Final report to the

Ohio Vegetable & Small Fruit Research & Development Program Committee

Project: Filling in the gaps for the invasive pest monitoring network

12/26/2018

Principal Investigators: Jim Jasinski, Celeste Welty, Elizabeth Long

Jasinski.4@osu.edu, 937-484-1526

Objectives(s) of research proposal:
1. Monitor and report the distribution and abundance of the brown marmorated stink bug and spotted wing Drosophila in vegetable and small fruit crops across Ohio using standardized traps and lures.
2. Expand the statewide pest monitoring network with cooperators checking traps weekly at 25-30 counties.

Overview: Both spotted wing Drosophila (SWD) and brown marmorated stink bug (BMSB) are invasive pests known to attack a wide array of small fruit and vegetable crops. Since 2012, personnel from The Ohio State University's Department of Entomology, Department of Extension, and Integrated Pest Management (IPM) Program have coordinated their monitoring efforts to track these pests as they expand across Ohio. The intent of the trapping is to understand the distribution and population dynamics of these pests, and to swiftly communicate first detections, rapid increases, or unusual findings to growers to help them manage susceptible crops. Trap monitoring information is released periodically through the vegblog (http://u.osu.edu/vegnetnews/), small fruit newsletter, and the vegetable and fruit insect pest management website at http://u.osu.edu/pestmanagement/trap-reports/.

In establishing these monitoring networks with the help of Extension educators, consultants, and growers themselves, a representative and consistent number of counties have been monitored for these pests over the past six years. Although this group of counties is a great starting point and represents the backbone of our network, we realize the need to push into new counties where monitoring has not been done so that we may gain additional insight into the distribution and population dynamics of these two pests on farms in those counties.

Objective 1A: Spotted wing drosophila (SWD) - Monitoring
In 2018, we deployed the same style of trap and bait as in 2016 and 2017 (**Figure 1**); Scentry SWD traps baited with Scentry lures plus a drowning solution of 25% apple cider vinegar (ACV). Traps were serviced weekly with the trap contents transferred to a vial and the drowning fluid replenished; lures were changed out monthly. At some locations after the first detections were made, the lure was not replaced but 100% ACV was used as both the bait and drowning solution.

Figure 1. SWD Scentry trap used in 2018.

Traps were placed on farms that had one or more susceptible crops, including peaches, grapes, raspberries, blackberries, blueberries, and strawberries (**Table 1**). Most traps were set up during the first week of June and removed the first week of October. Each monitoring site had 1-3 traps deployed per crop. Trap counts were posted on an on-line spreadsheet. The trap counts were viewable to anyone with the link, which was given to growers in several VegBlog and Ohio Fruit News newsletter articles.

At the Franklin County site, traps that had been placed in a tree line next to a raspberry patch on the Waterman farm in May 2017 were kept in place and checked weekly for the entire winter of 2017/2018. Surprisingly, SWD adults were trapped during warm spells on January 7-13 and 21-27, indicating these pests survived the winter up to that point and were active in that area. No more SWD adults were detected at that site until May 13-19.

In Greene and Hardin Counties, traps were also placed in wooded areas and tree lines next to cultivated crops. In all three counties, SWD adults were found in the wooded or non-crop areas before they were found in the cultivated crop. This finding is in line with previous work from other states which suggests adult flies likely over-winter and are active in these non-crop areas before they migrate to cultivated crops.

In cultivated crops, initial detection of SWD adults ranged from May 20-26 (Franklin, Greene Counties) to Aug. 5-11 (Lake Co.). Five counties (Fairfield, Lucas, Mercer, Shelby and Summit) did not find any SWD adults in traps during the season.

Table 1. Monitoring sites by county. Counties shaded in green were added to the network in 2018. Sites that had zero capture of SWD are shaded yellow.

