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Section I - Insect and Mite Research

Project No. 87-A8 - Insect and Mite Research
Navel Orangeworm and Carob Moth Pheromones
Orangeworm Attractants

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Objectives: (1) Navel orangeworm attactants (Disruption of navel orangeworm [NOW] host finding using almond odors) - (A) Characterize behaviorally and chemically the almond odor components used by NOW females for host-finding and oviposition. (B) Develop formulations of these chemical constituents for either widespread disruption of NOW or for a multiple point-source "attracticide." (2) Navel orangeworm pheromone - Isolate and identify the secondary pheromone components essential for optimal male navel orangeworm attraction. (3) Carob moth pheromone - Isolate and identify the sex pheromone of the carob moth.

Interpretive Summary:

Navel orangeworm adult female attraction and disruption - During 1986-87, substantial progress was made in the development of an effective sticky trap to monitor females. An advantage of female traps is that they will be a more direct measure of population level than egg traps. It is possible to attract NOW females to black sticky traps baited with various blends of crude and acidulated almond oil under both wind tunnel and field conditions. The traps used were constructed entirely from 15-mil black vinyl with their design similar to that of the standard (white) Pherocon 1C trap. A field comparison using marked females which were released showed that over four percent of them (112) were recaptured after seven days and of these, 98.2 percent were recovered from black traps. Compared to studies of this nature on other insects, this recapture rate indicates the high attractancy of the almond oil - black trap combination to females. In addition, six times as many wild unmarked NOW females were recovered from black traps as from white traps (i.e., 29 versus 5).

In previous work, 16 to 18 carbon fatty acids were identified as major behaviorally active constituents of crude almond oil (CAO); however, in wind tunnel studies it was not possible to duplicate NOW female response to CAO by using synthetic fatty acids. This year's work has demonstrated that the weaker response to synthetic fatty acids was a result of impurities. In wind

tunnel studies using highly pure (greater than 99.5%) fatty acids, NOW response to CAO could be matched. In fact, behavioral activity appeared to be due to oleic acid (an 18 carbon fatty acid) alone. Accordingly, tests with short chain (i.e., four to eight carbon) fatty acids also found in CAO, did not enhance NOW response and may have been somewhat repellent.

In a final series of wind tunnel bioassays, the relative attractiveness of alternative sources (e.g., peanut, corn, soy bean, palm, cotton seed, olive) of acidulated oils was tested. Consistent with findings from bioassays of synthetic fatty acids, oleic acid content in these acidulated oils correlated well with behavioral activity, with acid peanut oil evoking a response equivalent to acid almond oil.

Work on disruption of NOW oviposition using acidulated almond oil, a waste product of vegetable oil processing, continues in an attempt to provide a product that: (1) utilizes a controlled-release substrate that provides longevity in the field; (2) uses conventional spray equipment, yet is not washed off by rain; and (3) minimizes leaf burn. To this end, extensive wind tunnel testing has produced candidate formulations that balance maximal attraction with water solubility. Field testing of these formulations for phytotoxicity proved somewhat more troublesome, but nevertheless instructive. These studies, carried out by Dr. Bob Van Steenwyk initially using single branches and then whole trees, yielded similar findings. Concentrations of ten percent or greater acidulated oil caused significant leaf burn or drop, and in the case of one water-stressed orchard,some phytotoxicity was observed at the five percent level, although this was not routinely the case. A problem uncovered by this work was that dilution of the formulated concentrate to a working concentration resulted in separation of the oil from the controlled-release carrier. Improved formulations to overcome these problems have been developed, but were too late to be field tested this season.

This year in cooperation with BioControl, Ltd. of Australia, a formulation for attracting and killing NOW females was tested. The dispensers, hung by hand in the orchard, contained large amounts of acidulated almond oil and highly pure Pydrin insecticide. The test demonstrated that future formulations should not involve hand placement of such dispensers and that the amount of acidulated oil was excessive.

Navel orangeworm pheromone - Identification of the NOW pheromone remains elusive. The problem is detecting and identifying the secondary componenets, which appears to be beyond current technology. As new methods emerge, they will be tried.

Carob moth pheromone - As part of the continuing effort to develop an effective detection and monitoring tool for the carob moth, this past year three compounds present in the carob moth female sex pheromone gland were identified and these very likely comprise the sex pheromone blend of this species. Blends of synthetic carob moth sex pheromone components will be tested for their attractancy to male moths in the wind tunnel and then in the field (in Southern California).

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