Pacific Spider Mite Control in the Lower San Joaquin Valley

Project No.: **07-ENTO6-Haviland**

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Objectives:

1. Evaluate the effects of miticide applications on Pacific spider mite control
   a. during the spring (April/May timing)
   b. during the summer (Hull split timing)
   c. in non-bearing almonds
   d. within two weeks of harvest

Interpretive Summary:

Pacific spider mite is one of the most important insect pests of almonds in the lower San Joaquin Valley. In this region, one or more miticide treatments are used annually on the majority of almond acreage. Even with miticides, however, mite-induced defoliation of entire almond orchards can become a region-wide phenomenon, as occurred during 2005.

One of the most interesting developments in spider mite management in almonds has been the recent registration of several new miticides, including a newly reformulated Apollo (clofentezine), Desperado (pyridaben + sulfur), Envidor (spirodiclofen), Fujimite (fenpyroximate), Kanemite (acequinocyl), Onager (hexythiazox), and Zeal (etoxazole). Each of these products appear to have something to offer to improve spider mite management; the objective now is to determine what is the best use of each product, and how can these new tools allow overall improvements in management programs.

We have made significant attempts at determining the best use of each product by evaluating them under a wide range of conditions: early season, hull split, at a 7-day PHI, and in non-bearing almonds. All trials were done on large scale plots in Kern County.

a. Spring Application Trial

In 2007 we conducted an 80-acre large scale trial in Kern County to evaluate the potential for Apollo, Envidor, Onager, and Zeal as alternatives to, or products to us in alternate year rotations with Agri-mek. Each treatment was sprayed onto six, 2.5 acre plots on 17 May at 200 GPA with an air blast sprayer, and mite densities were evaluated every one to two weeks through harvest.

The effects of miticide treatments are shown in Figure and Table 1. At the time of treatment in mid-May, mite densities were close to undetectable. Mite counts continued close to zero through June and July. Mite densities in two unreplicated control plots began to increase in mid-July and exceeded 15 mites per leaf by first week in August when these control plots were oversprayed to prevent defoliation. On the 13 August evaluation date (88 days after treatment, DAT), mite densities in all treated plots remained under 1.5 per leaf, with all treatments but Apollo maintaining mite densities under 0.5 per leaf. By late August, plots treated with Zeal had the lowest mite densities.

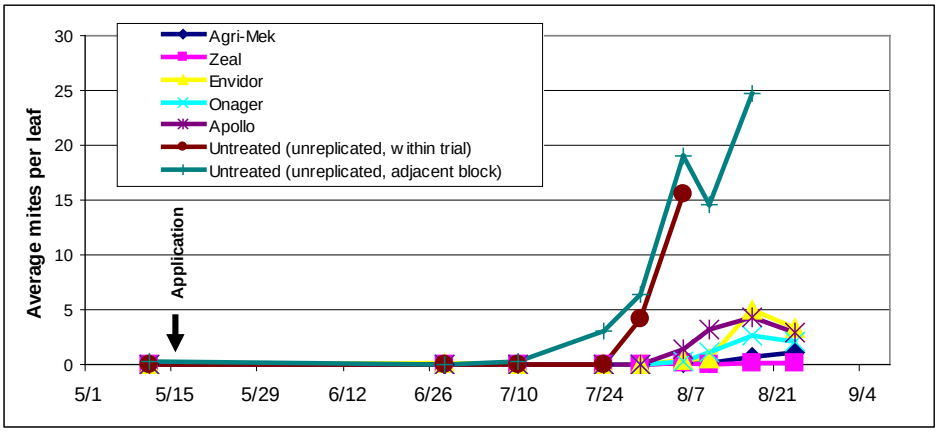
In general, all miticides performed very well compared to the unreplicated control plots and delayed the onset of spider mite infestations. As for a side-by-side comparison of miticide treatments, Zeal provided the best overall season-long control of spider mites that was numerically better than and statistically equivalent to that of Agri-Mek. Based on data in the trial, it is unlikely that plots treated with either of these products would have needed retreatment. Onager, Envidor, and Apollo also did well compared to the untreated check, but did not have as long a residual effect as Zeal or Agri-Mek, and required retreatment prior to harvest.

