Evaluation of systemic and foliar insecticides for asparagus miner control

The asparagus miner (*Ophiomyia simplex* Loew; Diptera: Agromyzidae) is a putative vector for pathogenic species of *Fusarium* fungus, which is the causative agent for "early decline syndrome" in asparagus fields. *Fusarium* can decrease the life span of an asparagus field by 5-8 years, making it economically unsustainable to continue production. So, it's important to explore options for controlling the asparagus miner.

METHODS

On 16 April 2012, the MSU vegetable entomology lab planted a new experimental asparagus field in Hart, MI. 'Millenium' crowns were planted 7 inches apart into 20-foot long rows with 5 feet row spacing. Treatment plots consisted of a single 20-foot row and treatments were separated from each other by a single buffer row. This design allowed for 10 treatments, each replicated four times.

On 22 May 2012, subsoil drip irrigation lines were installed just slightly offset from the asparagus row. Drip lines originated at the north end of the plot and were crisscrossed between blocks to allow only one line for each treatment (ie., the same line runs through all four replications). At the beginning of each drip line is an injection port for applying insecticides. These individual injection ports allowed for quick application of insecticides and prevented backflow/intermixing of chemicals into the main irrigation line, and thus, into other plots.

Nine insecticide treatments and two application methods (chemigation through drip irrigation and foliar spray) were tested (Table 1). The same insecticide applications were made in 2013 as in 2012, and the same treatment arrangement was kept between the two years, to avoid confounding effects. None of the insecticides used in this trial are currently registered for use on asparagus. Drip treatments were applied twice during the season, on 14 May (first generation) and 20 August (second generation). A red dye was used to indicate when the compound had completely moved through the lines. The irrigation was turned on 30 min before and turned off 2 hours after the drip treatments were applied. The first foliar applications of Movento were made on 4 June, with a second application required 7 days later for one treatment and 14 days later for the other treatment. Foliar treatments were applied using a single-nozzle hand-held boom at 30 gallons/acre and 30 psi. The adjuvant Dyne-Amic was applied with Movento at a rate of 0.5% v/v.

Sampling for asparagus miner was conducted weekly by visually surveying and counting the total number of stems per plot and number of damaged stems per plot. Sampling started as soon as damage caused by asparagus miner larvae became first visible on the stems (in 2013, this was about a month after the drip application). The percent number of damaged stems was arcsine transformed prior to statistical analysis. Analysis of variance was used for data analysis and ad-hoc Tukey means separation was used to compare treatment means ($P < 0.05$).

RESULTS

The two Movento 240 SC treatments did not significantly reduce the percent number of damaged stems, compared to the untreated control. In 2010 and 2011, data suggested that Movento might be used to suppress asparagus miner damage early in the season, but both 2012 and 2013 data showed otherwise. Two different surfactants were tested with Movento: MSO (2012) and Dyne-Amic (2010, 2011, 2013).

Among the seven drip treatments, Platinum performed the best and consistently reduced the percent number of damaged stems, compared to the untreated control (Fig. 1). On June 18, visible signs of miner damage were relatively low across treatments and there were no significant differences among the treatments. On June 25, all of the drip insecticide treated plots had significantly less damage than the two Movento treatments and the untreated control. On July 2, only the Platinum treatment was significantly less damaged than the untreated control, all other treatments were not significantly different from the control. On July 9, Platinum and Durivo were the only two treatments that significantly reduced the percent damaged stems relative to the untreated control. On July 16, none of the insecticide treated plots were significantly different from the untreated control. Overall, asparagus miner damage was reduced from 50% in the control plots to about 30% in Platinum treated plots. The longevity of the Platinum in the asparagus stems was about 8 weeks.

Future work will focus on improving the timing of delivery of active ingredients through soil/drip application into the asparagus stem.

Table 1. Treatment list with application modes, rates, and dates for asparagus trial conducted in Hart, MI, summer 2012 and 2013.

