# *Getting Next Year Off To A Good Start: Thrips Management*

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Southeast Row-Crop Entomology
SERCEWG
Working Group

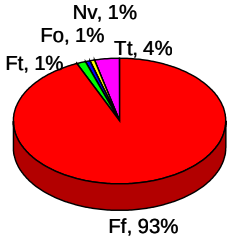

What can we do to minimize this?


What can we do to prevent this?

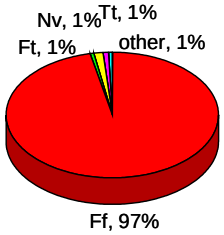

TIMELAPSE CAMERA V.1.0 2013/04/17 15:11:04

# Thrips

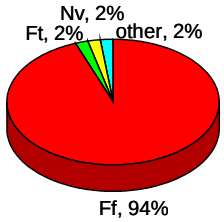

- The most predictable (“reliable”) insect pests of cotton
- So predictable that “preventative” treatments should probably be called “reactive” instead…we know they will be an issue, right?
- What species are important?



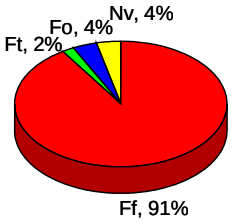

**Keiser, AR**



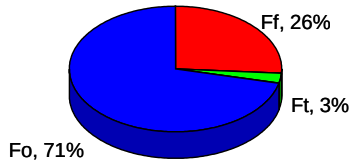

**Marianna, AR**



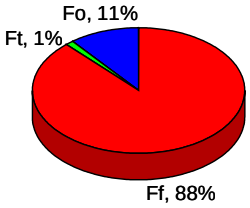

**Rohwer, AR**



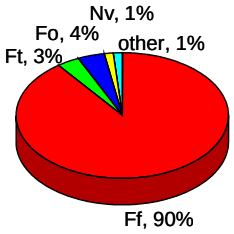

**ABAC Farm, Tift Co., GA**



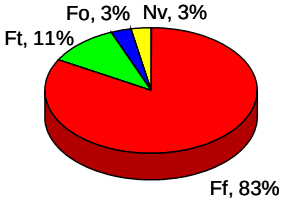

**Lang Farm, Tift Co., GA**



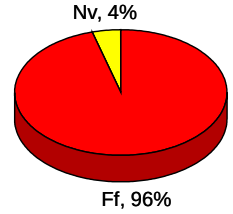

**Macon Ridge, LA**



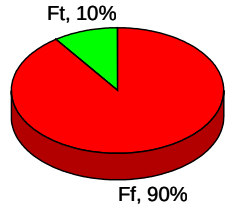

**Red River Res. ST., LA**



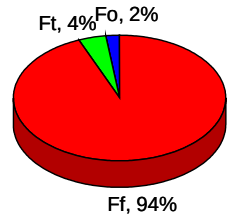

**Portageville, MO**



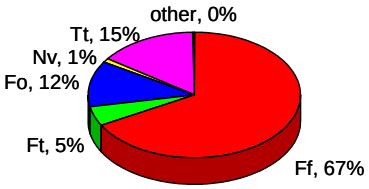

**Raymond, MS**



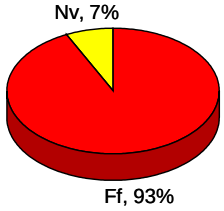

**Starkville, MS**



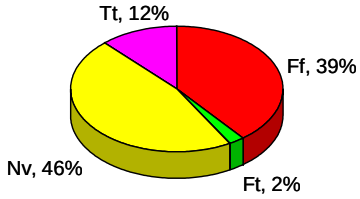

**Stoneville, MS**



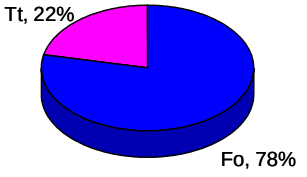

**Raleigh, NC**



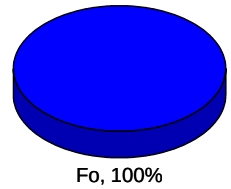

**Blackville, SC**



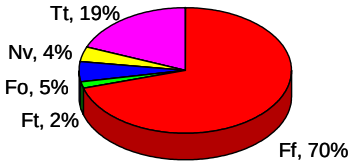

**Jackson, TN**




**Dimmitt, TX**




**Sunray, TX**




**Suffolk, VA**

- Tobacco thrips
- Western flower thrips
- Flower thrips
- Soybean thrips
- Onion thrips

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:

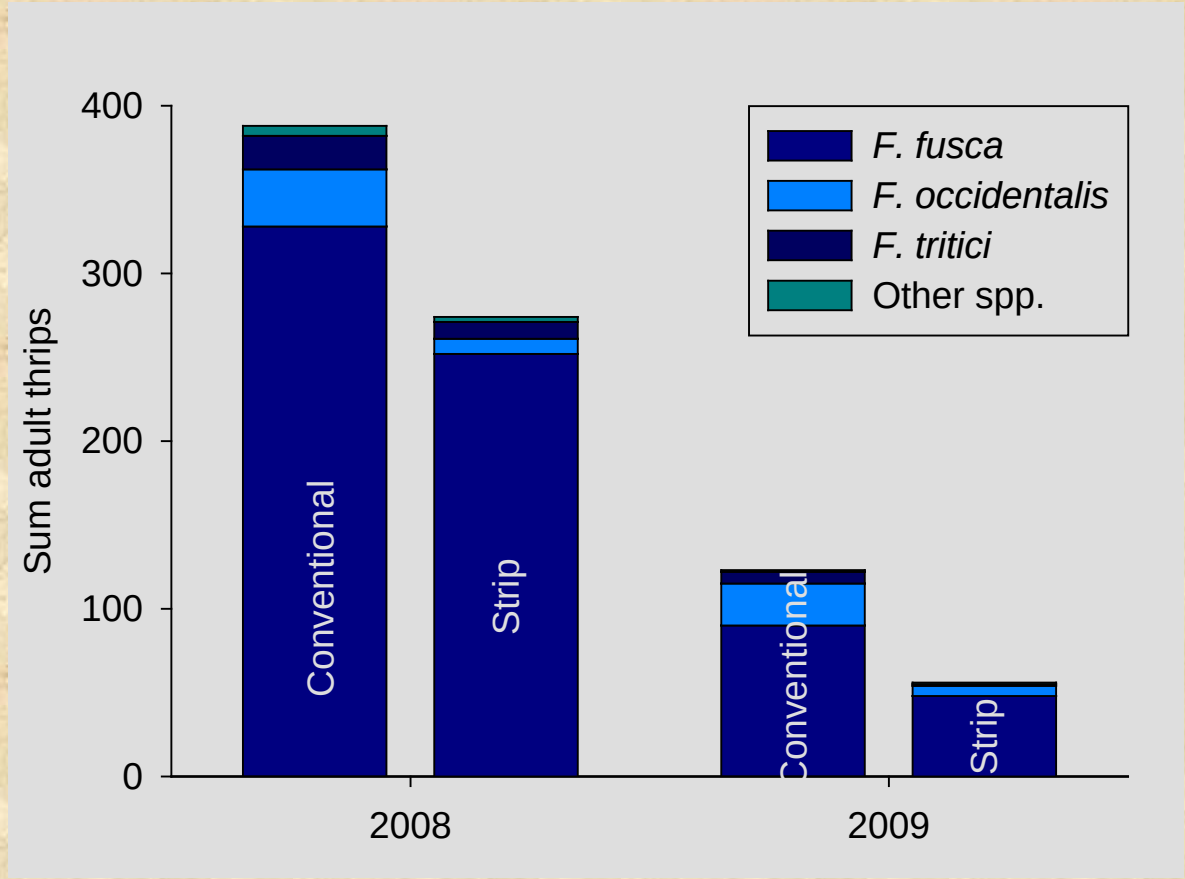
1. **Examine how a seed treatment and the addition of starter fertilizer may reduce observed injury and impact from thrips.**
2. **Determine optimal timing of a single acephate overspray to decrease thrips numbers.**
3. **Evaluate efficacy of foliar insecticides for managing thrips on seedling cotton (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

# 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

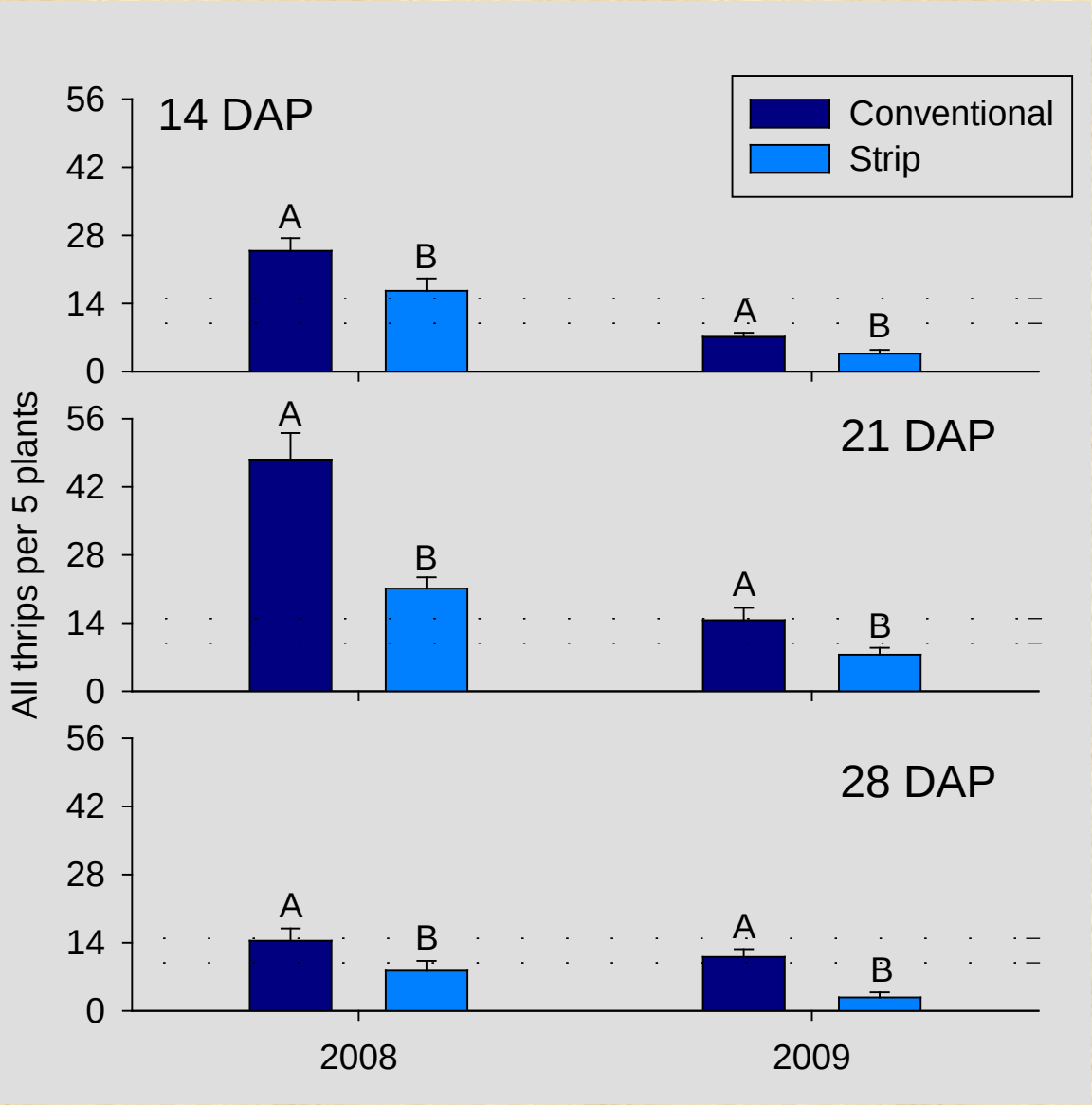



662 adults
931 immatures

179 adults
383 immatures

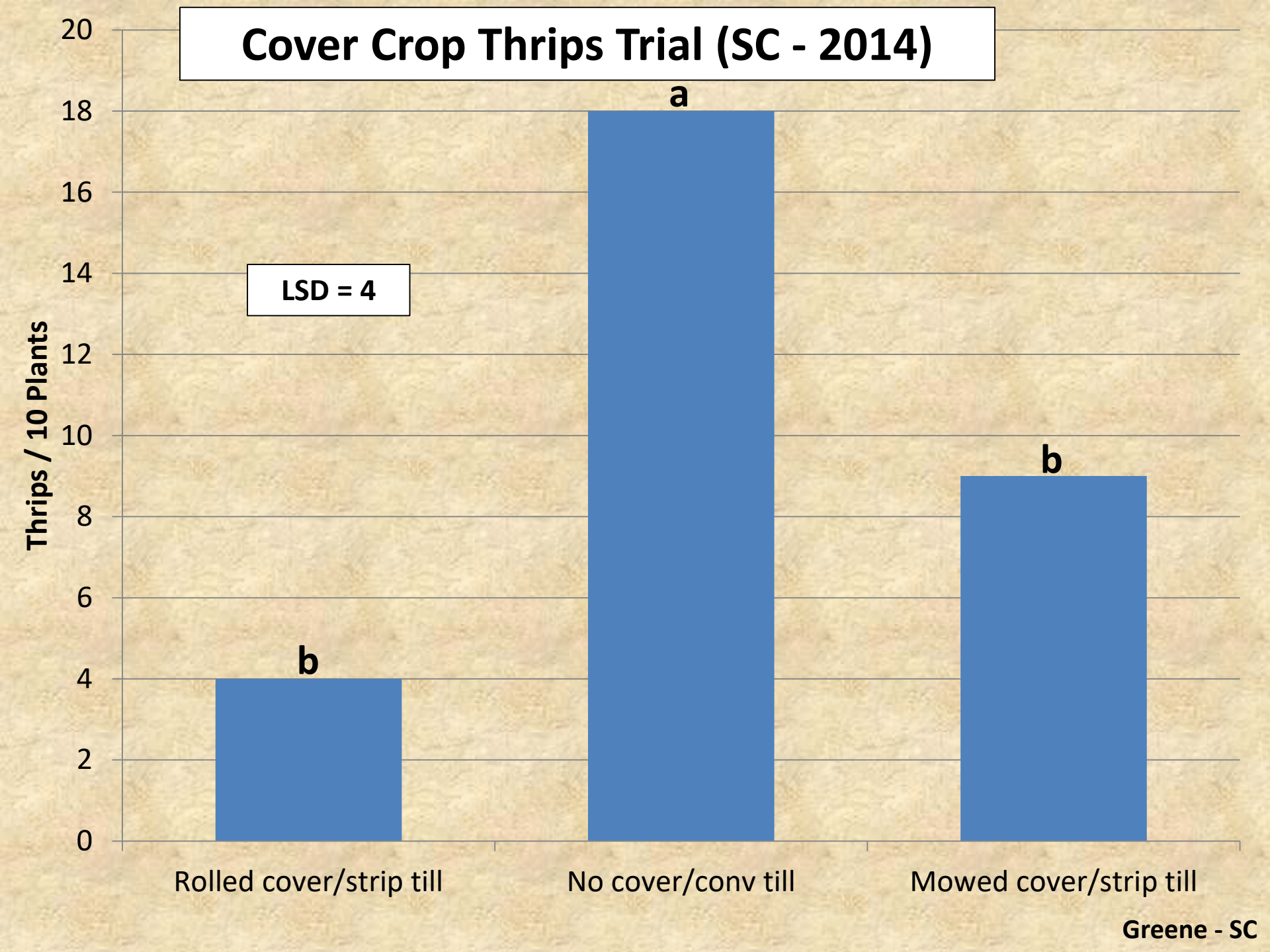
85.4% *F. fusca*, 8.8% *F. occidentalis*, 4.5% *F. tritici*, 1.3% other spp.

# 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)
Thrips / 10 Plants
20
18
16
14
12
10
8
6
4
2
0
LSD = 4
a
b
b
Rolled cover/strip till
No cover/conv till
Mowed cover/strip till
Greene - SC


So, what makes this better for managing thrips?

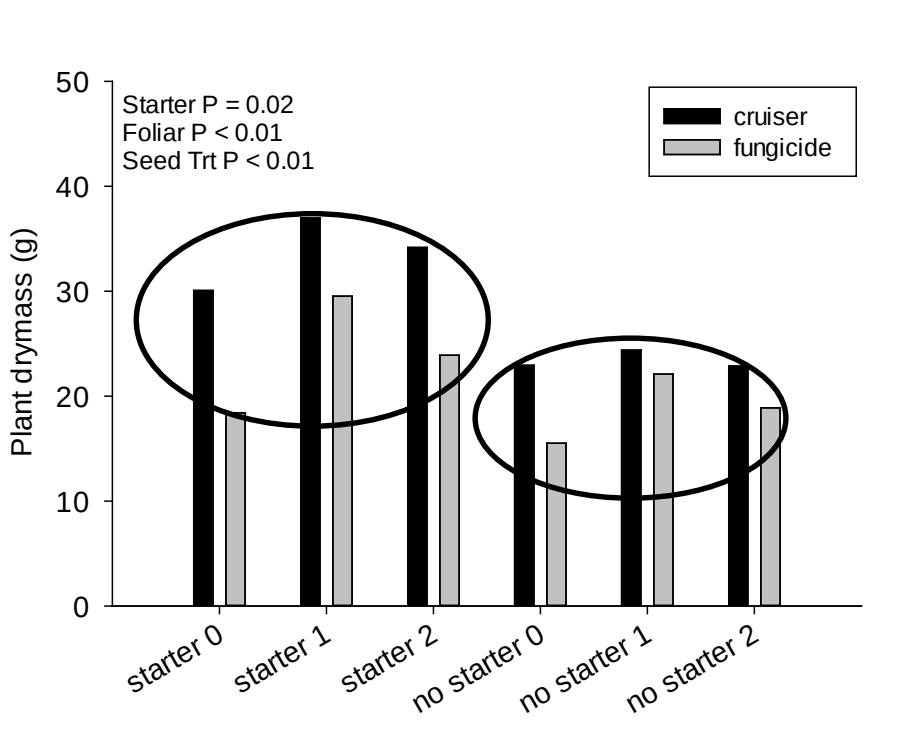
# Starter Fertilizer and Thrips

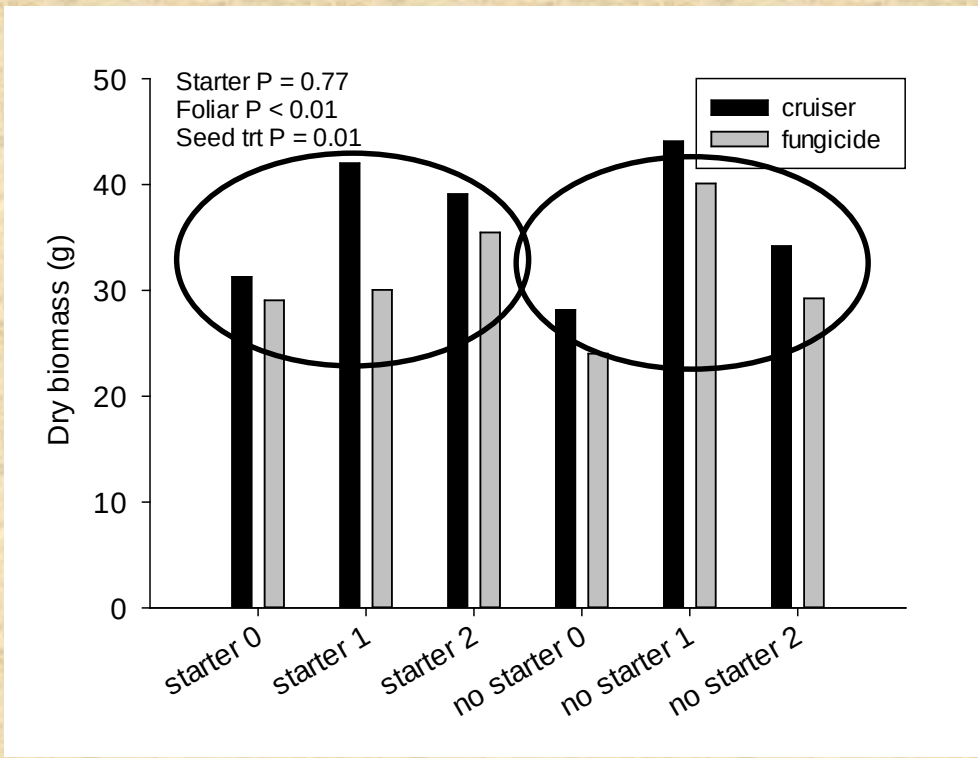
- Question: does the use of a starter fertilizer help in the “fight” against thrips damage?

