Implementation Programs

Biologically Intensive Orchard Systems vs. Conventional Insecticides: Two Approaches to Pest Management in Almonds

Walt Bentley, Cressida Silvers, Lonnie Hendricks, Roger Duncan, Anne Marie Ridgely
Kearney Agricultural Research and Extension Center, Parlier, CA

Keywords: Biologically Intensive Orchard Systems, BIOS, organophosphate insecticides, beneficial insects, peach twig borer, navel orangeworm, San Jose scale, webspinning spider mites, *Goniozus legneri, Pentalitomastix plethoricus, Galandromus occidentalis*, almond

Biologically Intensive Orchard Systems (BIOS) is a term used to describe a group of growers that has been emphasizing the use of seeded cover crops and reduced synthetic chemical inputs (particularly organophosphate insecticides) and releases of beneficial insects such as *Goniozus legneri, Pentalitomastix plethoricus,* and *Galandromus occidentalis* to manage pest problems in orchards. These growers farm primarily in Merced and Stanislaus counties, between Fresno and Modesto. Forty-five growers are currently enrolled as BIOS participants. Many them are reporting very low levels of damage from pests such as peach twig borer (PTB), navel orangeworm (NOW), San Jose scale (SJS) and webspinning spider mites. The commonly held belief is that cover crops are providing a habitat for beneficials that prey on pests.

A project was funded by the Almond Board of California to investigate insect damage and arthropod dynamics in orchards farmed under a BIOS approach and those farmed using conventional techniques such as the use of organophosphate insecticides and no seeded cover crops. Six comparisons were made in the two-county area. These were either neighbors or the same grower using each of the two practices. All orchard comparisons contained the primary soft shell variety Nonpareil.

Samples of 500 nuts were collected at harvest from each of the comparison orchards and evaluated for NOW, PTB, and ant damage. The results are presented in Table 1.

The primary parasitoid of NOW, *Goniozus legneri*, was released in 3 of the BIOS orchards but was found at only one site at harvest. The parasitism rate at the site was 3.5%. No other parasitoids were recovered from NOW larvae collected during nut evaluation.

Examination of unharvested "mummy" nuts from 43 orchards also produced low levels of the parasitoid *Goniozus legneri.* Table 2 presents results from mummy nut crackouts ranging from 50 to 100 mummy nuts.

Mummy load at 44 sites with the Nonpareil cv. ranged from 0 to 177. Current recommendations are that almond growers reach a level of 2 or fewer mummies per tree by spring. Of the 34 grower sites where harvest collections were made, 14 achieved this level (11 indicating they do winter sanitation and 3 do not remove mummies). Infestation for these 14 growers averaged 1.48% NOW damage at harvest. The range of damage was 0 to 5%. Mummy load in the remaining 21 sites ranged from 3 to 177 nuts per tree and averaged 3.52% NOW

infestation. The range of infestation was .2% (3.3 mummies per tree during the winter to 14% (113 mummies per tree during the winter).

In summary, there was no statistical difference among the comparison orchards in infestation from NOW, PTB, or ants. However there were significantly more good nuts harvested from the orchards that followed a conventional management approach. This is due to a greater incidence of various diseases which cause gumming and shriveling of almonds. The influence of parasitoids on reducing insect damage in the BIOS orchards was not evident. The greatest contributor to reduced NOW infestation was winter sanitation, not sprays or beneficial releases.

Table 1. Nut damage (Nonpareil cv.) due to various insect pests from 6 BIOS vs. 6 spray comparisons, 1996.

Farming practice	% NOW damage	% PTB damage	% ant damage	% total damage	% good nuts
BIOS	4.4a	0.8a	1.9a	6.8a	87.06a
Spray	2.2a	0.8a	0.8a	3.8a	90.87b

Means followed by the same letter (columns) are not significantly different ($P<0.05$; Fisher's Protected LSD).

Table 2. Navel orangeworm infestation and parasitism from unharvested mummy nuts in selected almond orchards, winter 1996.

Average no. mummies/tree (52 sites)	Average NOW infestation (44 sites)	No. sites with *Goniozus* (44 sites)	No. sites with *Pentalitomastix* (44 sites)
17.98	12.11	2	2