

# **Brown marmorated stink bug in grape and raspberry: research to date**

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BMSB Working Group Meeting

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# BMSB in grapes

- Invasive species: Occasional pest in wild and cultivated grapes in its native habitat
- Significant economic problem in vineyards in mid-Atlantic states
- Potential to taint the taste of wine, but taint intensity fades away with the fermentation process (Joseph Fiola, UMD)



# Pest status of BMSB in grapes

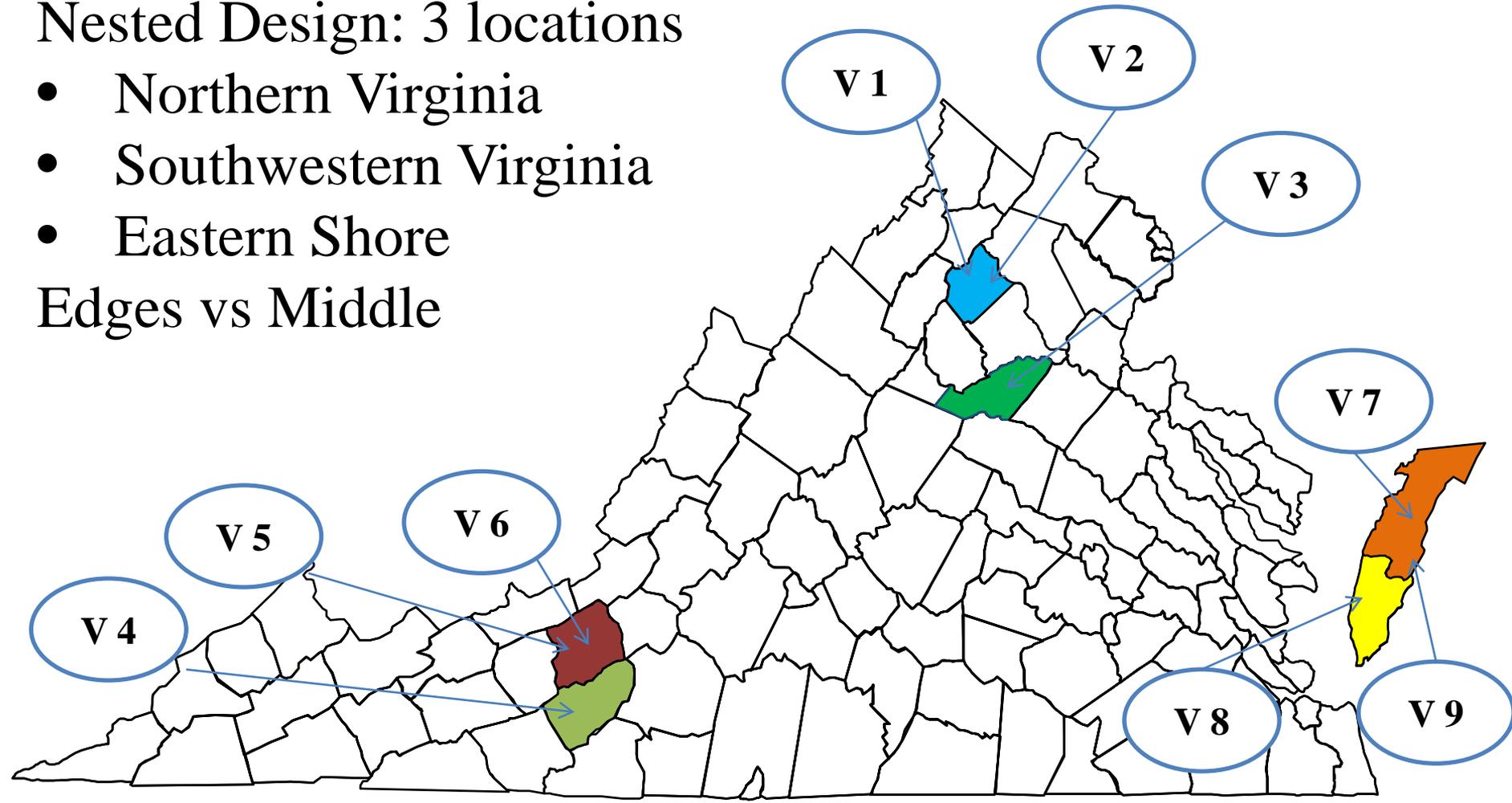
- Distribution
- Seasonal phenology
- Feeding preference and injury level

