INDIANA CERTIFIED CROP ADVISER CONFERENCE December 13, 2016

Stink Bug Complexes in Soybean: Scouting, Damage, and Control Options

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2014 Soybean Insect Losses in the Southern US

Musser, F. R.*¹, A. L. Catchot, Jr.¹, J. A. Davis², D. A. Herbert, Jr.³, G. M. Lorenz⁴, T. Reed⁵, D. D. Reisig⁶, and S. D. Stewart⁷

For the states of AL, AR, LA, MS, NC, TN, VA

Yield & Management Results

Total Bushels Harvested	527,750,000
Total Bushels Lost to Insects	22,496,417
Percent Yield Loss	4.09%
Yield w/o Insects	48.91
Ave. # Spray Applications	1.382
Seed Treated Acres	7,203,700
Scouted Acres	7,279,500

Economic Results

	Total	Per Acre
Foliar Insecticides Costs	\$139,743,335	\$12.42
Seed Treatment Costs	\$77,1 85,244	\$ 6.86
Scouting costs	\$50,590,907	\$ 4.50
Total Costs	\$267,519,487	\$23.78
Yield Lost to insects	\$230,272,330	\$20.47
Total Losses + Costs	\$497,791,816	\$44.25

Top 3 Soybean Insect Pests

Corn earworm	25%
Stink Bugs	16%
Soybean looper	10%



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Loss + Cost of Control for Stink Bugs (2011 to 2014): \$47 million to \$89 million 2013 2014

Stink Bug Composition % of SB Species Brow n 23.1 Brow n Marmorated 1.0 48.4 Green Redbanded 11.7Redshouldered 4.3 Southern Green 11.5 Total 100

Stink Bug Composition

Species	% of SB
Brown	29.5
Brown Marmorated	0.7
Green	<mark>56.8</mark>
Redbanded	3.3
Redshouldered	0.9
Southern Green	8.7
Total	100

Soybean Stink Bug Pest Complex



Nezara viridula





J. Davis 2010

Euschistus servus





5367951

UGA213408

Russ Ottens, University of Georgia, Bugwood.org

Green stink bug adult identification (distinct spine)



Southern green stink bug adult identification (no spine)







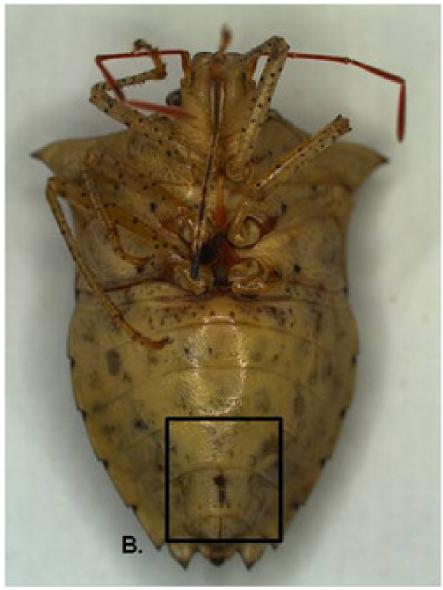
Southern green stink bug nymphs and egg mass





Euschistus quadrator



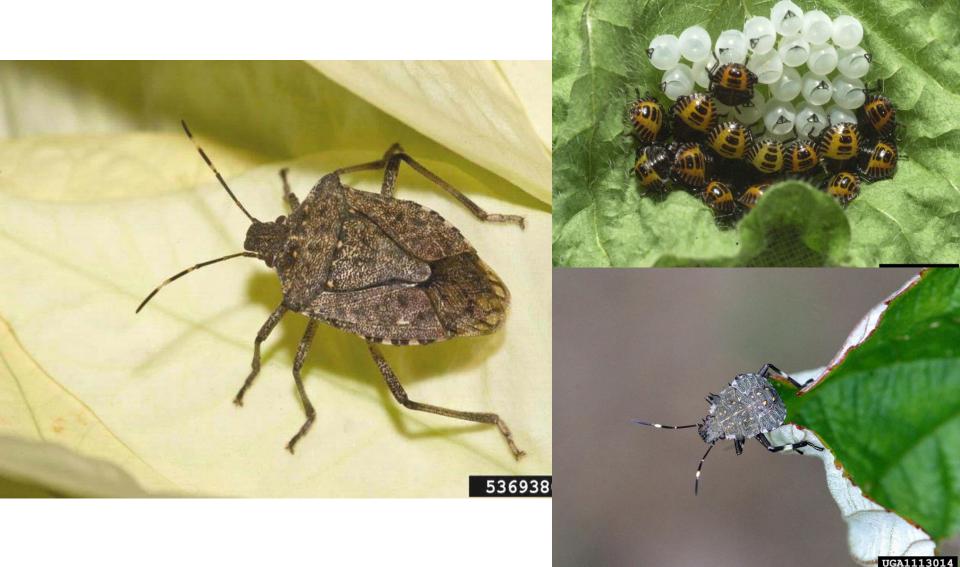


Ventral

Dusky brown stink bug adult identification



Brown marmorated stink bug (Halyomorpha halys Stahl)



That red stink bug...



