# 1.2, 1.3, 3.1, and 3.2. Vegetables

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Collaborating Institutions

University of Delaware

ars

Penn State

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Washington State University

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University of Maryland

VirginiaTech

OSU Oregon State University

NC State University

Stop BMSB .org

# Vegetable Crop Team Members

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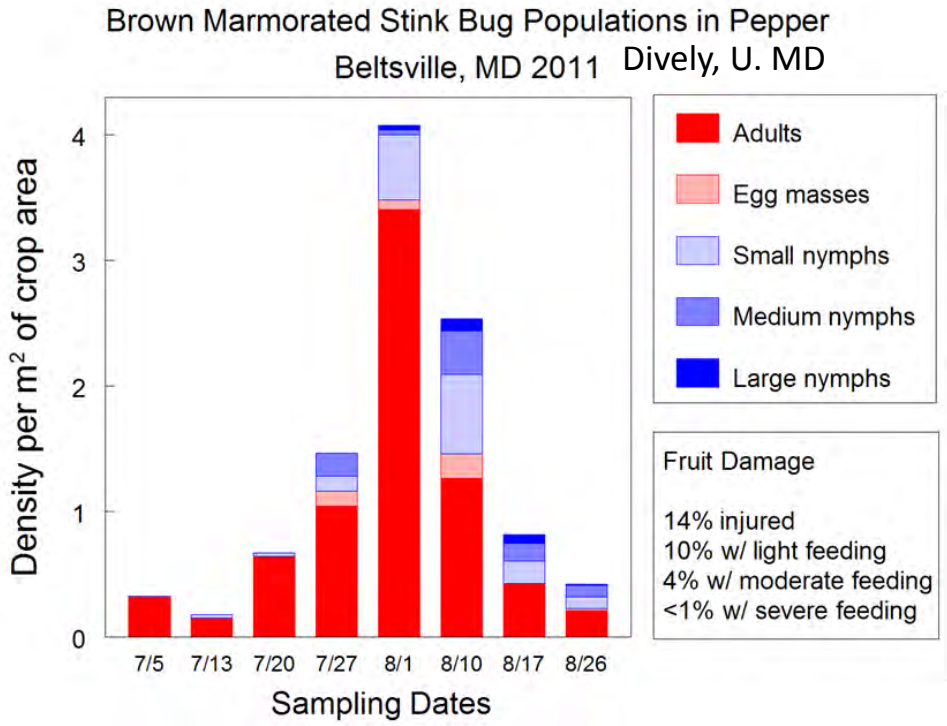
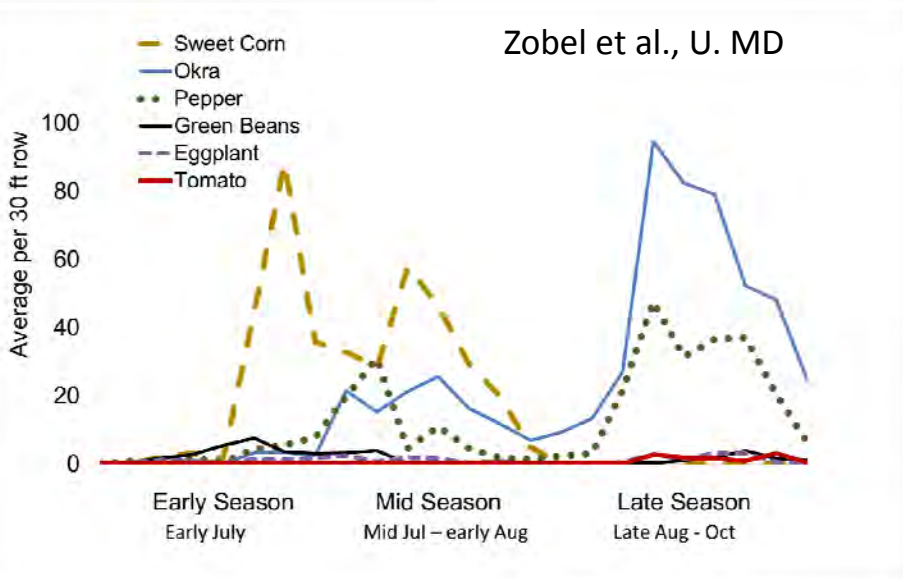
Others

# What we've learned so far

# BMSB on Vegetable Crops

- For vegetables, BMSB attacks fruiting structures from July to October in the mid-Atlantic U.S.
- There is often significant inter-crop movement of BMSB adults and nymphs throughout the season as the relative attractiveness of each crop changes.



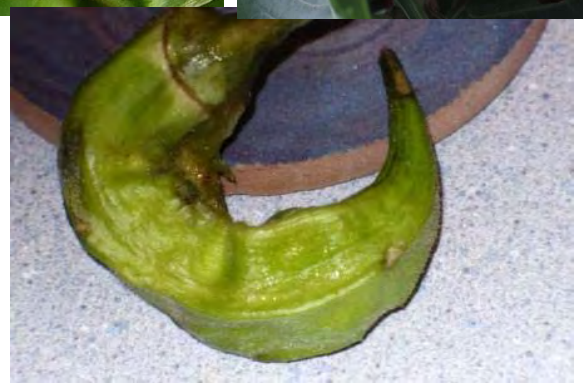



# Impact of BMSB on Vegetable Crops

- Among the vegetables, sweet corn, peppers, beans, and okra are preferred for adult colonization and reproduction (Kuhar et al. 2012).







