

Monitoring for Spotted-Wing Drosophila in Blackberries in Arkansas

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Background

Spotted-wing drosophila (SWD), *Drosophila suzukii*, is an invasive fruit fly that was first observed in Arkansas in 2012¹. SWD flies damage small fruits by laying eggs in ripening fruit that later develop into larvae that are present in harvested fruit. While our native fruit flies generally only infest overripe or damaged fruit, female SWD have a serrated ovipositor which allows them to lay their eggs under the skin of many ripening small fruit crops. Fruit is often infested by SWD prior to being harvested which leads to consumers finding larvae as they are biting into or processing fruit. These negative eating experiences can lead to a loss of customers and wholesale fruit buyers have been known to reject fruit containing any amount of SWD larvae². Due to the potential economic loss, management of SWD in blackberry currently requires weekly insecticide sprays starting when fruit color begins to blush through the end of harvest².

Although an insecticide spray schedule is required for adequate control, monitoring for SWD presence in the field can optimize management². Adult SWD flies can be monitored using baited traps to assess the presence and population levels

of the flies prior to harvest and determine if earlier applications of insecticide may be necessary to reduce populations. Once harvest commences, fruit samples can be taken to monitor for the presence of larvae in fruit. Fruit sampling helps to determine how successful a spray management program is at controlling SWD. Sampling can determine if there is a potential issue with spray applications, or if extra measures should be taken, and it provides insight to what buyers will be seeing when they check fruit for larvae. Adult trapping and fruit sampling should be used every blackberry season to monitor SWD but are especially beneficial in years with elevated SWD pressure.

Monitoring Adult SWD Flies in the Field

The flies of adult SWD can be monitored using traps baited with specific plant-based kairomones. The traps should be placed in the field prior to harvest to determine when the flies are moving into blackberry plantings. Adult SWD reproduce rapidly and can very quickly become difficult to manage with insecticides. Early season buildup of adult populations can result in an increased occurrence of larvae in fruit later in the season because large populations of adult flies can lay high numbers of

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eggs in a short period of time. When this occurs additional early applications of insecticide may be necessary to reduce adult populations prior to fruit blushing.

Traps for adult SWD should be placed within blackberry canopies on the edge of fields several weeks (~3 weeks) before harvest is estimated to begin. Traps are easy to build and use for monitoring (Figure 1). The simplest SWD traps can be made at home.

How to build a SWD fly trap

The supplies needed are:

- one plastic quart-sized container with a lid
- water
- liquid unscented soap
- one synthetic SWD lure
- two pieces of wire (one to hold trap and another to hold the lure)
- tool to punch holes
- reusable coffee filter

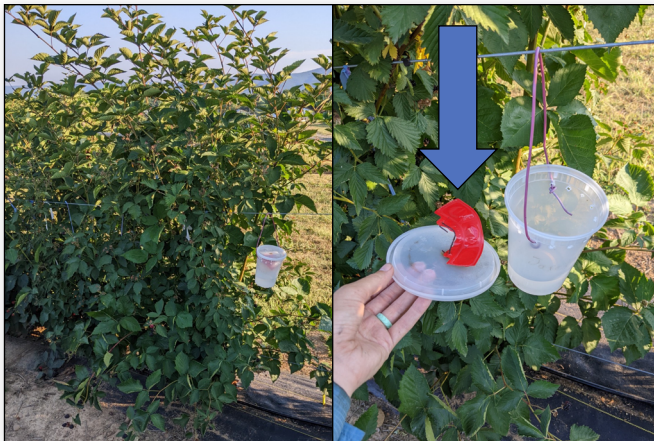


Figure 1. (left) Adult spotted-wing fly trap placed in blackberry planting on the wire of the trellis near the canopy of the plant and (right) synthetic lure (blue arrow) of the adult trap. (Photo by Amanda Lay-Walters in Clarksville, AR)

Start by punching several small (1cm) holes around the top edge of one of the containers (Figure 1), leaving 2 inches of the edge without drilled holes to make pouring easier in the future. The holes will allow flies to enter the container when the lid is on the trap. Then fill the container one-third to one-half full with water and add one to two drops of unscented liquid soap. Soap is added so that when flies enter the trap and land in the soapy water they will be killed. It is recommended to add a synthetic SWD lure to the traps (Figure 1) due to their specificity in attracting SWD

adults. These lures should be attached with a small piece of wire to the lid of the container and should not touch the water (Figure 1). Traps should be checked weekly by draining the trap into a reusable coffee filter to catch the contents of the trap. The trap contents should then be examined using a hand lens to identify and count adult SWD male and female flies. Male SWD can be identified by the single black spot on the tip of each wing as well as two dark bands on their lower forelegs (Figure 2). Female SWD do not have male identifying characteristics but can be identified by their serrated (saw-like) ovipositor located on the abdomen (Figure 3).

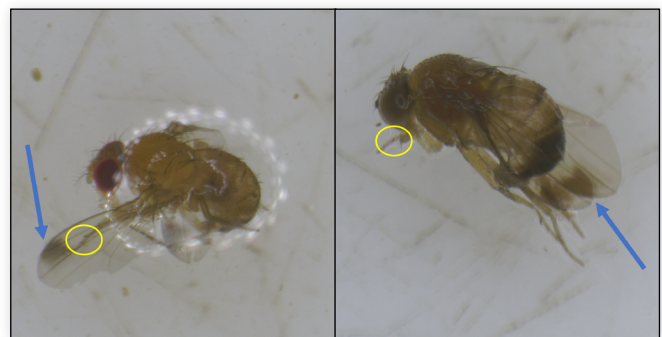


Figure 2. Male spotted-wing drosophila flies, note the single spot on the tip of each wing (blue arrow) and black bands on the tarsae (lower forelegs) (yellow circle). Photo by Amanda Lay-Walters, Clarksville, AR.