Redbanded Stink Bug



Red Shouldered Stink Bug



Redbanded stink bug Spine extending from the second abdominal segment between the hind coxae





Redbanded stink bug nymphs and egg mass



- Common name: redbanded stink bug (RBSB)
- Scientific name:
 Piezodorus guildinii (Westwood)
- Most damaging species
 - Deeper seed damage
 - Greater enzyme activity Salivary pectinases
 - Larger food and salivary canals







Not all stink bugs are bad





Podisus maculiventris (Say), spined soldier bug



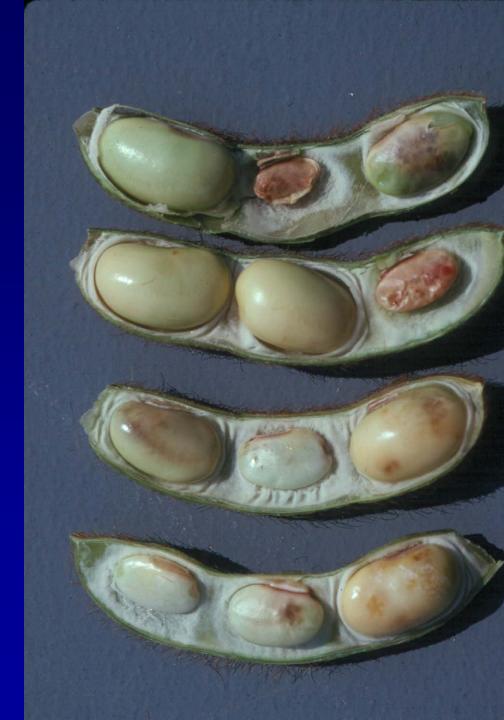


Stink Bug Injury

Stink bug feeding:

Reduces yield, quality and oil content

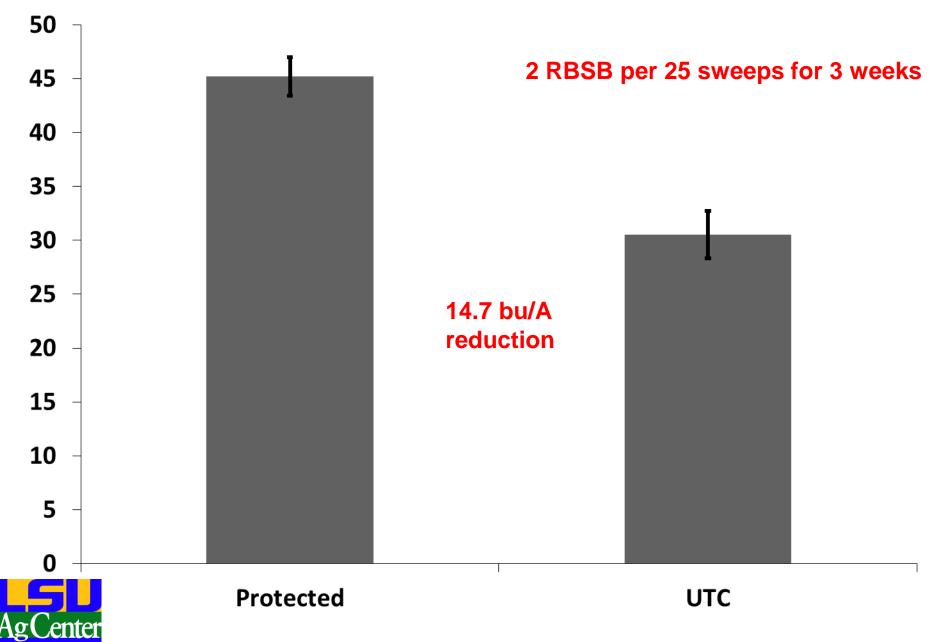
(Todd and Turnipseed 1974)



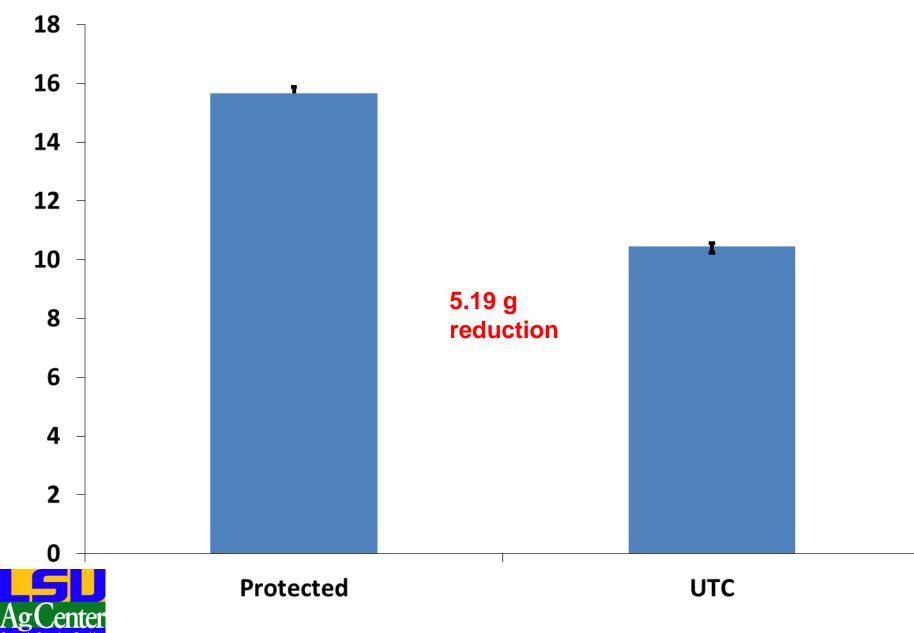




Yield (bu/A)