Table 1. The effects of miticide treatments on spider mite density in almonds, 2007

	Rate	13Aug	20Aug	27Aug	30Aug	Cumulative
Agri-mek[1]	10 fl oz	0.1a	0.1a	0.7ab	1.1ab	2.0ab
Apollo[3]	8 fl oz	1.4b	3.3b	4.3b	2.9b	12.0c
Envidor[2]	18 fl oz	0.4a	0.5a	5.0ab	3.4b	9.4c
Onager[2]	20 fl oz	0.2a	1.1a	2.7ab	2.1b	6.1bc
Zeal[1]	3 oz	0.1a	0.1a	0.2a	0.2a	0.6a
P		0.003	0.004	0.177	0.017	0.007

[1] Application included 1% 415 oil. [2] Application included 0.25% non-ionic surfactant.
[3] Application included 2 fl oz/100gal of an organosilicone surfactant.

Figure 1. The effects of miticide treatments on spider mite density in almonds, 2007.



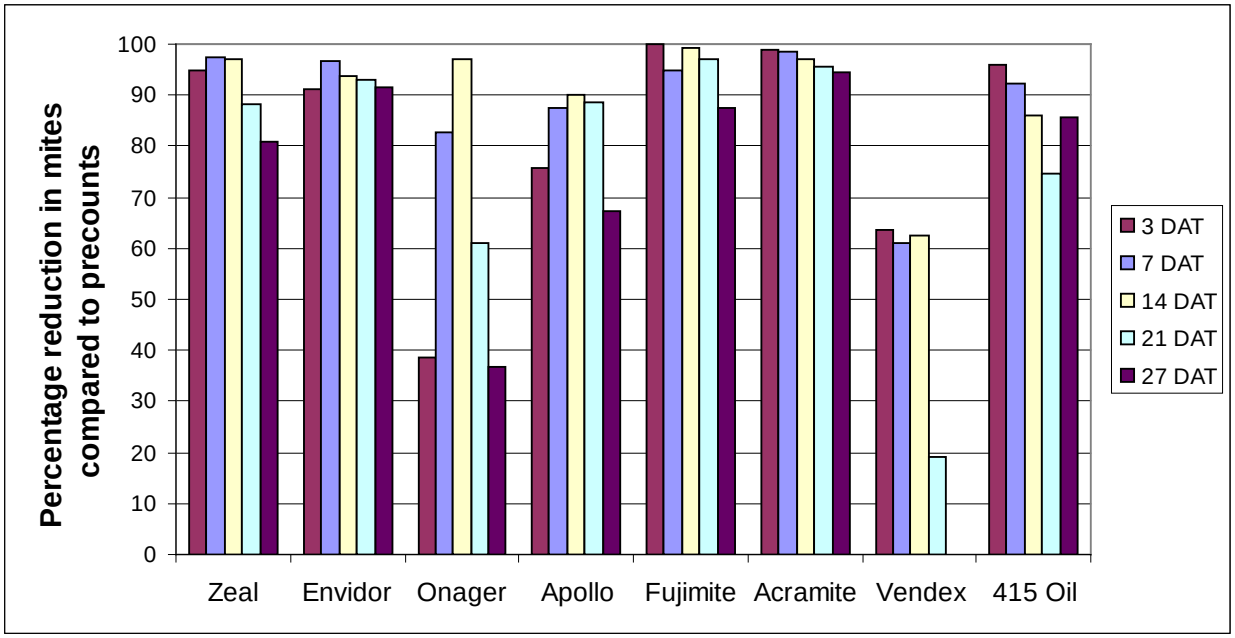
b. Hull Split Application Trial

In 2007 we conducted an 80-acre large scale miticide trial in Kern County at hull split. Each treatment was sprayed onto three, 2.5 acre plots on 3 August at 200 GPA with an air blast sprayer. Mite densities were evaluated 3, 7, 14, 21, and 27 DAT, after which the entire trial was oversprayed. The trial also had three plots that were sprayed with Agri-Mek on 17 May, and one untreated check.

Average precount mite densities were 7.0 mites per leaf. Mite densities in the unreplicated control block increased to 19.0, 14.6, and 24.7 mites per leaf 3, 7, and 14 DAT, respectively, after which they were oversprayed. Plots treated with Agri-mek in May never had mites develop in them throughout the duration of the trial.

All August miticide treatments resulted in significant reductions in mite densities compared to the precounts (Figure 2), with the greatest reductions coming from plots treated with Acramite, Fujimite and Envidor. However, due to the spotty nature of where mites showed up in the field, statistical comparisons of mite densities among treatments on any given evaluation date were not significant.

