Annual Report to
Almond Board of California
May 1, 2005

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Objectives:

1. Purchase pheromone traps, navel orangeworm (NOW) bait traps, and lures for UC Cooperative Extension Farm Advisors as part of their ongoing monitoring and extension efforts.

2. San Jose scale - evaluate reduced-risk management strategy for SJS in infested orchards and determine if and how long recovery will take.

3. Peach Twig Borer - evaluate efficacy and treatment timing for registered and candidate insecticides, and determine the impact of buffering dormant organophosphate, oil and copper tank mixes.

4. Validate Best Management Practices for mitigating dormant spray runoff - conduct orchard field trials to test the impact of vegetated filter strips as mitigation methods for runoff.

5. Spider mites – evaluate efficacy and treatment timing for registered and candidate miticides, and determine potential for use in an almond IPM program.

Summary of Results:

Objective 1, Monitoring supplies and regional trapping. Each year through this project, trapping supplies are purchased for use by UC Cooperative Extension Farm Advisors to help them to monitor the phenological activity of almond insect pests in their counties. The Advisors use the data gathered from these traps to update pest status for local growers and PCA's. Trapping records are solicited from the Advisors at the end of each season, and become part of a historical database. For the 2004 season, supplies purchased and distributed included 1350 wing traps and trap liners, 760 San Jose scale traps, 1485 pheromone lures, and 14 lbs of navel orangeworm (NOW) bait. As in 2002-03, funding was provided to Rich Coviello for trapping NOW, peach twig borer, oriental fruit moth and San Jose scale at multiple sites in Fresno Co., and providing regular updates on this monitoring via email and the web. Funding for this objective also provided labor and travel for our cooperative work with Dr. Walter Leal to monitor black light traps weekly in 3 locations beginning in late May, 2004, for ten lined June beetle and to assist in collections of female beetles at night for his pheromone isolations. (Figures 1 and 2).

Figure 1. Number of ten lined June beetle males captured at the first Manteca site.

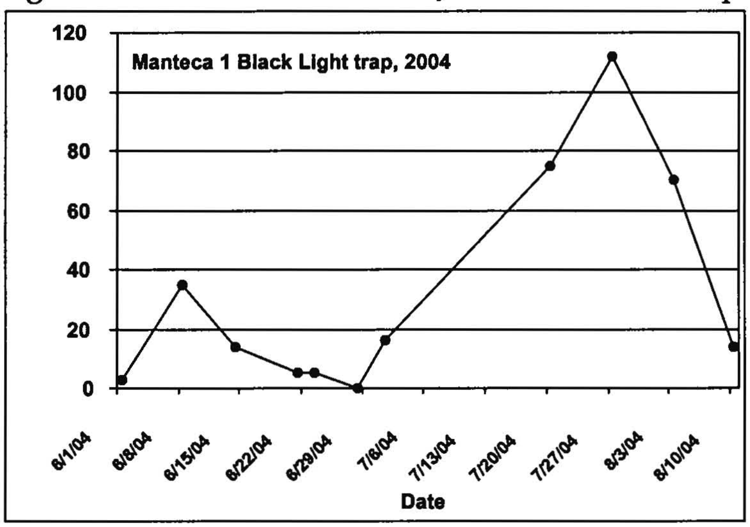
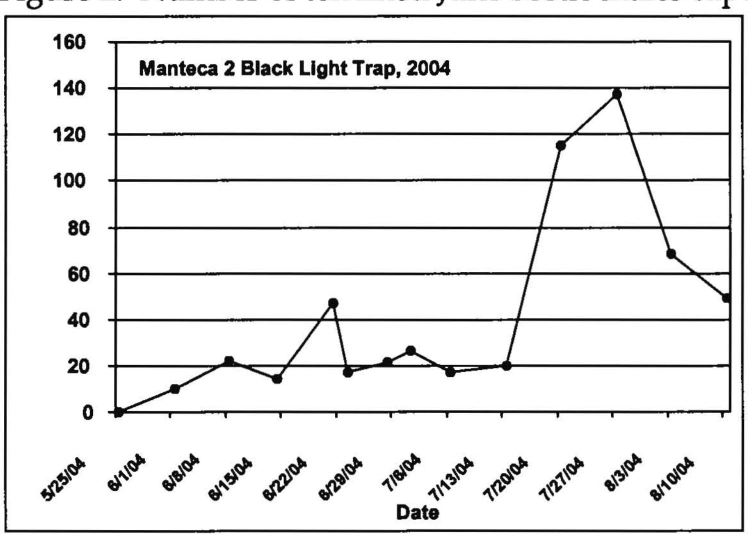


Figure 2. Number of ten lined June beetle males captured at the second Manteca site.



