

# Pitch Canker Disease of Loblolly and Pond Pines in North Carolina Plantations

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## ABSTRACT

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Pitch canker disease, caused by *Fusarium moniliforme* var. *subglutinans*, is reported for the first time in plantations of loblolly (*Pinus taeda*) and pond pine (*P. serotina*). In 1983, pitch canker caused a high incidence of dieback on plantations in eastern North Carolina. Loblolly pines with terminal dieback were smaller in both height and diameter than healthy trees, whereas only pond pines with severe terminal dieback were shorter but not smaller in diameter than healthy pond pines.

Pitch canker disease of southern pines causes dieback of the terminal and upper lateral branches of loblolly pine (*Pinus taeda* L.) in seed orchards (5-7). Pond pine (*P. serotina* Michx.) seedlings were susceptible to infection by *Fusarium moniliforme* Sheld. var. *subglutinans* Wollenw. & Reink. in a greenhouse inoculation study, but both pond and loblolly pines were rated less susceptible than Virginia (*P. virginiana* Mill.) or slash (*P. elliottii* Englem. var. *elliottii*) pines (2). This paper reports the occurrence and severity of pitch canker disease on loblolly and pond pines in plantations.

## MATERIALS AND METHODS

**Survey.** In 1983, a low-altitude aerial survey of 814 km<sup>2</sup> of eastern North Carolina revealed pitch canker symptoms in many 2- to 8-yr-old loblolly and pond pine plantations. Our study was established in a pocosin in Beaufort County, NC, that had been drained and prepared for planting by clearing, piling, burning, and bedding. The soil was about 50% organic matter in the upper 61 cm. The loblolly pines were progeny of a single open-pollinated clone, planted in an 80-ha block at a spacing of 1.8 × 3.0 m in 1977. The pond pines were from a bulk seed collection planted at the same spacing in the same year in an adjacent 16-ha block.

Incidence of the disease throughout the 6-yr-old loblolly pine plantation was determined in a systematic survey over the 1,050-m-long plantation in May 1983. At intervals of 40 m in each of 24 rows, five trees were examined for presence of

dieback; 2,760 trees were tallied.

The effect of the disease on height and diameter growth was determined in a 0.675-ha plot for each species. Within each plot, 320 individuals were randomly selected for assessment of the presence or absence of terminal dieback. Trees were assigned to healthy or diseased (lightly and severely diseased in pond pine) categories. For growth measurement, equal numbers of trees in each disease category were selected on the basis of the priority established in the random number selection. For growth assessment, the height to the top of the live crown and the diameter at breast height (dbh) were measured. Growth differences were compared with an analysis of variance and Duncan's multiple range test.

**Isolation.** Branches with dieback were collected from pond pine trees. Chips of wood and bark were removed from the branches at the point of transition from healthy to diseased tissue. The chips were surface-sterilized in 65% ethyl alcohol and plated on a medium selective for *Fusarium* spp. (9). Germinating single spores from *Fusarium* colonies were transferred to water agar, carnation leaf agar (CLA) (10), or water agar with oat grains. Incubation was at 25 C with a 12-hr photoperiod provided by fluorescent lights.

## RESULTS AND DISCUSSION

Dieback occurred throughout the 6-yr-old loblolly pine plantation. Sporodochia

bearing macroconidia of *F. moniliforme* var. *subglutinans* were present on dead branches. The disease, present on 39% of the 2,760 trees, was widespread; individual diseased trees were available in all areas for the growth study. Dieback in this plantation affected only the current year's growth and did not extend farther down the main stem. In the growth study area, 67% of the 320 randomly selected loblolly pines had dieback. Height and dbh of healthy loblolly pines were significantly larger than those of diseased loblolly pines (Table 1).

In the pond pine plantation, 45% of the 320 randomly selected trees had terminal dieback. Isolates of *F. moniliforme* var. *subglutinans* were obtained from 28 of 30 pond pine branches with dieback; this confirms the association of the fungus with this host. Two types of damage occurred in the pond pine: 33% of the trees had light damage with only the youngest terminal growth affected, and 12% of the trees had severe damage with dieback extending at least 0.6 m down the main stem. Healthy pond pines were not significantly different in height or dbh from lightly diseased pond pines, but severely diseased trees were smaller in height but not in dbh than the other two groups. These differences between species in growth of healthy and diseased trees suggest two possibilities: Either the loblolly pine had been diseased for a longer time so that both height and dbh of diseased trees were reduced, or the smaller trees were more susceptible to infection. Infection may have occurred more recently in the pond pine, since only the height of the severely infected trees was reduced.

Greenhouse studies have shown that loblolly and pond pine seedlings were more resistant to infection than Virginia, shortleaf (*P. echinata* Mill.), or slash pine seedlings (2,4). In our study plots in North Carolina, disease incidence in the more resistant species was relatively high.

**Table 1.** Comparisons of height and diameter of 6-yr-old loblolly and pond pines with various amounts of dieback caused by pitch canker disease

Disease category of terminal	Loblolly			Pond		
	No. of trees	Height (m)	dbh (cm)	No. of trees	Height (m)	dbh (cm)
Healthy	106	4.8 a <sup>2</sup>	8.7 a	81	5.1 a	9.6
Light	97	3.9 b	6.8 b	40	4.8 a	9.0
Severe	...	...	...	38	4.1 b	9.0

<sup>2</sup>Means within columns followed by the same letters are not significantly different ( $P = 0.01$ ) according to Duncan's multiple range test.

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Further surveys will be needed to determine if this is an isolated occurrence or an indication of a widespread problem on these species. Pitch canker disease causes growth loss and death of slash pine in plantations (1,3,8,11,12), but its long-term effect on loblolly and pond pines is unknown. By following disease progression along with pine growth and form for at least 5 yr, we hope to better understand the impact of this disease on these hosts.

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