

Management of Spotted Wing Drosophila (SWD) with Overwintering (OW) Knowledge.



Drosophila suzukii, a vinegar fly

To better understand the overwintering habits of spotted wing drosophila, (SWD), SWD has been studied over the winter months in mid-Willamette Valley, OR. This newsletter will inform you of survival rates and refuges; and provide management options regarding SWD's winter habitat preferences, while answering some frequently asked questions.

How do SWD survive cold OR winters?

- SWD rely on suitable habitats as well as evolved physiology that may allow them to survive the winter months. While their survival is low, they can reproduce quickly when temperatures warm!
- Habitat is a must: SWD have several criteria for a comfortable winter home to increase their survival, including protection (Tanabe 2002), avoidance of enemies (Speith 1986), favorable temperature and humidity (Parker 1995), and food sources (Toda 1992).
- Physiology is key: the body takes on a winter form, which helps them through months with little to no food supply; fat bodies built up in the fall months can last them months (Ohtsu 1993). SWD enter a diapause phase where, once in a suitable habitat, they may shut down non-essential body functions. The females mate and store the sperm to be released in the spring (Collett 2001). In short, think of a bear building up fat stored for long winter hibernation. Many *Drosophila* enter "lighter" diapause phases, in which they wake up when favorable weather and feed to resupply, otherwise they may "run out of gas" (Ohtsu 1993).

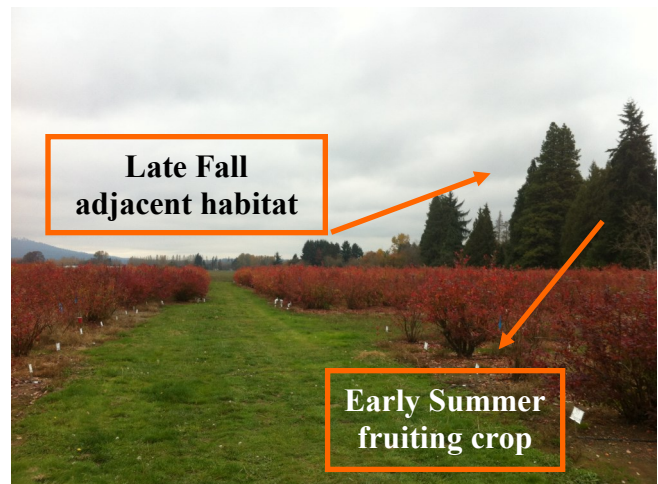
Do SWD have seasonal preferences within the landscape?

- It sure appears so! SWD have varying seasonal desires and shifts in abundance within the fruiting

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crop and adjacent landscape (tree habitats).

- During fall months, when food supply in crops begin to dwindle and daylength and temperature decline, trap counts shift from high counts in the crop to surrounding trees and adjacent habitat.



- In the late spring-summer, we see a resurgence of SWD in crops as fruits ripen and when females desire to lay eggs, just prior to harvest.
- The figure above shows a visual representation of SWD population shifts (Dreves, Ohrn, and Winfield in prep, 2014).

Where do SWD overwinter?

- Quality OW habitats provide some level of cold, wind, and predator avoidance, and providing some level of humidity and/or food (Danks 2006).



- It is difficult finding SWD in their overwintering habitats. Only a handful were found over the years.
- Within the husks and skins of decaying fruit in both cultivated crops and in surrounding tree habitats provide suitable OW habitats for SWD, with a vast food supply for winter months.
- Bordering trees offer a variety of habitats for SWD, as lichens/mosses, cracked and spitting barks, and crooks provide architecture, while saps and honeydew produced by soft-bodied insects provide ample energy for *Drosophila* spp.

What do SWD feed on throughout the seasons?

- SWD can feed on a variety of food sources, which change throughout the year.
- In the spring, SWD may, like several other drosophila species, have an interest in extrafloral nectaries (Heil et al. 2001), nectar (du Toit 1987), yeasts (Carson 1956), honeydew (Wakers 2008) and pollen (Nicolson 1994) to increase body strength, and increase egg production, longevity & vitality of their eggs.
- In the summer harvest months, SWD will continue to feed and most interested in laying eggs in cultivated crops including cherries, blueberries, caneberries; and uncultivated hosts.
- In the fall months, SWD can be found feeding within the skin and husks of fruits including wild walnuts, persimmons and rotting apples.
- Food supplies tend to dwindle in the harsh winter months, however SWD 'wake-up' on warmer days and feed on saps, yeasts, and honeydew produced by soft-bodied insects (Bizzo 2012) left on needles and leaves.

How can we apply knowledge in combatting SWD?

- Fruit sanitation are key to limit food sources and egg-laying opportunities for SWD (Walsh et al. 2011)
- Removal and harvest of late-season food sources such as decaying persimmons, apples, figs, and walnuts, as they may provide late season refuge and food sources for overwintering SWD.
- Exploit the 'hot spots'- bordering tree habitats, early in the season, by a mass trapping efforts to minimize SWD. Additionally, monitor for SWD presence and population size to identify potential risk areas (Cini 2012).

A few flies were found in tree barks and lichens using a vacuum; and using cardboard collars placed around trunk.

A few flies were found in hanging, rotting apples, figs, and walnut husks in the late fall.



Overwintering SWD were found hidden within the air pockets of some decomposing fallen fruits. No SWD were found on the ground in leaf litter or from soil samples.

Trapping in diverse adjacent habitat near fruiting crop can increase chances of finding SWD, which is a difficult task!

Additionally, it is worth noting that visual inspection led to finding 1 adult below a loose board on the ground in a hoop house, and 2 adults underneath black plastic lining a strawberry crop. This may indicate that SWD will utilize any available, albeit makeshift, protected habitat to increase their chances of survival.

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