Refined Management of Late-Season Insects in California Cotton to Protect Lint Quality

Larry D. Godfrey
Dept. of Entomology, Univ. of California, Davis, CA
Late-Season Insect Pests and Cotton Lint Quality

• **Sticky cotton became an issue in the SJV with the 2001 crop**
• combination of late-season cotton aphid and silverleaf whitefly infestations
Late-Season Insect Pests and Cotton Lint Quality

P. B. Goodell – Statewide IPM Program, Univ. of California, Parlier, CA
K. E. Keillor – Dept. of Entomology, UC-Davis, Shafter, CA
T. Pierce – Dept. of Entomology, UC-Davis, Shafter, CA

S. D. Wright -- Univ. of California Cooperative Extension, Tulare, CA
M. R. McGuire -- USDA-ARS, Western Integrated Cropping Systems Research Unit, Shafter, CA
R. B. Hutmacher – Dept of Plant Sciences, UC-Davis, Shafter, CA
J. Bancroft -- USDA-ARS, Western Integrated Cropping Systems Research Unit, Shafter, CA
Late-Season Insect Pests and Cotton Lint Quality

- Reports from mills of 2001 SJV crop being sticky
- Combination of late-season cotton aphid and silverleaf whitefly infestations
- Not unprecedented but fairly rare for SJV cotton
- Set of conducive conditions in 2001
  - Long warm fall with no rainfall
  - Much of the planting was delayed until late April
  - Delayed harvest which placed exposed lint during the period of highest insect pressure
- Cotton economics
Late-Season Insect Pests and Cotton Lint Quality

- for a production region to be implicated for producing sticky cotton is very serious
- other commodities are assessed at the point of sale for “quality” and the grower paid accordingly
- cotton is not

Why?
- stickiness is difficult and expensive to quantify
- meaning of data unclear
Late-Season Insect Pests and Cotton Lint Quality

- if a production region gains the reputation for producing sticky cotton the merchants pursue that cotton less aggressively
- less demand = lower price
- much of the cotton is sold and utilized internationally and the information flow is far from perfect
Late-Season Insect Pests and Cotton Lint Quality

• Unique challenge for the grower
  Spend money ≠ yield and immediate return
  Spend money = protect quality and long-term returns

• Challenge for industry
  Deny presence of sticky cotton?
  Accept responsibility
Late-Season Insect Pests and Cotton Lint Quality

- **Industry-wide meeting to discuss situation** – Feb. 2002
- **Growers, ginners, brokers**
  - Unified in response that sticky cotton unacceptable and penalties will be applied
- **Extension & Research**
  - Production meetings, information developed, re-education
  - Emphasizing the risk and discussing the solution
- **CA Cotton Growers and Ginners Assn.**
- **Crop protection companies**
  - PCA education on use of products
Late-Season Insect Pests and Cotton Lint Quality

Cotton Aphids
Late-Season Insect Pests and Cotton Lint Quality
Late-Season Insect Pests and Cotton Lint Quality

Silverleaf Whitefly, Sweet Potato Whitefly – Biotype B
Late-Season Insect Pests and Cotton Lint Quality

**Silverleaf Whitefly**
- first found in SJV in 1992
- southern end and eastern side of SJV had highest levels
- in recent years populations have developed earlier and are more widespread
Late-Season Insect Pests and Cotton Lint Quality

**Cotton Aphid**
- Rosenheim suggested a threshold of 15 aphids per leaf in CA for sticky cotton
- Slosser in TX found the threshold ranged from 11 to 50 aphids per leaf

**Silverleaf Whitefly**
- Considerable research showing relationships between populations and yield loss
- Firm relationships to cotton quality less well defined
Cotton aphid and silverleaf whitefly infestations often occur in the same field. Populations can develop very rapidly. The period immediately before harvest is most important. Insecticide approaches differ for the two pests. Falls are typically warm with little to no rain. The cotton crop is matured by stopping irrigation and drought-stressing the plants. Pima cotton.
Late-Season Insect Pests and Cotton Lint Quality

