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

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BMSB Working Group Meeting

Bridgeton, NJ

July 12, 2013

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

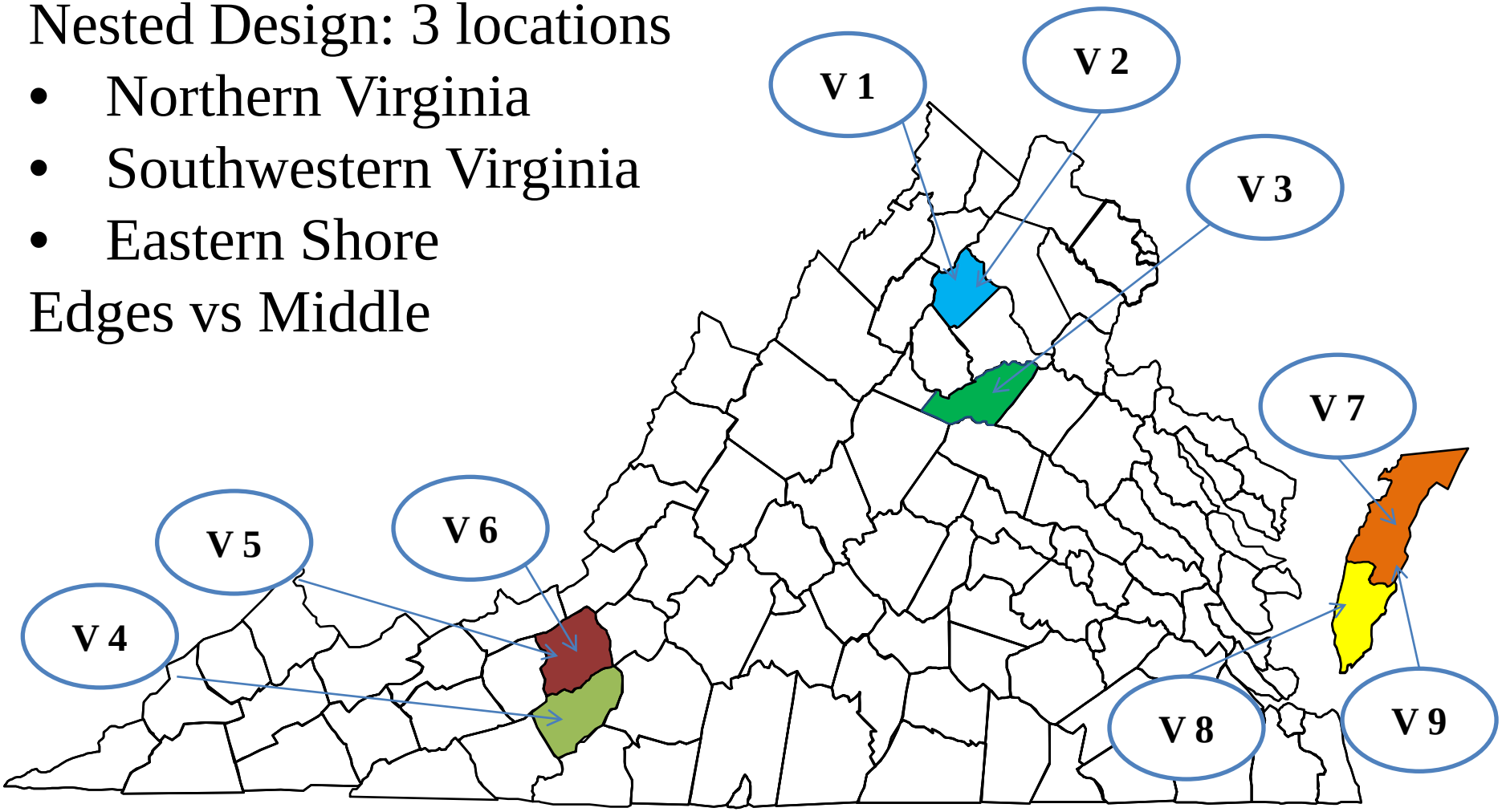
- Distribution
- Seasonal phenology
- Feeding preference and injury level