Data are presented for 2 sites only as no beetles were captures at the third site which was reported to be infested the previous year. As in the previous year, only male beetles were captured in the black light traps. As in the previous year, adult males were captured beginning the first week of

June. If this holds true for 2005 as well, we will be confident that this can be used for predictive purposes in terms of control.

Objective 2, San Jose scale. Walt Bentley, together with Mario Viveros, have been leading the effort to develop sampling decision rules and management options for San Jose scale (SJS) which would allow growers and PCAs to predict the need for a dormant spray application and use reduced-risk control options. The study is being conducted in the Kern Co. Almond Pest Management Alliance Orchard in Wasco. The orchard is 160 acres in size. It is divided into 8 separate plots of 20 acres. This site has an established SJS population. Four plots were treated with conventional organophosphate dormant and in-season sprays (Conventional treatment). Four plots were treated with products considered to be reduced-risk pesticides that include horticultural mineral oil, spinosad and tebufenozide (Reduced Risk treatment). Each of these 8 plots were further divided into 10 acre plots, half of which have not received a dormant spray for 3 years (beginning with the winter of 2002). Because of the severity of the SJS infestation in the untreated sections, it became possible to evaluate orchard recovery from a severe SJS infestation.

In late January, 2004, all plots received a delayed dormant spray that included 6 gallons of Volck Supreme oil and 4 ounces Seize® 35wp per acre in 200 gallons of water. Subsequently, the conventional treated plots received a hullspit application of phosmet (Imidan 70WP) at the rate of 4 lbs per acre in 200 gallons of water. This spray was buffered to a pH of 6. The reduced risk plots were treated in May with tebufenozide (Confirm 2F) at the rate of 16 ounces per acre in 200 gallons of water.

San Jose scale traps were deployed in late February, 2004, and monitored through October. Male San Jose scale, and the parasitoids *Encarsia perniciosa* and *Aphytis* spp. were counted every week on these traps. Double-sided sticky tape was wrapped around a secondary scaffold from the tree holding the trap, as well as on each tree to the north, south, east, and west of the trap tree. The tapes were deployed in March, monitored through October for crawler abundance. In early October, each of the trees with a sticky tape (five per plot) was evaluated for San Jose scale infestation. Each tree was visually searched for 3 minutes for live scale on new shoots and for damage due to scale feeding. The tree was then rated on a scale from 0 to 3 as follows: no scale found = 0; any live scale = 1; live scale and yellowing leaves =2; live scale and dead or dying limbs=3. These same trees were evaluated on February 13, 2004, for live scale infesting spurs. Twenty spurs were collected from each of the 5 trees at each trap location. Spur infestation was identified as the independent variable and tree damage as the dependent variable to perform a simple regression analysis. The 2004 data were pooled with the results of the 2002 and 2003 evaluations.

A dramatic reduction in SJS infestation from the previous year was shown by each of the sampling methods. From previous years, plots where no dormant spray was applied were the most severely infested and damaged by SJS. For example, the seasonal total of crawlers per inch of tape in the Conventional treated blocks (Figure 3) with no dormant spray applied averaged 957.34, 656.88 and 0.12 in the years 2002, 2003, 2004 (dormant was applied in this year). The seasonal total crawlers per inch of tape in the Reduced Risk treatment blocks (Figure 4) averaged 90.22, 6.08, and 0.15 for 2002, 2003 and 2004, respectively.

Figure 3. Crawlers per square inch in conventionally managed plots for 2002-04, Kern Co.

