Management of Late-Season Infestations of Cotton Aphids and Sweetpotato Whiteflies (Strain B) in Pima Cotton in the San Joaquin Valley

Larry D. Godfrey, Univ. of California Davis
Treanna Pierce, UC Davis Entomology
Surendra K. Dara, UC Cooperative Extension - Santa Barbara Co.
caused significant crop losses in Imperial Valley and southern CA in late 80’s & early 90’s

found to be a new biotype of sweetpotato whitefly – strain B (also called a new species but now that is thought to be incorrect)

first found in San Joaquin Valley in July 1992

in 1993, populations of this pest were found in cotton fields in late July and densities reached moderate levels in Sept.

in 1994, whitefly populations occurred about 3 weeks earlier than in 1993 and infested cotton fields in June and built to fairly high densities in some fields

greenhouse whitefly and original sweetpotato whitefly occasional cotton pests previously
generalized host plant sequence in the southern SJV was melons, acala cotton, pima cotton, fall melons, weeds, carrots, lettuce, cole crops, alfalfa, and citrus
Whitefly Timeline

- significant problem in some areas – near cities, southern and eastern side of SJV
- overwintered in cities on ornamental plants
- PCAs learned to deal with whiteflies in these areas – a fairly spotty problem
most of our WF recommendations came from Arizona research
  - WF started in AZ in the 1980’s
  - a more widespread and general problem there
- we developed some brochures, held meetings, put information in PMGs, and conducted some adaptive research
**Whitefly Management**

<table>
<thead>
<tr>
<th>Species identification is critical</th>
<th>Practice areawide management when possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain good sanitation in winter/spring host crops</td>
<td>Cotton production-strive for as short of season as possible</td>
</tr>
<tr>
<td>Utilize smooth-leaf cotton varieties as much as possible</td>
<td>Follow appropriate sampling and thresholds</td>
</tr>
<tr>
<td>Utilize insecticides appropriate for the whitefly density and time of season</td>
<td>Follow resistance management programs</td>
</tr>
</tbody>
</table>
from late 1990’s to present - mid-season to late-season cotton aphid was the greater, more general problem than WF
we conducted considerable research on cotton aphids
Cotton Aphid Studies

- Aphid biology/morphs - Rosenheim
- Effectiveness of natural enemies - Rosenheim
- Comparison of susceptibility of cotton varieties - Godfrey
- Thresholds on cotton
  - pre-squaring - Rosenheim
  - squaring to boll filling - Godfrey
  - after boll opening - Godfrey
- Insecticide efficacy - Godfrey, Farm Advisors
- Insecticide resistance - Godfrey, Grafton-Cardwell
Cotton Aphid Studies

- Influence of aphid injury on cotton plant physiology - Godfrey
- Extending results to users - Goodell, Godfrey, Farm Advisors
- Factors influencing insecticide susceptibility - Godfrey
- Influence of cultural factors on aphid populations - Godfrey
- Effects of nitrogen on population dynamics - Godfrey, Hutmacher
- Influence of broad-spectrum insecticides on aphid populations - Godfrey
- Expanding the complex of biocontrol agents – CDFA, USDA, Godfrey
- Cotton aphid seasonal life history - Godfrey
Whitefly and Aphid

- the key period of concern for both pests is late-season
  - importance of lint quality
  - absence of precipitation
  - warm fall period
  - production of Pima cotton
- large cotton canopy
- reliance on aerial application making deposition difficult
Whitefly Active Chemistries

Insecticide Use – WF materials
Aphid Active Chemistries

Insecticide Use – Cotton Aphid materials

![Graph showing the use of Acetamiprid and Chlorpyrifos in acres treated from 1997 to 2013.](image-url)
Whitefly Issues in Cotton – 2013-14

- populations developed early - July
- populations occurred in areas where WF are not commonly seen
- populations continued to develop instead of level off in cotton
- insecticides not working as well?
- cotton aphid populations also developed in some areas
Whitefly Issues in Cotton – 2013-14

One additional generation?
Assail - 0.07
Oberon - 0.2
Novaluron - 0.04
Knack - 0.043
Courier - 0.27
Danitol + Orthene - 0.16 + 0.43
Centric - 0.04
Capture + Endosulfan - 0.08 + 0.9
Warrior - 0.03

% Whitefly Nymph Control

Product – Rate (lbs. AI/A)

