Progress/Termination Report

PROJECT: 4096

TITLE: Monitoring codling moth with high load lures in areawide sites

Year Initiated: 1997/98 **Current Year:** 1997/98 **Terminating Year:** 1997/98

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JUSTIFICATION:

The ability to monitor CM is crucial to the success of both conventional and MD-based pest management programs. In conventionally treated orchards the use of pheromone traps in combination with degree-day models is the most accurate method of timing insecticide treatments. Furthermore, trap catch thresholds can be used to determine the need for treatment in many situations, significantly reducing insecticide use for CM control. In MD orchards, moth catch in pheromone traps baited with the standard lure (1 mg of codlemone in a red septum) is inhibited, thus interfering with our ability to monitor CM populations. Research has determined that a trap baited with a 10 mg lure is an effective tool for monitoring CM in MD orchards (1, 2, 3). This system can be used to track CM flight and to determine the need for supplemental treatments of pheromone or conventional insecticides where MD is failing to control CM.

However, the reliability of this monitoring system to indicate the potential for fruit injury in MD orchards with low CM pressure is suspect. High load traps have been used extensively in the Codling Moth Areawide Pilot Project (CAMP) for the past two years, and researchers and participants at all sites continue to stress the need for an improved CM monitoring program (4, 5). Of particular concern is the regular occurrence of substantial levels of CM fruit injury at harvest in orchards where 10 mg baited traps capture very few moths or none.

An experimental lure tested in 1996, a high load Biolure® (Consep, Inc.), was as attractive as the 10 mg red septum and lasted significantly longer. The red septum lost attractancy after three weeks in the spring and two weeks in the hot summer months, while the Biolure® generally maintained attractancy for six weeks in the spring and summer (5). At a cost of about $3 for a high load septum, use of a longer life lure, such as the Biolure®, would represent a substantial savings in monitoring costs in MD orchards.

OBJECTIVES:

ONE: To improve the attractancy and overall performance of high systems in MD orchards.

TWO: To increase the reliability of CM pheromone trapping systems in MD orchards by developing standards for the placement of traps.

PROCEDURES:

OBJECTIVE ONE: The high load trapping system currently used to monitor CM in pheromone treated orchards does not always provide satisfactory results. We propose the following two approaches to improving trap performance: 1) use a more attractive longer-lasting lure and 2) optimize the positioning of traps.

High load /tires: The attractancy of a high load Biolure® and red septum loaded with 10 mg of codlemone (Trece, Inc.) will be directly compared in orchards at all five CAMP sites. The experiment will be conducted in at least five orchards at each

CAMP site. Additional comparisons will be conducted in pheromone-treated orchards at other sites. Specifically, the lures will be evaluated in 5-10 non-CAMP orchards that, based on 1996 fruit injury counts, are expected to have moderate to high CM activity in 1997. Pherocon® I-CP traps (Trece, Inc.) baited with red septa containing either the Biolure® or red septa will be uniformly distributed in orchards at a density of approximately one trap per 2.5 acres. Traps will be placed in the upper third of the canopy. The number of male moths captured will be recorded weekly and trap bottoms will be replaced after a cumulative catch of 40 moths, more often if dirty. Red septa will be replaced every two or three weeks during the first generation CM flight (two weeks in California only) and biweekly during the second generation flight. Biolures will be replaced every six weeks. A sample of 25 fruits on each of 20 trees around (one-acre) each trap will be inspected for CM fruit injury at harvest. Evaluation of moth capture in traps baited with different lures will be done by paired trap comparisons established in the original design of the study. The relationships between moth capture and larval density or fruit injury will be evaluated by regression analysis.