# Distribution survey, 2011

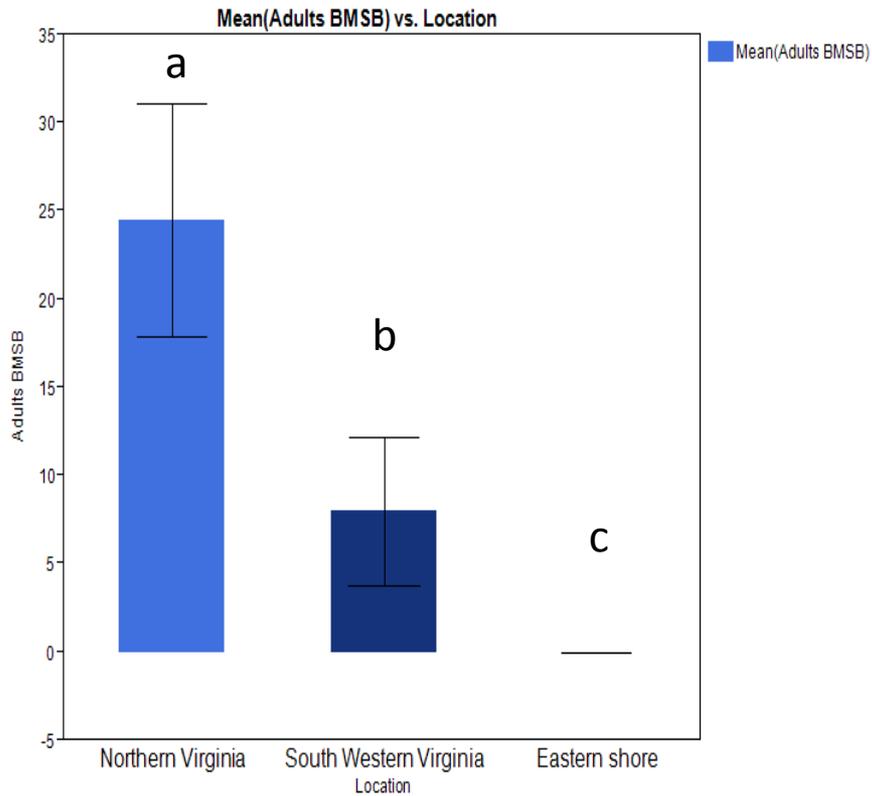
Nested Design: 3 locations

- Northern Virginia
- Southwestern Virginia
- Eastern Shore

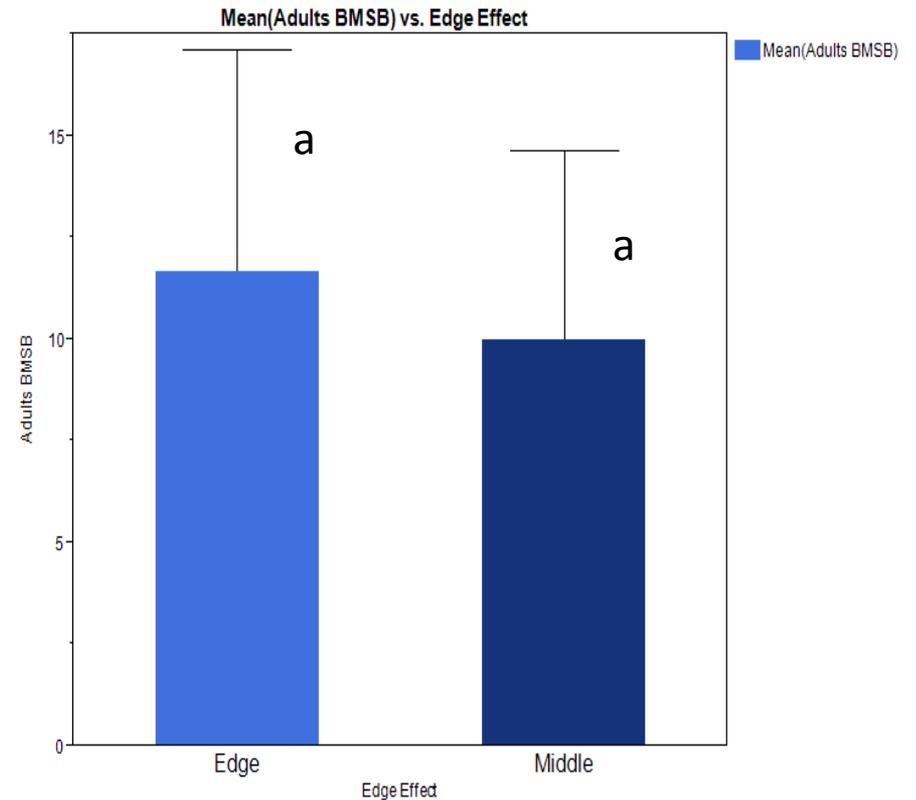
Edges vs Middle



# Location and edge effect on BMSB density



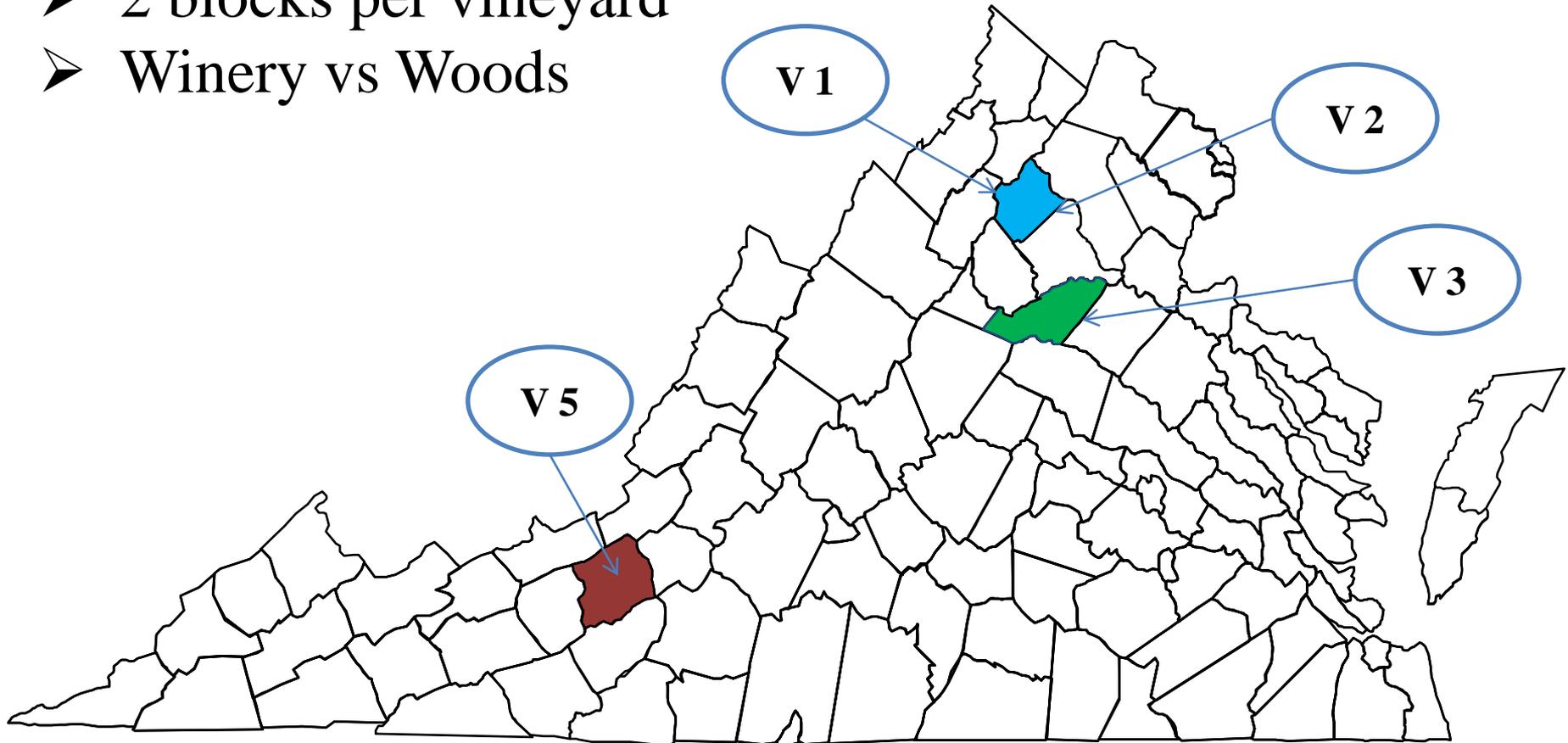
