

A New Pest Attacking Healthy Ripening Fruit in Oregon

Spotted wing *Drosophila*: *Drosophila suzukii* (Matsumura)

EM 8991 • October 2009

Infestations of the spotted wing *Drosophila* fly (Diptera: Drosophilidae), an exotic pest, have been found in Oregon fruits in 13 counties. Of the 3,000 species of *Drosophila*, commonly known as vinegar flies, approximately 175 are known in North America. Two of these known species have been found to be harmful to crops, of which spotted wing *Drosophila* (SWD) is one.

These flies can infest and cause a great deal of damage to ripening fruit, as opposed to the overripe and fallen fruit that are infested by most other *Drosophila* species. We have confirmed findings of SWD in blueberries, wild blackberries, red raspberries, Marionberries, cherries, strawberries, plums, peaches, grapes, figs, hardy kiwis, and Asian pears.

It is crucial to find infestations of this pest as early as possible, when they can still be treated effectively.

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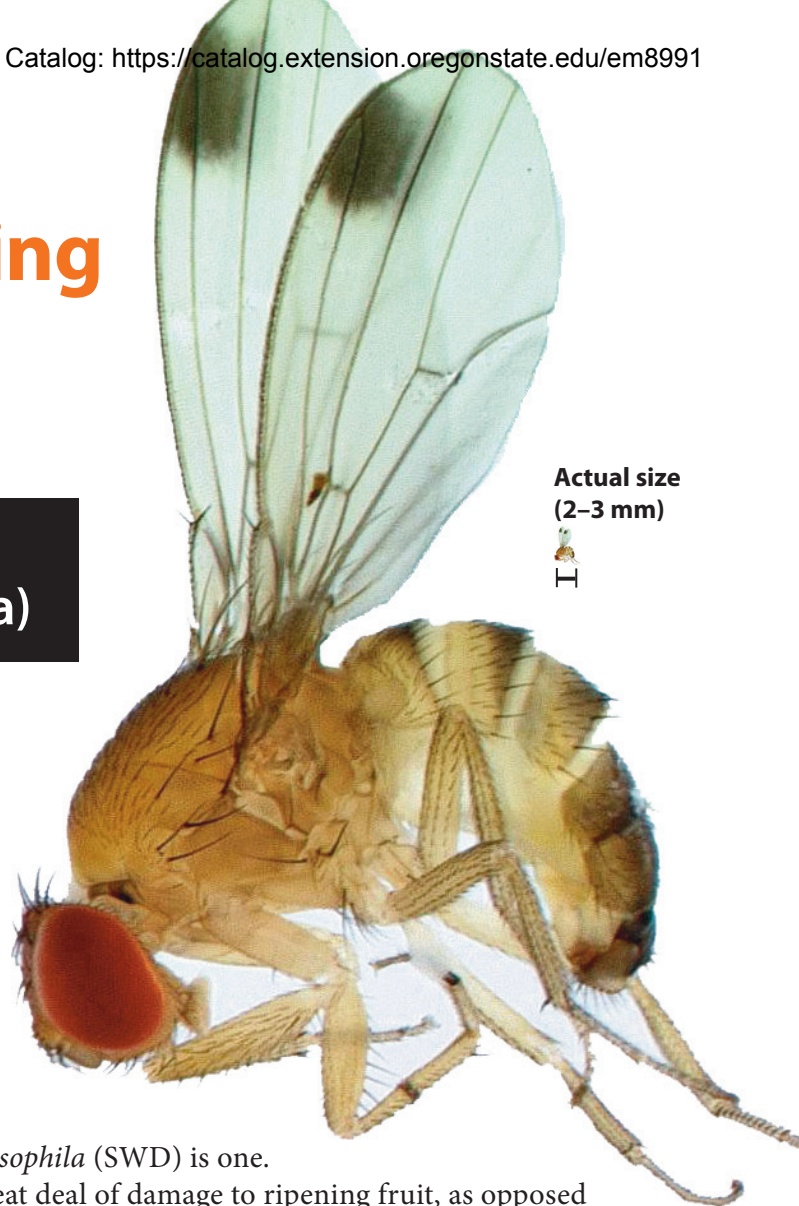
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Description