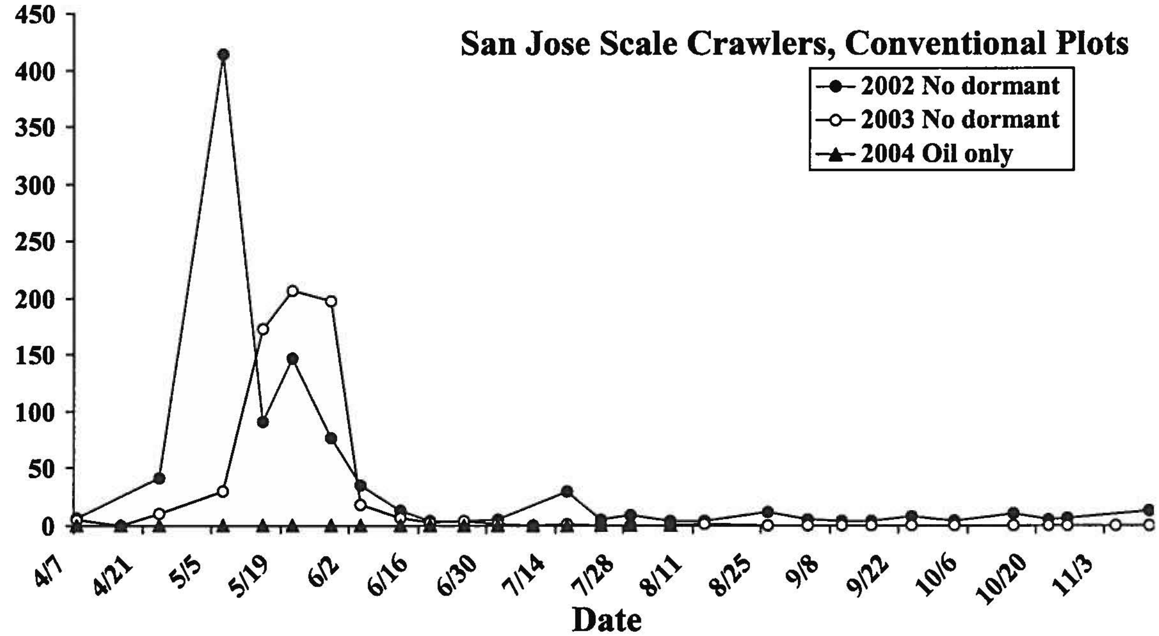
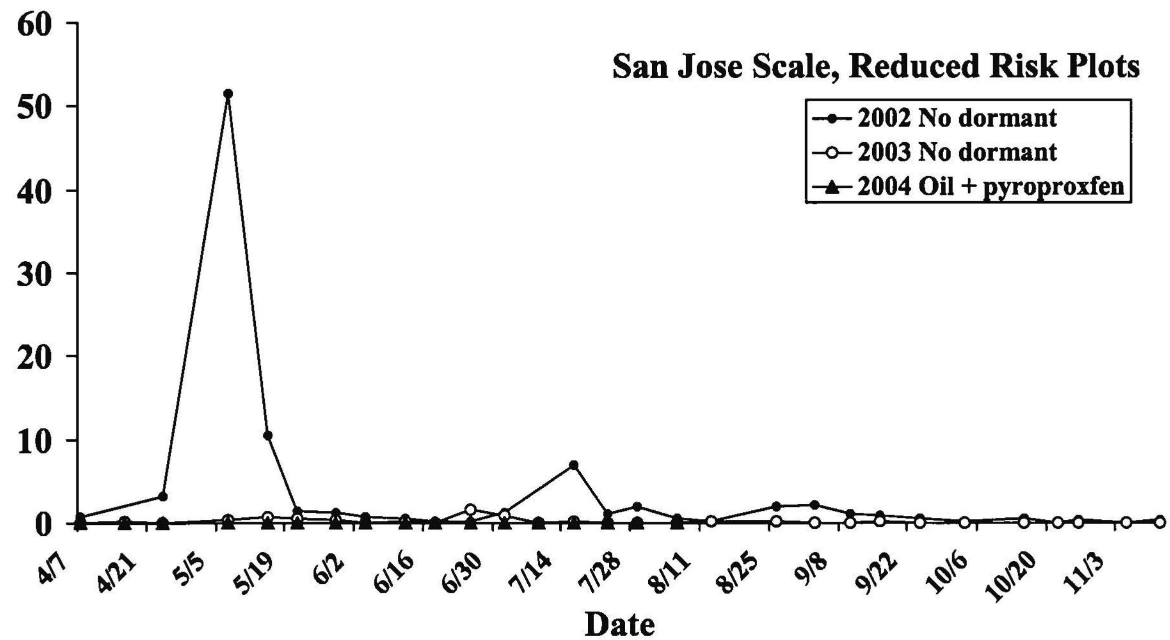


Figure 4. Crawlers per square inch in plots managed for reduced risk for 2002-04, Kern Co.



Damage severity ratings in 2004 were similarly affected by the application of a dormant treatment in both the Conventional and Reduced Risk treatments. In 2002, the severity ratings for SJS averaged 0.250, 0.50, 4.25, and 5.50 for the Conventional organophosphate plus oil treatment, Reduced Risk dormant oil treatment, Reduced Risk no dormant oil treatment, and Conventional no dormant spray treatment, respectively. The Conventional no dormant spray treatment had significantly ($P<0.05$, Fisher's protected LSD) more damage than all but the Reduced Risk and no dormant spray treatments. The Reduced Risk no dormant spray treatment was not different than the Reduced Risk dormant spray treatment.

