Laurel Wilt Disease Update

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What is Laurel Wilt Disease?

- Laurel wilt is a disease of North American trees and shrubs in the laurel family (Lauraceae)
- Common laurel species in the southeastern U.S. include; sassafras, redbay, and swampbay, and the economically important avocado in southern Florida
- Over 90% of redbay/swamp bay trees die within 3 years of stands being attacked
- Laurel wilt is caused by a non-native fungus (*Raffaelea lauricola*)
- The fungus is introduced into native trees by the redbay ambrosia beetle (*Xyleborus glabratus*), an invasive woodboring insect native to Asia

Figure 1: Example of tunnel excavation in redbay (*Persea borbonia*) by the female redbay ambrosia beetle (*Xyleborus glabratus*). Photo by James Johnson.

Figure 2: Adult ambrosia beetles tending fungal gardens and larvae inside excavated tunnels/galleries. Credit: Jiri Hulcr, ambrosiasymbiosis.org

- Other native and non-native ambrosia beetles have also picked up the pathogen through a process called “lateral transfer”, increasing the difficulty of this already hard to manage problem
- Due to a lack of co-evolutionary history, our native trees are unable to defend themselves from the non-native beetle-fungus complex
Laurel trees and shrubs have a lethal “allergic reaction” and completely halt water movement in vascular tissues once exposed to the fungus.

Large, mature trees can wilt and die within weeks.

**Ambrosia Beetles and Fungi**

Ecologically, ambrosia beetles play an important role in forest health world-wide because they target and help dispose of stressed, weakened, and/or dying trees. Nearly every species of tree is a host for at least one ambrosia beetle species. Once a suitable host is chosen by a female ambrosia beetle, she bores through the bark and excavates tunnels and galleries through the wood to lay eggs and tend to her offspring (Figure 1). Instead of eating wood, ambrosia beetles cultivate fungal gardens in the tunnels for both the adults and larvae to eat (Figure 2). The fungi are introduced by the female ambrosia beetle during tunnel excavation. Once introduced, the fungi spread throughout the tunnels and can often take over. However, male ambrosia beetles are known to tend the fungal gardens and also defend the tunnels from intruders. Introduction of the fungi and tunnel excavation aids forest nutrient cycling by beginning the decomposition of trees before they fall to the forest floor. Unfortunately, the redbay ambrosia beetle transports one of the few ambrosia fungi known to cause mortality of otherwise healthy trees.

**Distribution and Hosts**

In addition to its native range in Asia, laurel wilt is currently found in the southeastern United States from North Carolina to Texas (Figure 3); however, laurel wilt has the potential to establish across most of the eastern U.S., as well as California. In Mississippi, as of September 2016, laurel wilt has been confirmed in Jackson, Harrison, Stone, George, Perry, and Forrest counties (Figure 3). Eleven species of North American laurels are susceptible to laurel wilt (Table 1). The species in Mississippi at risk include; redbay (*Persea borbonia*), swampbay (*P. palustris*), sassafras (*Sassafras albidum*), northern spicebush (*Lindera benzoin*), as well as the already endangered shrubs, pondberry (*Lindera melissifolia*) and pondspice (*Litsea aestivalis*).
Identification of the Beetle and Disease Symptoms

**Beetle**
- The redbay ambrosia beetle is difficult to spot and/or identify with the naked eye—it's about half the length and diameter of an uncooked rice grain (Figure 4)
- The only evidence of beetle infestation may be tiny circular holes in the bark (Figure 5A), sawdust at the base of the tree (Figure 5B), or compacted sawdust sticks protruding from the bark (Figure 5C)
- Proper identification of the beetle is difficult and should be confirmed by a professional entomologist

**Disease**

*In all laurel species*
- Dark streaking/staining under the bark
- Initial symptoms may only appear in a small section of the crown
- Disease progression may happen at different times and rates in the crown, but symptoms usually begin in the terminal leaves

