Penn State Extension

Spotted Wing Drosophila

Part 3: Monitoring

Spotted wing drosophila (SWD) is an invasive vinegar (fruit) fly that lays its eggs in ripening fruit, so its larvae may be present in harvested fruit. Some growers in Pennsylvania have lost large portions of their late summer and fall berry crops to SWD. Monitoring can help growers determine whether action is needed. Growers should monitor for both adults and larvae to improve odds of detection.

Monitoring for Adult SWD with Traps

Using bait traps allows for identification of adult SWD, most easily of males. Trap use as described is for monitoring purposes, not for providing control.

Lures

SWD is attracted to many volatiles, including those in vinegar, wine, yeast, and fruit. Previously, apple cider vinegar (ACV) was used because it is easy to see through, easily obtainable, and preserves flies while inhibiting molds. However, ACV is not more attractive to SWD than the crop, so trap catches do not provide sufficient warning of SWD presence—SWD larvae were found in the fruit when SWD adults were found in traps.

At least one lure is under commercial development; otherwise, homemade lures are used. Evidence shows that a yeast bait (1 tablespoon dry yeast, 4 tablespoons white sugar, and 2 cups of water) is more attractive than ACV early in the season. However, yeast bait is impossible to see through, and specimens in it may break down quickly. Late in the season, a Merlot wine/ACV mixture (60:40 wine:ACV) was more attractive than yeast bait or ACV alone. Growers should try more than one bait, and check current extension information for the latest recommendations.

The solution in the trap should 1–2 inches deep and contain one drop of unscented dish detergent, which breaks down the solution's surface tension so the flies sink rather than escape.

Trap Designs

Homemade traps (Fig. 1) have caught more SWD than commercial ones. Inexpensive traps can be made from 16- or 32-ounce clear drink cups with lids, deli containers, or screw-top wide-mouth plastic jars. Drill or burn with a soldering iron six to twelve $^{3}\!\!/_{16}$ -inch-diameter holes in the upper half of the container about two-thirds of the way around; if holes encircle the container, flies will be lost when pouring out bait. Smaller holes can be used to exclude larger insects, including beneficials. However, more holes are needed for attractive scents to escape (decreasing the hole diameter by one-half reduces the area of the hole by four). To hang the trap,



Figure 1

thread a wire through holes drilled opposite each other near the top.

Personnel at the University of Rhode Island and the Connecticut Agricultural Experiment Station are developing a trap design/lure combination that suspends a screened container of yeast bait over an ACV drowning solution. With this design, SWD are attracted into the trap by yeast bait volatiles but are caught in the ACV.

Sticky cards placed in the traps do not improve trap attractiveness, allow adults

to degrade over time, and make identification of female SWD more difficult.

Color

Certain colors may attract more SWD than others, but the best may vary with the crop. Red and black have received the most attention. Color appears to play a less important role than scent.

When and Where to Place Traps

Traps should be in the field 2 weeks before fruit begins to color. Female SWD may be caught first, but identifying them is difficult without at least a 16x hand lens. Monitor any susceptible crop in both the field and tunnels, and areas where you suspect SWD may be present.

Place traps on the north side of rows at fruit level (Fig. 2). 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 in the shady side of the row and where humidity is highest.

Since SWD likely overwinters outside the field, place traps near suspected areas of shelter early (woods, piles of organic matter) as well as in the field at multiple locations. Once harvest is well under



Figure 2

way, trap location in the field is likely of little consequence.

The optimum number of traps probably varies with planting size. Four to five traps per crop in smaller plantings (½ acre or less), and two traps per acre on larger plantings (5 acres or more) is reasonable. Traps can be moved as crops ripen. Leaving a trap or two in a crop after harvest may indicate that a "clean-up" spray would be useful.

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Checking the Traps

Check traps as frequently as possible, preferably every day after fruit starts to color and at least twice per week. Checking traps only once per week may allow SWD a head start. Replace lures weekly to maintain attractiveness. Discard old lures away from the planting.

To extract flies, strain the solution through one half of a mesh tea ball or a funnel lined with very fine netting or fabric. Then wash the flies into a container (Fig. 3) or blot the strainer on a paper towel to wick out moisture, which frees up the flies, and gently gather the flies with a craft brush and roll them into another container (Fig. 4).

Replace the lure with water to improve clarity, and pour the solution into a shallow white container or a clear container on a white background to increase contrast. Add more water to disperse the flies. Use a magnifying glass or hand lens to examine the flies, or take a close-up digital photo. If the water is shallow, all of the flies will be in focus (Fig. 5). View the photo on a computer screen, zooming in as necessary. The lures are attractive to various species of drosophila fruit flies, so knowing how to identify at least the male SWD is very important.



Figure 3



Figure 5

Figure 4

Thresholds for Treatment

Thresholds are not yet established. However, finding even one adult fly in the crop means that eggs may be laid, so check fruit for larvae as outlined below. If any SWD are found in traps or larvae are found in fruit (be sure you are not confusing SWD larvae, which are very small, with that of sap beetles or other common pests), a spray program should be initiated quickly.

Storing and Shipping Samples

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 alcoholbased 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. Checking fruit for larvae also indicates whether sprays are effective. Only sound-appearing fruit should be sampled to minimize the possibility of detecting native drosophila larvae, which cannot be distinguished from SWD. Place fruit in a flat, dark pan or zip-lock bag and add a salt solution (¼ cup salt to 4 cups water). After approximately 15 minutes, the larvae will exit the fruit. If after 15 minutes no larvae are visible, gently crush the fruit and check again. SWD larvae are white and legless, range from 0.6 mm when newly hatched to 3.5 mm when full sized, and have no obvious head. Differentiating SWD from maggots of other species is nearly impossible. However, maggots found in recently ripened fruit 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. Look for a small oviposition hole surrounded by decomposing fruit tissue as a clue for finding larvae or pupae.

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