BLUE ALFALFA APHID: OLD PEST WITH NEW MANAGEMENT CHALLENGES

E. T. Natwick and M. I. Lopez

E. Natwick is a UCCE Farm Advisors, UC ANR Cooperative Extension
M. I. Lopez is a Laboratory Assistant, UC ANR Cooperative Extension
University of California Desert Research and Extension Center, Holtville, CA 92250.

Mention of any pesticide in this presentation is not a recommendation.
Aphids


Considerable progress has been made toward the control of the aphid pests via host plant resistance, but insecticide applications are commonly needed to maintain population densities of aphids below damaging levels.
Blue Alfalfa Aphid (BAA) Problems

- **BAA**: a serious pest of alfalfa for the past 40 years
- Managed by IPM practices;
  - host plant resistance
  - economic treatment thresholds
  - Natural enemies (aphid parasites and generalist predators)
  - insecticides.
- Spring of 2013, **BAA** once again causing severe economic loss
- Proposed reasons for the recent outbreaks have been included:
  - host plant resistance breaking strain
  - development of insecticide-resistance
  - depletion of aphid natural enemies (e.g. predator and parasite) caused by increased use of broad spectrum insecticides
  - climate change; may be related to drought in western U.S.
Identification is Important

- Pea aphid & blue alfalfa aphid are green aphids so similar in appearance that they may easily be confused.
- The antennae provide the distinguishing characteristic.
- Antennae of pea aphid have narrow dark bands at the tip of each segment.
- Blue alfalfa aphid antennae are uniformly brown.
Identification is Important

- Spotted alfalfa aphid is yellowish in color and the only alfalfa aphid with spots.
- Cowpea aphid is the only aphid in alfalfa that is black.
- Adult cowpea aphids are shiny black with whitish legs and antennae with black at the joints and tips.
- Cowpea aphid nymphs appear to be gray due to wax secretions.
Aphid Management

- Host Plant Resistance
  - Plant resistant varieties
  - Resistant varieties may need to be sprayed, but are not stunted and do not die from BAA feeding

- Biological Control (preserve aphid natural enemies)
  - Many predators (lady beetles, lace wings, syrphid fly larvae, minute pirate bug, bigeyed bug, etc.)
  - Several parasites (*Aphidius smithii*, *A. ervi*, *Lysiphlebus* spp. and *Diaraetiella* spp.)
  - Entomopathogenic fungi

- Insecticides (new efficacious insecticides safe for aphid natural enemies are needed)
APHID-RESISTANT VARIETIES

- Severe aphid infestations retard growth, reduce yield, and may even kill plants.

- Damage can also reduce the alfalfa's feed value.

- A black fungus that grows on the honeydew excreted by the aphid reduces palatability.

Planting varieties resistant to aphids is the most effective means of control.
ENCOURAGE NATURAL ENEMIES OF APHIDS FOR BIOLOGICAL CONTROL

Convergent lady beetle
Sevenspotted lady beetle
Aphid parasite
Minute Pirate bug
Bigeyed bug
Lysiphlebus spp.
Syrphid fly
Green lacewing larva
Adult green lacewing
Diaraetiella spp.
# TREATMENT THRESHOLDS
(#aphids/stem)

<table>
<thead>
<tr>
<th>Aphid Type</th>
<th>less than 10&quot;</th>
<th>10-20&quot;</th>
<th>more than 20&quot;</th>
<th>Summer</th>
<th>Spring</th>
<th>After last fall cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pea aphid</td>
<td>40-50</td>
<td>70-80</td>
<td>100+</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Blue alfalfa aphid</td>
<td>10-12</td>
<td>40-50</td>
<td>40-50</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cowpea aphid</td>
<td>10-12</td>
<td>40-50</td>
<td>40-50</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Spotted alfalfa aphid</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>40*</td>
<td>20*</td>
<td>50-70</td>
</tr>
</tbody>
</table>

* Do not treat if there are 4 or more adult lady beetles or 3 or more lady beetle larvae per sweep for every 40 aphids counted per stem (on stubble this ratio is 1 larva/sweep to every 50 aphids/stem).
Sprays applied Jan 17, 2013

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Blue Alfalfa Aphids per Stem, Holtville, CA, April 2013

Sprays applied April 5, 2013

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Blue Alfalfa Aphids per Stem, Holtville, CA, February 2014

Sprays applied Feb 5, 2014

Mention of any pesticide in this presentation is not a recommendation.
Blue Alfalfa Aphids per Stem, Holtville, CA, February 2014

Sprays applied Feb 7, 2014

Mention of any pesticide in this presentation is not a recommendation.
## Efficacy of Ground Rig, Broadcast, Application Timing of Various Insecticide for Control of Blue Alfalfa Aphid, Holtville, CA, 2014

