

LIKES & DISLIKES OF SPOTTED WING DROSOPHILA

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Infestations of the Spotted Wing Drosophila fly, *Drosophila suzukii* (Diptera: Drosophilidae; SWD), an invasive pest, were first found in Oregon fruits in Fall 2009, and now appear widely established. These flies are native to SE Asia --China, Japan, Thailand, and Korea. They were first discovered on mainland United States in California in 2008 and now found in Oregon, Washington, Canada, Florida, North Carolina, South Carolina, Utah, Michigan, and New Jersey. They have been established in Hawaii since 1986. The SWD can infest and cause a great deal of damage to ripening to ripe fruit, as opposed to overripe and fallen fruit that are infested by most of the other *Drosophila* species. We have confirmed findings of SWD in 17 Oregon counties. Fruits includes, but limited to, blueberries, raspberries, caneberries, blackberries, strawberries, cherries, peaches, and grape.

Fruit preference (type and ripeness stage), trap bait attractiveness, seasonal distribution, landscape design, and affects from treatments (chemical and biological) will be discussed based on observational and research data.

Description of Pest

Adult *Drosophila* flies resemble small fruit or vinegar flies that you may notice buzzing around your compost pile. They have a body length of 2-3 mm, with red eyes and a yellowish-brown colored body. The male flies have a small dark spot on the front edge near the tip of each fore-wing. Females do not have this wing spot. Females have a large saw-like ovipositor on their tail end for inserting < 1 mm white eggs with two tail filaments in fruit (Fig. 1). The maggots are small (~3 mm) and white-to-cream colored. After maggots mature they pupate. The pupae are cylinder-shaped, reddish-tan, 2 to 3 mm in length with two small respiratory horns (for breathing) on the end (See Fig. 2).



Fig. 1: SWD eggs

Life History

Three to nine generations were predicted in Oregon production climates in 2010 (Coop et al unpublished). Flies are most active at temperatures of 68° F. They particularly favor shady and diversified landscape. It has been reported that activity, longevity, and egg laying decrease at higher temperatures (above 86° F). They thrive at cool temperatures typically experienced during the most of late spring/early summer and fall seasons; this means that most of Oregon's small and stone fruit crops could be at risk during the growing season. The largest populations of SWD were found in late fall after most of fruit was harvested. 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 greenhouse tunnels, no-spray practices, as well as shady areas in fruiting fields were hit the hardest by the fly. However, this fly is found in California and Florida's summer seasons in warmer 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 through November as we experienced in 2010. In mid-season, adult life span is 3-4 weeks. Late summer or fall emerging flies are noted to overwinter. Lab studies revealed little to no adult survival past 100+days. Outdoor field trials are currently in progress. Last winter, eggs (6%), larvae (13%), and adults (39%) survived a 60d exposure period (.72C to 17C). They will lay eggs the following season on early ripening fruit. Females typically insert their ovipositor into the fruit, lay 1-3 eggs per fruit, 7-16 eggs per day, and greater than several hundred 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 overwinter in Oregon. However, because it occurs to the south, there is great potential for continual re-introductions.



Fig. 2: SWD Larva Pupae Adults

Fruit Damage and Symptoms

SWD appeared to prefer ripe fruit in laboratory conditions. They laid eggs in green and overripe fruit but minimal adult flies were able to develop. Infestation of fruit reveals small scars and indented soft spots on the fruit surface left by the place where the female laid her eggs. 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 2-4 days, the fruit begins to collapse around the feeding site. Fungal and bacterial infections and secondary pests may contribute to further damage. These damage symptoms may result in fruit losses.

Management

There are a team of Oregon, California, Washington, and Canadian researchers addressing questions of overwintering survival in the lab and field, spring emergence, timing of oviposition, fruit preference and susceptibility to better understand the life cycle and phenology of SWD in Oregon. With this knowledge, a management strategy and control recommendations/guidelines are being developed. 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. Monitoring traps for detection and as a means of controlling the pest (e.g., mass trapping) are being investigated. Cultural and preventative practices such as sanitation techniques, netting fruit, and timely harvesting are a few tools used for reducing numbers of SWD. Insecticide products labeled for use on specific fruits in conventional, IPM, and organic fruit systems were studied in 2009-2010, and are listed on the SWD.hort.oregonstate.edu website and found in the PNW Insect Management Handbook in 2011.

Monitoring

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

Bait attractants: Pure apple cider vinegar with a drop of unscented soap to reduce surface tension is the bait of choice for 2011.

Trap Choice for 2011: A 32 oz. plastic clear cup with a lid, and a hanging coated wire are cheap and working methods for trapping flies. About 2-inches of liquid bait are added to traps. Several holes, 5/16" are drilled in side of cup for entry of flies.

Traps need to be serviced once per week in order to determine population dynamics and optimize trap efficiency. Place traps within the canopy of plant on shady side. Increased numbers have been found near diversified borders and perimeters of fields. See monitoring protocol on website.