Development of an Industrially Viable Oxytetracycline Nano-Formulation and OXYCHECK Detection System to Combat Citrus Greening: Year 3

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Citrus greening, or Huanglongbing (HLB), is the most devastating citrus disease, affecting all major producers. Florida was the nation’s largest citrus industry before HLB caused a 75% decline in production and $3B loss. Oxytetracycline (OTC) is the only approved antibiotic for Florida citrus growers. However, the OTC industry standard is phytotoxic, rapidly crystallizes in the vascular system, and requires impractical methods to detect its translocation in trees. This project aims to treat and prevent HLB through the development of an effective, industrially viable OTC formulation and detection system that addresses the industry standard's limitations for foliar and trunk applications. The proposed treatment (OTC-OS-K) incorporates nanotechnology shown by molecular modeling and laboratory analysis, antioxidant phytochemicals, nutrition for disease prevention, and an overall neutral pH. This research encompasses OTC-OS-K from concept to commercialization. Results to date show effectiveness of OTC-OS-K compared to the industry standard: (i) Effective neutralization of reactive oxygen species, (ii) Reduced degradation after photon exposure, (iii) Reduced inhibitory effect on seed germination, (iv) Uptake in citrus seedlings, (v) Antimicrobial efficacy against E. coli. In collaboration with an agrochemical company, industrial viability of OTC-OS-K was determined: (i) Stability under various storage conditions, (ii) Consistent results across batches, (iii) Comparable manufacturing and end costs for growers. Field trials in Florida are underway to test OTC-OS-K effectiveness in diseased trees. Finally, the OXYCHECK system, a paper sensor and goggles, is capable of detecting 11 PPM of OTC-OS-K from leaf sap using OTC’s inherent fluorescence on-site.

Awards Won: