

Getting Next Year Off To A Good Start: Thrips Management

J. Greene and F. Reay-Jones, Clemson Univ.

D. A. Herbert, VA Tech Univ.

J. Bacheler and D. Reisig, NC State Univ.

P. Roberts and M. Toews, Univ. of GA

T. Reed and R. Smith, Auburn Univ.





What can we do to minimize this?



What can we do to prevent this?

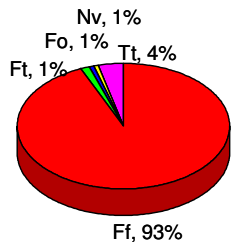


TIMELAPSE CAMERA V.1.0 2013/04/17 15:11:04

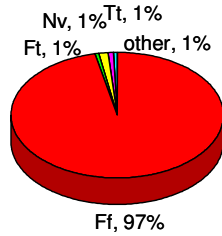
Thrips



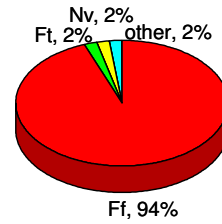
- The most predictable (“reliable”) insect pests of cotton
- So predictable that “preventative” treatments should probably be called “reactive” instead...we know they will be an issue, right?
- What species are important?



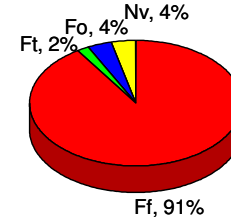
Keiser, AR



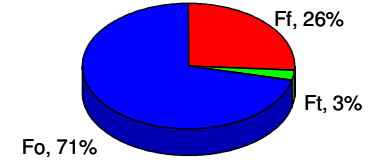
Marianna, AR



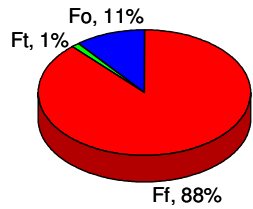
Rohwer, AR



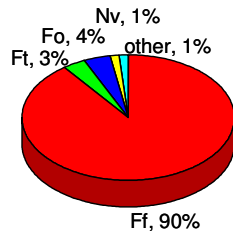
ABAC Farm, Tift Co., GA



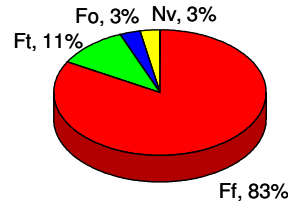
Lang Farm, Tift Co., GA



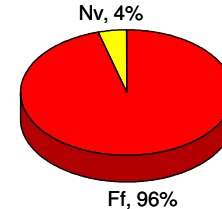
Macon Ridge, LA



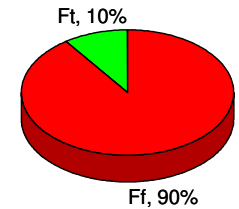
Red River Res. ST., LA



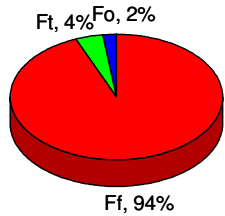
Portageville, MO



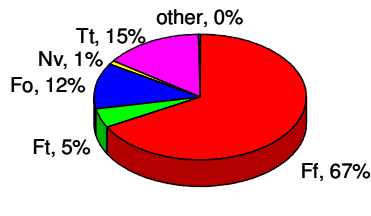
Raymond, MS



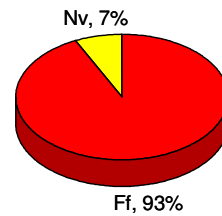
Starkville, MS



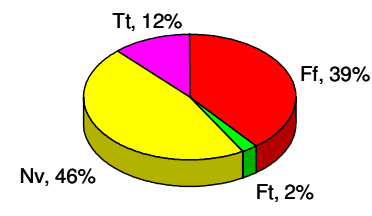
Stoneville, MS



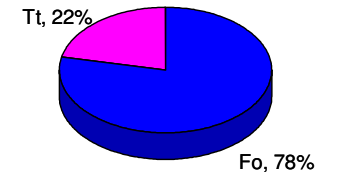
Raleigh, NC



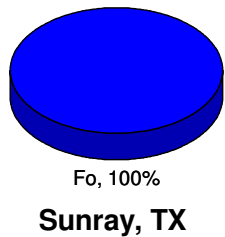
Blackville, SC



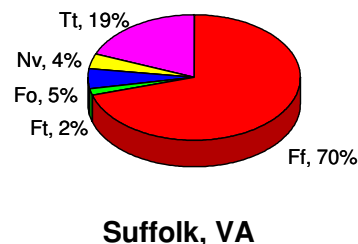
Jackson, TN



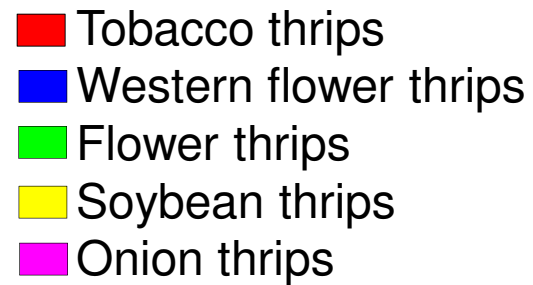
Dimmitt, TX



Sunray, TX



Suffolk, VA



Reed et al. 2009
(Poster #90)



“Preventative”
treatment

Untreated

What Gives a Good Start?

- At-plant insecticide?
- Foliar-applied insecticide overspray? When?
- Starter fertilizer?
- Tillage (or reduction of it)?
- Cover crops?
- Preventing stress (e.g. herbicide injury) on young plants?
- Knowing when and where thrips are going to be a problem? Computer model to predict?

Risk Factors for Thrips

- Planting date
 - Early planting (April to early May) = cool temps, slower growth
 - Later planting (mid-May to July) = warmer temps, faster growth
- Tillage and residue (cover crops)
 - Conventional > Reduced...and, residue = fewer thrips
- Herbicide stress
 - Chemical injury puts plants at risk for feeding stress from thrips
- Choice of at-plant insecticides
 - Seed treatments provide control for 0-3 weeks
 - In-furrow liquids and granular, hopper-box treatments, etc?
- Variety? Surrounding habitats, etc...

CI Funded Research on Thrips

Objectives during 2011-2014 for research on thrips in the Southeast funded by Cotton Incorporated:

- 1. Examine how a seed treatment and the addition of starter fertilizer may reduce observed injury and impact from thrips.**
- 2. Determine optimal timing of a single acephate overspray to decrease thrips numbers.**
- 3. Evaluate efficacy of foliar insecticides for managing thrips on seedling cotton (with and without seed trt).**
- 4. Evaluate effects of tillage and cover crop systems on thrips.**
- 5. Quantify potential interactions of thrips management programs with pre-emergent herbicide injury.**
- 6. Evaluate at-plant and post-plant options for controlling thrips.**
- 7. Develop predictive modeling for thrips infestations.**

Tillage and Cover Crop Residue



Tillage and Cover Crop Residue



Wheat cover +
conventional

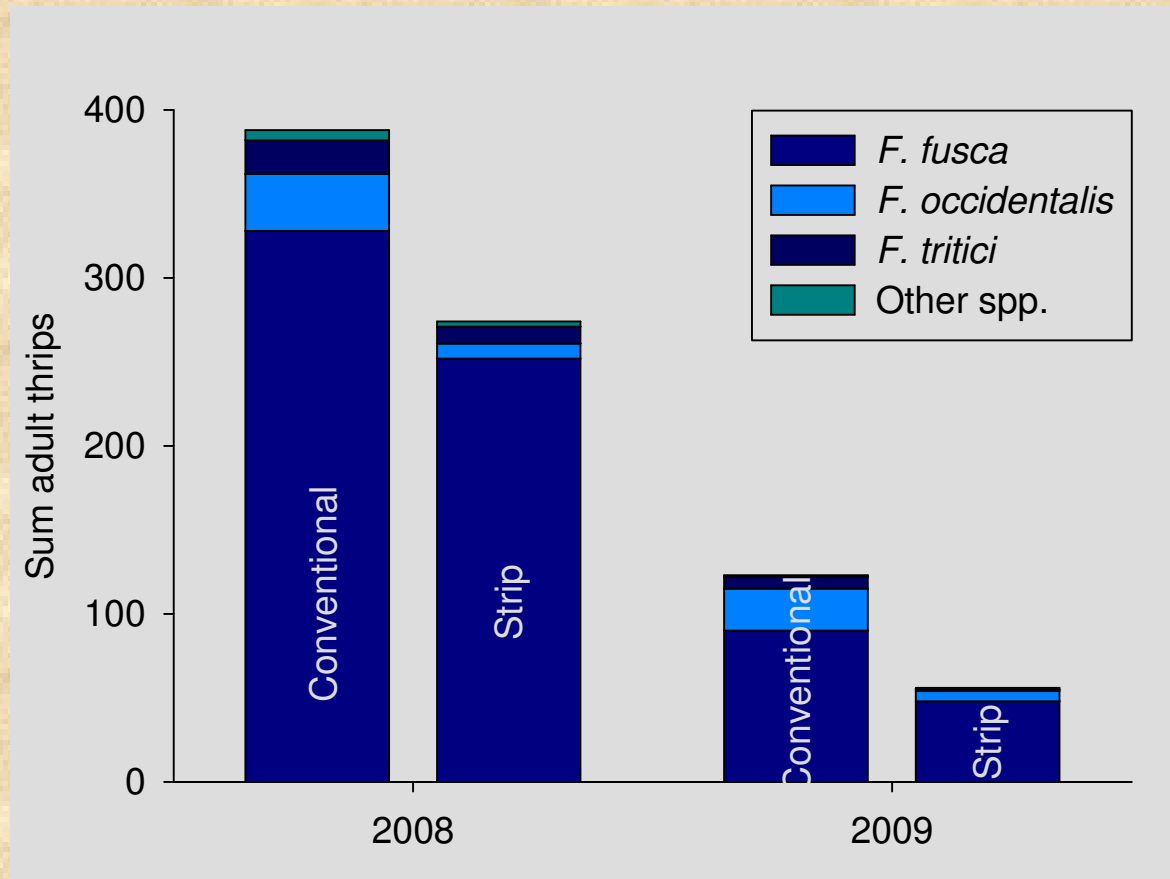
Wheat cover +
strip tillage

Conservation Tillage

- Strip tillage and winter cover crops confer many benefits for production
 - Reduced soil erosion and soil compaction, increased water infiltration and build up of organic matter...**thrips???**



Tillage and Thrips Populations

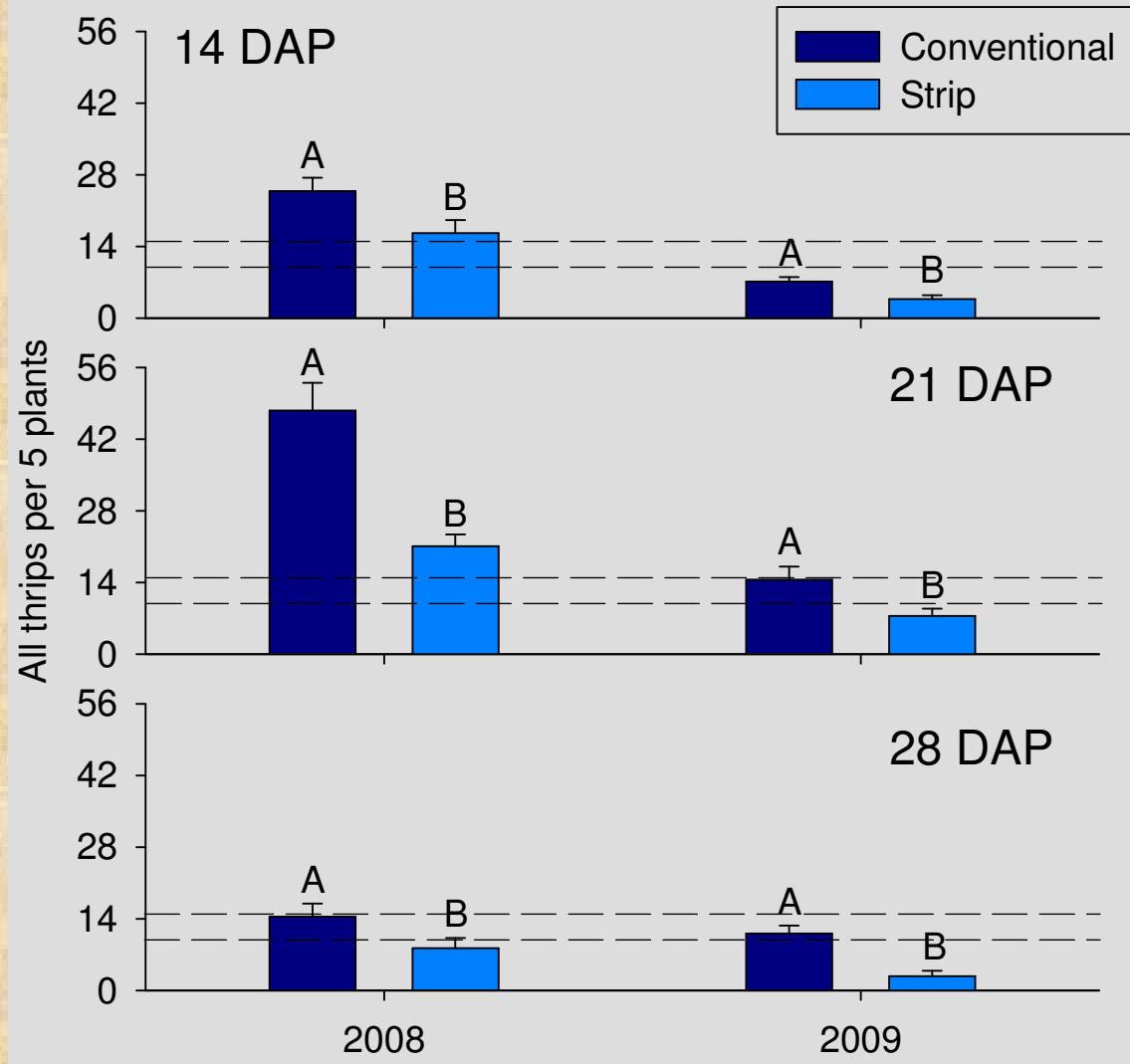


662 adults
931 immatures

179 adults
383 immatures

85.4% *F. fusca*, 8.8% *F. occidentalis*, 4.5% *F. tritici*, 1.3% other spp.

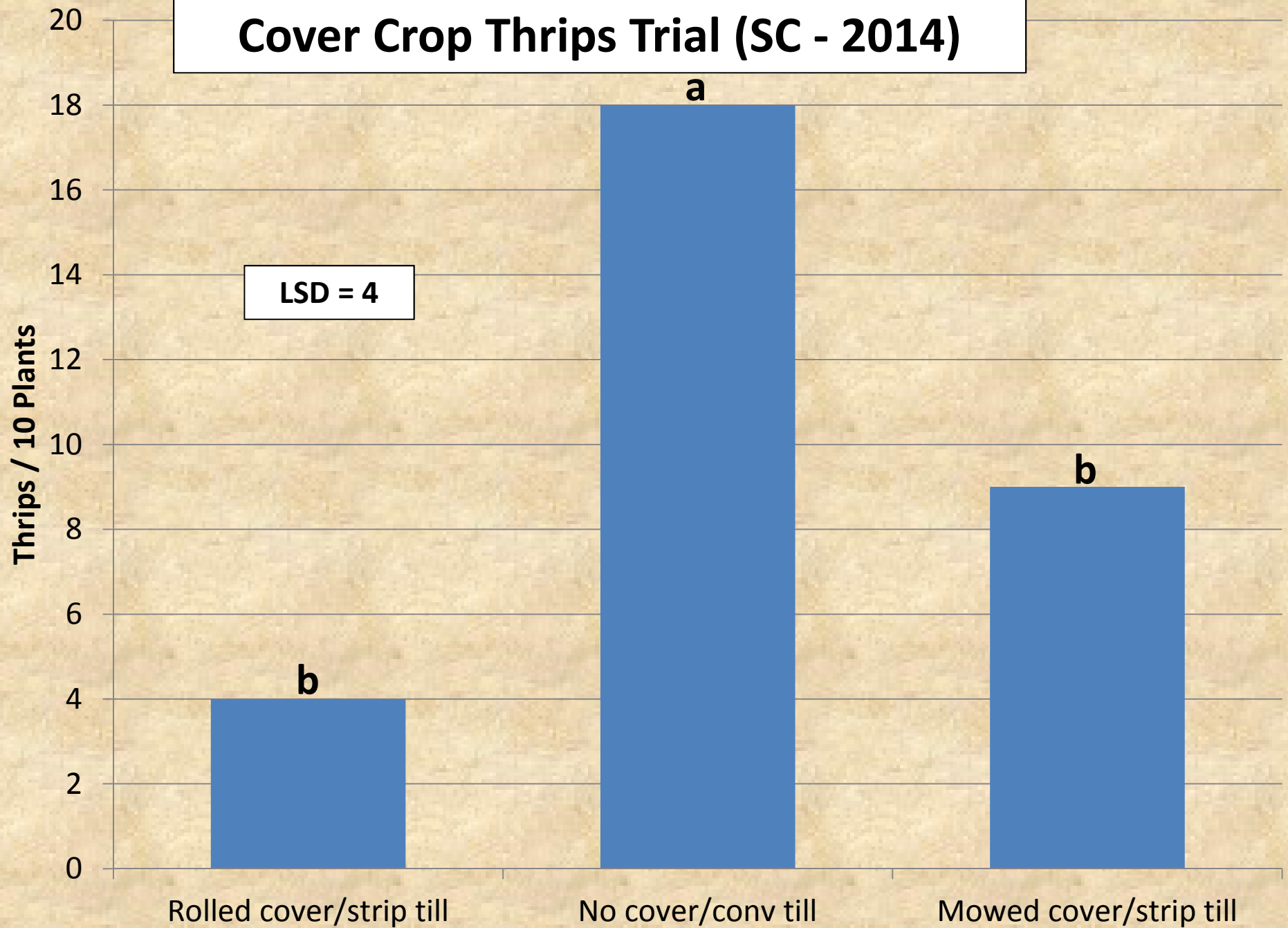
Tillage and Thrips Populations



There were no tillage by cover crop interactions, and there were no significant differences among cover crops

Dotted lines designate the extension recommended foliar treatment threshold of 2 to 3 thrips per plant

Cover Crop Thrips Trial (SC - 2014)



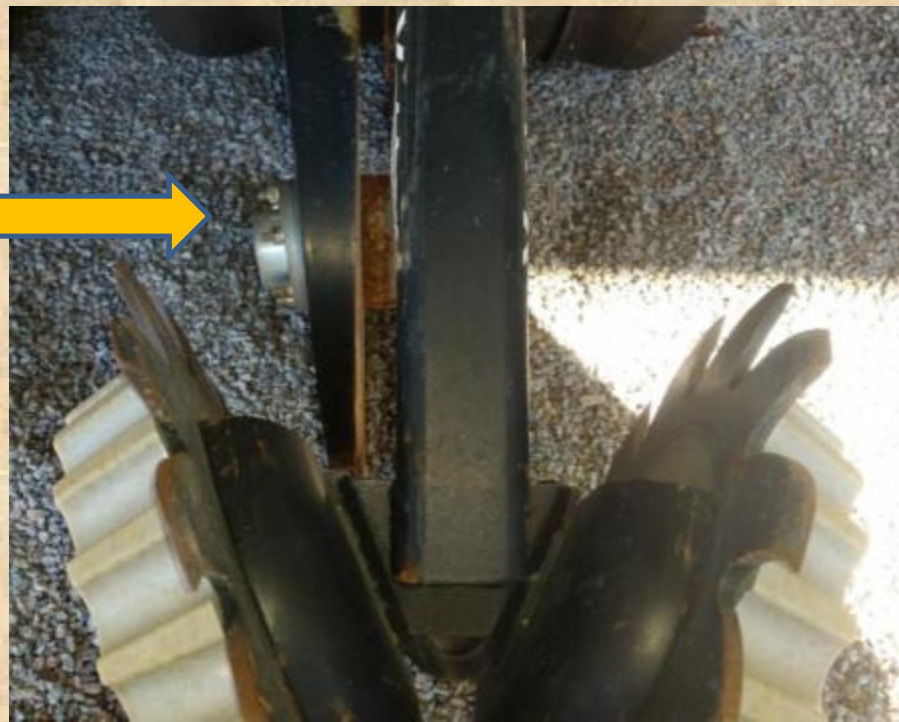
So, what makes this better for
managing thrips?



Starter Fertilizer and Thrips

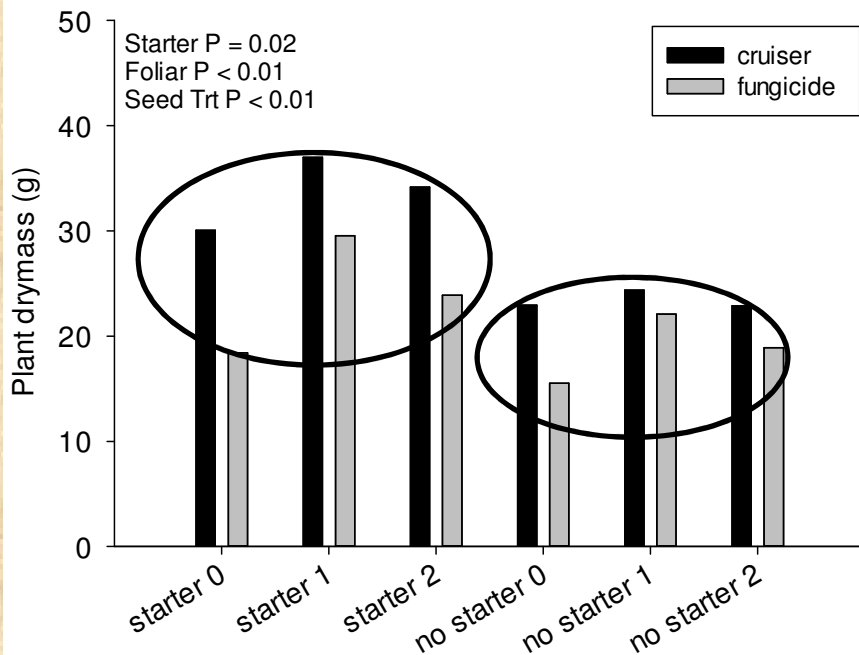
- Question: does the use of a starter fertilizer help in the “fight” against thrips damage?

2 x 2
fertilizer
application
set up



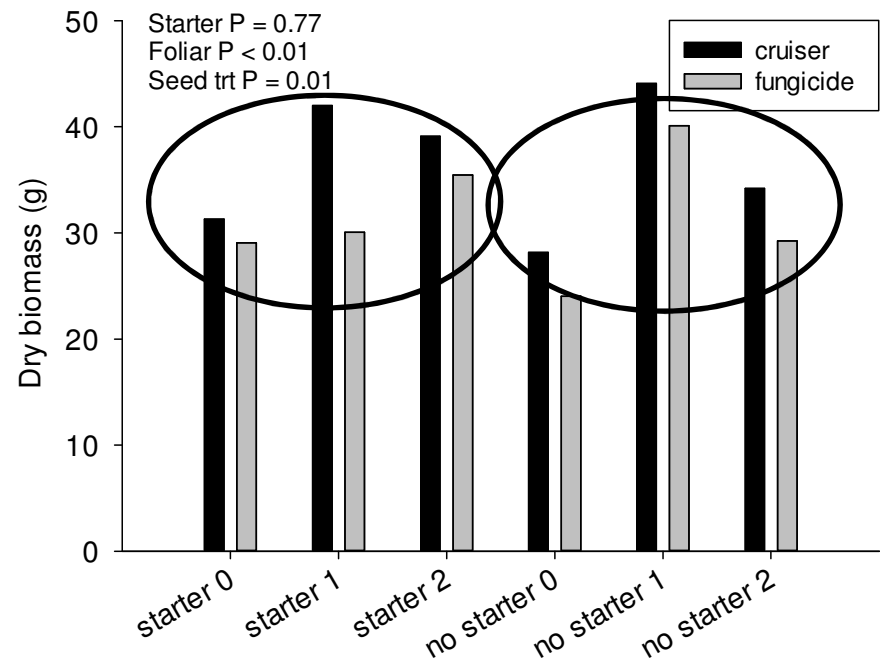
Starter Fertilizer and Thrips

Irrigation



Irrigated

Starter provided boost to plants
Obvious benefit to foliar overspray
Compare seed trt to foliar timing

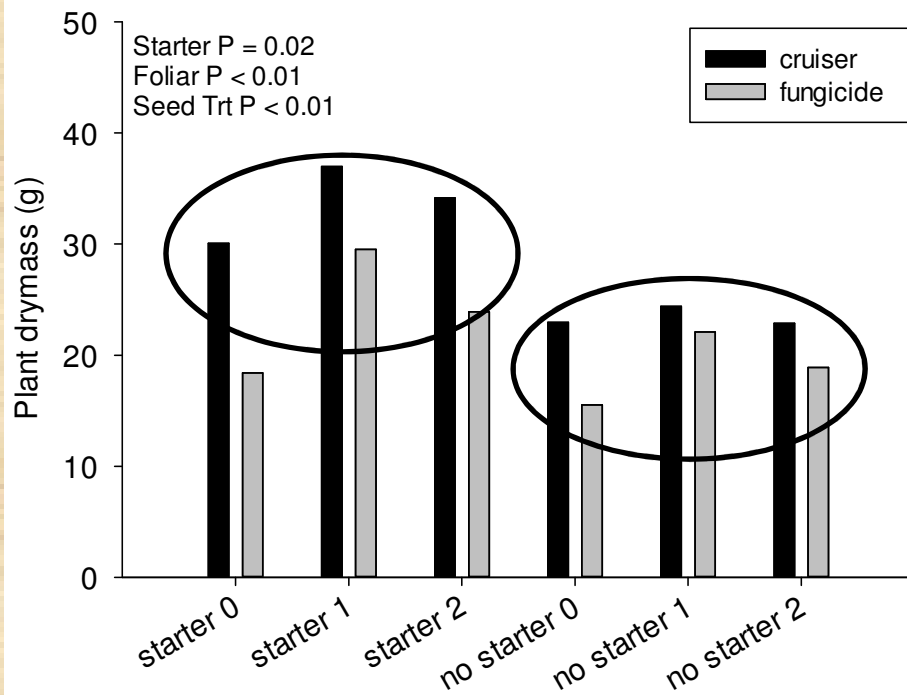


Dryland

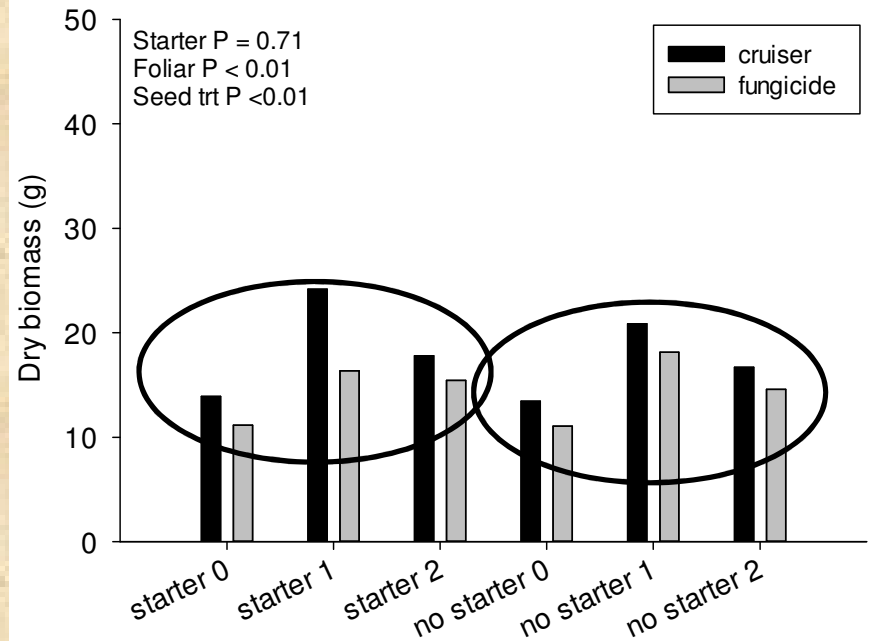
No boost from starter
Obvious benefit to foliar overspray
2nd leaf spray looks better here

