Pacific Spider Mite Control in the Lower San Joaquin Valley

Project No.: **09-ENTO6-Haviland**

Project Leader: David Haviland
Entomology Farm Advisor
UCCE - Kern County
1031 S. Mount Vernon
Bakersfield, CA 93307
(661) 868-6215
dhaviland@ucdavis.edu

Project Cooperators and Personnel:
Bradley Higbee, Paramount Farming Company
Stephanie Rill, UCCE - Kern County

Objectives:

Provide overall improvements in IPM for spider mites in almonds by:

1) Demonstrating the differences between a treatment programs that is based on preventative May and hull split sprays to one that utilizes monitoring and treatment thresholds.
2) Continuing to screen new miticides and other insecticides for their effects on spider mites.

Interpretive Summary:

Pacific spider mite is one of the most common pests of almonds in the lower San Joaquin Valley. Standard practice for most growers is to spray once for mites in the spring around May, and to spray a second time at hull split as a tank mix with a navel orangeworm spray. Historically, May programs have been defined by optimal use patterns of treatments with abamectin. Since abamectin works best while leaf tissue is still soft, usually defined as prior to June, abamectin treatments have typically been made in late April through May despite whether or not mites are present. Hull split sprays may or may not also be used preventatively. Since mites can get bad during harvest, and hull split is usually the last opportunity to spray, a miticide is often included (despite whether or not mites are present) in order to ensure a mite-free harvest period from August through September or October.

Since these programs have been established, several new miticides have been registered for almonds in California. Based on research conducted over the past several years, as well as grower experience, some of the most utilized have been Envidor, Fujimite, Onager, and Zeal, as well as Acramite and Oil. The first objective of

this project is to determine if these new tools can allow for growers and pest control advisors to revert back to threshold-based treatment decision programs, or if it is better to maintain calendar-based, preventative programs. The second objective of the project is to continue efforts to screen new miticides against Pacific spider mite, as well as evaluate the effects of insecticides that might be used for other pests for their secondary impact on mites.

Objective 1: Season-long approaches to management

The first objective was accomplished in a large scale research area near Shafter, Kern Co., CA. A total of 280 acres of mature almond trees were divided into sixteen, 17-acre plots that each contained approximately 1,500 trees. Each plot was assigned to one of four treatments in a randomized complete block design. Treatments were 1) preventative use of abamectin, 2) Envidor at a treatment threshold, 3) Onager at a treatment threshold, and 4) Zeal at a treatment threshold. The abamectin treatment was applied on 28 April as a tank mix with an Alternaria spray, whereas the threshold treatments were made on 27 May once the presence/absence treatment thresholds noted in the UC-IPM guidelines (http://www.ipm.ucdavis.edu/PMG/C003/almonds-mites.pdf). All treatments were made with the addition of 1% 415º Oil. Each of the four blocks also contained a 2- to 3-acre untreated control plot. Control plots were kept untreated until the mite populations exploded, and then were used as test plots to determine the effectiveness of 'rescue' treatments with Fujimite and oil.

This project documented that almond growers have multiple options available to them when it comes to season-long mite programs. The preventative abamectin program and the threshold-based programs with Envidor, Onager, or Zeal all had comparable results of season-long control of Pacific spider mites (**Figure 1**). This is consistent with data from the 2008 trials that are included on the 2008 research project reports CD that is included with the proceedings of this conference. Data also showed that Fujimite can provide excellent knock-down of spider mites in cases where mites have gotten out of control. However, the overall level of season-long control while letting things get out of hand and then trying to repair them was not as effective as either the preventative or threshold-based programs.

This project also showed that University of California (UC-IPM) thresholds can provide an excellent guideline for whether or not a treatment is needed. This was particularly true in July when the untreated trial plots (that got out of hand and were oversprayed with Fujimite) were again reaching treatment threshold levels. Despite widespread webbing of the trees, utilization of UC thresholds for when predators were present suggested that we avoid spraying despite mite densities approaching 2 per leaf with ~30% of the leaves infested (range from 3 to 65%), and considerable webbing beginning to occur. The result was that populations of beneficials became sufficiently established that mite populations were reduced, defoliation of trees did not occur, and mite populations never returned after hull split, thus allowing mites to be managed without a hull-split miticide spray in July.

