2012 SOYBEAN BREEDERS/ENTOMOLOGISTS WORKSHOP

Identifying Host Plant Resistance to Redbanded Stink Bug

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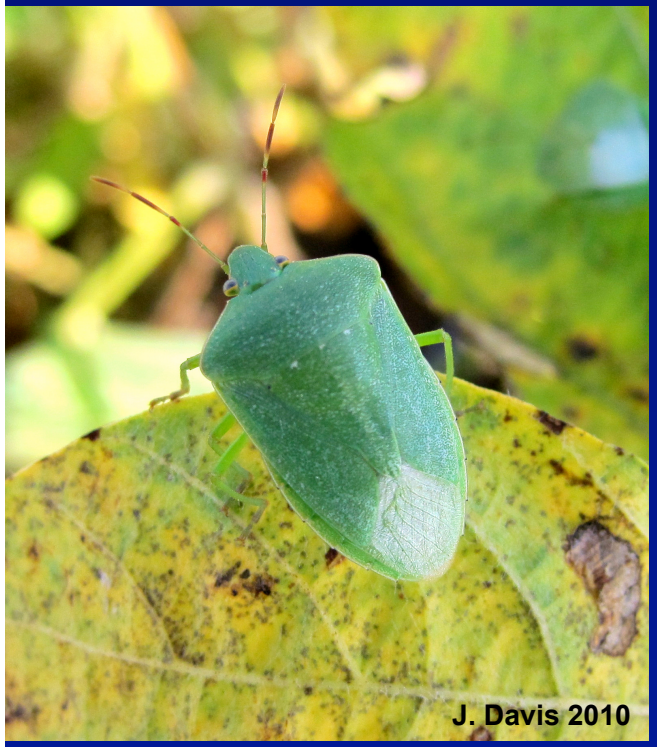
LSU AgCenter Research & Extension

Mid-South Soybean Stink Bug Pest Complex



Nezara viridula

Acrosternum hilare

J. Davis 2010

Euschistus servus

Russ Ottens, University of Georgia, Bugwood.org

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Report

2010 Soybean Insect Losses for Mississippi, Tennessee, and Arkansas

Musser, F. R.,*[1] G. M. Lorenz,[2] S. D. Stewart,[3] and A. L. Catchot, Jr.[1]

Table 3. Estimated losses plus management costs ($/ac) due to insect pests in Mississippi, Tennessee, and Arkansas. Management costs do not include seed treatments and scouting fees.

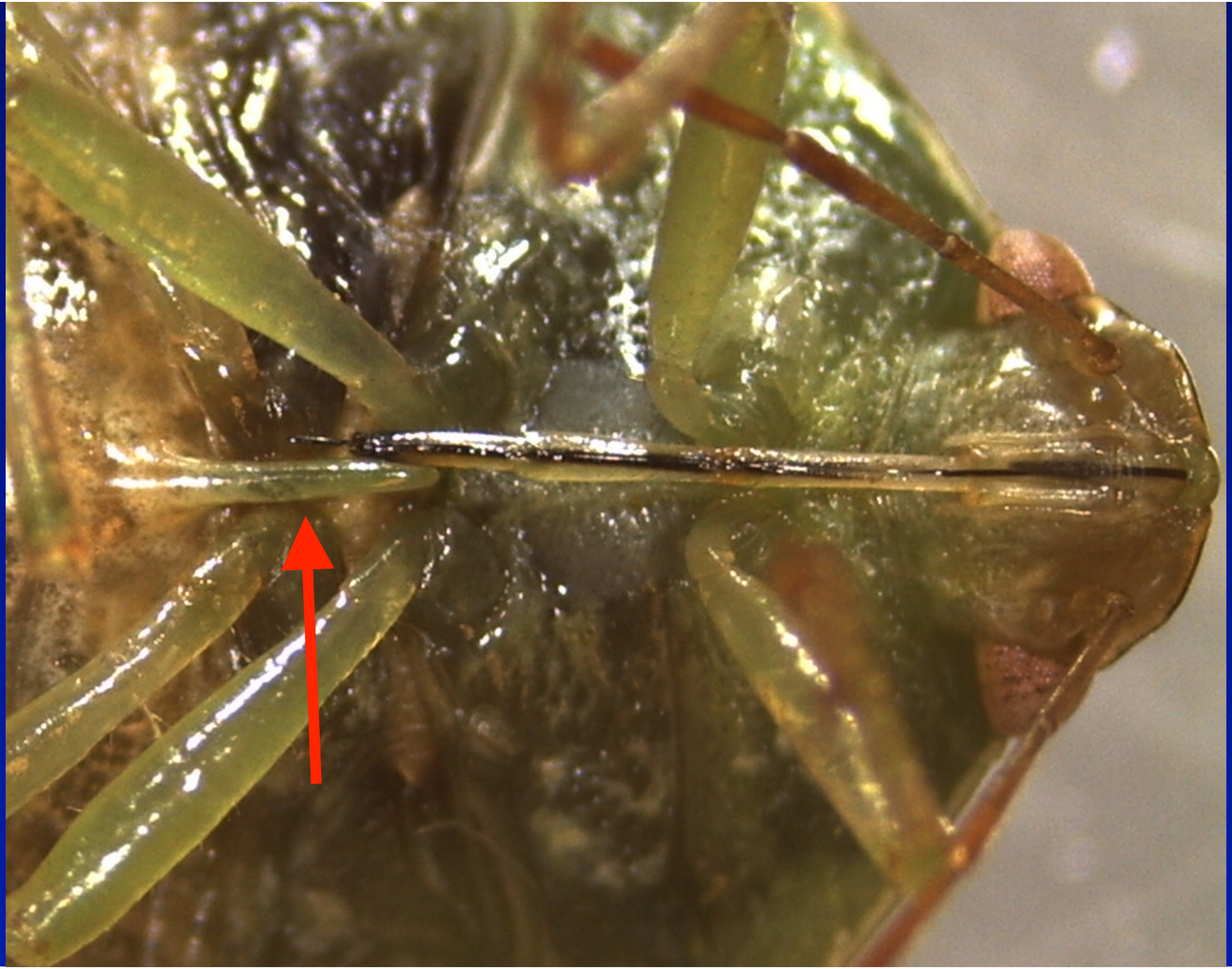
Pest	MS		TN		AR		Overall	
	2004–2009	2010	2008–2009	2010	2009	2010	2009	2010
Stink bug	14.65	6.32	10.35	17.11	8.51	17.02	9.69	13.90
Corn earworm	1.93	12.41	1.51	6.16	7.09	18.50	6.26	13.77
Soybean looper	4.56	8.51	0.19	5.80	1.08	13.96	2.40	10.46
Bean leaf beetle	3.76	6.93	0.28	0.17	1.24	2.35	1.43	3.18
Saltmarsh caterpillar	0.07	2.54	0.00	0.00	0.00	3.80	0.02	2.53
Armyworms	0.19	0.93	0.29	2.69	2.91	3.32	1.71	2.50
Threecornered alfalfa hopper	4.03	1.92	2.28	0.36	2.19	0.66	2.40	0.97
All insects	30.66	43.21	17.76	34.38	27.00	65.73	26.85	51.76

- **Common name:**
  redbanded stink bug

- **Scientific name:**
  Piezodorus guildinii
  (Westwood)

