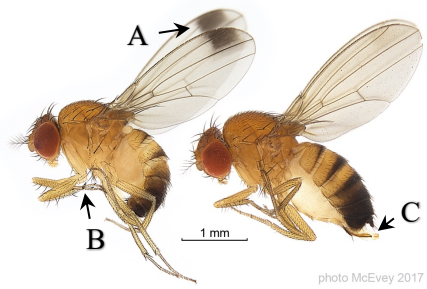
# Managing Spotted Wing Drosophila in Michigan Cherry

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Julianna Wilson[1], Larry Gut[1], Emily Pochubay[2], Karen Powers[2], Nikki Rothwell[2], and John Wise[1]
MICHIGAN STATE UNIVERSITY
1. Department of Entomology, 2. Northwest Michigan Horticulture Research Center.

**Figure 1.** Male SWD (left) have an obvious spot on the margin of each wing (A) and two small black bands on each foreleg (B); female SWD (right) have a pointed, deep amber-colored, serrated ovipositor (C). *Photo credit: Shane F. McEvey, Australian Museum*

## ASSESSING LOCAL POPULATION PRESSURE

Weekly monitoring for spotted wing drosophila (SWD) (*Drosophila suzukii*) adults (Figure 1) from fruit set until the end of harvest will help identify the start of fly activity and determine when populations are increasing with respect to ripening fruit. Sampling fruit for larvae will help determine whether management programs are working to protect fruit.

***The most commonly used trap for capturing adult flies.*** A plastic 32-ounce cup perforated with ten 3/16”-3/8” holes near the lip of the cup is the standard trap used for SWD (Figure 2). The trap must be baited with an attractant and contain an inch of drowning solution (soapy water or liquid bait) in the bottom. The small holes allow access to vinegar flies but keep out larger insects.

***Making the yeast-sugar bait.*** When using the yeast-sugar bait, the bait also acts as the drowning solution and must be replaced when the trap is checked each week. Combine 1 tablespoon of active dry yeast, 4 tablespoons of sugar, a drop of dish soap, and 12 ounces of water. After straining out the contents for identification, the yeast-sugar bait solution needs to be disposed of away from the trapping area.

***Commercial lures.*** Several commercial lures work about as well as the yeast-sugar mix. Most we have tested remain attractive for about 3-4 weeks, so expect at least one lure change depending on how long you plan to monitor. The lure is hung over an inch of soapy water, and the liquid should be checked for SWD adults and changed weekly.

**Figure 2.** An SWD trap can be made from a deli container. A commercial lure hung from inside the lid (pictured) or a homemade yeast-sugar bait attracts the flies. A drowning solution (soapy water or liquid bait) captures the flies.

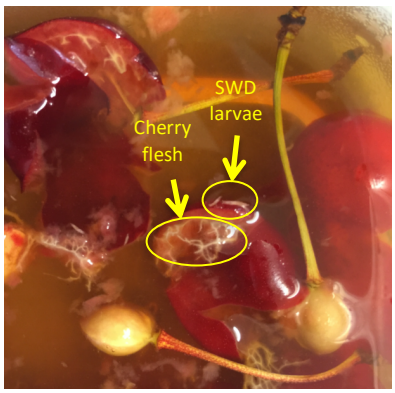


**Figure 3.** Tart cherries in brown sugar solution used to detect larvae emerging from fruit. This image shows different larval instars as well as the white veins of crushed tart cherries.

***Trap density and placement.*** SWD like moderate temperatures and humid conditions, so the best place to hang traps to monitor a cherry orchard is within the canopy in a tree at the end of a row closest to a wooded edge. Use at least one trap per orchard block. SWD populations can be patchy in distribution, especially early in the season. It is important to look at overall incidence across multiple traps on the farm *and* fruit develop in a given block to know when to take action against this pest.

***Sampling fruit for larvae.*** A salt (see page 4) or sugar test can be used to determine if fruit are being infested. The sugar method allows for detection of living larvae as they emerge from the fruit. Instructions for how to complete a sugar test follow:

- Dissolve 1.5 pounds of light brown sugar in 1 gallon of warm water.
- Place 1-2 cups of fruit in a shallow pan and cover with the sugar solution.
- Stir the fruit every few minutes to disturb the larvae. Take care not to break the skins as light-fleshed cherries have veins that can be mistaken for SWD larvae (Figure 3).
- After 15 minutes, inspect the mixture for larvae exiting fruit.
- Detection of small larvae will require good lighting and the use of a hand lens (15-20x will work, but 30x is better).

## SWD CONTROL

Managing SWD is challenging because populations can grow rapidly under warm summer conditions, especially after rain events. Frequent rain events will require shorter spray intervals. High heat conditions will make some pesticides less effective. Pesticide registrations and recommendations change as we learn how to better manage this pest. Growers can remain informed through the MSU SWD website, local Extension Educators and regional newsletters, and the MSU Extension News for Agriculture.