100 seed wt (g)



Redbanded Stink Bug Action Threshold = 4 stink bugs per 25 sweeps

0 stink bugs/25 sweeps

3 stink bugs/25 sweeps for 3 weeks





12 stink bugs per 25 sweeps for 3 weeks

6 stink bugs per 25 sweeps for 3 weeks



Stink Bug Injury

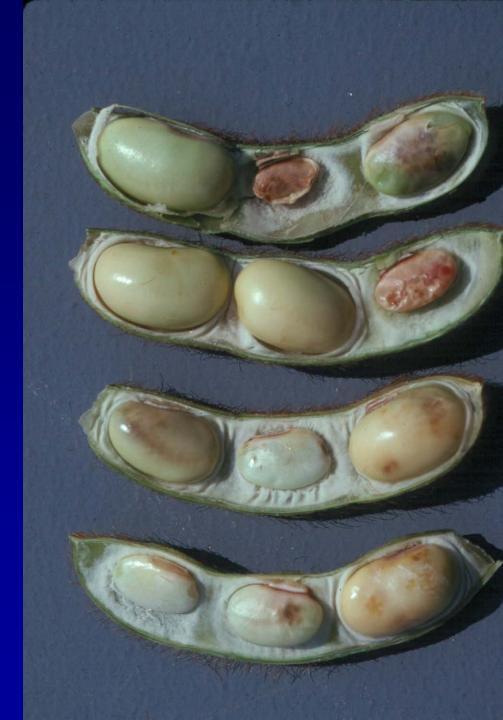
Stink bug feeding:

Reduces yield, quality and oil content

(Todd and Turnipseed 1974)

Reduces germination (Jensen and Newsom 1972)

Causes delayed maturity (Boethel et al. 2000)





Delayed Maturity







Stink Bug IPM Program in Soybean

Monitor and Sample



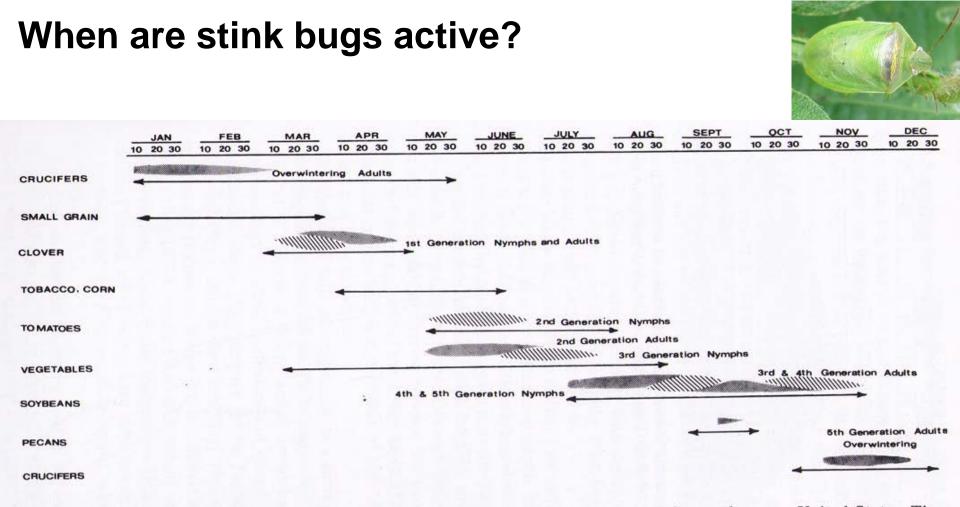
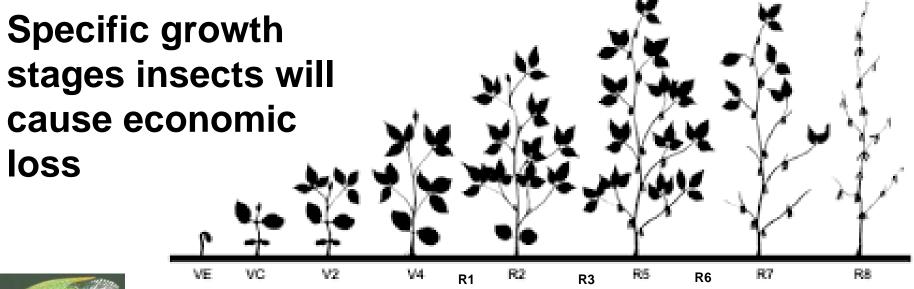
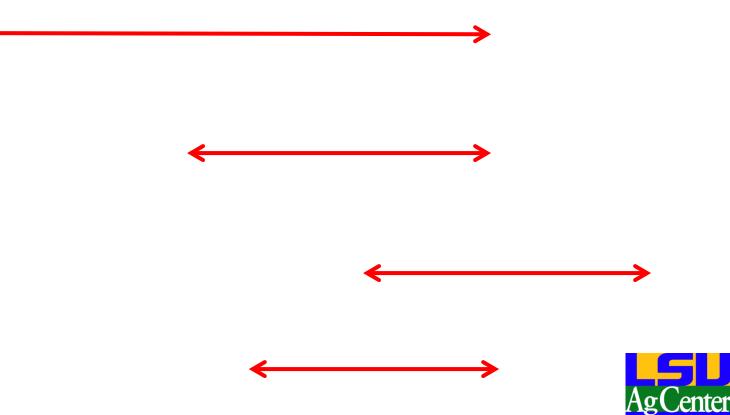


Figure 23-3. Seasonal host sequence of various phytophagous stink bug species in the southeastern United States. Time lines indicate periods when host plants are available and suitable for stink bug feeding. Movement of adults among various hosts for feeding and oviposition is common. Todd and Herzog 1980









Monitoring Pest Status and Populations



Control initiated at 9 stink bugs per 25 sweeps or 1 stink bug per row ft.