Redbanded stink bug

Red shouldered stink bug

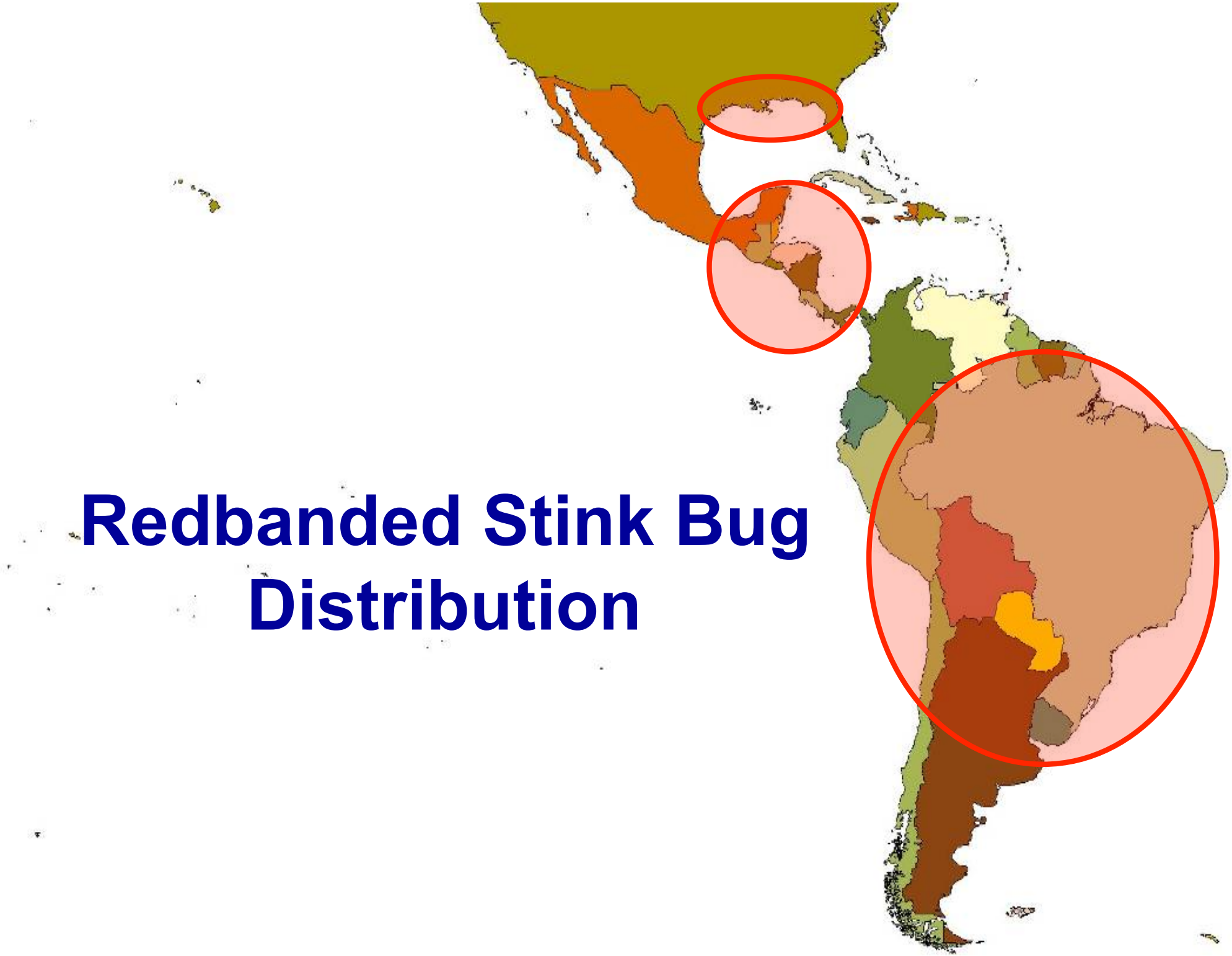


Piezodorus guildinii (Westwood)

- **5 Instars:**
  - **1st & 2nd: 1-3 mm in length, mostly red coloration but may have some yellow**
  - **3rd through 5th: 4-8 mm in length**
- **Adults:**
  - **10-12 mm in length, brilliant green but yellowish with age**
  - **Black, red, and yellow stripe along back of pronotum**
- **Identification:**
  - **Much smaller than other green stinkbugs**
  - **Can be distinguished from *Thyanta spp.* on the basis of a spine extending from the second abdominal segment between the hind coxae**
  - **Eggs: black, barrel shaped, clusters of about 15 eggs laid in two rows on pods, leaves, and stems.**
- **First Found in LA in 2000**

McPherson & McPherson, 2000

Redbanded Stink Bug Distribution



Past U.S. Distributions

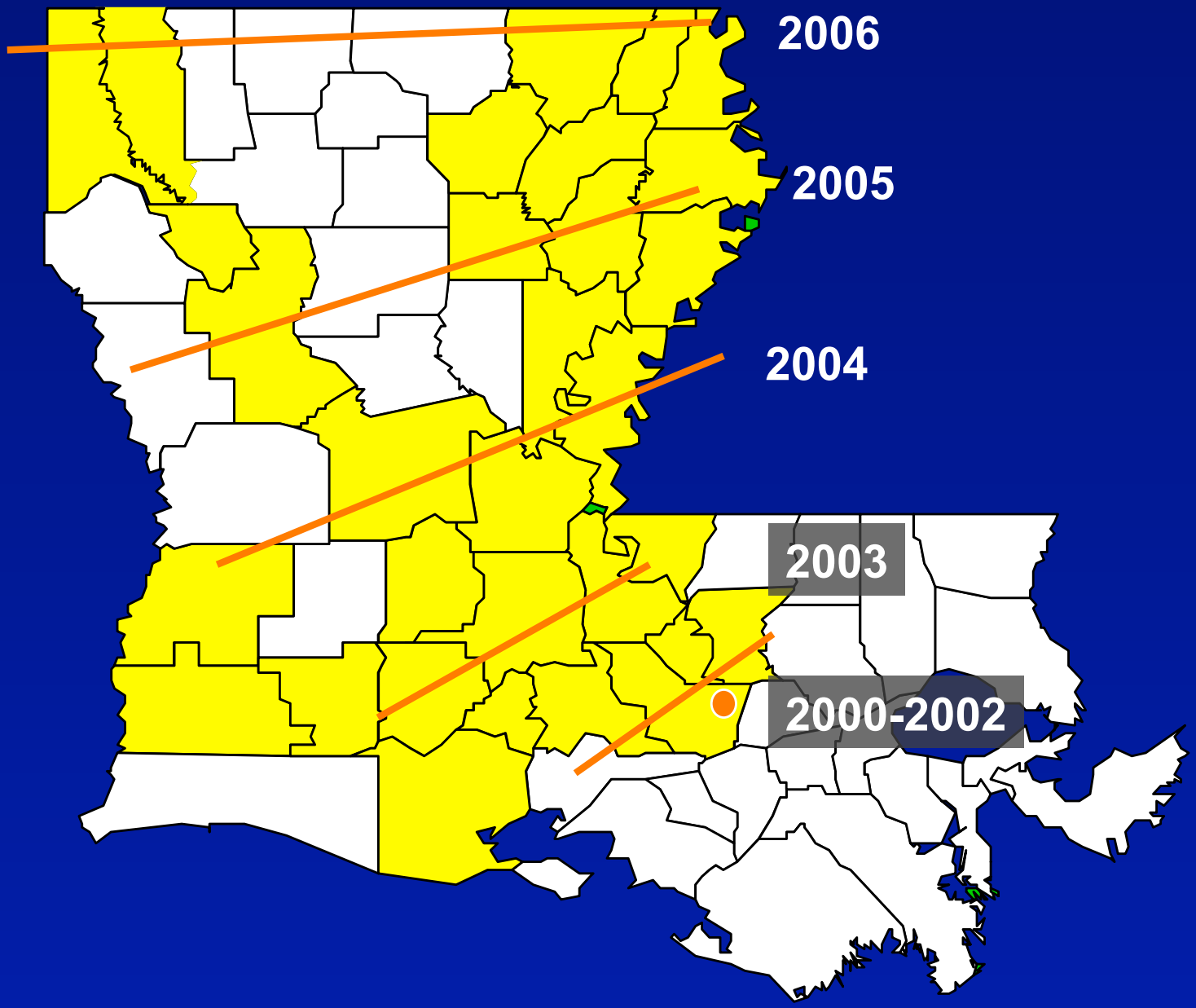
- **From David Rider, Department of Entomology, NDSU**

- A couple specimens from Ormond Beach, Volusia Co., Florida in 1983.
- A specimen from La Feria, Cameron Co., Texas in 1987.
- A specimen from Sabal Palm Grove, Cameron Co., Texas in 1987.
- A specimen from Leon Co., Florida in 1970.
- A specimen from Lake Placid, Florida in 1966.

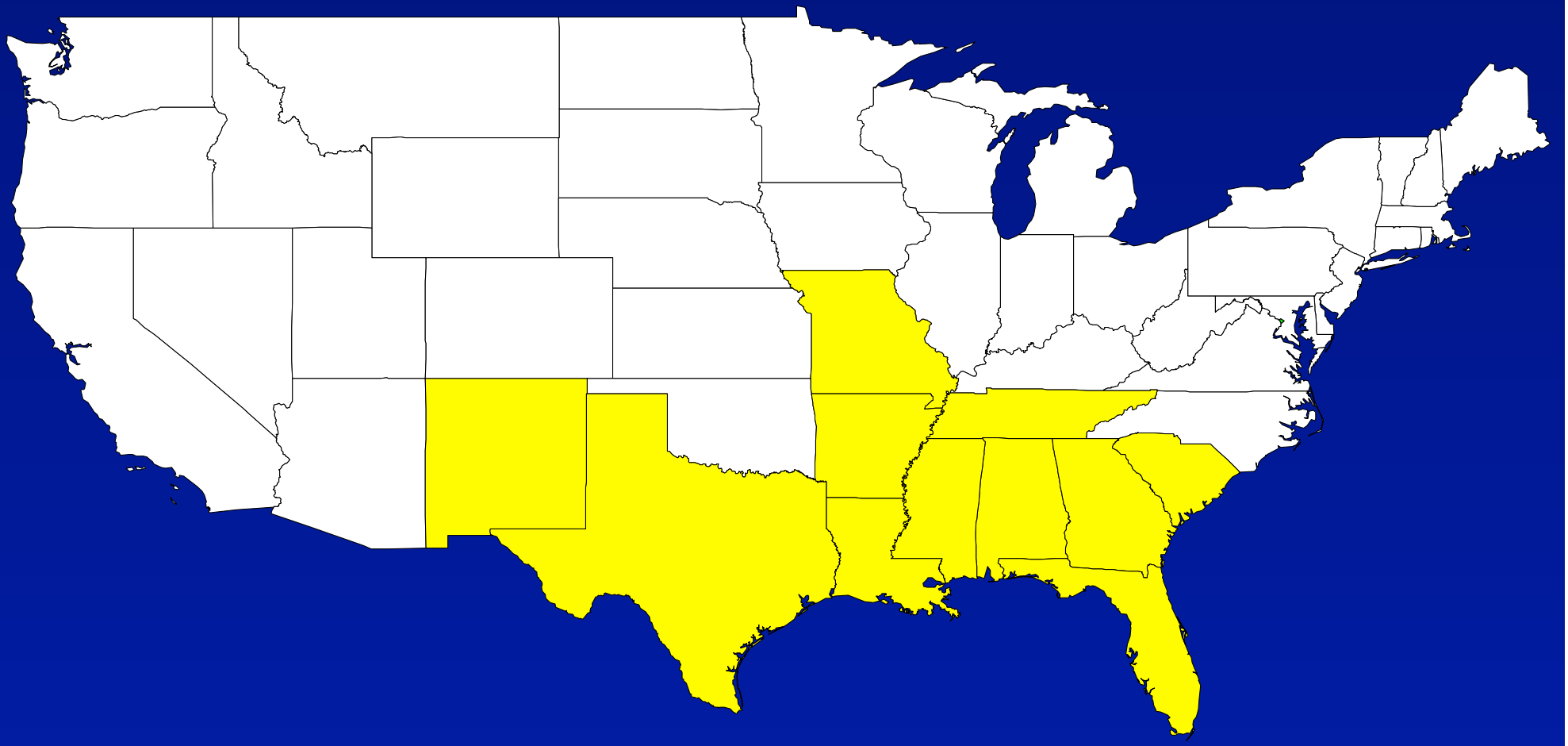
- **From McPherson & McPherson (2000)**
  FL, NM, GA, SC

