

CONTROL OF NECROTIC FAIRY RINGS ON BERMUDAGRASS PUTTING GREENS

Monica Elliott¹ and Bob Hickman²

¹University of Florida, Fort Lauderdale Research and Education Center

²AgrEvo Environmental Health, Business Support Team

Note: *Necrotic fairy rings are a problem that can be researched only on actual golf greens. Drs. Lawrence Datnoff and Monica Elliott are looking for sites to use for preventive studies (see the Sun N Lake Golf Club study below) and curative studies. We want to continue to examine currently labeled products such as ProStar (AgrEvo) and Heritage (ICI) and examine new products coming soon for turf use. If you are interested in cooperating with us, please call Dr. Datnoff at 561/996-3062 or Dr. Elliott at 954/475-8990.*

INTRODUCTION

A problem often observed on new or rebuilt bermudagrass putting greens in the southeastern U.S. is necrotic fairy rings caused by a puffball mushroom called *Lycoperdon*. This fungus is quite common in woods, flower beds and other moist areas where it will produce a mature mushroom that will send thousands of spores into the air, some landing on new putting greens. This fungus starts to grow in the recently fumigated root-zone mix and appears to produce a product that coats the sand particles, making them hydrophobic. The sand then repels water rather than absorbing water.

The result is numerous rings of hydrophobic soil. Rings are observed because that is the way fungi grow, from a central point in a 360 degree radius. The grass in this ring declines and eventually dies, which is why we call it a necrotic (dead) fairy ring. In many cases, it is observed that the soil is thoroughly saturated outside and inside the necrotic ring, but the ring itself is powder dry.

These rings are unsightly and not conducive for playing golf. If the hydrophobic condition is not corrected, the area within and surrounding the ring usually declines and becomes very thin. Puffball mushrooms may form on the putting green surface. Although the daily mowing of putting greens levels the mushrooms, the resulting surface is still disruptive.

Research on this problem has not been easy. You cannot simply establish necrotic fairy rings at will, but must rely on Mother Nature to do this for you. We have been fortunate to have been able to conduct the two experiments described below.

Experiment 1: Fort Lauderdale, Florida

A new research putting green had been fumigated and planted with 'Tifdwarf' bermudagrass during the winter of 1992/93 at the Fort Lauderdale Research and Education Center. Necrotic fairy rings and associated mushrooms began to appear in mid-July 1994. Initially, it was limited to one area of this green, but within a

month over 50% of the area was affected.

The treatments applied in this experiment included the fungicide ProStar® 50 WP, the soil wetting agent Aqua-Gro™ and combinations of these two products. Treatments were initiated on August 23, 1994. Materials were applied to small plots by mixing with water at the rate of 20 gallons per 1000 sq. ft. and spreading with a watering can in two directions. After all materials had been applied, the area was irrigated for 5 minutes. The research putting green was maintained as a regular putting green between 5/32 and 3/16 inch height of cut, mowed six times each week.

Unfortunately, the necrotic rings disappeared entirely due to the excessive amount of rainfall we had in September (13 inches). Therefore, the products were evaluated on the number of mushrooms that were produced. These were plentiful due to the rainfall! The results are presented in Table 1.

On August 30 and September 22, the use of ProStar, with or without the use of Aqua-Gro, did significantly limit the number of mushrooms produced compared to the check treatment. On September 8, this comparison was not significant. On the September dates, the number of mushrooms associated with the Aqua-Gro alone treatments was quite high. While not statistically different from the ProStar treatments, most golf course superintendent would consider this a significant decrease! The only conclusion that could be made from this experiment was that the ProStar, with or without the addition of the soil wetting agent, did indeed stop mushroom production.

Unfortunately, from a plant pathology point of view, no new rings or mushrooms have developed on this research putting green since this experiment. So, we were very excited when the opportunity to conduct another experiment became available.

Experiment 2: Sebring, Florida

Sun N Lake Golf Club had rebuilt 9 putting greens in 1995 and experienced severe necrotic fairy rings. Therefore, when they were ready to rebuild 9 more putting greens in 1996 using Tifdwarf bermudagrass, the club wanted to know what to do to prevent these fairy rings from ever becoming established. The membership and the golf course superintendent, Mark Hopkins, agreed to work together and became a research site for evaluating the use of ProStar on a preventative basis. We applaud them for their teamwork and willingness to participate in this experiment!

