

A new pest attacking healthy ripening fruit in Oregon: Spotted Wing Drosophila, *Drosophila suzukii* (Matsumura)

Pest of Concern

Infestations of the Spotted Wing Drosophila fly (Diptera: Drosophilidae; SWD), an exotic pest, were found in Oregon fruits. Of the 3000 species of *Drosophila*, commonly known as vinegar flies, but only two have been found to be harmful to crops, of which SWD is one. The SWD can infest and cause a great deal of damage to ripening fruit, as opposed to overripe and fallen fruit that are infested by most of the other *Drosophila* species. We have just confirmed findings of SWD in blueberries in Philomath, Benton County in Oregon, and have found suspect maggots (larvae) in wild blackberries, red raspberries and some leftover late hanging Marion blackberries east of Corvallis. In addition, maggot samples from the North Willamette Research and Extension Center (Aurora, OR) are also being reared to confirm fly identity. Continued searches for SWD are currently being conducted outside Corvallis over the next weeks.

It is crucial to find infestations of this pest as early as possible when they can still be treated effectively. This document makes use of information gathered from both Florida and University of California and USDA Scientists. Several links are provided at the end of this document to aid dissemination of information. This document is based on that information and is being distributed to the Oregon small fruits and grape industries in order to rapidly inform growers, pest management consultants, and extension agents.

Description of Pest

Adult *Drosophila* flies resemble small fruit or vinegar flies that you may notice buzzing around your kitchen fruit or found around fallen fruit in the 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 colored body. If you look closely you can see dark brown bands on the segments of the abdomen. The male flies have a small dark spot on the front edge near the tip of each fore-wing (Figure 1). Females do not have this wing spot (Figure 2). Females have a large saw-like ovipositor on their tail end for inserting eggs in fruit. The maggots are small (~3 mm) and white-to-cream colored (Figure 3). After maggots mature they may pupate. The pupae are cylinder-shaped, reddish-brown, 2-3 mm in length with 2 small projections on the end.

Remember, there are many species of ‘vinegar flies’, so be careful not to mistake it for the common vinegar fly, *Drosophila melanogaster*, or the western fruit fly, *Rhagoletis indifferens*, a larger maggot in a different fly family.

Host Range and Potential Impact

These flies are native to SE Asia. Presently, they have been found in California, Florida, Oregon, Washington, and have been established in Hawaii since 1986. This fly attacks a variety of fruits including but not limited to blueberries, blackberries, strawberries, raspberries, cherries, apple, peach, plum, persimmon and *Rubus*. There is still no proof that the fly attacks grapes, however it

has been observed in a lab no-choice food test to oviposit on table grapes and was reported to cause damage to grapes in Japan in the 30's. The SWD lays its eggs within ripening fruit, which makes it an important economic pest to a range of important crops in Oregon.

Life History

At this point not much is known about the life cycle in Oregon. In Japan, 13 generations have been observed per year. Three to ten generations are predicted for most Californian production climates. It is believed that this fly can have several generations per season in Oregon. 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 typically experienced during the most of early summer and fall, but do poorly at temperatures above 86° F. This means that most of Oregon's berry crops are at risk during the growing season. This is especially concerning due to the fact that 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 up to high number in many crops. Berry growers who utilize closed canopies and tunnels and well as shady areas in crop fields are hit the hardest by the fly. However, this fly is found in California and Florida's summer seasons in hot locations, which mean that they should be able to survive in temperatures found during the height of Oregon's summer period.

A single life cycle can be as short as 8-14 days, depending on the weather. Flies can be active from April to November. In mid-season, adult life span is 3-9 weeks. Late summer or fall emerging flies can overwinter. They will lay eggs during the following summer on early ripening fruit. Females typically will insert their ovipositor into the fruit, lay 1-3 eggs per fruit, 7-16 eggs per day, and greater than 300 eggs in their lifetime. Pupation can take place both inside and outside of fruit in about 3 to 15 days. It is unknown as to how well this pest will over-winter in Oregon. However, because it occurs to the south, there is great potential for continual re-introductions.