*Knowledge Gap: Where did it come from and why is it such a significant pest in the Mid-South when it has not been a significant pest in Southeast?

Piezodorus guildinii
2003-07 Distribution – Positive ID



Piezodorus guildinii
Current U.S. Distribution



Pentatomid Species Collected 2008-2009

Red Banded

***Piezodorus guildinii*, redbanded stink bug**

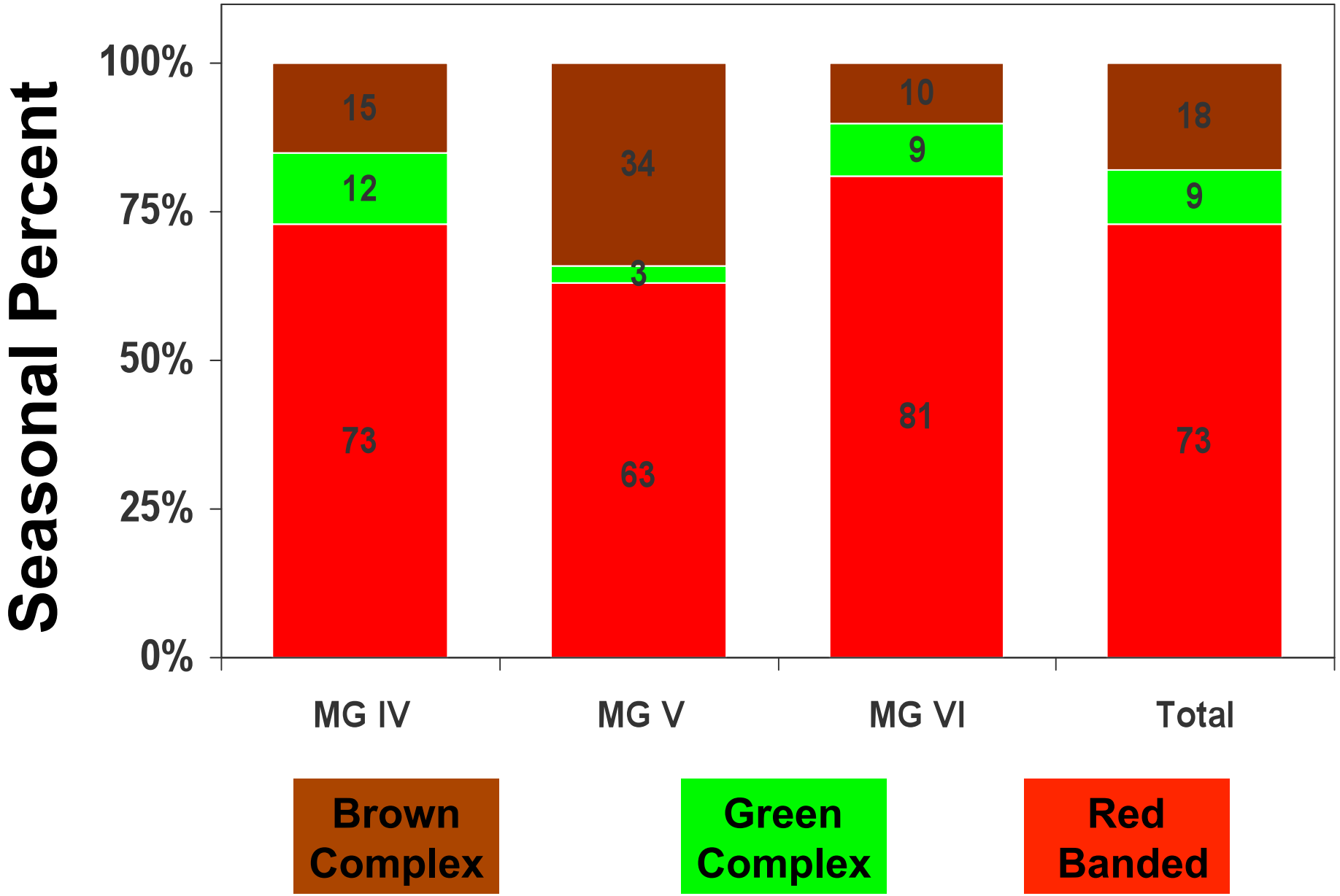
Green Complex

***Nezara viridula*, Southern green stink bug**
***Acrosternum hilare*, green stink bug**

Brown Complex

***Euschistus servus*, brown stink bug**
***Euschistus quadrator*, lesser brown stink bug**
***Euschistus tristigmus*, dusky stink bug**
***Euschistus conspersus*, consperse stink bug**
***Euschistus variolarius*, onespotted stink bug**

Pentatomid Abundance BHRS 2009



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)

