Developing fall spray alternatives to dormant spray.

Carolyn Pickel, Rich Buchner, Bill Krueger, and Franz Niederholzer

Objectives

This project has three objectives that were examined in 2006:

1. Evaluate the use of labeled pesticides for aphid and peach twig borer (PTB) control in October and November.
2. Evaluate use and benefit of nitrogen and/or zinc in fall sprays and their compatibility with labeled pesticides.
3. Extend research results to prune growers throughout the state via grower meetings and newsletters.

Procedure

Objective 1: Three field studies were established in separate locations (Sutter, Glenn, and Tehama Counties) in fall, 2005. These experiments were single tree treatment, replicated and blocked, and applied by handgun sprayer. Materials and rates were the same at all sites, with four treatment dates in the Sutter County trial, and three each in Glenn and Tehama Counties. Spray dates were:

- Sutter County: October 6, October 19, November 2, and November 16, 2005
- Glenn County: October 19, November 2, and November 16, 2005.
- Tehema County: October 25, November 10, and December 5, 2005.

Four materials were tested at each spray date. These materials and rates were as follows:

Material	Rate per acre	Adjuvant/Oil?
Imidan® 70WSP	2.125 pounds/acre	Buffered to pH 5.5
Diazinon AG500	2 pints/acre	None
Asana® XL	4.8 oz/acre	None
Actara®	3 oz/acre	0.5 gallons oil/acre

All treated trees were separated by individual "buffer" trees, which were not treated. Spray treatments were applied in spray volume equivalent to 100 gallons per acre spray volume.

Treated trees were visually evaluated for % canopy damaged by aphids – Mealy plum aphid (MPA) and Leaf Curl plum aphid (LCPA) -- in late April, 2006 at all trial sites and again in early June, 2006 in Sutter County, only.

Evaluation of fall sprays for PTB control was available through a concurrent study with Dr. Frank Zalom, UC Davis Entomology Department. A study was established in a 1st leaf almond orchard in Sutter County. Trees were sprayed on October 24, November 17, December 19, or

January 20, 2005 with one of two spray solutions -- diazinon + oil or Asana + oil. Solution concentrations were equivalent to 2 quarts diazinon + 4 gallons of oil/acre or 9.6 oz Asana + 4 gallons of oil/acre. Treatments were applied using backpack mistblower (Stihl 420) at a spray volume of 600 ml/tree. Shoot strikes were evaluated in April, 2006.

Objective 2: A large (20 acre), replicated trial was established in Sutter County to test interactions of foliar nutrients and pesticides. The trial was applied on October 31-November 1, 2005. Treatment blocks of 36 trees (6 x 6 tree square) were randomly distributed across six blocks and sprayed with a PTO-driven airblast sprayer. Treatments were as follows:

Treatment 1: Not sprayed (control)
Treatment 2: Asana® (5 oz/acre)
Treatment 3: Asana® (5 oz/acre) + Solubor® (2 pounds/acre)
Treatment 4: Asana® (5 oz/acre) + urea (30 pounds/acre)
Treatment 5: Asana® (5 oz/acre) + urea (30 pounds/acre) + zinc sulfate (20 pounds/acre)
Treatment 6: Asana® (5 oz/acre) + urea (30 pounds/acre) + zinc sulfate (20 pounds/acre) + Solubor® (2 pounds/acre)

No oil was applied.

Fifteen flowers were sampled from each the interior 4 trees of each 36 treatment replicate for a total of 60 flowers from each treatment replicate. Recently opened flowers, based on anther appearance, were sampled on April 7, 2006. Flowers were dried at 55^{o}C and analyzed for nitrogen, boron, phosphorus and potassium at the UC ANR Analytical Lab in Davis, CA.

The interior 4 trees within each treatment replicate were visually evaluated for % canopy damaged by aphids on May 31, 2006.

