INCIDENCE OF FUSIFORM RUST IN GEORGIA FOREST TREE NURSERIES, 1959-1973

In eight nurseries in Georgia and four in Florida, rust infection averaged 2.5 percent in sprayed beds over 15 years. Hazard varied considerably by nursery.

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Fusiform rust, *Cronartium fusiforme* Hedgc. & Hunt ex Cumm., is the most serious nursery disease of slash *(Pinus elliottii* Engelm. var. *elliottii)* and loblolly (*P. taeda* L.) pines in the Southern United States. The disease is controlled by spraying ferbam two or more times each week or spraying prior to each infection period beginning with seedling emergence and continuing until late June or mid-July.

From 1959 to 1973, I visited several Georgia and Florida nurseries, observing and recording the amount of fusiform rust infection. These included the Davisboro, Morgan, Walker, Herty, Brunswick Paper, Rayonier, Union Bag, and Continental Can nurseries in Georgia and the Buckeye Cellulose, Gilman Paper, St. Regis, and Andrews nurseries in Florida. This paper reports these observations and includes a discussion of the data.

Table 1.—*Incidence of fusiform rust in slash and loblolly pine seedlings in five Georgia nurseries from 1959 to 1973*[1]

Year	Davisboro nursery	Morgan nursery	Page nursery	Walker nursery	Herty nursery
1959					
Check[2]	12.6	—	—	—	—
Ferbam[3]	0.6	—	—	—	—
1960					
Ferbam	3.0	1.3	1.6	1.4	1.2
1961					
Ferbam	14.5	1.5	0.2	0.1	0.1
1962					
Ferbam	2.1	—	—	—	—
1963					
Ferbam	1.8	—	—	—	—
1964					
Ferbam	0.6	2.5	0.1	0.1	0.1
1965					
Ferbam	3.0	1.7	1.7	1.6	1.3
1966					
Ferbam	0.8	—	—	—	—
1967					
Ferbam	0.9	0.6	8.0	1.4	1.7
1968					
Check	—	10.8	—	—	—
Ferbam	4.1	6.5	—	—	—
1969					
Ferbam	2.5	0.5	—	0.7	0.1
1970					
Check	36.9	—	—	—	—
1972					
Check	68.5	—	—	—	—
Ferbam	45.0	—	—	—	—
1973					
Check	71.0	5.5	—	11.7	29.8
Ferbam	2.0	0.1	—	0.7	0.1
Average					
Check	47.3	8.2	—	11.7	29.8
Ferbam	6.2	1.8	2.3	0.9	0.7

[1] Data are expressed as the average percentage of infection in both pine species when both were planted at a given nursery.
[2] Observations of nonsprayed seedlings.
[3] Observations of seedlings sprayed with ferbam at recommended rates.

Methods

Observations were made during November and December of each year in beds of seedlings sprayed with ferbam. A few nonsprayed plots were established to estimate rust hazard and degree of control. The percentage of seedlings infected was determined by counting both infected and healthy seedlings at random locations in each nursery. When available, a counting frame (1 x 4 feet or 0.5 x 4 feet) was used to take samples. A few samples were taken without a counting frame by counting seedlings until a minimum of 100 were observed at each sample point.

Results and Discussion

The data (table 1) indicate that the risk of nursery infection (rust hazard) is higher at the Davisboro nursery than at any of the other four Georgia nurseries. The most obvious difference that may account for the higher rust

hazard at Davisboro is the higher number of susceptible oaks, especially water oaks (*Quercus nigra* L.), near the'nursery.

The data also indicate that ferbam sprays control fusiform rust when properly applied. The percentage of infection averaged 24 percent in non-sprayed beds and 2.5 percent in sprayed beds during the 15 years of observation. The degree of control obtained with ferbam at the Davisboro nursery in 1973, a severe rust year, is convincing evidence of the effectiveness of this fungicide (table 1).

The high incidence of rust in sprayed seedlings at the Davisboro nursery in 1961, 1968, and 1972 resulted from inadequate coverage of seedling tissue with ferbam during extended rust infection periods. Rainfall during such periods often makes it almost impossible to move tractors and spray equipment through the nursery when the risk of infection is highest.

I also surveyed rust incidence in loblolly and slash pine seedbeds in 12 nurseries in Georgia and Florida in 1969 (table 2). These data indicate that weather conditions cannot be the primary cause of high rust incidence in a given nursery and year. Neighboring nurseries such as Davisboro and Morgan, Rayonier and Continental Can, or Gilman Paper, St. Regis, and Buckeye Cellulose are only a few miles apart but infection levels differ markedly between these sites. The higher incidence of rust in one of two neighboring nurseries must be related to the rust hazard or the thoroughness of the spray program. Although weather conditions must be conducive to infection, weather at two neighboring nurseries should not differ as much as the rust hazard or spray program.

Table 2.—*Incidence of fusiform rust in slash and loblolly pine seedlings sprayed with ferbam in 12 Georgia and Florida nurseries in 1969*[1]

Nursery	Location	Percent infection
Davisboro	Davisboro, Ga.	2.5[2]
Morgan	Bryon, Ga.	0.5
Walker	Reidsville, Ga.	0.7
Herty	Albany, Ga.	0.1
Brunswick Paper	Gardi, Ga.	0.3
Rayonier	Glynnville, Ga.	0.8
Union Bag	Belleville, Ga.	1.0
Continental Can	Statesboro, Ga.	5.6
Buckeye Cellulose	Foley, Fla.	9.7
Gilman Paper	Day, Fla.	0.8
St. Regis	Lee, Fla.	0.0
Andrews	Chiefland, Fla.	0.1

1 Where both pine species were present an overall average is shown.
2 Survey made by counting 50 seedlings at randomly selected sites until a minimum of 1,000 were counted at each nursery.

Table 3.—*Average percentages of slash and loblolly pine seedlings infected with fusiform rust in two Georgia nurseries during 1968, 1972, and 1973*[1]

	Nursery	
Year and species	Davisboro	Morgan
1968		
Slash	6.9	6.8
Loblolly	1.4	6.2
1972		
Slash	64.3	—
Loblolly	72.6	—
1973		
Slash	81.1	6.6
Loblolly	61.0	4.3

1 Except for the 1968 data, percentages are for unsprayed beds.

The relative susceptibility of slash and loblolly pine to fusiform rust has often been argued. The published evidence may indicate slash to be the more susceptible species, but my data indicate that the relative susceptibility of the two species is variable (table 3). Table 3 compares two seed lots (one of slash and one of loblolly pine) planted at both nurseries within a 2-day period. Slash appears to be more susceptible than loblolly pine at the Davisboro nursery, but the two species appear to be equally susceptible at the Morgan nursery. In the 1972 planting at Davisboro, loblolly appears to be more susceptible than slash pine.

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In the 1973 plantings of both species in both nurseries, loblolly pine appears to be the more resistant of the two species. The average rust incidence over the 3 years in both nurseries indicates that slash seedlings are slightly more susceptible (33.1 percent) than loblolly pine (29.1 percent). These data do not prove which of the two species is more susceptible to fusiform rust but do illustrate that the comparative susceptibility varies considerably under differing conditions.

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