Redbanded Stink Bug
The Most Damaging Stink Bug

- **Depieri and Panizzi 2011**

  More damaging than *N. viridula* and *E. heros*

  - Deeper seed damage

  - Greater enzyme activity

  - Larger food and salivary canals

R5 to R8

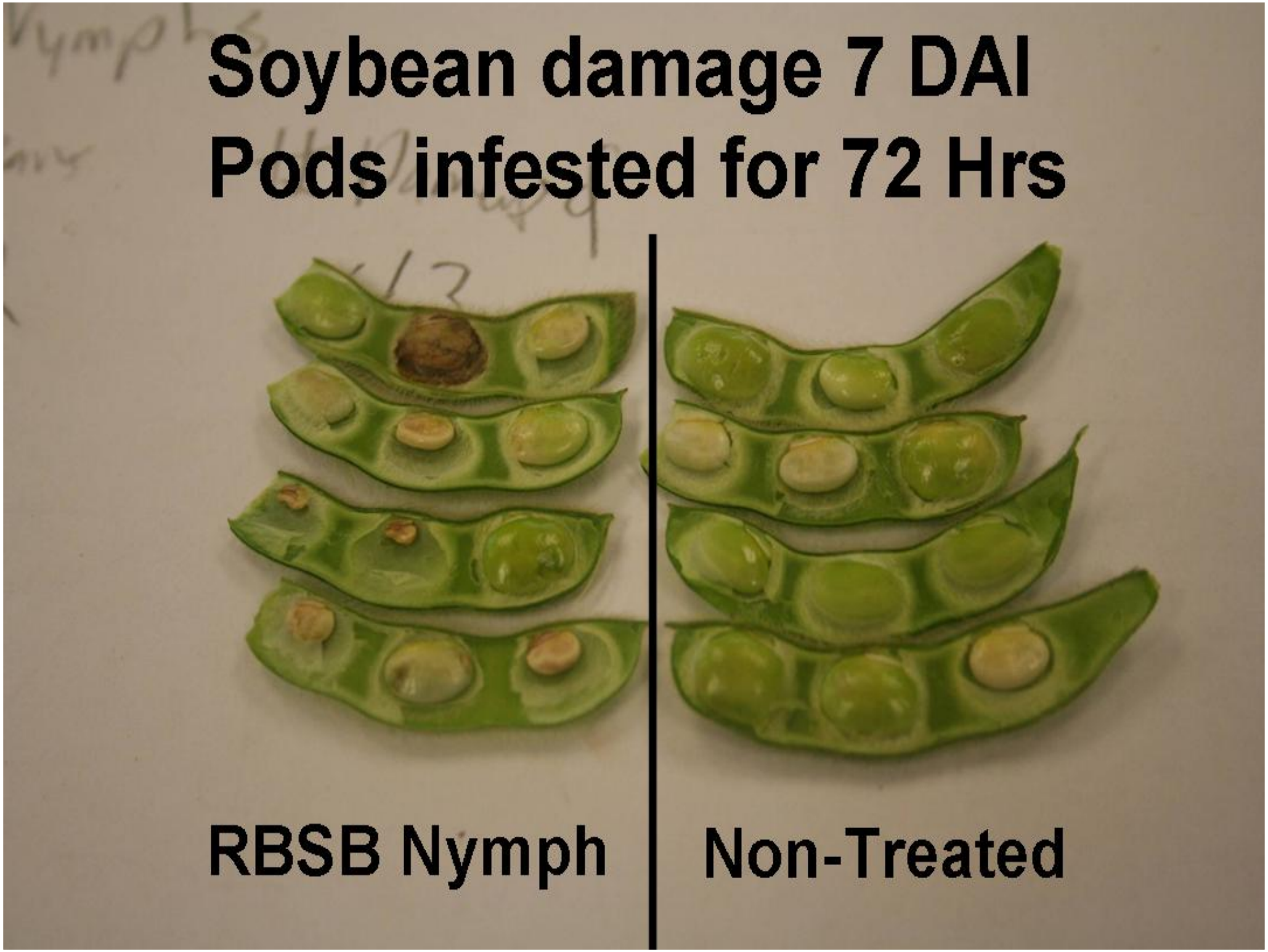
0 stink bugs/25 sweeps

3 stink bugs/25 sweeps

Stink Bug Action Threshold = 9 per 25 sweeps


8-8-08
A

Soybean damage 7 DAI
Pods infested for 72 Hrs



Soybean Damage at Harvest
Pods infested for 72 Hrs (RBSB Nymph)

41 % of Soybean Seed Damaged

Mid-to-Late Season Injury Insecticide Termination Trials

Insecticide Termination Trials

Treatment	Rate/Acre lb ai	Sprays (No.)	Yield (bu/A)	Moisture (%)	100 seed wt. (g)	Abnormal seed (#/100)
Non-treated	-----	0	29.2 b	18.5 a	10.7 b	19.3 a
Orthene (R5)	0.8	4	35.0 b	17.6 ab	11.3 b	6.3 a
Orthene (R6)	0.8	5	39.8 a	16.3 b	11.6 b	7.4 a
Orthene (R7)	0.8	6	40.5 a	16.0 b	12.1 a	3.8 a
(*P>F*)			< 0.01	< 0.01	0.04	0.09

Insecticide applications started at R4.

MRSB0822

Soybean Yield and Quality

Treatment	% SB dmg	Yield (bu/A)	% Oil
Non-treated	56 ± 7 a	21 b	19.6 ± 0.5 b
Treated*	37 ± 6 b	37 a	21.1 ± 0.2 a
(*P*>*F*)	< 0.001	< 0.001	0.033

*Treated 4 times

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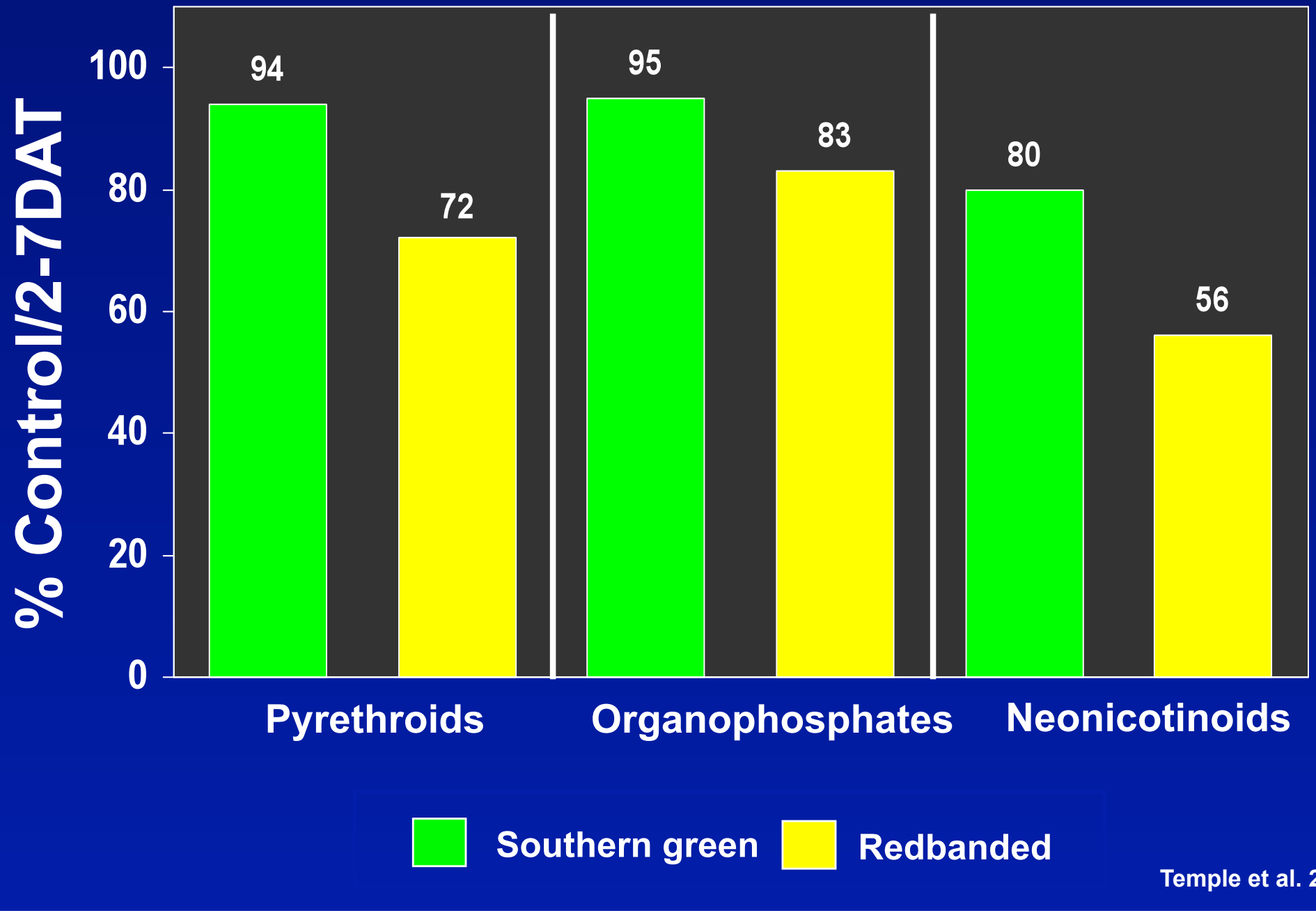
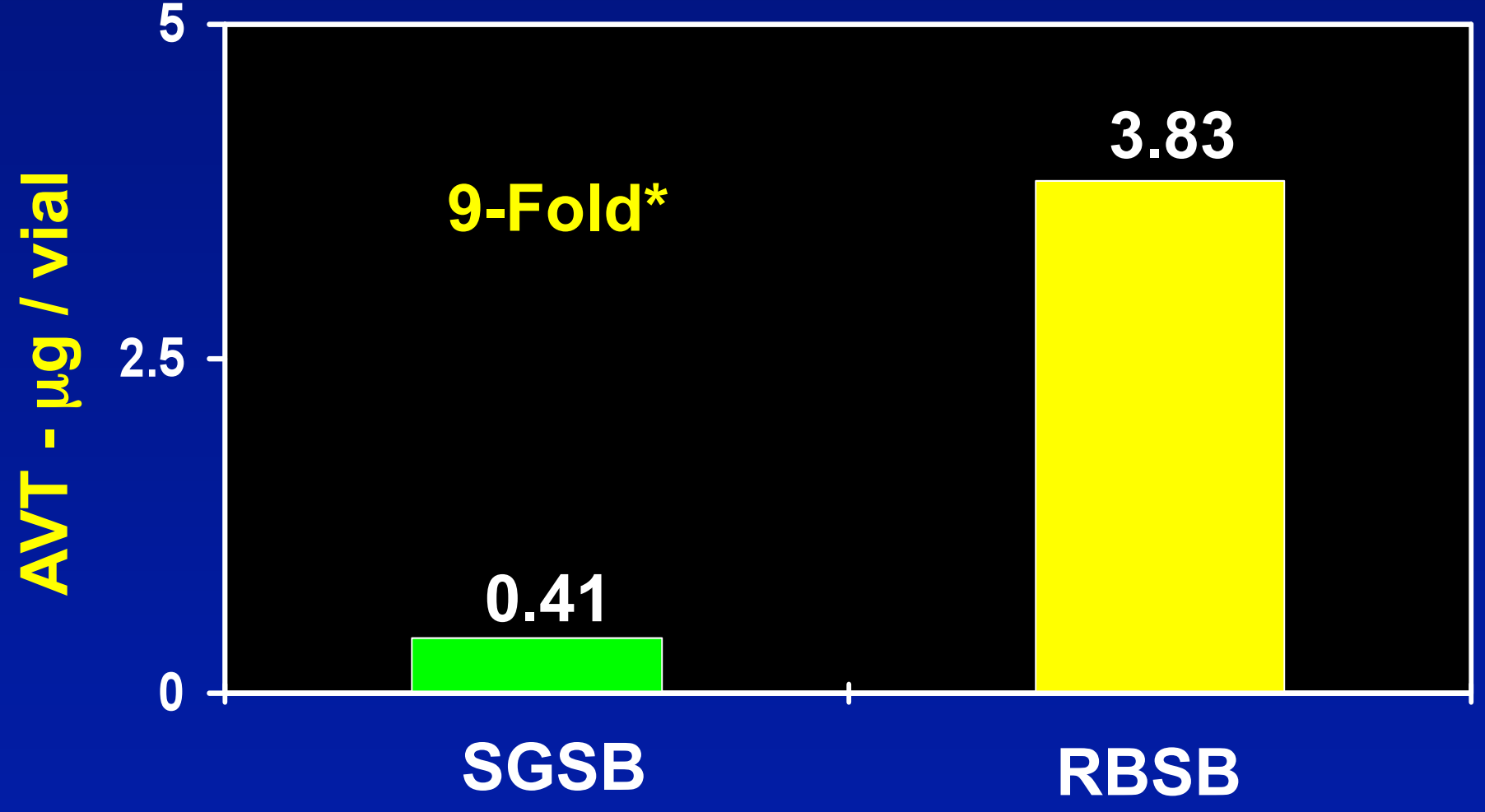
Field Efficacy of Single Products