Kuhar, T.P., K.L. Kamminga, J. Whalen, G.P. Dively, G. Brust, C.R.R. Hooks, G. Hamilton, and D.A. Herbert. 2012. The pest potential of brown marmorated stink bug on vegetable crops. Plant Health Progress. doi:10.1094/PHP-2012-0523-01-BR.

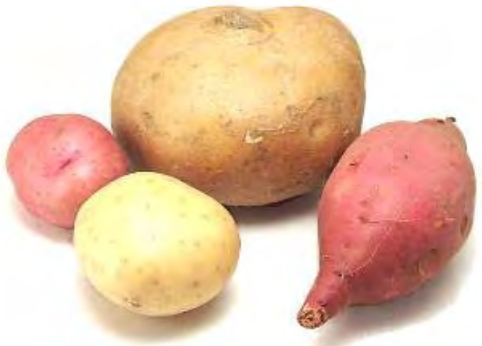
# Impact of BMSB on Vegetable Crops

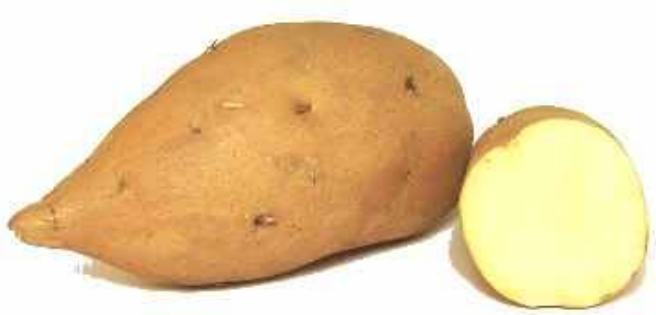
- Although probably not a suitable host plant for BMSB egg laying and early nymphal development (Zobel et al., in prep), tomato can suffer severe fruit damage, particularly in late August.

Zobel, E.S., G.P. Dively, and C.R. Hooks. In prep. Assessing the economic impact of brown marmorated stink bug on selected vegetable crops: relative attractiveness, reproductive suitability and plant injury. PLoS-One.

