RESEARCH LABORATORY TECHNICAL REPORT

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Laurel Wilt

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Laurel wilt is a vascular wilt disease caused by an invasive fungus that affects members of the plant family Lauraceae. This plant family includes redbay, swampbay, sassafras, and avocado. In susceptible plants, the disease disrupts the water-conducting tissue, leading to rapid wilting and death. This disease was first detected in 2002 near Port Wentworth, GA, and has since spread rapidly across the southeastern United States. It is estimated that over half a billion redbay trees have died from laurel wilt, and that this epidemic may have resulted from a single introduction of the redbay ambrosia beetle carrying the pathogen (its symbiotic fungus) *Raffaelea lauricola*. This disease could result in the disappearance of redbay and other Lauraceae from our natural ecosystems. Laurel wilt has been confirmed in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas.

Symptoms

Laurel wilt causes symptoms typical of a wilt disease. Initially, individual branches in the upper/outer canopy may wilt and continue to hold dead, dried leaves (Figure 1). Over time, these symptoms will progress to the other branches and eventually the tree will die. In addition to these symptoms, vascular discoloration (Figure 1) will occur in the sapwood xylem; this symptom can be observed by removing the bark tissues if disease is suspected. Trees that die from laurel wilt will often produce basal sprouts in subsequent years, but these shoots will eventually succumb to the disease and wilt as well.

Figure 1: Dieback and wilt symptoms on redbay trees (left), and vascular streaking/discoloration symptom (right)

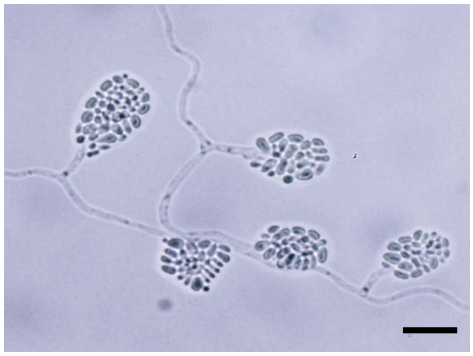
Causal Agent

Laurel wilt has a complex life cycle involving an ambrosia beetle and its associated fungus. The fungus that causes laurel wilt is *Raffaelea lauricola* and is in the same taxonomic family of fungi as the Dutch elm disease pathogen, Ophiostomataceae. The fungus is introduced or vectored into trees by the redbay ambrosia beetle, *Xyleborus glabratus* (Figure 2).

Figure 2: The redbay ambrosia beetle, *Xyleborus glabratus*. Photo used with permission from Jiri Hulcr

The vector. Ambrosia beetles burrow into the xylem of trees to create galleries where they "farm" a symbiotic fungus which they carry to new trees. This fungus is the primary source of nutrition for the ambrosia beetle. Typically, ambrosia beetles are attracted to stressed, weakened, or recently killed trees. Conversely, the redbay ambrosia beetle does not exhibit this behavior, and is attracted to healthy plants in the family Lauraceae. The redbay ambrosia beetle deposits its mutualistic fungus, *R. lauricola*, into the tree where it grows in the beetle galleries. The female beetles lay eggs in these fungal-filled galleries where the larvae mature by consuming spores produced by *R. lauricola*. Once the insects mature into adults, they exit the tree carrying spores of *R. lauricola* and drill into a new tree to start the life cycle again. In addition to the redbay ambrosia beetle, there have been several additional beetles proven to transmit the infectious spores of *R. lauricola.*

Figure 3: Clusters of *Raffaelea lauricola* spores, the causal agent of laurel wilt. Scale bar=10 µm



The pathogen. *R. lauricola* spores (Figure 3) cause the plant to overreact by producing tyloses, specialized structures produced in the water-conducting xylem vessels to slow or stop the spread of foreign agents, within the tree. This overreaction is what causes the plant to wilt and die. As the infection progresses throughout the tree, more xylem vessels become clogged and eventually a majority of the plant's "water pipes" stop working, resulting in death of the plant. In addition to the ambrosia beetle vectors, there is some evidence from avocado orchards that root grafting between trees can also spread this disease (similar to other wilt diseases such as oak wilt). While this fungus can kill susceptible hosts on its own, it requires assistance to move from host to host (i.e., ambrosia beetles or root grafts).

Management

While there are systemic products that can successfully kill beetles, these materials are located inside the wood tissues. Therefore, the beetle vector must first feed on the tree and consume the product before it dies. The redbay ambrosia beetle can vector thousands of spores in specialized spore sacs (mycangia) near its mouth with only hundreds of spores required to cause infection and tree death. This is why management of the beetle with protective insecticidal products is not an efficient management tactic. By the time the beetle feeds on the wood, it has already deposited enough spores to cause disease.

Preventive products with the active ingredient, propiconazole, are available in forms that protect susceptible hosts from fungal infection. These products must be injected into trees which can be time consuming and expensive. For this reason, it is impractical to treat at the forest level, but injection can be a successful management tactic for specimen trees on the local scale. It should be noted that there are currently no products that are labeled for avocados grown in residential localities, so injections can only be performed on ornamental trees. Lastly, these products are only effective when applied for preventive management, not as therapeutic treatments.

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