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Spotted Wing Drosophila and the Green Industry

By Karla Adresso, Research Assistant Professor of Entomology, *TSU Orls L. Floyd Nursery Research Center, McMinnville, TN*

Spotted wing drosophila (SWD) is a vinegar fly native to Asia. Like its North American relatives, SWD is attracted by the smell of fermenting fruit. Unlike its relatives, SWD does not have to wait until fruit is rotting to attack. The fly can lay its eggs in fruit as it begins to ripen on the plant, making this species one of the few *Drosophila* of agricultural concern.

About SWD

Spotted wing drosophila is small (2-3 mm long), with red eyes and a yellow body with black, contiguous stripes across the abdomen. Males have a distinct black spot on the front tip of their wings (Photo 1a). Females do not have a wing spot (Photo 1b), but they can be recognized by their dark, serrated egg-laying organ, which allows them to cut the skin of ripening fruit (Photo 1b insert). These distinct characteristics will not be seen in other, native vinegar flies.

Spotted wing drosophila has a wide host range consisting of cultivated small fruits and berries, ornamental plants and wild hosts (see Table 1). Most of the known hosts are members of the Rosaceae family, but plants in other families are also readily attacked. Knowledge of SWD's host preference for berry-producing ornamentals is limited, but the list is bound to expand with further investigations.

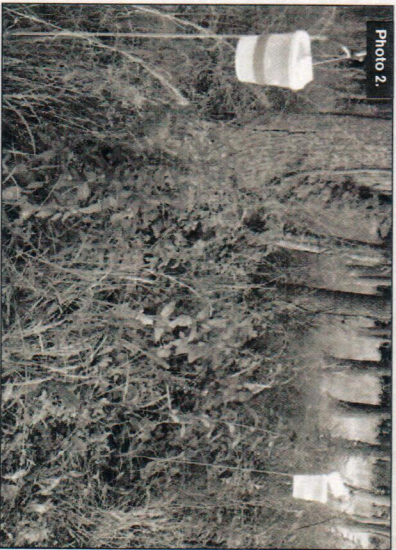
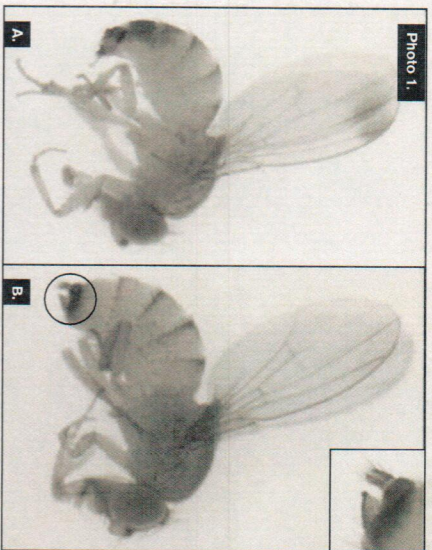
Spotted wing drosophila was first detected in California in 2008. In 2009, it spread north to British Columbia and was reported in Florida for the first time. In 2010, the fly was caught in Michigan, Mississippi, North and South Carolina, Utah and Wisconsin and continued to spread throughout the United States. As of October 2013, the only states that have not reported the presence of SWD are Nevada, Arizona, New Mexico and Alaska.

Spotted wing drosophila was first reported in Tennessee in 2010 from an infested

Photo 1. Spotted wing drosophila: (a) male and (b) female. Inset photo: the female's serrated egg-laying organ.

Photo 2. Traps on the roadside.

Photo 3. Wild blackberry is a host of spotted wing drosophila.





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blueberry field in Union County. The first capture of SWD in Middle Tennessee was at the Tennessee State University's Nursery Research Center in McMinnville on December 14, 2012. There have been positive IDs of SWD in counties throughout the state, and given the fly's documented presence in all states surrounding Tennessee, SWD is likely to achieve a statewide distribution.

Spotted wing drosophila is fairly cold tolerant and is active at temperatures above 50°F. Average high temperatures during December, January and February in Middle Tennessee are at or above this activity threshold, making it possible for the fly to be active in some parts of the state year-round.

Monitoring in Middle Tennessee

We initiated a survey for SWD in the five-county nursery production region of Middle Tennessee in June 2013 in order to determine whether the fly was established in the landscape. Simple traps constructed of 32 oz. deli containers and marked with yellow or red bands (Photo 2) were placed along roadsides in Warren, DeKalb, Coffee, Franklin and Grandy counties at three different locations. Traps were baited with an active yeast and sugar-water mixture, and flies were collected from the traps for eight weeks.

Spotted wing drosophila flies were captured at every trap location in all five counties at least once. Trap captures increased throughout the study and dramatically during the final two weeks of monitoring, coincident with wild blackberry ripening (Photo 3 and Figure 1). Flies were caught at trap locations with hosts present and at locations where no known hosts were observed. The color of the trap did not matter. A total of 6,713 SWD were captured over an 8-week period.

Concerns to Industry

Host preferences for ornamental fruits have not been conducted, but the wide range of hosts attacked suggest that any berry with a thin skin is potentially susceptible. At the Nursery Research Center, the flies built up a large population on wild blackberry bordering the grounds, moved into a kousa

patch on the property and subsequently infested neighboring flowering dogwoods (which had not been previously identified as a host of SWD). The observed buildup and host-shifting by the fly may suggest that non-preferred hosts will be attacked following population buildup on nearby preferred hosts.

No studies on seed viability of dogwoods or other ornamentals following infestation of SWD have been conducted to date. Infestations of fruits by other insects have been documented to negatively affect seed formation and vigor, resulting in poor germination. Infestation by SWD can also cause premature abscission of fruit. Taken together, these effects may result in decreased quantity and quality of seed for production.

