Title: Control of Secondary Pests in Codling Moth Mating Disrupted Orchards

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Abstract:

Two replicated trials were conducted for oblique-banded leafroller control in Mendocino and Sacramento counties. Lorsban, Asana and Confirm applied at two different timings were compared against an untreated control. There was no significant difference between treatments at either of the two locations. Boxelder bug seasonal presence and damage was investigated. Boxelder bug population and damage decrease with increasing distance from the riparian corridor. True bug damage occurred early in the spring prior to May 23, remained constant through late May and early June and then increased 3 to 4% every week from late June until harvest.

Introduction:

As mating disruption has been successfully implemented throughout the state, two secondary pests are of increasing concern: oblique-banded leafrollers (OBLR) and true bugs. In the North Coast the true bug of major concern is boxelder bug.

Presently, OBLR are controlled by a delayed dormant application of the organophosphate (OP) Lorsban. The implementation of the Food Quality Protection Act (FQPA) and the Water Quality Act may impact the use of this OP. As the EPA implements the FQPA provision to evaluate the cumulative effects of chemicals with the same mode of action, it is anticipated that EPA will mandate further restrictions of OP insecticides. Alternative strategies and evaluation of insecticides that meet the FQPA standards are needed for OBLR control.

Boxelder bug is a consistent secondary pest in orchards under mating disruption next to riparian areas. The most severely affected area is the first 25 to 30 rows next to the river, with up to10% damage in the first row and an average of 1 to 2 % throughout this area. We do not know when the damage occurs or if both nymphs and adults are responsible for the damage. Thus, we are unclear as to the best timing for control. In addition the use of the OP's Cygon and Carzol will likely be eliminated or face severe restrictions with the implementation of FQPA. We propose to do a seasonal susceptibility

study to determine when the damage occurs and if both nymphs and adults cause the damage.

Objectives: To develop and evaluate efficacious pest control for secondary pear pests

Plans and Procedures:

Control of Secondary Pests in Mating Disruption Orchards:

Oblique Banded Leafroller:

Field Evaluations – Two replicated air-blast orchard sprayer trials were conducted for OBLR control: 1) in the Sacramento delta Region by Chuck Ingels; and 2) in the North Coast by Lucia Varela. Six treatments were replicated three times in a randomized complete block design. The treatments were: 1) Asana applied at delayed dormant and Agrimek at petal fall; 2) Lorsban applied at delayed dormant and Agrimek at petal fall; 3) Asana applied at delayed dormant and Agrimek + Confirm applied at petal fall; 4) Lorsban applied at delayed dormant and Agrimek + Confirm applied at petal fall; 5) untreated at delayed dormant and Agrimek + Confirm applied at petal fall, and 6) untreated at delayed dormant and Agrimek at petal fall. The timings are shown in the table below. Each treatment was five acres in size. All treatments will receive a dormant oil application.

Applications timings

Delayed Dormant	Petal Fall
Asana	Agrimek
Lorsban	Agrimek
Asana	Agrimek + Confirm
Lorsban	Agrimek + Confirm
Untreated	Agrimek + Confirm
Untreated	Agrimek

We evaluated OBLR damage weekly in 200 to 300 fruit pairs per treatment and 300 growing terminals periodically from 400 DD after OBLR biofix.

Boxelder Bug:

Seasonal Susceptibility of Bartlett Pear – Adult boxelder bugs were caged on developing fruit throughout the season in an untreated orchard. Shortly after bloom, groups of 5 adults were placed in separate cages on the foliage with developing fruit and replicated ten times. An equal number of caged fruit with no bugs served as an untreated control. The bugs were held on the fruit for one week. Cages were inspected twice a week. Cages were removed and another set of fruit was caged two-weeks later. This was repeated throughout the season. Fruit abscission in the cages with and without bugs was recorded weekly throughout the season. Shortly before commercial harvest, all fruit was removed and examined for true bug feeding according to the week period during which it was caged.

Beating tray samples were performed every other week at three different orchards. A beating sample consists of beating a limb three times. Ten trees per row were sampled in eight rows per site, for a total of 80 samples per site. The rows selected for sampling were row 1, 2, 3, 4, 5, 10, 15 and 20 away from the river.

