CITRUS ADVANCED TECHNOLOGY PROGRAM

QUARTERLY & FINAL PROGRESS REPORT FORM: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

SELECT PERIOD August 2020

Quarterly Report Final

Proposal Title

Functional IPM for Asian citrus psyllid under circumstances of chronic HLB.

Today's Date 09/04/2020

Sponsoring Organization (drop-down) Citrus Research and Development Foundation

Category (drop down) ACP Vector

ABSTRACT (750-word Executive Summary-public report-do not disclose proprietary information or intellectual property)

Objective 2. Revise insecticide resistance management for psyllid IPM in new plantings

An insecticide resistance management protocol is being developed for young tree protection in Florida citrus that: 1) could be deployed in areas where insecticide resistance is already present and reduce ACP populations and 2) would allow return to normal susceptibility levels for insecticides that have been compromised in effectiveness due to resistance.

ACP has developed resistance to neonictinoids in some Florida citrus groves. Therefore, we assessed the mechanism(s) conferring resistance in these ACP populations, compared to the highly susceptible laboratory colony of ACP. Knowing the mechanisms allows development of methods to reverse the problem where it exists and prevent it where it has not yet developed.

Previously, we determined that resistance to the chemical fenpropathrin (pyrethoroid insecticide) occurs among populations of Asian citrus psyllid (ACP) after continuous exposure to this insecticide for 10 egg to adult generations of ACP. We also conducted a risk assesment for resistance development to this insecticide in Florida, and compared relative expression of the gene *CYP6A2-1* between insecticide resistant (RR) populations of ACP and a laboratory susceptible population (SS). Our results indicated that continuous exposure of ACP populations to fenpropathrin can generate high levels of resistance (100 fold increase) and that this is, in part, caused by increased expression of cytochrome P450 (CYP) genes. Cytochrome P450 genes aid in metabolic detoxification and are one of the mechanisms contributing to fenpropathrin resistance in ACP. In our most recent experiments, we used the same populations of ACP that are known to be resistant to fenpropathrin to assess the stability of fenpropathrin resistance in ACP. We compared ACP populations with differing initial frequencies of resistance to understand the reversal process back to susceptability. In addition, we performed molecular analysis of fenpropathrin resistance by targeting the specific receptor that confers fenpropathrin insensitivity and also conducted biochemical analysis to determine how metabolic detoxification of fenpropathrin differs between resistant and susceptable populations of ACP.

First, we collected ACP from commercial citrus groves that exhibit resistance to fenpropathrin (RR) and crossed (mated) these psyllids with ACP from the laboratory susceptible population (SS). The ratios of crossed populations that were established were 100RR+0SS, 75RR+25SS, 50RR+50SS, 25RR+75SS and 0RR+100SS. The five populations were set up on March 23, 2020 in a greenhouse environment without exposure to insecticides. Thereafter, we performed bi-monthly leaf dip bioassays

PI First Name Lukasz

PI Last Name Stelinski

Email stelinski@ufl.edu

Phone 863-956-8851

Organization University of Florida

Sponsor Project Number 18-056C

Project Duration (years 2 *Year of Project* 2

% Completion of Objectives 82.00%

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.