Biology, Economic Impact, and Management of the Brown Marmorated Stinkbug, a New Soybean Pest

Galen P. Dively
Department of Entomology
UNIVERSITY OF MARYLAND



- Stink bugs are destructive insect pests of soybeans
- Complex now includes native and introduced species

Green stink bug, *Acrosternum hilare*

Brown stink bug, *Euschistus servus*

Not all stink bugs are pests

Spined Soldier Bug,
Podisus maculiventris

Piezodorus guildinii
Red Banded Stink Bug

Megacopta cribraria
Kudzu Bug

Halyomorpha halys
Brown marmorated stink bug

Introduced Stink Bugs

Brown Marmorated Stink Bug

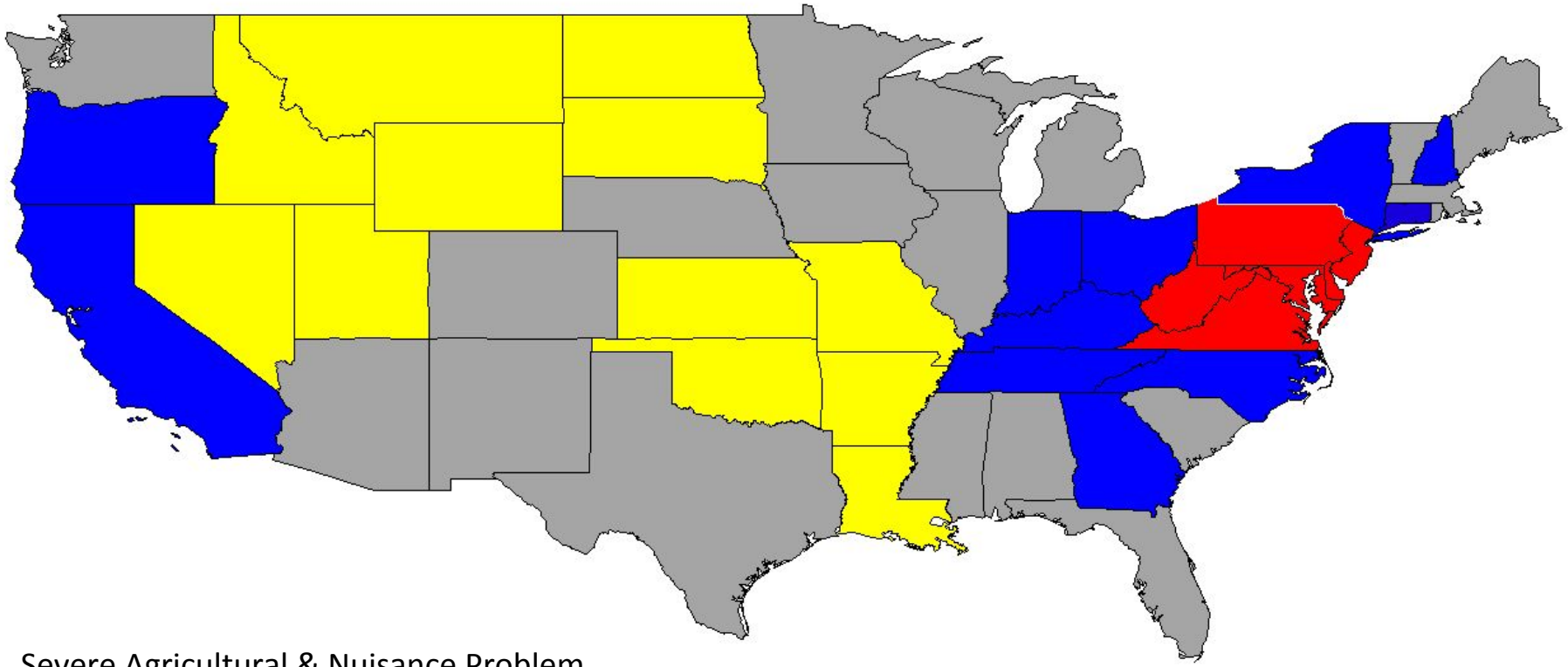
Origin: Eastern Asia - China, Japan, Korea

Initial Detection: Pennsylvania in 2001, but probably present since 1996

Distribution in U.S.: 37 states, including most eastern states

Hosts: More than 70 plants in U.S., and 200-300 worldwide

Current US Distribution by Infestation Status



Severe Agricultural & Nuisance Problem

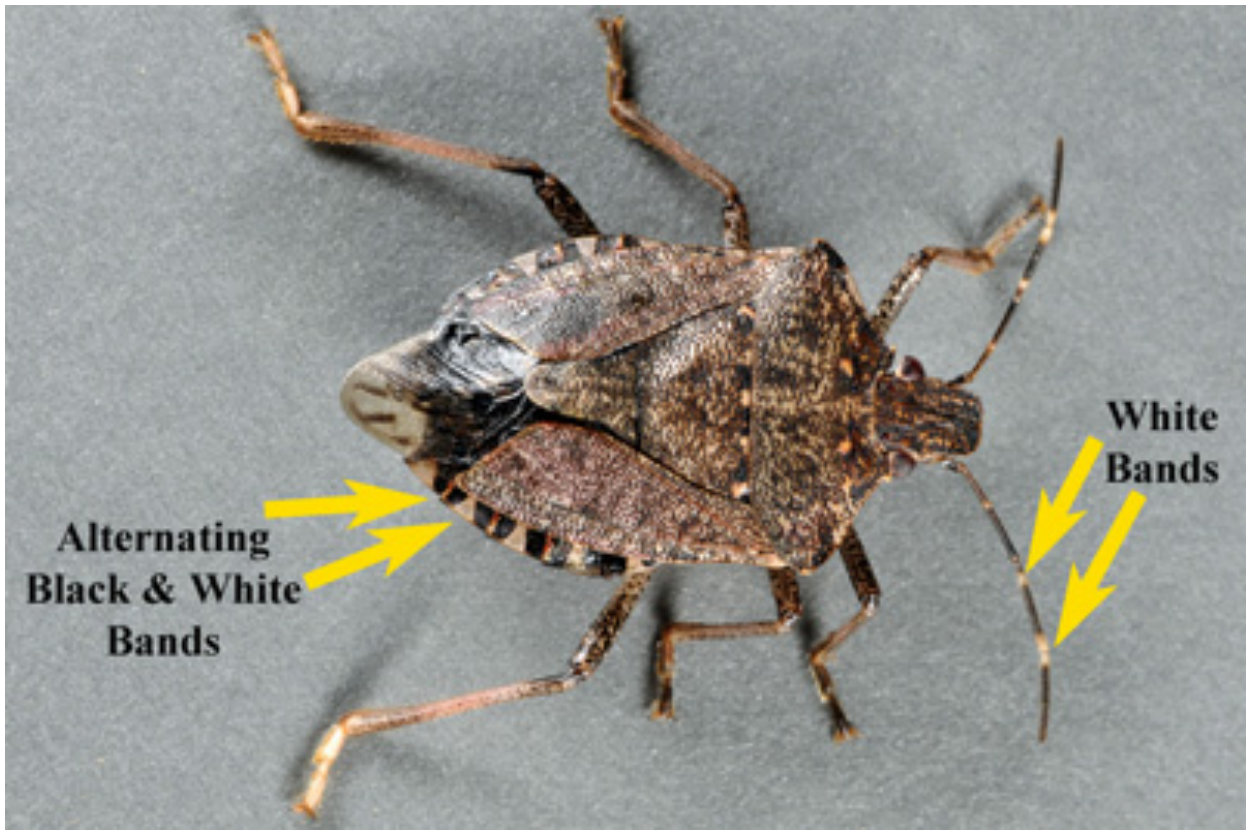
Nuisance Problem Only

Detection Only

Not Found

Aggregations in September-October


Full Service Pest Management Company
APM
Advanced Pest Management
www.APMservices.com
Character - Competence - Service
Welcome To
STINK BUG
Territory!
Call Us Today!
1-800-5NO-BUGS
B. B. Martin


Alternating
Black & White
Bands
White
Bands


LIBERTY
QUARTER DOLLAR
UNITED STATES OF AMERICA

Stink Bug Life Stages

Egg Mass

1st Instar Nymphs

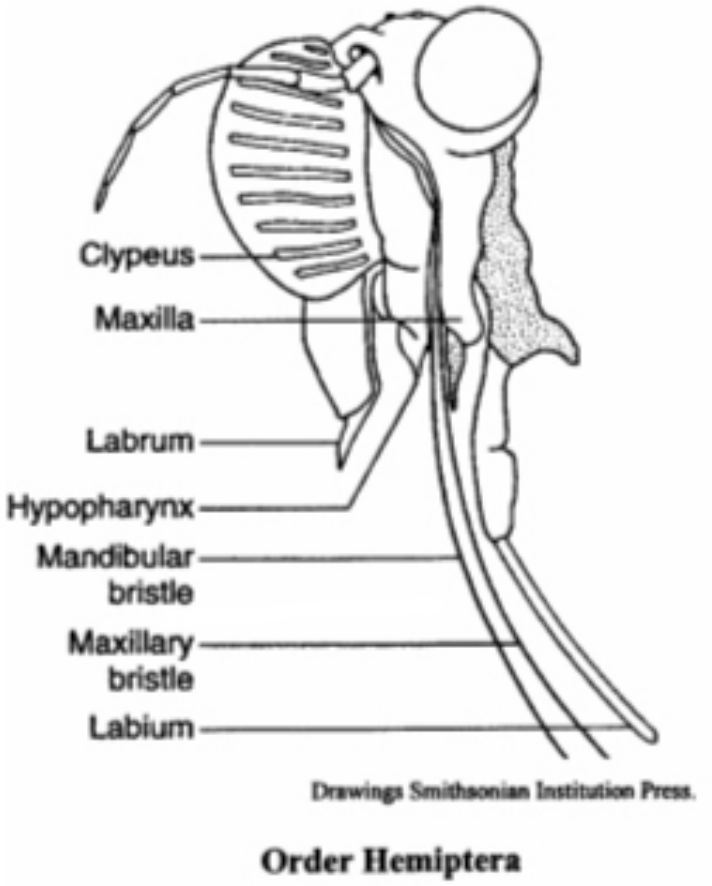
2nd 3rd 4th 5th

Instar Nymphs

Adult Male

Adult Female

Stink Bug Feeding



Order Hemiptera

- Feeds primarily on fruiting structures and meristematic tissues.
- Injects enzymes to dissolve plant tissues.
- Physical destruction of seed/tissues.
- Introduces or allows entry (wounds) of some pathogens and decay organisms.

