Florida Citrus Advanced Technology Program

QUARTERLY & FINAL REPORTS: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

Instructions Complete the fields based on your project specs. When finished, save the form to your local disk using a unique name. Then, go to **http://research.fcprac.com**, and log in with your user name and password using Researcher Login in the lower left. Find this project title and click on **Submit a Report**. Update your profile information if needed, then upload this report as directed.

2009-2010 REPORT	CATEGORY (drop-down)	TODAY'S DATE (m/d/yr)
● *Quarterly Report* ○ *Annual Report* ○ *Final*	Psyllid	6/25/09

WHAT IS THE "HEADLINE" FOR THIS REPORT (e.g. a one-sentence "newspaper headline" describing what you accomplished)

First field testing of DMDS reveals that it is an effective repellent for Asian citrus psyllid

TITLE and CONTACT INFORMATION

Proposal Title Development of Effective Guava-based Repellent to Control Asian Citrus Psyllid and Mitigate Huanglongbing Disease Incidence

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Organization University of Florida/IFAS	*Total Direct Funds (current year)* 159869

REPORT UPDATE (650 words; provide details about your headline)

The purpose of this project has been to develop an effective repellent for the Asian citrus psyllid (ACP). Our work was initiated by investigating the volatiles released by guava plants and their effects on ACP behavior. Following the discovery that synthetic dimethyl disulfide (DMDS) was produced in large quantities by wounded guava leaves, we initiated an investigation of the effects of this chemical on ACP behavior. DMDS is a known plant defense chemical against insects that acts as both a repellent and a neurotoxin. In laboratory tests, we have confirmed that volatiles from guava leaves significantly inhibited ACP's response to normally attractive citrus host-plant volatiles. A similar level of inhibition was recorded when synthetic DMDS was co-released with volatiles from citrus leaves. In addition, the volatile mixture emanating from a combination of intact citrus and intact guava leaves induced a knock-down effect on adult ACP suggesting toxicity of guava volatiles to this insect. We quantified the airborne concentration of DMDS that induced the behavioral effect in the laboratory behavioral tests and found it to be 107pg/cc. Compounds similar to DMDS including dipropyl disulfide, ethyl-1-propyl disulfide, and ethyl disulfide did not affect the behavioral response of ACP to attractive citrus host plant volatiles in laboratory behavioral tests. These data suggest that the activity of DMDS on the behavior of ACP is unique and not shared by all disulfide compounds. However, much more work is needed to determine whether blends of guava-released chemicals are more potent than single components. Also, it is possible that DMDS-related compounds may show behavioral activity at elevated dosages as compared with DMDS. Head-space volatile analyses were conducted to compare volatile profiles of citrus and guava using gas chromatography-pulsed flame photometric detector and -mass spectrometry techniques. Eleven guava-specific, 15 citrus-specific and 17 shared compounds were identified. Several possible candidate compounds were identified during this process that require further testing on ACP behavior and mortality. A field trial was conducted to test the effect of synthetic DMDS released from polyethylene vials on population densities of ACP. The treatments compared were plots treated with DMDS versus untreated control plots. Fifteen ml of synthetic DMDS was formulated per polyethylene vial. This release device was developed with one of our industry partners (Alpha Scents, West Linn, OR). In this initial field experiment, populations of ACP were significantly reduced by deployment of synthetic DMDS from the polyethylene vials compared with untreated control plots. Our small plot field experiment confirmed the results of our laboratory olfactometer assays. Deployment of synthetic DMDS from polyethylene vials reduced populations of ACP in an unsprayed citrus orchard for up to 3 weeks following deployment. Given that population densities were equivalent among plots prior to the deployment of DMDS treatments, we hypothesize that DMDS repelled adult ACP from treated plots. By the fourth week, there was no remaining DMDS in the polyethylene vials, which likely explains why populations were once again equivalent in treated and control plots by the fourth week of the trial. Given the volatility of DMDS, one of the main obstacles to the development of a practical DMDS formulation for ACP management will be development of a slow-release device that maintains the chemical above a behaviorally active threshold for long periods. Ideally, a slow-release device should be developed that could achieve 150-200 d of behaviorally efficacious release. In summary, volatiles from guava inhibit the response of ACP to citrus host plant volatiles. Our results indicate that synthetic DMDS may explain guava's behavioral activity against ACP. DMDS, a guava-released metabolite, appears to be a potential candidate repellent for ACP. Our current on-going efforts include formulating DMDS into controlled release devices for extended release of the chemical in the field. Control of ACP with behavioral modification may be one potential tool for management of this plant disease vector.