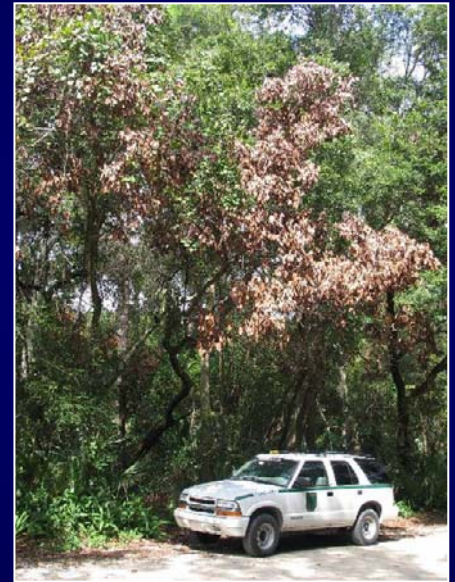


Evaluation of Systemic Fungicides for Preventing Laurel Wilt



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Jekyll Island, January 18, 2007

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A vascular wilt disease, caused by an *Ophiostoma* (anamorph = *Raffaelea*) sp., is causing high levels of redbay mortality in neighborhoods, parks and forests, and resulting in substantial economic, aesthetic, and ecological impacts. Systemic fungicides have been used successfully to prevent wilt disease development in other tree species, such as elms (Dutch elm disease) and oaks (oak wilt). The systemic fungicides thiabendazole (Arbotect® 20-S) and propiconazole (Alamo®) will be tested for efficacy in preventing wilt disease in asymptomatic redbays at two locations in northern Florida in spring 2007. Field trials will include exposure of fungicide-treated and control trees to both artificial inoculation with the wilt pathogen and natural inoculation pressure from the ambrosia beetle vector (*Xyleborus glabratus*). Sensitivity of the wilt fungus to the two fungicides *in vitro* will be evaluated. Bioassays to detect fungicide in branches of treated trees will also be conducted.

Justification

- Mortality of mature redbays in neighborhoods, parks, and forests can have substantial negative economic, aesthetic, and ecological impacts
- Options to help prevent wilt development in individual redbays or other Lauraceous trees are needed
- Systemic fungicides have been used successfully to prevent (and in some cases remediate) wilt disease in certain other tree species
 - E.g. Dutch elm disease, caused by an *Ophiostoma* (*anamorph* = *Raffaelea*), vectored by a non-native scolytid beetle

Fungicides and Dutch Elm Disease

- Thiabendazole hypophosphite
 - Arbotect® 20S
 - 2-3 year rotation to protect elms from DED
 - Some therapeutic efficacy reported
 - Requires substantial dilution to avoid foliar toxicity
- Propiconazole
 - Alamo®
 - May not provide as many years protection between treatments as Arbotect
 - Can be diluted in smaller volumes than Arbotect

Macro-injection

- Delivers large volume of diluted chemical solution directly into vascular system via holes drilled in stem or root flare
- Solution flows from pressurized container through tubing and tees



Proposed Study: Spring 2007

- Trial 1
 - Objective: evaluate the efficacy of Arbotect® and Alamo® in preventing wilt disease development in visibly healthy redbays expected to face attack pressure by *Xyleborus glabratus*
 - Sites: Two locations where a proportion of the redbay population is infested with *X. glabratus* and infected with *Ophiostoma* sp.
 - Jennings State Forest
 - Fort Clinch State Park

Trial 1: Methods

- At each site, tag and record dbh for 45 visibly healthy redbays along transect
 - Lacking external symptoms of wilt or ambrosia beetle attack
 - At least 5 inches dbh
 - Spaced at least 30 feet apart
- Rank diameters and create 15 groups of 3 trees based on similar dbh

Trial 1: Methods (cont.)

- Within each dbh grouping, randomly assign each tree to one of the following macro-injection treatments (n=15 trees per treatment):
 1. Max label rate thiabendazole hypophosphite:
 - 2.4 oz. Arbotect® in 154 oz. water for each 1" dbh
 2. Max. label rate propiconazole:
 - 0.2 fl. oz. Alamo® in 34 oz water for each 1" dbh
 3. Control
 - (injection with of amt of water used in treatment 2).

Trial 1: Methods (cont.)

- Treat trees in April-May 2007 after leaves from initial spring growth flush have fully expanded
- Monitor trees every 3 months for signs of wilt and ambrosia beetle attack
- Remove bark from wilted trees to verify presence of *X. glabratus* and/or vascular staining
 - Trees felled to make confirmations if necessary
- Stained wood samples from wilting trees will be collected, surface sterilized and plated in petri dishes with CSMA* to confirm *Ophiostoma* sp.

*Cycloheximide-streptomycin-malt agar

Trial 1: Analysis

- Chi-square test for homogeneity to test the null hypothesis that the percentage of dead trees is lower in each fungicide treatment than in the control treatment.
- Evaluate at 12 months post-injection and thereafter if 1-year efficacy is shown.
- To demonstrate an acceptable level of fungicide protection:
 - Reject null if $>20\%$ of the fungicide-treated trees die
 - Invalidate if $<60\%$ of the control trees die.

Trial 2

- Identical to Trial 2 w/ the following exceptions:
 - All trees (treatment and control) will be manually inoculated with isolates of *Ophiostoma* sp. approximately two weeks after injection.
 - Possibly fewer trees per treatment (n=10)

Possible Companion Studies

- Evaluate ability of various dilutions of Arbotect® and Alamo® to inhibit growth of *Ophiostoma* sp. in vitro
- Bioassay to detect/quantify presence of fungicide in branch tissue of treated trees

Collaborations with

- Bruce Fraedrich, Bartlett Tree Research
- Steve Fraedrich, US Forest Service
- Ed Barnard, FL-DOF
- Jason Smith, Univ. of Florida