Progress Report – Submitted Feb 10, 2013

Second Quarterly Report

A. Title: New Project: Spotted wing drosophila in Virginia vineyards: Distribution, varietal susceptibility, monitoring and control

B. Investigators:

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C. Type of Project: Research

D. Objectives:

This proposed project addresses a new invasive pest, brown marmorated stink bug (BMSB), an insect that is having a dramatic impact on a wide variety of crops in the mid-Atlantic area.

The specific objectives are:

1. Determine abundance and seasonal phenology in vineyards in Virginia
2. Determine varietal differences in severity of infestation,
3. Determine efficacious chemical control tactics,
4. Comparing apple cider vinegar traps with a dry chamber model.

E. Progress to date on objectives:

1. The species is now considered generally distributed in the state. Fig. 1 shows our records through October 2012. Preliminary studies indicate that infestation can start soon after veraison, increasing toward harvest. Larvae were seen in Pinot Noir berries at this time (Fig. 2).

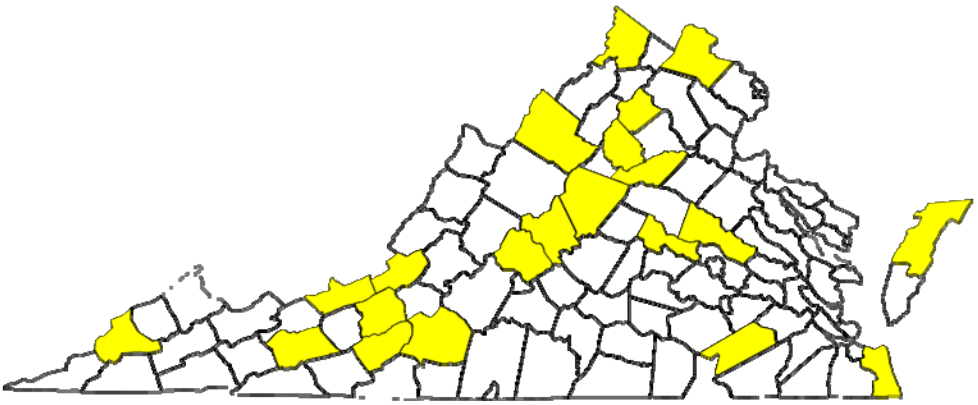

Fig. 1. Collection counties for spotted wing drosophila in Virginia, as of October 2012.

Fig. 2a. Spotted wing drosophila larvae in raspberry, b. Larvae in Pinot Noir grape, c. Adult on Pinot Noir cluster (note oviposition puncture in berry above the fly).

2. Varietal differences: In our studies red varieties appear at greater risk than white; however, Chardonnay is the only white variety examined to date. This will be expanded. In some thin-skinned varieties, high infestation levels were seen (up to one larva per four berries; this is erratic however). In the following tables, % injured berries includes any factor that causes shriveled berries. The larvae per berry column is a better indicator if infestation.

Cultivar	% Injured Berries	Larvae/Berry
Pinot Noir	8.6	0.03a
Chardonnay	5.7	0.00b

Cultivar	% Injured Berries	Larvae/Berry
Petit Verdot 1	22.0a	0.24a
Petit Verdot 2	7.0b	0.05b
Merlot	5.2b	0.02b
Chardonnay	10.8ab	0.01b
Cabernet Franc	3.4b	0.00b

3. Chemical control: SWD is now in colony in Blacksburg and chemical studies are planned.

4. Trapping studies: Apple cider vinegar traps are not very competitive with ripening fruit. However, ACV traps continue to be the most effective. We compared three fruit scents (plum, sweet cherry and sour cherry) in a caneberry planting at Kentland Farm near Blacksburg, and

while these collected SWD in greater numbers than other drosophilids, were not as attractive as the ACV control traps (Fig. 3).

