

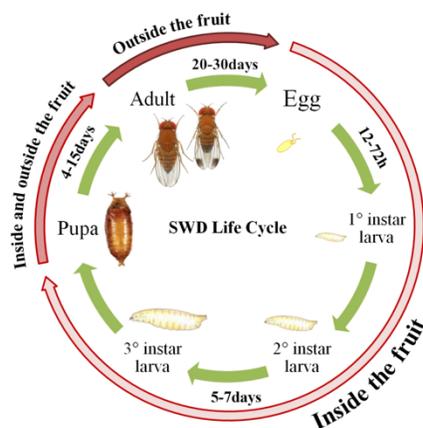
IPM Fact Sheet Series

**UMass Extension Fruit Team**

Fact Sheet #R/BI-005

**Raspberry – Spotted Wing Drosophila (*Drosophila suzukii*)**

**ID/Life Cycle:** Spotted Wing Drosophila, SWD, is a recently introduced species of fruit fly in the United States. It was first found on the west coast in 2008, but has rapidly colonized most fruit producing regions of the country. It was found in New England in late summer 2011 shortly after Hurricane Irene. Shortly thereafter, it caused significant crop damage in fall raspberries among other crops. While fruit flies (or vinegar flies) are nothing new in the US, this species is different in its ability to infest healthy fruit. Other species typically infest over-ripe or damaged fruit. Females of this species have serrated ovipositors that can cut into healthy fruit to insert eggs. This can lead to problems with deteriorating fruit in the field or with customers who find multitudes of larvae in fruit after harvest.



**Figure 1)** Diagram showing distinctive SWD life stages and locations of each life stage. **Image Credit:** M. Rossi-Stacconi, Oregon State Univ.

SWD adults are a small ( $\frac{1}{8}$  inch long) vinegar fruit fly similar in appearance to other fruit flies. They are generally golden in color and have red eyes. Distinguishing features of SWD males that are visible to the naked eye are the two spots, one on each wing tip, from which the species gets its common name. Few other species have spots on the wings. Female SWD lack these wing spots. Distinguishing adult female SWD from other fruit flies is more difficult with the naked eye. When looking with 10x (20x is preferable) magnification, it is possible to see that SWD females have a large and serrated ovipositor at the base of their abdomen. Finer features include dark bands on each of the forelegs of males, and abdominal striping that are different from other species, but these are rarely useful for general purpose identification by growers.

SWD eggs are very small and laid individually (rather than in clusters), and have characteristic 2 breathing tubes that protrude out of the fruit. SWD larvae are very small, legless, cream colored 'worms' with dark markings near the head. SWD go through 3 larval stages (instars) and a pupal stage before becoming adults. SWD pupae are found in the soil beneath infested fruit and range in color from cream to brown.

Adults are believed to be the primary overwintering life stage. SWD overwinters in leaf litter, duff, and the remains of rotting fruit usually outside the field in woody margins. They do not survive winter in New England in large numbers and start each new season with low populations. For this reason, SWD populations do not built up to damaging levels until mid-summer (early to mid-July) in Massachusetts. However, first sustained captures and recorded damage dates have been trending earlier every year. Early ripening, summer ripening (Floriscane) varieties may escape serious damage from SWD but mid-season and later season varieties are very vulnerable. 'Fall Bearing' or primocane fruiting varieties are the most vulnerable as they ripen when SWD population numbers are high.

SWD have a wide host range of other fruiting plants, both wild and cultivated, that they can exploit and where populations can build up throughout the growing season.

To see a list of currently known host plants for SWD, go to:  
[www.canr.msu.edu/uploads/files/AABI/SWDHostPlantList.pdf](http://www.canr.msu.edu/uploads/files/AABI/SWDHostPlantList.pdf)

### Key SWD Life Cycle features:

- Adult SWD live for up to 2 weeks
- Female SWD can lay up to 300 eggs in her lifetime
- SWD can develop from egg to adult in as little as 8 days, depending on ambient temperatures
- SWD are likely to have over 10 generations per growing season in Southern New England

