Florida Citrus Advanced Technology Program

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

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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)

Dispensers developed and/or acquired for recruiting beneficial insects for improved biological control of Asian citrus psyllid

TITLE and CONTACT INFORMATION

Proposal Title Development of attractants for Tamarixia radiata, a parasitoid of Asian citrus psyllid (ACP), for improved biological control of ACP

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Organization University of Florida/IFAS	*Total Direct Funds (current year)* 43098

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

The main objective of this series of investigations has been to develop an effective attractant for Tamarixia radiata, the main parasitic wasp attacking Asian citrus psyllid (ACP) in Florida. Development of an effective attractant for this insect will allow for accurate monitoring of this beneficial insect and it will allow us to recruit and establish high populations of this beneficial insect to improve biological control of ACP. The first goal of this proposal was to conduct an in depth morphological investigation of the antenna sensilla of this wasp parasitoid, including functional morphological studies, which would reveal the functional details of the discovered sensilla. As originally proposed, transmission electron microscopy (TEM) studies of T. radiata's antennal sensilla were required to guide further electrophysiological investigations of this ACP parasitoid, which would allow identification of chemical attractants. This first objective has been completed and the investigation has been published in a peer-reviewed scientific journal (Onagbola, E.O., D.R. Boina, S.L. Herman, and L.L. Stelinski. 2009. Antennal sensilla of Tamarixia radiata (Hymenoptera: Eulophidae), a parasitoid of Diaphorina citri (Hemiptera: Psyllidae). Annals of the Entomological Society of America. 102: 523-531). Specifically, we examined the external and functional morphology of the antennal sensilla of adult male and female T. radiata using scanning (SEM) and transmission (TEM) electron microscopy, respectively, to gain insights into the behavioral ecology of this parasitoid. The antennae of male and female T. radiata were composed of a long scapula-shaped scape with a basal radicula, a barrel-shaped pedicel and a long flagellum with a basal ring-like annulus. Five morphologically distinct sensilla including two aporous sensilla trichoidea (AST-1 and AST-2), one multiporous sensilla trichoidea (MST), one multiporous placoid sensilla (MPS), and one aporous basiconic capitate peg sensilla (BCPS) were identified on the antennae of both sexes. Male antennae consisted of four funicular flagellomeres and possessed a greater number of olfactory MST than female antennae suggesting their possible function in perception of mate-related volatile cues. Female antennae were characterized by three funicular flagellomeres and a greater number of MPS than male antennae suggesting their possible function in the perception of host-related volatile cues. Thus male antennae likely function to detect female-produced pheromones, while female antennae function to detect host volatiles used in finding ACP for parasitization. Next, we moved onto conducting an in depth analysis of the chemicals produced by both sexes of this parasitoid. We discovered that both male and female ACP parasitoids release several volatile compounds. Our analyses revealed Propa-2-one, 1-Butanol and 4,6,8-Trimethyl nonene as female parasitoid-specific volatiles; Dodecane, 4,6-dimethyl, Acetc acid, γ-Butyrolactone, and Diphenylamine as male specific volatiles while Decanal and 3-Methyl diphenylalamine were produced by both sexes. In laboratory behavioral tests, we found that male parasitoids were attracted to γ-Butyrolactone to the same degree as to female parasitoids, indicating that this is likely the sex-attractant pheromones females produce and release to attract males. Electrophysiological recordings from male parasitoid antennae confirmed that males are capable of detecting this chemical. Subsequently, we set out to develop a dispenser for releasing this chemical in the field for both monitoring of parasitoid populations and for recruiting parasitoids into groves to increase their population densities and improve biological control of ACP. We partnered with an industry collaborator (Alpha Scents, West Linn, OR) to develop an appropriate dispenser for releasing γ-Butyrolactone. We have developed a polyethylene-tube dispenser for releasing this chemical. We also obtained a second chemical (Methyl Salicylate) and associated dispenser from a second collaborator (AgBio, Corporation). This chemical is known to recruit beneficial insects and improve biological control. We are currently field testing both products to determine whether we can improve biological control of ACP.