Observations and Biology of Kudzu Bugs and Their Management in Southeastern Soybeans

University of Georgia

P. Roberts, J. All, D. Buntin, W. Gardner, John Ruberson, M. Toews, D. Suiter, and T. Jenkins

Clemson University

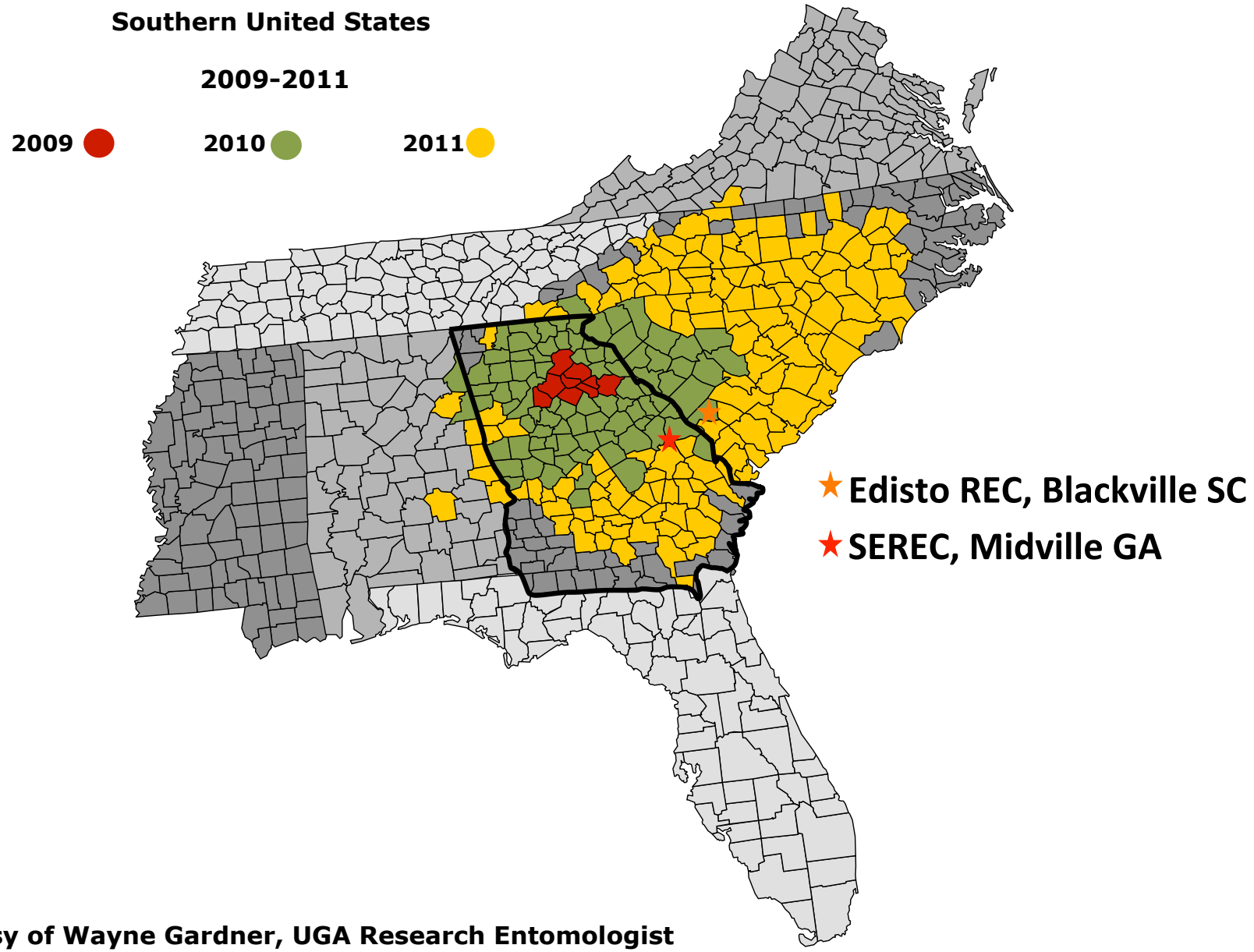
J. Greene, N. Seiter, and F. Reay-Jones

USDA-NBCL

W. Jones

Soybean Breeders' and Entomologists' Workshop

February 28, 2012



Map, courtesy of Wayne Gardner, UGA Research Entomologist

Dr. Mike Toews, Research Entomologist, SEREC Midville GA – 2011 (2 kudzu bugs observed at SEREC in 2010)

★ **Edisto REC**
Blackville SC

Yield Loss in Soybeans

Georgia and South Carolina, n=19

Year	State	% Yield Reduction	Maturity Group	Test Type
2010	GA	11%	MGVII	Trt vs Unt
2010	GA	19%	MGVII	Trt vs Unt
2010	GA	23%	MGVII	Efficacy
2010	GA	23%	MGVII	Efficacy
2010	GA	14%	MGVII	Efficacy
2010	GA	22%	MGVII	Efficacy

18% AVG

Range: 0%-47%

Year	State	% Yield Reduction	Maturity Group	Test Type
2011	SC	0%	MGIV	Threshold
2011	SC	10%	MGVII	Threshold
2011	GA	27%	MGV	Threshold
2011	SC	14%	MGVIII	Pheno
2011	SC	12%	MGVII	Pheno
2011	GA	47%	MGV	Pheno
2011	GA	36%	MGV	Efficacy
2011	SC	20%	MGVII	Efficacy
2011	SC	25%	MGVII	Efficacy
2011	GA	30%	MGVII	Efficacy
2011	GA	0%	MGVII	Efficacy
2011	GA	13%	MGVII	Efficacy
2011	GA	0%	MGVII	Efficacy

Kudzu Bug

- Adults and nymphs feed on the main stem
- Sucking mouthparts
- Feeds on plant sap
  - excrement, sooty mold
- Purplish lesions on main stem and petioles
- Does not feed on pods

