

Control of *Pythium* spp. and Pythium Blight of Turfgrass with Fosetyl Aluminum

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ABSTRACT

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Fosetyl aluminum showed no toxicity to 25 isolates of *Pythium*, representing eight species, on potato-dextrose agar amended with 1, 10, and 100 μg a.i./ml agar. Field control of Pythium blight with fosetyl aluminum was evaluated on Pennfine perennial ryegrass (*Lolium perenne* L.). At 1 wk postspray, 114 and 228 g/93 m² provided 87 and 100% symptom suppression, respectively. Residual efficacy diminished gradually, and at 4 wk posttreatment, the 228-g rate provided 43% control. In the absence of direct fungitoxicity to species of *Pythium*, field control of Pythium blight on ryegrass may result from elicitation of antifungal responses in the host.

Pythium blight (cottony blight, grease spot, and spot blight), caused by several species of *Pythium*, is a severe and devastating foliar disease of turfgrasses. In hot, wet weather, this disease can decimate an established stand in 24 hr. The causal fungi are most aggressive under conditions of high humidity at air temperatures of 29–35 C (12).

Fosetyl aluminum (LS 74783, Aliette) has been reported to control Phytophthora diseases on avocado (1,9), citrus (5,8), pineapple (1), and ornamentals (4) and Pythium damping-off of citrus seedlings (11). These studies evaluated suppression of various species of *Pythium* in vitro and Pythium blight on ryegrass in the greenhouse and field with fosetyl aluminum.

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MATERIALS AND METHODS

The in vitro toxicity of fosetyl aluminum (80W) to 25 isolates, representing eight species of *Pythium* (*P. aphanidermatum* (Edson) Fitz., *P. mamillatum* Meurs, *P. torulosum* Coker & Patterson, *P. dissotocum* Drechs., *P. artotrogas* (Mont.) de Bary, *P. periplocum* Drechs., *P. graminicolum* Subramaniam, and *P. ultimum* Trow), was evaluated as inhibition of mycelial growth on potato-dextrose agar (PDA) amended with the chemical at 0, 1, 10, and 100 μg a.i./ml PDA.

Fosetyl aluminum (80W) was evaluated for efficacy against Pythium blight in the greenhouse on seedling Pennfine perennial ryegrass pot-grown (10-cm-diameter plastic pots) in steam-treated sand:loam:vermiculite (1:1:1). The chemical was tested as a foliar spray at rates of 57, 114, and 228 g/93 m² in water equivalent to 11.5 L/93 m², and as soil drenches at rates of 57, 114, and 228 g/93 m² in water equivalent to about 1.3 cm of irrigation. Care was taken not to wet the grass foliage during drenching. Individual pots of grass were drenched by retracting the foliage at the side of the pot adjacent to the rim and pouring the fungicide solution over the soil surface. Each

treatment was replicated three times and untreated controls were included for comparison.

Individual pots of grass were inoculated at 1, 7, and 14 days posttreatment. Inoculum was prepared by growing six pathogenic isolates of *P. aphanidermatum* separately on autoclaved rye grain. Rye inoculum was pooled and homogenized with a small quantity of sterile water in a blender to make a thick homogenate. Each pot of grass was inoculated by placing about 2 ml of the pooled homogenate in the center of the grass area of the pot. After inoculation, the pots were placed on a shaded greenhouse bench under individual plastic covers to maintain high humidity. One week after inoculation, the plastic covers were removed and the grass was evaluated for disease severity. Disease was visually rated as percentage of foliage blighted.