Objective 3:

The use of fall sprays for prune aphid control received extensive visibility designed to reach growers and PCAs through a number of avenues in fall, 2006:

- A newsletter article on fall aphid control was written and circulated by UCCE farm advisors in the Sacramento Valley through their newsletter subscription and/or local grower lists in early fall, 2006. CDPB extended this same information statewide to all prune growers in their fall, 2006 newsletter.
- An article on fall treatments for prune aphid control appeared in the fall, 2006 issue of Advisor, the quarterly magazine of the California Association of Pest Control Advisors.
- Research results were brought to the attention of DuPont's local sales representative for the Sacramento Valley in October, 2006. DuPont manufacturers and markets Asana XL.
- Presentations on fall aphid sprays were made at four grower meetings in Sutter County (May 4, November 2, 8, and 30, 2006) as well as at the statewide Prune Day on March 3, 2006.

Results

Objective 1

No damage from MPA was observed in the Glenn or Tehama trials, but both LCPA and MPA damage was measured in the Sutter trial. Given that fall spray timing results will be compared with those from dormant spraying where complete aphid control is expected, detailed statistics are not needed and results are presented simply as treatment averages ± one standard error (to show the range in variability in each treatment.

Aphid control was affected by spray timing and material selection with some interaction of timing x material. Asana provided excellent control for both MPA and LCPA at all timings (Figures 1, 2, 3, 4, and 5). Imidan gave only slightly less control for MPA and LCPA across timings and locations (Figures 1, 2, 3, 4, and 5). Failure to add buffer to the spray solution resulted in unacceptable damage in the Glenn County trial on the November 16 spray date (Figure 5). Diazinon did not provide consistent aphid control at the timings and concentration (2 pints/acre) used in this study (Figures 1, 2, 3, 4, and 5). Actara provided excellent aphid control in October, but poor control in November (Figures 1, 2, 3, 4, and 5).

Objective 2

No aphid damage was observed in any of the measurement trees in any of the spray treatments. LCPA damage was seen in border trees on the southern edge of at least one unsprayed treatment.

There were no differences in flower boron ($p=0.63$), nitrogen ($p=0.80$), phosphorus ($p = 0.54$), or potassium ($p = 0.61$) flower concentration (Table 1).

Conclusions

Objective 1

Very effective prune aphid control throughout a growing season is possible with one application of a registered pesticide the previous fall (Figures 1, 2, 3, 4, and 5). Asana consistently provided the best aphid control, followed closely by Imidan and Actara (in October). Aphid control with diazinon was inconsistent, ranging from very good to poor across the treatment timings and dates. Actara provided unsatisfactory control in November.

Objective 2

This experiment was conducted in a low-vigor block on heavy texture soil. Fall foliar nutrients applied with Asana did not appear to affect pesticide performance, but also did not affect flower nutrient levels at bloom the following April (Table 1). There was no negative impact of mixing different foliar nutrients with Asana in a spray applied Oct 31/Nov 1.

Objective 3

Excellent visibility of these research results was obtained by the multiple newsletter mailings. Grower acceptance of this practice (fall sprays for aphids) is growing.

Figure 1. Affect of spray timing, location, and pesticide on Leaf Curl plum aphid damage in mature prune canopies. Separate spray trials were established in the fall, 2005 in Tehema, Glenn, and Sutter County and evaluated in spring, 2006. Data bars represent means of individual trial locations and spray dates for pesticides appearing at the head of the graph. Bars = ± 1 S.E.

