michiganensis, a gram positive causative agent of canker and systemic infections in tomato. Studies were conducted to determine the Minimum Inhibitory Concentration (MIC) and compared against Kocide 3000 and copper sulfate. MICs of Fixed-Quat A-II were found to be 0.6-1.25 µg/mL for X. alfalfae, 1.25 µg/mL for P. syringae and 2.5 µg/mL for C. michiganensis.

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Total Funds (current year) $87,393.00

SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.