Crops Damaged

- Apple
- Asian pear
- Grape
- Hazelnut
- Nectarine
- Peach
- Pear
- Pecan
- Plum
- Raspberry

- Cucumber
- Eggplant
- Pepper
- Okra
- Pole bean
- Green bean
- Sweet corn
- Tomato

- Field corn
- Soybean
- Sunflower

Favorite Spring Host Plants

Paulownia


Catalpa


Tree of Heaven

Wild cherry


Mimosa

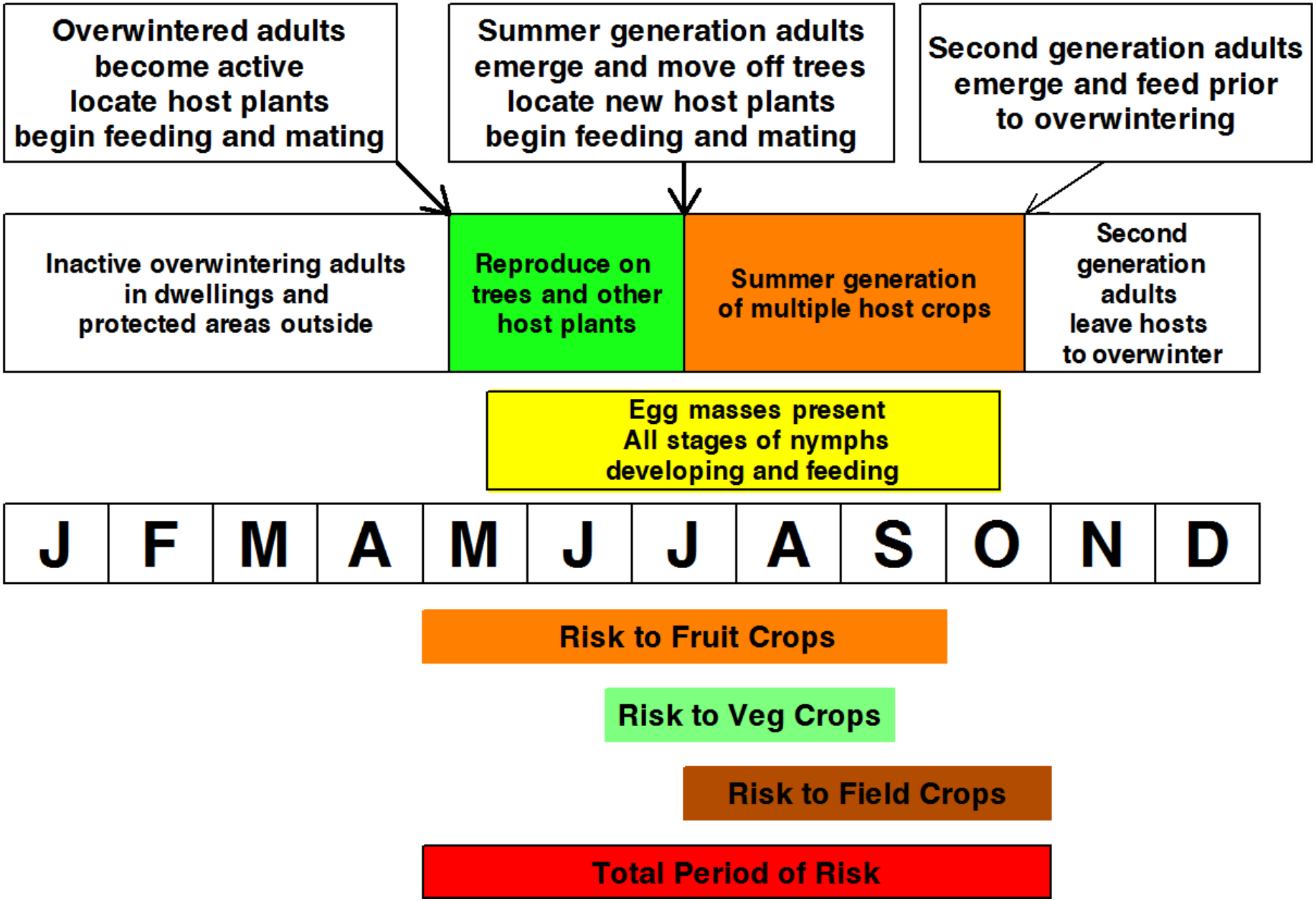

Eastern Redbud


Mulberry

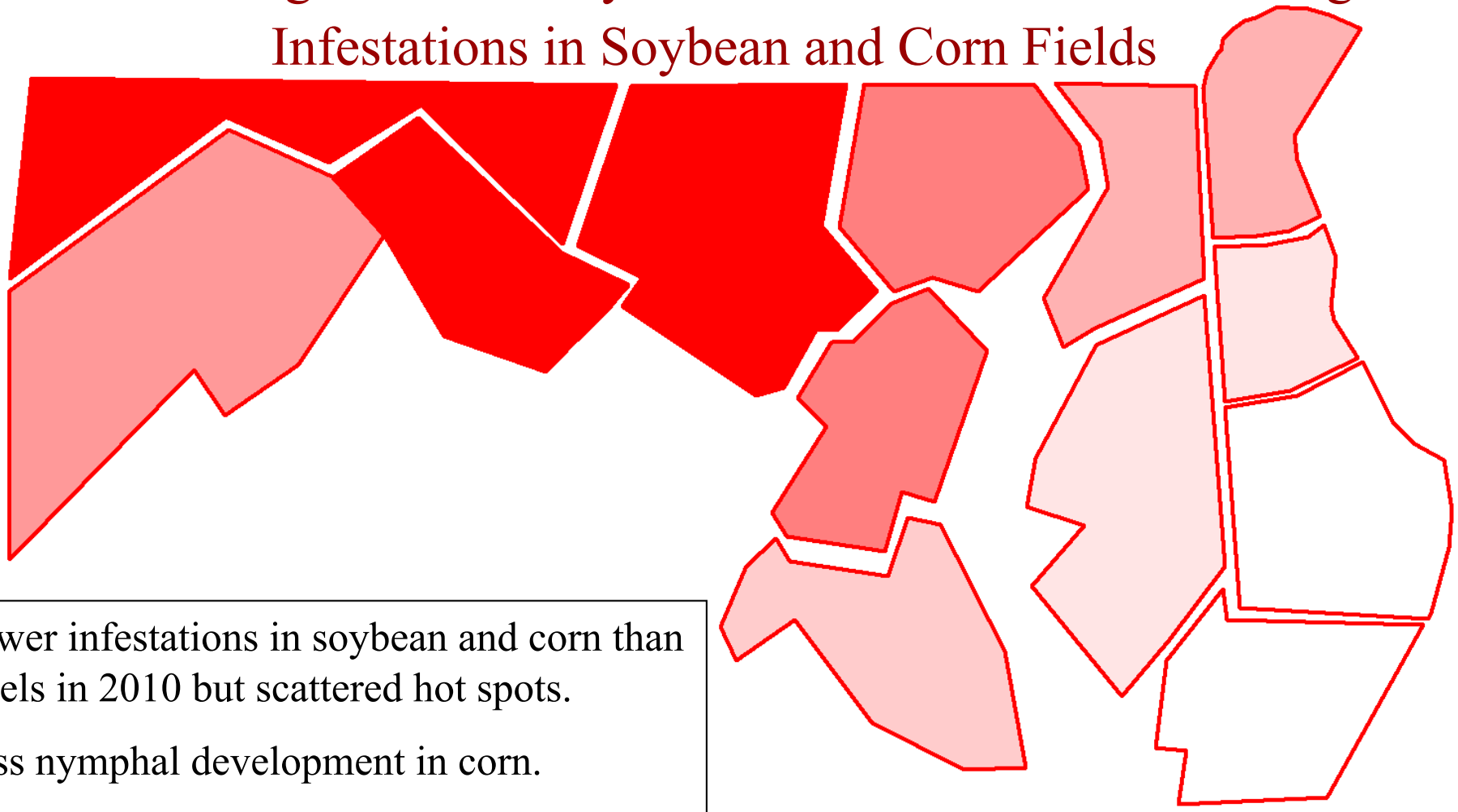

Black Walnut


Silver maple

Brown Marmorated Stink Bug Seasonal Phenology



2011 Range and Severity of Brown Marmorated Stinkbug Infestations in Soybean and Corn Fields



Lower infestations in soybean and corn than levels in 2010 but scattered hot spots.

Less nymphal development in corn.

