Asparagus

Tuesday morning 9:00 am

Where: Gallery Overlook (upper level) Room A & B
MI Recertification credits: 2 (1B, COMM CORE, PRIV CORE)
CCA Credits: PM(1.0) CM(1.0)
Moderator: Norm Myers, MACMA Asparagus Division, Shelby, MI

9:00 am	Washington Asparagus Industry Outlook and Variety Trials • Alan Schreiber, Executive Director, Washington Asparagus Commission
9:45 am	Asparagus Irrigation Update- Effects on Spear Cooling, Quality, and Yield • Daniel Brainard, Horticulture Dept., MSU
10:10 am	Asparagus Insect Pest Management • Adam Ingrao, Vegetable Entomology Lab, Entomology Dept., MSU • Zsofia Szendrei, Entomology Dept., MSU • Amanda Buchanan, Entomology Dept., MSU
10:35 am	Asparagus Pathology Research - Results of 2015 Trials • Mary Hausbeck, Plant, Soil and Microbial Sciences Dept., MSU
11:00 am	Session Ends

Asparagus Insect Pest Management

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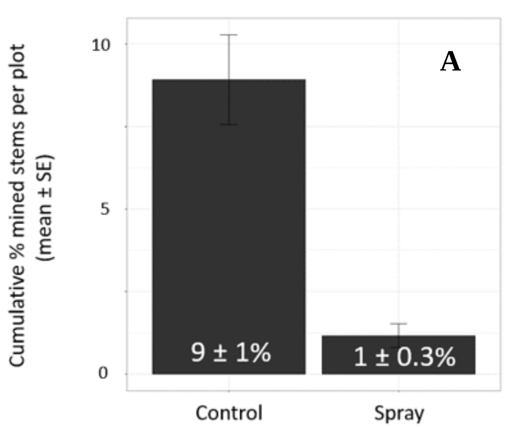
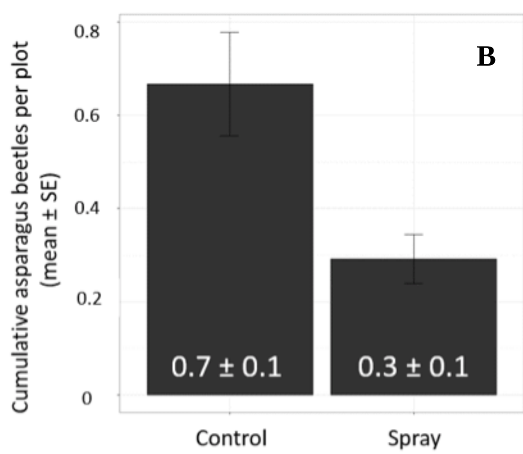
Insect pests are a major concern for asparagus growers, reducing long-term yields and imposing substantial management costs. Because of the specialty status of asparagus, growers have few chemical options for pest control. Therefore, alternative pest management strategies to control specialist and generalist asparagus pests are needed. These strategies include attracting natural enemies and using non-spray insecticides. We describe three tactics of asparagus pest management to promote crop yield and longevity in asparagus: (1) insecticide treatments on young plants to control asparagus miner and beetles, (2), habitat management to attract beneficial insects, and (3) behavioral manipulation to kill Japanese beetles.

Chemigation for asparagus pests

Three key pests of asparagus are asparagus miner (a specialist mining fly), asparagus beetle (specialist chewing beetle), and Japanese beetles (generalist chewing beetle). Eight plots planted with four rows of 2nd-year asparagus crowns received two broadcast sprays (one month apart) of Platinum insecticide immediately followed by overhead irrigation, or were left untreated (control). A sample of asparagus stems was collected after each spray to assess insecticide uptake. Each week following the first application and for nine weeks thereafter, we counted the number of asparagus stems, asparagus miner-damaged stems, adult Japanese beetles, and adult asparagus beetles.





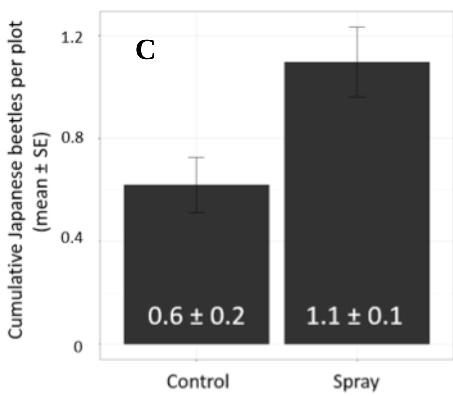


Figure 1. Results of chemigation trial; (A) miner damage; (B) asparagus beetle abundance, (C) Japanese beetle abundance.

