# ENVIRONMENTALLY SOUND DRIED PLUM FARMING PRACTICES

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## PROBLEM AND SIGNIFICANCE

Balancing cost-effective pest management with minimal environmental impact is an ongoing challenge for California agriculture. This project continues previous work on fall sprays for aphid control.

Aphid (mealy plum and leaf curl plum aphid) is the primary pest in dried plum production, although spider mites, scale, and peach twig borer can occasionally require control. Integrated pest management is particularly challenging in dried plum production due to the lack of inexpensive, "soft" materials for aphid control. This makes in-season aphid management challenging, as registered materials may harm beneficial mites and cause mite outbreaks or are expensive compared to disruptive materials. Dormant spray application in dried plum is very effective, but under regulatory scrutiny due to links to surface water contamination. Previous research has shown certain fall spray materials for aphid control to be effective, but little information exists on rates and timings of several new materials.

Reliance on Asana, a pyrethroid, for fall aphid control may lead to increased tolerance or resistance to this material in aphid and other pest populations. Identification of effective alternative chemistries for aphid control can contribute to a pesticide resistance management program in dried plums. Recent registration of new "soft" pesticides [Actara, Provado, Assail and BeLeaf] in dried plum production, and pending registration of two anothers (Assail and Movento) may lead to the use of these new materials as a valuable alternative to pyrethroids or organophospates in fall and/or in-season sprays. Timings and rates of these materials, plus the new pyrethoids recently registered for use in dried plum (Warrior and Baythroid) should be evaluated in a continuation of treatments applied in fall, 2007 for evaluation in spring, 2008.

A fall sprays serves as an effective alternative to a dormant spray for aphid control in dried plums. However, a dormant spray can control a suite of pests including scale and peach twig borer (PTB). Both of these pests can harm dried plum orchards, but no information exists on affect of fall sprays on populations of these pests in fall treated orchards.

## OBJECTIVES

1. Evaluate registered pesticides for aphid control at fall application timing.

2. Monitor scale and PTB populations in fall sprayed blocks.

3. Test "new" sprayer designs for improved coverage in dried plum orchards. Assess uniformity of spray application and deposition between standard air-blast sprayer vs. tower sprayer.

4. Improve application efficiency and reduce drift with existing sprayer technology. Develop a suite of practices to improve application efficiency and reduce drift with standard airblast sprayer.

5. Increase grower awareness of available spray technologies through meetings and newsletter articles.

PROCEDURES

1. A replicated, single tree trial was established in a Sutter County orchard with a history of high mealy plum aphid pressure to evaluate previously untested but registered pesticides for effective aphid control with fall application. Seven pesticides were applied using an air-assisted, backpack mistblower this fall at two timings – the first week of November and the end of November/early December, 2007. Materials in the test represent four chemistry classes (1B, 3, 4A, and 9C) and are reported below, followed by their IARC (Insecticide Resistance Action Committee) classification:
    - Warrior (3)
    - Diazinon (IB)
    - Baythroid (3)
    - BeLeaf (9C)
    - Provado (4A)
    - Supracide (1B)
    - Lorsban (1B)

Aphid populations were evaluated in early May, 2008 using two separate observations:

I. The percent tree canopy infested with aphids was estimated by walking around the tree and looking for symptoms of aphid infestation including:
    a. Tighly curled leaves (sign of leaf curl plum aphid activity)
    b. Honey dew and bee activity (sign of mealy plum aphid activity)

II. Determining aphid damage based on a simple 0-3 scale of damage, with 0= no damage to 3 = extensive infestation. The scale was as follows:
    a. 0 = no aphids present
    b. 0.5 = aphids present, but not visible to casual observation
    c. 1.0 = aphids present from casual observation, but not large population
    d. 2.0 = aphids readily visible, but not extreme
    e. 3.0 = extreme aphid infestation “Spray today” situation.

2. San Jose scale populations were monitored following the IPFP guidelines for dormant spur samples in seven orchards in winter 2007/2008. Several orchards were very large (300+ acre) and were several samples were taken. Four of the orchards were fall sprayed in 2007, and three were treated with a standard dormant spray (oil + Asana) in late January/early February, 2008. Peach twig borer populations were monitored in two of the fall sprayed blocks.