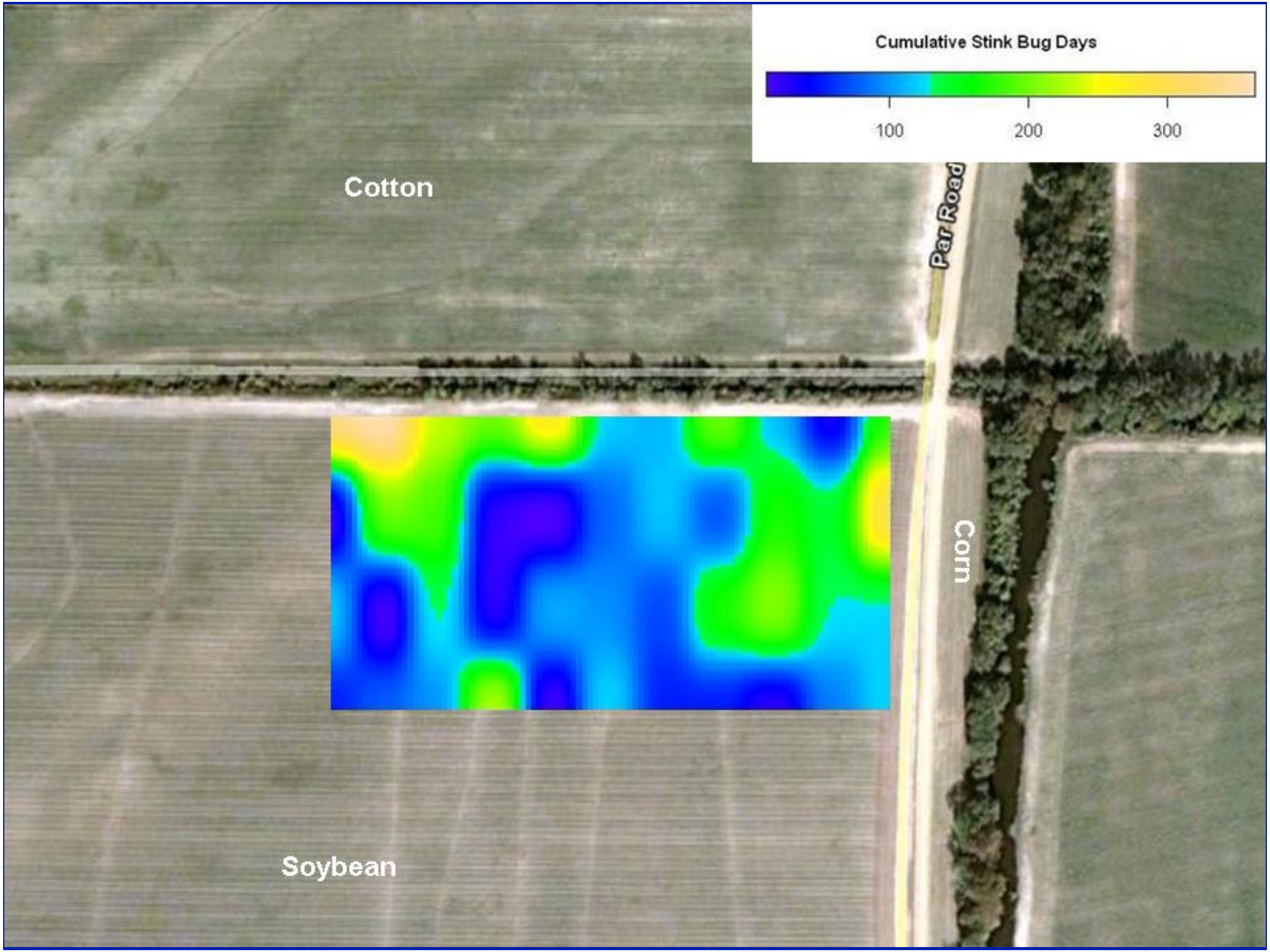
Temple et al. 2012

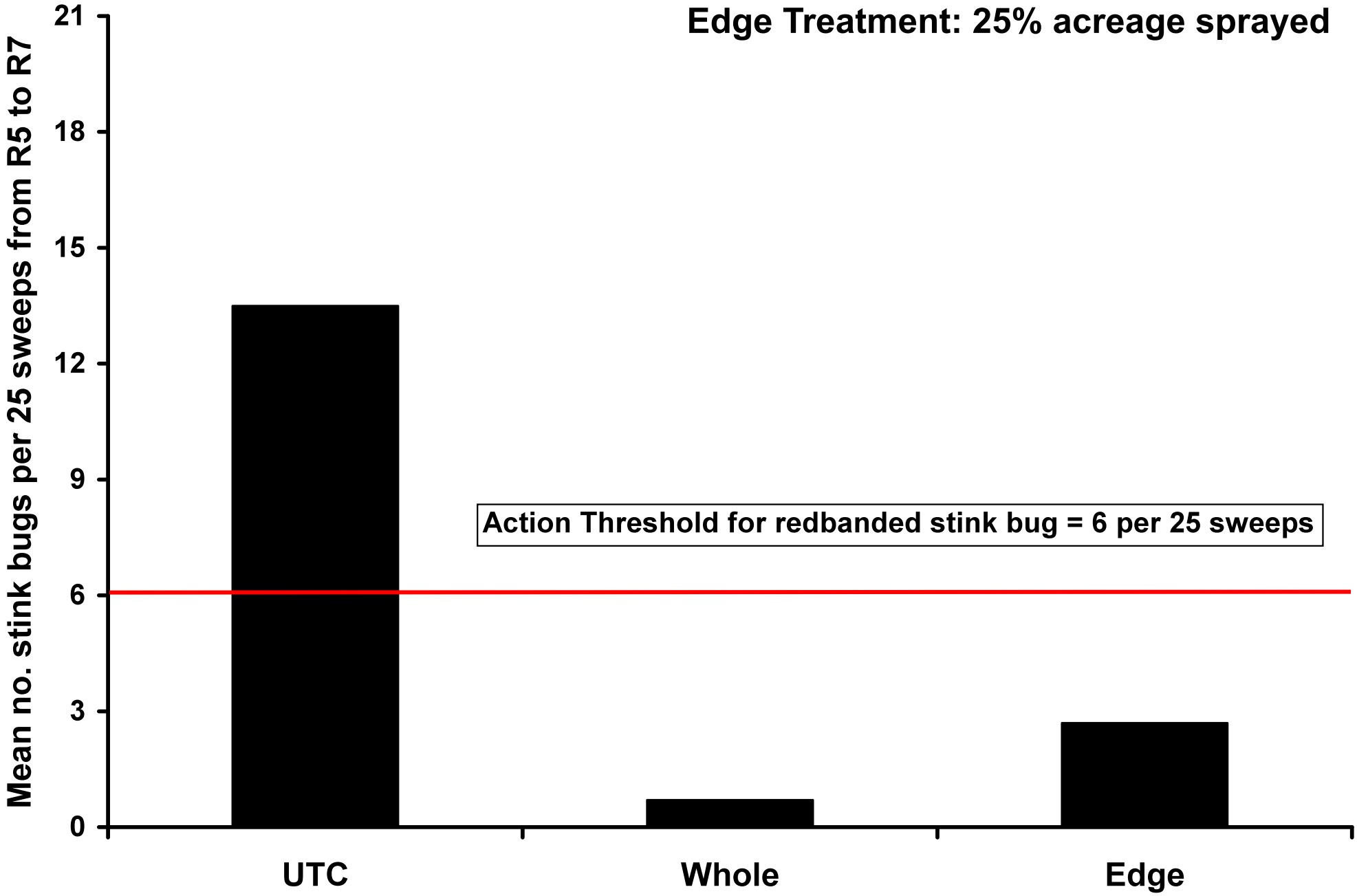
Stink Bug Susceptibility to Acephate (Orthene®)LC_{50}