***Keys to success.*** 1) Use on-farm monitoring to know when SWD flies are active, 2) When SWD flies are present, protect ripening cherries through harvest using effective, registered insecticides, 3) Use the salt or sugar test to look for larvae in ripening fruit to check whether management programs are working, and 4) Minimize any delay in harvest – the longer ripe fruit remain on trees, the more likely they are to be infested.

***When to begin your management program.*** The most conservative approach to SWD management in cherries is to begin protecting fruit when fruit starts to turn color *AND* you have captured an SWD fly in one of your traps. If using the regional trapping reports to guide management decisions, some growers may opt to treat susceptible orchards soon after the first SWD flies are captured. However, our experience suggests that management can be initiated in a susceptible block when fruit are at risk to SWD infestation and 5-10% of the traps in the region are reporting fly catches. We are currently validating a growing degree day (GDD) model based on cherry growth that predicts the risk of cherry infestation by SWD starting at around 900 GDD base 39.2°F from full bloom.

***Maintain coverage, tighten spray intervals.*** **Based on our experience in Michigan, SWD control will likely require a 7-day spray interval under dry conditions with tighter intervals following rain or other wetting events, alternating with different materials.** Because SWD can complete a single generation in 8-10 days at 77°F, it is crucial to maintain excellent coverage with effective insecticides *and* alternate insecticides with different modes of action. Under high heat conditions, some pyrethroids will be less effective. Excellent coverage requires tighter spray intervals, particularly in rainy conditions, applying full covers rather than alternate row middle sprays, reducing tractor speeds, accurately calibrating sprayers, and using adequate spray volumes. Growers should **not** stretch spray intervals, even with materials that are rated as excellent against SWD (Table 1). It is also important to understand the seasonal limits for each product, re-entry interval (REI) restrictions, and their re-treatment intervals or minimum number of days between applications. Some of these particulars are summarized in Table 1, but growers should always refer to the product label first.

***OMRI approved materials.*** There are only two products approved by the Organic Materials Review Institute (OMRI) that show activity against SWD, Entrust and Grandevo. Entrust has a 7-day PHI and Grandevo has a 0-day PHI. Preliminary data suggest that Entrust has improved activity against SWD compared with Grandevo, however these compounds are good rotation partners for resistance management.

**Figure 4.** Other common late-season pests of cherries. The cherry fruit fly (left), *Rhagoletis cingulata* (Loew), and the black cherry fruit fly (middle), *Rhagoletis fausta* (Osten Sacken) can infest cherries around the same time as SWD, but they are much larger and only produce a single generation per season. The obliquebanded leafroller (right), *Choristoneura rosaceana* (Harris), a moth pest of both pome and stone fruit, can also be a problem in cherries close to harvest. Traps to monitor for these pests are commercially available. *Photos courtesy NY State Ag Experiment Station.*

***Targeting multiple pests.*** Cherry fruit flies and leafrollers are some other important cherry pests that may need to be managed when SWD are active (Figure 4). Table 1 also contains the cross-efficacy ratings for these late season cherry pests. Consult the current version of the Michigan Fruit Management Guide E-154 for more details on cross-efficacy against other cherry pests.

**Table 1.** Insecticides registered for use in Michigan CHERRIES and their expected efficacy against SWD, cherry fruit flies, and leafrollers, the main late season targets.[†]

| Trade Name | Active Ingredient | Class (IRAC Group) | PHI[‡] (days) | REI (hrs) | Interval bet trts (days) | Rate per acre (lbs of AI) | Max lb AI/A per season | Relative efficacy against: | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SWD | Cherry fruit flies | Leaf-rollers |
| **Grandevo**[1] | Chromo-bacterium subtsugae | biological | 0 | 4 | NS | 3 lb (0.9) | NS | G | | G |
| **Danitol 2.4 EC** | fenpropathrin | pyrethroid (3) | 3 | 24 | 10 | 21.3 fl oz (0.4) | 0.8 | E | G | G |
| **Exirel 10SE** | cyantraniliprole | diamide (28) | 3 | 4 | 7 | 13.5-20.5 fl oz (0.088-0.133) | 0.4 | E | E | E |
| **Mustang Maxx 8EC** | zeta-cypermethrin | pyrethroid (3) | 3[§] | 12 | 7 | 4 fl oz (0.025) | 0.15 | E | F | G |
| **Verdepryn 100SL** | cyclaniliprole | diamide (28) | 7 | 4 | 7 | 11 oz (0.072) | 0.22 | E | E | E |
| **Baythroid XL** | beta-cyfluthrin | pyrethroid (3) | 7 | 12 | 14 | 2.4-2.8 oz (0.019-0.022) | 0.044 | G | G | G |
| **Delegate WG**[2] | spinetoram | spinosyn (5) | 7 | 4 | 7 | 4.5-7 oz (0.071-0.109) | 0.438 | G | G | E |
| **Entrust SC**[1] | spinosad | spinosyn (5) | 7 | 4 | 7 | 4-8 oz (0.062-0.124) | 0.45 | E | G | E |
| **Imidan 70W**[3] | phosmet | OP (1B) | 7 | 72 | NS | 2.125 lb (1.5) | 5.25 | E | E | E |
| **Movento 2F** | spirotetramat | LBI (23) | 7 | 24 | 14 | 6-9 fl oz (0.09-0.14) | 0.24 | G, S | | |
| **Rimon 0.83EC**[4] | novaluron | benzoy-lurea (15) | 8 | 12 | 7 | 20-40 fl oz (0.129-0.259) | 0.97 | G | G | E |
| **Apta 15SC** | tolfenpyrad | METI (21A) | 14 | 12 | 10 | 21-27 fl oz (0.22-0.28) | 0.56 | E, S | | |
| **Warrior II 2CS**[2] | lambda-cyhalothrin | pyrethroid (3) | 14 | 24 | 5 | 2.56 fl oz (0.04) | 0.2 | E | G | G |

