Management Whiteflies in Cotton

sampling, insecticides, harvest aids, etc.

Larry Godfrey, Dept. of Entomology and Nematology, UC-Davis
caused significant crop losses in Imperial Valley and southern CA in late 80’s & early 90’s

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

found in SJV 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, silverleaf 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
we conducted considerable research on cotton aphids
most of our WF recommendations came from AZ research
  WFs started in AZ in the 1980’s
  a more widespread and general problem there
we developed some brochures, held meetings, put information in PMGs
- Populations developed early.
- Populations occurred in areas where WF are not commonly seen.
- Populations continued to develop instead of leveling off in cotton.
- Cotton aphid populations also developed in some areas.
Whitefly Management in Cotton – Arizona system

**Action Levels**
1 nymph/disk or 3 adults on leaf
**Whitefly Management in Cotton – Arizona system**

**WF Adults**

Sample:

- 30 leaves 5th leaf from top
- Presence/absence
- Leaf is infested if it has 3 or more WF adults
- This equals 40% infested leaves
WF Nymphs

• Sample:
  – 30 leaves, 5\textsuperscript{th} leaf from top
  – Presence/absence
  – Look between veins
  – Use disk for nymphs
  – Count only LARGE (3\textsuperscript{rd} & 4\textsuperscript{th} instar)

Action Levels

– 40/40
– 1 nymph/disk or 3 adults on leaf
Whitefly Management in Cotton – Arizona system

Three-Stage Management of Bemisia Whiteflies in Cotton

<table>
<thead>
<tr>
<th>Stage &amp; Timing of Use</th>
<th>Insecticides (MOA Group No.)</th>
<th>Rate</th>
<th>Safety to Beneficials</th>
<th>Control Interval</th>
<th>Strategic Fit¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage I</strong></td>
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<tr>
<td>Chemistry (Full Selectivity)</td>
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<tr>
<td>Timing: 40% disks infested with ≥1 large nymph and 40% leaves infested with ≥3 adults</td>
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<tr>
<td></td>
<td>buprofezin, Courier 40SC (Group 16)</td>
<td>12.5 oz</td>
<td>Excellent</td>
<td>14–30 days</td>
<td>no more than 1 use per season; 1st spray for long-term control and bioresidual; safe on beneficials; appropriate up to 30 days before green-leaf drop; molting inhibitor, effective against nymphs.</td>
</tr>
<tr>
<td></td>
<td>pyriproxyfen, Knack Insect Growth Regulator (Group 7C)</td>
<td>8–10 oz</td>
<td>Excellent</td>
<td>14–30 days</td>
<td>no more than 1 use per season; 1st spray for long-term control and bioresidual; safe on beneficials; appropriate up to 30 days before green-leaf drop; juvenoid, effective against eggs and mature nymphs.</td>
</tr>
<tr>
<td></td>
<td>spiromesifen, Oberon 2SC (Group 23)</td>
<td>8–10 oz</td>
<td>Excellent at these rates*</td>
<td>14–30 days</td>
<td>no more than two, non-consecutive uses per season; 1st spray for long-term control and bioresidual; safe on beneficials at this rate range*; appropriate up to 21 days before green-leaf drop; lipid synthesis inhibitor, effective primarily against nymphs.</td>
</tr>
</tbody>
</table>

Mite control as well
**Whitefly Management in Cotton – Arizona system**

**40/40 Decision Table - IGRs**

<table>
<thead>
<tr>
<th>IGR Threshold Decision Matrix</th>
<th>Adult Levels</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>fewer than 3/leaf</td>
</tr>
<tr>
<td><strong>Large Nymph Levels</strong></td>
<td></td>
</tr>
<tr>
<td>fewer than 1 per disk</td>
<td>Wait and resample 3-7 days</td>
</tr>
<tr>
<td>at least 1 per disk (40%)</td>
<td>Wait: resample in 3 days or apply Courier</td>
</tr>
</tbody>
</table>
## Whitefly Management in Cotton – Arizona System

