Spotted Wing Drosophila
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WHAT YOU SHOULD KNOW

- Spotted Wing Drosophila (SWD) is a new Utah pest (first found August, 2010) that can infest un-ripened (pre-harvest), ripe, over-ripe, and spoiled fruits.
- SWD attacks a broad range of fruits, including tree fruits, berry fruits, and vegetable fruits.
- SWD can be easily controlled using standard insecticides, and by expanding the spray program to pre- and post-ripe fruit stages.
- Suspect SWD flies should be sent to the Utah Plant Pest Diagnostic Lab (UPPDL) for identification.

BACKGROUND

Spotted Wing Drosophila (SWD) (Drosophila suzukii) is a new fruit pest recently discovered in Davis County, Utah (August, 2010). Because this pest is widespread in the western and southeastern United States, it is considered “non-actionable,” meaning no import or export restrictions, or quarantines will be implemented. SWD is similar to other vinegar flies (genus Drosophila), except they can infest unripe fruit. SWD can be easily controlled using insecticides common in fruit integrated pest management plans. If SWD is caught in monitoring traps, insecticide applications must be used during the unripe fruit stage to prevent damage.

This fact sheet describes SWD biology and current monitoring and control strategies for growers and homeowners. Any suspect SWD should be sent to the UPPDL for identification. Many flies have spots on their wings. Small flies with only 1 spot per wing (Fig. 1) should be considered suspect.

BIOLOGY

Scientific Name: Drosophila suzukii (Drosophilidae)

Range in U.S.: Davis County, Utah; California; Oregon; Washington, Florida, Louisiana, North Carolina, and South Carolina.

Hosts: Detected in a raspberry and blackberry field in Kaysville, Utah (trap survey). Hosts include: tree fruits (apple, apricot, cherry, mulberry, nectarine, peach, persimmons, plum, plum); small fruits (blackberry, blueberry, grapes, raspberry, strawberry); vegetable fruits (melons, tomato). Any soft-skinned fruit may be susceptible to SWD.

Damaging Stage: Larvae and adults. Larvae feed inside fruit causing abscesses; secondary fungal and pest infection may occur. Adults cause superficial scarring by sawing into fruit to lay eggs.

Overwintering Stage: Unknown if SWD will survive winter in northern Utah; survival in southern Utah is likely. Adults and pupae may overwinter.

Egg: Small, white, inserted into fruit. Two thin filaments used for breathing are visible protruding out of fruit. Over 350 eggs may be laid by a single female (Fig. 2).

Immature: Small (0.067-3.5mm or 0.003-.01in) cream-colored maggot with black mouthparts (Fig. 3).

Adult: Typical vinegar fly appearance: 2-3 mm (0.1 in) long, red eyes, pale brown body, featherlike antennae. Males have one circular black spot per wing (Fig. 1); females have no spots on wings and a sawlike ovipositor (Fig. 2). They are most active at 68°F; egg laying decreases above 86°F.

Pupae: Small (2-3 mm or 0.1 in) brown, cylindrical capsules with two extensions on one end (Fig. 4). Found in fruit or just below leaf litter in soil.

Generations per year: Unknown for Utah. Three to eight gen/yr have been observed in Oregon, and 10-13 gen/yr in California.
**Seasonal Emergence:** Unknown for Utah. Washington State University estimates SWD emergence between late May and early June (514 degree days °F, base temp. 48°F).

**Important Behaviors:** Can lay eggs in unripe, ripe, overripe, shriveled, or spoiled fruit. Adults prefer to feed on damaged or fermenting fruit.

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**MONITORING METHODS**

Control is not recommended unless SWD is caught in monitoring traps, fruit injury is detected, or a high-value crop needs protecting. The following traps can be used for monitoring:

**Clear Cup Trap:** For homeowners or low-budget growers, simple traps can be made from a 16 to 32 oz clear plastic cup and lid, hanger, bait solution, twist-tie or paper clip, and a yellow sticky card.

- On one side of the cup, drill four to six, 3/16” holes in the upper portion of the cup.
- Drill two holes on opposite sides of the cup to put hanger through (to hang trap).
- Put yellow sticky card in cup by attaching to a twist-tie put through two small holes in the top of the lid. Optional, but may make monitoring easier.

- Prepare bait and add to cup: mix 0.25 oz yeast (one package) + 4 teaspoons sugar + 12 fl oz water, or 2-3” of apple cider vinegar as a substitute for the yeast mixture.
- Add 1 to 2 drops of dish soap (optional, but will improve fly capture).
- Attach lid.
- Hang traps at fruit level. In low-growing fruits such as strawberries, sink traps 2-3” in the ground.

**Commercially Available Traps:** Easy-to-use commercial traps are available from Contech (Fruit Fly Trap) for about $10 for a two-pack (Fig. 6). McPhail traps from ISCA Tech. are more complex to use and cost about $14 per trap (available in bulk order rates at $11 each). There are many other similar traps on the market that work on the same principles. Homemade and commercial traps are equally effective at catching SWD. See “Trap Sources” at end of publication for contact information.