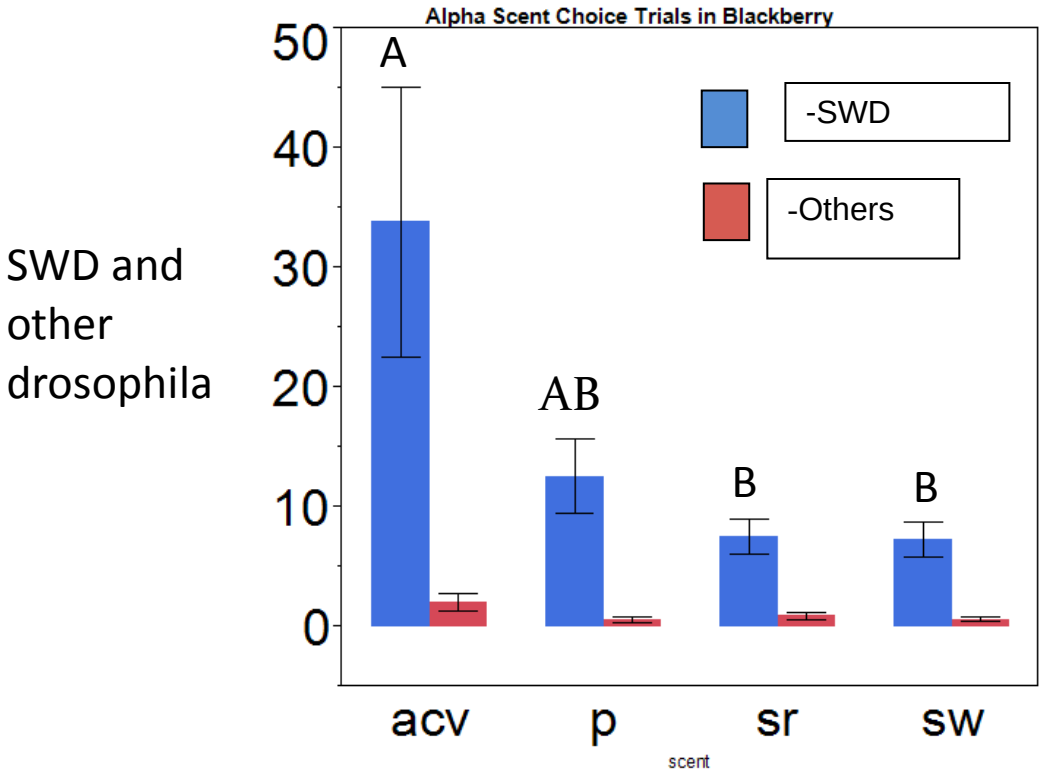

Figure 3. Alpha Scent lure trial comparing plum, sour cherry and sweet cherry with apple cider vinegar. SWD and total drosophilids trapped in blackberry planting in Montgomery County, VA.

5. New finding: Additional invasive pest discovered:

While investigating a suspected infestation of SWD in Albemarle County in September 2012, the grape grower commented that he had an infestation of a different fly, marked by distinctive stripes on the body. Drosophilids were collected and grapes retrieved to the laboratory. In one block of Petit Verdot grapes, many individuals of the striped fly would fly from between grapes in the cluster when disturbed. A few individuals of SWD were also observed. The clusters looked generally intact, except for portions with shriveling berries typically seen in cases of SWD infestation, with a characteristic odor of sour rot. The striped fly was determined to be *Zaprionus indianus* Gupta. This is an invasive drosophilid originally from Africa, having invaded Brazil in 1999, and being found in Florida in 2005. It has since colonized Arizona and California (San Diego) (2006), South Carolina and Oklahoma (2007), and is now established in North Carolina (Burrack personal communication) and Mississippi. The *Zaprionus* collected and reared in 2012 from Virginia vineyards were at the time, the northernmost reported populations of this drosophilid. The species has since been collected in Michigan, Wisconsin,

Pennsylvania and Connecticut. The distribution in Virginia through November 2012 is shown in Fig. 4. While the range is not as extensive as that of SWD, it nevertheless includes some of the most important fruit (including winegrape) counties. While there is no ESA-approved common name, African fig fly (AFF) has been used in the literature and is appropriate.

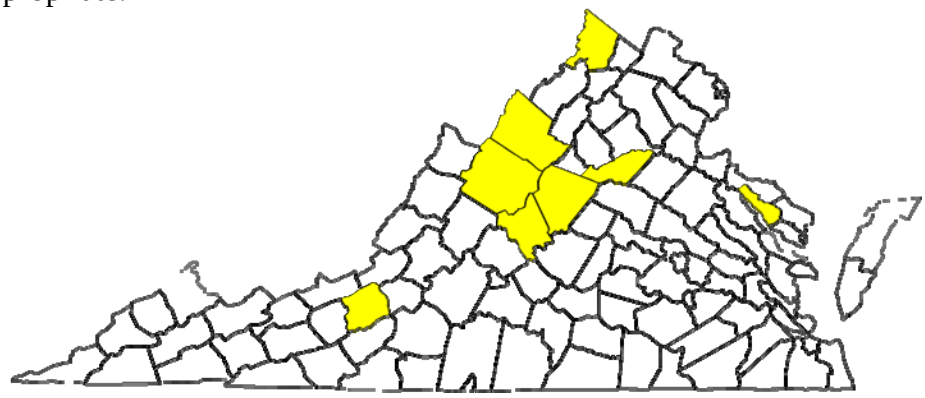

Fig. 4. Collection counties for African fig fly, *Zaprionus indianus* Gupta, in Virginia as of November 2012.

