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Issues concerning the Control of the Redbay Ambrosia Beetle (*Xyleborus glabratus*) and Spread of the Laurel Wilt Pathogen (*Raffaelea lauricola*)

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Background

The natural spread of the redbay ambrosia beetle-laurel wilt pathogen (RAB-LW) through the natural areas has been estimated to be as high as ~34 miles per year; others estimate between 15-20 miles per year (Koch and Smith, 2008). Furthermore, the beetle is attracted to volatiles naturally emitted by living trees, severed limbs, tree stumps, and wounded (pruned) trees of avocado (*Persea americana*) and redbay (*Persea borbonia*) trees (Hanula et al., 2008). Finally, anywhere RAB-LW has been established for more than 12-18 months resulted in >95% mortality for redbay trees (Fraedrich et al., 2008).

The redbay ambrosia beetle reproduces in the galleries of infested hosts (e.g., redbay, sassafras, avocado) thus protecting them from predators. The developmental time of the RAB inside the galleries of the host tree from egg to adult is 7 to 8 weeks depending upon temperatures (Hanula et al., 2008). Logs, limbs, sections of limbs (called bolts) and stumps may all be infested by the RAB. Furthermore, chipping infested wood material may not destroy adults, eggs, larvae, and pupae. The time from beetle infestation of a host to tree damage or death varies with the host species, tree health, tree size, and ranges from about 7 days to about 3 months (Fraedrich et al., 2008; Mayfield et al., 2008).

Antidotal evidence and documentation of the dates and locations of new infestations demonstrate man-made spread of RAB-LW is much faster and has moved the RAB-LW infestation farther and faster than by natural means. For example, RAB-LW was established only as far south as Chatham County, GA in 2004 but suddenly was found in Duval County, Florida in 2005; having moved over 130 miles. Several issues need to be address by regulatory agencies at the local, state, regional and federal level if movement of this pest complex is to be slowed or stopped. Issues include but are not limited to:

1. Movement of firewood and logs by entrepreneurs, residents, landscape companies, pruning companies (e.g., Asplundh) and wood-turners.
2. Movement of wood chips from infested wood (same groups plus mulch companies).
3. Movement of wood products (logs, chips) to landfills (same groups including municipal waste companies and arborists).
4. Illegal dumping of wood products (logs, brush, limbs, etc.); especially in the main avocado production area of south Florida/Miami-Dade County.
5. Movement of potentially infested host trees. There needs to be a protocol designed to kill the beetle and fungus that nurseries can follow that would allow them to ship product out of an infested area.

Currently we recommend:

1. Report any suspicious redbay (and other native host trees) and avocado trees to DPI and USDA-APHIS.
2. Redbay and other host woody forest species should not be moved or sold as firewood, tree trimmings, BBQ smoke-wood, mulch, or wood-turning material.
3. Extreme caution should be used in moving host trees (e.g., redbay, avocado) and wood products into Miami-Dade County from other counties. Insect- and disease-free containerized host trees should only be purchased from reputable nurseries, and trees showing any signs of wilt or dieback should be destroyed immediately.

What we don't know concerning control strategies

1. Pest and disease control substances that are efficacious and economic for insect/disease control under commercial conditions (in application method and cost of material)? Propiconazole injections have been shown efficacious for redbay and it is assumed permethrin will kill the beetle – however, we need to expand greatly our pest control options.
2. Will tarping and composting the cut wood/chips from an infested tree preclude beetle emergence and laurel wilt pathogen spread?
3. Can the disease be transmitted by contaminated pruning equipment?
4. What can regulatory agencies implement as soon as possible with respect to monitoring and control strategies to preclude manmade movement of RAB-LW?

Tentative recommended control measures

Urban and rural residents

Rural and urban residents should be on the look-out for redbay and other host trees (including avocado) showing signs of rapid wilting, dieback, and insect boring, and should report this to the Department of Plant Industry (<http://www.doacs.state.fl.us/pi/index.html>) and Division of Forestry (<http://www.fl-dof.com/>). The local DPI office can be located through calling DPI headquarters [(352) 372- 3505 ext. 118] or through their county locator website (http://www.doacs.state.fl.us/pi/plantinsp/pi_inspectordirectory/pi_insp_map.html). This will help regulatory agencies and scientists track the movement of this pest. Preliminarily, redbay ambrosia beetle attacks of redbay appear to be highest from June through October.

The wood (i.e., limbs, trunk, stems) of door yard avocado trees should not be placed into the urban debris stream, that is, taken to the local landfill because adult and immature (eggs, larvae, pupae) RAB remain and develop in this wood and can emerge to infest more trees.

Current recommendations for urban and rural residents with infested redbay or avocado trees include: immediately cutting the tree to ground, placing all wood (or chips) on top of the stump, and covering with a tarp all the way to the ground. Perhaps the composting process can be accelerated with ingredients such as topsoil, manure, fertilizer and water. For more information on how to build compost piles visit <http://edis.ifas.ufl> or go to <http://edis.ifas.ufl.edu/pdffiles/EP/EP32300.pdf> and <http://edis.ifas.ufl.edu/pdffiles/HE/HE02600.pdf>. Ideally, the stump should be painted with glyphosate (e.g., Roundup[®]) or another compound to kill the roots and prevent sprouting.

