

Refinement of the BMSB Pheromone-Baited Trap



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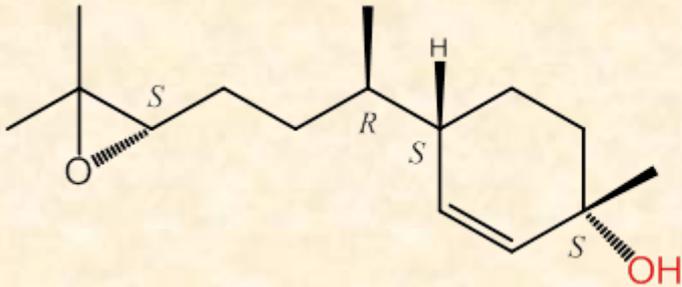


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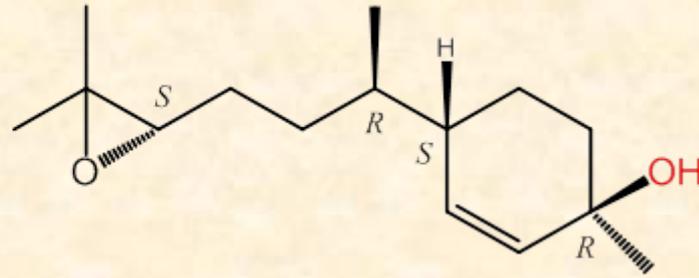


Two-Component BMSB Aggregation Pheromone and Synergist

Main component of BMSB aggregation pheromone
(3*S*,6*S*,7*R*,10*S*)-10,11-epoxy-1-bisabolen-3-ol

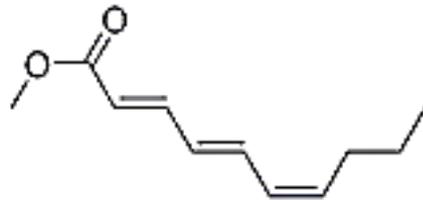


Minor component of BMSB aggregation pheromone
(3*R*,6*S*,7*R*,10*S*)-10,11-epoxy-1-bisabolen-3-ol



+

Methyl (*E,E,Z*)-2,4,6-decatrienoate (MDT) acts as a synergist for BMSB pheromone



Season-long attraction

=

Synergism

Standard Pyramid Trap



- Visual Stimulus
 - Large black pyramid (trunk-mimicking stimulus)
- Olfactory Stimulus
 - PHER + MDT
- Capture Mechanism
 - Tapered pyramid attached to inverted funnel jar with DDVP kill strip
- Deployment Strategy
 - Traps placed in peripheral row or border area

Can we make trapping simpler for growers?

- Can we develop a more user-friendly trap design that is comparably effective to the standard pyramid trap?
- What is the most effective lure type and formulation?
- What is the most effective deployment strategy?
- How can we further refine the use of this trap?

Standard Pyramid vs. Clear Sticky Trap



Pyramid Trap



Sticky Trap (Double-sided)

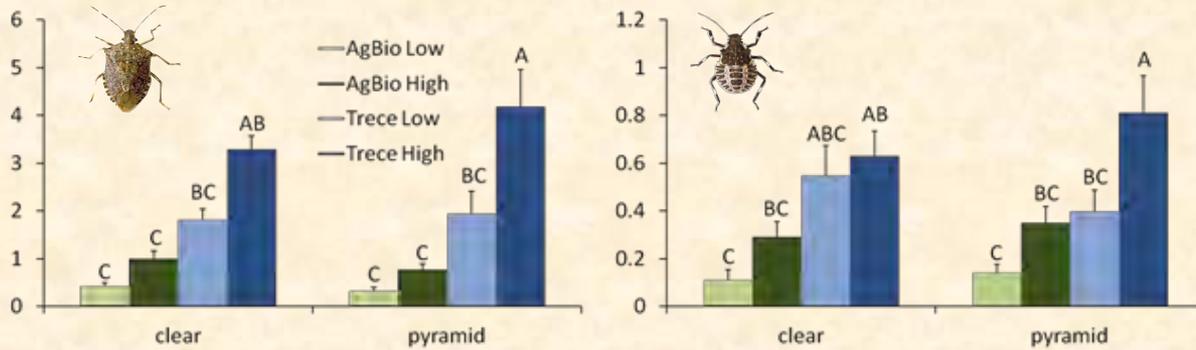
- 2 companies, Trece and AgBio, formulated lures.
 - Low dose (1x, 5mg PHER/50 mg MDT)
 - High dose (4x, 20 mg PHER/200 mg MDT)
- Measured season-long captures at 12 sites in WV, MD and VA.

