



# Pacific Spider Mite, Navel Orangeworm and Leaf-footed Bug Control in the lower San Joaquin Valley



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## Pacific Spider Mite

**Introduction** Spider mites are a significant pest of almonds, especially late in the season during hot, dry weather. During 2013, 2014 and 2015 we conducted miticide trials to evaluate the effectiveness of registered and experimental miticides for use in California

almonds. All trials were done in Kern County using replicated 3-tree plots. Data were evaluated at least weekly for the number of motile mites per leaf and data were converted into cumulative mite-days to simplify charts used on this poster.

- **Industry standards-** Acramite, Envirdor, Fujimite 5EC, Onager, Vigilant and Zeal all provided significant reductions in mite density for at least 3 weeks.
- **Banter (bifenazate)** is a generic form of Acramite and Vigilant. Banter 4SC performed significantly equivalent to Vigilant. Banter 50WG was significantly lower than Acramite, however, this could be due to low mite pressure in 2015, so more trials with this product need to be conducted.
- **Fujimite XLO** is a new low-odor version of Fujimite and **Miteus** is a low-odor and low VOC formulation that is similar to the fenpyroximate product Nichino will make available to growers in the upcoming season. The new formulation performed statistically equivalent to the old formulation.
- **Magister (fenazaquin)** is a new METI I contact acaricide with the same mode of action (MoA) as Fujimite. It provided excellent control of mites for at least 3 weeks in 2013 and 2015 trials but is not yet registered for almonds.
- **Nealta (cyflumetofen)** is a new METI II acaricide that is a new MoA for miticides. It provided excellent mite control in 2013-2015 trials (Fig. 1,2).

