Tarnished Plant Bug Threshold Developments in Cotton

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Midsouth TPB Sprays & Losses
AR, LA, MS, MO, TN

Compiled from Cotton Insect Losses (http://www.msstate.edu/Entomology/resources/Cotton/Cotton.html)
Relationship between # TPB sprays and yield in Midsouth (1990-2007)

\[ R^2 = 0.7208 \]

Lint Yield (lb/ac)

# TPB applications

Compiled from Cotton Insect Losses (http://www.msstate.edu/Entomology/resources/Cotton/Cotton.html)
Relationship between # TPB sprays and yield in Midsouth 1990-2000 (red), 2001-2007 (blue)

Compiled from Cotton Insect Losses (http://www.entomology.msstate.edu/resources/tips/cotton-losses/data/)

R² = 0.7208
Pre-Bloom TPB Thresholds

**Trial Treatments**

– **Auto:** Automatic insecticide application at pinhead square and 7 and 14 days later

– **Low:** Threshold of 8 PB / 100 sweeps or square retention below 80%

– **High:** Threshold of 16 PB / 100 sweeps or square retention below 60%

– **UTC:** No insecticide prior to first bloom

Plots at least 24 rows wide and 100 ft long

Conducted in 29 locations throughout the Midsouth from 2006-2008
Pre-bloom TPB Thresholds
LA, 2006

Early Season TPB Thresholds

Lint (lb/acre)

Weekly

8 TPB

Untreated

# of Sprays

Yield

Number of Sprays

LA, 2006
Pre-bloom TPB Thresholds
AR, 2007

Early Season TPB Thresholds

Lint (lb/acre)

Number of Sprays

8 TPB

16 TPB

Untreated

Yield

# of Sprays

Pre-bloom TPB Thresholds

AR, 2007
Pre-bloom TPB Thresholds
MS, 2007

Wk 1 = 36/100 sweeps
Wk 2 = 37/100 sweeps
Wk 3 = 50/100 sweeps
Wk 3.5 = 17/100 sweeps

Wk 1 = 30/100 sweeps
Wk 2 = 33/100 sweeps
Wk 3 = 46/100 sweeps
Wk 3.5 = 20/100 sweeps

Wk 1 = 29/100 sweeps
Wk 2 = 33/100 sweeps
Wk 3 = 53/100 sweeps
Wk 3.5 = 48/100 sweeps
Pre-bloom TPB Thresholds
MS, 2007

% square retention

<table>
<thead>
<tr>
<th>Weekly</th>
<th>Threshold</th>
<th>Untreated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Week 2</td>
<td>Week 3</td>
</tr>
<tr>
<td>68</td>
<td>65.5</td>
<td>58.8</td>
</tr>
<tr>
<td>68.75</td>
<td>58.5</td>
<td>37.75</td>
</tr>
<tr>
<td>70</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

Weekly Threshold Untreated
Week 1 Week 2 Week 3 Week 4
Percent Square Retention
Lauderdale, TN 2008

All plots oversprayed 7/21/08 with 6 oz. Bidrin

Yield (lb/ac)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1691</td>
<td>a</td>
<td>1584</td>
<td>a</td>
<td>1439</td>
</tr>
<tr>
<td>1287</td>
<td>b</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Pre-bloom TPB Thresholds
Sites exceeding low threshold
(2 in 2006, 7 in 2007, 5 in 2008)
Pre-bloom Sites with few TPB
(7 in 2006, 6 in 2007, 2 in 2008)
Pre-Bloom TPB Threshold Summary

• When TPB > threshold (8 TPB/100 sweeps OR square retention < 80%)
  – Insecticide applications needed to preserve yield
  – Weekly applications not adequate under severe pressure

• When TPB < threshold
  – Weekly insecticide applications tend to reduce yield slightly
TPB Thresholds - Mid Season

**Trial Treatments**

- **Weekly:** Insecticide application every 7 days from first bloom to cutout
- **Low:** Threshold of 1 PB / 5 row ft.
- **Med:** Threshold of 3 PB / 5 row ft.
- **High:** Threshold of 5 PB / 5 row ft.
- **VHigh:** Threshold of 10 PB / 5 row ft.