- **STRESS inducing pest**

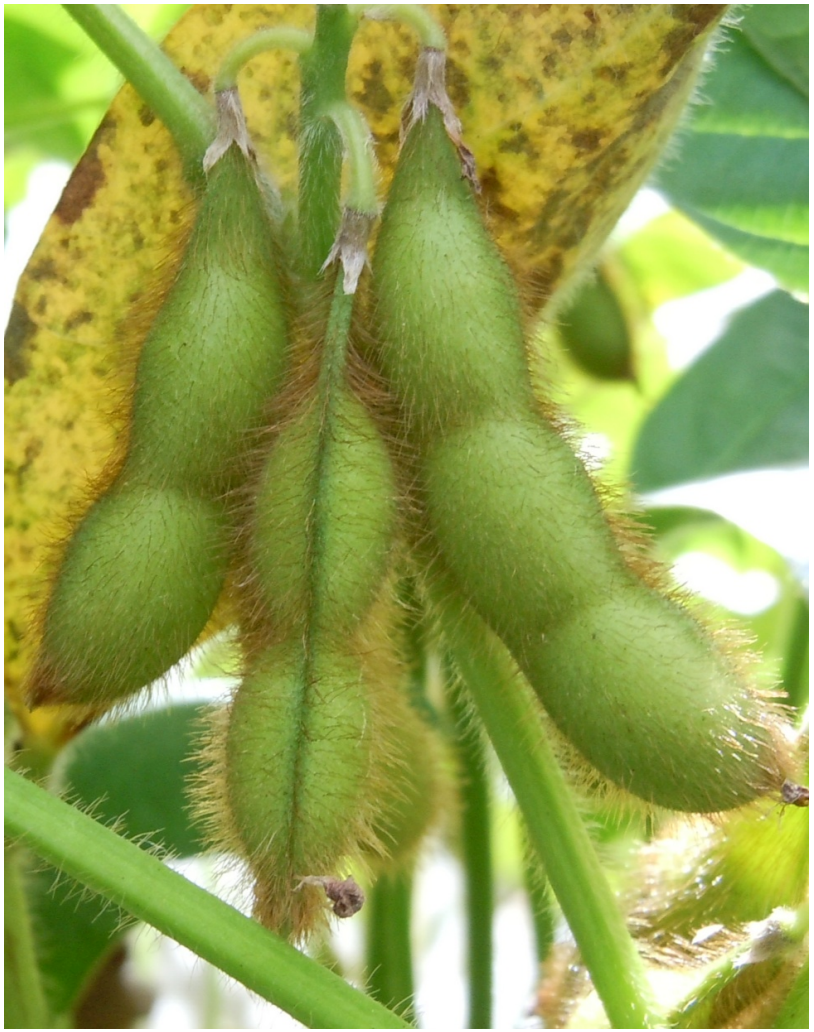
Yield Component Analysis (2010-2011)

Percent Change in Kudzu Bug Infested Treatment

(P<0.05)	2010 Cage	2011 Cage	2011 Field (Midville)
Seed Wt. per Cage/Plot	**-34.8**	**-23.5**	**-27.2**
Pods per Plant	**-30.6**	**46.2 ?**	-10.5
Seeds per Pod	**-11.6**	**-33.9**	-5.1
Weight per Seed	-12.2	**-11.9**	**-20.9**

Clemson Cage Trial 2011

(Seiter et al.)

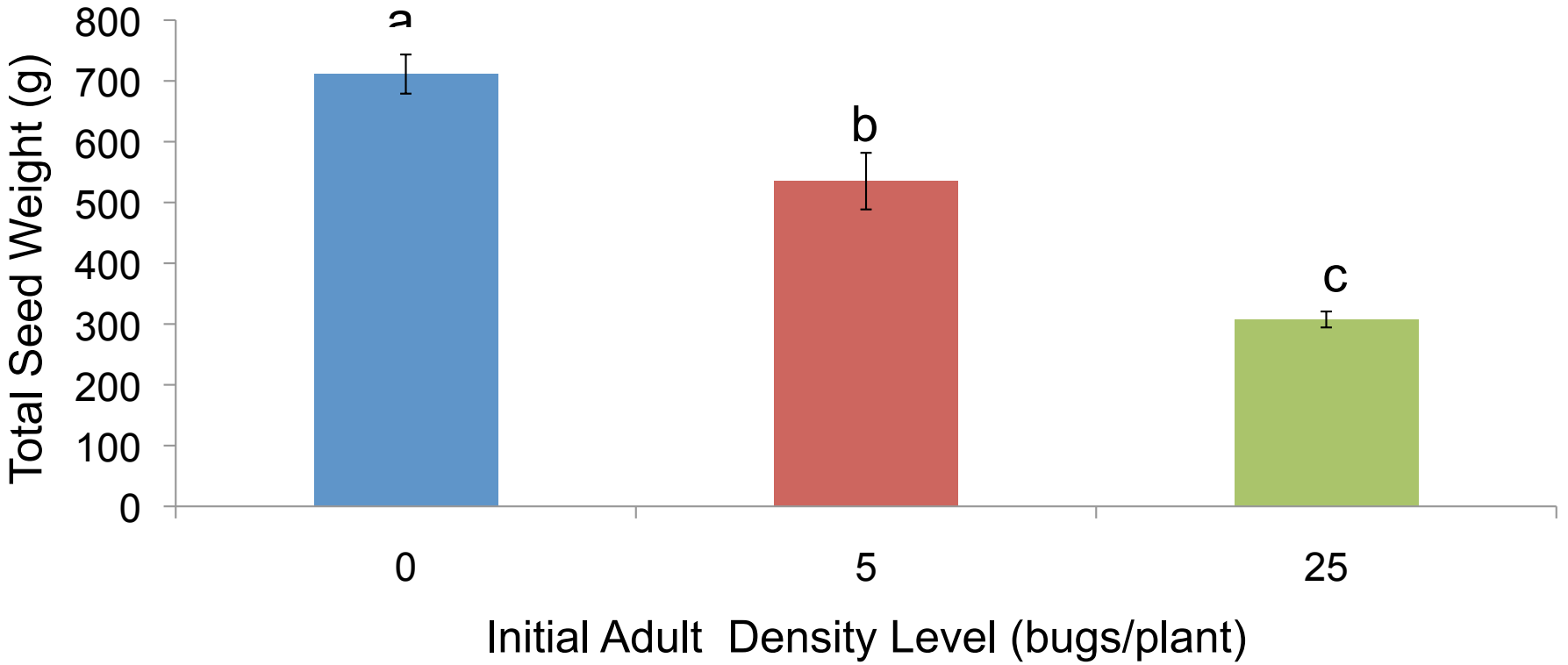


- 1.5x1.5x1.5 m cages
- MG VI (27 plants per cage)
- 0, 5, and 25 *M. cribraria* adults per plant (V8-maturity)

Total Seed Weight/Cage (g)

(27 plants/cage)

F = 36.3927
P < 0.0001



Density Level (Bugs/Plant)	Pods/Plant	Seeds/Pod	Weight (g./ seed)
0	73.7 a	2.4 a	0.151 a
5	67.1 a	2.2 a	0.137 b
25	60.1 a	1.8 b	0.108 c

Soybean Invasion (Observations)

- Migration to soybean from spring host(s).
  - Kudzu appears to be an important early season reproductive host (source)….Wisteria?
    - **Developmental biology of kudzu bugs on kudzu/soybean.**
      - Migration/invasion patterns (late June-July in Georgia)
  - Is kudzu or another spring reproductive host required?
    - Infestations on seedling soybeans (OW adults).
      - Very early plantings?
      - Latitude?
- Tends to prefer soybeans 8-10 inches in height.
- Infestations typically higher on field edges.
- Populations higher in early planted soybeans compared with later plantings.

