Section III
Biological & Cultural Control

RECRUITING NATURAL ENEMIES WITH METHYL SALICYLATE IN STRAWBERRY

Jana Lee
USDA ARS HCRL
3420 NW Orchard Ave
Corvallis, OR 97330

Herbivory induces plants to produce signaling volatiles. Methyl salicylate (MeSA) is commonly released from infested crops and is attractive to predators (DeBoer & Dicke 2004). In grape and hop fields, the application of synthetic MeSA has increased the abundance of predators and parasitoids (James and Price 2004). Application of MeSA can potentially prevent aphid and spider mite outbreaks in strawberry fields since MeSA attracts a variety of foliar predators. The impact on ground dwelling predators and the optimum distance and timing of MeSA application in the field are not well known.

Objectives

1. Determine if MeSA affects ground dwelling predators
2. Determine if synthetic MeSA lures can increase foliar natural enemy (NE) abundance, and can reduce pest abundance
3. Determine the effects of MeSA spatially and temporally

Methods

Control and MeSA plots were embedded in a large strawberry field. In MeSA plots, one 30 d Predalure® (AgBio Inc.) dispenser was hung at the center, 1.5ft aboveground, and another at ground level. The effect on ground dwelling predators was monitored by pitfall traps, and the effect on foliar insects by white sticky traps and visual inspection of strawberry leaves. To determine spatial trends, pitfall and sticky traps were set up at the point source, 5 and 10 m away, and ten leaf samples were taken at 1, 5, and 10 m radius from the point source. Six collections made over a month described temporal trends. Centers of each plot were spaced 100 m apart to minimize volatile overlap. Previous tests with various volatiles including MeSA have reported differences from the unbaited control when bait stations were 15 m apart (James 2005).

Does MeSA affect ground dwelling predators?

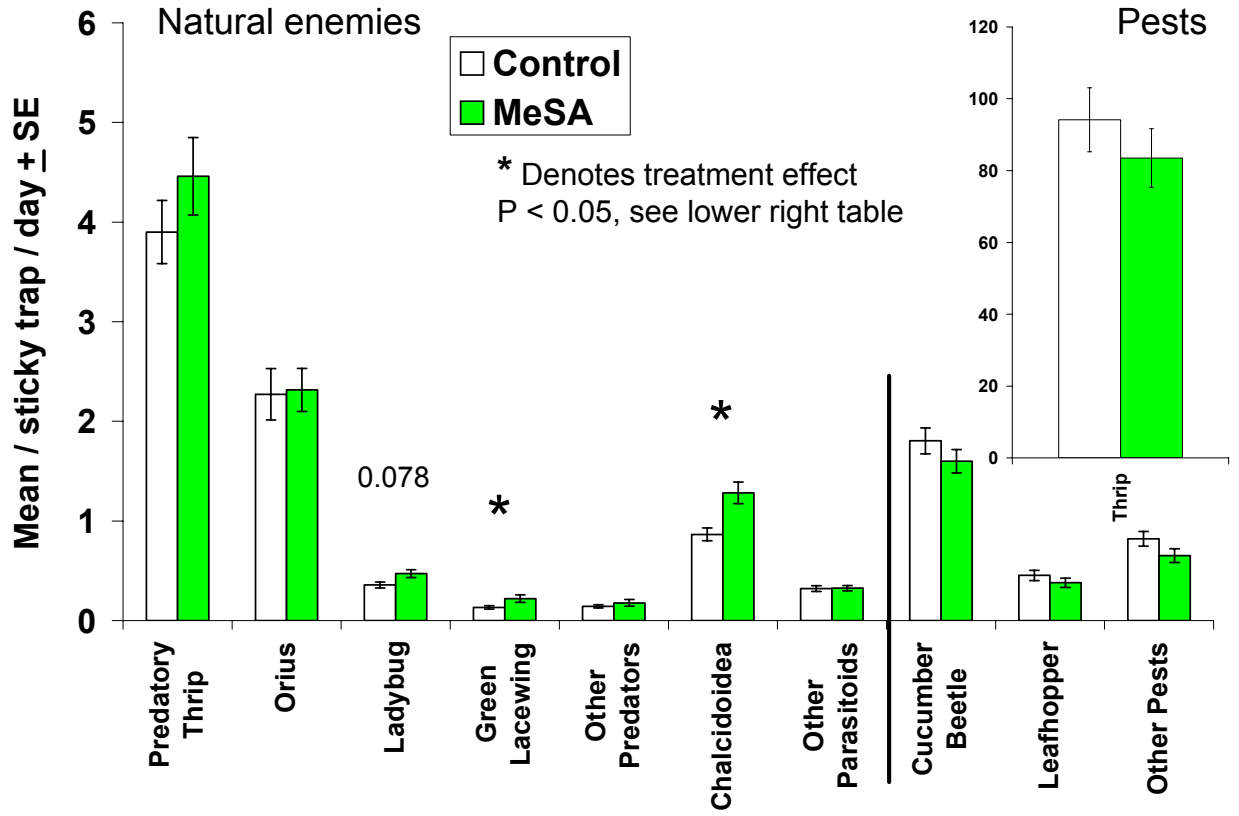
Pitfall captures were similar for most groups, including the dominant carabid. Other carabid species were slightly higher in MeSA than control plots. Additional testing when other carabids are more active is needed.

