Strawberry Pests and Diseases: IPM Studies and the Pallidosis-related Decline

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Strawberry meeting 20 November, 2013
# Strawberry-IPM trial 2012

<table>
<thead>
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## Treatments:

1. Untreated control
2. Assail 70 WP (acetamiprid) 3 oz/ac in 50 gal
3. BotaniGard WP (*Beauveria bassiana*) 2lb/ac in 50 gal
4. BotaniGard WP 2lb/ac + Molt-X (azadirachtin) 8 fl oz/ac in 50 gal
5. BotaniGard WP 2lb/ac + Danitol (fenpropathrin) ½ label rate 5.3 fl oz/ac in 50 gal
6. BotaniGard WP 2lb/ac + Assail ½ label rate 1.5 oz/ac in 50 gal
7. AzaGuard (azadirachtin) 8 fl oz/ac in 50 gal
8. AzaGuard 16 fl oz/ac in 50 gal
9. Rimon 0.83 EC (novaluran) 12 fl oz/ac + Brigade (bifenthrin) 16 oz/ac in 50 gal

**Experimental period:** July-August, 2012
Strawberry-IPM trial 2012

All stages of Lygus

# insects/20 plants

Untreated, Acetamiprid (Assai)
Strawberry-IPM trial 2012

Lygus population change during the trial period

- Percent change in lygus bug population

- I Spray
- II Spray
- III Spray

- Untreated
- Acetamiprid (Assail)
- Bb (BotaniGard)
- Bb+Azas (BotaniGard+MoltX)
- Bb+1/2 Fenpropatrin (BotaniGard+1/2Danitol)
- Bb+1/2 Acetamiprid (BotaniGard+1/2Assail)
- Aza 8 fl oz (AzaGuard)
- Aza 16 fl oz (AzaGuard)
- Novaluron+Bifenthrin (Rimon+Brigade)
Strawberry-IPM trial 2013
## Strawberry-IPM trial 2013

<table>
<thead>
<tr>
<th>Variety: Virtue</th>
<th>Spray volume: 50 gpa</th>
<th>Applied on: 5/14, 22 and 29</th>
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<tbody>
<tr>
<td><strong>1&lt;sup&gt;st&lt;/sup&gt; application (Rate/acre)</strong></td>
<td><strong>2&lt;sup&gt;nd&lt;/sup&gt; application (Rate/acre)</strong></td>
<td><strong>3&lt;sup&gt;rd&lt;/sup&gt; application (Rate/acre)</strong></td>
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<tr>
<td>1</td>
<td>Untreated</td>
<td>Untreated</td>
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<tr>
<td>2</td>
<td>Assail 70 WP (3 oz)</td>
<td>Assail 70 WP (3 oz)</td>
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<tr>
<td>3</td>
<td>Beleaf 50 SG (2.8 oz)</td>
<td>Beleaf 50 SG (2.8 oz)</td>
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<td>4</td>
<td>Athena (17 fl oz)</td>
<td>Athena (17 fl oz)</td>
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<td>5</td>
<td>Rimon 0.83 EC (12 fl oz) + Brigade (16 oz)</td>
<td>Rimon 0.83 EC (12 fl oz) + Brigade (16 oz)</td>
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<tr>
<td>6</td>
<td>Rimon 0.83 EC (12 fl oz) + Brigade (16 oz)</td>
<td>BotaniGard ES (2 qrt) + Molt-X (8 fl oz)</td>
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<tr>
<td>7</td>
<td>Grandevo (2 lb)</td>
<td>Grandevo (2 lb)</td>
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<td>8</td>
<td>BotaniGard ES (2 qrt) + Molt-X (8 fl oz)</td>
<td>Grandevo (2 lb)</td>
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<td>9</td>
<td>EverGreen (16 fl oz)</td>
<td>EverGreen (16 fl oz)</td>
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<tr>
<td>10</td>
<td>BotaniGard ES (2 qrt) + Low Assail (1.5 oz)</td>
<td>BotaniGard ES (2 qrt) + Low Beleaf 50 SG (1.4 oz)</td>
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<tr>
<td>11</td>
<td>Closer (4.5 oz)</td>
<td>Closer (4.5 oz)</td>
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<tr>
<td>12</td>
<td>Closer (3 oz)</td>
<td>Closer (3 oz)</td>
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</table>
Strawberry-IPM trial 2013

Number of lygus nymphs and adults/20 plants

- Pre-treatment
- Post-treatment

Options:
- Untreated
- Assail-Assail
- Beleaf
- Athena
- Rimon+Brigade
- R+B
- EverGreen
- Molt
- Bot+M
- Grandevo
- BotaniGard
- Grandevio
- EverGreen
- Bot+Assail
- Bot+Bel
- Closer Hi
- Bot+Grand
- Closerlo+Bel

Graph shows the comparison of number of lygus nymphs and adults pre- and post-treatment for different treatments.
Strawberry-IPM trial 2013