Field Trials

- Insecticide Efficacy
- Phenological Susceptibility
- Preliminary Thresholds

Kudzu Bug Insecticides

UGA Plant Science Farm, July 9, 2010 (2 DAT1)

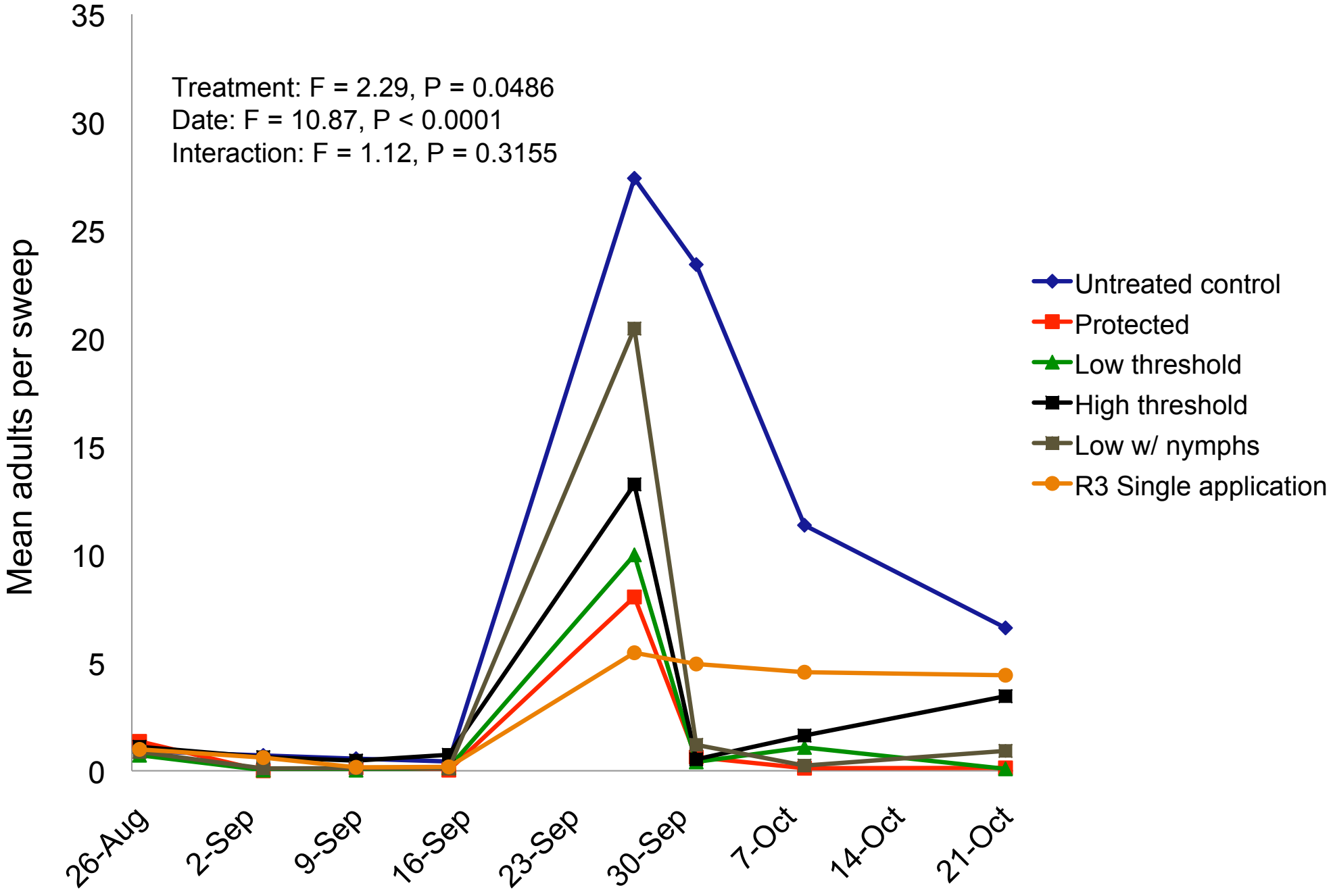
Insecticide	(n)	Mean % Control (2-5 DAT)	CV
Hero	1	96	
Brigade	**4**	**95**	**2**
Karate+Orthene	1	94	
Endigo	**9**	**92**	**3**
Brigadier	**2**	**91**	**0**
Discipline	**3**	**90**	**3**
Sevin	**3**	**90**	**1**
Karate	**8**	**89**	**4**
Declare	**3**	**85**	**5**
dimethoate	1	84	
Cobalt	**6**	**82**	**12**
Mustang Max	**4**	**81**	**9**
Orthene	**5**	**81**	**18**
methyl parathion	1	80	
chlorpyrifos	4	75	4
Asana	2	72	18
Besiege	2	71	6
Stallion	1	69	
Tracer	1	68	
Larvin	2	66	33
Baythroid	8	65	10
Fastac	1	63	
Belay**	4	62	20
Rimon	1	56	
Leverage	5	53	45
Lannate	1	53	
Belt	3	41	37
Dimilin	4	31	13
Steward	2	19	100

cv=s.d./mean*100

Reinfestation after Insecticide Application?

- Late June-July migration from kudzu.
- Early fall migration when soybeans senesce (adults produced in early MG soybeans migrate to late MG soybeans).