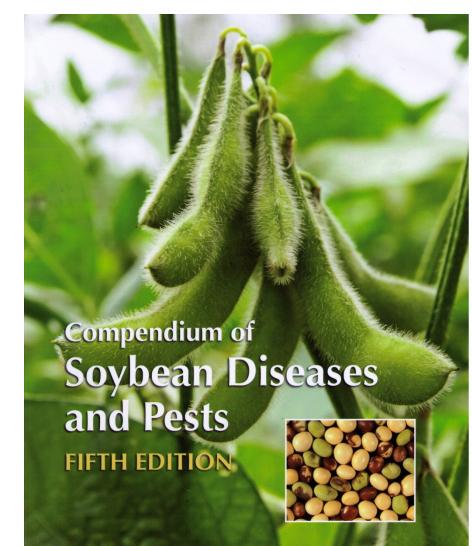
Stink Bug IPM Program in Soybean

Monitor and Sample Identify

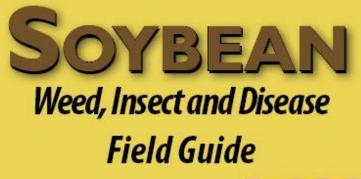


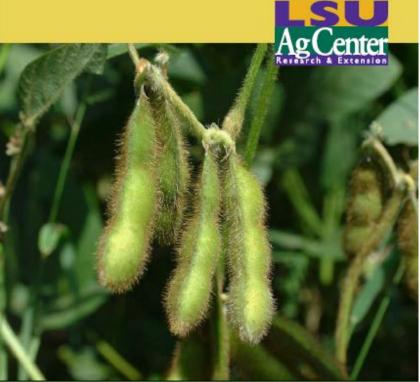
Identify

- Consult
 identification keys
- Many are wellillustrated and provide key diagnostic features









Funded by the Louisiana Soybean and Grain Research & Promotion Board

Soybean Weed, Insect and Disease Field Guide



Soybean Insects www.LSUAgCenter.com/soybeans/insects

http://www.lsuagcenter.com/en/crops_livestock/crops/soybeans/Publications/Soybean-Weed-Insectand-Disease-Field-Guide.htm

Stink Bug IPM Program in Soybean

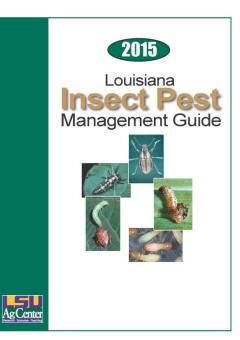
Monitor and Sample Identify Consult Control Action Guidelines



-								
Insect	Insecticide	Amount of Concentrate per Acre	Pounds Active Ingredient per Acre	Acres Treated per Gallon or Pound	When to Treat (Economic threshold)			
Redbanded stinkbug ⁴	Orthene (Acephate)	12-16 oz	0.75-1.0	1.3-1	16 bugs in 100 sweeps. Caution: 8 oz of acephate applied alone has provided unsatisfactory control of redbanded stink bugs.			
	Endigo ZC	4.0-4.5 oz	premix	32-28.4				
	Brigade (2)	6.4 oz	0.1	20				
	Hero (1.24)	10.3 oz	0.1	12.4				
	Leverage 360	2.8 oz	premix	45.7				
	Belay (2.13)	4.0 oz	0.067	32				
	1	1	1		1			

Based on the guidelines, you may:

- Do nothing
- Sample again
- Use tactic to reduce pest populations





Do Nothing

Pest always below economic injury level

Crop can tolerate low levels of injury

Using any tactics will be too costly



Sample Again

Pest is below action threshold

Pest populations are static and not increasing



Use Tactic

Pest population has been increasing over several weeks

Pest is at action threshold

 Decide which tactic and tool best fits your pest management program and implement it



Stink Bug IPM Program in Soybean

- Monitor and Sample Identify
- **Consult Control Action Guidelines**
- **Applying Tools and Tactics**



Control Options Insecticides



Stink Bug Ease of Control with Insecticides

Successful control

Difficult control



S. Green & Green Stink Bug





Large, lateinstar nymphs

Brown Stink Bug Spp.

