

Bug-Wise
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Spotted Wing Drosophila Control in Commercial Small Fruits: Producers of commercially-grown blueberries, blackberries and strawberries need to be aware of an important new pest of small fruit and be prepared to control this pest in their orchards this year. Spotted wing drosophila (SWD) was first detected in the western US in 2008. It quickly spread across the country and has already caused hundreds of millions of dollars in damage to cherries and other soft-skinned small fruit. SWD was first detected in Mississippi in 2010. Last year it caused significant losses for blueberry and blackberry producers in south Mississippi, with infestation levels exceeding 90% in some blackberry harvests. 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. Growers who had SWD last year will probably see it again, and growers who didn't have it, or did not realize they had it, are also likely to see this pest. If you grow small fruit commercially, you need to be able to recognize this pest and the damage it causes; you should plan to run traps to detect the pest early; and you should be prepared to control SWD if necessary.

Damage: SWD looks and acts like the native fruit flies, aka. vinegar flies, that we are so used to seeing around damaged or decaying fruit. It is the same size, same color, and has red eyes like our native fruit flies, but there is one important difference. Female SWD have a serrated, 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 contaminated fruit, and they also cause excessive fruit drop and sour/low quality fruit. Most important, consumers quickly develop negative perceptions about a commodity when they find larvae or pupae in fruit they have purchased. Several larvae can develop in a blueberry or strawberry and dozens of larvae can develop in a single blackberry. Another reason this pest is such a major problem is that it causes producers to have to spray during harvest season, making it necessary to coordinate harvest schedules with the pre-harvest intervals of the insecticides used. The increased potential for insecticide residues on harvested fruits also negatively affects consumer attitudes.

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. Thicker skinned fruit like apples, persimmons, and tomatoes usually require some type of damage or break in the skin before the flies are able to lay their eggs. These are "fruit flies", and they also will readily reproduce in damaged, overripe, or decaying fruit that has fallen to the ground. SWD will also reproduce 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: Running traps is an important first step in SWD management. The goal is to find out if you have the flies so you will know whether or not you need to treat. Traps are only useful for detection; they will not help control this pest. 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. Three or four traps should be enough for small plantings of one acre or less. For large plantings, plan on using two to three traps per acre, and concentrate traps around the periphery of the planting, especially near wooded areas or abandoned fields where wild hosts occur.

These traps will also catch native fruit flies, sometimes in large numbers, so finding flies in your traps does not necessarily mean you have SWD. You will have to sort through the flies you catch, looking for flies with the distinctive spots typical of male SWD (females are difficult to identify without good magnification). Be aware that some native fruit flies also have wing spots, but they are in a different location or pattern than on male SWD. Compare any flies you suspect of being SWD to a good photograph of a male SWD (see photo on page 1).

You can also send flies to the Extension Entomology Insect Identification Lab for identification. Just place flies in a leak-proof vial containing vinegar or alcohol, wrap the vial in a few paper towels, pack in 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. 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.



The dirty-white larvae, which are a little over 1/8 inches long when fully mature, may be found inside infested fruit or emerging from infested fruit and 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 recently harvested fruit, they are probably SWD.

Controlling Spotted Wing Drosophila: Control depends on killing adult flies before they can lay eggs. Eggs and larvae developing inside fruit are impossible to control because they are protected from contact with insecticide sprays. Fortunately there are several insecticides that are labeled for fruits, are effective on adult SWD, and have short enough pre-harvest intervals (PHI) to be used on ripening fruit. Recommended insecticides are listed in the following table.

Timing is the key to successful control. If you have SWD and you want to minimize the number of berries with larvae in them, you will need to treat for this pest. 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. If you wait until there are already a lot of larvae developing in your fruit before beginning your spray program, it will be difficult to catch up. 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.

Resistance Management is an Important Concern: Because these flies have so many generations per year, and because fruit flies have such high genetic adaptability, it is likely that SWD will quickly develop resistance if repeatedly exposed to the same class of insecticide. This means it is important to practice a rigorous resistance management program by alternately using insecticides from different IRAC groups (different modes of action). As the table shows, we currently have only three different groups of insecticides to use against this pest, pyrethroids/IRAC group 3A (Mustang Max, Danitol, and Brigade), organophosphates/IRAC group 1B (Imidan and Malathion), and spinosyns/IRAC group 5 (Delegate, Radiant, and Entrust). Just switching insecticides is not necessarily enough; you have to switch to an insecticide from a different group. Apply no more than two successive sprays with any single insecticide before switching to an insecticide from a different IRAC group. Growers on aggressive spray programs should be sure to rotate among all three available insecticide groups.

Be Ready to Spray: For growers who have SWD, making that first spray at the proper time (as soon as the first fruit begin to ripen) and maintaining an adequate spray schedule during harvest are the keys to effective control. This means you need to have a well-maintained, properly calibrated sprayer that has the capacity to cover your particular acreage in a reasonable amount of time. Don't wait until you start catching SWD in your traps or seeing damaged fruit to start getting the sprayer ready!

Cultural Practices: Cultural practices that reduce the amount of fallen, decaying fruit or reduce the number of nearby alternate hosts will help control SWD. This includes harvesting promptly, thoroughly, and regularly, and cleaning-up and destroying all overripe and damaged fruit. Although aggressive sanitation practices are logistically more feasible on smaller plantings than on large commercial plantings, any steps that can be taken to reduce the amount of fallen or discarded decaying fruit in the area will help reduce SWD populations.

Insecticides for Control of Spotted Wing Drosophila on Commercial Fruit

Insecticide		IRAC Group	Labeled for use on this crop? (PHI)		
Active ingredient	Brand Name		Blueberries	Blackberries	Strawberries
zetamethrin	Mustang Max	3A	Yes (1 day)	Yes (1 day)	No
bifenthrin	Brigade WSB	3A	Yes (1 day)	Yes (3 days)	Yes (0 days)
fenpropathrin	Danitol 2.4 EC	3A	Yes (3 days)	Yes (3 days)	Yes (2 days)
malathion *	Malathion *	1B	Yes (1 day)	Yes (1 day)	Yes (3 days)
phosmet	Imidan 70-W	1B	Yes (3 days)	No	No
spinetoram	Delegate 25 WG	5	Yes (3 days)	Yes (1 day)	No
spinetoram	Radiant 1 SC	5	No	No	Yes (1 day)
<i>(Organic Treatment Options Listed Below)</i>					
spinosad	Entrust 2 SC **	5	Yes	Yes	Yes
Pyrethrins	Pyganic 5 EC ***	3A	Yes (0 days)	Yes (0 days)	Yes (0 days)

* Malathion has a strong, persistent odor. Some growers report having berries rejected by buyers—because of odor—even though they complied with the pre-harvest interval.

** For organic production, provides relatively long residual control.

*** For organic production, short-lived residual control, requires frequent spraying.

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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.