Burning has not been recommended because of the necessity to obtain state, county, and/or municipal burn permits and the danger of uncontrolled burning by residents.

Tentative recommendations for commercial avocado growers

1. Commercial growers should be on the look-out for avocado trees showing signs of rapid wilting, dieback, and insect boring, and should report this to the Department of Plant Industry (<http://www.doacs.state.fl.us/pi/index.html>) and Division of Forestry (<http://www.fl-dof.com/>). The local DPI office can be located through calling DPI headquarters [(352) 372- 3505 ext. 118] or through their county locator website (http://www.doacs.state.fl.us/pi/plantinsp/pi_inspectordirectory/pi_insp_map.html). This will help regulatory agencies and scientists track the movement of this pest. Preliminarily, redbay ambrosia beetle attacks of redbay appear to be highest from June through October.
2. Scout the grove, if a suspect is found, verify through visual symptoms including black streaks under the bark.
3. Avoid plant stress caused by abiotic (non-living) and biotic (living) factors. Usually, ambrosia beetles attack trees suffering from some type of environmental or cultural stress (e.g., drought, flooding, freezing, nutrient deficiencies, etc.). Thus it is highly recommended to keep your trees as healthy as possible, especially optimizing nutrition and water management strategies to prevent nutrient deficiencies and drought stress. Critical periods to avoid drought stress include when avocado trees are flowering and during fruit development. Periodic irrigation during prolonged drought conditions may be necessary. In contrast, over irrigation which results in prolonged soil saturation is also detrimental to avocado trees and may result in phytophthora root rot caused by *Phytophthora cinnamomi*.
4. Once the beetle and fungus is detected in the avocado production area:
 - (a) Do not move infested avocado trees or tree parts as this may spread the infestation. Burn infested tree parts or trees in the grove to destroy redbay larvae and adults inside the wood (permits may be obtained from the county). Chipping the infested wood will eliminate the wood from being used for breeding beetles but will not destroy the beetles or larvae due to their very small size. The stumps of dead or dying trees should be burned in-place to prevent further spread of the redbay ambrosia beetle and larvae. In mature groves we do not recommend painting the stumps with glyphosate as this may be translocated to adjacent avocado trees and kill them.

At present, we recommend that if a tree is positively identified with this beetle or signs of disease/infestation [i.e., sudden wilting, desiccating and dead leaves remaining on the stems, stem and/or limb dieback, black streaking under the bark (sign of the laurel wilt pathogen), very small entrance holes (perhaps some with white-powdery sap at the entrance)] that swift removal and destruction of this tree may decrease the magnitude of the infestation or help restrict the area of attack. In other words, destroying the first or second positively identified redbay ambrosia beetle – laurel wilt infested tree in the grove may decrease the amount of infestation of the grove. We are not advocating destruction of the grove, just infested limbs and/or the first and/or second infested tree (if a whole tree is infested). The idea is to catch the infestation in the early stages and try to limit its spread. However, the time may come that infestation of the agricultural area is so widespread that destruction of the trees is not an economically viable strategy.

In case it is a positive for the redbay ambrosia beetle, growers should be prepared and already have their Burn Permit issued by the County. For more information on an annual burn permit from the County go to http://www.miamidade.gov/agriculture/burn-permit_print.asp. Usually the inspection process of an actual burn (after you have your permit) is lengthy however, Charles LaPradd, Agricultural Manager, has been in contact with the Chief Manny C. Mena, County Fire Marshal and they have agreed that Miami-Dade Fire Rescue will act as quickly as possible through Inspector Stringer who is located in the agricultural area. If a burn is necessary, Inspector Stringer should be contacted immediately at 786-336-6634 or 6635 and request to speak to inspector 22. Inspector Stringer or his representative will respond to the site and assure conditions are appropriate for safe burning or assist with possible alternative burn procedures. Inspector Stringer can also issue a permit to conduct the actual burn on the spot for growers who do not have burn permits and he will contact Dispatch on their behalf.

(b) Until we know if the laurel wilt pathogen can be spread mechanically consider requiring disinfection of mechanical and hand pruning equipment prior to pruning a grove.

5. Chemical control

At present there are no registered fungicides for avocado that will control laurel wilt. Preliminary research on protecting redbay trees from laurel wilt by root-flare (at the trunk-root interface) injections with fungicides have been successful but are probably not feasible for commercial avocado groves. Research continues on determining the avocado variety host susceptibility and potential strategies to ameliorate the impact of the laurel wilt disease.

Control of the redbay ambrosia beetle is complicated by the fact that adult beetles must be in the immediate area of aerial sprays to be controlled, detection of adult beetles involves monitoring traps and/or scouting groves, and that once adult beetles bore into the trees contact insecticides are ineffective. The current recommendation is to periodically apply permethrin to the trunk and major limbs up to about 10 ft above the ground beginning in early March. Alternatively, if an infestation is taking place, the beetles will be flying in the area and an application of permethrin should be made to knock down the population as soon as possible. Research continues on determining if beetle attack differs among cultivars and testing of repellents and insecticides to control the beetle.

Literature cited

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