3. A large (20 acre) replicated trial was established in the fall, 2007 in Sutter County prune orchard with a high aphid pressure history to test efficacy of drift reduction modifications

to existing orchard pesticide delivery. These modifications included:

- Venturi (low drift) nozzles
- "Cornell donuts" intended to reduce airflow to the fan by 20-30%. The "Cornell donut" is a round piece of marine-grad plywood with an interior round removed. The plywood is bolted over the air intake and reduces the rate flow into and out of the sprayer, thus reducing air delivery. In PTO sprayers without a fan gearbox, a "Cornell donut" is reported to reduce airflow and drift in dormant or early season timings.
- Tanslaminar pesticide (Actara). Contact pesticides often provide poor aphid control because total coverage is difficult to achieve. Use of a pesticide that moves into leaves might provide good pest control from spray coverage that would be inadequate for good control when a contact pesticide was used.

All treatments were applied using a 34" Air-O-Fan PTO sprayer delivering 80 GPA at 150 psi with 1 quart Non-ionic surfactant (NIS) per 100 gallons of water (0.25%NIS). The sprayer did not have a fan gearbox. Nine separate treatments were applied in October 22-23 (Actara or Asana) and December 15-17(Asana) following a randomized, complete block design. Each treatment area (replicate) was six rows wide and 9 trees long (0.45 acres). Plots will be evaluated for aphid control in early May, 2008.

RESULTS AND DISCUSSION

1. A marked range of aphid pressure resulted from fall treatments. The following results were observed:
    - No leaf curl plum aphid damage was evident in visual evaluations in early May, 2008.
    - Significant mealy plum aphid pressure was evident, with untreated trees showing more than 50% canopy infestation (Figures 1 and 2).
    - Provado and BeLeaf provided no aphid control when sprayed in early November or December. These materials are meant to be applied to leaves. The pesticide moves into the leaf tissue and kills the pest when it feeds on the plant tissue below the surface. In 2007, leaf drop was well underway by early November. We speculate that Provado and Beleaf were applied too late in this study to effectively control aphids. Actara, like Provado a 9A class pesticide, controlled aphids extremely well when applied 2 weeks earlier (see below for more details).
    - Organophosphate pesticides (diazinon, Lorsban, and Supracide) provided better aphid control when applied at the end of November compared to early November.
    - Pyrethroid pesticides (Warrior and Baythroid) provided good to excellent aphid control when applied either in early November or early December.
2. Spurs with live SJS ranged from 0-30% (Table 1). There was not pattern in SJS populations between fall or dormant treated orchards. A dormant spur sample is a key IPM practice in prune production.

   Peach twig borer levels were relatively high in both fall, 2007 sprayed blocks evaluated in May, 2008. The IPFP treatment threshold is 2% infested fruit (20 out of 1200 sampled). Insect damage was not an issue at harvest in these blocks, but more extensive sampling is needed to determine the potential for fruit damage from PTB feeding in fall sprayed blocks.

3. All treatments showed no aphid population in May, 2008. Reducing air flow and/or increasing droplet size are two drift control practices that may provide growers with a means to reduce the risk of off-site pesticide movement (drift) while maintaining excellent aphid control. Further work will be required, as earlier studies with another sprayer with a smaller fan and lower pressure (100 psi) did not deliver adequate aphid control following an early November application of Asana.at 3 oz/acre with no NIS.

Figure 1. Percent mature prune tree canopy infested with mealy plum aphid in early May, 2008 following fall, 2007 application of a range of labeled pesticides. Bars indicate 1 Standard Error of the treatment mean. Where no bars appear next to a treatment label, no aphid population was found in any of the trees so treated.

