Recent Advances in Lygus Management

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Lygus hesperus Nymphs
Lygus Reduce Fruiting Sites

Untreated

Treated
Note height difference
Insecticide Use in AZ Cotton

- Selective technologies have helped to stabilize & reduce usage overall (i.e., Bt cotton & whitefly IGRs in 1996)
- However, current usage reflects the importance of Lygus

- Whitefly
- Pink bollworm
- Lygus bugs
- Other

$113 (ave. cost / A)
Major Threat to Cotton Production in AZ

• Over the last 5 years…

• 45% of all insecticide sprays have been targeted at Lygus

• 41% of the entire insecticide budget has been invested against Lygus

• 66% of the yield loss has been attributed to Lygus
Studies Identified Effective Compounds

(5-fold increase in yield)

<table>
<thead>
<tr>
<th>Compound</th>
<th>Lint (bales/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthene 90S</td>
<td>a</td>
</tr>
<tr>
<td>Orthene 97</td>
<td>a</td>
</tr>
<tr>
<td>Vydate CLV</td>
<td>abc</td>
</tr>
<tr>
<td>Regent</td>
<td>bc</td>
</tr>
<tr>
<td>Program (3X)</td>
<td>c</td>
</tr>
<tr>
<td>Must &amp; Thio</td>
<td>d</td>
</tr>
<tr>
<td>Lann &amp; Thio</td>
<td>d</td>
</tr>
<tr>
<td>Thiodan 3E</td>
<td>d</td>
</tr>
<tr>
<td>Legend</td>
<td>de</td>
</tr>
<tr>
<td>UTC</td>
<td>f</td>
</tr>
</tbody>
</table>

Legend:
- Thiodan 3E
- Lann & Thio
- Must & Thio
- Program (3X)
- Regent
- Vydate CLV
- Orthene 97
- Orthene 90S

5-fold Increase in Yields (98F4W)
> 10-fold Increase in Yields (02F4L)

Yield in bales per acre

Control (0.11 bales)

Orthene (1.28 bales)
Yield & Revenue : Density

- Maximum Yield @ 1.7 nymphs / 100
- Maximum Revenue @ 5.2 nymphs / 100
- Recommendation: 4 nymphs with at least 15 total Lygus per 100 sweeps (‘15:4’)

\[ R^2 = 0.86 \]
Sampling & Thresholds

13 Adults + 4 Nymphs (17:4) is over ‘15:4’ Spray
Recent Questions in Lygus Management

- When should managers **discontinue** any further Lygus chemical controls in cotton?
  - Late season populations can far exceed thresholds
  - Square (bud) populations decline as crop cuts-out

- Can we estimate & characterize inter-crop effects of Lygus spatially?
  - Severe and negative interactions among forage hay (alfalfa), seed alfalfa, and cotton producers in 1999-2000
Timing Late Season Controls
(when should you stop spraying?)

<table>
<thead>
<tr>
<th>Lygus Termination (LT)</th>
<th>Spray Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5-Aug</td>
</tr>
<tr>
<td></td>
<td>16-Aug</td>
</tr>
<tr>
<td></td>
<td>23-Aug</td>
</tr>
<tr>
<td></td>
<td>6-Sep</td>
</tr>
<tr>
<td></td>
<td>20-Sep</td>
</tr>
<tr>
<td>LT4</td>
<td>✓</td>
</tr>
<tr>
<td>LT3</td>
<td>✓</td>
</tr>
<tr>
<td>LT2</td>
<td>✓</td>
</tr>
<tr>
<td>LT1</td>
<td>✓</td>
</tr>
</tbody>
</table>

c.o. = cut-out or nodes above white flower = 5
Lygus Counts > Cut-out

Lygus Chemical Termination Timing (LT)

02.F4LT

Ellsworth/UA
Large Yield Difference

LT1 << LT2

Lygus Chemical Termination X Variety

Ellsworth/UA
Control of Nymphs is Key!

Nymph reductions related to yield gains in LT2
Initiated in 2000 in response to extreme and negative interactions among producers of different crops

- Communication / Awareness
- Education
- Systematic Survey / Research
Spatial Study

- Two townships, spring & early summer hosts (April - July)
- Cotton, alfalfa, seed alfalfa, fallow, weeds, and small grains; georeferenced
- Sweeps (15 in. diam.) from each potential host weekly
- Examine source / sink relationships among crops
Focal Cotton Fields (50)

- Focal cotton field
- Seed alfalfa
- Forage alfalfa
- Cotton
- Fallow

Distance: 0.75 km

Ellsworth/UA
Ring Analyses of Area & Distance Effects on Lygus

- Around focal cotton fields, estimate area of different crops within each 0.75 km concentric ring
  - Area of unidentified & unknown crops similar for each ring (ca. 21%)
- Each crop’s area within a ring is multiplied by the mean density of Lygus; Estimate of source potential
- Estimate the association between Lygus density in focal fields and the source potential of each crop type
## Mean Lygus Density (adults & nymphs)

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>N</th>
<th>Lygus Density (log D + 1)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed Alfalfa</td>
<td>9</td>
<td>1.50a</td>
</tr>
<tr>
<td>Forage Alfalfa</td>
<td>34</td>
<td>1.45a</td>
</tr>
<tr>
<td>Fallow</td>
<td>3</td>
<td>1.44a</td>
</tr>
<tr>
<td>Cotton</td>
<td>72</td>
<td>0.69b</td>
</tr>
</tbody>
</table>

* Values fb same letter not significantly different (P > 0.05)
## Source: Sink Effects

<table>
<thead>
<tr>
<th>Ring</th>
<th>Crop Type</th>
<th>Coefficient from Multiple Regression $(x \times 10^{-6})^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0.75 km</td>
<td>Seed Alfalfa</td>
<td>1.1**</td>
</tr>
<tr>
<td></td>
<td>Forage Alfalfa</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Fallow</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Cotton</td>
<td>-0.58*</td>
</tr>
<tr>
<td>2) 0.75 - 1.5 km</td>
<td>Seed Alfalfa</td>
<td>0.7*</td>
</tr>
<tr>
<td></td>
<td>Forage Alfalfa</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Fallow</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Cotton</td>
<td>0.1</td>
</tr>
</tbody>
</table>

No significant associations in rings 3 & 4; * $P = 0.06$; ** $P < 0.001$
Lygus Associations

- Seed alfalfa fields are sources of Lygus for cotton fields. This effect does not extend beyond 1.5 km.

- Cotton fields are sinks for Lygus. This effect disappears beyond 0.75 km.

- Strategic placement of crops could help alleviate Lygus problems.
Strategic Planting

Sensitive host

Non host

Source

1.5 km
Acknowledgments

• Virginia Barkley who supervised and others (7) who conducted the sampling
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• ACGA and Cotton Incorporated who supported (pce) the Lygus termination studies
Information

• All University of Arizona crop production & crop protection information is available on our web site,

• **Arizona Crop Information Site (ACIS)**, at

• [http://ag.arizona.edu/crops](http://ag.arizona.edu/crops)