The adult is depicted in Fig. 5. AFF is more sensitive to cold than *Drosophila* species, making it normally a tropical and subtropical species. It rises to dominance under warm conditions, causing other drosophilid species to make ecological adjustments.

Fig. 5. Adult African fig fly, *Zaprionus indianus*, collected in a winegrape vineyard in Albemarle County.

Other grape growers communicated that they also saw striped flies in Petit Verdot blocks. We collected flies from such blocks in Nelson and Orange Counties. Grapes were retrieved from one of the affected blocks to the lab in Blacksburg in order to rear adults. Both SWD and AFF were reared from grapes. In one sample, AFF comprised about 90% of the emerging adults. AFF is thought to be less able to attack intact fruit because of the less developed ovipositor (Fig. 6b,c). The fact that AFF outnumbered SWD emerging from grapes needs further consideration in order to clarify its potential status as a grape pest. It may be secondary in nature, taking advantage of injury inflicted by SWD or other

factors. Secondary in this sense does not mean unimportant, however. AFF is known to inoculate host fruits with the yeast, *Candida tropicalis*, in Brazil. Drosophilid-infested grape berries become affected by sour rot, and hence the quality of the crop may be affected. The grower in the Albemarle County vineyard removed the most affected clusters, and estimated a 30% reduction in the crop in the vineyard block.

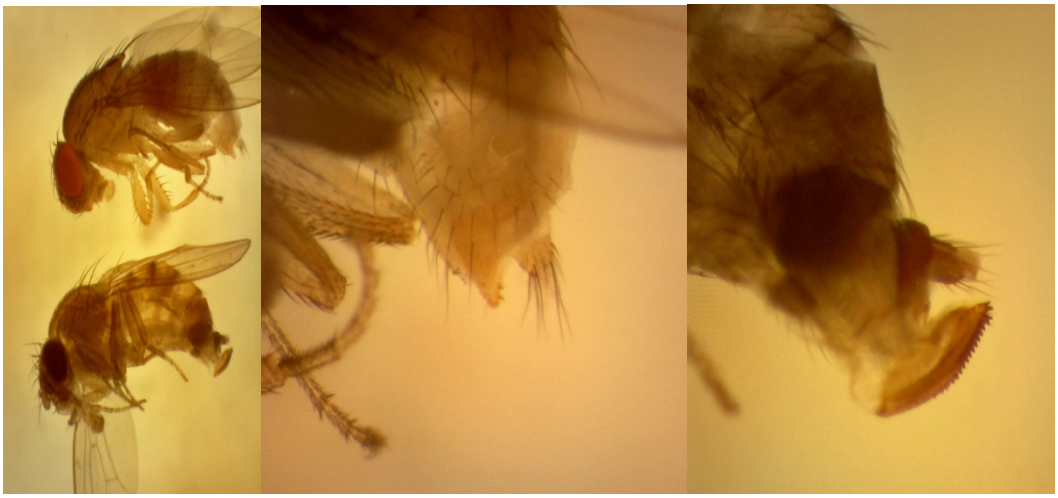

Fig. 6a. African fig fly, *Zaprionus indianus*, above, spotted wing drosophila, *Drosophila suzukii*, female below, b. ovipositor of African fig fly, c. ovipositor of spotted wing drosophila.

F. Technology Transfer Progress:

a. Information has been shared at scientific conferences (Entomological Society of America, the Cumberland-Shenandoah Fruit Workers Conference, and the Eastern SWD Working Group),
b. growers meetings (Virginia Vineyards Association, and in the coming month, Eastern Wineries Exhibition),
c. numbered extension publications, and in the Virginia Vineyards web site, and
d. progress has also been disseminated through an e-mail list for grape growers and county agents, already in place, part of the Vineyard Scholar project management site established and maintained by the PI.