

# Investigation of Annual Bluegrass Control in Greens Height Creeping Bentgrass Utilizing Multiple Application Timings

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## Introduction

This study was conducted on a mature stand of ‘Penncross’ creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) at the Valentine Turfgrass Research Center, Penn State University, University Park, PA. The objective of the study was to determine if selected materials could reduce the annual bluegrass population under simulated golf course putting green conditions with applications made monthly throughout the season.

## Methods and Materials

This study was a randomized complete block design with three replications. Treatments were applied on April 15 (APR), May 17 (MAY), June 15 (JUNE), July 15 (JULY), August 15 (AUG), September 15 (SEPT), October 17 (OCT), and November 18, 2011 (NOV) using a three foot CO<sub>2</sub> powered boom sprayer (Figure 1) calibrated to deliver 87.12gpa using one, flat fan, TP9508EVS nozzle at 40 psi. The test area was maintained at 0.125 inch using a Toro triplex reel mower. Additionally, turfgrass was irrigated on an as needed basis to prevent moisture stress. The test area received maintenance fungicide applications to control disease.

The test site consisted of approximately 25 percent creeping bentgrass and 75 percent annual bluegrass (Figure 2) at the initiation of the study. The annual bluegrass population was visually evaluated on April 7, 2011, again on November 1, 2011, and finally on April 12, 2012 on a plot by plot basis, to determine the baseline population and percent change of the population in each plot.

## Results and Discussion

Annual bluegrass phytotoxicity was rated seven times during the study (Table 1). Phytotoxicity was variable but was observed following some of the treatments. This is normal and expected.

The annual bluegrass population was evaluated for control in November 2011 (Table 2). At this point it appears that MRC has the potential to reduce the annual bluegrass population. At no time were any voids in the turfgrass canopy recorded. It seems that the annual bluegrass dissipated at a slow rate and the creeping bentgrass filled in any potential voids. On the April 12, 2012 rating date, the best treatments (significantly so) were those applied in August or September at any rate. Treatments applied in the spring tended to reduce populations to a lesser degree (55 to 75 %) which is a slower and more desirable rate of elimination in some cases. Less than a 30% reduction in the population was found when materials were applied in October and November. It would seem that when applied early spring or fall, MRC is highly effective in reducing annual bluegrass populations.

The soil textural analysis has been included as a reference (Table 3). Additionally, the precipitation rate, daily high temperatures, and daily low temperatures for the duration of the study are included for reference in Table 4.

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**Table 1.** Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in a mixed greens height sward of ‘Penncross’ creeping bentgrass and annual bluegrass in 2011.

Treatment	Form	Rate oz/A	Timing	Poa Phytotoxicity						
				5/20	6/15	7/15	8/20	9/15	10/15	11/15
MRC	EC	55	APR	6.8	10.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	82	APR	6.5	10.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	110	APR	6.8	10.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	55	MAY	10.0	7.3	10.0	10.0	9.5	10.0	9.5
MRC	EC	82	MAY	10.0	7.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	110	MAY	10.0	7.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	55	JUNE	10.0	10.0	7.3	10.0	9.5	10.0	9.5
MRC	EC	82	JUNE	10.0	10.0	7.2	10.0	9.5	10.0	9.5
MRC	EC	110	JUNE	10.0	10.0	6.8	10.0	9.5	10.0	9.5
MRC	EC	55	JULY	10.0	10.0	10.0	7.2	9.5	10.0	9.5
MRC	EC	82	JULY	10.0	10.0	10.0	7.0	9.5	10.0	9.5
CHECK				10.0	10.0	10.0	10.0	10.0	10.0	10.0
MRC	EC	110	JULY	10.0	10.0	10.0	7.0	9.5	10.0	9.5
MRC	EC	55	AUG	10.0	10.0	10.0	10.0	6.8	10.0	9.5
MRC	EC	82	AUG	10.0	10.0	10.0	10.0	6.5	10.0	9.5
MRC	EC	110	AUG	10.0	10.0	10.0	10.0	6.3	10.0	9.5
MRC	EC	55	SEPT	10.0	10.0	10.0	10.0	9.5	7.3	9.5
MRC	EC	82	SEPT	10.0	10.0	10.0	10.0	9.5	6.8	9.5
MRC	EC	110	SEPT	10.0	10.0	10.0	10.0	9.5	6.7	9.5
MRC	EC	55	OCT	10.0	10.0	10.0	10.0	9.5	10.0	8.0
MRC	EC	82	OCT	10.0	10.0	10.0	10.0	9.5	10.0	8.0
MRC	EC	110	OCT	10.0	10.0	10.0	10.0	9.5	10.0	8.0
MRC	EC	55	NOV	10.0	10.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	82	NOV	10.0	10.0	10.0	10.0	9.5	10.0	9.5
MRC	EC	110	NOV	10.0	10.0	10.0	10.0	9.5	10.0	9.5

**Table 2.** Percent control of annual bluegrass in a mixed greens height sward with ‘Penncross’ creeping bentgrass in 2011 and 2012.