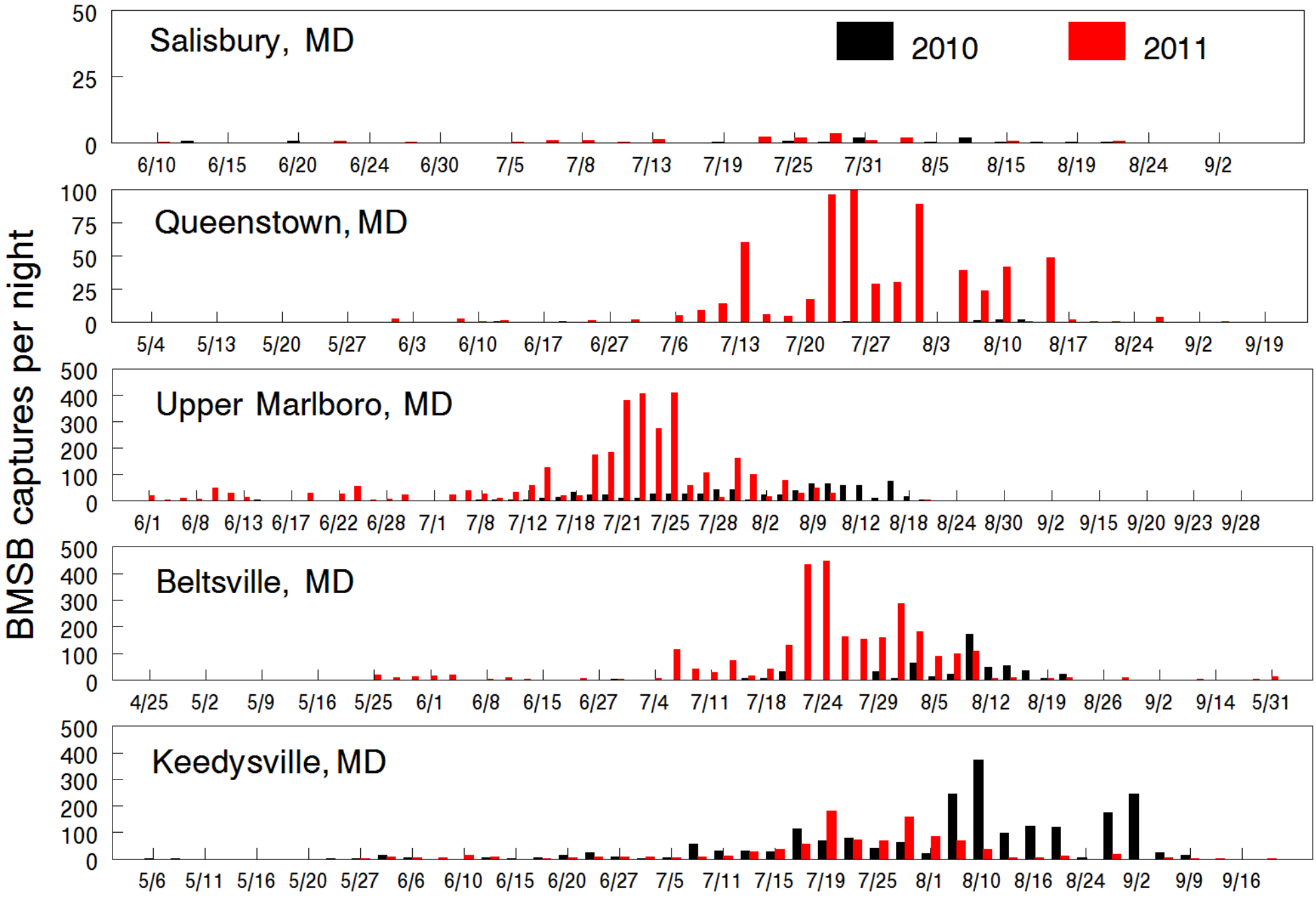
Higher populations in full-season soybeans.

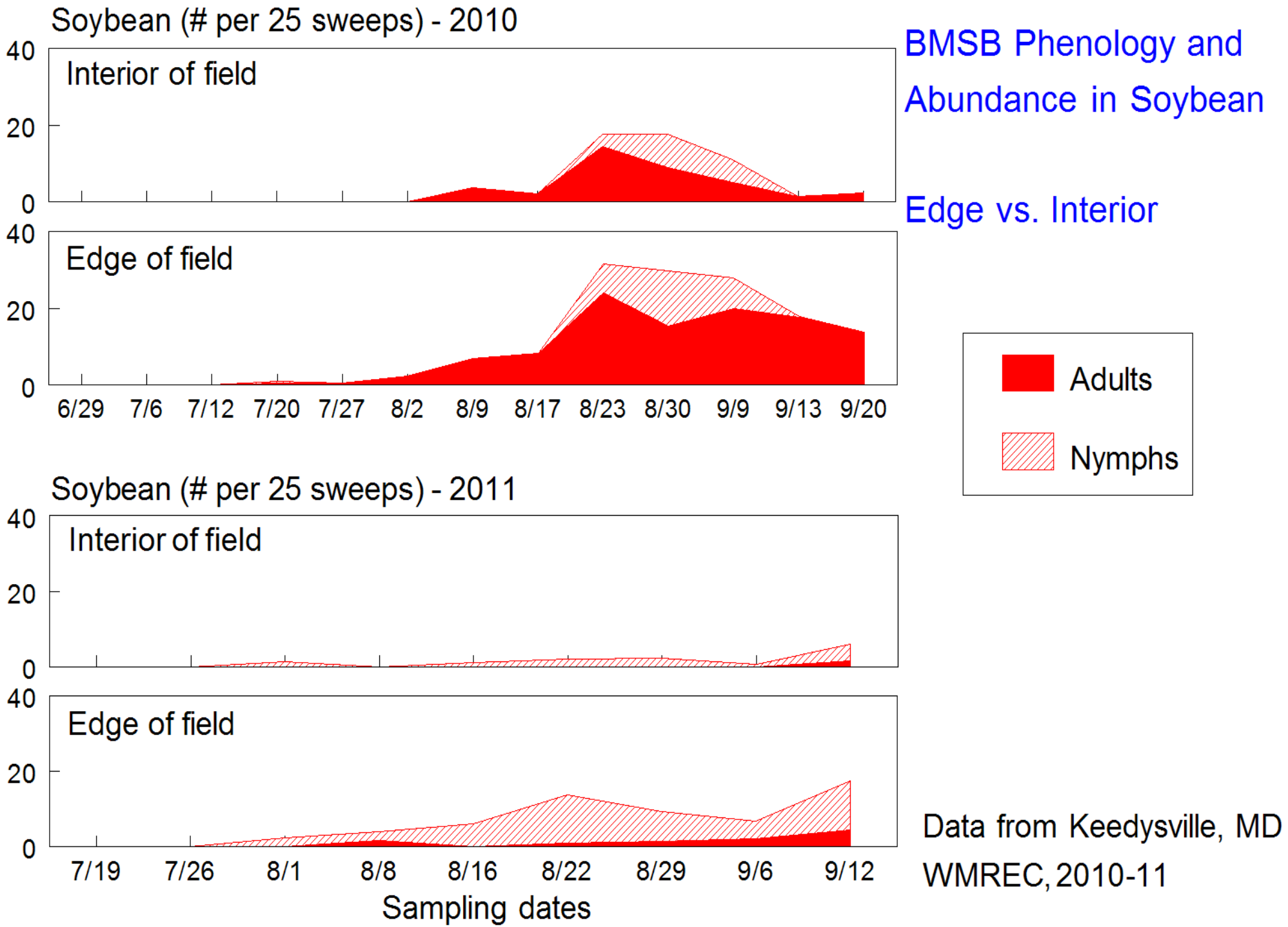
In most infested areas, 5-75% of the soybean fields were perimeter-treated.

Good to excellent control with SPs and re-colonization was not a problem.

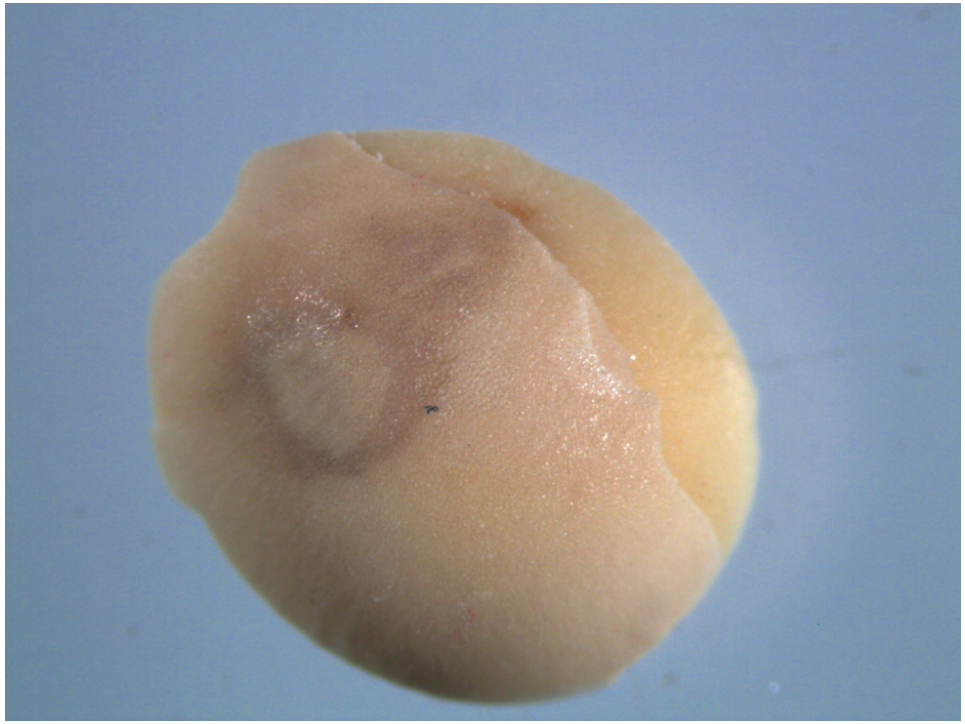
*Intensity of red in regions depicts the severity of field infestations