Location effect



Edge effect

# Sampling, 2012/2013

- 2 blocks per vineyard
- Winery vs Woods

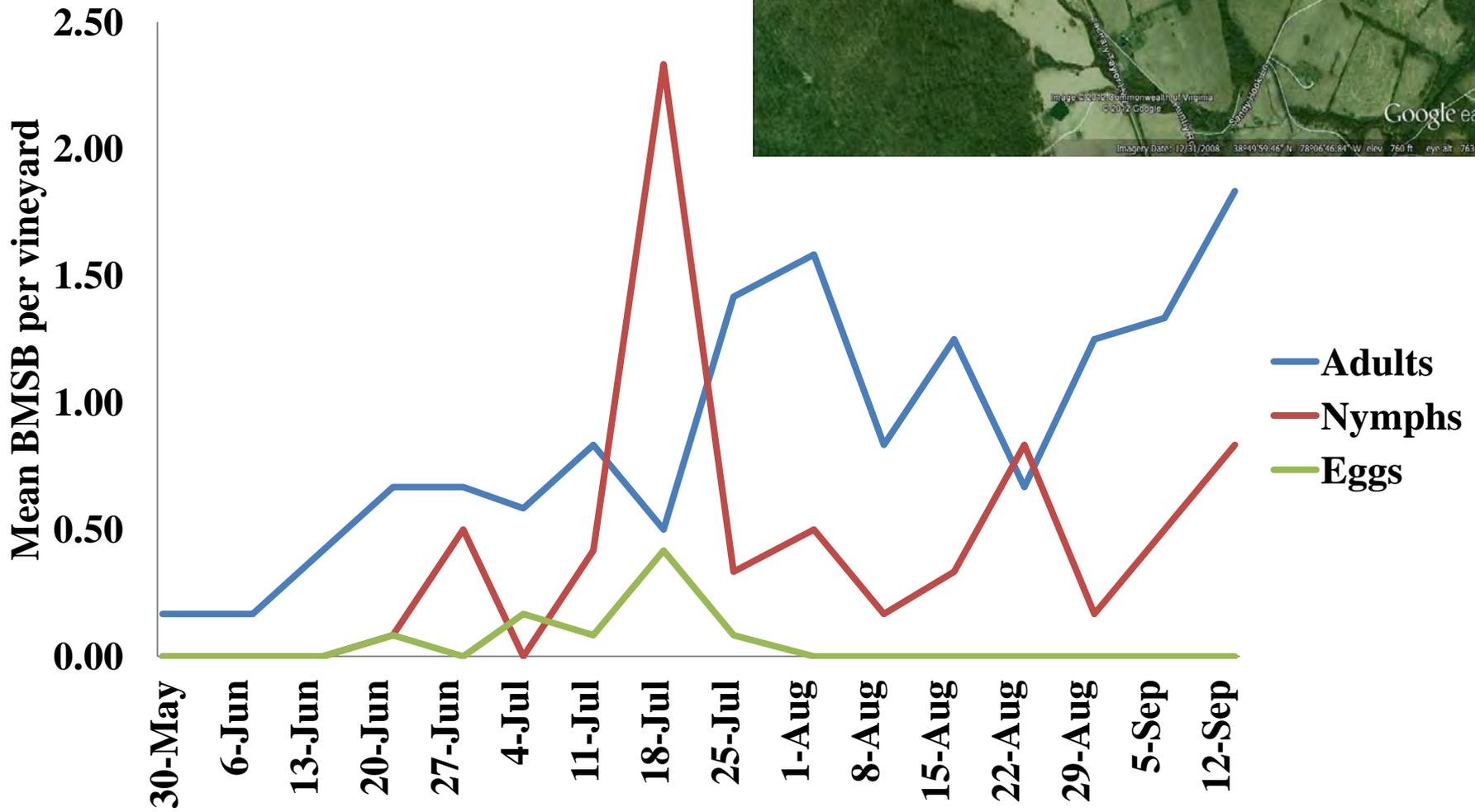
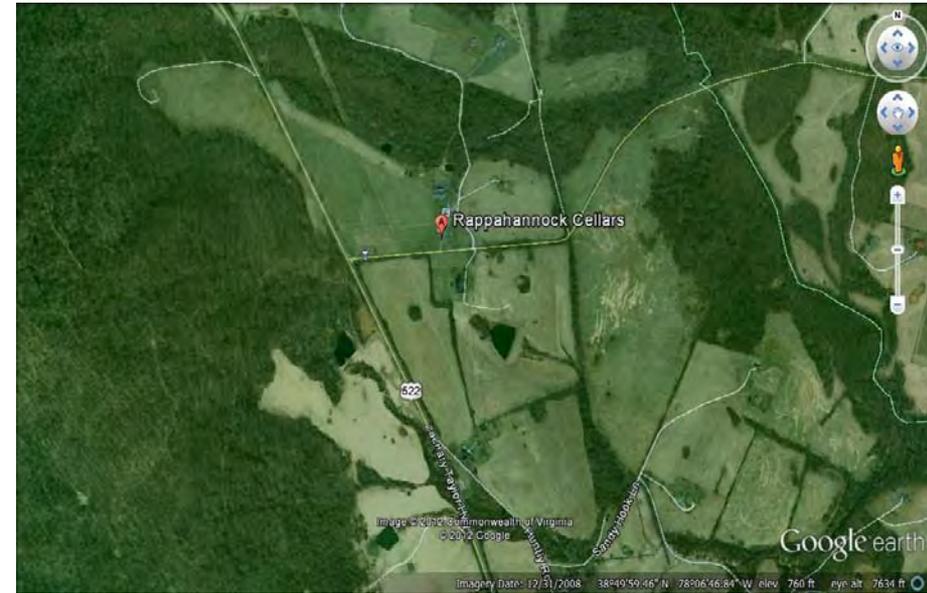


# Sampling Procedure, 2012/2013

- Weekly 3 minute timed count visual sampling
- Border section & middle section
- 3 samples at edge & middle