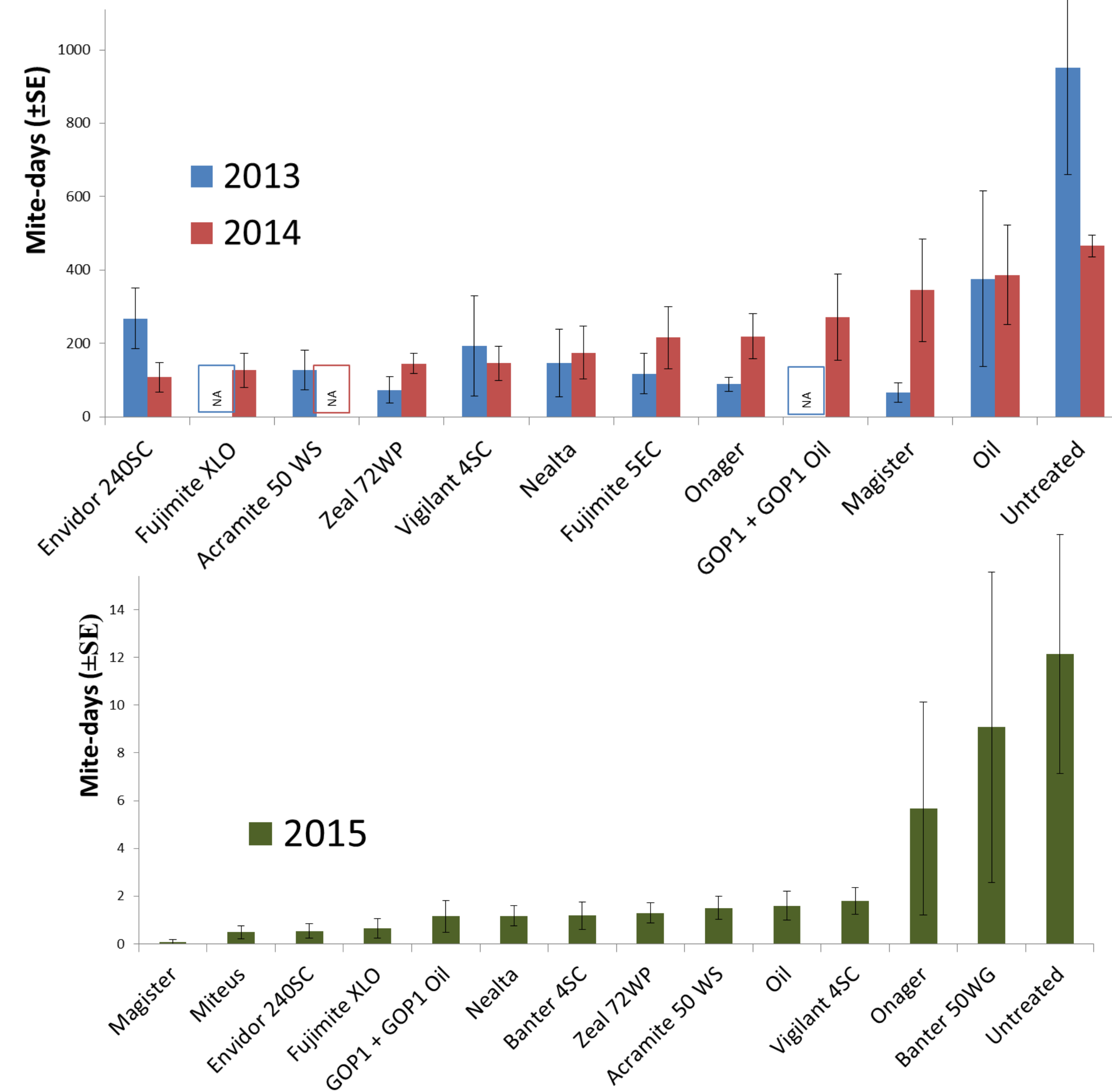


Fig 1 & 2 . The effectiveness of different miticide treatments on the density of Pacific spider mite in almonds.

## Monitoring for spider mite predators with herbivore-induced plant volatiles (HIPVs)

**Introduction** During 2014-15 we evaluated herbivore-induced plant volatiles (HIPVs) for potential use as lures for beneficial organisms that attack spider mites. The three HIPVs we chose (methyl salicylate, geraniol, and phenyl ethanol) are all known to be volatile compounds that trees release into the air when attacked by herbivores.

For our project we placed the three HIPVs individually, as well as in combination with each other, on yellow sticky cards and monitored them weekly for five weeks. Traps were placed at a spacing of 5 Trees apart and 4 Rows apart with five reps of each treatment and an untreated check (cards with no lures). On each card we counted the number of sixspotted thrips, mite destroyer beetles, minute pirate bugs, and lacewings.

