CENTRAL COAST AGRICULTURE HIGHLIGHTS

SANTA BARBARA COUNTY **MARCH 2010**

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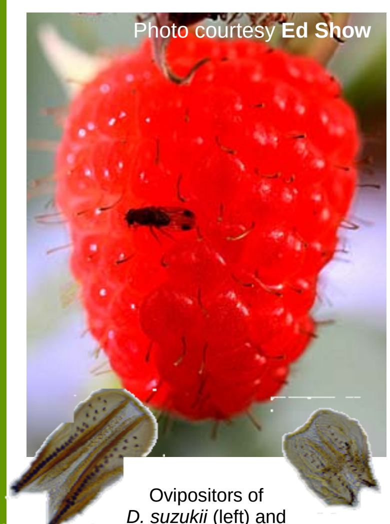
A New Vinegar Fly Pest in California

Spotted wing drosophila, *Drosophila suzukii*

Mark Bolda



Ovipositors of *D. suzukii* (left) and *D.melanogaster* (right)

History: Spotted wing drosophila (SWD), *Drosophila suzukii*, is native to Southeast Asia and is an established pest in Japan, Korea and southern China. SWD was first found in August, 2008 on strawberries and caneberries in Santa Cruz county, California and spread to the rest of the state as well as to Oregon, Washington states in the US and the province of British Columbia, Canada in 2009. Unlike the common vinegar fly, *D. melanogaster*, which oviposits on over-ripe or rotten fruit, SWD lays eggs in fruit which is soon to be harvested.

Biology: *Drosophila* species are not known to be economic pests, of which SWD is a notable exception. Males and females of SWD are easily identified: male SWD have a characteristic black spot towards the tip on each wing; females have a large, serrated ovipositor used to deposit eggs under the skin of soft fruit, which other common vinegar flies lack. A female SWD will deposit 1 to 5 eggs per fruit, and can lay a total of 300 to 400 eggs, meaning that egg laying will take place across many fruit. Larvae, also known as maggots, hatch out shortly after and develop within the fruit and move to the surface of the fruit or exit completely to pupate.

At ideal temperatures of 70°F SWD takes a little more than a week to complete its lifecycle from egg to adult. SWD development ceases at approximately 48 °F, and all stages are killed at exposure to freezing temperatures or sustained temperatures above 100°F. In California's moderate coastal climates, it is probable that SWD could cycle through ten generations in a year.

Photo courtesy **Chrislyn Patricka**

Trapping: Monitoring for the presence and abundance of the pest is fundamental to a program of control for SWD. Research through 2009 identified a mixture of 2.5 oz baker's yeast, 4 teaspoons of sugar and 12 ounces of water distributed among four or five plastic bottles with three or four 7/16" inch diameter holes drilled through the lid as being a very attractive medium for attracting and trapping SWD, especially in the summer months. Bottles are hung or placed in cool shady areas in the production field and checked daily.

Chemical Control: GF120 Fruit Fly Bait is registered for selective attraction and control of multiple species of tephritid fruit flies infesting various tree, fruit, nut, vine and vegetable crops, but the label claims no efficacy against *Drosophila* species. Research in 2008 and 2009 has shown that while GF120 has some efficacy against SWD, it probably cannot be used as a stand alone product in many situations.

Malathion, zeta-cypermethrin and spinetoram were highly effective in controlling SWD for at least two weeks in research done in raspberries. Spinosad and pyrethrin were moderately effective in controlling SWD meaning they suppressed populations for at least one day. Growers should note that in the future, resistance or tolerance of SWD can develop in response to the overuse of any single product. Rotations of products with different modes of action should be a matter of course in a sound program of insecticide management.

The effect of pesticide use on non- target species is also a very important consideration. Malathion and zeta-cypermethrin are broad spectrum pesticides that will negatively impact beneficial insects such as predators, parasitoids and honeybees. Although these products do provide immediate SWD control, additional IPM solutions incorporating cultural and biological controls must be found over the long term .

Sanitation: Since SWD lays eggs in and develops within raspberry and strawberry fruit, removal of fruit during harvest or by collecting and then destroying culled fruit rather than simply discarding in the production field, eliminates the fly's ability to complete its life cycle. It is common practice for caneberry harvest crews to simply dump rotten or overripe fruit at the foot of the hedgerow which would allow SWD to continue development in infested fruit. Sanitation programs involving the removal and destruction of culled fruit should reduce the local contribution of adult SWD reinfestation. Sanitation for strawberry growers consists of the same strategies as those used for limiting *Rhizopus* rot and *Botrytis* grey mold. Overripe and rotten fruit are removed from under the plant canopy and deposited in the furrow. Passing over the fruit with a tractor after each harvest renders that fruit much less suitable for SWD development as desiccation accelerates from physical destruction.

