



## Bug-Wise

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**Spotted Wing Drosophila, A Serious New Pest of Homegrown Small Fruits:** Blackberry cobblers, blueberry pies, strawberry shortcake, fig preserves, and fresh fruit for munching are just a few of the reasons blackberries, blueberries, strawberries, and figs are grown in home gardens throughout Mississippi. These popular backyard fruits are relatively easy to grow and have few major insect or disease pests. One of the key reasons these fruits are so popular with home gardeners is that they can usually be grown without applying pesticides. However, a tiny fly that has recently invaded the state may make these small fruits more challenging to grow.

Spotted wing drosophila (SWD) is a recent immigrant to the US; it was first detected in California in 2008. In the past five years it has quickly spread across the country and has already caused hundreds of millions of dollars of losses in commercially grown small fruits, such as cherries, blueberries, raspberries and blackberries. SWD was first detected in Mississippi in 2010. We did not notice many problems in 2011, but last year it caused significant losses for commercial blueberry and blackberry producers in south Mississippi, with infestation levels exceeding 90% in some blackberry harvests. It also appeared in many home fruit orchards. Most affected gardeners did not immediately recognize the cause, but they quickly noticed that many of their berries were sour, leaky, collapsed when picked, dried up on the plant, or dropped off the plant early. They may have also noticed small white larvae in or emerging from harvested fruit. This little fly is a big pest of small fruits, and it looks like it is here to stay!

SWD infestations will likely be even more widespread this year. Home gardeners who had SWD last year will probably see it again, and gardeners who didn't have it, or did not realize they had it, are also likely to see this pest. If you grow blackberries, blueberries, or other small fruit in your backyard, you need to be aware of this new pest; you need to be able to recognize the flies and the damage they cause, and you need to be prepared to deal with SWD if it occurs in your orchard.

*Damage:* SWD looks and acts like the native fruit flies (a.k.a. vinegar flies) we are used to seeing around bananas and other ripening fruit on the kitchen counter, around compost bins, and around damaged or decaying fruit in the home orchard. It is similar to our native fruit flies in size and color, including the red eyes, but there is one important difference. Female SWD have a saw-like ovipositor that allows them to cut through the skin of undamaged fruit and deposit their eggs inside. The small white larvae develop in fruit that is still on the plant at harvest, resulting in insect-contaminated fruit, and they also cause excessive fruit drop and sour/low quality fruit. Several larvae can develop in a single blueberry or strawberry and dozens of larvae can develop in a single blackberry.

*Hosts:* SWD is most damaging to soft, thin-skinned fruits, like blueberries, blackberries, strawberries, and figs, because the females can lay eggs in sound fruit that is just beginning to ripen (they can even lay eggs in green blueberries). But SWD can reproduce in most of the fruit crops we grow here, including: peaches, plums, pears, apples, grapes, muscadines, persimmons, and even tomatoes. Fortunately, thicker skinned fruit like apples, muscadines, persimmons, and tomatoes usually require some type of damage or break in the skin before the flies are able to lay their eggs. Hopefully, this will prevent SWD from

becoming serious pests of most of our “large fruit” crops. But these are “fruit flies”, and they will readily reproduce in damaged, overripe, or decaying fruit that has fallen to the ground. SWD will also breed in uncultivated fruits such as wild blackberries, persimmons, and similar fruit.

*Biology:* SWD develop quickly. Females begin laying eggs within a day or two after emerging from the pupal stage and can lay up to 300 eggs during their life. Eggs hatch in one to three days, and a single generation can be completed in two weeks or less, allowing these pests to complete a dozen or more generations per season. This pest is more active in the spring and fall than during mid-summer, when high temperatures suppress adult activity. Female SWD will lay eggs in fruit that is just beginning to ripen, as well as ripe or over-ripe fruit that is still on the plant and fallen decaying fruit. Mature larvae may pupate inside fruit, or may exit fruit before pupating.

*Trapping SWD:* Home gardeners who take their blueberry and/or blackberry crops seriously will probably want to run traps this year. Although trapping does not control SWD, it is the best way to get an early heads-up as to whether or not you have this damaging pest in your orchard. Catching SWD helps you decide whether and when to begin a spray program or other management efforts. Not catching SWD gives you one more thing to be thankful for this year. Of course, you can just wait to see if you start seeing damage and finding little white larvae in your berries, but such well-established infestations are more difficult to control.