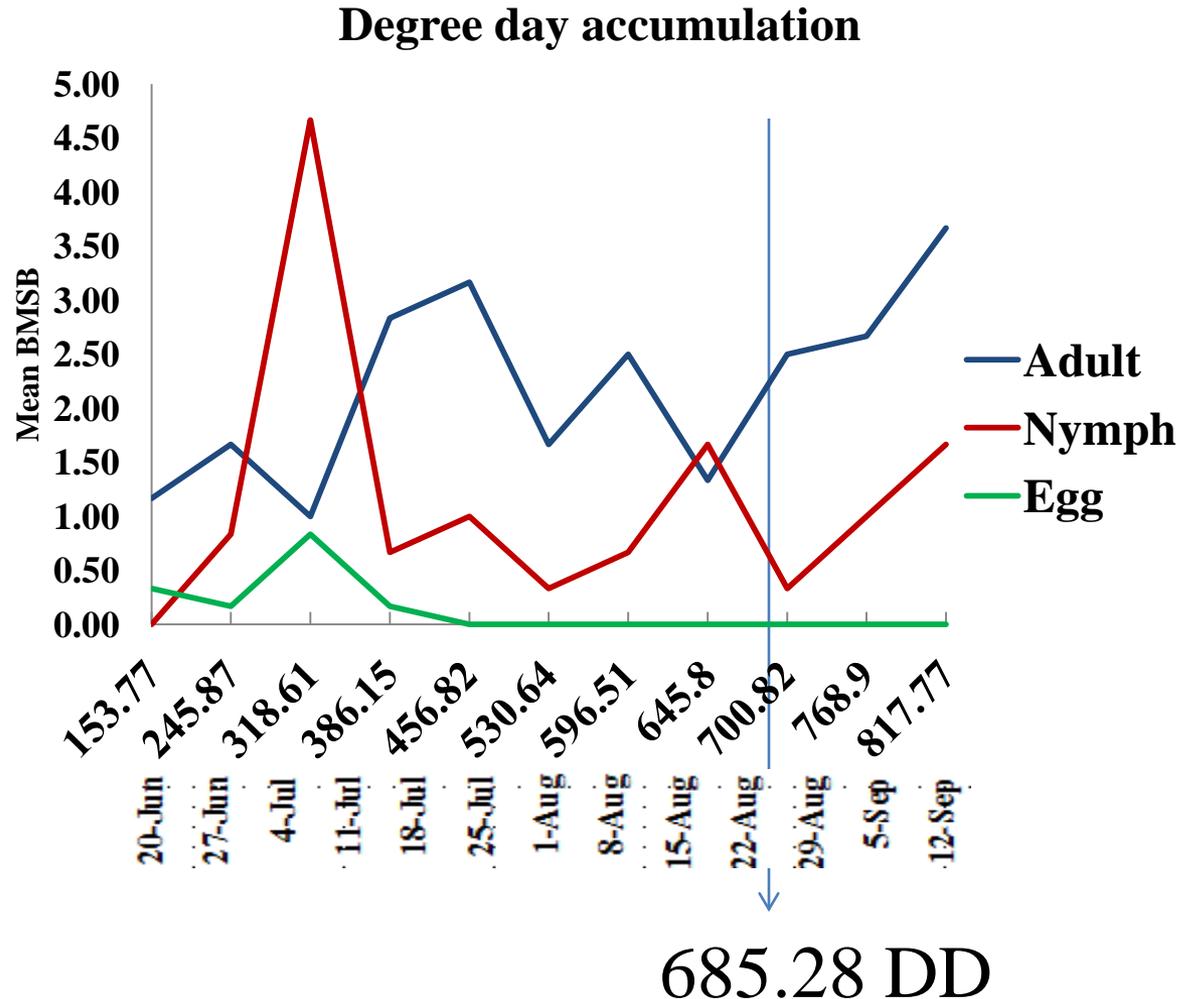


# Seasonality of BMSB in Vineyard 1



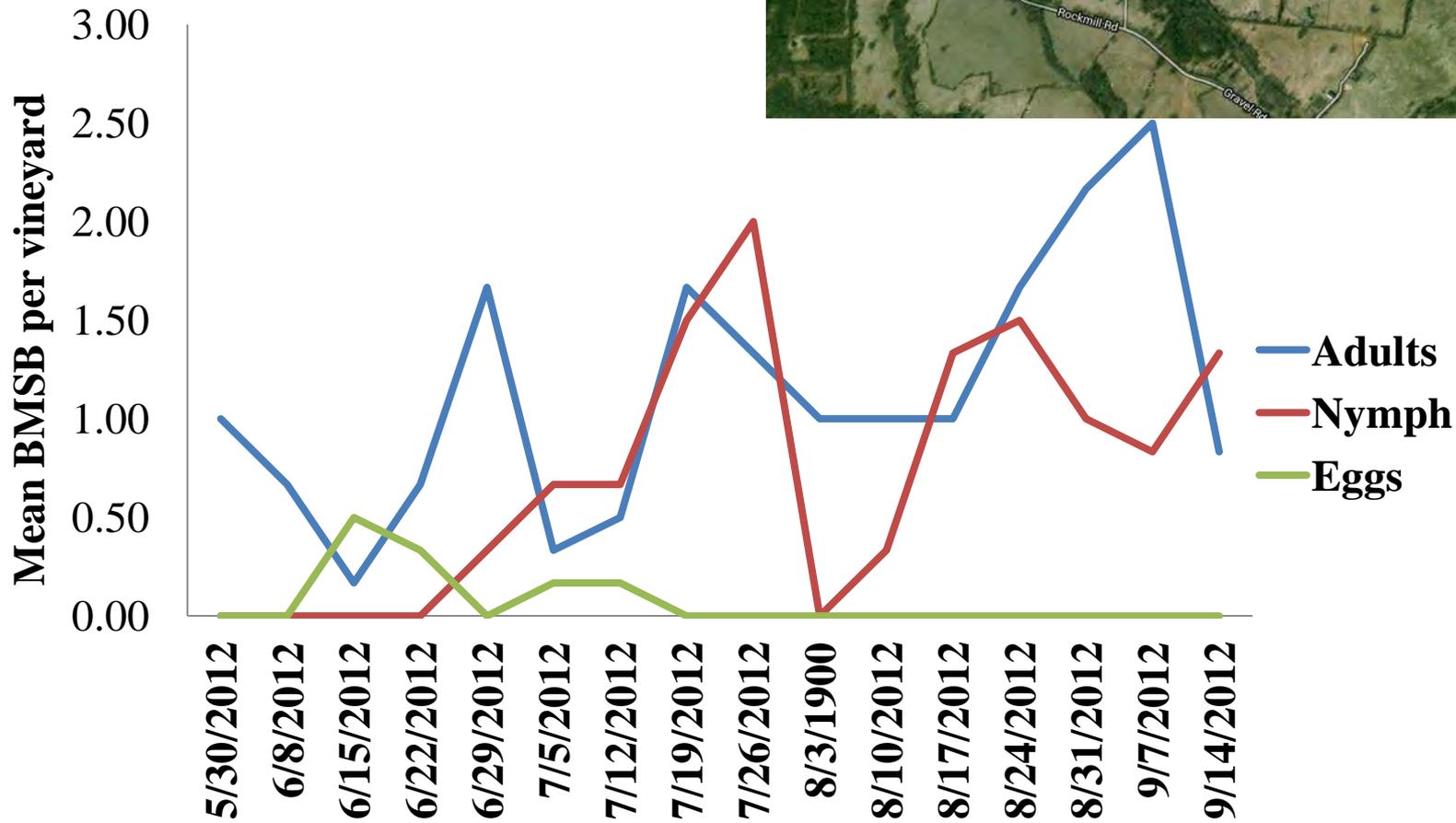
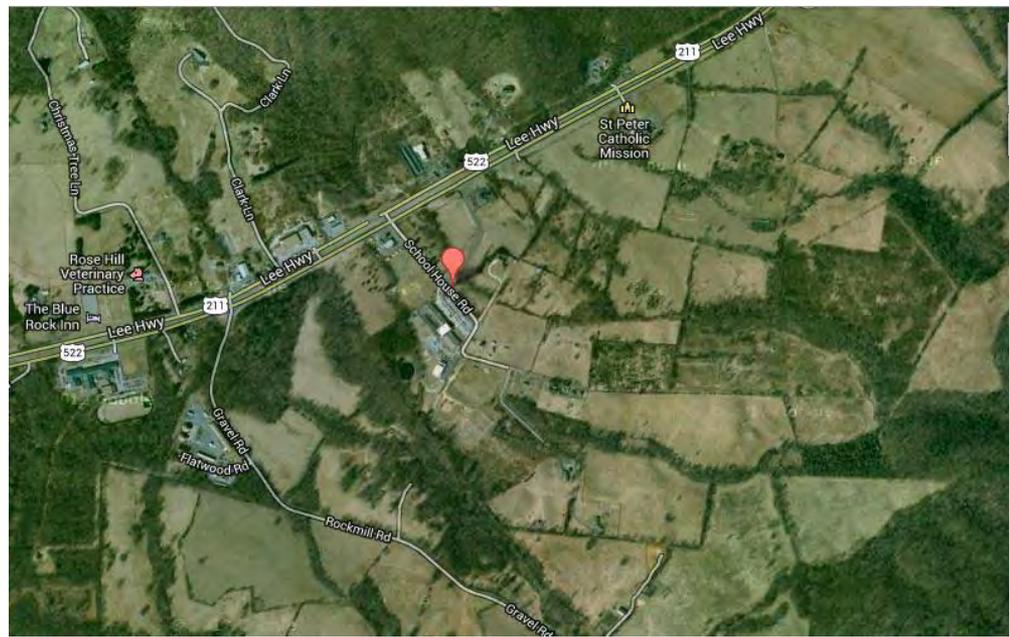
# Degree day accumulation in Vineyard 1