### Three-Stage Management of Bemisia Whiteflies in Cotton

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<tr>
<th>Stage &amp; Timing of Use</th>
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</table>
| **Stage II Chemistry (Partial Selectivity)** | **spiromesifen, Oberon 2SC (Group 23)** | 12–16 oz   | Good at these rates   | 14–30 days       | • no more than two, non-consecutive uses per season;  
  • follow-up spray for long-term control;  
  • good, but partial, safety for beneficials;  
  • lipid synthesis inhibitor, effective primarily against nymphs. |
| **Timing:** 57% leaves infested with ≥3 adults | **acetamiprid, Intruder WSP (Group 4A)** | 1.7–2.3 oz | Moderate              | 14–30 days       | • no more than two, non-consecutive uses per season**;  
  • follow-up spray for moderate to long-term control, or;  
  • before Stage I, late season or to control mass migrations;  
  • partial safety for beneficials;  
  • neonicotinoid, effective against all stages. |
| | **dinotefuran, Venom 20SG (Group 4A)** | 10.7 oz    | Moderate              | 7–14 days        | • no more than two, non-consecutive uses per season**;  
  • short-term control; partial safety for beneficials;  
  • neonicotinoid, effective against all stages. |
| | **thiamethoxam, Centric 40WG (Group 4A)** | 2 oz       | Moderate              | 7–14 days        | • no more than two, non-consecutive uses per season**;  
  • short-term control; partial safety for beneficials;  
  • neonicotinoid, effective against all stages. |
| | **Other Non-Pyrethroids** | various    | Poor to Fair          | 5–10 days        | • broad spectrum, short-term control only, late season;  
  • primarily adulticidal; only limited control of other stages. |
## Three-Stage Management of Bemisia Whiteflies in Cotton

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</table>
| Stage III Synergized Pyrethroids (see Stage II timing) | Pyrethroid combinations (Group 3) | various | Poor | 7–14 days | • no more than two pyrethroids per season;  
• broad spectrum, short-term control only, late season;  
• primarily adulticidal; only limited control of other stages. |
Why the effort?

- Sticky cotton is unacceptable!
- Realizing the severity of the problem and the potential downfalls
  - Trying to prevent the development of insecticide resistance
  - Build-up of other pests
    - Spider Mites
    - Cotton Aphids
  - Economics
## Timing/Placement of Insecticides - 2003

<table>
<thead>
<tr>
<th>Timing</th>
<th>IGRs</th>
<th>Neonicotinoids</th>
<th>Pyrethroids</th>
<th>Organophosphates</th>
<th>Carbamate</th>
<th>Organochlorine</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>Courier (16)</td>
<td>Provado (4A)</td>
<td>Warrior (3)</td>
<td>Curacron (1B)</td>
<td>Temik (1A)</td>
<td>Endosulfan (2A)</td>
</tr>
<tr>
<td></td>
<td>Knack (7C)</td>
<td>Centric (4A)</td>
<td>Capture (3)</td>
<td>Lorsban (1B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assail (4A)</td>
<td>Danitol (3)</td>
<td>Acephate (1B)</td>
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<tr>
<td>June</td>
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<td>July</td>
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<td>August</td>
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<td>Sept</td>
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<tr>
<td>Oct</td>
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</tbody>
</table>
Timing/Placement of Insecticides – 2010

IGRs
- Courier (16)
- Knack (7C)
- Oberon (23)

Neonicotinoids
- Provado (4A)
- Centric (4A)
- Assail (4A)
- Venom (4A)

Pyrethroids
- Warrior (3)
- Capture (3)
- Danitol (3)
- other pyrethroids

Organophosphates
- Curacron (1B)
- Lorsban (1B)
- Acephate (1B)

Carbamate
- Vydate (1A)