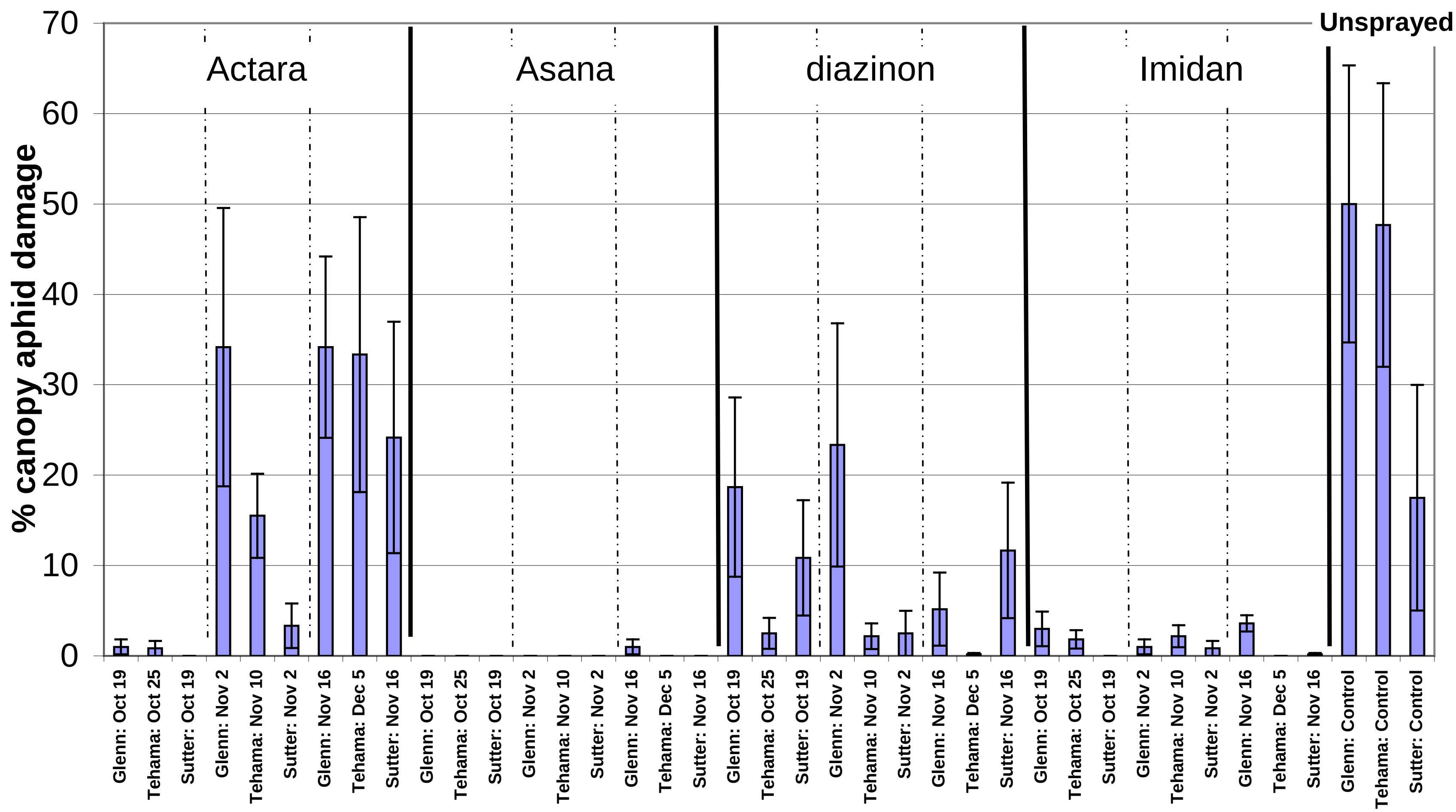

Figure 2. Affect of spray timing, location, and pesticide on Mealy plum aphid damage in mature prune canopies. Sprays were applied on dates shown in graph in 2005, and damage assessed in June, 2006. Data bars represent means of spray dates for pesticides appearing at the head of the graph. Bars = ± 1 S.E.