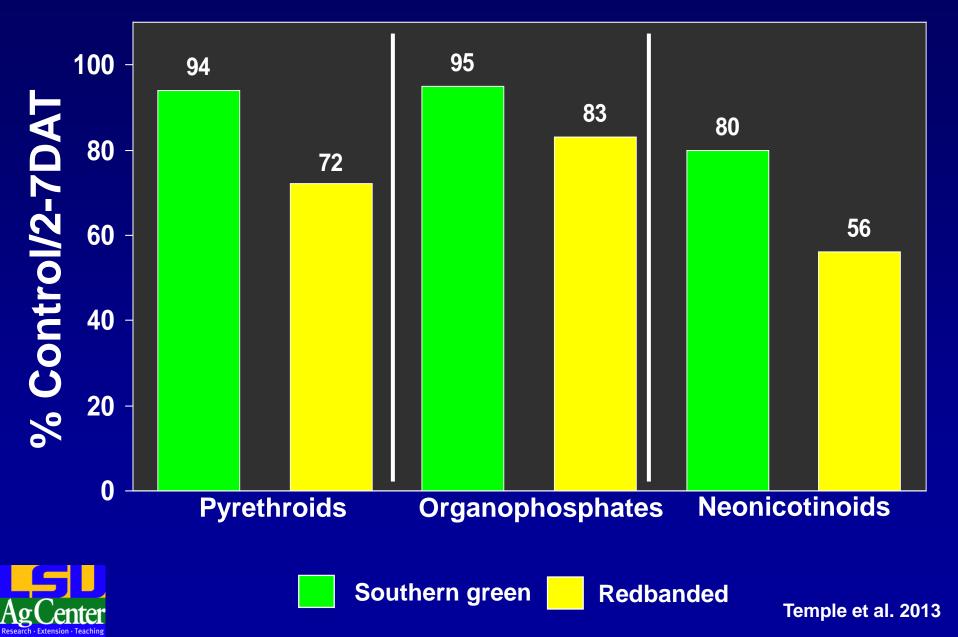




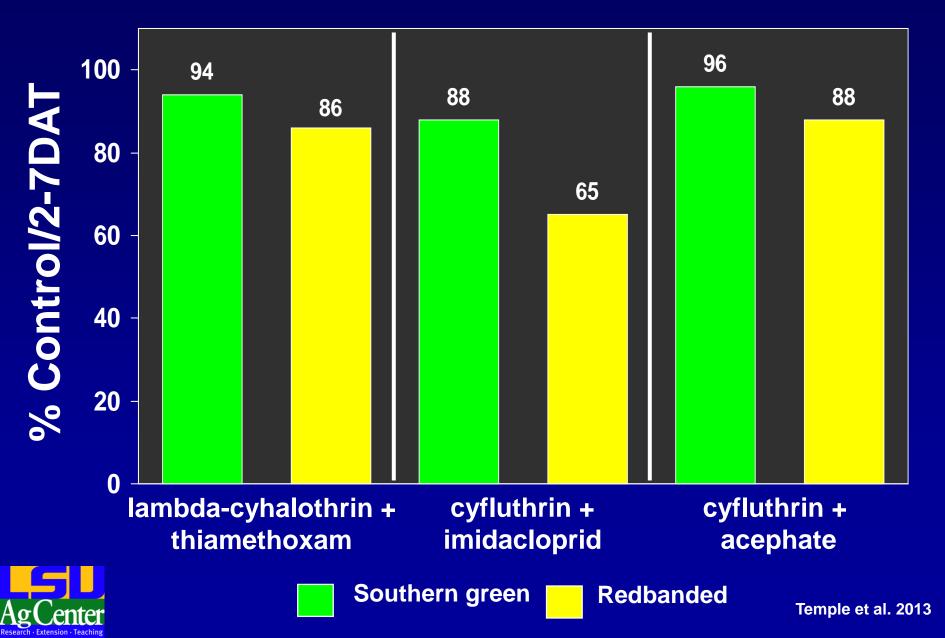
Red Banded Stink Bug



Field Efficacy of Single Products



Field Efficacy of Tank/Pre-Mixes



Redbanded stink bug control

Insect	Insecticide	Amount of concentrate/ac	lb ai/ac	ac treated/gal or lb	When to Treat (Economic threshold)
Redbanded stinkbug ⁴	Orthene (Acephate)	12.0 – 16.0 oz	0.75- 1.0	I.3 – I	16 bugs in 100 sweeps
	Endigo ZC	4.0 - 4.5 oz		32 – 28.4	
	Brigade (2)	6.4 oz	0.1	20	
	Hero (1.24)	10.3 oz	0.1	12.4	
	Leverage 360	2.8 oz		45.7	
	Belay	4.0 oz	0.067	32	



LSU AgCenter recommends budgeting a minimum of three stink bug insecticide applications

Rotate chemistries/modes of action Acephate = 1B Pyrethroids = 3A Neonicotinoids = 4A



Insect	Insecticide	Amount of concentrate/ac	lb ai/ac	ac treated/gal or lb	When to Treat (Economic threshold)
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	Hero (1.24)	10.3 oz	0.1	12.4	
	Leverage 360	2.8 oz		45.7	
	Belay	4.0 oz	0.067	32	

Possible order of insecticide applications for stink bug control:

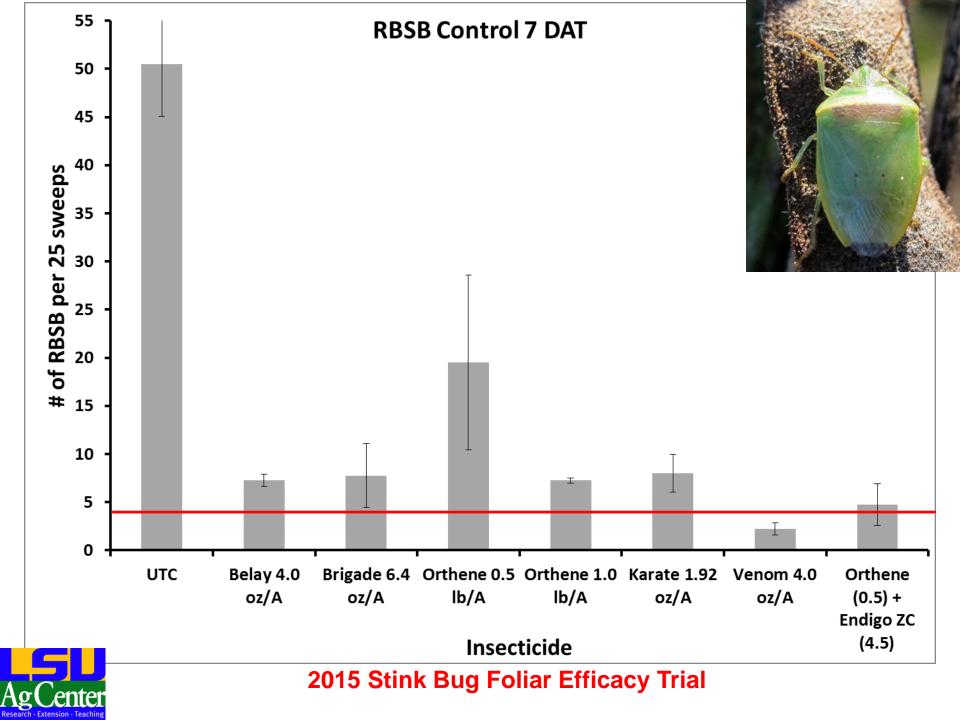
<u>1st application</u>: bifenthrin Pre-Harvest Interval (PHI): 18 days Why? From the label: "Apply...at a minimum of 30 day intervals."

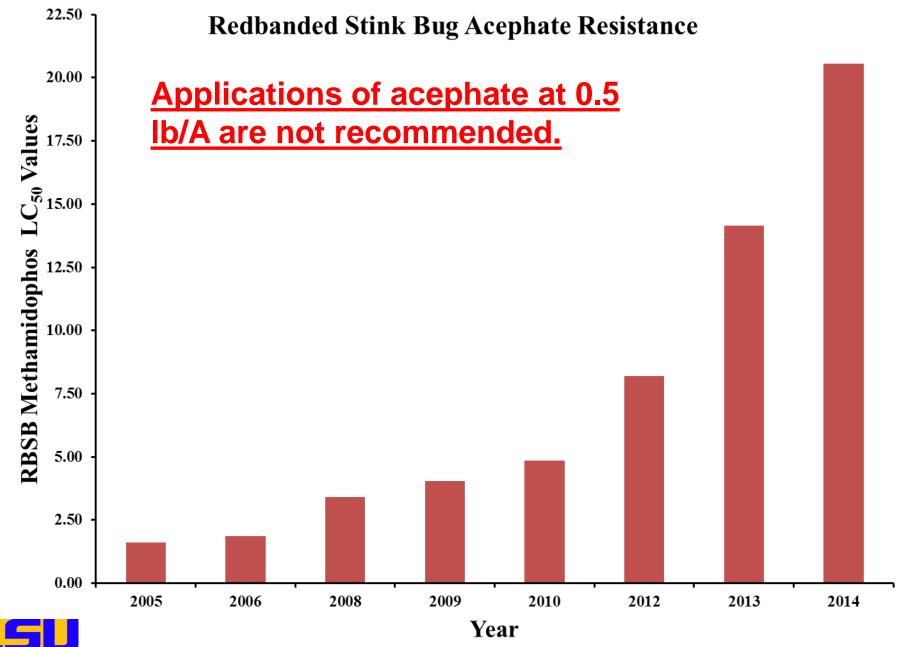
<u>2nd application</u>: lambda-cyhalothrin + thiamethoxam (PHI: 30 days) or clothianidin (PHI: 21 days)

<u>3rd application</u>: acephate at a minimum of 0.75 lb/a (PHI: 14 days) Why? LSU AgCenter Soybean Entomology Lab (Dr. Davis) has documented redbanded stink bug resistance to acephate at 0.5 lb/a

<u>4th application: acephate at a minimum of 0.75 lb/a (PHI: 14 days)</u>







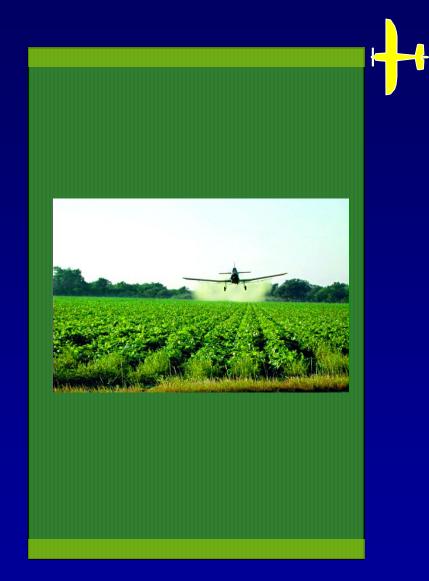
Ag Center Research - Extension - Teaching

