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?
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

Tt - Tobacco thrips
Nv - Neohydatothrips variabilis (soybean thrips)
Fo - Frankliniella occidentalis (western flower thrips)
Ft - Frankliniella tritici (flower thrips)
Tt - Thrips tabaci (onion thrips)

Reed et al. 2009 (Poster #90)
Untreated

“Preventative” treatment
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

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

- Rolled cover/strip till
- No cover/conv till
- Mowed cover/strip till

LSD = 4

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?
Starter Fertilizer and Thrips

Irrigation

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

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

*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

<table>
<thead>
<tr>
<th>Compound(s)</th>
<th>Formulated product rate</th>
<th>Lb a.i./A</th>
<th>Application details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acephate 97PE</td>
<td>16 oz/A</td>
<td>0.974</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Avicta Complete + Acephate 97PE</td>
<td>Seed treatment 8 oz/A</td>
<td>0.340</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Admire Pro 4.6F</td>
<td>9.2 oz/A</td>
<td>0.330</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Velum Total</td>
<td>14 oz/A</td>
<td>0.173</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Avicta Complete + Admire Pro 4.6F</td>
<td>Seed treatment 9.2 oz/A</td>
<td>0.340</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Avicta Complete</td>
<td>Seed treatment</td>
<td>0.340</td>
<td>---</td>
</tr>
<tr>
<td>Aeris</td>
<td>Seed treatment</td>
<td>0.375</td>
<td>---</td>
</tr>
<tr>
<td>Aeris + Acephate 97PE</td>
<td>Seed treatment 8 oz/A</td>
<td>0.375</td>
<td>Liquid in-furrow</td>
</tr>
<tr>
<td>Aeris + Admire Pro 4.6F</td>
<td>Seed treatment 9.2 oz/A</td>
<td>0.375</td>
<td>---</td>
</tr>
<tr>
<td>Aeris + Poncho/VOTiVO</td>
<td>Seed treatment</td>
<td>0.375</td>
<td>---</td>
</tr>
<tr>
<td>Thimet 20G</td>
<td>5 lb/A</td>
<td>1.000</td>
<td>Granular in-furrow</td>
</tr>
<tr>
<td>Temik 15G</td>
<td>5 lb/A</td>
<td>0.750</td>
<td>Granular in-furrow</td>
</tr>
<tr>
<td>Untreated</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
2013 At-plant Results
South Carolina, Two Leaves  
(2 Weeks After Planting)
South Carolina, Three Leaves
(3 Weeks After Planting)

- Acephate 97 (16 oz)
- Avicta Complete + Acephate 97 (8 oz)
- Admire Pro 4.6 (9 oz)
- Avicta Complete + Admire Pro 4.6 (7.4 oz)
- Avicta Complete
- Aeris
- Aeris + Admire Pro 4.6 (7.4 oz)
- Aeris + Poncho/VOTiVO
- Temik 15G (5 lb)
- Velum Total (14 oz)
- Untreated

Thrips per plant

2013
South Carolina, Five Leaves (5 Weeks After Planting)

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
Counter 6.5 lb

Section 18 for cotton in GA/SC during 2014
North Carolina, Cotyledon (2 Weeks After Planting)
Virginia, Two Leaves
(4 Weeks After Planting)

- Acephate 97 (16 oz)
- Avicta Complete + Acephate 97 (8 oz)
- Admire Pro 4.6 (9 oz)
- Avicta Complete + Admire Pro 4.6 (7.4 oz)
- Avicta Complete
- Aeris
- Aeris + Admire Pro 4.6 (7.4 oz)
- Aeris + Poncho/VOTiVO
- Temik 15G (5 lb)
- Velum Total (14 oz)
- Untreated

Thrips per plant

2013
Virginia, Two Leaves
(4 Weeks After Planting)

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
North Carolina, Four Leaves
(4 Weeks After Planting)

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
Virginia, Four Leaves
(5 Weeks After Planting)
North Carolina, 6 Weeks After Planting

