Major and Minor Diseases of Strawberry in California

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2013 Strawberry production

- USA total acres: 58,190
- USA total value: 2.54 billion $

- CA total acres: 41,500 (71%)
- CA total value: 2.20 billion $ (87%)

USDA-NASS
<table>
<thead>
<tr>
<th>County</th>
<th>Acres</th>
<th>Billion $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventura</td>
<td>13,555</td>
<td>0.6</td>
</tr>
<tr>
<td>Monterey</td>
<td>10,980</td>
<td>0.9</td>
</tr>
<tr>
<td>Santa Barbara</td>
<td>7,313</td>
<td>0.4</td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>3,324</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35,172</td>
<td>2.1</td>
</tr>
</tbody>
</table>
Botrytis fruit rot fungicides

• 2013 trials: no significant differences in percent rot:
  – Botector, Fontelis, Fracture, Merivon, Pristine, Quadris Top, Switch, Tavano, experimentals, untreated

• Recent field surveys (Monterey/Santa Cruz): some indication of resistance to Cabrio, Elevate, and Endura (but not to Rovral) [A. D. Pokorny]
Zygomycetes

Rhizopus

Mucor
Phytophthora cactorum
Leaf blotch
Zythia on fruit calyx tissues
Xanthomonas
Fusarium wilt
Fusarium oxysporum f. sp. fragariae
Verticillium wilt
# Diagnostic challenge: Similar symptoms

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Poor growth</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Stunting</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Dieback</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Pl. collapse</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Crown discolor</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Stress factor</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Assoc. w/ H₂O</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>
Association with changes in IPM
Inoculations: *Macrophomina* isolate 3

- Albion
- Ventana
- Seascape
<table>
<thead>
<tr>
<th>Cultivar</th>
<th><strong>Macroph.</strong></th>
<th><strong>Fusarium</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chandler</td>
<td>“resistant”</td>
<td>susceptible</td>
</tr>
<tr>
<td>Seascape</td>
<td>“resistant”</td>
<td>susceptible</td>
</tr>
<tr>
<td>Monterey</td>
<td>susceptible</td>
<td>“resistant”</td>
</tr>
<tr>
<td>San Andreas</td>
<td>susceptible</td>
<td>“resistant”</td>
</tr>
<tr>
<td>Ventana</td>
<td>susceptible</td>
<td>“resistant”</td>
</tr>
</tbody>
</table>

* Resistant ≠ Immune
Macrophomina / Fusarium: The bad news for CA strawberry growers

- *Macrophomina* and *Fusarium* both very damaging.
- Spreading in fields, counties, state.
- No truly resistant strawberry cultivars.
- Alternative fumigants not completely effective.
- Bed fumigations not sufficient.
- Post-plant fungicides do not work.
Macrophomina / Fusarium: The good news for CA strawberry growers
Macrophomina / Fusarium: The good news for everyone else

- *Fusarium* is host-specific to strawberry.
- *Macrophomina* has not been found causing disease on vegetable crops in coastal counties where strawberry dieback has been a problem.
- *Macrophomina* from strawberry may have strawberry as a preferred host.
Verticillium wilt: Future concerns
Verticillium wilt

Strawberry

Lettuce
Management: soilborne diseases

• Site selection: avoid infested fields.
• Crop rotation: plant non-hosts.
• Pre-plant fumigation: still useful.
  – Prefer flat fume, tarpped
• Sanitation: don’t move infested mud, contaminated equipment.
• “Resistance”: use tolerant (?) cultivars.
• Production: reduce plant stress.
Diagnosis

- Biotic diseases / Abiotic problems: symptoms may be similar.
- Factors to check:
  - Time of year
  - Field distribution
  - Environmental conditions
Transplant establishment problems
Transplant establishment problems