Group VII Threshold Trial - adults



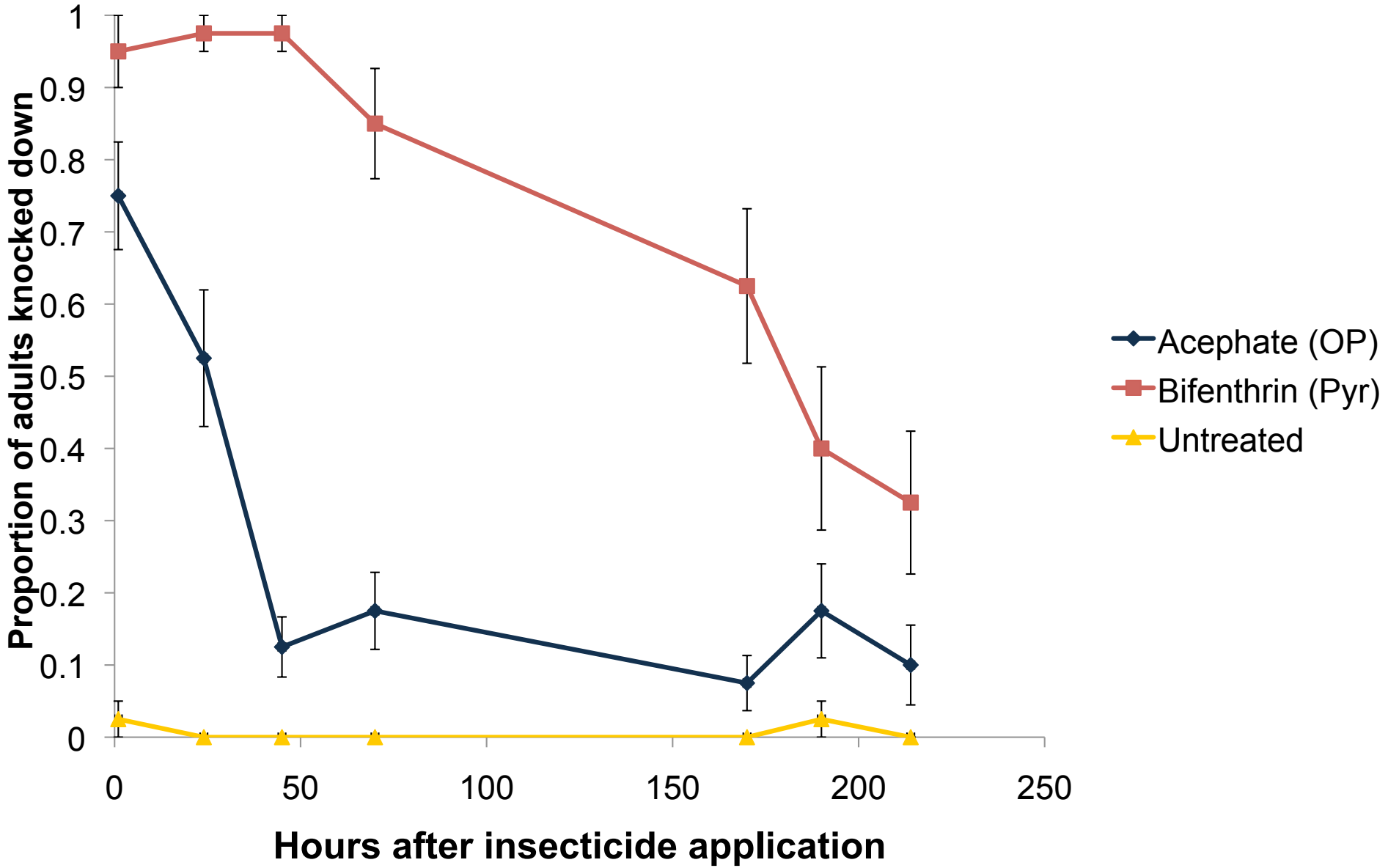
(Seiter et al.)

Insecticide Residual Control
(Seiter et al.)

- Soybeans treated with pyrethroid (Bifenthrin) vs organophosphate (Acephate) insecticides
- Exposed upper leaves collected from field, placed in petri dishes in lab
- Adults and 5^{th}-instar nymphs (n = 4 per dish) exposed for 24 hrs.

