The honeydew moth, *Cryptoblabes gnidiella* Millière (Lepidoptera: Pyralidae) in vineyards and deciduous groves and its control

Thesis

Submitted to the Robert H. Smith Faculty of Agriculture, Food and Environment
The Hebrew University of Jerusalem
Towards a "Master of Agriculture Sciences" Degree

By
Lea Sella

Rehovot **Israel** **April 2009**

Abstract:

The honeydew moth, *Cryptoblabes gnidiella* Mill. (Lepidoptera: Pyralidae), is a key pest in Israeli vineyards and deciduous orchards. Worldwide trends calling for minimal pesticide residues in agricultural produce have encouraged the replacement of current chemical spraying methods with integrated pest management (IPM), which favors correctly scheduled application of selective, environmentally friendly materials. Encouragment of existing natural enemy populations can help to reduce pest populations, contributing to a decrease in pesticide use. However, the use of environmentally friendly control measures against other pests, such as the European grape berry moth (*Lobesia botrana*) and the apple moth (*Cydia pomonella)*, can increase the impact of the honeydew moth and lead to revived use of toxic pesticides against the latter.

The honeydew moth is a polyphagous insect with a host range encompassing numerous plant families. Deemed a quarantine pest in many countries, in Israel it can produce 6-7 generations a year and is an economic pest of grapes, persimmons, pomegranates and citrus. Substituting IPM for chemical control requires an understanding the pest's population dynamics and host preferences; knowledge of its phenology is essential for predicting population outbreaks and for effective implementation of environmentally sound pest control.

Little is known about the population dynamics of the honeydew moth on its various hosts. It does not undergo diapause, and may therefore depend on phenologically suitable alternative hosts for winter nutrition. Adult moths can move among different host plants, altering their host preference in accordance with seasonal availability. In order to examine population fluctuations in areas with different assortments of hosts, and to study the phenology of the honeydew moth under field conditions, four sites were chosen. Each site contained six known host species – persimmons, grapes, plums, apples cv. Anna, pomegranates and loquats – in an area with no citrus groves; the sites were were adjacent to one other, enabling the moth to move among them. The number of males in pheromone traps and the host's phenological stage were recorded weekly throughout the year, and the fruit was monitored for the presence of moth eggs and larvae, in order to correlate counts of adult and immature insects with fruit damage and host phenology.

The plots were monitored for three growing seasons, from mid-2003 to the end of 2005. Population density of *C. gnidiella* was highest in all four plots during 2004.

During 2003, plums were the preferred host, but as the population grew during 2004-5, the moth consistently preferred grapes, with apples (cv. Anna) second in line. The number of adults in the traps indicated 6-7 peaks during weeks 24 to 47. The trapping peaks occurred on similar dates on the various hosts, in all four areas, and during all three years, in spite of the phenological differences among the hosts. These findings indicate the existence of a year-round local population on each host. Comparison among the male trapping rates in the various seasons during 2004-5 showed that the moth was active during the winter, although the population was relatively low. The population grew in the spring and reached its peak during the summer and autumn. The high trapping level in vineyards in the summer and autumn of those two years indicates that this was the moth's preferred host for oviposition. The two significant trapping peaks found on 'Anna' apples in the winter of those years, indicate that this apple could serve as a source of nectar or pollen, in the absence of other nutrition sources.

A negative correlation was found between the adult trapping rate relative to the density of immatures, and the degree of fruit damage. Although only very small numbers of males were trapped in persimmon orchards, persimmons showed the highest rate of infestation during all years of the study. The level of the honeydew moth population on mealybug-infected persimmons was significantly higher than on mealybug-free fruit, and a preference test in the laboratory confirmed this finding. Thus, suppession of mealybug populations through ant control, pruning and weed control can contribute to the management of the honeydew moth in persimmons.

Another means of combating the honeydew moth is the male mating disruption method, which has proved effective against the European berry moth on wine grapes. The resulting decrease in chemical pesticide applications against the grape berry moth has, however, increased the importance of the honeydew moth as a vineyard pest, especially on late-ripening species. The effectiveness of pheromone-induced mating disruption against the honeydew moth was evaluated in eight Merlot vineyards during 2006-8. Pheromone ropes and patches were introduced into four of the vineyards, while the other four served as controls, receiving standard insecticide spray treatments. In the third year of the trial, pheromone ropes against the European grape berry moth were added in the control plots, to allow us to distinguish between damage caused by the honeydew moth and that caused by the European grape berry moth.

Male captures in the pheromone traps were monitored weekly. Fruits were also

monitored weekly for the presence of eggs or larvae.

The first indication of success of the male mating disruption method is an absence of males in the monitoring traps; during the 3 years of the study, males were, in fact, captured in traps in the mating disruption plots. A possible explanation is the active movement of males from neighboring vineyards into the plots, as a result of attraction to high pheromone concentrations. If this is the case, the high density of males in the mating disruption plots is reflected by their occasional capture in the pheromone traps. This issue was addressed during 2007 by hanging traps outside of and within the plots, and comparing capture rates before and after pheromone patches were placed in the mating disruption plots If males were drawn to the pheromone in the mating disruption plots, a significant difference would be evident between traps placed outside the control plots and outside the mating disruption vineyards after placing the pheromone. No such difference was observed. It was therefore concluded that the absence of "shut down" of traps in the mating disruption plots indicated irregular vaporization of the pheromone, or an inappropriate dissipation rate of the pheromone from the patches. The manufacturer was consulted and confirmed that the evaporation rate and distribution did not match their specifications.

Few honeydew moth eggs or larvae were found in grape clusters during the three years of research, in either the mating disruption or the control plots. Since damage in the vineyard is characterized by the appearance of groups of larva on only a small number of clusters, it is difficult to monitor eggs and larvae. It was thus difficult to find a direct connection between the density of the honeydew moth population, as indicated by male trapping rates, and the number of larvae or the degree of damage to the fruit. In addition, there was a significant difference between the number of spray applications in the mating disruption plots and the control plots during 2007.

The honeydew moth is an unpredictable pest; its population level varies widely from year to year, and it can produce several generations annually. When populations are high, severe economic damage can result. Most importantly, *C. gnidiella* is a quarantine pest in many countries, and its presence can cause economic losses to fruit exporters. Since the pest is "local" and does not readily change hosts, control can be applied in a limited area, precluding the need for regional cooperation. The male mating disruption method makes use of commercially available pheromones and is a suitable, environmentally friendly means of managing the moth, but it must be adapted to conditions in Israel in order to be effective.

Successful employment of this method in vineyards would provide information relevant to its application in persimmon and pomegranate orchards, as well.