Whole-farm Organic Management of BMSB and Endemic Pentatomids Through Behavior-based Habitat Manipulation

Year 1 Update

USDA NIFA OREI

PD: Nielsen

RUTGERS
UNIVERSITY

OREI PI's

1. Rutgers University – Nielsen and Hamilton*
2. West Virginia University – Park and Kotcon
3. Redbud Farm- Mathews
4. University of Tennessee - Rogers
5. University of Kentucky - Bessin
6. University of Maryland – Hooks and Dively*
7. USDA – AFRS and BIIR – Leskey and Hoelmer*
8. Rodale Institute – Zinati
9. Michigan State University - Grieshop
10. University of Florida - Mizell
11. North Carolina State University – Walgenbach*
12. Ohio State University – Welty
13. Virginia Tech – Pfieffer*
14. *e*Organic – Stone

$ 2.67 million

3 years

The Threat of BMSB to Organic

- Relies on systems-level solutions
- Integration of tactics
- Biological control
- Synthetic chemicals are not available

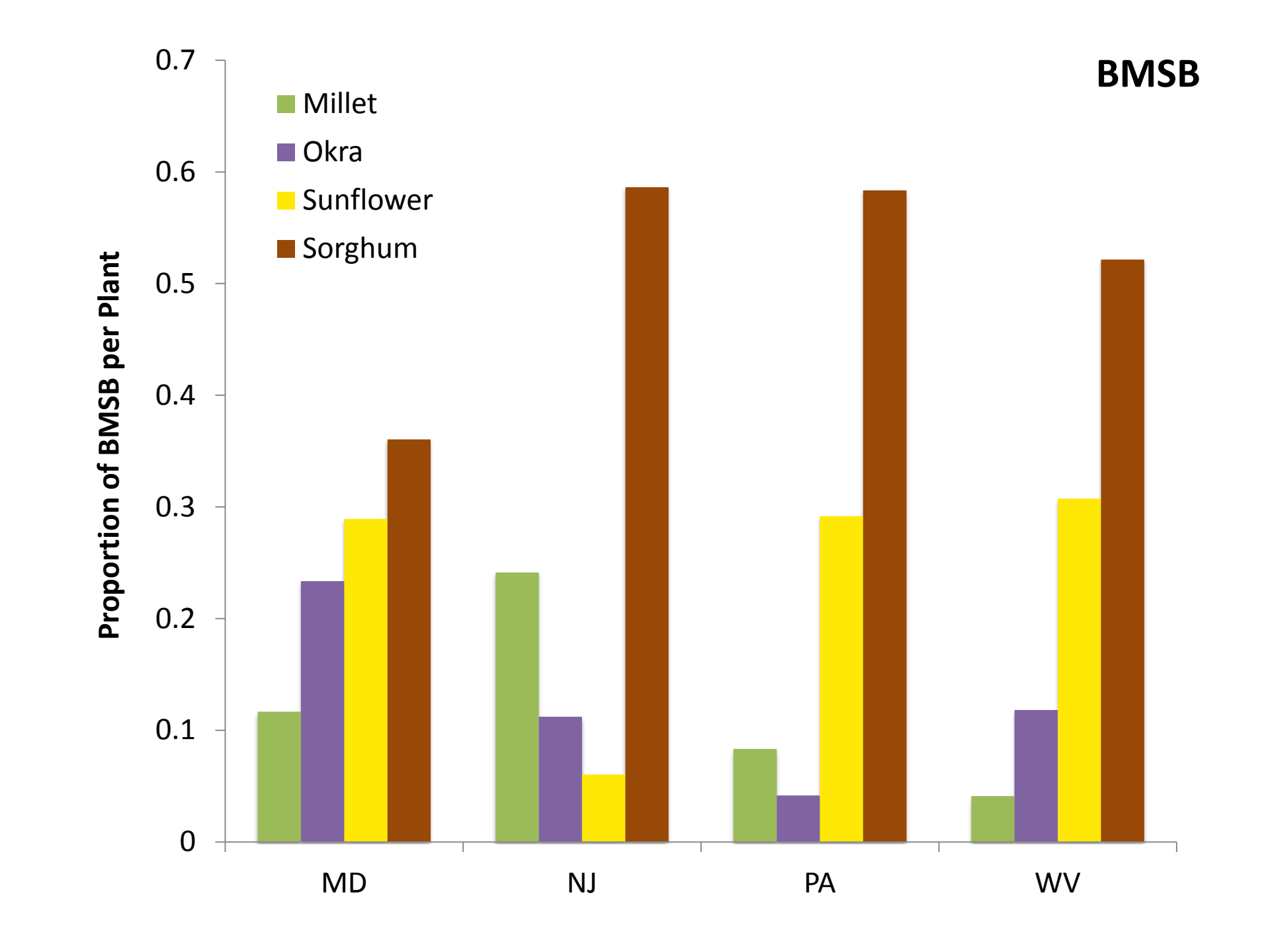
OREI Objectives

1. Trap crops
2. Dispersal and movement
3. Natural enemies
4. Integrated management
5. Extension and Outreach

Obj. 1 - Develop habitat manipulation tactics based upon how host plant phenology impacts BMSB preference and dispersal

- Identify top two candidate trap crops
  - Sunflower
  - Okra
  - Sweet Corn
  - Millet
  - Admiral Pea or Buckwheat


