PREVENTION: FROM CRISIS MANAGEMENT TO IPM PROGRAMMING

LESSONS AND CHALLENGES

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Introduction

The invasive pest, *Drosophila suzukii* (SWD), arrived in Oregon in 2009, and now has established a stronghold in the Western and Eastern United States (>30 states); and is widespread in many of the European countries. SWD came out in force in 2012. Fruit quality was reduced along with increased economic losses (measured by increased sprays, reduction in grade, added labor for monitoring, etc).

The lack of adequate knowledge about SWD has triggered numerous applications of insecticide treatments; and chemical use became the lead management practice.

Why is this pest difficult to manage?

1) Fly infestation occurs inside the fruit, which makes control challenging and enhances accidental dissemination of flies; and the difficulty of treating SWD, hidden in plant canopies.

2) SWD has a very short generation time, and many generations (3-7 are predicted in Oregon), which could mean at least 2 generations in a single fruit-cropping period.

3) SWD has a wide host range including managed and unmanaged fruits, including ornamental/garden plants and non-commercial uncultivated berries; and within a single season SWD can move from one fruit type to the next as well as between wildland habitat and agroecosystems. (The preferred suitability of each host is being investigated.

4) *Drosophila* flies can randomly acquire genetic mutations that can manifest as morphological and physical changes, so the rate of fly adaptation and the associated competitive ability, reproductive fitness, and potential for pesticide resistance is of great concern.

Research addressing decision support tools and prevention-oriented IPM practices (e.g., timely harvesting, sanitation, cold storage) will increase opportunities for growers to widen their options for managing SWD. Seasonal variations and activity-density changes are most likely influenced by varying environmental conditions, behavioral needs, and other factors.

SWD prevention is key. This requires a thorough understanding of SWD biology, behavior and movement not only in cultivated crops but in adjacent landscape.

The following report will address some findings that could help minimize SWD populations:

1) Monitoring (trapping adults, degree-day modeling, larvae extraction)
2) Sanitation (e.g., fallen fruit)
3) Cold Storage (post-harvest treatment)
4) Use of Landscape Knowledge

Monitoring. *Trapping Adults*. Color (Fig. 1), entry area (Fig. 2), headspace (volume) (Fig. 3,4), new design and bait types (Fig. 5) were tested in 2012. All studies were replicated 3 times over a time period of 11 to 13 weeks. Traps were rotated into new positions each week. Trap catch was compared using apple cider vinegar (ACV) and a yeast solution baits over a 3-year period in no-spray blueberry field.

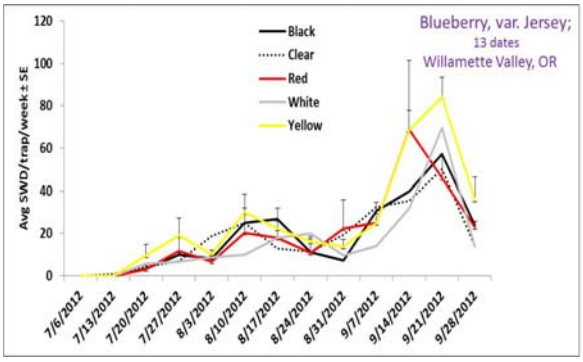


Fig. 1. SWD attractiveness to trap color varied.

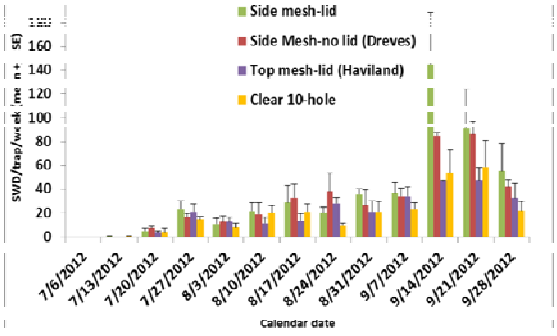


Fig. 2. Increased entry area caught more flies.

