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

Progress Report, 2010 E-01

Extension Project

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, the public, and other stakeholders on identification and detection of the spotted wing drosophila (SWD).
2. To develop 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 & Description

The spotted wing drosophila (*Drosophila suzukii* (Matsumura)) is a recently detected invasive species in North America with significant potential to damage small fruit crops. Unlike its close relatives, SWD larvae feed on sound (not rotting) fruit, and have the potential to cause significant yield and quality losses, much like those possible in blueberry maggot, Mediterranean fruit fly, and apple maggot infestations. Crop loss estimates in the western United States average 20%, but infestations can approach 100% if left unchecked. Because it is a direct fruit feeder, the establishment of SWD may significantly impact all small fruit production in the southeast. SWD was first detected in backyard plantings in California in fall 2008 and was found throughout California, Washington, and Oregon the following year. Since its detection in North America, SWD has been recorded feeding on cherry, raspberry, blackberry, blueberry, peaches, grapes figs, and strawberry. Like many *Drosophila* spp., SWD can increase its population rapidly, with females laying approximately 300 eggs over the course of their weeklong lifespan. In August 2009, SWD was detected in Florida, and in September 2010, SWD was detected in Michigan. None of the states included in our network had plans to monitor for SWD, meaning that without this project, this potentially devastating insect may have moved undetected into our region.

Methodologies

Monitoring sites were established at 24 locations (6 in SC, 15 in NC, and 3 in VA) (Figure 1) and volunteers include county extension agents, NCDA & CS regional agronomists, and extension specialists. Volunteer training was conducted via webinars,

which were recorded and made publicly available via PI Burrack's blog (www.ncsmallfruitsipm.blogspot.com). Webinars were conducted on 8 April and 14 July 2010, and a third webinar will be conducted in November 2010 to assess program success and discuss modifications for 2011. Traps were placed and monitoring began in May. Each site contained 6 traps total, 3 baited with apple cider vinegar (Figure 2) and 3 baited with a yeast-sugar lure (2 Tbsp yeast and 4 Tbsp sugar dissolved in 12 oz water).

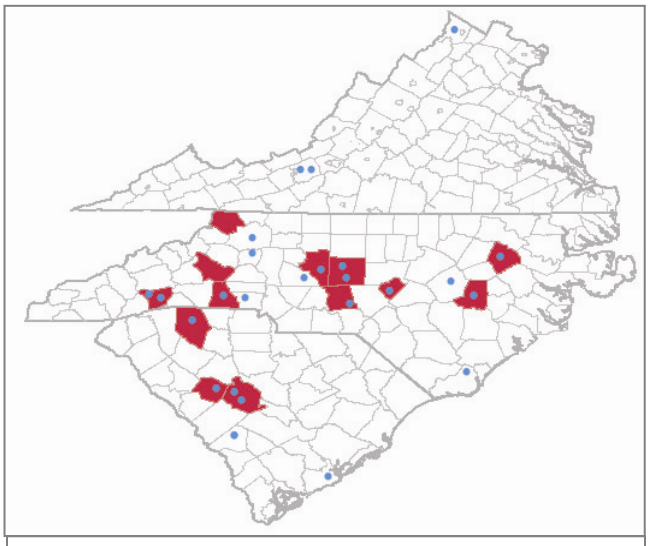

Figure 1. Current SWD monitoring locations (blue) and counties with confirmed SWD trap captures or larval infestations (red areas).

Results

SWD was first detected in SC in USDA-APHIS Mediterranean fruit fly monitoring traps in Beaufort County, the southernmost county. SWD was detected in our monitoring traps in Saluda County SC on 2 July, and was detected in Randolph County, NC on 14 July. SWD has now been confirmed from 10 NC and 3 SC counties. (Figure 1) Because SWD detections began in mid to late summer, susceptible fruit were not present at monitoring sites, and no fruit infestations were observed until 24 September when a large larval infestation, approaching 100%, was discovered at the North Carolina State University (NCSU) Upper Mountain Research Station (UMRS) near Laurel Springs. A replicated caneberry variety trial that included several primocane fruiting varieties and a day neutral strawberry trial at UMRS were heavily infested. Following this detection, SWD were also found infesting fruit at the Mountain Horticultural Crops Research Station, Mills River, NC and in primocane fruiting raspberries and blackberries at 2 grower locations.