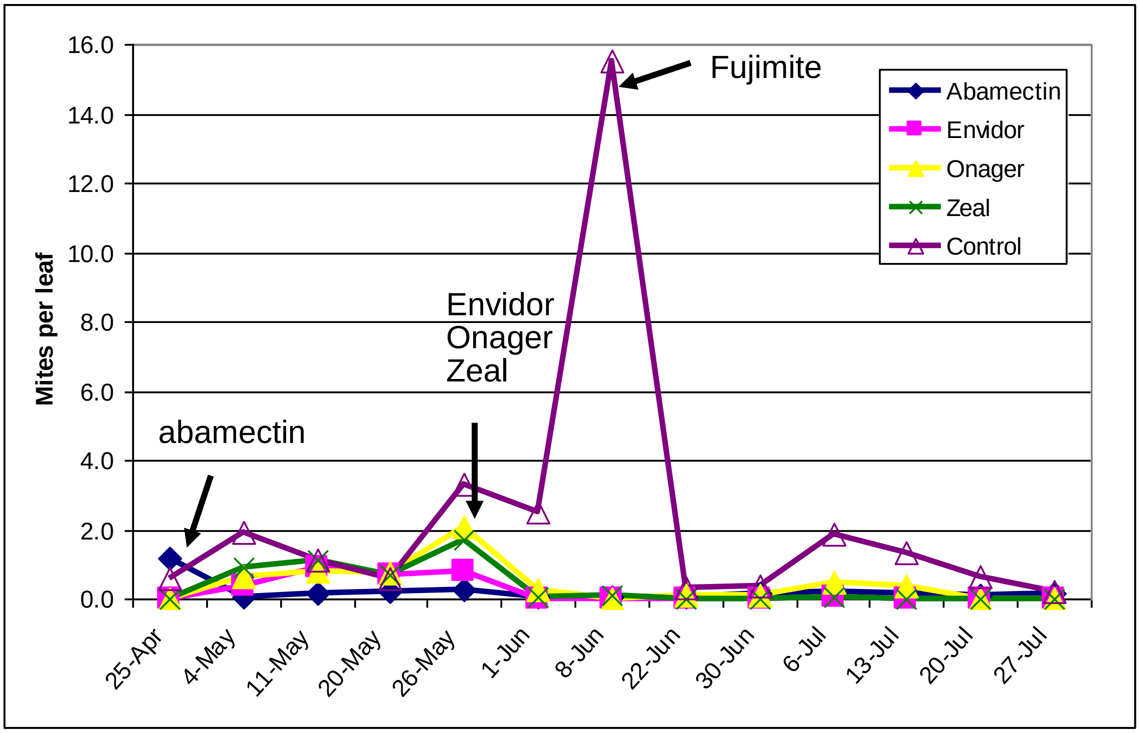

Figure 1. A comparison of treatment programs based on 1) a preventative abamectin treatment, 2) threshold-based treatments of Envidor, Onager or Zeal, or 3) knock-down ‘rescue’ treatments of Fujimite, on season-long control of Pacific spider mites in large scale plots of mature almonds. Arrows indicate time of application of each miticide.

<u>Objective 2: Screening of new miticides</u>

During 2009 we conducted a trial in Shafter, CA to evaluate the effects of miticides and insecticides on the density of Pacific spider mites in almonds **(Table1)**. The trial location was an orchard of non-bearing, first-leaf almonds. Approximately 4.4 acres of trees were divided into 90 plots that each contained 5 trees in 20 by 22 ft spacing. Plots were organized into a randomized complete block design with 5 blocks of 17 treatments and an untreated check. Treatments were applied to individual trees with a hand gun at a water volume equivalent to 200 GPA on either 17 or 19 June, and were evaluated 3 days after treatment, and then weekly through eight weeks after treatment.

Spider mite pressure in this trial was moderate. Pre-counts averaged 2.03 mites per leaf across the entire trial. Mite densities in the untreated check dropped substantially by 4 days after treatment, increased consistently through 7 weeks after treatment (WAT), and remained high at the 8 WAT final evaluations. All treatments resulted in significant reductions in mite density from the 2 WAT evaluations through 7 WAT, with the exception of 415º oil on the last of these evaluation dates.

Acramite and Proclaim reduced spider mite densities to <1 per leaf through 4 WAT for Acramite and 5 WAT for Proclaim. After that, mite densities in plots treated with either miticide increased substantially to densities between 3.5 and 8.4 per leaf on the 6, 7 and 8 WAT evaluation dates. Plots treated with EC formulations of abamectin (Agri-Mek 0.15EC and Zoro 0.15EC) had ≤0.12 mites per leaf through 5 WAT, regardless of rate. They remained low, never exceeding 0.57 mites per leaf, for the remainder of the trial. Evaluations of Zoro compared to Agri-Mek resulted in no significant differences in mite knockdown or in residual length of activity. Comparisons of the new, low volatile organic compound, SC formulation of Agri-Mek compared to the EC formulation resulted in no significant differences through the duration of the trial.