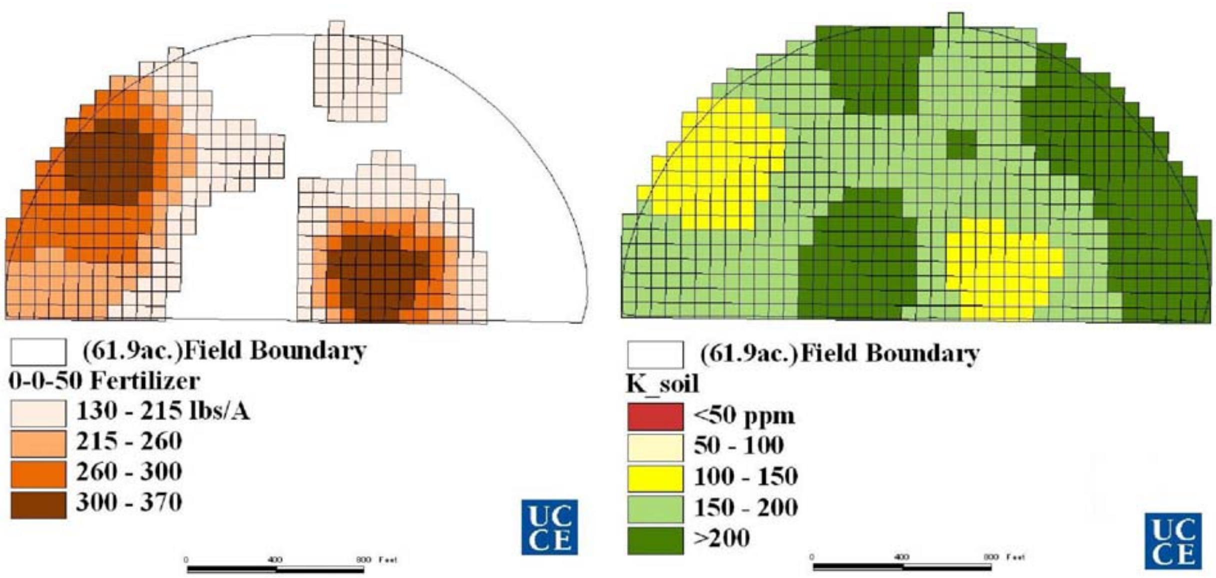
There are several insecticides mentioned for control of vinegar flies in this article. Before using any insecticides, check with your local Agricultural Commissioner's Office and consult product labels for current status of product registration, restrictions, and use information.

Site-Specific Fertilization Can Improve Profits

Andre Biscaro and Steve Orloff

Crop production and especially nutrient management have become more costly over the years. Implementation of site-specific crop management (SSM) has the potential to help growers achieve input optimization, improve yields and consequently increase efficiency and save money. Although SSM (or precision agriculture) has become common practice in the Midwestern US (70% of growers use the technology), most growers and researchers in California have not adopted the technology (only 15% in the Western States). However, California growers should consider exploring the benefits of this technology.

Site-Specific Management involves consideration of the variability of soils and the crop in order to optimize inputs. Variable Rate fertilization is the most common SSM practice used due to the relative ease of assessing soil fertility variability. Soil variability is the result of natural and man-made factors including changes in relief, parent material, climate and management practices like land leveling, fertilization, tillage and crop rotation.



Soil potassium map (left) and 0-0-50 recommendation map (right) of an onion field (61.9 acres) located in Lancaster, CA.

Grid sampling is a superior method to assess soil fertility variability (except for nitrogen). Using this sampling strategy, growers can identify deficient areas of the field that would be overlooked with the conventional soil sampling method. The fertility maps developed in the first year could be used to identify distinct soil fertility zones and could direct future soil sampling to drastically reduce the number of samples and soil analyses required in subsequent years. Plant tissue sampling is another valuable diagnostic tool that could also be used in association with the soil fertility maps.

Sampling every 3 acres is the recommended practice for most fields. The higher the sampling density, the more accurate the map will be but soil sampling and analyses can be costly. The field history, including knowledge of the previous crop and soil management practices, should also be considered to help determine the ideal number of samples.

Studies in Southern California have shown that the use of Variable Rate application of phosphorus and potassium fertilizers in alfalfa and onion fields helped avoid both over and under-fertilization on significant portions of the fields, and that fertilizer savings were generally enough to pay for the extra costs of soil analysis when compared to the conventional soil sampling method.

Whether Variable Rate application results in an actual fertilizer savings or not is secondary. It depends whether conventional sampling under or over-estimates soil fertility levels. The important point to keep in mind is that grid sampling and the Variable Rate method the fertilizer application better matches the actual fertility level of the field.

A MESSAGE FROM THE EDITOR

To make the best use of available technology, I have started Twitter feeds to address strawberry and vegetable issues. I will be *tweeting* about important announcements regarding meetings, workshops, pests, production issues, alerts, or anything that might be useful to growers.

Since there is a character limit of 140, these feeds (as they call the messages in this bird language) will be very brief or a single message will be broken down into multiple feeds.

