Powdery mildew and arthropod pest management in strawberries

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## Powdery mildew trial-2011

| Treatments | 1. Untreated control  
|            | 2. Switch (14 oz) alternated with Quadris Top (14 fl oz)  
|            | 3. Quintec (6 fl oz) alternated with Quadris Top  |
| Spraying | 40 gal/ac at 60 psi  |
| Plot size | 15' bed replicated 4 times  |
| Design | Randomized complete block  |
| Cultivar | PSI 4634  |
| Planted | 11/15/2010  |
| Trial duration | 3/31 to 5/19/2011  |
| Treated on | 3/31, 4/10, 4/22, 5/4, 5/11  |
| Sampling | One trifoliate leaf from every third plant in each plot on 5/19/11  |
Powdery mildew incidence
Severity of the infection was no more than 2-3% of the leaf surface
# Miticide trial-2011

| **Treatments** | 1. Untreated control  
|                | 2. Nealta (cyflumetofen, 13.7 fl oz) from BASF  
|                | 3. Agri-Mek 0.15 EC (abamectin, 16 fl oz)  |
| **Spraying**   | 100 gal/ac at 60 psi  |
| **Plot size**  | 20’ long bed replicated 4 times |
| **Design**     | Randomized complete block |
| **Cultivar**   | San Andreas |
| **Trial duration** | 7/6 to 8/25/11  |
| **Treated on** | 7/7 and 7/29/11 |
| **Sampling**   | 10 mid-tier leaflets from each plot at 0, 3, 7, 14, 21 and 35 days after treatment. Mites counted using mite brushing machine |
Miticide trial-2011 First spray

**EGGS**

- **0 DAT**: Untreated, Nealta, Agri-Mek
- **3 DAT**: Untreated, Nealta, Agri-Mek
- **7 DAT**: Untreated, Nealta, Agri-Mek

**MOBILE STAGES**

- **0 DAT**: Untreated, Nealta, Agri-Mek
- **3 DAT**: Untreated, Nealta, Agri-Mek
- **7 DAT**: Untreated, Nealta, Agri-Mek
Miticide trial-2011 Second spray

EGGS

MOBILE STAGES

(21 DAT of first spray)

0 DAT

3 DAT

Number/leaflet

Untreated Nealta Agri-Mek

Untreated Nealta Agri-Mek
Miticide trial - Population change

3 DAT

- Untreated
- Nealta
- Agri-Mek

Eggs
Mobile stages

Percent change in population relative to pretreatment counts

First spray

7 DAT

- Untreated
- Nealta
- Agri-Mek

Second spray
Greenhouse trial-Aphids, thrips and whiteflies

**Treatments**
1. Untreated control
2. BotaniGard 22 WP (*Beauveria bassiana*, 1 lb/100 gal)
3. Spinosad
4. AzaSol (azadirachtin, 4 g/ gal)
5. Spinosad+AzaSol

**Plot size**
15’ long X 4 rows, replicated 4 times

**Design**
Randomized complete block

**Cultivar**
Albion

**Trial duration**
10/19 to 11/22//11

**Treated on**
10/27 and 11/15/11

**Sampling**
From five plants by gently beating the plants to dislodge insects into a container
Greenhouse trial - Aphids, thrips and whiteflies

Percent change by 7 DAT

Aphids

I Spray  II Spray

-50 0 50 100 150

Untreated  BotaniGard  Spinosad  AzaSol  Spinosad+AzaSol
Greenhouse trial-Aphids, thrips and whiteflies

Thrips

Percent change by 7 DAT

-100 -50 0

Untreated BotaniGard Spinosad AzaSol Spinosad+AzaSol

I Spray II Spray
Greenhouse trial - Aphids, thrips and whiteflies

Adult whiteflies

Percent change by 7 DAT

- Untreated
- BotaniGard
- Spinosad
- AzaSol
- Spinosad + AzaSol

I Spray vs II Spray
Spider mites

- Twospotted spider mite is a predominant species in the coastal areas.

