Alternaria leaf blotch and fruit spot of apple in Australia

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Alternaria leaf blotch symptoms
Alternaria leaf blotch symptoms
Alternaria leaf blotch symptom: premature defoliation
Alternaria fruit spot symptom
Alternaria leaf blotch and fruit spot distribution

- Pathogen: *Alternaria*
- First report leaf blotch: Stanthorpe 1990’s
- First report fruit spot: Stanthorpe 2003
Problem

- Erratic control of the diseases.
- Identity of the *Alternaria* species involved is still uncertain.
- No information on disease cycle.
Research Aims

Improve our understanding of Alternaria leaf blotch and fruit spot of apples in Australia

1. Pathogen
2. Disease cycle

This study will provide a better understanding of the diseases which can serve as foundation for improved management options.
1. The pathogen

1. What is the identity and diversity of the *Alternaria* species involved in causing the diseases?

2. What is the geographical distribution of the species?

3. Do the same species infect both leaf and fruit?
Identity and diversity of *Alternaria* species

**Experimental design**

- 51 isolates obtained from leaf and fruit symptoms from different regions in six states of Australia
- DNA sequencing 5 genes and morphological examination
Identity and diversity of *Alternaria* species

Results

- Three different *Alternaria* species involved:
  1. *A. arborescens*
  2. *A. tenuissima*
  3. *A. alternata*

- None of the species was specific to leaf or fruit symptoms or region.

- 71% of isolates obtained from symptomatic fruit were identified as *A. tenuissima* and *A. alternata* from Queensland and New South Wales.

- 70% of the isolates obtained from leaf symptoms were identified as *A. arborescens*, occurring in all states.
2. Disease cycle

1. What are the sources of inoculum in the orchard?

2. When during the season are symptoms expressed in the orchard?

3. How do the diseases develop in the tree canopy?

4. What climatic conditions may influence disease expression in the field?
Source of inoculum

- Three orchards at Applethorpe, Queensland.
- Monthly sample collection of 3 trees per orchard from July 2010- now

Sources of inoculum and average quantities of *Alternaria* spp. conidia per cm²

<table>
<thead>
<tr>
<th>Season</th>
<th>Leaf residue</th>
<th>Buds</th>
<th>Twigs</th>
<th>Canopy leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter-’10</td>
<td>6842</td>
<td>0</td>
<td>41</td>
<td>No leaves</td>
</tr>
<tr>
<td>Spring-’10</td>
<td>985</td>
<td>No buds</td>
<td>103</td>
<td>25</td>
</tr>
<tr>
<td>Summer-’10/’11</td>
<td>Residue removed</td>
<td>No buds</td>
<td>161</td>
<td>112</td>
</tr>
<tr>
<td>Autumn-’11</td>
<td>959</td>
<td>No buds</td>
<td>79</td>
<td>223</td>
</tr>
<tr>
<td>Winter-’11</td>
<td>3558</td>
<td>63</td>
<td>51</td>
<td>No leaves</td>
</tr>
</tbody>
</table>
Disease incidence

Alternaria leaf blotch disease incidence

% Disease Incidence

Fruit set

Harvest

Nov-10 Dec-10 Jan-11 Feb-11

Alternaria fruit spot: end of January 2011 - harvest February 2011
Alternaria leaf blotch disease mostly affecting leaves at the bottom level of the trees.

Disease initiates at all levels of tree canopy (indicates air dispersal of spores)
Climate

Climate data obtained from Bureau of Meteorology (Applethorpe station)
Fungus overwinters in leaf residue and twigs

Temperature ± 20°C + high rainfall

Symptom development
Leaf blotch: Nov–Feb+
Fruit spot: end Jan-Feb

Multiple Alternaria species involved

Disease cycle of Alternaria in apple

Symptom development
Leaf blotch: Nov–Feb+
Fruit spot: end Jan-Feb

Multiple Alternaria species involved

Fungus overwinters in leaf residue and twigs
Management suggestion so far

- Reduction of infected apple leaf residue in the orchard by application of urea.
- Orchard hygiene can reduce the amount of inoculum available to infect next season’s crop.
Acknowledgements

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Horticulture Australia