Starter Fertilizer and Thrips

Soil Type



Loamy Sand (80:14:6)



Sandy Clay Loam (60:14:26)

Starter Fertilizer and Thrips



- Starter fertilizer trials
 - Use of starter fertilizer was most appropriate for use under **irrigation** on **sandy soils**
 - No obvious benefit under dryland conditions or on heavy clay soils

At-Plant Insecticide Options

- Do nothing...not an option
- Seed treatment
- In-furrow granular material
 - Temik (anyone still have any?)
 - Counter (Section 18) for nematodes (works on thrips too)
 - Thimet
- In-furrow liquid material
 - Imidacloprid
 - Acephate
- A combination of the above

Commercially Available Insecticidal Seed Treatments

Trade Name	Active Ingredients			Days of Thrips Mgmt.
	Thrips Insecticide*		Additional	
	Name	Recommended rate per seed		
Aeris	imidacloprid	0.375 mg	thiodicarb	10-21
Acceleron-I	imidacloprid	0.375 mg		10-21
Acceleron-N	thimethoxam	0.375 mg	azoxystrobin, fludioxonil, mefenoxam	10-14
Avicta Complete	thimethoxam	0.34 mg	abamectin	10-14
Avicta Duo	thimethoxam	0.34 mg	abamectin	10-14
Cruiser	thiamethoxam	0.375 mg		10-14
Gaucho	imidacloprid	0.375 mg		10-21
Poncho/VOTiVO/Aeris	clothianidin, imidacloprid	0.424 mg (clothianidin), 0.375 mg (imidacloprid)	<i>Bacillus firmus</i> I-1582, thiodicarb	10-21

*BayerCrop Science varieties (FiberMax and Stoneville) include an additional base insecticidal seed treatment at 0.135 mg imidacloprid per seed

Evaluate efficacy alone and in combination of liquid in-furrow and insecticide seed treatments

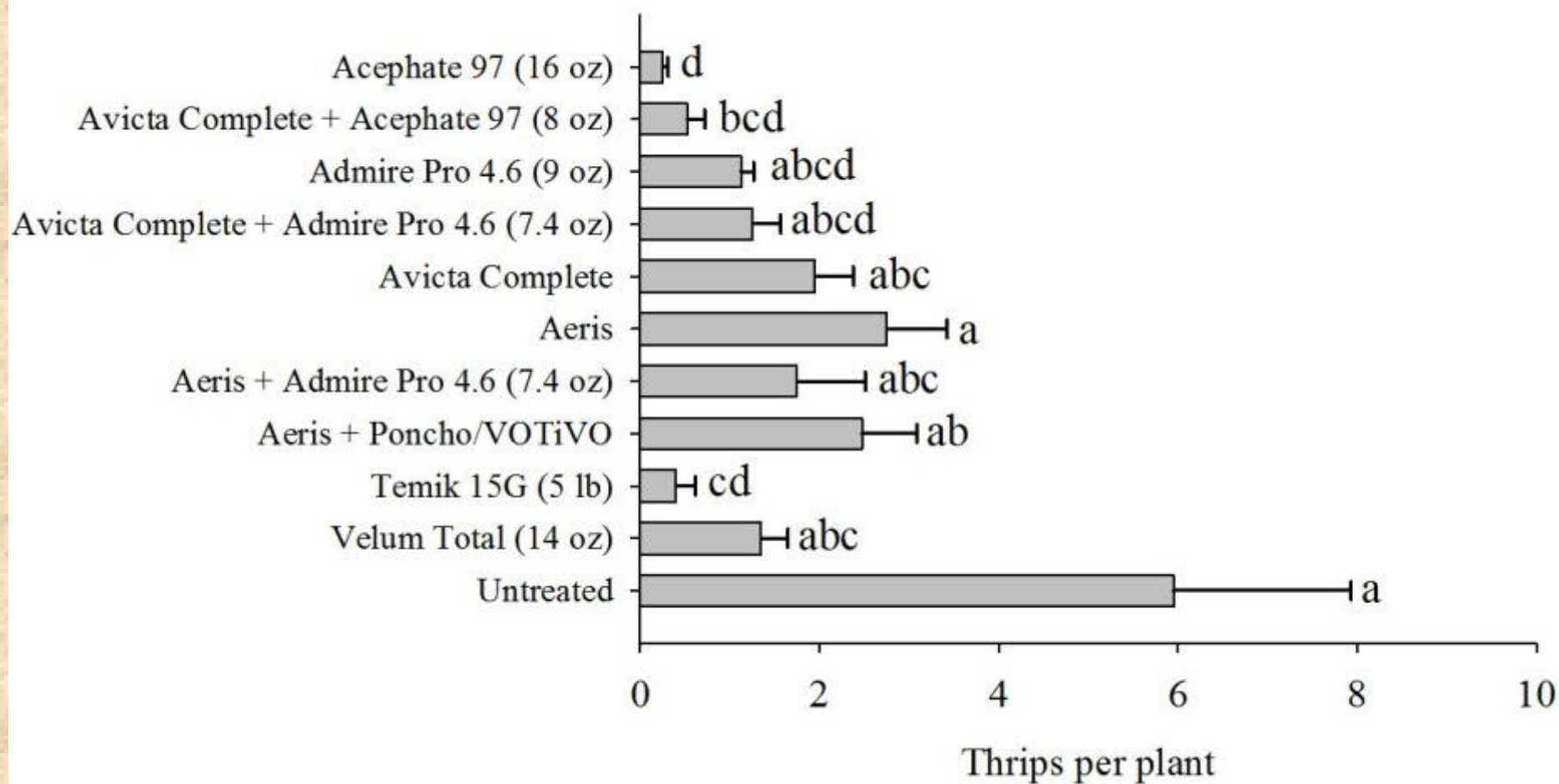
Compound(s)	Formulated product rate	Lb a.i./A	Application details
Acephate 97PE	16 oz/A	0.974	Liquid in-furrow
Avicta Complete + Acephate 97PE	Seed treatment 8 oz/A	0.340 0.487	--- Liquid in-furrow
Admire Pro 4.6F	9.2 oz/A	0.330	Liquid in-furrow
Velum Total	14 oz/A	0.173	Liquid in-furrow
Avicta Complete + Admire Pro 4.6F	Seed treatment 9.2 oz/A	0.340 0.330	--- Liquid in-furrow
Avicta Complete	Seed treatment	0.340	---
Aeris	Seed treatment	0.375	---
Aeris + Acephate 97PE	Seed treatment 8 oz/A	0.375 0.487	--- Liquid in-furrow
Aeris + Admire Pro 4.6F	Seed treatment 9.2 oz/A	0.375 0.330	--- Liquid in-furrow
Aeris + Poncho/VOTiVO	Seed treatment Seed treatment	0.375 0.424	--- ---
Thimet 20G	5 lb/A	1.000	Granular in-furrow
Temik 15G	5 lb/A	0.750	Granular in-furrow
Untreated	---		---



2013 At-plant Results

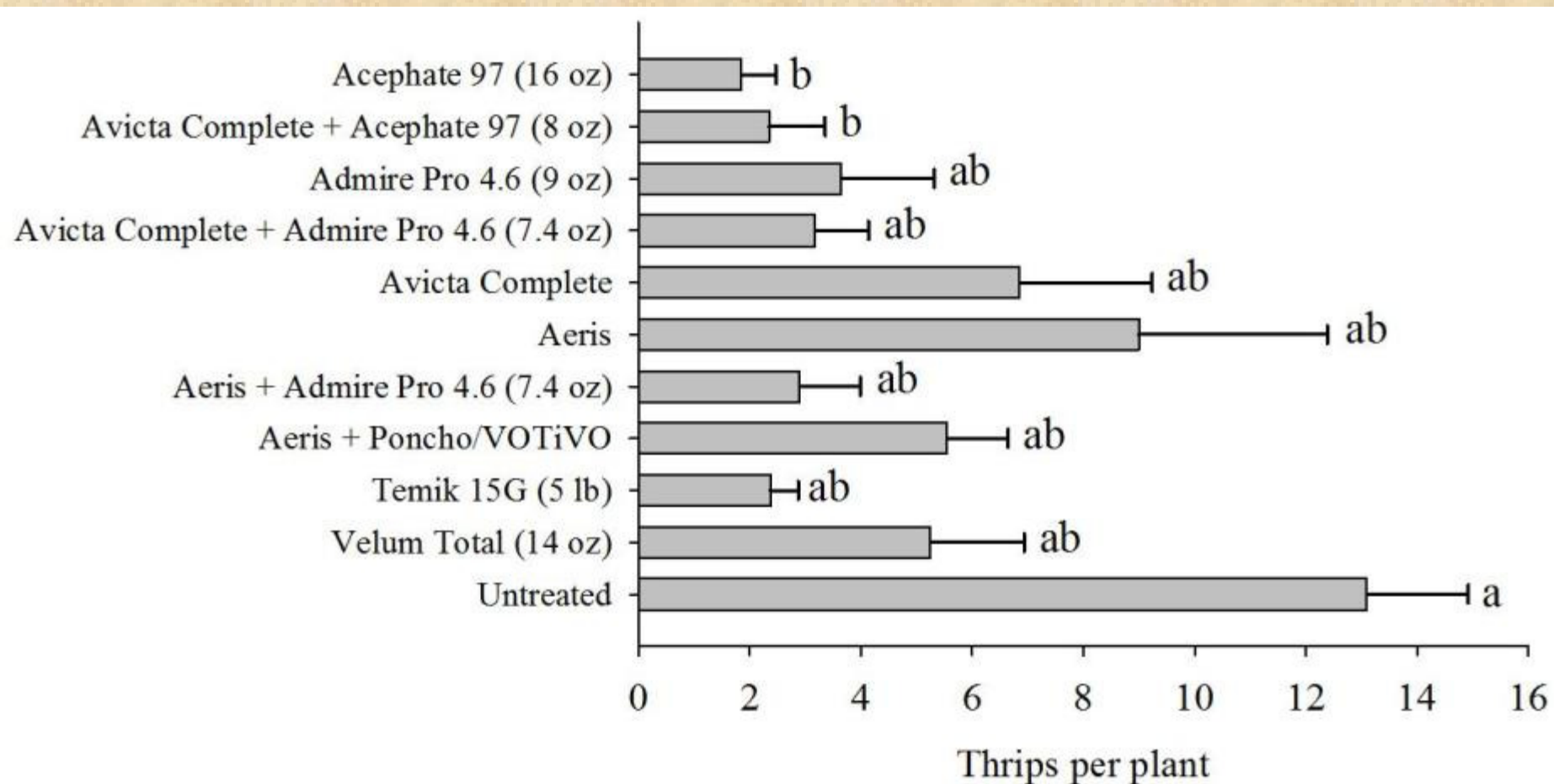
2013

South Carolina, Two Leaves (2 Weeks After Planting)



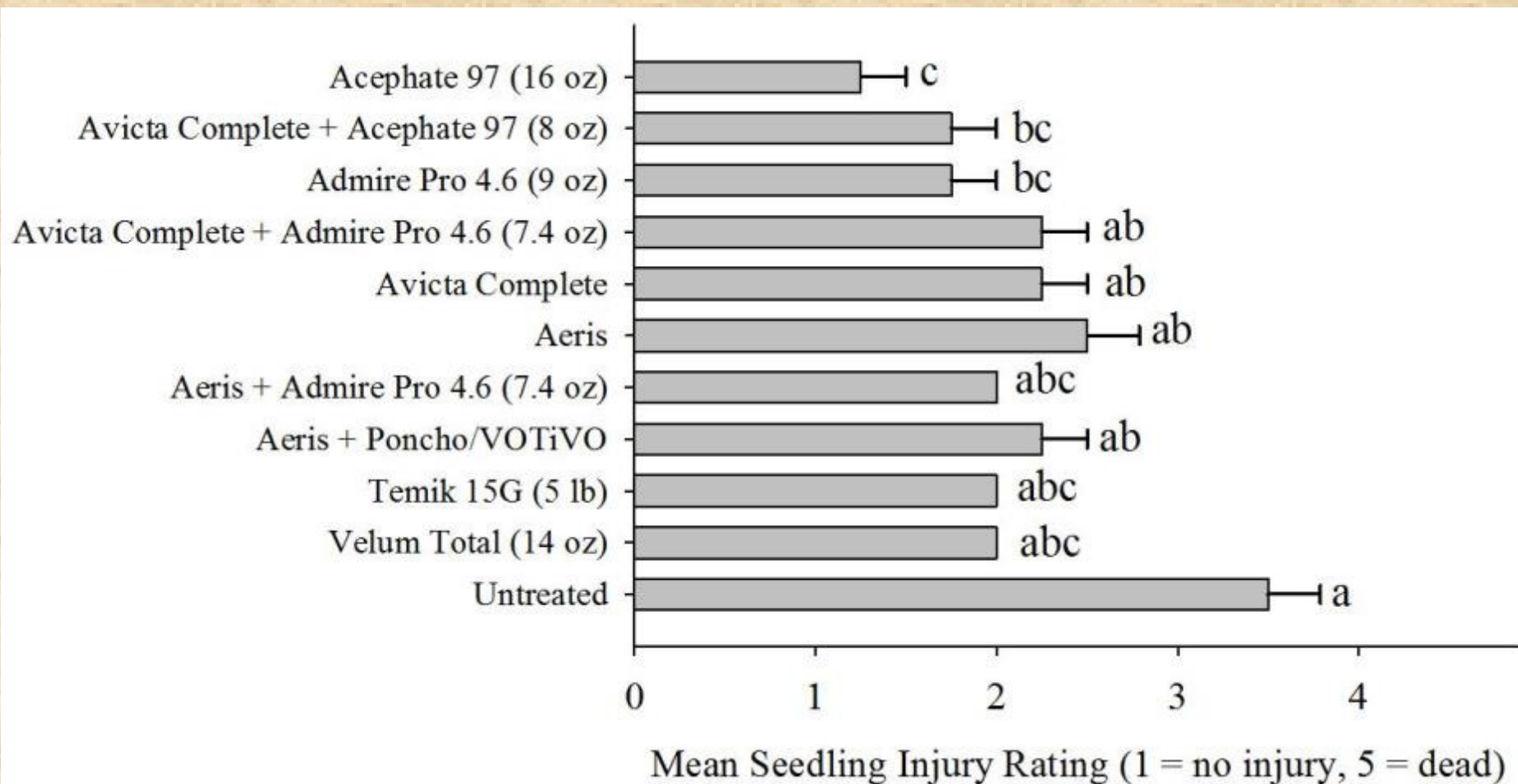
2013

South Carolina, Three Leaves (3 Weeks After Planting)



2013

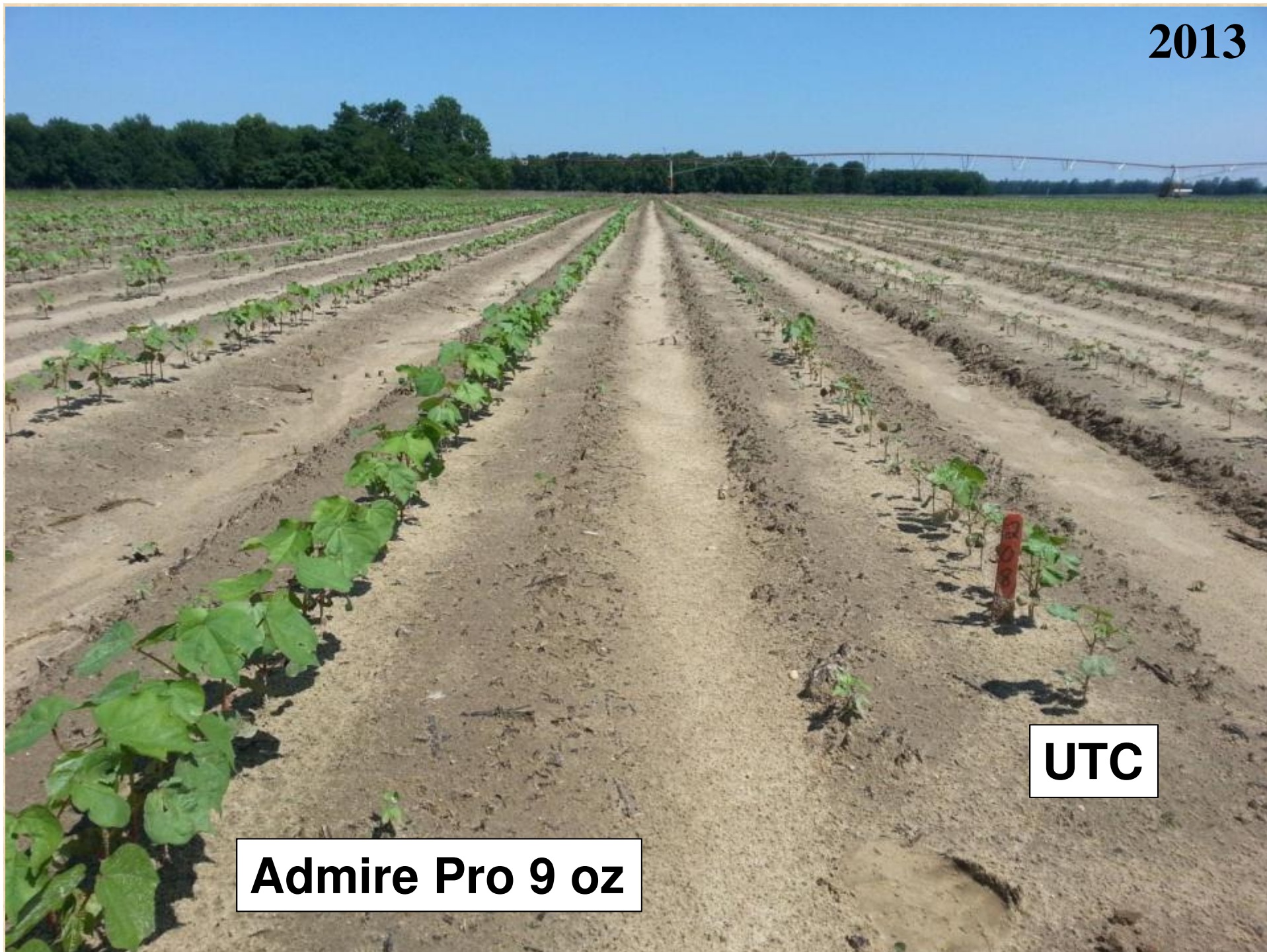
South Carolina, Five Leaves (5 Weeks After Planting)



2013

Admire Pro 9 oz

UTC



2013



Acceleron N

UTC

2013



UTC

Temik 5lb

2013



Thimet 5 lb

UTC

2013



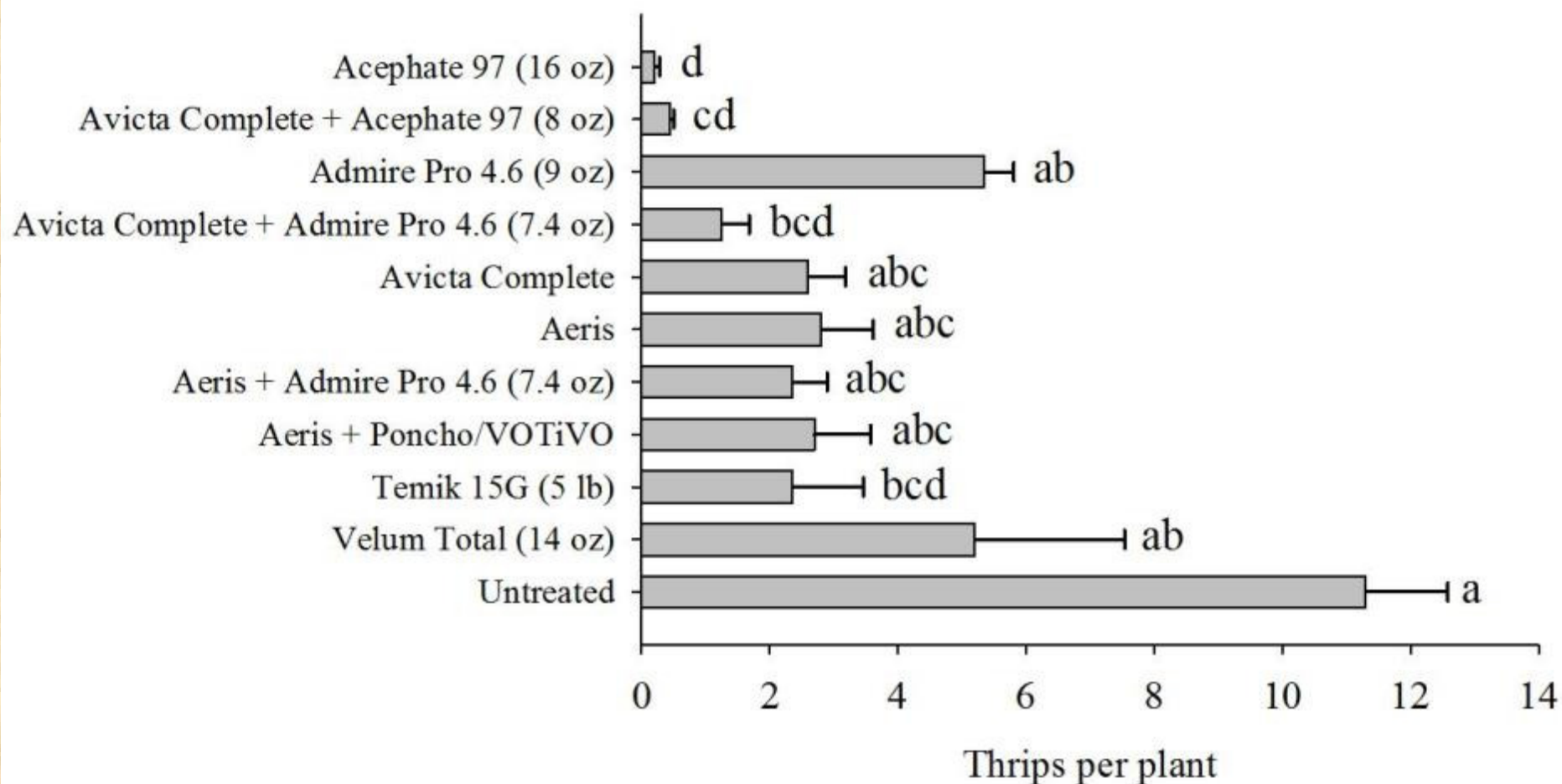
UTC

Counter 6.5 lb

**Section 18 for cotton
in GA/SC during 2014**

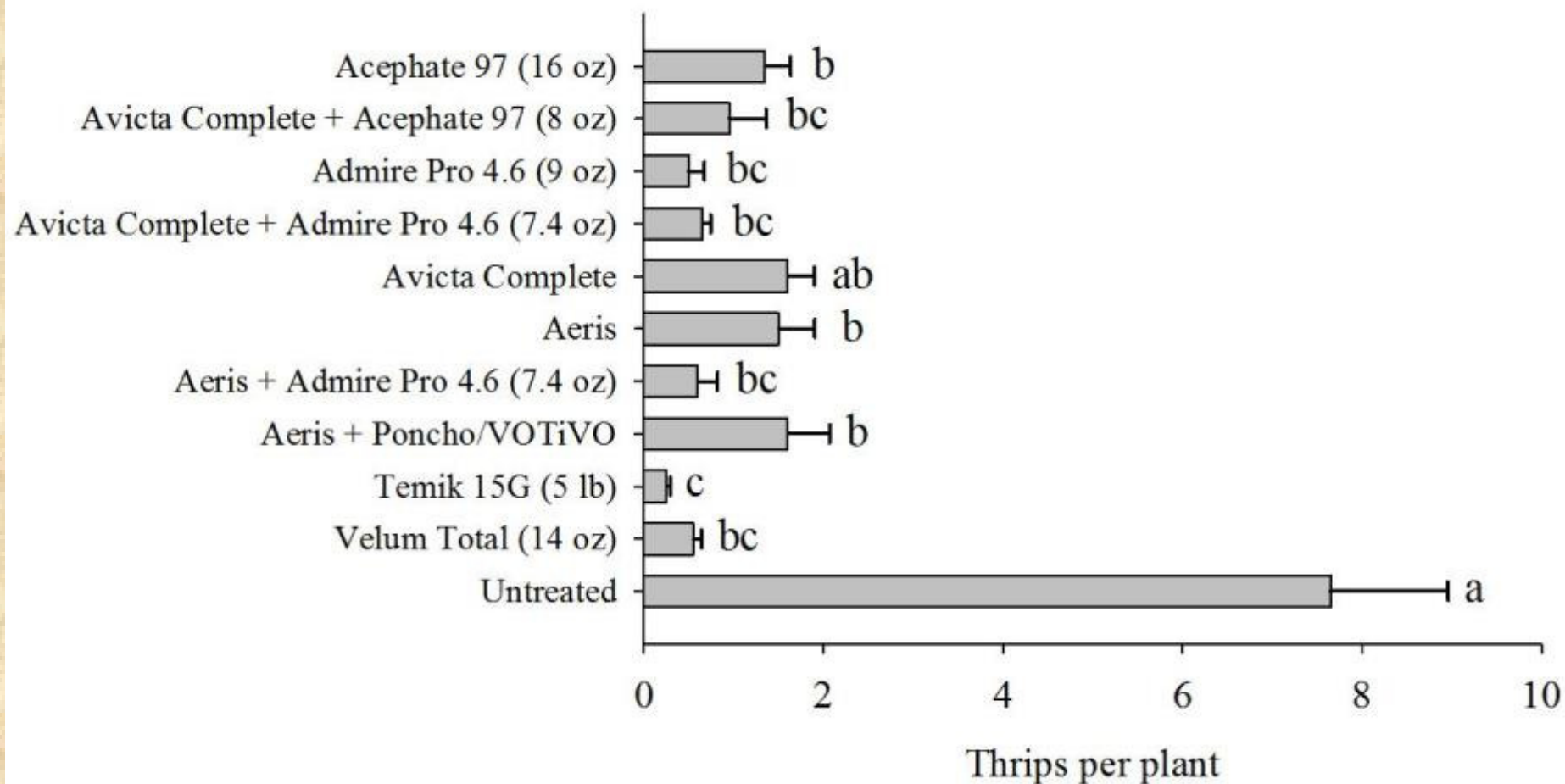
2013

North Carolina, Cotyledon (2 Weeks After Planting)