HEVROLET


BMSB
Millet
Okra
Sunflower
Sorghum
Proportion of BMSB per Plant
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
MD
NJ
PA
WV

	BMSB				Native			
	MD	WV	NJ	PA	MD	WV	NJ	PA
Millet	b	bc	ab	n/s	c	b	ab	n/s
Okra	ab	ab	ab	n/s	ab	a	b	n/s
Sunflower	ab	a	b	n/s	bc	a	a	n/s
Sorghum	a	a	a	n/s	a	ab	ab	n/s
Buckwheat		c				b		
P-value	0.046	<0.001	0.020	0.075	0.006	<0.001	0.018	0.568

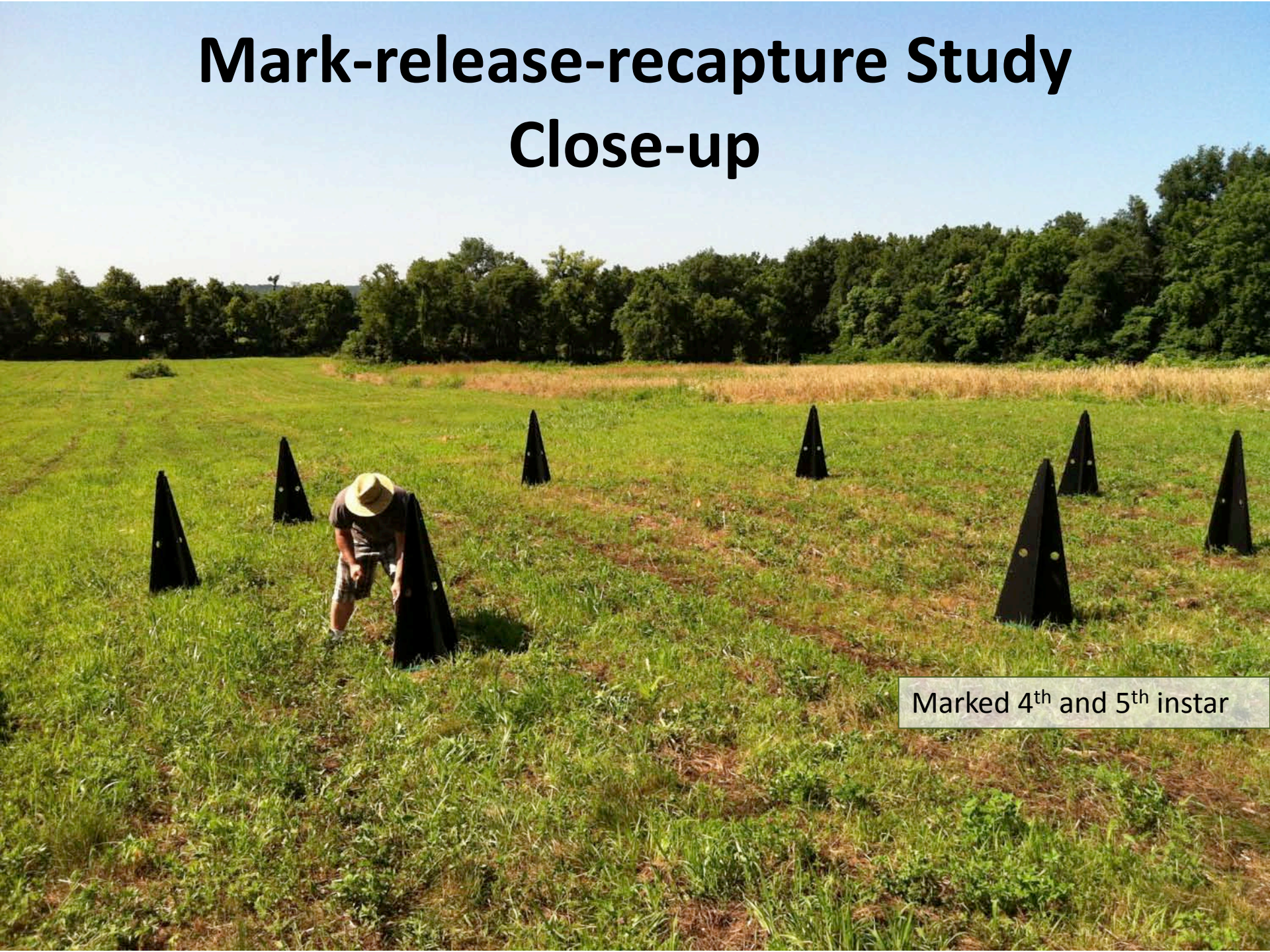
Means and SEM not shown. Different letters within column indicate significance at $P<0.05$. Tukey's HSD test.