2 x 2 fertilizer application set up

# Starter Fertilizer and Thrips

## Irrigation




### Irrigated

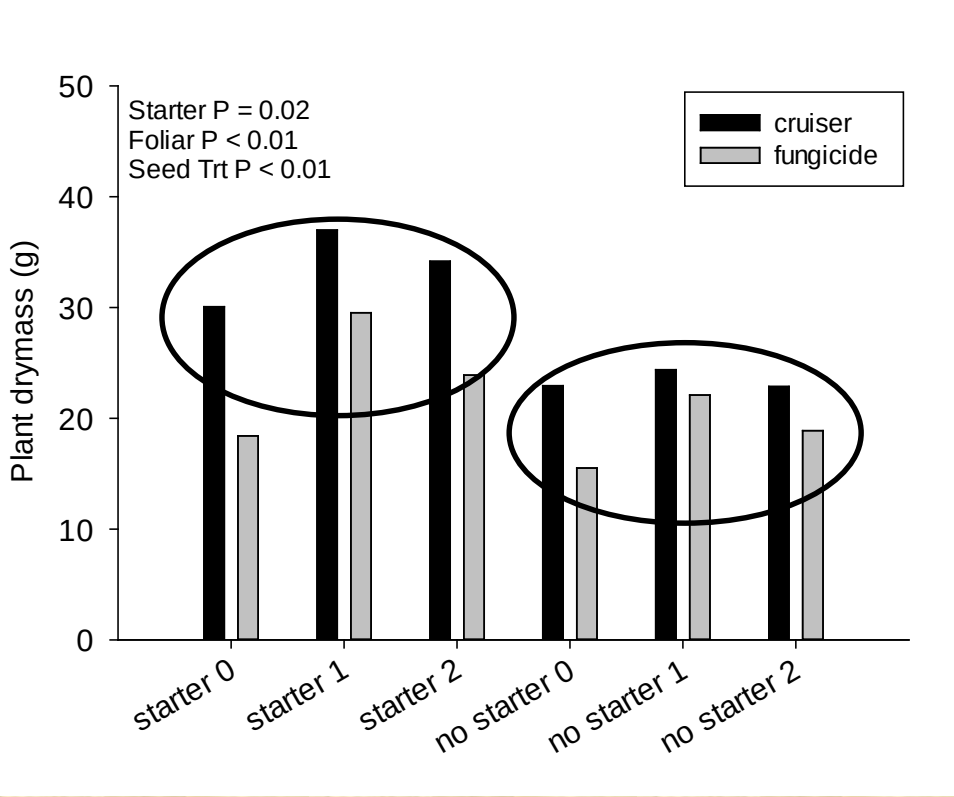
Starter provided boost to plants
Obvious benefit to foliar overspray
Compare seed trt to foliar timing

### Dryland

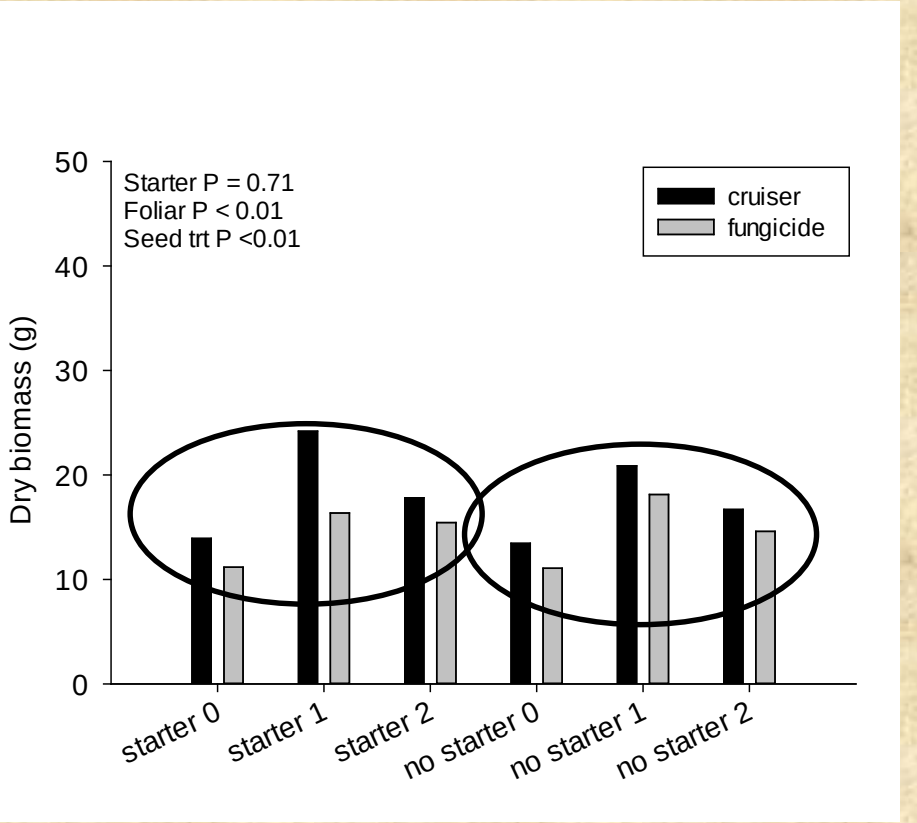
No boost from starter
Obvious benefit to foliar overspray
2nd leaf spray looks better here

# 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) | *Bacillus firmus* 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

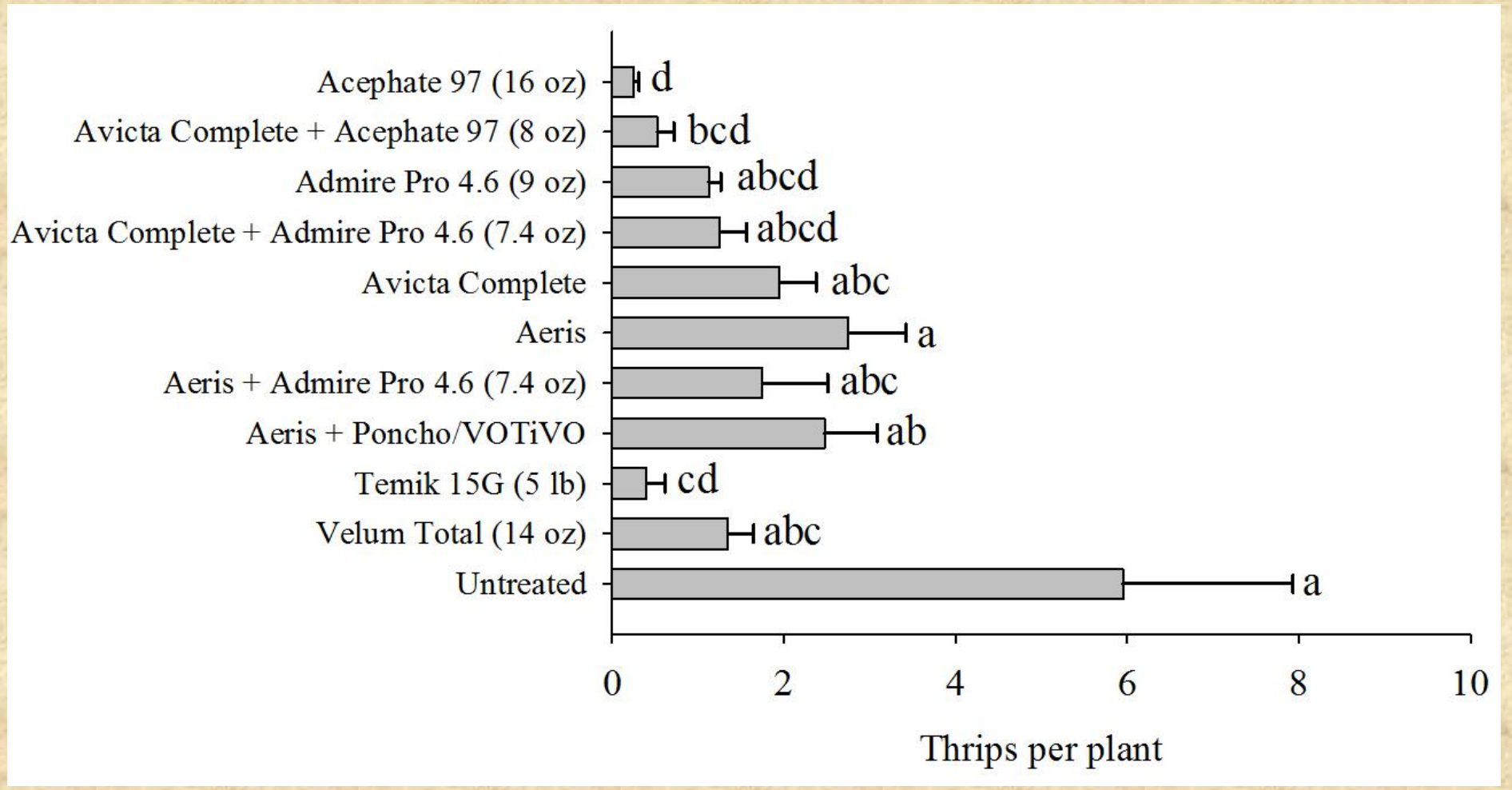
# Evaluate efficacy alone and in combination of liquid in-furrow and insecticide seed treatments

| Compound(s) | Formulated product rate | Lb a.i./A | Application details |
|---|---|---|---|
| **Acephate 97PE** | 16 oz/A | 0.974 | Liquid in-furrow |
| **Avicta Complete**<br>**+ Acephate 97PE** | Seed treatment<br>8 oz/A | 0.340<br>0.487 | ---<br>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**<br>**+ Admire Pro 4.6F** | Seed treatment<br>9.2 oz/A | 0.340<br>0.330 | ---<br>Liquid in-furrow |
| **Avicta Complete** | Seed treatment | 0.340 | --- |
| **Aeris** | Seed treatment | 0.375 | --- |
| **Aeris**<br>**+ Acephate 97PE** | Seed treatment<br>8 oz/A | 0.375<br>0.487 | ---<br>Liquid in-furrow |
| **Aeris**<br>**+ Admire Pro 4.6F** | Seed treatment<br>9.2 oz/A | 0.375<br>0.330 | ---<br>Liquid in-furrow |
| **Aeris**<br>**+ Poncho/VOTiVO** | Seed treatment<br>Seed treatment | 0.375<br>0.424 | ---<br>--- |
| **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

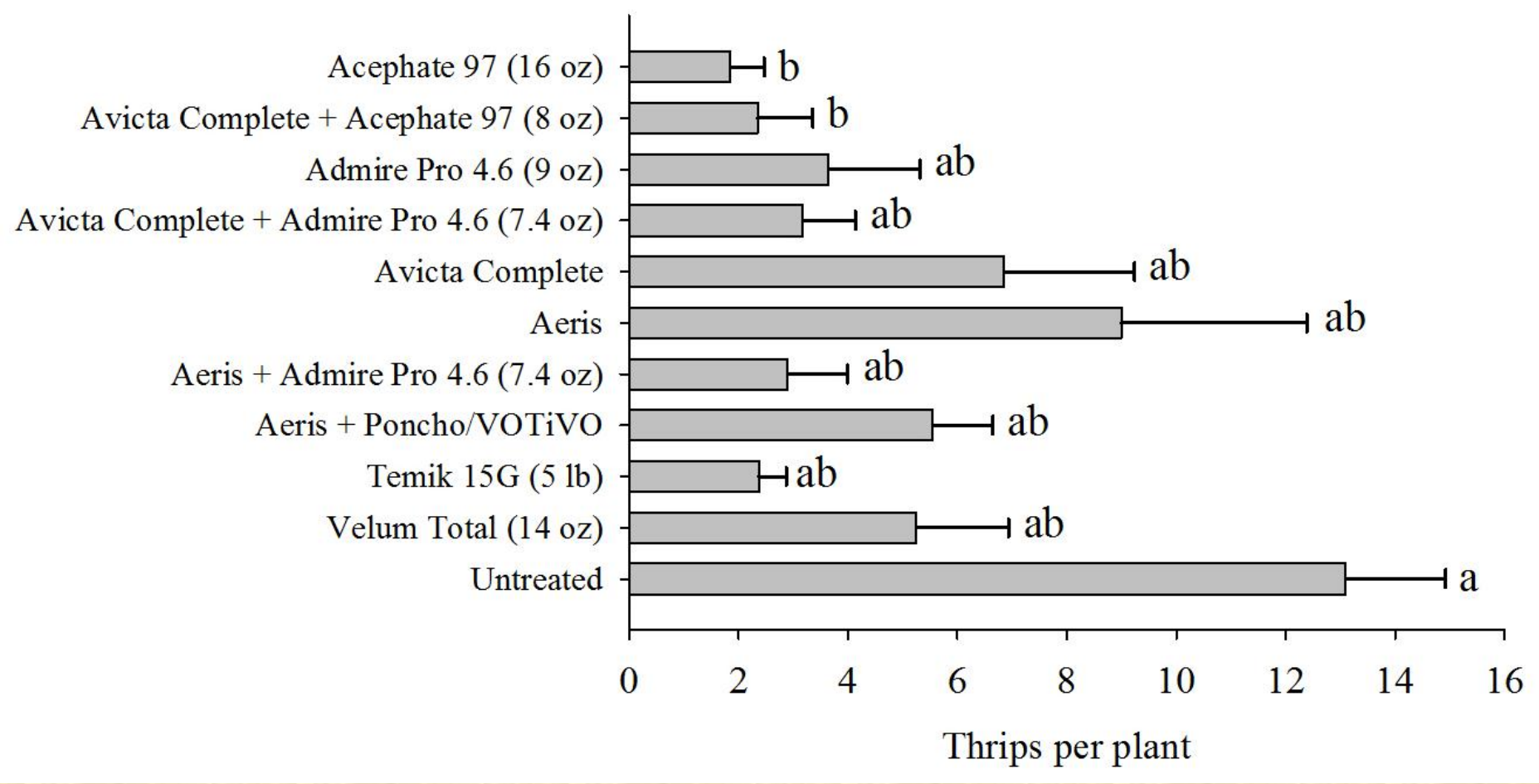
2013

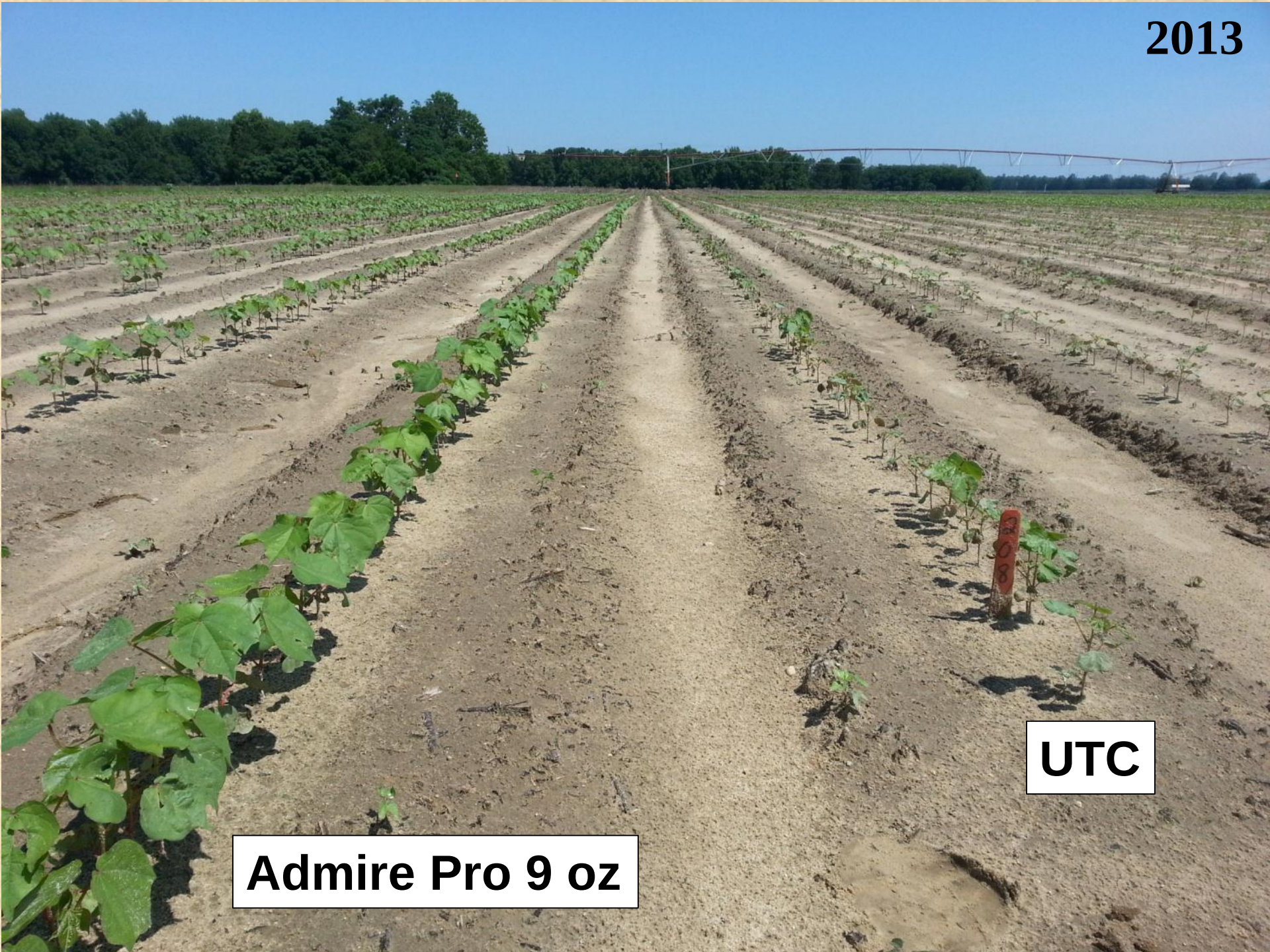
# South Carolina, Two Leaves (2 Weeks After Planting)