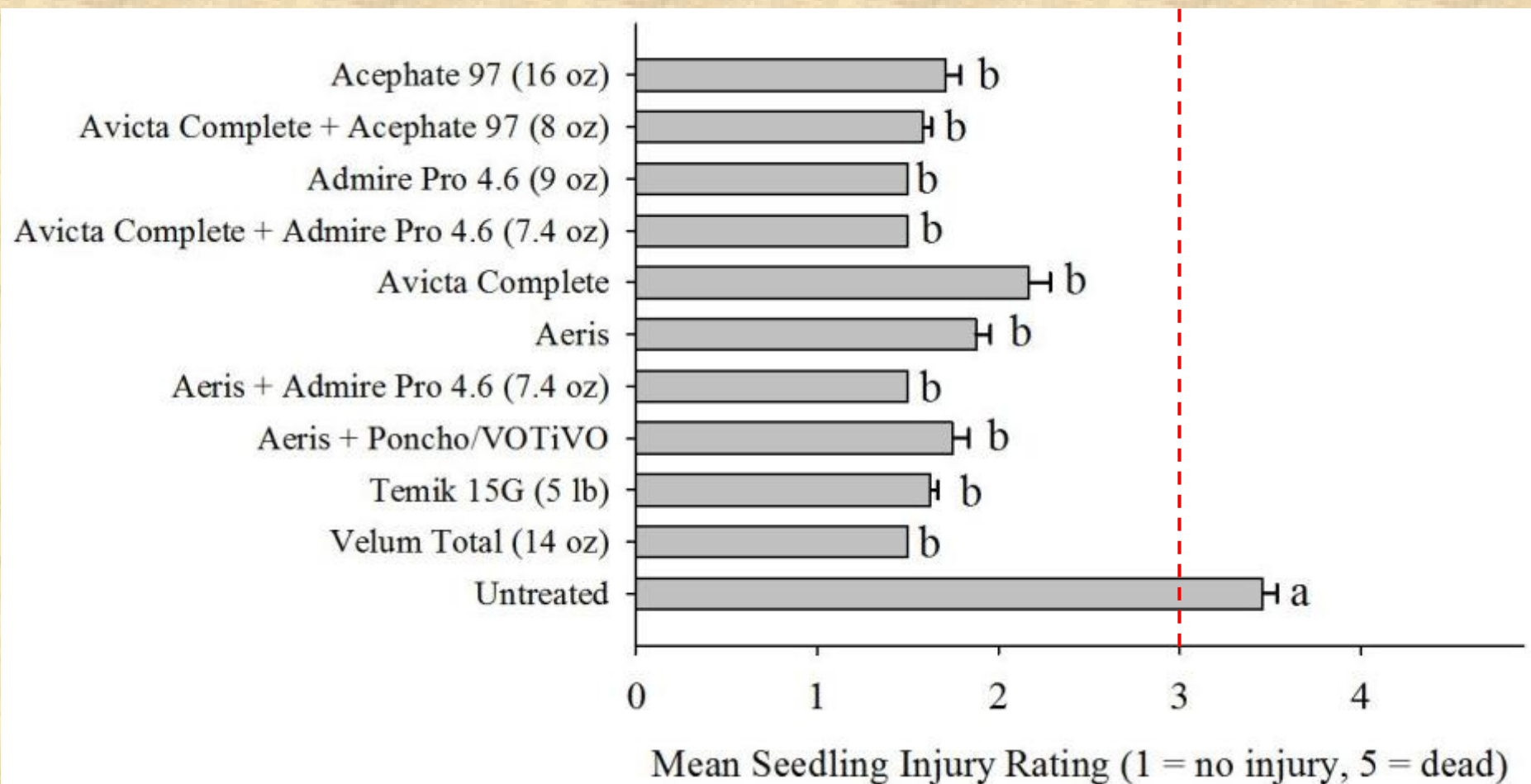
2013

Virginia, Two Leaves (4 Weeks After Planting)



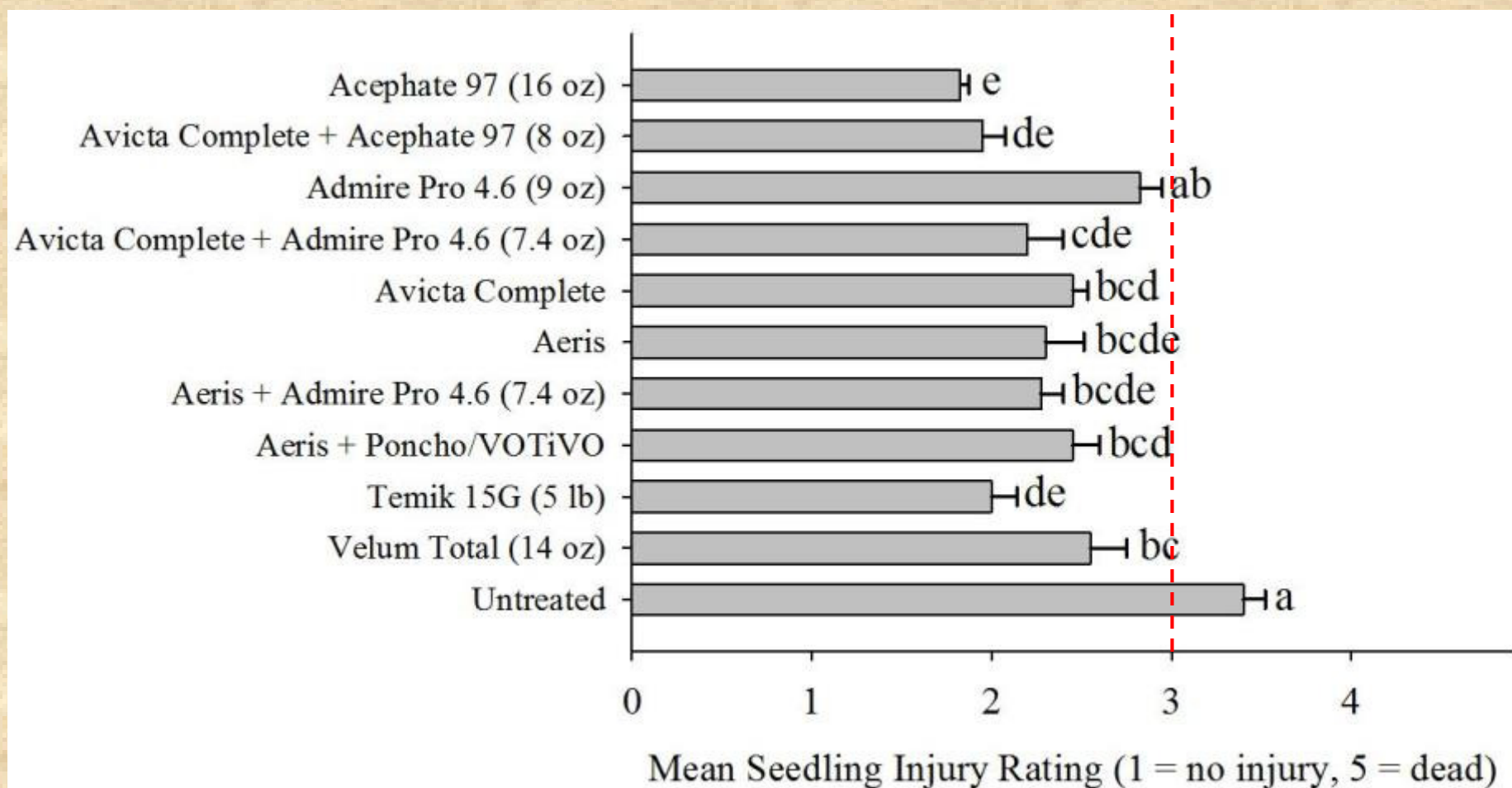
2013

Virginia, Two Leaves (4 Weeks After Planting)



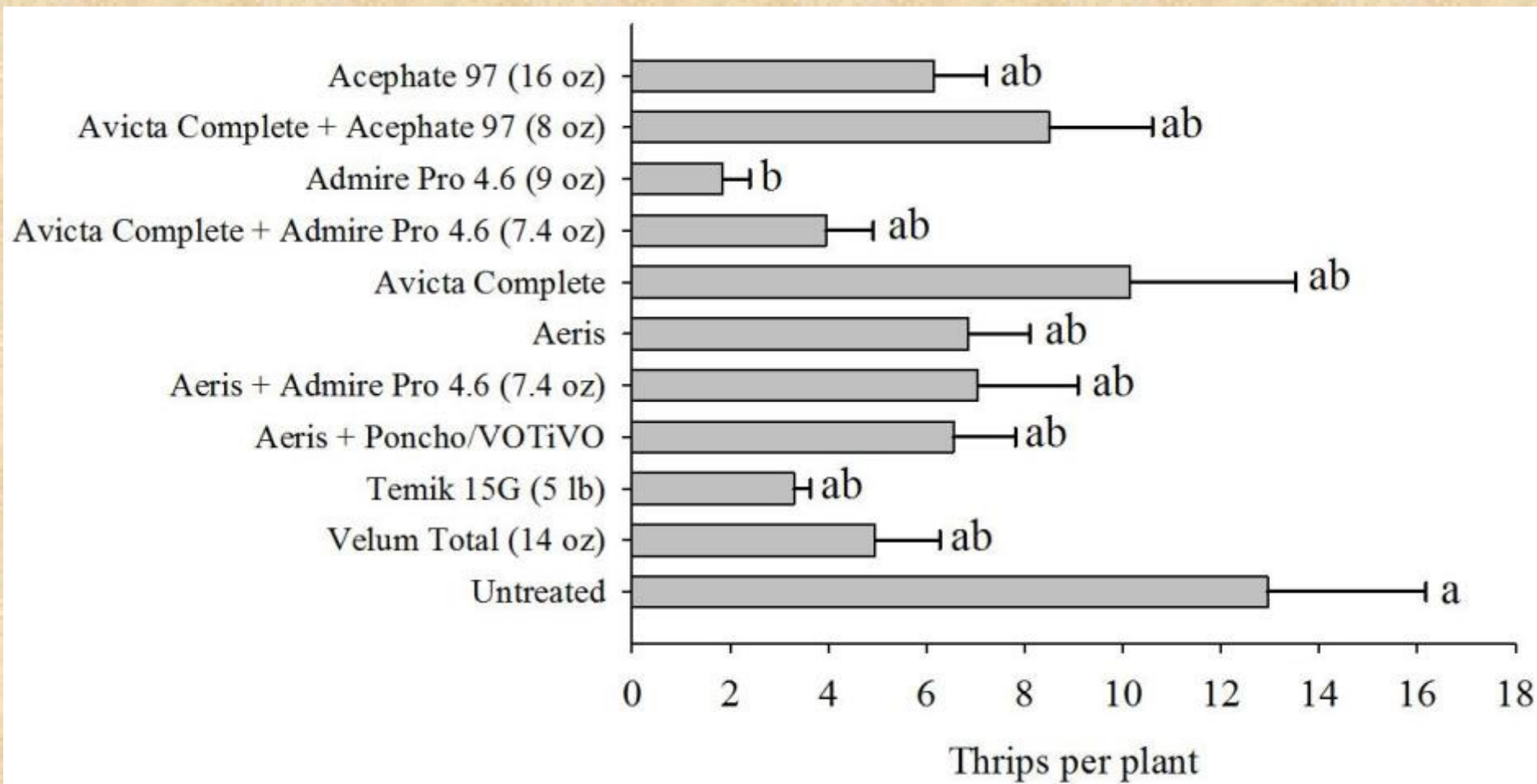
2013

North Carolina, Four Leaves (4 Weeks After Planting)



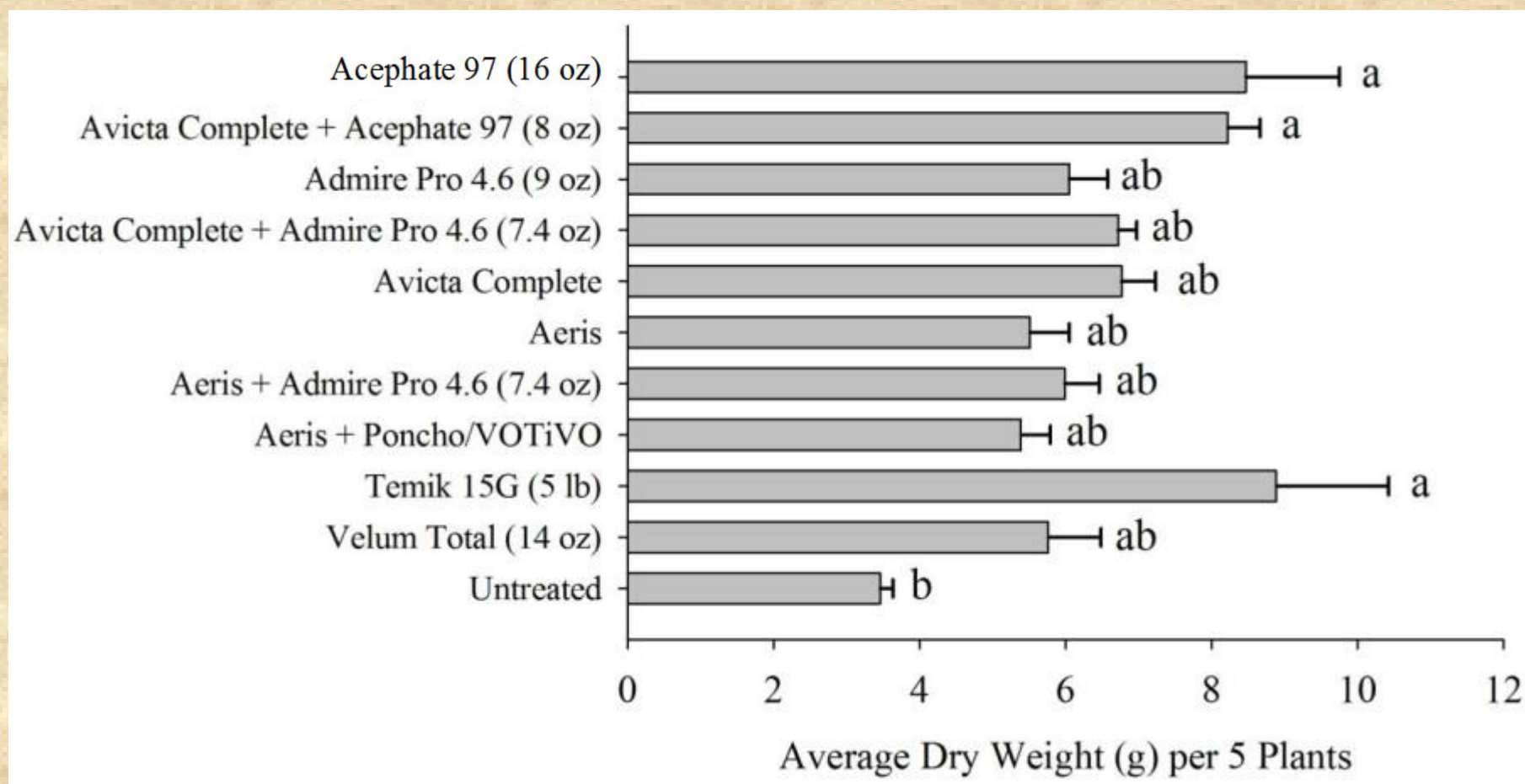
2013

Virginia, Four Leaves (5 Weeks After Planting)



2013

North Carolina, 6 Weeks After Planting

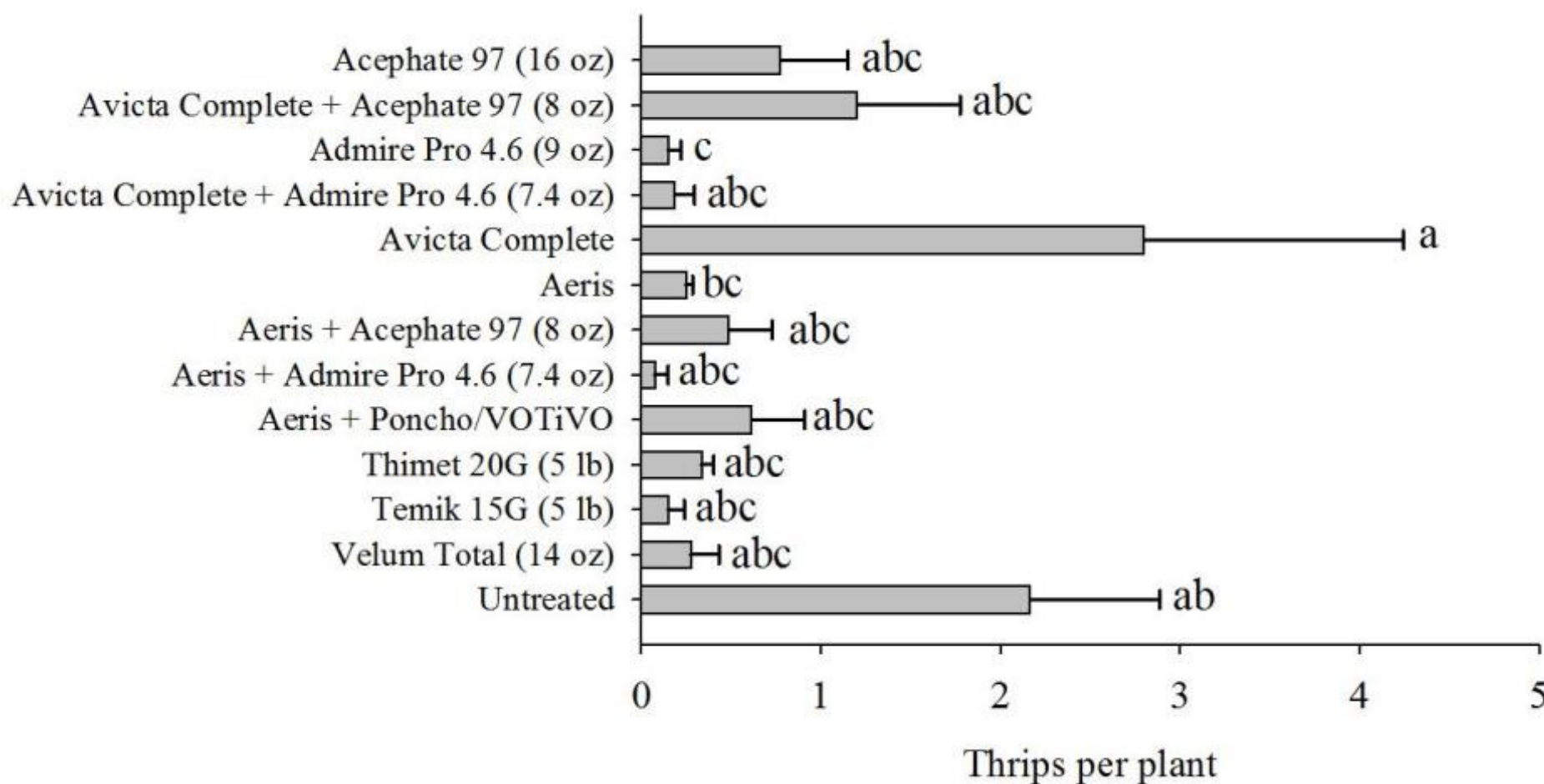




2014 At-plant Results

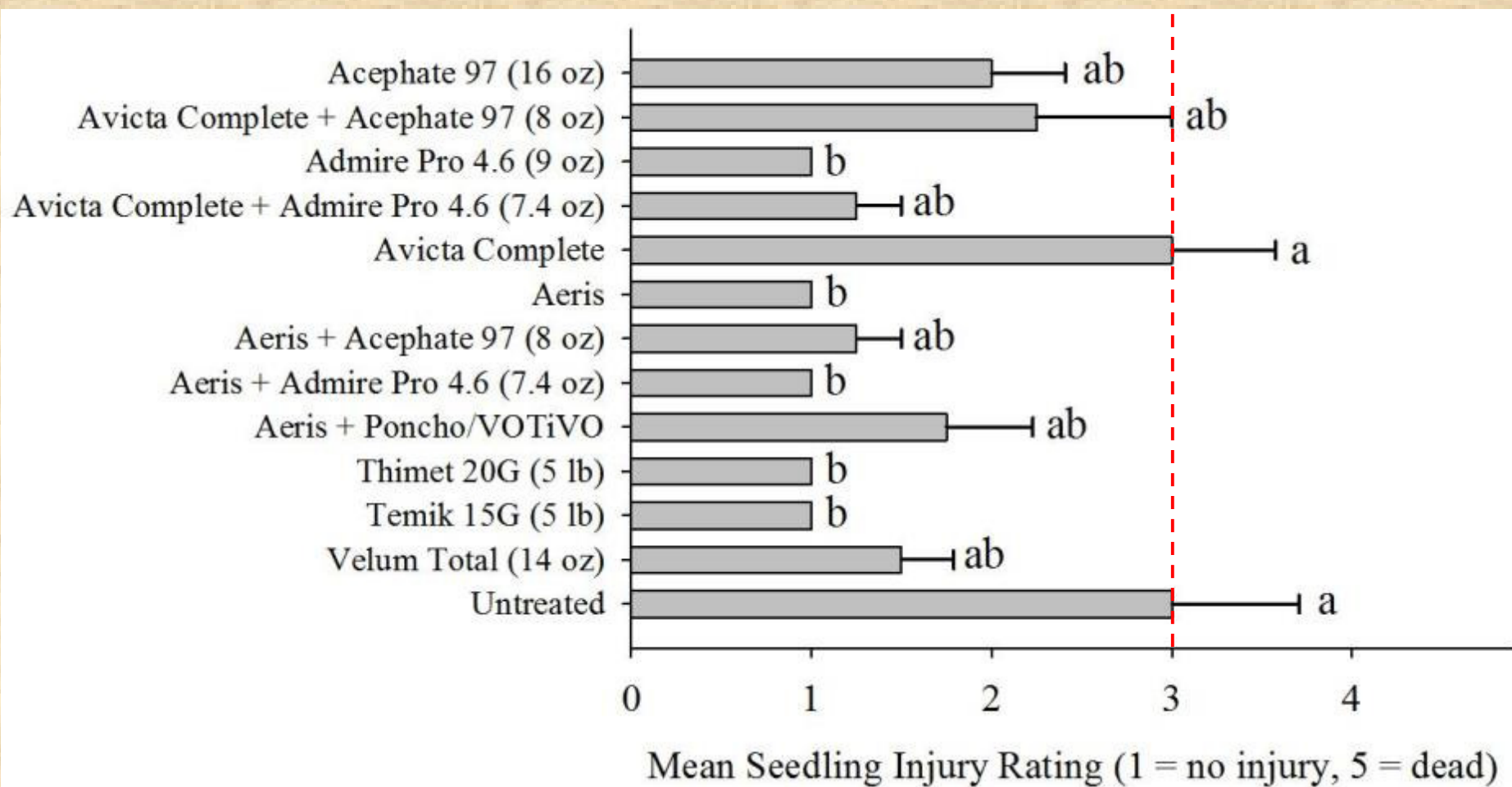
2014

South Carolina, Three Leaves (3 Weeks After Planting)