Obj 2. - Determine biotic and abiotic factors affecting adult and juvenile BMSB whole-farm movement

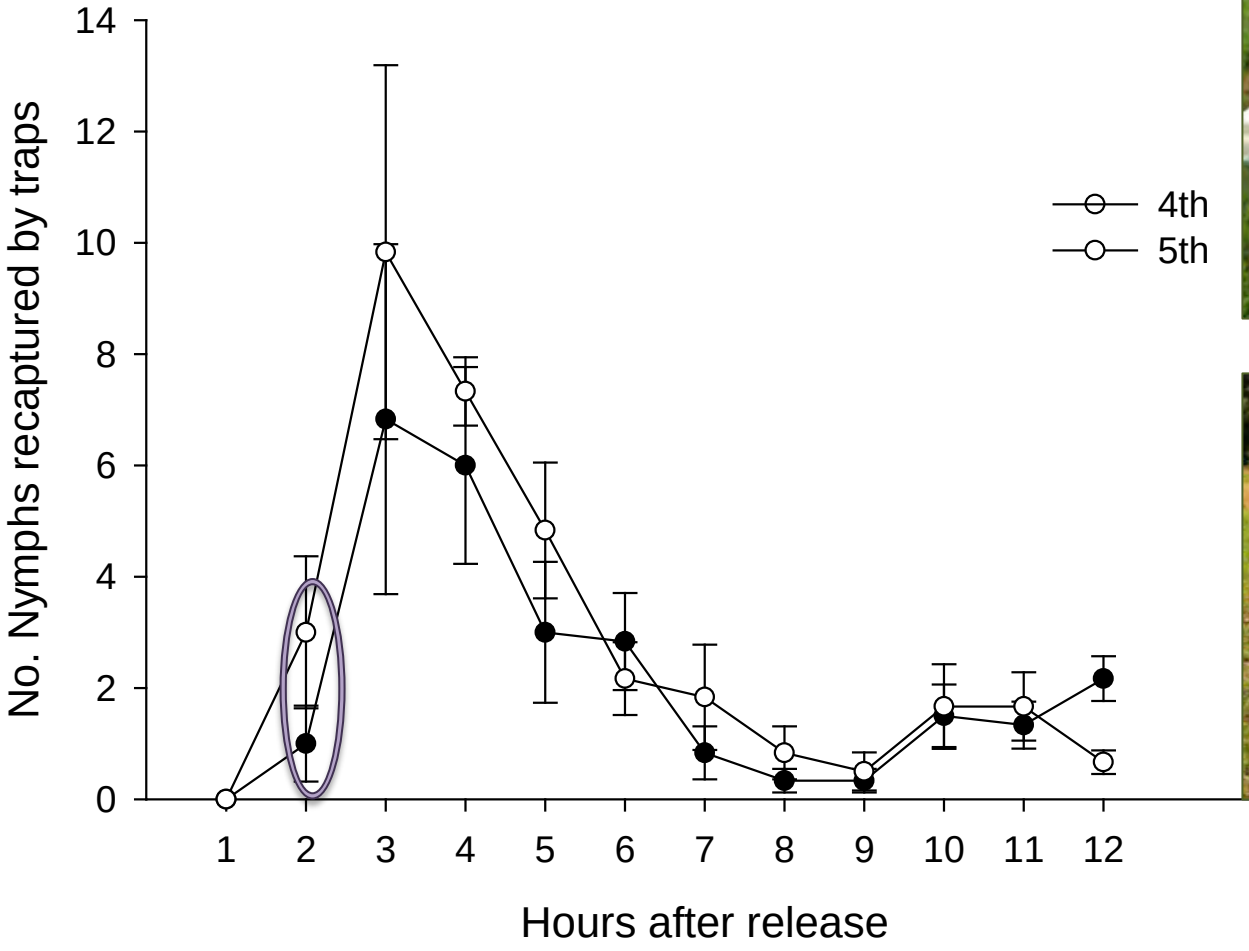
- Patterns of within-farm movement
  - Whole-farm sampling to establish colonization sequence

- Dispersal behavior of nymphs
  - Lab and field dispersal capacity
  - Field nymphal host plant choice