# Crops fed upon by BMSB, but less preferred than other vegetables

# Vegetable crops that are probably not suitable host plants for BMSB

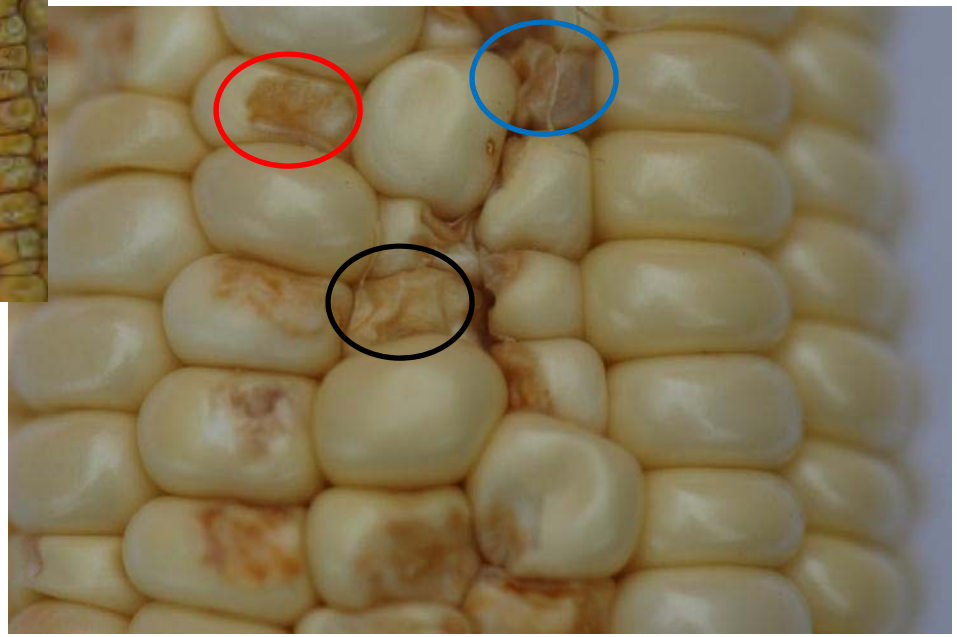


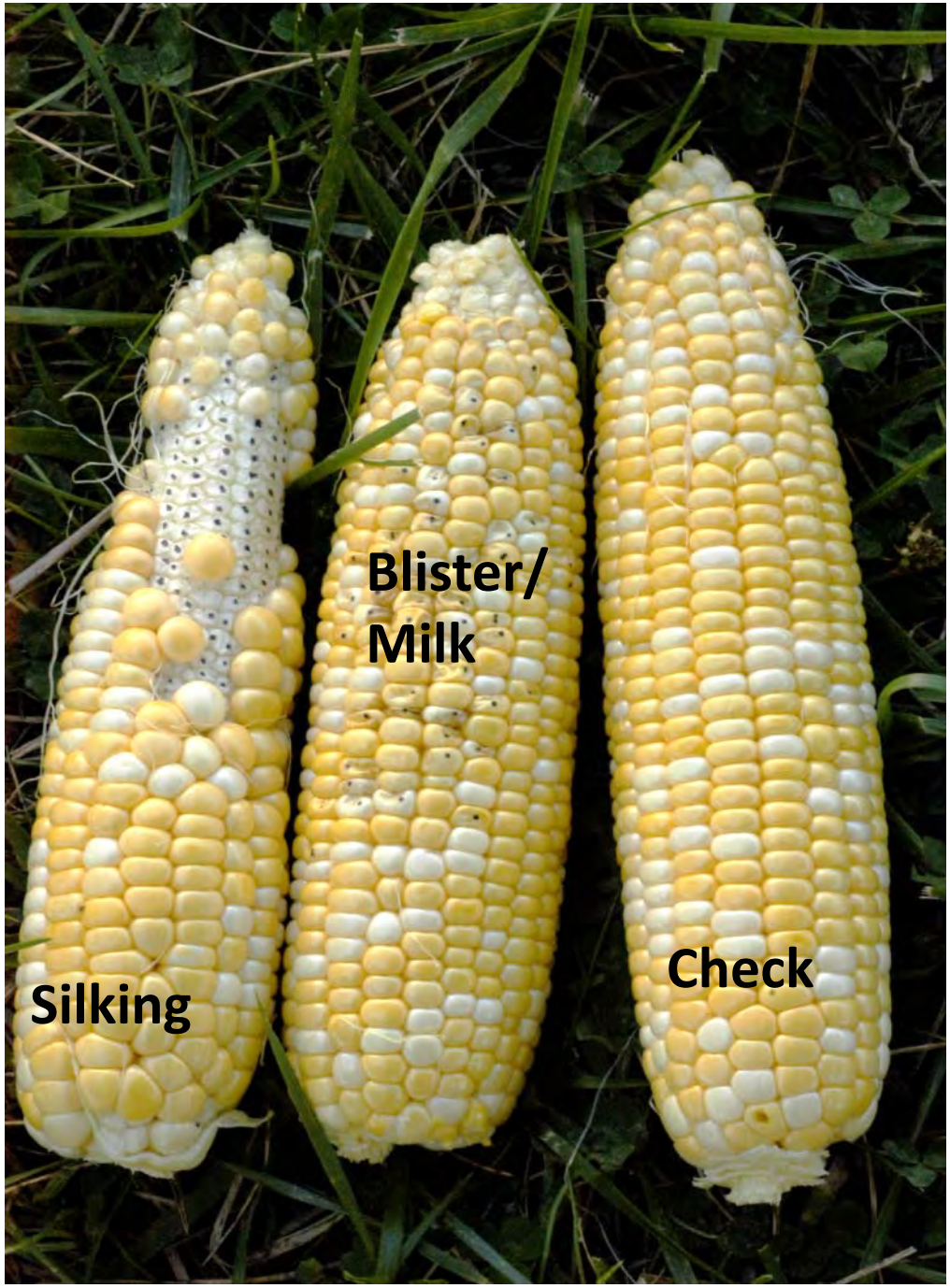


# BMSB Damage to Sweet Corn

## Evaluations in Delaware (Whalen & Cissell)

- **Discolored Kernels**
- **Sunken Kernels**
- **Blasted Kernels**
  - **Collapsed**
  - **Aborted**






**Sweet corn**

- Infestations occurring prior to pollination may result in incomplete kernel fill
- BMSB must be managed from ear shank emergence to harvest
- Densities of 1 BMSB per ear can result in economic loss

Cissel et al. Effect of brown marmorated stink bug (Hemiptera: Pentatomidae) feeding injury on sweet corn yield and quality. *J. Econ. Entomol.* (in review)

# Fruiting vegetables

Injury to fleshy fruit, like tomatoes and peppers, produces white spongy areas on the skin and tissue damage internally.

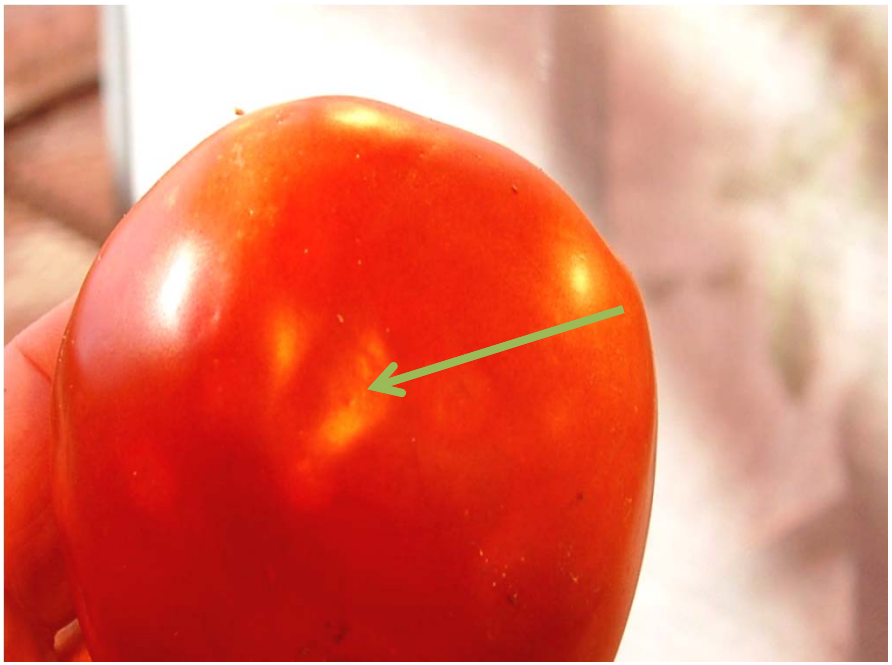
# Edible-podded beans

- BMSB feeding also may reduce fruit set and subsequent yield by causing abortion of flower buds and young fruiting bodies.