The aesthetic quality of berry-producing ornamentals may also be impacted by infestation. Spotted wing drosophila attacks fruit just as it begins to open, causing the fruit to discolor and shrivel on the plant and abscise. Plants with showy berries (such as hollies) may be affected. In addition, without routine insecticide sprays, this pest will also reduce the benefit of ornamentals grown for edible fruits.

Intrastate movement of flies by nursery stock is of minimal concern due to the widespread establishment of the pest across the United States. There are presently no international quarantine restrictions for nursery stock with regards to SWD.

Actions for producers and landscape professionals

Due to the amount of uncertainty surrounding SWD's impact on the green industries, the most important thing that growers and landscape professionals can do is to be vigilant. Table 1 is not a definitive list of plants attacked by SWD; other plants are likely to produce fruit suitable for SWD. If problems (such as premature fruit drop or shriveled and deformed fruit) arise with a berry-producing crop, SWD may be the culprit. If you suspect SWD in a crop, collect fallen or damaged fruit and hold them in a Zipperweave container for two weeks to see if SWD flies emerge. You may need to take samples to your local county Extension agent for identification.

Table 1. Production, Ornamental and Wild Hosts of Spotted Wing Drosophila^a.

Family	Common Name	Genus Species
Asteraceae	Kiwi	<i>Actinidia</i> spp.
Aquifoliaceae	Mountain Holly	<i>Ilex microcneta</i>
	Deciduous Holly	<i>Ilex decidua</i> ^c
Caprifoliaceae	Honeysuckle	<i>Lonicera</i> spp.
Celastraceae	Burntbrush	<i>Euonymus alatus</i>
	Kousa Dogwood	<i>Cornus kousa</i>
	Cornelian Cherry	<i>Cornus mas</i>
	Silky Dogwood	<i>Cornus obliqua</i>
	Grey Dogwood	<i>Cornus racemosa</i>
	Flowering Dogwood	<i>Cornus florida</i>
Ebenaceae	Common Persimmon ^b	<i>Diospyros virginiana</i>
Elaeagnaceae	Autumn Olive	<i>Elaeagnus umbellata</i> ^c
	Sea-buckhorn	<i>Hippophae rhamnoides</i>
Ertaceae	Blueberry	<i>Vaccinium</i> spp.
	Huckleberry	<i>Gaylussacia</i> spp.
Liliaceae	Garden Asparagus	<i>Asparagus officinalis</i>
	Fig	<i>Ficus</i> spp.
Moraceae	Mulberry	<i>Morus</i> spp.
	Osage Orange	<i>Maclura pomifera</i>
Phytolaccaceae	Pokeweed	<i>Physalica</i> spp.
Rhamnaceae	Glossy Buckthorn	<i>Frangula alnus</i>
	Common Buckthorn	<i>Rhamnus cathartica</i>
	Raspberry, Blackberry, Loganberry, Marionberry, Boysenberry	<i>Rubus</i> spp.
Rosaceae	Cherry, Peach, Plum, Apricot	<i>Pyrus</i> spp.
	Strawberry	<i>Fragaria</i> spp.
	Apple ^b and Crabapple	<i>Malus domestica</i>
	Hawthorne	<i>Crataegus</i> spp.
	Rose	<i>Rosa</i> spp.
	Purple Chokeberry	<i>Photinia floribunda</i>
Solanaceae	Tomato ^b and Nightshades	<i>Solanum lycopersicum</i> , <i>Solanum</i> spp.
Taxaceae	Japanese Yew	<i>Taxus caroliniana</i>
Vitaceae	Grape ^b and Amur Peppervine	<i>Vitis</i> spp., <i>Ampelopsis brevipedunculata</i>

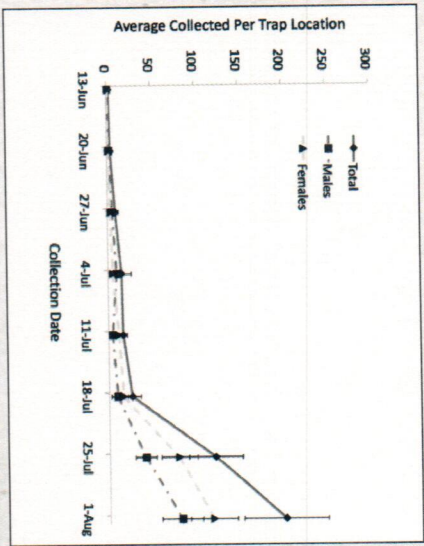
^a Species lists adapted from Dreyer & Langellato-Rhodaback 2011 and Mauer 2013.
^b Damaged fruit attacked.
^c Confirmed in Tennessee.

Current recommendations for SWD in commercial fruit production include, at minimum, removal of fallen fruit and weekly application of pesticides once fruit begins to ripen, continuing until harvest. Such a management plan is likely to be impractical for ornamentals, but it may be necessary to protect seed on plants used for propagation or to maintain the aesthetic quality of certain plants until sale.

The following active ingredients have been shown to be effective against SWD in fruits: bifenthrin, lambda-cyhalothrin, cypermethrin, spinetoram, spinosad, phosmet, Malathion, acetamiprid, pyrethrum and azadirachtin are effective to a lesser extent. Check pesticide labels for approved use on target nursery and landscape plants.

Spotted wing drosophila, like so many invasive species, is here to stay. Awareness of its presence and potential effects is key to minimizing its impacts on the green industry.

Figure 1. Spotted wing drosophila capture data.



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