Distribution survey, 2011

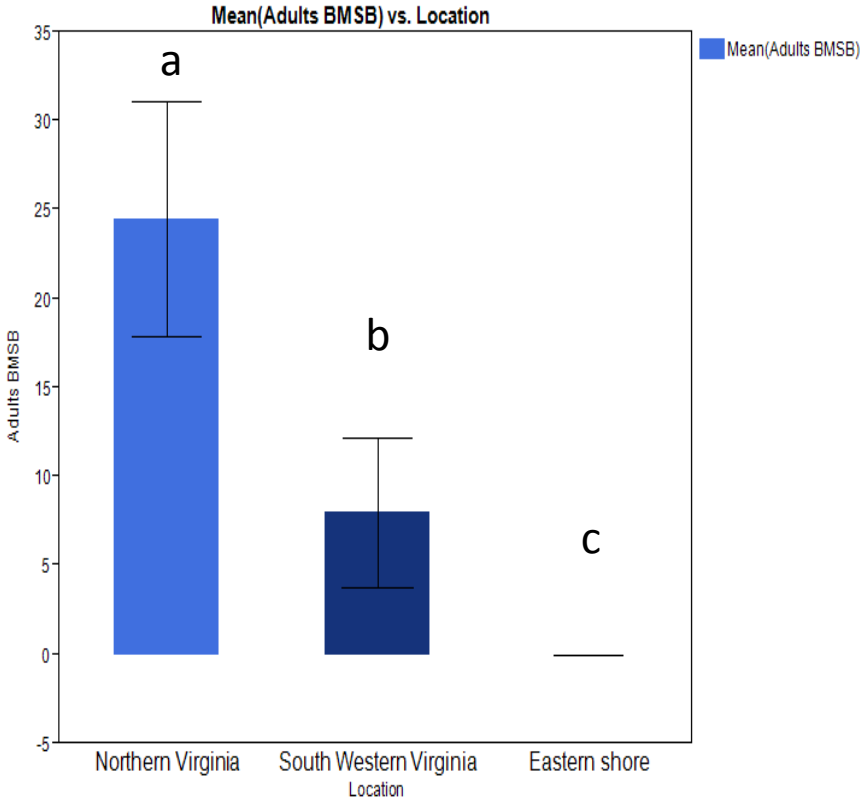
Nested Design: 3 locations

- Northern Virginia
- Southwestern Virginia
- Eastern Shore

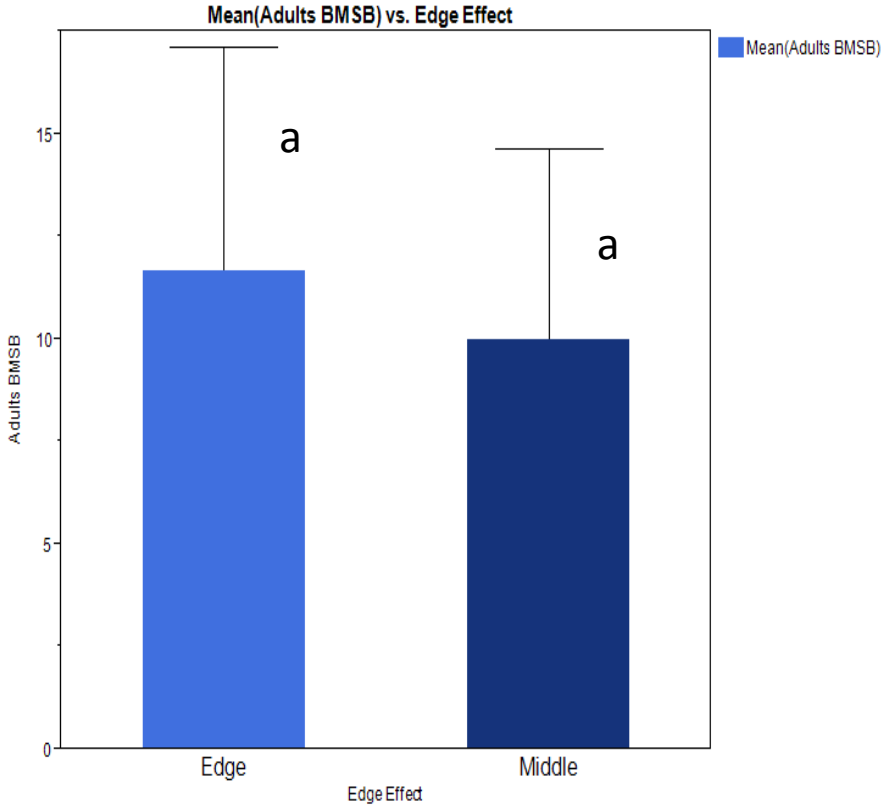
Edges vs Middle