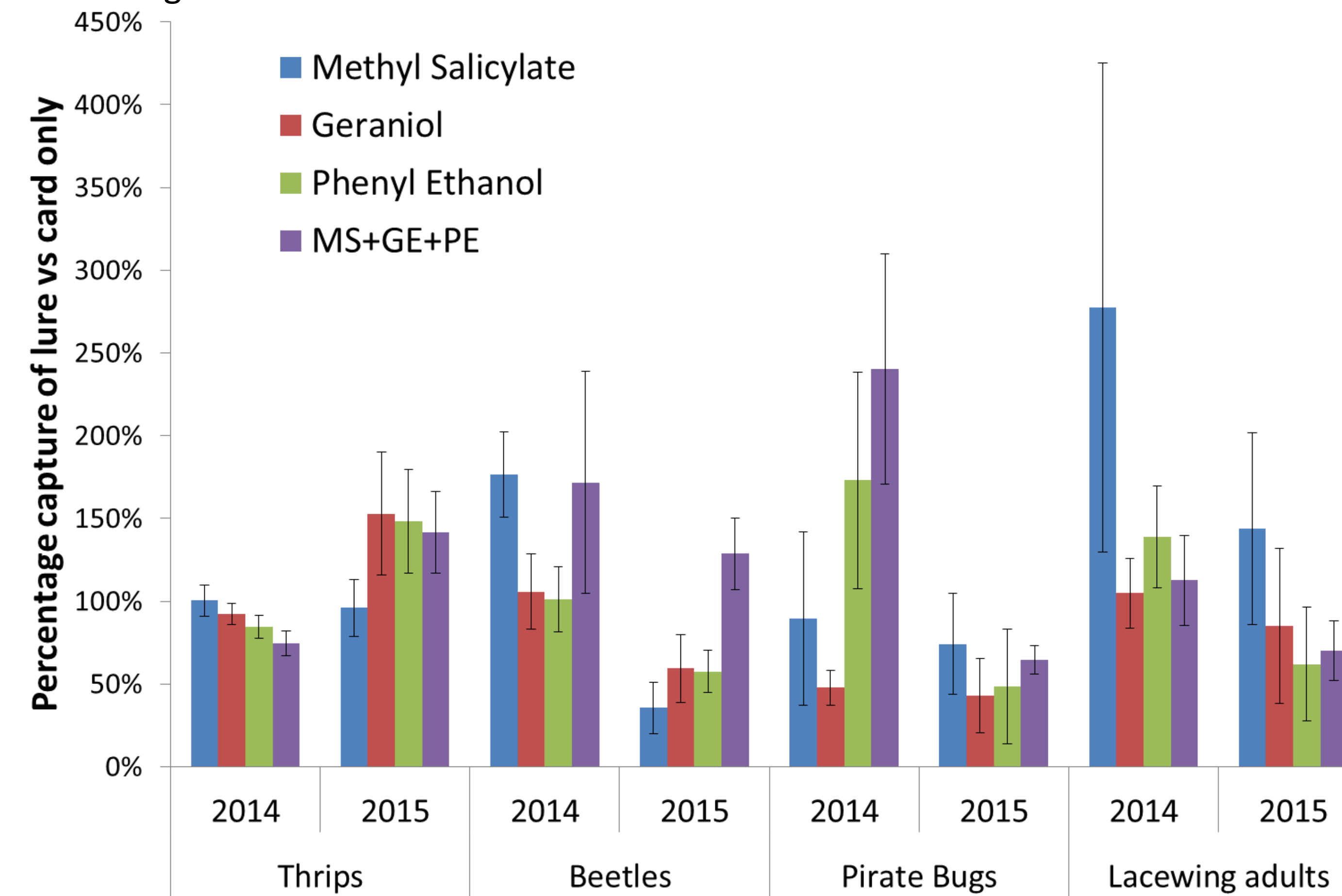


Fig 3. The percentage capture of six-spotted thrips, spider mite destroyer, beetles, pirate bugs, and lacewing adults with three herbivore-induced plant volatiles (HIPVs) and a combo of all three vs. card only captures in almonds.

**Results and Conclusions** During both years of the study we captured large numbers of beneficials (especially thrips), but evaluation of data did not result in any significant differences among treatments. These data are shown in Fig. 3 as percentage captures on cards with lures compared to the same cards without the lures, and in Fig. 4-5 as the average number of thrips predators caught each week on individual cards.

However, we found it interesting that the number of beneficials caught on all cards was very high. In the case of sixspotted thrips, yellow sticky cards (even without lures) averaged over 150 thrips per card during each week of the study. In both years these numbers, in combination with other beneficials (about 10 per card per week) were sufficient to provide complete mite control within this almond orchard without miticides after trees on the orchard edge started to become webbed over. Based on this observation we consider it possible that all of the lures placed in the field caused a large influx of sixspotted thrips, but that the yellow sticky cards were too close together to make a proper comparison of which lures were, and were not, attracting the thrips. During 2016 we plan on evaluating this hypothesis by repeating our experiments on a much larger scale to determine if the abundance of beneficials on the cards occurred naturally, or if it was related to a regional effect of all of the HIPV lures placed in the orchard.

