Thrips Control in Cotton

... and Closely Related Stuff

Scott Stewart
The University of Tennessee
THRIPS

Tobacco thrips, eastern flower thrips, western flower thrips, onion thrips, soybean thrips, etc.

- Adult and larval stages
- Leaf deformity, stunting, maturity delay, plant death, and yield loss
- Consistently among the top 3 pests in the Mid-South Cotton
TOBACCO THRIPs

Beltwide survey of species composition in cotton during 2009 and 2010

- Stewart et al. 2014 (J. Cotton Science)
- Based on adults

In the Mid South and Southeast (15 locations):
- 2009 = 81.0% tobacco thrips
- 2010 = 81.8% tobacco thrips

Over 90% in Mississippi were tobacco thrips
THRIPs INJURY

0.2

1.0

2.3

3.0

4.1  Almost certain yield loss

4.6  Major yield loss
CURRENT THRIPS CONTROL OPTIONS

- Imidacloprid at 0.375 mg ai/seed*
  - Gaucho, Aeris, Acceleron IF
- Imidacloprid in-furrow (e.g., Admire Pro)
- Aldicarb (AgLogic15G at 3.5-5 lb/acre)
- Acephate in-furrow or seed treatment
- Recommended foliar applied insecticides
  - Acephate (Orthene), Bidrin, Dimethoate, Radiant
  - Typically not used as stand alone approach

* Base seed treatments and rates vary by company, and some already include imidacloprid. For example, FiberMax and Stoneville varieties have a base treatment that includes imidacloprid at 0.135 mg ai/seed (36%).
SOME HISTORY

Gaucho and Cruiser insecticide seed treatments were quickly adopted in the Mid South after their introduction in 1996

- Largely replaced Temik (aldicarb)
  - Aldicarb provides a greater reduction in thrips numbers, but imidacloprid and thiamethoxam seed treatments typically provided a similar level of yield protection
- Easier and safer to use
- Nearly 100% use in cotton for many years
- Effective but not perfect
  - Resistance
  - Real or perceived effects on bees
LINT YIELD INCREASE ABOVE UNTREATED COTTON
AVERAGED OF 22 TRIALS FROM 1998-2007, TN (STEWART) AND AR (LORENZ)

The difference between imidacloprid and thiamethoxam was < 10 lbs
YIELD INCREASE FROM A NEONICOTINOID IST
J. NORTH, REPLICATED TRIALS FROM AR, LA, MS, AND TN (2007-2014)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average Increase</th>
<th>Number of Trials</th>
<th>≈ Net Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton *</td>
<td>107 Lb Lint/Acre</td>
<td>67</td>
<td>$70/Acre</td>
</tr>
<tr>
<td>Corn *</td>
<td>11.8 Bushels/Acre</td>
<td>91</td>
<td>$45/Acre</td>
</tr>
<tr>
<td>Soybean *</td>
<td>2.0 Bushels/Acre</td>
<td>170</td>
<td>$10/Acre</td>
</tr>
</tbody>
</table>

THRIPS CONTROL DEMONSTRATION (TN, 2011) AVERAGES DON’T TELL THE WHOLE STORY

Untreated + Foliar                 Untreated
Gaucho + Foliar                   Gaucho
Stunting, maturity delay, and some plant death
Cruiser + Foliar                  Untreated
Catastrophic yield loss
Sprayed at second leaf with Acephate 90S (0.25 lb/a), and plots with untreated seed were sprayed again at 4<sup>th</sup> leaf.
Beginning about 2011, complaints about the performance of insecticide seed treatments began to increase (and especially with Cruiser).

- Resistance of tobacco thrips to neonicotinoids was subsequently confirmed.
  - Thiamethoxam is no longer marketed for use in cotton.
  - However, imidaclloprid continues to provide adequate protection in most cases.

There are other things that can, have, and will be confused with thrips injury (and may compound the impact of thrips).
RESISTANCE TO THIAMETHOXAM

TN, 2011

Stoneville (Aeris)  Phytogen (Cruiser)
THRIPS INJURY (0 - 5), 24 DAP, 18 DAE  
CORY VINEYARD, MS STUDENT, THE UNIVERSITY OF TENNESSEE, 2013-2014

Thrips Treatment (P < 0.0001)

Pre-emerge Herbicide (P < 0.01)

P(I x H Interaction) = 0.6366
STRESS ON STRESS (DOUBLE WHAMMY)

PHY375 WRF / Cruiser
Roundup WM (24 oz) +
Dual Magnum (16 oz)

PHY375 WRF / Cruiser
Roundup WM (24 oz) +
Dual Magnum (16 oz) +
Liberty (32 oz)
COTTON LEAFROLL DWARF VIRUS …

CAUSING THRIPS- OR HERBICIDE-LIKE INJURY
Still, imidacloprid seed treatments are working OK (e.g., 2018)
THRIPS INFESTATION PREDICTOR FOR COTTON

http://climate.ncsu.edu/CottonTIP

A light year for thrips

2019
REGIONAL INSECTICIDE SEED TREATMENT TEST, 2019

Relative Injury (7 Locations, P = 0.0018)  Relative Yield (6 Locations P = 0.1422)