In 2003, the Conventional with no dormant spray treatment was again most severely damaged. The ratings were 0, 0.75, 3.75, and 7.25 for the Conventional organophosphate plus oil treatment, the Reduced Risk treatment plus a dormant oil spray, the Reduced Risk treatment with no dormant spray, and the Conventional with no dormant spray treatment, respectively. The Conventional with dormant oil and organophosphate treatment and the Reduced Risk with dormant oil treatment were not statistically different ($P>0.05$, Fisher's protected LSD) from one another. The Conventional with no dormant spray treatment had significantly ($P<0.05$, Fisher's protected LSD) more damage than the remaining treatments.

In 2004, damage due to live scale ceased after the oil plus pyriproxifen treatment was applied. The ratings for damage were 0.03, 0, 0, and 0 for the Conventional and no dormant spray treatment, Conventional with a dormant spray treatment, Reduced Risk no dormant spray treatment, and Reduced Risk dormant spray treatment, respectively. These treatment results were similar in that all four categories received a dormant spray in January, 2004.

San Jose scale spur infestation was also reduced in all 2003 treatments by the dormant oil plus pyriproxifen application in January. In 2002, percent spur infestation (in January) for this sequence was 8.75, 0, 7.00, and 0. In 2003, percent spur infestation (in January) for this sequence was 12.25, 10.50, 50.50, and 0.25. Each of the treatments had increased spur infestation from the previous year. In 2004, subsequent to application of a dormant spray across all previous years treatments, the percent spur infestation was 6.75, 2.00, 1.50, and 0.

Damage severity due to live scale was rated on October 4, 2004. As shown previously, damage was not detected in 2004. The relationship between spur infestation and damage rating was pooled over the 3 year period, providing 48 separate datapoints. Results of the pooled regression analysis indicate a significant relationship between spur infestation and the severity of damage due to live SJS ($R^2 = 0.617$, $Y= 0.00 +0.153X$; $P< 0.001$, no intercept model) for the three year period. The relationship between the average number of scale per treatment and damage severity was also significant, but not as highly related ($R^2 = 0.398$, $Y= 0.00 + 0.009X$; $P< 0.001$, no intercept model) for the three year period. The results of the pooled percent spur infestation analysis are similar to the results from 2002 and 2003.

Objective 3, Peach Twig Borer. An experiment was conducted to determine the efficacy of several insecticides applied for PTB control during orchard dormancy. The site of this study was a commercial third leaf almond orchard located about 7 miles north of Marysville, Yuba Co., California. The orchard was a standard planting for the area, and was immediately adjacent to a mature almond orchard to the west. Dormant treatments were applied on 26 January, 2004. Each treatment replicate was a single tree, and all treatments were replicated 9 times (12 times for the Lorsban and diazinon treatments) in a randomized complete block design. The experimental trees were blocked into the 3 rows which each of which had a different almond variety. Treatments were applied using a Solo Piston Pump Sprayer at the equivalent volume of

100 gal/acre. All treatments except the 2 Intrepid and the Dimilin treatment applied at 20% bloom also included Volck Supreme Oil at 1.5% vol/vol. The Dimilin treatment at 20% bloom was applied with 0.25 % summer oil vol./vol.

Table 1. Mean (± SE) peach twig borer shoot strikes per tree, 2004.

Treatment and timing	Rate (product/acre)	n	Mean (± SE) shoot strikes		
Untreated		9	4.000	±	0.667
Dimilin dormant [1]	16 oz	9	0.111	±	0.111
Dimilin delayed dormant [1]	12 oz	9	0.333	±	0.333
Dimilin @ 20% bloom [2]	12 oz	9	0.444	±	0.444
Dibrom dormant [1]	3 pts	9	0.222	±	0.147
Dibrom dormant [1]	2 pts	9	1.110	±	0.455
Asana dormant [1]	8 oz	9	0.111	±	0.111
Success dormant [1]	6 oz	9	0.222	±	0.147
Intrepid @ 20% bloom	10 oz	9	0.667	±	0.333
Intrepid @ 80% bloom	10 oz	9	0.889	±	0.564
Danitol dormant [1]	21.33 oz	9	0.111	±	0.111
Danitol dormant [1]	10.76 oz	9	0.222	±	0.222
Brigade dormant [1]	0.5 lb	9	1.222	±	0.596
MustangMax dormant [1]	0.26 lb	9	1.000	±	0.764
Lorsban dormant [1]	2 pts	12	0.750	±	0.250
Lorsban dormant [1]	1 pt	12	1.250	±	0.629
Diazinon dormant [1]	4 pts	12	0.500	±	0.261
Diazinon dormant [1]	2 pts	12	0.583	±	0.288

[1] Applied with 1.5% oil v/v.
[2] Applied with 0.25% summer oil v/v.
Dormant spray application date: January 26, shoot strikes counted April 9.
ANOVA statistics, F=4.423, df=17,156, P<0.0001.
** Peach twig borer shoot strikes are significantly different from the untreated control by pairwise t-tests at $P<0.05$ in all cases.

