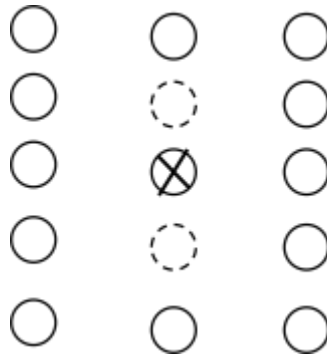


Commercial avocado recommendations for scouting and control of the redbay ambrosia beetle-laurel wilt disease

1. The laurel wilt pathogen carried by the redbay ambrosia beetle may be spread mechanically on pruning equipment and until we have a definitive answer pruning (especially topping and hedging) should cease.
2. Growers must have a Burn Permit issued by the County to burn affected trees. 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, and Chief Manny C. Mena, County Fire Marshal have agreed that Miami-Dade Fire Rescue will act as quickly as possible through Inspector Stringer. If a burn is needed, Inspector Stringer should be contacted immediately at 786-336-6634 or 6635; request to speak to inspector 22. Inspector Stringer or his representative will visit 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.
3. Surveying for the ambrosia beetle and their fungal symbionts (partners). Growers and their workers should survey their groves immediately and then weekly or more often if an infestation is detected or detected nearby.
 - a. Symptoms to look for might include (see scouting factsheet photographs):
 - i. Leaf and young stem wilting.
 - ii. Leaf color changing from light green to dark green, greenish-brown. Some leaves showing leaf mottling (dark and light green areas) and yellowing.
 - iii. Dead leaves curled hanging on the tree.
 - iv. A few stems and limbs with 2 to 4 ft 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, 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. In addition, small, dark holes in the sapwood further indicate wood boring beetles are present.
4. In order to have a sample taken, to confirm an infestation and to track the spread of this insect vectored disease, please report this to the Division of Plant Industry at 305-252-4360 or 1-888-397-1517.
5. If the tree shows *only a few stems and limbs with 2 to 4 ft of dieback*, wait for confirmation of laurel wilt before removing the tree (Fig. 1). 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. After removal paint with pruning paint or tar.



Fig. 1. Avocado tree with dead areas at the top and two terminal of several shoots.



2. Laurel wilt positive tree [X] adjacent in-row avocado trees [dashed circle].

After a positive identification for laurel wilt has been made on a tree

Do not move infested avocado trees or tree parts from the grove as this may spread the infestation. Burn infested tree or trees in the grove to destroy redbay beetle larvae and adults inside the wood (permits may be obtained from the county). Because the laurel wilt pathogen is systemic it may move from a laurel wilt positive avocado tree to adjacent avocado trees by root grafting; commonly this would most likely be the two in-row adjacent trees. This may be especially true of severely laurel wilt symptomatic trees. Therefore removing the two in-row adjacent trees is recommended (Fig. 2).

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. Burning “green” trees may be difficult and you may need to apply an accelerant, let it soak in, and then attempt the burn. After burning, what is left of the stump should be painted with pruning paint or tar to reduce the potential for re-infestation by the redbay ambrosia beetle.

If laurel wilt is confirmed on a tree, swift removal and destruction of the tree may decrease the magnitude of the infestation or help restrict the area of attack. In other words, destroying the first and/or second positively identified redbay ambrosia 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 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.

6. Sanitation: The laurel wilt pathogen probably can be spread mechanically and so we recommend that all tools and mechanical equipment coming into contact with suspect or positive wood be disinfested immediately after use. Although not proven, quaternary ammonium chloride (QAC) disinfectants are recommended for tools and pruning equipment; as always read and follow the label directions. A list of materials can be found at <http://www.doacs.state.fl.us/pi/chrp/schedules/decontamination.pdf> and local chemical companies have been provided this list.

Chemical control

Insect control. Either before or after the infested/infected tree or trees are burned the grove should be sprayed with permethrin or other insecticides (i.e., malathion) at label rates. The air-blast equipment should be configured to cover the entire tree canopy and the volume of solution should be sufficient for good coverage of the trees. This may kill redbay ambrosia beetles already present on plant surfaces or flying in the grove. The efficacy of permethrin is poor in high pH water (7.3+) and we recommend you buffer your water with a commercially available buffer material to a pH of 6 to 6.7. In addition, permethrin breaks down rapidly in sunlight (UV radiation) and so we recommend the addition of a spreader/sticker [e.g., NuFilm 17, LI-700 (also a buffer), Cohere, or similar materials]. This will extend the efficacy of the permethrin by an estimate several weeks.

- Spray groves with a contact insecticide plus buffer and spreader/sticker
- Repeat this application in 15 days
- If additional applications are necessary rotate insecticides to avoid insect resistance (e.g., Permethrin, Malathion, Danitol, and Lannate).

Disease 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 may not be economically feasible for commercial avocado groves at this time; alternative applications measures are being researched.