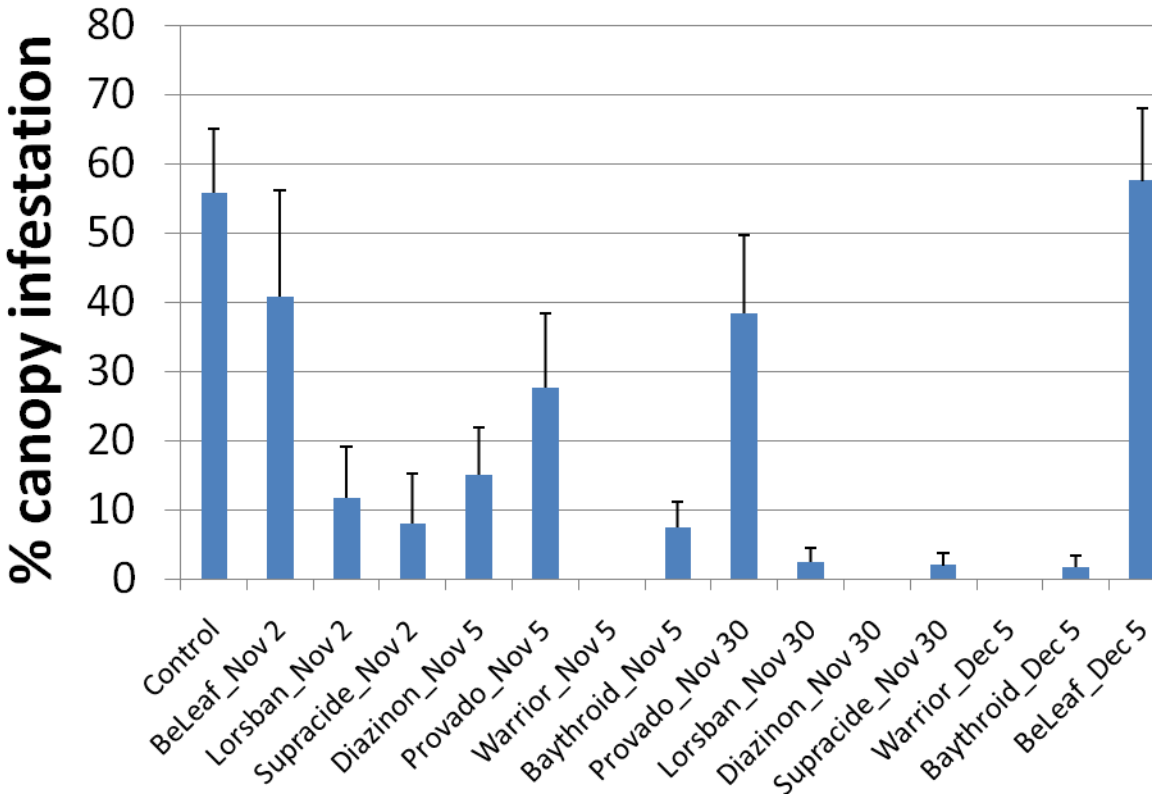

Figure 2. Relative scale (0-3) for aphid damage to a mature prune tree canopy infested with mealy plum aphid in early May, 2008 following fall, 2007 application of a range of labeled pesticides. 0=no aphids present, 3= exBars indicate 1 Standard Error of the treatment mean. Where no bars appear next to a treatment label, no aphid population was found in any of the trees so treated.