Figure 2. The effects of hull split miticide treatments on the percentage reduction in mite densities compared to precounts



c. Non-bearing almonds trial

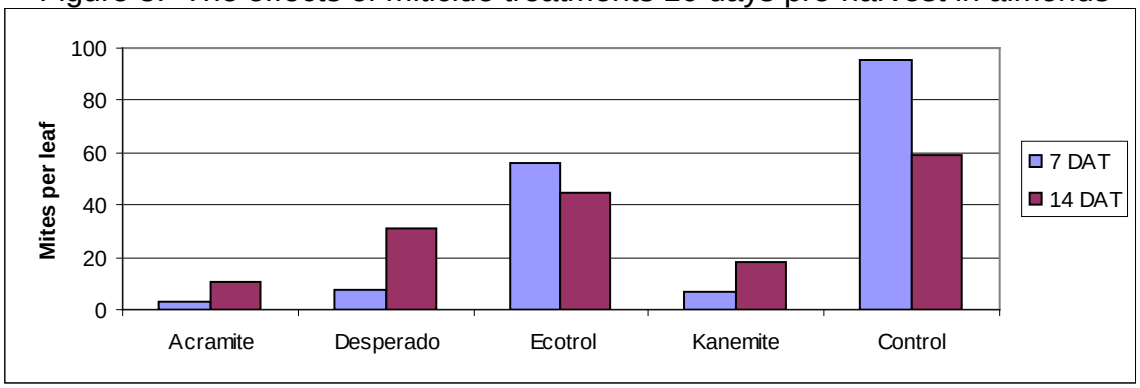
In July 2006 we conducted a large scale miticide trial in a two-year old, non-bearing block of almonds. We evaluated a total of nine treatments on replicated 2.1 acre plots. A report of this trial is included with the CD of 2006-7 reports to the Almond Board of California. In this trial, all miticides significantly reduced mite densities compared to the untreated check. Residual activity of miticides in this trial, as measured in the time it took for mite densities to return to treatable levels of 2 mites per leaf, was approximately 3 weeks for Acramite, Kanemite and Onager; 4 weeks for Ecotrol, Vendex and Zeal; 5 weeks for Envidor; and an undetermined amount in excess of 5 weeks for Fujimite and Omite.

d. Trial at a 7 day PHI

Sometimes despite one's best intentions, spider mite outbreaks can occur close to harvest when pre-harvest intervals severely limit management options. This trial was conducted to evaluate four miticides (Acramite, Desperado, Ecotrol and Kanemite) with a 7 day or less PHI for their ability to knock down mite densities under an outbreak situation close to harvest.

Ten days prior to harvest each of the four miticides was sprayed onto four, 0.7 acre plots. Mite densities at the time of application averaged 68 mites per leaf, and increased to 95.3 and 59.1 by 7 and 14 DAT. The decrease in mite densities in the control plots from 7 to 14 DAT was because all of the most heavily infested leaves had fallen to the ground. As for treatments, by 7 DAT Acramite, Desperado and Kanemite all reduced mite densities to below 10 per leaf (Figure 3). By 14 DAT only Acramite and Kanemite kept mite densities under 20 per leaf.

Figure 3. The effects of miticide treatments 10 days pre-harvest in almonds



Conclusions:

We are making considerable progress in determining the best way to utilize new miticides in management programs. Of all of the new miticides, we have identified Zeal as the best alternative to, or product to use in alternate rotations with, Agrimek during a traditional spring application timing. Envidor, Onager and Apollo also worked well at that timing. At hull split we have identified Fujimite as the best alternative to Omite, followed by Envidor. Zeal and Acramite also had excellent knock-down of mites at hull split but did have as long of a residual as Fujimite, Omite or Envidor. Similar results to those of our hull split trial were seen in our July nonbearing almond trial. Kanemite and Acramite provided the best knock-down of mites from products with a PHI of 7 or less days.

The next step in our research is to utilize information from all of the trials, and future trials, to determine how to make improvements to current management programs. For example, we plan to answer questions such as whether or not preventative Agrimek treatments are still the best management option in the spring, and whether or not we can utilize new miticides as effective alternatives to Omite. We will also utilize information from existing, and future miticide trials to develop the best possible approaches to resistance management for spider mites.