Title: **Developing a volunteer monitoring network for a new insect pest of small fruits**

Final report, Extension project 2011 E-01

Hannah J. Burrack
Principle Investigator

Asst. Prof. & Ext. Specialist
Department of Entomology
NC State University
Campus Box 7630
Raleigh, NC 27695
hannah_burrack@ncsu.edu

Douglas G. Pfeiffer
Co- Principle Investigator
Professor
Department of Entomology
Virginia Polytechnic University
205C Price Hall
Blacksburg, VA 24061-0319
dgpfeiff@vt.edu

J. Powell Smith
Co- Principle Investigator
Extension Associate
CUCES-Lexington County
605 W. Main St. Ste. 109
Lexington, SC 29072
jpsmth@clemson.edu

Objectives

1. To educate southeastern cooperative extension agents, small fruit growers, and the public on identification and detection of the spotted wing drosophila (SWD).
2. To expand a volunteer monitoring network for SWD in North Carolina, South Carolina, Virginia, and potentially other states.
3. To detect and track the spread of SWD in the southeast.

Justification

The spotted wing drosophila (SWD, *Drosophila suzukii*) is a significant pest of soft skinned fruits that has recently been detected in the southeast, Mid-Atlantic, and Great Lakes Regions. The larvae of this highly polyphagous fly feed on many economically-important crops including blueberries, caneberries, peaches, cherries, strawberries, grapes, pears, plums, apples, fig, and persimmons, in addition to other common wild and cultivated hosts. Tree fruits (e.g. peaches and cherries) and berries (e.g. caneberries, blueberries, and strawberries) are at the greatest risk of SWD injury. These high value crops ($10.6 billion annually) are grown on over 1.8 million acres throughout the United States (data compiled from USDA NASS 2010 *Crop Values Summary* and NASS 2010 *Noncitrus Fruits and Nuts Summary*).

SWD is unique among *Drosophila* spp. in that female flies preferentially lay their eggs in ripe and ripening fruit rather than rotting fruit, and larvae feed on the fruit itself rather than on secondary fungal growth. This results in high risk of larvae being present at the time of harvest, thus reducing the chance of meeting the zero threshold for marketing fresh or processed fruit. Because SWD can complete a generation in as little as 8 days, they can rapidly increase their populations to potentially devastating levels.

The risk posed by SWD to fruit crops is great. Losses in California host crops, where damage has been highest to date, average 20% but have been as high as 80% (in raspberries), with high infestations even in fields receiving insecticide applications (Bolda, et al. 2010). Across the range of susceptible crops, these losses could total $1.4 billion annually in the eastern US alone. Our project has tracked the movement of SWD as it has spread throughout the region and has educated growers and public about this pest's potential impact and management. Results from our work have been delivered to

end users through extension channels, through scientific meetings, and through SWD websites. Unfortunately, 2011 also saw significant losses to SWD in the southeast, particularly in caneberries. These losses only highlight the importance of increased understanding of this pest in our environment.

Methodologies

We expanded our volunteer monitoring network (SWD*VMN) from 19 participants to 30, and from 3 states (NC, SC, and VA) to 8 (including sites in LA, GA, WV, MD, and AR). The only state where we have not yet detected SWD is Arkansas. In addition to the traps used in the SWD*VMN, we also distributed ca. 500 sample traps and SWD voucher specimens to growers, fruit purchasers, homeowners, and cooperative extension personnel. These tools were designed to aid in detecting and identifying SWD. While our initial strategy was to hold small, hands on identification trainings for volunteers, in the interest of practicality we shifted our education efforts to grower groups, fruit marketers, and the use of online tools. This was in part due to the enthusiastic response of volunteer trappers to a January 2011 end of season survey. Of the 19 participating volunteers in 2010, 13 responded to this survey, and all were either very or somewhat comfortable identifying SWD after completing the series of 3 training webinars. All respondents were comfortable with identifying SWD following confirmation by one of the project PIs.

To enhance our online delivery tools, we partnered with EDDMapS (http://www.eddmaps.org/, University of Georgia) to develop a more robust data collection and display tool (http://www.eddmaps.org/project/project.cfm?proj=9). Cooperators in NC, SC, VA, GA, LA, AR, WV, and MD are now using this site to record and display their trap captures.

Results

SWD has now been detected at all active monitoring locations in NC and VA. WV, GA and MD sites were established after initial detection in these states, and all monitoring locations have captured flies (Figure 1).

Additional activities

The SWD*VMN facilitated additional research activities, most notably continued data collection on species and variety infestation differences in North Carolina (Figure 2) and participation in a national trapping trial designed to compare different trap designs (Figure 3). We are also partnering with geneticists at NCSU and beyond to study the population biology of SWD in the eastern US and have utilized SWD*VMN sites to collect samples.