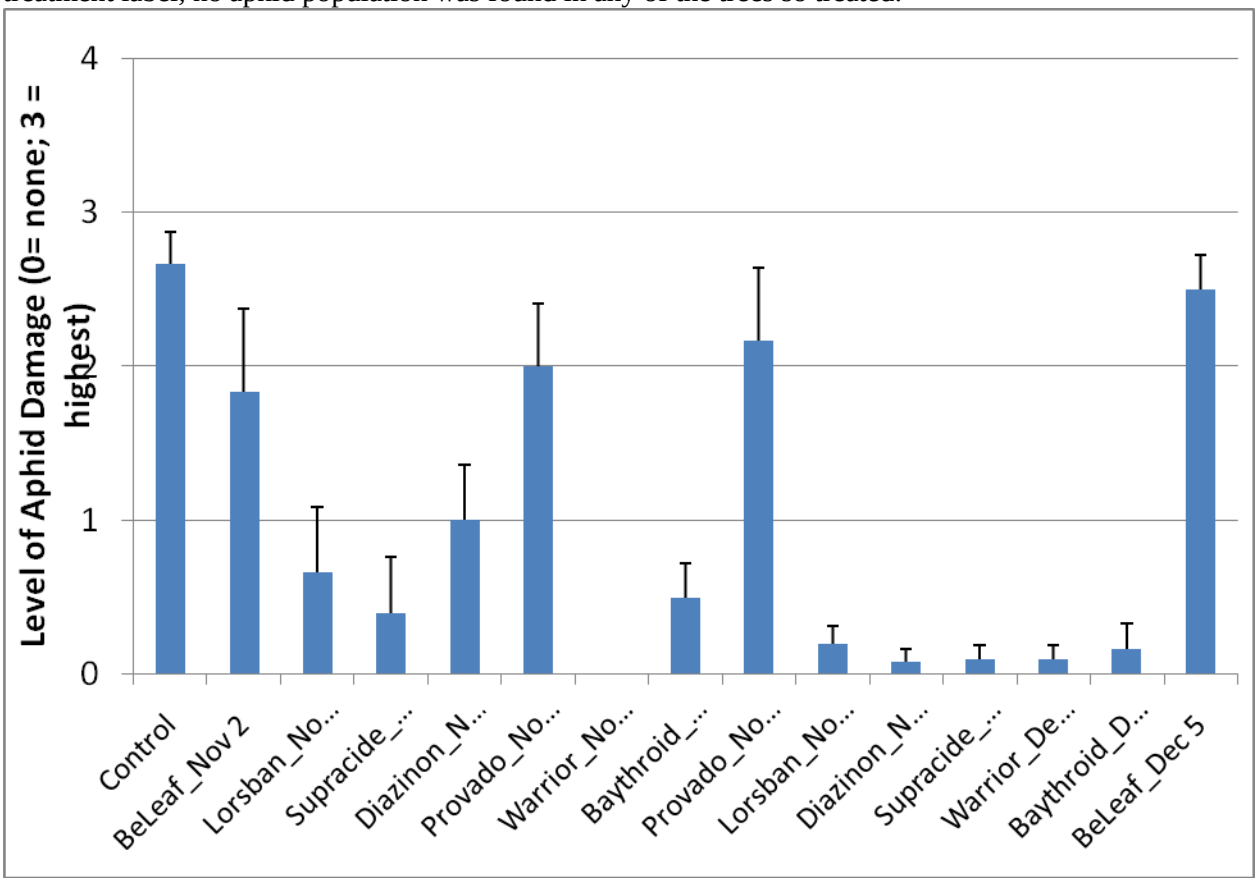


Table 1. San Jose scale (SJS) and peach twig borer (PTB) levels in orchards sprayed with Asana in fall, 2007 for aphid control. SJS monitoring was done with dormant spurs in December/January. PTB monitoring was done in May, 2008. All monitoring followed IPFP protocol. Where multiple data points are presented, multiple samples were evaluated in large blocks. SC indicates Sutter County, YC indicates Yuba County.

| Orchard | General Location | % SJS infested spurs | %PTB | Spray Timing |
|---|---|---|---|---|
| SC1** | S of Hwy 20 | 3 | ND | Dormant |
| SC2 | Broadway & Sanders* | 0, 0, 0, 0 | 2.41 | Fall |
| SC3** | Township | 3 | ND | Dormant |
| SC4** | Township | 9, 7, 9 | ND | Dormant |
| SC5 | Broadway | 2 | 1.91 | Fall |
| SC | Geo. Washington | 10 | ND | Fall |
| YC | Feather River Blvd* | 3, 30 | ND | Fall |

*Fall sprayed in November, 2006 as well as November, 2007.
** Received standard winter dormant spray of oil + Asana in late January/early February, 2008.

Table 2. Sprayer set up, pesticide treatments, and aphid control results from field trial to evaluate efficacy of low-drift aphid control measures in fall and dormant spray timings. All treatments were applied using a 34" Air-O-Fan sprayer delivering 80 GPA with 1 quart Non-ionic surfactant (NIS) per 100 gallons of water (0.25%NIS). Sutter County, 2007-2008.

| Treatment | Spray Date | Air flow | Nozzles | Pesticide rate per acre | % canopy aphid infestation: May, 2008 |
|---|---|---|---|---|---|
| 1 | Oct 22-23 | Full | Hollow cone | 5 oz Asana | 0 |
| 2 | Oct 22-23 | Full | Hollow cone | 3.5 oz Actara | 0 |
| 3 | Oct 22-23 | Reduced air | Venturi hollow cone | 3.5 oz Actara | 0 |
| 4 | Oct 22-23 | Reduced air | Hollow cone | 3.5 oz Actara | 0 |
| 5 | Oct 22-23 | Full | Venturi hollow cone | 3.5 oz Actara | 0 |
| 6 | Dec 12-13 | Full | Hollow cone | 5 oz Asana | 0 |
| 7 | Dec 12-13 | Reduced air | Hollow cone | 5 oz Asana | 0 |
| 8 | Dec 12-13 | Full | Venturi hollow cone | 5 oz Asana | 0 |
| 9 | Dec 12-13 | Reduced air | Venturi hollow cone | 5 oz Asana | 0 |