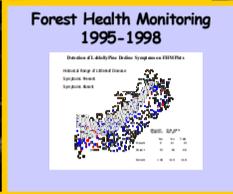


The Occurrence of *Phytophthora cinnamomi* on Loblolly Decline Sites in Alabama

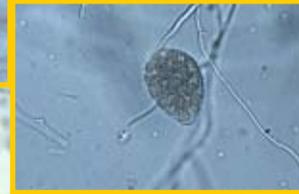
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Loblolly decline has been reported throughout the southeastern U. S. It seems similar to littleleaf disease of shortleaf pine, which has about the same range as loblolly. However, symptomatic loblolly has been found equally inside and outside the historic littleleaf disease range.



Phytophthora cinnamomi was linked to littleleaf disease of shortleaf pine by Campbell in the 1950's. This led us to question the possibility of a role for *P. cinnamomi* in the etiology of loblolly decline



A study area established on federal and state lands in central Alabama initially included 39 plots which exhibited a range of decline symptoms. Plot establishment followed the forest health monitoring guidelines (FHM) with a 1/24 acre central permanent plot and three 1/24 acre subplots. The central plot was used for initial sampling with the subplots reserved for future sampling. Field collection of soil samples was accomplished by using a two root method (Otrosina et al, 1997) in which three dominant/co-dominant symptomatic trees nearest to plot center were selected. A soil probe was used on the left side of the uncovered main root to take soil samples from a depth of 6 to 8 inches starting from the bottom of the trunk of the tree out to the drip line. A total of 9 soil samples were taken from each side of the tree.

Phytophthora cinnamomi was isolated from soil through the use of a baiting technique. Sample soils, 100 gms dry weight, were placed into 414 ml plastic containers with 330 ml of deionized water. Ten 1 cm round disks of camellia leaves were floated on the water surface in each container. The disks were taken out after 24 and 72 hours incubation. These disks were placed on a PARPH selective media for *Phytophthora* spp.



Nine measures of tree vigor were made on the trees at each plot: Total pine basal area, last 5 yr. basal area increment, last 10 yr. basal area increment, DBH, crown dieback (%), crown density (%), foliage transparency (%), live crown ratio (%) and resin flow. Plots were rated also as to whether *Phytophthora cinnamomi* was isolated from one, two, three or none of the sampled trees. Statistical analysis indicated that the only significant interaction, at $p=0.01$, was with total pine basal area. None of the other measures of tree vigor gave statistically significant interactions.

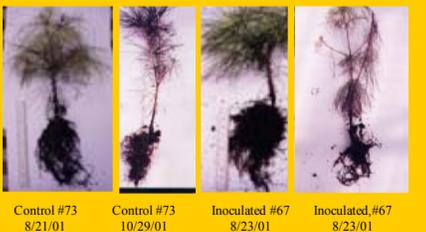
Flooded Control & Inoculated Loblolly Seedlings
100 g Sterile & *P. cinnamomi* Inoculated Wheat Bran.



Effects of *Phytophthora cinnamomi* on Height of Flooded and Unflooded Loblolly Seedlings Over a Six Week Period

Effect	DF	DF	F Value	Pr > F
Wheat Bran	1	319	2.75	0.0984
Flooding	1	319	0.14	0.7084
Wheat Bran vs. Flooding	1	319	0.2	0.6520
<i>P. cinnamomi</i>	1	319	0.07	0.7974
Wheat Bran vs. <i>P. cinnamomi</i>	1	319	0.36	0.5510
Flooding vs. <i>P. cinnamomi</i>	1	319	25.22	< 0.001
Wheat Bran vs. Flooding vs. <i>P. cinnamomi</i>	1	319	1.31	0.2510

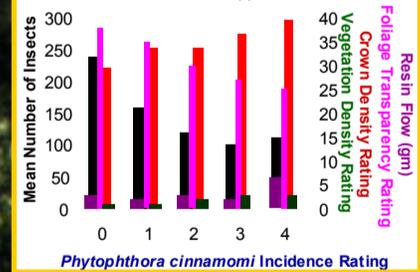
Unflooded Control and Inoculated Loblolly Seedling,
100g Sterile & Inoculated *P. cinnamomi* Wheat Bran.



Effects of *Phytophthora cinnamomi* on Stem Diameter of Flooded and Unflooded Loblolly Seedlings Over a Six Week Period

Effect	DF	DF	F Value	Pr > F
Wheat Bran	1	318	1.27	0.2611
Flooding	1	318	0.04	0.8478
Wheat Bran vs. Flooding	1	318	3.08	0.0801
<i>P. cinnamomi</i>	1	318	1.91	0.1678
Wheat Bran vs. <i>P. cinnamomi</i>	1	318	0.00	0.9938
Flooding vs. <i>P. cinnamomi</i>	1	318	8.93	0.003
Wheat Bran vs. Flooding vs. <i>P. cinnamomi</i>	1	318	0.76	0.3845

As the incidence of *P. cinnamomi* increases, resin flow increases, Foliage transparency rating decreases, crown density rating increases, vegetation density increases and numbers of trapped insects decrease.



An inoculation experiment of 2 year old loblolly seedlings was conducted August 22, 2001 through November 15, 2001. Four treatments were used. The treatments consisted of inoculating with 50 or 100 gms. of *P.c.* infested wheat bran and maintained in either flooded or non-flooded condition. Sterile uninoculated wheat bran was used as control.

The results of this first inoculation study were varied, but do not indicate that *P. cinnamomi* is pathogenic on loblolly seedlings. *P.c.*, however was recovered from both the roots and soil of the 50 g and 100 g inoculated seedlings, whether flooded or not.

Conclusions: The literature on littleleaf disease indicates that the pathogen involved is *Phytophthora cinnamomi* and that both shortleaf and loblolly pines can have littleleaf. The work reported here indicates that the connection between *P. c.* and loblolly pine is not statistically significant. One conclusion to be drawn, then, is that loblolly decline and littleleaf are two different diseases. The preliminary inoculation study also was not supportive of pathogenicity of *P. cinnamomi* to loblolly seedlings. An inoculation study presently in progress includes loblolly, shortleaf, and hardwood seedlings such as sweetgum, dogwood and water oak. These hardwoods were the most prevalent species on the loblolly decline plots and could explain the presence and role of *P.c.* in this system. Since *P. cinnamomi* was isolated at higher levels from the soil of non-symptomatic plots, the pathogen might be present because of these hardwoods. We will also be looking at the role of soil/site parameters in the etiology of this disease, which are the primary factor in littleleaf disease and may be significant in loblolly decline also.