Blacklight Trap Monitoring for BMSB

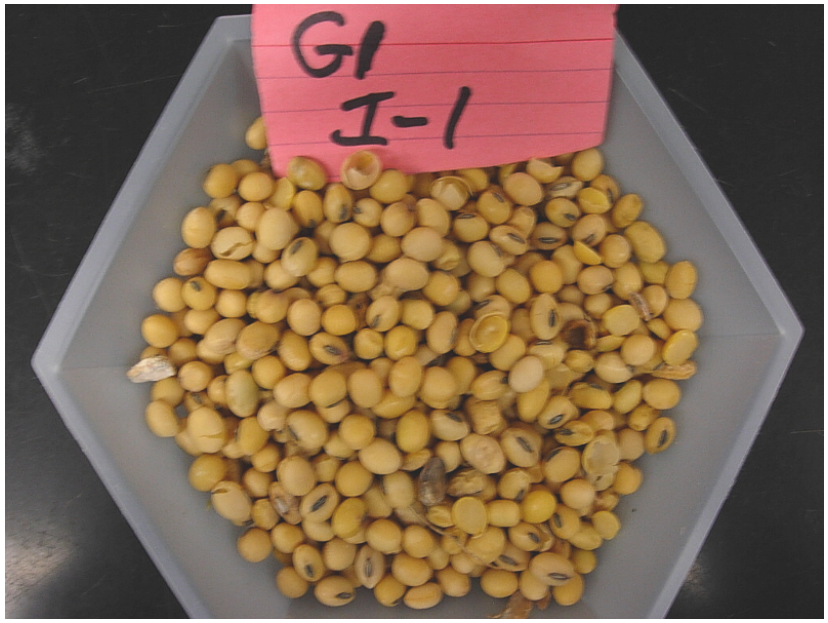


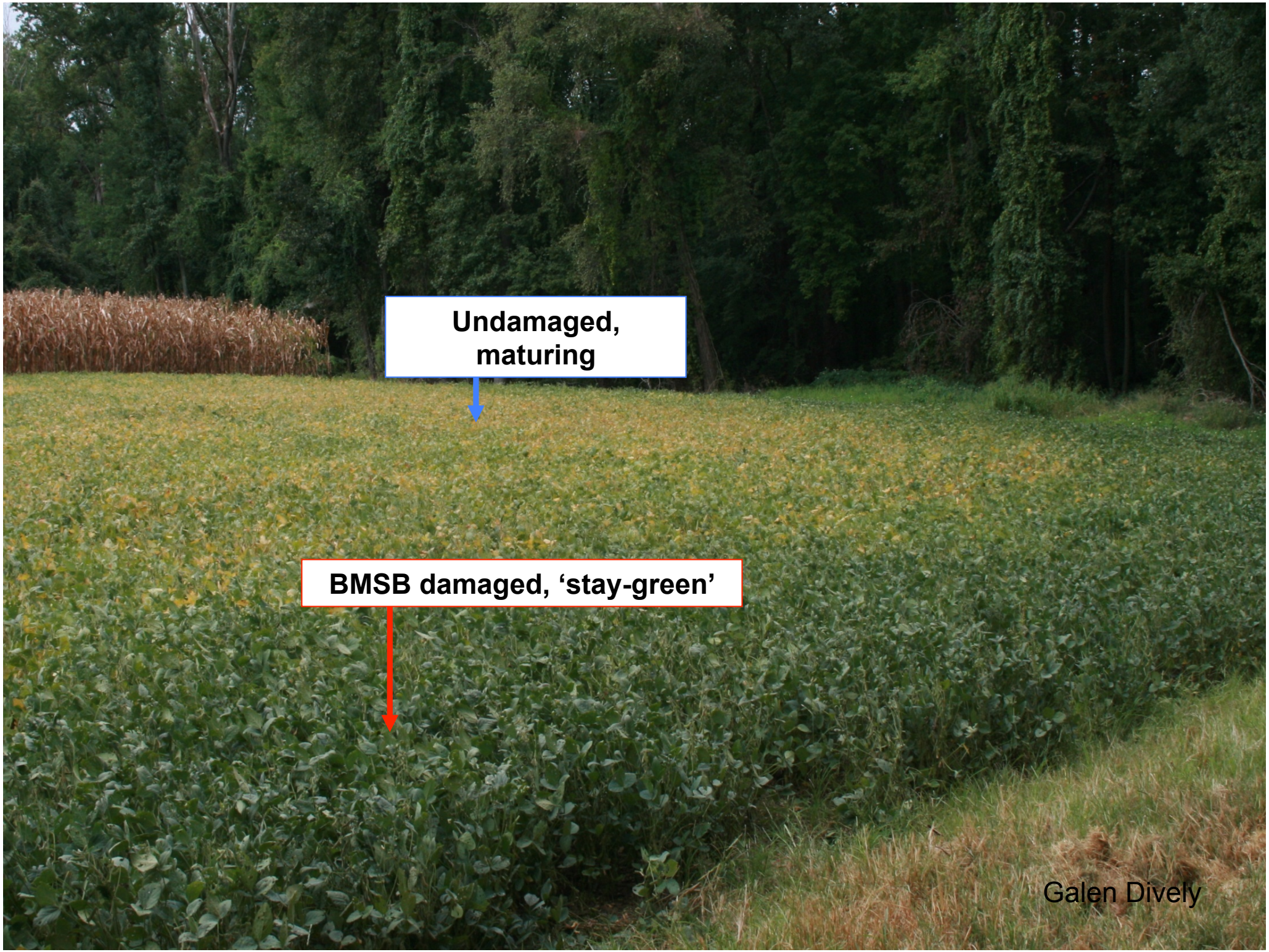

Soybean (# per 25 sweeps) - 2010
Interior of field
Edge of field
40
20
0
6/29
7/6
7/12
7/20
7/27
8/2
8/9
8/17
8/23
8/30
9/9
9/13
9/20
Soybean (# per 25 sweeps) - 2011
Interior of field
Edge of field
7/19
7/26
8/1
8/8
8/16
8/22
8/29
9/6
9/12
Sampling dates
BMSB Phenology and Abundance in Soybean
Edge vs. Interior
Adults
Nymphs
Data from Keedysville, MD
WMREC, 2010-11