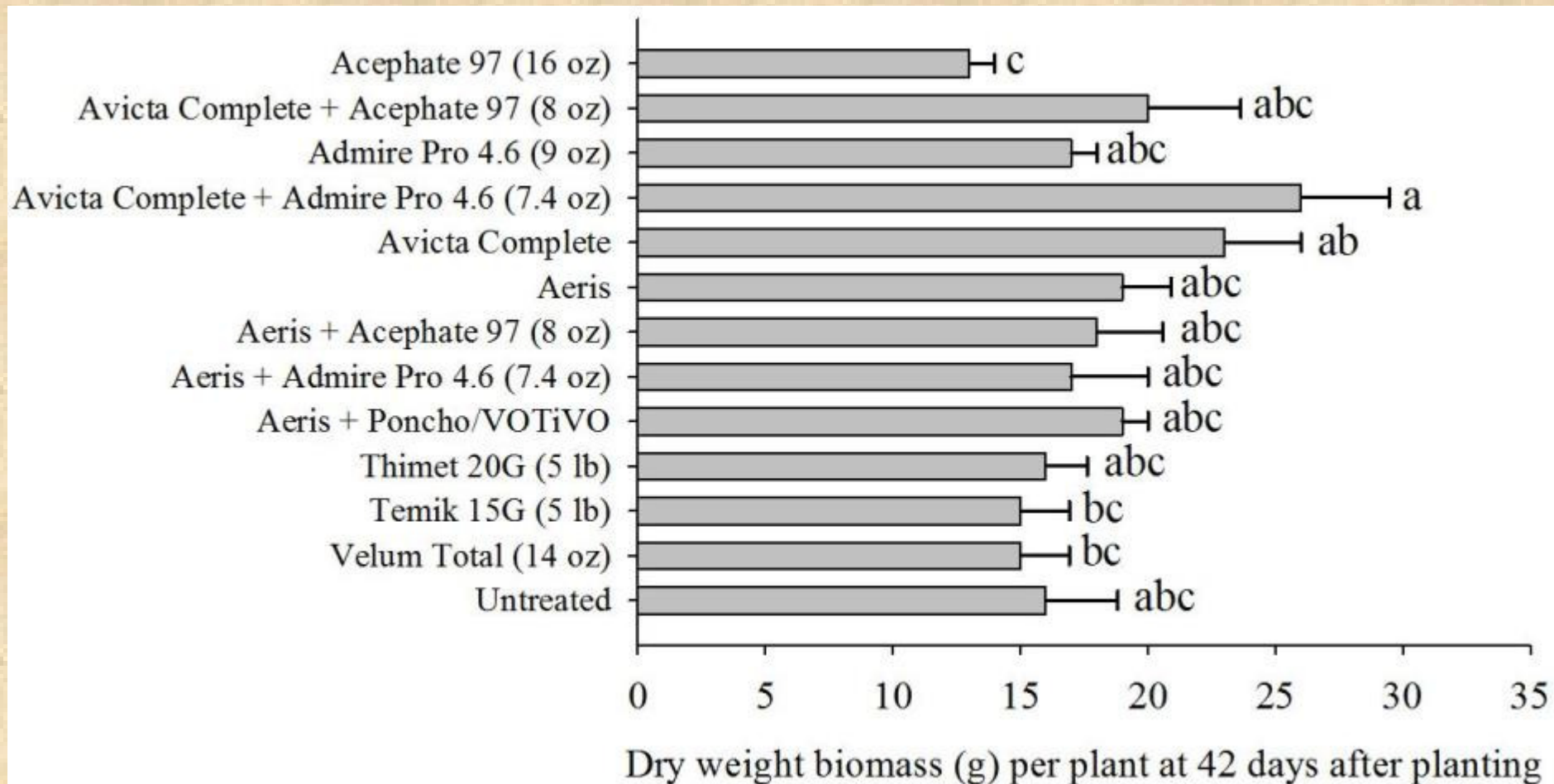
2014

South Carolina, Three Leaves (3 Weeks After Planting)



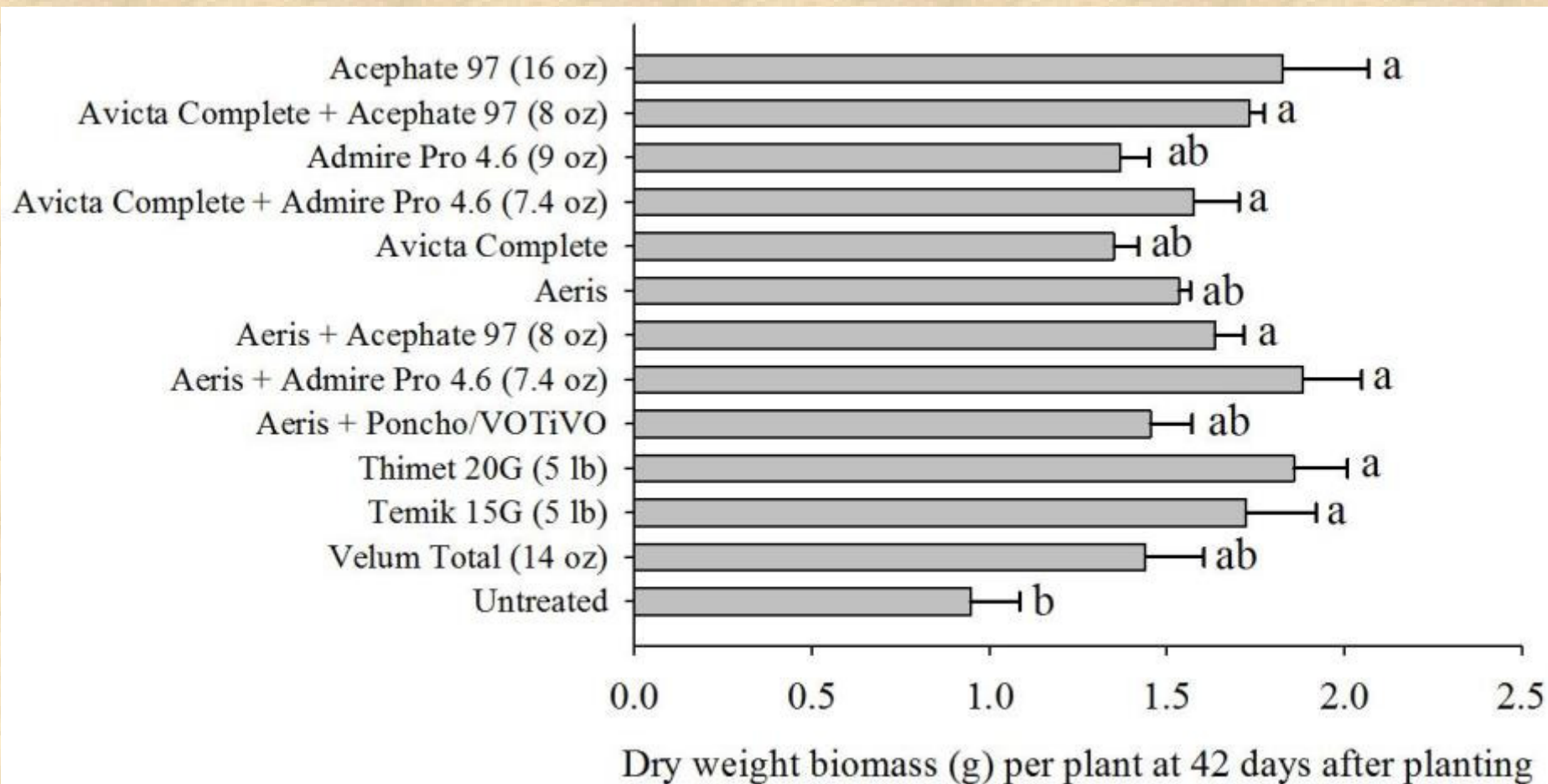
2014

South Carolina, 6 Weeks After Planting



2014

North Carolina, 6 Weeks After Planting



Post-Plant Options

- Protection during the first 14 days is critical.
- Scout and spray as needed based on local threshold.
- Presence of immatures suggests at-plant insecticide is failing.
- Plant Injury: pay close attention to newly expanding leaves.
- Foliar sprays rarely needed once seedlings reach the 4-5 leaf stage and are growing rapidly.



Immatures
-wingless
-cream colored



**4-leaf
cotton**

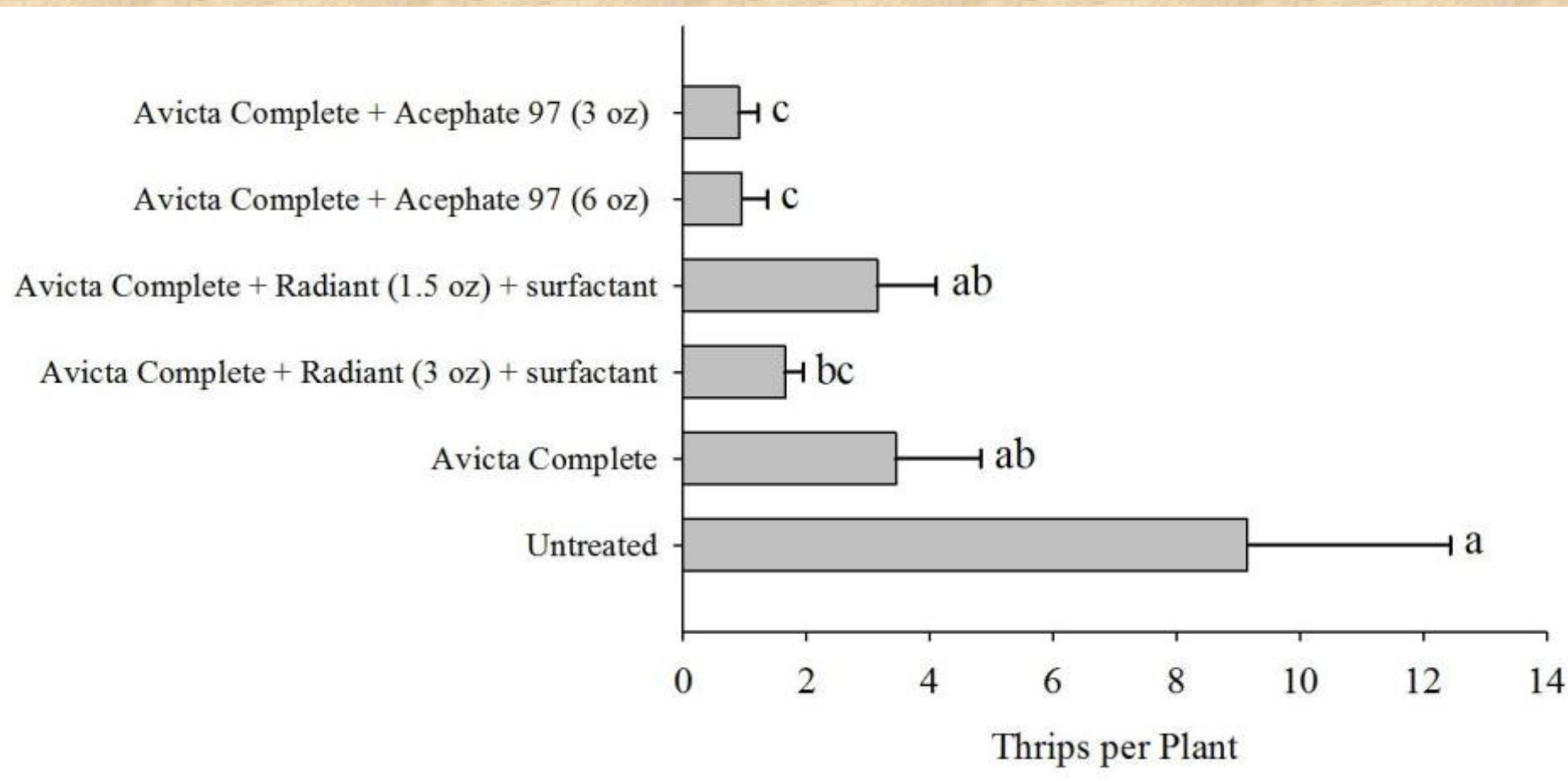


2013 Foliar spray results



2013

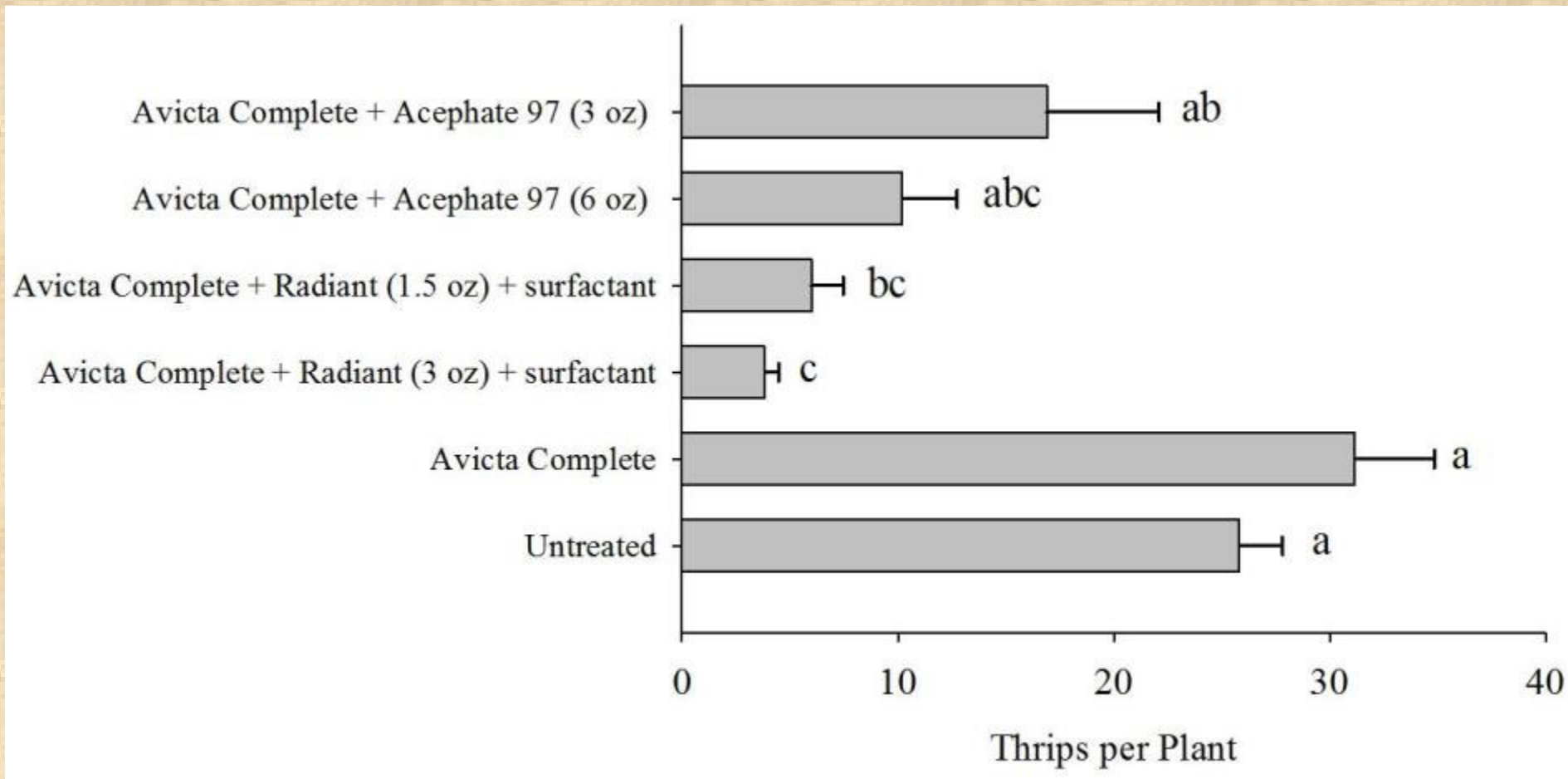
South Carolina, One Leaf (2 Weeks After Planting)



Sprayed 2 weeks after planting, sampled four days post-spray

2013

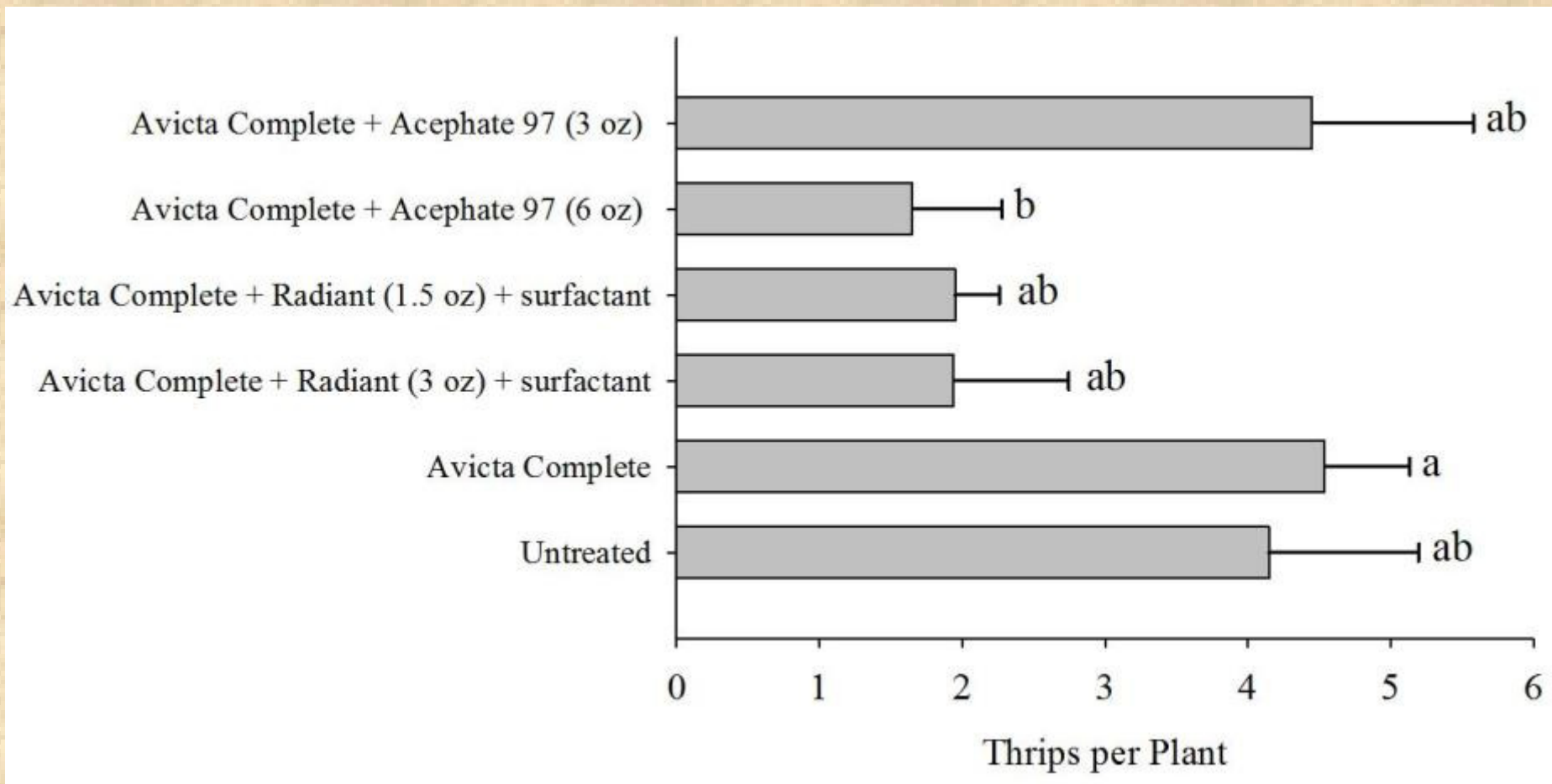
North Carolina, Two Leaves (4 Weeks After Planting)



Sprayed 3 weeks after planting

2013

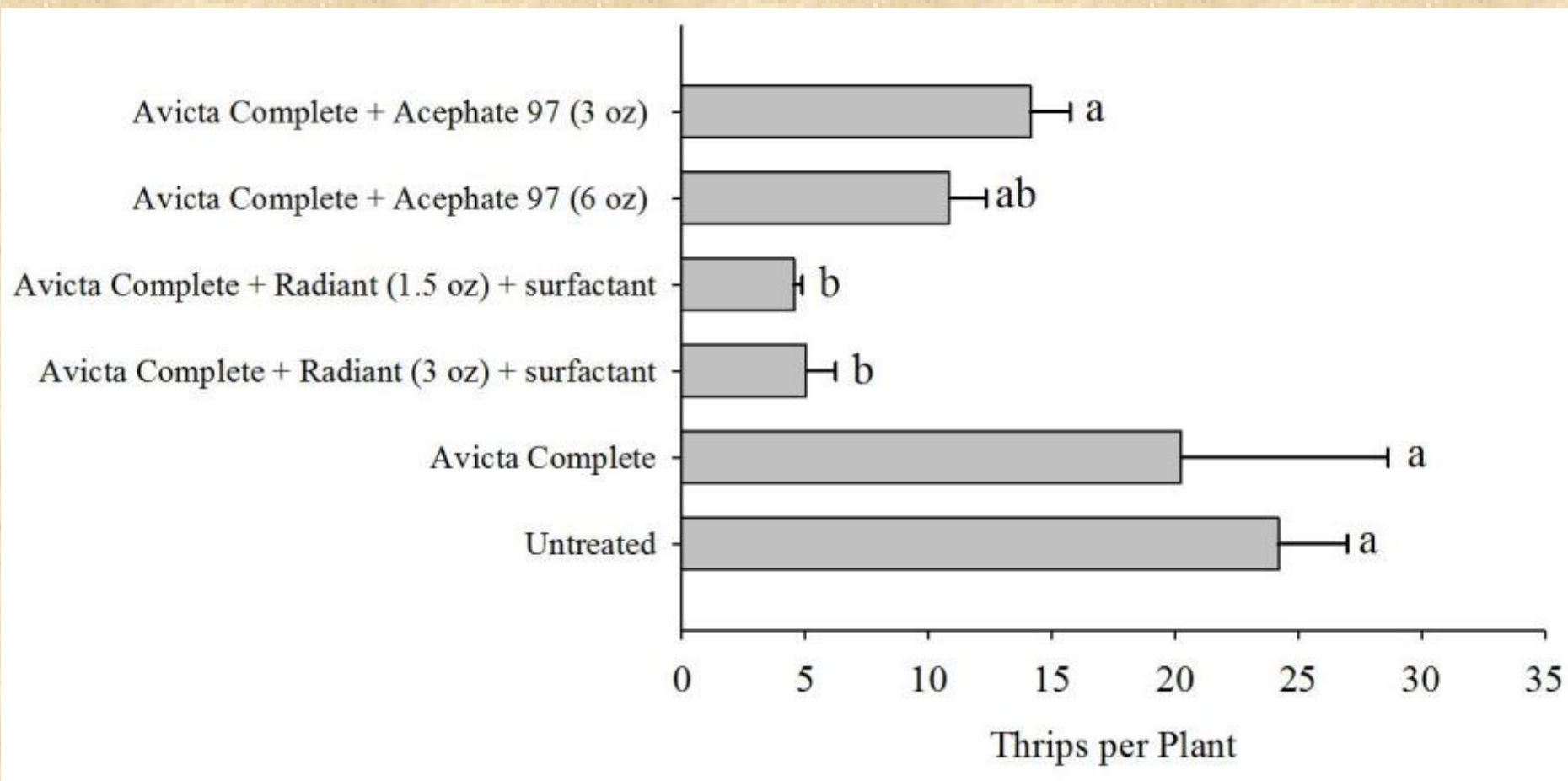
Virginia, Two Leaves (4 Weeks After Planting)



Sprayed 2 weeks after planting

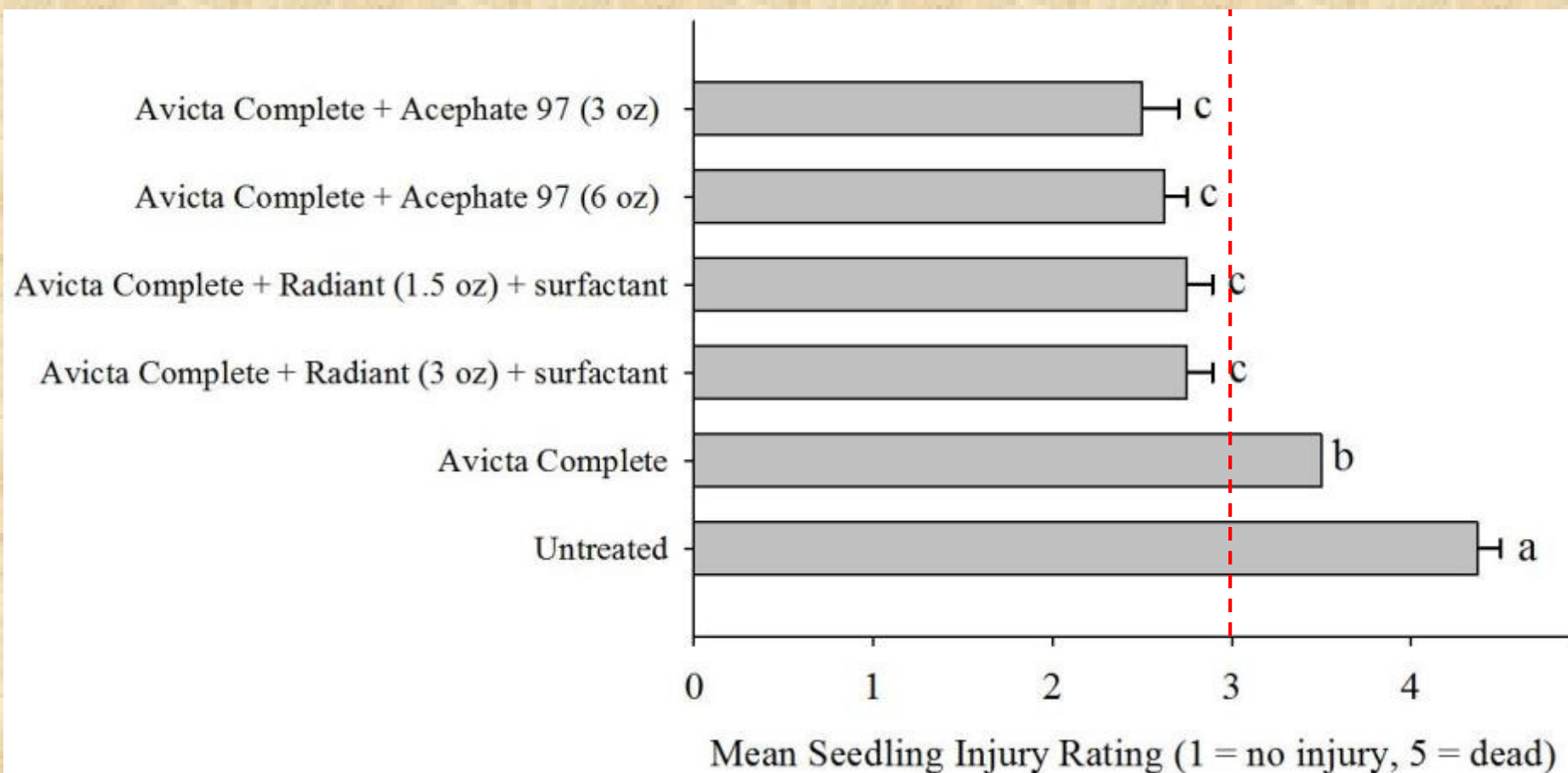
2013

Georgia, Three Leaves (4 Weeks After Planting)



