

# Evaluation of Miticides for Potential Use in Alfalfa Hay, 2004

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## Abstract

*Five treatments were applied at time of bale removal to evaluate several products for twospotted spider mite (Tetranychus urticae) management in alfalfa hay. Mite numbers were very high prior to this harvest and were assumed to be more than adequately present for this study. Data were obtained at six, fifteen and eighteen days post treatment. Data at six days after application documented that only Zeal™ and Trilogy® had fewer spider mites than the untreated check, but data also indicated that western flower thrips (Frankliniella occidentalis) were also probably present and feeding on mites. Western flower thrips were present in almost equal numbers as twospotted spider mites at fifteen days post treatment and mite numbers had decreased greatly from the previous sampling date. Mite numbers/stem were similar at eighteen days to that of fifteen days post treatment. Thrips predation was thought to obscure differences in spider mite populations resulting from treatments in this experiment, and therefore data from this experiment should be so noted when future treatment decisions are considered.*

## Introduction

Twospotted spider mites (*Tetranychus urticae*) have been locally problematic in recent years, especially on alfalfa hay using bedded production systems. Few miticides are registered for this crop, and currently the only registered products demonstrated to provide control of spider mites in alfalfa hay are Trilogy and a combination of Lorsban + Dimethoate. Both of these products are fairly slow (12+ days) to result in effective (85%+) control, with only about 67% reduction of spider mite populations compared with untreated alfalfa noted by five days post treatment (Rethwisch et al., 2004).

Previous local research trials had been initiated when regrowth was already several inches in height, but results may be different when treatments are applied earlier in the growth cycle after cutting, as greater/more uniform coverage may be expected. The effects of treatments when applied at time of bale removal had not previously been documented. This research was initiated to obtain information on the efficacy of some known miticides as well as comparing them with a recently registered alfalfa insecticides to ascertain if this product had any miticidal activity.

## Methods and Materials

Treatments were applied the morning of April 27, 2004, with a backpack CO<sub>2</sub> sprayer calibrated to deliver 18.8 gpa at 24.4 psi with a boom equipped with four T-Jet 8002EVS nozzles. Plots were 7 foot wide by 8 beds (26.67 ft) long, and alfalfa bales had just been removed from the field following the previous harvest. Treatments included the insecticide Steward®, Trilogy®, the miticide Zeal™, and Aza-Direct®.

Steward<sup>®</sup> (active ingredient = indoxacarb; DuPont) was used at a very high rate (11.3 oz/acre) as this chemistry has only been available for a few years on alfalfa hay in California and was not known to have miticidal activity. It was thought that if any activity did exist it would be most pronounced at this high rate.

Usage of Trilogy<sup>®</sup> (clarified neem oil; Certis USA) at 32 oz./acre in large strip plots had been documented to control spider mites in a 2003 experiment (Rethwisch et al., 2004). This treatment was included for comparisons with other unknown products as well as to further develop information about this product's activity on twospotted spider mites.

Two rates (36 and 48 oz./acre) of Aza-Direct<sup>®</sup> (active ingredient = azadiractin; Gowan Company) were included as this product is related to Trilogy<sup>®</sup> and may have similar activity to that noted for Trilogy<sup>®</sup> from the 2003 experiment (Rethwisch et al., 2004) but has not previously been locally evaluated for spider mite control in alfalfa hay. The Aza-Direct<sup>®</sup> label notes that it can be used against western flower thrips and mites, but did not have alfalfa listed as a specific crop site at initiation of this study.

Zeal<sup>™</sup> 72WDG (active ingredient = etoxazole, Valent USA) was used at 1.5 oz/acre. Previous experimentation with this unregistered product for alfalfa hay had resulted in excellent mite control in alfalfa (Rethwisch et al., 2003). Zeal<sup>™</sup> acts as a mite growth inhibitor so that eggs do not hatch and numbers of this life stage are usually much higher than the untreated check at about 7 days post treatment due to lack of eclosion. This product has potential for registration on alfalfa hay for spider mite control.