2013

# South Carolina, Three Leaves (3 Weeks After Planting)




2013
UTC
Admire Pro 9 oz


Acceleron N

UTC


2013
UTC
Temik 5 lb


**Thimet 5 lb**

**UTC**

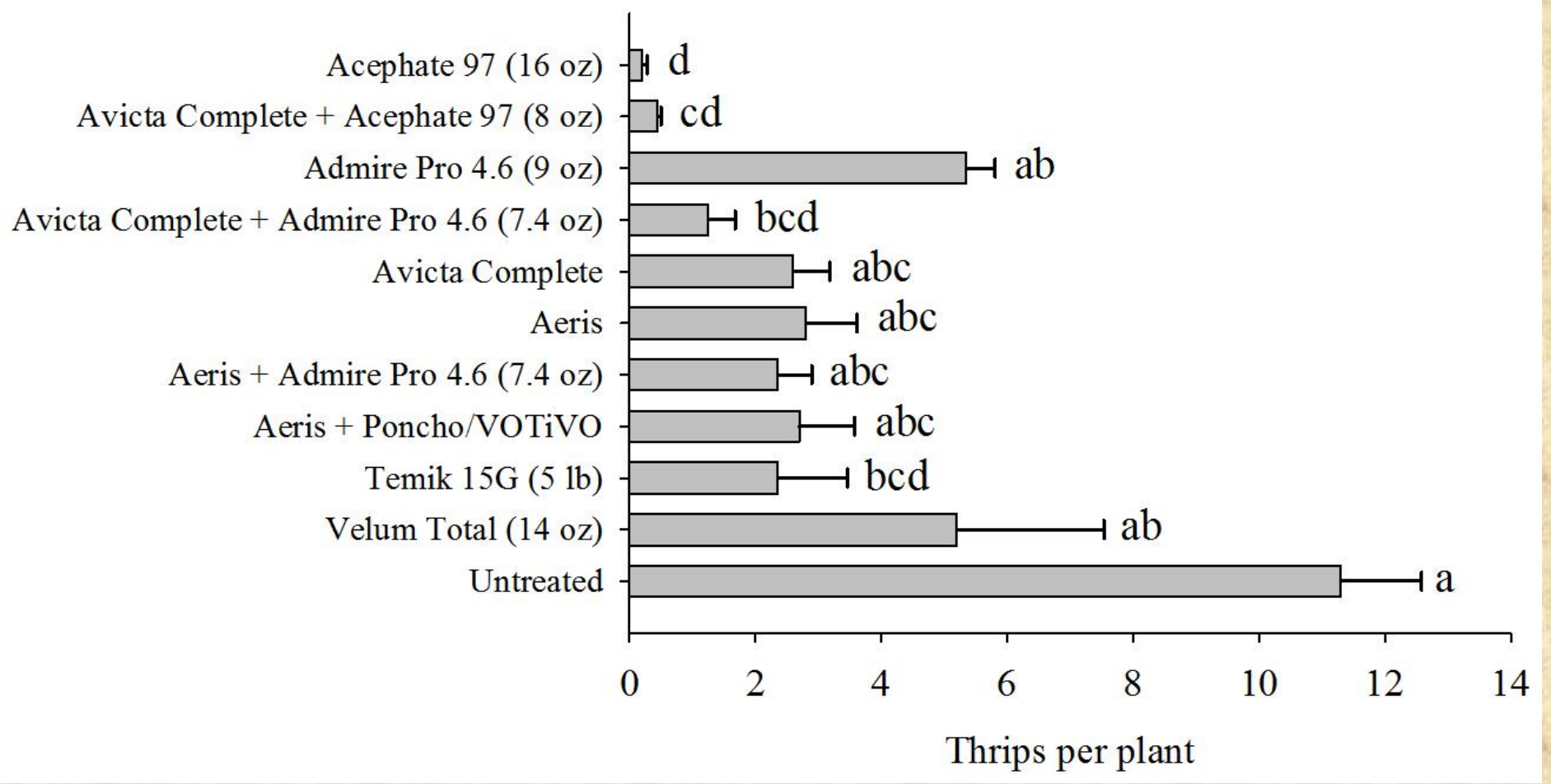

**UTC**

**Counter 6.5 lb**

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

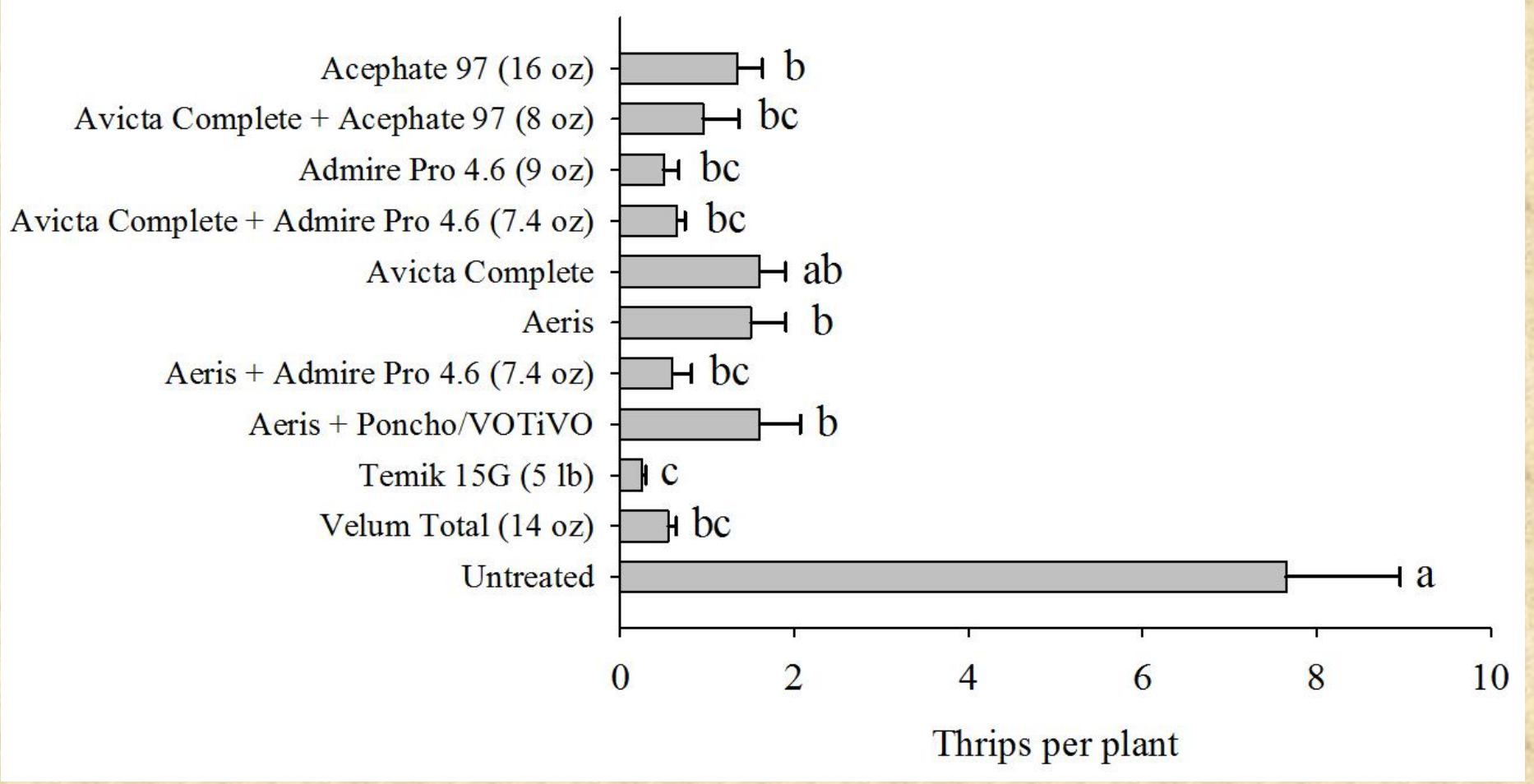
2013

# North Carolina, Cotyledon (2 Weeks After Planting)



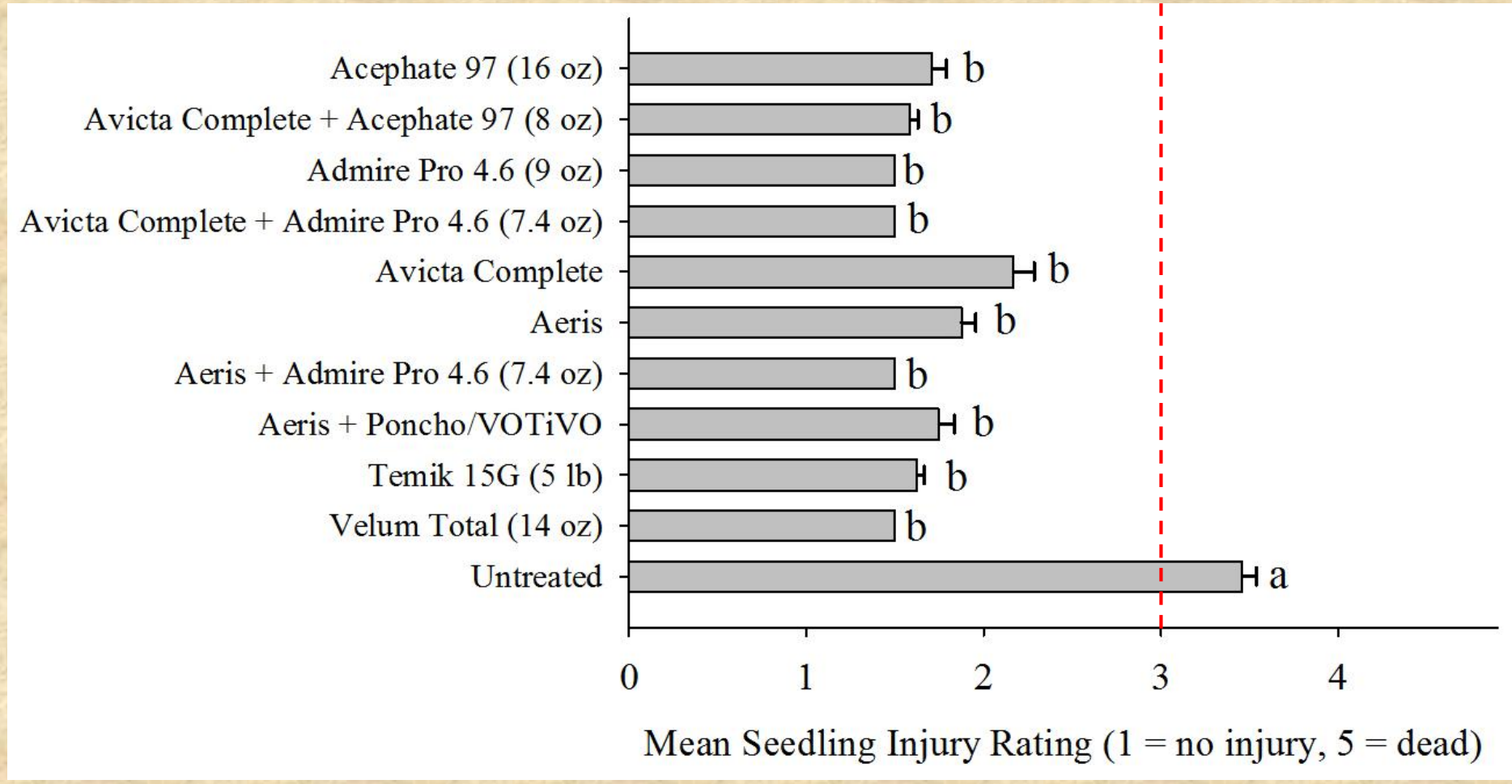
2013

# Virginia, Two Leaves (4 Weeks After Planting)



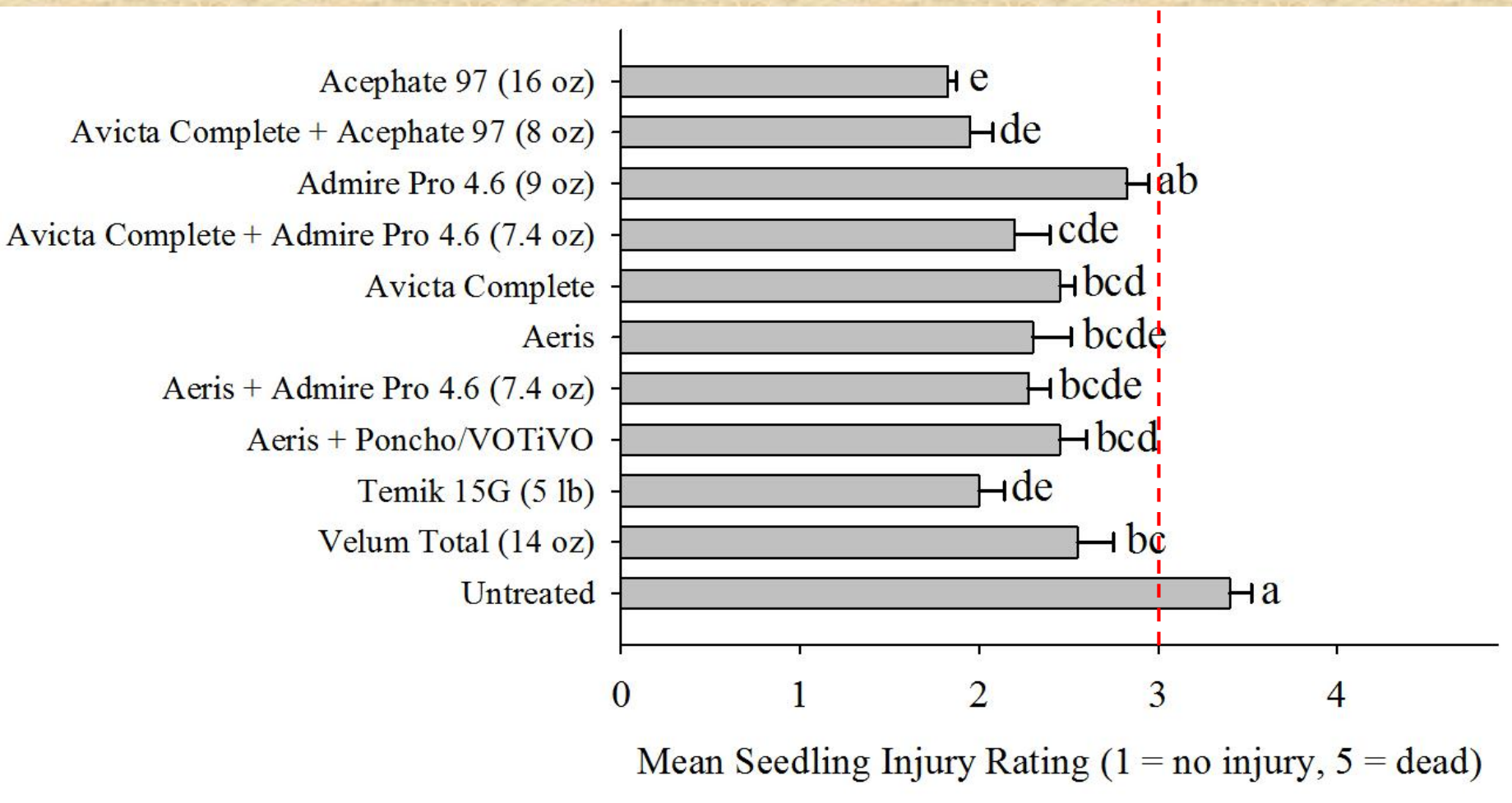
2013

# Virginia, Two Leaves (4 Weeks After Planting)



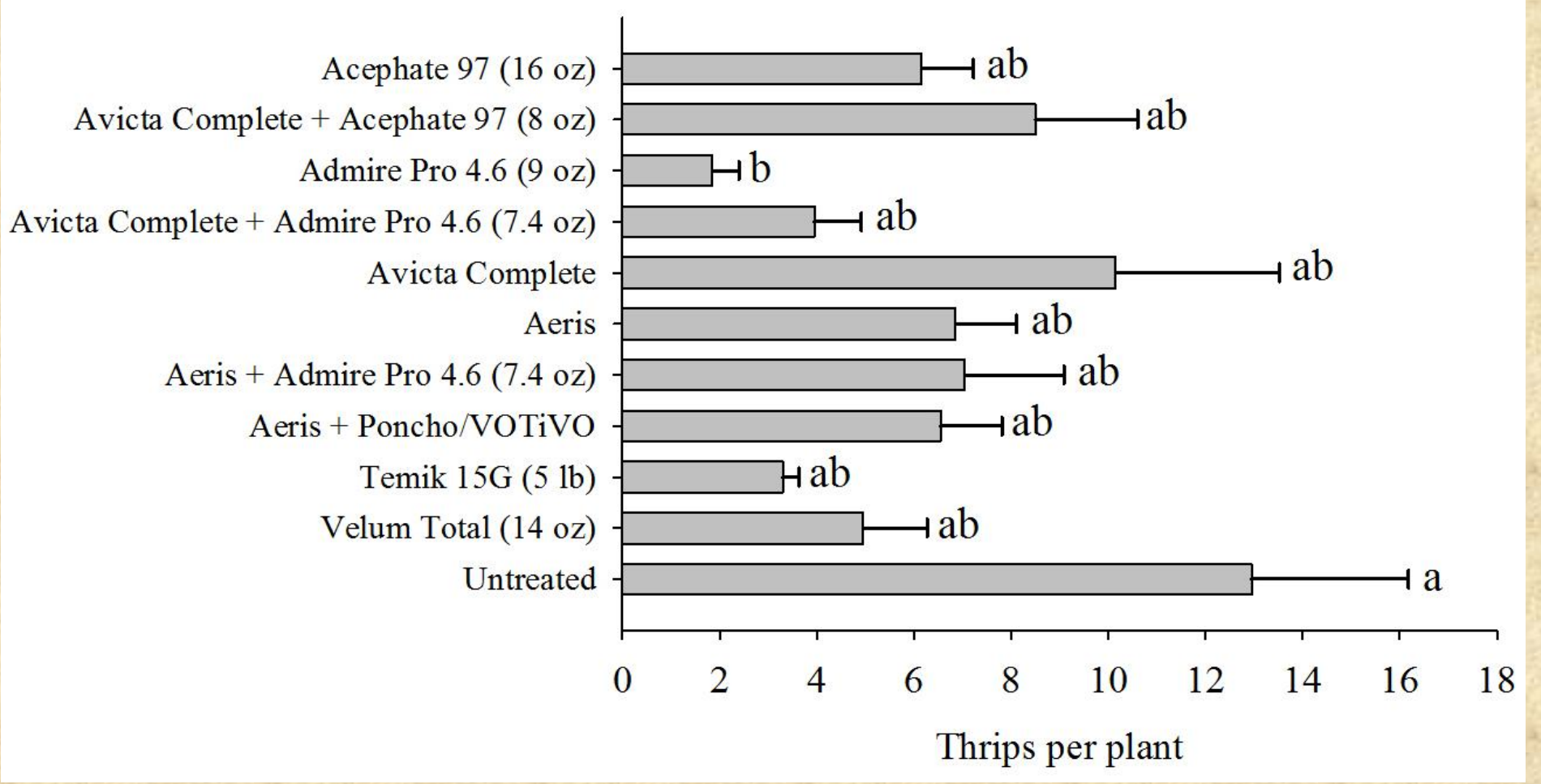
2013

# North Carolina, Four Leaves (4 Weeks After Planting)



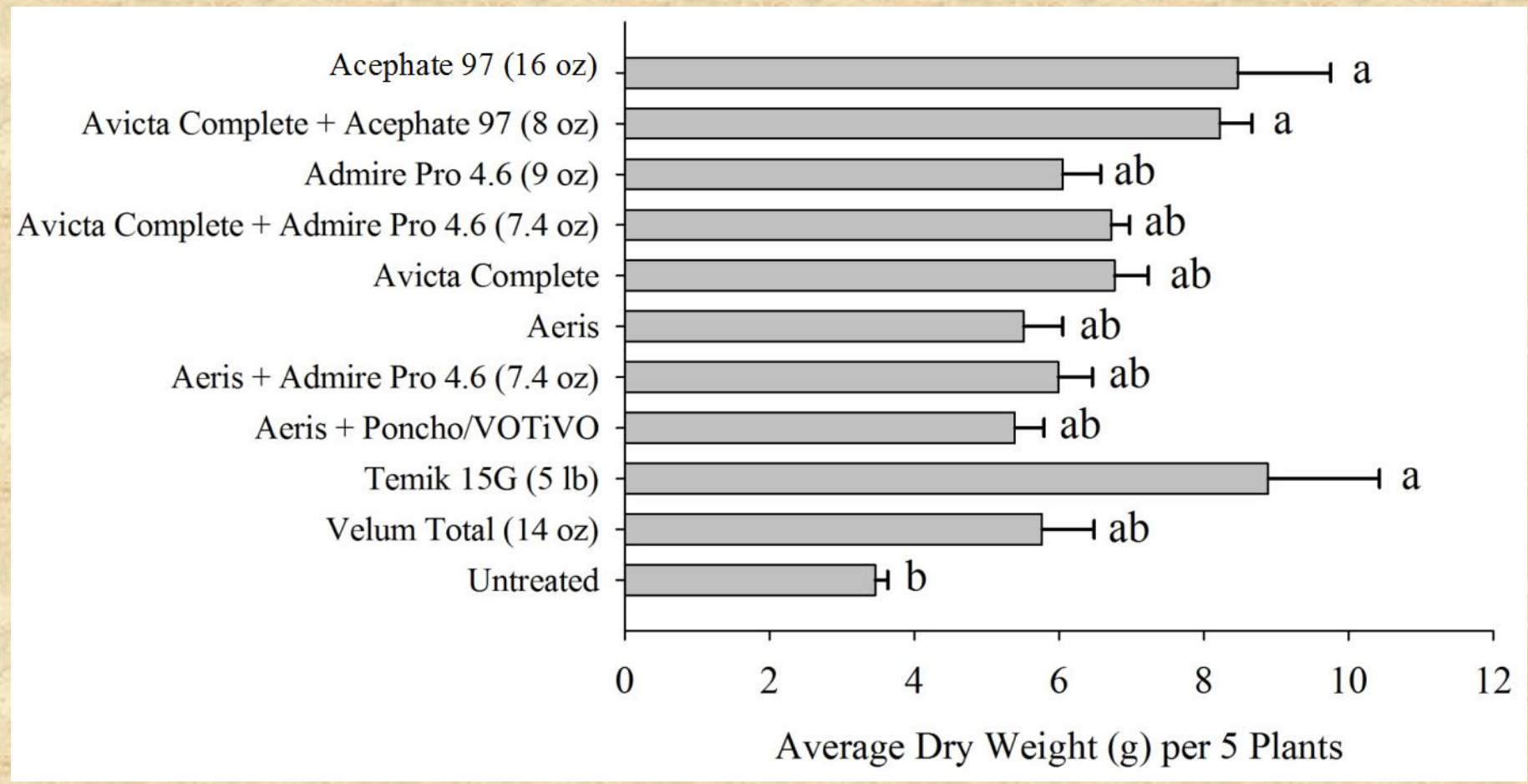
2013

# Virginia, Four Leaves (5 Weeks After Planting)



2013

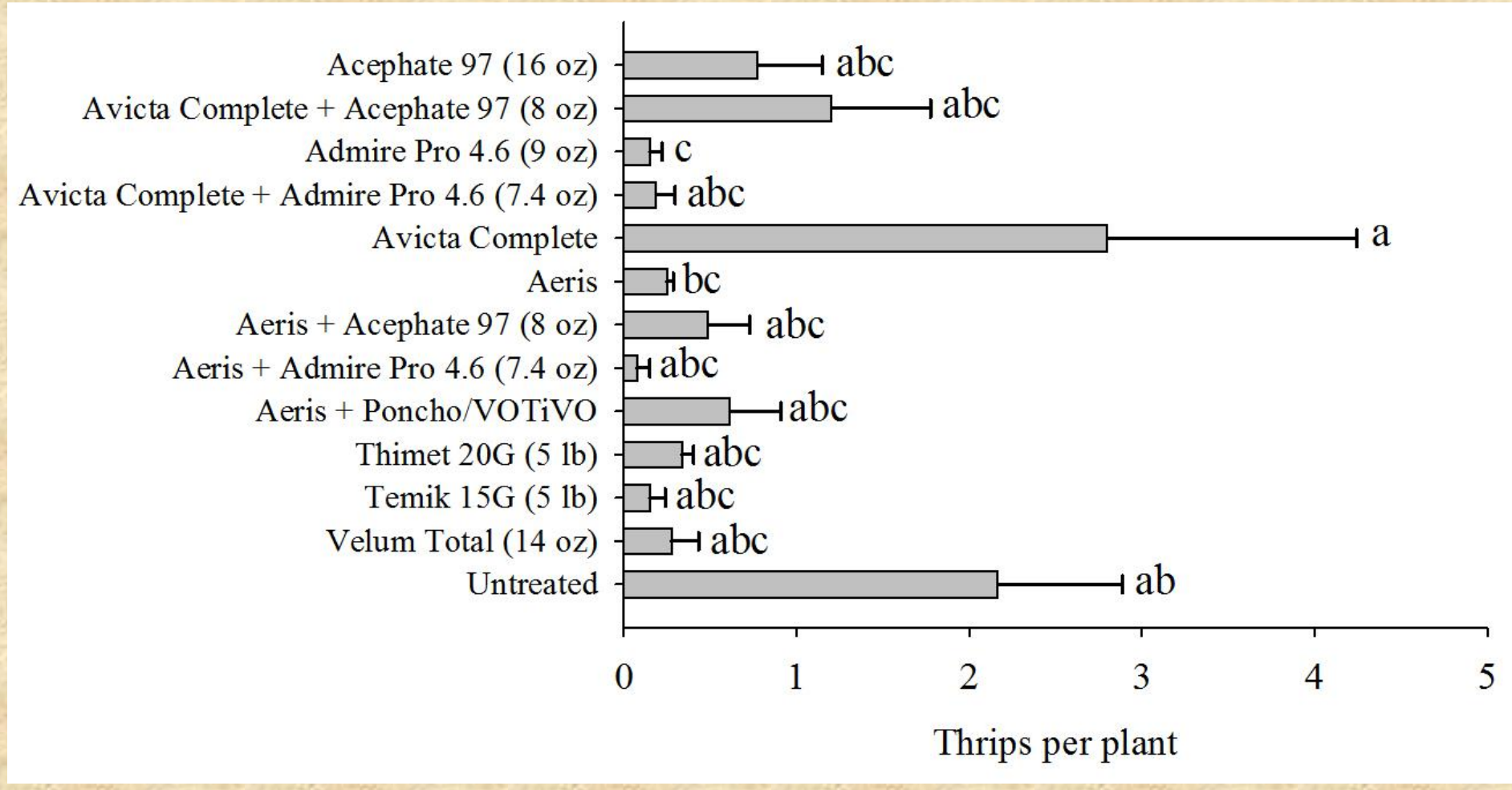
# North Carolina, 6 Weeks After Planting