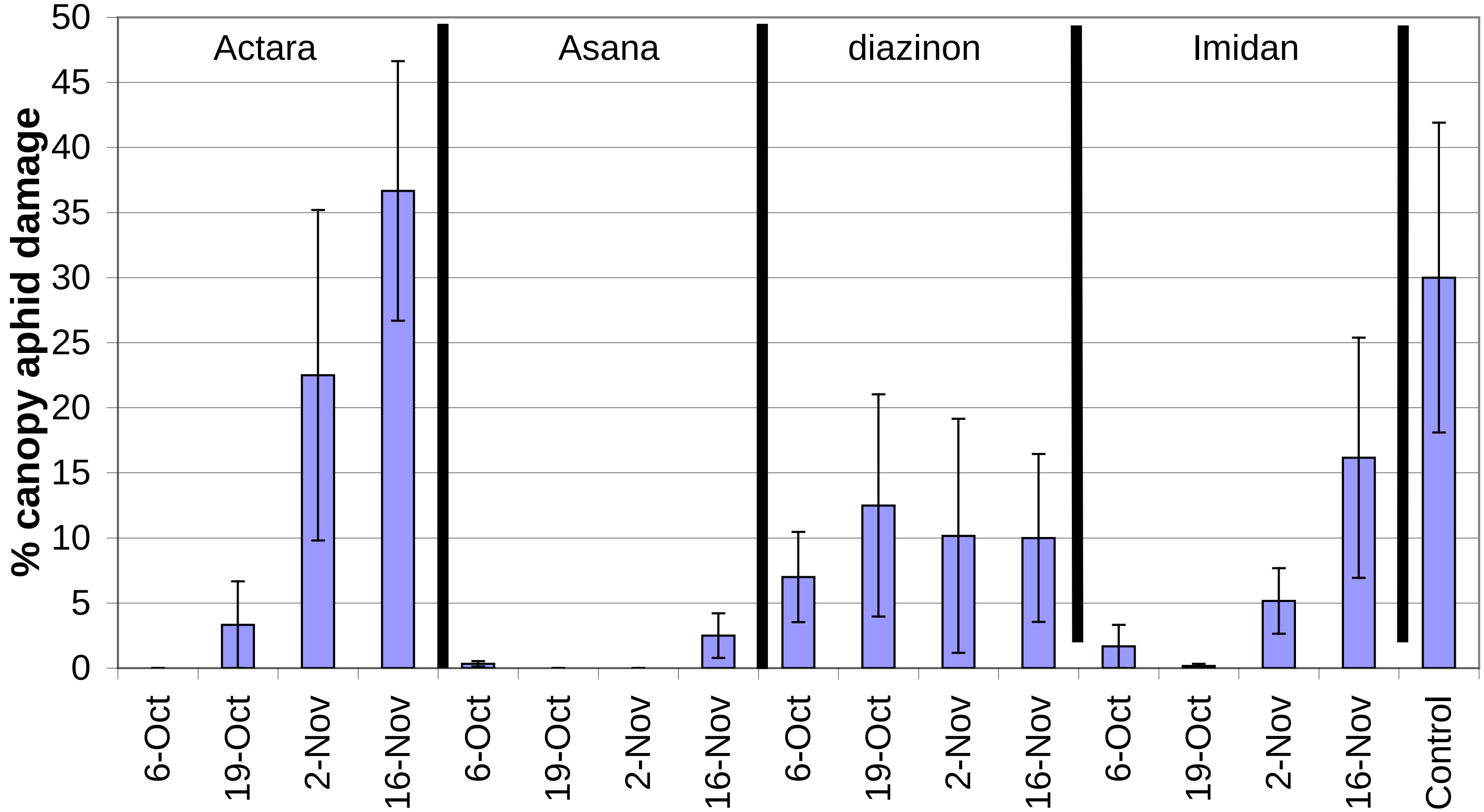

Figure 3. Affect of spray timing and pesticide on Mealy plum aphid damage in mature prune canopies in Sutter County. Sprays were applied on dates shown in graph in 2005, and damage assessed in June, 2006. Data bars represent means of spray dates for pesticides appearing at the head of the graph. Bars = ± 1 S.E. See text for treatment details.