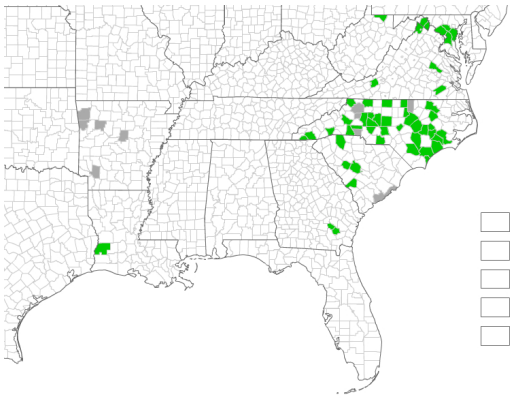

Figure 1. Southeastern counties with positive SWD captures (green) and monitoring sites but no captures (grey). Counties in NC and SC with sites that have not captured SWD are no longer active.

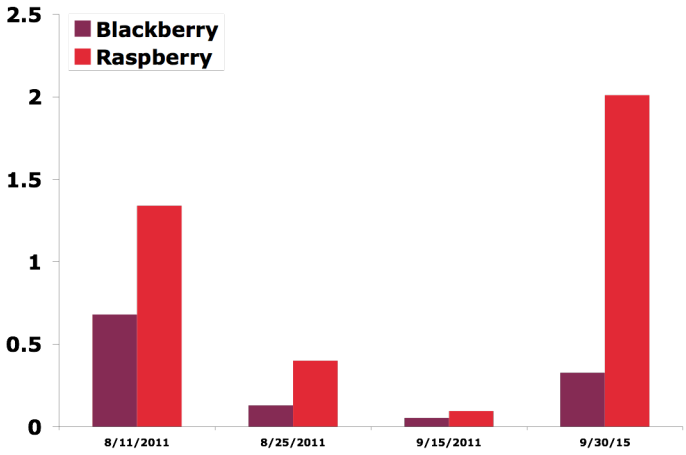

Figure 2. Number of larvae per fruit in raspberry and blackberry samples collected at the Upper Mountain Research Station, Laurel Springs, NC. On each sample date, significantly more larvae were present in raspberries than blackberries. There were also significantly more larvae in outside plants than in high tunnel plots, and numerically more larvae in some raspberry varieties (data not shown).

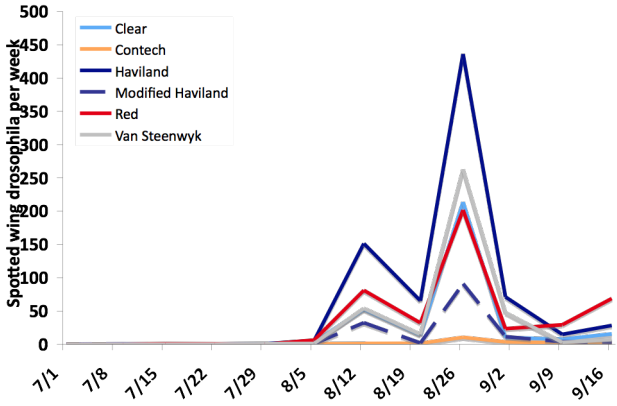

Figure 3. Comparison of several traps for SWD designed by researchers from around the United States. Haviland traps (clear containers with red lids and a wire mesh top) performed better than other trap types on 12 August and 26 August. However, this trap also caught large numbers of non target flies.

Conclusions

SWD has rapidly spread throughout the southeastern US and is beginning to cause significant damage. The SWD*VMN has provided a valuable early warning for growers and homeowners, but damage experienced in 2011 underscores the need for additional work. We are pursuing long term funding sources that will help support this necessary research.

Impact Statement

Our work has generated significant value for the investment. We have detected the first populations of spotted wing drosophila (SWD) in NC, SC, and VA, have prepared growers for changing management needs, and have assisted scientists and growers in other states as SWD has spread. We have successfully leveraged SRSFC funds in support of North Carolina Specialty Crop Block Grant ($29,712) and North Carolina Tobacco Trust Fund ($40,000) support for 2012. These funds will support increased and enhanced monitoring efforts in partnership with NCSU and NCDA & CS research stations and pre and post harvest management trials. These funds and additional monies currently being sought through regional and national granting programs will ensure that we are able support our crucial research on SWD for the next several years.

Publications

Publicaitons on trapping trials and in field infestation between species and varieties are in preparation. In addition, 29 posts related to SWD were written in 2011 for NC Small Fruit & Specialty Crop IPM (http://ncsmallfruitsipm.blogspot.com/), a blog maintained by PI Burrack and visited 8,642 times (1.85 page views per visit) in 2011. The single most viewed page is dedicated to SWD and was visited 973 times. The vast majority of these visits originate in the southeast.