Adult *Drosophila* flies resemble the small fruit or vinegar flies that one might notice buzzing around the kitchen or around rotting fallen fruit outdoors. Typically, the well-known vinegar flies lay eggs in damaged or decaying fruit; however, SWD damage intact, ripening fruit. They have a body length of 2–3 mm, with red eyes and a yellowish-brown body. Upon close examination, brown bands are visible on the posterior of the abdomen. The male flies have a small dark spot on the front edge near the tip of each forewing (fig. 1) and two darkened bands (sex combs) on the forelegs. Females do not have this wing spot (fig. 2). The females have a



Actual size
(2–3 mm)





Figure 1. Male *D. suzukii* fly (2–3 mm). Lower right shows male genitalia. *Left and bottom right*, photos by G. Arakelian, Los Angeles County Department of Agricultural Commissioner/Weights and Measures, reproduced by permission; *top right*, photo by M. Hauser, California Department of Food and Agriculture (CDFA), reproduced by permission.



Figure 2. Female *D. suzukii* fly (2–3 mm). Right shows female genitalia. *Top left and right*, photos by G. Arakelian, Los Angeles Weights and Measures, reproduced by permission; *bottom left*, photo by M. Hauser, CDFA, reproduced by permission.

large, sawlike ovipositor for inserting eggs into fruit. The maggots are small (~3 mm) and white-to-cream colored (fig. 3). After the maggots mature, they pupate. The pupae are cylinder-shaped, reddish-brown, and 2–3 mm in length, with two small projections on the end.

There are many species of “vinegar flies,” so one should be careful not to mistake SWD for the common vinegar fly, *D. melanogaster*, or for the Western fruit fly, *Rhagoletis indifferens*, a larger maggot in a different fly family.

Host Range and Potential Impact

These flies are native to Southeast Asia. At present, they have been found in California, Florida, Oregon, Washington, and Canada. They have been established in Hawaii since 1986. They are reported to attack a variety of fruits including blueberries, blackberries, strawberries, raspberries, cherries, apple, peach, plum, persimmon, and grapes, as well as other *Rubus* species. The SWD lays its eggs within ripening fruit, which makes it an important economic pest for a range of important high-value horticultural crops in Oregon.

Life History

At this point, not much is known about the life cycle of SWD in Oregon. In Japan, 13 generations have been observed per year. Three to ten generations are predicted for most California production climates. The flies are most active at temperatures of 68°F. Activity, longevity, and egg laying decrease at higher temperatures (above 86°F). They thrive at cool temperatures experienced during early summer and fall. This means that most of Oregon’s berry crops are at risk during the growing season. This is especially concerning because Oregon has a variety of crops that ripen at different times during the season. SWD may move from one crop to another as the season progresses, and populations may build to high numbers in many crops.

Berry growers who use closed canopies and tunnels, as well as those who use shady areas in crop



Figure 3. *D. suzukii* larvae (top), pupae (middle), and adult flies (bottom) (each 2–3 mm) reared from blueberries in Oregon. Photos by M. Reitmajer, copyright Oregon State University.

fields, will be hit the hardest. However, this fly is found in California and Florida's summer seasons in hot locations, which means that they should be able to survive in the highest temperatures found during Oregon's summer.

A single life cycle can be as short as 8–14 days, depending on the weather. The flies can be active from April to November. In midseason, adult life span is 3–9 weeks. Flies that emerge in late summer or fall can overwinter. They will lay eggs during the following summer on early ripening fruit. Females typically will insert their ovipositor into the fruit, lay one to three eggs per fruit, 7–16 eggs per day, and more than 300 eggs in their lifetime. Pupation can take place both inside and outside of fruit.

It is not known how well this pest will overwinter in Oregon.

Fruit Damage

Infestation of fruit reveals small scars (speckles) and indented soft spots and bruises on the fruit surface left by the female's ovipositor ("stinger"; figs. 4 and 5). The eggs hatch in a short time, about 1–3 days, and maggots soon begin feeding inside the fruit. Fruit damage is caused by the maggot feeding. In as few as two days, the fruit will begin to collapse around the feeding site. Thereafter, fungal and bacterial infections and secondary pests may contribute to further fruit deterioration. These damage symptoms may result in severe crop losses. The implications for exporting producers may also be severe, depending on quarantine regulations.