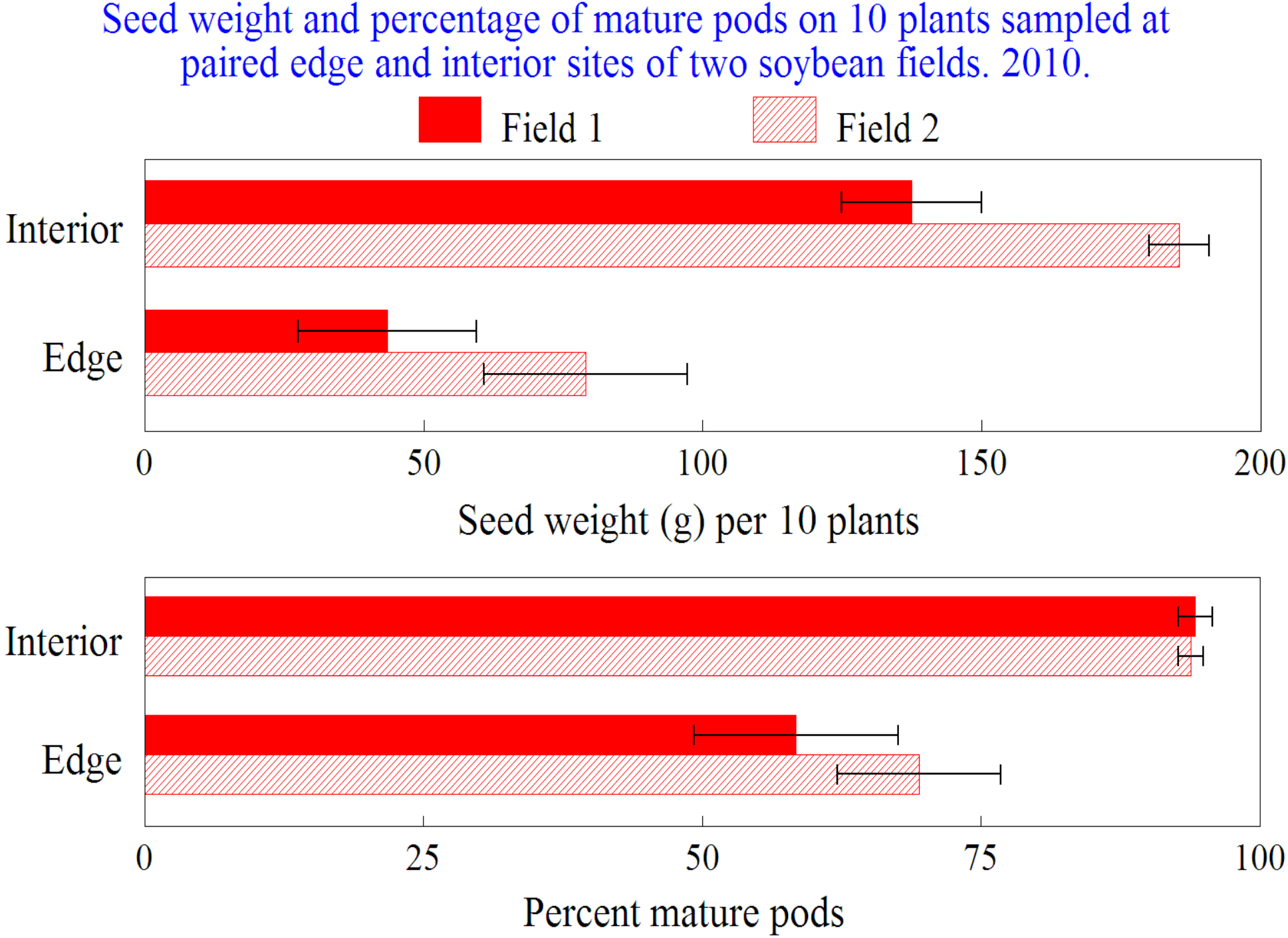
Field Cage Studies: VA, MD and DE



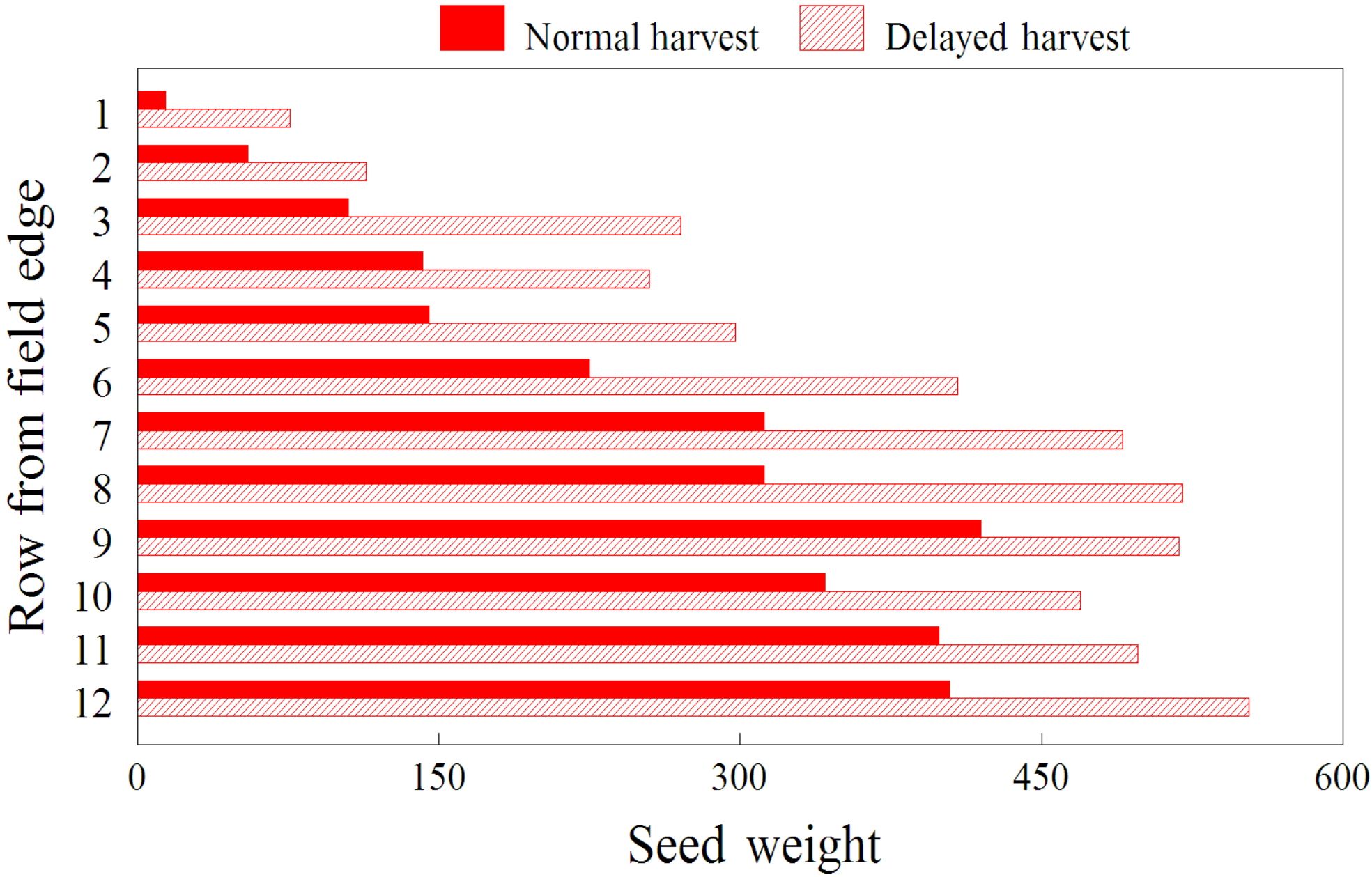

G1
E-1


G1
I-1

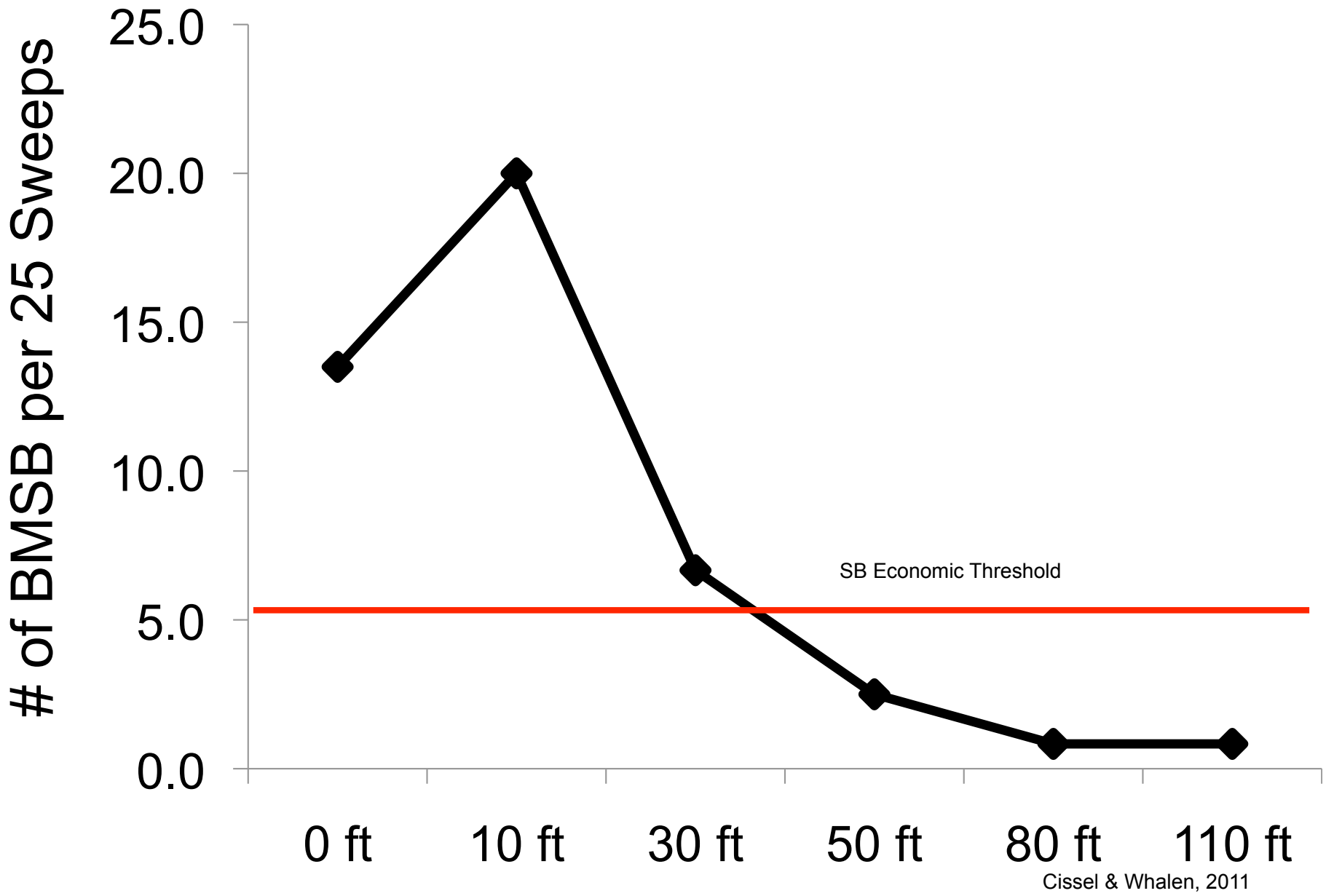

Undamaged, maturing
BMSB damaged, ‘stay-green’
Galen Dively

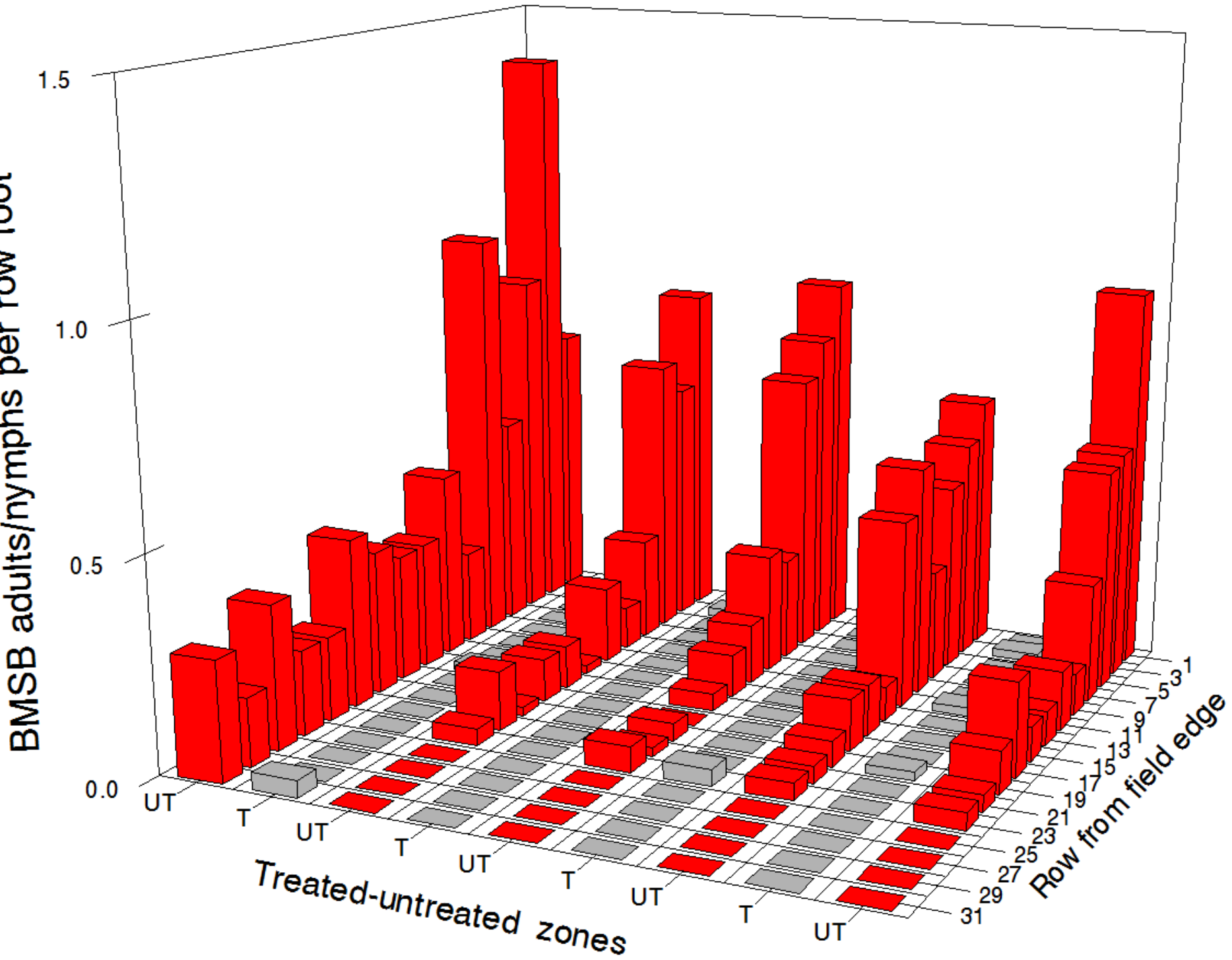

Seed weight and percentage of mature pods on 10 plants sampled at paired edge and interior sites of two soybean fields. 2010.
Field 1
Field 2
Interior
Edge
0
50
100
150
200
Seed weight (g) per 10 plants
Interior
Edge
0
25
50
75
100
Percent mature pods

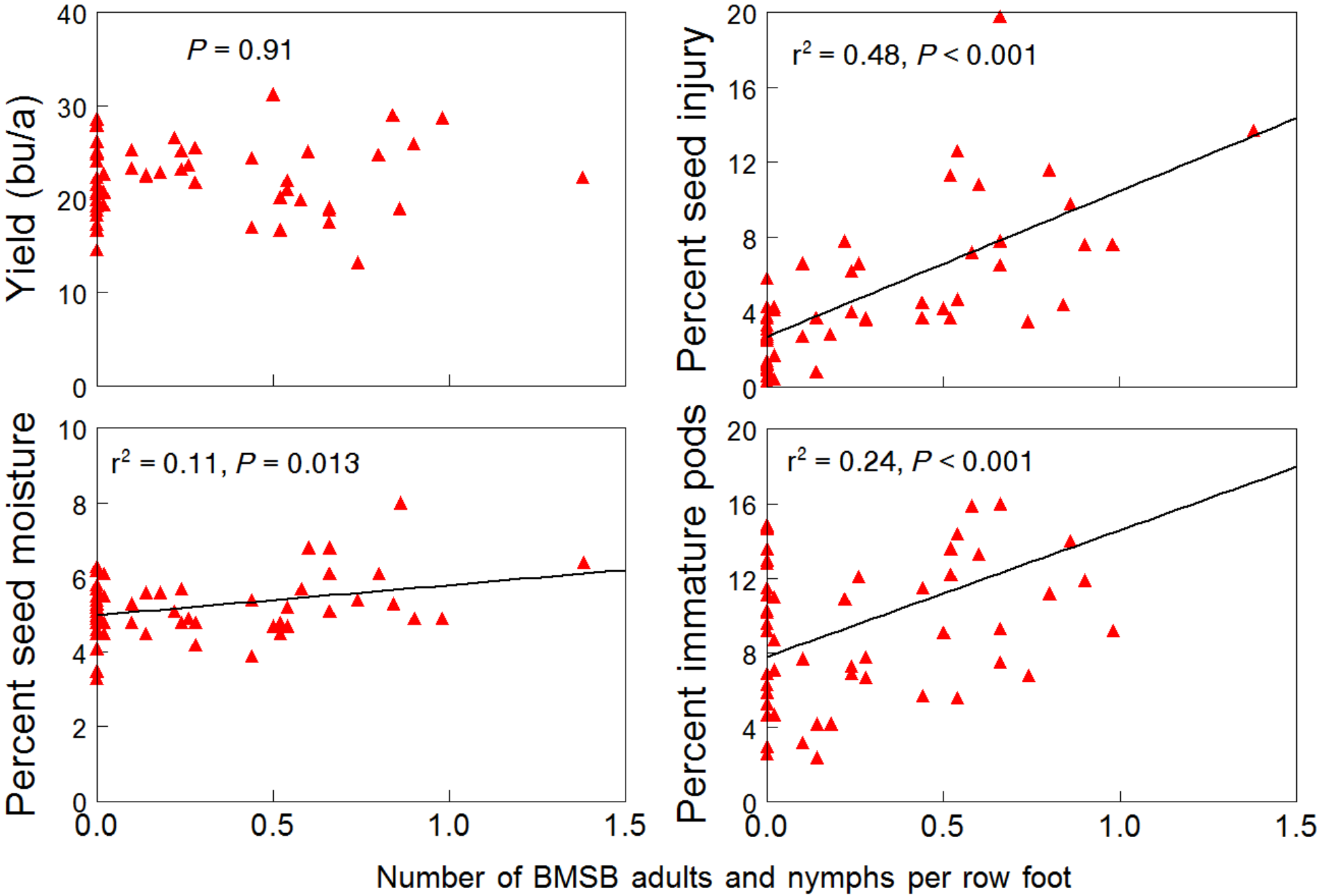
Seed weight at normal and delayed harvests from soybeans sampled across a gradient of BMSB-damaged rows from the field edge. 2010.



BMSB Soybean Field Infestation Gradient




BMSB adults/nymphs per row foot
1.5
1.0
0.5
0.0
UT
T
UT
T
UT
T
UT
T
UT
Treated-untreated zones
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
Row from field edge


Yield (bu/a)
P = 0.91
Percent seed injury
r² = 0.48, P < 0.001
Percent seed moisture
r² = 0.11, P = 0.013
Percent immature pods
r² = 0.24, P < 0.001
Number of BMSB adults and nymphs per row foot

Management recommendations for BMSB

- ❑ Use pheromone traps to monitor for BMSB activity and check field margins next to woodlots for first sign of invasion.

- ❑ Examine foliage and fruit structures for adults and nymphs; often found on top canopy in the morning.

- ❑ No specific treatment thresholds for BMSB.