Petri Dish Insecticide Residual Assay-Adults

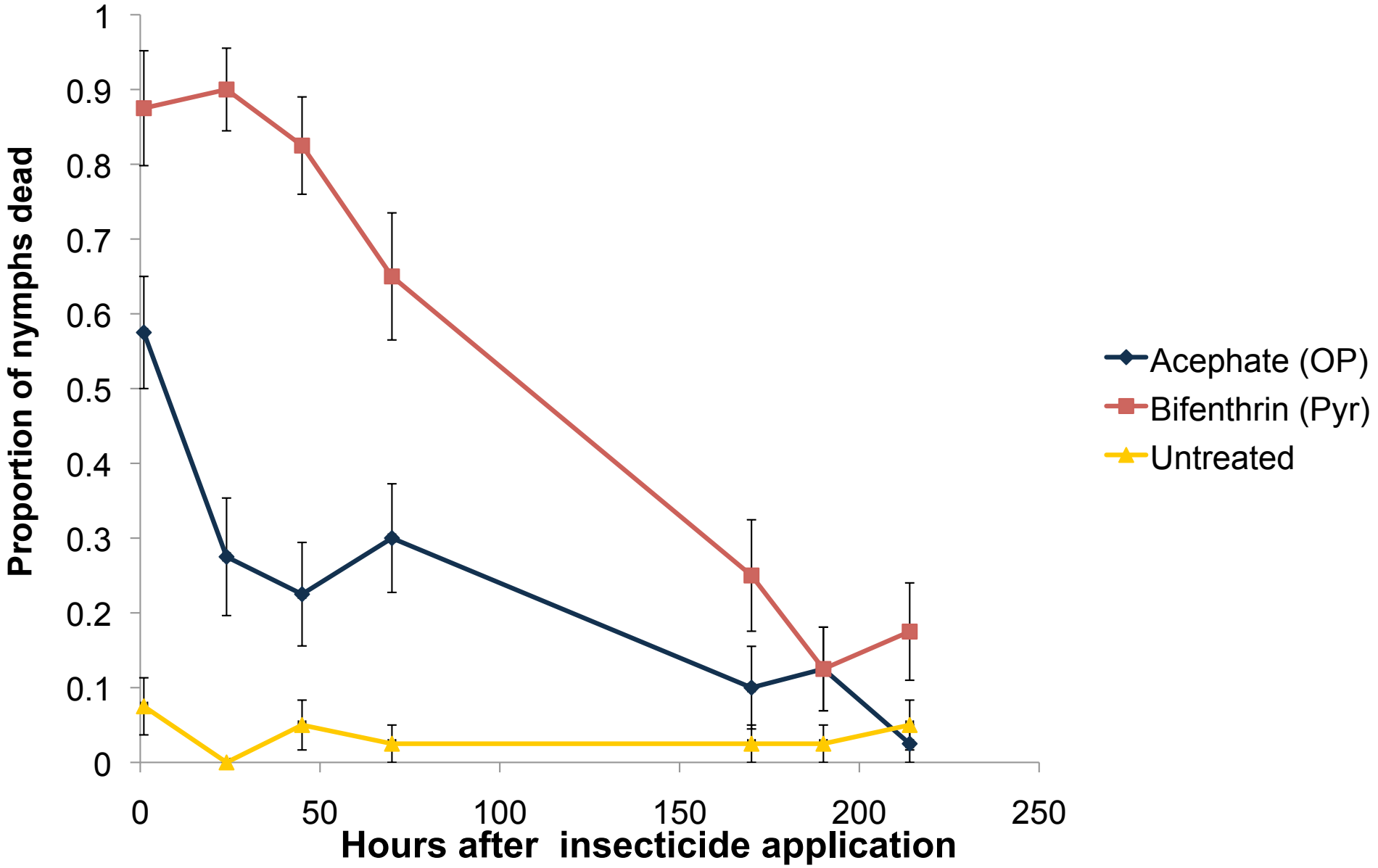
Spray application 2 Sep 2011



n = 40 individuals per treatment per interval (20 male, 20 female)