Mite densities in plots with a combination of bifenazate (Acramite) and abamectin (Prevamite SC) had mite densities comparable to that of plots treated with abamectin. No synergistic benefits of putting the two active ingredients together were observed. Comparisons of the high versus low rate of Mesa resulted in no significant differences on any evaluation date. Onager treatments kept mite densities <0.15 per leaf through 4 WAT, between 0.7 and 1.3 from 5 to 7 WAT, and then at 3.0 on the final evaluation date.

Table 1. Effects of miticide treatments on the density of motile spider mites on almond leaves. Shafter 2009.

	Average spider mites per leaf										
Treatment[1]	Rate	Pre	4 DAT	1 WAT	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT
Acramite 4SC	11 fl oz	1.0a	0.0a	0.0a	0.2a	0.1a	0.2ab	1.4a	7.8d	5.7ef	3.6a-e
Acramite 4SC	15 fl oz	1.2a	0.1a	0.1a	0.0a	0.0a	0.2ab	2.0a	6.2d	4.2def	6.4cde
Prevamite SC	11 fl oz	3.7a	0.0a	0.0a	0.0a	0.0a	0.0a	0.1a	0.4ab	0.9a-d	3.6a-d
Prevamite SC	15 fl oz	3.9a	0.3a	0.0a	0.0a	0.0a	0.0ab	0.1a	0.0a	0.1ab	0.3a
Agri-Mek 0.15EC	10 fl oz	0.2a	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a
Agri-Mek 0.15EC	12 fl oz	1.2a	0.1a	0.0a	0.0a	0.2ab	0.0ab	0.0a	0.1ab	0.2ab	0.1a
Agri-Mek 0.15EC	15 fl oz	3.6a	0.0a	0.0a	0.0a	0.0a	0.0a	0.1a	0.0a	0.3abc	0.6ab
Agri-Mek 0.15EC	20 fl oz	1.9a	0.0a	0.0a	0.0a	0.0a	0.0ab	0.0a	0.1ab	0.0a	0.3a
Zoro 0.15EC	10 fl oz	2.7a	0.4a	0.0a	0.0a	0.1a	0.0ab	0.0a	0.2ab	0.3abc	0.1a
Zoro 0.15EC	20 fl oz	2.1a	0.0a	0.0a	0.0a	0.0a	0.1ab	0.1a	0.2ab	0.4abc	0.1a
Agri-Mek SC	2.57 fl oz	2.6a	0.3a	0.1a	0.0a	0.1a	0.3ab	0.1a	0.9abc	0.3abc	0.6ab
Mesa EC	25 fl oz	1.2a	0.0a	0.0a	0.0a	0.0a	0.2ab	0.1a	0.6ab	2.3a-e	0.9ab
Mesa EC	30 fl oz	0.5a	0.3a	0.0a	0.0a	0.0a	0.0ab	0.2a	0.0a	0.1ab	0.2a
Onager 1E	19.2 fl oz	0.1a	0.0a	0.1a	0.0a	0.0a	0.0ab	1.3a	1.0ab	0.7abc	3.0abc
Proclaim 5SG	3.2 oz	1.7a	0.0a	0.0a	0.2a	0.7b	0.5ab	0.5a	3.6bcd	3.5b-e	8.4b-e
Proclaim 5SG	4.8 oz	5.5a	0.3a	0.5a	0.0a	0.1ab	0.4ab	0.5a	4.4bcd	7.3def	4.3a-e
415º oil	1% v/v	1.0a	0.4a	0.7a	0.0a	0.2ab	1.0b	0.9a	5.4cd	13.7fg	12.1e
Untreated Check	--	2.4a	0.1a	0.5a	1.7b	2.6c	4.9c	9.5b	14.7e	17.1g	10.1de
	F	0.51	1.24	1.66	3.70	5.25	4.54	2.50	4.72	5.38	3.02
	P	0.938	0.261	0.072	<.0001	<.0001	<.0001	0.0040	<.0001	<.0001	0.0006

[1] 415º oil used as a surfactant at 1% v/v

Means in a column followed by the same letter are not significantly different ($P > 0.05$, Fisher's protected LSD) after square root (x + 0.5) transformation of the data. Untransformed means are shown.