KEY: NS = not specified on product label; S = specimen label lists this material as suppressive only; F = Fair, G = Good, E = Excellent, based on MSU field/lab bioassays.

NOTES:

[†] This is not meant to be an exhaustive list, for more pest and disease ratings on materials registered for use in cherries, please refer to the Michigan Fruit Management Guide E-154. If there is no efficacy rating listed for a given product/pest combination, efficacy should be considered unknown for that particular pest. For more information on the proper use of individual insecticides, please refer to the specimen label for each material.

[‡] When producing cherries for export, some materials may exceed the maximum residue limits for some markets. For example, while Exirel and Danitol each have a 3-day PHI, there is a risk of exceeding the MRLs for certain markets if these materials are used within 1 month of harvest (China and Taiwan for Exirel; European Union for Danitol). Because MRLs can be a moving target, the conservative approach when exporting fruit, is to avoid using materials listed as having stricter MRLs than the United States. Materials without a set tolerance for a specific market should be interpreted as having zero tolerance for residue of that material.

[§] Mustang Maxx 8EC is now available for use up to 3 days pre-harvest in both sweet and tart cherries with the 24C label issued during the 2020 field season.

[1] This material is OMRI approved.

[2] SWD is not listed as a target pest on the label for stone fruit, but relative efficacy against SWD has been evaluated through field and/or lab bioassays at MSU.

[3] Not labeled for use in sweet cherry due to phytotoxicity issues.

[4] While not having contact toxicity to adults, sublethal effects following adult exposure leads to nonviable eggs.

***Pruning to improve pesticide coverage and deter SWD activity in crop canopy.*** The denser the cherry tree, the more difficult it is to get adequate pesticide coverage. Water sensitive paper should be used to help calibrate sprayers and to determine whether additional pruning is needed to open up the crop canopy. Preliminary data suggest that pruning a tart cherry tree during the dormant season could also help to decrease SWD population pressure by reducing relative humidity and increasing temperatures in the canopy, two environmental factors that are directly related to infestation risk. This work is ongoing and we are refining pruning strategies with respect to SWD behavior.

***Physical barriers to protect fruit.*** While netting may work in some fruit production systems (e.g. raspberry or blueberry) that are more compact or of higher market value, the logistics and cost of covering cherry trees with a physical barrier to prevent fruit infestation makes this impractical for most growers. The exception might be for high density sweet cherries grown for fresh market or under high tunnels. However, this practice in general should be used with caution because it could interfere with disease management.

***Post-harvest handling of fruit.*** For other susceptible fruit (e.g. blueberries) refrigeration for 72 hours at 35°F has been found to slow the development of eggs and larvae. Freezing fruit immediately after harvest will halt development all together. These techniques are presumed to be effective for cherries with otherwise undetectable infestation at harvest. Processing tart cherries for juice will also effectively halt development.

***Post-harvest orchard sanitation.*** At the end of harvest, cherries left on trees can be readily infested by SWD. However, it is not generally recommended that post-harvest orchards continue to be sprayed unless the orchard is immediately adjacent to a block that is still waiting to be harvested.

For fruit that drops to the ground, there is evidence that flailing or otherwise crushing the fruit will help reduce post-harvest opportunities for SWD infestation, build-up and movement to adjacent orchards. Whether this practice results in fewer SWD the following season is unknown.

## FOR MORE INFORMATION

- For details on its history as a pest in Michigan, its biology, and for weekly seasonal reports, visit: www.ipm.msu.edu/invasive_species/spotted_wing_drosophila
- For more on general cherry pest management, refer to the Michigan Fruit Management Guide: Bulletin E0154 www.shop.msu.edu/product_p/bulletin-e0154.htm
- To download specific pesticide labels, visit the Pesticide Label Database: www.cdms.net/Label-Database
- For instructions on how to do the salt test: https://academic.oup.com/jipm/article/8/1/23/4157137

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