# 2014 At-plant Results

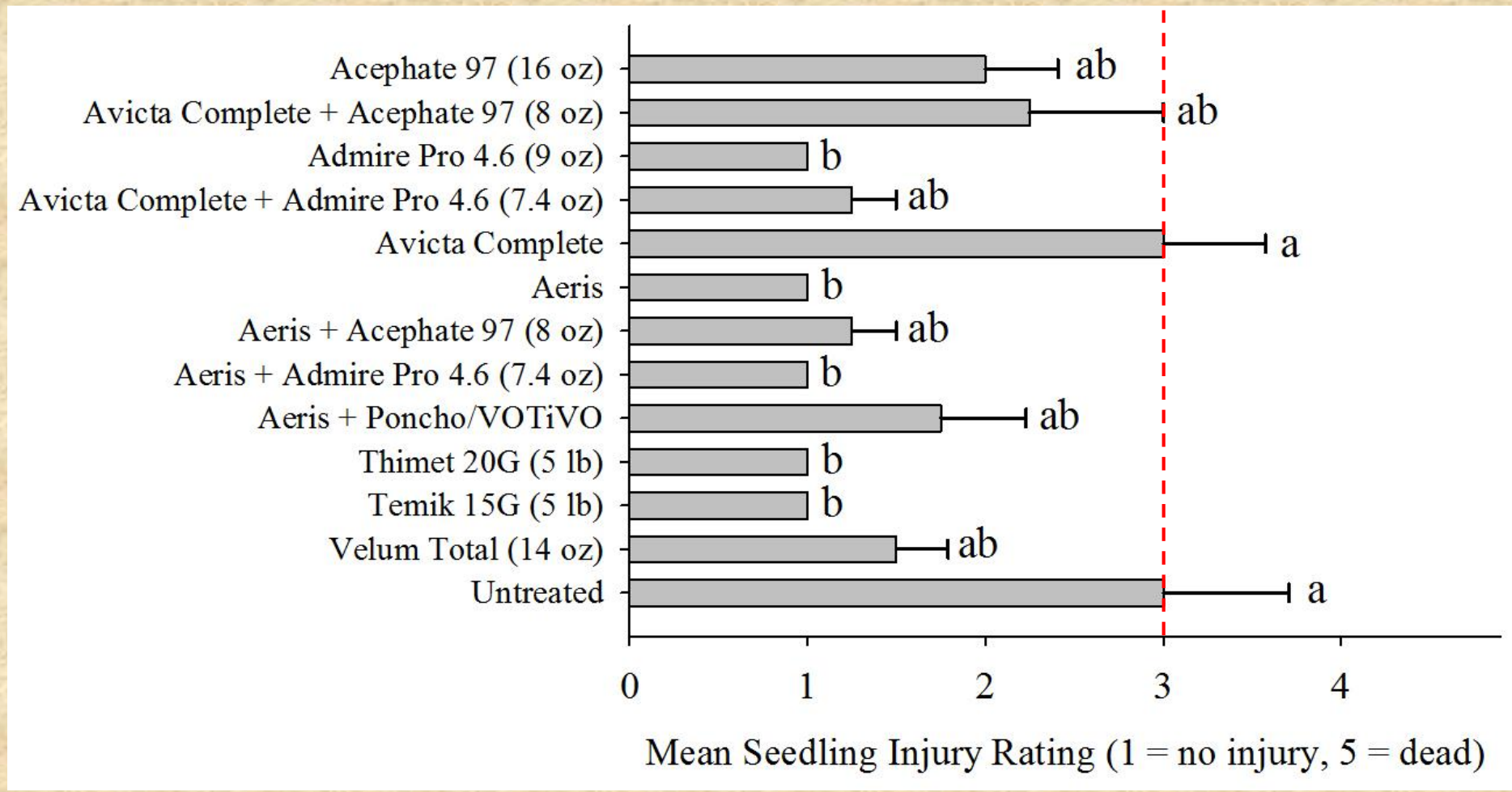
2014

# South Carolina, Three Leaves (3 Weeks After Planting)



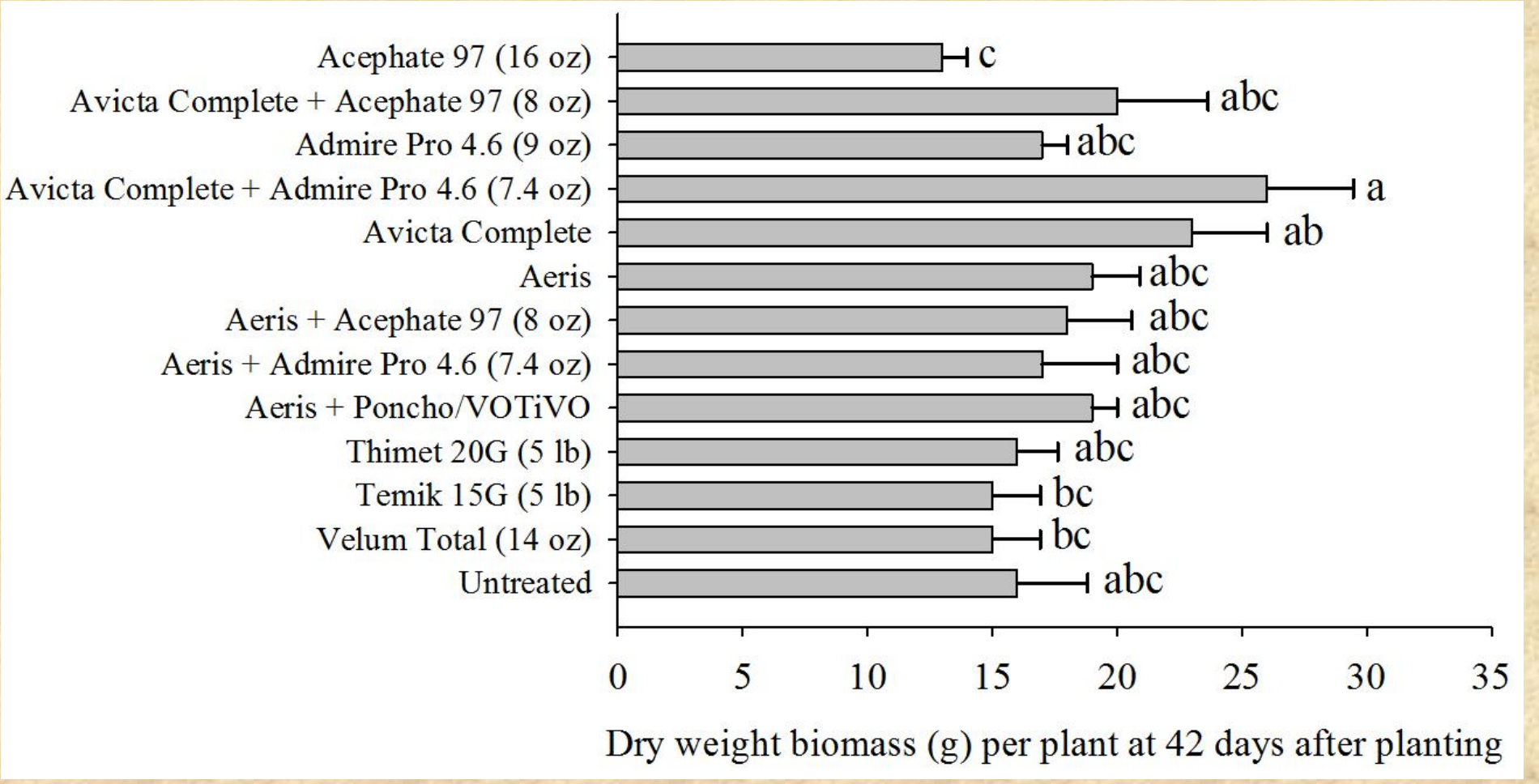
2014

# South Carolina, Three Leaves (3 Weeks After Planting)



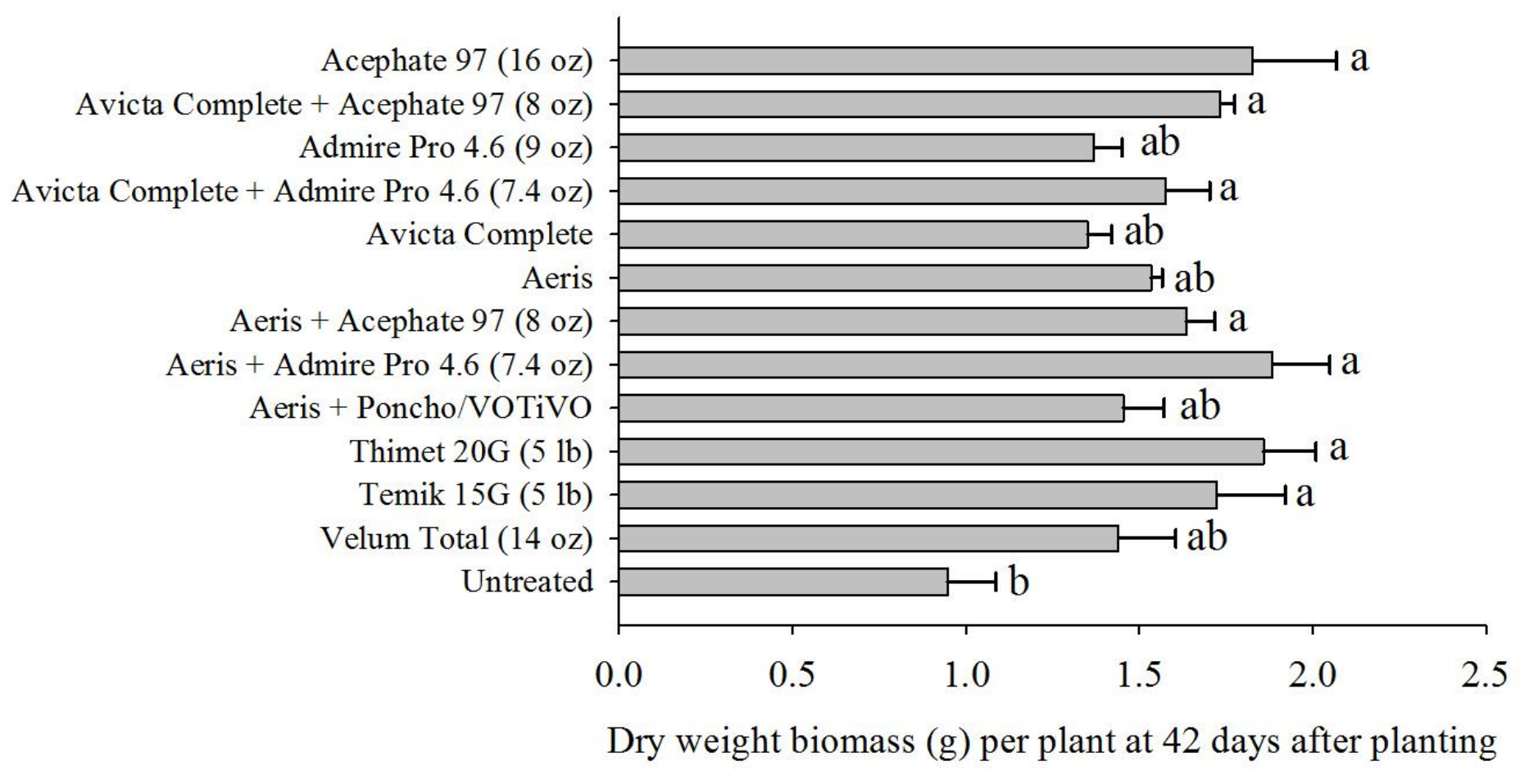
2014

# South Carolina, 6 Weeks After Planting



2014

# North Carolina, 6 Weeks After Planting



# Post-Plant Options

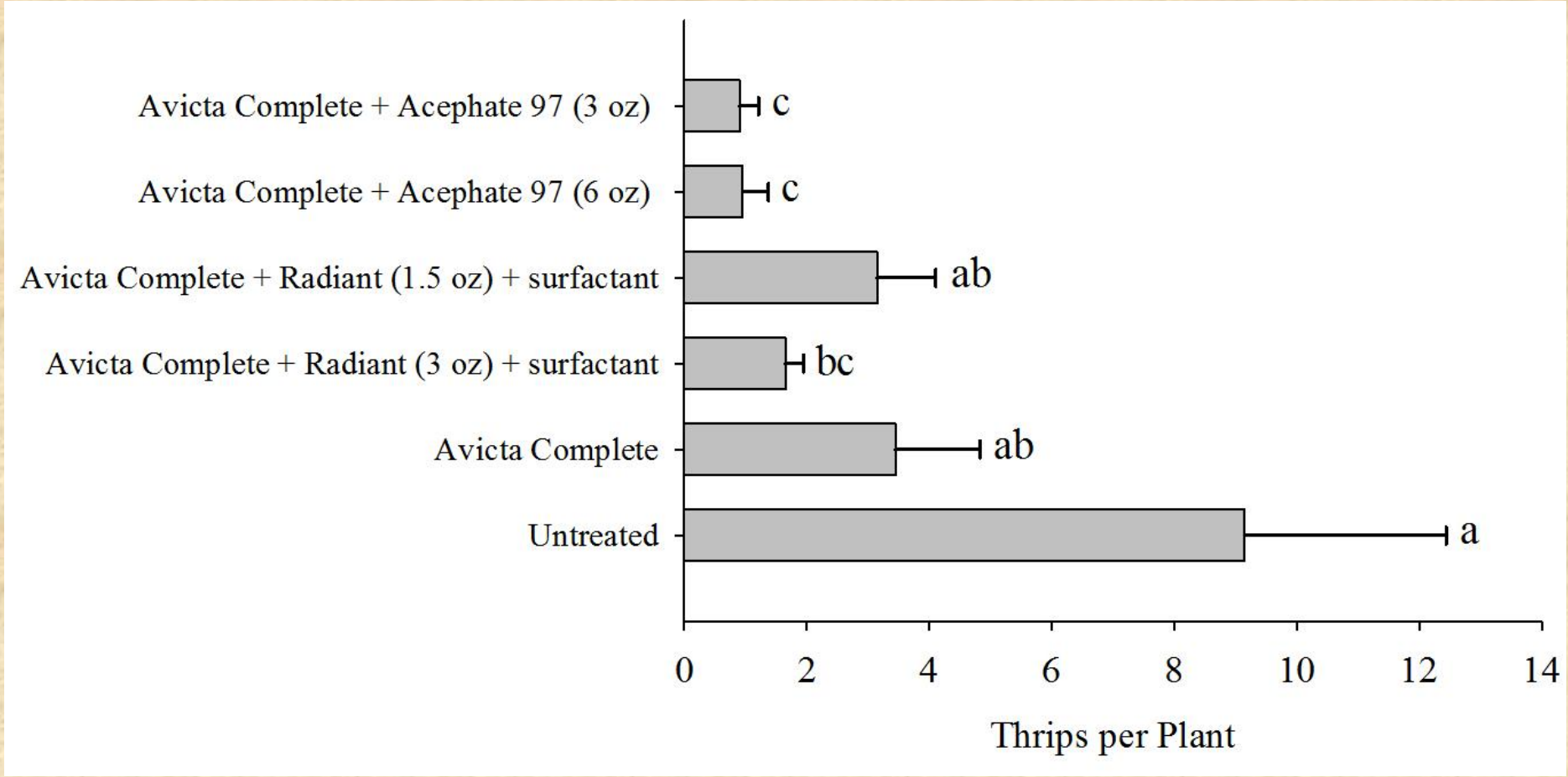
- Protection during the first 14 days is critical.
- Scout and spray as needed based on local threshold.
- Presence of immatures suggests at-plant insecticide is failing.
- Plant Injury: pay close attention to newly expanding leaves.
- Foliar sprays rarely needed once seedlings reach the 4-5 leaf stage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


**4-leaf cotton**

# 2013 Foliar spray results

2013

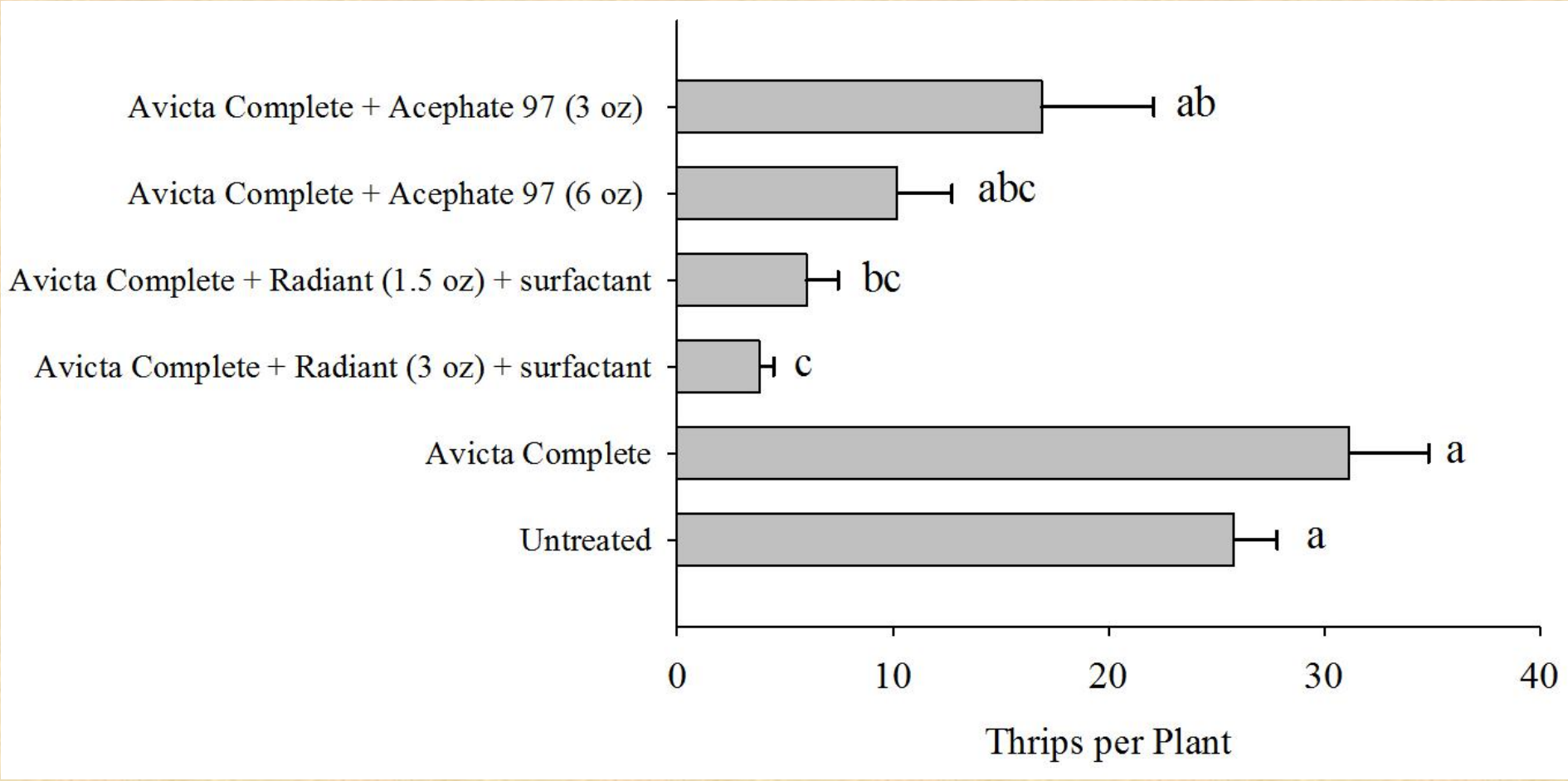
# South Carolina, One Leaf (2 Weeks After Planting)




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

2013

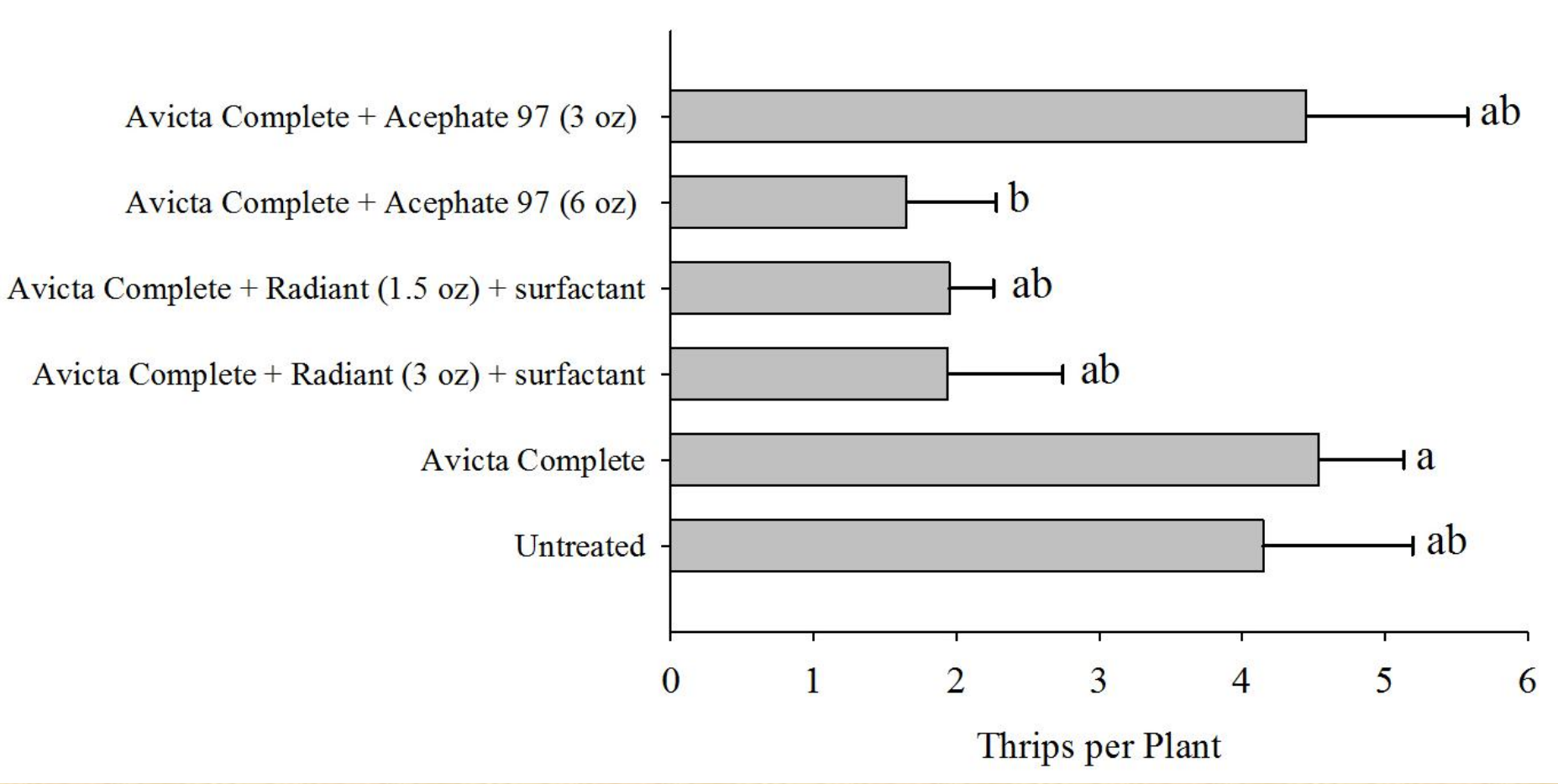
# North Carolina, Two Leaves (4 Weeks After Planting)




Sprayed 3 weeks after planting

2013

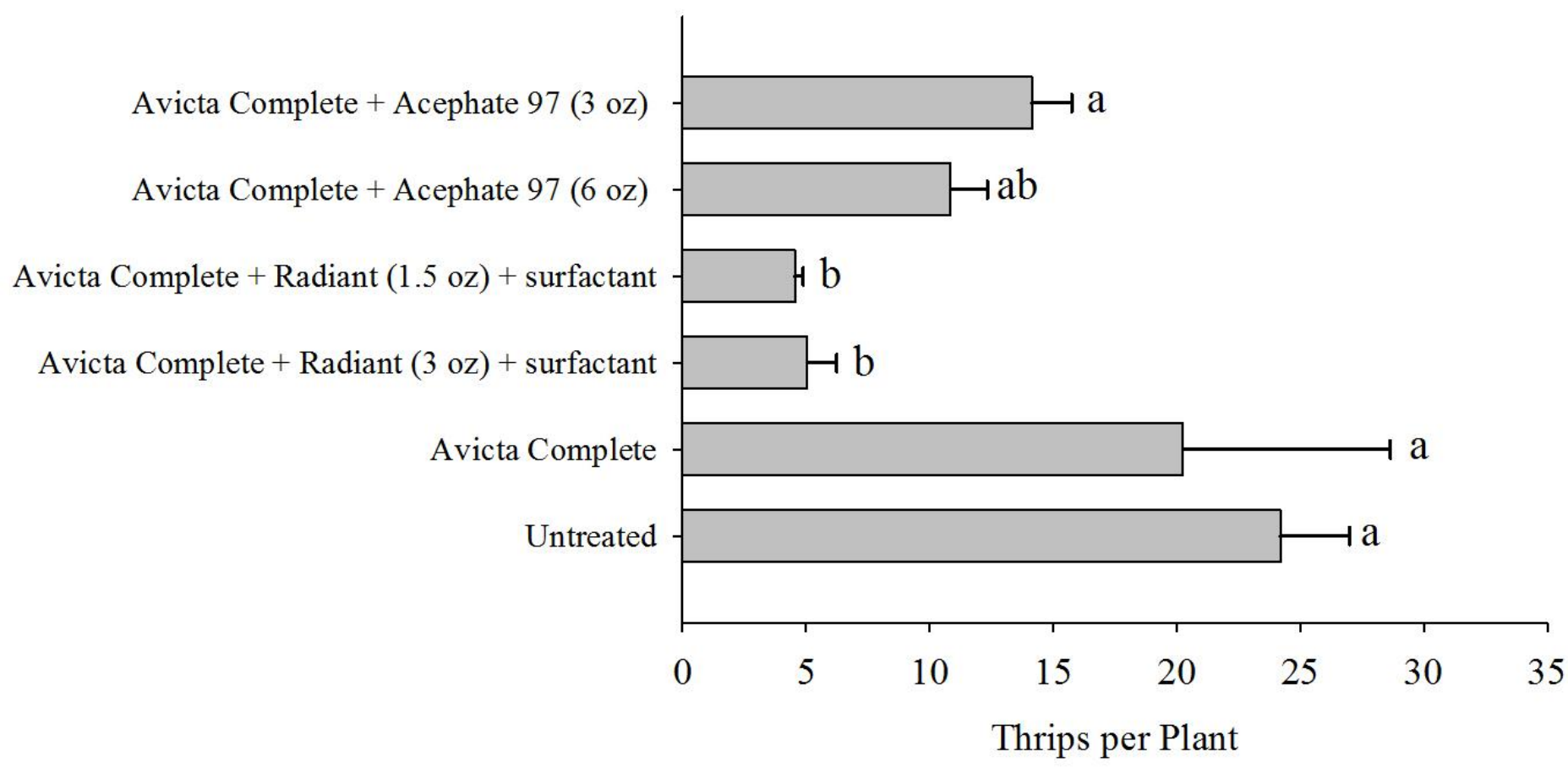
# Virginia, Two Leaves (4 Weeks After Planting)