Control Plants Infested Plants

Bagged Pepper Plant Study MD - 2011

Yeasts transmitted by BMSB
Jerry Brust and Karen Rane (U. MD)



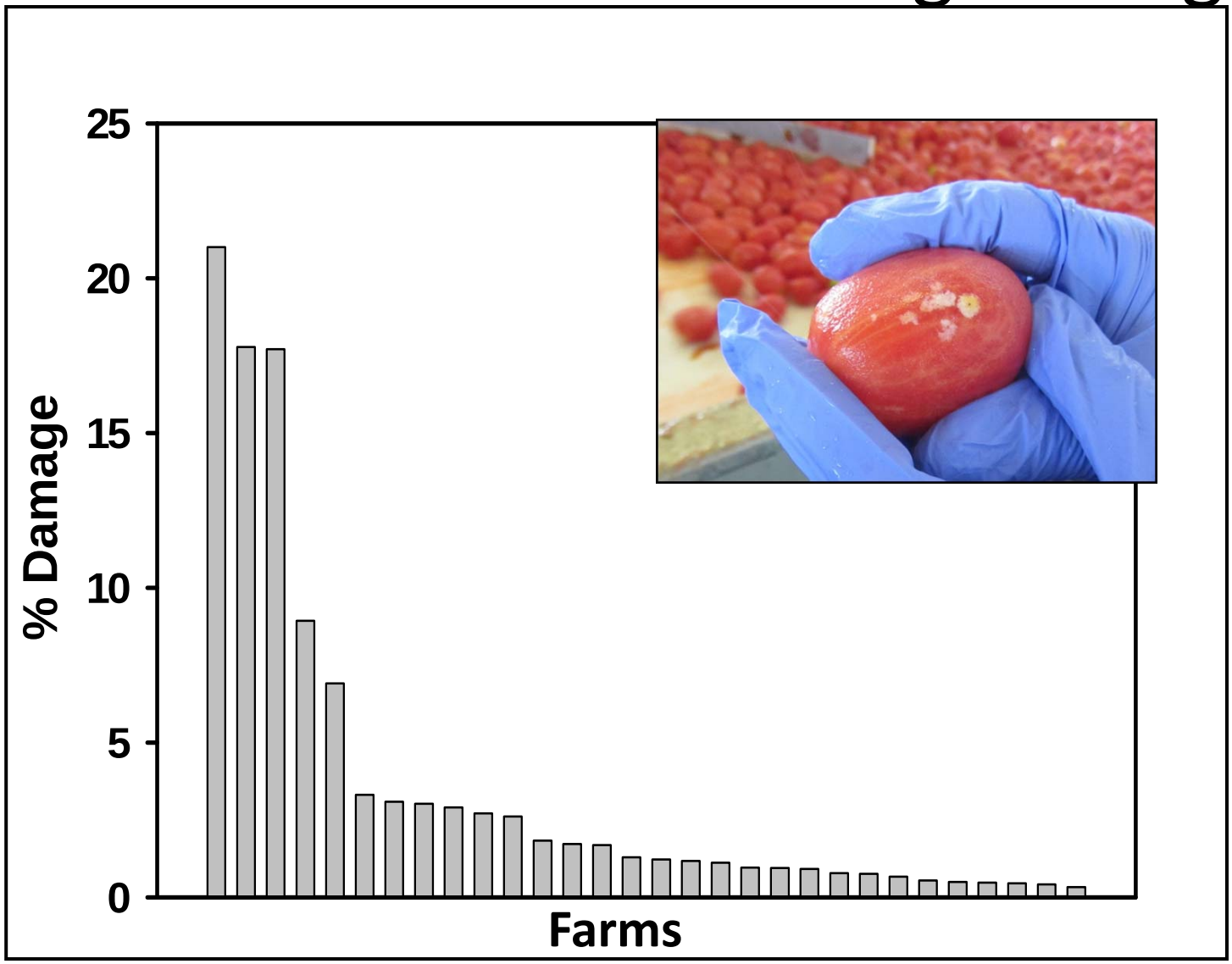
From 2010 to 2014, the percentage of harvested fruit with stink bug injury was recorded from various vegetable crops that were not treated with insecticides. Data are comprised of 142 harvests of either pepper, sweet corn, tomato, snap bean, eggplant or okra planted in DE, MD, NJ, NC, or VA.

| | n | 2010 | 2011 | 2012 | 2013 | 2014 | Average |
|---|---|---|---|---|---|---|---|
| Sweet corn: | 10 | | 44% | 69% | 67% | 5% | 46% |
| Pepper: | 48 | | 29% | 22% | 33% | 12% | 24% |
| Tomato: | 36 | 41% | 12% | 24% | 27% | 27% | 26% |
| Okra: | 20 | | 39% | 10% | 16% | NA | 22% |
| Eggplant: | 17 | | | 6% | 4% | NA | 5% |
| Bean: | 11 | | 6% | 5% | 2% | NA | 5% |

# Sampling Furmano Processing Tomatoes (Penn State)

- Processing plant
- Two 25 lb. samples/truck
  - Surveyed damage
- 230 trucks sampled
  - 2013

# High variation in damage; most fields had less than 5% stink bug damage



# Sampling processing sweet corn for stink bugs & damage (Dively, U. MD)

- S.E.W Friel Cannery
- In 2014, two field technicians conducted surveys of 93 fields totaling 7,373 acres throughout the Delmarva Peninsula.
- Overall stink bug levels were very low and strongly associated with field edges.