Field control of Pythium blight with fosetyl aluminum (80W) was evaluated on Pennfine perennial ryegrass. Individual treatment plots, 0.9 × 4.6 m, were arranged in a randomized complete block design with three replicates. Fosetyl aluminum was applied with a CO₂-powered boom sprayer at rates of 114 and 228 g/93 m² in water equivalent to 10 L/93 m². Untreated control areas were included for comparison. Two days after chemical application, a 0.9-m strip across all treatments was inoculated with a six-isolate pool of *P. aphanidermatum* grown on autoclaved rye grain. The 0.9-m strip was covered after inoculation with a translucent plastic-covered humidity chamber equipped with intermittent mist to maintain a saturated atmosphere and to minimize radiational cooling at night. After 1 wk of incubation, the chamber was removed and disease was visually

Table 1. Suppression of *Pythium* blight on seedling pot-grown Pennfine perennial ryegrass with fosetyl aluminum (80W)

Treatment	Rate (g/93 m ²)	Disease severity ^a (%)		
		1 Wk ^b	2 Wk	3 Wk
Untreated control	...	9.7	10.0	10.0
Foliar spray	57	6.7	9.3	10.0
Foliar spray	114	3.2	6.7	9.3
Foliar spray	228	1.7	7.7	7.7
Soil drench	57	10.0	10.0	10.0
Soil drench	114	10.0	10.0	10.0
Soil drench	228	10.0	10.0	10.0

^a Mean of three replicates.

^b Posttreatment rating interval; plants inoculated 1, 7, and 14 days posttreatment.

Table 2. Suppression of *Pythium* blight on field-grown Pennfine perennial ryegrass with fosetyl aluminum (80W)

Treatment	Rate (g/93 m ²)	Disease severity ^a (%)			
		8 Days ^b	15 Days	23 Days	31 Days
Untreated control	...	6.0	6.8	7.5	8.7
Foliar spray	114	0.8	2.3	7.5	8.0
Foliar spray	228	0.0	0.9	2.2	5.0

^a Mean of three replicates.

^b Posttreatment rating interval; plants inoculated at 2 days and 1, 2, and 3 wk posttreatment.

evaluated as percentage of foliage blighted. Successive inoculations were made at weekly intervals on uninoculated strips of grass for 4 wk posttreatment to evaluate long-term disease suppression.

RESULTS AND DISCUSSION

In the test for *in vitro* fungitoxicity of fosetyl aluminum, there was no inhibition of mycelial growth of the 25 *Pythium* isolates at any rate of the chemical. Results from the greenhouse experiment are presented in Table 1. There was no disease suppression in the soil-drench treatments at any rate tested or at any posttreatment interval. At the first rating (1 wk posttreatment), the foliar sprays had provided significant disease suppression, with efficacy increasing with rate (31, 67, and 82%). At the second rating, disease suppression had markedly diminished, and by 3 wk posttreatment, only the highest spray rate had provided significant symptom suppression compared with the untreated check (23%).

Results from the field experiment are presented in Table 2. At 1 wk posttreatment, both rates of fosetyl aluminum provided excellent disease suppression

compared with the untreated check (87 and 100%). Residual efficacy diminished gradually over 4 wk after treatment to 43% with the 228-g rate of the chemical.

Fosetyl aluminum was not directly toxic to the species of *Pythium* tested *in vitro*. From the soil-drench treatments in the greenhouse experiment, there was no evidence of acropetal movement of an anti-*Pythium* compound from the roots to protect the grass foliage. In greenhouse studies by Bolton (2), attempts to control *Pythium* blight on annual bluegrass with foliar sprays of fosetyl aluminum also resulted in unsatisfactory disease suppression. In our field study, however, ryegrass treated with fosetyl aluminum accrued long-lived residual protection against *Pythium* blight. The action of fosetyl aluminum in suppression of *Pythium* blight may be indirect, possibly involving elicitation of antifungal responses in the host. In physiological, cytological, and cytochemical studies on tomato, pepper, and bean (3,6), defense responses were induced in fosetyl aluminum-treated hosts that were similar to natural defense reactions of plants against parasitic fungi. Fosetyl aluminum-induced defense responses depended more on the type of

host than on the type of fungal pathogen (3). Such elicitor compounds, although more difficult to detect by normal screening procedures, may offer the advantages of decreased effects on nontarget fungal species and less likelihood of development of fungicide resistance in pathogen populations. The fungicide triadimefon (Bayleton), in addition to having fungitoxic properties, may also elicit host-mediated defense responses (10). There is also research evidence that direct fungitoxicity of the fungicide propamocarb (Banol) is insufficient to explain disease suppression obtained with the chemical in the field (7) (P. L. Sanders, unpublished).

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