- Biofix: first egg mass found, June 20
- Av. temperature recorded from nearby research station
- Temperature threshold: 14.17 (°C)
- Total Development: 537.63 DD. Pre-oviposition period 147.65DD (Nielsen et al. 2008)
- 1 Generation found





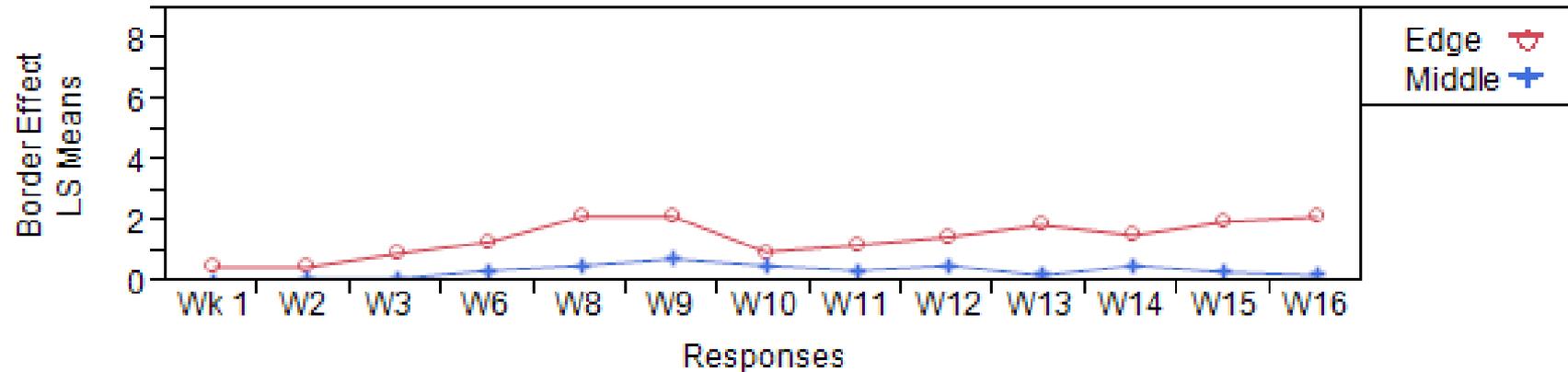
# Seasonality of BMSB in Vineyard 3



# Are there border and orientation effects on the distribution of BMSB in vineyards?

- The data were collected for 16 consecutive weeks in 4 vineyards
- The number of nymphs and adults were added together and mean stink bug count was analyzed
- Border effect and orientation effect was determined for vineyard as repeated measures MANOVA.