Two hundred fruit were covered with brown paper bugs every week (four fruit per tree in 50 trees weekly) in the first row adjacent to the riparian corridor. The first 200 bags were placed on May 23. The riparian corridor is where boxelder bug overwinter and the first row has the highest percent of damage. Bagging fruit protects them from insect feeding. All bags were removed before harvest and the fruit was inspected for damage.

Results and Discussion:

Oblique-Banded Leafroller:

There was no statistical significant difference between treatments in either the Sacramento or Mendocino trials (see Table 1). Oblique-banded leafroller populations were low at both sites and the variability between replicates was too high to give significant differences.

Boxelder Bug Seasonal presence and damage:

No damage was observed by caging 5 adult boxelder bugs for a week at two-week intervals throughout the season. The insects did survive the week inside the cage. Since the boxelder bugs were caged on the entire limb, it is possible that they fed on the limbs and may explain why no damage was observed on the fruit.

The distribution of boxelder bug adults and nymphs obtained with the beating tray samples in the rows adjacent to the riparian corridor are presented in Figure 1. Higher populations were found in the row next to the river and decrease in rows further from the river. This coincided with damage that was 18% in the first row, 10% in the second row adjacent to the river and decreased to less than 1% by row 10.

Overwintering adults were active early in the spring and started laying eggs by the second week of April. First nymph was recorded on April 19. The overwintering adults decreased in number throughout May. The next generation adults began to appear in late June / early July (see Figure 2).

We bagged every week to exclude insects from feeding on a weekly basis to determine the amount of damage of fruit exposed to feeding through the season. We started the experiment on May 23 and some damage had already occurred from feeding prior to that date. Feeding damage remained constant from May 23 until June 13 (see figure 3). After mid-June damage increased approximately 3 to 4% per week until harvest. The experiment was conducted in the first row from the riparian corridor in an orchard with a history of high boxelder bug populations and damage. In beating tray samples boxelder bug was the predominant true bug found. We speculate

that the damage that occurred prior to May 23 was caused by the overwintering adults. The lack of increase in damage through late May and early June could be due to the decrease in adults in the field. The increase in damage after June 20 might be due to an increase of the next generation of adults. It is also possible that as the fruit softens feeding by both nymphs and adults increases. Further studies are needed to determine if the damage is primarily caused by adult boxelder bugs and if nymphs are responsible for damage late in the season.

Figure 1 - Cumulative Numbers of Adult and Nymph Boxedler Bugs Sampled with Beating Trays by Proximity to River