Commercial SWD traps are available, but traps are also easy to make using empty clear plastic food containers (as for peanut butter, mayonnaise, etc.) or clear plastic drink cups with lids. Drill or melt a half-dozen 3/16 to 3/8 inch holes in one side of the top half, leaving the other side free of holes so you can easily empty the trap; add a wire or string for hanging the trap; pour an inch or so of apple cider vinegar in the bottom; add a drop of liquid dishwashing liquid; hang trap in a shady spot near the fruit; and check every few days. The flies will be attracted by the vinegar odor, enter the holes and drown in the vinegar (the drop of dishwashing liquid causes flies to drown more readily). They can then be picked or sieved out for identification. One to three traps should be enough for most home orchards. If you have plantings in more than one location you will probably want to have a trap at each location. You can also move traps from early crops, like strawberries, to later maturing crops, like blueberries or figs.



Just catching a bunch of flies in your traps does not necessarily mean you have SWD. These traps will also catch native fruit flies, sometimes in large numbers. You will have to sort through the flies you catch, looking for flies with the distinctive wing spots typical of male SWD (females are difficult to identify without good magnification—at least 40X). Be aware that some native fruit flies also have wing spots, but they are in a different location or pattern than on male SWD. Male SWD have a single spot at the front edge of the wing, near the tip (see photo on previous page).

You can also send flies in to the Extension Entomology Insect Identification for identification. Just place flies in a leak-proof vial containing vinegar or alcohol, place the vial in a crush-proof container, and mail to: Blake Layton, Box 9775, Mississippi State, MS 39762. Be sure to include your contact information.

*Identifying SWD:* Female SWD look like our other fruit flies. They are small, gnat-sized (less than 1/8 inch long) yellowish brown flies with red eyes. The saw-like ovipositor is distinctive, but can only be seen with good magnification (at least 40X). The males also look like typical fruit flies, but have a single dark spot at the front edge of each wing, near the tip. Even this trait can be difficult to see without some magnification, such as a hand lens.

The dirty-white larvae, which are a little over 1/8 inches long when fully mature, may be found inside infested fruit or seen emerging from infested fruit or crawling about in containers of harvested fruit. The light brown pupae are oval-shaped with two distinct protrusions at one end (these are spiracles, through which they take in air). Larvae and pupae of SWD look like the larvae and pupae of other fruit flies, but if you find fruit fly larvae and pupae in containers of recently harvested fruit, they are probably SWD.

*Dealing with SWD in Home Orchards:* Home fruit producers vary widely in their reasons for growing backyard fruit, which species of fruit they value most, and attitudes toward insecticide use. Such personal attitudes will greatly affect how individual gardeners choose to deal with SWD should their orchards become infested.

This pest is so new that management methods are still being worked out and its ultimate impact on backyard fruit production remains to be seen. If SWD becomes as big a problem as anticipated, home gardeners will most likely respond in one of three ways: 1} learn to use non-insecticidal management tools to limit damage and to tolerate and “pick around” damaged fruit, 2} learn to use insecticides to protect berries from this pest, or 3} quit growing fruit that are most susceptible to SWD. It is likely we will see all three of these responses, or combinations thereof, adopted by home gardeners over the next few years. Home gardeners who use a combination of cultural practices and timely insecticide sprays will likely be most successful.

*Non-Insecticide Management Methods:* Cultural practices that reduce the amount of ripe/over-ripe fruit on the plants and the amount of fallen decaying fruit in the area will help reduce SWD populations. Picking fruit early and frequently will help limit the amount of time ripening berries are exposed to egg-laying flies, and culling carefully will help limit the amount of damaged/infested fruit that is harvested. More detailed examples of cultural practices that may be useful in managing SWD follow.