Average Dry Weight (g) per 5 Plants

- Acephate 97 (16 oz) - a
- Avicta Complete + Acephate 97 (8 oz) - a
- Admire Pro 4.6 (9 oz) - ab
- Avicta Complete + Admire Pro 4.6 (7.4 oz) - ab
- Avicta Complete - ab
- Aeris - ab
- Aeris + Admire Pro 4.6 (7.4 oz) - ab
- Aeris + Poncho/VOTiVO - ab
- Temik 15G (5 lb) - a
- Velum Total (14 oz) - ab
- Untreated - b
2014 At-plant Results
South Carolina, Three Leaves (3 Weeks After Planting)

- Acephate 97 (16 oz)
- Avicta Complete + Acephate 97 (8 oz)
- Admire Pro 4.6 (9 oz)
- Avicta Complete + Admire Pro 4.6 (7.4 oz)
- Avicta Complete
- Aeris
- Aeris + Acephate 97 (8 oz)
- Aeris + Admire Pro 4.6 (7.4 oz)
- Aeris + Poncho/VOTiVO
- Thimet 20G (5 lb)
- Temik 15G (5 lb)
- Velum Total (14 oz)
- Untreated

Thrips per plant
South Carolina, Three Leaves (3 Weeks After Planting)

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
South Carolina, 6 Weeks After Planting

Dry weight biomass (g) per plant at 42 days after planting

- Acephate 97 (16 oz)
- Avicta Complete + Acephate 97 (8 oz)
- Admire Pro 4.6 (9 oz)
- Avicta Complete + Admire Pro 4.6 (7.4 oz)
- Avicta Complete
- Aeris
- Aeris + Acephate 97 (8 oz)
- Aeris + Admire Pro 4.6 (7.4 oz)
- Aeris + Poncho/VOTiVO
- Thimet 20G (5 lb)
- Temik 15G (5 lb)
- Velum Total (14 oz)
- Untreated

Legend: 
abc
ab
a
ab
abc
bc
bc
abc
North Carolina, 6 Weeks After Planting

Dry weight biomass (g) per plant at 42 days after planting

- Acephate 97 (16 oz)
- Avicta Complete + Acephate 97 (8 oz)
- Admire Pro 4.6 (9 oz)
- Avicta Complete + Admire Pro 4.6 (7.4 oz)
- Avicta Complete
- Aeris
- Aeris + Acephate 97 (8 oz)
- Aeris + Admire Pro 4.6 (7.4 oz)
- Aeris + Poncho/VOTiVO
- Thimet 20G (5 lb)
- Temik 15G (5 lb)
- Velum Total (14 oz)
- Untreated
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.
2013 Foliar spray results
South Carolina, One Leaf (2 Weeks After Planting)

Sprayed 2 weeks after planting, sampled four days post-spray
North Carolina, Two Leaves  
(4 Weeks After Planting) 

Sprayed 3 weeks after planting
Virginia, Two Leaves
(4 Weeks After Planting)

Sprayed 2 weeks after planting
Georgia, Three Leaves (4 Weeks After Planting)

- Avicta Complete + Acephate 97 (3 oz)
- Avicta Complete + Acephate 97 (6 oz)
- Avicta Complete + Radiant (1.5 oz) + surfactant
- Avicta Complete + Radiant (3 oz) + surfactant
- Avicta Complete
- Untreated

Thrips per Plant

2013
Georgia, Three Leaves
(4 Weeks After Planting)

Avicta Complete + Acephate 97 (3 oz)
Avicta Complete + Acephate 97 (6 oz)
Avicta Complete + Radiant (1.5 oz) + surfactant
Avicta Complete + Radiant (3 oz) + surfactant
Avicta Complete
Untreated

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
North Carolina, Six Leaves (6 Weeks After Planting)

Sprayed 3 weeks after planting

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
North Carolina, 6 Weeks After Planting

Sprayed 3 weeks after planting
North Carolina, Yield

Sprayed 3 weeks after planting

2013

Avicta Complete + Acephate 97 (3 oz)
Avicta Complete + Acephate 97 (6 oz)
Avicta Complete + Radiant (1.5 oz) + surfactant
Avicta Complete + Radiant (3 oz) + surfactant
Avicta Complete
Untreated