ANOVA revealed no significant difference in shoot strikes in untreated trees located among the 3 varieties (F=1.596, df=2,18, P=0.2301). Therefore, it was not necessary to include variety as a factor in further analysis of treatments.

ANOVA revealed significant differences (Table 1) between treatments (ANOVA statistics, F=4.423, df=17,156, P<0.0001). All treatments significantly reduced of peach twig borer shoot strikes relative to the untreated check. A rate effect was observed for both the Diazinon and Lorsban treatments with the full label rate applications resulting in fewer shoot strikes that the half rate in both cases. Rate effects were also noted for Dibrom and Danitol, the other insecticides for which more than one rate was applied at the same treatment timing. A treatment timing effect was observed for the insect growth regulators Dimilin and Intrepid, with the earlier timing being superior to the later timings, although Dimilin applied as a full dormant spray was applied at a higher rate than for the other 2 treatment timings. From our previous experience, the mean number of peach twig borer shoot strikes found in the untreated checks of our study would be considered relatively few. The need for treatment at this level would be marginal for almonds and prunes, but would probably be considered necessary for fresh or canned soft fruit.

Copper ions are known to catalyze the hydrolytic decomposition of organophosphate insecticides, and may result in accelerated decomposition of the organophosphate on the tree surface requiring higher rates to achieve control. Last year we reported field results that confirmed a biological affect which reduced efficacy somewhat against peach twig borer. These results correlated to our previous laboratory experiments using diazinon and chlorpyrifos in combination with copper hydroxide which suggested that the presence of copper hydroxide accelerates organophosphate decomposition. Since copper not only catalyzes organophosphates but can change the pH of a solution, an experiment was run this year to determine if addition of a buffer to the organophosphate plus copper tank mix could mitigate the observed effect of copper. The laboratory procedures consisted of preparing a chemical mixture in distilled water of the same products and rates as described for treatments in the associated field experiment (Table 2). For each set of experimental conditions, 0.05 grams of mixture was weighed into the depressions of 8 glass microscope well slides. These slides were placed in a chemical hood for 2 hours to allow for complete water evaporation, leaving the chemical mixture residue in the depression. These slides were then placed in a container at room temperature and 100 percent humidity for storage. At zero time, 4 days, 8 days and 15 days, 2 slides were removed from the storage container, extracted with solvent, and analyzed for chlorpyrifos by liquid chromatography. Results of the laboratory experiment showed that the buffer improved the longevity of the organophosphate in the tank mix, but the mechanism was both mitigation of the pH effect and neutralizing the catalytic effect of the copper by having the salts present.

A field experiment conducted simultaneously with the efficacy experiment previously described and using the same methods was conducted in winter, 2004, to determine biological significance of buffering the organophosphate and copper tank mix. Results (Table 2) show that in every case fewer peach twig borer shoot strikes resulted from either organophosphate applied without the addition of copper, but that the effect of copper was mitigated by the addition of a phosphate buffer.

Table 2. Mean ± SD number PTB strikes counted per singletree replicate in a third-leaf almond orchard, N. of Marysville, Yuba Co., CA, 2004.

Treatments	Rate (form)	Copper?	Buffer?	n=	PTB Strikes	
untreated	NA	No	No	12	5.17	± 2.55
Lorsban + oil	2 pts + 1.5% oil	Yes	Yes	12	0.83	± 1.27*
Lorsban + oil	2 pts + 1.5% oil	Yes	No	12	1.25	± 2.18
Lorsban + oil	2 pts + 1.5% oil	No	No	12	0.58	± 0.90*
Lorsban + oil	1 pts + 1.5% oil	Yes	Yes	12	1.00	± 1.04*
Lorsban + oil	1 pts + 1.5% oil	Yes	No	12	2.08	± 3.87*
Lorsban + oil	1 pts + 1.5% oil	No	No	11	0.82	± 0.87*
Diazinon + oil	4 pts + 1.5% oil	Yes	Yes	12	0.50	± 0.91*
Diazinon + oil	4 pts + 1.5% oil	Yes	No	12	1.08	± 1.24*
Diazinon + oil	4 pts + 1.5% oil	No	No	12	0.42	± 0.67*

Diazinon + oil	2 pts + 1.5% oil	Yes	Yes	10	1.20	± 1.48*
Diazinon + oil	2 pts + 1.5% oil	Yes	No	12	2.08	± 3.12*
Diazinon + oil	2 pts + 1.5% oil	No	No	11	0.55	± 1.04*
			F=		*5.2940*	
	ANOV statistics:		df=		12,139	
			P=		*0.0001*	

*Mean is significantly different from untreated at p=0.05 by Dunnett's Method.