Control Options Border Sprays

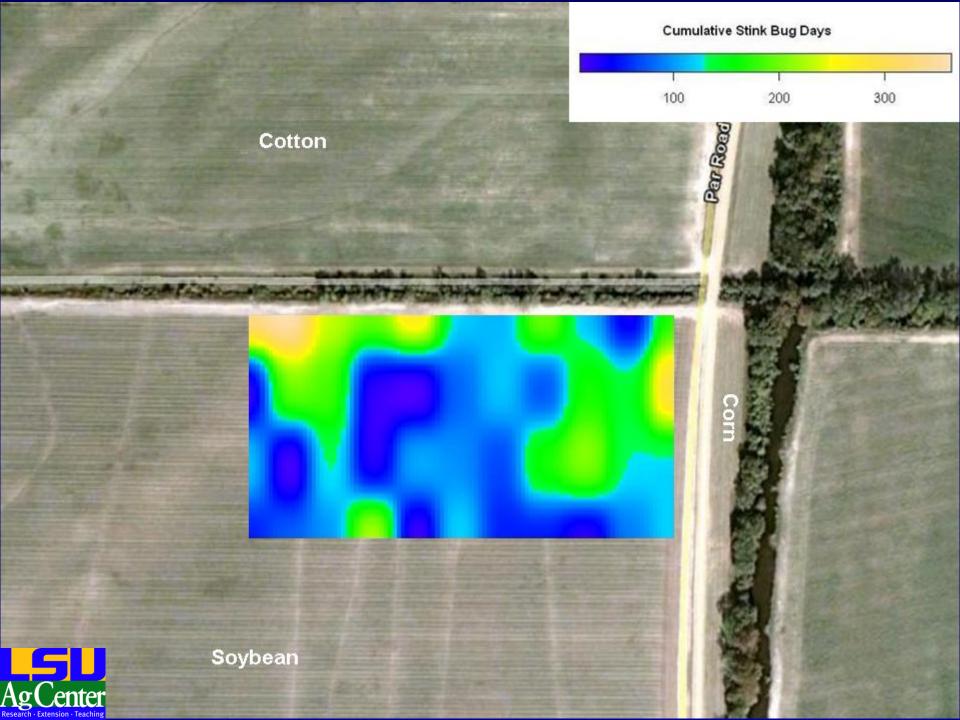


Reduce Insecticide Use: Border Sprays

- If stink bugs are aggregated along field edges, spray only these edges
- Reduce amount of product used and application time
- Save producer money while protecting natural enemies

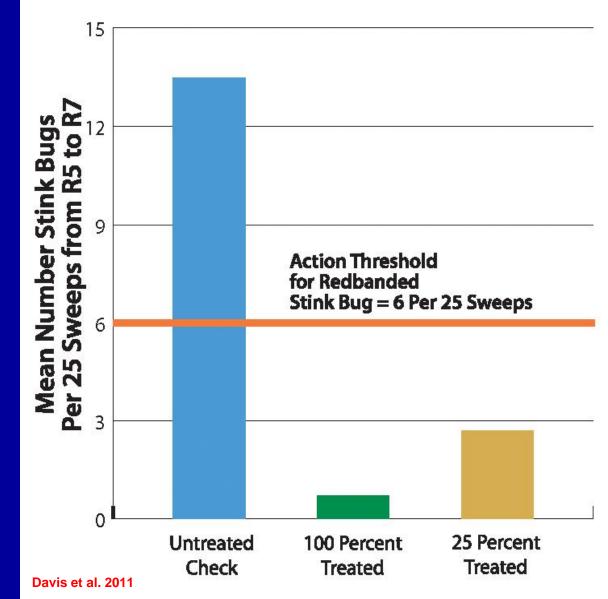






Field Perimeter Sprays

Figure 2. Perimeter insecticide applications keep stink bug numbers below the action threshold.





Control Options Conserve Natural Enemies



Why Conserve Natural Enemies? Stink Bug Egg Parasitoids

- 20 to 54% of individual eggs parasitized
- 26 to 68% of egg masses parasitized
- Can significantly impact populations



Why Conserve Natural Enemies? Entomopathogens





Control Options Trap Crops



Trap Crops to Control Stink Bugs

Tillman (2006): sorghum trap crop; cotton main crop

- Concentrated *N. viridula*, reduced insecticide applications, increased parasitism by *T. pennipes*