Petri Dish Insecticide Residual Assay-5th Instar Nymphs

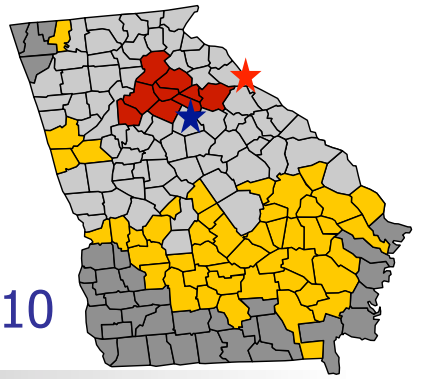
Spray application 2 Sep 2011

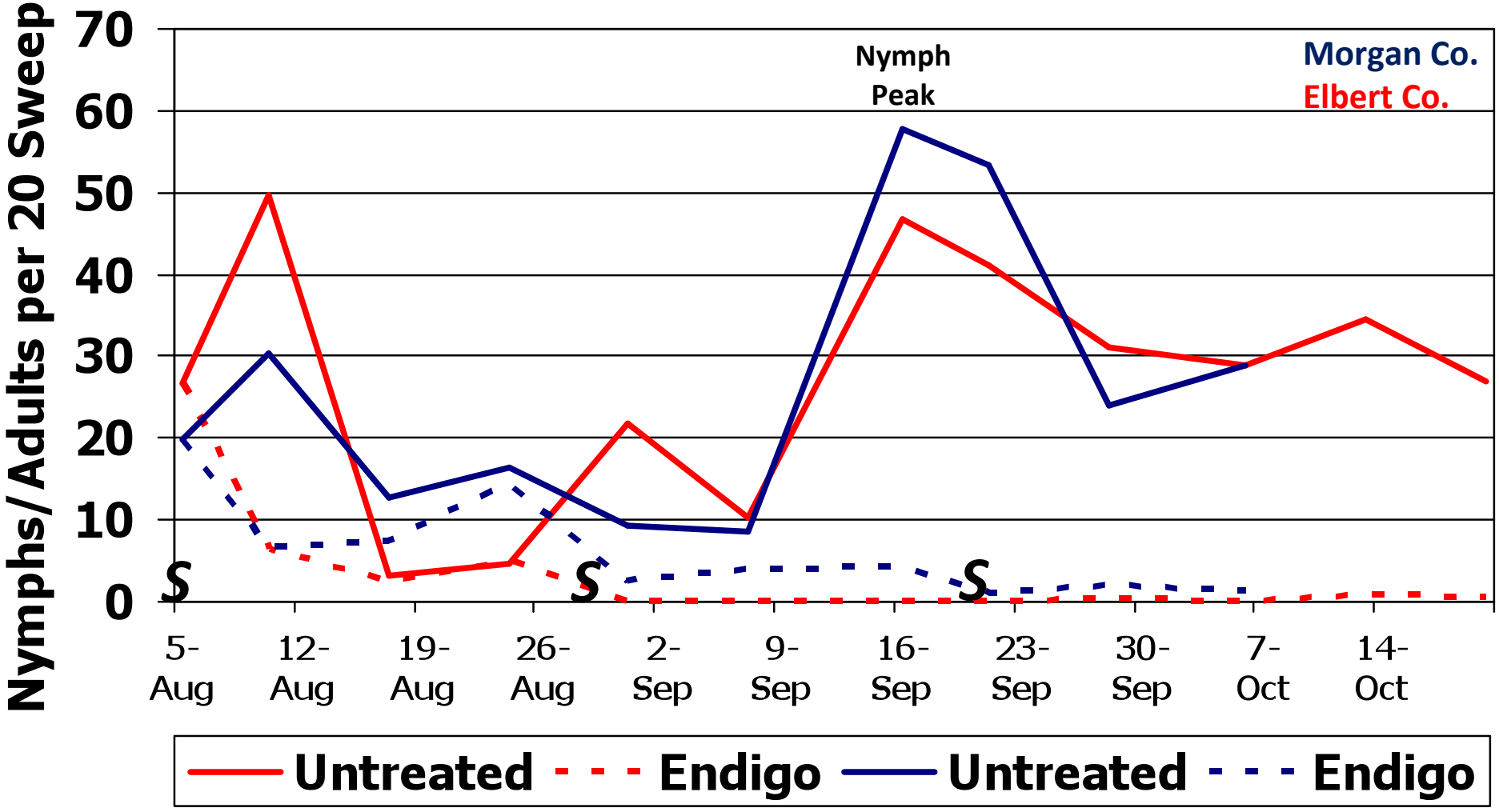


n = 40 individuals per treatment per interval

Kudzu Bug Large Plot Trials

Morgan Co. (Bobby Smith) and Elbert Co. (Clay Talton) 2010



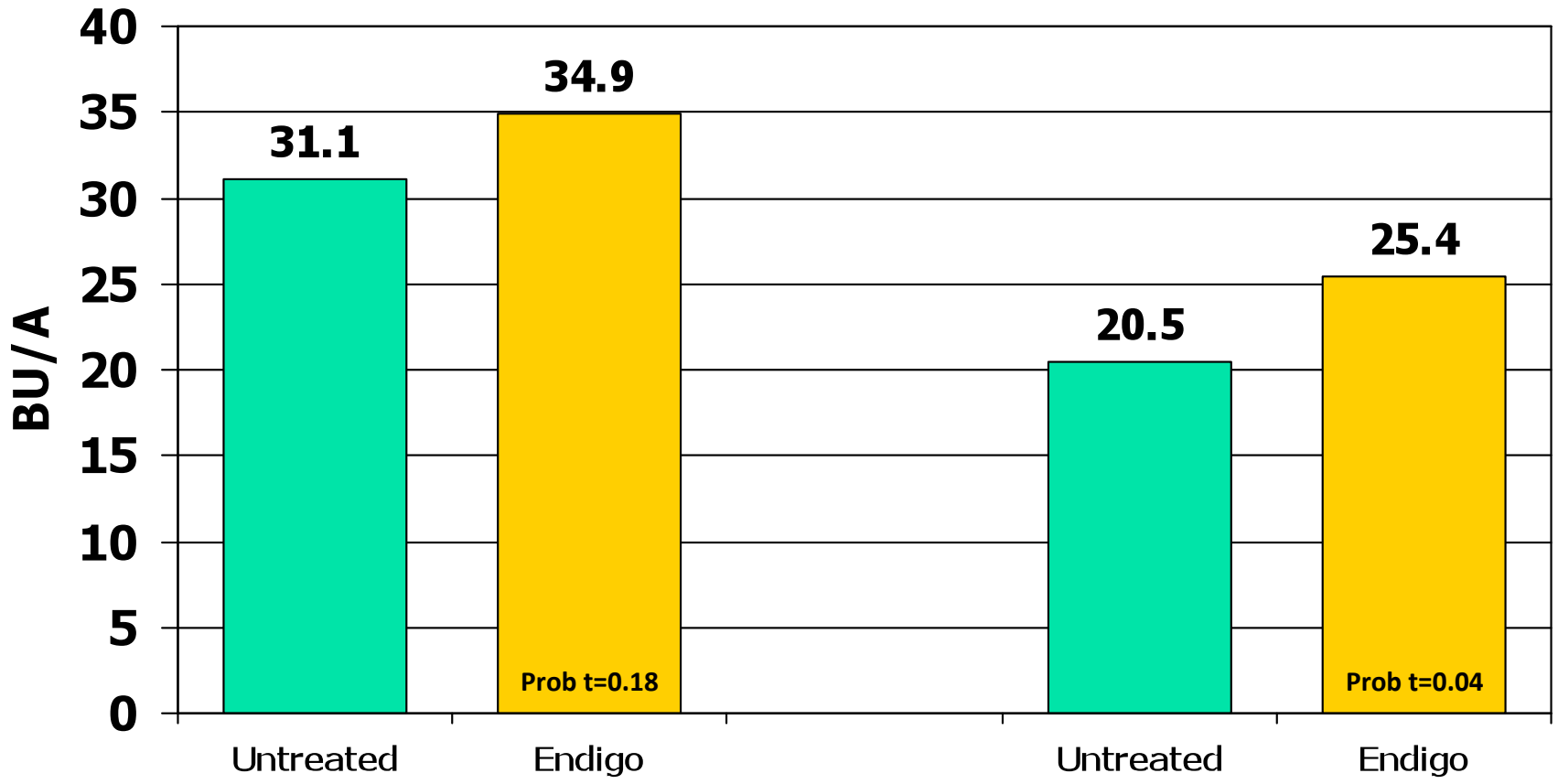



Elbert Co. GA


Morgan Co. GA

Kudzu Bug Insecticide Efficacy Trial

Morgan Co. (Bobby Smith) and Elbert Co. (Clay Talton) 2010



Applications:
August 5 & 27
September 16
3 Reps 2.5 A plots

Pheno Trials

- Quantify the susceptibility of soybean phenological growth stages to field infestations.
- Insecticide applications (Endigo 4.5 fl ozs/a) applied on 1-2 week interval when initiated at:
    - R1
    - R1 + 2 weeks
    - R1 + 4 weeks
    - R1 + 6 weeks
    - R1 + 8 weeks
    - Untreated

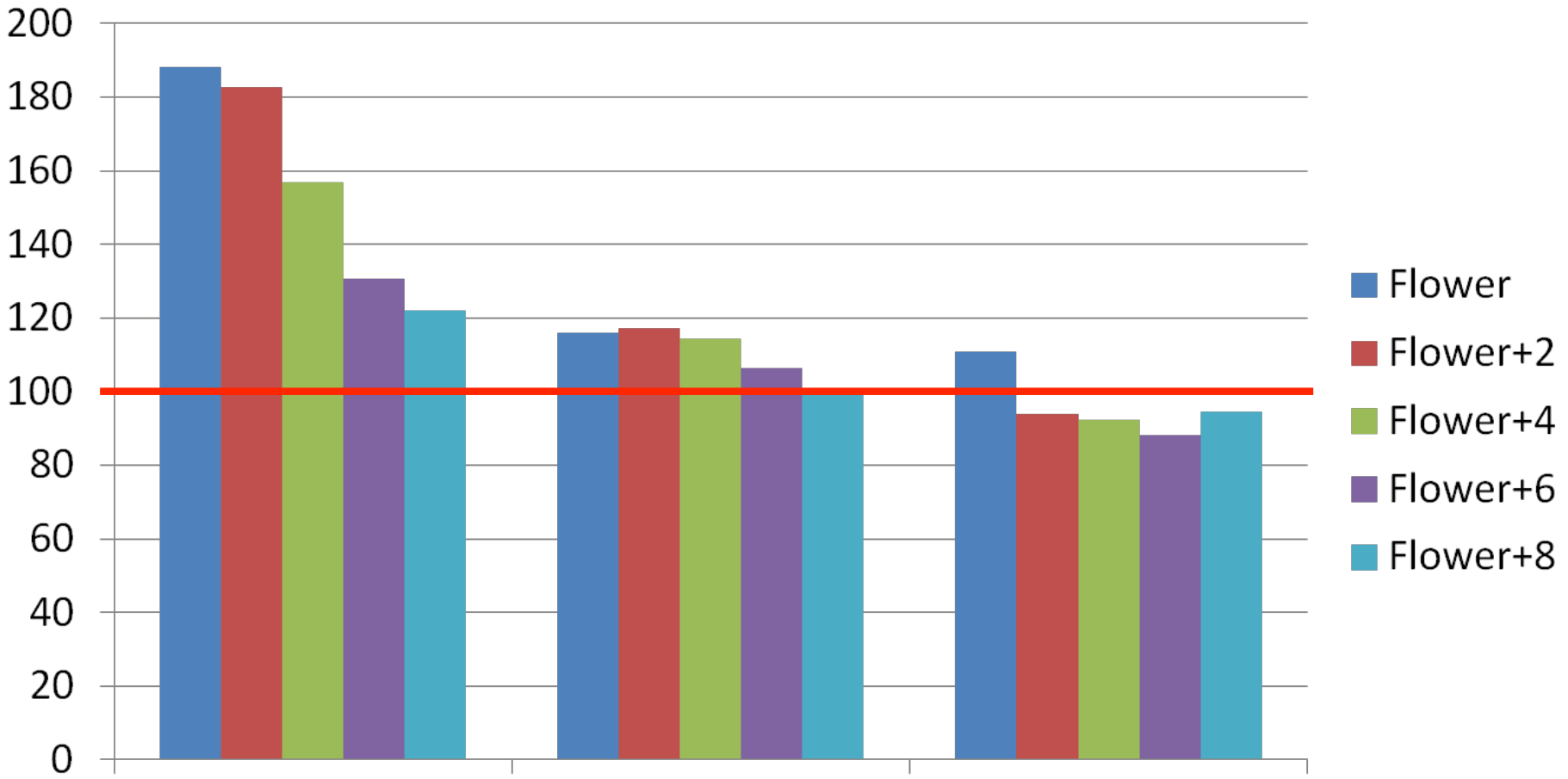
Forward and Reverse needed.