Pounds Seed Cotton/A
2014 Foliar spray results
Virginia, Two Leaves (3 Weeks After Planting)

![Graph showing thrips per plant for different treatments.](image_url)
Virginia, Two Leaves
(3 Weeks After Planting)

2014

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
North Carolina, Six Leaves
(4 Weeks After Planting)

- Avicta Complete + Acephate 97 (3 oz)  b
- Avicta Complete + Acephate 97 (6 oz)  b
- Avicta Complete + Radiant (1.5 oz) + surfactant  b
- Avicta Complete + Radiant (3 oz) + surfactant  b
- Avicta Complete  ab
- Untreated  a

Thrips per Plant

2014
North Carolina, Six Leaves (4 Weeks After Planting)

- Avicta Complete + Acephate 97 (3 oz)
- Avicta Complete + Acephate 97 (6 oz)
- Avicta Complete + Radiant (1.5 oz) + surfactant
- Avicta Complete + Radiant (3 oz) + surfactant
- Avicta Complete
- Untreated

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
Virginia, Six Leaves
(5 Weeks After Planting)

Mean Seedling Injury Rating (1 = no injury, 5 = dead)
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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Foliar Insecticide Applied (DAE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>21-28</td>
<td></td>
</tr>
<tr>
<td>14-21-28</td>
<td></td>
</tr>
<tr>
<td>7-14-21-28</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>x</td>
</tr>
<tr>
<td>0-7</td>
<td>x</td>
</tr>
<tr>
<td>0-7-14</td>
<td>x</td>
</tr>
<tr>
<td>0-7-14-21</td>
<td>x</td>
</tr>
<tr>
<td>0-7-14-21-28</td>
<td>x</td>
</tr>
<tr>
<td>Temik 15G 5#</td>
<td></td>
</tr>
<tr>
<td>Temik+foliar</td>
<td>x</td>
</tr>
</tbody>
</table>

X=foliar acephate applied
Progressive / Regressive
Thrips Damage - Georgia 2010

Thrips Damage Rating (1-5)

<table>
<thead>
<tr>
<th></th>
<th>Untreated</th>
<th>28</th>
<th>21</th>
<th>14</th>
<th>28</th>
<th>21</th>
<th>14</th>
<th>7</th>
<th>14</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>28</th>
<th>21</th>
<th>14</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSD</td>
<td>35 DAE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td></td>
<td>1.83</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>1.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Progressive / Regressive
Dry Weight - Georgia 2009 & 2010

<table>
<thead>
<tr>
<th>Treatment</th>
<th>0</th>
<th>0</th>
<th>7</th>
<th>7</th>
<th>14</th>
<th>14</th>
<th>14</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>10.93</td>
<td>17.78</td>
<td>13.37</td>
<td>15.42</td>
<td>21.41</td>
<td>31.01</td>
<td>33.36</td>
<td>37.55</td>
</tr>
<tr>
<td>Temik</td>
<td>40.15</td>
<td>49.79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temik + Orthene</td>
<td>32.42</td>
<td>30.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Progressive / Regressive Yield - Georgia 2009 & 2010

LSD (0.05) 341
LSD (0.10) 282

Lint (lbs/acre)

1700
1600
1500
1400
1300
1200
1100
1000

Untreated
28
21
14
14
21
21
28
28

7
0
7
0
7
0
7
0

Temik
14
14
21
14
21
21
28

Temik+Orthene
1578
1556.5
1559.5
1621
1615
1615
1652.5
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)
# PRE x Thrips (Mean-AL, GA, SC, and VA 2013)

**Thrips Damage Rating**

<table>
<thead>
<tr>
<th></th>
<th>Thrips Damage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>3.61</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>2.59</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>1.89</td>
</tr>
<tr>
<td>Untreated</td>
<td>3.67</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>3.02</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>2.23</td>
</tr>
<tr>
<td>Untreated</td>
<td>4.06</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>3.44</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>2.89</td>
</tr>
</tbody>
</table>