Location and edge effect on BMSB density



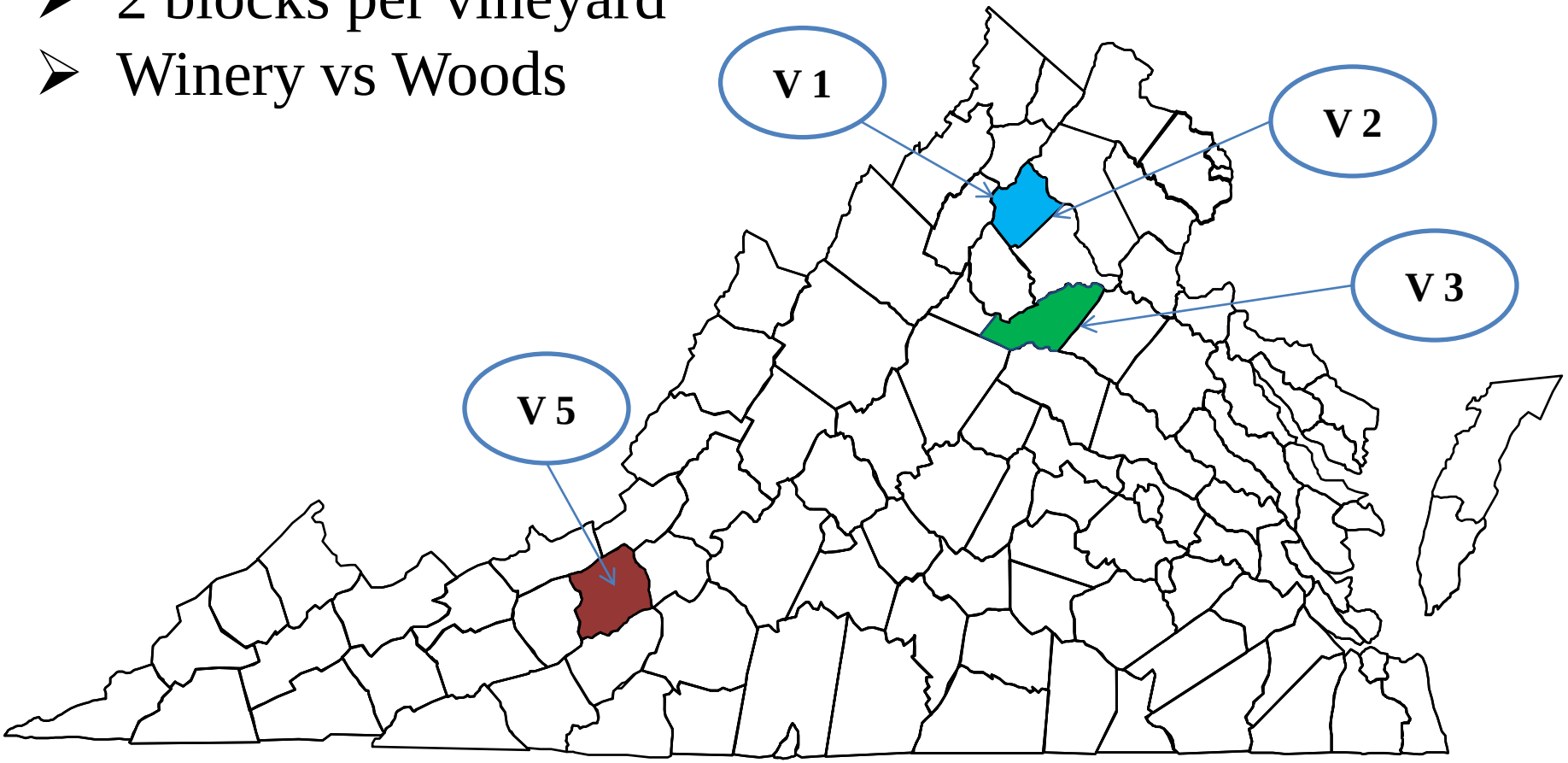
Location effect



Edge effect

Sampling, 2012/2013

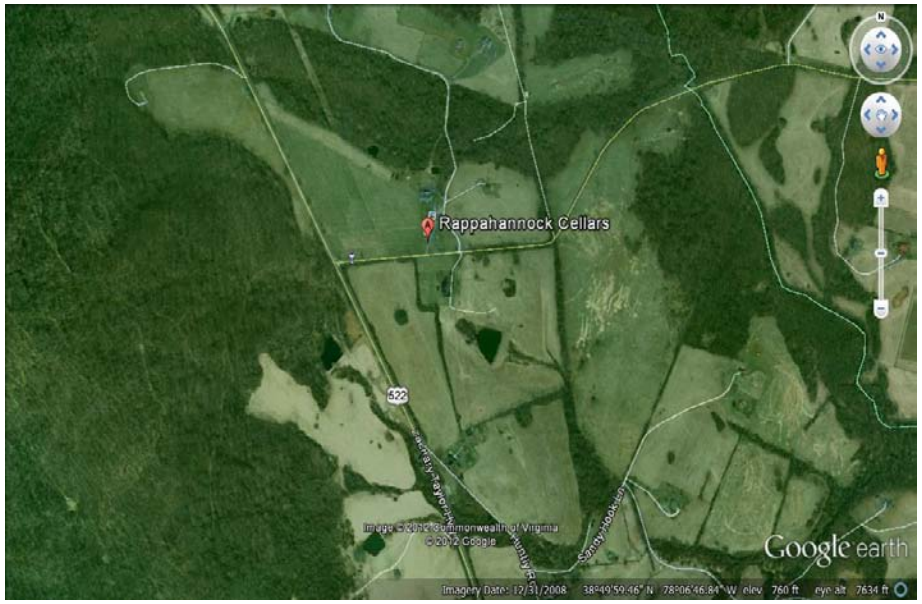
- 2 blocks per vineyard
- Winery vs Woods