Percent change in lygus after each application

I Spray  II Spray  III Spray
Strawberry-IPM trial 2013

Post-treatment Change

Percent change in lygus post-treatment

- Untreated
- Assail
- Beleaf
- Athena
- Brigade
- R+B-EverGreen
- Molt+x-Bot+M
- Grandevo
- BotaniGard
- EverGreen
- Bot Assail
- Bot+Bef Bot+Ath
- Closer+Hi Closer+Hi Bot+Grand
- Closer+Lo Closer+Lo Beleaf

Change
Conclusions

- Some insecticides provided good control of lygus bug
- *B. bassiana* can be an effective alternative to chemical insecticides
- Combination of *B. bassiana* and azadirachtin can be a reasonable substitute for their chemical equivalents
- Resistance management through
  - Rotating and/or combining different modes of action
  - Lowering pesticide rates
  - Using non-chemical alternatives
Strawberry-Miticide trial 2013

Treatments

1. Untreated
2. Acramite 50 WS (bifenazate) 1 lb
3. Agri-Mek SC (abamectin) 4.29 fl oz
4. BotaniGard ES (B. bassiana) 1qrt + Acramite 0.75 lb
5. Eco-Mite 1% (rosemary and cotton seed oils)
6. Fujimite 5 EC (fenpyroximate) 2 pt
7. Fujimite XLO 2 pt
8. Grandevo (C. subtsugae) 2 lb
9. Venerate (MBI206) 2 gal
10. Nealta (cyflumetofen) 13.7 fl oz

Spraying 150 gal/acre at 70 psi with hollow cone nozzle

Plot size 14’ longX44” wide bed replicated 4 times

Treated on May 16 and 25, 2013
Strawberry-Miticide trial 2013

![Graph showing various treatments and their effectiveness in reducing eggs and mobile mites. The graph compares different miticides and their impact on post-treatment number/leaflet.]
Strawberry-Miticide trial 2013

Post-treatment-Eggs+Mobile

Number/leaflet

- Untreated
- Acramite 50WS
- Agri-Mek SC
- BotaniGard+Acramte
- Eco-Mite
- Fujinite SEC
- Fujinite XLO
- Grandevo
- MBI 206
- Nealta
Strawberry-Miticide trial 2013

Post-treatment-All

<table>
<thead>
<tr>
<th>Product</th>
<th>Percent Reduction compared to control</th>
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<tr>
<td>Acramite 50WS</td>
<td>-60</td>
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<tr>
<td>Agri-Mek SC</td>
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<tr>
<td>BotaniGard+Acra.</td>
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<tr>
<td>Eco-Mite</td>
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<tr>
<td>Fujinite 5EC</td>
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<td>Grandevo</td>
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<tr>
<td>MBI 206</td>
<td>-60</td>
</tr>
<tr>
<td>Nealta</td>
<td>-60</td>
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Conclusions

- Treatments provided moderate control of mites.
- Nealta and Eco-Mite provided the highest reduction followed by Venerate (MBI206) and Fujimite 5EC compared to untreated control.
- Combining *B. bassiana* with chemical miticides can play a role in resistance management.
Strawberry diseases

Gray mold or Botrytis fruit rot
Strawberry diseases

Powdery mildew

Doug Gubler
### Strawberry-Fungicide trial 2013

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Strawberry-Fungicide trial 2013-Var 324

Weight in grams from ~20 plants

- Fresh berries
- Infected berries

Treatment

Incidence and severity of powdery mildew

- Avg. Incidence
- Avg. Severity

Incidence and severity of powdery mildew

0.00 0.50 1.00 1.50

1 2 3 4 5 6 7 8 9

100 200 300 400 500 600 700 800 900

1 2 3 4 5 6 7 8 9
Conclusions

• Regularly monitor and apply fungicides at the first sign of disease
• Monitor weather conditions especially for gray mold
• Remove infected plant material
Strawberry diseases - Pallidosis
Strawberry diseases-Pallidosis

Red discoloration
Stunted growth
Severity of infection
Symptoms in new growth
Affected root system
Dieback
Strawberry diseases-Pallidosis

- **Pollen**
  - Apple mosaic
  - *Fragaria chiloensis* latent
  - Strawberry necrotic shock

- **Nematodes**
  - *Arabis* mosaic
  - Raspberry ringspot
  - Strawberry latent ringspot
  - Tomato black ring
  - Tomato ringspot

- **Thrips**
  - Strawberry necrotic shock

- **Aphids**
  - *Strawberry chlorotic fleck*
  - *Strawberry crinkle*
  - *Strawberry latent C*
  - *Strawberry mild yellow edge*
  - *Strawberry mottle*
  - *Strawberry pseudo mild yellow edge*
  - *Strawberry vein banding*

- **Greenhouse whiteflies**
  - Beet pseudo-yellows
  - Strawberry pallidosis associated

**Transmitted by others**
- Mild or no symptoms

**Whitefly-transmitted**
- Variable degrees of symptoms of pallidosis-related decline
- Mild or no symptoms
Vectors of pallidosis disease

Greenhouse whitefly

Western flower thrips

Strawberry aphid
Strawberry pallidosis disease-Video

http://www.youtube.com/watch?v=m1YRRE_PY8s
Acknowledgments

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