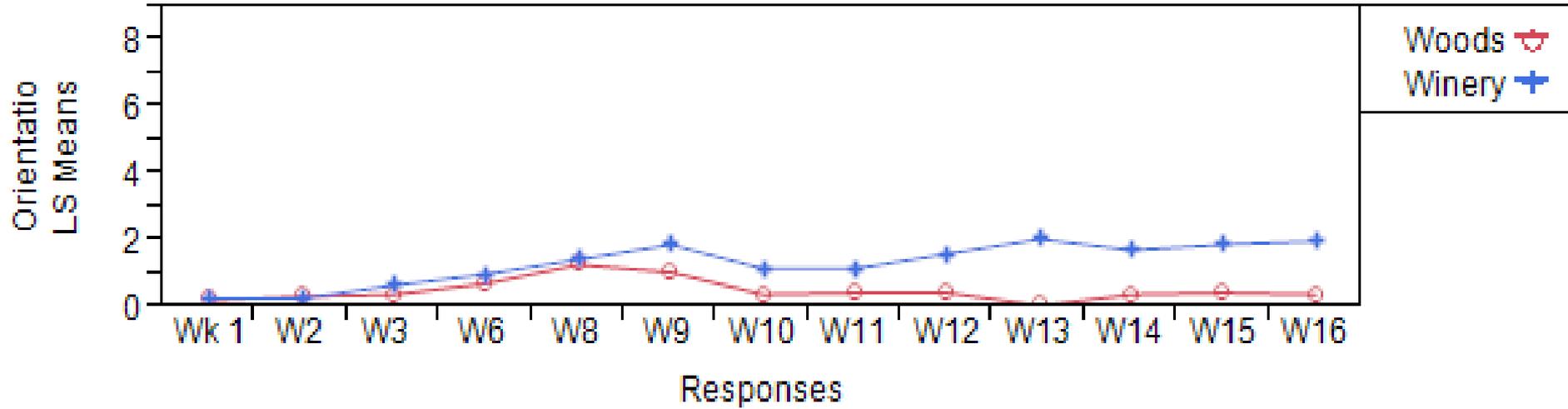
# Border effect across time



$$F = 0.81, df = 1, 9, P = 0.02^*$$

➤ Significant border effect

# Orientation effect



$$F = 0.45, df = 1, 9, P = 0.0738$$

➤ No significant effect on orientation of vineyard

# Oviposition characteristics

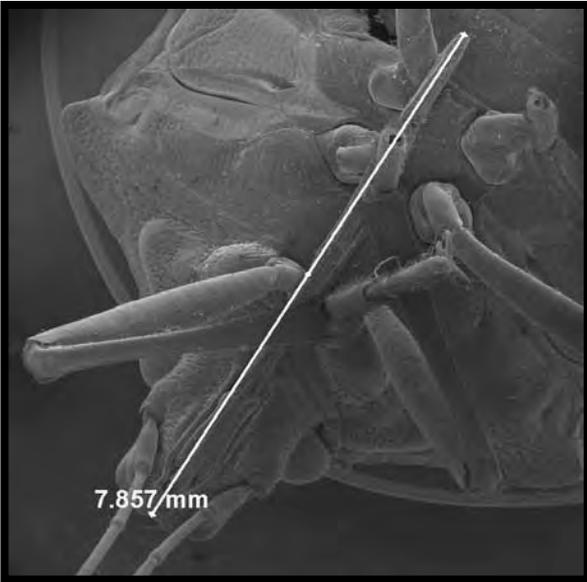
- Av. number of eggs/mass: 27.72  
Median: 28 (53.69%)  
Range: 14-32
- Av. egg hatchability in field condition 82.1% (N=80)
- Eggs laid underside of the leaves with occasional deposition on rachis & grape berry



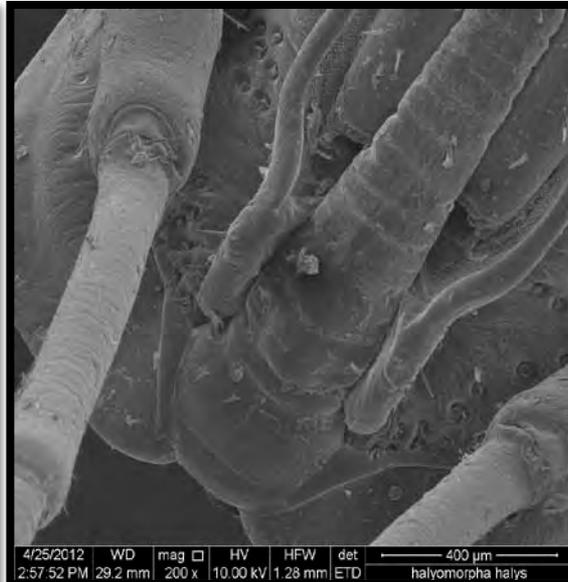
# Feeding preference and injury

- Do BMSB has feeding preference to growth stages of grape berries?
- Do BMSB has feeding preference to varieties of grapes?

# Background



Length of stilet sheath



SEM image of stilet tips



Ventral view of *H. halys*



Injury to the berries



*H. halys* feeding on grape



Seen in pair

# Experimental design

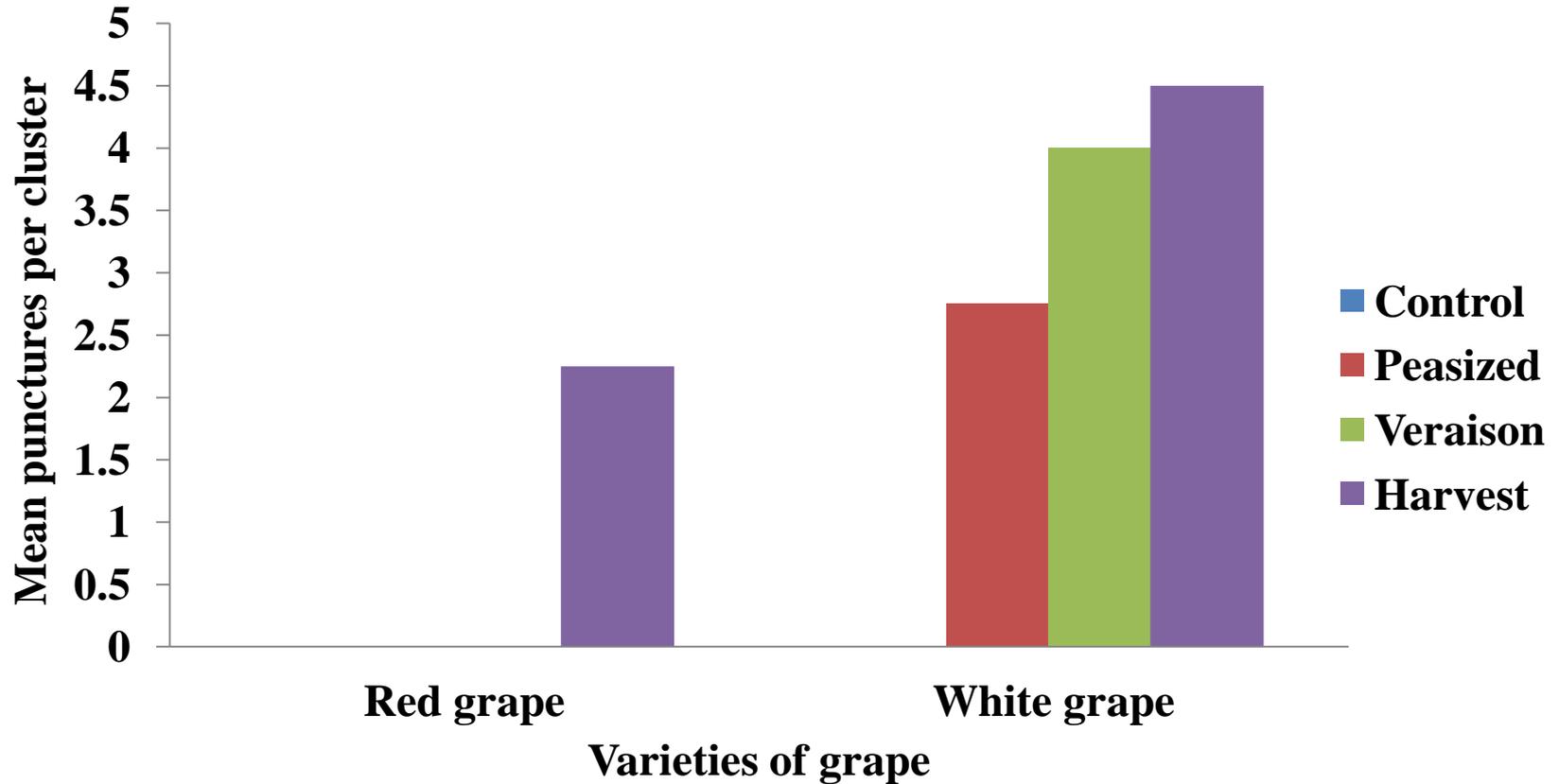
- Cage study conducted in a commercial vineyard
- Factor 1: Grape berry developmental stages
  - : Pea-sized, veraison & harvest stage
- Factor 2: Variety of grapes : Cabernet Sauvignon (Red) & Chardonnay (White)
- 40 cages established beginning from pea-sized stage
- Four BMSB were placed in each cage for a week
- No. of punctures in each cluster was noted down