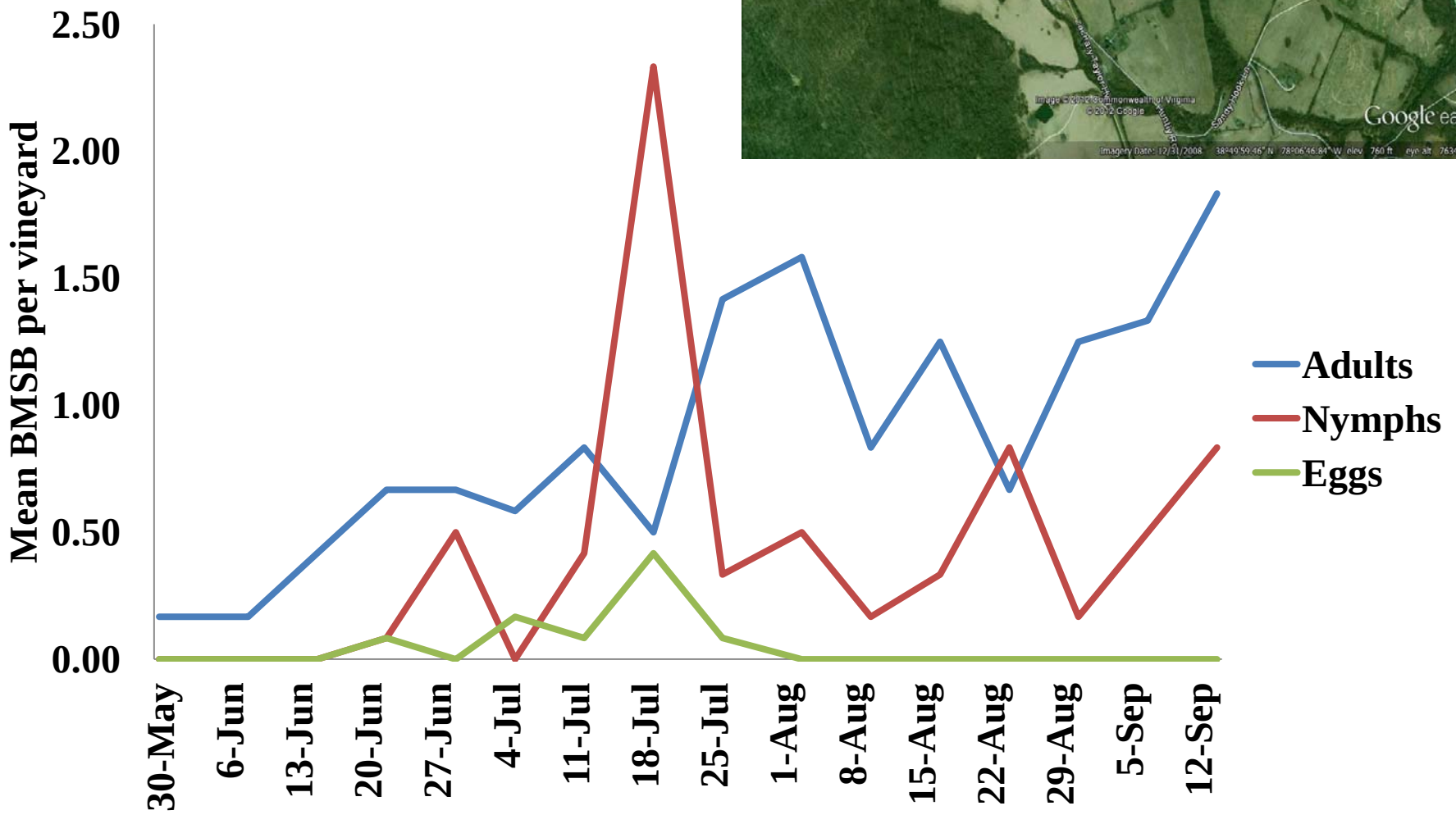


Sampling Procedure, 2012/2013

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

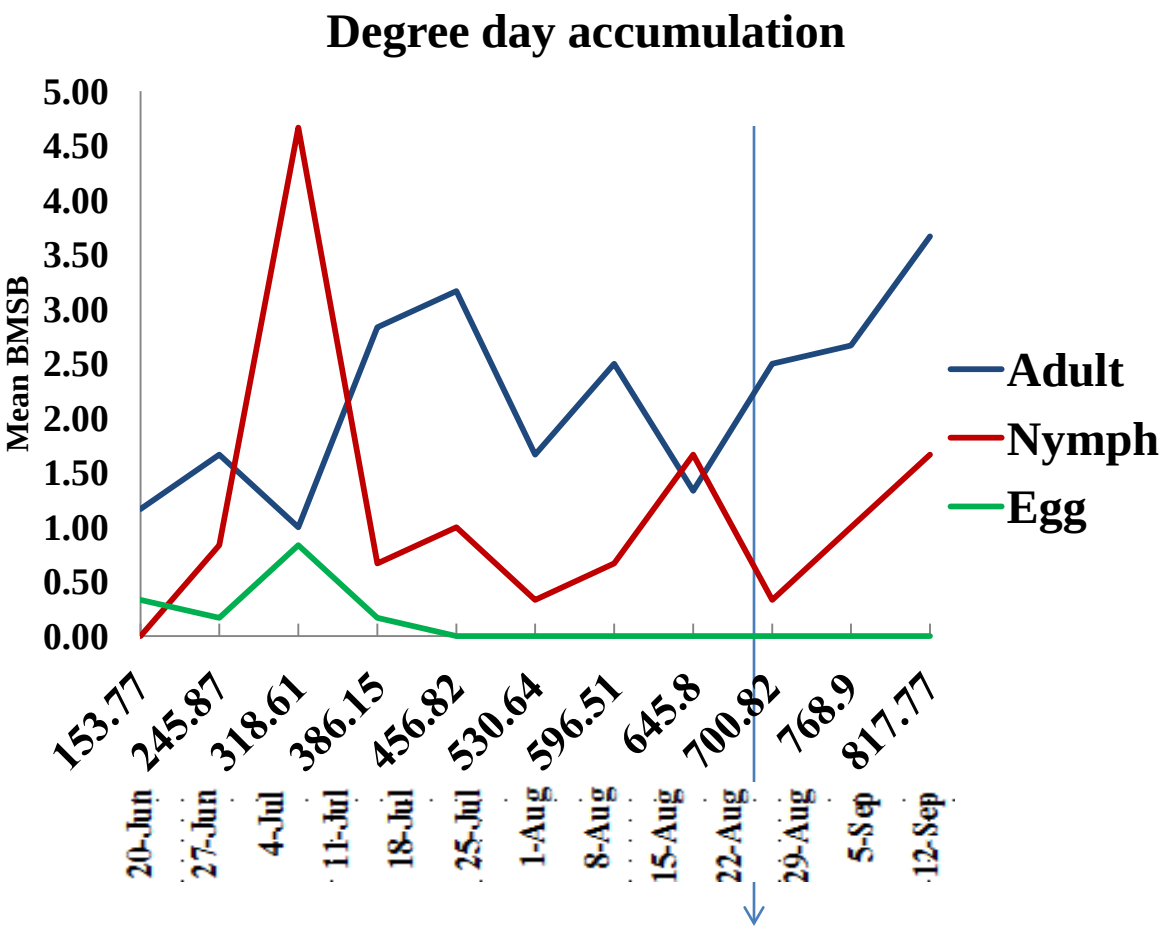
Seasonality of BMSB in Vineyard 1





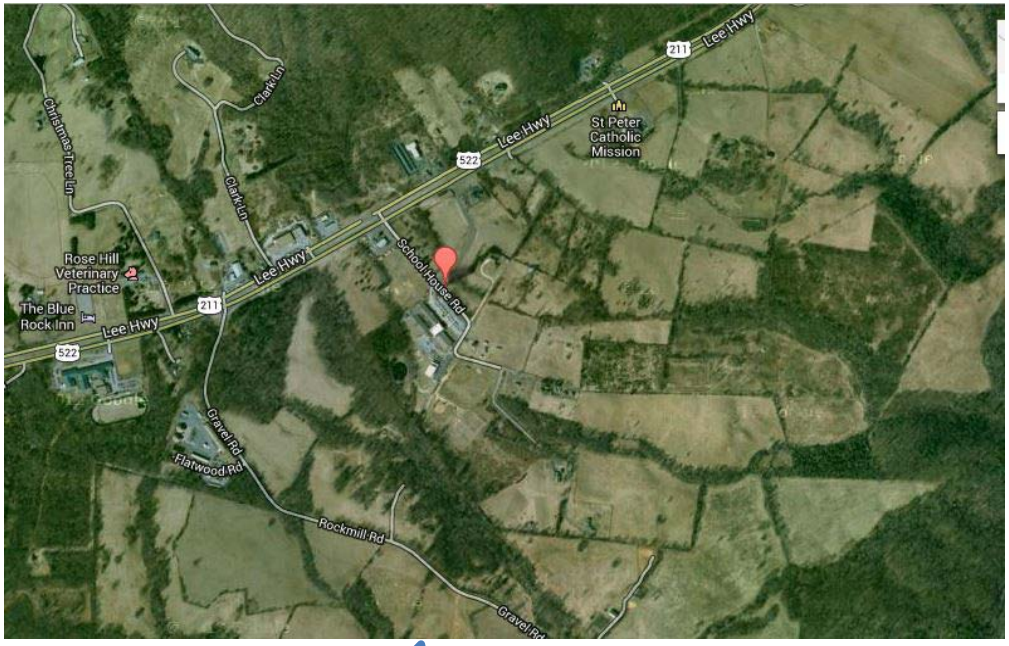
Degree day accumulation in Vineyard 1