Mark-release-recapture Study Close-up

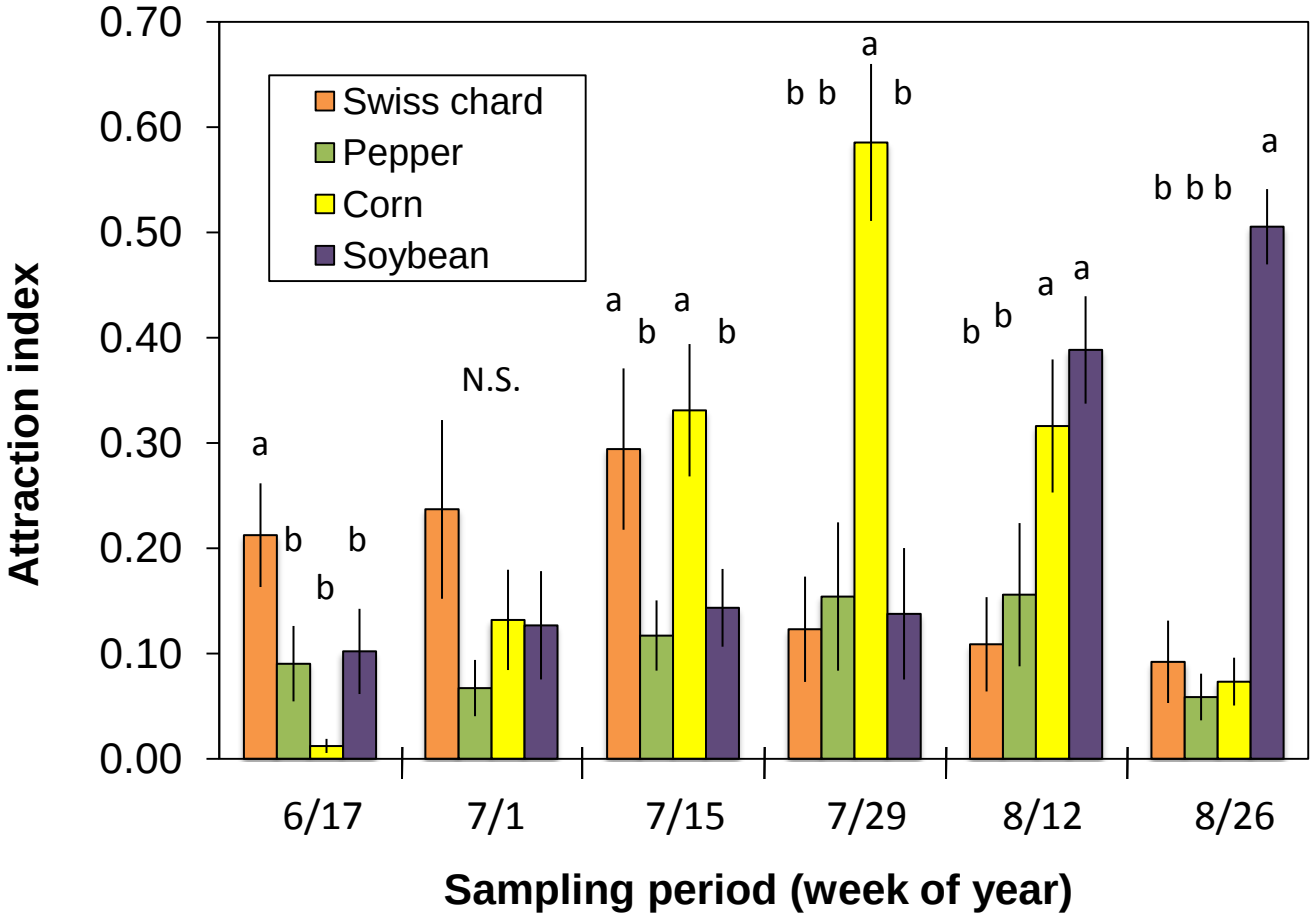


Time to Recapture



Nymphal Host Choice in the Field

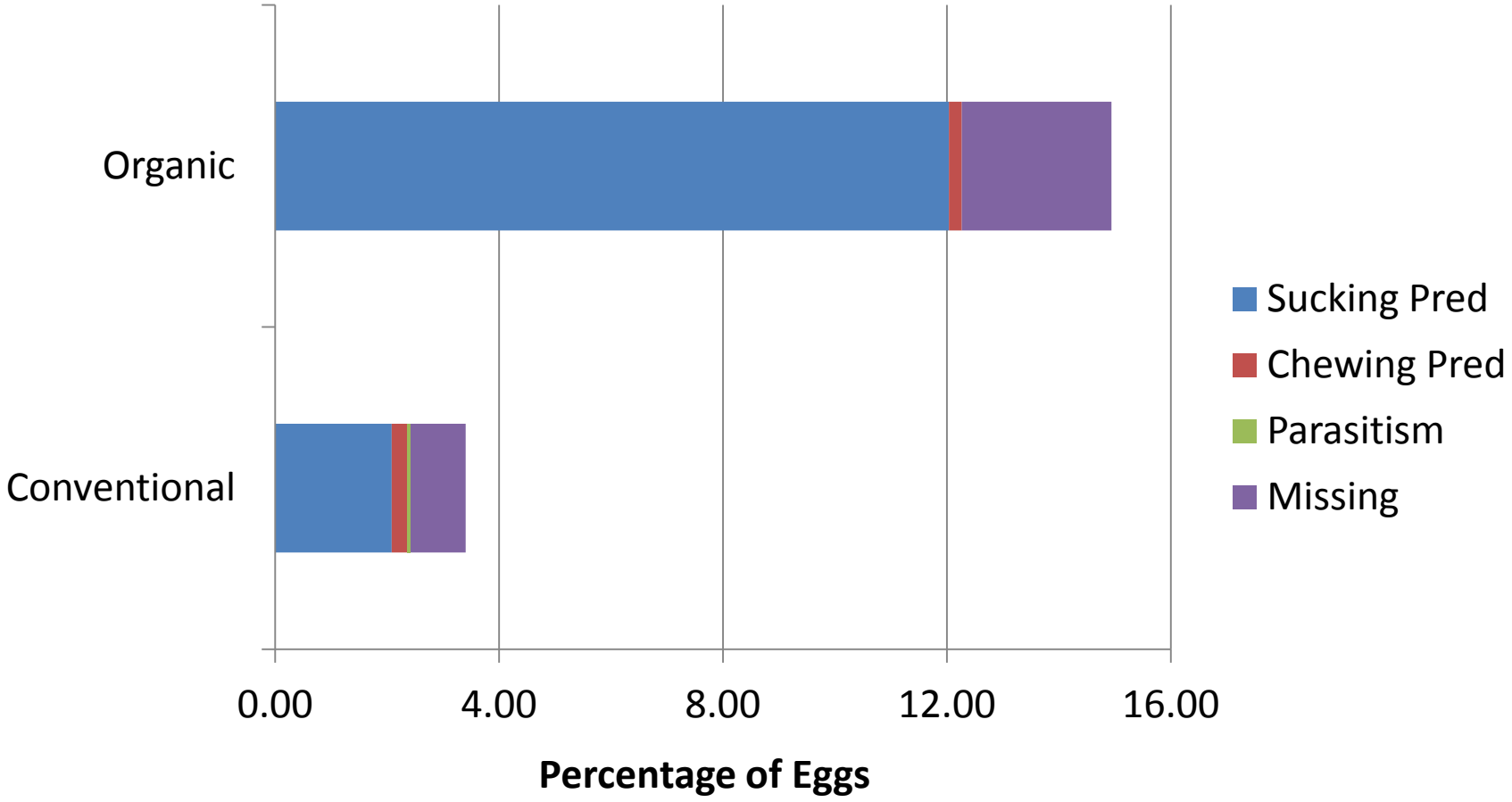
Host plant attraction changes throughout the season