Samples for spider mite efficacy were obtained on May 3, 12 and 15 (six, 15 and 18 days post treatment). Sampling consisted of collecting 12 stems per bed (two stems per bed from the center six of the eight beds). Samples were obtained by cutting the stems at previous harvest level with a scissors. Stems were then transferred to gallon size plastic food storage bags. Bags were then sealed and returned to the laboratory where they were placed in a refrigerator cold enough (5°C) to halt spider mite development while not freezing the foliage or mites.

Stems were then examined using a dissecting microscope, and eggs, immatures and adult spider mites were counted and recorded for leaf material at each node. Numbers of western flower thrips present (both adults and nymphs) were also recorded for each stem examined from each of the last two sample dates. Mean numbers of eggs, immatures and adult spider mites as well as thrips per stem for each plot were then calculated. Means were then analyzed with Fisher's least significant difference (Statgraphics for Windows, Manugistics, Inc.) to determine if significant differences existed between the various treatments.

## Results

Spider mites were very prevalent in this field prior to cutting (approximately 7 days prior to treatment applications) with as many as 450 motiles recorded from a single stem, but populations at time of application were not obtained. Populations of spider mites were fairly high at six days post treatment but declined thereafter due to thrips predation. Thrips predation was thought to obscure differences in spider mite populations resulting from treatments in this experiment, and therefore data from this experiment should be so noted when future treatment decisions are considered.

### *Six days post treatment*

Zeal<sup>™</sup> and Trilogy<sup>®</sup> treatments resulted in numerically fewer spider mites than the untreated check at six days post treatment, with Zeal<sup>™</sup> treatments having the fewest of each life form (Table 1). Other miticide treatments resulted in numerically more total spider mites than the untreated check, and the higher rate (48 oz./acre) of Aza-Direct<sup>®</sup> did have numerically more spider mites than the lower (36 oz./acre) rate. Zeal<sup>™</sup> treatments did result in significantly fewer adult mites than the 48 oz./acre rate of Aza-Direct<sup>®</sup> and the Steward<sup>®</sup> treatment on this sample date, but not total mites.

Data noted for the treatments indicate that western flower thrips were probably present and feeding although presence and numbers of western flower thrips were not documented/recorded for alfalfa stems on this sample date. The data noted that fewest eggs per stem resulted from an application of Zeal<sup>™</sup>. This result was unexpected, as Zeal<sup>™</sup> affects egg hatch, with an accumulation of a large number of eggs noted at the first sample date in previous local research (Rethwisch, et al, 2003). In the current experiment Zeal<sup>™</sup> treated alfalfa had the fewest eggs at the first sample date,

rather than the most. More mites were also noted in the 48 oz./acre rate of Aza-Direct<sup>®</sup> than the 36 oz./acre rate of this product, which could also indicate that more thrips were present in the lower rate and fed upon mites. This product is labeled as a biological repellent and antifeedant and is labeled for usage against western flower thrips.

#### *Fifteen days post treatment*

Western flower thrips were very prevalent at 15 days post treatment (Table 2), with numbers/stem of these insects sometimes exceeding those of spider mites in the various treatments on this sample date. Average total mites in all plots declined from approximately 70/stem at 6 days post treatment to <5/stem at 15 days post treatment, thought due to predation by western flower thrips.

No significant differences for any life stage(s) of spider mites were noted due to treatments on this sample date. Fewest spider mites/stem (1.92) were noted in alfalfa treated with Trilogy<sup>®</sup> (Table 2) and this was the only treatment to have fewer spider mites than the untreated check. Aza-Direct<sup>®</sup> treated alfalfa did have more than twice as many total spider mites as the untreated check, but this may be due to potential effects of this chemistry on western flower thrips and interactions with twospotted spider mites as total spider mites/stem for the two rates of this product were almost identical.