# Experimental set up in field



# Yes! Growth stage and varietal preference

**BMSB injury in grape berries**



# Injury to the berries



Same cluster

Injury after a week

# Field observation for varietal preference

Nebbiolo



Cabernet Sauvignon



Seyval Blanc

# Future work

- Varietal preference test in the laboratory to assess the feeding preference

Variety	Acreage	Type
Chardonnay	443	White
Merlot	316	Red (dark blue)
Cabernet Franc	282	Red (black)
Cabernet Sauvignon	232	Red
Viogner	185	White
Petit Verdot	121	Red
Chambourcin (hybrid)	128	Red
Vidal Blanc (hybrid)	118	White
Norton (American)	115	Red

Source: Commercial grape report, VA (2011)

# Stink bug species composition in raspberry, southwest, VA

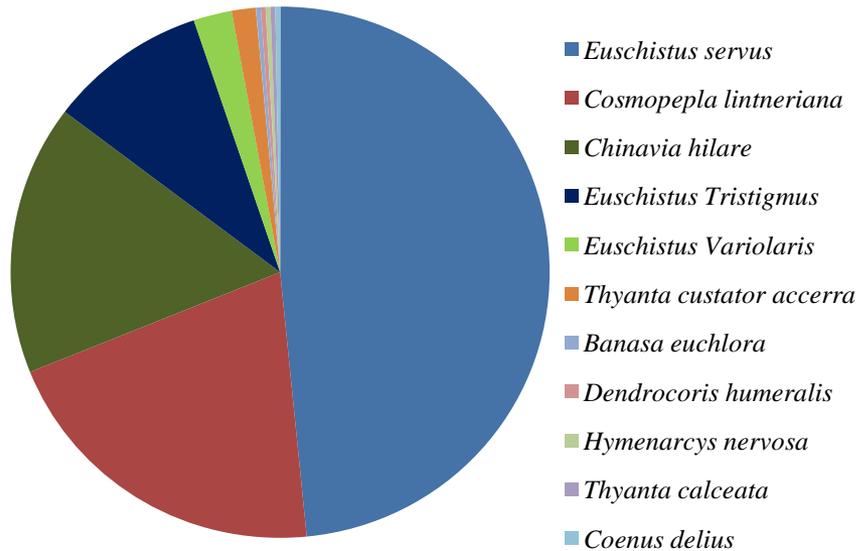


Fig. 1. Stink bugs collected from 2008-2009 were added together to get an overall stink bug species composition of two years (Maxey 2011).

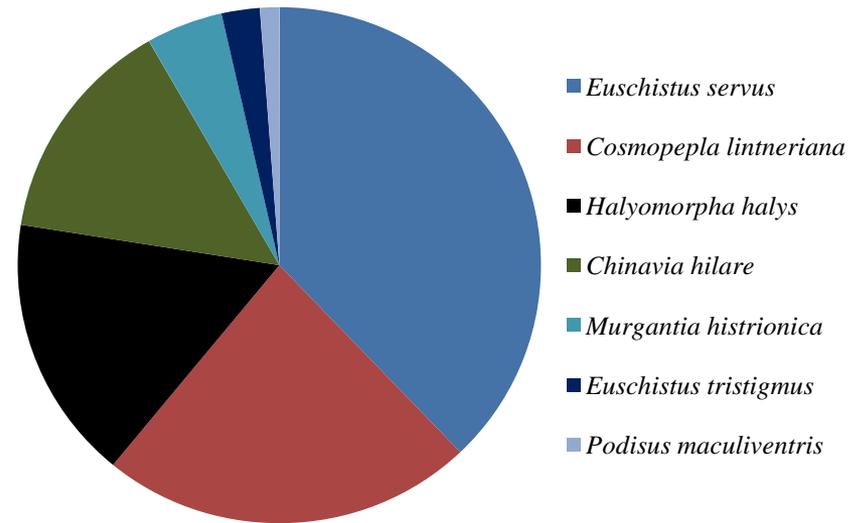


Fig. 2. Stink bugs collected from 2011-2012 were added together to get an overall stink bug species composition of two years.

# Seasonal abundance

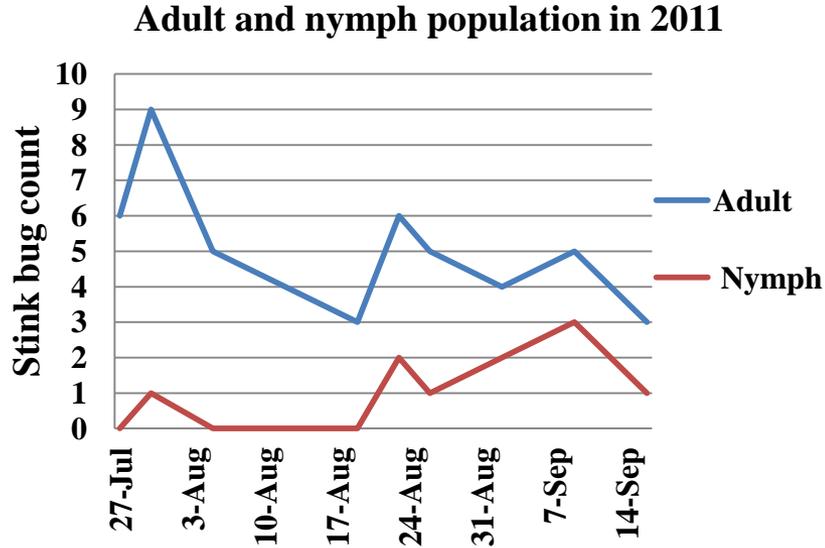


Fig. 1. Seasonal abundance of stink bugs in raspberry planting in 2011.