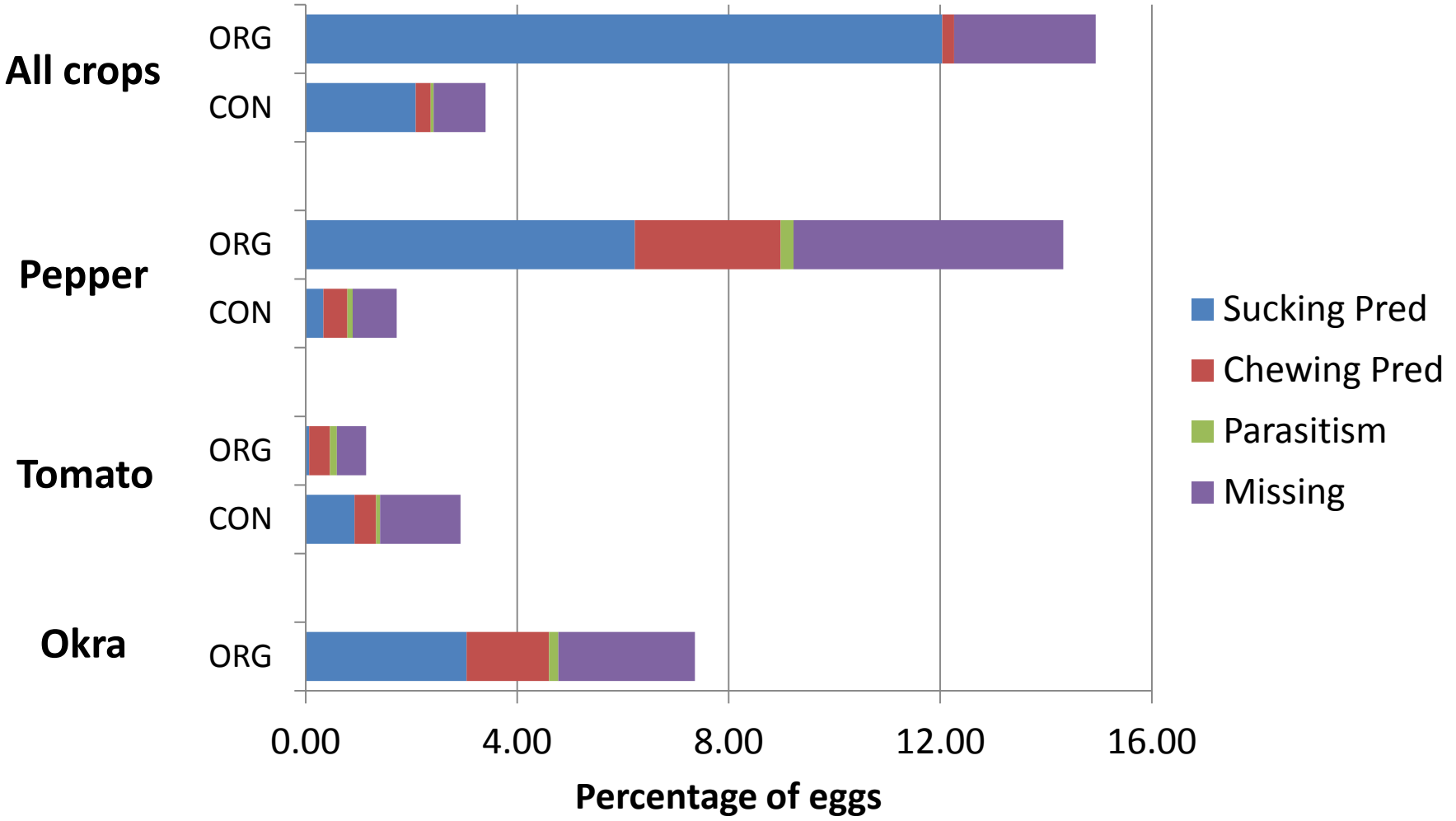
Obj. 3 - Determine the identity and importance of extant natural enemies of stink bugs and their impact on BMSB populations

- Impact of natural enemies
- Impact of trap crops on natural enemies
- Potential of insectary plants to enhance mortality
- Impact of organic insecticides on natural enemies