Whitefly Issues in Cotton
Aphid and Whitefly Management – 2013-14

Issues

Loss of chemistries - regulatory
- OP insecticides
- Endosulfan
- Neonics – Belay
- Chlorpyrifos – Lorsban
  - process underway in California to alter use
  - VOC issues

Loss of efficacy
- Neonics
  - not as active on cotton aphid as previous

Late-season management
- challenging

New active ingredients nearing registration
Aphid and Whitefly Management - 2013

Procedures:
Location: Univ. of Calif. West Side Research and Extension Ctr.,
Plot size: 5 rows by ~ 50’ long, 4 blocks
Application parameters: 20 gallons per acre, 5 nozzles per row
Sampling:
• Aug. 15 to Sept. 23
• WF nymphs and adults and cotton aphid populations were quantified from 5th mainstem node leaves
• 10 leaves were sampled on each date in each plot
• Yield data collected
• Stickiness data collected from hand-harvested and picker-harvested lint
• Used Lintronics FCT (Fiber Contaminant Tester) from SJV Quality Cotton Growers Association
Aphid and Whitefly Management – 2013

Untreated Plots – Cotton Aphids
Untreated Plots – Whitefly Nymphs
Aphid and Whitefly Management – 2013

Untreated Plots – Whitefly Adults

![Graph showing whitefly adult population per leaf over time](image-url)
# Aphid and Whitefly Management - 2013

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (Product/A)</th>
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<tbody>
<tr>
<td>Lorsban Advanced</td>
<td>32 fl. oz.</td>
</tr>
<tr>
<td>Carbine 50DF</td>
<td>1.7 oz.</td>
</tr>
<tr>
<td>Untreated</td>
<td>---</td>
</tr>
<tr>
<td>Assail 70WP + Bifenture 10DF + Abamectin 0.15EC</td>
<td>2.3 oz. + 16 oz. + 16 fl. oz.</td>
</tr>
<tr>
<td>Assail 70WP + Lambda-Cy 1EC + Abamectin 0.15EC</td>
<td>2.3 oz. + 5.12 fl. oz. + 16 fl. oz.</td>
</tr>
<tr>
<td>WF1</td>
<td>6.84 fl. oz.</td>
</tr>
<tr>
<td>WF2</td>
<td>6.84 fl. oz.</td>
</tr>
<tr>
<td>Transform WG</td>
<td>0.75 oz.</td>
</tr>
<tr>
<td>Transform WG</td>
<td>2.25 oz.</td>
</tr>
<tr>
<td>Knack</td>
<td>10 fl. oz.</td>
</tr>
<tr>
<td>Venom 70SG</td>
<td>3 oz.</td>
</tr>
<tr>
<td>Belay 2.13SC</td>
<td>6 fl. oz.</td>
</tr>
<tr>
<td>Sivanto</td>
<td>10.5 fl. oz.</td>
</tr>
<tr>
<td>Assail 70WP + Abamectin 0.15EC</td>
<td>1.1 oz. + 16 fl. oz.</td>
</tr>
<tr>
<td>Pyrifluquinazon SC</td>
<td>2.4 fl. oz.</td>
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<td>Cyazypyr 10SE</td>
<td>13.5 fl. oz.</td>
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Aphid and Whitefly Management - 2013

Application on 16 Aug.

 vượt mức 150 con Aphids per Leaf
Aphid and Whitefly Management - 2013

Application on 3 Sept.
Aphid and Whitefly Management - 2013

Application on 16 Aug.
Aphid and Whitefly Management - 2013

Application on 3 Sept.
Aphid and Whitefly Management - 2013

Averaged over study period
Aphid and Whitefly Management - 2013

Averaged over study period

WF Nymphs per Leaf

- Assail + Abamectin
- Assail + Bifenture + Abamectin
- Assail + Lambda-Cy+Abamectin
- Belay
- Carbine
- Cyazypyr + MOO
- Knack
- Lorsban Advanced
- Pyrifluimisazon-H
- Pyrifluimisazon-L
- Siwanlo
- Torac
- Transform-H
- Transform-L
- Untreated
- Venom
- WF1
- WF2
Aphid and Whitefly Management - 2013

Lint Yield (lbs./A)
Aphid and Whitefly Management - 2014

**Procedures:**
Location: Shafter Research Station
Plot size: 5 rows by ~ 50’ long, 4 blocks
Application parameters: 30 gallons per acre, 5 nozzles per row
Application dates: Sept. 3 and Sept. 17, 2014