Sprayed 2 weeks after planting

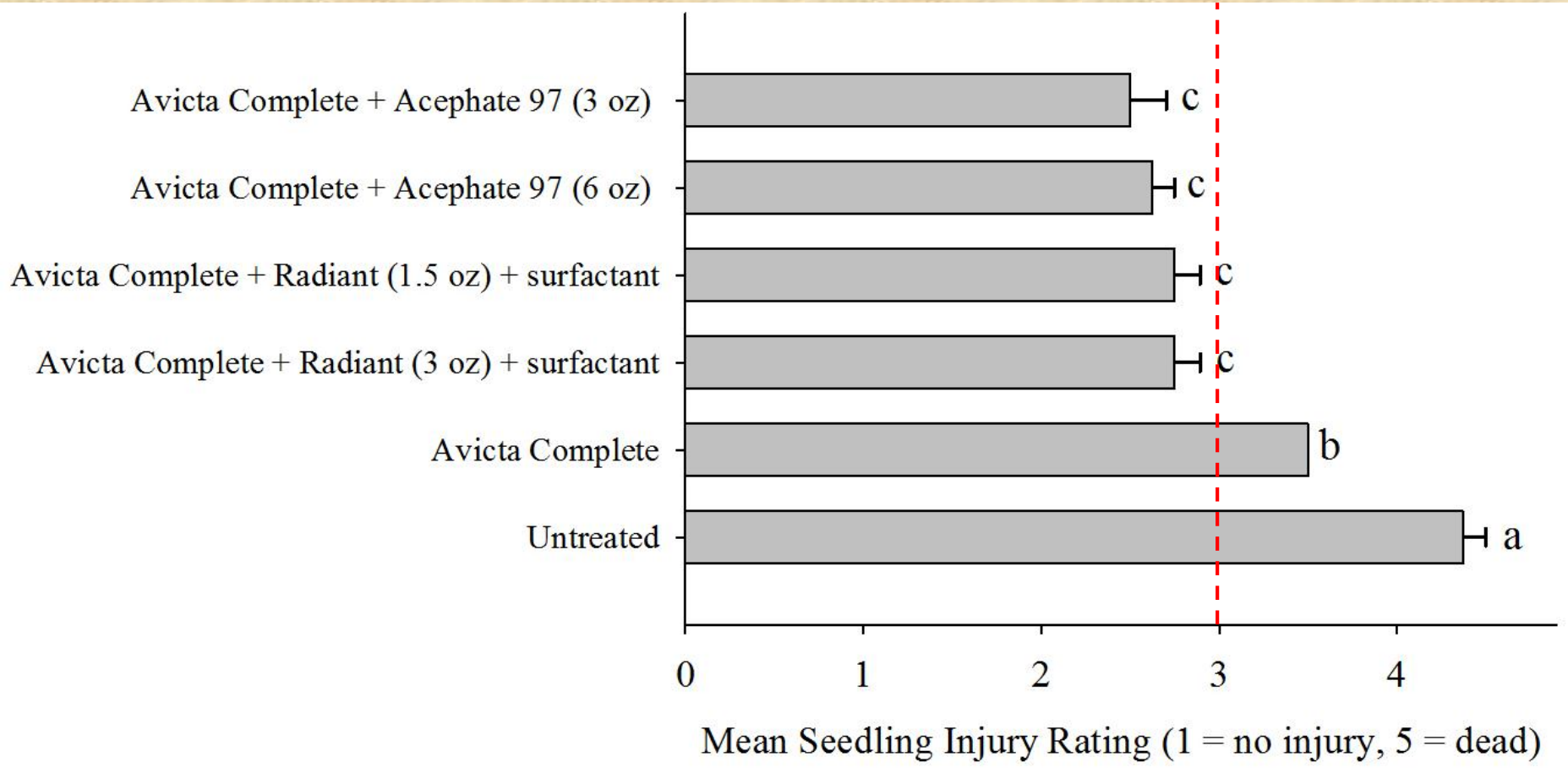
2013

# Georgia, Three Leaves (4 Weeks After Planting)



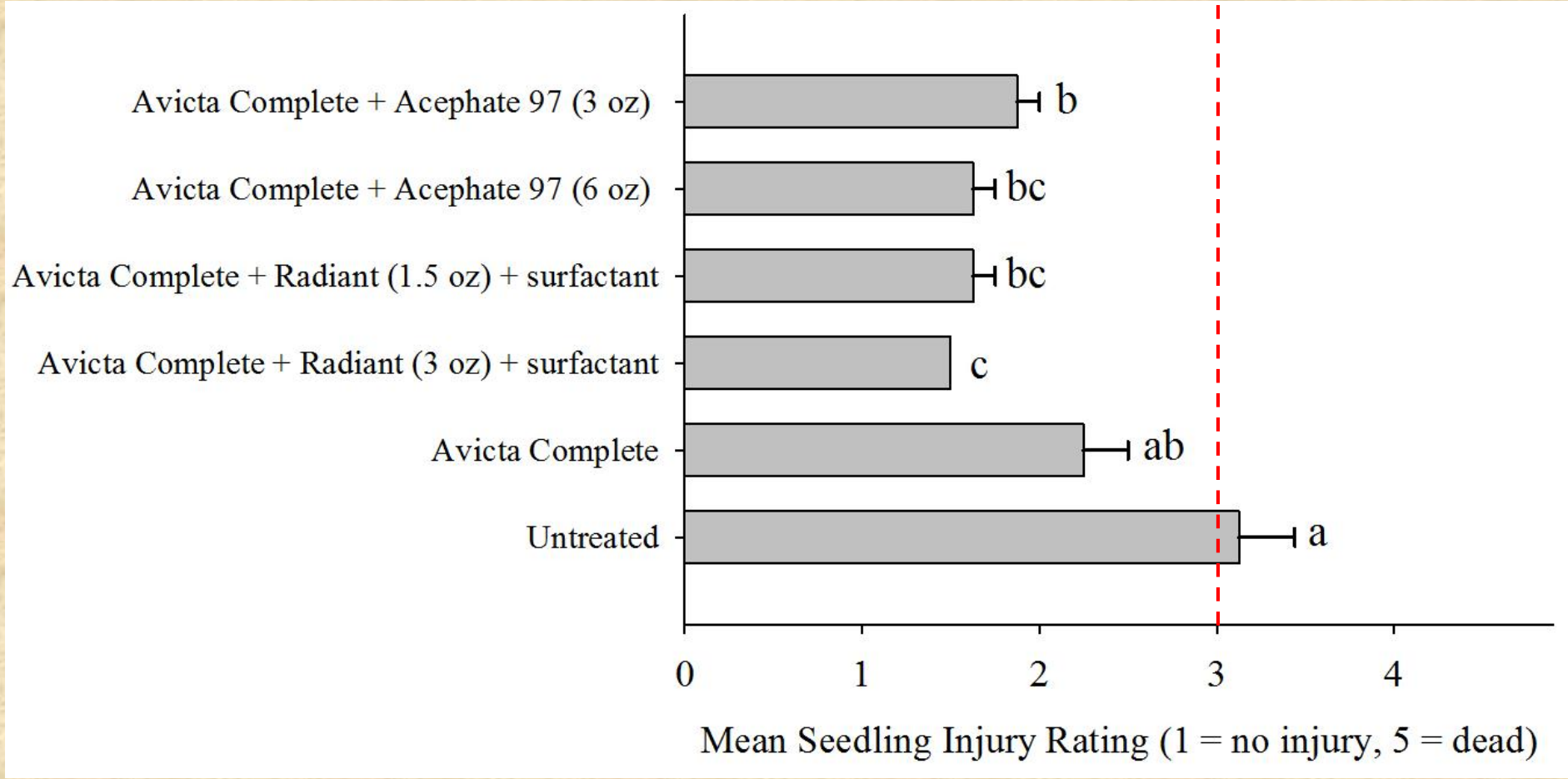
2013

# Georgia, Three Leaves (4 Weeks After Planting)



2013

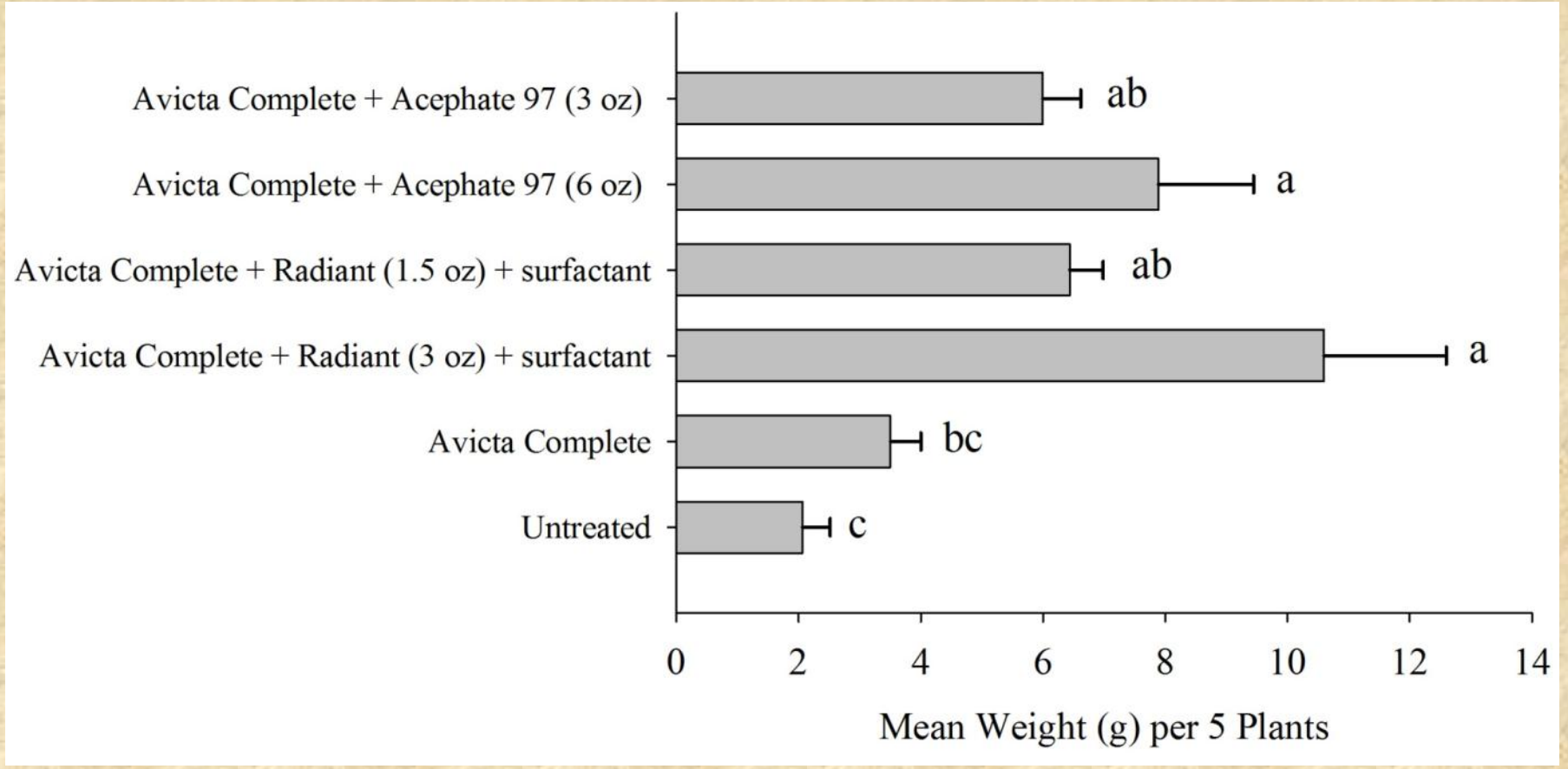
# North Carolina, Six Leaves (6 Weeks After Planting)




Sprayed 3 weeks after planting

2013

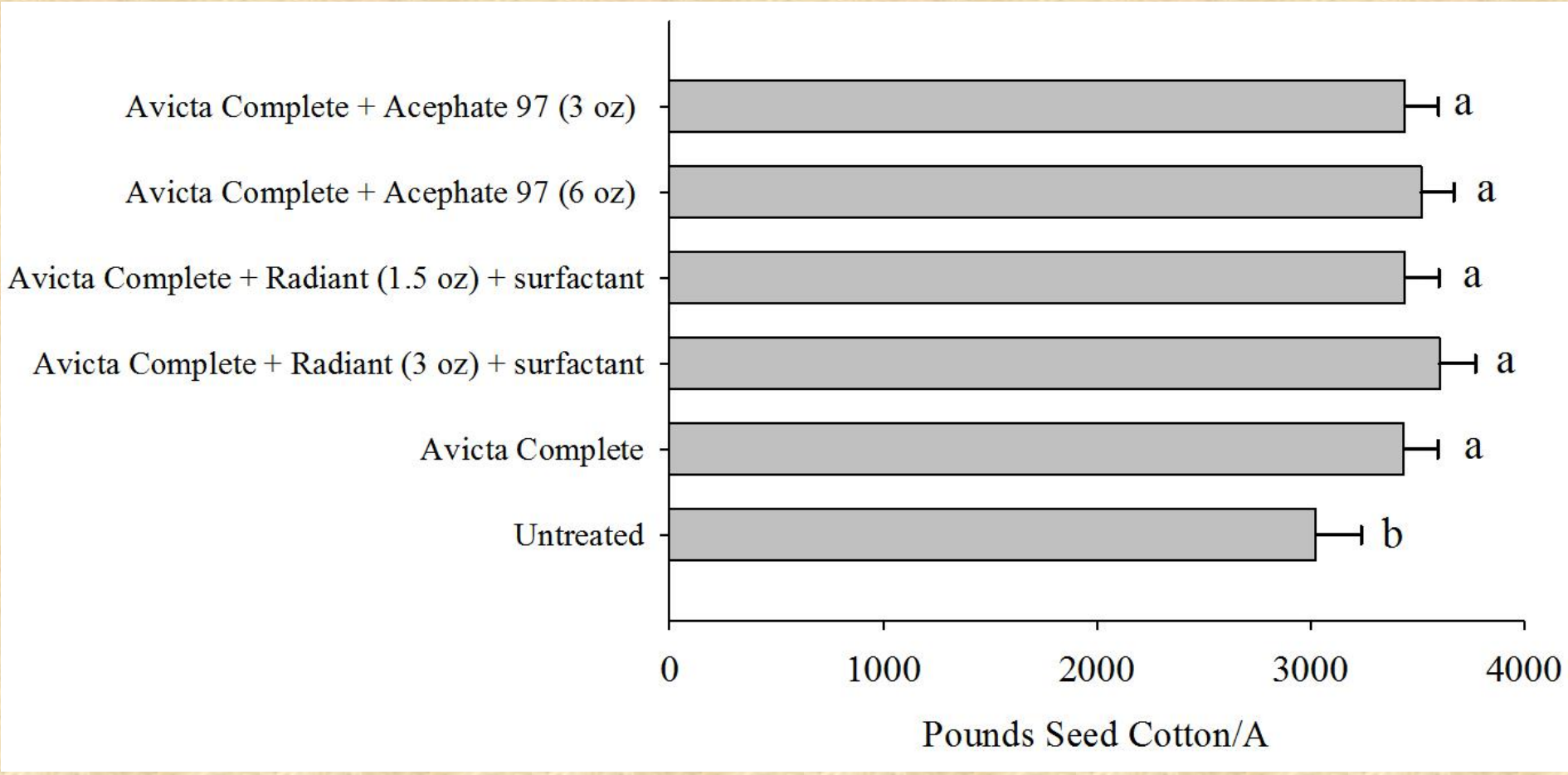
# North Carolina, 6 Weeks After Planting




