TIME BETWEEN APPLICATION OF FERBAM AND IRRIGATION IMPORTANT FOR FUSIFORM RUST CONTROL

For maximum effectiveness ferbam spray residues must be dry before irrigation is applied or rain falls on pine seedlings susceptible to fusiform rust.

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The incidence of fusiform rust (caused by *Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme*) in southern forest tree nurseries averaged 2.5 percent in ferbam sprayed beds and 10.2 percent in unsprayed beds during 18 years of observation from 1959 to 1976 (*3, 7*). A maximum of 81 percent rust incidence was observed in unsprayed slash pine at the Davisboro, Georgia nursery in 1973 (*7*). Ferbam will control fusiform rust when all susceptible pine tissues are covered (*1, 3, 7*). The lack of control in certain nurseries in certain in certain years as well as the relatively high average incidence in sprayed seedbeds (2.5 percent) is probably due to either inadequate spray frequency (*5*); inadequate spray coverage (*1, 5*); inadequate tenacity of spray residues (*6*); or improper timing of spray applications (*2, 8, 9*). Irrigation or rain may remove ferbam residues if either occurs too soon after sprays are applied, i.e., before ferbam residues have dried. Reported in this paper are the results of a greenhouse study in which the efficacy of ferbam sprays was determined in relation to the time interval between spray application and irrigation.

Methods

Slash pine seedlings were transplanted into 25 flats (33-by 13-by 11 cm) containing milled pine bark (*4*). Twenty seedlings in each flat were fertilized weekly for the first 6 weeks with a commercially available liquid fertilizer (4). During the 5th week after emergence, 20 flats were sprayed with 6 pounds of ferbam (4.6 lb ai) and 8 ounces of Dupont Spreader Sticker in 200 gallons applied per acre. Following application of ferbam spray, five replicate flats were allowed to dry5,30,60,and120minutes before being placed in a rain chamber equipped with a cone Raindrop® nozzle. Two hours after being irrigated with one-fourth inch of simulated rain, all seedlings were inoculated with a high inoculum density (86,000 basidiospores per ml) of the fungus. The high inoculum density was used to create a severe infection hazard because seedlings were partially protected by ferbam residues. Nonsprayed seedlings (check) were also inoculated. Aeciospores collected from loblolly pine galls from Clark County, Georgia in February 1974 were used to produce the basidiospore inoculum on northern red oak seedlings. The percentage of seedlings infected (galled) was determined 6 months after inoculation.

Results and Discussion

The incidence of fusiform rust was drastically increased by irrigating the pine seedlings soon after ferbam sprays were applied (table 1). Although some control was obtained by ferbam sprays even when irrigation was applied 5 minutes after spraying, the degree of control obtained was unacceptable (table 1). These results suggest that fusiform rust control programs can be improved by ensuring that seedlings are not irrigated until at least 60 minutes after ferbam is applied. Drying time of residues will vary with weather conditions, but the efficacy of ferbam is improved (within limits) with greater drying time. If a rain occurs before spray residues have dried, seedlings should be resprayed as soon as possible to prevent infection.

Table 1.—*Efficacy of ferbam sprays for control of fusiform rust of slash pine seedlings when one-fourth inch of irrigation is applied before spray residues have dried.*

Time after spray	Seedlings infected[1]
	percent
Nonsprayed check	94.7 d
5-minutes	43.0 c
30-minutes	27.1 b
60-minutes	13.5 a
120-minutes	7.2 a

[1]Means followed by a common letter do not differ significantly at the 95 percent level according to Duncan's New Multiple Range Test.

(Literature Cited on p. 21)

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