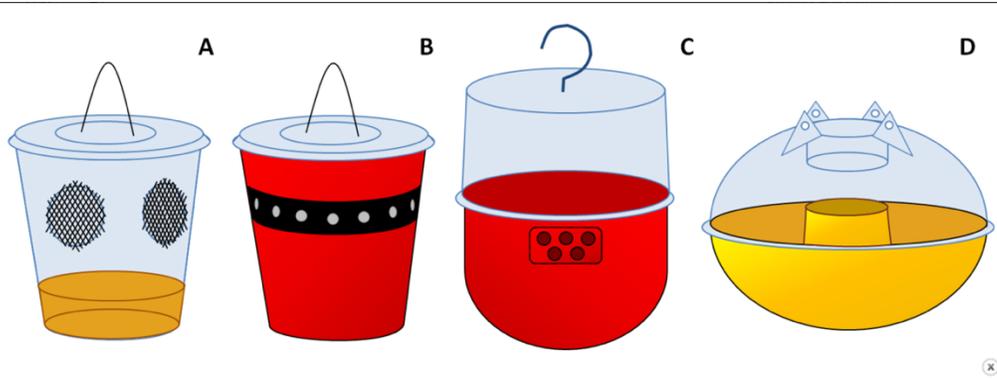
**Damage:** Female SWD damage fruit by cutting through the skin and inserting an egg into the flesh of the fruit. This provides entry wounds for ambient fungal spores and can lead to fruit rot, but more certainly leads to breakdown of the fruit from larval feeding after eggs hatch. Lowest risk varieties include 'Prelude' and 'Boyne' and highest risk varieties include 'Encore' and 'Royalty' (purple). Blackberries and Black Raspberries are all highly susceptible to damage. All 'Fall Bearing' (primocane fruiting) varieties are also highly susceptible. It does seem that the light colored (yellow/golden) varieties like 'Anne' or 'Double Gold' seem to be less attractive to SWD while dark colored varieties like 'Niwot', 'Bristol' (Black Raspberries) and 'Triple Crown', 'Chester', 'PrimeArk Freedom' (Blackberries) are more attractive to them.



**Figure 2)** Left - Female SWD on surface of ripe raspberry (**Photo:** J. Obermeyer, Purdue Univ.); Right - SWD inside ripe raspberry (**Photo:** D. Handley, Univ. of Maine)

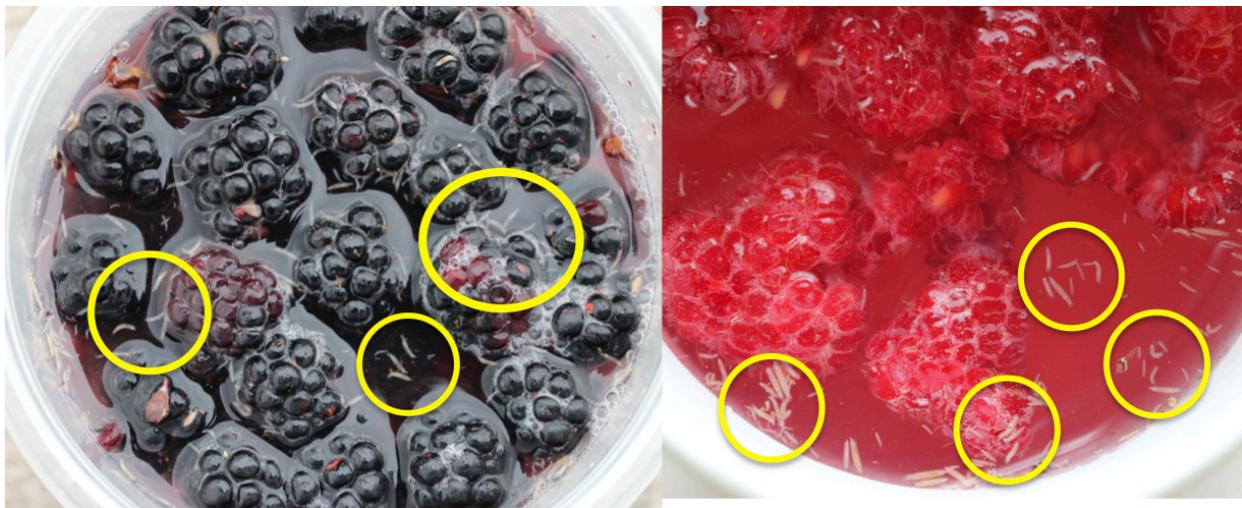
**Monitoring:** Adult SWD flies can be monitored with traps that contain various lures including apple cider vinegar, diluted Concord grape juice – prepared by mixing 1 part of juice in 3 parts of water, sugar/yeast solution w/ or w/o whole wheat flour, or commercial lures (e.g., Scentry, Trécé, Alpha Scents).

