Understanding and Managing Pecan Bacterial Leaf Scorch

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A Bit of History

• Disease first recognized in 1972
• Identified as a bacterial disease and named pecan bacterial leaf scorch (PBLS) in 2000
  • *Xylella fastidiosa* subsp. *multiplex* (2012)
    • Lives in the water-conducting tissues (xylem) of the plant

PBLS in ‘Cape Fear’ pecan.
PBLS Symptoms

‘Early’-stage PBLS symptoms.

Late-stage PBLS symptoms.
PBLS Symptoms

PBLS in a young grafted tree.

PBLS in a mature tree.
## Cultivar Susceptibility

<table>
<thead>
<tr>
<th>*Barton Caddo</th>
<th>Elliott Farley</th>
<th>Moreland Navaho</th>
<th>Shoshoni Stuart</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Cape Fear Candy</td>
<td>Forkert Jackson</td>
<td>Nacono *Ocone</td>
<td>*Sumner Woodman</td>
</tr>
<tr>
<td>Cherokee</td>
<td>Kiowa</td>
<td>*Pawnee *Rome</td>
<td>Natives/seedlings</td>
</tr>
<tr>
<td>*Cheyenne Desirable</td>
<td>Mahan Melrose</td>
<td>Schley</td>
<td></td>
</tr>
</tbody>
</table>

**NO RESISTANT CULTIVARS HAVE BEEN IDENTIFIED.**

*Highly susceptible cultivars.

## Effect of PBLS on Yield and Tree Growth

### Yield

<table>
<thead>
<tr>
<th>Time Period</th>
<th>% Leaflet Defoliation</th>
<th>% Reduced Kernel Weight</th>
<th>% Reduced Nut Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>67</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>Year 2</td>
<td>66</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>Year 3</td>
<td>41</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>58</strong></td>
<td><strong>16.3</strong></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

### Tree Growth

<table>
<thead>
<tr>
<th>Age of Trees</th>
<th>% Less Diameter</th>
<th>% Less Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Years Old</td>
<td>43</td>
<td>40</td>
</tr>
<tr>
<td>9 Years Old</td>
<td>52</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Graft Transmission in Pecan

• Infected scions
  – 21% transmission rate

• Infected rootstocks
  – 85% transmission rate

Identified PBLS-infected limbs.

Prepared scions for storage.

Bundled scions with a weight.

Submerged scions in hot water.

**Treatment**

- 115°F water for 30 min
- Room temperature water for 1-2 min

**Completely submerge!**

Grafted to non-infected rootstock.

The link to the publication “Procedure for Hot Water Treatment of Pecan Scion Wood” can be found at the end of this presentation.
### Hot-water Treatment of Scions

<table>
<thead>
<tr>
<th>Two-Year Totals</th>
<th># of Scions Tested</th>
<th>% Graft Success</th>
<th># of Trees with PBLs Symptoms</th>
<th># of X. fastidiosa-Infected Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot-water Treated Scions</td>
<td>165</td>
<td>84.8</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Non-treated Scions</td>
<td>105</td>
<td>84.7</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>

At a 21% graft-transmission rate, 29 of the 140 hot-water-treated scions should have been infected. **97% EFFECTIVE**

PBLS Spread in a Mature Orchard

- Orchard location: LSU AgCenter Pecan Research-Extension Station, Shreveport, Louisiana
- Planting date: 1986 or 1987
- Composition:
  - 3 cultivars and non-grafted trees
  - 5 rootstocks

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Diseased Trees/Number of Trees in Orchard (% Infected Trees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>5/410 (1.2%)</td>
</tr>
<tr>
<td>2002</td>
<td>12/410 (2.9%)</td>
</tr>
<tr>
<td>2003</td>
<td>17/409 (4.2%)</td>
</tr>
<tr>
<td>2004</td>
<td>33/390 (8.5%)</td>
</tr>
<tr>
<td>2005</td>
<td>63/390 (16.2%)</td>
</tr>
<tr>
<td>2006</td>
<td>91/390 (23.3%)</td>
</tr>
</tbody>
</table>

An increase in the number of PBLS-infected trees was observed in all cultivars and in most non-grafted trees. However, the greatest increase in the number of infected trees occurred in cultivar Cape Fear, the cultivar in the orchard with the highest susceptibility.
Insect Transmission in Pecan

Collected potential vectors – xylem-feeding insects (spittlebugs and sharpshooters).

Fed captured insects on infected pecan tissue and then caged them onto Cape Fear pecan seedlings.
Insect Transmission in Pecan

- Percent transmission varied from 2% – 100% depending on the insect species

Dr. R. S. Sanderlin at the LSU AgCenter Pecan Research-Extension Station in Shreveport, LA, has monitored five pecan orchards in Louisiana for the presence of known and potential vectors of *Xylella fastidiosa* using yellow sticky traps.

Data indicated that the greatest number of known and potential vectors were present in orchards from May through August.

*Orchard locations:

1. Orchard location 1
2. Orchard location 2
3. Orchard location 3
4. Orchard location 4
5. Orchard location 5

*Known and potential vectors*
Subspecies of *Xylella fastidiosa*

- **Subspecies fastidiosa** (2004)
  - Almond, grapevine
- **Subspecies multiplex** (2004)
  - Almond, peach, oak, pecan
- **Subspecies pauca*** (2004)
  - Citrus, coffee
- **Subspecies sandyi** (2005)
  - Oleander
- **Subspecies tashke** (2009)
  - Chitalpa

*Not currently present in the U.S.*
Management of PBLS

- FOCUSED ON PREVENTION!
- Plant non-infected trees
- Use non-infected rootstock
- Collect scion wood from non-infected trees
- Hot-water treatment of scions
- Monitor vectors in orchards and apply insecticides during peak trapping periods or at first appearance (?)
- Avoid planting/remove plants near orchards that attract vectors OR manage vectors on those plants (?)
- Branch or tree removal (?)
Thank you for your attention!

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The research discussed in this presentation was conducted by R. A. Melanson and R. S. Sanderlin at the LSU AgCenter Pecan Research-Extension Station or at Louisiana State University. Unless otherwise specified, photographs were taken by R. A. Melanson or R. S. Sanderlin.
Additional Resources

- Articles:
  - Pecan Bacterial Leaf Scorch Cultivar Susceptibility and Pathogen Transmission
  - Pecan Bacterial Leaf Scorch: A New Look at an Old Problem
  - Procedure for Hot Water Treatment of Pecan Scion Wood

- Additional photos of PBLS (search ‘Xylella fastidiosa and pecan’)
  - www.ipmimages.org/


Sanderlin, R. S. 2005. Cultivar and seedling susceptibility to pecan bacterial leaf scorch caused by Xylella fastidiosa and graft transmission of the pathogen. Plant Disease 89:446-449.

