

Evaluation of Fungicides for Control of Rapid Blight of *Poa trivialis* in fall 2005

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Abstract

Rapid blight is a new disease of cool season turf grasses that has occurred on over a dozen golf courses in Arizona. It is caused by Labyrinthula terrestris, an organism in a group referred to as the marine slime molds. A trial was conducted in fall 2005-winter 2006 to evaluate efficacy of selected fungicides for control of rapid blight at a golf course in central Arizona with a previous history of disease and high salinity irrigation water (about 5 dS/m). Plots were established in late October 2005 on a practice tee on which Bermuda was overseeded with Poa trivialis. Treatments included Insignia and Fore, alone and in combinations; elemental sulfur, potassium sulfate and potassium chloride as pre-plant applications on Bermuda; gypsum, Daconil Zn, Heritage TL, Soil Life and Soil Builder. Disease symptoms appeared immediately after the first mowing. Disease ratings at 3 weeks after first mow showed that applications of the high rate of Insignia at first mow and the pre-overseed application of sulfur gave excellent control. Moderate control was shown in applications with early applications of Fore alternated with the lower rate of Insignia, Fore alone, Soil Life, and of the high rate of Insignia combined with Fore applied as a curative at first disease. Treatments with Daconil Zn, Heritage TL, Soil Builder, and pre-overseed treatments with potassium sulfate, potassium chloride and gypsum gave little or no control compared to the untreated control. At 10 weeks after first mow, treatments with Insignia and the high rate of sulfur were still effective but all other treatments were either marginal or not different from the untreated control. Results show that applications of Insignia at first mow are effective for severe early season disease, and extended intervals of Insignia applications give effective long term control. Results also show that treatments of Bermudagrass with elemental sulfur reduced disease dramatically indicating that preventive chemical applications before overseeding may be possible.

Introduction

Rapid blight is a new disease of cool season turf grass on golf courses in Arizona. It is caused by *Labyrinthula terrestris*, an organism in a group referred to as the marine slime molds (Bigelow, et al., 2005). Early symptoms of disease include patches of turf that appear water soaked, slightly sunken and darker than healthy turf. Affected turf yellows and dies. Small patches several inches across may enlarge rapidly to over a foot in diameter, coalesce and result in larger areas of dead turf. Rapid blight was first described in southern California in 1995, but it now has been reported in eleven states (Stowell et al., 2005). In most cases in Arizona, disease has occurred on golf courses using irrigation water with moderate to high salinity (EC > 2.0 dS/m). It has been observed in overseeded

commercial lawns and sport turf as well. It affects turf varieties used for overseeding Bermuda such as rough bluegrass (*Poa trivialis*), perennial rye (*Lolium perenne*), annual bluegrass (*Poa annua*) and colonial bent (*Agrostis tenuis*). Bermuda (*Cynodon* spp.) appears to be unaffected but is a known host (Olsen and Kohout, 2006).

Trials have been conducted for three years at a golf course in central Arizona with a known history of rapid blight to determine the efficacy of various chemicals for control (Olsen and Gilbert, 2005). In the 2005 trials, new fungicides or combinations of fungicides with known efficacy, biologicals that may reduce salinity, and treatments of Bermudagrass before overseeding were tested. Objectives of this study were to determine maximum treatment intervals for chemicals with known efficacy and the possibility of treating Bermudagrass to prevent disease in susceptible cool-season grasses used for overseeding.

Materials and Methods

Plots were established on a practice tee at a golf club near Litchfield, Arizona in October 2005. The golf course has a history of severe rapid blight disease. Plots were overseeded with *Poa trivialis* on October 24, 2005 and maintained on a regular maintenance schedule. Salinity of the irrigation water was about 5.0 dS/m. The first mowing of the *Poa trivialis* overseed was on November 3, 2005.