# Chemical control of BMSB in vegetables

- Several pyrethroids and neonicotinoids as well as products containing both active ingredients provide effective control of BMSB on vegetables

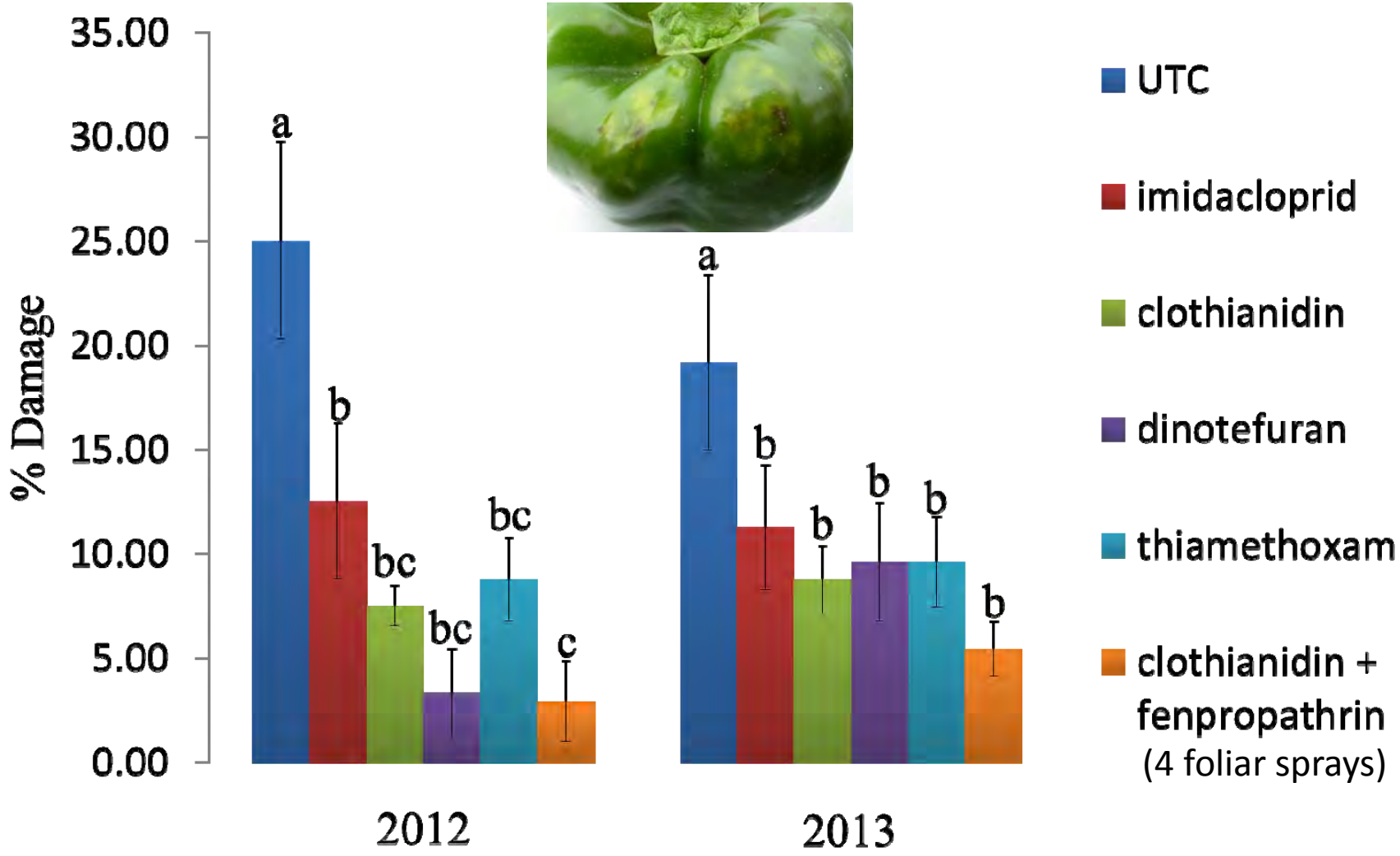
- However, these insecticides are disruptive to natural enemies and can undermine IPM programs