- Four years of research (2002-2005)
- Efficacy of registered and experimental insecticides on cotton aphid and whitefly
- Treatment thresholds for cotton aphids and whiteflies to minimize sticky cotton
- Role of harvest aid materials (defoliants) in minimizing sticky cotton
Late-Season Insect Pests and Cotton Lint Quality

California Cotton Review
The Newsletter of the UC Cooperative Extension Cotton Advisors
Volume 76  September 2005
In This Issue
Defoliation Challenges in Later-Maturing Fields
Preventing Sticky Cotton—What Have We Learned?
Cotton Field Day Announcements
Dan Munk—Sabbatical Leave (2005-2006)
Other Announcements
Visit our web site at:  http://cottoninfo.ucdavis.edu
Editor: Robert B. Hutmacher            Assoc. Editor: Brian Marsh

DEFOLIATION CHALLENGES IN LATE-MATURING FIELDS
Bob Hutmacher, Steve Wright, Ron Vargas, Dan Munk

PREVENTING STICKY COTTON—WHAT HAVE WE LEARNED?
Larry Godfrey, Peter B. Goodell, Steve Wright, Bob Hutmacher
Late-Season Insect Pests and Cotton Lint Quality

- Insecticide use increased
  - 2.7 applications per acre in 2001
  - 2.9 applications per acre in 2002
  - 3.5 applications per acre in 2003

- thiamethoxam and endosulfan (aphid controls) and pyriproxyfen and buprofezin (whitefly materials) were primary products with increased use in 2002

- acetamiprid use increased by over 500% from 2002 to 2003
Late-Season Insect Pests and Cotton Lint Quality

Sustainability??
Late-Season Insect Pests and Cotton Lint Quality

- Four year study (2002-2005)
- naturally-occurring aphid populations
- study utilized insecticide treatments for aphid control made at different timings following initiation of boll opening
- aphid (and whitefly) populations were monitored weekly
- cotton lint was hand-harvested and stickiness quantified at ITC
Late-Season Insect Pests and Cotton Lint Quality

Applied insecticide treatments at weekly intervals to manipulate aphid populations

<table>
<thead>
<tr>
<th>% Open Bolls</th>
<th>5%</th>
<th>20%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>defoliation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2002</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2003</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2004</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Late-Season Insect Pests and Cotton Lint Quality

- Assail (acetamiprid), 1.15 oz./A, applied by ground to control aphids (and whiteflies)
- Also applied Warrior (lambda-cyhalothrin), 3.84 oz./A, on each date to flare aphid levels
- Untreated plots
Aphid Population - 2002

![Graph showing aphid population over time with different treatments: Warrior 8/27, Assail 8/27, and Untreated.](image)

- **Aphids per Leaf**
- **Time Periods:**
  - 27-Aug
  - 3-Sep
  - 10-Sep
  - 17-Sep
  - 24-Sep
  - 1-Oct
Aphid Population - 2002

Accumulated Aphid Days

27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct

Warrior 8/27
Assail 8/27
Assail 8/27, 9/10
Warrior 9/3
Assail 9/3
Warrior 9/10
Assail 9/10
Warrior 9/17
Assail 9/17
Warrior 9/24
Assail 9/24
Untreated
Stickiness - 2002

H2SD (sticky spots)

Warrior 8/27
Assail 8/27
Assail 8/27, 9/10
Warrior 9/3
Assail 9/3
Warrior 9/10
Assail 9/10
Warrior 9/17
Assail 9/17
Warrior 9/24
Assail 9/24
Untreated
Aphid Population - 2003

Aphid Population - 2003

Warrior 9/25
Assail 9/4
Untreated

Aphids/Leaf

4-Sep 11-Sep 18-Sep 25-Sep 2-Oct 9-Oct 16-Oct
Aphid Population - 2003

Accumulated Aphid-Days

4-Sep 11-Sep 18-Sep 25-Sep 2-Oct 9-Oct 16-Oct

0 100 200 300 400 500 600 700 800 900 1000

Warrior 9/4
Assail 9/4
Assail 9/4,18
Warrior 9/11
Assail 9/11
Warrior 9/18
Assail 9/18
Warrior 9/25
Assail 9/25
Warrior 10/1
Assail 10/1
Untreated
Whitefly Population - 2003