Figure 3. Spotted-wing drosophila female. Note the serrated ovipositor of the female SWD (blue arrow right). Photo by Amanda Lay-Walters in Clarksville, AR.

As soon as any number of adult SWD flies are found in the traps before harvest starts, an insecticide spray application is recommended. This insecticide application should help suppress early populations that may lead to excessive SWD pressure later in the year. Early season adult monitoring is one of many useful tools in a successful integrated pest management (IPM)

program for SWD. Trapping generally isn't as useful later in the season once flies become more attracted to ripe blackberry fruit than the traps. Other cultural tactics such as harvest frequency and field sanitation should be utilized along with an insecticide spray application to minimize the activity of adult SWD in blackberry plantings during harvest^{3,4}.

Monitoring SWD Larvae in Fruit

Monitoring for spotted-wing drosophila (SWD) larvae in harvested blackberry fruit is another important tool to use during the harvest season to determine the success of your pest management approach². Consumers and wholesalers often have zero tolerance for larvae in fruit and finding them in berries can lead to rejection of the fruit by the buyer. Monitoring fruit in the field at harvest gives you an idea of what buyers will be seeing when they check fruit for larvae and what a customer may find when he or she takes a bite. This tool also helps a grower to determine early on if insecticide spray applications and other control measures are being effective or if additional measures should be taken to achieve acceptable levels of SWD control.

How to examine blackberries for SWD larvae

The supplies needed are:

- 75-100 marketable berries per field
- one gallon-size plastic zip-top bag or plastic container
- water
- salt

Samples containing 75-100 marketable berries should be collected from each field of interest at the start of harvest and should continue on a weekly basis. Sampled berries should be lightly squeezed and should be submerged in a saltwater solution comprised of one cup of table salt to one gallon of water. Simple containers such as buckets, one gallon plastic zip-top bags and/or large plastic containers can be used to submerge the fruit in the saltwater solution for at least 15 minutes (Figures 4 and 5). The SWD larvae will emerge from the berries and float to the surface, making them easy to identify in the saltwater bath. The larvae are small, opaque cream-colored maggots

that can reach up to 1/8 inch long, however the size will vary depending on their growth stage (Figure 4).

No management system is perfect, and a small number of SWD larvae will sometimes be found in fruit even in a well-managed field. Finding small amounts of larvae (<3 larvae per 75-100 berry sample) indicates that management tactics are working, and monitoring should continue. However, finding 35 to 50+ larvae per sample indicates that on average every other berry is affected. This indicates that current management strategies are not working, and a new approach is needed to reduce SWD populations.



Figure 4. Berries in salt-water solution where SWD larvae are emerging. Larvae are seen in the surface water of a bucket with submerged berries (yellow circle). A zoomed-in image of a SWD larva can be observed in the top right. Photo by Amanda Lay-Walters in Clarksville, AR.

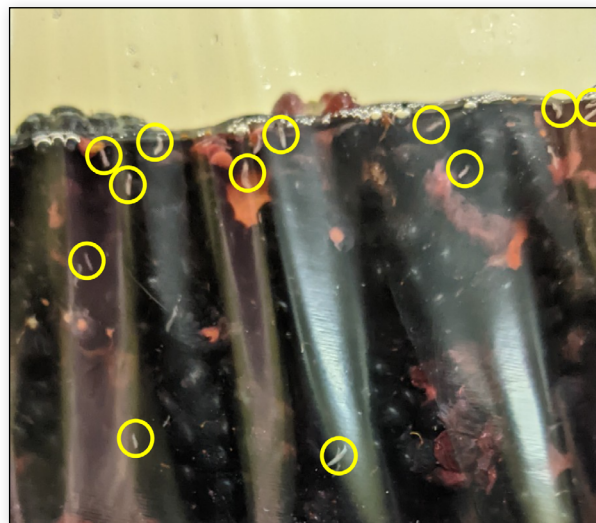


Figure 5. Berries in salt-water solution where SWD larvae are emerging. Larvae are seen through a plastic zip-top bag with submerged berries (right, yellow circle). Photo by Amanda Lay-Walters in Clarksville, AR.

Possible reasons why SWD populations may be high even when insecticides are being used include clogged or poorly calibrated spray equipment that is limiting the effectiveness of insecticide spray programs, or simply that SWD pressure is high enough that more aggressive control strategies are necessary. Response to finding high numbers of larvae should include an assessment of current management strategies. Some alternative control methods include tightening spray intervals to less than seven days, increasing harvest frequency, improving field sanitation by removing cull fruit from the field, and cooling harvested berries down to 32-34°F as quickly as possible to slow larval SWD development^{3,4}. Using fruit monitoring every season gives growers the opportunity to augment and integrate management tactics each year to ensure that infested fruit are not making their way to buyers and consumers.

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- ⁴Sustainable Spotted Wing Drosophila Management <https://swdmanagement.org/webinars/>

Printed by University of Arkansas Cooperative Extension Service Printing Services.

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