Adults

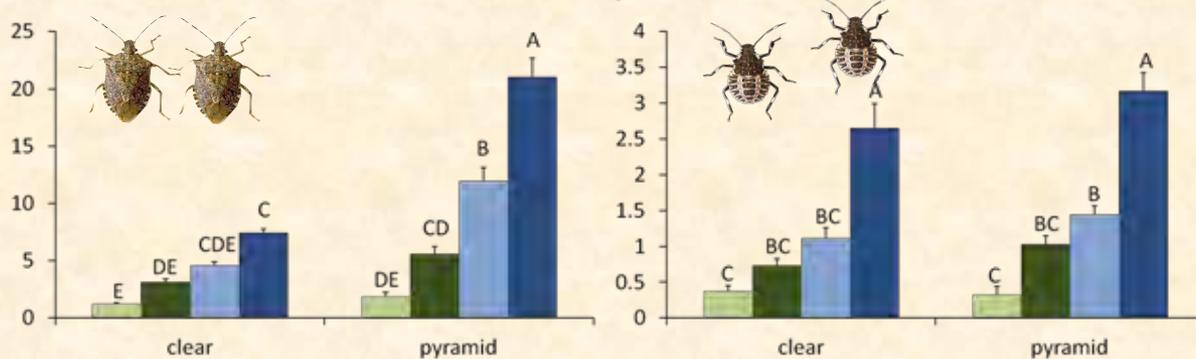
Nymphs

Mean Weekly Trap Capture of *H. halys* (\pm SE)

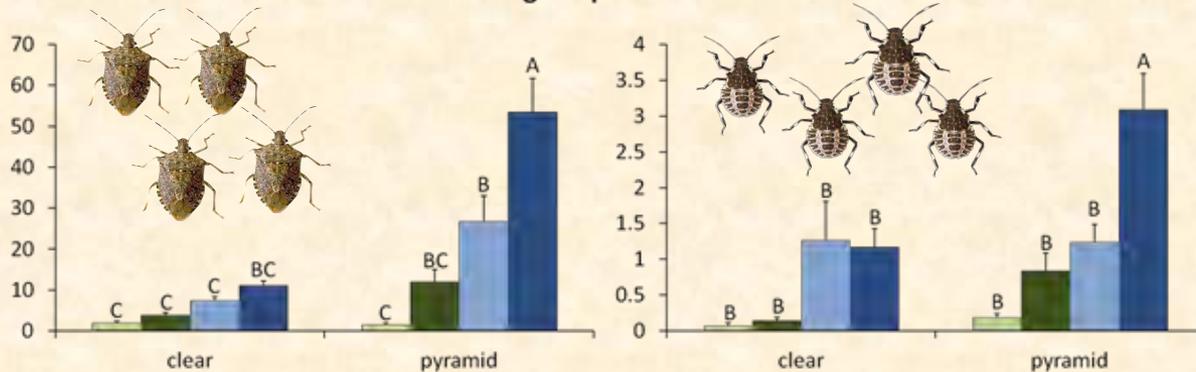
Low Population Pressure



Medium Population Pressure



High Population Pressure



Trap Type

- Trece lures outperformed AgBio lures.
- The higher the dose, the higher the captures.
- Low populations: Captures were the same between sticky and pyramid traps.
- High populations: Captures in pyramid traps were higher than sticky cards.

Strong positive correlations between pyramid and sticky trap captures at all population levels using the most effective lures.



Table 1. Pearson correlation coefficients between captures of *H. halys* in pyramid traps compared to clear sticky cards under low, medium, and high population pressure

Population Pressure		Adults				Nymphs		
		r	df	P		r	df	P
<i>Trece Low</i>								
Low		0.777	37	0.0001		0.883	37	0.0001
Med		0.617	158	0.0001		0.499	158	0.0001
High		0.663	40	0.0001		0.414	40	0.007
<i>Trece High</i>								
Low		0.740	37	0.0001		0.703	37	0.0001
Med		0.528	158	0.0001		0.462	158	0.0001
High		0.673	40	0.0001		0.322	40	0.04

Strong positive correlations between sticky trap captures baited with low and high pheromone doses.



Table 2. Pearson correlation coefficients between captures of *H. halys* on clear sticky cards baited with Trece Low and Trece High under low, medium, and high population pressure

Population Pressure	Adults			Nymphs		
	r	df	P	r	df	P
Low	0.804	18	0.0001	0.438	18	0.0001
Med	0.956	18	0.0001	0.812	18	0.0001
High	0.931	18	0.0001	0.770	18	0.007

What is the most effective deployment strategy for the sticky trap?