# Insecticide efficacy test peppers , Blacksburg, VA (4 weekly sprays)

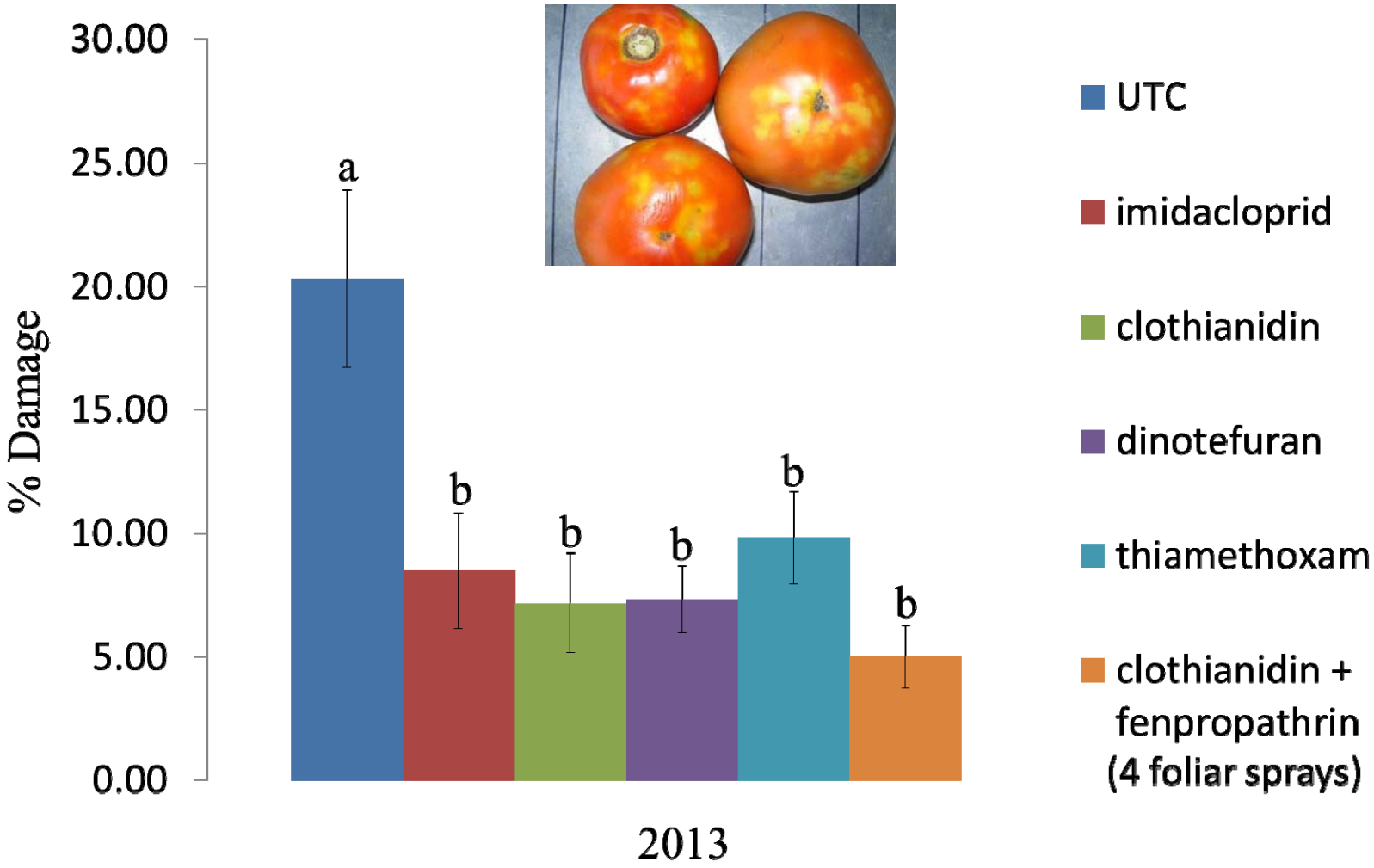
| Treatment | Rate / acre | % stink bug damage | | | % control (…ng …tion) | Mean no. green peach aphids / 20 leaves (Sept) |
|---|---|---|---|---|---|---|
| Untr. Control | | | | | | 10.3 |
| Bifenture 2EC | | | | | 8 | 765.5 |
| Lambda-Cy 1EC | | | | | 0 | 850.8 |
| Perm-up 3.2EC | | | | | 6 | 539.0 |

# In VA and NC: evaluated efficacy of neonicotinoid insecticides applied via chemigation

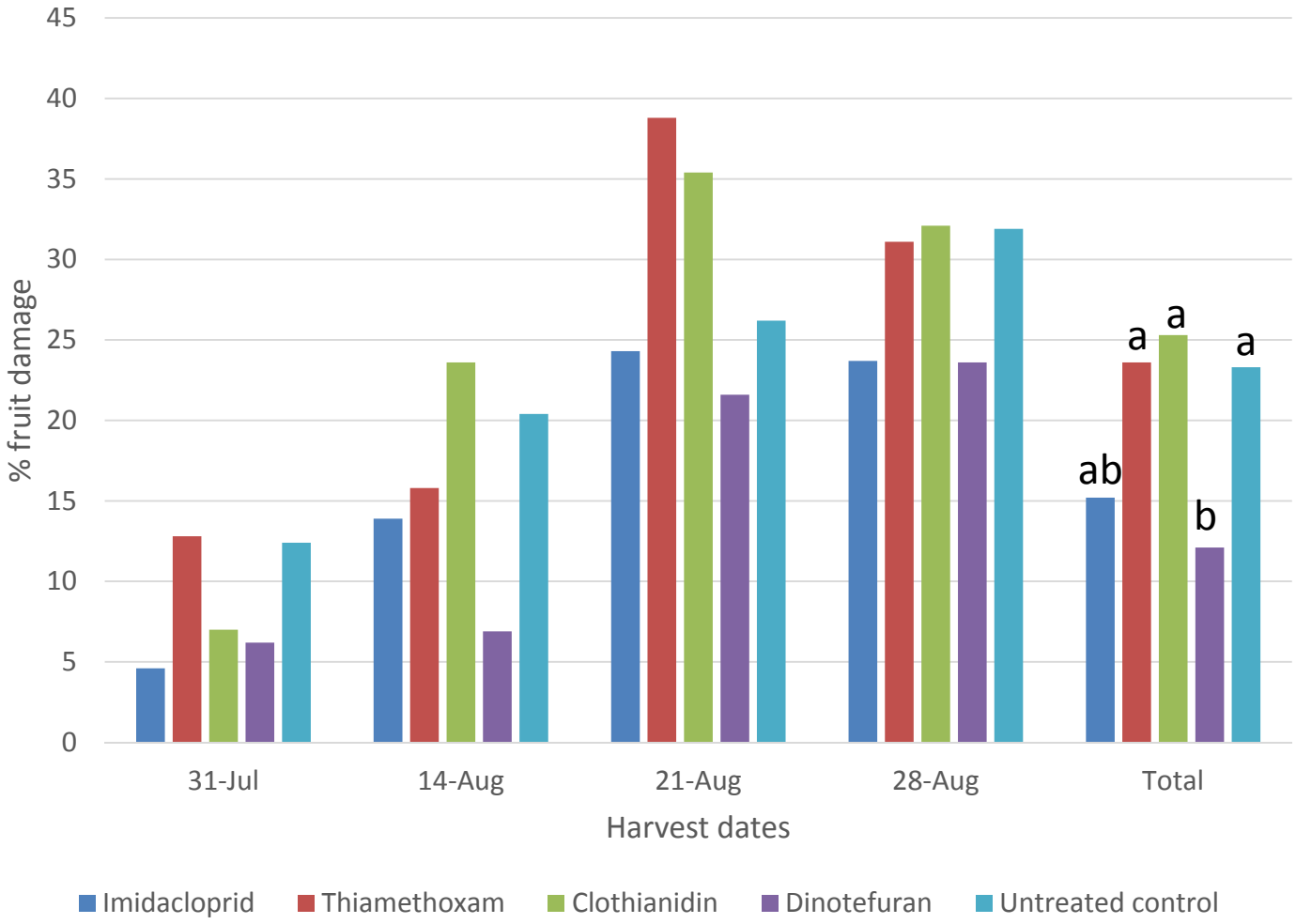
Cumulative % stink bug damaged peppers treated with **two** applications of soil-applied neonicotinoids (30 days apart) in VA



