



NSF Convergence Accelerator's 2023 Cohort Phase 1 Award

Project Title

Bio-Inspired Scalable Colloidal Materials for Improving Crop Productivity on the Path to Climate-Smart Sustainable Agriculture

Awardee

Benanova, Inc.

Award/Contract

24C0018

Award Contract Type

R&D

Award Date

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NSF Funded Program

NSF Convergence Accelerator

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Track M: Bio-Inspired

Design Innovations

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PROJECT ABSTRACT

This project addresses major national and global problems in production agriculture and food security. The research effort is focused on the development of use-inspired design solutions for sustainable agriculture based on fundamental knowledge of plant biology and plant physiology using multi-disciplinary convergence methodologies. The research will leverage millions of years of evolutionary selection and explore the use of plant secondary metabolites such as phenolic monoterpenes in creating advanced bio-compositions for sustainable crop protection. Importantly due to the broad spectrum of activity of plant-derived biochemicals in the engineered bio-inspired formulations, pathogen resistance is much less likely to develop. This will provide growers with new bio-inspired and bio-based crop protection tools that are highly efficacious.

Phenolic monoterpenes have low water solubility which hinders their widespread use. Through the technology proposed here, phenolic monoterpenes adsorbed and infused onto colloidal particle carriers will be dispersed in water to form stable, fully bio-degradable crop protectants. A scalable formulation process to prepare secondary metabolite-colloidal carrier particle complexes will be developed. Notably, not only the product, but the processing medium will be much more environmentally conscious, as the new naturally sourced bio-active particles will be fabricated using water medium. The new materials will be extensively characterized in the greenhouse and in micro-plot tests to determine their efficacy to prevent development of destructive soil-borne and foliar diseases.

This Convergence Accelerator project utilizes a highly collaborative, multi-disciplinary approach and is based on a partnership between Benanova, Inc., Clemson University, and North Carolina Agricultural and Technical State University.