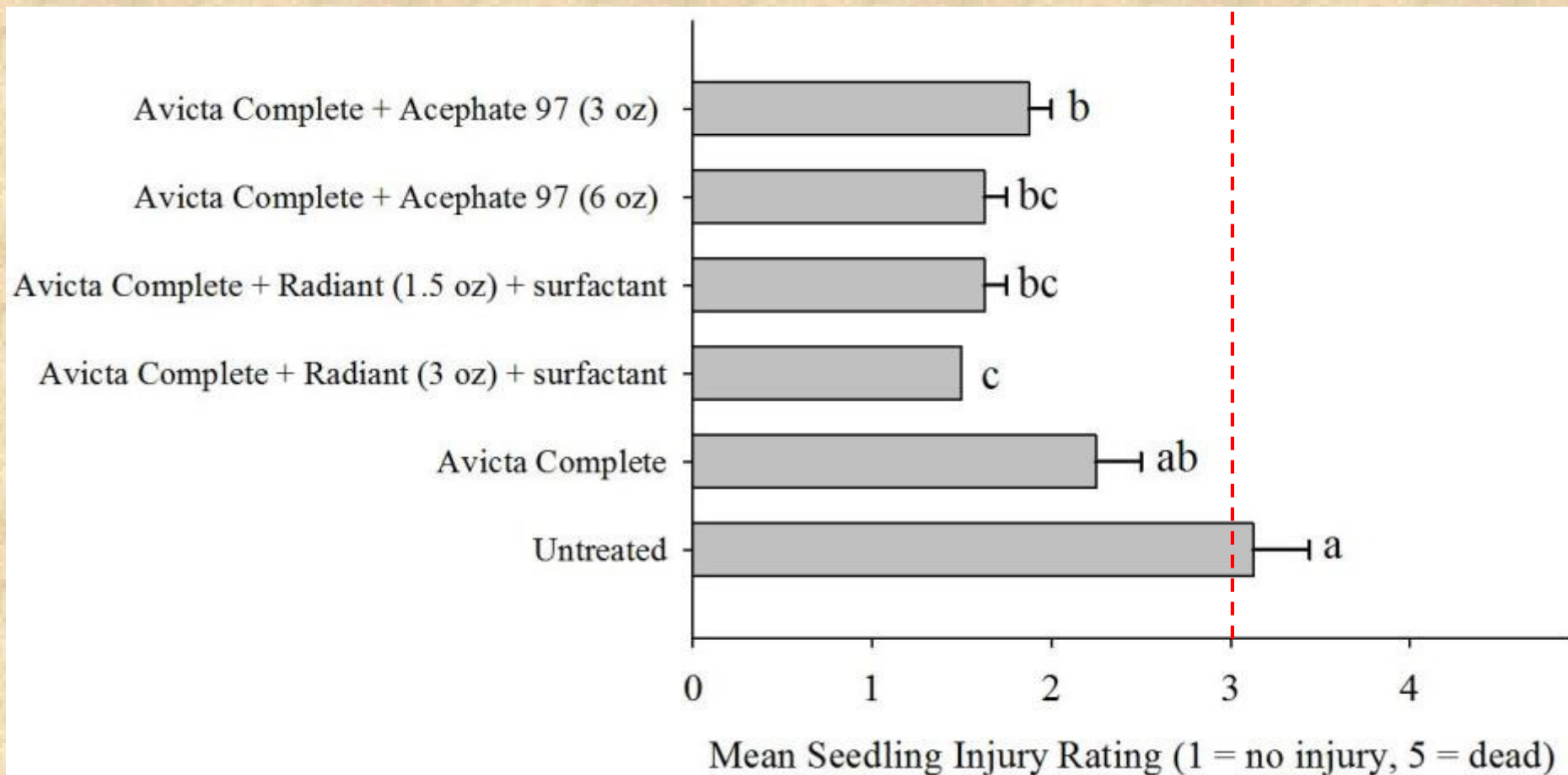
2013

Georgia, Three Leaves (4 Weeks After Planting)



2013

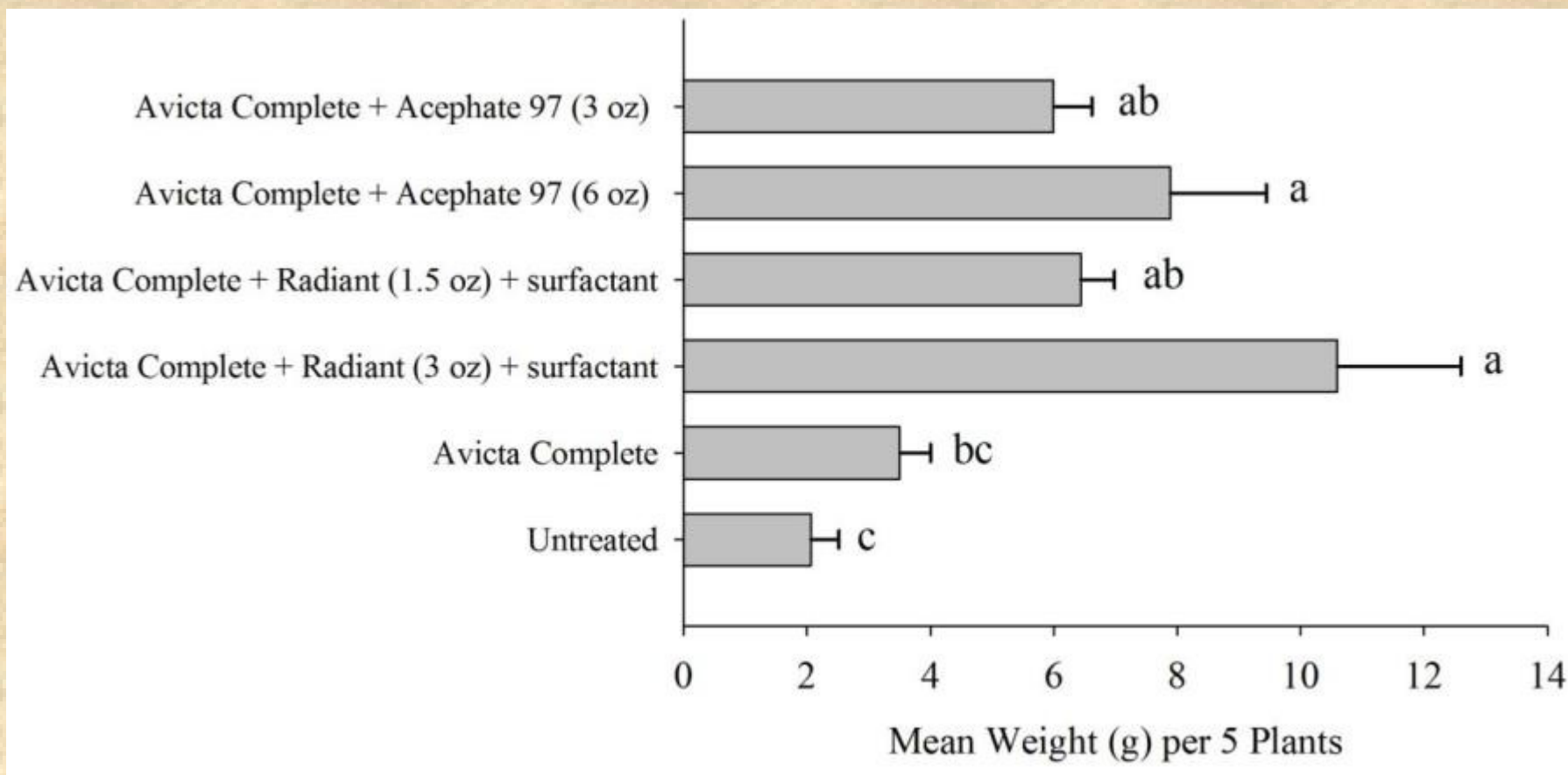
North Carolina, Six Leaves (6 Weeks After Planting)



Sprayed 3 weeks after planting

2013

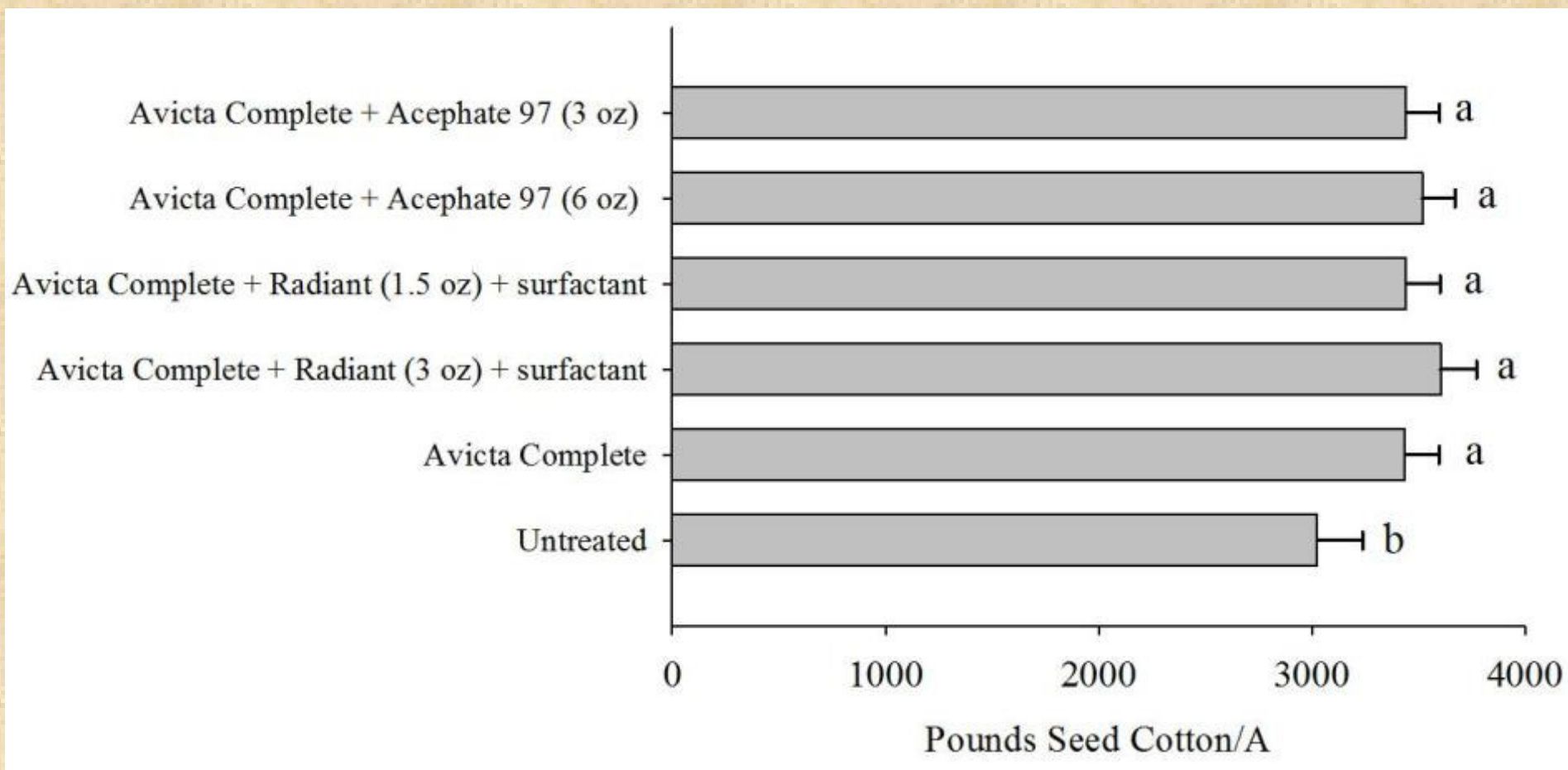
North Carolina, 6 Weeks After Planting



Sprayed 3 weeks after planting

2013

North Carolina, Yield



Sprayed 3 weeks after planting

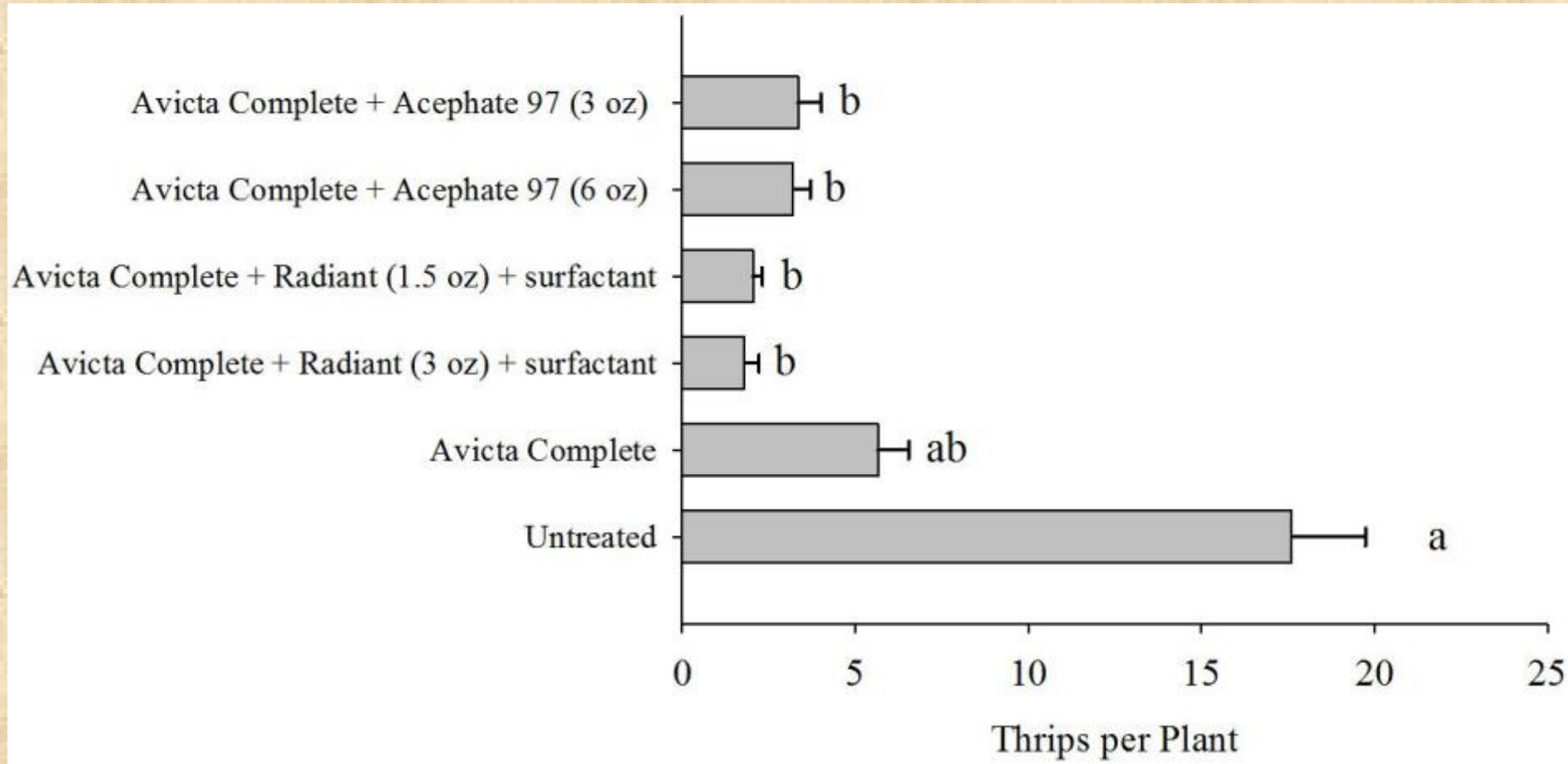


2014 Foliar spray results



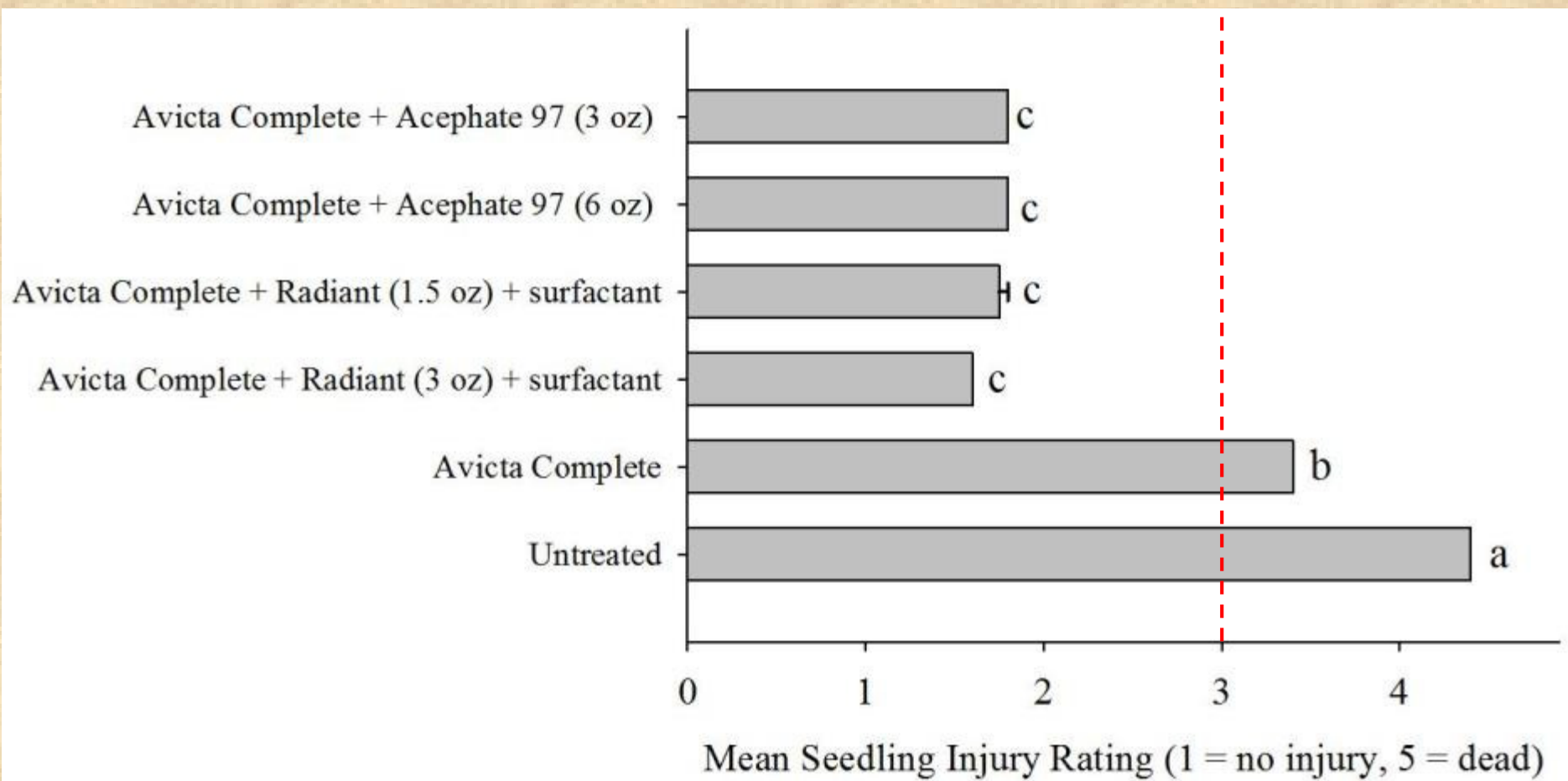
2014

Virginia, Two Leaves (3 Weeks After Planting)



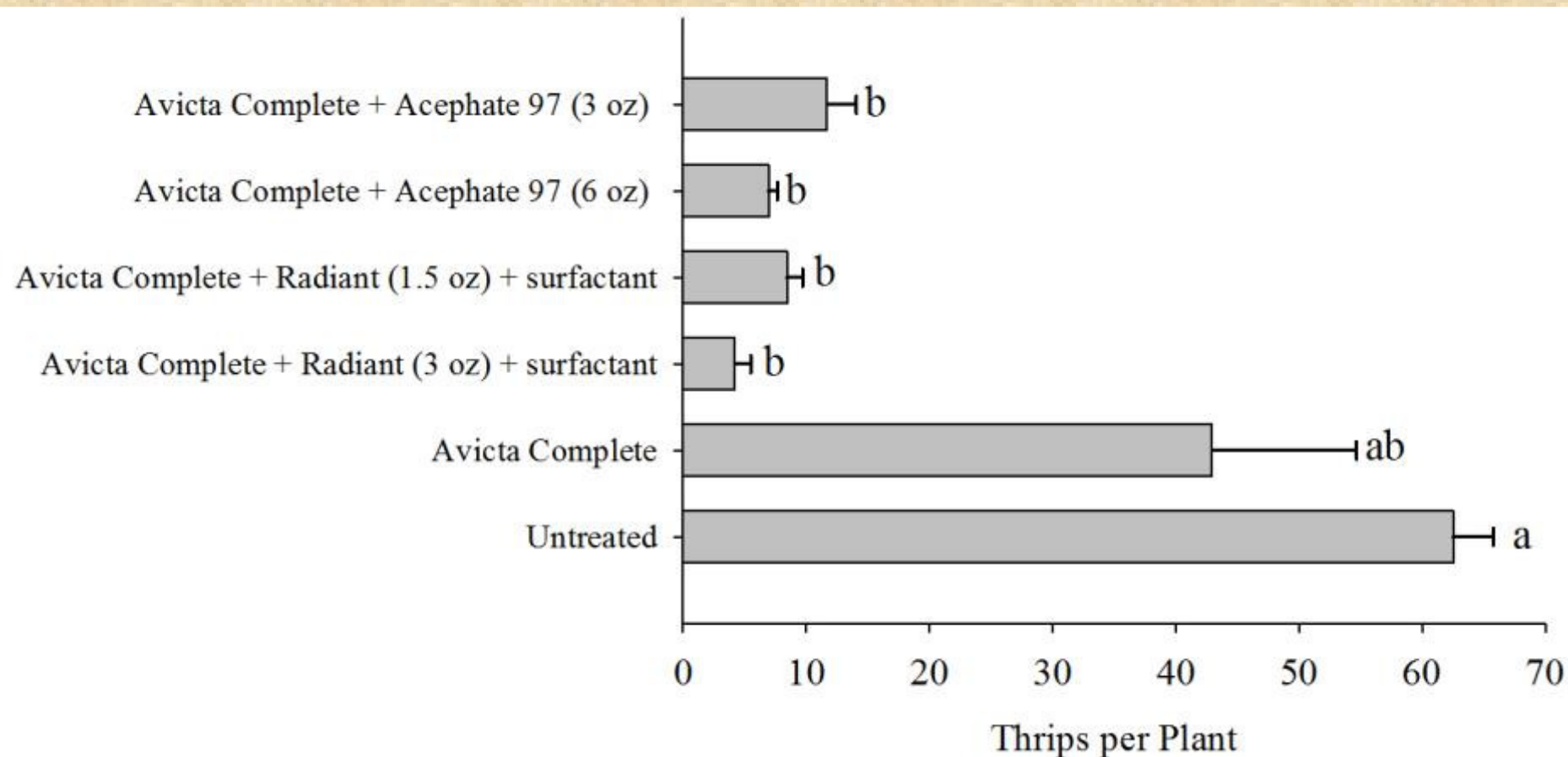
2014

Virginia, Two Leaves (3 Weeks After Planting)



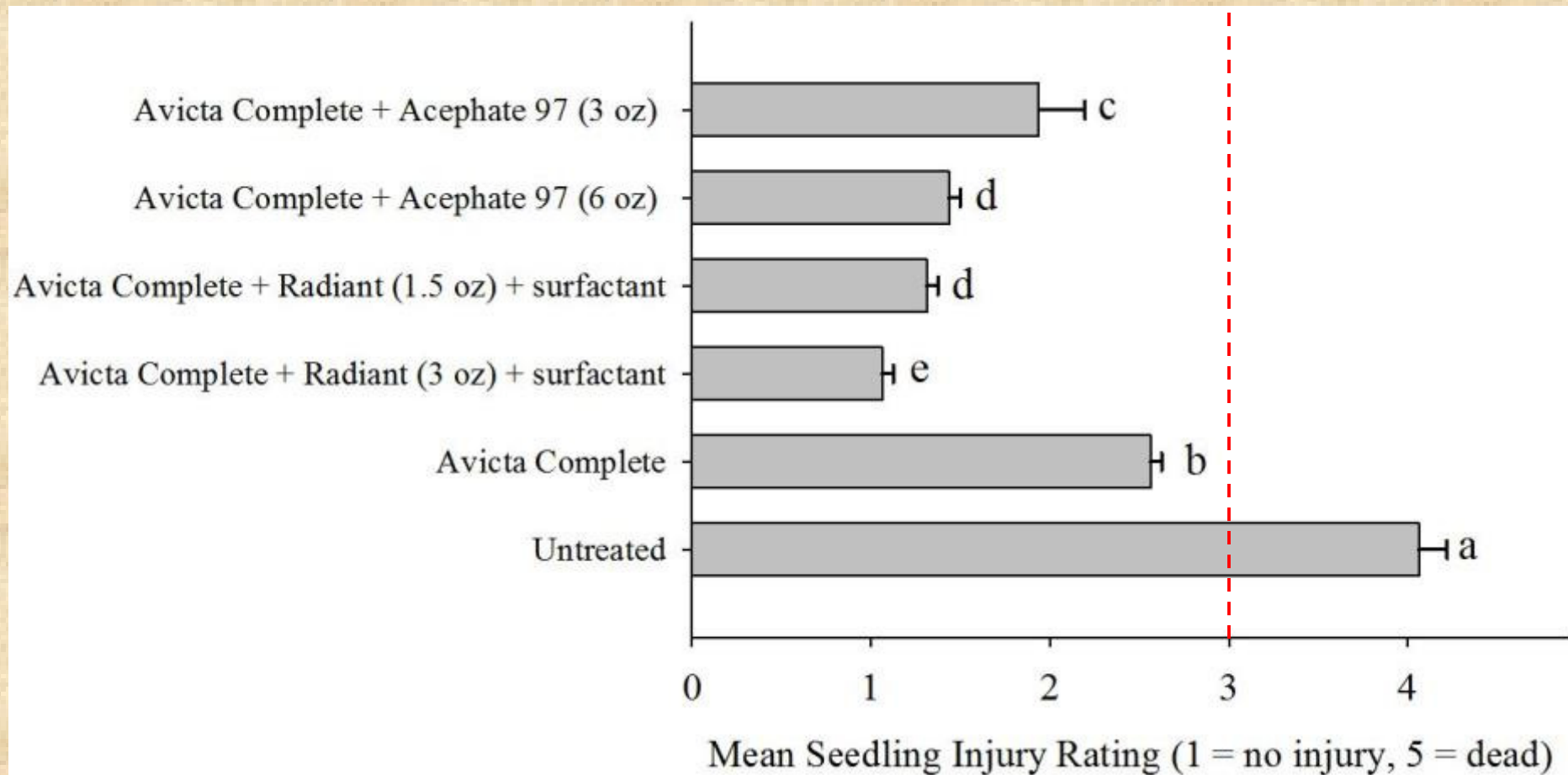
2014

North Carolina, Six Leaves (4 Weeks After Planting)