Hanging



Single-sided **Double-sided**



Staked

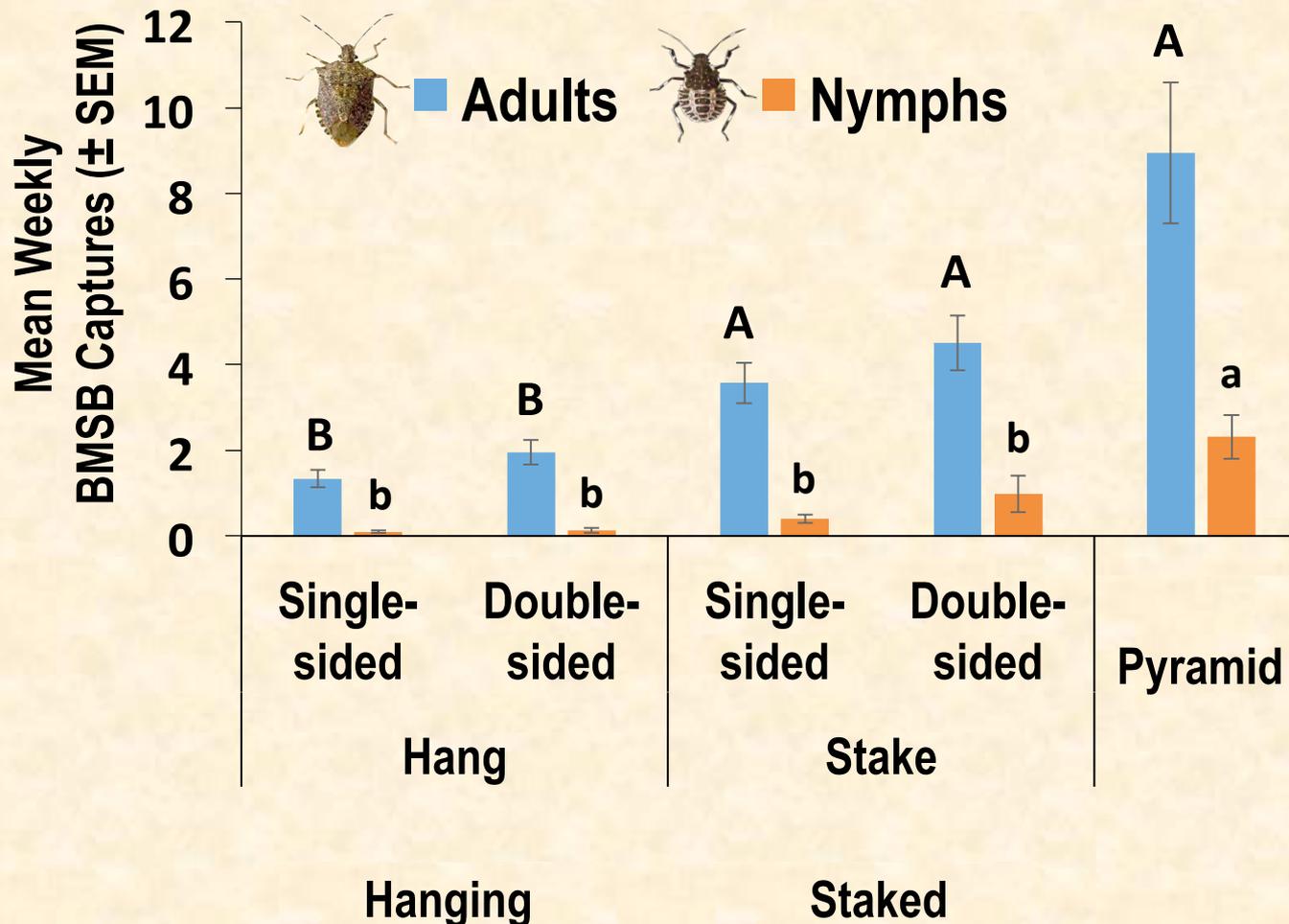


Single-sided **Double-sided**



Pyramid

Season-Long Captures



- Captures in pyramid traps and sticky traps on stakes were the same.
- More bugs were captured on sticky traps on stakes than hung sticky traps.
- No difference in captures between single- vs double-sided sticky traps.

Key Components of the BMSB Sticky Card as a Monitoring Trap



- Visual Stimulus
 - Upright wooden post
- Olfactory Stimulus
 - Trece (1x) low dose
- Capture Mechanism
 - Single-sided sticky card
- Deployment Strategy
 - Card attached to top of post
 - Deployed in border regions between wild host habitat and agricultural production area

Can we further refine the sticky trap to increase efficacy?

- What is the effect of blockage on the sticky card effectiveness?
- Is there an effect of card age on the effectiveness of the sticky cards?
- What is the most effective glue?

What is the effect of blockage on the sticky card effectiveness?

- Do the capture rates of sticky cards with 0%, 25%, 50% and 75% blockage differ?
- Does the type of blocking material (flat, non-living vs 3-D, dead) affect the capture rates?



Flat and non-living
blocking materials:

- Dust
- Small particles

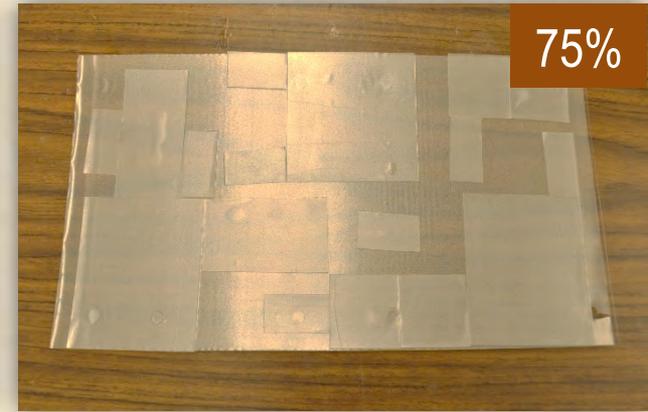
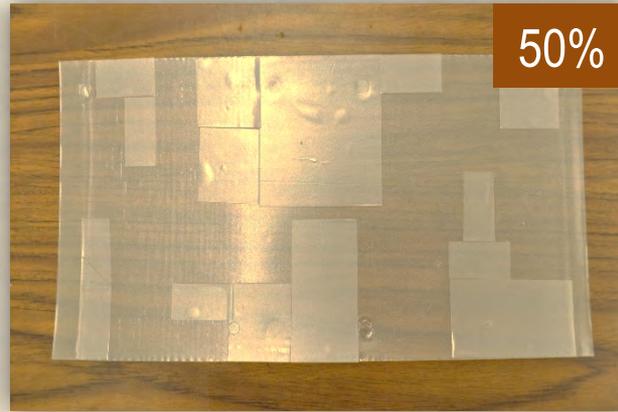
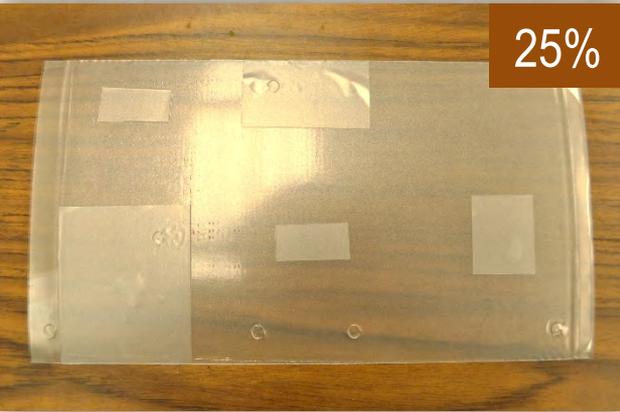
3-D and dead
blocking materials:

- Insects
- Other arthropods



Methodology

Paper-Occluded Cards (Flat, Non-living)



Cricket-Occluded Cards (3-D, Dead)

