Spotted wing drosophila in the southeastern United States: Status, management, and needs

What is spotted wing drosophila

Spotted wing drosophila (SWD) is an invasive pest of soft skinned fruit, which in the southeastern United States included blueberries, blackberries, raspberries, and strawberries. Damage has also been observed in cherries. SWD is established throughout the eastern US. SWD can complete up to 16 generations per year and larvae feed internally, contaminating fruit, shortening shelf life, and facilitating the entry of other pests. Wholesalers and marketers have zero tolerance for SWD in fresh market fruit.

Spotted wing drosophila impacts

Caneberries (blackberries and raspberries), blueberries, and strawberries have been most significantly impacted in the southeastern US. Blueberry crop losses alone totaled over $23 million in 2012. Blackberry and raspberry crop losses in North Carolina during 2012 were greater than $2.1 million, over only 450 acres of production. SWD larvae have also been observed in grapes and figs, although it is unclear if they are primary pests in these crops or attacking already damaged fruit. SWD have not been observed in sound peaches preharvest but are common in windfalls on the ground, and areas with

Spotted wing drosophila management

Pesticides are the primary SWD management tool, but their efficacy is reduced under rainy conditions , which are common during eastern summers. SWD infestations can reach 100% if left unchecked or if pesticide applications are impacted by rain. Prior to the detection of SWD in 2010, blackberry growers made one or no insecticide applications during harvest. These same growers may now make up to 11 insecticide applications during harvest, solely directed at SWD. Similarly, insecticide applications in southeastern blueberries have increased 10-30%. Organophosphate, pyrethroid, and spinosyn insecticides appear most effective for SWD in research trials in the western and eastern US. Currently labeled insecticides are not only less effective that desired, their labels limit the number of applications pre season. This means that for crops with long fruiting periods, growers may run out of pesticide options before the end of harvest. This situation is even more challenging for organic growers, who have only two insecticide options. This insecticide intensive strategy also raises the very real concerns of increased pesticide residues and pesticide resistance development, and future efforts must be targeted to developing integrated strategies for SWD management.

Thorough, frequent harvest may reduce the time ripe fruit is exposed to SWD and the population of SWD developing in fields. Removing and destroying unmarketable or unwanted fruit in a way that will kill any SWD present will also reduce in field populations. Although it is assumed that SWD feeds on wild hosts, what wild plants host SWD and the significance of movement of wild SWD into fields is unclear.

Spotted wing drosophila monitoring

Monitoring traps baited with apple cider vinegar or yeast are helpful in determining SWD presence or absence, but they are non specific, inefficient, and less attractive than ripening fruit. Larvae can be sampled using salt or sugar flotation methods or by chilling fruit, which will cause large larvae to exit.

Research needs

In the *short term* **we need to fill the growers' toolbox with effective management tools**. This means, we need to identify the most effective individual insecticides and the most effective insecticide programs. Research in the southeast, Midwest, northeast, and western US has identified compounds that kill SWD in the laboratory. We now need to take these compounds to the field and combine them into a management program, cognizant of insecticide resistance threats, that can be implemented during the next two years.

Research needs, cont.

In the *short term*, we also need to improve the efficacy of the insecticides options we have. This could include new formulations, incorporating baits or adjuvants, and improving application technology.

In the *short term*, we need to relate SWD trap captures, using all available baits, to infestation in fruit. We need to determine if any of the baits currently available are useful in detecting SWD populations before they damage fruit. These comparisons can be completed over no more than two years, potentially in one if research can be conducted in multiple states. In the *long term*, we need to develop monitoring and sampling programs that actually predict risk and develop economic thresholds for SWD using these tools.

In the *short term,* we need to understand the implications of an insecticide intensive management strategy. We need to determine the relationship between number of applications and insecticide residues, with particular attention to maximum residue levels (MRLs) for fruit sold both domestically and internationally. In the *long term, we* need to assess the impact of this high level of insecticide use on predators, pollinators, and other pests.

In the *short term,* scientists and stakeholders must communicate with each other to ensure that research done is non redundant and that results are communicated to growers as they become available.

In the *long term,* we need to develop post harvest methods that can help manage SWD infestations that were not detectable in the field and prevent further SWD spread in marketed fruit.

In the *long term*, we need to identify the source of the SWD that move into fields. This means identifying the non crop hosts most commonly utilized by SWD and SWD overwintering sites. After these non crop hosts and overwintering sites are identified, we can determine if management actions targeting these sites will reduce crop damage.

In the *long term,* we need to develop non chemical management tools. These may include mass trapping (if an attractive lure is available), trap cropping (if more attractive hosts are identified), physical barriers (edible coatings, netting), and possible genetic pest management techniques (sterile insect technique or gene drivers). These non chemical tools will reduce reliance on insecticides.

How do we move forward?

SWD working group meetings have been held in NC, NY, and MI to identify research priorities. A multistate effort is necessary to accomplish these goals. Scientists are pursuing grant funds (USDA Regional IPM and Specialty Crop Research Initiative grants), and stakeholder engagement is crucial to receiving grant funding. Stakeholders can demonstrate their engagement through directly funding research, participating in working groups , participating in grant proposals, and communicating with policy makers to ensure they are aware of the threat caused by SWD.

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