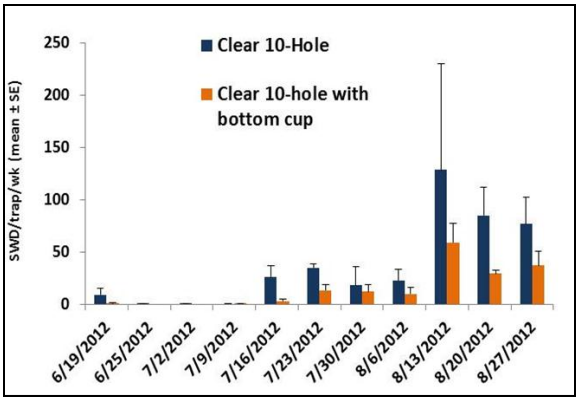


Fig. 3. Less headspace in trap more SWD catch.

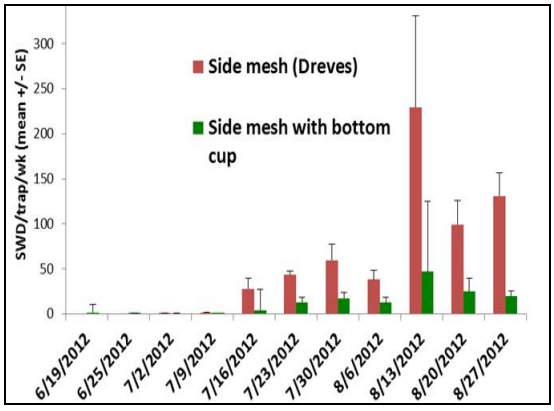


Fig. 4. Less headspace more trap catch.

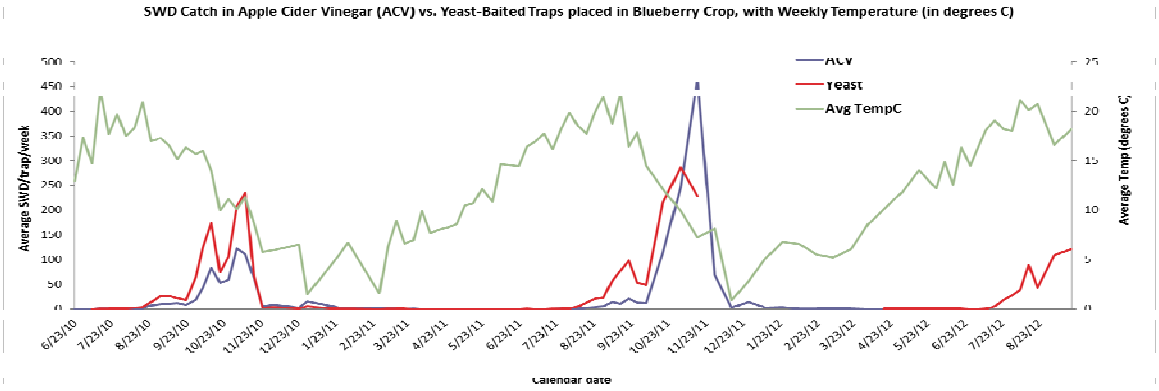


Fig. 5. Yeast baits caught significantly more SWD than vinegar baits during harvest periods.

***Degree-Day Modeling*.** Predictive models are being tested and validated to help answer questions, including: Can trap catch found in late fall traps correlate with counts collected after winter mortality predict the risk of spring populations? Can DD models predict 1st generation activity and egg-laying events to help time treatments and reduce unnecessary treatments?

***Larval Extraction*.** Crushing fruit, rather than leaving whole, will increases larval exit from fruit (>50% more) to determine SWD infestation. Solution types salt (15 Brix; 1 cup), brown sugar (16 Brix; 2 ½ c), or white sugar (15 Brix; 3 ¼ c) did not yield significant different numbers of larvae in total (p = .45), but relative performances of methods based on efficiency (the fraction of total larvae that are harvested after 15 minutes) were significantly different (p-value < 10-7) when adding a solution of. Boiling fruit was not as effective in extracting small larvae.