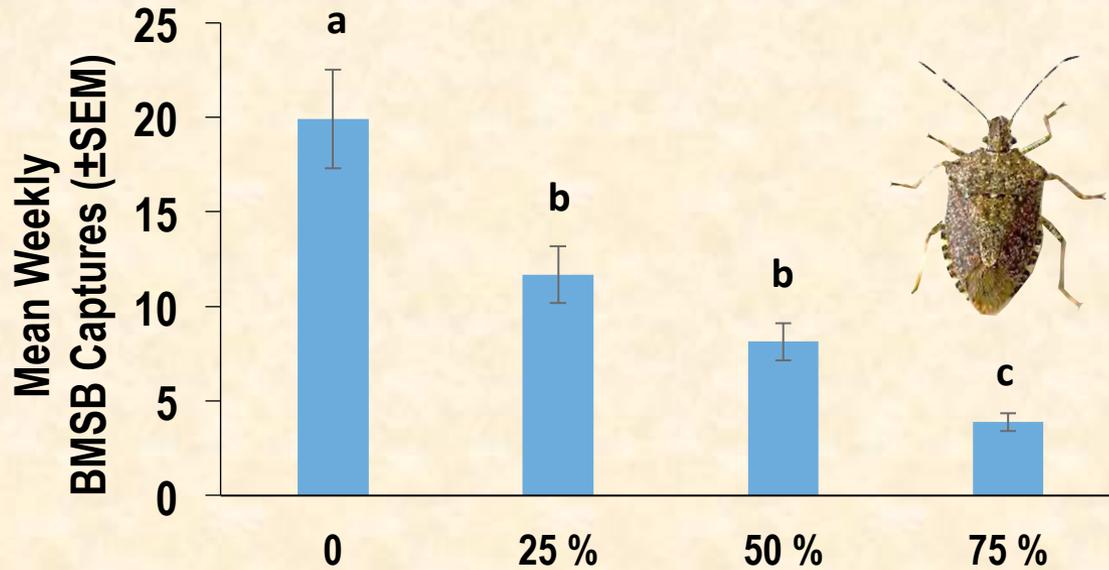


Methodology

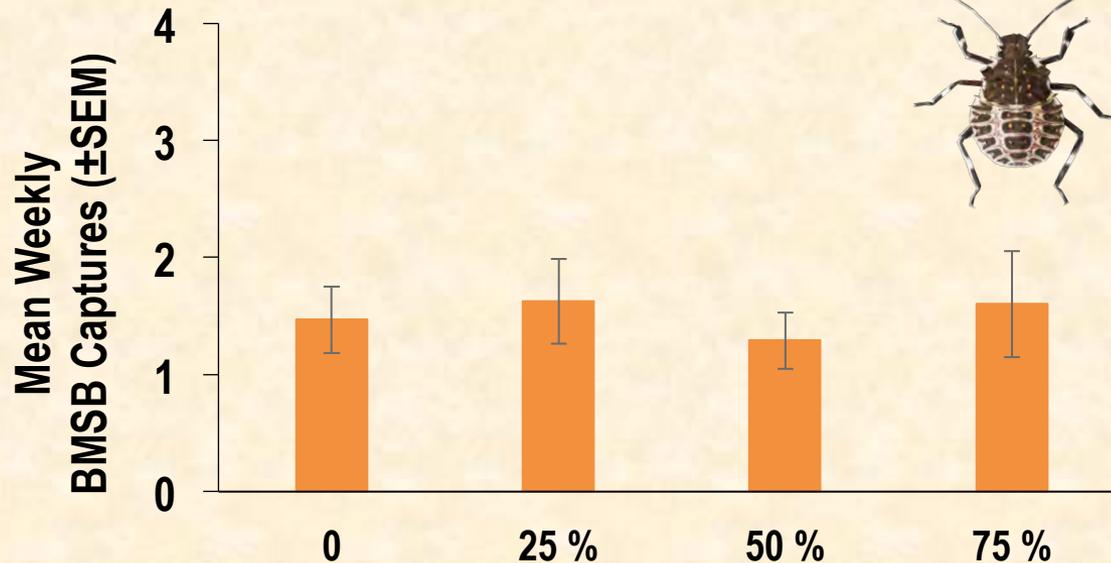


- Cards deployed for one week at 6 different sites (3 sites for paper cards and 3 sites for cricket cards).
- Unblocked cards served as control.
- Trapping period: Aug. 22 – Sept. 27, 2017

Paper Occlusion Results

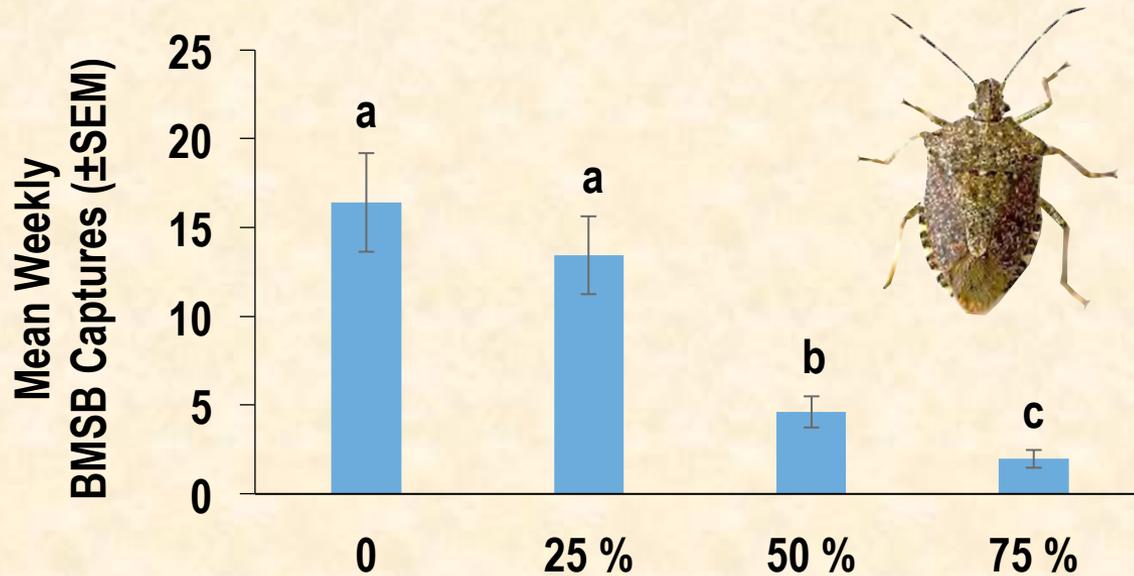


- 25% & 50% blocked cards captured less adults than unblocked cards.
- 75% blocked cards captured the least adults.

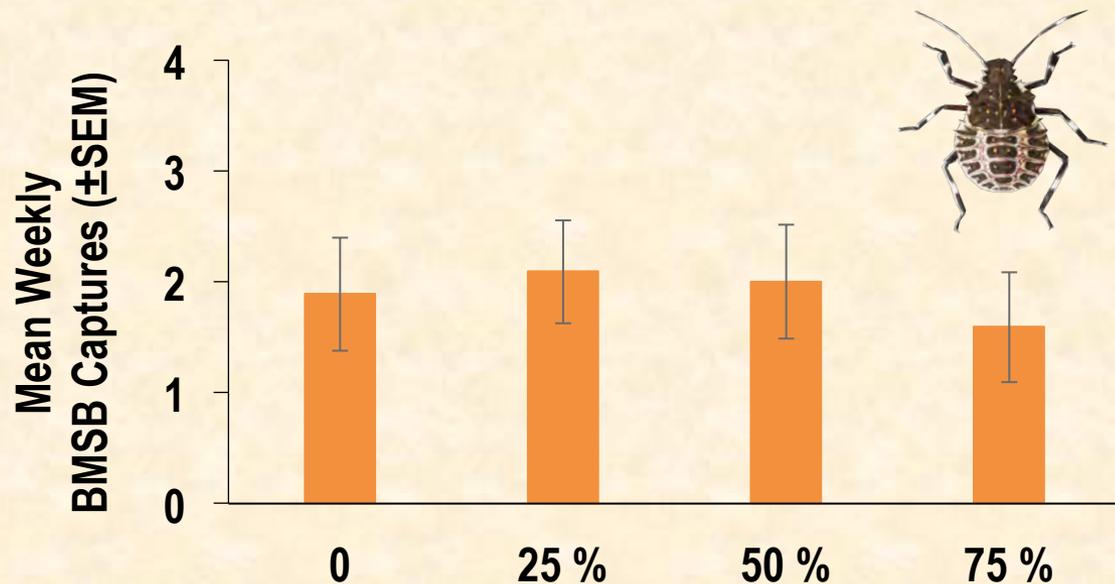


- No difference in the nymphal captures among cards with different levels of blockage.