2005

Temple et al. 2012


Cumulative Stink Bug Days
100
200
300
Cotton
Par Road
Corn
Soybean



Davis et al. 2011

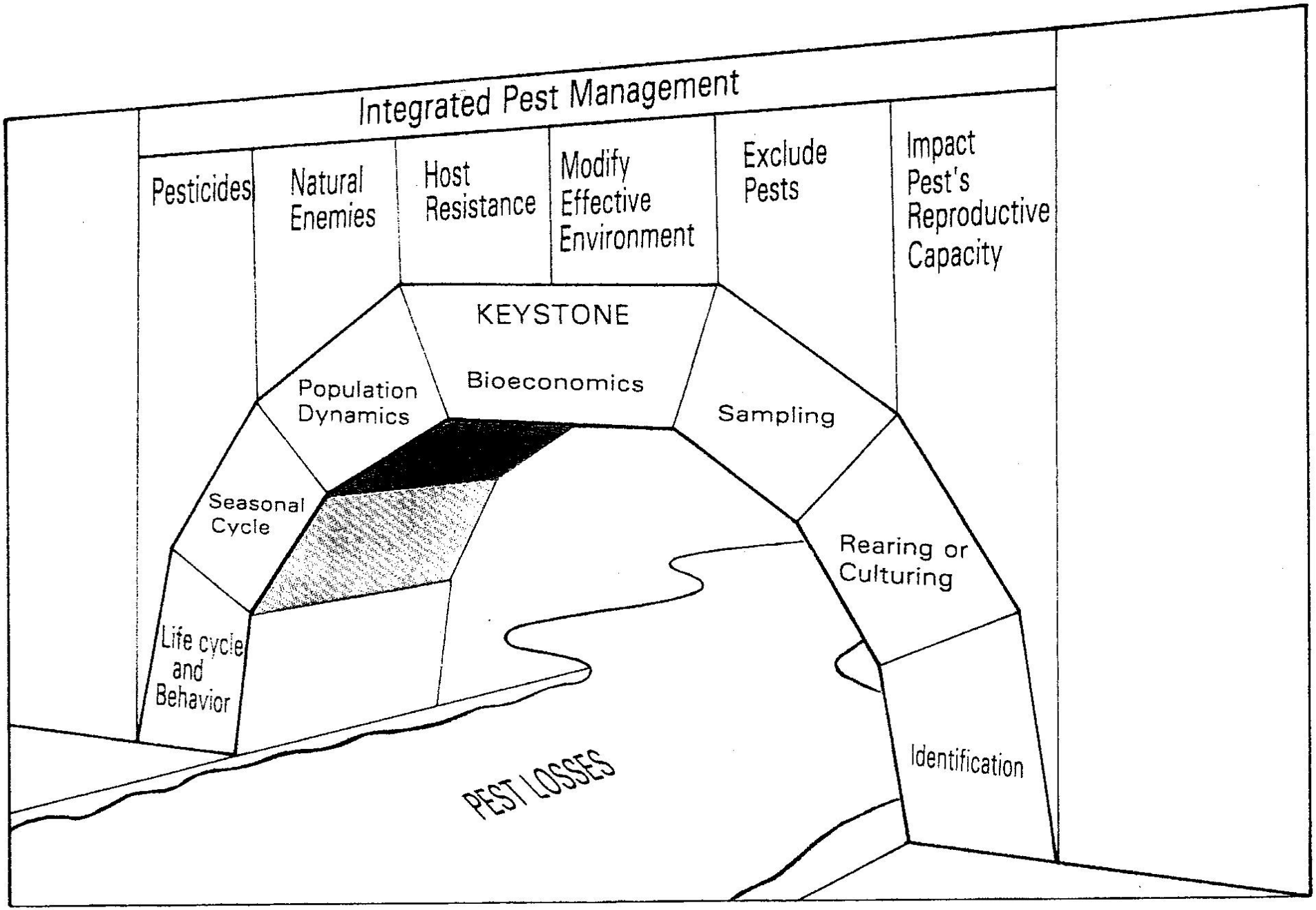
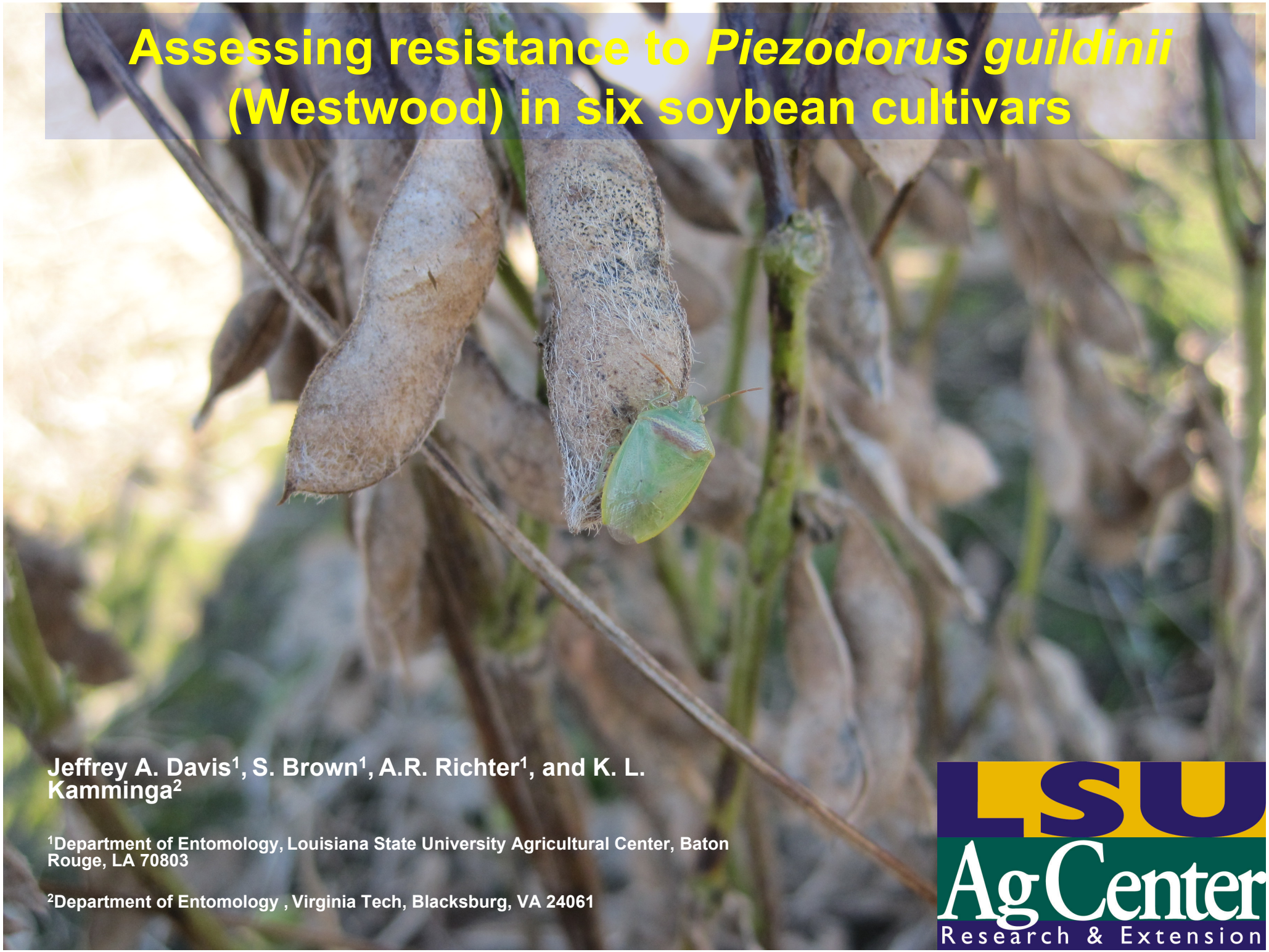


Figure 8.14 Schematic representation of the major components of an insect pest management program.