Figure 2. SWD trap baited with apple cider vinegar.

Data from sites catching flies in 2010 indicated that apple cider baited traps performed as well or better than yeast-sugar lure baited traps. (Table 1) Based on this observation, monitoring locations terminated the use of yeast-sugar lure traps on 27 September and continued with 3 apple cider vinegar baited traps. PI Burrack continues to maintain 2 sites with both lure types for comparison purposes.

Table 1. Mean[1] ± SE flies per site captured in two lure types.

Site	Mean flies	
	Apple Cider Vinegar Lure	Yeast & Sugar Lure
Davidson County, NC	6.00 ± 0.89 **a**	0.33 ± 0.21 **b**
Edgecombe County, NC	1.13 ± 0.36 **a**	0.27 ± 0.15 **a**
Henderson County, NC Site 2	9.08 ± 1.40 **a**	2.46 ± 0.58 **b**
Lee County, NC	2.00 ± 1.30 **a**	0.55 ± 0.38 **a**
Montgomery County, NC	1.00 ± 0.35 **a**	0.50 ± 0.29 **a**
Randolph County, NC Site 1	5.22 ± 3.67 **a**	0.78 ± 0.46 **a**
Lexington County, SC	1.77 ± 0.78 **a**	0.33 ± 0.33 **a**

Preliminary observations at the Upper Mountain Research Station, near Laurel Springs, NC indicate that SWD may prefer certain plant species (Figure 3a) when presented with a choice, and limited sample data from the same location further suggests that SWD may prefer varieties within species. (Figure 3b) Also intriguing based on this limited sample is the observation that raspberries grown outside were generally more heavily infested than those grown in high tunnels (large open-ended greenhouse-like structures) with the exception of Redeva, which had low infestation levels regardless of environment.

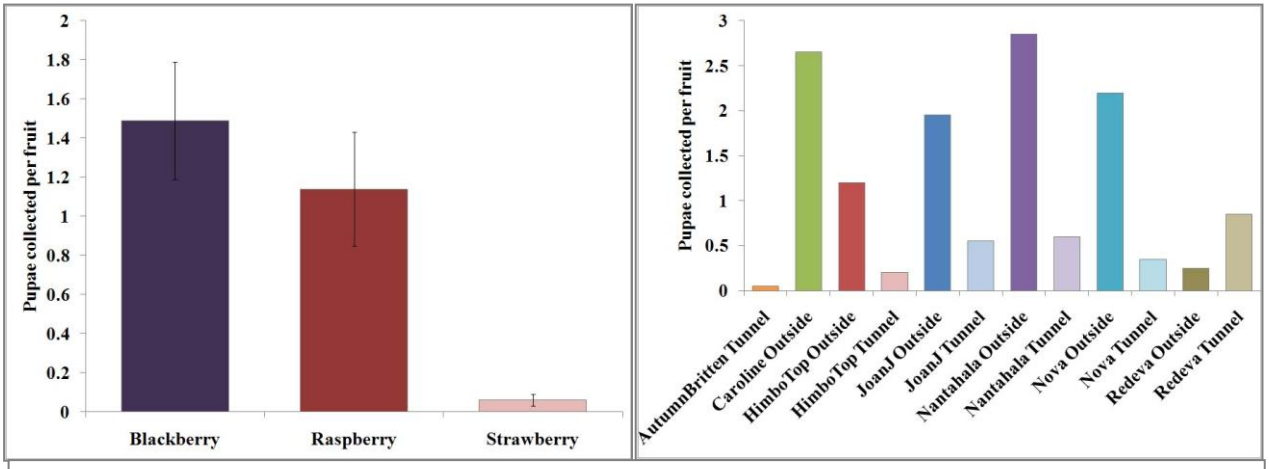

Figure 3a. (left) Pupae per fruit, by species (n = 30 fruit). 3b. (right) Pupae per fruit by raspberry variety and climate (high tunnel vs. outside) (n = 30 fruit).