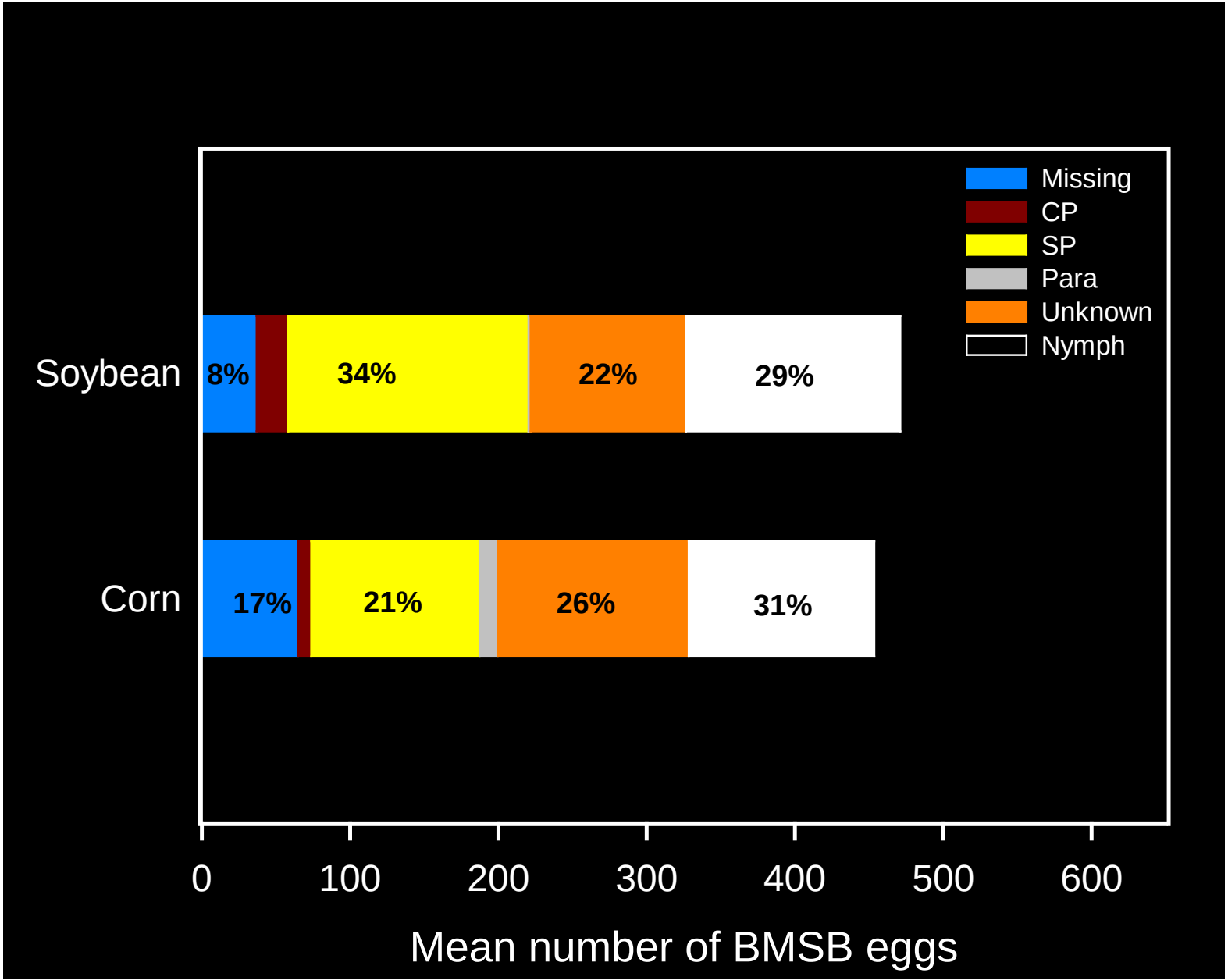
NC Biocontrol Survey in Apple (Fresh + Frozen Eggs)



NC Biocontrol Survey (Fresh + Frozen Eggs)