**Liquid Baits:** The two best bait solutions to use in traps are apple cider vinegar, or a sugar-water-yeast solution. The yeast solution is likely a better attractant when SWD populations are low. If you are trapping to detect the presence of SWD, you may want to use the yeast solution. The downside of the yeast solution is that it needs to be changed at least every 2 weeks, is messy, and has a bad odor. Once a SWD population is confirmed, you can switch to the vinegar solution for monitoring. All liquid baits should be changed weekly for optimal performance.
**Fruit Dunk:** Developed at Oregon State University, this method of larva detection works best with smaller fruits, e.g., berries and cherries. Collect 50 to 75 randomly selected fruits (depending on the fruit size), and place them in a 1 gallon ziplock bag. Lightly crush fruit to expose larvae. Add 1 cup of a sugar solution (1/4 cup sugar to 4 cups water) and wait a few minutes. If present, larvae will float to the surface, while fruit will sink. The presence of larvae may indicate SWD in your fruit crop. There are other species of fruit-infesting insect larvae, such as cherry fruit fly, currant maggot and sap beetle. The UPPDL can assist with insect larva identification.

**CHEMICAL CONTROL**

A SWD control program starts with monitoring. If SWD is detected, chemical control is necessary to preserve the marketability of fruit. For commercial growers, some chemicals already used in your IPM program for similar pests should give effective control of SWD. To protect fruit, an additional insecticide application will be needed at the pre-ripe (straw color) stage, with additional applications as per the label directions through harvest, and post-harvest if a high volume of fruit remains on trees or plants.

Select insecticide products based on the fruit type you want to protect. Products that are effective against tephritid fruit flies will be effective against SWD. Products for commercial and homeowner (\(^1\)) use, including organically certified (\(^2\)) products, listed in Table 1, have shown good to excellent control of SWD in preliminary tests. Do not apply insecticides while pollinators are active.

**Table 1. Insecticides for SWD control.** Products are not complete listings of all available options. \(^1\)H\(^1\) signifies that the product is registered for homeowner use, \(^2\)O\(^1\) signifies an organically compatible insecticide. Not all products are labeled on all fruits; read label to ensure that your product matches the site. Alternate the MoA (mode of action) of the product you choose on a yearly basis to minimize resistance build-up.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Active Ingredient</th>
<th>MoA</th>
</tr>
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<tbody>
<tr>
<td>Asana</td>
<td>esfenvalerate</td>
<td>3A</td>
</tr>
<tr>
<td>Assail(^1)</td>
<td>acetamiprid</td>
<td>4A</td>
</tr>
<tr>
<td>Baythroid(^1)</td>
<td>beta-cyfluthrin</td>
<td>3A</td>
</tr>
<tr>
<td>Delegate(^1)</td>
<td>spinetoram</td>
<td>5</td>
</tr>
<tr>
<td>Diazinon</td>
<td>diazinon</td>
<td>1B</td>
</tr>
<tr>
<td>Dimethoate</td>
<td>dimethoate</td>
<td>1B</td>
</tr>
<tr>
<td>Entrust(^1),(^2)</td>
<td>spinosad</td>
<td>5</td>
</tr>
<tr>
<td>Guthion</td>
<td>azinphos-methyl</td>
<td>1B</td>
</tr>
<tr>
<td>Malathion(^1)</td>
<td>malathion</td>
<td>1B</td>
</tr>
<tr>
<td>Pounce</td>
<td>permethrin</td>
<td>3A</td>
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<tr>
<td>Proaxis</td>
<td>gamma-cyhalothrin</td>
<td>3A</td>
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<tr>
<td>Provado(^1)</td>
<td>imidacloprid</td>
<td>4A</td>
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<tr>
<td>Pyganic(^1),(^2)</td>
<td>pyrethrin</td>
<td>3A</td>
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<tr>
<td>Sevin(^1)</td>
<td>carbaryl</td>
<td>1A</td>
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<tr>
<td>Success(^1)</td>
<td>spinosad</td>
<td>5</td>
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<tr>
<td>Warrior</td>
<td>lambda-cyhalothrin</td>
<td>3A</td>
</tr>
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**USEFUL SWD REFERENCES**

BC Ministry of Agriculture and Lands: http://www.al.gov.bc.ca/croppro/swd.htm

Google page on SWD: http://sites.google.com/site/spottedwingdrosophila/


Oregon Department of Agriculture: http://www.oregon.gov/ODA/PLANT/IPPM/

Oregon State University: http://swd.hort.oregonstate.edu/

University of California: http://www.ipm.ucdavis.edu/EXOTIC/drosophila.html

University of California SWD blog: http://ucanr.org/blogs/strawberries_cranberries/

Washington State University: http://jenny.tifco.wsu.edu/otm/displaySpecies.php?ppn=165

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