

Redbay Ambrosia Beetle Poses Potential Threat to California's Avocado Industry

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California produces approximately 90 percent of the nation's avocado crop. California avocado growers compete in both the domestic and international markets with countries with much lower costs of production and better labor availability. To stay competitive will require more efficient farming strategies and a significant increase in productivity on the part of California growers, especially with the increase of water costs and labor constraints. To adapt, growers need to dramatically increase yield per acre using the same amount of water or less. In addition to cultivation challenges, invasive pests can cause even more challenges to growers. In recent years, California avocado growers have had to deal with the Polyphagous and Kuroshio Shot Hole Borers, collectively known as the Shot Hole Borer complex (SHB). These invasive wood-boring beetles attack over 50 tree species in Southern California, including the avocado tree. They spread a pathogenic fungus (*Fusarium euwallacea*) which can severely debilitate or even kill its host. Current research has determined that the SHB does not kill avocado trees, however, even this theory has its controversy since in Israel where the Polyphagous Shot Hole Borer also exists, it has been known to severely debilitate avocado trees.

Another invasive ambrosia beetle, the redbay ambrosia beetle (RAB; *Xyleborus glabratus*), is currently spreading through the Florida avocado industry (Photo 1). This beetle has been slowly spreading across the southeastern United States and is currently found as far west as eastern Texas. Therefore, the California growers need to be aware that this pest-disease complex may spread to California and cause severe problems to the state's avocado industry. RAB has a fungal symbiont, *Raffaelea lauricola*, that causes the deadly Laurel Wilt Disease, LWD (photo 2). Laurel wilt affects redbay (*Persea borbonia*) and other tree species of the Laurel family (Lauraceae), including avocado. *R. lauricola* is introduced into host trees when RAB colonizes a tree.



Photo 1. Adult RAB are very small (~1/16-inch-long), dark brown to black in color, slender and cylindrical in shape and spend most of their life within the tree. Photo: Florida DACS, Bugwood.org

Native to Southeast Asia, RAB has similarities to our current ambrosia pests, Polyphagous and Kuroshio shot hole borers. However, the fungus associated with laurel wilt is unlike the disease here in California. Trees become infected when female beetles attack host trees and introduce the pathogen into the xylem while boring their galleries (Photo 3). The infection restricts the flow of water in the tree, induces a black discoloration in the outer sapwood and causes the leaves to wilt. The tree dies so fast that it doesn't even have a chance for the leaves to fall off the dying branches (Photo 4).

Adult RAB are very small (~1/16-inch-long), dark brown to black



Photo 2. Redbay ambrosia beetle causes the deadly vascular disease laurel wilt affects redbay and other tree species of the Laurel family (Lauraceae), including avocado. Photo by Sonia Rios

in color, slender and cylindrical in shape and spend most of their life within the tree. Larvae are white, legless grubs with an amber colored head capsule and are found within galleries throughout infected trees. Female beetles can produce flightless male offspring without mating, but females may mate with their male offspring or sibling males to produce males and females. Females greatly outnumber males in populations. In the Southeast, the RAB's lifecycle from egg to adult appears to take 50-60 days, and there appear to be multiple overlapping generations per year (Hanula et al. 2008). Female beetles emerging from galleries may reinfest the same tree or disperse in search of new hosts. Host trees can remain standing for years and may continue to serve as host material for the beetles for several months after initial colonization. Their flight activity peaks in the late afternoon and early evening. It is known that ambrosia beetles are notoriously difficult to control because they are inside the tree most of their lifecycle versus being outside the tree.

RAB can fly short distances, but laurel wilt fungus spreads more quickly through the movement of insect infested plant material, such as firewood. Additionally, the pathogen also spreads to other ambrosia beetle vectors. This happens when beetles feed on diseased trees and become contaminated with spores of *R. lauricola*. Spread can also occur through root-grafting between trees.

Sanitation is the most effective way to manage this problem. Scouting for wilted branches and quickly removing the wilted branches has been the key to early intervention and eradication. It is suggested to remove symptomatic trees immediately upon their identification. Since when frass and streaks in the wood are apparent, the tree is already infected and has been for some time. As soon as a grower sees the wilt in the branches, it's time to move quickly. Verticillium wilt and Phytophthora root rot can be mistaken for laurel wilt so growers should check for these diseases before removing trees.

Contact insecticides are ineffective because the insects are primarily inside the tree. One of the first goals to avoid infestation with the beetles by maintaining a healthy tree. Stressed trees are

more attractive to beetles. The beetles prefer dense canopies with overlapping leaves and branches. Chipping infected trees is effective in reducing the spread of the disease; however, chips must be small (1 square inch pieces or smaller) as possible and dried quickly so that the wood is not conducive to fungal growth. A potential pitfall to this approach is that the smell of the chipped wood can attract other wood boring insects. Research is currently being conducted to determine if different commercial formulations of insecticides can be effective in controlling the beetle.

Photo 3. Cross-section of an infested avocado tree showing ambrosia beetle galleries. Trees become infected when female beetles attack host trees and introduce the pathogen into the xylem while boring their galleries. Photo by Sonia Rios





Photo 4. Most trees die so quickly that the leaves do not fall off the dead branches (Avocado tree pictured here). Photo by Sonia Rios



Photo 5. Small, dark holes in the sapwood further indicate wood boring beetles are present. Photo by Sonia Rios

Scouting for laurel wilt in commercial avocado groves

Surveying for the symptoms of laurel wilt is a key component to limiting the spread of the disease. Growers and their workers should survey their groves weekly or more often if an infestation is detected in an adjacent grove. Pathogen sniffing dogs are currently being used in Florida, however there are less than half-dozen trained dogs for this purpose.

1. Symptoms to look for might include:

- i. Leaf and young stem wilting.
- ii. Leaf color changing from dark green to light green, bluish-green or greenish-brown. Some leaves showing leaf mottling (dark and light green areas) and yellowing.
- iii. Dead, curled leaves hanging on the tree.
- iv. A few stems and limbs with 2 to 4 feet of dieback or whole sections or entire limbs with dieback.
- v. Inspection of the trunk and major limbs may show dried sap (white, crystalline powdery material) that indicates insect boring. In any case, on symptomatic limbs remove the bark down to the sapwood and look for dark streaking. Dark streaks in the sapwood may indicate fungal infection. Normally this sapwood should be white to yellowish with no dark staining or streaking. Additionally, small, dark holes in the sapwood further indicate wood boring beetles are present.

2. If the tree shows only a few stems and limbs with 2 to 4 feet of dieback, wait for confirmation of laurel wilt before removing the tree. You can remove the dead part of the limb by cutting several feet below the dead area of the limb; burn or bury the infested limb.

If you have any questions regarding the Redbay ambrosia beetle or Laurel wilt disease, please visit the Florida Department of Agriculture and consumer services website, <http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Agriculture-Industry/Pests-Diseases/Laurel-Wilt-Disease> or contact your local Cooperative Extension Farm Advisor or State Specialist. ■

References

- Hanula, J.L., Mayfield, A.E. III, Fraedrich, S.W., and Rabaglia, R.J. 2008. Biology and host associations of the redbay ambrosia beetle, (Coleoptera: Curculionidae: Scolytinae), exotic vector of laurel wilt killing redbay trees in the southeastern United States. *Journal of Economic Entomology* 101: pp. 1276-1286.
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