Arthropod Management in the lower San Joaquin Valley

(NOW mating disruption, sixspotted thrips for mite control, miticides)

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Navel orangeworm mating disruption

- During 2017 we conducted a navel orangeworm (NOW) mating disruption (MD) trial.
- Four MD products were evaluated compared to a non-MD check (Fig. 1).
- Plot size was 40 acres.
- The trial was replicated in three Kern County orchards (Wasco, Maricopa, and Buttonwillow).
- All four MD products reduced male captures by greater than 90% (Figs. 2-4).
- All four MD products reduced NOW kernel damage by 41-50% (Average 46%) (Fig. 5).
- MD reduced damage by 66.4% (Buttonwillow), 44.2% (Maricopa) and 18.8% (Wasco).

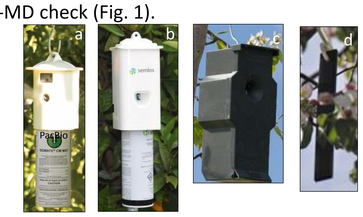

Fig. 1. MD dispensers from a) Pacific Biocontrol, b) Semios, c) Suterra, and d) Trécé (not registered).

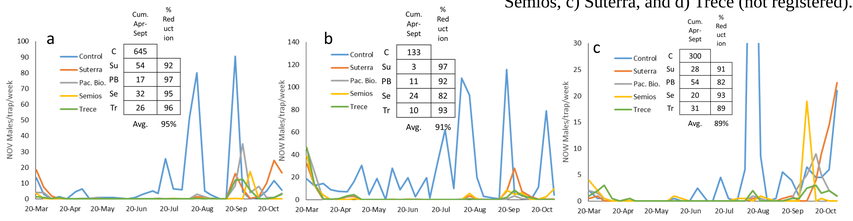

Fig. 2-4. The effects of MD products on male captures in pheromone traps in a) Buttonwillow b) Maricopa c) Wasco.

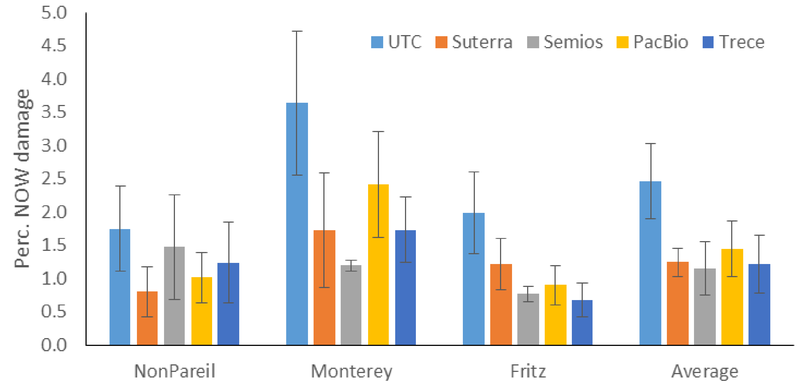

Fig. 5. The effects of four NOW MD products compared to an untreated check on three almond varieties.

Economics

- Across all four products, average grower returns were increased by $106-$125 per acre.
- Across all three sites, increases in grower returns of $158 (Buttonwillow), $154 (Maricopa) and $25 (Wasco).

	Per-acre returns	$ difference/ ac
No MD	$7,275	
Suterra	$7,400	+$125
Semios	$7,385	+$110
Pac. Bio.	$7,385	+$110
Trécé	$7,381	+$106

[1] Reductions based on the average of the four mating disruption products
[2] Value based on estimated price of $2.50/lb with yields from Nonpareil (1500lb/ac), Monterey (750lb/ac) and Fritz (750lb/ac) using a Blue Diamond Schedule for quality premiums.

Other Economic Values of Mating Disruption to Consider

- Reduction of aflatoxins
- Benefit likely increased in larger plots
- No treatment timings, PHIs, REIs or residues
- Setup and takedown occur when labor is available
- Value of being 'green' and 'sustainable' when marketing almonds
- Reduced risk of NOW resistance to limited insecticide tools (Intrepid, Altacor, pyrethroids)
- Year over year benefit (post-harvest mating disruption)
- Cost-benefit ratios would be higher in higher-pressure orchard situations
- Additional premiums possible (such as premiums for in-shell deliveries)

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Miticides for Pacific spider mites

- During 2017 we evaluated eleven different miticides when applied with 1% 415 oil for their impacts on spider mite density in Shafter, Kern County.
  - Plots treated miticides reduced mite densities by 48-95% respectively compared to the untreated check 14 DAT.
  - The trial ended 21 DAT when sixspotted thrips reduced mites to <0.1 per leaf.

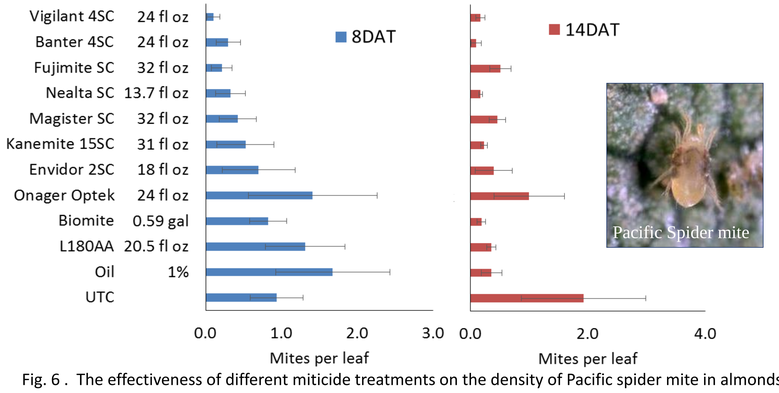

Fig. 6 . The effectiveness of different miticide treatments on the density of Pacific spider mite in almonds.

