# EVALUATING COVERAGE AND EFFICACY OF INSECTICIDES TO CONTROL NAVEL ORANGEWORM

Joel P. Siegel* USDA/ARS, SJVASC, CPQ, Parlier, CA, 93648, Gary Weinberger, Weinberger and Associates, Chris Wylie, AgriWorld, James Bettiga S&J Ranch, and Jennifer Estrada, S&J Ranch

The navel orangeworm (NOW), *Amyelois transitella*, is the primary lepidopteran pest of almonds and pistachios in California, and is also an important pest of walnuts. These three crops cover more than 485,000 hectares in the Central Valley of California, and are valued at over 3 billion dollars per year. In October 2007, a five-year areawide project was initiated by USDA/ARS to improve control of this insect and reduce the use of broad-spectrum insecticides. An important component of this project is evaluation of the new insecticides entering the market. In this project evaluation consists of establishing their efficacy relative to the insecticides currently in use. Additionally, the greater issue of insecticide coverage is also being reexamined. In this presentation we describe methods that were developed to evaluate both and chemical efficacy and application coverage, as well as factors that limit insecticide coverage.

Our emphasis is establishing the egg and larval activity of the insecticides used to control NOW in pistachios and almonds, and our current methods consist of bioassay combined with spray cards. Initially, we attached NOW eggs and adults in mesh cages to dowels that were then hung in the canopy and removed 24 hours after insecticide application. The adults were scored as living or dead and the eggs were placed on diet, incubated, and percent survival to the third or fourth-instar determined. Subsequently, these assays were refined, by eliminating adults and concentrating on the survival of eggs pinned into nut clusters immediately before insecticide application. This technique allowed us to assess spray coverage inside the canopies of the pistachio trees as well as at different heights. Pinning eggs inside nut clusters is a more realistic scenario than hanging egg papers glued to dowels in the canopy. Using eggs as targets also allows us to determine relative differences among insecticides by quantifying egg/larval toxicity. We refined this method in 2009 by cutting spray cards into small squares and then pinning these squares onto nuts adjacent to the nuts with the egg papers. The ultimate goal is to establish a relationship between percent mortality and the number of droplets per square centimeter. In 2009, we also incorporated the use of spray cards mounted onto PVC pipe in order to determine the relationship between insecticide coverage and target height. The range covered was 1.8 m – 6.1 m at tractor speeds of 3.2, 4.0 and 5.2 kilometers per hour, and spray volume was 155.5 liters per hectare. Figure 1 depicts the relationship between spray coverage and height, and there was a 50% reduction in coverage relative to 1.8 m at approximately 4.3 m, at a tractor speed of 3.2 kilometers per hour. At the maximum height tested, 6.1m, there was a 90% reduction in coverage relative to 1.8 m. When faster tractor speeds were evaluated, Figure 2, spray coverage at each height assessed was reduced compared to coverage at 3.2 kilometers per hour, and the greatest reductions occurred at heights above 4 meters. This experiment demonstrated that as the speed of the tractor increased, the spray coverage in the upper canopy decreased. Experiments with different spray rigs are ongoing and we are in the process of evaluating the variation in coverage among pistachio clusters based on our egg assays.

Figure 1.

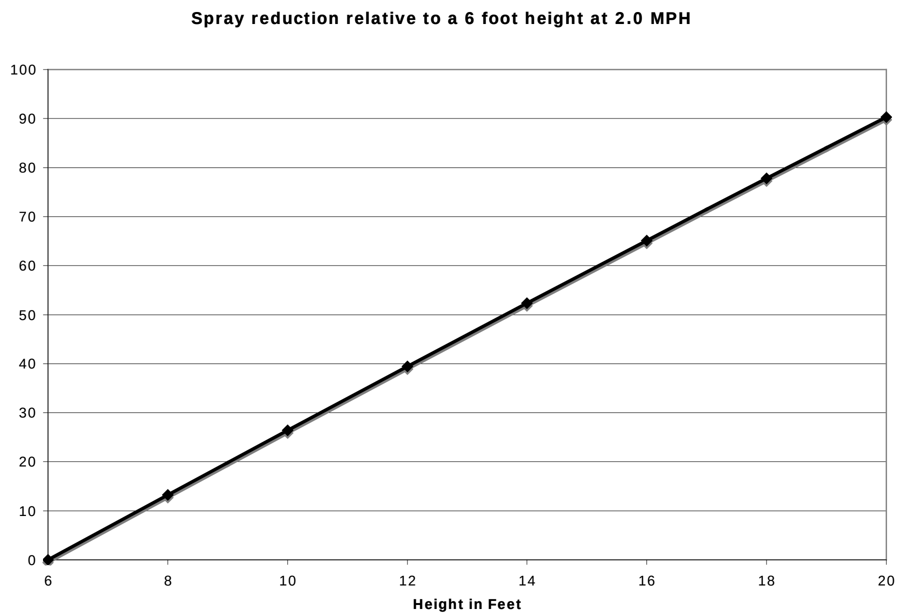


Figure 2.