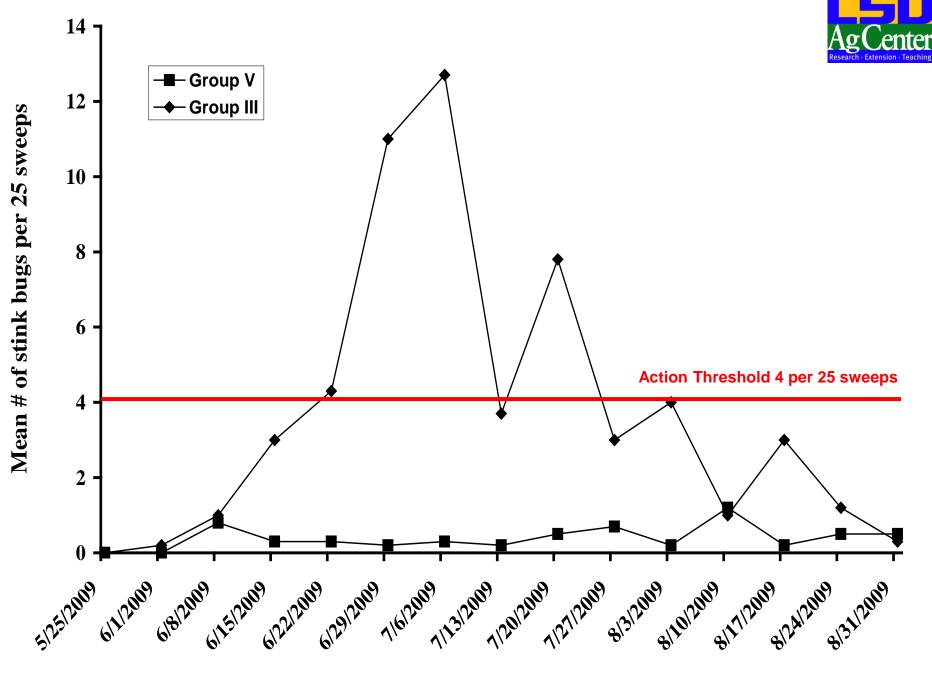
- Mizell et al. (2008): buckwheat, field pea, millet, sorghum, sunflower and triticale trap crop
- Rea et al. (2002): black mustard trap crop; sweet corn main crop
 - Trap crop reduced damage from 22% to 1%
- McPherson and Newsom (1984): trap and main crop = soybean
 - Confined 85% of *N. viridula* using 10% of total acreage



Why aren't trap crops being used?

- Shelton and Badenes-Perez (2006)
 - Trap crops are usually species specific
 - Often planted at different times than main crop
 - Not harvestable
- Didn't work in ESPS (Smith et al. 2009)
 - Trap crop (MGIII) was planted 6 wks before main crop (MGV)
- To overcome these obstacles, we used a MG III soybean trap (attractive to multiple pests, harvestable) planted at the <u>same</u> <u>time</u> as the MG V main crop



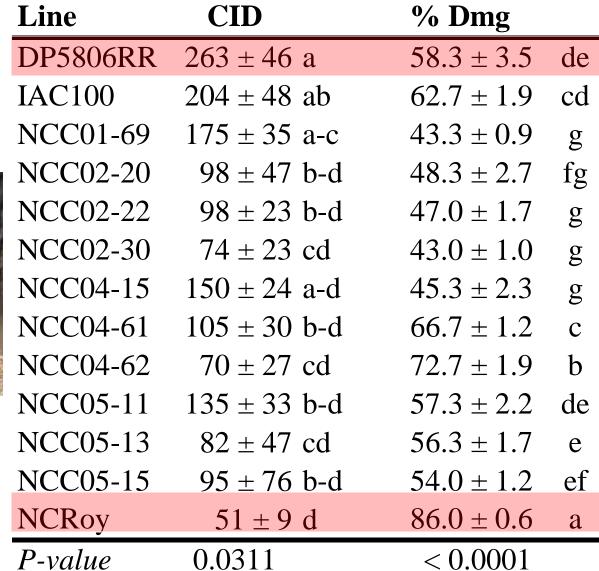


Week

Control Options Host Plant Resistance



Breeding Line HPR Screening







Screening current high yielding varieties for RBSB tolerance 2013 and 2014

	b	_	
Variety	Sprayed	Unsprayed	Diff. (bu/A)
Terral REV 4753	69.2	53.8	+15.4
Dyna-Gro 31RY45	67.9	61.5	+6.4
Syngenta NK S44-D	59.5	49.6	+9.9
Delta Grow 4670	70.6	69.0	+1.6
Armor DK 4744	68.9	61.3	+7.6
Dyna-Gro 39RY57	66.1	63.6	+2.5
Terral REV 56R63	65.6	64.5	+1.1
Delta Grow 5565	64.3	57.4	+6.9
Delta Grow 5625	64.3	45.9	+18.4
Armor 55R22	61.1	58.7	+2.4



4 RBSB per 25 sweeps for 3 weeks

Use current soybean varieties that are resistance to stink bugs

We recommend that if resistant varieties fit your needs, they should be planted to reduce insecticide applications

		bu/A				
Variety	Treated	Untreated	Response	Cost \$	\$/bu	Savings
Asgrow 4632	54.4	45.4	9.0	\$20	\$8.60	\$57.40
Asgrow 4934	54.8	32.3	22.5	\$20	\$8.60	\$173.50
Asgrow 5332	49.5	43.3	6.2	\$20	\$8.60	\$33.32
Croplan R2C5482	47.0	44.4	2.6	\$20	\$8.60	\$2.36
Delta Grow 5625	48.8	43.4	5.4	\$20	\$8.60	\$26.44
Dyna-Grow S47RY13	49.9	44.8	5.1	\$20	\$8.60	\$23.86
HBK RY4721	44.7	42.1	2.6	\$20	\$8.60	\$2.36
Terral REV 47R53	63.7	52.3	11.4	\$20	\$8.60	\$78.04
Terral REV 56R53	55.3	50.0	5.3	\$20	\$8.60	\$25.58
Terral REV 57R21	43.1	37.6	5.5	\$20	\$8.60	\$27.30



Questions?

Thank you

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LOUISIANA SOYDEAN & GPAIN RESEARCH & PROMOTION BOARD