Fruit Damage

Infestation of fruit reveals small scars and indented soft spots on the fruit surface left by the females ovipositor ("stinger") (**Figures 4 & 5**). The egg(s) hatch in a short time, about 1-3 days, maggots soon begin feeding inside the fruit. Fruit damage is caused by the feeding from maggot development. Within as little as 2 days, the fruit begins to collapse around the feeding site. Thereafter, fungal and bacterial infections and secondary pests may contribute to further damage. These damage symptoms may result in severe crop losses. The implications for exporting producers may also be severe, depending on quarantine regulations.

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 or a yeast mixture (1 package of Brewers yeast, 4 teaspoons of sugar and 12 oz of water) have been used in traps to lure and catch adult flies. The mixture of yeast, sugar and water appears to be the most successful. GF 120 is a commercially-available Spinosad-based material which will both attract and kill fruit flies. Traps: These flies can be particular about entering traps. A large can or wide-mouth jar with a funnel placed inside to reduce numbers of flies escaping once they enter a funnel's hole; or a plastic Nalgene bottle with a perforated lid and hanging wire are cheap but working methods for trapping flies. Three commercial traps that should work well are the glass McPhail trap, Omni

trap (or slight variations) or the liquid Rescue FlyTrap. Traps need to be serviced/cleaned at least once per week in order to determine population dynamics, and optimize trap efficiency. These traps can be purchased through many companies (see below). The first two traps are baited and then suspended above ground at about the level of the ripening fruit.

To evaluate the numbers of flies in a row area within a crop, use a sweep net swept over the crop canopy or fruit on the ground per designated distance. Tap fruit canes with a stick to dislodge flies. After sweeping is complete, the net can be inverted over a bucket of soapy water and flies counted (e.g., 40 flies captured over 36 feet of raspberry hedgerow). Do this in the morning or at dusk for optimum catch. Check trap captures for flies and confirm fly id.

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. Control the flies before they lay eggs; and reduce the fly's breeding sites by immediately removing and disposing of infested fruit. 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.

Conclusion

The SWD is a potential serious pest in Oregon fresh fruit production systems. If you suspect you have SWD in your fruit, it is essential that samples of fruit or adult flies be sent directly to: Jim LaBonte, **ODA Plant Division**, 635 Capital St. NE, 97391-2532, Salem OR, in order to positively identify adults. This will aid OSU, ODA, and USDA researchers to direct their research efforts during the coming crop season. Your help in this regard is greatly appreciated.



Figure 1. *Drosophila suzukii* male fly (2-3 mm).

Photography credit: G. Arakelian, Los Angeles County Agricultural Commissioner/Weights & Measures Department and adult fly photo by Martin Hauser (UC IPM).



Figure 2. *Drosophila suzukii* female fly (2-3 mm).

Photography credit: G. Arakelian, Los Angeles County Agricultural Commissioner/Weights & Measures Department and adult fly photo by Martin Hauser (UC IPM).



Figure 3. *D. suzukii* larvae (~3 mm), pupae and adult flies (each 2-3mm) reared from blueberries in Oregon.

Photography credits: M. Reitmajer, Oregon State University Research Technician, Corvallis OR and D. Bruck, USDA-ARS Horticultural Crops Research Laboratory, Corvallis OR



Figure 4. Collapse of blueberry fruit damaged by *Drosophila suzukii* around oviposition and feeding site.

Photography credit: D. Bruck, USDA-ARS Horticultural Crops Research Laboratory, Corvallis OR.



Figure 5. Cherries damaged by *Drosophila suzukii*.

Photography credit: University of California Cooperative Extension, Mariposa County.

Additional sources of information

Further details on identification,

<http://cemariposa.ucdavis.edu/files/67726.pdf>.

Further biological information is summarized by California scientists,

<http://ucanr.org/blogs/blogcore/postdetail.cfm?postnum=1483>

Additional images of damage to cherry fruit can be viewed,

<http://cemariposa.ucdavis.edu/files/67726.pdf>

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). The liquid Rescue Flytrap can be ordered from Ace Hardware, etc.

Acknowledgements

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