Sanitation. SWD can survive in fallen infested fruit under blueberry plants (Fig. 6); and SWD will oviposit in clean fruit on the ground, when fruit is not available on the plant (Fig 7).

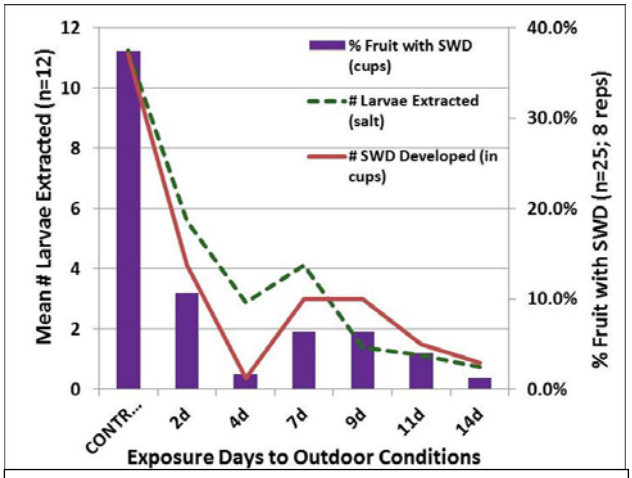


Fig. 6. A percentage of SWD are able to survive in fruit that falls to the ground.

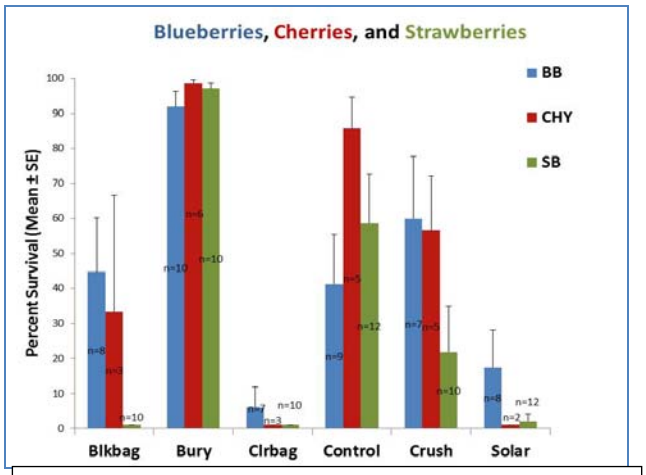
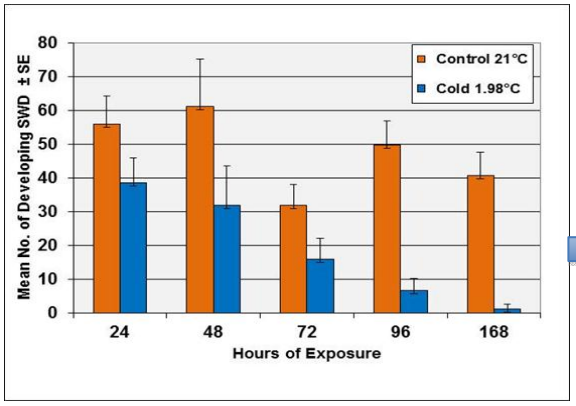


Fig. 7. Solarizing and bagging (clear) infested fruit were effective when environmental conditions were sunny with minimal rain.



Cold Storage. SWD eggs and both young and old larvae were reduced in post-harvest fruit when exposed to cold periods compared to the control (21°C), however older larvae and pupae were less susceptible to cold than eggs and 1st instar larvae (Fig. 8). When fruit exposed to longer periods of cold, less larvae survived.

Fig. 8. Cold treatment reduced SWD survival and development in post-harvest fruit.