Sprayed 3 weeks after planting

2013

# North Carolina, Yield

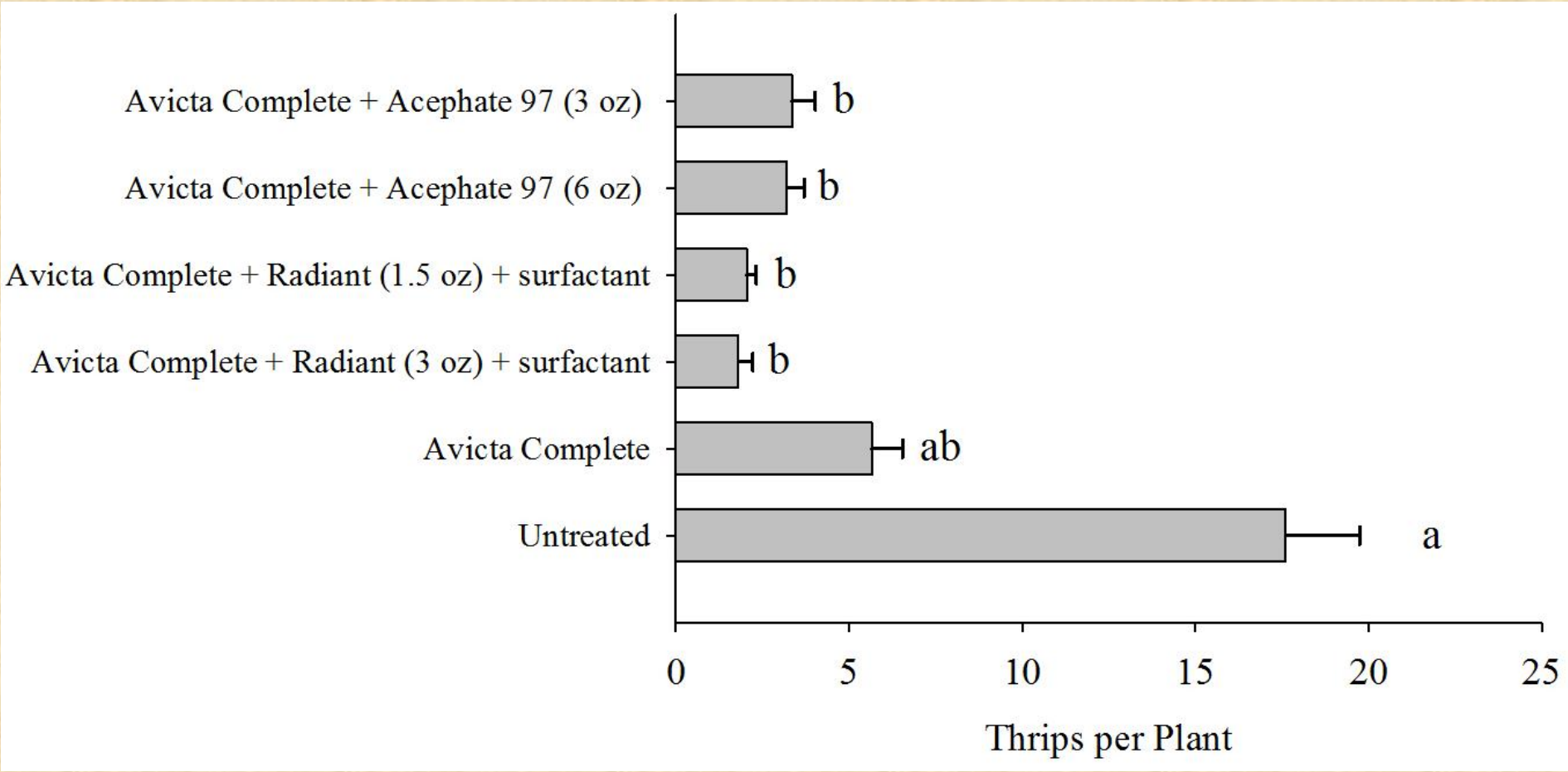



Sprayed 3 weeks after planting

# 2014 Foliar spray results

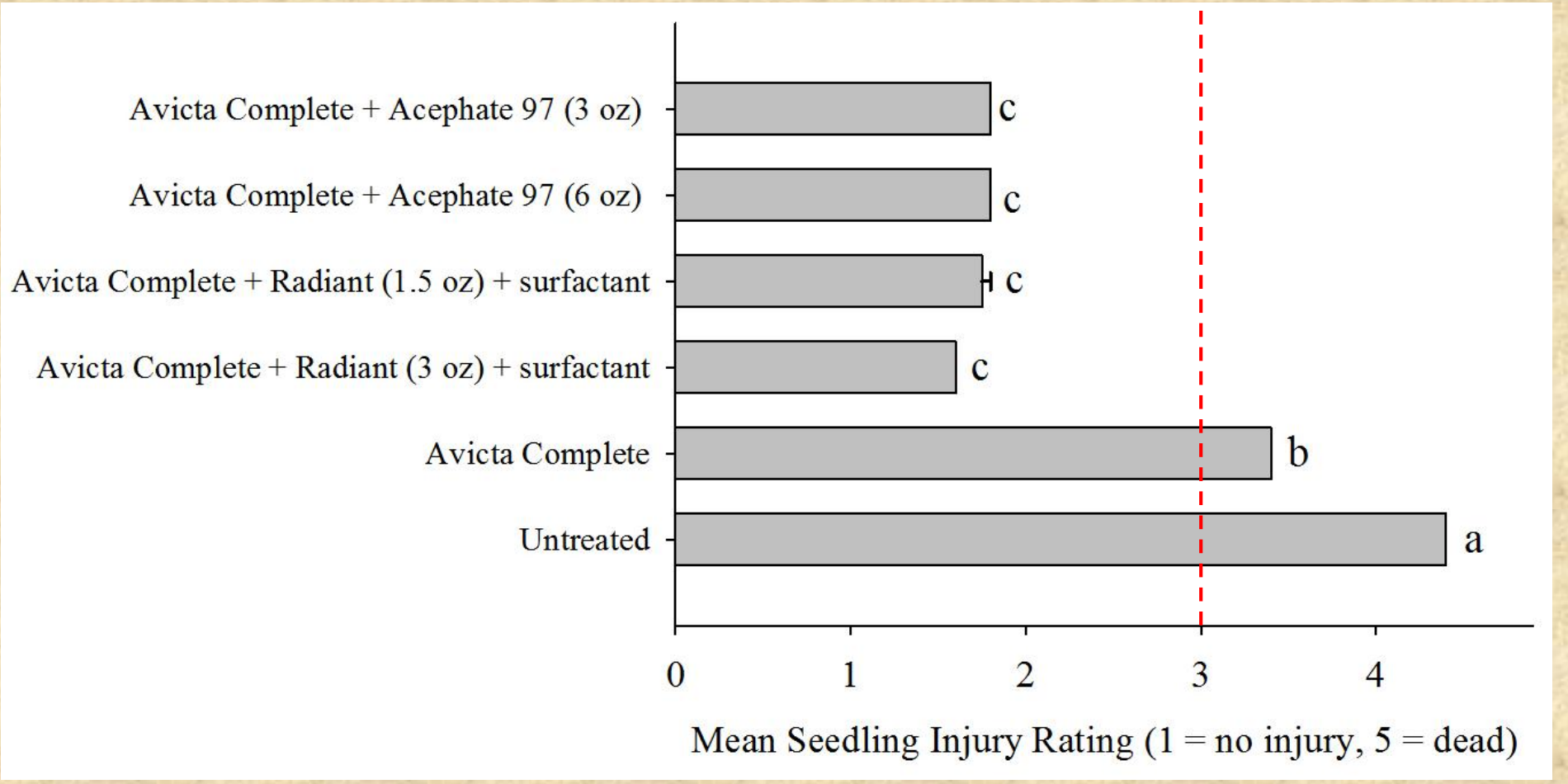
2014

# Virginia, Two Leaves (3 Weeks After Planting)



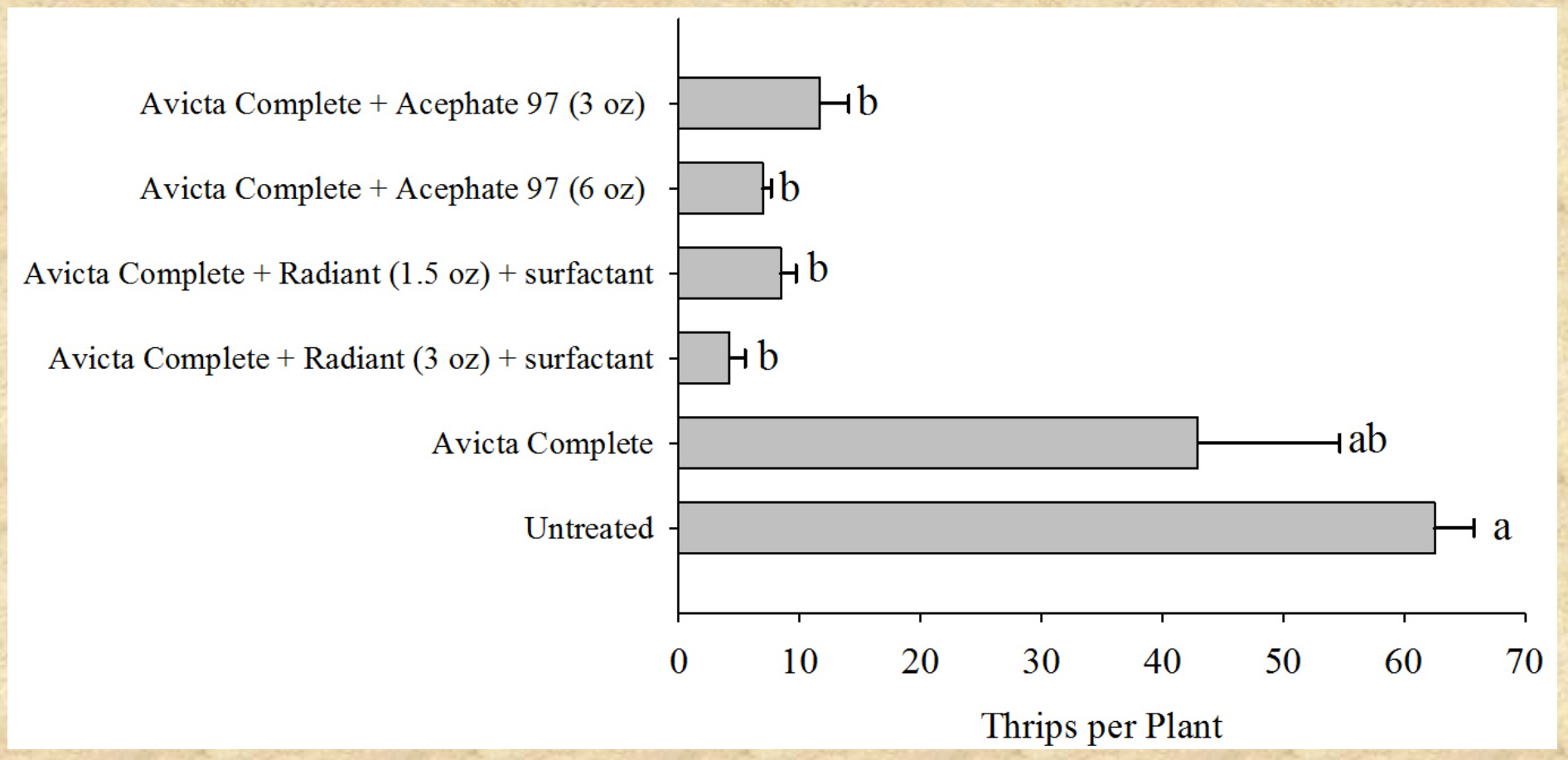
2014

# Virginia, Two Leaves (3 Weeks After Planting)



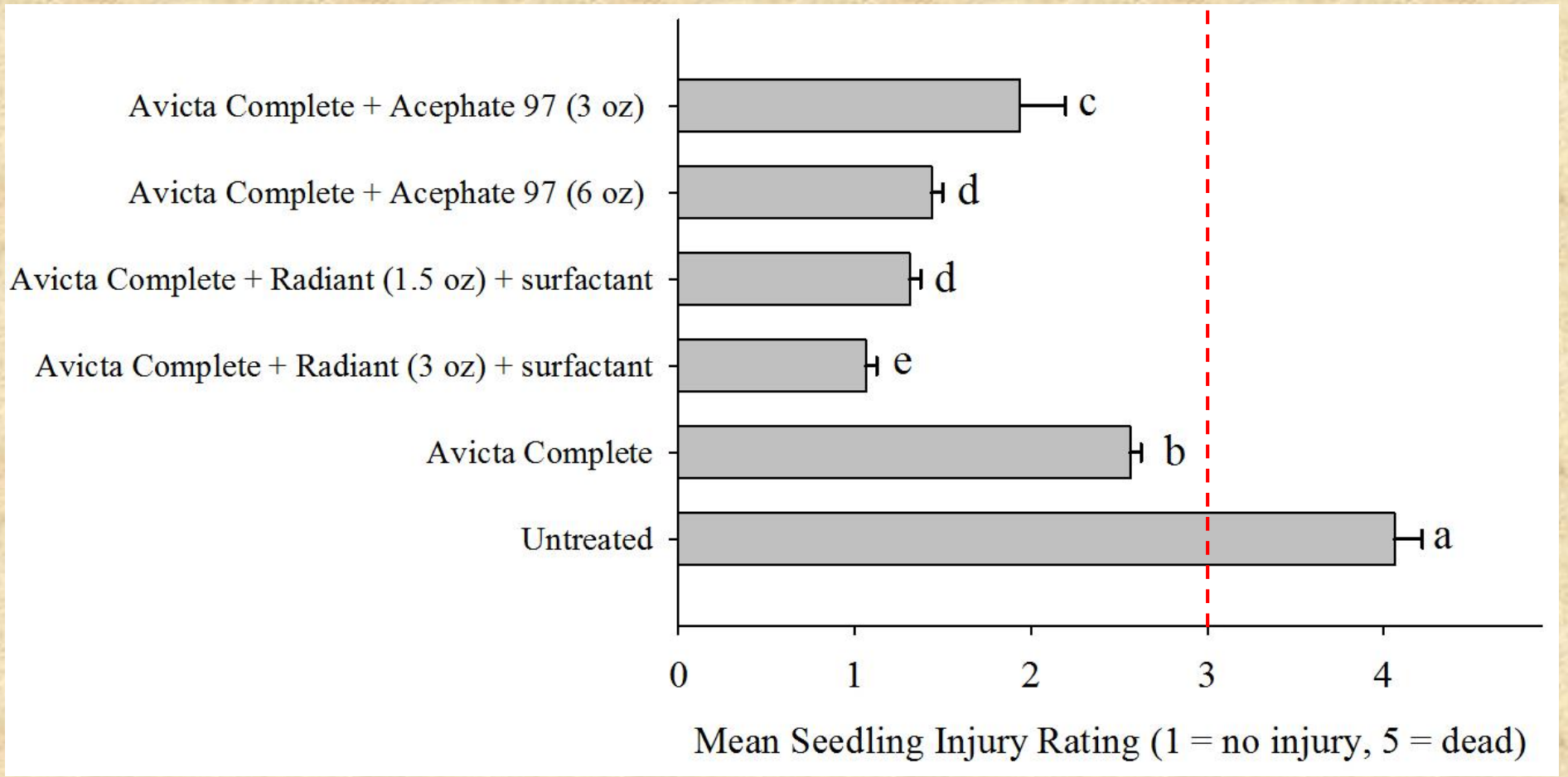
2014

# North Carolina, Six Leaves (4 Weeks After Planting)



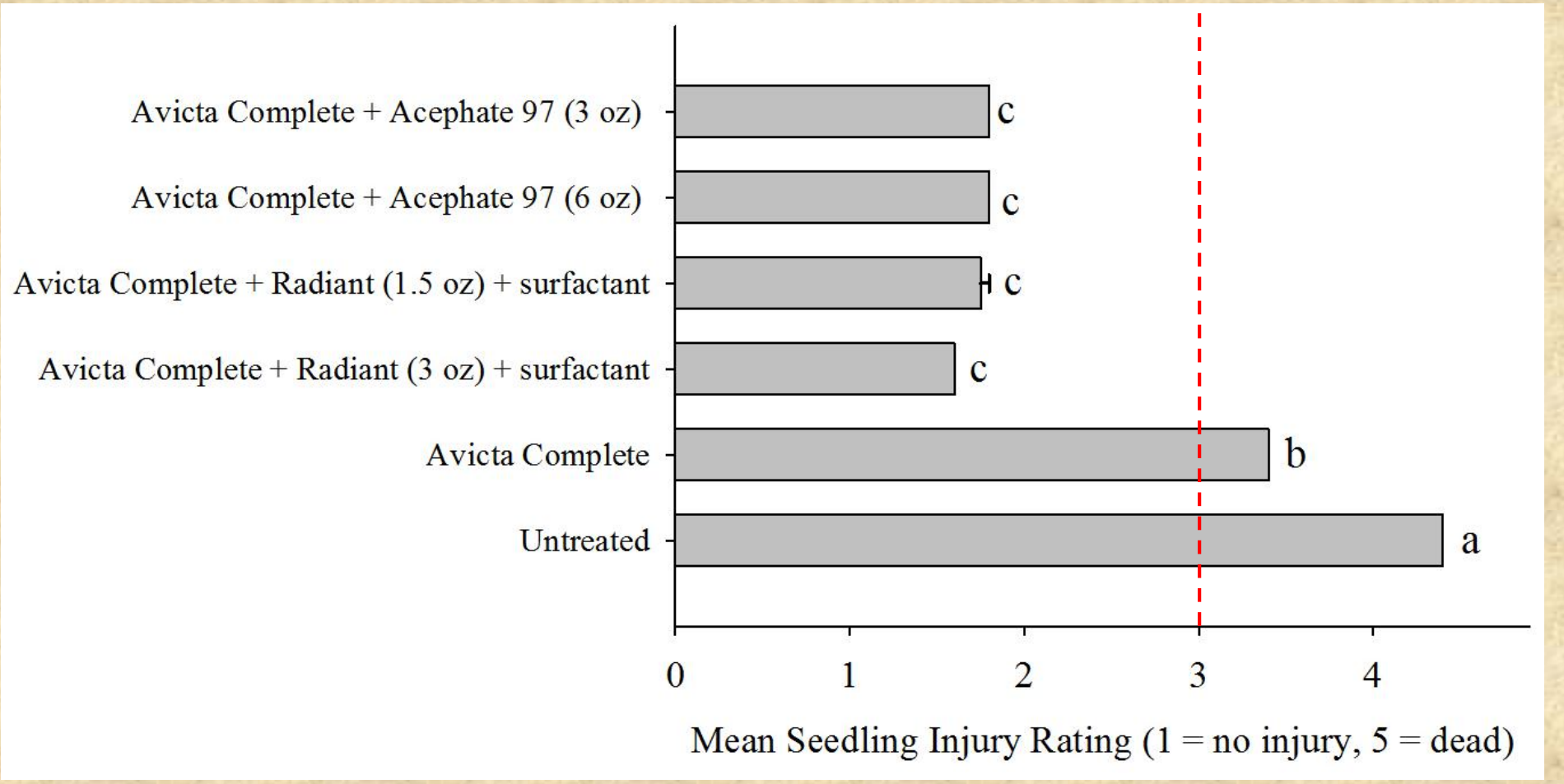
2014

# 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

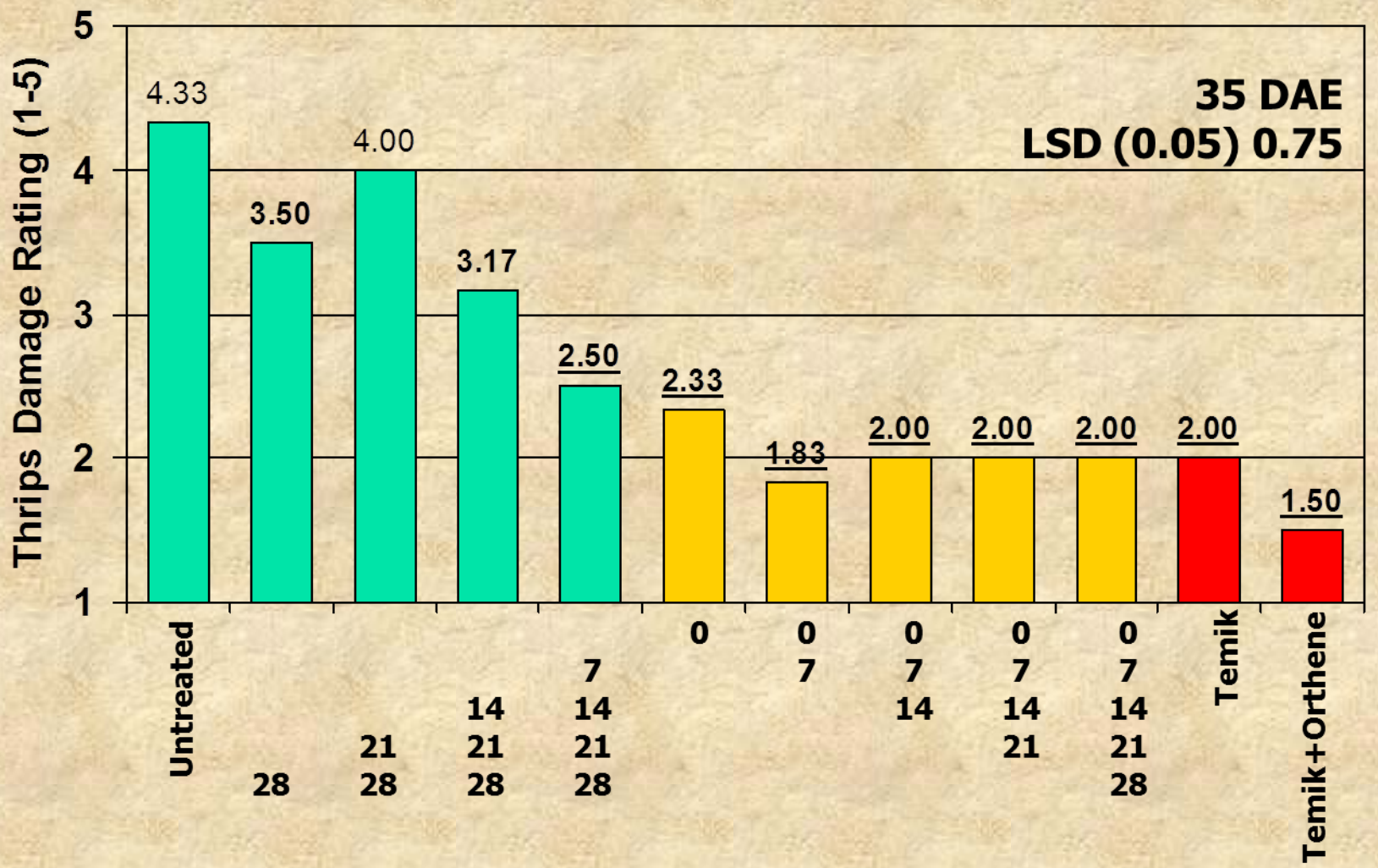
- Progressive and regressive foliar insecticide regimes (acephate 0.2 lb ai/acre).
- Two states (GA, SC)
- RCB design w/ four replications.
- Data Collection:
  - Thrips Counts
  - Thrips Damage Ratings
  - Plant Height
  - Plant Dry Weights
  - Yield