County	Cooperator	Crop(s)	First detection	Total SWD flies identified
Butler	C. Meyer	Grapes	June 17-23	2270
Champaign	A. Douridas	Red Raspberry	June 17-23	655
Clinton	J. Jasinski	Raspberry	June 10-16	1426
Darke	S. Custer	Raspberries/Grapes	July 8-14	379
Fairfield	J. Iles	Black Raspberry	did not catch	0
Franklin	C. Welty	Raspberry	May 20-26	58
Franklin	C. Welty	Treeline	January 7-13	286
Geauga	E. Draper	Blueberries	July 15-21	2974
Greene	J. Jasinski	Blueberry	May 20-26	3619
Greene	J. Jasinski	Blackberry	June 24-30	3122
Guernsey	C. Little	Caneberries	July 1-7	291
Hardin	M. Badertscher	Black Raspberry	July 22-28	94
Knox	S. Schirtziner	Raspberries	June 17-23	81
Lake	L. Ober/Dehaus	Wine Grapes	August 5-11	2383
Lucas	A. Stone	Raspberry	did not catch	0
Mercer	J. Knapke	Grapes	did not catch	0
Monroe	M. Landefeld	Blueberries	July 1-7	32
Morrow	C. Jagger	Caneberries	July 29-Aug 4	94
Pickaway	M. Estadt	Blackberries	July 8-14	583
Pike	R. Slaughter	Blueberries	July 1-7	298
Shelby	A. Heilers	Grapes	did not catch	0
Summit	J. Kowalski	Blueberries	did not catch	0
Warren	J. Jasinski	Grapes	June 24-30	190
Wayne	E. Long	Grapes	July 8-14	2048
Wayne	R. Lewandowski	Stawberries/brambles	July 1-7	1235
Wayne	R. Lewandowski	Peaches	July 22-28	851

Wayne	R. Lewandowski	Grapes	Aug 5-11	307
Wayne	R. Lewandowski	Strawberry/blueberry	July 8-14	14
Wayne	R. Lewandowski	peaches	July 29-Aug 4	1749
Wayne	R. Lewandowski	Strawberry/raspberry	June 17-23	56
Wayne	R. Lewandowski	Peaches	July 15-21	348
Wayne	R. Lewandowski	Strawberry	July 29-Aug 4	10
Wayne	R. Lewandowski	Strawberry/raspberry	July 8-14	7
Wayne	R. Lewandowski	Grapes	Aug 12-18	799
Wayne	R. Lewandowski	blueberries	July 15-21	15
Wayne	R. Lewandowski	Peaches	Aug 12-18	986
Williams	J. Schoenhals	Grapes	July 29-Aug 4	456

Objective 2A: Spotted Wing Drosophila (SWD) – Network Expansion

Aside from monitoring SWD adults, the second key objective was to expand the monitoring network to include counties where SWD had not been monitored before. In 2018, 10 counties were added to the monitoring network compared to the 2017 footprint (**Figure 2**). Thirteen counties that had previously contributed to the SWD trap network were retained in 2018. Most of these counties were on the western side of the state. Of those 10 newly added counties, six detected SWD adults using baited traps. In total, 18 out of 23 counties detected SWD.

All counties surveyed from 2012-2017 with their current SWD detection status were compiled to see the distribution of this pest in the past six years (**Figure 3**). County SWD status was determined either by monitoring with a baited trap and positively identifying trap catch or indirectly through larval infested fruit brought to the county Extension office.

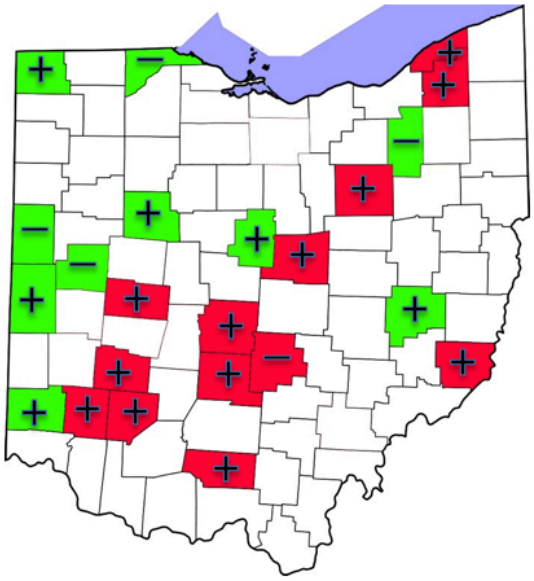

Figure 2. Counties monitoring for SWD in 2018. Green counties are new to the survey compared to 2017 network; red counties were also monitored in 2017. Counties with a "+" were positive for SWD and those with a "-" did not detect adult SWD in 2018.