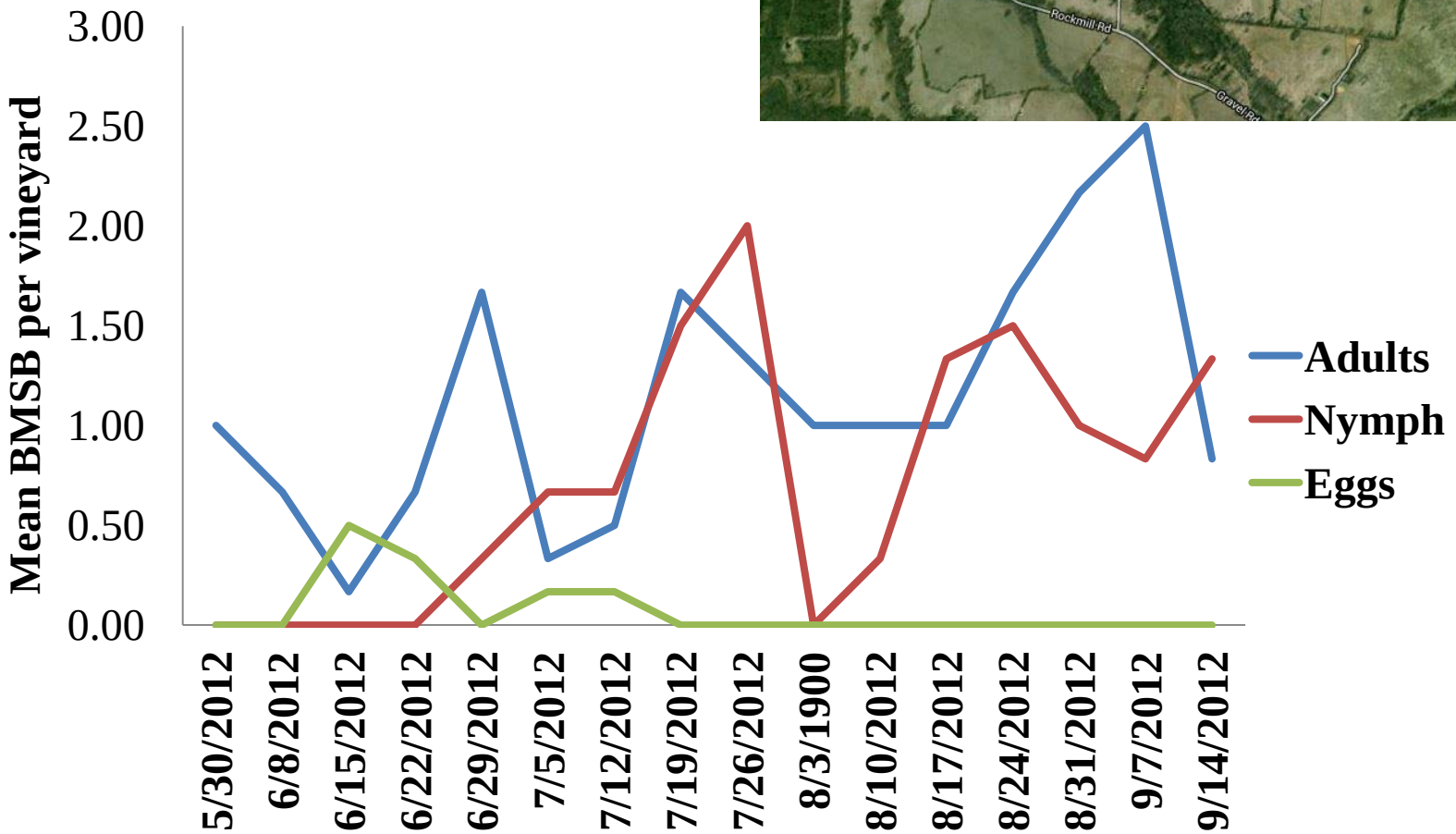
- Biofix: first egg mass found, June 20
- Av. temperature recorded from nearby research station
- Temperature threshold: 14.17 (°C)
- Total Development: 537.63 DD. Pre-oviposition period 147. 65DD (Nielsen et al. 2008)
- 1 Generation found



