Can biological control agents replace chemical fungicides?

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Control of disease in two strawberry production systems

- Primary interest in grey-mould of fruit (*Botrytis cinerea*)
- Using outdoor and protected (polytunnel) fruit
- Main goal to reduce chemical usage
- How,
  - Decision support systems
  - Modified films
  - Biological control agents
Disease control in strawberry

- Typically use chemical fungicides
- Consumer sensitivity to residues
- Possible build up of tolerance in pathogen
  - Need to address this situation
- Reduce/remove fungicide usage
- Alternatives to be found
  - Biological control agents
Biological control agents (BCAs)

- Use of organism(s) to control pest/disease
- Several commercial BCAs

Can these commercial formulations work under Irish conditions?
Trial I: Evaluation of commercial BCAs in protected strawberry

- Trial in Teagasc, Clonroche 2003
- Used cv. Elsanta (13 mm crowns)
- Planted in modules (10 plants per bag)
- Sprayed all plants with *Botrytis* spores
- Applied five BCAs
- Rovral (chemical control)
- Two harvests ~ fruit yield & diseased fruit
Effect of BCAs (in italics) on average marketable yield and diseased fruit yield (g) per bag (10 plants) of strawberry (cv. Elsanta) over a 60-day cropping period (Summer 2003)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total yield (g)</th>
<th>Marketable yield (g)</th>
<th>Diseased fruit yield (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Botrytis</td>
<td>1065.2</td>
<td>941.3</td>
<td>123.8 (12%)</td>
</tr>
<tr>
<td>Botrytis only</td>
<td>845.8*</td>
<td>717.8</td>
<td>128.0 (15%)</td>
</tr>
<tr>
<td>Botrytis + Rovral</td>
<td>1112.1</td>
<td>1029.8</td>
<td>82.8 (7%)</td>
</tr>
<tr>
<td>Botrytis + Serenade</td>
<td>1108.2</td>
<td>975.7</td>
<td>132.5 (12%)</td>
</tr>
<tr>
<td>Botrytis + Trichospray</td>
<td>1147.2</td>
<td>968.7</td>
<td>178.5 (16%)</td>
</tr>
<tr>
<td>Botrytis + Trianum-P</td>
<td>977.3</td>
<td>848.3</td>
<td>129.0 (13%)</td>
</tr>
<tr>
<td>Botrytis + Trichodex</td>
<td>909.0</td>
<td>794.0</td>
<td>115.0 (13%)</td>
</tr>
<tr>
<td>Botrytis + Messenger</td>
<td>1214.8</td>
<td>970.3</td>
<td>244.5 (20%)*</td>
</tr>
</tbody>
</table>

Significant differences: yes  yes  yes
Indoor trial I: Summary & conclusions

- BCAs can work in protected strawberry e.g. under high disease pressure of trial. Loss with BCAs ~ 13% and no effect on yield.
- Some BCAs seem inappropriate e.g.

<table>
<thead>
<tr>
<th>Serenade</th>
<th>Messenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketable yield: 970.3 g</td>
<td></td>
</tr>
<tr>
<td>Diseased fruit yield: 244.5 g</td>
<td></td>
</tr>
<tr>
<td>Diseased/total (%): 20%</td>
<td></td>
</tr>
</tbody>
</table>

White powdery residue on fruit
Indoor trial I: Summary & conclusions

Future work

1. Repeat trial I – trials this year at Oak Park
2. Include additional commercial BCAs (?)
3. Trials under light modifying film covers
4. Use Irish microorganisms
Irish microorganisms as BCAs

- Foreign microbes do not always work well outside their own country/environment
- Irish microbes better suited to environment in Ireland (?)

- Use laboratory techniques to isolate microbes
- Use greenhouse and field trials to evaluate
Integrated Pest Management

Cultural techniques
variety choice, hygiene practice, water management etc.
in tandem with
BCAs instead of/with fungicides
with
Decision support system (outdoor)
or
Control of environment (indoor)
Acknowledgements

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