Development of Biologically-Based Strategies for Managing Insect Pests of Horticultural Crops

PRINCIPAL INVESTIGATOR:
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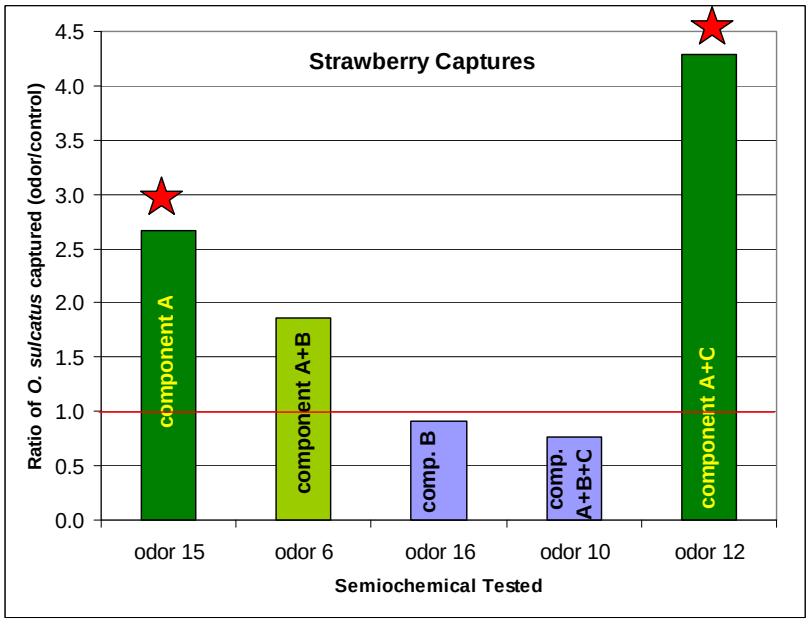
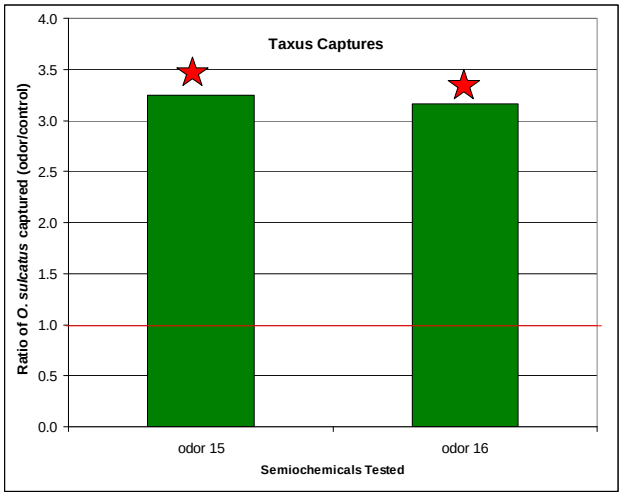
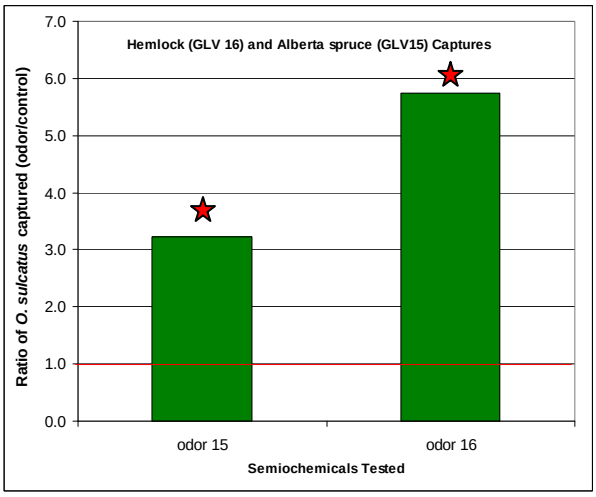
PROJECT OBJECTIVES:
Develop biologically-based management strategies for controlling insect pests of nursery and small fruit crops. Tactics utilized include the use of natural enemies and insect pathogens as well as semiochemicals to develop novel monitoring and management strategies.

ACCOMPLISHMENTS:
Weevils (*Otiorhynchus* spp.) are often cited as the number one insect pest in the major nursery and small fruit production areas throughout the United States, western Canada and northern Europe. The black vine weevil (BVW), *Otiorhynchus sulcatus*, is the primary member of this pest complex. Traditional management of these insects centers on the use of insecticide sprays targeted at adults in an attempt to avert egg laying. However, growers continually have problems properly timing spray applications because of the invisibility of the two life-stages of the weevil, namely 1) adults are night-active feeding on leaves, 2) larvae live in soil eating living plant roots. Repeated insecticide applications targeting adults throughout the growing season kill a large percentage of beneficial insects resulting in secondary pest outbreaks. These sprays also make it impossible for growers to employ augmentive or inundative control strategies utilizing natural enemies for other insect pests. The advent of effective attractants in conjunction with suitable trap designs will revolutionize current weevil management programs by providing growers enhanced monitoring tools which will allow them to precisely time and locate their insecticide applications. The development and field testing of these attractive compounds have been a collaborative effort of scientists located at the ARS Horticultural Crops Research Unit in Corvallis, Oregon, Plant Research International, Wageningen, the Netherlands, and cooperating nursery and small fruit growers in Oregon. Experiments were performed in a variety of crops (strawberries, field-grown *Taxus*, container-grown Hemlock and Alberta spruce) infested with *Otiorhynchus* spp. Attractants developed in the laboratory were tested in the field using baited and control traps. Traps tested included the Exosect Trap, Boll Weevil Trap, and Whalon modified Tedders Trap. Attractants were



replicated at each location with corresponding controls. After the placement of traps in the field, odors were refreshed weekly and weevils collected and counted from each trap. In addition, we carefully searched all plants within 0.5m of each trap for adult weevils. The first BVW adults were collected in May 2009. Trials were continued thru July 2009 at which time BVW numbers





in the field were significantly reduced due to grower-applied insecticide applications. None of the traps tested captured a significant number of BVW adults. Work is underway to build alternative trap designs for field testing in 2010. Because the plants surrounding each trap were also carefully searched, we were able to determine that some of the odors tested were attractive to BVW adults. A y-axis ratio value of 1.0 in all figures indicates a 1:1 proportion of BVW captured between the attractant and control treatments. Odors indicated by a star attracted a significant proportion of BVW adults.

TECHNOLOGY TRANSFER/IMPACT:

Presentations on attractants presented to professional and grower groups. Growers collaborating in these trials have experienced high levels of weevil control with fewer insecticide applications due to the improved timing and location of those applications.

Invention Disclosure Statements Approved for Patent Filing:

Bruck D.J., R.W.H.M. van Tol, F.C. Griepink. Invention Disclosure Docket No. 0113.09 "Chemical Attractants for Management of *Otiorhynchus* spp."

ADDITIONAL FUNDING/EXTERNAL REPORT:

A 3-year collaborative project is currently underway between the USDA-ARS, Horticultural Crops Research Unit and Plant Research International, Wageningen, The Netherlands. This research was initiated in the spring of 2008 with funding of $90,000 provided by the Northwest Center for Nursery Crop Research along with €90,000 in matching funds provided by Plant Research International.

COLLABORATORS:

Rob van Tol, Frans Griepink and Willem Jan de Kogel, Plant Research International, Wageningen, The Netherlands; numerous Oregon nursery and small fruit growers.