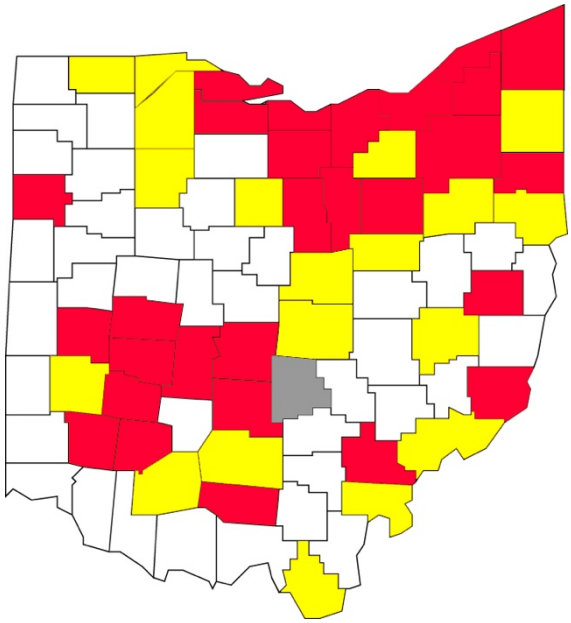

Figure 3. Spotted wing Drosophila county status from 2012-17. Red shaded counties are positive, yellow shaded counties are suspected positive, the gray shaded counties have not been confirmed positive, and white shaded counties have not been surveyed.

Summary for SWD monitoring

In 2018, SWD remained a major pest of small fruit. Growers who were able to treat for this pest saw little or no fruit damage, but those who were not able to spray saw losses increase as the season progressed. We were able to expand the size of the network by 10 counties thanks mostly to a vigorous recruiting campaign of Extension educators and a few growers who underwent training to trap and identify adults.

The most important objective of trapping was first detection of SWD at any site. We caught SWD as early as January in Franklin County, but most detections began around the end of May, which was a few weeks earlier than 2017. Similar to other years, we were able to trap adults in non-crop habitats such as woods and tree lines before we could detect them in cultivated crops.

In an effort to try a different style of trap that would make monitoring potentially easier for growers to use, one yellow sticky panel trap baited with a Scentry lure (**Fig. 4**) was placed out in a tree line adjacent to baited yellow sticky panel trap placed along a blueberry field edge in Greene County. The tree line and blueberry crop were also paired with a standard Scentry-baited jar trap located about 50 feet away from the sticky trap. Research from Michigan State University indicated that when using red sticky traps, male SWD were found on the sticky panel at the same time they were detected in the standard Scentry-baited jar trap. According to MSU, males can be readily seen on the sticky trap with the naked eye, speeding up detection without sacrificing timing or earliness of catch.

Figure 4. Yellow sticky trap baited with SWD lure. Red spots were used for only a few weeks at a few sites.

In our brief comparison of traps placed in the tree line, we found the Scentry-baited jar traps captured SWD adults five weeks earlier than the Scentry-baited yellow sticky traps. Comparing just the sticky traps

between the tree line and crop, the sticky traps in the tree line captured a SWD adult one week earlier than the edge of the blueberry field. The same trend was seen with baited Scentry jar traps, they captured SWD adults in the tree line before they were captured at the crop edge. The results of this brief comparison did not favor using the sticky trap and will require follow up in 2019. At this point we do not have the confidence or data to support switching to the sticky trap and will continue to recommend the baited Scentry jar traps. Male SWD adults captured on the sticky trap were also difficult to detect with the naked eye, and given all of the other non-target insects on the traps, and still required the use of a stereo microscope to identify, resulting in no real time savings. A negative side effect of using the yellow sticky trap included trapping a large number of beneficial pollinators early in the season. Perhaps the use of a red sticky trap will reduce the number of pollinators and other beneficial insects captured but red sticky traps are not commercially available at the present time.

Objective 1B: Brown marmorated stink bug (BMSB) – Monitoring

In 2018, we deployed the same style of trap and bait as in 2017 (Figure 4): a wooden post with a double-sided clear sticky panel baited with a dual pheromone lure that was effective for 12 weeks. There were 36 monitoring sites total, each with three traps per site. At most sites, the traps were along the edge of a tree line near a crop field, which is a preferred habitat for stink bugs. Crops included berries, grapes, tree fruit, sweet corn, field corn, soybeans, peppers, and mixed vegetables. Traps were checked every 1 to 2 weeks. Most cooperators used the traps for 24 weeks, from May until September. Other cooperators used the traps for 12 weeks, from June through August. The earliest that some traps were deployed was 4/9. Trap counts were posted on an on-line spreadsheet. The trap counts were viewable to anyone with the link, which was given to growers in several VegBlog and Ohio Fruit News newsletter articles.