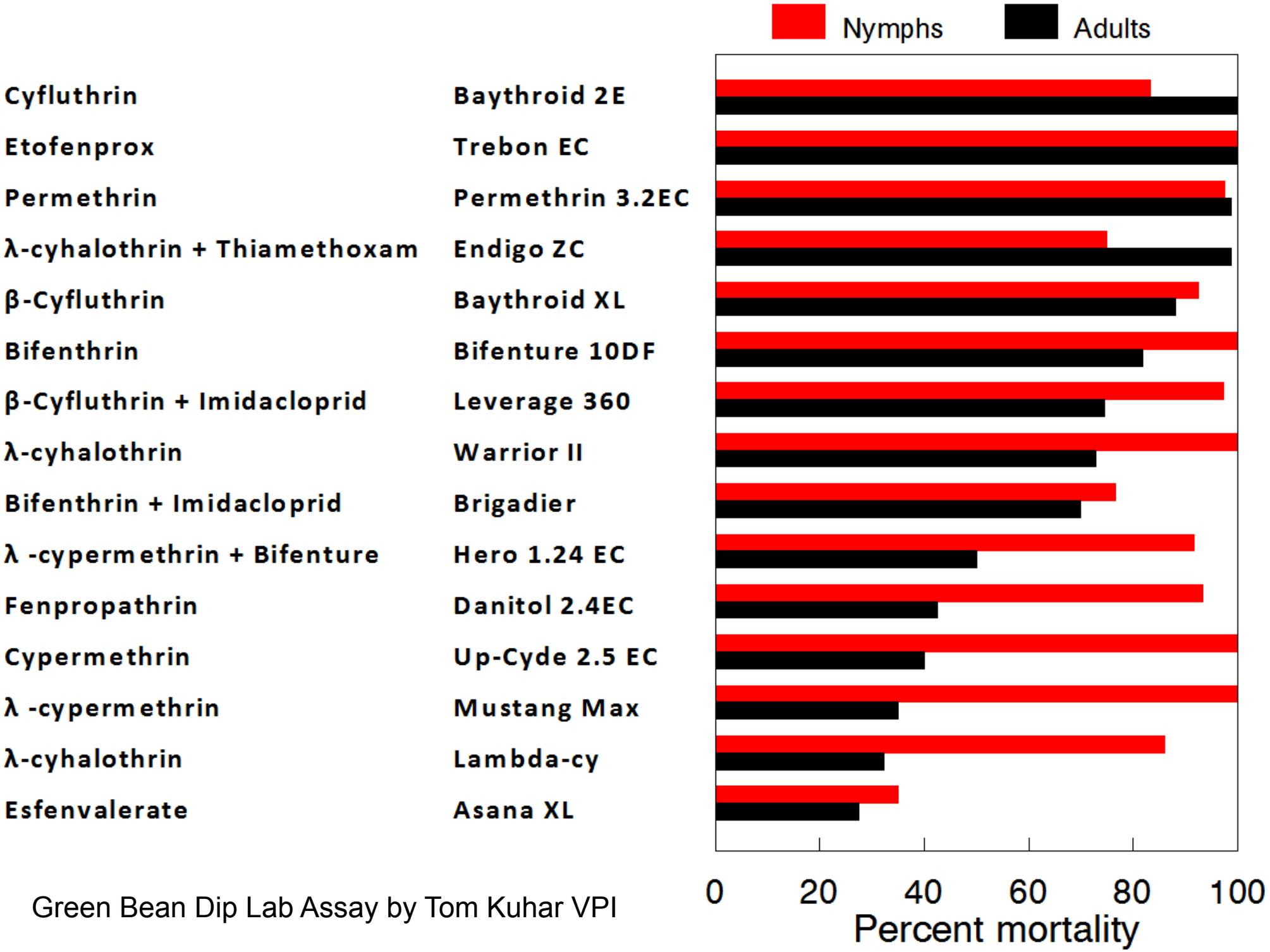
- ❑ Treat areas 30-50 ft around field edges next to woodlots.

- ❑ Additional applications may be necessary, if pressure is high and re-invasion occurs.

BMSB Management Tactics

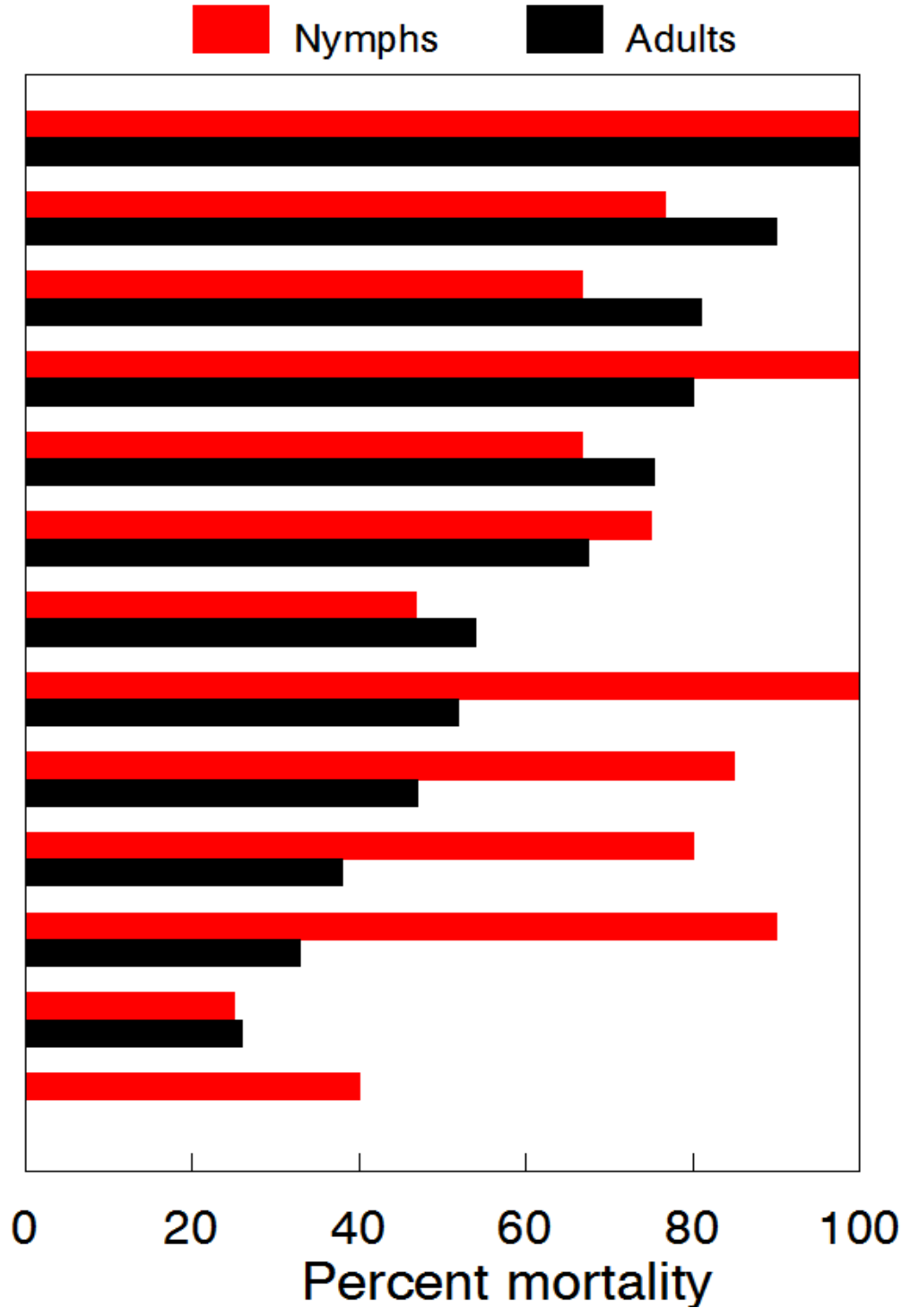
Insecticidal control

- Lab and field tests suggest that certain pyrethroids and neonicotinoids provide the best control.
- Disruptive to natural enemies, undermine IPM programs.
- Repeated use fosters outbreaks of secondary pests
- Depending on the crop, adult stink bugs sometimes recover after knocked down by pyrethroids
- Very hazardous to bees



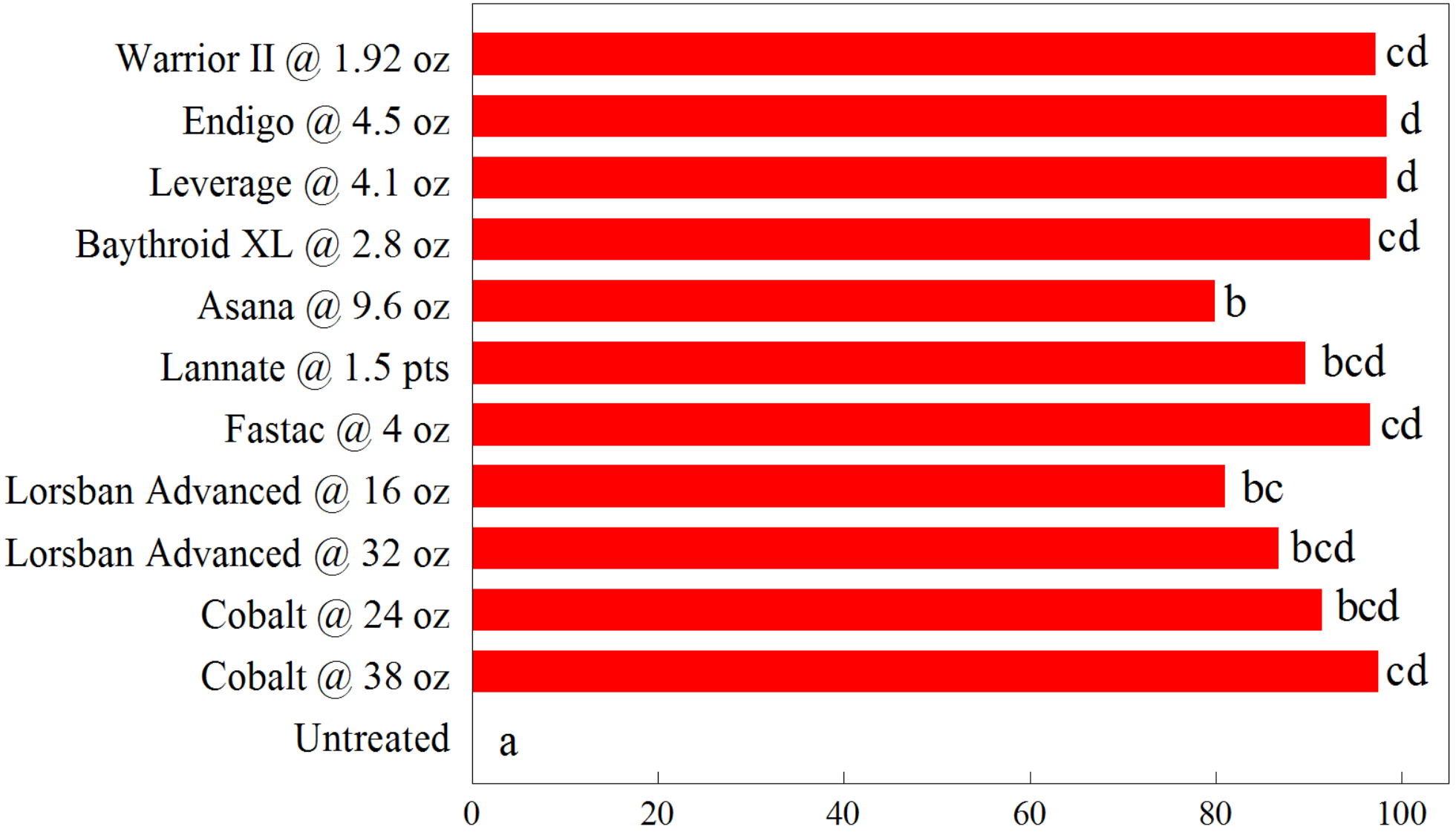
Green Bean Dip Lab Assay by Tom Kuhar VPI