Treatments were made up of different rotations, combinations and timing of applications on Bermudagrass before overseeding or on *Poa trivialis* used for overseeding. Early applications on Bermudagrass were initiated or applied once prior to overseeding in August 2005 to determine if treatments on Bermudagrass, a non-symptomatic host, are effective for disease prevention in the susceptible overseed grass, *Poa trivialis*. These treatments were: potassium applied at 2.0 lb K₂O/1000 ft² in 120 gal water/A as potassium chloride and potassium sulfate every week until Nov 10; granular sulfur (Disper-Sul) at 10 lb and 20 lb sulfur/1000 ft² applied once by spreader; SuperBio products Soil Builder and Soil Life at 6 oz (initial application August 25) and 3 oz (subsequent applications every 4 weeks)/1000 ft² in 60 gal water/A; and mancozeb (Fore) applied at 6 oz prod/1000 ft² in 60 gal water/A.

Since rapid blight has a history in some areas of showing up very quickly after the first mow, other applications were made immediately after first mow on November 4, 2005 and applied from one to five times through December 28, 2005 as preventive treatments. These treatments were: gypsum at 100 lb prod/1000 ft² applied once by spreader at first mow; chlorothalonil (Daconil Zn) at 5.4 oz/1000 ft² in 120 gal water/A applied at first mow and every 14 days; azoxystrobin (Heritage TL) at 2.0 oz/1000 ft² in 120 gal water/A applied at first mow and every 14 days.

Extended interval preventives, one curative and a combination treatment were also made with pyraclostrobin (Insignia). Insignia performed well in previous trials, and the purpose of these treatments was to determine efficacy with reduced applications and as a curative applied after disease was observed. Insignia at 0.9 oz/1000 ft² in 60 gal water/A was applied for extended interval preventive at first mow and 28 days either alone or combined with potassium sulfate as a fertilizer at 1.0 lb/1000 ft² or Fore at 6 oz/1000 ft². It was applied as a tank mix with Fore at 6 oz/1000 ft² as a curative at first disease and 14 days, and it was used as a preventive/curative when applied alone as a preventive at first mow and as curative at 15% disease expression. Insignia at the lower rate of 0.5 oz/1000 ft² was combined with Fore at 6 oz/1000 ft² for application at first disease and 14 days, and it was alternated with Fore at 14 day intervals.

Plots were 3 ft x 10 ft with a 2 ft alley between every two plots. There were eight replications of each treatment in a randomized complete block experimental design. Fungicide treatments were applied with a CO₂ pressurized sprayer (R&D Sprayers, Inc.) at 30 lb psi using two fine screen fan nozzles spaced 19 inches apart on the boom. Plots were visually rated for disease on a scale of 1 to 9 with 1 = very poor with little *Poa trivialis* remaining and 9 = excellent with complete coverage of *Poa trivialis* remaining. Disease was observed in plots on November 10, 2005. Ratings made on November 16, 2005 and January 13, 2006 are reported here. Ratings for replications within each treatment were subjected to ANOVA, and results were subjected to comparison of means (Tukey test).

Results and Discussion

Rapid blight began on the golf course soon after overseeding in late October and was visible in the research plots on November 10, within one week after first mow. Treatments, application dates and ratings for treatments are given in Table 1 for the November 16, 2005 ratings and Table 2 for the January 13, 2006 ratings. Results of the November 16, 2005 rating show that treatments that included Insignia applied immediately after first mow of *Poa trivialis* as a preventive or early treatment on Bermudagrass with Disper-Sul at both rates were significantly better than the untreated control, while all other treatments were not significantly different (Table 1).

Results of the January 13, 2006 rating show that two preventive treatments of Insignia maintained good control as did the high rate of Disper-Sul (Table 2). Moderate control was achieved with the Insignia+ Fore combination. There was less control with Fore/Insignia alternated (Fore applied at first mow); and Fore alone even though it was applied every two weeks from August 4, 2005 on Bermudagrass and then on *Poa trivialis* after overseed. All other treatments did not differ from the untreated control and there was little *Poa trivialis* remaining in any of these plots. The low rate of Disper-Sul that gave good control for the first two weeks did not hold up as well as the higher rate.