685.28 DD

Seasonality of BMSB in Vineyard 3

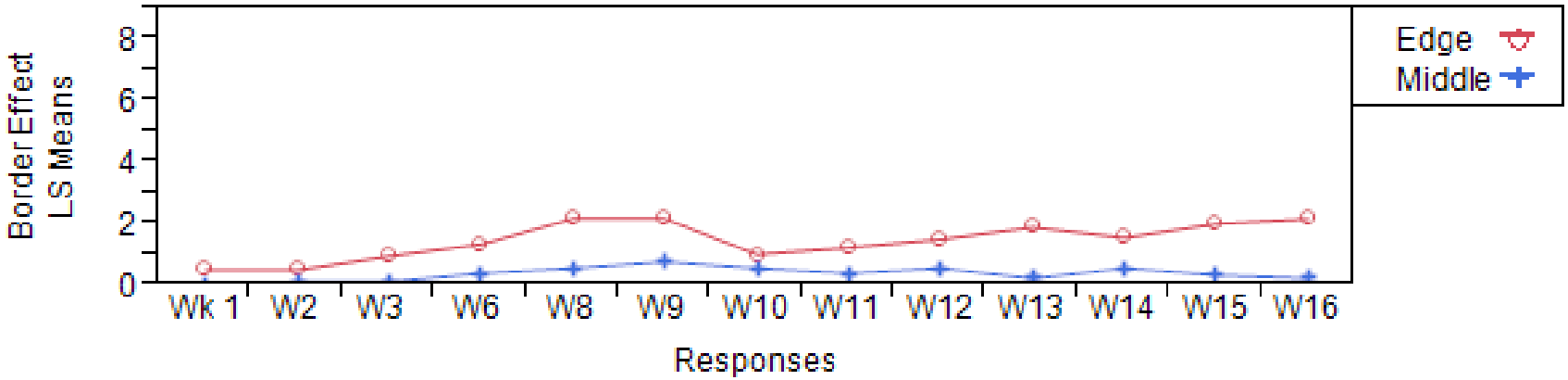




Are there border and orientation effects on the distribution of BMSB in vineyards?

- 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.

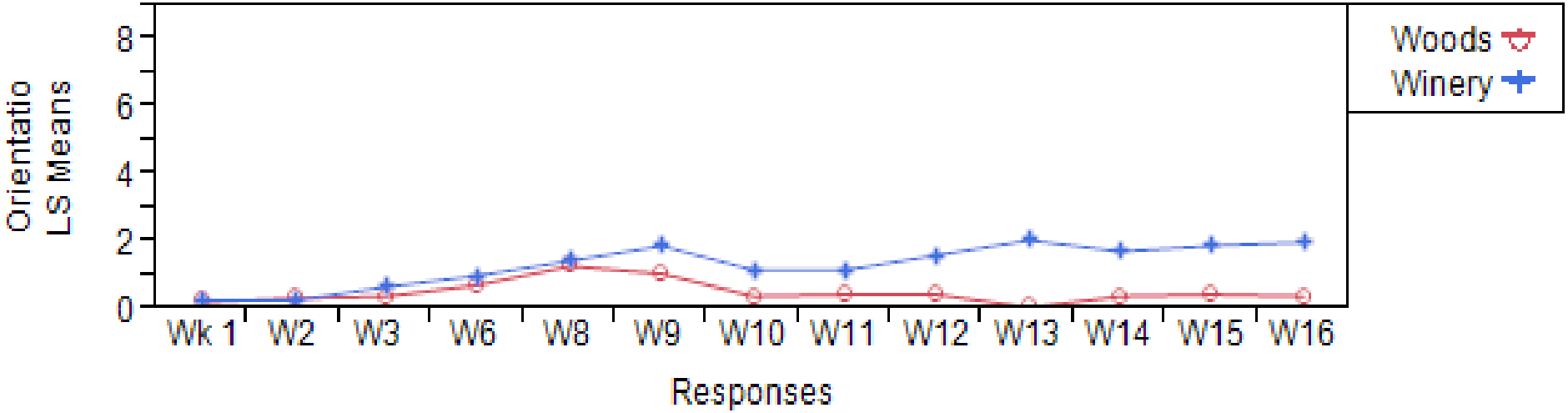
Border effect across time



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

- Significant border effect

Orientation effect



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

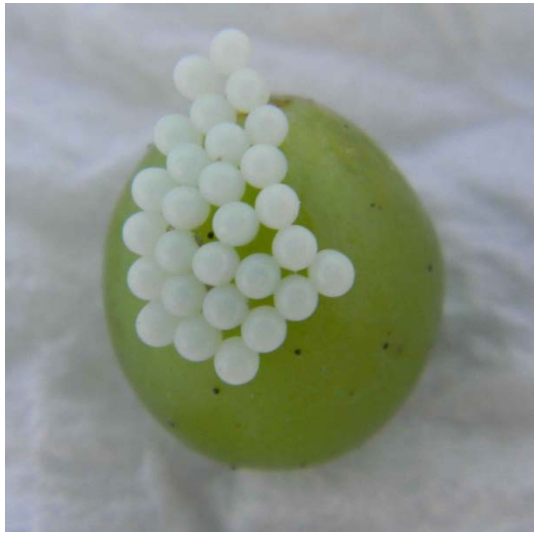
- No significant effect on orientation of vineyard

Oviposition characteristics

- Av. number of eggs/mass: 27.72

  Median: 28 (53.69%)

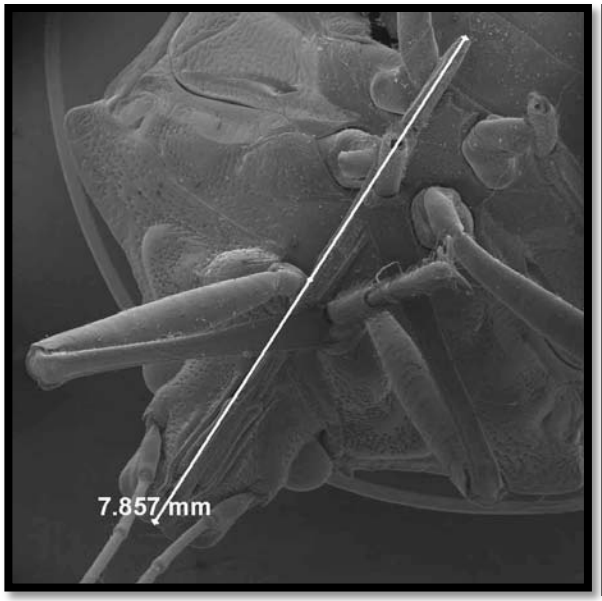
  Range: 14-32
- Av. egg hatchability in field condition 82.1% (N=80)
- Eggs laid underside of the leaves with occasional deposition on rachis & grape berry