Cricket Occlusion Results



- 50% and 75% blocked cards captured less adults than 25% and unblocked cards.



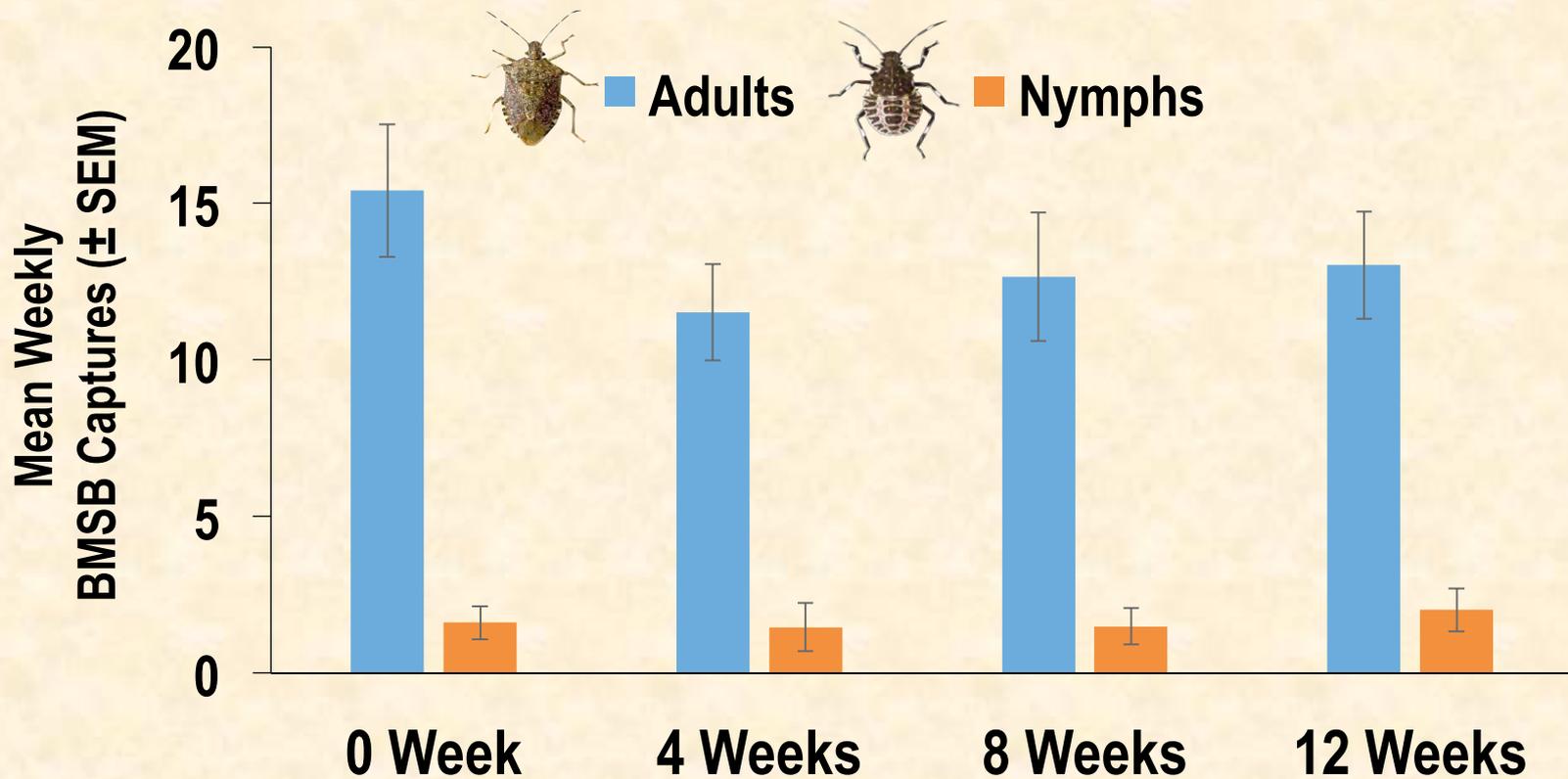
- No difference in the nymphal captures among cards with different levels of blockage.

What is the effect of card age on the effectiveness of the sticky cards?