**Sampling:**
- Sept. 3 to Oct. 3
- Continued sampling after plots were oversprayed with harvest aid + an insecticide
- WF nymphs and adults (entire leaf and in sample zone/leaf disk) and cotton aphid populations per leaf were quantified from 5th mainstem node leaves
- 10 leaves were sampled on each date in each plot
- Yield data collected
- Stickiness data collected from hand-harvested and picker-harvested lint (Lintronics FCT)
### Aphid and Whitefly Management - 2014

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<tr>
<td>4. Assail 70WP + Lambda-Cy 1EC</td>
<td>2.3 oz. &amp; 5.12 fl. oz.</td>
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<td>5. Oberon 2SC</td>
<td>16 fl. oz.</td>
</tr>
<tr>
<td>7. Courier SC</td>
<td>12.5 fl. oz.</td>
</tr>
<tr>
<td>8. Transform WG</td>
<td>0.75 oz.</td>
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<tr>
<td>11. Venom 70SG</td>
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<td>13. Assail 70WP</td>
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<td>15. Torac 15EC</td>
<td>14 fl. oz.</td>
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<td>16. Danitol 2.4 EC + Orthene 97</td>
<td>9.0 fl. oz. &amp; 1.0 lb.</td>
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<tr>
<td>17. Lorsban 4EC</td>
<td>32 fl. oz.</td>
</tr>
<tr>
<td>18. Leverage 360</td>
<td>3 fl. oz.</td>
</tr>
</tbody>
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Aphid and Whitefly Management - 2014

Overall Average

Whitefly Nymphs per Leaf

Stickiness Evaluations

2013

- Hand-harvested on 4 October
  - only lint from Assail + Lambda-Cy + Abamectin and Sivanto treatments classified as non-sticky
- Hand-harvested and picker-harvested on 4 and 6 November, respectively
  - lint from all treatments and from both methods classified as sticky
  - “best” lint was ~2.5 and 3.3 times over threshold from hand and picker samples, respectively
Stickiness Evaluations
2014

- Hand-harvested on 10 November
  - only lint from Courier treatment was classified as sticky
  - 0.5” rain on 31 October
- Picker-harvested on 12 November
  - samples not processed yet
Summary

Cotton Aphids
- Several effective registered products – Assail, Carbine, Lorsban 4E (Advanced)
- Other products nearing registration very effective – Pyrifluquinazon, Torac, Transform, Sivanto
- Many of these are not applicable to late-season period; still problematic
- Organic treatments showed promise
  - Metarhizium brunneum + Azagard and Botanigard + Azagard both ~65% effective averaging all sample dates
  - Botanigard + low rate of Sivanto ~98% reduction; better than full rate of Sivanto
Summary
Sweetpotato Whitefly Strain B
- Several effective registered products – Assail (+ Lambda-Cy), Knack, Oberon, Courier, Danitol + Orthene
- Other products nearing registration effective – Pyrifluquinazon, Sivanto
- These reduced whitefly nymph populations by ~65-75%
- “Organic” treatments showed promise
  - Botanigard + low rate of Sivanto ~65% reduction
**Sweetpotato Whitefly Strain B**

- WF threshold of 1 large nymph/disk (use disk between veins) or 3 adults on leaf

### Treatment of Sweetpotato Whitefly

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<tr>
<td>Assail 70WP + Lambda-Cy 1EC</td>
<td>2.3 oz. &amp; 5.12 fl. oz.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oberon 2SC</td>
<td>16 fl. oz.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oberon 2SC + Requiem EC</td>
<td>16 &amp; 32 fl. oz.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Courier SC</td>
<td>12.5 fl. oz.</td>
<td>X</td>
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<td>Leverage 360</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Metarhizium brunneum (MET52) + Azagard</td>
<td>16 &amp; 16 fl. oz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Botanigard ES + Azagard</td>
<td>2 qts. &amp; 16 fl. oz.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Botanigard ES + Sivanto</td>
<td>1 qt. &amp; 10.5 fl. oz.</td>
<td>X</td>
<td></td>
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</table>
Why the Recent Challenges with Whiteflies in Cotton

- Changes in whitefly?
- Increased insecticide tolerance?
- Warmer than average spring-summer
- Influence of shifts in cropping landscape?
- Longer growing season required for Pima cotton
- Dry winters?