- All applications made using acephate or Bidrin
- 8 locations in 2006, 13 locations in 2007
Mid-Season TPB Thresholds
Macon Ridge, LA, 2007

Drop Cloth Thresholds

- Automatic
- Low-1/5ft
- Med-3/5ft
- High-5/5ft
- Very High 10/5ft

Lint (lb/acre)

Number of Sprays

0
1
2
3
4
5
6
7

Yield

# of Sprays

1,2,3,4,5,6
2,3,4,5
4,5
5

a
ab
bc
cd
d
Mid-Season TPB Thresholds
MS, 2006

Drop Cloth Thresholds

<table>
<thead>
<tr>
<th>Lint (lb/acre)</th>
<th>Number of Sprays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic</td>
<td>1,2,3,4,5,6</td>
</tr>
<tr>
<td>Low-1/5ft</td>
<td>1,2,3,5,6</td>
</tr>
<tr>
<td>Med-3/5ft</td>
<td>1,3,6</td>
</tr>
<tr>
<td>High-5/5ft</td>
<td>2,4,5</td>
</tr>
<tr>
<td>Very High 10/5ft</td>
<td>2,4,5</td>
</tr>
</tbody>
</table>

Yield

# of Sprays
Mid-Season TPB Thresholds
Lee Co. AR, 2006

Drop Cloth Thresholds

Lint (lb/acre)

Number of Sprays

- Automatic
- Low-1/5ft
- Med-3/5ft
- High-5/5ft
- Very High 10/5ft

Yield

# of Sprays

1,2,3,4,5

a

a

a

a

a
Mid-Season TPB
Actual Threshold

$R^2 = 0.1299$

% of auto yield vs. Threshold/5 ft

$R^2 = 0.1299$
Alternate Threshold Measurements

![Graph showing TPB per drop cloth over weeks 1 to 6.](image)
**Alternate Threshold Measurements**

- Highest threshold still sprayed the same
  - Set to pre-determined threshold if never sprayed
Alternate Threshold Measurements

- Highest threshold still sprayed the same
  - Set to pre-determined threshold if never sprayed
- Lowest threshold still sprayed the same
  - Set to just below highest density sprayed if always sprayed
Mid-Season TPB
Maximum Thresholds

$R^2 = 0.0891$

% of auto yield

Maximum Threshold / 5 ft
Mid-Season TPB Minimum Thresholds

\[ R^2 = 0.1843 \]

% of auto yield vs. Minimum Threshold / 5 ft

- 60%
- 70%
- 80%
- 90%
- 100%
- 110%
- 120%
- 130%

- Minimum Threshold / 5 ft
- 0 1 2 3 4 5 6 7 8 9
TPB Yield Impacts

Yield change for each increase in the TPB spray threshold

<table>
<thead>
<tr>
<th></th>
<th>Lint loss (lb/ac)</th>
<th>Lint Loss (% yield)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Min. Threshold</td>
<td>Max. Threshold</td>
</tr>
<tr>
<td>2006</td>
<td>-19.5*</td>
<td>-11.6</td>
</tr>
<tr>
<td>2007</td>
<td>-21.3*</td>
<td>-11.5*</td>
</tr>
<tr>
<td>Overall</td>
<td>-20.9*</td>
<td>-11.6*</td>
</tr>
</tbody>
</table>

* P<0.05

Lint yield ranged from 630 to 1514 lb/ac in automatic treatment
Mid-Season TPB Insecticide Applications

![Graph showing the number of insecticide applications vs. TPB threshold/drop cloth for 2006 and 2007.]
Mid-Season TPB Insecticide Applications

![Graph showing TPB Insecticide Applications](image_url)
Mid-Season TPB Costs

Current Economics

insecticide = $12/application
## Mid-Season TPB Costs

### Current Economics

- Insecticide = $12/application, lint = $0.65/lb

<table>
<thead>
<tr>
<th>Insecticide Cost</th>
<th>Max. Yield Loss</th>
<th>Min. Yield Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$80</td>
<td></td>
<td></td>
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<tr>
<td>$100</td>
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</tbody>
</table>

### Graph Description

- **Y-axis:** $/acre
- **X-axis:** TPB threshold (/ 5 row ft)
- **Lines:**
  - **Black Line:** Insecticide Cost
  - **Turquoise Line:** Max. Yield Loss
  - **Orange Line:** Min. Yield Loss
Mid-Season Total TPB Cost
Current Economics

insecticide = $12/application, lint = $0.65/lb
Mid-Season Total TPB Cost
Higher Input Costs

insecticide = $16/application, lint = $0.65/lb

[Graph showing the total TPB cost per 5 row ft as a function of TPB cost per acre, with points marked at $40, $60, $80, $100, $120, and $140.]
Mid-Season Total TPB Cost
Higher Cotton Price

insecticide = $12/application, lint = $0.85/lb

TPB per 5 row ft

$ / acre

$0.8

2.1

$40

$60

$80

$100

$120

$140

0 1 2 3 4 5 6 7

TPB per 5 row ft
Bloom Threshold Conclusions

- Lose between 12 and 20 lb lint/ac for each increase in threshold of 1 TPB/drop cloth
- Number of applications per season altered greatly by changing the threshold
- Threshold of 1.5-2.5 TPB per drop cloth (5 row ft) economically justified in 2006 and 2007
- Insecticide costs do NOT include indirect costs of insecticides
- Threshold affected by scouting frequency and insecticide efficacy
Acknowledgements

Cooperating Growers

COTTON INCORPORATED

Extension

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University of Missouri