Mating Disruption and Monitoring Lures of the Navel Orangeworm

Project No.: **09-ENTO9-Carde**

Project Leader: Ring T. Cardé
Department of Entomology
University of California, Riverside
Riverside, CA 92521
(951) 827-4492
e-mail: ring.carde@ucr.edu

Project Cooperators and Personnel:
Brad Higbee, Paramount Farms
Walter Leal, Entomology, UC Davis
Jocelyn Millar, Entomology, UC Riverside
Tom Larsen, Suterra

Objectives:

1. Continue exploration of the large-cage method described by Koch et al. (in press) to compare disruptant formulation types, rates and blend combinations (the complete, 4-component mixture vs. partial blends).

2. Use our wind tunnel assay to evaluate lures produced by Suterra, with the aim of developing a field active lure that can replace caged females in monitoring traps.

Interpretive Summary:

Using our wind tunnel assay, we have determined the optimal pheromone blend for attraction of male navel orangeworm (NOW) moths, using the proportion arriving at the source as the principal metric. Attraction requires at a minimum the simultaneous presence of two components, (*Z*11,*Z*13)-hexadecadienal and (3*Z*,6*Z*,9*Z*,12*Z*,15*Z*)-tricosapentaene, although, with this two-component blend, the portion of males finding the source is fairly low. Addition of two other components, either (*Z*11,*Z*13)-hexadecadien-1-ol or (*Z*11,*E*13)-hexadecadien-1-ol, to these first two components increased the proportion and rapidity of males contacting the source, and a mixture of all four components produced the highest levels of source contact. In this wind-tunnel assay, surprisingly males did not seem to distinguish among a wide range of ratios of any of the three components added to (*Z*11,*Z*13)-hexadecadienal. In other words, males are ratio insensitive provided the component is present. This feature of the NOW communication system means that lures for monitoring traps not need be formulated to release a precise blend of the four pheromone components.

Currently, field monitoring of the NOW uses sticky traps baited with virgin, caged females generally replaced weekly. This method is clearly inefficient in terms of cost and likely does not deliver a consistent performance. Clearly what is desired in a synthetic lure is sensitivity and longevity comparable to lures that are commercially available such as those currently used for other moth pests such as the codling moth or the oriental fruit moth. At present, there is no reliable lure. The identification of the four-component blend and determining that the ratio of components in unimportant, as described above, is a very useful finding, but the unresolved issue is finding synthetic pheromone components that yield optimal attraction. Synthetic pheromones often contain compounds (e.g., impurities such as geometrical isomers) that act as antagonists of attraction, or the pheromone may be unstable and generate antagonists. Our previous wind-tunnel studies have shown considerable variation in attractiveness of some batches of the aldehyde or alcohol components.

We are now using the wind tunnel assay to determine which of the various sources of these pheromone components evoke differing levels of attraction. For example, one commercial source of the main pheromone component, (*Z*11,*Z*13)-hexadecadienal, mixed with the other components evoked 41% source finding, whereas another batch produced 67% attraction, a more than 50% increase. The most likely explanation is that contaminants in one or more of these synthetics interfered with attraction. In collaboration with Walter Leal, we have evaluated and will continue to evaluate a number of synthetics from various sources (commercial and some prepared by Jocelyn Millar). The immediate goal of this work is to identify which contaminants interfere with attraction. Identification of antagonists will be undertaken by Walter Leal. Once these are known, then purity requirements of the four pheromone components can specified and work on formulating a commercial lure can begin.

Other work with Brad Higbee is determining the pattern of pheromone dispersal in almond orchards by using visible tracers (“smoke” from a titanium tetrachloride source) as a surrogate for pheromone plumes and documenting their vertical and horizontal trajectories. This effort will help us understand how males search for females by understanding how their pheromone plumes disperse. Such work may influence how and where pheromone monitoring traps are placed.

For further details please refer to Project 08-ENTO9-Carde in the 2008 – 2009 Final Reports on CD included with the Proceedings.