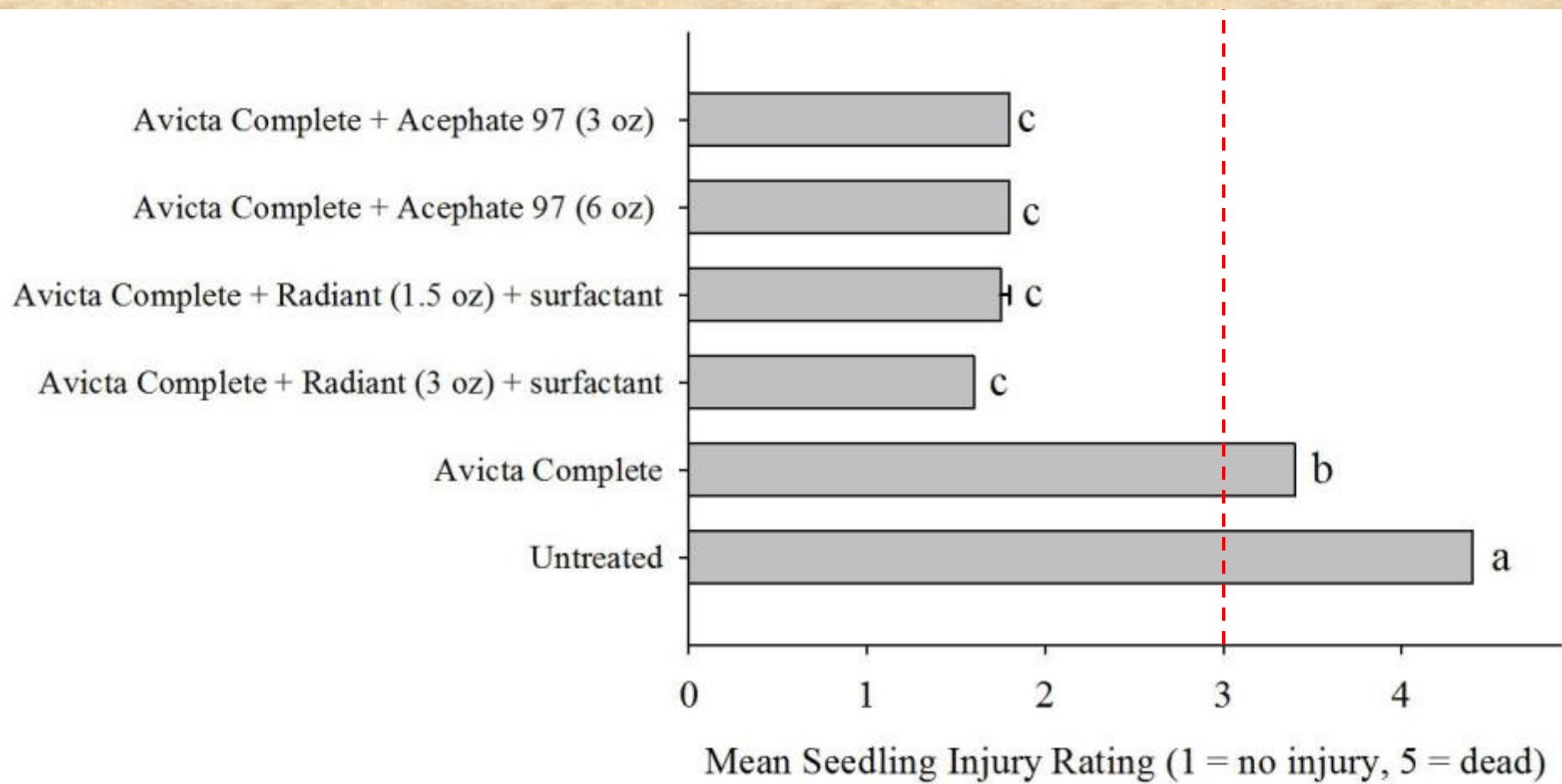
2014

North Carolina, Six Leaves (4 Weeks After Planting)



2014

Virginia, Six Leaves (5 Weeks After Planting)



Optimal Overspray Timing

- When is the best time to spray for thrips?
At threshold, of course!
- A better way to ask – when is the most susceptible time (crop phenology) to protect from thrips?



Optimal Overspray Timing



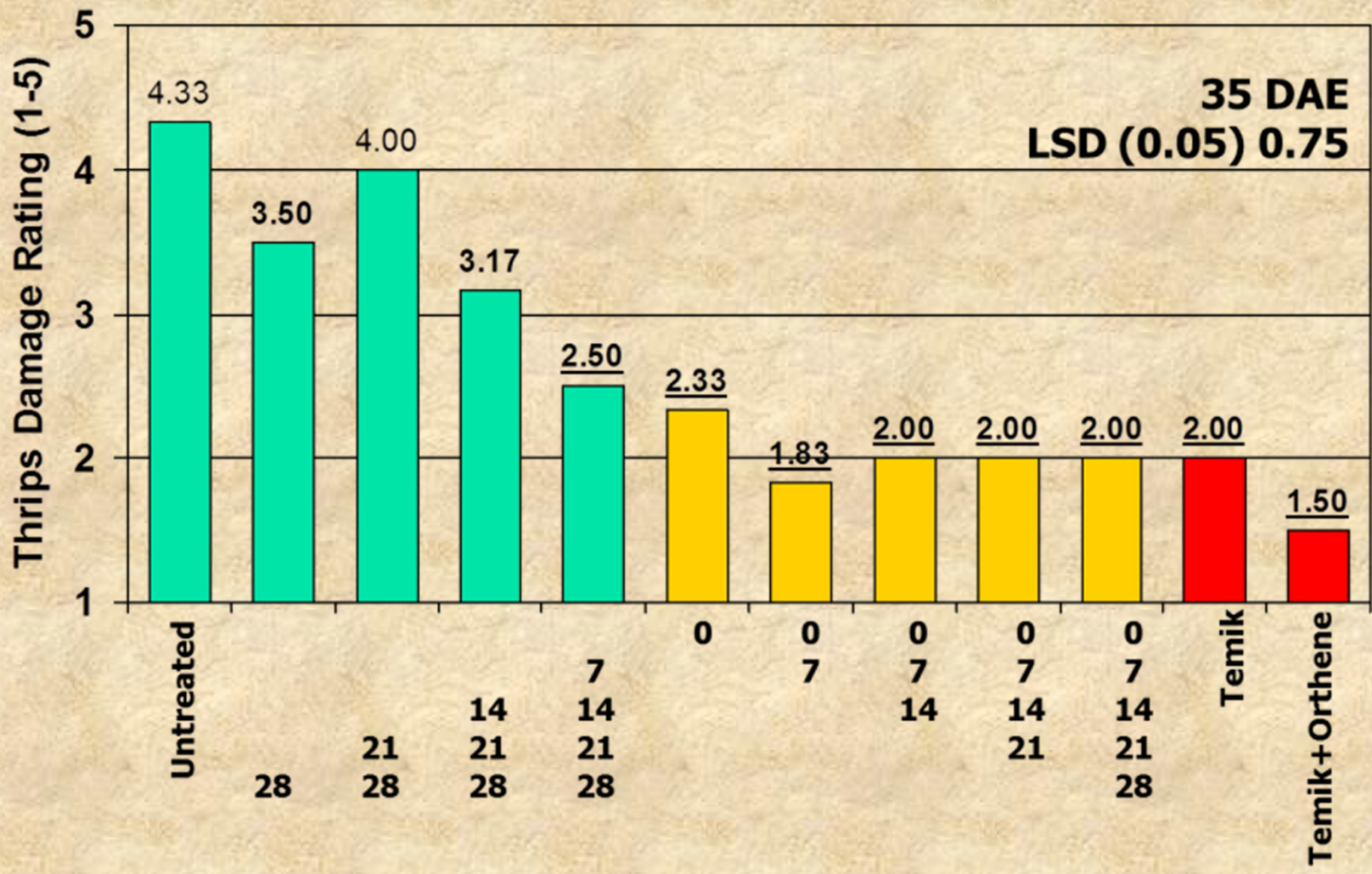
- Progressive and regressive foliar insecticide regimes (acephate 0.2 lb ai/acre).
- Two states (GA, SC)
- RCB design w/ four replications.
- Data Collection:
 - Thrips Counts
 - Thrips Damage Ratings
 - Plant Height
 - Plant Dry Weights
 - Yield

Treatment	Foliar Insecticide Applied (DAE)				
	0	7	14	21	28
Untreated					
28					X
21-28				X	X
14-21-28			X	X	X
7-14-21-28		X	X	X	X
0	X				
0-7	X	X			
0-7-14	X	X	X		
0-7-14-21	X	X	X	X	
0-7-14-21-28	X	X	X	X	X
Temik 15G 5#					
Temik+foliar	X	X	X	X	X

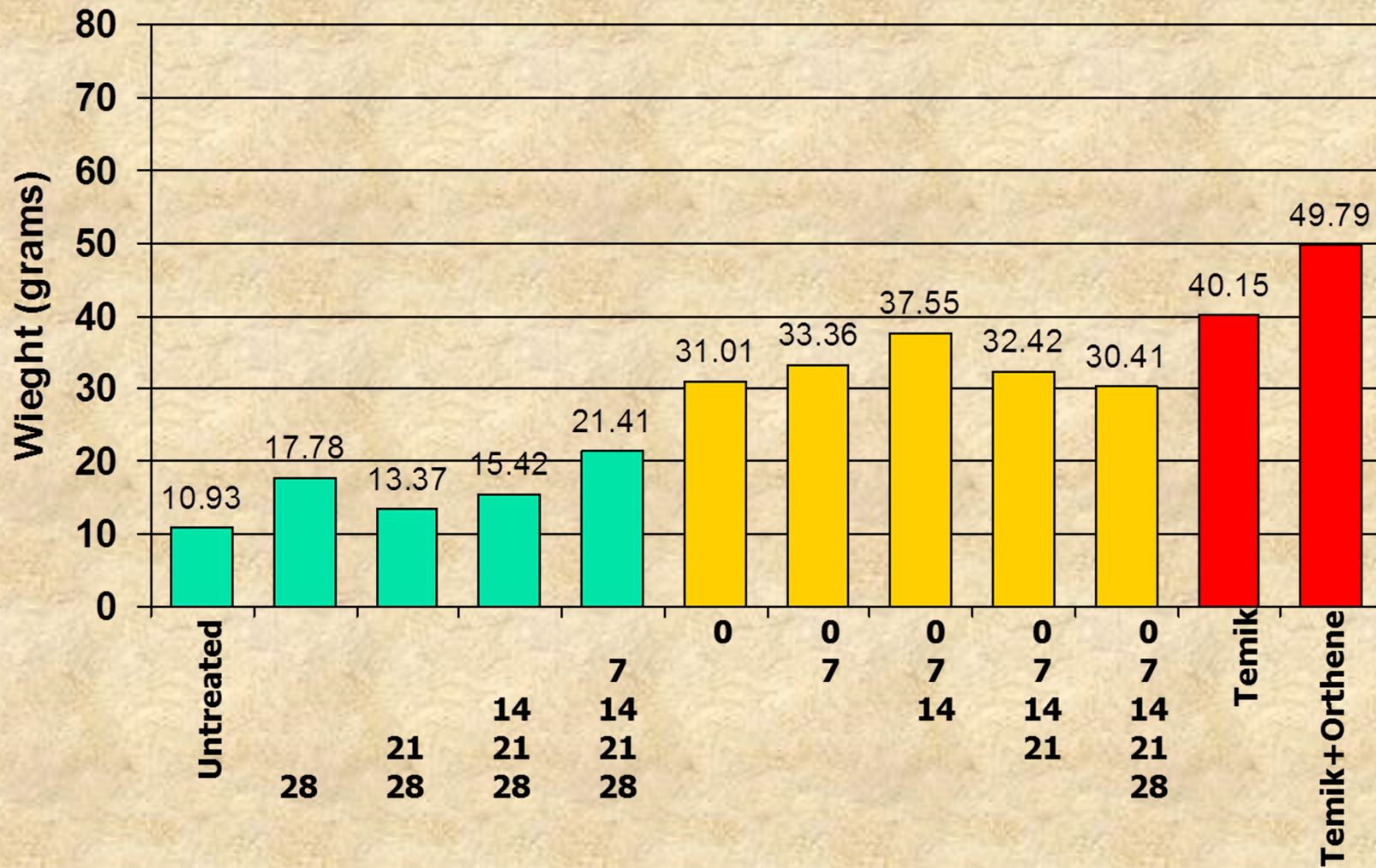
X=foliar acephate applied

Progressive / Regressive

Thrips Damage - Georgia 2010

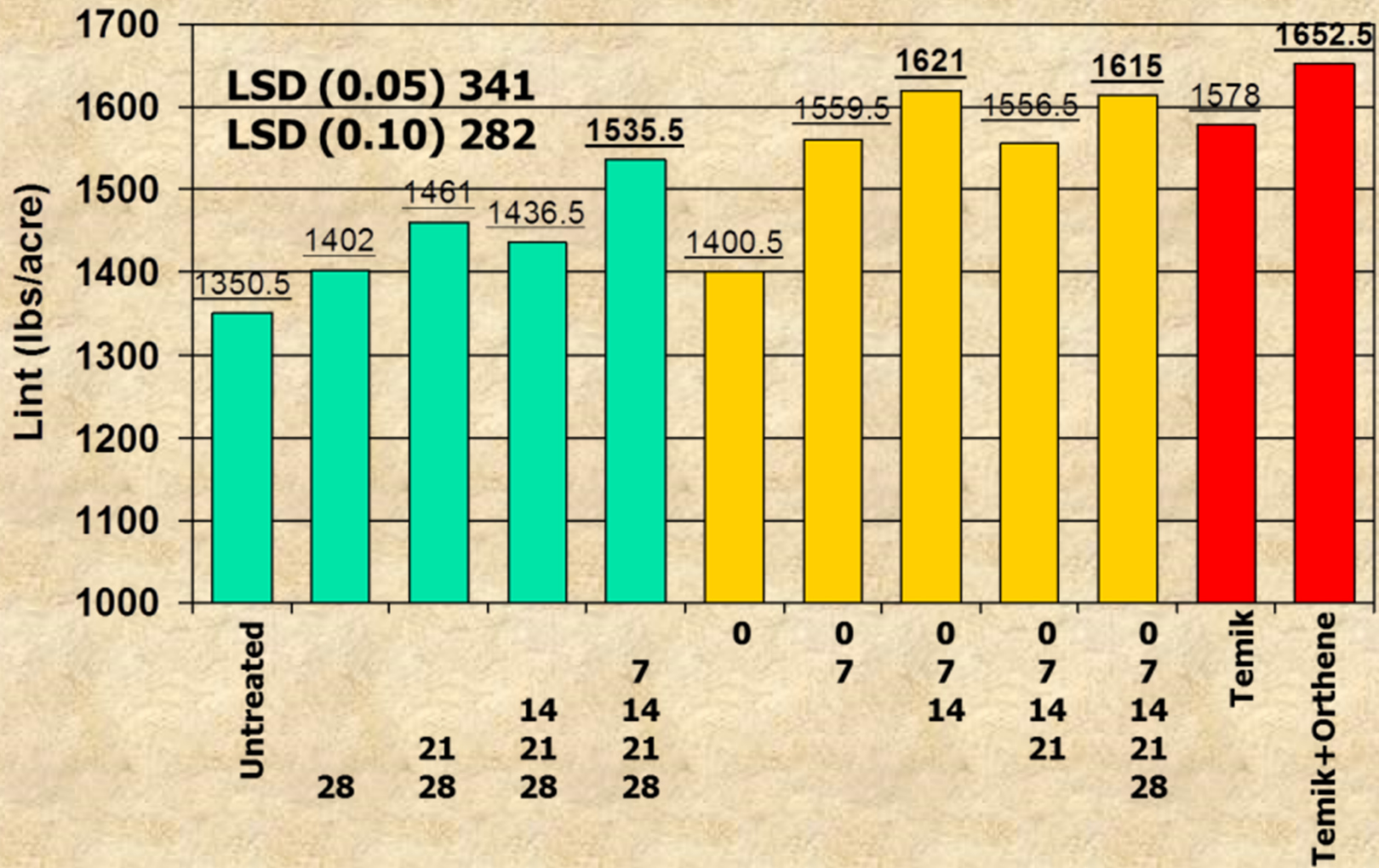


Progressive / Regressive Dry Weight - Georgia 2009 & 2010



Progressive / Regressive

Yield - Georgia 2009 & 2010



Herbicide and Thrips Injury

Palmer amaranth changed our production system!



- **Conventional tillage increased.**
 - Higher thrips populations compared with reduced tillage.
- **PRE and POST residual herbicide use increased.**
 - Potential for stress, slower seedling growth.
 - Thrips damage potential greater on slow growing seedlings.
 - Thrips susceptibility window extended (time to 4th leaf stage).

Potential Interaction of Herbicide and Thrips Management Programs

- Hypothesis: a specific stress or multiple general stressors create a high-risk environment for thrips injury and yield loss.
 - this could be created by early planting and associated cool conditions, conventional tillage, herbicide injury, etc.
 - as a specific stress, plant injury and yield loss resulting from increased thrips injury when PRE herbicide injury occurs.

Methods

- Small Plot Trials conducted in AL, GA, SC, and VA
 - 2013 was year one of a 2-year project
- Factorial Design with four replications
 - Insecticide Treatments
 - None
 - Avicta Complete Cotton ST
 - Avicta Complete Cotton ST + Orthene 97 foliar at 1-leaf
 - PRE Herbicide Treatments
 - None
 - PRE (1X)
 - PRE (2X)
- Data Collection
 - Thrips counts and injury ratings.
 - Plant Biomass
 - Yield

No insecticide

Avicta

Avicta + Orthene

**No
PRE**



**1x
PRE**



**2x
PRE**



Virginia, Ames Herbert (2013)

Rep I-GA

June 4, 2013

No PRE

PRE 1X

PRE 2X

No Insecticide



Avicta

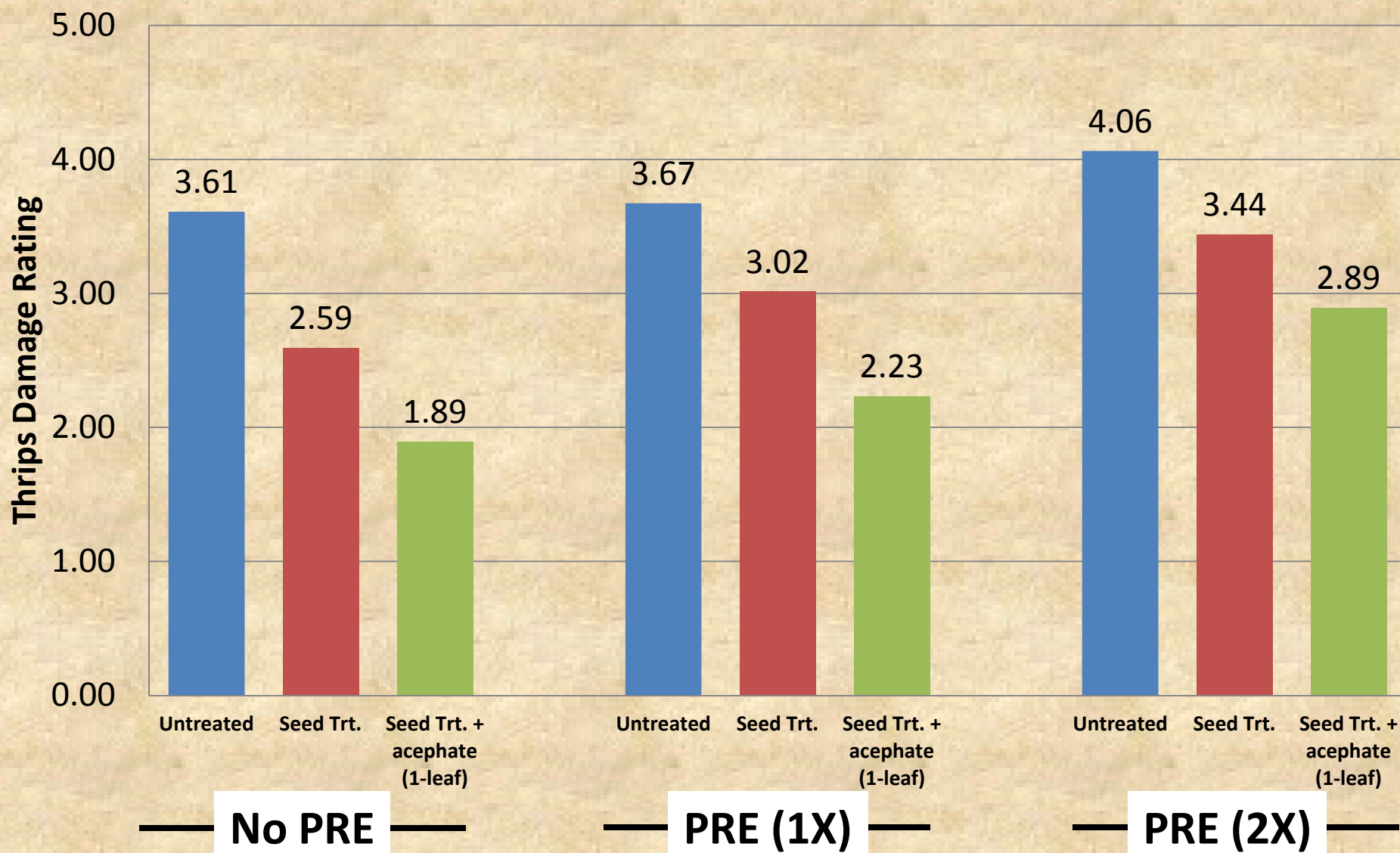


Avicta+Orthene



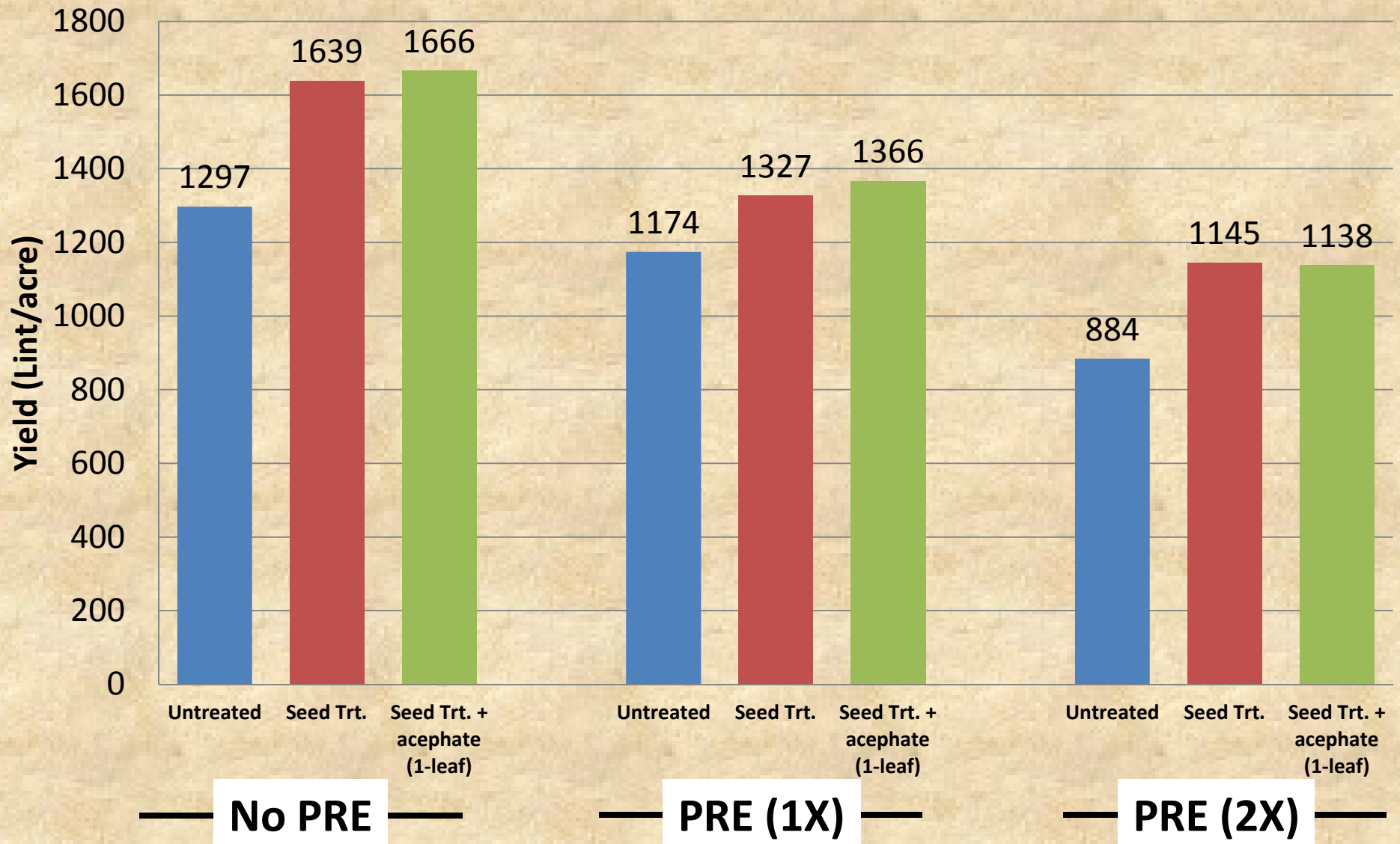
PRE x Thrips (Mean-AL, GA, SC, and VA 2013)