Asparagus plants in unsprayed plots had approximately nine times more asparagus miner mines than treated plants, and approximately twice as many asparagus beetle adults. Conversely, untreated plants had nearly twice as many Japanese beetles than insecticide sprayed plants (Figure 1). While differences in Japanese and asparagus beetle abundances between treatments were clear, abundances were also quite low, and so actual beetle numbers differed on the order of one additional beetle per 200 asparagus stems. The observed reduction in miner damage from 9% to 1%, however, likely represents an economically important effect for asparagus growers. Insecticide spray did not affect the number of asparagus stems. Analysis of stem tissue showed that the asparagus ferns in the spray treatment did uptake the insecticide.

Floral resources for parasitoids of asparagus miner

Adult asparagus miners lay eggs in asparagus stems, where larvae develop and feed (Figure 2). Asparagus miner is particularly damaging in the fern stage, since spears are harvested too often for damage to occur. There are several species of parasitoid wasps known to attack asparagus miner larvae and pupae. Parasitoid wasps lay eggs in miner larvae and pupae, where their offspring consume the miner. Large populations of parasitoids can therefore help control pest populations. Parasitoid wasp adults feed on flower nectar, and so providing floral resources near asparagus fields may help control asparagus miner populations and reduce miner damage.

Figure 2. Asparagus miner adult (left) and asparagus miner larval damage (right)

One-meter-square plots were established with one of three species of flowering plants, in a common garden adjoining a mature asparagus field. The flowers choses (Figure 3) were known to be poor resources for asparagus miner adults, but potentially good resources for parasitoids.

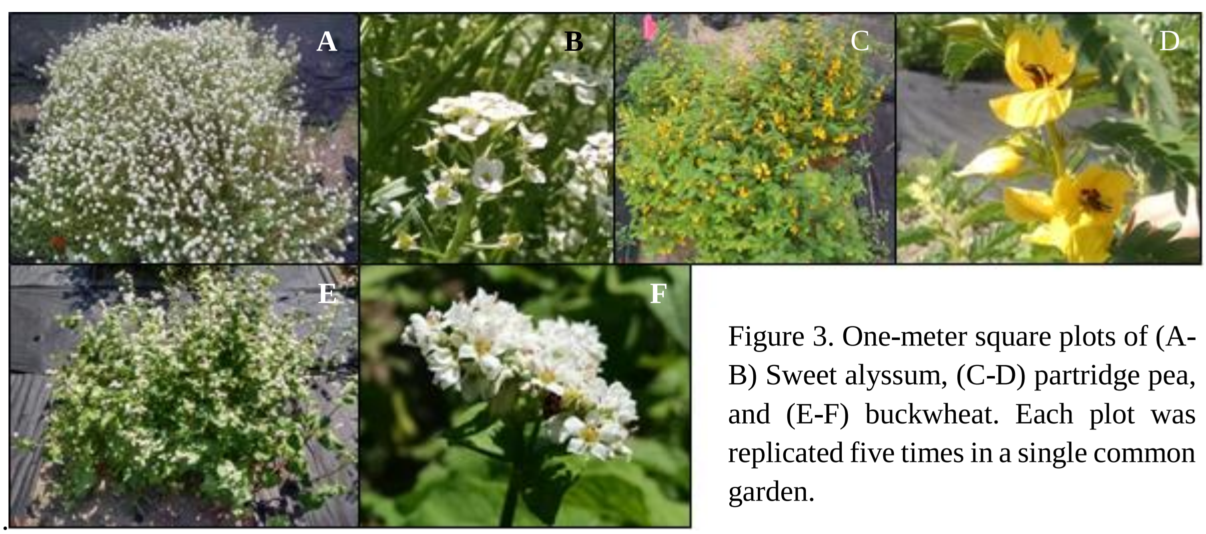


Figure 3. One-meter square plots of (A-B) Sweet alyssum, (C-D) partridge pea, and (E-F) buckwheat. Each plot was replicated five times in a single common garden.

Sweet alyssum is a low-growing annual with dense rapid growth, many small flowers, and a long flowering period. Partridge pea is a low-growing annual legume with a sprawling habit, yellow flowers and extrafloral nectaries, and a fairly slow growth rate. Buckwheat is a leggy annual with rapid growth and many small flowers at varying heights along the stem. We compared these three species to plots where no flowers were planted but naturally occurring weeds were allowed to grow. Weed plots were dominated by lambsquarters and pigweed. Each week we used a hand-held vacuum to sample small insects found in the floral canopy. Samples were stored and sorted to species or functional group: parasitoid wasps, predators such as minute pirate bugs and spiders, and herbivores (=plant eating insects) such as tarnished plant bugs.