Conclusions & Future Directions

SWD has been detected in multiple locations in North and South Carolina. Based on observations in the western US, SWD will be able to overwinter throughout the southeast

[1] Means within a site followed by the same letter are not significantly different (α = 0.05) via LSD. Analyses (via Proc Mixed in SAS v.9.3) were conducted separately for each site with date and lure as fixed independent variables and replicate as a random effect. Interactions between date and lure were non significant.

and has the potential to become a devastating pest. We are seeking funding to expand research on SWD detection, host preference, and management.

Funds obtained from SRSFC have been used to leverage requests for additional support from the North Carolina Tobacco Trust Fund (**$76,908**), the USDA Southern Region Integrated Pest Management (IPM) Program **($157,371**). These proposals were submitted in November 2010. Work in 2010 facilitated North Carolina participation in the USDA NIFA rapid response multistate working group, W504: Biology and Management of Spotted Wing Drosophila in Small and Stone Fruits.

Impact Statement

Our program has trained 19 volunteer trappers to identify and monitor spotted wing drosophila (SWD) adults and is responsible for the first detections of this potentially devastating pest of small fruit in 13 North and South Carolina counties. We the first to detect larval infestations of SWD on the east coast, in North Carolina. We have provided small fruit growers with valuable lead time, which can be used to learn how to detect and manage SWD before it arrives on their farms.

Citations

Trapping data and general information on SWD were shared with volunteer trappers and the public via a blog maintained by PI Burrack (www.ncsmallfruitsipm.blogspot.com). To date, 21 blog posts using information developed through this project have been produced. These posts have been viewed by 1683 visitors during 2010. Over 700 visitors per month view the entire blog. Information generated from this project has been used in presentations to the Cleveland County Blackberry Field Day (21 October 2010, 45 attendees), the Southeastern Strawberry Expo (9 November 2010, 40 attendees), and the Strawberry High Tunnel Workshop (17 November 2010, 120 attendees). Data generated by the project will also be presented at the SRSFC Agent Training on 6 January 2011.

Our efforts have also garnered considerable media attention:

News & Observer. "Asian fruit fly may plague state next year." Matt Ehlers. 20 October 2010. http://www.newsobserver.com/2010/10/20/750341/asian-fruit-fly-may-plague-state.html#storylink=addthis

North Carolina Public Radio. "NC farmers face new foe." Laura Leslie. 20 October 2010. http://www.newsobserver.com/2010/10/20/750341/asian-fruit-fly-may-plague-state.html#storylink=addthis

Triad Business Journal. "Invasive fruit flies found in NC." 19 October 2010. http://www.bizjournals.com/triad/news/2010/10/19/invasive-fruit-flies-found-in-nc.html

Richmond Daily Journal. "Heat may have helped growers." Dawn Kurry. 19 October 2010. http://www.yourdailyjournal.com/view/full_story_home/9970782/article-Heat-may-have-helped-growers?instance=homesecondary_news_left_column

PhysOrg.com. "Invasive fruit fly found in North Carolina." 19 October 2010. http://www.physorg.com/news/2010-10-invasive-fruit-north-carolina.html?utm_source=twitterfeed&utm_medium=statusnet

Growing (South Region). “Preparing for spotted wing drosophila: southeast growers on the watch”, Kara Lynn Dunn. 8:9. B1-B8. (September 2010). http://www.growingmagazine.com/article.php?id=5943

Growing (*Northern Features*). “Spotted wing drosophila on the horizon?”, Kara Lynn Dunn. (20 June 2010). http://www.growingmagazine.com/article.php?id=5579.