Accumulated WF-Days

4-Sep 11-Sep 18-Sep 25-Sep 2-Oct 9-Oct 16-Oct

Warrior 9/4
Assail 9/4
Assail 9/4,18
Warrior 9/11
Assail 9/11
Warrior 9/18
Assail 9/18
Warrior 9/25
Assail 9/25
Warrior 10/1
Assail 10/1
Untreated
Stickiness - 2003

Thermodection Rating (Stick Spots)

Warrior 9/4
Assail 9/4
Warrior 9/11
Assail 9/11
Warrior 9/18
Assail 9/18
Warrior 9/25
Assail 9/25
Warrior 10/1
Assail 10/1
Untreated
Late-Season Insect Pests and Cotton Lint Quality - 2003

• hand harvested plots on Oct. 28
• hand-harvested selected treatments on 4 Nov. following 0.26” rainfall on 1 Nov.
• HPLC analyses of sugar type on selected treatments
Sugar Type - 2003

The diagram illustrates the percentage of sugar in fiber for different types of sugar, categorized as harvested before rain or after 0.26" of rain. The types of sugar include:

- Trehalulose
- Melezitose

For each type of sugar, there are two categories shown:

- Harvest - before rain
- After 0.26" rain

The diagram is annotated with specific data points, such as:

- Trehalulose - Assail 9/4,18
- Trehalulose - Untreated
- Melezitose - Assail 9/4,18
- Melezitose - Untreated

The diagram also includes markers for whitefly and aphid sugar.
Late-Season Insect Pests and Cotton Lint Quality

2004

• added Lorsban 4E treatment to control aphids without affecting whitefly populations
• added WF IGR treatment to control WF without affecting aphids

Hand-harvests

<table>
<thead>
<tr>
<th>18 Aug. (50% open bolls)</th>
<th>8 Sept. (90% open bolls)</th>
<th>14 Oct. (normal harvest)</th>
<th>25 Oct. (0.76” rainfall)</th>
</tr>
</thead>
</table>

Pest Populations in Untreated Plots - 2004

Treatments were generally successful.
Lint Stickiness-2004

Whiteflies controlled

Sticky Spots

- Warrior-8/4
- Assail-8/4
- Warrior-8/11
- Assail-8/11
- Warrior-8/18
- Assail-8/18
- Warrior-8/25
- Assail-8/25
- Warrior-9/1
- Assail-9/1
- Warrior-9/8
- Assail-9/8
- Untreated
Whiteflies contributed about 10 sticky spots where left uncontrolled.
Sugar Type - 2004

- Trehalulose: -A, -W
- Melezitose: -A, -W

% in Fiber

18 Aug.
8 Sept.
harvest - 14 Oct.

Whitefly marker sugar
Aphid marker sugar
Late-Season Insect Pests and Cotton Lint Quality - 2005

- Continued to look at aphid and whitefly infestations and sticky cotton

### Graph

- **Acala Cotton**
  - Untreated
  - Assail - 9/12
  - Warrior - 9/12

### Axis
- **Aphid-Days**
- **Dates:** 20-Sep, 27-Sep, 4-Oct, 11-Oct, 18-Oct

**Note:** The graph shows the progression of aphid days over time for different treatments.
Late-Season Insect Pests and Cotton Lint Quality - 2005
Late-Season Insect Pests and Cotton Lint Quality – Defoliation to Harvest

- Previous study concentrated on period from initial boll opening until defoliation
- At defoliation – management needed?
- Do all harvest aid materials perform the same?
Late-Season Insect Pests and Cotton Lint Quality – Defoliation to Harvest

Aphid population
Day 0 - 2/leaf; peak
– 7.6/leaf
Summary

- in acala cotton threshold for aphids and sticky cotton is ~5 aphids per leaf (5th MSN leaf from terminal)
- in pima cotton - ??
- rainfall as low as 0.25” can remove ~20% of the aphid honeydew and ~75% of the whitefly honeydew
- populations of aphids can develop rapidly
Summary

- an insecticide application can reduce stickiness
- at defoliation – stickiness potential still exists
- Def (+Prep) appears to aid in reducing stickiness from aphids and especially from WF
- 2002-2005 California cotton crops have mostly been free of stickiness