| 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

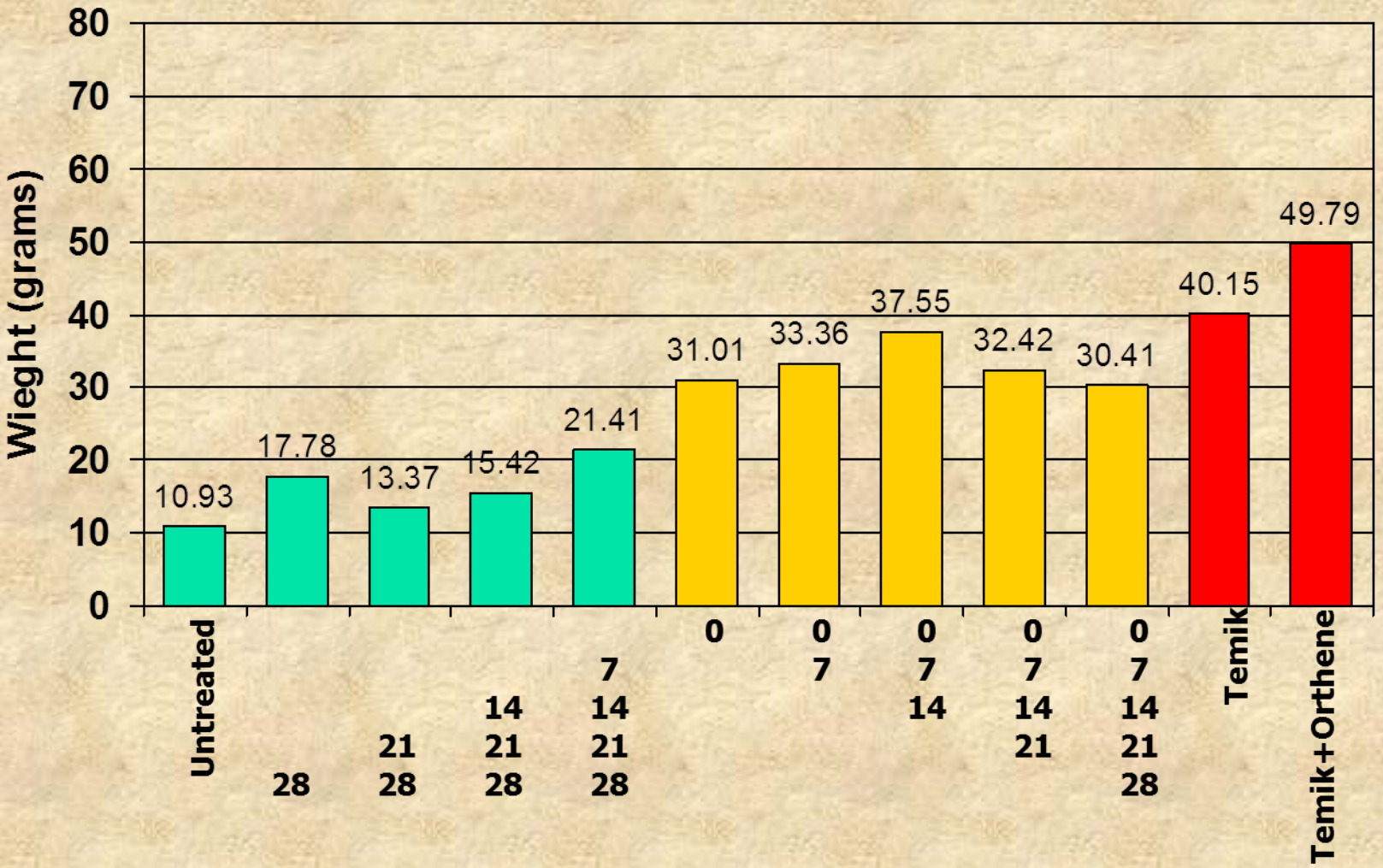
# Progressive / Regressive

## Thrips Damage - Georgia 2010



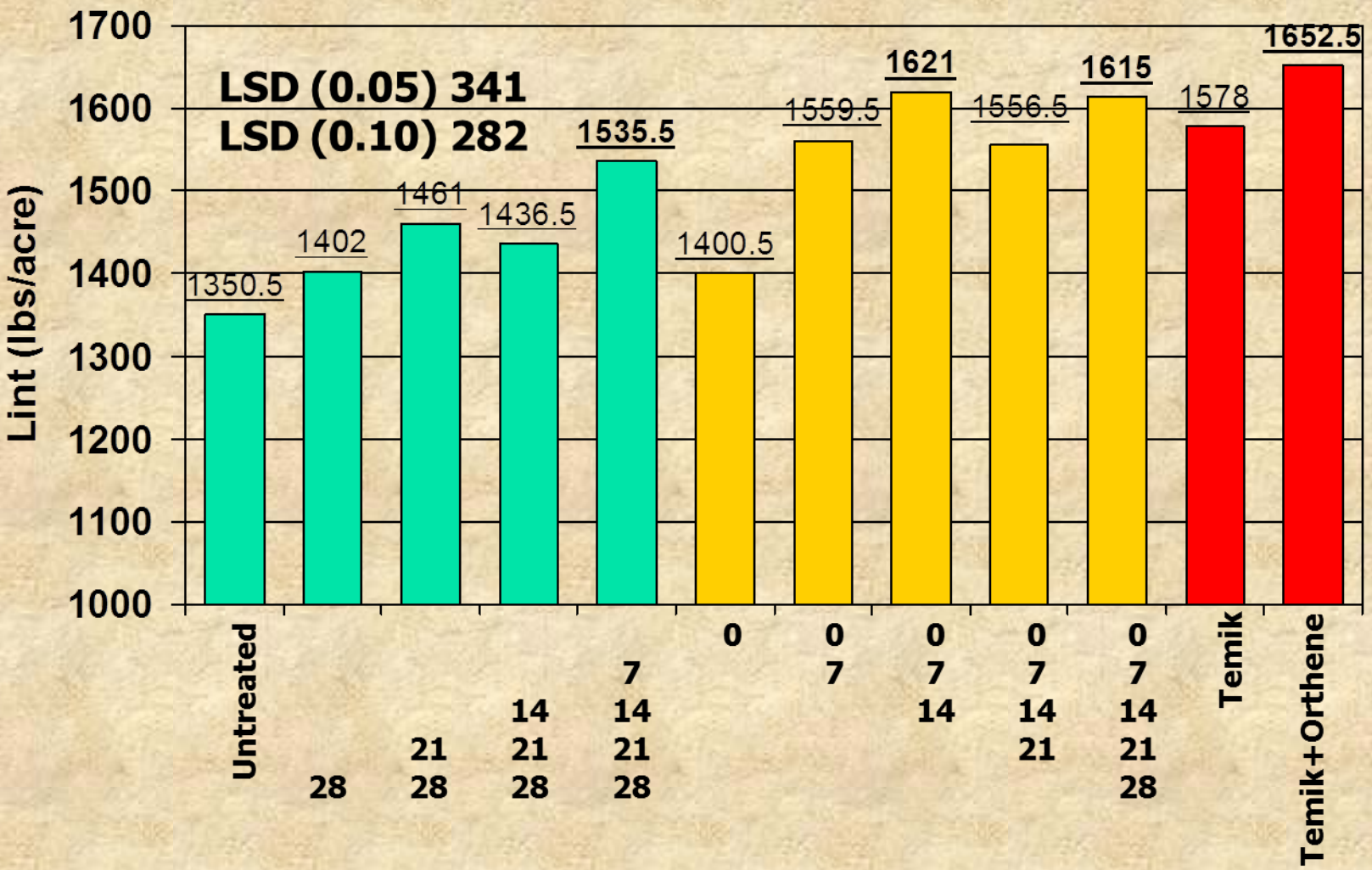
# Progressive / Regressive

## 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 4$^{th}$ 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)

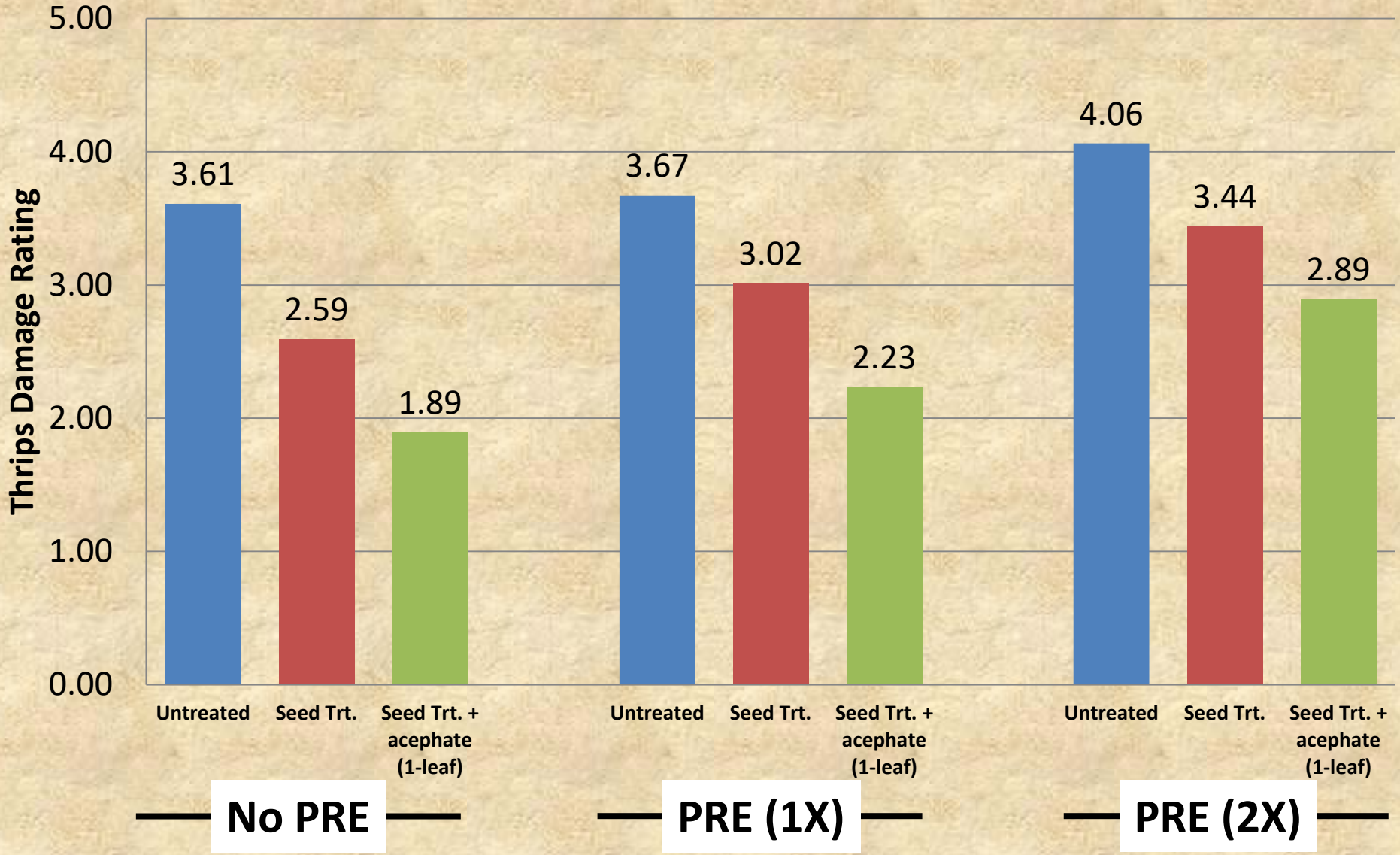
**Rep I-GA**

June 4, 2013

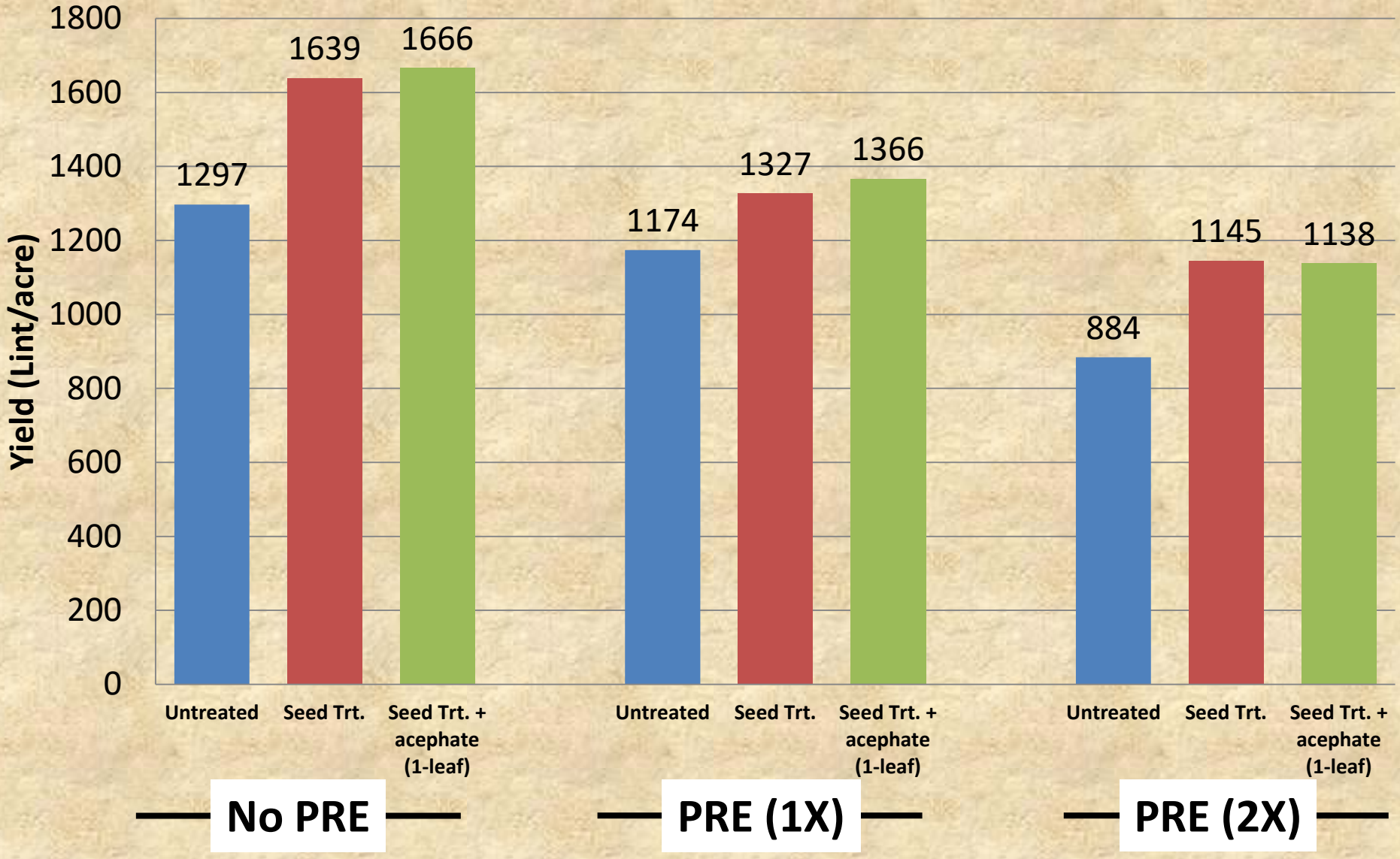
| | No PRE | PRE 1X | PRE 2X |
|---|---|---|---|
| No Insecticide |  |  |  |
| Avicta |  |  |  |
| Avicta+Orthene |  |  |  |

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

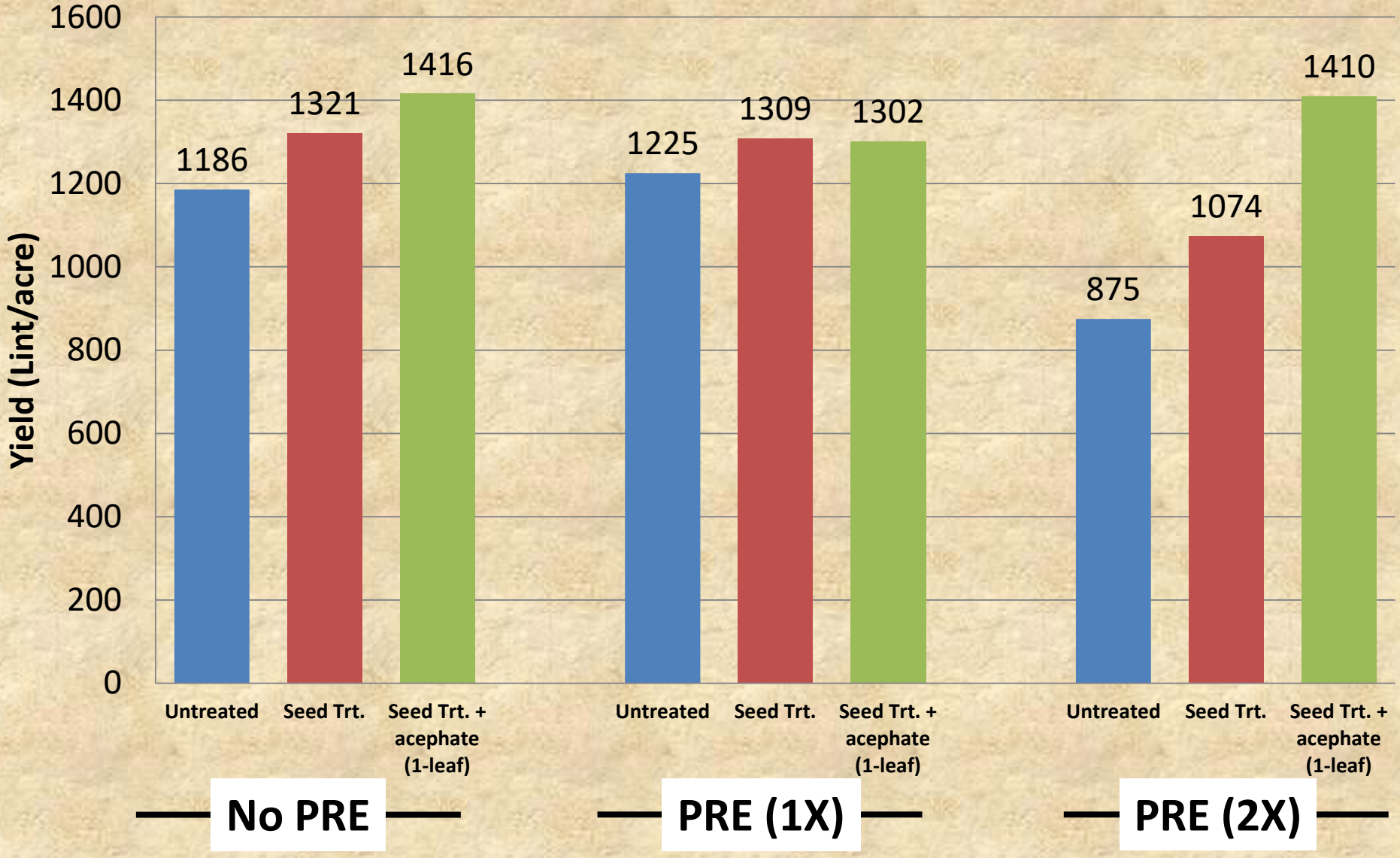
## Thrips Damage Rating



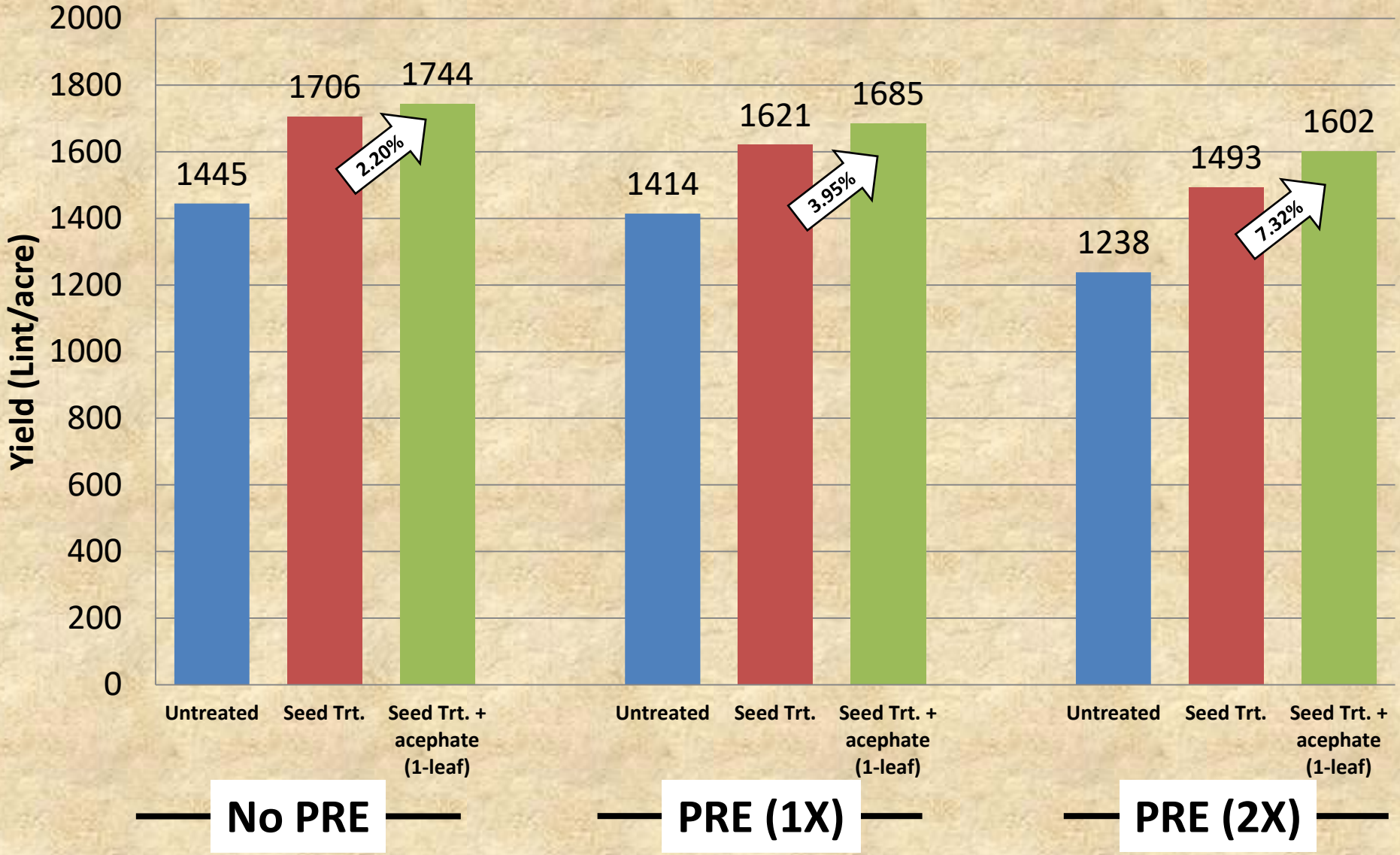
# PRE x Thrips (Virginia 2013)
## Lint Yield per Acre