Harvesters and Packinghouses. Harvesters should be instructed not to include any avocado wood or limbs from picking bins prior to and after picking and transport to the packinghouses. Packinghouse personnel should inspect bins for avocado wood and limbs and place these materials in a closed container and taken to a burn site for immediate destruction.

Commercial grove recommendations in brief

- Stop all pruning of groves (for now)
- Scout your groves at least once a week, more often if a positive find is in your immediate area
- If a suspicious tree is found, call DPI at 305-252-4360.
- Once a confirmed laurel wilt positive tree is found in the grove call Mr. Stringer, Fire Inspector at 786-336-6634 or 6635 and request to speak to inspector 22.
 - Cut the positive tree down and the two adjacent in-row trees
 - Kill the stump but, not with systemic herbicide
 - Burn the trees in-place
 - Spray the grove twice with Permethrin (solution pH needs to be 6.0-6.7; add a sticker) at a 15-day interval. If more insecticide applications are warranted rotate insecticides.
 - Continue to monitor groves

Common questions about controlling the redbay ambrosia beetle and the laurel wilt pathogen

1. Should a grove with suspect tree be sprayed with insecticide before or after the suspect tree is burned? Will pruning a tree showing laurel wilt and redbay ambrosia beetle symptoms disturb the redbay ambrosia beetles and make them flee – thus spreading the insect and disease further? Answer: Based on the behavior of other ambrosia and wood boring insects it is unlikely that they will flee or easily flee during the cutting and burning of the tree. Spraying insecticide before or after the tree is burned is an option. However, the re-entry period between spraying an insecticide to kill the beetle is 12 hours for permethrin and malathion, 24 hours for Danitol and 48 hours for Lannate – so this may delay your destruction of an infected/infested tree.
2. Is laurel wilt transmitted through root grafting from 1 avocado tree to another? Answer: At this time there is no proof of this but based on the behavior of similar diseases and observation of redbay sprouts and sassafras it is possible it can move through the root system.
 - If this is the case should we remove some or all the surrounding avocado trees (that could be up to 8 trees) adjacent to a positive or suspected laurel wilt tree? Answer: Most likely the laurel wilt pathogen will spread through root grafting to the two in-row adjacent trees. Therefore we recommend the confirmed laurel wilt positive and these two trees be destroyed.
3. Will the infection of laurel wilt spread downward toward the trunk of the tree if redbay ambrosia beetle attacks a limb and infects the limb with laurel wilt within the last 3-5 ft of the tip? If so how long will it take to spread to the major limbs and trunks? Answer: Yes it appears the pathogen can spread upward and downward inside the tree. How long it takes to go from the top (or near top) of a limb down to a major limb or the trunk is not known.
4. What if some trees only show the last 3 to 4 ft of some limbs that are wilted or dead (i.e., the rest of the tree looks ok, not wilted)? Is this laurel wilt or some other disease from a different beetle? Answer: At this time we do not know if a tree with only some shoots (the last 3-4 ft showing symptoms) showing dieback symptoms are due to laurel wilt pathogen or some other ambrosia beetle pathogen. Samples from these limbs have been taken and are in the process of being analyzed.

- Should we remove those whole trees as well? Answer: Since we do not know if it is laurel wilt and we do know that other wood boring insects and their fungal symbiont cause localized dieback it may be premature to remove those trees. Cut 2-3 ft below the dead area and burn this material. Cover the cut surface with a pruning paint or tar to deter further beetle attack.
- 5. Is the dead wood often seen in avocado groves host material for the redbay ambrosia beetle – laurel wilt pathogen? Should all the dead wood be removed from the avocado trees/groves? Answer: The redbay ambrosia beetle is attracted to healthy wood, not old, dead wood (e.g., from last year's pruning or freeze damage). We do know that fresh damage or pruning of avocado trees is attractive to the redbay ambrosia beetle and the beetle is not attracted to old dead wood but healthy and dying wood. We do not know how long the wood is suitable for development of the laurel wilt pathogen. In addition, pruning out all the dead wood in the grove would increase dramatically the number of fresh pruning cuts in the trees and make them even more attractive to the redbay ambrosia beetle.
- 6. What can be done about surveying and controlling the redbay ambrosia beetle – laurel wilt pathogen in abandoned or neglected groves? Answer: If access can be obtained the CAPS survey teams may include abandoned or neglected groves in their survey. The grove owners will be notified of the findings.
- 7. Is trapping and killing the redbay ambrosia beetle possible? If so do we have a system to do that now? Answer: There are traps and attractants for the beetle but placing attractants along with the traps at this time might invite new infestations. Certainly traps have been and can be located throughout the production area to monitor the spread and behavior of the beetle.
- 8. Would aerial spraying with malathion kill the redbay ambrosia beetle? Answer: The concentration of malathion used to control mosquitoes probably would not control the beetles.

(c://ext/2009/handouts/RAB-LW recommendations 8-5-09.docx)