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 stylet sheath

SEM image of stylets

Ventral view of *H. halys*

Injury to the berries

H. halys feeding on grape

Seen in pair

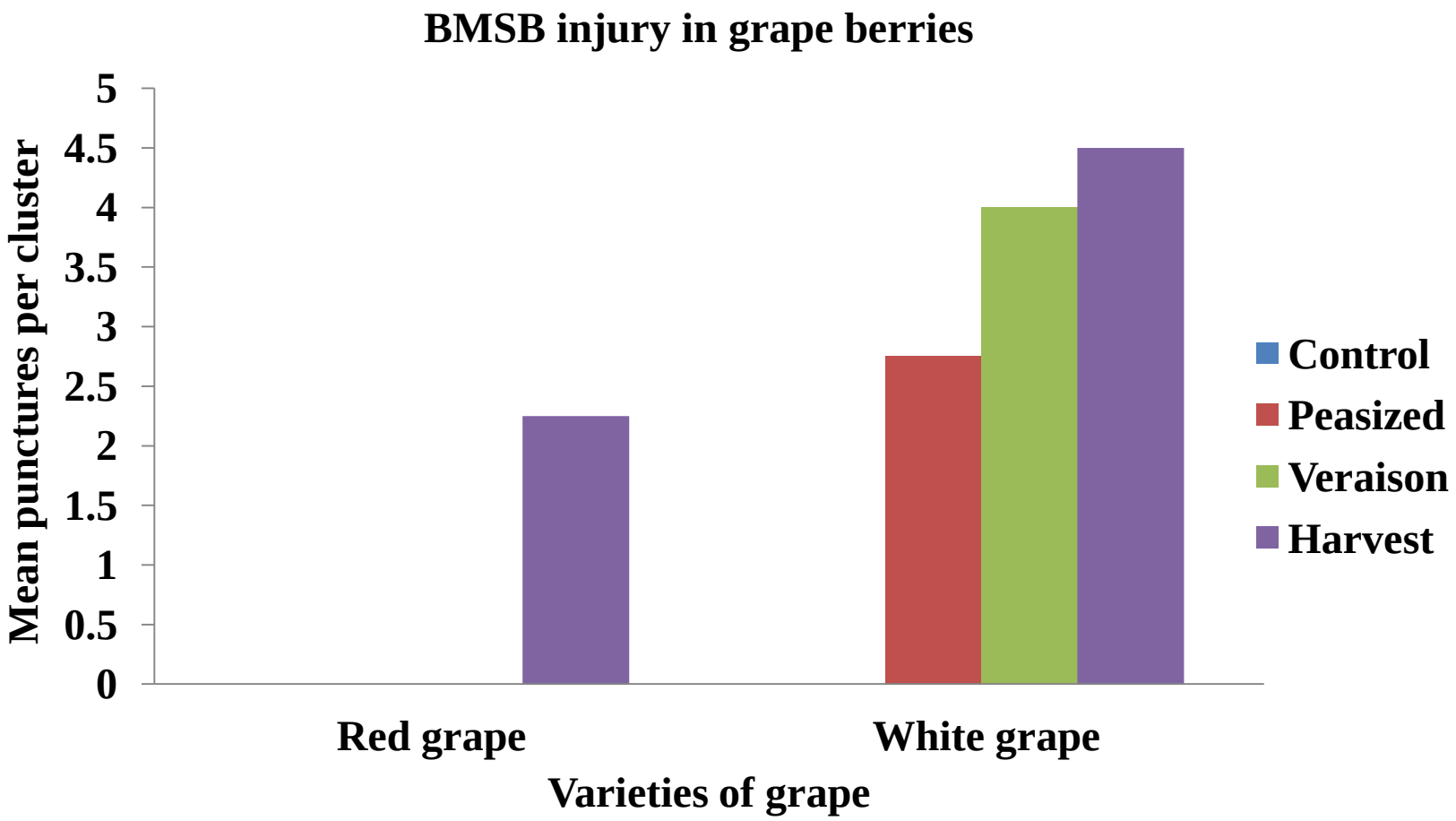
Experimental design

- 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



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

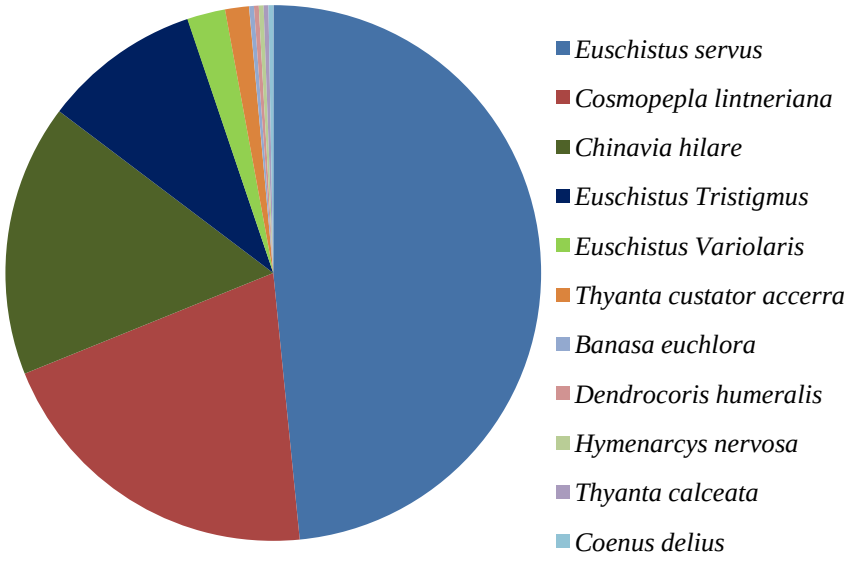


Fig. 1. Stink bugs collected from 2008-2009 were added together to get an overall stink bug species composition of two years (Maxey 2011).