Given the rapid development of disease on the *Poa trivialis* overseed during this trial, results must be considered as those of a very rigorous test. In previous trials in 2002 and 2003, disease did not develop until at least six weeks after overseeding and progressed more slowly. In 2004, disease never developed probably due to substantial amounts of rain in the fall and winter months. The reason for the early development of disease in 2005 may be increased salinity of the irrigation water. Salinity of water used for irrigation in previous years was 3.5-4.0 dS/m, but in 2005 the source of water changed and salinity was about 5.2 dS/m. Laboratory trials have shown that disease is more severe in turfgrasses as salinity of irrigation water increases (Olsen et al., 2004; Kohout et al., 2005). When irrigated with water at EC 4.0 dS/m, inoculated plants in the laboratory become symptomatic within 7 days and usually die within 10 days, while at EC 1.5 dS/m, plants are symptomatic with some wilting within 10 days, but few plants die. In field observations, susceptible turfgrass irrigated with water below 2.0 dS/m EC is affected but disease is manageable by excessive leaching fractions, salt tolerant varieties of turfgrass and timely application of fungicides.

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Table 1. Efficacy of fungicide applications for control of rapid blight of *Poa trivialis* on a golf course in central Arizona with a history of rapid blight. Turf was rated for quality based on amount of diseases on Nov 16, 2005 after initial symptoms appeared. Quality was rated on scale of 1-9 with 1=very poor and 9=very good. Values are the average of 8 replications.

*Treatment	Application dates	**Rating Nov. 16, 2005
Disper-Sul, 20 lb as sulfur granular applied by spreader to Bermudagrass once	Aug 4	8.50 a
Insignia 0.9 oz extended interval preventive 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	7.8 ab
Insignia applied once and then not reapplied until symptoms hit a threshold (based on previous curative trials –15% disease symptom expression) Insignia 0.9 oz One preventive then curative at disease 1 – first mow 2 – at first disease	Nov 4, Nov 23	7.5 abc
Disper-Sul, 10 lb as sulfur granular applied by spreader to Bermudagrass once	Aug 4	7.13 abcd
Insignia 0.5 + Fore 6 oz tank mix preventive 28 day 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	6.9 abcde
Insignia 0.9 oz + K2SO4 fertilizer 1.0 lb extended interval preventive 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	6.89 abcde
Adv Mic Prod: Soil Life 6 oz initial then 3 oz every 4 weeks on Bermuda then <i>Poa trivialis</i> overseed	Aug 25, Sept 15, Oct 5, Nov 4, Nov 30, Dec 28	6.13 bcdef
Fore 6 oz preventive Aug 4 on Bermuda then every 14 days	Aug 4, Aug 18, Aug 31, Sept 15, Sept 28, Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	6.13 bcdef
Fore 6 oz / Insignia 0.5 oz / Fore 6 oz / Insignia 0.5 oz preventive 1 – Fore at first mow 2 – Insignia 14 days after application 1 3 – Fore 28 days after application 2 4 – Insignia 14 days after application 3	Nov 4, Nov 16, Dec 14, Dec 28	6.0 bcdef
Insignia 0.9 oz + Fore 6 oz tank mix curative	Nov 10, Nov 23	5.8 bcdef

1 – first disease 2 – 14 days after first application		
Heritage TL 2.0 oz in 120 gal/A water preventive 1 – first mow 2 – 14 days after first application continued at 14 day intervals	Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	5.25 cdef
On Bermuda: 2 lb K ₂ O applied as K ₂ SO ₄ in 120 gal/A water On Poa trivialis: 0.5 lb K ₂ O applied as K ₂ SO ₄ in 120 gal water	Aug 4, Aug 11, Aug 18, Aug 25, Aug 31, Sept 15, Sept 28, Oct 5, Nov 4, Nov 10 Terminated Nov 10	5.25 cdef
Adv Mic Prod Soil Builder 6 oz initial then 3 oz every 4 weeks on Bermuda then Poa trivialis overseed	Aug 25, Sept 15, Oct 5, Nov 4, Nov 30, Dec 28	5.00 def
NT control		4.75 ef
Gypsum 100 lb applied as powder and watered in applied once after overseed	Nov 4	4.75 ef
Daconil Zn 5.4 oz in 120 gal/A water preventive 1 – first mow 2 – 14 days after first application continued at 14 day intervals until evaluation	Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	4.38 f
On Bermuda: 2 lb K ₂ O applied as KCl in 120 gal/A water on Poa trivialis: 0.5 lb K ₂ O applied as KCl in 120 gal/A water	Aug 11, Aug 18, Aug 25, Aug 31, Sept 15, Sept 28, Oct 5, Nov 4, Nov 10 Terminated Nov 10	3.89 f

*Rates are given for product per 1,000 square feet. Chemicals were applied at 30 lbs/in² in 60-gal of water/A, unless otherwise noted.