<table>
<thead>
<tr>
<th>Treatment</th>
<th>oz/acre</th>
<th>Appl. date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>2. Sivanto + Agri-dex†</td>
<td>7 fl + 16 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>3. Sivanto + Agri-dex†</td>
<td>10 fl + 16 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>4. Sivanto + Agri-dex *</td>
<td>10 fl f/b</td>
<td>24 Mar</td>
</tr>
<tr>
<td>5. Cobalt Advanced + Oroboost*</td>
<td>28 fl + 0.78% v/v</td>
<td>24 Mar</td>
</tr>
<tr>
<td>f/b Transform WG †</td>
<td>1.5 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>6. Warrior II 2.09 CS + Dimethoate 2.67 EC + Oroboost*</td>
<td>1.92 fl + 16 fl + 0.78% v/v</td>
<td>24 Mar</td>
</tr>
<tr>
<td>f/b Mustang 1.5 EW + Lorsban Advanced + Oroboost †</td>
<td>4.3 fl + 26 fl + 0.78% v/v</td>
<td>4 Apr</td>
</tr>
<tr>
<td>7. Beleaf 50 SG + Agri-dex*</td>
<td>2.8 dry + 16 fl</td>
<td>24 Mar</td>
</tr>
<tr>
<td>f/b Stallion 3.025 EC + Agri-dex †</td>
<td>11.75 fl + 16 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>8. Stallion + Agri-dex *</td>
<td>11.75 fl + 16 fl f/b</td>
<td>24 Mar</td>
</tr>
<tr>
<td>f/b Beleaf + Agri-dex †</td>
<td>2.8 dry + 16 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>9. Warrior II 2.09 CS + Dimethoate 2.67 EC + Agri-dex *</td>
<td>1.92 fl + 16 fl f/b + 16 fl</td>
<td>24 Mar</td>
</tr>
<tr>
<td>f/b Stallion 3.025 EC + Agri-dex †</td>
<td>11.75 fl + 16 fl</td>
<td>4 Apr</td>
</tr>
<tr>
<td>10. Beleaf + Agri-dex †</td>
<td>2.8 dry + 16 fl</td>
<td>4 Apr</td>
</tr>
</tbody>
</table>

*Pre-irrigation 1st application; stubble treatment

†Mid-season 2nd application treatment; just prior to 2nd irrigation

‡Mid-season 1st application treatment

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Blue Alfalfa Aphids per Stem, Holtville, CA, March/April 2014

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Change in BAA control percentages and trend lines from 2004 to March 2014 for organophosphate insecticides

\[ y = -0.0041x + 241.97 \]
Change in BAA control percentages and trend lines from 2005 to March 2014 for Pyrethroid insecticides

\[ y = -0.0068x + 350.98 \]
Change in BAA control percentages and trend lines from 2012 to March 2014 for Flonicamid

\[ y = -0.0304x + 1331.7 \]
Change in BAA control percentages and trend lines from 2012 to March 2014 for IRAC group #4 (nAChR agonists; Sivanto & Transform) against BAA

\[ y = -0.0205x + 930.74 \]
Change in BAA control percentages and trend lines from 2009 to March 2014 for chlorpyrifos + pyrethroid

\[ y = -0.034x + 1462.8 \]
What has changed allowing BAA to cause widespread damage to western alfalfa?

Several reasons for the recent outbreaks have been proposed:

- Has a host plant resistance breaking strain of BAA emerged in the U.S., as was described in Australia (Humphrie et al. 2012)?
- Have aphid natural enemies been depleted by broad spectrum insecticides allowing a BAA outbreaks?
- Has a biotype of insecticide-resistant BAA developed in the U.S.?

- It was correctly stated (Godfrey et al., 2013) that for many years, alfalfa has been a model system for the development, implementation, and use of IPM tactics in California.

- IPM programs in the southwestern United States depend on alfalfa as a source of natural enemies that help keep pest insects in check in a diverse array of crops including cotton, grain crops, sugarbeet and vegetable crops.
CONCLUSIONS?

- A BAA control problem became apparent in the Imperial Valley, CA in the late spring of 2013 and has continuing through the spring of 2014.
- Control percentages began to drop for organophosphate insecticides, pyrethroid insecticides and combinations of the two chemistries late in the spring of 2013 and continued to be low in the spring of 2014.
- The BAA problem quickly spread throughout California, the southwestern U.S. and north to southern Utah by the summer of 2014.
- The drop in control percentages was not nearly as dramatic for newer chemistries (Sivanto 200SL, Transform 50WG and Beleaf 50SG).
- What is not confirmed from the insecticide efficacy studies is insecticide-resistance, but it is certainly suggested.
- It is unclear if there is a host plant resistance breaking strain of BAA that has developed or been introduced into the western United States.

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