Treatment	Insecticide class	Application mode	Rate	Application dates
Scorpion 35 SL	neonicotinoid	drip	10.5 fl oz./A	14 May, 20 August
Scorpion 35 SL	neonicotinoid	drip	13 fl oz./A	14 May, 20 August
Durivo	neonicotinoid + ryanodine receptor modulator	drip	13 fl oz./A	14 May, 20 August
Platinum 75 SG	neonicotinoid	drip	5.67 oz/A	14 May, 20 August
Coragen	ryanodine receptor modulator	drip	7.5 fl oz./A	14 May, 20 August
Admire Pro	neonicotinoid	drip	10.5 fl oz./A	14 May, 20 August
Admire Pro	neonicotinoid	drip	14 fl oz/A	14 May, 20 August
Movento 240 SC + Dyne-Amic	acetyl CoA carboxylase inhibitor + adjuvant	foliar	8.0 fl oz./A + 0.5% v/v	4 & 10 June
Movento 240 SC + Dyne-Amic	acetyl CoA carboxylase inhibitor + adjuvant	foliar	8.0 fl oz./A + 0.5% v/v	4 & 18 June
Untreated				

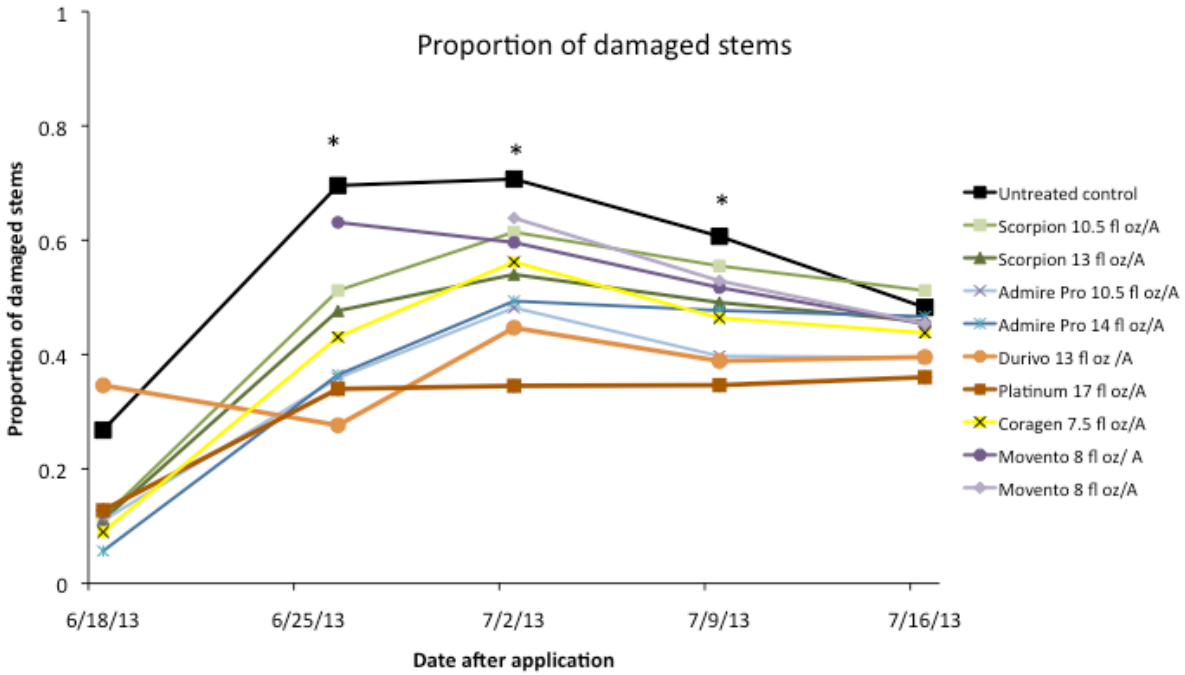

Figure 1. Asparagus stems in Platinum treated plots are significantly less damaged compared to the untreated control and some of the less successful insecticide treatments (such as Admire, Scorpion or Coragen); this pattern holds up until 7/9. Starting on 7/16 there are no significant differences any more among the treatments. Stars above lines indicate statistically significant differences among the treatments.