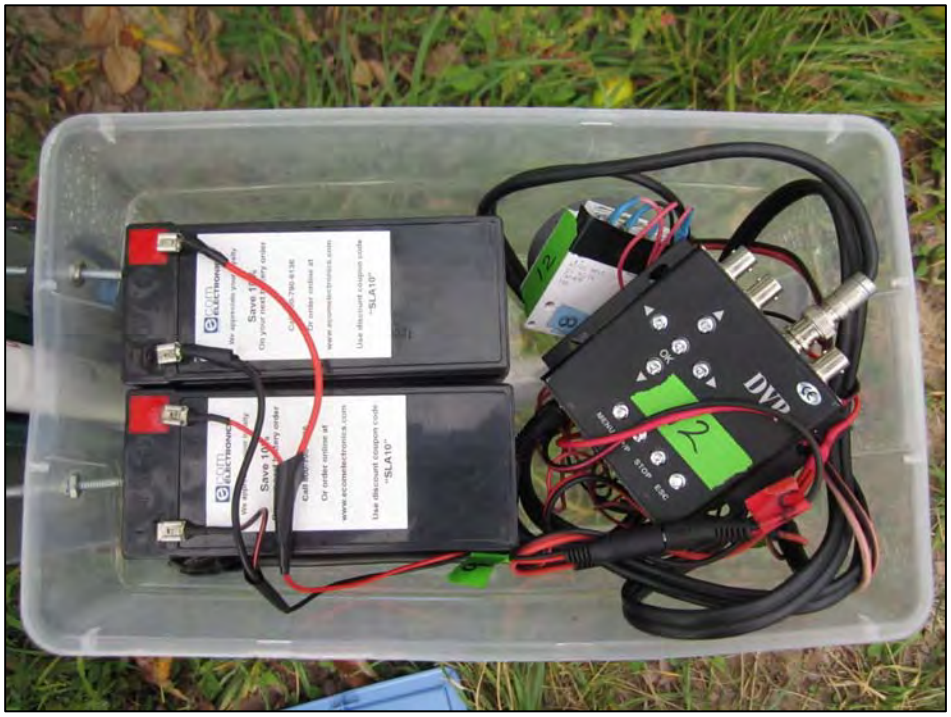


MD Biocontrol Survey

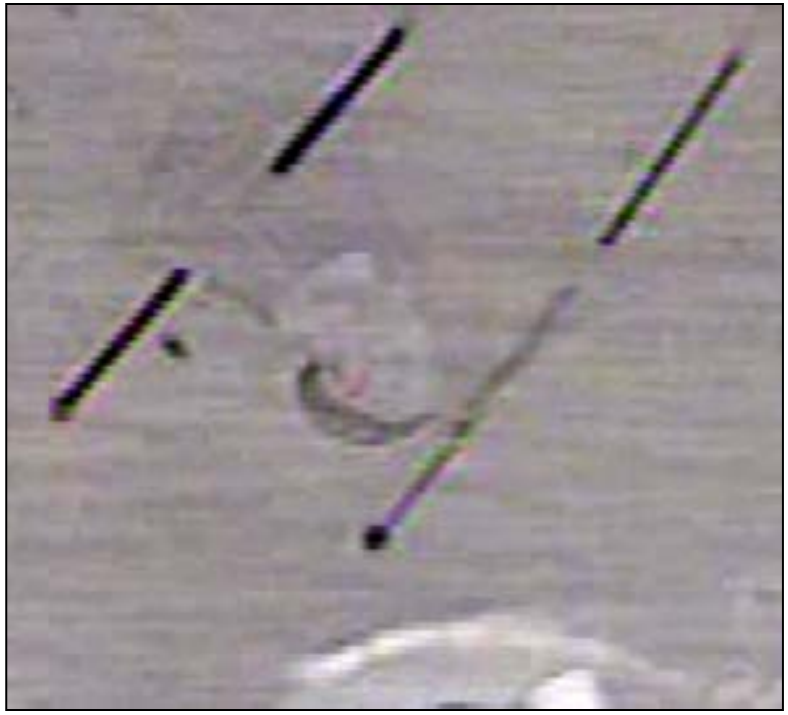


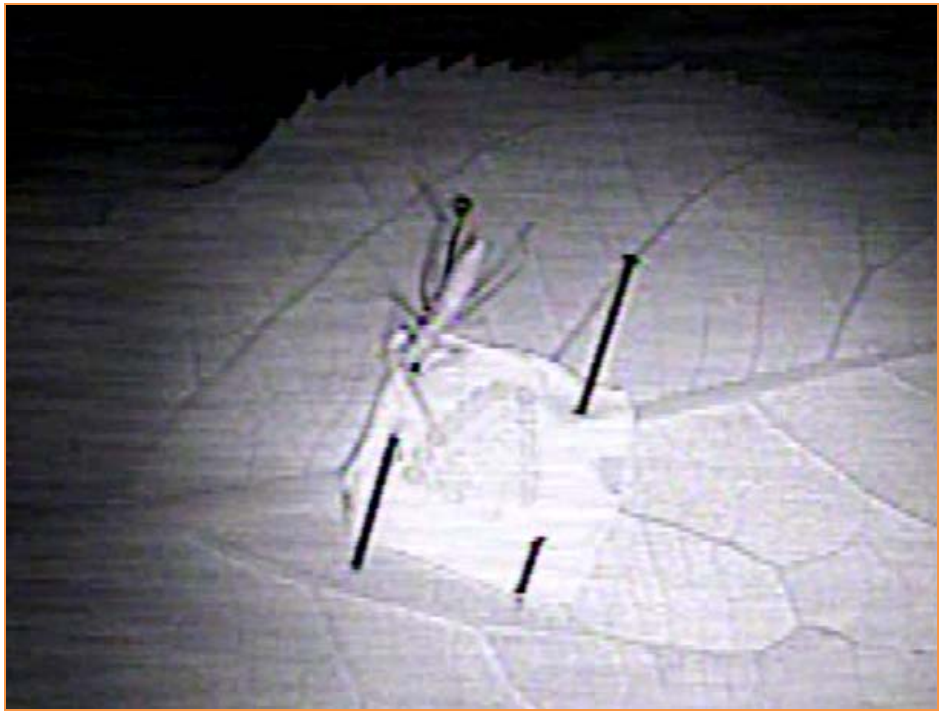
MI and NJ Biocontrol Surveys

Surveillance Methods



Diel Rhythm of Observed Natural Enemies



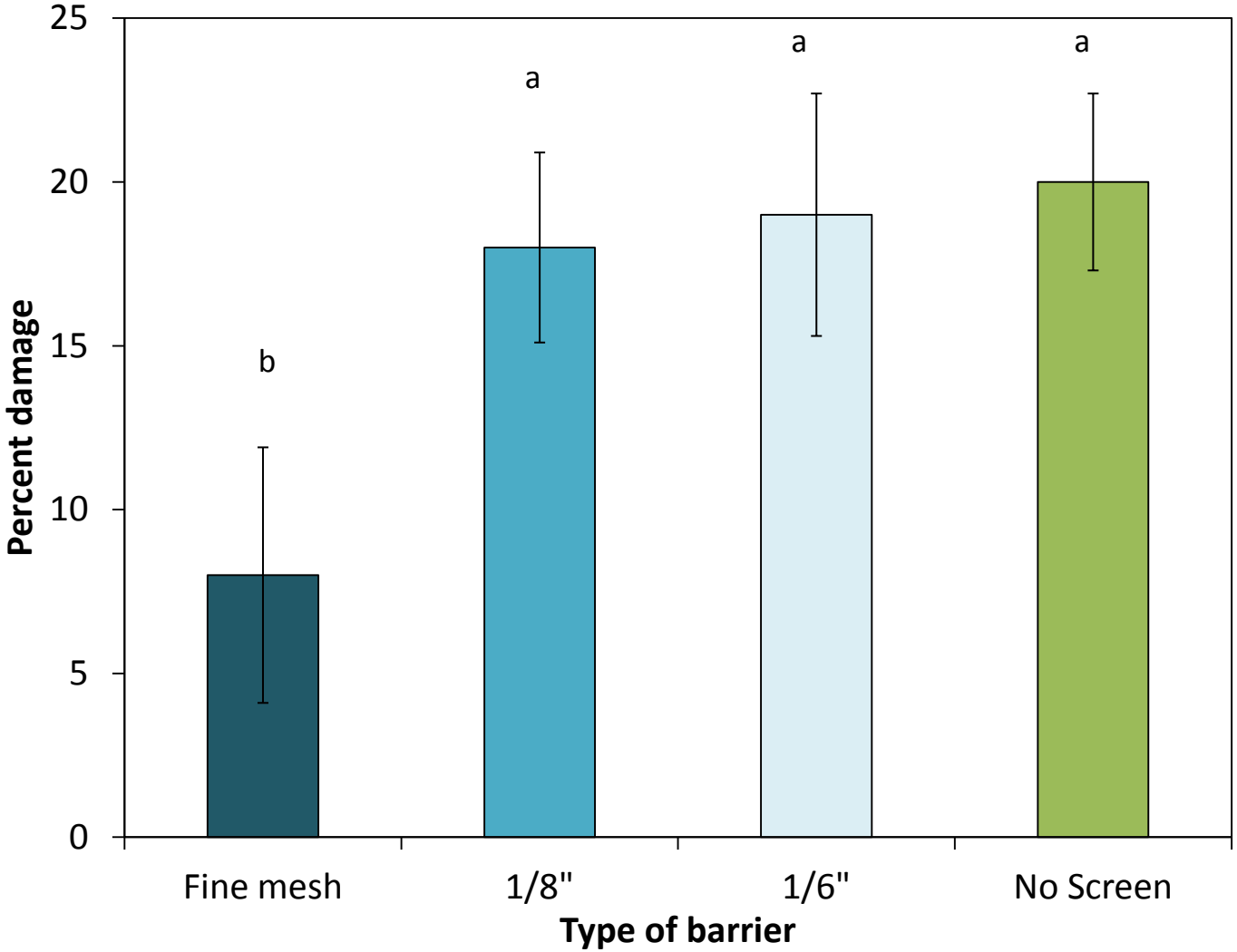


In Michigan, 63% of visits occurred at night

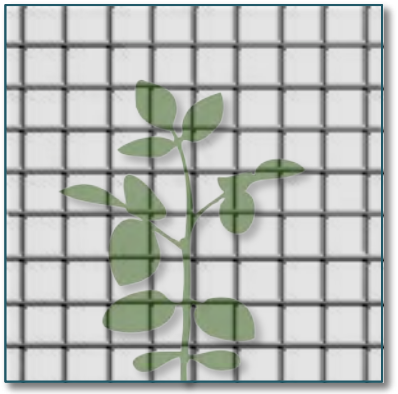
Obj. 4 - Evaluate integrated management plans for BMSB and endemic stink bugs specific to organic production systems

- Barrier fabrics for cultural control
- Integrated organic management in final year

Fewer stink bugs led to decreased pepper damage

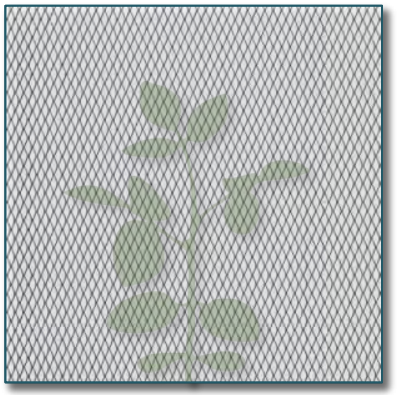


1/6th inch



1/8th inch

Fine mesh



Obj. 5 Extension and Outreach

- Web-based materials
- On-farm demonstrations
- Field day at each cooperating farmer site
- Traditional extension materials
- Rodale Institute
- *e*Organic partnership
- Project evaluation at ‘integrated’ farms