Thrips Damage Rating



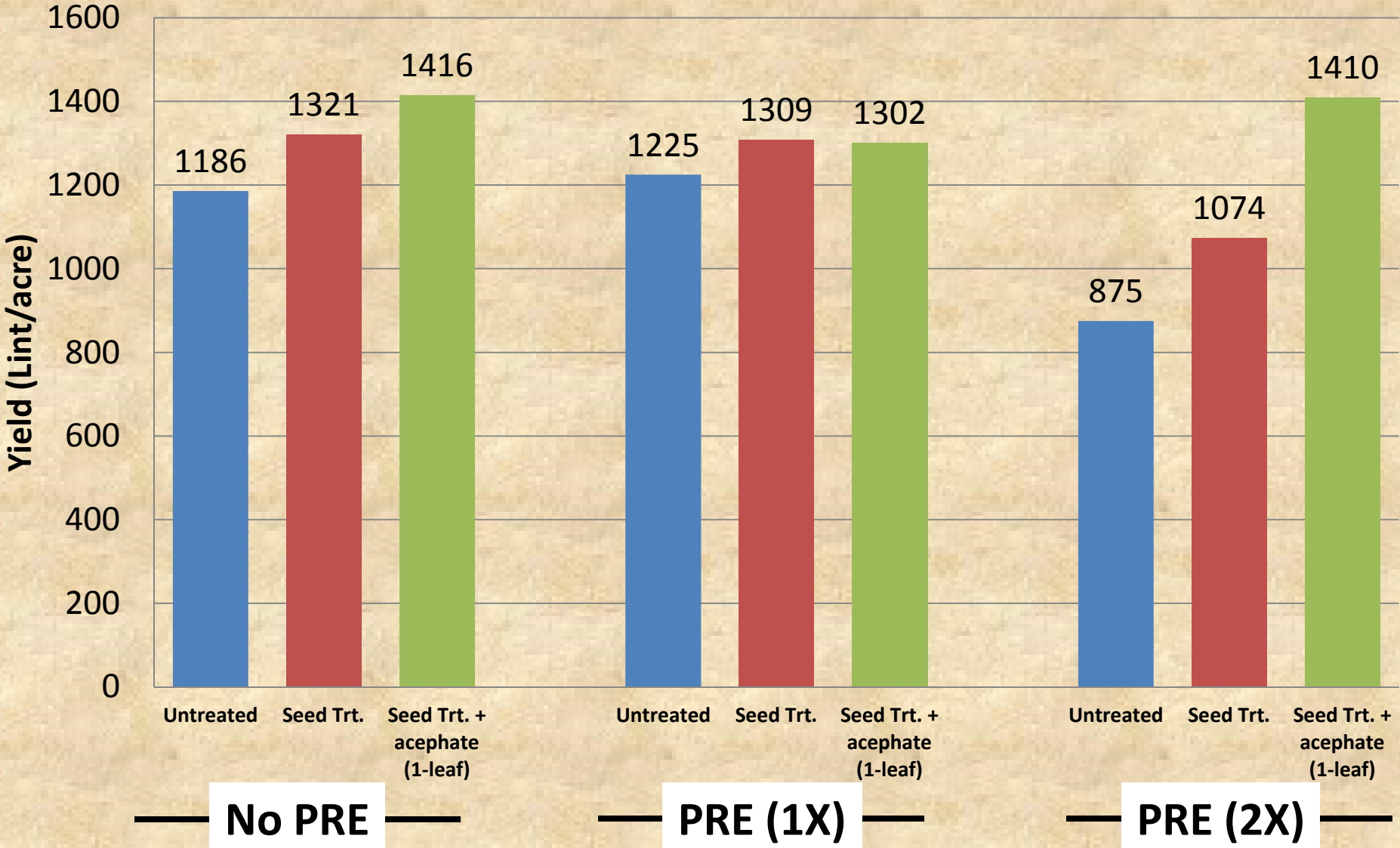
PRE x Thrips (Virginia 2013)

Lint Yield per Acre

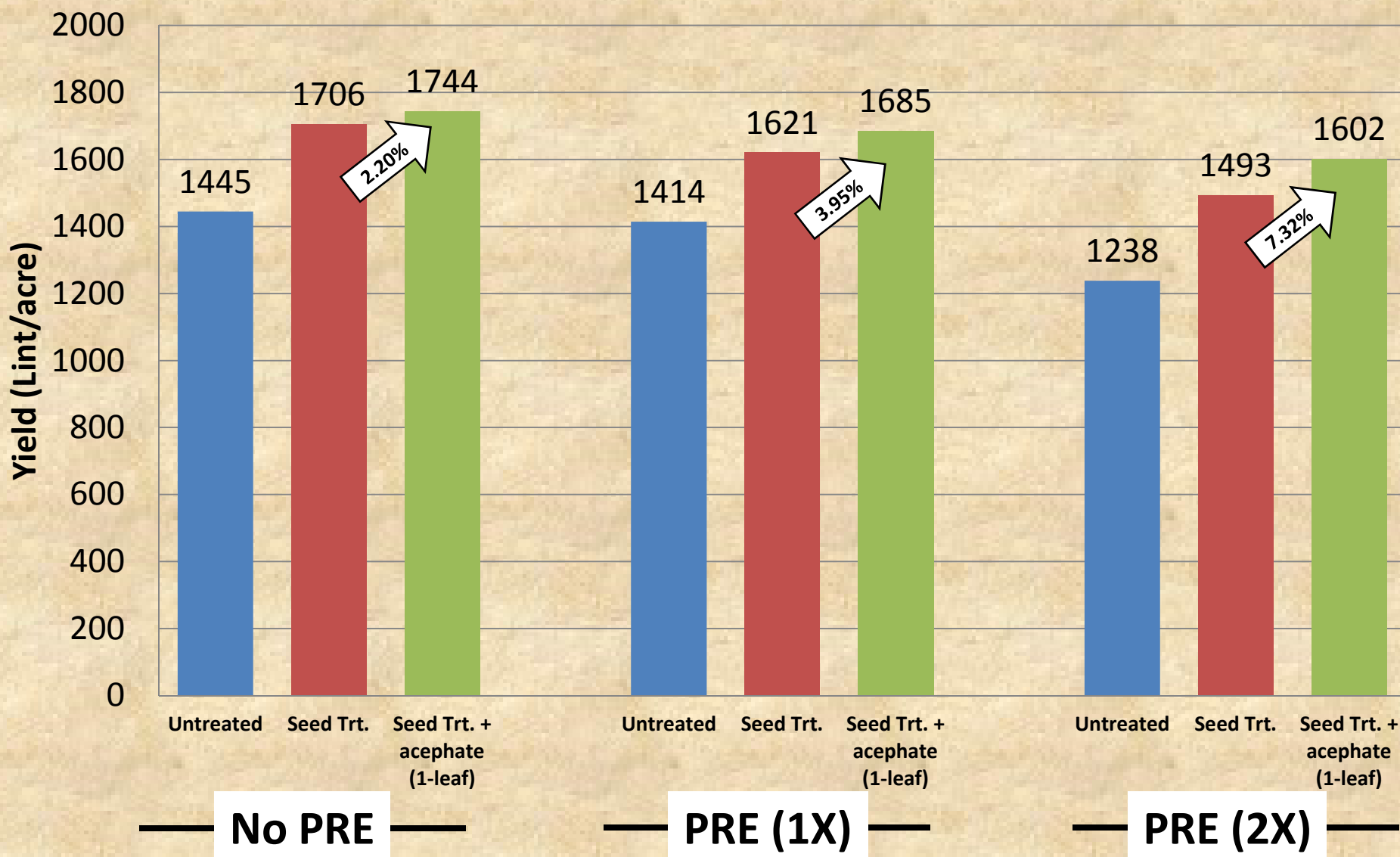


PRE x Thrips (Alabama 2013)

Lint Yield per Acre

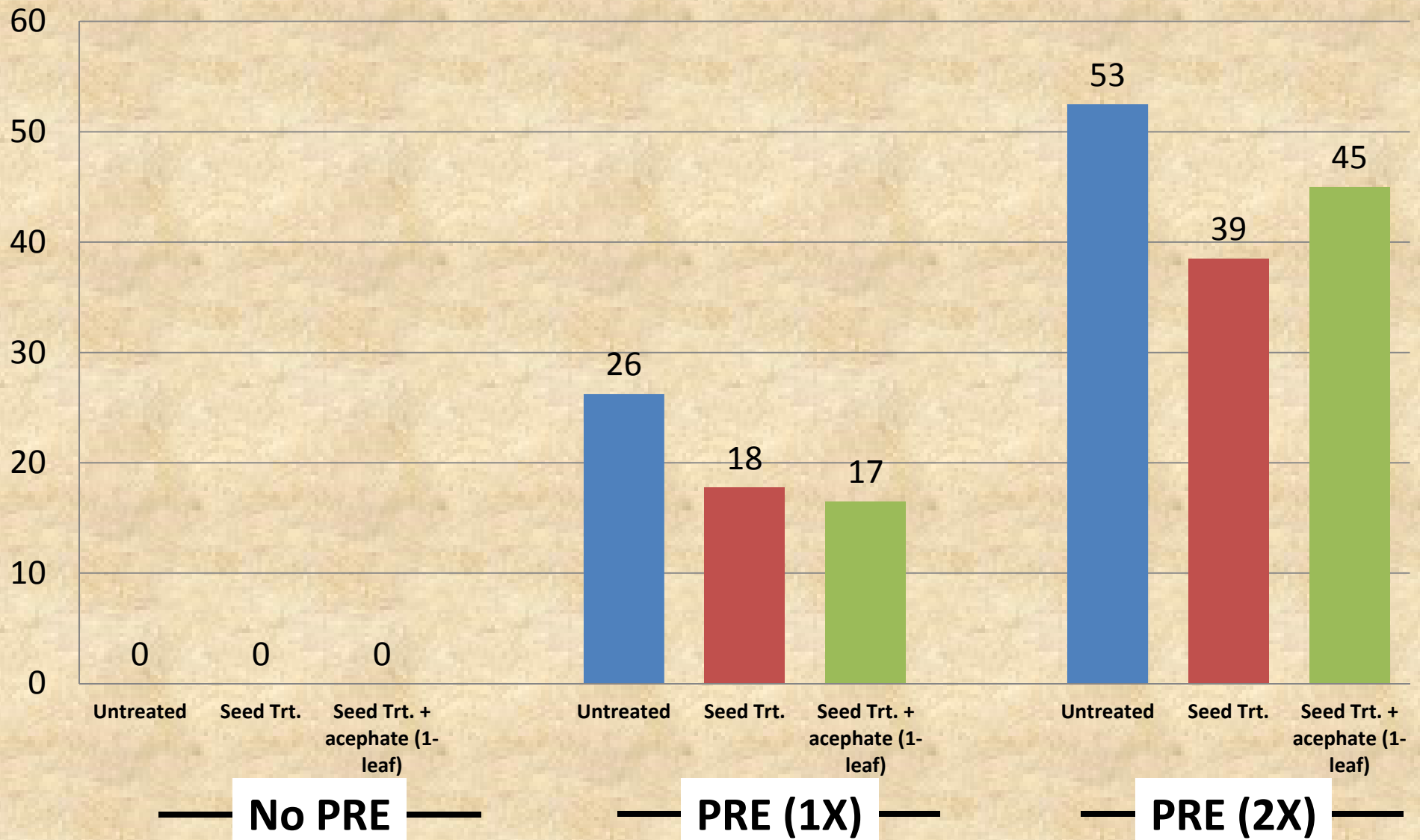


PRE x Thrips (Mean-AL, GA, SC, and VA 2013) Lint Yield per Acre



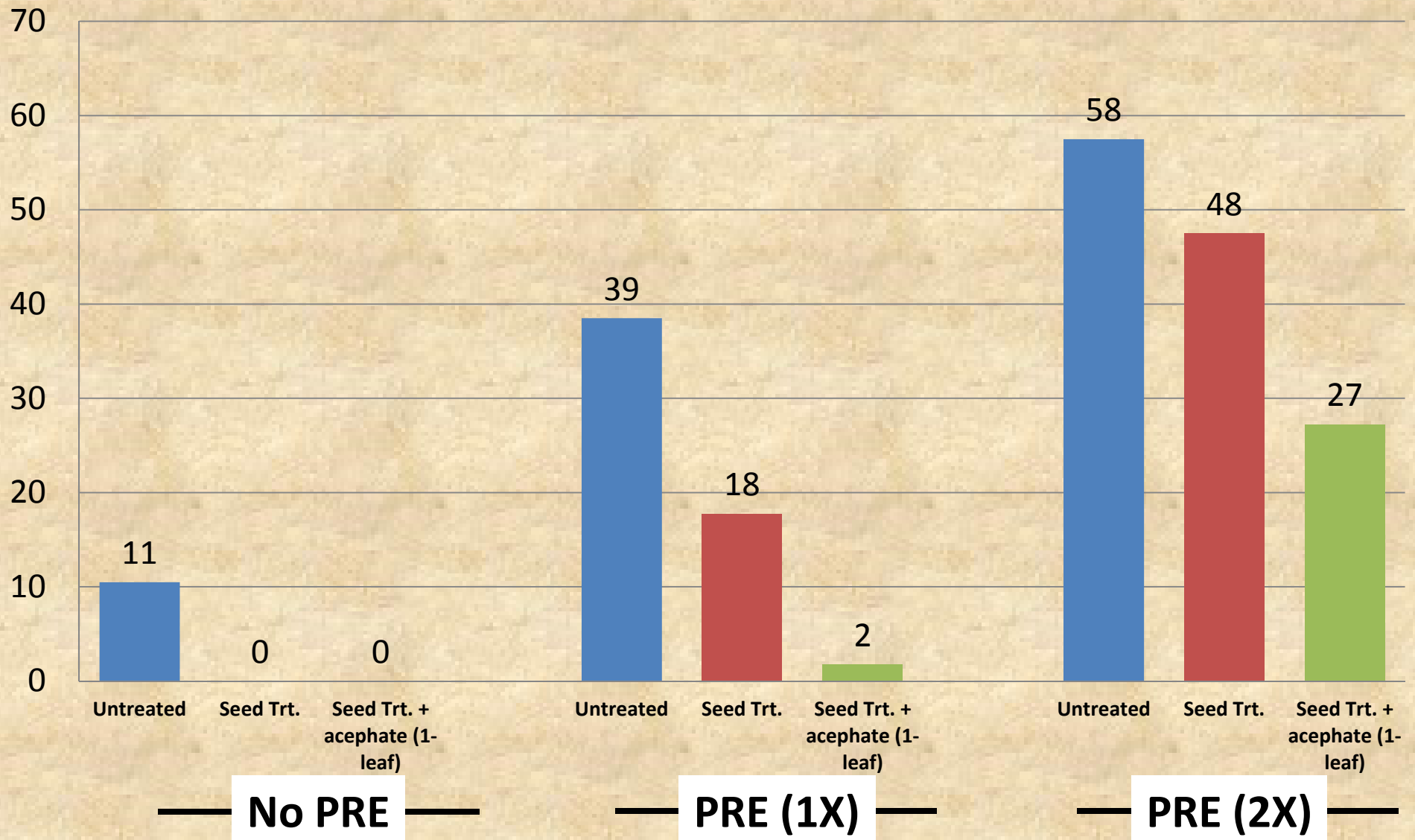
Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Injury--Culpepper May 21



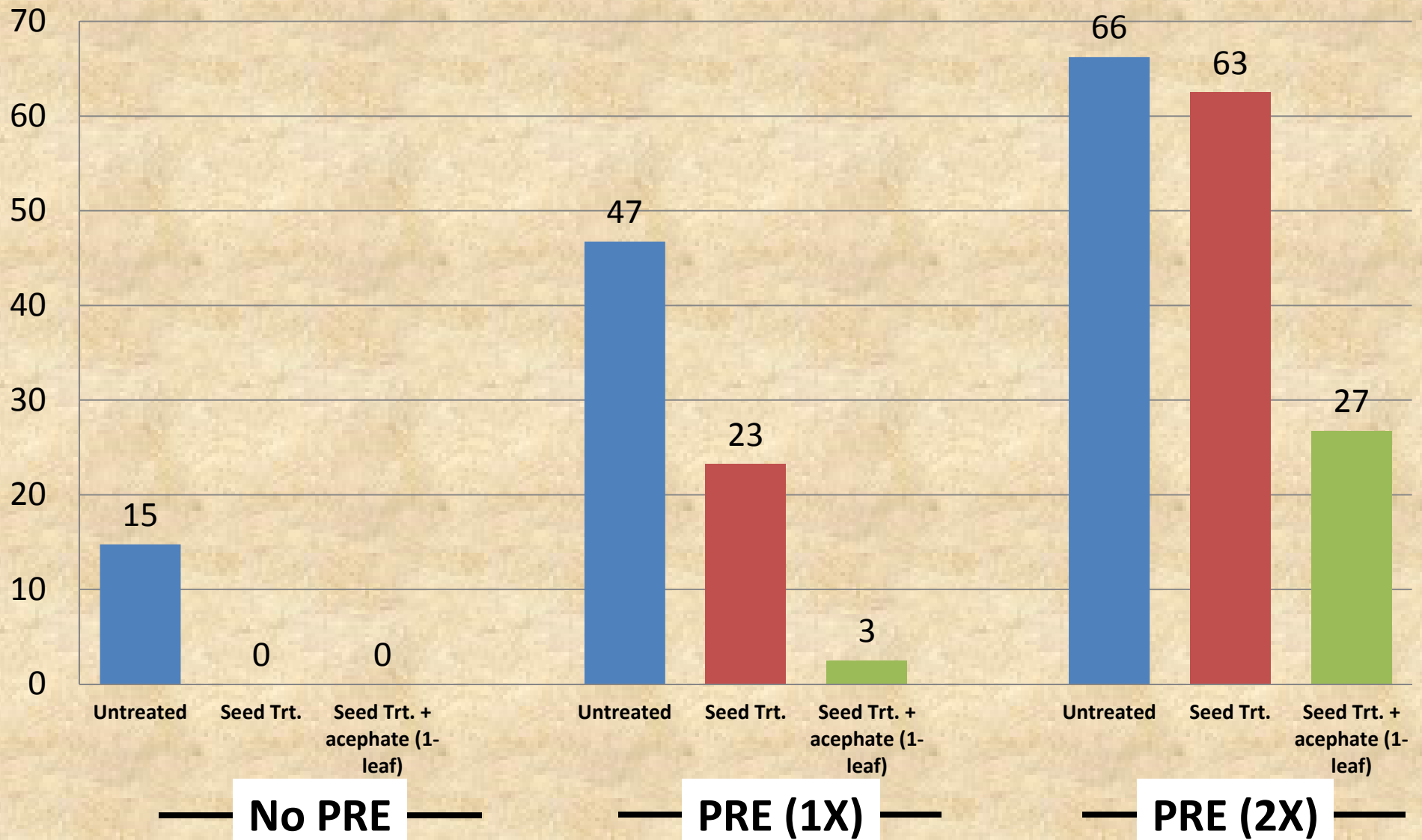
Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Injury--Culpepper May 30



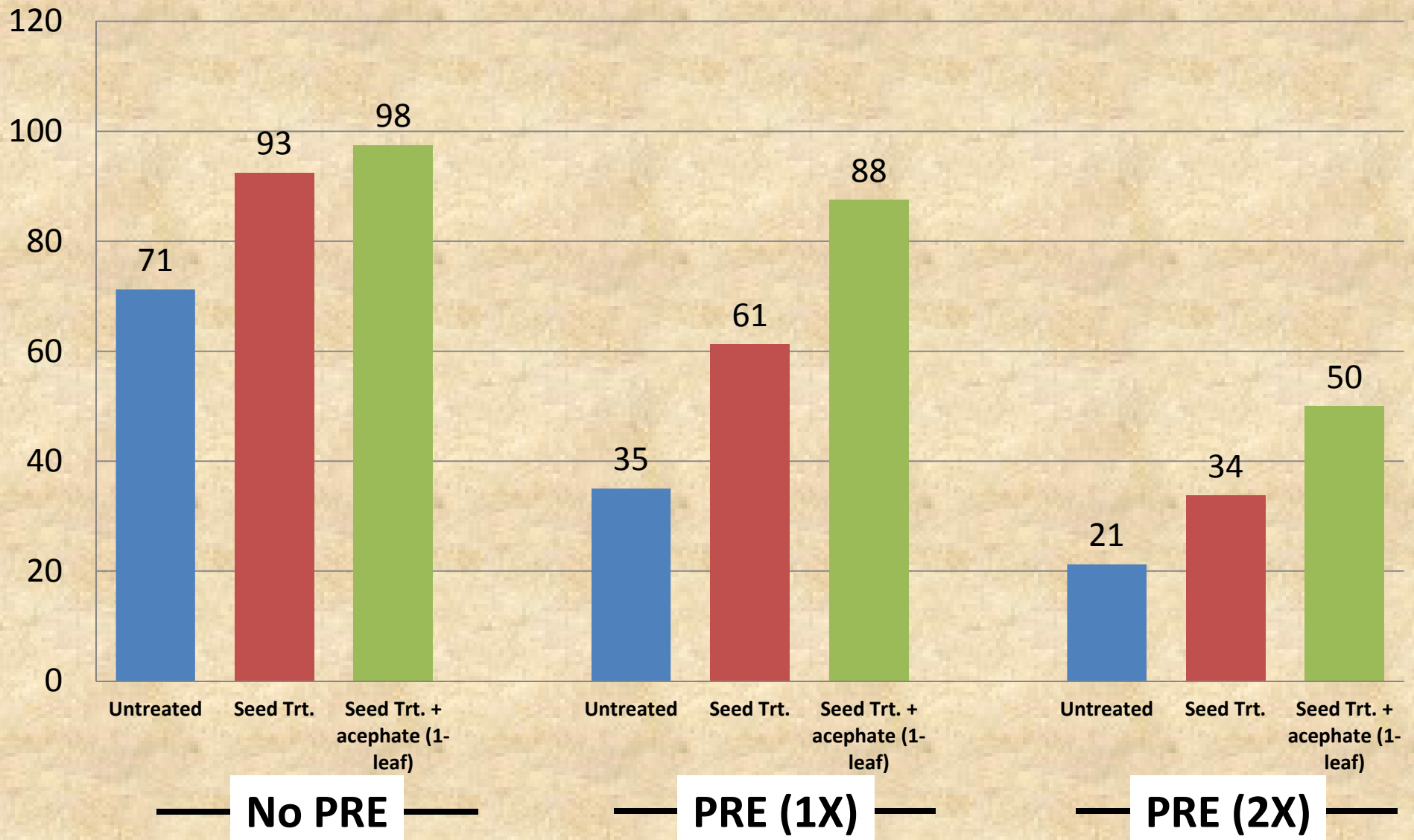
Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Injury--Culpepper June 9



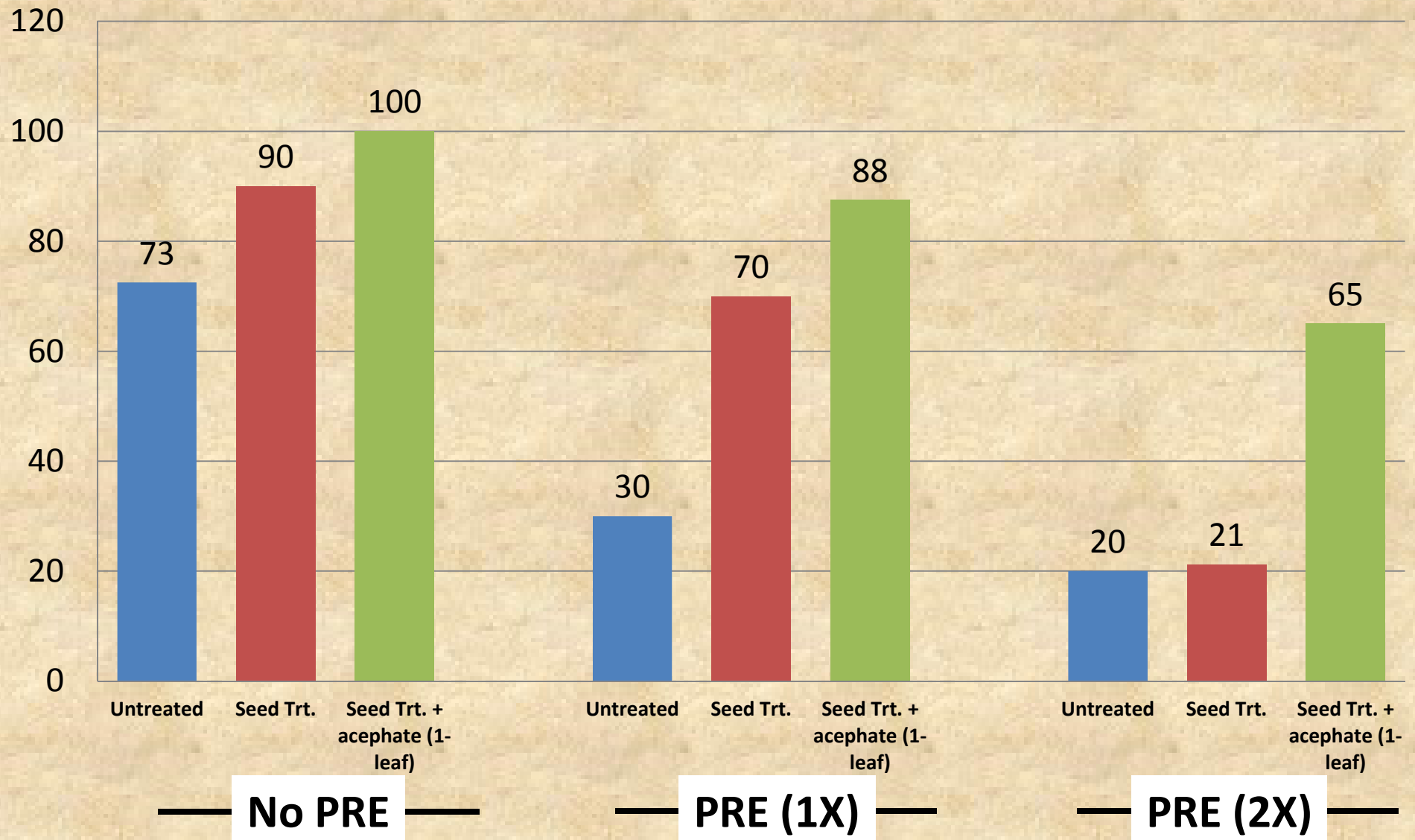
Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Vigor-Roberts May 28