Organochlorine
- Endosulfan (2A)

Carbamate
- Temik (1A)
Timing/Placement of Insecticides – 2014

after loss of some products

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</tr>
<tr>
<td>Oberon (23)</td>
<td>Assail (4A)</td>
<td>Danitol (3)</td>
<td>Mixtures of OP (or Vydate) and</td>
</tr>
<tr>
<td></td>
<td>Venom (4A)</td>
<td>other pyrethroids</td>
<td>pyrethroid</td>
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<td>Oberon (23)</td>
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Mixtures of OP (or Vydate) and pyrethroid
Whitefly Active Chemistries

Insecticide Use – WF materials

Ha Treated (Thousands)

- Pyriproxyfen
- Buprofezin
- Dinotefuron

Other Whitefly Active Chemistries- 2014

Active on WF but not not registered

- Transform – 2015
- Sivanto – 4th quarter 2014
- Belay – registered but uses curtailed due to pollinator issue
  in the future??
- Movento
- NNI-0101 – pyrifluquinazon
- Cyazypyr - DPX-HGW86, cyantraniliprole
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 Parameter: 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
• **numbers on entire leaf was counted**
• 10 leaves were sampled on each date in each plot
• Yield data collected
• Also stickiness evaluation
Aphid and Whitefly Management - 2013

Averaged over study period

0.25% NIS added to all treatments
Aphid and Whitefly Management - 2013

0.25% NIS added to all treatments
Whitefly Management - 2004

- Assail – 1.1 oz
- Oberon – 16 oz
- Diamond – 12 oz
- Knack – 10 oz
- Courier – 12.5 oz
- Danitol+ Orthene – 16 + 9 oz
- Actara-2 oz
- Capture+Endosulfan-6.4 + 48 oz
- Warrior-5.1 oz.

Product(s) and Rate (kg AI/ha)
- Acetamiprid-0.077
- Spiromesifen-0.22
- Novaluron-0.045
- Pyriproxyfen-0.048
- Buprofezin-0.3
- Fenpropatrin + Acephate-0.18+0.47
- Thiamethoxam-0.042
- Bifenthrin + Endosulfan-0.09+0.98
- Lambda-cyhalothrin-0.036

nymphs – application to Pima cotton on 11 Sept.
1. Is a good defoliation a good enough to avoid sticky cotton?
2. Is it cost effective to tankmix an insecticide & harvest aid?
3. Is an OP harvest aid a useful tool in late season whitefly management?
Observations and data show:

- Time to green leaf drop (i.e., 14-21 days) & is never complete.
- Pest generation time (14-21 days is enough time for 1 generation of whiteflies or aphid).
- Even a good defoliation results in a green top. Hosted on 2-3 green leaves in the terminals can still rain honeydew on open cotton.
- Need to clean-up aphid and WF infestation before harvest aid application.
- Synergism with Def + pyrethroid helps to reduce whitefly adults.
Early Harvest Aid Application Approach to Pima Cotton Defoliation

- still in research mode
- shows promise
- could shorten Pima season without loss of quality or yield
- reduces period of greatest susceptibility to aphid and WF infestations and sticky cotton

Steven Wright, Robert Hutmacher, Gerardo Banuelos, Sonia Rios, Kelly Hutmacher, Dan Munk, Katherine Wilson, Jonathan F. Wrobles, & Mark Keeley

University of California Cooperative Extension
Gaps in our Knowledge

• Which Biotype? There are other ones that are even more of a problem than biotype B.
  – no evidence they have infested SJV fields
  – needs to be researched
• Increased insecticide tolerance?
• Are developmental thresholds still relevant?
• Influence of shifts in cropping landscape?
• Sampling and monitoring? Still appropriate? Applicable for Pima cotton?
Whitefly Review
Optimistic?

2013 was just an unusual year –
will not happen again??

2014 – keep a close watch, be calm, keep
Pete and I informed

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