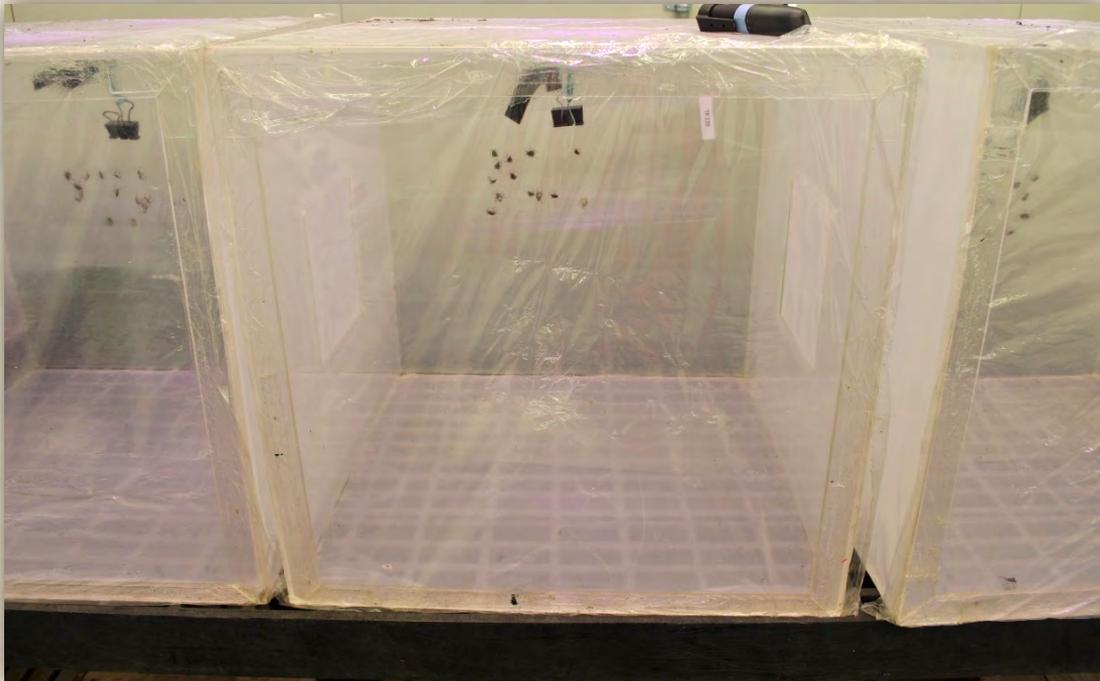
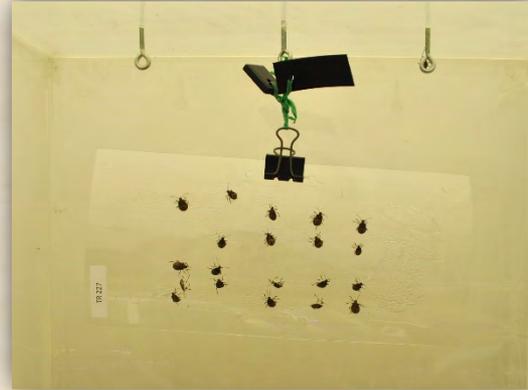
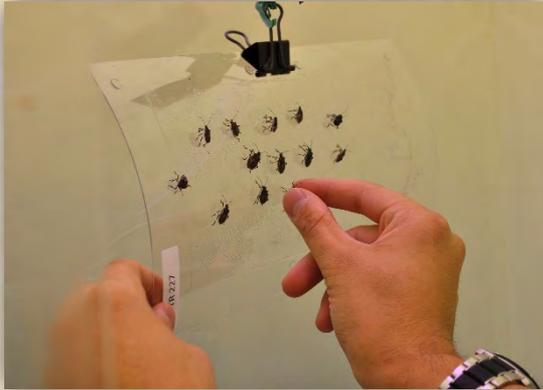


- Cards were aged inside an environmental chamber with standardized exposure to UV light and rainfall
- Age treatments:
0 Week, 4 week, 8 week and 12 weeks
- Cards deployed for one week at 3 different sites (3 reps at each site).
- Trapping period:
Aug. 21 – Sept. 14, 2017

No differences in the BMSB captures among different aged sticky cards.