Pedigo 1999

Assessing resistance to *Piezodorus guildinii* (Westwood) in six soybean cultivars



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[2]Department of Entomology , Virginia Tech, Blacksburg, VA 24061

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Host Plant Resistance

- Prior to the soybean aphid, only soybean three cultivars had been released with insect resistance (Lambert and Tyler 1999)

  Lamar (1989): MGVI; resistance to soybean looper, velvetbean caterpillar, and corn earworm

  Lyon (1993): MGVII; resistance to lepidopterans

  Crockett (1990): MGVIII; resistance to foliar feeding insects

Limitations of Released Resistant Cultivars

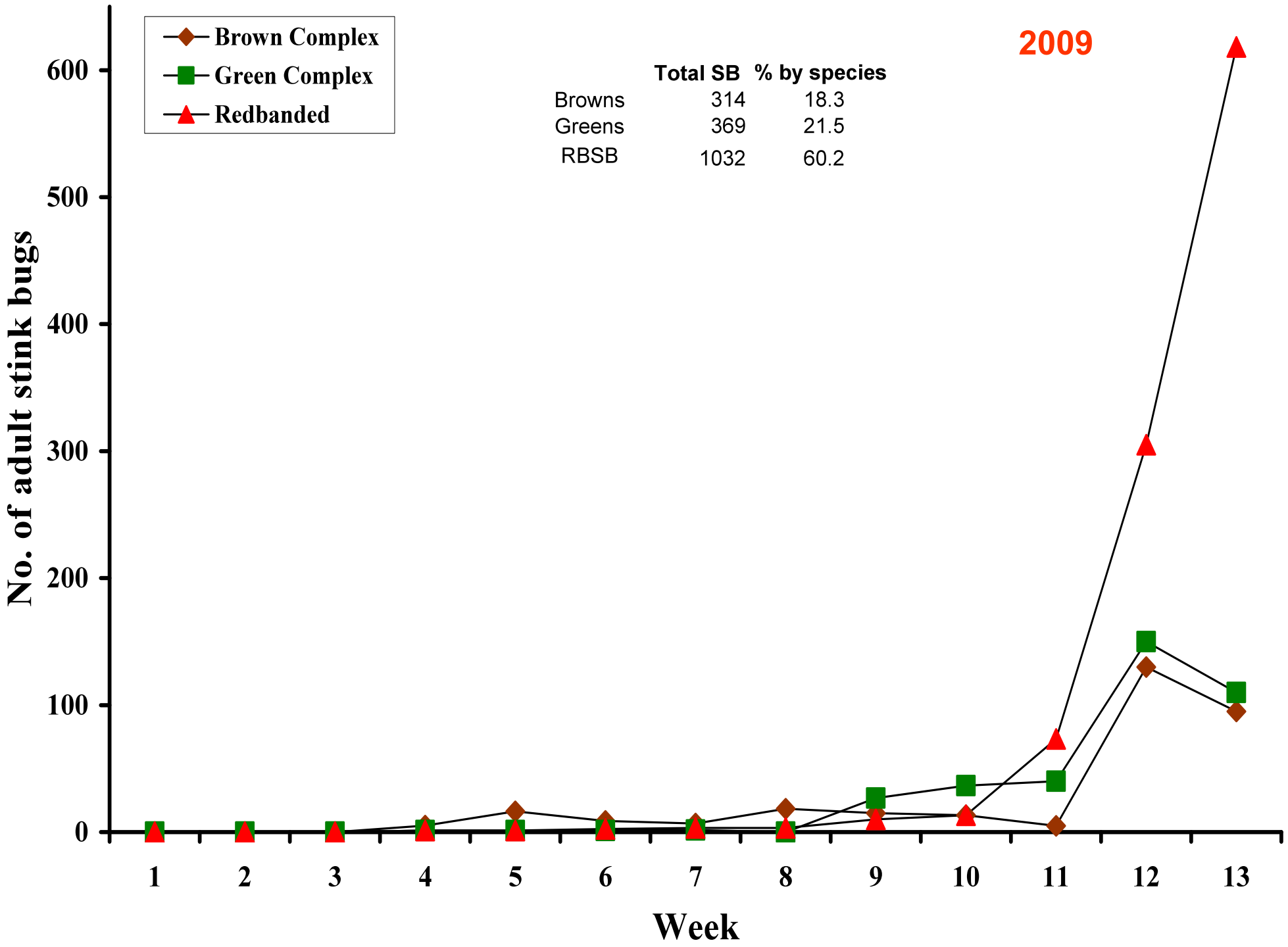
- Low yield
- Late maturity

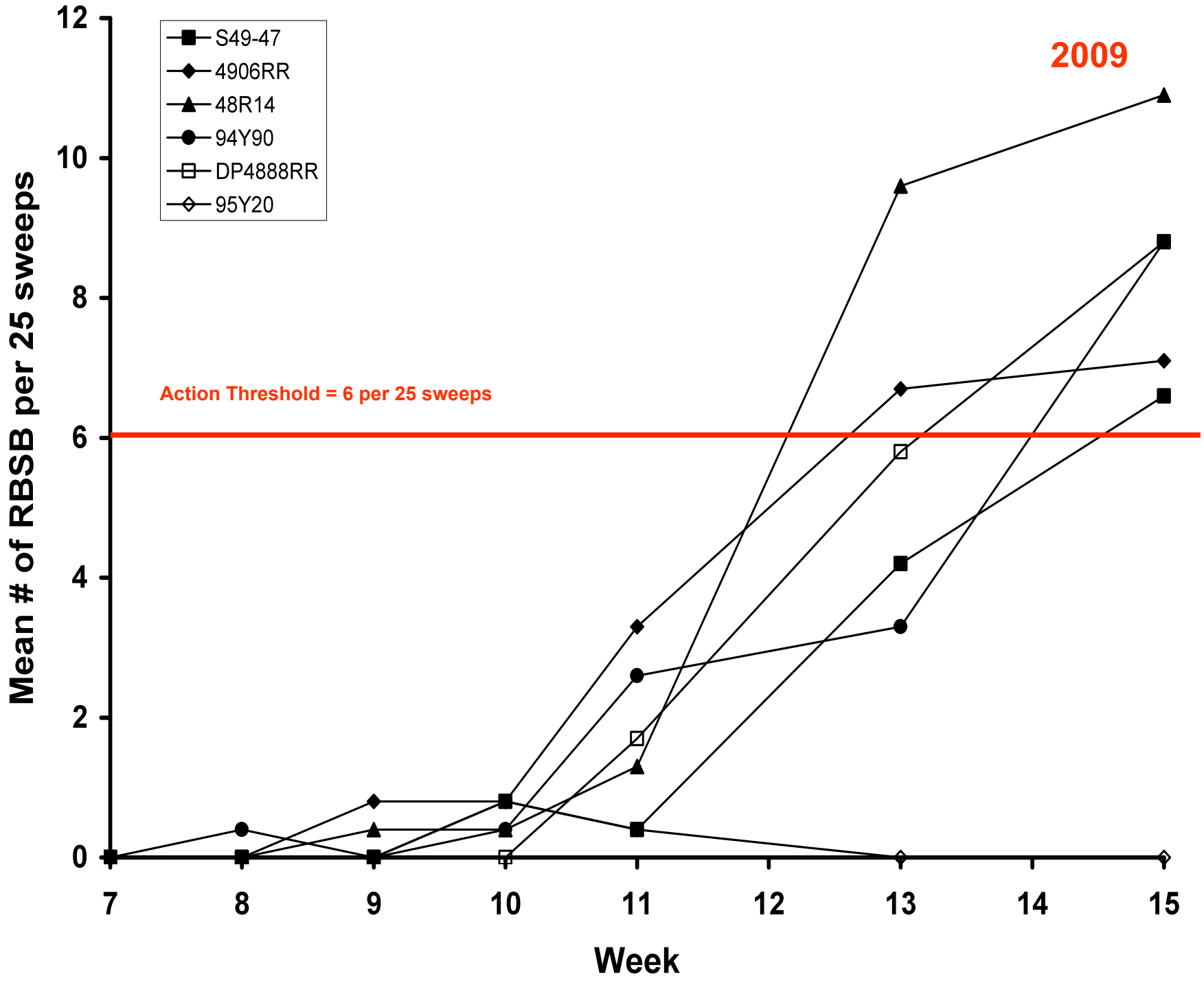
Current soybean cvs

- Low levels of host plant resistance can effectively lessen pest pressure by increasing developmental duration and reducing fecundity, and thus favoring population regulation by natural enemies

Experimental Design

- Conducted 2009 and 2010
- RCBD
  - 4 reps, 6 treatments (2009)
  - 9 reps, 6 treatments (2010)
- Treatments
  - DP 4888RR/S
  - NK S49-47
  - Pioneer 94Y90
  - Pioneer 95Y20
  - Progeny 4906RR
  - Terral 48R14
- Swept weekly from V4 to R8
- Recorded no. stink bugs per 25 sweeps
- Yield and Quality


Brown Complex
Green Complex
Redbanded
2009
Total SB % by species
Browns 314 18.3
Greens 369 21.5
RBSB 1032 60.2
No. of adult stink bugs
0
100
200
300
400
500
600
1
2
3
4
5
6
7
8
9
10
11
12
13
Week


2009
S49-47
4906RR
48R14
94Y90
DP4888RR
95Y20
Action Threshold = 6 per 25 sweeps
Mean # of RBSB per 25 sweeps
Week
0
2
4
6
8
10
12
7
8
9
10
11
12
13
14
15