# PRE x Thrips (Alabama 2013)
## Lint Yield per Acre

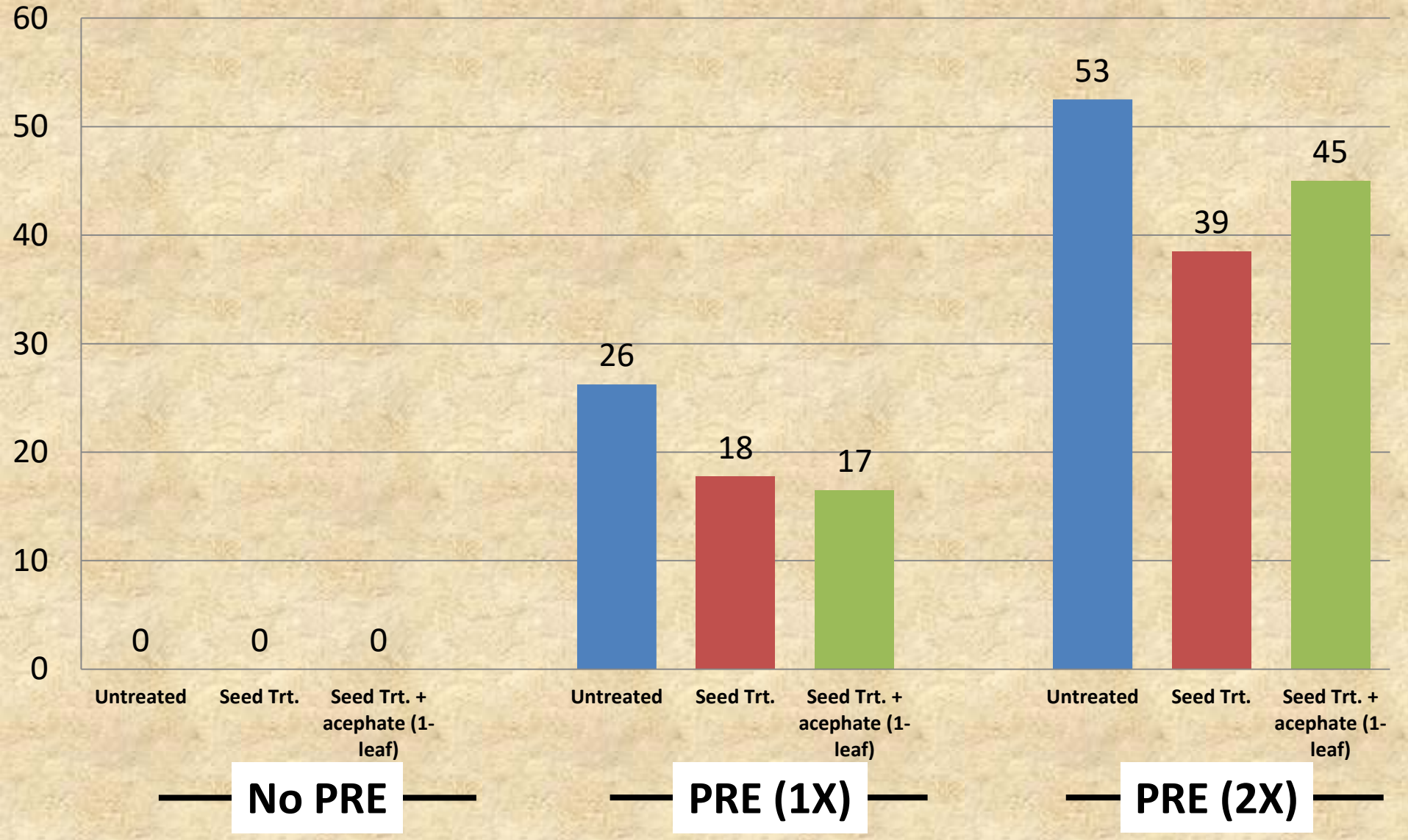


# PRE x Thrips (Mean-AL, GA, SC, and VA 2013)
## Lint Yield per Acre



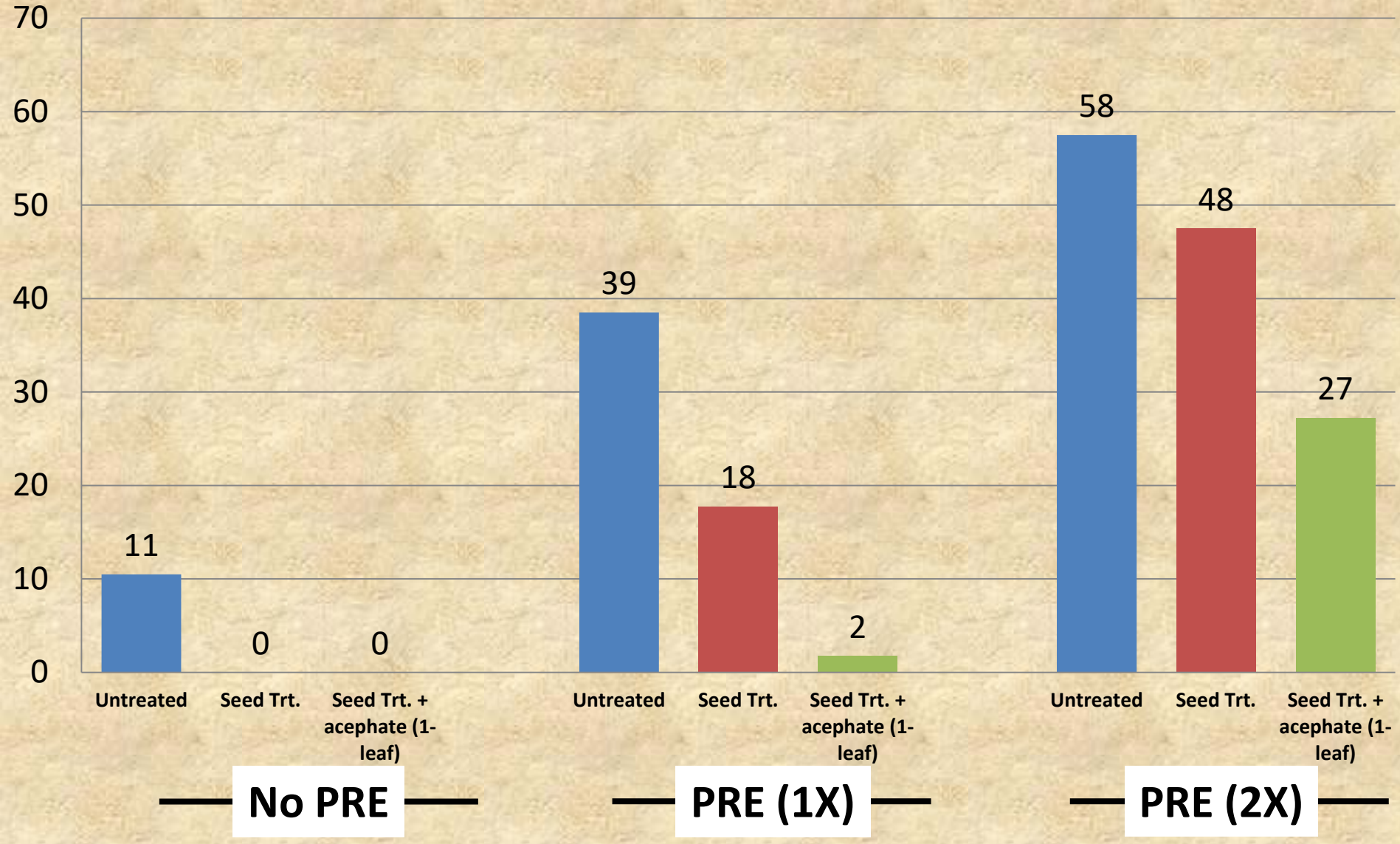
Planted May 7, 2014

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



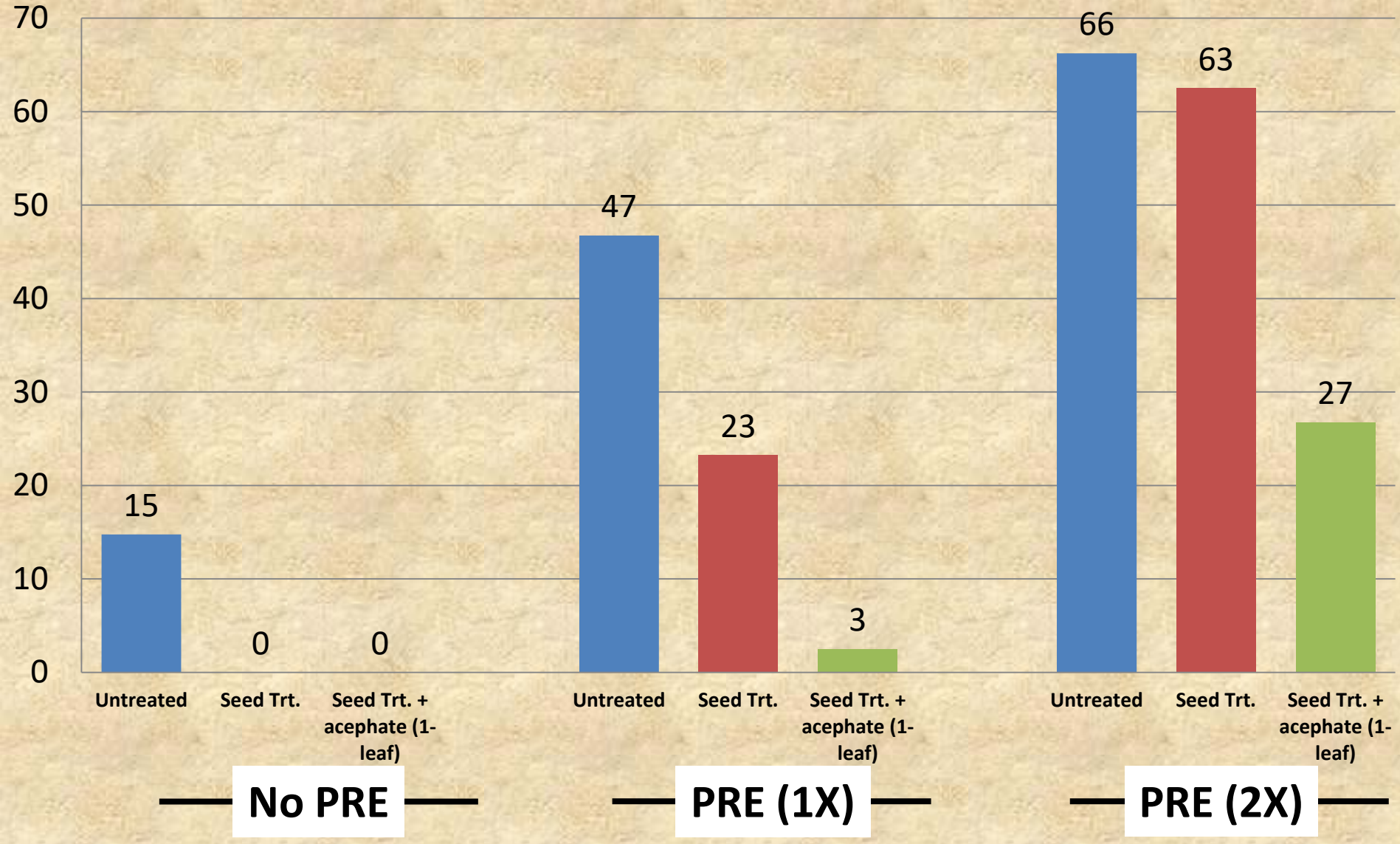
Planted May 7, 2014

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



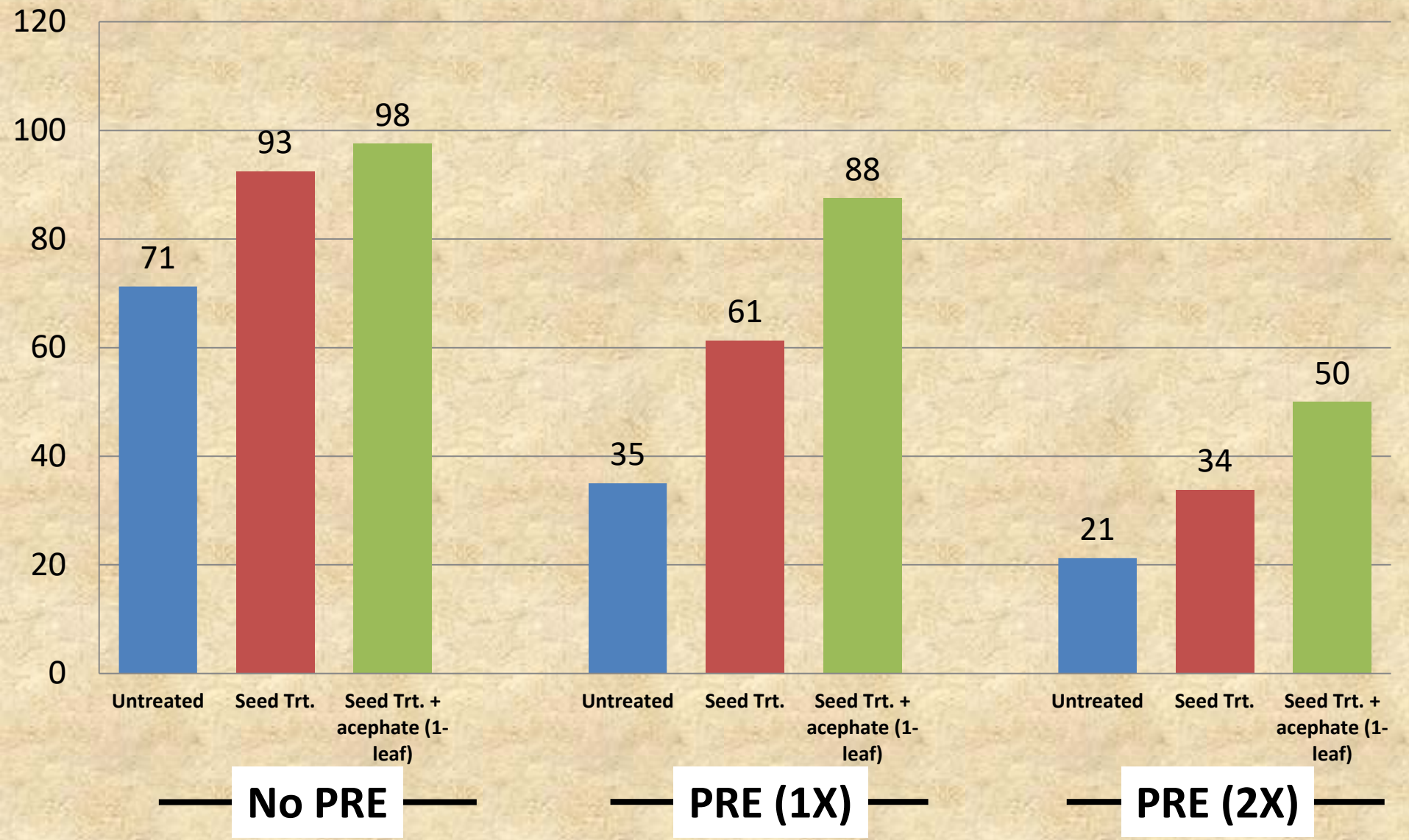
Planted May 7, 2014

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



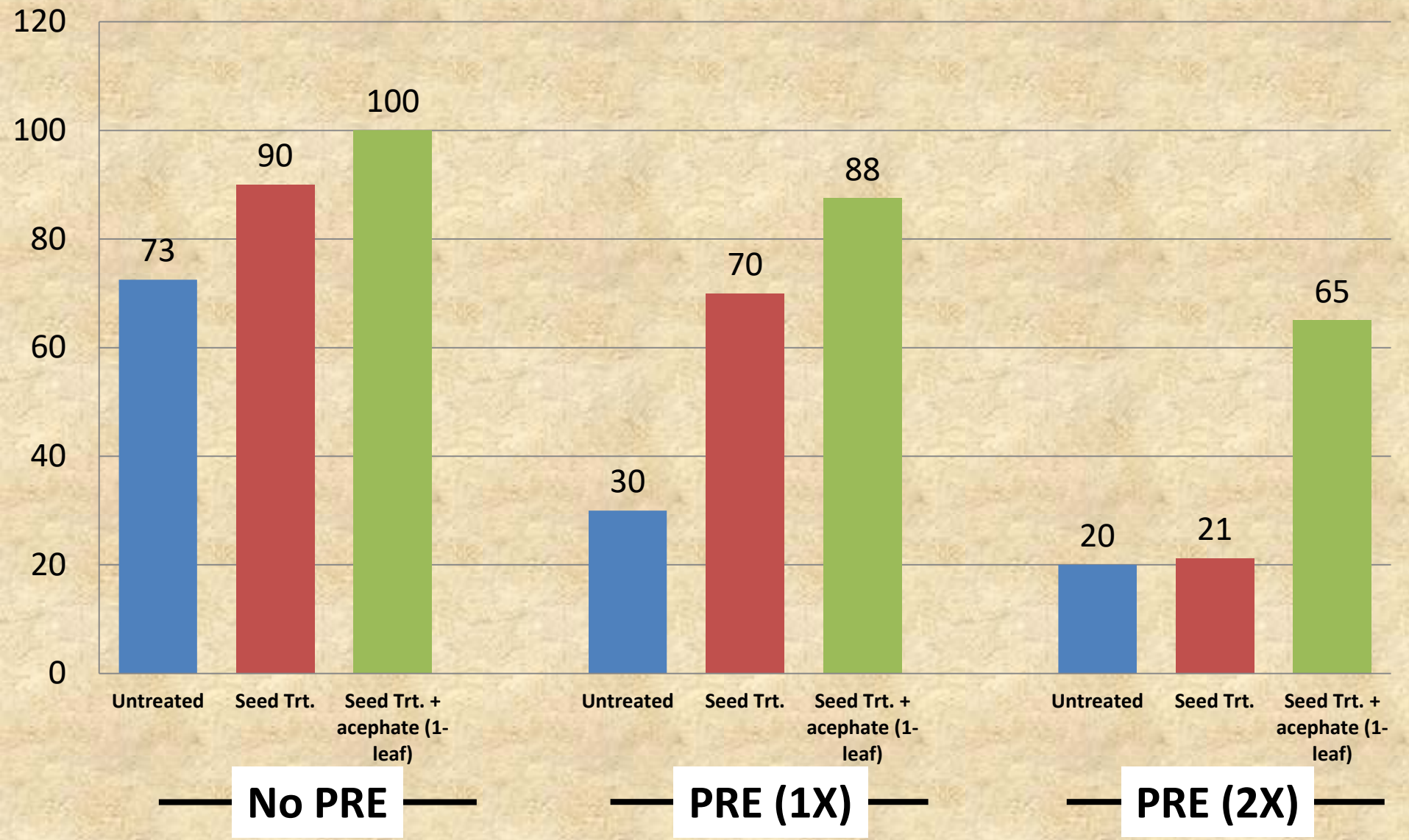
Planted May 7, 2014

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



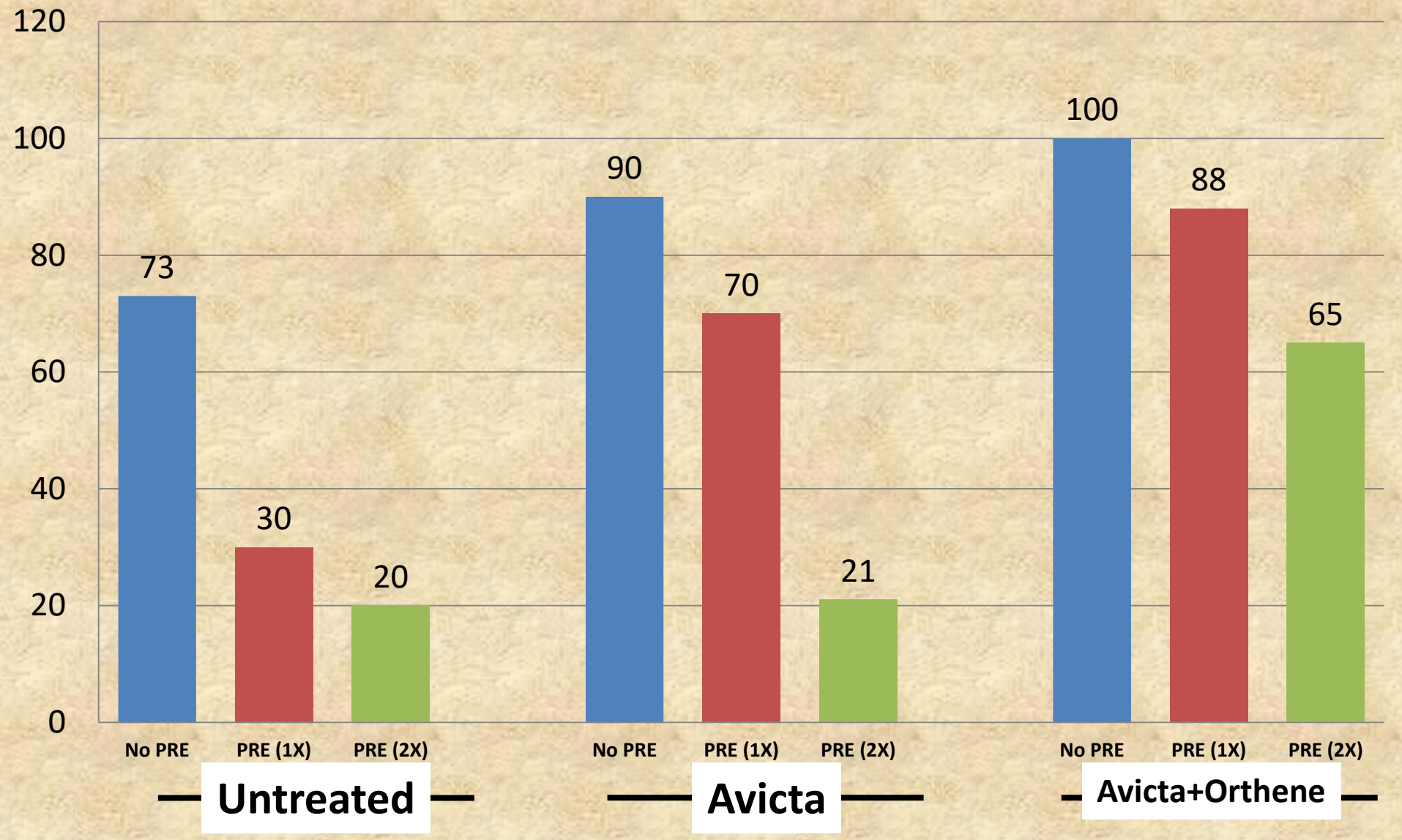
Planted May 7, 2014

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



Planted May 7, 2014

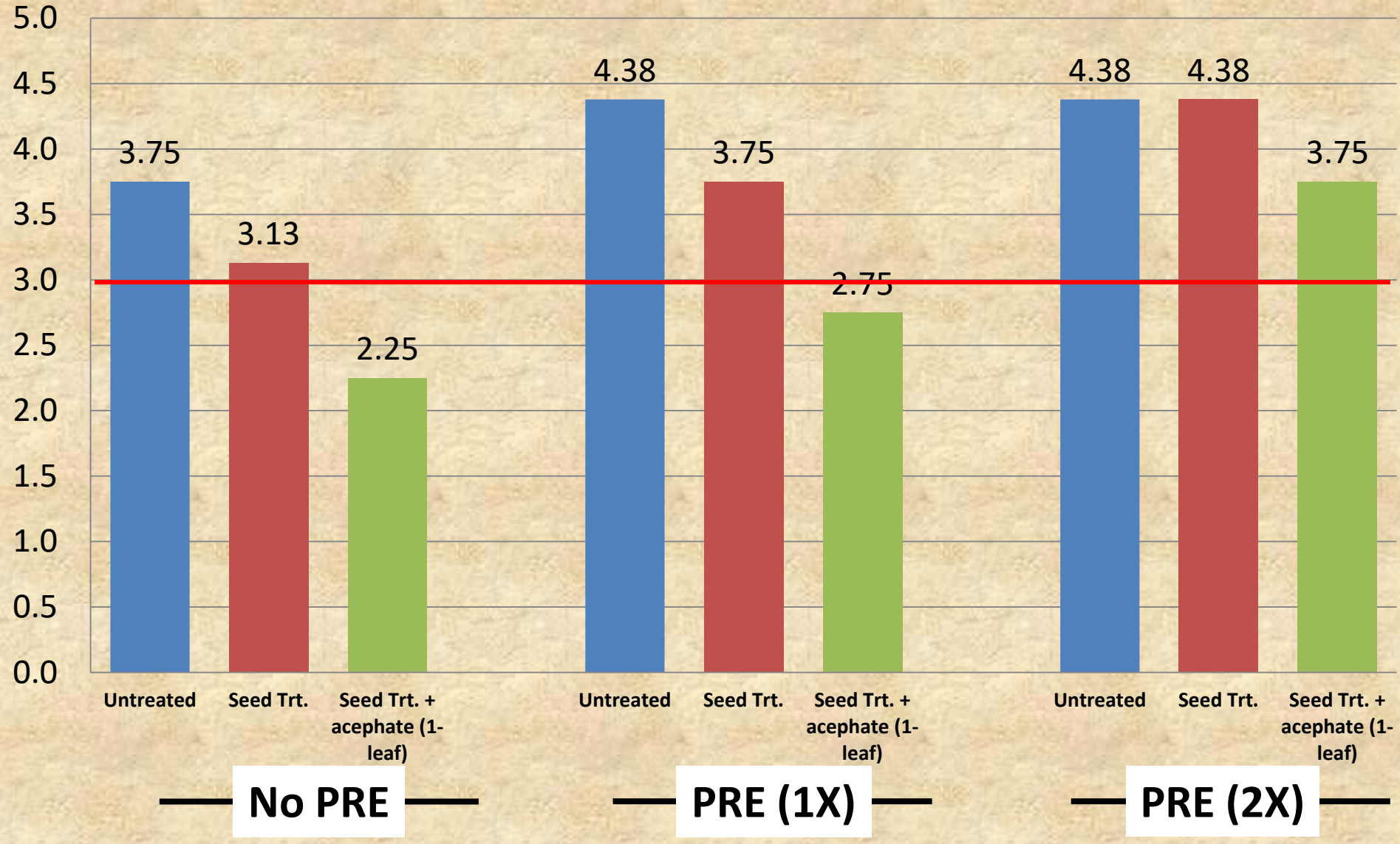
# PRE x Thrips (Georgia 2014)
## Percent Vigor-Roberts June 11



Planted May 7, 2014

# PRE x Thrips (Georgia 2014)
## Thrips Damage Rating 1-5, June 4

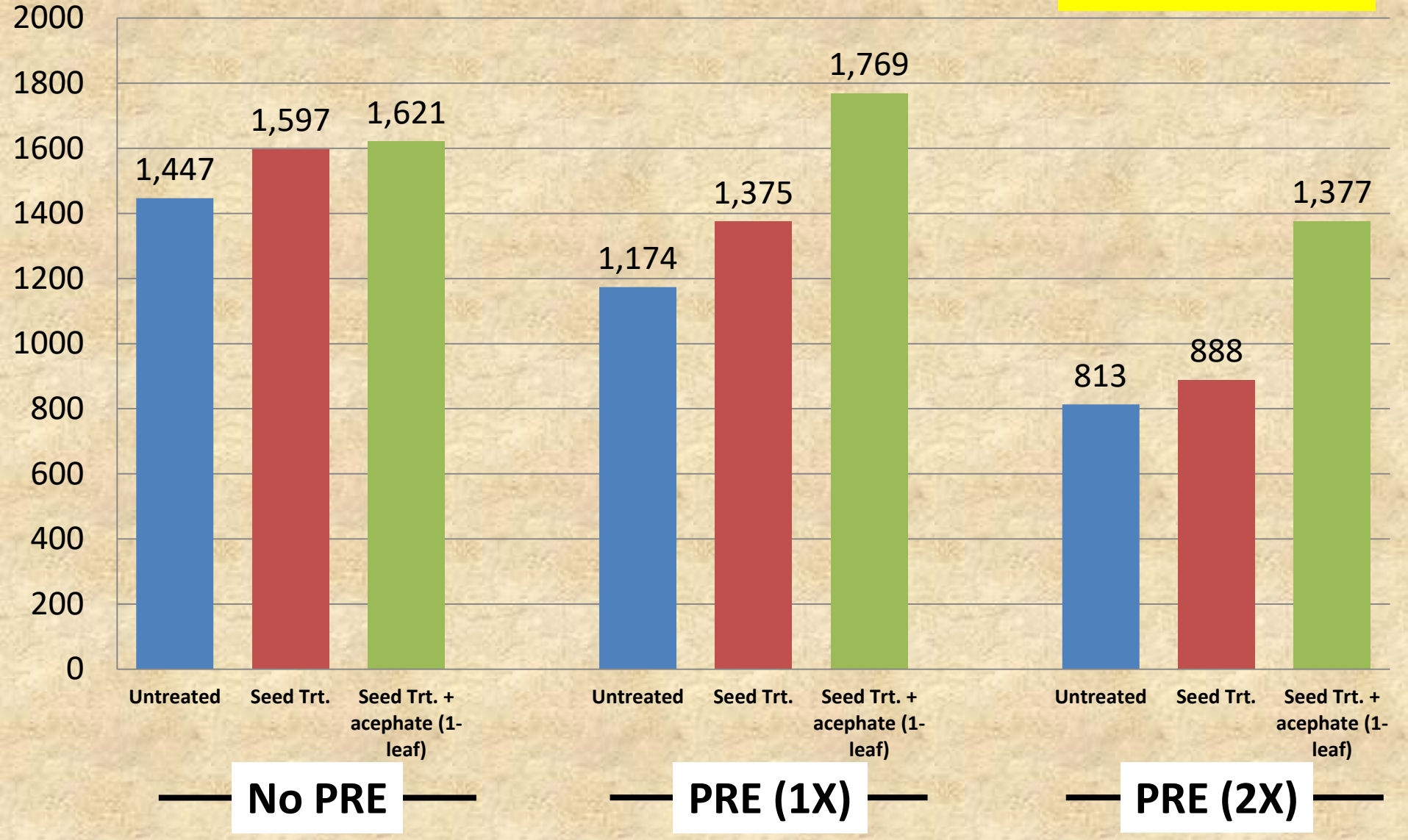
**Ratings > 3 are unacceptable**



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)

# Acknowledgments

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

**Cotton Producers Beltwide**

**Cooperators in Industry**

COTTON INCORPORATED