** Numbers followed by the same letter are not significantly different using Tukey's method for pairwise comparison of means.

Table 2. Efficacy of fungicide applications for control of rapid blight of *Poa trivialis* on a golf course in central Arizona with a history of rapid blight. Turf was rated for quality based on amount of diseases on January 13, 2006. Quality was rated on scale of 1-9 with 1=very poor and 9=very good. Values are the average of 8 replications.

*Treatment	Application dates	**Rating Jan 13, 2006
Insignia 0.9 oz extended interval preventive 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	7.7 a
Disper-Sul, 20 lb as sulfur granular applied by spreader to Bermudagrass once	Aug 4	7.3 ab
Insignia applied once and then not reapplied until symptoms hit a threshold (based on previous curative trials – 15% disease symptom expression) Insignia 0.9 oz One preventive then curative at disease 1 – first mow 2 – at first disease	Nov 4, Nov 23	7.1 ab
Insignia 0.9 oz/1,000 sqft + K2SO4 fertilizer extended interval preventive 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	7.0 ab
Insignia 0.5 + Fore 6 oz tank mix preventive 28 day 1 – first mow 2 – 28 days after first application	Nov 4, Nov 30	6.3 abc
Insignia 0.9 oz + Fore 6 oz tank mix curative 1 – first disease 2 – 14 days after first application	Nov 10, Nov 23	5.8 bcd
Fore 6 oz / Insignia 0.5 oz / Fore 6 oz / Insignia 0.5 oz preventive 1 – Fore at first mow 2 – Insignia 14 days after application 1 3 – Fore 28 days after application 2 4 – Insignia 14 days after application 3	Nov 4, Nov 16, Dec 14, Dec 28	4.7 cd
Fore 6 oz preventive Aug 4 on Bermuda then every 14 days on Bermuda then on <i>Poa trivialis</i> overseed	Aug 4, Aug 18, Aug 31, Sept 15, Sept 28, Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	4.3 cde
Disper-Sul 10 lb as sulfur granular applied by spreader to Bermudagrass once	Aug 4	4.0 def

Daconil Zn 5.4 oz in 120 gal/A water preventive 1 – first mow 2 – 14 days after first application continued at 14 day intervals until evaluation	Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	2.4 efg
Adv Mic Prod : Soil Life 6 oz initial then 3 oz every 4 weeks; on Bermuda then Poa trivialis overseed	Aug 25, Sept 15, Oct 5, Nov 4, Nov 30, Dec 28	2.0 fg
On Bermuda: 2 lb K ₂ O applied as KCl in 120 gal/A water on Poa trivialis overseed: 0.5 lb K ₂ O applied as KCl in 120 gal/A water	Aug 11, Aug 18, Aug 25, Aug 31, Sept 15, Sept 28, Oct 5, Nov 4, Nov 10 Terminated Nov 10	1.9 g
Heritage TL 2.0 oz in 120 gal/A water preventive 1 – first mow 2 – 14 days after first application continued at 14 day intervals until evaluation	Nov 4, Nov 16, Nov 30, Dec 14, Dec 28	1.7 g
On Bermuda: 2 lb K ₂ O applied as K ₂ SO ₄ in 120 gal/A water On Poa trivialis overseed: 0.5 lb K ₂ O applied as K ₂ SO ₄ in 120 gal water	Aug 4, Aug 11, Aug 18, Aug 25, Aug 31, Sept 15, Sept 28, Oct 5, Nov 4, Nov 10 Terminated Nov 10	1.7 g
Gypsum 100 lb applied as powder and watered in applied once after overseed at first mow	Nov 4	1.7 g
Adv Mic Prod: Soil Builder 6 oz initial then 3 oz every 4 weeks; on Bermuda then Poa trivialis overseed	Aug 25, Sept 15, Oct 5, Nov 4, Nov 30, Dec 28	1.6 g
NT		1.4 g

*Rates are given for product per 1,000 square feet. Chemicals were applied at 30 lbs/in² in 60-gal of water/A, unless otherwise noted.

** Numbers followed by the same letter are not significantly different using Tukey's method for pairwise comparison of means.