Awards issued prior to January 20, 2025, were funded under previous Administrations and may not reflect the priorities and policies of the current Administration.

United States Department of Agriculture
Project Initiation

Project Data for Accession Number 1005600

Project Title

Developing an Infrastructure and Product Test Pipeline to Deliver Novel Therapies for Citrus Greening Disease

Project Details

Sponsoring Institution National Institute of Food and Agriculture	**Project Status** COMPLETE
Funding Source NIFA Non Formula	**Grant Year** 2015
Grant No. 2015-70016-23028	**Cumulative Award Amt.** $9,802,490.00
Proposal No. 2014-10154	**Multistate No.** (N/A)
Project Start Date Mar 01, 2015	**Project End Date** Feb 14, 2020
Program Code [CDRE] Citrus Disease Research and Extension Program	

Project Director

Brown, S.

Recipient Organization

KANSAS STATE UNIVERSITY

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Performing Department

Biology

Non Technical Summary

U.S. citrus growers have a critical need for grove-deployable management practices that keep healthy citrus from becoming infected and infected trees from becoming symptomatic. We present a systems-based pipeline approach delivering commercial, grove-deployable solutions using a novel therapeutic delivery strategy and citrus transgenics. A data integration and analysis platform combining existing complex -omics/biological data with molecular/cellular research will steer hypothesis-driven testing of inhibitors of multiple molecular pathways to provide solutions that can be optimized by combinatorial delivery to citrus. Research areas will include: 1) molecular interaction inhibitor discovery (gut membrane binding peptides, RNA aptamers and non-toxic chemical library screening) to block psyllid acquisition/ transmission of HLB and/or growth in the plant; 2) dsRNA delivery to induce psyllid RNAi responses that block HLB transmission or kill the psyllid (or both). The proposed delivery system has negligible environmental impact, is economical in comparison to current control strategies and is highly tractable, allowing it to function as a delivery

vehicle for different solution strategies. Co-delivery with bactericides (previously shown to be effective against HLB through laborious injection methods) will be evaluated as complementary methods of control. To translate these therapeutic treatments into long-term solutions, transgenic research will be initiated to produce interdiction molecules (peptides and dsRNA) expressed in the phloem. By engaging stakeholders in design and testing stages, and educating the public, we will deliver acceptable solutions that are applicable to citrus greening and extensible to a wide variety of related economically important pathogens of citrus and other specialty crops.

Animal Health Component

Animal Health Component: 0%

Research Effort Categories

Basic	80%
Applied	20%
Developmental	0%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
216	2499	1040	20%
216	4010	1040	10%
216	3110	1040	70%

Knowledge Area

[216] Integrated Pest Management Systems

Subject Of Investigation

[2499] Plant research, general

[4010] Bacteria

[3110] Insects

Field Of Science

[1040] Molecular biology

Keywords

Genome Science, HLB therapeutics, disease and transmission blockers

Goals / Objectives

Research:Improved understanding of HLB transmission and interactions in psyllid and plant phloem.Grove deployable solutions and suite of effective management practices identified to keep current citrus production, maintain high fruit quality, and prevent fruit drop.Extension/OutreachIncreased growers/public understanding of biotechnology methods

of disease management.Researchers understand consumer attitudes towards biotechnologies.Increased awareness of novel therapeutic application technologies and products by industry segments.Industry understands economic feasibility and practicality of management recommendations.Students increase knowledge of bioinformatics, genome analysis, database construction: New data visualization tools.Understanding of industry/ consumer knowledge about HLB and its impact on U.S. citrus production.

Project Methods

Objective 1: Data integration / AnalysisCombine -omics data into single platform.Manually curate target gene sets in psyllid.Model biochemical pathways.Create visual digital library to access organ or organ system data.Objective 2:HLB Science to SolutionPerform PPI and proteomic studies on gut proteins.Mine interactome and screen dsRNA, RNA aptamer and nontoxic small molecule libraries for blocker molecules.Test candidate molecules in soil application, RNAi and transgenic plant.Test grove-deployable strategies.Conduct metabolomics analysis of treatment efficacy. Evaluate delivery strategies in greenhouse experiments.Objective 3 Engagement, Extension, EducationUtilize industry-relevant Extension and Engagement Methods to introduce emerging agricultural strategies to the citrus industryInvestigate consumer attitudes toward and acceptance of HLB reduction and prevention technologies to inform consumer engagement and outreach