- Harvest promptly and thoroughly and carefully cull damaged fruit. (Realize that even if you are meticulously careful to only harvest fruit that appear free from damage, you may still end up harvesting, and eating, some insect-contaminated fruit.)
- Limit orchard size (Smaller orchards are easier to care for and implement the increased sanitation and management required to deal with SWD.)
- Promptly and continuously clean up fallen, decaying fruit (It takes a dedicated fruit producer and a lot of effort to make this work. Free range poultry may be a useful and acceptable clean up tool for some home gardeners—even though they will eat the lower berries on the plants as well.)
- Effectively destroy culled and fallen fruit (Composting is not an effective method of destroying fruit. The flies will continue to develop and emerge from the compost.)
- Avoid growing fruit that are highly susceptible to SWD and thus allows populations to build up and move to the fruit crops you value most. (For example, if SWD are building up on the early-maturing blackberries and then moving to the blueberries, but you rarely pick the blackberries and would rather have blueberries, then destroying the blackberries may help reduce SWD pressure in the blueberries.)
- Grow fruit that mature during the hottest times of the year, such as later maturing varieties of blueberries and blackberries. (SWD adults are less active at warmer temperatures (over 90°F)
- Avoid growing fruit in shade (the cooler temperatures are favorable to SWD)
- Control nearby wild hosts (This is easier said than done, because there are quite a few wild hosts, and you may not have access/control of the property where they are growing.)

*Insecticide Sprays for SWD:* If you have SWD and you want to minimize the number of berries with larvae in them, you will need to spray for this pest. Timing is the key to successful control. Begin spraying when the very first fruit begins to ripen and continue spraying on a weekly schedule, or more

frequently if necessary, throughout harvest. Beginning your spray program early, before the flies get well established, is critical. Be sure to choose an insecticide that is labeled for the crop you are treating and observe the pre-harvest interval (PHI) for that crop. Picking first and then spraying later that same day is the best way to fit a reasonable harvest schedule into some of the longer pre-harvest intervals.

Control depends on killing the adult flies before they can lay eggs, and this requires frequent, regular spraying. Eggs and larvae developing inside fruit cannot be controlled because they are not exposed to insecticides. Fortunately, there are some insecticides that are labeled for use by homeowners, control adult SWD, and have short enough pre-harvest intervals to be used on ripening fruit. These are listed in the following table. Insecticides are listed by active ingredient. The brand name of one labeled product is given as an example only. Other brand name products that contain these active ingredients and give specific label directions for use on the crops(s) you plan to treat should give similar control. Read the label carefully before buying the product.

### **Insecticides for Control of Spotted Wing *Drosophila* on Home-grown Fruit**

<b>Insecticide</b>		<b>Labeled for use on this crop? (PHI)</b>		
<b>Active ingredient</b>	<b>Brand Name (1 example)</b>	<b>Blueberries</b>	<b>Blackberries</b>	<b>Strawberries</b>
malathion *	Bonide Malathion *	Yes (1 day)	Yes (1 day)	Yes (3 days)
spinosad	Greenlight Lawn & Garden Spray **	Yes (3 days)	Yes (3 days)	Yes (1 day)
pyrethrins	Bug Buster O **	Yes (0 days)	Yes (0 days)	Yes (0 days)
pyrethrins + PBO ***	Evergreen Crop Protection EC 60-6	Yes (0 days)	Yes (0 days)	Yes (0 days)

\* Malathion has an unpleasant odor that may linger on fruit after harvest.

\*\* Certified for organic control. (Note that some, but not all, formulations of spinosad are certified for organic control.)

\*\*\* Formulations of pyrethrins that contain PBO or other synergists are not certified for organic control.

Note: Products containing pyrethrins or pyrethrins + PBO provide very short-lived residual activity, and these products usually have to be applied several times per week when attempting to control heavy infestations. Pyrethrin products containing PBO, or some other labeled synergist, are more effective than pyrethrins alone, but the additional synergist does not greatly increase residual activity. Overall, malathion and spinosad are relatively more effective, and longer-lasting, than pyrethrin products.

*Be Ready to Spray:* If you plan to use insecticide sprays to control SWD in your orchards, it is important to have a sprayer on hand that allows you to treat your orchard promptly and efficiently. The size and type of sprayer required will depend on the size of your home orchard. If you only have three small blueberry bushes, a one gallon hand pump sprayer may be sufficient for your needs. On the other hand, home gardeners with large orchards may need to have some type of mechanically operated air-assisted sprayer, like those used in commercial orchards. Be sure to rinse your sprayer after each application and keep it well-maintained and ready to use.

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This information is for educational and preliminary planning purposes only. Brand names mentioned in this publication are used as examples only. No endorsement of these products is intended. Other appropriately labeled products containing similar active ingredients should provide similar levels of control. Always read and follow the insecticide label.