AREAWIDE CONTROL OF NAVEL ORANGEWORM IN ALMONDS

Bradley S. Higbee
Paramount Farming Co., Bakersfield, Ca.
bradh@paramountfarming.com

Navel orangeworm (NOW) is a primary and intractable pest of almonds, pistachios, and walnuts. These three crops comprise more than 1.1 million acres of planted trees and there has been unprecedented expansion of almond and pistachio acreage in the last four years (current almond acreage 730,000, pistachio acreage 152,644, walnut acreage 241,000). Direct damage by NOW can exceed 30% in almonds and 11% in pistachios, and infested nuts face an increased likelihood of mycotoxin (aflatoxins B1, B2, G1, G2) contamination, which is an emerging food quality concern. The European Union, the largest market for California almonds and an important market for pistachios and walnuts, will lower the allowable level for aflatoxins as of September 1, 2007. This stringent standard has the potential to drastically impact grower returns. Currently, the only way to ensure that almonds and pistachios meet this standard is to improve control of NOW.

Navel orangeworm in almonds is currently managed by a combination of orchard sanitation (removal of any crop remaining after harvest), in-season insecticidal sprays, early harvest and post harvest fumigation. In pistachios, orchard sanitation has been adopted relatively recently and the emphasis has been on in-season sprays, early harvest and post harvest fumigation. A similar management program is used in walnuts, but NOW is controlled by managing pests that break the integrity of the walnut husk early in the season, although there is some question about its ability to act as a primary pest. The insecticides used in these crops are subject to continuous regulatory scrutiny due to changing air and water quality standards and it is imperative that cultural and chemical control strategies are updated to ensure that economically sound management practices are available to meet the new food, air and water quality standards.

Recent studies have shown that NOW moths are dispersive and frequently move between crops. This characteristic, along with the development of new insecticides and control strategies such as mating disruption, makes an areawide management approach compelling. Mating disruption (MD) is a technique that has proven effective for major pests in other crop systems (apples, peaches, tomatoes, and others), and has looked promising in our studies as a management tool for NOW. The further development of MD and the integration of sanitation, MD and insecticides is the focus of our efforts as part of the "Area-wide Pest Management Project for Navel Orangeworm Control in Almonds, Pistachios, and Walnuts" funded by the USDA-ARS.

The Lost Hills Areawide Project was initiated in 2006 and currently consists of 3,649 acres of almonds (planted in 1996) with an additional 230 acres of pistachio (planted in 1997). Mating disruption for NOW was used alone or in combination with a conventional insecticide program (2 applications of Intrepid=methoxyfenozide). The site was divided

into alternating quarter mile wide strips which received either mating disruption alone or mating disruption with insecticides and these were compared to an adjacent area which received the insecticides alone. Figure 1 depicts treatment areas and trap locations in the project as designed for the 2008 study.

Winter sanitation (destruction of “mummy” nuts left in the tree and on the ground after harvest) was performed and reduced almond mummy loads to less than 0.5/tree in the trees and 9/tree on the ground by March 1 in all treatments and years of the project. The sanitation program has been demonstrated to remove a high percentage of overwintering NOW from the orchards and forms the foundation of the existing NOW control effort.

Results thus far suggest that an areawide approach to controlling NOW has excellent potential to provide consistent and reliable control of NOW. The combination of NOW MD and insecticide treatments resulted in the lowest damage levels observed in the Lost Hills project in all 3 years of the project, while these two treatments used alone resulted in similar damage levels. Evaluation of kernel damage at harvest from both commercial (processor/huller) inspections and research samples taken directly from the field are shown in figures 1 and 2. There are many technical details and aspects relating to procedures and implementation that have been identified and characterized during the course of this project; these will continue to be refined as the project continues.