Sweet alyssum had the most parasitoids and herbivores, possibly due to a higher density of flowers (Figure 4). All flowers had similar numbers and types of predators. Because the herbivores found in sweet alyssum are generally not major pests of asparagus, sweet alyssum is a good candidate for natural enemy attraction in asparagus. Future research will investigate the effect of sweet alyssum borders on parasitism rates and miner damage in established asparagus fields.

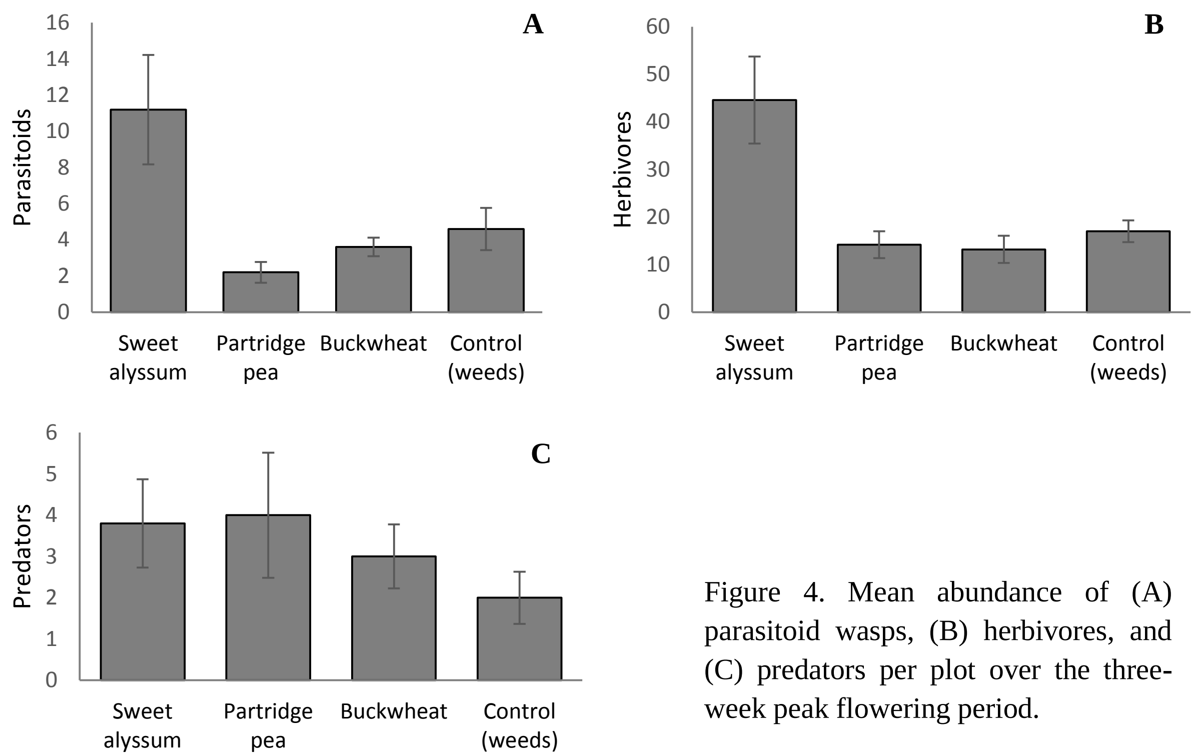


Figure 4. Mean abundance of (A) parasitoid wasps, (B) herbivores, and (C) predators per plot over the three-week peak flowering period.

Attract-and-kill for Japanese beetle

Japanese beetles can cause severe damage when aggregated in high numbers. Japanese beetle damage to asparagus occurs as adult beetles scrape away the top green layer of the fern, 'skeletonizing' the plant (Figure 5). We tested an attract-and-kill strategy for Japanese beetles, using commercial Japanese beetle pheromone lures inside delatmethrin-infused fabric pouches (Figure 6) to test for changes in the behavior or density of beetles in asparagus fields.

Figure 5. Japanese beetle adult (left), Japanese beetle damage (right).

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Edge

Figure 6. (A) Attract and kill devices were attached to asparagus ferns. (B) Pheromone lures attract beetles, and the insecticide-infused pouch kills Japanese beetles within 3 hours of a 5-second contact. (C) Japanese beetle traps contain lures but no insecticide. (D) Graphical representation of devices (orange dots) and traps ("T") in an asparagus field.