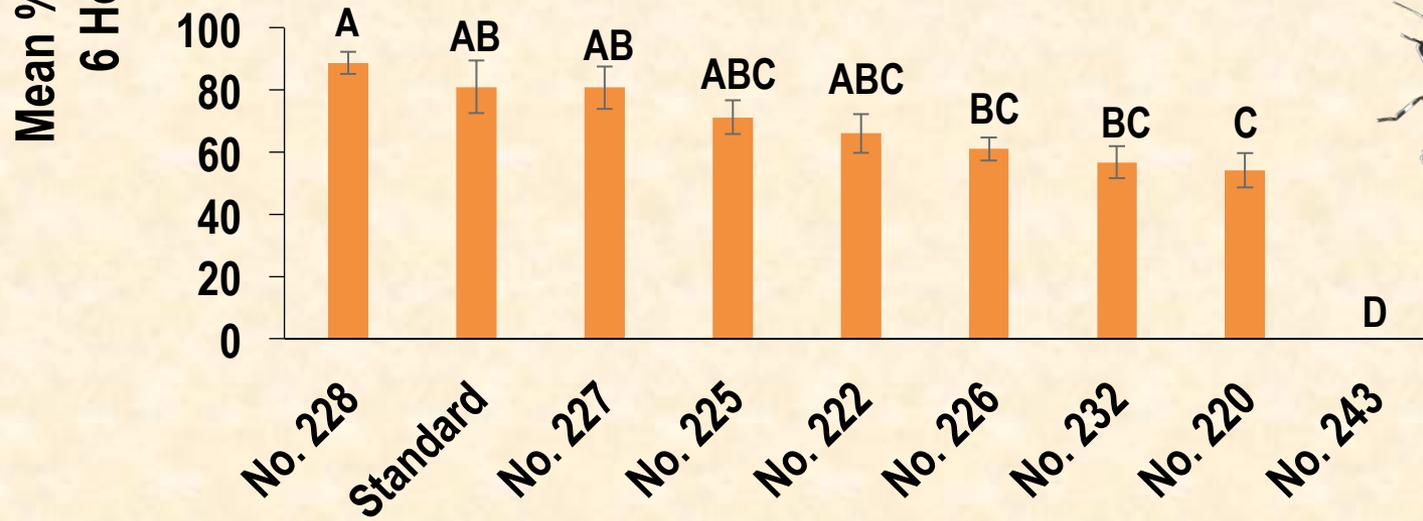
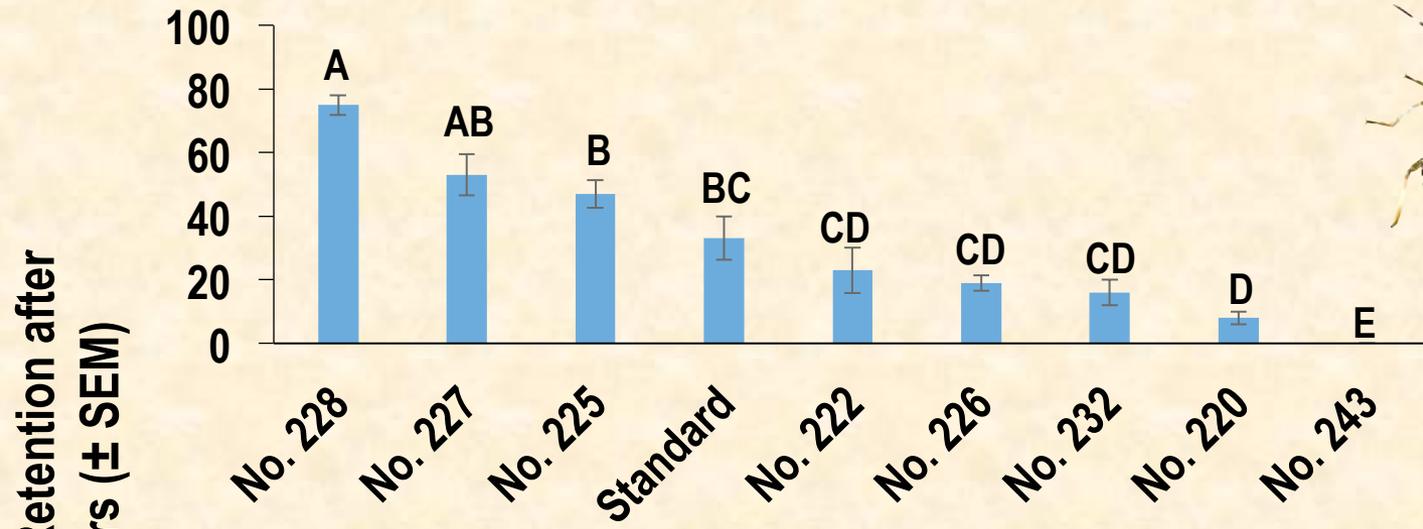


What is the most effective glue?



- 20 BMSB nymphs or adults glued individually to a card (N = 5 for nymphs and adults)
- No. of bugs retained counted after 6 hours
- Trials done in the presence of Trece (1x) low dose lure
- Cards suspended vertically during trials
- 9 glues compared including the standard glue

Other glues proved to be better in retaining BMSB adults and nymphs compared to the standard glue.



Summary and Future Directions

- Reliable BMSB captures with Trece low dose lures deployed in association with sticky traps on posts at all BMSB densities.
- Sticky traps hung within the canopies of trees resulted in significant declines in captures.
 - Captures on single-sided sticky traps were comparable to double-sided traps.
- Sticky traps with 25%, 50% and 75% blockage resulted in low BMSB captures compared to unblocked cards. Recommend replacing cards at 25% occlusion.
- Age of card has no effect on card efficacy.
- Does temperature and moisture have an effect on sticky trap efficacy?
- How many traps are required in an area? Estimating trapping area for Trece (1x) low dose lures.

Trapping Area Preliminary Results

- Plume Reach < 3m.
- Trapping Radius ~121 m.
- Trapping area ~4.83 hectares.



We expect to capture ~3.1% of the BMSB population inhabiting 4.83 ha in ~12h.

Acknowledgements



- BMSB SCRI CAP Team and Leskey Lab
- USDA NIFA SCRI # 2011-51181-30937, USDA NIFA OREI #2012-51300-20097
- NE SARE # LNE14-334, Ministry of Primary Industries, USDA NIFA SCRI # 2016-51181-25409