UCF | NanoScience Technology Center

UNIVERSITY OF CENTRAL FLORIDA

GRADUATE RESEARCH SEMINAR SERIES

Friday
April 27, 2018

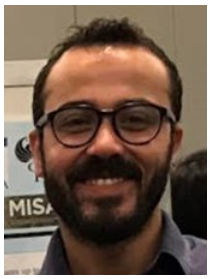
12:00 PM

Research Pavilion
NSTC
Room 475

Pizza and drinks will be provided

Development of Locally Systemic Pesticide (LSP) Particles for Bacterial Spot Disease of Tomato

Ali Ozcan
Dr. Swadeshmukul Santra's Group



Bacterial spot of tomato is caused by *Xanthomonas* strains. This disease is affecting tomato industry in Florida and many tropical and sub-tropical regions worldwide. Bacterial spot contributes to yield loss of marketable fruit up to 50% at peak conditions. *X. perforans*, which is the dominant factor for bacterial spot of tomato species in Florida has become tolerant to traditional Copper (Cu)-based bactericides. This demands design and development of novel bactericides for controlling the bacterial spot. In this talk, we present a concept of delivering locally two antimicrobial actives (Cu and Quaternary Ammonium compound; Quat) through an inert Silica nanoparticle based delivery system (called hereafter Locally Systemic Pesticide, LSP). It is hypothesized that actives with different modes of killing will minimize development of bacterial resistance. The nanoparticle delivery system will improve rainfastness and deliver actives in a sustained manner locally. The entire synthesis process is done in a modular fashion, producing well-defined sets of nanoparticles of three different sizes (~50 nm, ~200 nm and ~500 nm). Particle sizes of LSP were characterized using DLS, SEM and HRTEM techniques. HRTEM images at high-magnification revealed the formation of ultra-small size (~5 nm) Cu oxide/ hydroxide particles in the silica shell. Plant injury potential (phytotoxicity) of LSP particles was evaluated using tomato plants (4.5-inch size). No sign of phytotoxicity was observed for LSP containing up to 250 ppm of metallic Cu and 62 ppm of Quat. Interestingly, Quat control itself showed phytotoxicity at and above 62 ppm. This suggests that silica serves as a diluent as well as a barrier for Quat minimizing their direct interaction with the plant tissue. *In vitro* antimicrobial efficacy was tested against both Cu susceptible and Cu tolerant strains of *X. perforans*. Minimum Inhibitory Concentrations (MIC) against both bacteria strains was found to be 2 ppm Cu /0.5 ppm Quat for LSP particles, and 0.5 ppm Quat alone, while film forming $Cu(OH)_2$ commercial product exhibited MIC of 62 ppm for Cu susceptible strain and 250 ppm for Cu tolerant strains. Finally, the washing process of LSP was carried out at the possible field application and antimicrobial efficacy was tested against both bacteria strains afterwards. It was found out that the antimicrobial efficacy of LSP after 5 wash is same as LSP control with only Cu active indicating the efficacy was preserved due to doped Cu nanoparticles.