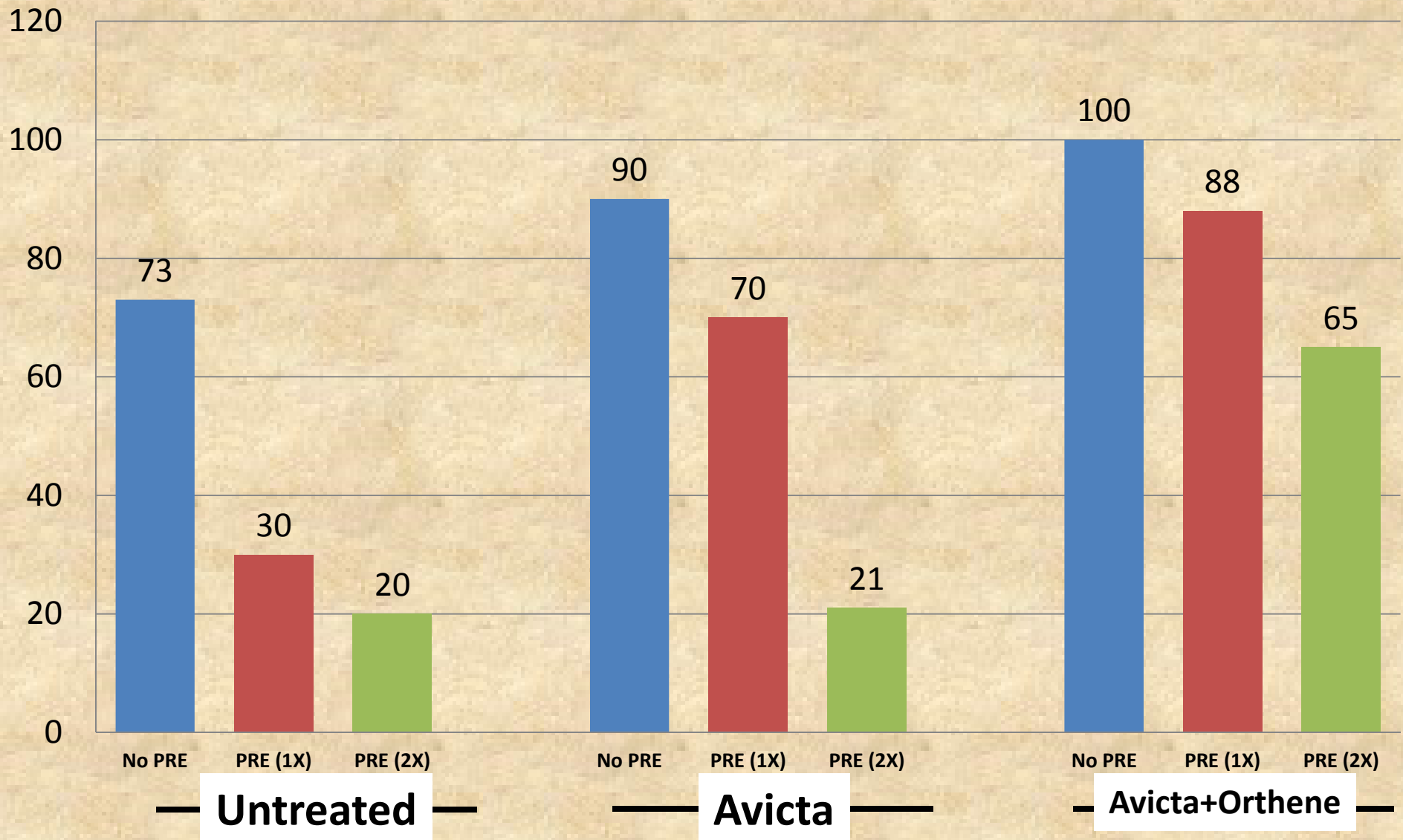
Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Vigor-Roberts June 11



Planted May 7, 2014

PRE x Thrips (Georgia 2014) Percent Vigor-Roberts June 11

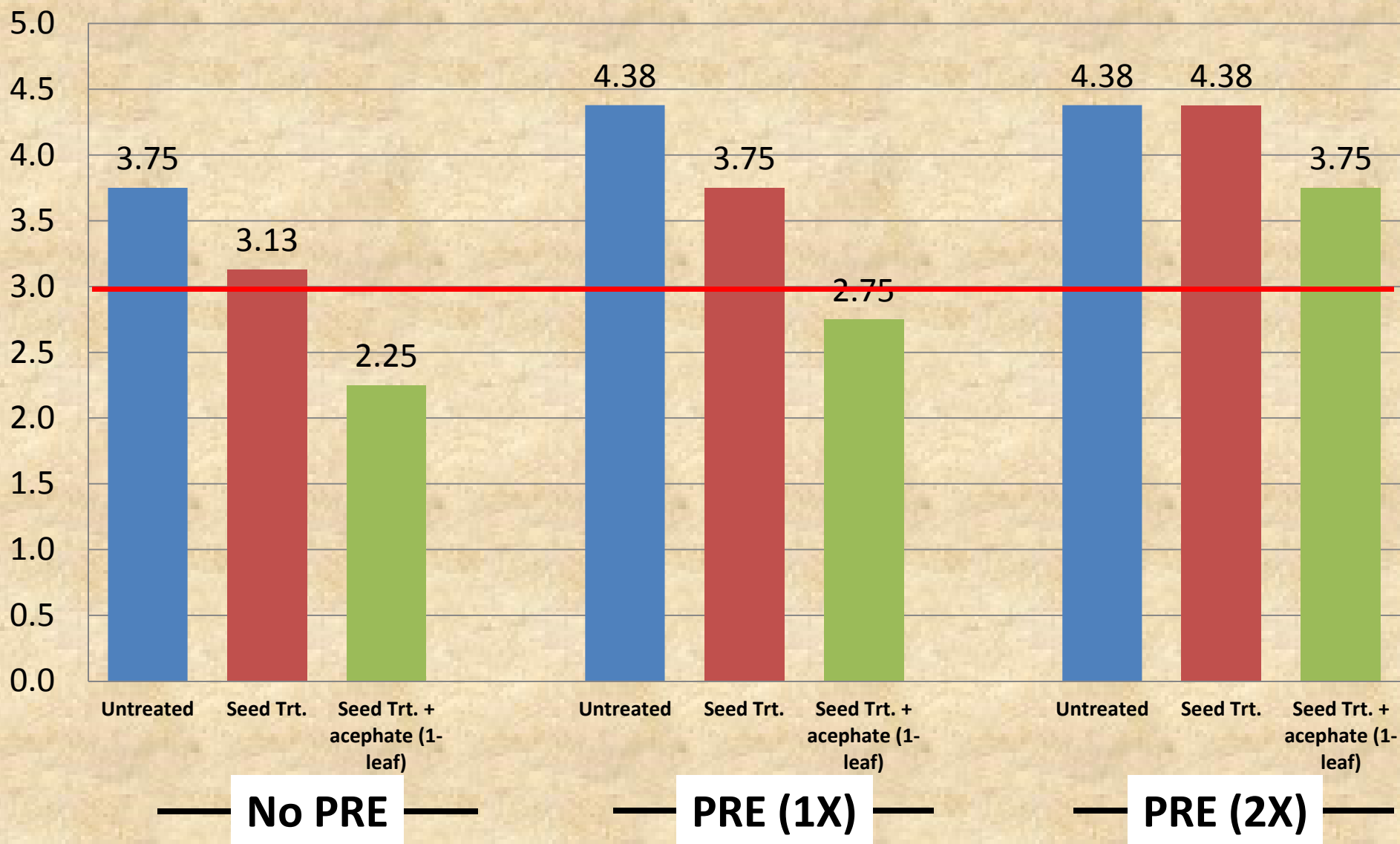


Planted May 7, 2014

PRE x Thrips (Georgia 2014)

Thrips Damage Rating 1-5, June 4

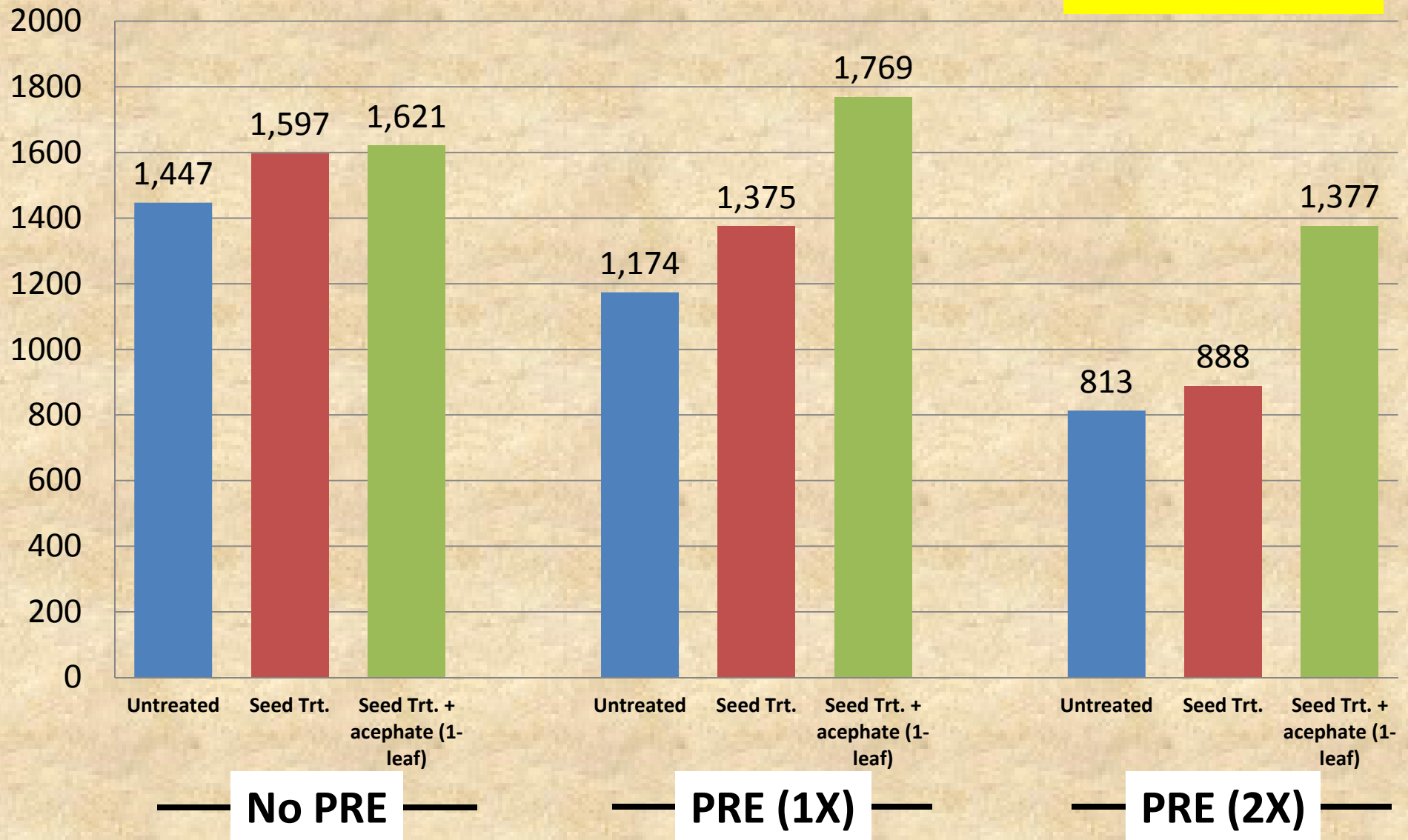
Ratings > 3 are unacceptable



Planted May 7, 2014
Pick Oct 2, 2014

PRE x Thrips (Georgia 2014) Lint Yield

	Prob(F)
Insecticide	0.0001
Herbicide	0.0001
Ins x Herb	0.0342



- **Thrips are a yield limiting pests!**
- **PRE herbicides are a necessity in southeastern cotton production!**
- Thrips injury increased as stress from PRE herbicides increased (i.e. 2X rate).
 - Distinguishing between herbicide and thrips injury can be challenging
- **Thrips management is important in all environments but perhaps elevated in stressful environment**

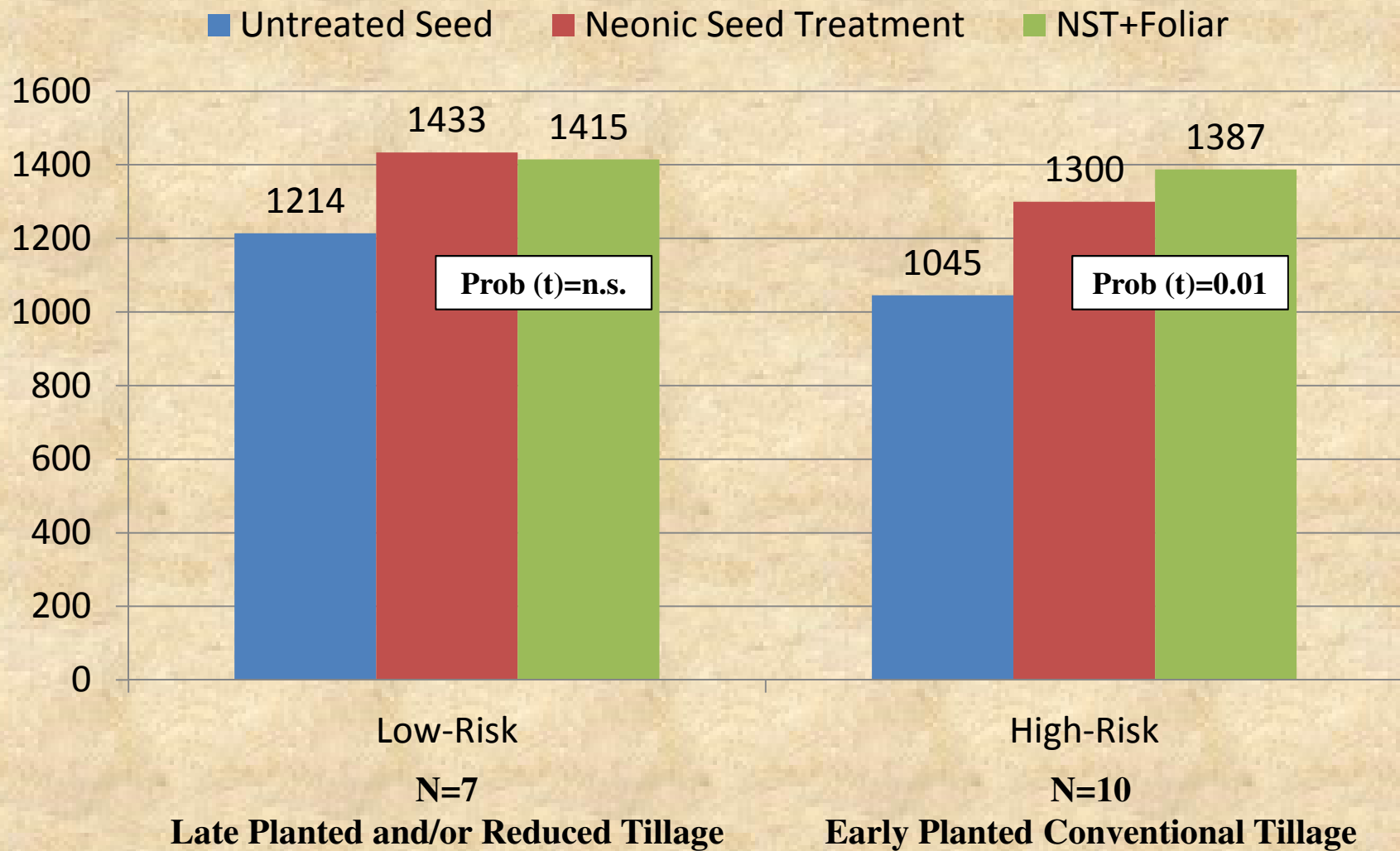
Predictive Modeling for Thrips



Predictive Modeling for Thrips

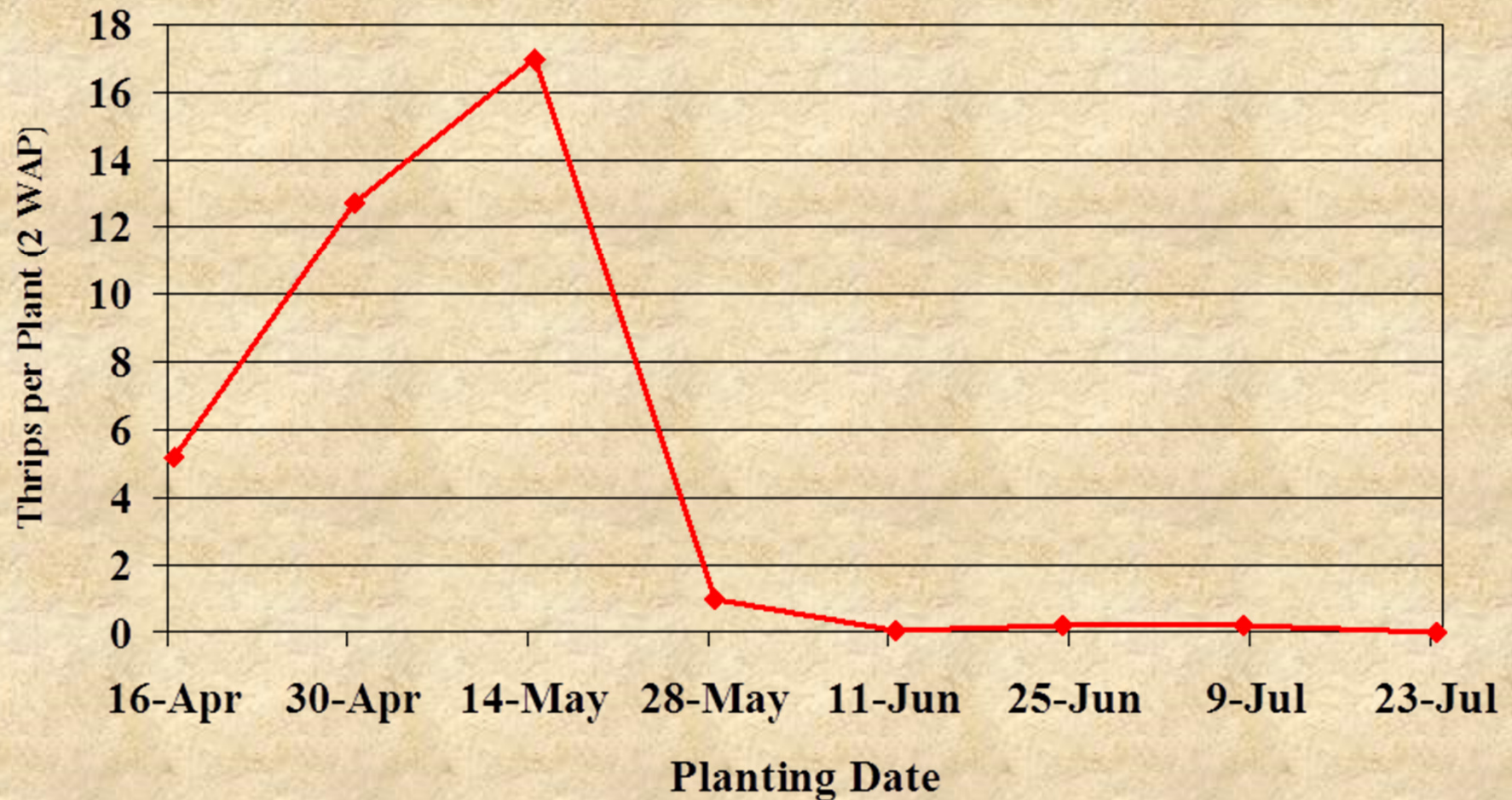
- Model exists for TSWV/thrips risk in tobacco
- Data from multiple states and years used to initiate development of model in cotton
- Identify the most significant factors that contribute to thrips abundance
- Use these associations to create a preliminary model that growers can use to predict when and where thrips will be a problem (high-risk environments)

Yield Response to Thrips Management in Low Risk and High Risk Environments



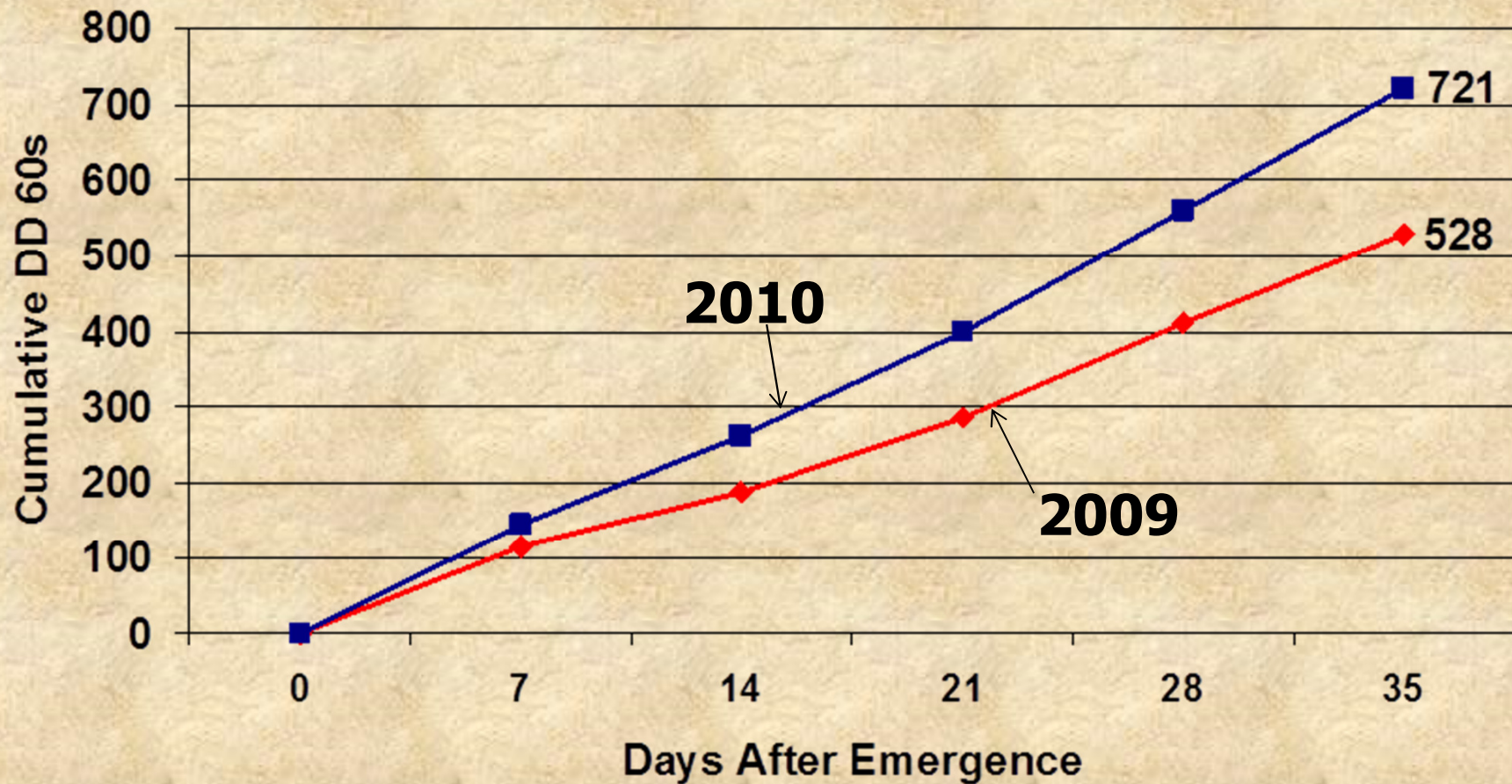
Thrips Planting Date Effects

Tift County GA (2004)



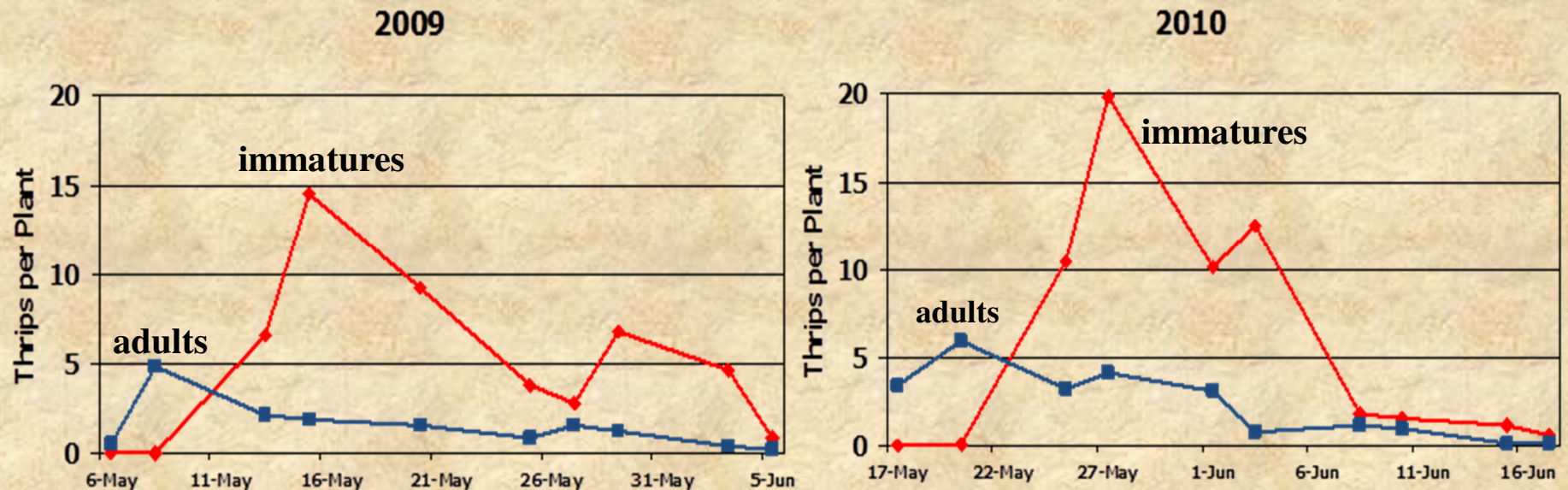
Thrips Susceptible Window

Cumulative DD 60s to reach 4-leaf stage.



Thrips Population Dynamics

Georgia: 2009 and 2010 (Untreated)



May 6, 2009	Emergence Date	May 17, 2010
2 DAE (4.85/plant)	Adult (max.)	3 DAE (5.95/plant)
9 DAE, <1 leaf (14.5/plant)	Immatures (max.)	10 DAE, 2 leaf (19.85/plant)

Summary for a Good Start on Thrips

- Thrips are predictable and important pests
- Recognize risk factors that promote thrips development and injury
- At-plant treatment is necessary – options there
- Reduced tillage and cover crop residue – great choices
- Minimize stress on plant – proper rates on herbicides
- Foliar applications should go out early...don't spray for revenge, spray when it will count the most
- Use of starter fertilizer on sandy, irrigated land should help
- Good luck in 2015!

Acknowledgments

**Cotton Boards and Cotton
Producers in
SC, VA, NC, GA, and AL**

**Cotton Producers
Beltwide**

Cooperators in Industry



COTTON INCORPORATED