MS Biotechnology Thesis Defense: Ms. Megan Berroth

Thesis Title: SYNTHISIS AND CHARACTERIZATION OF CORE-SHELL ZINC SILICA NANOPARTICLES AND ZINC SILICA NANOGELS FOR AGRICULTURAL APPLICATIONS

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ABSTRACT

Plant pathogens are a serous problem facing the agricultural industry today. Current methodologies use copper based biocides as the main form of defense. Unfortunately this can lead to damaging environmental effects and increased risk of antimicrobial resistance. In this study, antimicrobial activity of multiple alternative zinc-based nanoformulations were tested against three important plant pathogens: *Xanthomonas alfalfae, Pseudomonas syringae, and Clavibacter michiganensis*. *Xanthomonas* sub species cause Citrus canker, a devastating disease that affects millions of citrus trees worldwide while the latter two affect tomato crops. Materials synthesis was completed and the resulting nanoformulations were characterized by Atomic Absorption Spectroscopy, Scanning Electron Microscopy, High Resolution Transmission Electron Microscopy, and X-Ray Photoelectron Spectroscopy. The antimicrobial efficacy of the newly synthesized formulas and two commercially available products, Kocide 3000 (DuPont) and Nordox (Brandt), were determined by Minimum Inhibitory Concentration Assays followed by Bacterial Viability Assays. The subsequent data demonstrated a marketed difference in the way the antimicrobial agents acted upon the bacterial species. The core-shell zinc silica nanoparticles (C-SZnSiNP) proved to be ineffective, while the zinc silica nanogel (ZnSiNG) was as successful at killing the bacteria as the commercial products. This shows promise for a new alternative material with zinc at the forefront of the fight against plant pathogens.

Committee Members

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Approved for distribution by Dr. Swadeshmukul Santra, Committee Chair, on 6/29/15

The public is welcome to attend.