

Codling Moth, *Cydia pomonella* (L.), Canopy Distribution and Implications For Mating Disruption Applications

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Keywords: *Cydia pomonella*, canopy distribution, mating disruption, diel behaviour

Abstract

A study aimed at determining the location of searching codling moth (*Cydia pomonella* [L.]) (Lepidoptera, Tortricidae) males and calling females in mating disrupted and non-disrupted plots was conducted in Michigan, USA in 2005 and 2006. A leaf blower, converted into a vacuum for sampling codling moth adults on branches and in the tree canopy, had a 70-80% success in recovering released moths on potted trees in a greenhouse and 20% - 25% of marked/released moths in a twenty-year old Red Delicious orchard. A series of four collections were made during the hours of 09:00-18:00 from May 25, 2005 through June 15, 2005 and a second series of four collections were completed during the hours of 18:00-22:00 from July 20, 2005 to August 22, 2005. Only eight codling moth adults were collected during the four daylight samples; one female and two male moths were sampled from the top third of the tree canopy, four males were sampled from the middle third of the tree canopy, and one male was sampled from the lower third of the tree canopy. Canopy distributions of adults during daytime hours (09:00-18:00) were also assessed by fogging trees with various pyrethroid insecticides. No codling moth adults were collected in any of these samples. Twilight vacuum samples (19:00 – 22:00) resulted in significantly higher moth captures ($p < 0.001$) than daylight samples. Ninety-four moths were collected during four evening samples, with equal numbers sampled in disrupted and non-disrupted plots. In mating disruption plots, 42% of females were found in the top third of the tree canopy, 46% were found in the middle third, and 12% were recovered in the lower third. There was no significant difference between females captured from the top third as compared to the middle third of the canopy in disrupted plots ($p < 1$), but differences were significant between the top third and lower third ($p < 0.05$) and middle third and lower third ($p < 0.03$). No significant differences in canopy height distribution of 22 females sampled from non-disrupted plots were found, with 36.4% in the top third, 36.4% in the middle third, and 27.2% in the lower third of the tree canopy. Releases of marked moths were conducted in 2006 in screened tents to identify the daytime (09:00-18:00) habitats for adult moths within the orchard. Of males released, 11.2% were recovered from the tree canopy and 6.2% were recovered from the ground (drive row grass and vegetation under the tree). Of females released, 18.6 % were recovered from the tree and 8.2% from the ground. Screen tent trials are continuing in 2007 to investigate daytime moth habitat selection. The overall aim of this research is to increase understanding of codling moth behavior in an effort to improve mating disruption. Based on our finding that males and females are distributed throughout the canopy, field experiments are being conducted in 2007 to revisit the question of how mating disruption dispenser placement at varying heights within the tree canopy effects orientational disruption of male moths to pheromone baited traps, and mating of tethered virgin female moths.