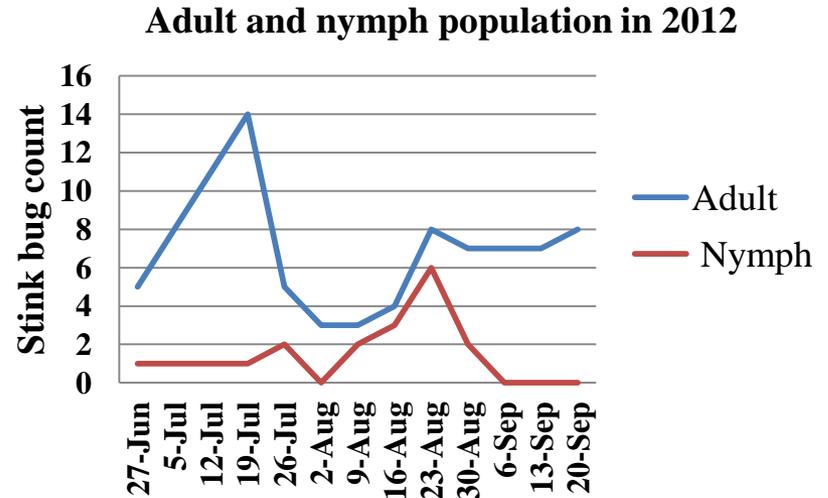


Fig. 2. Seasonal abundance of stink bugs in raspberry planting in 2012.

# Work on raspberry

- Stink bug leaves salivary sheaths at the feeding location (Bowling 1980)
- Stink bug inserts its stylets between drupelets of raspberry (Maxey and Pfeiffer 2009)
- Acid Fuchsin test to locate the stylet sheaths in receptacles



# Conclusions

- Vineyards are favorable breeding ground for BMSB
- Grape is development and feeding host of BMSB
- Distribution and abundance are influenced by geography and surroundings
- Pronounced edge effect in vineyards
- Only one generation in Virginia vineyards
- Harvest stage of grape is most preferred, and BMSB starts feeding grape berry from early veraison stage.
- BMSB prefer white variety of grape to red

# Public Interest

wiki.pestinfo.org/wiki/Southwestern\_Entomologist\_(2005)\_30\_p\_29\_(Prom\_et\_al.)

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## Southwestern Entomologist (2005) 30, p. 29 (Prom et al.)

Louis K. Prom, Juan D. Lopez Jr. and Gurudev P. Mayalagu (2005)

Passive transmission of sorghum ergot (*Claviceps africana*) by four species of adult stink bugs

Southwestern Entomologist 30 (1), 29-29

**Abstract:** The ability of *Oebalus pugnax* (F.) (rice stink bug), *Acrostemum hilare* (Say) (green stink bug), *Nezara viridula* (L.) (southern green stink bug), and *Euschistus servus* (Say) (brown stink bug) to passively carry and transmit *Claviceps africana* spores from diseased to non-infected plants was evaluated at the USDA-ARS, Southern Plains Agricultural Research Center (SPARC), College Station, Texas. Following exposure to ergot-infected sorghum panicles in the field for 30 minutes, stink bugs were captured and subsequently released in cages containing panicles of healthy green-house-grown sorghum plants of male-sterile line ATx623 in full bloom. The highest level of disease severity was 14.1% when greenhouse-grown ATx623 plants were exposed to ergot contaminated rice stink bugs for 30 minutes; whereas, the lowest ergot infection (2.8%) was exhibited by panicles exposed to ergot contaminated brown stink bugs. Estimates of the mean number of *C. africana* spores adhering to the external body parts of ergot contaminated stink bugs after being used as vectors on healthy sorghum panicles also was recorded. The highest mean concentration of adhering *C. africana* spores ( $2.2 \times 10^5$  spores/ml) was recovered from ergot-contaminated rice stink bugs, while the lowest mean concentration of  $6.2 \times 10^4$  spores/ml was from contaminated green stink bugs. No significant differences in mean count of external spore concentration recovered between southern stink bugs and rice stink bugs were noted, however, these mean spore counts were significantly higher than the amounts found on green and brown stink bugs. No ergot infection was evident on ATx623, and no spore was recovered from non-contaminated stink bugs.

Database assignments for author(s): Louis K. Prom

Research topic(s) for pests/diseases/weeds:  
transmission/dispersal of plant diseases

**Pest and/or beneficial records:**

Pest Information Wiki

- Main page
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**Jeffrey Thuman** I feed those to my lizard, he doesn't like them very much.  
Like · Reply · 1 · May 25 at 9:49am via mobile

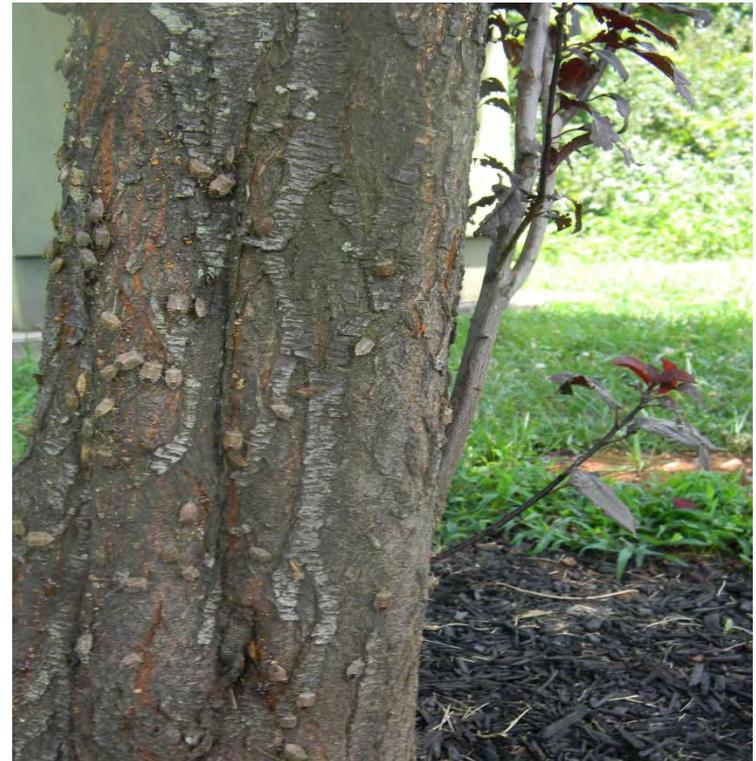
**Relax, I'm an Entomologist** replied · 2 Replies

**Anj Fabian** GET THEM!  
This is the first year we've had them and I'm very very tolerant of bugs and whatnot, but I terminate them with extreme prejudice inside of the house.  
Like · Reply · 1 · May 25 at 10:19am

**Gee Maya** vectors of sorghum ergot?  
Like · Reply · May 25 at 8:53pm via mobile

**Christopher Needham** Great! So please tell me why I keep finding them in my home!  
Like · Reply · May 25 at 10:11am via mobile

# BMSB aggregation in crab apple tree



# Acknowledgements

- Dr. Katherine Kamminga
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Friends

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# Questions & Suggestions



Front Royal, VA, 2012