*In Redbay*
- Initial symptoms of laurel wilt in redbay present as yellowish green leaves that rapidly wilt and turn bronze, and finally grey (Figures 6A and 6B)
- The grey leaves can stay attached for up to a year or more after the tree dies

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<tbody>
<tr>
<td>redbay</td>
<td>Persea borbonia</td>
</tr>
<tr>
<td>swampbay</td>
<td>Persea palustris</td>
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<tr>
<td>silkbay</td>
<td>Persea humilis</td>
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<td>avocado</td>
<td>Persea americana</td>
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<td>Lindera benzoin</td>
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<td>pondspice</td>
<td>Litsea aestivalis</td>
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<td>California bay laurel</td>
<td>Umbellularia californica</td>
</tr>
<tr>
<td>lancewood</td>
<td>Ocotera coriacea</td>
</tr>
<tr>
<td>Gulf licaria</td>
<td>Laurus triandra</td>
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Figure 5: The only visual signs of infestation by the redbay ambrosia beetle may be; A) boring holes in the bark, B) sawdust at the base of the tree, or C) compacted sawdust sticks protruding from the bark. Photos by John Formby (A and C) and Ron Billings (B).
In Sassafras

- Initial symptoms in sassafras appear as yellow, wilted leaves that quickly turn brown
- The dead leaves quickly drop from the tree
- New sprouts may be seen in the crown during the final stages of laurel wilt progression (Figure 7)

Impact

**United States**

- Approximately 300 million redbay and swampbay trees have been killed by laurel wilt since the introduction of the redbay ambrosia beetle into the United States
- Sassafras is being increasingly attacked and killed over a larger area
- Winter temperatures are not expected to be cold enough in the upper midwest or California to help protect native sassafras or California bay laurel

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**Figure 6:** Example of laurel wilt symptoms in redbay (*Persea borbonia*). A) Leaf progression and B) crown symptoms in redbay after introduction of the laurel wilt pathogen. Initial symptoms usually begin in the terminal leaves and a tree can show different symptomatic stages in its crown (shown in B). Photos by Chip Bates (A) and John Formby (B).

**Figure 7:** Example of epicormic shoots in laurel wilt symptomatic sassafras in Jackson County, Mississippi. Photo by John Riggins.
• Avocado groves in Florida are being clear-cut or abandoned
• Numerous insects, such as the palamedes butterfly, and and other creatures including turkey, songbirds, and mammals who depend on redbay fruit as a food source
  - Mississippi
• Ornamental plantings and natural stands of redbay and swampbay have experienced the greatest amount of laurel wilt-induced mortality in Mississippi, especially in Jackson County
• Sassafras occupies a larger geographic range in Mississippi (Figure 8) than any other laurel species; therefore, sassafras will likely experience increasing mortality as the redbay ambrosia beetle expands its range
• Palamedes swallowtail butterfly (Papilio palamedes; Figure 9) and yellow-fringed orchid (Platanthera ciliaris; Figure 10) populations in Mississippi are being threatened by laurel wilt Management
  Unfortunately, at this time there is very little that can be done to control the spread of the laurel wilt. The redbay ambrosia beetle lives inside trees, therefore contact insecticides (i.e. those that must make direct contact with the insect) offer little in the way of control. Systemic fungicides (e.g. Propiconazole, trade name Alamo©) can be
injected into individual trees and have been shown to offer resistance against the laurel wilt pathogen, but these are expensive, difficult to apply in certain settings, require reapplication every 7 months, and cannot be applied at the forest level. In most instances, the best management tool for laurel wilt is to cut and burn newly infested trees and limit the movement of infested wood. However, newer technologies such as biocontrol using fungi that can kill ambrosia beetles, better trapping technology, including more attractive lures are being developed. Additionally, recent research indicates there may be some fairly inexpensive volatile compounds that are effective at repelling redbay ambrosia beetles from avocado groves in south Florida.

References


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