

Laurel Wilt Disease

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Figure 6. Ambrosia beetle. Source: Tim Motis

Introduction

"Save the Guacamole!" is the battle cry of a Florida campaign (<https://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Save-the-Guac>) to fight the fungal disease killing avocado (*Persea americana*) trees throughout Florida. Laurel wilt disease is caused by the fungus *Raffaelea lauricola* and spread by the redbay ambrosia beetle (*Xyleborus glabratus*) (Figure 6). The redbay ambrosia beetle (a member of the insect order Coleoptera for the entomologists among you) was first identified in Georgia in 2002 (<http://cirs.ucr.edu/blog/invasive-species/redbay-ambrosia-beetle-and-laural-wilt/>). It is thought that this beetle, native to Southeast Asia, was introduced through untreated cargo pallet wood and spread quickly to native redbay (*Persea borbonia*) and sassafras (*Sassafras albidum*) trees.

Other common trees and shrubs of the Lauraceae family are also susceptible, including Asian spicebush (*Lindera latifolia*), yellow litsea (*Litsea elongate*), camphor (*Cinnamomum camphora*), silkbay (*Persea borbonia humilis*), California bay laurel (*Umbellularia californica*), and the endangered native species pondspice (*Litsea aestivalis*) and pondberry (*Lindera melissifolia*) (GISD 2015). Plant death is not caused by the feeding of the beetles but from the laurel wilt fungus, which is now carried by the exotic redbay and native species of ambrosia beetle. The fungus grows in a tree's vascular system (the xylem and phloem), leaving it unable to transport food and water. The adult and larval stages of the beetle feed on the fungus in a symbiotic relationship. The beetles "farm" the tree, harvest their crop, and the spreading fungus chokes the tree.

The spread of the disease has been rapid due to the abundance of wild and ornamental host plants, and the transportation of firewood and other untreated wood products across state lines (Figure 7). Laurel wilt has spread throughout coastal regions of southeastern US, and infected redbay trees were identified in Texas in 2015 (<http://www.tsusinvasives.org/home/database/raffaelea-lauricola>).

Signs of attack (<https://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Save-the-Guac>) by the ambrosia beetle and laurel wilt infection are toothpick-like accretions of sawdust (i.e., frass created while tunneling; Figure 8) protruding from trunk or branches, drooping leaves that turn reddish or purple (Figure 9), and black streaks in the sapwood. The sapwood of dead and dying branches should be examined with a knife or ax to detect black or bluish streaks caused by fungal staining. Lack of black streaks indicates stress from phytophthora root rot, drought stress, freeze damage, lightning strike, and other causes. The University of Florida Plant Diagnostic Center (<https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>) is a good resource for pest and disease questions and lab services.



Figure 7. Redbay die-off in The Everglades. *Source: JaxStrong, Creative Commons Attribution License*



Figure 8. Frass tunnels (top) and sawdust frass at base of tree (bottom). *Source: Tim Watkins*



Figure 9. Dead leaves on infected branches. Source: Tim Watkins

Past and Future Impact

Avocado consumption in America increased sevenfold in the past twenty-four years, eclipsing bananas as America's highest value fruit import (<https://www.nytimes.com/2018/03/27/magazine/the-fruit-of-global-trade-in-one-fruit-the-avocado.html?rref=collection%2Fsectioncollection%2Fmagazine&action=click&contentCollection=magazine®ion=rank&module=package&version=highlights&contentPlacem>). Ninety percent of US production (<http://www.growingproduce.com/fruits/can-avocados-be-saved-from-deadly-laurel-wilt-disease/>) is in California, and 90% of US consumption is grown in Mexico. Avocados are high in vitamins, minerals, and unsaturated fats, which is part of the reason for their extraordinary growth in popularity. The emergence of avocados as a lucrative international commodity led to the nickname "green gold." The impact of laurel wilt on Florida's agriculture sector, the second largest avocado producing state, has included more than 40,000 culled trees (<http://www.growingproduce.com/fruits/can-avocados-be-saved-from-deadly-laurel-wilt-disease/>), millions of dollars of lost revenue, and job losses.

If redbay ambrosia beetle makes its way to the US west coast, its spread will be hastened by the native California bay laurel (*Umbellularia californica*) and will quickly infect avocado orchards. The disease could also spread rapidly through avocado's native range of central Mexico, the highlands of Guatemala, Costa Rica, and Panama, as well as several commercial production regions elsewhere in Latin America. This epidemic potential has led faculty from the University of Florida Tropical Research and Education Center (<https://trec.ifas.ufl.edu/>) in Homestead, Florida, to collaborate with California researchers on best practices to detect infected trees, implementing swift sanitation procedures, and trapping ambrosia beetle populations (Crane *et al.* 2011).

Prevention and Treatment

No cost-effective fungicides or insecticides have yet been found. A complicating factor is that the pathogen can spread through root grafts (i.e. roots from adjacent trees that contact each other and join together). Infected trees should be removed immediately and neighboring trees should be treated with antibiotics (Ploetz *et al.* 2017). Preferred integrated pest management (IPM) options include:

- constant scouting with tree inspections
- removal and burning of affected trees (Ploetz *et al.* 2017)
- spraying chemical pheromone repellents to disorient and disrupt ambrosia beetles, combined with pheromone traps (Figure 10)
- use of a parasitic biocontrol containing the fungus *Beauveria bassiana* that infects beetles (Zhou *et al.* 2018)

Long-term control will probably only come through breeding and identifying resistant varieties and rootstocks, which may take decades of research.

Though avocados have generally been a low maintenance, nutritious, and high yielding crop, increased vigilance and management are now required. ECHO community members in the Western Hemisphere should start inspecting their trees for signs of beetle attack and fungal disease on a regular basis. Since avocados are an important food and income source for smallholder farmers, it is important to have a cooperative community effort to identify the ambrosia beetle and affected trees, and to respond with whatever measures are available and affordable in your area.



Figure 10. Pheromone trap. Source: USDA, Creative Commons Attribution License

References

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