VECTOR TRANSMITTED PHYTOPLASMAS
Class Mollicutes

- Phytoplasmas, spiroplasmas & mycoplasmas
- Degenerate walled bacteria, not primitive precursors
- Clostridial / Bacillus precursors - **Reductive evolution**
- Osmotically fragile
- Morphology - **pleomorphic**
- Reside in phloem sieve tubes of infected plants, move systemically
Genus *Phytoplasma* contains numerous \textquoteleft{candidatus}\textquoteright species

- Not cultivable — \textit{obligate parasites} of plants and insects
- Size \(\sim\) 500 nm diameter
  - Tiny genomes (530 - 1350 Kb)
  - AT rich, GC poor
  - Contain plasmids & viruses
- Not helical
Transmission - Insects

- LH are true alternate hosts
- Transmission is circulative – propagative
- Mollicute-leafhopper interaction varies
Mollicute entering leafhopper gut cells

microvilli

A. Wayadande
Mollicute path within the insect vector

Diagram: A. Wayadande
All phytoplasmas are phytopathogens... and all are transmitted by insects

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Disease</th>
<th>Host</th>
<th>Vector(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidatus phytoplasma mali</td>
<td>Apple proliferation</td>
<td>Apple</td>
<td>Several leafhoppers, planthoppers, psyllids</td>
</tr>
<tr>
<td>Candidatus phytoplasma asteris</td>
<td>Aster yellows</td>
<td>Many vegetables, fruits, ornamentals</td>
<td>Macrosteles quadrilineatus (Aster leafhopper)</td>
</tr>
<tr>
<td>Candidatus phytoplasma australiense</td>
<td>Grapevine yellows</td>
<td>Grapes</td>
<td>Scaphoideus titanus</td>
</tr>
</tbody>
</table>
Aster yellows

Macrosteles quadrilineatus

Aster yellows in carrot

Aster yellows in lettuce
Grapevine yellows

Scaphoideus titanus

Photo by Robert E. Davis
August 25, 2010
Apple proliferation phytoplasma

Witches’ broom

*Fieberiella florii* is reported in parts of the United States and Canada.

Fruits small, off-color
New Apple Disease Found In Canada

The USDA Animal and Plant Health Inspection Service (APHIS) has been notified by the Canadian Food Inspection Agency (CFIA) that they have detected apple proliferation phytoplasma in an apple orchard near Kentville, Nova Scotia. The affected orchard has been placed under quarantine. The affected trees are Pacific Gala and were imported into Canada from the U.S. in 2008. This is the first APP detection in North America.
Management of apple proliferation

- APP, or 'Ca. P. mali', is a quarantine pest in both Canada and the U.S.
- Use clean propagation material
  - Budding and grafting
  - Trade of infected rootstock, scionwood, or budwood
- Use of resistant cultivars
- Insect control
- Cultivation practices

- **Note**: APP genome has been sequenced – approx 600 kb