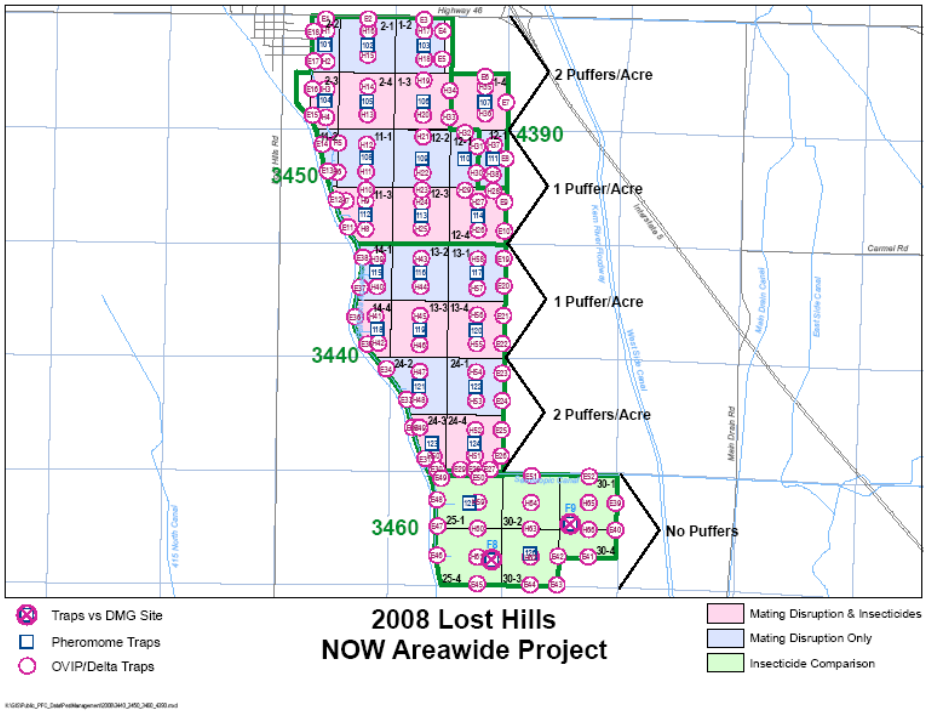

Figure 1. Diagram of the Lost Hills Areawide Project indicating trap positions and treatment areas in 2008.

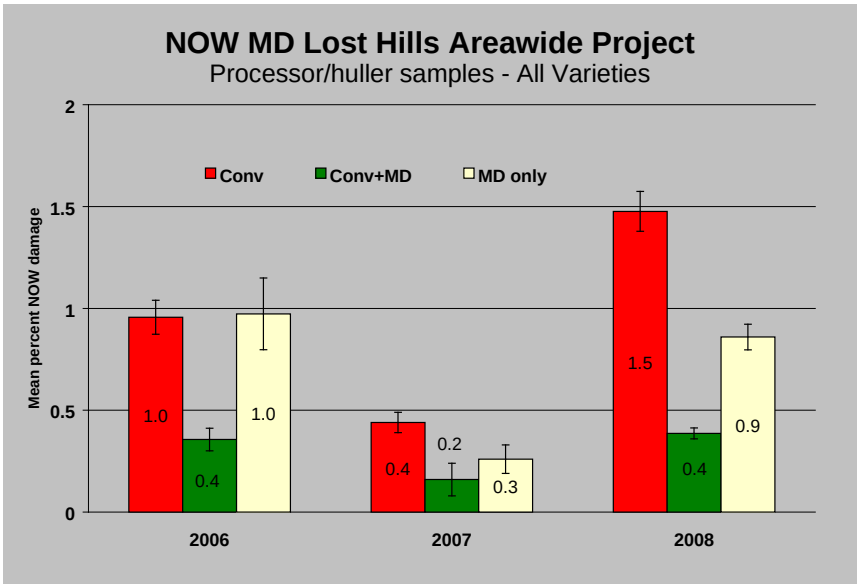

Figure 2. Percentage of almond kernel damage from NOW (all varieties pooled) in conventional insecticide (conv), conventional insecticide combined with NOW mating disruption (conv+MD) and MD alone (MD) plots in the Lost Hills Areawide Project during 2006, 2007, and 2008. Samples were collected and scored by the processor after nuts had been harvested.

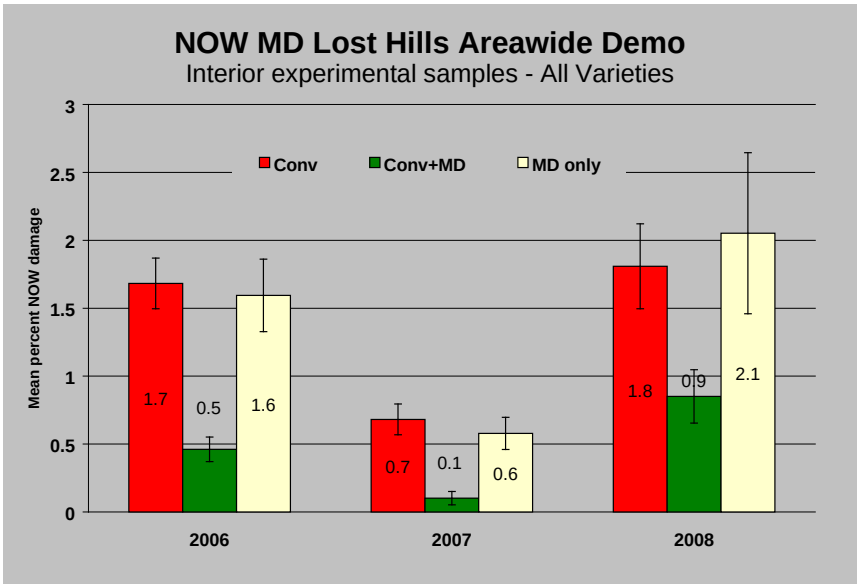

Figure 3. Percentage of almond kernel damage from NOW (all varieties pooled) in conventional insecticide (conv), conventional insecticide combined with NOW mating disruption (conv+MD) and MD alone (MD) plots in the Lost Hills Areawide Project during 2006, 2007, and 2008. Samples were taken directly from the field in interior treatment areas after harvest shaking.