Endosulfan	Thionex 3EC
Dinotefuran	Scorpion 3.24
Thiamethoxam	Actara 50WG
Dinotefuran	Venom 70SG
Methomyl	Lannate LV
Clothianidin	Belay
Thiacloprid	Calypso
Acephate	Acephate 97UP
Oxamyl	Vydate L
Carbaryl	Sevin XLR Plus
Acetamiprid	Assail 30SG
Imidacloprid	Provado 1.6F
Flubendiamide	Belt SC

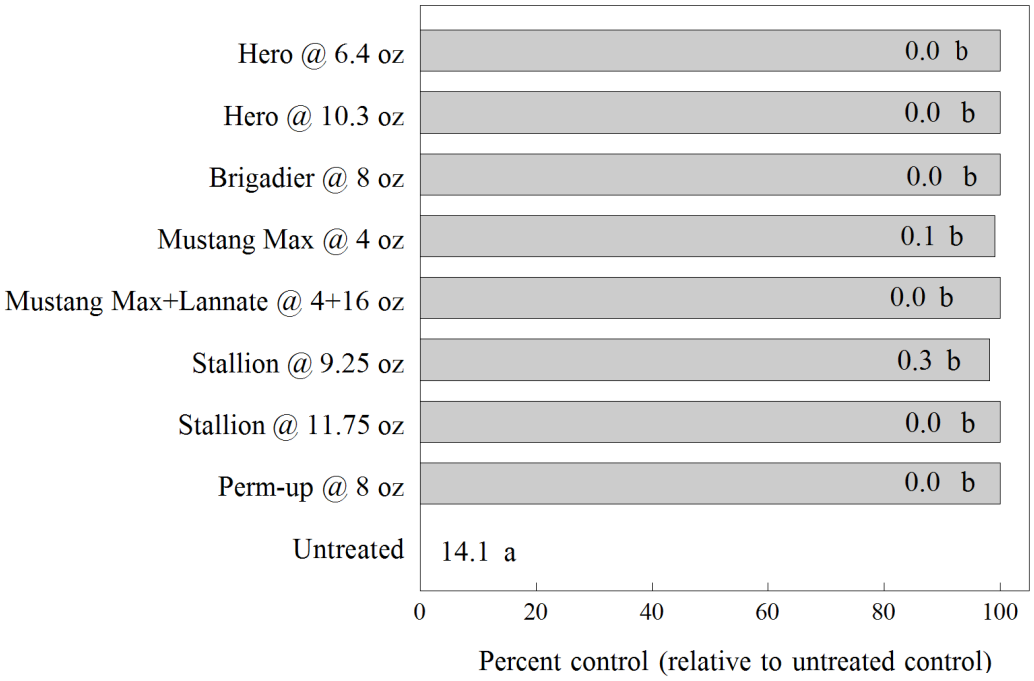


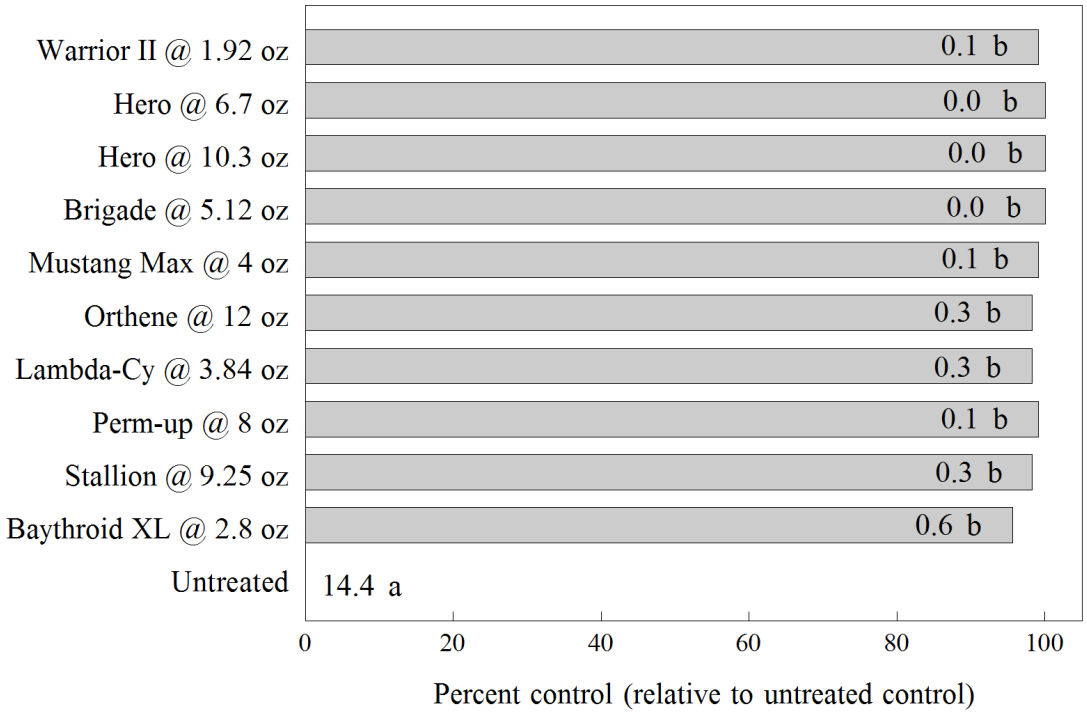
Green Bean Dip Lab Assay by Tom Kuhar VPI

Insecticide Efficacy Trial in Soybean – Beltsville, MD 2011



Dively and Patton
UMD, 2011


Hero @ 6.4 oz
0.0 b
Hero @ 10.3 oz
0.0 b
Brigadier @ 8 oz
0.0 b
Mustang Max @ 4 oz
0.1 b
Mustang Max+Lannate @ 4+16 oz
0.0 b
Stallion @ 9.25 oz
0.3 b
Stallion @ 11.75 oz
0.0 b
Perm-up @ 8 oz
0.0 b
Untreated
14.1 a
0
20
40
60
80
100
Percent control (relative to untreated control)


Warrior II @ 1.92 oz
0.1 b
Hero @ 6.7 oz
0.0 b
Hero @ 10.3 oz
0.0 b
Brigade @ 5.12 oz
0.0 b
Mustang Max @ 4 oz
0.1 b
Orthene @ 12 oz
0.3 b
Lambda-Cy @ 3.84 oz
0.3 b
Perm-up @ 8 oz
0.1 b
Stallion @ 9.25 oz
0.3 b
Baythroid XL @ 2.8 oz
0.6 b
Untreated
14.4 a
0
20
40
60
80
100
Percent control (relative to untreated control)

BMSB Management

Insecticidal control

- Lab and field tests suggest that certain pyrethroids and neonicotinoids have the most promise
- Disruptive to natural enemies, undermine IPM programs
- Repeated use fosters outbreaks of secondary pests
- Depending on the crop, adult stink bugs sometimes recover after knocked down by pyrethroids
- Very hazardous to bees

Biological control with parasitic wasps

Asian wasp (*Trissolcus*) kills 70% of the eggs

Four species introduced from Asia

USDA tests for impacts on native pentatomids

BMSB Management

Insecticidal control

- Lab and field tests suggest that certain pyrethroids and neonicotinoids have the most promise
- Disruptive to natural enemies, undermine IPM programs
- Repeated use fosters outbreaks of secondary pests
- Depending on the crop, adult stink bugs sometimes recover after knocked down by pyrethroids
- Very hazardous to bees

Biological control with parasitic wasps

Asian wasp (*Trissolcus*) kills 70% of the eggs

Four species introduced from Asia

USDA tests for impacts on native pentatomids

Cultural control

Trap crop with a highly preferred host plant

Placement of high risk crops away from woodlots

1. Determine the effects of nymphal and adult feeding on plant growth, seed quality and yield.

What soybean growth stage is most susceptible to injury? Does adult and nymphal feeding affect soybean production differently? What are the effects of delayed growth compared to pod injury on yield? What density and combination of BMSB life stages cause economic injury to soybeans?

2. Examine the spatiotemporal patterns of infestations in relation to surrounding woodlots, other crops, non-cropped areas, and dwellings.

How far do infestations extend into fields? What types of farmscapes surrounding soybean fields correlate positively with higher BMSB infestations? Can high-risk fields and points of adult invasion be identified based on surrounding landcapes?

3. Conduct surveys to determine the range of infestations in soybean fields in the mid-Atlantic region.

Is the range of BMSB infestations in soybeans expanding?

4. Evaluate effectiveness of perimeter treatments to prevent spread of infestations into fields.

Can insecticide treatments targeted against adults invading along field perimeters prevent further spread and colonization of fields?

5. Determine species composition of indigenous parasitoids and predators and rate of egg parasitization and predation for the BMSB.

Are indigenous natural enemies of native stink bugs attacking BMSB?