Please try to follow www.twitter.com/calstrawberries and www.twitter.com/calveggies on your cell phones or computers. This is a great way too stay tuned to important happenings.

Thank you,
Surendra Dara

Just a sample of what's tweeing...

"New UC strawberry short-day cultivars, Benicia (large fruit-excellent flavor) and Mojave will be ready for production fields next year."

twitter

"Fujimite (fenpyroximate) registered for spidermite control on strawberries. Up to 30 day residual. But hard on predatory mites."

"Fujimite (fenpyroximate) registered for spidermite control on strawberries. Up to 30 day residual. But hard on predatory mites."

"Rimon 0.83EC (Novaluron) approved in California.For Lygus on strawberries. Maximum rate: TOTAL of 36 fl oz/acre/crop year. Exp. 2/28/2015."

Arthropod Pest-Plant Interactions Part I

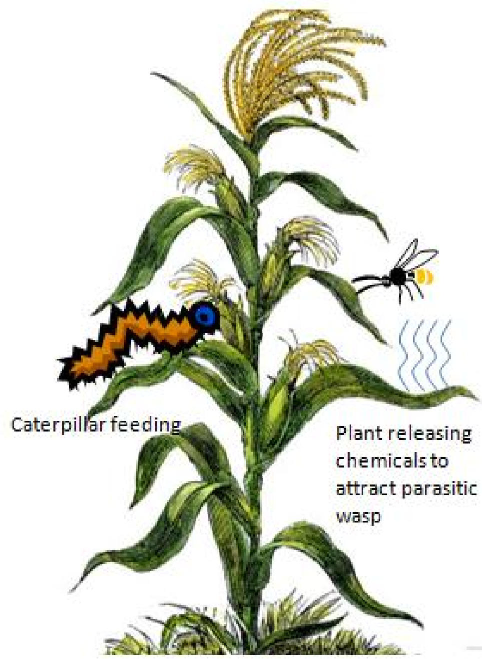
Herbivores, herbivore-induced plant volatiles and natural enemies

Surendra Dara

Arthropod pests-insects and mites-interact with various factors like host plants, natural enemies, pesticides, fertilizers, irrigation, weeds and others in their environment. Knowledge of these interactions can help identify vulnerable areas that can be manipulated to manage pests. Removal of the weeds that harbor pests, avoiding chemicals that are harsh on natural enemies, rotating chemicals of different modes of action to minimize resistance development, crop rotation to break pest cycles are just a few of those techniques that interfere with arthropods and their environment. I will try to address some of those interactions in an attempt to expand the knowledge base.

Plant's own defense mechanisms are the first line of defense against herbivores (organisms that feed on plants). This mechanism involves various approaches. Some plants have foliage and other parts that are less attractive to herbivores or have substances that are toxic to herbivores. Some plants have hairs or structures that provide mechanical obstruction to insect feeding. Plant chemicals like phenols, alkaloids, glycosides, cyanides act as natural insecticides, repellents, or herbivore growth regulators. In other cases plants develop mutually beneficial relationship with natural enemies like ants and wasps by providing nectar and receive protection from herbivores.

Herbivores cause damage to the plant by feeding on the stems, leaves, flowers, fruits or roots. Feeding can be chewing the plant parts or by sucking the plant sap. Herbivore feeding causes some plants to release volatile compounds that attract wasps which will attack the herbivores. For example, corn plants release large quantities of volatile terpenoids when caterpillars feed on them. The parasitic wasp, *Cotesia marginiventris* is attracted to these compounds, finds the caterpillars and lays eggs in them.



Sometimes, these interactions can become complex when more than one pest is involved. In Lima beans, the plant hormone, jasmonic acid plays an important role in the release plant volatiles that attract natural enemies. A monoterpene, (*E*)-*b*-ocimene is such a volatile compound which is released by plants infested with spider mites. This compound attracts predatory mites like *Phytoseiulus persimilis*. If Lima beans are infested with whiteflies (*Bemisia tabaci*), the amount of jasmonic acid and consequently the monoterpene release diminishes rendering the plant less attractive to the predatory mites. Two-spotted spider mites also lay more eggs on plants infested with whiteflies.

A similar response was seen in cotton where whiteflies reduced the release of terpenoids in response to beet armyworm (*Spodoptera exigua*) feeding. In contrast, production of volatile compounds and thus the attractiveness to a predatory mirid (*Macrolophus caliginosus*) was increased in the presence of both the two-spotted spider mite and the green peach aphid (*Myzus persicae*) than either pest alone.

While such herbivore, plant defense chemical production and natural enemy interaction can vary in different plant species, this information can help direct the pest management strategies in a more efficient way. For example, a decision to release predatory mites can be influenced when whitefly infestation is seen along with spider mite infestation. Alternatively, if the presence of two pests makes the plant more attractive to a natural enemy, releasing or conserving the natural enemy will be more effective.

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