#### *Eighteen days post treatment*

Mite numbers at 18 days post treatment (Table 3) were similar and yet lower than noted three days earlier. Western flower thrips presence was almost non-existent on this date however, with no western flower thrips noted from most samples which may explain why numbers of spider mite eggs/stem increased for the untreated check from 2.0/stem at 15 days post treatment to 2.23/stem on this sample date. Significant differences in spider mite eggs/stem were noted for alfalfa treated with Zeal<sup>™</sup> (0.125 eggs/stem) and the high (48 oz./acre) rate of Aza-Direct<sup>®</sup> (3.73 eggs/stem), although no treatment resulted in significant differences when either was compared with the untreated check. This was also noted for immatures/stem as well as total mites/stem. Significant differences for adult mites/stem were noted between Zeal<sup>™</sup> and low rate (36 oz./acre) of Aza-Direct<sup>®</sup> on this sample date, but not the 48 oz./acre treatment of Aza-Direct<sup>®</sup>.

Alfalfa treated with Zeal<sup>™</sup> had the fewest overall mites at this sample date (0.17/stem), followed by Trilogy<sup>®</sup> (2.44/stem) Highest numbers of spider mites were noted in both Aza-Direct treatments, again thought due to prior interactions of this product with western flower thrips.

## **Literature Cited**

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**Table 1. Mean spider mite life forms/alfalfa stem at six days post treatment**

<u>Treatment and rate/acre</u>	<u>Eggs</u>	<u>Immatures</u>	<u>Adults</u>	<u>Motiles</u>	<u>Total Mites</u>
Aza-Direct® @ 36 oz	60.2a	2.85a	6.79ab	9.64ab	69.83a
Aza-Direct® @ 48 oz	69.0a	3.42a	8.42 b	11.83 b	80.85a
Steward® 1.25 SC @ 11.3 oz	74.8a	2.69a	8.27 b	10.96ab	85.71a
Trilogy® @ 32 oz	48.9a	3.04a	5.08ab	8.12ab	57.08a
Zeal™ 72WDG @ 1.5 oz	38.3a	1.48a	2.91a	4.39a	42.69a
Untreated check	59.0a	3.25a	5.83ab	9.08ab	68.13a

Means in columns followed by the same letter are not significantly different at the  $p \leq 0.05$  level (Fisher's LSD test).

**Table 2. Mean spider mite life forms and western flower thrips/alfalfa stem fifteen days post treatment.**

<u>Treatment and rate/acre</u>	<u>Eggs</u>	<u>Immatures</u>	<u>Adults</u>	<u>Motiles</u>	<u>Total Mites</u>	<u>Thrips</u>
Aza-Direct® @ 36 oz	4.23a	0.57a	0.57a	1.13a	5.36a	2.11a
Aza-Direct® @ 48 oz	4.23a	0.58a	0.44a	1.02a	5.25a	1.97a
Steward® 1.25 SC @ 11.3 oz	2.29a	0.19a	0.52a	0.71a	3.00a	2.66a
Trilogy® @ 32 oz	1.64a	0.02a	0.25a	0.27a	1.92a	2.36a
Zeal™ 72WDG @ 1.5 oz	1.96a	0.33a	0.21a	0.54a	2.50a	1.42a
Untreated check	2.00a	0.06a	0.39a	0.46a	2.46a	2.08a

Means in columns followed by the same letter are not significantly different at the  $p \leq 0.05$  level (Fisher's LSD test).

**Table 3. Mean spider mite life forms and western flower thrips/alfalfa stem at eighteen days post treatment.**

<u>Treatment and rate/acre</u>	<u>Eggs</u>	<u>Immatures</u>	<u>Adults</u>	<u>Motiles</u>	<u>Total Mites</u>
Aza-Direct® @ 36 oz	2.56ab	0.33ab	1.35 b	1.60a	4.17ab
Aza-Direct® @ 48 oz	3.73 b	0.25 b	0.81ab	1.60a	5.32 b
Steward® 1.25 SC @ 11.3 oz	1.83ab	0.33ab	0.33ab	0.67a	2.50ab
Trilogy® @ 32 oz	2.04ab	0.25ab	0.14ab	0.39a	2.44ab
Zeal™ 72WDG @ 1.5 oz	0.125a	0.00a	0.04a	0.04a	0.17a
Untreated check	2.23ab	0.25ab	0.39ab	0.64a	2.87ab

Means in columns followed by the same letter are not significantly different at the  $p \leq 0.05$  level (Fisher's LSD test).