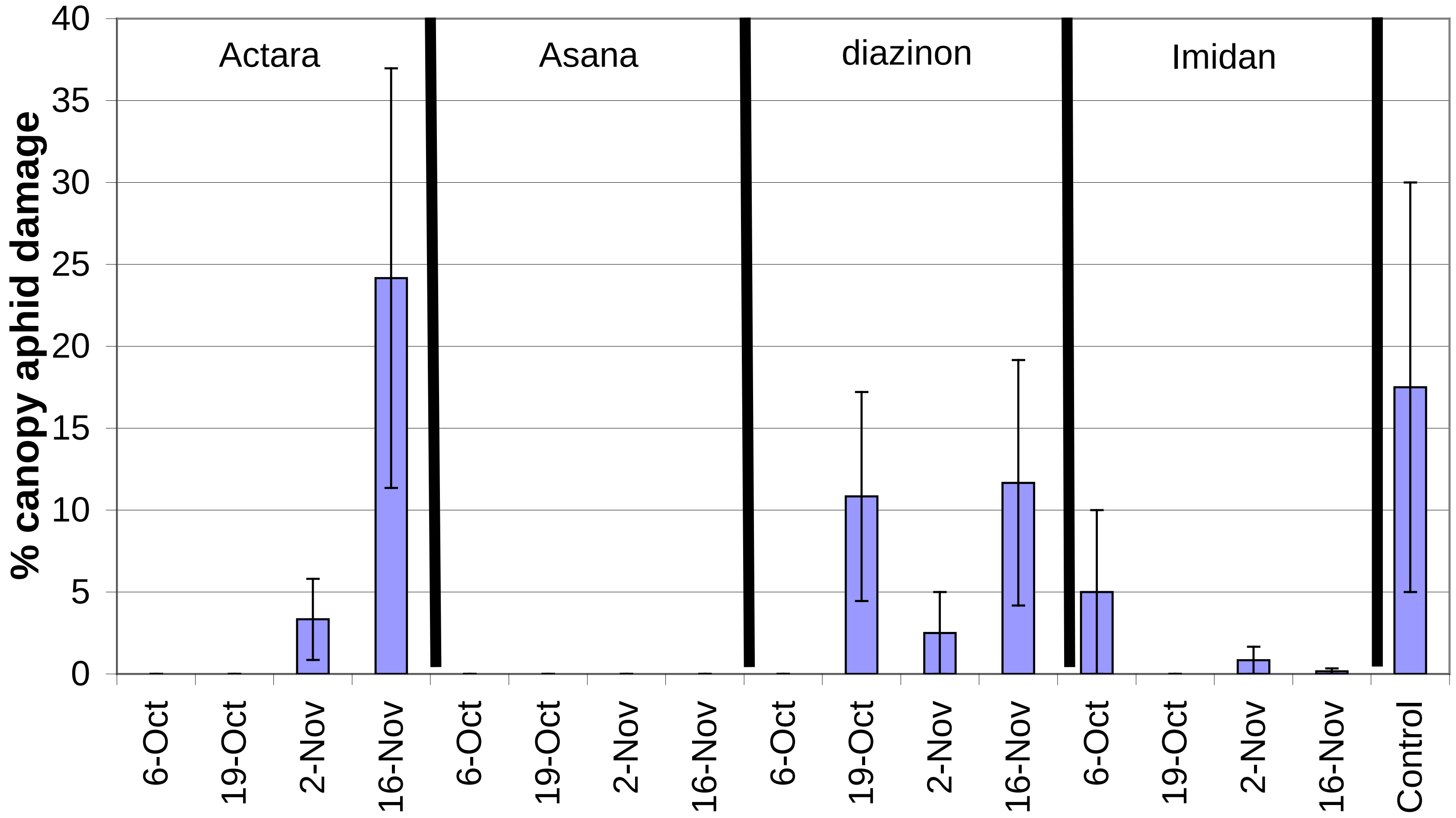

Figure 4. Affect of spray timing and pesticide on Leaf Curl plum aphid damage in mature prune canopies in Tehama County. Sprays were applied on dates shown in graph in 2005, and damage assessed in June, 2006. Data bars represent means of spray dates for pesticides appearing at the head of the graph. Bars = ± 1 S.E. See text for treatment details.