Sticky card monitoring for beneficials

- ***Trial 1: Color Study*** During 2017 we evaluated nine different color sticky cards for monitoring sixspotted thrips and other beneficials at two sites (Wasco and Lost Hills, Kern County) and replicated four times (Fig. 7-8).
  - All cards were cut to 3" x 6" in size to remove size differences.
  - Average trap counts ranged from 3 to 475 sixspotted thrips per week.
  - The yellow strip, small yellow, or green cards were all effective in capturing sixspotted thrips and spider mite destroyer beetles.
  - The green card was also effective, but is difficult to use.

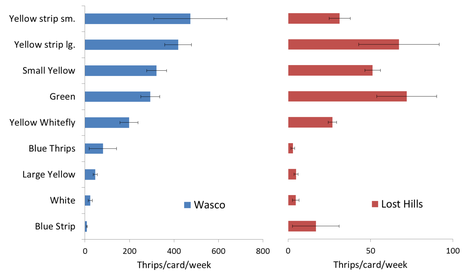

Fig. 7. Sixspotted thrips densities in Wasco and Lost Hills.

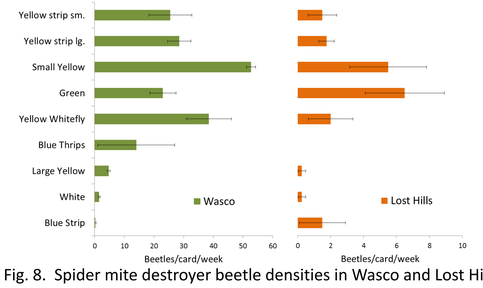

Fig. 8. Spider mite destroyer beetle densities in Wasco and Lost Hills.

Research Almond Orchard

We maintain a 7-acre almond orchard in Shafter, CA with partial support from the Almond Board of California. Between the years of 2010 and 2017 this orchard and a sister orchard in Fresno County (that in 2015 was repurposed for non-pest management research) were used for a total of 65 different field experiments on pest of almonds.

Sticky card monitoring for beneficials

- ***Trial 2: Size Study*** During 2017 we evaluated five different sizes of the yellow strip card for monitoring sixspotted thrips and other beneficials in Wasco and Lost Hills, Kern County (Fig. 9-10).
  - Size of traps were a full size yellow strip card (72 in^2), then cut in half, fourth, eighth, and sixteenth replicated four times at two sites.
  - Sixspotted thrips captures are directly proportional to size. Other than direct surface area there is no additional disadvantage of being smaller nor additional disadvantage of being larger (Fig. 9.)
  - Spider mite destroyer beetles followed a similar pattern of captures as sixspotted thrips (Fig. 10).
  - A 3" x 5" to 4" x 6" card is adequate for monitoring for sixspotted thrips and spider mite destroyer beetles.
  - The yellow strip sold by Great Lakes IPM range from $0.24-0.35/card and small yellow sold by Alpha Scents cost $0.96/card.

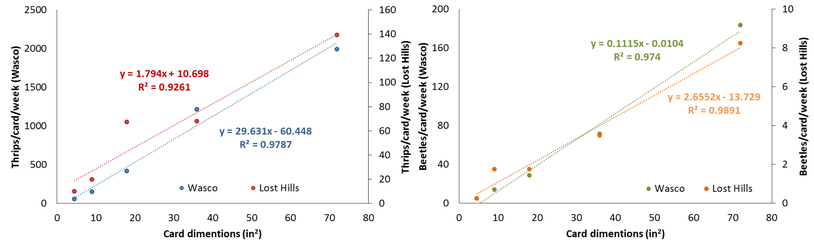

Fig. 9-10. Effects of card size on the capture rates of sixspotted thrips and spider mite destroyer beetles.

Sixspotted thrips Phenology

- During 2017 we monitored sixspotted thrips populations throughout the season.
- Sixspotted thrips were present in all three orchards from mid-April until mid-May with peaks around May 1st.
- Thrips provided 100% control of early-season spider mites.
- In all three orchard comparisons, application of abamectin negatively impacted thrips density (Fig. 11).
- Growers should avoid May sprays unless a threshold is reached and monitoring has shown that thrips are not present.
- At all three sites mites reappeared and increased exponentially in July. Two weeks after mite increases sixspotted thrips increased exponentially at all three sites.
- Thrips completely controlled spider mites at two sites. One miticide was applied at the third site (Fig. 12-13).
- During this period, sixspotted thrips population doubled every 3.4 days compared to 7.4 days for spider mites.

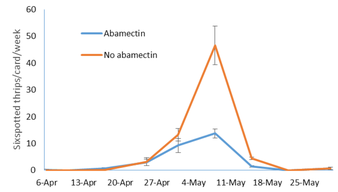

Fig. 11. The effects of abamectin on thrips.

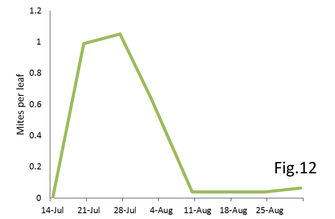

Fig.12

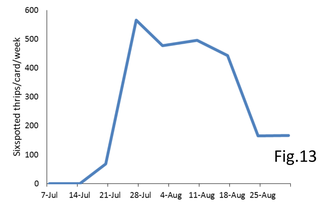

Fig.13

Fig. 12. Spider mite increases at hull split compared to the biocontrol response two weeks later by sixspotted thrips (Fig. 13).

Acknowledgements

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