

Influence of Method and Rate of Application of Bayleton on Fusiform Rust on Slash Pine Seedlings

S. J. Rowan

Principal Research Plant Pathologist, USDA Forest Service, Southeastern Forest Experiment Station, Athens, Ga.

Among four methods of application tested, effective control of fusiform rust was obtained when Bayleton was applied as a soil drench or as a foliar spray. Foliar sprays were equally effective whether applied 2 weeks before or 2 weeks after inoculation.

The systemic fungicide Bayleton¹ (triadimefon) (1-[4-Chlorophenoxy]-3,2-dimethyl-1-1 [1H-1,2,4-triazol-1-yl]-2-butanone) is effective against several plant diseases including rust and mildews on a wide variety of hosts (6). The chemical is registered in the United States for control of azalea petal blight and has 24—C registrations in several southeastern States for control of fusiform rust caused by *Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme* (Cumm.) Burds. & Snow in pine tree nurseries. Bayleton has been tested as foliar sprays and seed soaks on pine for control of fusiform rust (3, 7, 8) and as foliar sprays, soil drenches, and seed soaks on other plants to achieve both

protective and curative control (1). Previous data (3, 8) have indicated that foliar sprays and seed soaks of Bayleton will control fusiform rust on pine, but spray frequency or dosage needs to be reduced to determine if the disease can be controlled without phytotoxicity (8). The seed-soak treatment also needs further testing to determine if such a treatment will provide control for the duration of the rust hazard season of each year (from date of seed sowing until the first week of July).

Because fusiform rust is one of the most serious diseases in southern pine tree nurseries (5) and Bayleton is a likely replacement of ferbam for its control, the effectiveness of the chemical applied by different methods at several dosages in greenhouse culture was tested. The purpose was to determine which application method provided best control of the disease and whether increased dosages increased the degree of control.

Methods

A mixed seedlot of open-pollinated slash pine (*Pinus elliottii* Engelm.) was divided into suitable size groups for purposes of seed and postgermination treatments. Four chemical application methods

were tested: seed soak, seed coat, soil drench, and foliar spray. For the seed soak method, seeds were soaked 24 hours at room temperature in aqueous solutions containing 400, 800, or 1,600 milligrams per liter of active ingredient (a.i.) of Bayleton prepared from a 50-percent wettable powder formulation. The seeds were air dried after treatment, germinated in a 50:50 (by volume) mixture of sandy clay loam and vermiculite, and transplanted (20 seedlings from each treatment) to each of five replicate flats. For the seed coat method, seeds were coated with a mixture of one part Dow latex 512R to nine parts water containing 0, 800, 1,600 or 3,200 milligrams per liter of Bayleton (wetable powder with 50 percent a.i.), germinated, and transplanted as previously described. Soil drench and foliar spray treatments were also applied to five replicate flats of seedlings germinated and transplanted as described above. For the soil drench method, soil drenches were applied as aqueous solutions (200 ml per flat) containing 100, 200, or 400 milligrams per liter 7 days before inoculation. For the foliar spray method, foliar sprays were formulated to contain 400 or 800 milligrams of Bayleton and 9.5 milliliters of Agri-dex Spreader Sticker (Helena Chemical Company) per li-

¹Bayleton is a registered trademark of Farbenfabriken Bayer GmbH, Leverkusen, West Germany.

ter. Sprays were applied at 8 milliliters per flat (184 gal per acre) by passing the seedling flats on a conveyor belt beneath a fixed atomization nozzle. The foliar sprays were applied at 400 milligrams per liter to seedlings 7 and 14 days before and after inoculation, and at 800 milligrams per liter 14 days before inoculation.

Seedlings in all treatments were inoculated with a suspension containing 75,000 basidiospores of *Cronartium quercuum* f. sp. *fusiforme* per milliliter 51 days after seedling emergence (64 days after seeds were sown) as previously described (2, 4).

The study included 16 treatments, 80 flats, and 1,600 seedlings arranged in a randomized complete block design with five replications on a greenhouse bench. Numbers of galled seedlings were recorded 11 months after inoculation. An analysis of variance and Duncan's Multiple Range Test were used to distinguish significant treatment effects. The percentage data were analyzed both before and after arcs in transformation.

Results and Discussion

A single foliar spray of Bayleton at 400 milligrams per liter effectively controlled fusiform rust when applied as early as 14 days before or as late as 14

days after inoculation (table 1). Soil-drench treatments were also effective with as little as 100 milligrams per liter when applied 7 days before inoculation.

Increasing the dosage of either the foliar spray or the soil drench offered no advantage as complete control was obtained with the lowest dosage used.

Table 1.—Effect of method and rate of application of Bayleton on degree of fusiform rust control of slash pine seedlings artificially inoculated 51 days after emergence

Treatment ¹ and dosage, a.i.	Application before or after inoculation	Galled seedlings
<i>Milligrams/liter</i>	<i>Days</i>	<i>Percent</i>
Control 0	— ²	63.1 ab ³
Seed soak		
400	64 before	66.6a
800	64 before	33.3d
1,600	64 before	38.3cd
Seed coat		
0	64 before	47.8cd
800	64 before	72.7a
1,600	64 before	68.6a
3,200	64 before	50.1 be
Soil drench		
100	7 before	0e
200	7 before	0e
400	7 before	0e
Foliar spray		
400	14 before	0e
400	7 before	0e
400	7 after	0e
400	14 after	1.3e
800	14 before	0e

¹Seeds were soaked 24 hours in an aqueous solution of the chemical; seeds were coated with 10 percent Dow latex 512R; soil drenches were applied at 200 milliliters per flat; foliar sprays were applied at 8 milliliters per flat.

²— = not applicable.

³ Means followed by a common letter are not significantly different (P = 0.05) according to Duncan's Multiple Range Test.

Seed-coat treatments were ineffective even at 3,200 milligrams per liter of Bayleton, but some degree of control was obtained with the seed-soak treatment when dosages of 800 milligrams or more of Bayleton were applied. The 1,600-milligram seed-soak treatment significantly reduced seed germination, but the 800-milligram treatment did not. Better control would probably have been obtained with the seed soak if inoculations had been made earlier. Mexal and Snow (3) have shown that seed-soak treatments with 800 milligrams per liter of Bayleton provided good control of fusiform rust when inoculations were made 18 days after the seed treatment. Snow and others (8) have also shown seed-soak treatment to give good control of the disease in forest nursery plantings.

Additional tests are obviously needed to determine the relationships between dosage and duration of effective control of foliar sprays and of soil drenches when applied before

and after inoculations and of seed soaks applied before sowing seed. Because of the increased volume of Bayleton required when applied as a soil drench as compared to a seed treatment or a foliar spray, this method of application is less promising than the others. The relative ineffectiveness of the seed soak when seedlings were inoculated 64 days after treatment indicates that this method of application will not provide control throughout the rust hazard period in nursery plantings. A combination of seed-soak and foliar spray treatments may be needed if seed germination occurs beyond a 14-day period in nursery plantings.

These data do indicate that Bayleton is translocated in slash pine seedlings in both an acropetal (upward) and a basipetal (downward) direction as previously reported to occur in other plants (6). Thus, this chemical can be effective for control of fusiform rust and possible other diseases of pine (1, 6) when applied above or below the infection site.

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