Figure 4. Deterioration of blueberry fruit damaged by *D. suzukii* around oviposition and feeding site. Photo by D. Bruck, USDA Agricultural Research Service, reproduced by permission.



Figure 5. Cherry damaged by *D. suzukii*. Photo by G. Arakelian, Los Angeles County Department of Agricultural Commissioner/Weights and Measures, reproduced by permission.

Monitoring

Monitor for presence of *D. suzukii* when fruit begins to ripen by using baits and traps.

Bait Attractants

Ripe bananas, strawberry puree, apple cider, and yeast mixtures (1 package of brewer's yeast, 4 teaspoons of sugar, and 12 oz. of water) have been used in bottle-type traps hung near fruit or placed on the ground during or after the fruit season to lure and catch adult flies. The mixture of yeast, sugar, and water alone appears to be the most successful. GF-120 is a commercially available Spinosad-based pesticide that will both attract and kill fruit flies.

Traps

A large can or wide-mouthed jar with a funnel placed inside (to reduce the number of flies escaping once they enter the funnel's hole) or a plastic Nalgene bottle with holes punched in the lid and hanging wire can serve as a cheap but functional method for trapping flies. Yellow sticky cards can be placed inside the trap walls to prevent escapees. Three commercial traps that should work well are glass McPhail, Omni (or slight variations), and liquid Rescue Fly traps. Traps need to be serviced and cleaned at least once per week in order to determine population dynamics and to optimize trap efficiency. These traps can be purchased through many companies (see below). The first two traps are baited and suspended above ground at the level of ripening fruit.

To evaluate the numbers of flies in an area within a crop, use a sweep net. In order to optimize catches, sweep close to the canopy that bears fruit as well as fruit that has dropped to the ground. After sweeping is complete, the net can be inverted over a bucket of soapy water and the flies counted. Do sweeping during the morning or at dusk for optimum catch. Check trap captures for flies and confirm the identity of flies by sending them for formal identification at the Oregon Department of Agriculture (see address below).

Management

Unfortunately, there are no established management plans for this new pest in Oregon. Control recommendations to best suppress fly populations are still under development. However, two principles will be at the heart of controlling this pest regardless of crop: controlling the flies before they lay eggs, and reducing breeding sites by immediately removing and disposing of infested or leftover fruit on the plant.

Insecticide products labeled for use on specific fruits may list fruit flies as pests. Check with a product representative or your local extension horticultural agent or entomologist for further information.

What to Do If You Suspect SWD

Spotted wing *Drosophila* is a potentially serious pest in Oregon fresh-fruit production systems. If you suspect SWD in your fruit, it is essential that samples of fruit or adult flies be sent directly to

Jim LaBonte
Plant Division
Oregon Department of Agriculture
635 Capital Street NE
Salem OR 97391-2532

in order to positively identify adults. Your help in this regard is greatly appreciated.

For More Information

- Further biological information:
<http://ucanr.org/blogs/blogcore/postdetail.cfm?postnum=1483>
- Additional details on identification and images of damage to cherry fruit:
<http://cemariposa.ucdavis.edu/files/67726.pdf>
- On the importance, detection, and management of SWD:
http://ucanr.org/blogs/strawberries_caneberries/

McPhail and Omni traps can be ordered from pest management supply companies such as ISCA Technologies (California) and Cooper Mill Ltd. (Canada). Liquid Rescue Fly traps can be ordered from Ace Hardware and similar suppliers.

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Thanks are due to Oregon State University, the Oregon State University Extension publishing unit and Mark Anderson-Wilk for rapid dissemination of this document, the Oregon Department of Agriculture, the Horticultural Crops Research Unit of the USDA Agricultural Research Service, the Division of Plant Industry of the Florida Department of Agriculture, the University of California Agriculture and Natural Resources blogs, the University of California Cooperative Extension, and the California Farm Bureau Federation. Cover photo by G. Arakelian, Los Angeles County Department of Agricultural Commissioner/Weights and Measures, reproduced by permission.

Published October 2009.