Check  Orthene IF (1 Lb)  Orthene IST (6.4)  AgLogic (4 Lb)  Admire Pro (9.2 oz)  Gaucho  Gaucho + Orthene IST  Gaucho + Orthene IF  Aeris

A  B  BC  BC  BC  CB  CB  BC  C

1,539 LB
THRIPS – SEED TREATMENT & IN-FURROW
2019, JACKSON, TN

Thrips Injury (0 - 5)

Furrow
- Admire Pro IF (9.2 oz)
- Orthene IF (1 lb)
- Gaucho + Orthene IF (1 lb)
- AgLogic (4 lb)
- Aeris

Seed
- Gaucho
- Gaucho + Orthene 97 (6.4 oz)
- Orthene 97 (6.4 oz)
- Untreated

Legend:
- a
- b
- c
- d
## FOLIAR THRIPS TESTS
(TENNESSEE, 2017)

### TEST 1

<table>
<thead>
<tr>
<th>Treatment (oz/acre)</th>
<th>No. Thrips (3 DAT)</th>
<th>No. Thrips (7 DAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>11.3 ab</td>
<td>18.5 a</td>
</tr>
<tr>
<td>Radiant (1.5)</td>
<td>5.8 b</td>
<td>6.8 a</td>
</tr>
<tr>
<td>Intrepid Edge (3)</td>
<td>9.0 ab</td>
<td>10.0 a</td>
</tr>
<tr>
<td>Acephate 90S (3.2)</td>
<td>15.3 a</td>
<td>16.0 a</td>
</tr>
</tbody>
</table>

### TEST 2

<table>
<thead>
<tr>
<th>Treatment (oz/acre)</th>
<th>No. Thrips (2 DAT)</th>
<th>No. Thrips (5 DAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>94.5 a</td>
<td>31.3 a</td>
</tr>
<tr>
<td>Radiant (1.5)</td>
<td>22.3 c</td>
<td>6.3 c</td>
</tr>
<tr>
<td>Intrepid Edge (3)</td>
<td>21.8 c</td>
<td>6.5 c</td>
</tr>
<tr>
<td>Acephate 90S (3.2)</td>
<td>52.5 b</td>
<td>20.8 b</td>
</tr>
</tbody>
</table>
REGIONAL FOLIAR THRIPS TRIAL, 2019
JEFF GORE, MISSISSIPPI STATE UNIVERSITY

Number of Immature Thrips (after 1st application)

- Check
- Intrepid Edge (3)
- Orthene 97S (3.4)
- Bidrin (3.2)
- Dimethoate (6.4)
- Radiant (1.5 + Adj)
- Karate Z (1.28)
- Vydate (8.5)
Tobacco Thrips Acephate Resistance

24-Hour Leaf-Dip Bioassays (2018, 2019)

% Mortality - 0.25 lb ai/acre of Orthene 97

Orthene
Check
Radiant 0.75 Oz/A
THRIPS ACEPHATE RESISTANCE BIOASSAYS
DOSE RESPONSE OF THREE POPULATIONS IN TENNESSEE, 2019

Acephate (Expected Mortality from Probit Analysis)

% Mortality

Dose (LB AI/A)

0 0.25 0.5 0.75 1 1.25 1.5 1.75 2

0 20 40 60 80 100

Jackson  Milan  Milan Selected

* Significant fit to probit model

Significant fit to probit model

*
THRIPS - PERFORMANCE OF FOLIAR APPLICATIONS OF ACEPHATE AND SPINETORAM (RADIANT OR INTREPID EDGE) IN TENNESSEE 2005 - 2019

% Control With Acephate (0.18-0.24 Lb/A)

% Control With Spinetoram (0.012 Lb/A)
THRIPS - PERFORMANCE OF FOLIAR APPLICATIONS OF ACEPHATE AND SPINETORAM IN TENNESSEE

% Control of Thrips Over Time

Orthene (0.18-0.24 lb ai/a)  Radiant or Intrepid Edge (0.012 lb ai/a)

Slope = 0.55%
P = 0.7555, R² = 0.01

Slope = -5.1%
P < 0.0001, R² = 0.40
IS OUR FUTURE THE BT THRIPS/LYGUS TRAIT?

SCOTT GRAHAM, PHD STUDENT, UNIVERSITY OF TENNESSEE

Averaged over 2 years and 2 locations
BT LYGUS/THRIPS VARIETY TRIAL (2019, JACKSON, TN)

Thrips Injury (0-5 Scale)

Imidacloprid Seed Treatment

Bt Thrips/Lygus Trait + Imidacloprid Seed Treatment
BT THRIPS / LYGUS TRAIT

Non-Bt Cotton

Bt Thrips Trait
MY SUGGESTIONS FOR COTTON IN 2020

Use AgLogic (3.5 – 5 Lb/Acre)
- Particularly in areas with reniform or root knot nematode

Or an imidacloprid-based seed treatment
- Consider add-on components like thiodicarb (Aeris), Avermectin, or Acephate
  - How much acephate will help will vary across the region

If using a seed treatment, use the thrips forecast model to judge the need for a foliar insecticide application
- If needed, make this application during the 1-2 leaf stage
- More than one application is rarely justified (even when you think it is)
QUESTIONS

Thanks to my support staff, graduate students, colleagues, Cotton Incorporated and our industry partners for their support of this research.