Attract and kill devices were deployed in two arrangements in four asparagus fields: a half-acre square grid laid out with five rows of five devices and two rows of twelve devices along the field edge. Japanese beetle traps were staked into each deployment, 75 feet from the field edge (corresponding with the center of the half-acre grid deployment). A different part of each field contained a trap with no nearby devices.

Each week for 9 weeks, we measured the number of beetles in each trap and counted the number of beetles on the plants. We found nearly three times as many beetles in the traps that were not surrounded by attract-and kill devices, but equal numbers of beetles on plants in all three areas of the fields (Figure 7).

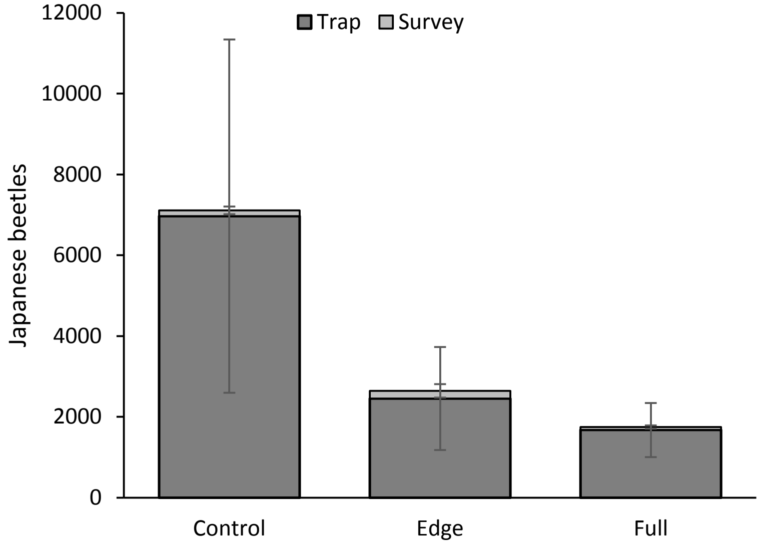

Figure 7. Number of Japanese beetles found in traps and on plants, summed over nine weeks of data collection in 2015.

Asparagus Pathology Research − Results of 2015 Trials

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Michigan State University, Department of Plant, Soil & Microbial Sciences

Michigan is ranked second nationally in asparagus production. With an average of 9,000 acres harvested, Michigan produced approximately 220,000 cwt of asparagus at a value of $20.5 million in 2014. These totals are lower than in previous years. This decline in yield may be partially attributed to increased diseases of asparagus and stressful growing conditions related to weather. Major asparagus-producing counties in Michigan, including Mason and Oceana in the northwest and Cass and Van Buren in the southwest, have been impacted by these factors. Asparagus is a perennial crop that should be in production for 20 or more years with proper pest management. Unlike annual crops where an epidemic one year will not necessarily influence yields in subsequent years, a pest infestation in asparagus that causes premature defoliation and reduced plant vigor may critically reduce expected subsequent yields. The primary pests of asparagus include foliar diseases and soilborne pathogens that are currently managed through the use of fungicides or expensive fumigants.

The goal of our research is to develop and test new tools for managing diseases in asparagus.

Evaluation of fungicides for control of purple spot.

A replicated field trial was established to test fungicides for control of purple spot foliar disease in Oceana County, MI. Treatments were applied on a 7- to 10 day schedule on 2, 11, 18 and 25 Jun; 2, 9, 17, 23, and 31 Jul; 10 and 24 Aug. Treatments were applied using a CO_2 backpack sprayer and a broadcast boom equipped with three XR8003 flat-fan nozzles calibrated at 50 psi and delivering 50 gal/A.

Disease developed in the untreated control with >50 to 75% of the fern with purple spot symptoms. At the last rating on 1 September, all treatments protected the asparagus fern. Several products limited purple spot to >3 to 6% disease, and included Priaxor SC, Quadris Top SC, Inspire EC, Luna Sensation SC, and Luna Experience SC. Quadris Top SC is currently a priority in the USDA IR-4 system and may become labeled for use on asparagus in the near future.