Objective 4, BMPs for Mitigating Dormant Spray Runoff. We continue to examine Best Management Practices to mitigate impacts of dormant season pesticide applications that are both effective and economically viable for growers to use. Much of the funding for this work is coming from a Department of Pesticide Regulation contract for this purpose, and from collaborative work we have through a grant from the California Dried Plum Board who has a contract from the State Water Resources Control Board for related work. In the winter of 2003-04, we conducted 2 studies. Our lab did all of the field work for the studies including finding the study site, setting up autosamplers, and collecting runoff volume and samples for residue analysis. Dr. Barry Wilson's conducted the chemical reside analysis. The larger study was intended to evaluate the efficacy of different widths of vegetative buffer strips in reducing the concentration of diazinon in surface runoff from dormant sprayed orchards. A second study was intended both to determine effect of post application sprinkler irrigation on concentration of organophosphates in runoff and the effect of a light rainfall (not sufficient to result in runoff) 24 hours after pesticides were applied, and this was embedded as a treatment in the first study with the treated controls being shared for both experiments.

Plots representing six treatments were established in 3 non-randomized fully replicated blocks in a mature dormant prune orchard where trees are planted on berms 20 feet apart. An earthen dam was constructed on the upslope end of each plot to prevent runoff from entering the measured plot area, and an earthen dam constructed on the downslope end of each plot was constructed to divert runoff from the plot into an autosampler unit which measured runoff volume and collected ~1% of the total runoff for chemical analysis. All plots were ~160 feet long (50 m) except as indicated. Diazinon treatments were applied on December 8, 2003. During the evening of 12/9/03, one inch of natural rainfall fell on the study site and did not result in runoff. The following day (12/10/03), simulated rainfall from a sprinkler irrigation system occurred (approx. 1.75 inches of rain equivalent) which resulted in runoff from all of the plots.

Experimental treatments were: 1) a 160 foot long (50 m) plot with 4 lb. of diazinon in 100 gal of water applied during the dormant season (treated control), 2) a 160 foot long (50 m) section of orchard floor sprayed between two berms with 4 lb. of diazinon in 100 gal of water during the dormant season. Following diazinon application and prior to onset of significant rainfall, the area received 1/4 inch of sprinkler irrigation without causing runoff, 3) a 160 foot long (50 m) plot with 4 lb. of diazinon in 100 gal of water applied during the dormant season with an additional 30 ft (10 m) length of unsprayed vegetated orchard floor for runoff to flow over before draining into an autosampling unit, 4) a 160 foot long (50 m) plot with 4 lb. of diazinon in 100 gal of water applied during the dormant season with an additional 60 ft length (20 m) of unsprayed vegetated orchard floor for runoff to flow over before draining into an autosampling unit, 5) a 160 foot long (50 m) plot with 4 lb. of diazinon in 100 gal of water applied during the dormant season with an additional 90 ft (30 m) length of unsprayed vegetated orchard floor for runoff to flow over before draining into an autosampling unit, and 6) a 320 foot long plot (100 m) with 4 lb. of diazinon in 100 gal of water applied during the dormant season with an additional 60 ft length (30 m) of unsprayed vegetated orchard floor for runoff to flow over before draining into an autosampling unit.

Analysis of variance results indicate that the vegetated buffer strips provided a measurable reduction of diazinon concentration in orchard runoff (ANOV results following arcsine transformation F=4.819; df=4,10; p=0.0200) relative to the treated control which did not have a buffer strip. Analysis using t-tests indicated that the 30 ft, 60 ft and 90 ft buffer strip widths were not significantly different from one another, and that there was no difference in diazinon concentration between the 3200 ft^2 (160 foot row length) and 6400 ft^2 (320 foot row length) areas drained over a 60 ft buffer strip (Table 3). In each buffer strip scenario, the diazinon concentration was reduced by at least 50% (Figure 5).

Post application sprinkler irrigation reduced diazinon concentration in orchard runoff by 45%, although the difference was not statistically significant (ANOV results following arcsine transformation; F=3.982; df=1,4; p=0.1167) (Table 4). The reduction in diazinon concentration might have been greater and the difference between sprinkled and non-sprinkled plots statistically significant had not one inch of natural rainfall fallen on the study site the evening after the post sprinkler irrigation was applied.