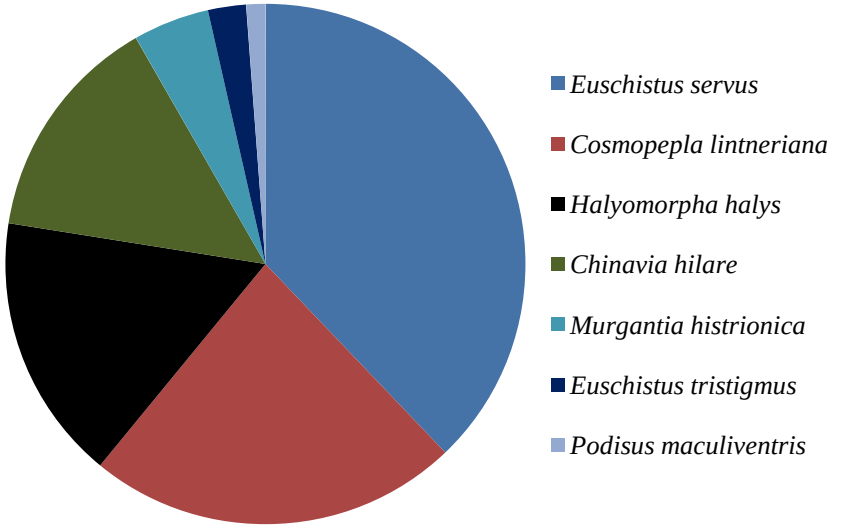


Fig. 2. Stink bugs collected from 2011-2012 were added together to get an overall stink bug species composition of two years.

Seasonal abundance

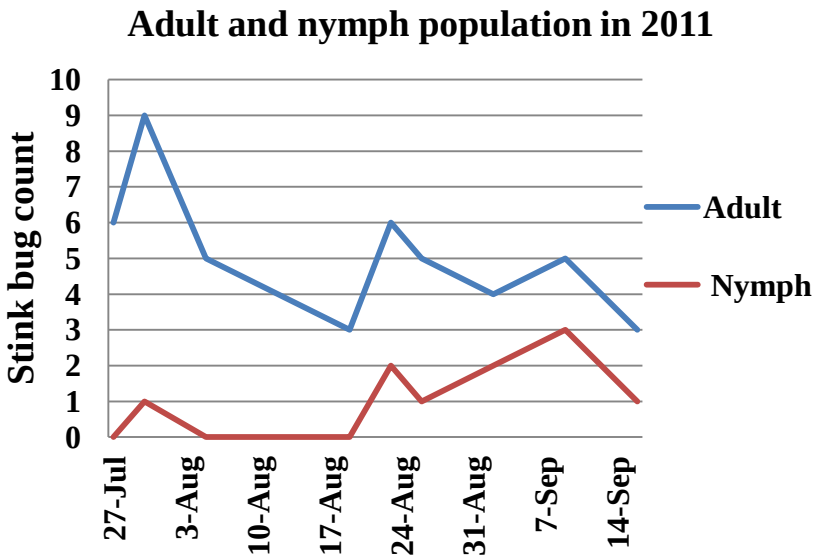


Fig. 1. Seasonal abundance of stink bugs in raspberry planting in 2011.

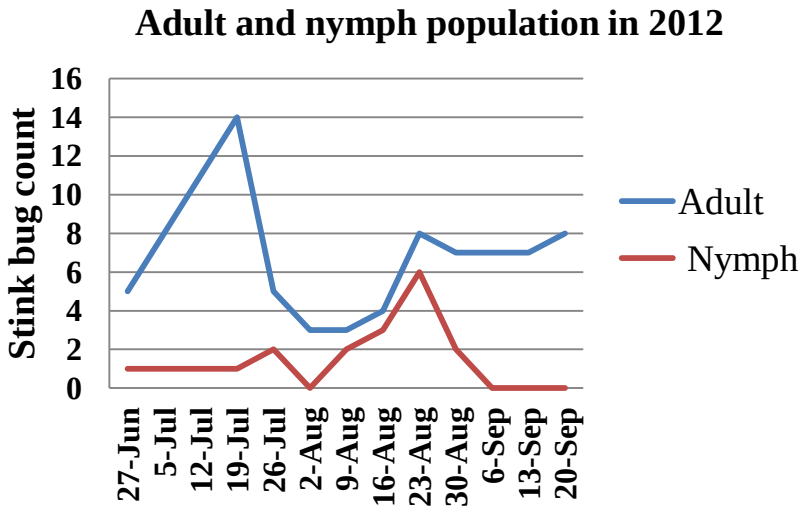


Fig. 2. Seasonal abundance of stink bugs in raspberry planting in 2012.

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), *Acrosternum 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 (2.2×10^5 spores/ml) was recovered from ergot-contaminated rice stink bugs, while the lowest mean concentration of 6.2×10^4 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:

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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.
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BMSB aggregation in crab apple tree

Acknowledgements

- Dr. Katherine Kamminga
- Dr. Carlyle C. Brewster
- Ryan Mays
- VT- Entomology Staff, Friends

Funding sources

- Virginia Wine Board
- SRSFC/IR-4
- BMSB SCRI Grant

Questions & Suggestions

Front Royal, VA, 2012

VirginiaTech