Treatment and rate/A, applied at 7- to 10-day intervals	Disease severity*		
	7/23	8/13	9/1
Untreated control	6.0 e**	6.5 f	7.5 e
Priaxor SC 8 fl oz	2.0 a	2.3 ab	2.3 a
Quadris Top SC 14 fl oz	2.0 a	2.0 a	3.0 ab
Inspire EC 7 fl oz	2.0 a	2.5 ab	3.0 ab
Luna Sensation SC 7.6 fl oz	2.3 a	2.8 ab	3.3 ab
Luna Experience SC 17 fl oz	2.3 a	2.5 ab	3.5 a-c
Omega SC 1.5 pt	2.3 a	2.3 ab	4.3 b-d
Manzate ProStick DF 2 lb	2.8 ab	3.0 a-c	4.3 b-d
Fontelis SC 24 fl oz	3.3 bc	3.5 b-d	4.3 b-d
Bravo WeatherStik SC 2 pt	2.0 a	2.8 ab	4.5 b-d
Tebuzol SC 0.38 pt	4.3 d	4.3 c-e	5.0 cd
Quadris SC 15.5 fl oz	4.0 cd	4.5 de	5.3 d
Quadris Opti SC 1.6 pt	2.8 ab	5.0 e	5.5 d

*Rated on the Horsfall-Barratt scale of 1 to 12, where 1=0% plant area diseased, 2=>0 to 3%, 3=>3 to 6%, 4=>6 to 12%, 5=>12 to 25%, 6=>25 to 50%, 7=>50 to 75%, 8=>75 to 87%, 9=>87 to 94%, 10=>94 to 97%, 11=>97 to <100%, 12=100% plant area diseased.

**Column means with a letter in common are not significantly different (LSD t Test; *P*=0.05).

Evaluation of fungicide drenches for control of root rots of asparagus.

A trial was established in Oceana County, MI where asparagus seeds were sown by the grower-cooperator on 30 May 2014. The trial was set up with 100 ft plot length and 11 rows per plot. Treatments consisted of 20 ft of row and four replicates. Treatments were applied with a backpack sprayer calibrated to deliver 50 gal/acre to the soil on 11 July, 8 August and 8 September 2014. Crowns were dug from the field on 15 April, washed on 16 April and rated and weighed on 22 April 2015.

Plants treated with Cannonball produced crowns that weighed significantly more than plants treated with Ridomil Gold or Fontelis. When visually rated, plants treated with Cannonball produced the highest percentage of crowns with the highest rating of 4, statistically better than the untreated control, Orondis SC, Topsin M, Fontelis, Presidio alternated with Cannonball, Ridomil Gold alternated with Cannonball, and Ridomil Gold alternated with Topsin. Untreated plants produced the largest percentage of crowns with the lowest rating of 1, a significantly greater percentage than plants treated with Presidio, Orondis, Presidio alternated with Cannonball, and Presidio alternated with Topsin M.

Treatment[1] and rate/A, applied at monthly intervals	Crown rating[2] (%)				Yield (oz/crown)
	#1	#2	#3	#4	
Untreated control	30.75 b[3]	36.25 a-c	28.25 a	4.75 ab	1.4 ab
Presidio SC 4 fl oz	4.69 a	28.94 ab	55.44 b	10.94 bc	1.5 ab
Ridomil Gold SL 2 pt	9.19 ab	56.94 d	28.19 a	5.69 a-c	1.2 b
Orondis SC 9.6 fl oz	4.63 a	43.63 b-d	48.38 ab	3.38 a	1.4 ab
Cannonball WP 7 oz	9.56 ab	25.56 a	52.06 ab	12.81 c	1.8 a
Topsin M WP 1.5 lb	9.31 ab	44.31 b-d	42.56 ab	3.81 ab	1.4 ab
Fontelis SC 24 fl oz	22.50 ab	34.00 ab	42.50 ab	1.00 a	1.2 b
Presidio SC 4 fl oz -*alt*- Cannonball WP 7 oz	5.94 a	44.19 b-d	47.69 ab	2.19 a	1.4 ab
Presidio SC 4 fl oz -*alt*- Topsin M WP 1.5 lb	2.25 a	35.75 a-c	54.25 b	7.75 a-c	1.5 ab
Ridomil Gold SL 2 pt -*alt*- Cannonball WP 7 oz	15.06 ab	41.31 a-d	40.31 ab	3.31 a	1.5 ab
Ridomil Gold SL 2 pt -*alt*- Topsin M WP 1.5 lb	12.19 ab	53.69 cd	31.69 ab	2.44 a	1.3 ab

[1]-*alt*- = alternate.
[2]Rated on a scale of 1-4, where 1=low root mass, 2=low-medium, 3=medium-high, and 4=high root mass.
[3]Column means with a letter in common are not significantly different (LSD t Test; *P*=0.05).

Acknowledgement. This research was supported by funding from the Michigan Asparagus Advisory Board.