

IPM Fact Sheet Series

UMass Extension Fruit Team

Fact Sheet #BI-005

Blueberry – 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.

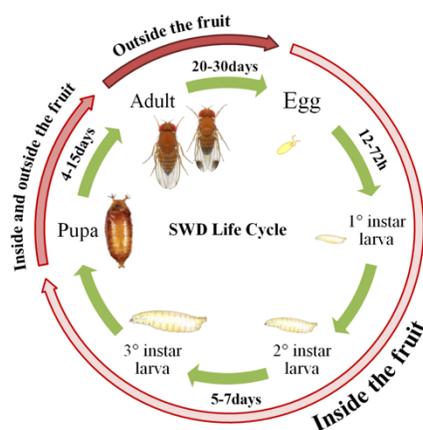


Figure 1) Diagram showing distinctive SWD life stages and locations of each life stage. **Image Credit:** M. Rossi-Stacconi, Oregon State Univ.

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 season blueberry varieties may escape serious damage from SWD but mid-season and later season varieties are very vulnerable.

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

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 'Earlyblue' and 'Bluetta' and highest risk varieties include 'Liberty' and 'Aurora'.

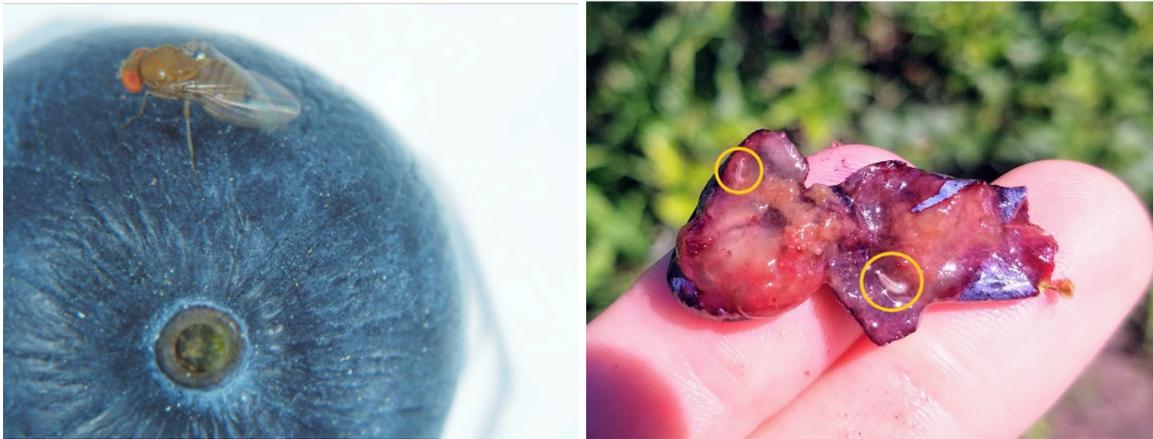


Figure 2) Left - Female SWD on surface of ripe blueberry (Photo: A. Sial, Univ. of Georgia); Right - SWD inside ripe blueberry (Photo: M. Gullickson, Univ. of Minnesota)

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 woody 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 measures are succeeding in keeping SWD infestations low.

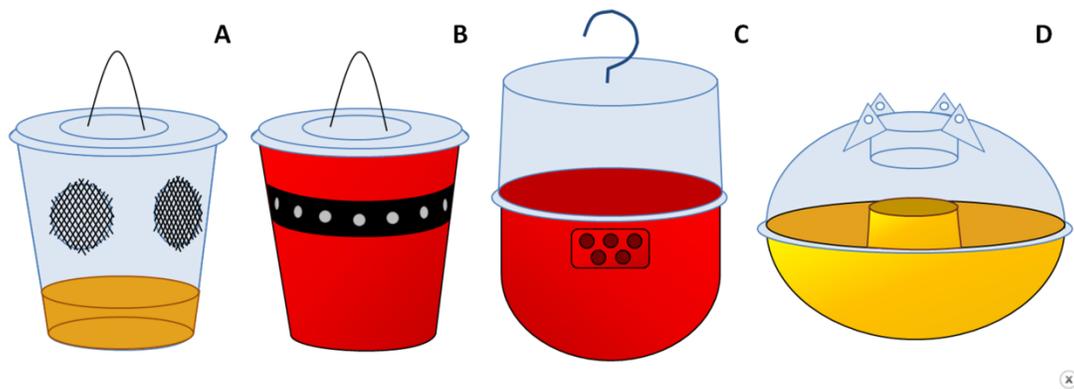


Fig. 3) Examples of homemade and commercially available traps for adult SWD monitoring. (A) Clear Plastic, 20-ounce deli-cup trap baited with apple cider vinegar with mesh covering on the two side openings; (B) red and black 12-ounce cup trap with many holes for entry points punctured around the black stripe; (C) the red Drosophila 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 trap placement in blueberry planting (**Photo:** P. Strawser, Ohio State Univ.)

Control Strategies:

Cultural/Biological:

- Reduce the abundance of SWD host plants (wild and cultivated) near blueberry plantings when possible and practical. This will reduce the exposure to overwintered populations early in the season.
- Plant blueberries with good spacing in and between rows to provide ample air circulation and sunlight penetration into the canopy. This will reduce interior humidity and increase ambient temperatures, both of which are unfavorable to SWD. It also creates a canopy with better spray penetration.
- Prune blueberries to promote an open canopy to optimize air circulation and light penetration into the canopy. Remove low branches that cast shade at the base of the bushes to increase sunlight exposure on the ground at the base of the bushes as SWD prefers shaded, more humid sites.

- 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).
- Refrigerate harvested fruit promptly.
- Placing a temporary mulch barrier (e.g., plastic or fabric) on top of regular mulch (e.g., wood chips), 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 stems 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.
- Because insecticide sprays target adult SWD only, then 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.
- 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.

Post-harvest cooling:

- After harvest, fruit should be cooled (e.g., at 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.

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