Seedling infestation data?

- Untreated plots sampled with a 15-inch diameter sweep net.

Pheno Trials

Yield (Percent of Untreated)



304 (n)
1549 (a)

51(n)
113(a)

77(n)
256(a)

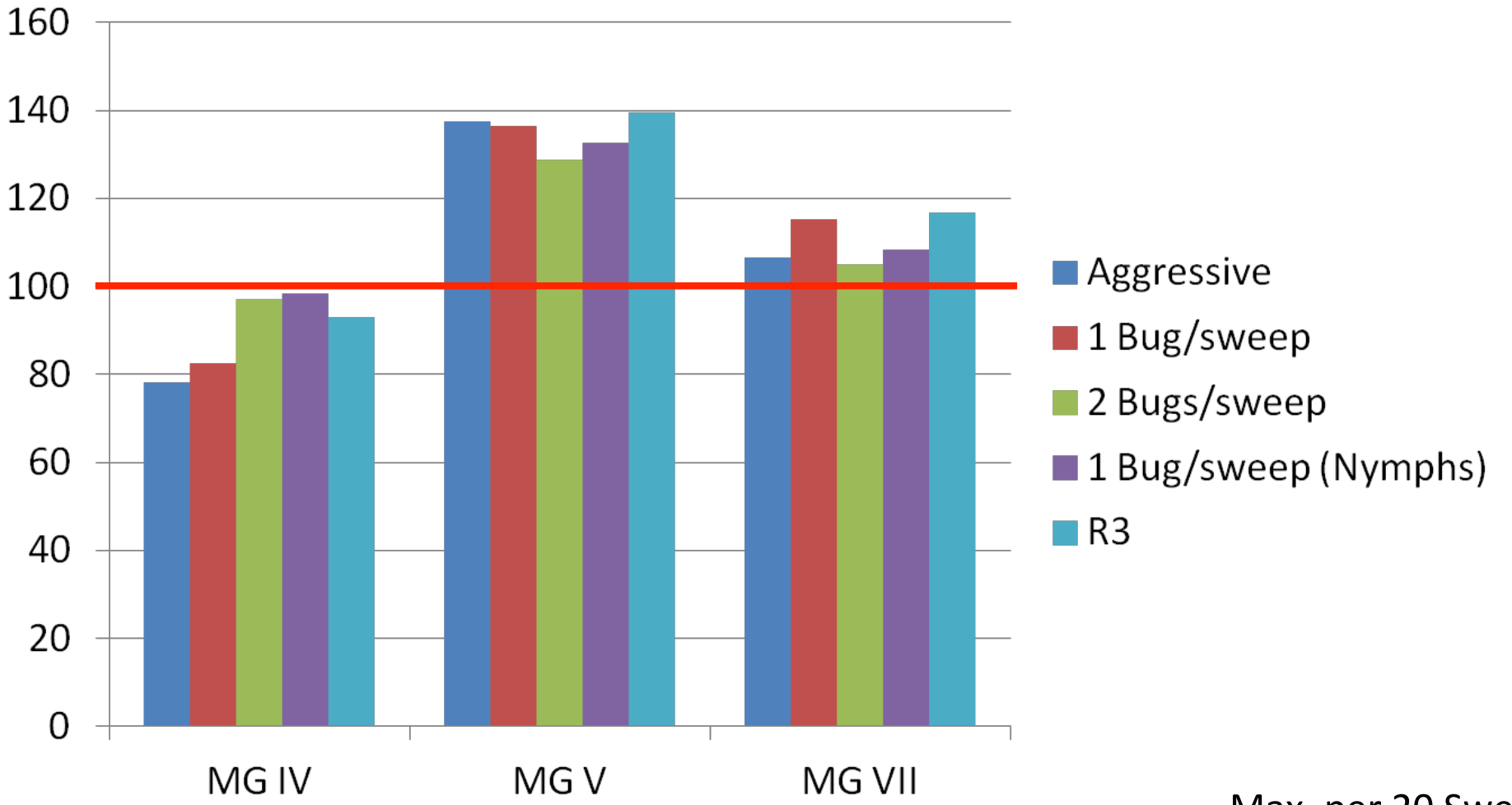
Max. per 20 Sweeps
nymphs
adults

Threshold Trials

- Evaluate potential action/economic thresholds for kudzu bugs in soybean.
- Plots sampled with a 15-inch diameter sweep net.
- Insecticide (Endigo 4.5 fl ozs/a) applied when action/ economic threshold is exceeded in specific treatments which include:
    - Untreated Control
    - Aggressively Protected (scheduled applications on 1-2 week interval)
    - 1 Bug/sweep
    - 2 Bugs/sweep
    - 1 Bug/sweep (nymphs present)
    - R3 (single application)

Threshold Trials

Yield (Percent of Untreated)



51 (n)
548 (a)

213 (n)
1270 (a)

6(n)
130 (a)

Max. per 20 Sweeps
nymphs
adults


Host Plant Resistance

Xing, G-n., T-j. Zhao, and J-y. Gai. 2006. Evaluation of soybean germplasm in resistance to globular stink bug [*Megacopta cribraria* (Fabricius)]. Acta Agronomica Sinica 32(4):491-496. [in Chinese; EBSCo]

Soybean resources Megacopta cribraria [Megacopta cribraria (Fabricius)] Resistance