Cumulative % stink bug damaged tomatoes treated with **two** applications of soil-applied neonicotinoids (30 days apart) in VA



# Stink bug damage to tomatoes treated via drip chemigation once (9 Jul, 2014) in Mills, River, NC (Walgenbach)

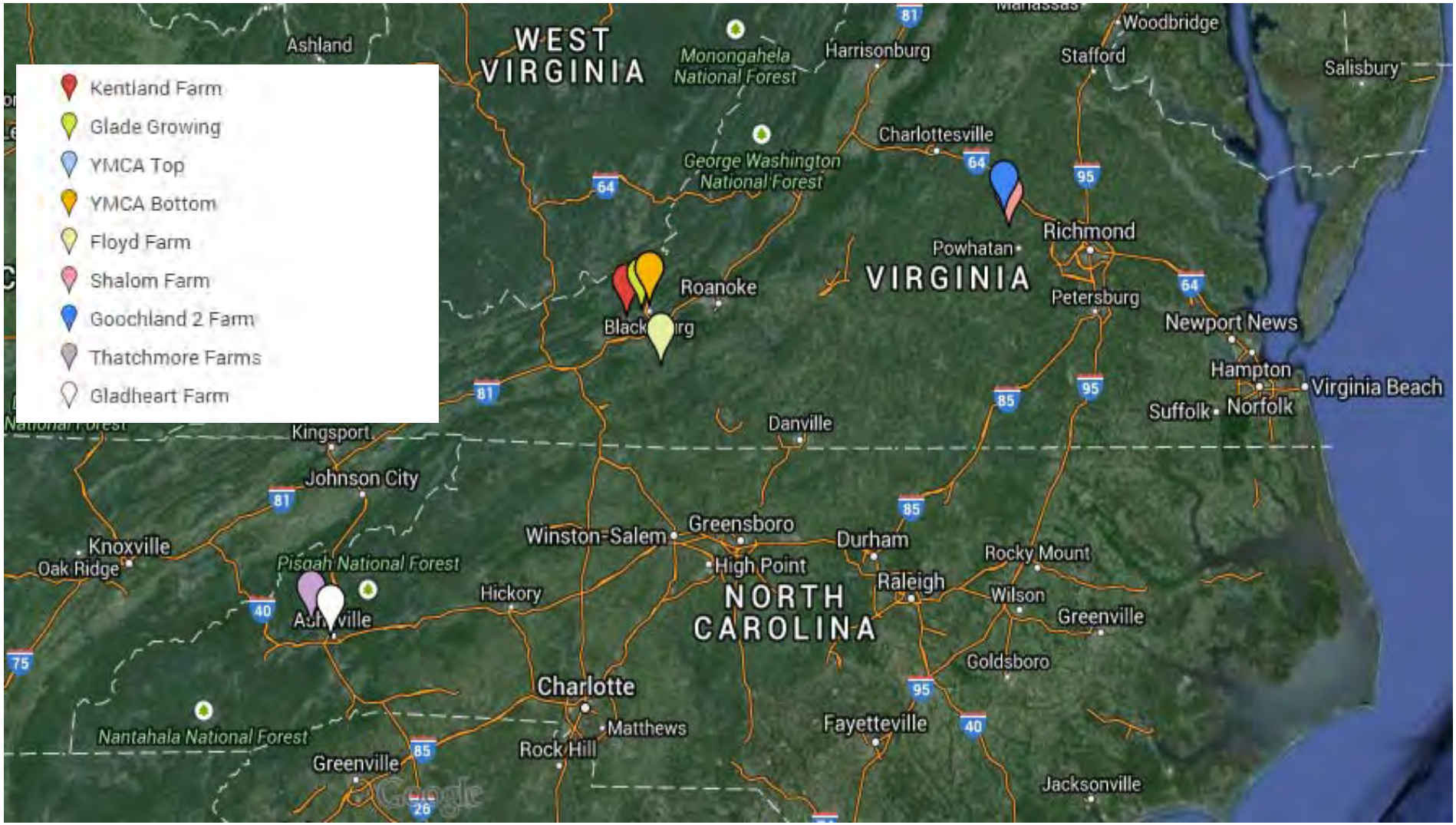


# Scouting for BMSB before spraying

# BMSB pheromone traps on vegetable farms

- Large black pyramid traps placed on outside of fields
- Each baited with the two-component BMSB aggregation pheromone + the synergist (MDT)
- Traps checked weekly for BMSB