2009 Results

Variety	RBSB CID	% Dmg Seed	Yield (bu/A)
S49-47	148 b	50 b	65 a
4906RR	222 ab	63 a	75 a
48R14	305 a	55 ab	50 bc
94Y90	187 b	51 b	65 ab
4888RR/S	212 ab	56 ab	48 c
95Y20	14 c	19 c	76 a
P -value	<0.0001	<0.0001	<0.0001

Conclusions

- Current soybean varieties differ in their susceptibility to the redbanded stink bug
- Pioneer 95Y20 had the lowest redbanded stink bug CID and least amount of stink bug damage
- These varieties are MG appropriate and yield well under various environmental conditions

Identifying Stink Bug Resistance in NC State Soybean Lines

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[3]Department of Entomology , Virginia Tech, Blacksburg, VA 24061

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Experimental Design

- Conducted 2009 - 2011
- RCBD
  4 reps, 13 treatments
- Plots 4 rows x 25 ft
- Swept weekly from V4 to R8
- Recorded no. stink bugs per 25 sweeps
- Yield and Quality

2009 and 2010 Results

Line	CID		% Dmg	
DP5806RR	263 ± 46	a	58.3 ± 3.5	de
IAC100	204 ± 48	ab	62.7 ± 1.9	cd
NCC01-69	175 ± 35	a-c	43.3 ± 0.9	g
NCC02-20	98 ± 47	b-d	48.3 ± 2.7	fg
NCC02-22	98 ± 23	b-d	47.0 ± 1.7	g
NCC02-30	74 ± 23	cd	43.0 ± 1.0	g
NCC04-15	150 ± 24	a-d	45.3 ± 2.3	g
NCC04-61	105 ± 30	b-d	66.7 ± 1.2	c
NCC04-62	70 ± 27	cd	72.7 ± 1.9	b
NCC05-11	135 ± 33	b-d	57.3 ± 2.2	de
NCC05-13	82 ± 47	cd	56.3 ± 1.7	e
NCC05-15	95 ± 76	b-d	54.0 ± 1.2	ef
NCRoy	51 ± 9	d	86.0 ± 0.6	a
P-value	0.0311		< 0.0001	

2011 Results

Line	CID
DP4888RR	376 ± 101 a
Jake	222 ± 69 b
N07-8059	33 ± 12 d
NC Roy	102 ± 53 b-d
NCC04-14762R	85 ± 6 cd
NCC04-5336R	123 ± 80 b-d
NCC06-5754R	79 ± 10 cd
NCC06-5894R	75 ± 17 cd
NCC06-7018R	100 ± 26 b-d
P-value	< 0.0001

Identifying Tolerance to Stink Bugs in Soybean Breeding Lines

Jeffrey A. Davis[1], B. R. Leonard[1], P. Chen[2], J. Heitholt[3], M. O. Way[3]

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[2]University of Arkansas

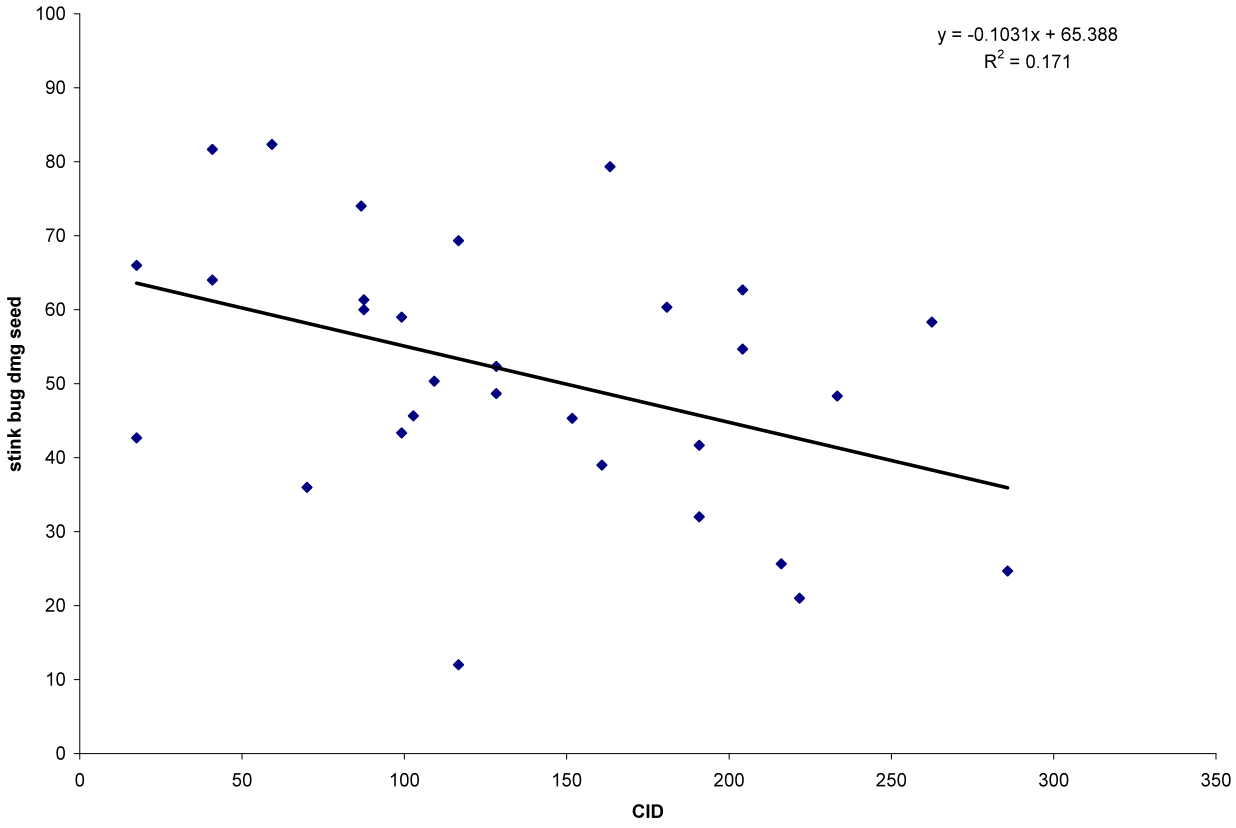
[3]Texas A&M

2008 to 2010 RBSB HPR Screening

- 28 selections were sent by Dr. Glenn R. Buss, Professor Emeritus, Dept. of Crop and Soil Environmental Sciences, Virginia Tech for evaluation
- 5 traditional soybean varieties
- 2 plant introductions with known stink bug resistance
- and NC Roy, a variety Dr. M.O. Way, Research/Extension Entomologist, Texas A&M University System Agricultural Research and Extension Center believes has stink bug resistance

2008 to 2010 Results

Line	CID	% Dmg
AG5905	181 ± 56 a-g	60.3 ± 2.4 f-h
Dillon	117 ± 31 c-i	69.3 ± 2.7 cd
DP5414	88 ± 61 e-i	61.3 ± 0.9 e-h
DP5634	161 ± 10 a-h	39.0 ± 1.2 pq
DP5806RR	263 ± 46 ab	58.3 ± 3.5 g-i
HBKR4924	87 ± 43 e-i	74.0 ± 1.2 bc
HBKR5226	103 ± 32 c-i	45.7 ± 0.9 m-o
IAC100	204 ± 48 a-e	62.7 ± 1.9 e-g
V00-0706	204 ± 32 a-e	54.7 ± 0.7 i-k
V00-0708	152 ± 41 b-h	45.3 ± 1.7 m-o
V00-0709	117 ± 21 c-i	12.0 ± 1.0 t
V00-0713	233 ± 67 a-c	48.3 ± 0.3 l-n
V00-0714	286 ± 29 a	24.7 ± 0.7 s
V00-0716	216 ± 71 a-e	25.7 ± 0.3 s
V00-0725	191 ± 68 a-f	41.7 ± 2.2 op
V00-0742	191 ± 45 a-f	32.0 ± 1.2 r
V00-0747	222 ± 72 a-d	21.0 ± 3.1 s
V00-0785	88 ± 62 e-i	60.0 ± 1.2 f-i
V00-0799	99 ± 56 d-i	43.3 ± 0.7 n-p
V00-0842	128 ± 58 c-i	52.3 ± 3.7 j-l
V00-0864	128 ± 12 c-i	48.7 ± 1.8 l-n
V00-0870	163 ± 79 a-h	79.3 ± 4.4 ab
V00-0875	18 ± 18 i	42.7 ± 3.0 op
V00-0891	59 ± 43 g-i	82.3 ± 0.9 a
V00-0907	70 ± 27 f-i	36.0 ± 0.6 qr
V00-4450	18 ± 0 i	66.0 ± 1.5 de
V99-1650	99 ± 25 d-i	59.0 ± 3.1 f-i
V99-1679	109 ± 42 c-i	50.3 ± 0.9 k-m
V99-1685	41 ± 33 hi	81.7 ± 0.9 a
V99-1720	41 ± 12 hi	64.0 ± 0.6 d-f
P-value	0.0026	< 0.0001



Don’t Gamble With Stink Bug Pests!!!!


Thank You
Questions?
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