Table 3. Mean concentration (ppb) of diazinon in first 400 gallons (2271 liters) of runoff and mean diazinon concentration of runoff from each treatment as a proportion of the no buffer strip control, winter 2003-04.

Treatment	Mean ± SE ppb [1]	Mean ± SE proportion [2]
No buffer	332.100 ± 99.641	1.000 ± 0.000
50 m + 10 m buffer	178.133 ± 101.309	0.470 ± 0.136 **
50 m + 20 m buffer	229.500 ± 129.907	0.500 ± 0.261 **
50 m + 30 m buffer	67.933 ± 13.763	0.273 ± 0.119 **
100 m + 20 m buffer	143.633 ± 99.151	0.373 ± 0.171 **

[1]ANOV results; F=1.034; df=4,10; p=0.4364
[2]ANOV results following arcsin transformation; F=4.819; df=4,10; p=0.0200;
** mean is significantly different p<0.05 from no buffer treatment by t-test.

Figure 5. Average diazinon concentration of runoff presented as a proportion of the no buffer strip control (n = 3 replicates).

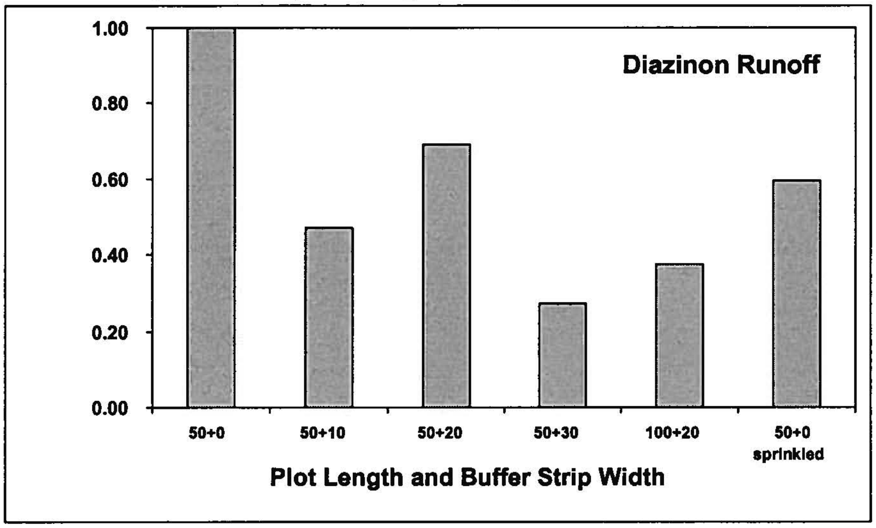


Table 4 Year 2 Study, mean concentration (ppb) of diazinon in first 400 gallons (2271 liters) of runoff and mean diazinon concentration of runoff from each treatment as a proportion of the not sprinkled control, winter 2003-04.

Treatment	Mean ± SE ppb [1]	Mean ± SE proportion [2]
Not sprinkled	332.100 ± 99.641	1.000 ± 0.000
Sprinkled	250.500 ± 171.225	0.550 ± 0.226

[1]ANOV results; F=0.170; df=1,4; p=0.7015
[2]ANOV results following arcsine transformation; F=3.982; df=1,4; p=0.1167

This study strongly suggests that vegetated buffer strips do afford a measurable reduction of diazinon concentration in orchard runoff, that 30 ft (10 m), 60 ft (20 m), and 90 ft (30 m) buffer strip widths were not significantly different from one another in terms of diazinon concentration in stormwater runoff, that post application sprinkler irrigation reduces diazinon concentration in orchard runoff (although the difference was not statistically significant possibly due to timing of a natural rainfall event relative to the time when the sprinkling occurred), and that there was no significant difference in diazinon concentration in orchard runoff flowing over a 60 ft (20 m) buffer strip that drained either 160 ft (50 m) or 320 ft (100 m) of orchard row that had been sprayed with diazinon.

