Biocontrol of Spotted-wing Drosophila


Biocontrol: A component of overall strategy

Biological control is based on the assumption that each pest is preyed upon or parasitized by a range of naturally occurring enemies. Biological control can stand alone, but is often a control strategy of integrated pest management. Biological control is environmentally safer and can be a cost-effective option for long-term pest management.

Spotted-wing drosophila is a mobile pest that feeds on many host plants. Wild fruits in the Willamette Valley serve as a reservoir from which SWD can reinvade chemically managed crops. Naturally occurring or introduced biological control agents have the advantage of multiplying in crops and the surrounding areas, and may help reduce SWD populations in both habitats.

Multiple biological control agents target SWD, including predators, parasitoids, nematodes and microorganisms such as fungi and bacteria. Predators ambush and feed on SWD, removing a substantial portion of them from the production system by targeting larvae, pupae, adults or all three (Figure 1, page 2). Their efficacy ranges from less than 15% to more than 90%. Efficacy depends in part on other management practices used on the crop. Low-input fields often have higher rates of predation than fields where chemical management plays a greater role. Few of the naturally occurring predator species, including crickets, spiders, ants, earwigs and several beetles, are commercially available. The rove beetle, Dalotia coriaria, showed some promise as a control of SWD in raspberry field trials with up to 50% pest reduction. However, it would be costly to release this predator at high rates.

Growers could increase the population of this predatory beetle by rearing it on dry pet food in breeding boxes.

In North America, few species of resident parasitoids are able to attack SWD pupae in the field. Field trials show the potential of these biological control agents to locate and suppress the pest when released in a netted raspberry field. In particular, their efficacy can be increased by using an augmentorium (Figure 2, page 3).

An augmentorium consists of containers of various sizes where infested or dropped fruits are regularly deposited. The container has a side of fine mesh net (optimal 1–0.8-mm holes) that prevents emerging SWD from escaping but allows the smaller parasitoids to enter. This sequesters part of the pest population from the field while providing SWD as a host on which the parasitoids can feed or lay their eggs (Figure 2, page 2).

Key points from this fact sheet

- Resident predator and parasitoid communities contribute to the natural control of spotted-wing drosophila (SWD).
- Conservation practices increase the levels of predation and parasitism.
- The augmentorium technique is used to increase the rate of parasitism on SWD in the field.
- More effective parasitoids have been selected from their native origin, with releases pending federal permit approval.
- Fungi, nematodes and pathogens can be sprayed on the soil or plant parts to infect SWD but field data about their efficacy are not yet available.
Insecticides kill pests, predators and parasitoids alike. Conservation practices can preserve and enhance biological control agent populations in the field. Such practices include the use of selective insecticides and providing artificial shelters and supplemental food.

Since spotted-wing drosophila is native to Asia, researchers have searched its native range for effective parasitoids. Explorations in China, Japan and South Korea have resulted in collections of several species that effectively parasitize SWD. Further laboratory work has indicated that the parasitic wasp *Ganaspis brasiliensis* may be the best candidate for field releases. In Japan, this species parasitized SWD at a rate as high as 76%. Future field releases of *G. brasiliensis* are pending federal permit approval by the USDA.

Researchers worldwide are exploring the possibility of using pathogens to control SWD. Pathogenic fungi, bacteria and nematodes can be sprayed directly on plant parts or on the soil to infect SWD adults, larvae and pupae. Such microbial organisms are specific to insects and could not harm the crop or consumers. Fungal products have been tested in the field, but all information about bacteria and nematodes are from laboratory trials. For all pathogens, efficacies vary from no effect to inducing high mortality. Recent research has explored the efficacy of pathogenic fungi in autoinoculation traps. Here, SWD adults are attracted inside by a food or odor and become dusted with fungal spores as they enter the trap. Adults then leave the trap carrying spores to other SWD, and thereby perhaps Infecting them.

**Further readings**


We thank our sources and collaborators: Oregon State Blueberry Commission, U.S. Department of Agriculture, National Institute for Food and Agriculture awards and OSU Agriculture Research Foundation. We thank Drs. Bernadine Strik, Chad Finn, Dave Bryla and Wei Yang for blueberry plots. We thank growers who helped us better understand this pest. We thank OSU NWREC, OSU MCAREC, Lewis Brown research farm staff, and WSU Research and Extension Center staff for assisting in field setup, maintenance, trials and sample analysis.

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**Figure 2.** Applying the augmentorium technique. 1) Dropped fruit that is normally removed from the field during sanitation is deposited inside the augmentorium container. 2) Emerged SWD cannot escape the box. 3) Smaller parasitoids can enter the container, reproduce on SWD larvae in a protected environment, and exit to disperse in the field.

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- **EM 9261:** How Seasons Affect Population Structure, Behavior and Risk on Spotted-wing Drosophila
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