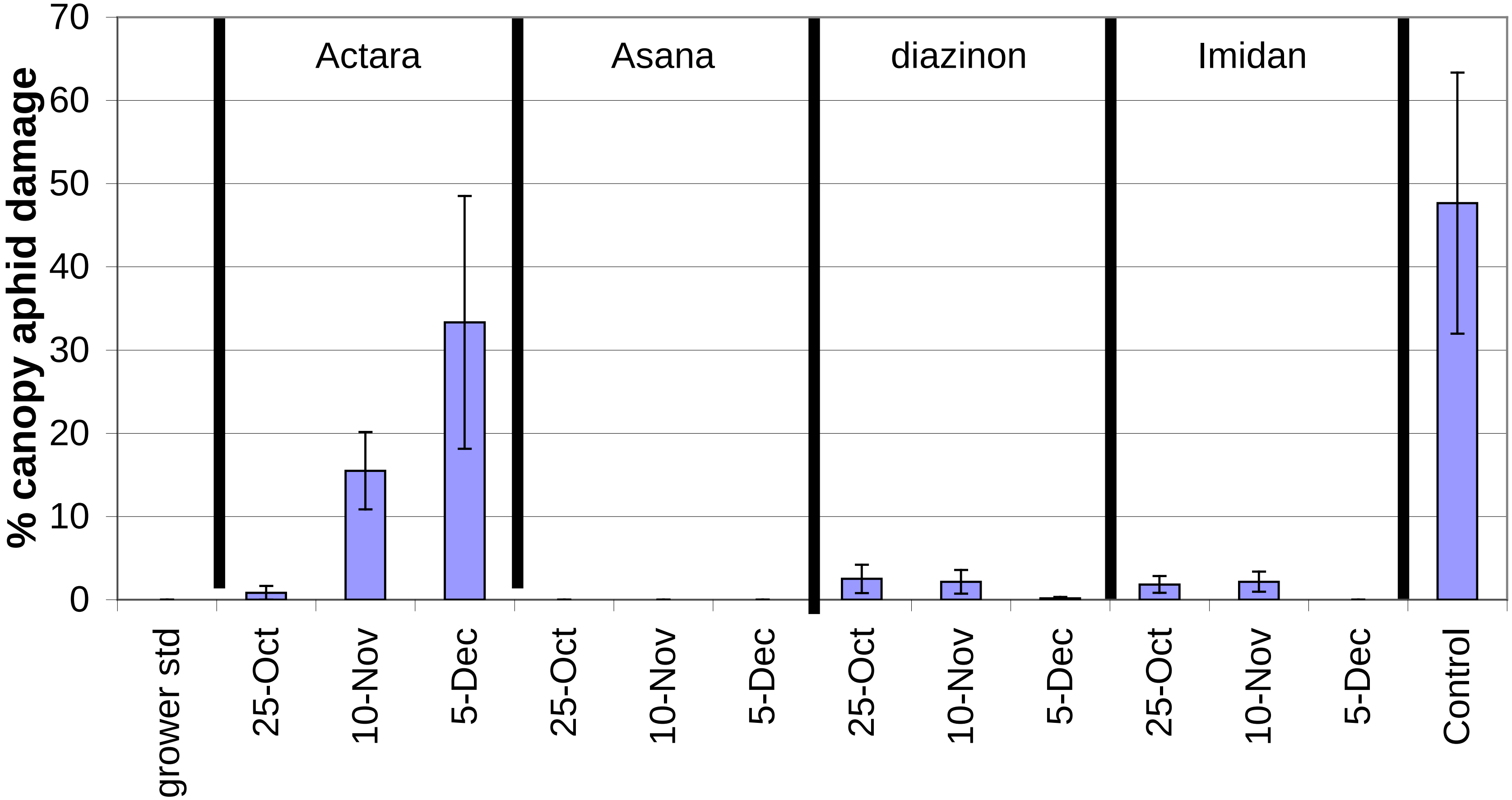

Figure 5. Affect of spray timing and pesticide on Leaf Curl plum aphid damage in mature prune canopies in Glenn County. Sprays were applied on dates shown in graph in 2005, and damage assessed in June, 2006. Data bars represent means of spray dates for pesticides appearing at the head of the graph. Bars = ± 1 S.E. See text for treatment details.