Traps should be placed first on field margins near wooded areas or other overwintering sites. These traps will help determine when SWD might be migrating into a field. Later, traps can be set in the field interior to monitor whether control measure are succeeding in keeping SWD infestations low.



**Fig. 3)** Examples of homemade and commercially available traps for adult SWD monitoring. (A) Clear Plastic, 20-ounce deli-cup trap baited with apple cider vinegar with mesh covering on the two side openings; (B) red and black 12-ounce cup trap with many holes for entry points punctured around the black stripe; (C) the red Droso-Trap model (Biobest Inc., Westerlo, Belgium) with lateral holes as entry points and a clear top; and (D) the yellow ISCA trap model (ISCA Technologies, Riverside, CA) with a single bottom entry point and a dome-shaped clear top. **Image Credit:** M. Rossi-Stacconi, Oregon State Univ.

Fruit should also be monitored regularly by sampling from the field or from harvest trays and performing a salt-test to extract any larvae that might be present. This is especially important for shipped fruit that might be rejected by buyers due to undiscovered larval infestation. Go to [Salt Test Protocol](#) for a description of how this test is performed.



**Figure 4)** SWD larvae emerging from Blackberry (left) and raspberry (right) fruit when using the salt flotation test. (Photo: J. Jasinski, Ohio State Univ.)

### Control Strategies:

#### *Cultural/Biological:*

- Reduce the abundance of SWD host plants (wild and cultivated) near raspberry/blackberry plantings when possible and practical. This will reduce the exposure to overwintered populations early in the season.

- Plant raspberries/blackberries with good spacing between rows to provide ample air circulation and sunlight penetration into the canopy.
- Prune raspberries to an open and narrow canopy to promote good air circulation and light penetration. Remove shoots and leaves below knee height that cast shade at the base of the canes. This increases sunlight exposure on the ground at the base of the rows which helps reduce SWD viability.
- Harvest frequently and thoroughly to reduce the egg-laying opportunities for SWD.
- Avoid allowing cull fruit to fall to the ground if possible (e.g., have pickers harvest cull fruit into a 'yuck bucket' and remove from the field).
- Cool harvested fruit to near 35°F as soon as possible to maintain fruit quality and to stop the development of SWD eggs and larvae that might be inside the fruit.
- Placing a temporary mulch barrier (e.g., plastic or fabric) on top of soil beneath the canes during the harvest period can help reduce pupal survival by keeping them out of the soil and thereby suppress population build-up. Permanent barriers are discouraged because they become havens for voles and other rodents that can chew on canes and roots during the winter.
- Several species of predator/parasite from SWD native range are being investigated for use in North America. This work is ongoing and will take some time before potential biocontrol agents are identified and made available. See [Biocontrol of Spotted Wing Drosophila](#) from Oregon State University for more on this.

*Chemical:*

- See: [New England Small Fruit Management Guide](#) and [Spotted Wing Drosophila Insecticide Chart](#) for currently recommended materials.
- Since insecticide sprays target adult SWD only, applications should begin prior to SWD egg-laying (before fruit start changing color). Eggs and maggots are impossible to control because they are already inside the fruit.
- Spray applications should be made after monitoring traps yield sustained captures. Starting before this may result in wasted and ineffective applications.
- Early morning or evening applications are most effective as this is when SWD are most active in the planting.
- If repeat applications are needed, rotate insecticides from different IRAC groups to reduce the chance of resistance development in the pest.
- Organic (OMRI approved) materials are also listed in the New England Small Fruit Management Guide.

**Date:** June 2020

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*This work was supported in part by funding provided by USDA NIFA Extension Implementation Program, Award No. 2017-70006-27137*