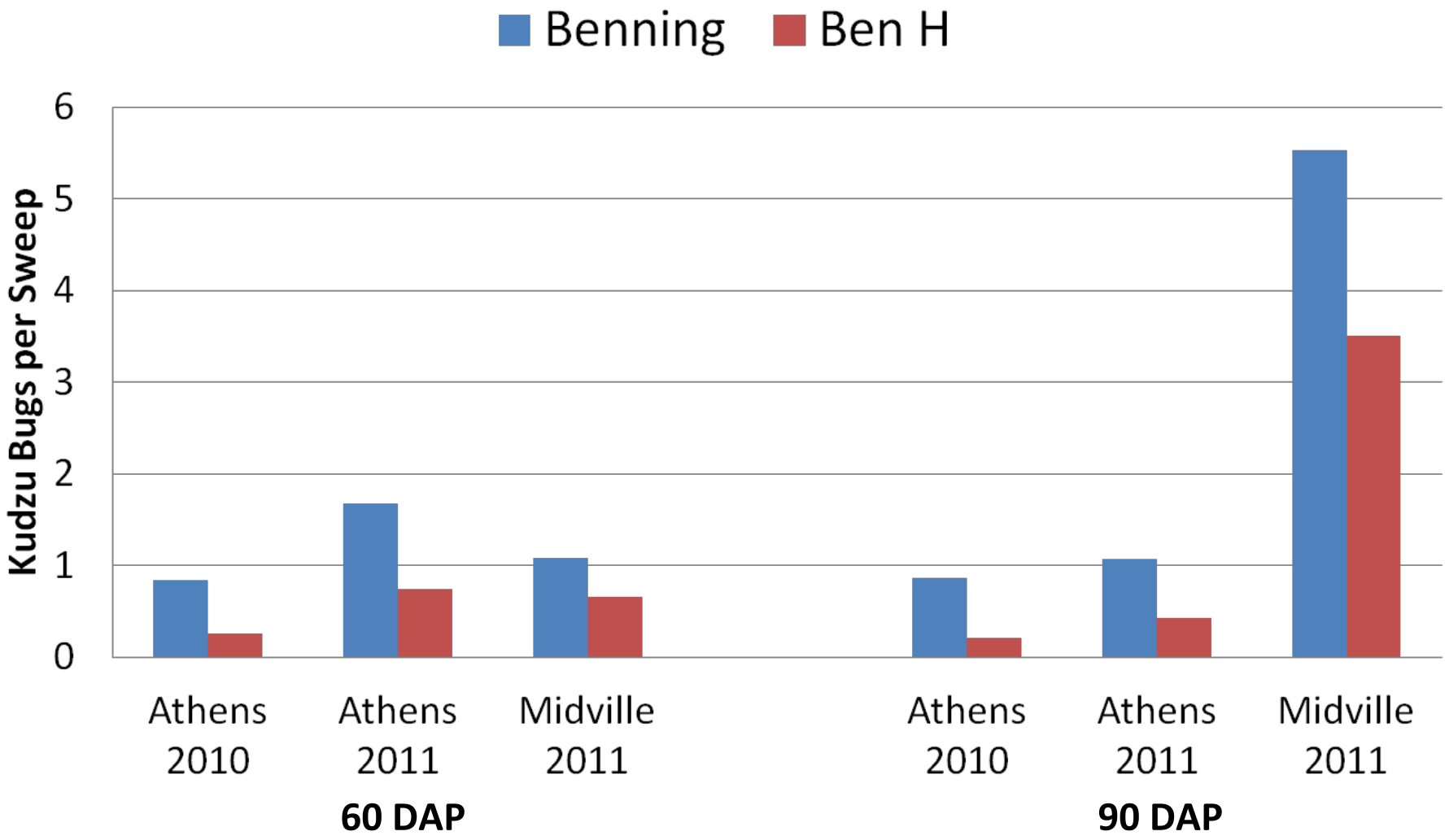
Evaluation of Soybean Germplasm in Resistance to Globular Stink Bug [Megacopta cribraria (Fabricius)] Evaluation of Soybean Germplasm in Resistance to Globular Stink Bug [Megacopta cribraria (Fabricius)]

下载PDF阅读器 Download PDF Reader

在
观察筛豆龟蝽发生情况及其在大豆上的危害特征基础上,比较了田间自然危害条件下各种抗性鉴定指标,以茎枝黑霉程度结合叶片紫斑数为抗性分级指标鉴定了国内外大批资源,筛选出58份抗、感食叶性害虫的大豆材料,其筛豆龟蝽抗性结果表明,品种间、观察日期间和区组间都有极显著差异,品种×观察日期互作也极显著,最终筛选出PI227687、安陆小黄豆、花柒黄毛豆、沔阳白毛豆等高抗种质,并提出了一套鉴定方法和指标. Megacopta cribraria in the observation of the occurrence of the hazard characteristics of the soybean, based on comparison of the various field conditions, resistance to natural hazards, identification of indicators to the extent stems with leaves of blackberry purple index number of resistance levels identified a large number of resources at home and abroad, selected 58 resistant and susceptible soybean leaf-eating pests materials, resistance Megacopta cribraria results show that the varieties were observed between groups and areas have significant differences in observed species × date interaction also was significant, and ultimately selected PI227687, Anlu small soybeans, soybean yellow flowers qi, Mianyang anti-white high soybean germplasm, and a set of identification methods and indicators.

Benning / Ben H

Kudzu Bugs per Sweep (approx. 60 and 90 DAP)



John All, Roger Boerma, and Wayne Parrott, University of Georgia

kudzu bug]

Comments

Under certain conditions, kudzu bug can cause economic losses if not controlled. Insecticides should be timed for optimum control of the immature stage. Trigger initial application when immatures are first detected in sweep-net samples at approximately 1 nymph/sweep. An application at R3/R4 will likely prevent this generation from completing development on soybean. Thereafter, use 2 bugs/sweep if populations build again.

Kudzu Bug Management

- **Threshold (preliminary):**
  - **Treatment should be initiated when nymphs exceed one per sweep.**

- Nymphs usually observed at R2/R3.
- Consider adding 2 ozs Dimilin as a preventive treatment for velvetbean caterpillar and green cloverworm.
- Planting Date Observations:
  - More bugs on early plantings.
  - Kudzu Bug Risk: May>June>July
- Questions???
  - Planting Date by Maturity Group Interaction
  - Developmental Biology in Kudzu and Soybean
  - Threshold Development
  - Insecticide Efficacy

Acknowledgments

- Soybean Boards in SC and GA
- Soybean Producers in SC and GA
- Cooperators in Industry
- Cooperators with USDA

South Carolina Soybean Board

CLEMSON UNIVERSITY

The University of Georgia