Spotted Wing Drosophila
Part 3: Monitoring

Spotted wing drosophila (SWD) is an invasive vinegar (fruit) fly first detected in Pennsylvania in 2011. This pest lays eggs in ripening fruit, so its larvae may infest fruit at harvest. Some growers in Pennsylvania lost large portions of fall raspberry and day-neutral strawberry crops to this pest. By monitoring for SWD, growers can know whether and when action is needed.

Monitoring for Adult SWD with Traps

Using bait traps allows positive identification of the adult male flies. Trap use as described here is for monitoring, not for providing control. See the Penn State Extension fact sheet "Spotted Wing Drosophila, Part 4: Management" for information on control measures.

Types of Traps and Lures

Homemade traps can be made inexpensively from 16- or 32-ounce clear drink cups with lids, deli containers, or rigid screw-top wide-mouth plastic jars. Drill or burn with a soldering iron six to twelve 3⁄16- to 3⁄8-inch-diameter holes into the upper half and about two-thirds of the way around the container. (Drilling holes around the entire container will cause flies to be lost when pouring out the vinegar bait.) To hang the trap, thread a wire through two holes drilled opposite each other near the top (Figure 1) or insert a paper clip or screw through a small hole in the lid. Applying red tape or paint to the trap may make it more effective. Commercially produced traps are available—e.g., the trap by Contech is convenient to use and catches only small insects, excluding bees, flies, and sap beetles. It also catches fewer SWD than homemade traps because it has only two entrance holes (Figure 2).

Figure 1

Figure 2

To make the recommended lure, pour in 1–2 inches of apple cider vinegar plus one drop of unscented dish detergent. Yeast mixtures and various juices may attract more flies, but they are messy, attractive to animals, and opaque, making observation difficult. Vinegar traps and preserves SWD, while the detergent breaks the vinegar's surface tension so the flies sink rather than escape.

Sticky Cards

Sticky cards do not improve trap attractiveness, allow adults to degrade over time, and make identification of female SWD more difficult for researchers or regulatory personnel who may check the cards later. Use sticky cards only when flies will not be sent elsewhere for identification.

When and Where to Place Traps

Traps should be in the field when fruit begins to color. Female SWD fly earlier in the season than males and may be caught first, but identifying them is difficult without a microscope. Monitor any thin-skinned fruit (e.g., strawberries, cherries, raspberries, blackberries, grapes). SWD has been found on cherry tomatoes and wild berries. Late season fruit crops are especially vulnerable as SWD populations are highest then. Even slightly attractive crops in tunnels should be monitored.

Place traps on the north side of rows in mid-field at fruit level (Figure 3). For stability in low crops, dig a depression to hold the trap, tie it to a stake, or use a short container. SWD is more likely to be found on the shady side of the row and where humidity is highest.

The optimum number of traps per area has not been determined. A good starting point is one trap per acre or, in smaller fields, one trap per susceptible crop. Move traps to later crops as they ripen. As with all fruit flies, SWD will continue to breed in dropped fruit residues after harvest.

Figure 3

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Checking the Traps

Check traps about once per week. Replace used vinegar with fresh vinegar to maintain attractiveness. Discard old vinegar away from the planting.

Draining off and replacing the vinegar with water makes the wing spots and black bands on the front legs more evident (see the Penn State Extension fact sheet "Spotted Wing Drosophila, Part 1: Overview and Identification"); so does pouring the solution into a shallow white container or a clear container on a white background. Add more water to disperse the flies. You will need a magnifying glass or hand lens to examine the flies, or you can take a close-up digital photo. If the water is shallow, all the flies will be in focus.(Figure 4). View the photo on a computer screen, zooming in as necessary.

Figure 4

Thresholds for Treatment

Thresholds have not been established due to SWD's recent arrival. One adult male per trap per week is cause for concern, so check fruit for larvae (maggots) as outlined below. Fifteen adult males per trap per week indicate a threatening population to the crop. These numbers are likely to change as we learn more about SWD.

Storing and Shipping Samples

If you wish to transfer samples to a container, strain the solution through one half of a mesh tea ball or a funnel lined with fine netting or fabric (e.g., tent netting, organza, or tulle fabric). The holes in typical kitchen strainers and screen door netting are too large. Next, wash the flies into a container (Figure 5) or blot the strainer on a paper towel to wick out moisture, which frees up the flies, and then gently gather the flies with a craft brush and roll them into another container (Figure 6).

Figure 5

Figure 6

Apple cider vinegar can be used to store and ship samples for about a month. If shipping samples, seal the containers with electrical tape and place them in a zip-lock bag. Label samples, preferably in pencil, with the collection date, crop, location, and other pertinent information.

In laboratories, samples are typically stored in 70 percent ethyl alcohol (ethanol). Rubbing (isopropyl) alcohol makes SWD brittle. Both types of alcohol are flammable, dissolve the writing of alcohol-based marking pens, and may be subject to shipping restrictions.

Checking Fruit for Larvae

Larvae (maggots) may be present in fruit even before adults are caught. Monitoring fruit for larvae also indicates whether sprays are effective. To check, mash fruit in a zip-lock bag and add a salt solution (¼ cup salt to 4 cups water). The larvae will float at the solution surface, while fruit will sink. SWD larvae are white, about ⅛ inch long when full sized, and have no obvious head. Differentiating SWD from maggots of other species is nearly impossible. However, if maggots are found in recently ripened fruit, they are likely to be SWD. If larvae are larger and have a head, they may be that of sap or picnic beetles.

You can also pull fruit apart to check for larvae. If raspberry receptacles are stained with juice, SWD larvae may be present, though staining may also simply indicate overripe fruit. Look for a small oviposition hole surrounded by decomposing fruit tissue as a clue for finding larvae or pupae.

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