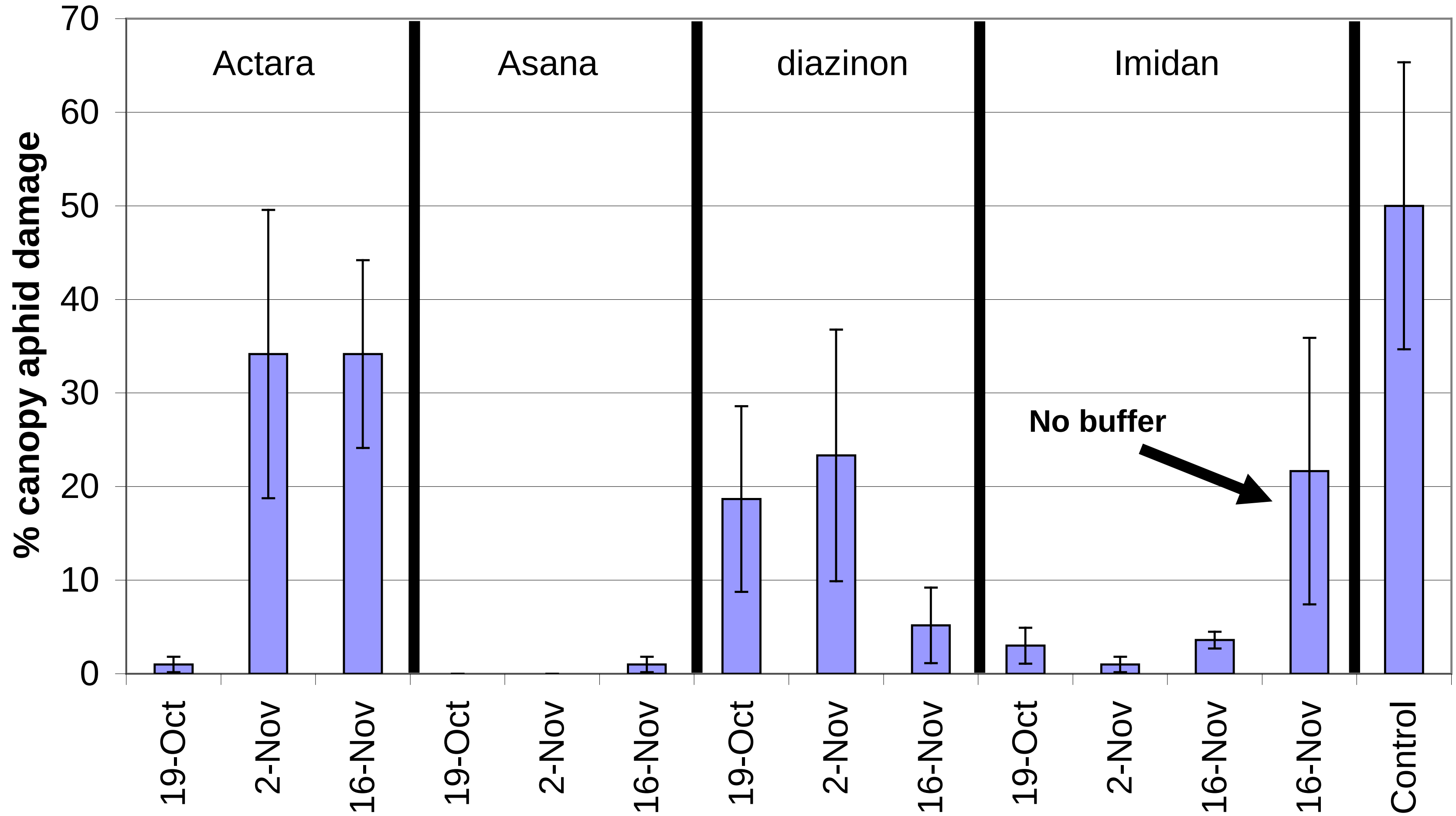

Table 1. Affect of Asana ± foliar nutrients applied on October 31/November 1, 2005 on French prune flower boron, nitrogen, phosphorus, or potassium concentrations sampled on April 7, 2006. Treatments within the same columns are not significantly different ($p \leq 0.05$) based on Bonferroni's multiple comparison procedure. See text for treatment details.

Nutrient	Boron (ppm)	Nitrogen (%)	Phosphorus (%)	Potassium (%)
Not sprayed (control)	99 a	2.73 a	0.35 a	1.98 a
Asana®	91 a	2.65 a	0.35 a	1.94 a
Asana® + Solubor®	101 a	2.66 a	0.35 a	1.97 a
Asana® + urea	91 a	2.71 a	0.34 a	1.98 a
Asana® + urea + zinc sulfate	95 a	2.66 a	0.34 a	1.98 a
Asana® + urea + zinc sulfate + Solubor®	96 a	2.70 a	0.34 a	1.93 a