The rebuilt putting greens were planted May 1996. These nine greens were split in half. One side of each green received the fungicide treatment and the other side did not. The treatment was a tank mix of ProStar® 50 WP fungicide at 3 oz. and Primer™ soil wetting agent at 6 oz., per 1000 sq. ft. Treatments applications were made with a normal golf course spray system calibrated to deliver 3 gallons per 1000 sq. ft. Applications were made every 6 weeks beginning September 19, 1996. The greens were overseeded with Gator perennial ryegrass on November 11, 1996.

Necrotic rings began to appear on the untreated side in February 1997. An evaluation was made on March 13 to compare each side of the nine greens. Results are presented in Table 2. No rings were observed on the ProStar treated side of each of the nine greens, whereas an average of 23 rings were present on the untreated side.

Due to the severity of the damage from these rings, the club decided to apply a curative application of ProStar to the previously untreated side. On March 17, a tank mix of ProStar at 6 oz. and Primer at 6 oz., per 1000 sq. ft., was applied. When the greens were examined one month later, this curative treatment to the former untreated halves of each green had eliminated the fairy rings and the bermudagrass had filled in the damaged areas.

CONCLUSIONS

Based on the results obtained to date, ProStar appears to be effective in preventing or controlling the growth of the *Lycoperdon* fungus, the puffball mushroom that causes necrotic fairy ring in the southeastern U.S. Twice we have observed the ProStar fungicide control the fungal growth when applied as a one-time curative treatment. We also have observed the fungicide prevent the development of the fungus and so the necrotic fairy ring symptoms. AgrEvo recently received a label change to allow the use of ProStar as a preventive treatment.

Note: This article first appeared in the January 1998 issue of the "The 19th Hole" (Volume 7, Number 1).

Table 1. Effect of ProStar fungicide (6 oz. per 1000 sq. ft.) and Aqua-Gro soil wetting agent (8 fl. oz. per 1000 sq. ft) on mushroom production by *Lycoperdon* spp.

No.	Treatment	Application	Number of mushrooms ^x		
			Aug. 30	Sept. 8	Sept. 22
1	ProStar	Aug. 23 only	3.3 bc	3.2 b	2.0 bc
2	ProStar plus Aqua-Gro ^y	Aug. 23 only weekly	1.7 c	7.2 b	4.3 bc
3	Aqua-Gro	Aug. 23 only	5.3 ab	37.2 ab	17.7 abc
4	Aqua-Gro ^y	weekly	7.3 a	20.3 ab	25.0 ab
5	ProStar + Aqua-Gro Tank Mix	Aug. 23 only	1.0 c	0.7 b	4.3 bc
6	ProStar + Aqua-Gro Tank Mix plus Aqua-Gro ^y	Aug. 23 only weekly	0.2 c	0.8 b	0.0 c
7	Check	-----	8.2 a	11.2 b	28.2 a

^xValues are means of six replicate plots except for check treatment which are means of twelve replicate plots. Means followed by the same letter are not significantly different at $P=0.05$ according to Waller-Duncan k-ratio t-test.

^yAqua-Gro was applied Aug. 23, Aug. 31, Sept. 7 and Sept. 14.

Table 2. Fairy ring counts and sizes of rings on **untreated** halves of nine putting greens at the Sun N Lake Golf Club. The ProStar treated halves of each of these greens had **no** rings.

Number of rings with diameter of:

Injury	Green	No. of Rings	Number of rings with diameter of:				Turf
			0-1 ft.	1-2 ft.	2-3 ft.	>3 ft.	
1		14	7	6	1	0	Severe
2		5	2	2	1	0	Light
3		30	7	14	6	3	Severe
4		30	14	10	5	1	Severe
5		22	4	12	6	0	Moderate
6		38	12	8	13	5	Severe
7		23	6	12	4	1	Severe
8		11	7	1	2	1	Severe
9		22	13	4	3	2	Severe

Figure 1. Puffball mushrooms (fruiting bodies or basidiocarp) of *Lycoperdon* spp.*Unavailable*Figure 2. Necrotic fairy rings caused by *Lycoperdon* spp.*Unavailable*

Figure 3. The plot in the middle was treated with ProStar and has no mushrooms in it. This is in contrast to the surrounding area not treated with ProStar that has numerous puffball mushrooms.

Unavailable

Figure 4. The area in front of the flag's shadow was not treated with ProStar. The area behind the flag's shadow was treated with ProStar preventively and never developed necrotic fairy rings.

Unavailable

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