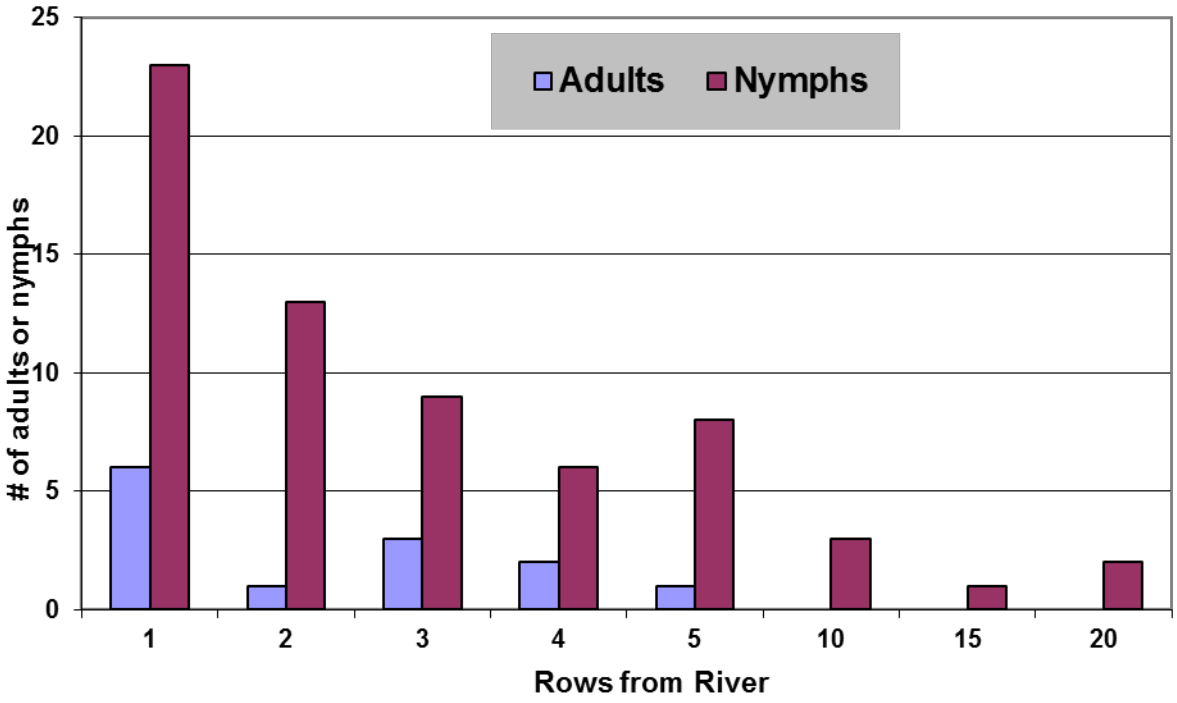

Figure 2 - Number of Adult and Nymph Boxelder Bugs Sampled with Beating Trays from April until Harvest

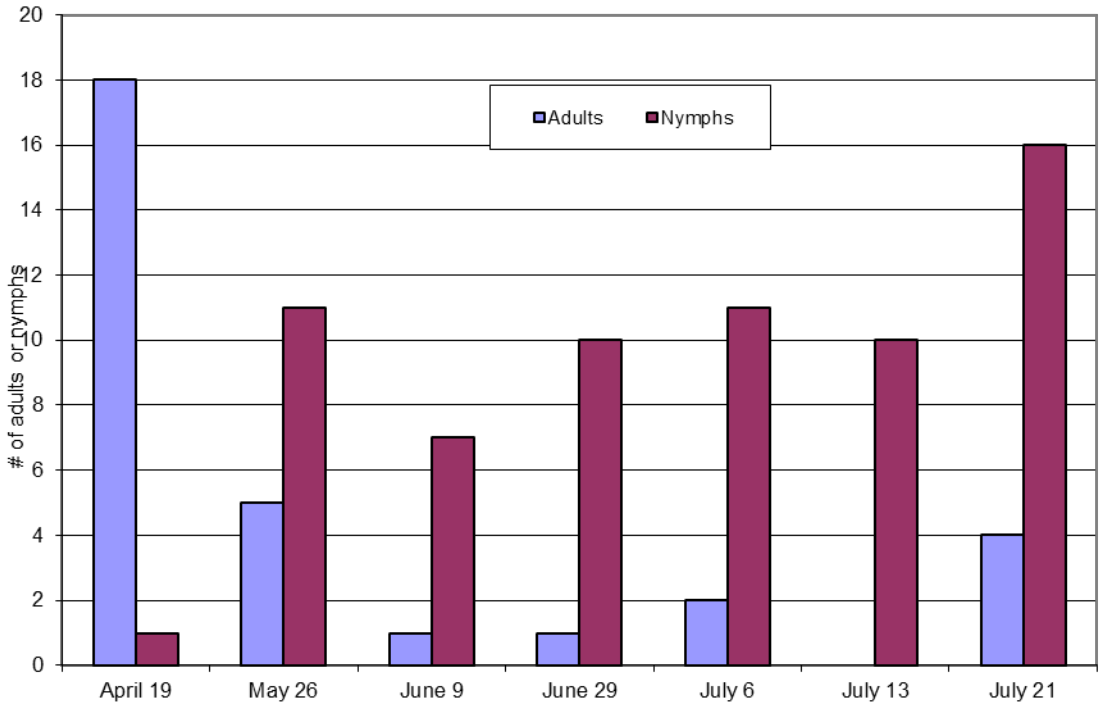

Figure 3 - Increase in Percent True Bug Damage through the Season Determined by Excluding Insects with Paper Bags