Objective 5, Spider Mites. A miticide trial was conducted on 72 Nonpareil trees in a commercial almond orchard near McFarland, Kern Co. by David Haviland and Mario Viveros who led the work on this objective in 2004. Miticides tested and rates were identified from my personal experience with the products on almonds and particularly on other crops. Thirty-six trees in each of two Nonpareil rows were flagged and split into four blocks. A single untreated buffer tree separated treated trees within each row, and rows of pollinator trees were left untreated between and flanking the Nonpareil rows. A total of 17 treatments plus a control were evaluated including Agrimek (15 oz) plus 1% oil, Acramite (0.75 lb), Acramite (1.0 lb), Desperado (1 gal) plus Sylgard 309 (4 oz/100 gal water), Envidor (14 oz), Envidor (18 oz), Fujimite (2 pt), Hexacide (4 qt), Kanemite (31 oz), Kanemite (31 oz) plus 1% oil, Mesa (20 oz) plus 1% oil, Mesa (25 oz) plus 1% oil, Oil (1%), Omite (6 lb), Onager (16 oz), Onager (20 oz), and Zeal (3 oz). The miticides were applied on May 17, 2004, using a John Bean sprayer equipped with a hand gun at 100 psi. Applications were made at 125 gpa with the hand gun adjusted to provide a spray pattern providing optimal coverage. Application timing was based on pre-treatment mite counts, field history from previous years, and in anticipation of 100+ degree weather; applications occurred approximately two weeks after the grower treated the rest of the block for spider mites.

Thirty-leaf samples were taken weekly from each of the 72 trees on May 17 (precount), May 25, June 3, June 10, and June 17. Leaves were individually placed under a dissecting scope and evaluated for the numbers of spider mites, spider mite eggs, predatory mites, predatory mite eggs and thrips.

The spider mite densities went from low to extremely low in all plots following the application. Average mites per plot from samples taken approximately one hour prior to pesticide applications ranged from 0.0 to 7.4 mites per leaf; averages for the four blocks were 0.98, 0.98, 0.11, and 0.02 mites per leaf, respectively. By one week after treatment, no treatment (including the untreated controls) had greater than 0.06 mites per leaf. Mite densities remained low for the next month, resulting in no significant difference by one way ANOV being detected for the treatments for any of the evaluation dates (Table 5). Because mite densities were so low, little prey was available for the predators to feed upon, resulting in no significant difference in the numbers of spider mite eggs, predatory mites, predatory mite eggs, or thrips.

During 2004, we began a detailed study to examine the direct and sublethal effects of new miticides that are or may soon be registered on almonds on the predator mite *Galandromus occidentalis*. Direct mortality in terms of LD50 for a number of products were reported previously, but indirect (or sublethal) effects such as reduced egg-laying, reduced egg hatch, reduced survival or immatures can only be seen by exposing females and doing a detailed life table analysis such as what my lab is now undertaking. The miticides currently being evaluated are shown on Table 6. Results are preliminary at this time as the life table studies are not complete, and will be reported in the 2005 annual report.

Table 5. Average number of spider mites per leaf for treatments applied at McFarland, 2004.

Treatment	5/17/2004	5/25/2004	6/3/2004	6/10/2004	6/17/2004
Untreated	0.163	0.038	0.075	0.095	0.013
Acramite .75 lb	0.050	0.000	0.000	0.000	0.000
Acramite 1.00 lb	0.113	0.000	0.000	0.000	0.000
Agri-Mek+oil	1.037	0.038	0.000	0.000	0.000
Desperado	0.675	0.000	0.000	0.000	0.000
Fujimite	0.025	0.000	0.000	0.000	0.000
Hexacide	0.313	0.013	0.050	0.000	0.000
Kanemite	2.075	0.062	0.000	0.000	0.000

Kanemite+oil	0.887	0.038	0.013	0.000	0.000
Mesa (20 oz)+oil	0.150	0.000	0.000	0.000	0.000
Mesa (25 oz) +oil	0.562	0.000	0.000	0.000	0.000
Oberon 14 oz	0.250	0.000	0.000	0.000	0.000
Oberon 18 oz	0.387	0.013	0.013	0.000	0.000
Oil	0.038	0.000	0.087	0.000	0.000
Onager 16 oz	0.550	0.000	0.000	0.000	0.000
Onager 20 oz	0.413	0.025	0.000	0.000	0.000
Omite	0.475	0.038	0.000	0.000	0.000
Zeal	1.225	0.000	0.000	0.000	0.000

ANOV detected no significant difference between treatments for any sample date.

Table. 6. Miticides being tested for sublethal effects on *Galandromus occidentalis*.

Active ingredient	Trade name	% a.i. and formulation	Concentration (ppm)	Registered for use on Almonds?
Fenpyroximate	Fujimite	5 SC	0.21	No
Etoxazole	Zeal	72 WP	24.12	Non bearing only
Acequinocyl	Kanemite	15 SC	158.0	Yes
Bifenazate	Acramite	50 WS	112.75	Yes
Spiromesifen	Oberon	23 SC	76.20	No