

PROJECT NO.: ARS Final Report

TITLE: Understanding adult codling moth behavior to develop the technique of mating disruption

YEAR INITIATED: 1992-93 **CURRENT YEAR:** 1997-98 **TERMINATION YEAR:** 1997-98

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SUMMARY: A large number of studies were conducted to determine the effect on the behavior of male and female codling moths of treating apple orchards with sex pheromones for mating disruption. We demonstrated the importance of placing dispensers high in the canopy to increase mating disruption. We looked at the role of habituation as a mechanism of how mating disruption works both in laboratory and field tests. Habituation occurred when males were exposed to high levels of pheromone, but these levels do not exist in the field except for adjacent to dispensers and habituation does not appear to be an important mechanism of mating disruption of codling moth. Laboratory studies demonstrated that exposure to pheromones caused female codling moths to call more frequently. No effect of pheromone exposure on oviposition was demonstrated. Dr. Roland Milli brought his portable electroantennogram device and we measured the pheromone concentration in orchards treated with two pheromone products. Lower levels of pheromone were found along the edges of orchards and little difference was found between the two products. A new passive monitoring tool was developed for assessing female mating status and moth movement patterns. We showed that males move towards pheromone-treated orchards and female movement was not affected. We found that the distribution of male moths in the canopy was shifted towards the dispenser placement, but female's distribution was unaffected. We demonstrated that a large proportion of female moths are mated in orchards with high population pressure. We demonstrated the potential for a delay in mating and demonstrated the potential impact of this on the population dynamics of codling moth. We found that egg predation is higher in mating disrupted-orchards, and is reduced in orchards treated with both pheromones and supplemental insecticides. We developed a predictive model for the emission rates of the ISOMATE-C and the ISOMATE C+ dispensers. We worked with Drs. Max Suckling and Gerhard Karg to measure the average pheromone concentration in the orchard to validate a model that will relate orchard canopy and dispenser release rate with atmospheric concentration.

Publications:

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- Weissling, T. J. and A. L. Knight. 1996. Oviposition and calling behavior of codling moth (*Lepidoptera: Tortricidae*) in the presence of pheromone. *Ann. Entomol. Soc. Am.* 89: 142-147.
- Williamson, E. R., R. J. Folwell, F. Howell, and A. Knight. 1996. Economics of mating disruption of codling moth in Washington apple orchards. *Crop Protection* 15: 473-477.