- Lewis spider mite is found causing heavy infestations especially in organic strawberry fields in Ventura County.
Twospotted and Lewis spider mites

- Egg
- Larva
- Male
- Female
- Twospotted spider mite
- Lewis mite
**Twospotted and Lewis spider mites**

<table>
<thead>
<tr>
<th></th>
<th><strong>Twospotted spider mite</strong></th>
<th><strong>Lewis mite</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Host range</strong></td>
<td>Multiple hosts. Pest of field crops and greenhouse plants.</td>
<td>Multiple hosts. Mainly greenhouse pest. AKA Poinsettia spider mite</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>Wedge-shaped, 0.3 mm</td>
<td>Wedge-shaped, mustard colored, 0.25 mm</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>Oval, 0.4-0.5 mm</td>
<td>Oval, 0.36 mm</td>
</tr>
<tr>
<td></td>
<td>Single dark spot on either side of the body</td>
<td>Multiple small spots</td>
</tr>
<tr>
<td><strong>Life stages</strong></td>
<td>Egg, larva, protonymph, deutonymph, and adult</td>
<td>Egg, larva, protonymph, deutonymph, and adult. Males have only one nymphal</td>
</tr>
<tr>
<td><strong>Egg</strong></td>
<td>Round, clear to whitish</td>
<td>Round, pale-greenish to light orange</td>
</tr>
<tr>
<td><strong>Egg laying</strong></td>
<td>About 100 eggs in 10 days</td>
<td>About 60-90 eggs in a month</td>
</tr>
</tbody>
</table>

*Figure: Tetranychus urticae and Eotetranychus lewisi are shown.*
### Twospotted and Lewis spider mites

**Twospotted spider mite**

- **Life cycle duration**: 5-20 days
- **Diapause**: Ceases reproduction during cold winters
- **Damage**: Feeds undersurface of leaves. Causes yellow mottling, scarring, bronzing and leaf fall off
- **Webbing**: Prominent
- **Predatory mites**: *Phytoseiulus persimilis*, *Neoseiulus californicus*, *N. fallacis*, *Amblyseius andersoni*, etc.

**Lewis mite**

- **Life cycle duration**: 12-14 days at 70°F
- **Diapause**: Continuously reproduces without diapause
- **Damage**: Similar, in general, but needs to be determined on strawberries
- **Webbing**: At high infestation levels
- **Predatory mites**: *N. californicus*, *N. fallacis*, *A. andersoni*, etc.
Spider mite damage
Spider mite damage
Management

• Several commonly used miticides are effective against Lewis mite
• Rotate chemicals with different modes of action
• Test before spraying if resistance is suspected
• *Phytoseiulus persimilis* doesn’t seem to be feeding on Lewis mites
Predatory mite assays - Daugovish & Howell

Neoseiulus californicus
N. fallacis
Amblyseius andersoni
Vs.
Lewis mite
Predatory mite assays - Daugovish & Howell

![Graph showing the number of Lewis mites over time for different species.](#)
Predatory mite assays - Daugovish & Howell

*Neoseiulus californicus*, *N. fallacis*, and *Amblyseius andersoni* vs. Twospotted and Lewis mite
Predatory mite assays - Daugovish & Howell

Twospotted and Lewis mites in controls

- Control-Lewis mite
- Control-Twospotted spider mite

Mean number of mites

Sampling Date:
- July 28
- Aug 1
- Aug 4
- Aug 8
- Aug 11
Predatory mite assays-Daugovish & Howell

N. californicus vs. Twospotted and Lewis spider mites

- Control-Lewis
- N. californicus-Lewis
- Control-Twospotted
- N. californicus-Twospotted

Number of Twospotted and Lewis mites

Sampling Date: July 28, Aug 1, Aug 4, Aug 8, Aug 11
Predatory mite assays - Daugovish & Howell

**N. fallacis vs. Twospotted and Lewis spider mites**

- **Control-Lewis**
- **N. fallacis-Lewis**
- **Control-Twospotted**
- **N. fallacis-Twospotted**

### Sampling Date
- July 28
- Aug 1
- Aug 4
- Aug 8
- Aug 11

### Number of Twospotted and Lewis mites
- 0
- 50
- 100
- 150
- 200
- 250
- 300
- 350
- 400
- 450
Predatory mite assays-Daugovish & Howell

A. andersoni vs. Twospotted and Lewis spider mites

Number of Twospotted and Lewis mites

Sampling Date

July28 Aug1 Aug4 Aug8 Aug11

Control-Lewis
A. andersoni-Lewis
Control-Twospotted
A. andersoni-Twospotted
Conclusions

• Quadris Top alternated with Switch or Quintec provided good control for powdery mildew
• Nealta and Agri-Mek provided comparable reduction in spider mite populations
• Twospotted spider mite seems to outcompete Lewis mite in laboratory conditions
• BotaniGard and AzaSol have some promise against aphids and whiteflies
• Commonly used predatory mites (except for *P. persimilis*) are effective against Lewis mite
• May have to watch for Lewis mite especially in sensitive areas
Acknowledgments

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