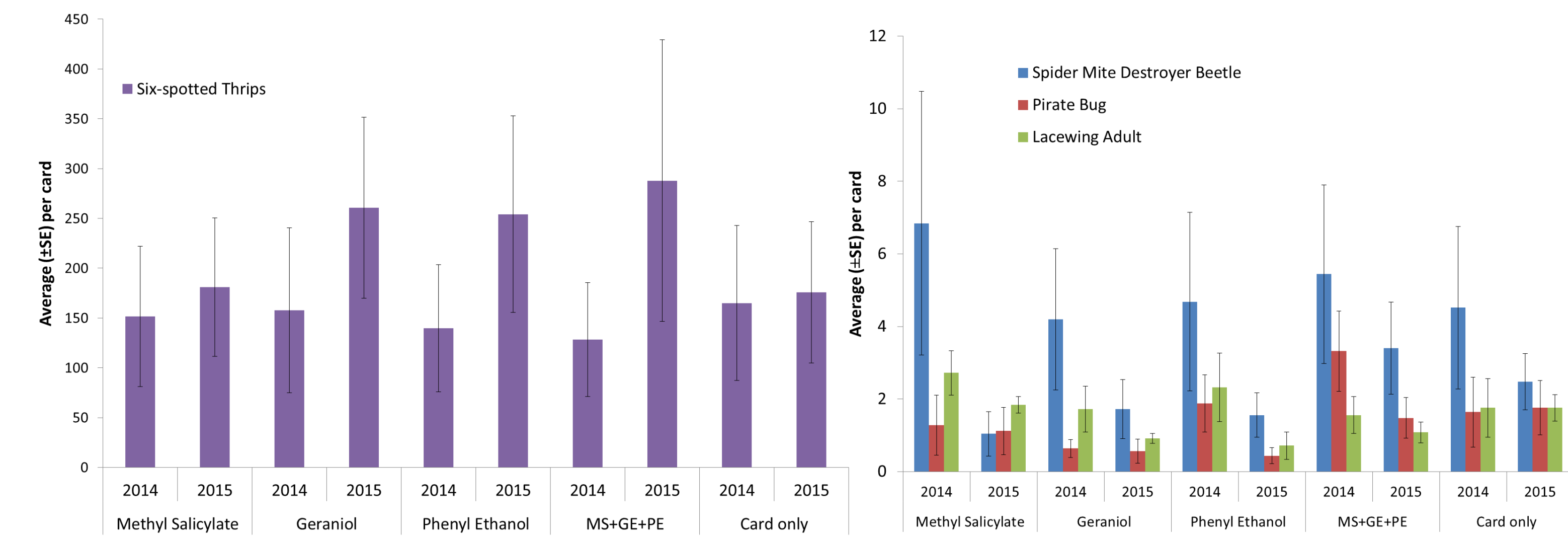


Fig 4 & 5 . The average number of predators (thrips, beetle, pirate bug & lacewing) per card captured with three herbivore-induced plant volatiles (HIPVs), a combo of all three and a card only in almonds.

## Insecticides for Navel Orangeworm

**Introduction** Navel orangeworm (NOW) is the most important pest of almonds in California due to its direct impact on the kernel and relationship with aflatoxins. Growers typically manage NOW through a combination of winter sanitation and one or more insecticide applications. Our trials evaluated 7 insecticides for their effects on NOW damage at harvest when trees were sprayed at hull split (27 Jun 2014), two weeks later (11 Jul 2014), or at both timings.

Table 1. The effects of larvicides on kernel damage by NOW.

Treatment	Mean kernel damage by NOW (%) Harvested on 1 August 2014			
	Rate	27 June application	11 July application	27 Jun & 11 Jul application
Altacor WG	4 oz	17.2	21.0	18.4
Intrepid 2F	16 fl oz	17.0	21.8	16.0
Intrepid Edge	12 fl oz	13.8	20.6	14.8
Belt SC	4 fl oz	17.4	22.6	16.8
Exirel 10SE	20.5 fl oz	19.3	20.4	20.7
Delegate WG	6.4 oz	15.2	12.5	14.5
Proclaim	4.5 oz	22.7	18.6	20.6
Untreated	-	19.7	21.0	25.7
	F=	0.59	0.68	1.58
	P=	0.7607	0.6890	0.1688

reduced damage numerically but not significantly compared to the untreated check (Table 1). Due to a lack of significant differences in our 2014 trial we repeated the study during 2015. Nuts from that trial are currently in storage and are being processed throughout the winter.

## Leaf-footed Bug

**Introduction** During 2014 we conducted a trial to evaluate the effects of 10 different insecticide residues on leaf-footed bug, *Leptoglossus zonatus* (Dallas). We continue to do extension work of those results that showed that the pyrethroids bifenthrin and lambda-cyhalothrin have excellent contact activity and residual control for two to four weeks. Chlorpyrifos also has excellent contact activity and residual effects of one week. Three reduced-risk insecticides containing abamectin, sulfoxaflor and clothianidin provided moderate to excellent activity when sprayed directly on the bugs, but did not have any effects on bugs placed on leaves once the residues had dried.