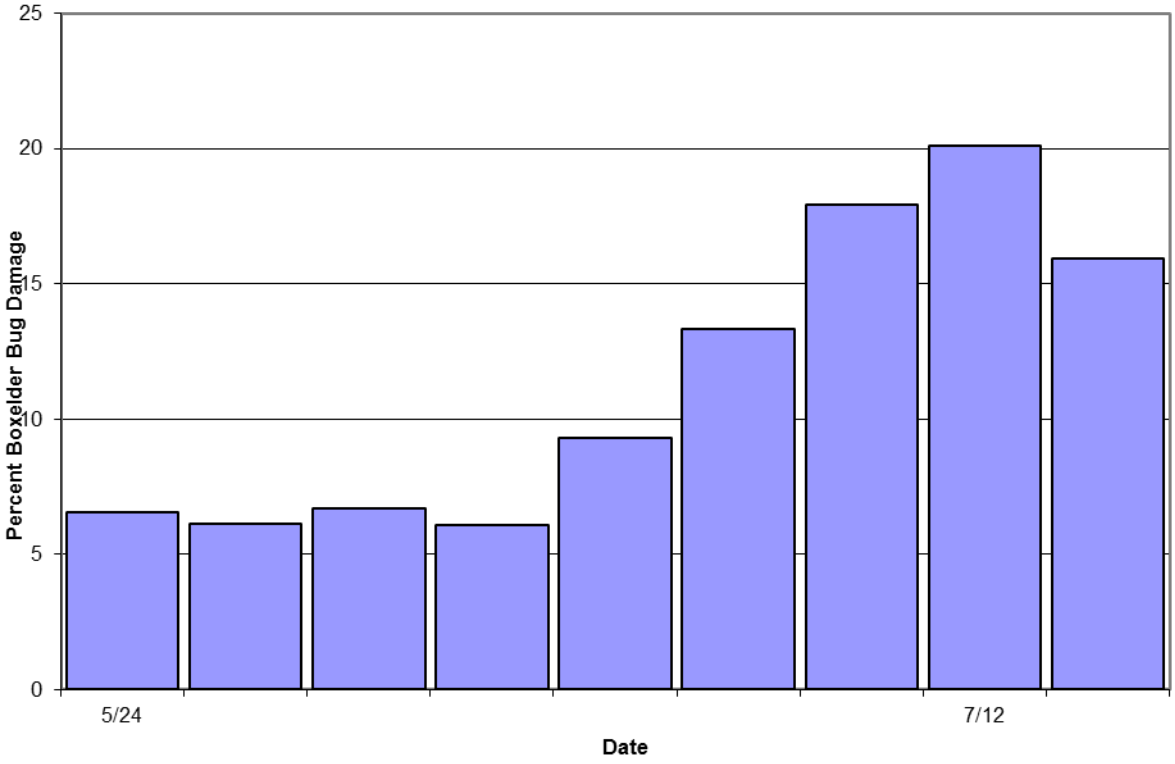

Table 1 – Mean Percent Oblique-banded Leafroller Damage in Replicated Trials Conducted in Sacramento and Mendocino Counties

Sacramento		**Clusters with OBLR Damage and/or Larvae**			
Treatments		June 27		July 19	
Delay Dormant	Petal Fall	# OBLR	%	# OBLR	%
Asana	Untreated	7	1.17a	15	1.67a
Lorsban	Untreated	3	0.50a	10	1.11a
Asana	Confirm	5	0.83a	23	2.56a
Lorsban	Confirm	4	0.67a	7	0.78a
Untreated	Confirm	4	0.67a	14	1.56a
Untreated	Untreated	8	1.33a	18	2.00a

Mendocino		**Clusters with OBLR Damage and/or Larvae**			
Treatments		%			
Delay Dormant	Petal Fall	June 14	July 5	July 19	July 24
Asana	Untreated	0.17a	0.83a	1.17a	0.67a
Lorsban	Untreated	0.17a	0.17a	0.17a	0.83a
Asana	Confirm	0.00a	1.00a	1.00a	0.50a
Lorsban	Confirm	0.00a	0.17a	0.50a	0.33a
Untreated	Confirm	0.33a	0.50a	0.33a	1.00a
Untreated	Untreated	0.17a	1.00a	1.00a	1.00a