Mean captures / pitfall trap / day ± SE

	P. melanarius	Other carabids	Spiders	Daddy long legs
Control	17.6 ± 1.0	0.15 ± 0.018	0.32 + 0.044	0.21 ± 0.031
MeSA	17.4 ± 1.1	0.19 ± 0.022	0.31 ± 0.047	0.26 ± 0.035

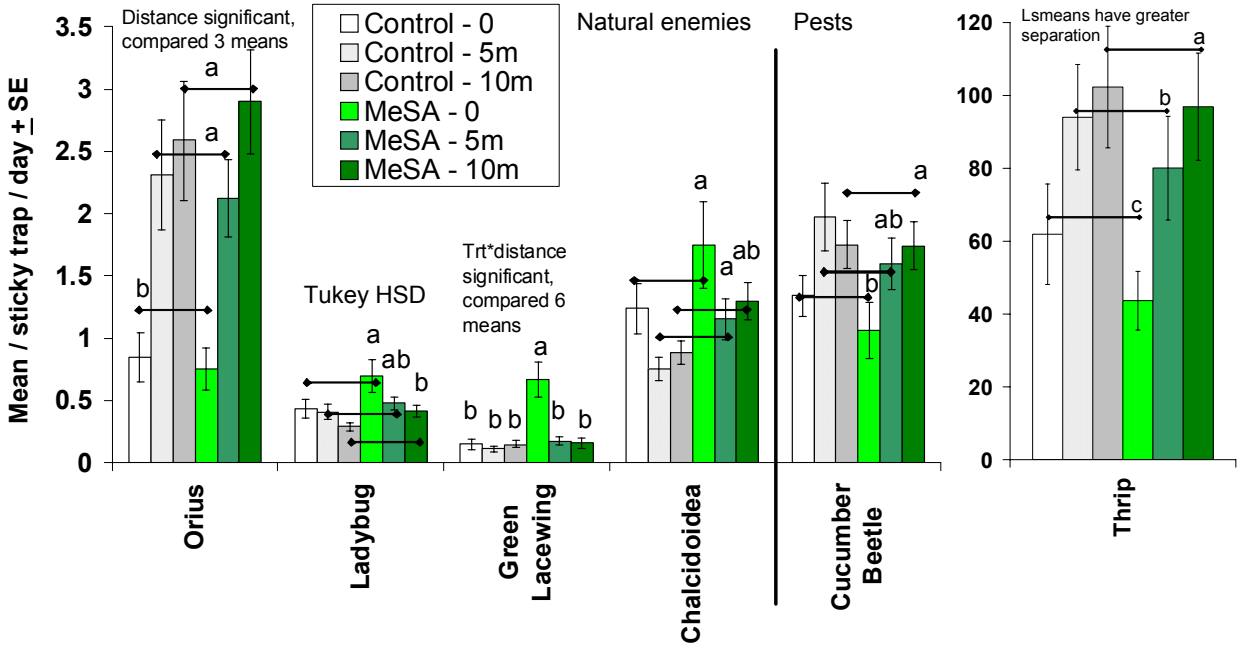
Does MeSA affect foliar NE / pests in the field?

In MeSA plots, marginally more ladybugs, 2X more green lacewings, and 45% more Chalcidoidea were captured from sticky traps (graph below), and 2-4X more total NE were observed on leaf samples. Pests were found in similar numbers from sticky traps and leaf samples.



What about spatial trends?

In sticky traps treatment*distant interactions affected green lacewings. More lacewings were captured at the point source of MeSA than at other stations (graph below). More ladybugs and Chalcidoidea were captured at the center, regardless of treatment, whereas fewer *Orius*, cucumber beetles, and pest thrips were captured at the center. Reasons for these trends are unknown; no significant edge effect was expected since all plots were embedded in a larger field.



What about temporal trends?
Differences in natural enemies captured on sticky cards appeared around 3-24 days after MeSA was placed in the field. Captures from 0-3 and 24-31 days were not different. In the beginning, a few days were possibly needed for MeSA dispensers to induce surrounding plants. Towards the end, volatiles may have overlapped across the field or plants may have acclimated to these signals.

Number of natural enemies observed directly on strawberry leaves was 2-4X greater in MeSA than control plots on days 14 and 17, and the reverse trend on day 28. While the number of pests on leaves was not significantly affected by treatment, pest abundance appeared somewhat lower in MeSA plots on days 17 and 21.

References
DeBoer J, Dicke M. 2004. The role of methyl salicylate in prey searching behavior of the predatory mite *P. persimilis*. J Chem Ecol 30: 255-271.
James DG, Price TS. 2004. Field-testing of methyl salicylate for recruitment and retention of beneficial insects in grapes and hops. J Chem Ecol 30: 1613-1628
James DG. 2005. Further field evaluation of synthetic herbivore-induced plant volatiles as attractants for beneficial insects. J Chem Ecol 31: 481-495.