# Organic farm/community garden locations in Virginia and North Carolina where BMSB were sampled in 2014



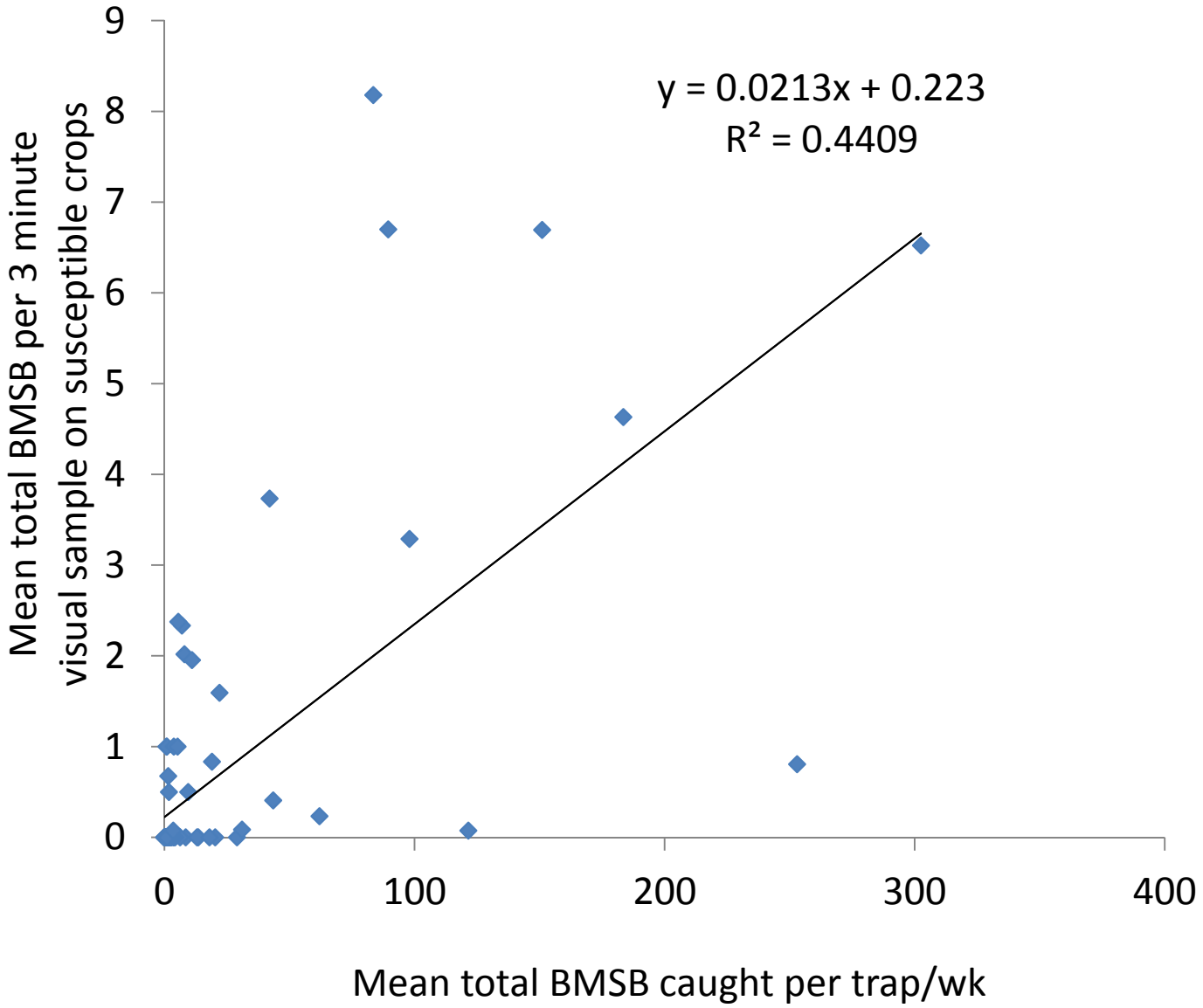
# BMSB Pheromone Trapping - 2014

- 6 out of 11 organic farms had a catch >10 BMSB/trap/week

- Commercial tomatoes:
  4 out of 9 farms in NC had >10 BMSB/trap/week
  0 out of 5 farms on the Eastern Shore of VA had >10 BMSB/trap/wk
  0 out of 3 Furmano farms in PA had >10 BMSB/trap/week

# Peak Trap Catch/Organic Farms

| Location | BMSB/trap/week | Date |
|---|---|---|
| Kentland Farm, Whitethorn, VA | 5 | September 4 |
| Glade Growing, Blacksburg, VA | 1 | August 7 |
| YMCA Top, Blacksburg, VA | 20 | September 4 |
| YMCA Bottom, Blacksburg, VA | 29 | September 4 |
| Floyd Farm, Floyd, VA | 1 | August 14 |
| Shalom Farm, Goochland, VA | 9 | August 11 |
| Goochland # 2, Goochland, VA | 14 | August 11 |
| Gladheart Farm, NC | 302 | August 26 |
| Thatchmore Farm, NC | 122 | September 10 |
| New Castle Co., DE | 8 | August 12 |


y = 0.0213x + 0.223
R² = 0.4409
Mean total BMSB per 3 minute visual sample on susceptible crops
Mean total BMSB caught per trap/wk
0
1
2
3
4
5
6
7
8
9
0
100
200
300
400

# Where do we go from here?

- Refine models for using pheromone trap catch information
- Evaluate efficacy of IPM-friendly insecticide options
- Develop sound crop-specific stink bug IPM programs for sweet corn, fruiting vegetables, and beans.
- Produce regional BMSB management guidelines/extension bulletins for each vegetable crop.