Figure 4. Sticky panel trap used to monitor stink bugs.

Among the 32 counties where traps were used in 2018, BMSB was detected in all 32 counties, with the average number ranging from 0.02 to 9.7 BMSB per trap per week. First detection of BMSB was in early to mid-May at sites where traps were deployed early, or during the first week that traps were in the field at almost all sites. Peak numbers of BMSB at most sites were found from 8/11 until 9/22. In addition to total numbers, counts were detailed by adult males and females and nymphs. Only adult BMSB were found until late June. The first nymphs were found on traps in late June or early July.

Objective 2B: Brown marmorated stink bug (BMSB) – Network Expansion

Traps were used in 19 new counties in addition to 13 counties that were previously involved (Table 2). This expansion has resulted in much better coverage of how this new stink bug is distributed in Ohio.

Summary for BMSB monitoring

In 2018, the stink bug population density in Ohio was similar to what we detected during the previous few years in terms of great variation among sites, with the stink bug population quite small at some sites and quite large at other sites. Collection of trap counts on a regular basis throughout the season allowed us to detect when crops are at the greatest risk from injury by invading stink bug populations.

Table 2. Monitoring sites for BMSB, by county, Ohio, 2018. Counties shaded in green were added to the network in 2018.

	County	Cooperator	Crop(s)	Number of weeks	Total number BMSB in 3 traps per site	Average number BMSB per trap per week
1	Athens	E. Brown	Blueberry, veg, apple, peach	13	52	1.3
2	Auglaize	J. Stachler	Corn	21	16	0.3
3	Butler	C. Meyer	Grapes	15	353	7.8
4	Champaign	A. Douridas	Apple	20	32	0.5
5	Clermont	G. Neal	Sweet corn	4	6	0.5
6	Clinton	F. Mahaffey	?	20	125	2.1
7	Crawford	J. Hartschuh	Corn	22	19	0.3
8	Darke	S. Custer	Soybean	13	7	0.2
9	Erie	T. Malinich	Apple/peach	22	95	1.4
10	Franklin	C. Welty	Treeline near corn	28	390	4.6
	Franklin	C. Welty	Apple	24	137	1.9
	Franklin	C. Welty	Sweet corn	15	92	2.0
11	Greene	J. Jasinski	Blueberry, blackberry, raspberry	22	465	7.0
12	Henry	G. Ruff	Soybean, green bean	13	3	0.1
13	Huron	B. Filbrun	Mixed vegetables	19	45	0.8
14	Jefferson	E. Lyon	Black raspberry	18	249	4.6
15	Knox	S. Schirtzinger	Sweet corn, beans, peppers, apple/peach	21	56	0.9
16	Lake	T. DeHaas	Apple, blackberry	12	64	1.8
17	Licking	D. Kreager	Raspberry, peach, apple, cherry	21	97	1.5
18	Lorain	A. Chanon	Grape, peach, raspberry	22	104	1.6
19	Lucas	A. Stone	Raspberry and mixed veg.	17	30	0.6
20	Miami	A. Bennett	Grape	10	113	3.8
21	Morrow	C. Jagger	Sweet corn, beans, tomato	19	64	1.1
22	Muskingum	C. Martin	Soybean	18	133	2.5
23	Perry	T. Wiseman	Soybean	19	117	2.1
24	Portage	R. Christensen	Treeline near peach	21	612	9.7
25	Putnam	B. Scheckelhoff	Sweet corn	15	8	0.2
26	Trumbull	L. Beers	Chard, greens, cucurbits	20	1	0.0
27	Tuscarawas	C. Zoller	Soybean	1	12	4.0
28	Warren	J. Jasinski	Grape	22	391	5.9
29	Washington	M. McCartney	Apple/peach	12	118	3.3
30	Wayne	R. Lewandowski	Peach, blueberry, blackberry	14	31	0.7
	Wayne	E. Long	Grape	13	43	1.1
	Wayne	A. Raudenbush	Soybean	21	67	1.1
31	Williams	J. Schoenhals	Grape	15	91	2.0
32	Wood	A. Sundermeier	Soybean	12	4	0.1