- **No PRE**
- **PRE (1X)**
- **PRE (2X)**
PRE x Thrips (Virginia 2013)
Lint Yield per Acre

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No PRE</th>
<th>PRE (1X)</th>
<th>PRE (2X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>1297</td>
<td>1174</td>
<td>884</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>1639</td>
<td>1327</td>
<td>1145</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>1666</td>
<td>1366</td>
<td>1138</td>
</tr>
</tbody>
</table>
PRE x Thrips (Alabama 2013)
Lint Yield per Acre

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No PRE</th>
<th>PRE (1X)</th>
<th>PRE (2X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>1186</td>
<td>1225</td>
<td>875</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>1321</td>
<td>1309</td>
<td>1074</td>
</tr>
<tr>
<td>Seed Trt. + acephate</td>
<td>1416</td>
<td>1302</td>
<td>1410</td>
</tr>
<tr>
<td>(1-leaf)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Yield (Lint/acre)

- Untreated
- Seed Trt.
- Seed Trt. + acephate (1-leaf)

No PRE
PRE (1X)
PRE (2X)

1445
1706
1744
1414
1621
1685
1238
1493
1602

2000
1800
1600
1400
1200
1000
800
600
400
200
0
PRE x Thrips (Georgia 2014)
Percent Injury--Culpepper May 21

Planted May 7, 2014

Untreated Seed Trt. Seed Trt. + acephate (1-leaf)

Percent Injury:
- No PRE: 26%
- PRE (1X): 18%
- PRE (2X): 17%
- Untreated: 53%

Seed Trt. + acephate (1-leaf)
- No PRE: 39%
- PRE (1X): 45%
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

- Untreated
- Seed Trt.
- Seed Trt. + acephate (1-leaf)

No PRE

PRE (1X)

PRE (2X)
Planted May 7, 2014

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

No PRE | PRE (1X) | PRE (2X)
PRE x Thrips (Georgia 2014)
Percent Vigor-Roberts June 11

Planted May 7, 2014

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No PRE</th>
<th>PRE (1X)</th>
<th>PRE (2X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>73</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>90</td>
<td>70</td>
<td>21</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>100</td>
<td>88</td>
<td>65</td>
</tr>
</tbody>
</table>
PRE x Thrips (Georgia 2014)
Percent Vigor-Roberts June 11

Planted May 7, 2014
Planted May 7, 2014

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

Ratings > 3 are unacceptable

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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Lint Yield</th>
<th>Prob(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>1,447</td>
<td>0.0001</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>1,597</td>
<td>0.0001</td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>1,621</td>
<td>0.0001</td>
</tr>
<tr>
<td>Untreated</td>
<td>1,174</td>
<td>0.0342</td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>1,375</td>
<td></td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>1,769</td>
<td></td>
</tr>
<tr>
<td>Untreated</td>
<td>813</td>
<td></td>
</tr>
<tr>
<td>Seed Trt.</td>
<td>888</td>
<td></td>
</tr>
<tr>
<td>Seed Trt. + acephate (1-leaf)</td>
<td>1,377</td>
<td></td>
</tr>
</tbody>
</table>

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

- Untreated Seed
- Neonic Seed Treatment
- NST+Foliar

Low-Risk:
- N=7
- Late Planted and/or Reduced Tillage
- Prob (t)=n.s.

High-Risk:
- N=10
- Early Planted Conventional Tillage
- Prob (t)=0.01
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)

<table>
<thead>
<tr>
<th>May 6, 2009</th>
<th>Emergence Date</th>
<th>May 17, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 DAE (4.85/plant)</td>
<td><strong>Adult (max.)</strong></td>
<td>3 DAE (5.95/plant)</td>
</tr>
<tr>
<td>9 DAE, &lt;1 leaf</td>
<td><strong>Immatures (max.)</strong></td>
<td>10 DAE, 2 leaf</td>
</tr>
<tr>
<td>(14.5/plant)</td>
<td></td>
<td>(19.85/plant)</td>
</tr>
</tbody>
</table>
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