Trap appearancy: Trap placement has a significant effect on CM capture in pheromone traps in MD orchards. It has been demonstrated that traps positioned in the upper third of the canopy catch more moths than traps placed lower in the canopy. Studies conducted in 1996 indicated that moth catch can be increased by removing dispensers from trees that are in close proximity to the trap. Low moth catches in most CAMP orchards, however, made it difficult to assess the effect of removing dispensers on increased trap appearancy. In 1997, the potential for increased trap appearancy will be evaluated at a single CAMP site, Howard Flat, using releases of sterile moths. Our familiarity with this site will facilitate the selection of test orchards that will not be treated with CM cover sprays. SIR Canada has agreed to provide moths. We will compare moth captures in traps placed in three positions: 1) in a tree in the center of a 25 square foot dispenser-free area; 2) in a tree in the center of a 10 square foot dispenser-free area; or 3) in a tree in the center of an area in which all trees contain at least one dispenser. The three appearancy treatments will be established in at least five orchards. Traps positioned in adjacent treatments will be separated by a distance of approximately 400 ft. Treatments will be accomplished by removing dispensers from trees within the dispenser-free region and placing Pherocon I-CP traps baited with red septa containing 10 mg of codlemone and placed in the upper third of the canopy. Six hundred sterile moths will be released in each treatment. An equal number of moths will be released from four positions, each 75 ft from the trap. Traps will be inspected and moth catch will be recorded every three days over a 1 2-day period. This sequence of releasing sterile moths in each treatment and observing subsequent captures in pheromone traps will be conducted three times during each CM flight period.

OBJECTIVE TWO : The relationship between trap position and performance was evaluated in all five CAMP sites in 1996. Moth catch, fruit injury and trap position within the orchard and tree were determined in a total of 43 orchards. However, identifying relationships between these factors was hindered by the design of the study. Specifically, the selection of orchards took place at the start of the season, most had low CM catch or received multiple cover sprays, and very few had CM fruit injury at harvest. We propose to modify the study in 1997, evaluating the relationship between trap position and performance only in orchards in which CM fruit injury is detected at the end of first generation or at harvest.

Standard protocols for trapping CM in MD orchards will be used at each CAMP site (Parker, Howard Flat, Oroville, Medford and Randall Island). Pherocon I-CP traps

baited with red septa containing 10 mg of codlemone will be placed in orchards at a density of one trap per 2.5 acres. Traps generally will be placed in the upper third of the canopy. The number of male moths will recorded weekly and lures replaced every two or three weeks during the first generation CM flight (two weeks in California only) and biweekly during the second generation flight. A maximum of 10 trap locations per CAMP site will be selected at the end of the first CM flight period and at harvest. These trap locations will be selected because they had significant moth capture and fruit injury was thought to be likely in an area associated with the trap. A sample of 25 fruits on 20 trees (total of 500 fruits) in the region around each trap will be inspected for CM fruit injury after the first CM flight and at harvest. The relationship between moth capture and the following aspects of trap placement will be evaluated: trap height in the canopy, trap height relative to dispenser height, relative location of the trap with respect to orchard slope, distance of the trap from the nearest dispenser, distance of the trap from the edge of the orchard, distance of the trap from the nearest detected CM infestation, and the distance of the trap from a bin or prop pile. The relationships between trap position, moth capture and fruit injury will be evaluated by stepwise regression analysis.

PROGRESS: A final report will be provided at the Entomology review in January 1998.

FIT INTO AREAWIDE PROJECTS:
This project will be conducted in all five CAMP sites. We believe that this is necessary because problems associated with monitoring CM with pheromone traps appear to be unique to each region. Growers, fieldmen and researchers have identified improved monitoring of CM as a key area of research if MD is to be adopted on a large scale.

RELATIONSHIP TO OTHER FUNDING AND PROJECTS:
Two active projects support research on monitoring CM with pheromone traps. Evaluating new IPM technologies is one component of a three-year project funded jointly by the Sustainable Agriculture Research and Education (SARE) special grants program and the Washington Tree Fruit Research Commission (WTFRC). For the past two years, three pheromone companies (Trece, Inc., Consep, Inc. and Hercon, Inc.), and the WTFRC have specifically funded research on the attractancy and effective longevity of the 10 mg red septum and other kinds of lures containing high amounts of codlemone. These studies have provided the foundation for developing the CM monitoring guidelines currently followed in most MD orchards. Through these efforts, we have determined that the 10 mg red septum is only attractive for three to four weeks in the spring and two weeks in the summer. Private industry continues to express interest in engineering longer lasting high load lures.

BUDGET:
Amount allocated by the Commission in 1997-98: $11,800
Request for FY 1998-99: $0

REFERENCES:
(1) Gut et al. 1992. Good Fruit Grower 43: 56; (2) Gut & Brunner. 1994. Good Fruit Grower 45: 35; (3) Knight. 1995. Good Fruit Grower 46: 37-44, 54; (4) WRCC-43 areawide project reports, 1995, Yakima; (5) WCC-43 areawide project reports, 1996, Summerland.