Treatment	Form	Rate oz/A	Timing	(-----% Control <sup>1</sup> -----)	
				11/1/11	4/12/12
MRC	EC	55	APR	78.1ab	71.5ef
MRC	EC	82	APR	70.3cd	66.1fg
MRC	EC	110	APR	79.9a	75.6de
MRC	EC	55	MAY	66.5def	64.6fgh
MRC	EC	82	MAY	70.5cd	61.3gh
MRC	EC	110	MAY	71.0cd	55.6h
MRC	EC	55	JUNE	63.1efg	58.6gh
MRC	EC	82	JUNE	62.9efg	63.2fg
MRC	EC	110	JUNE	71.7cd	71.4ef
MRC	EC	55	JULY	67.5def	58.3gh
MRC	EC	82	JULY	72.7bcd	77.1de
CHECK				0.0j	0.0j
MRC	EC	110	JULY	68.9de	83.1cd
MRC	EC	55	AUG	56.8h	86.3bc
MRC	EC	82	AUG	61.4fgh	95.0ab
MRC	EC	110	AUG	60.2gh	92.5ab
MRC	EC	55	SEPT	70.5cd	95.1ab
MRC	EC	82	SEPT	76.0abc	98.7a
MRC	EC	110	SEPT	78.3ab	95.1ab
MRC	EC	55	OCT	4.6ij	25.3i
MRC	EC	82	OCT	6.5i	25.0i
MRC	EC	110	OCT	4.8ij	16.2i
MRC	EC	55	NOV	0.0j	23.3i
MRC	EC	82	NOV	0.0j	22.9i
MRC	EC	110	NOV	0.0j	20.6i

<sup>1</sup> - Means followed by same letter do not significantly differ (P=0.05, Duncan's New MRT)

**Table 3.** Soil textural analysis of the ‘Penncross’ creeping bentgrass/annual bluegrass green test area.

Size Fraction	% by weight
>2 mm	0
1-2 mm	5.4
0.5-1 mm	21.9
0.25-0.5 mm	46.5
0.15-0.25 mm	18.8
0.05-0.15 mm	4.0
Silt	2.5
Clay	0.9

**Table 4.** Precipitation rate, daily high temperatures, and daily low temperatures for the duration of the study in 2011.

<b>April</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>	<b>May</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>	<b>June</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>
4/15/2011	0	17.6	-0.9	5/1/2011	0	17.2	1.3	6/1/2011	0	30.5	15.8
4/16/2011	0	13.8	0.2	5/2/2011	0.12	12.4	7.8	6/2/2011	0	28.6	16.6
4/17/2011	0.76	9.3	3.7	5/3/2011	0	17.7	9.2	6/3/2011	0	21	8
4/18/2011	0	11.6	1.3	5/4/2011	0.61	22	4.8	6/4/2011	0	21.9	4.6
4/19/2011	0	16.7	-0.3	5/5/2011	0.18	8.2	3.5	6/5/2011	0.19	21.4	5.1
4/20/2011	0.36	10.2	3.3	5/6/2011	0	15.2	0.6	6/6/2011	0	27	11.7
4/21/2011	0	21.2	5.6	5/7/2011	0	17.2	0.4	6/7/2011	0	25.7	7.9
4/22/2011	0	10	-1.3	5/8/2011	0	16.2	3.8	6/8/2011	0	24.9	10.2
4/23/2011	0.21	3.6	-2.4	5/9/2011	0	18.8	2.4	6/9/2011	0	31.1	12.2
4/24/2011	0.16	19	2.3	5/10/2011	0	18.9	2.4	6/10/2011	0.02	30.4	17.1
4/25/2011	0	19.6	10.4	5/11/2011	0	21.7	0.5	6/11/2011	0.76	26.4	14.5
4/26/2011	0.02	26.1	10.3	5/12/2011	0	23	7.8	6/12/2011	0.42	25.3	15.9
4/27/2011	0.31	25.5	11.4	5/13/2011	0	22.8	9.4	6/13/2011	0.13	24.6	11.6
4/28/2011	0.03	24	12.6	5/14/2011	0	18.7	13.3	6/14/2011	0	19.2	8.6
4/29/2011	1.21	20	5.6	5/15/2011	0.01	14.1	12.8	6/15/2011	0	18.3	7.1
4/30/2011	0.01	9.2	3.6	5/16/2011	0.67	17.7	12.4	6/16/2011	0	23.5	4.1
				5/17/2011	0.01	16.1	8.8	6/17/2011	0.42	18.9	11
				5/18/2011	0.45	14.5	8.6	6/18/2011	0	22.4	11.8
				5/19/2011	0.76	16.1	10.7	6/19/2011	0	25.5	12.8
				5/20/2011	0.25	15.8	8.4	6/20/2011	0	25.3	12.7
				5/21/2011	0.28	19.2	10	6/21/2011	0.44	23.8	15.7
				5/22/2011	0.01	23.1	7.1	6/22/2011	0.08	27.1	16.7
				5/23/2011	0	X	X	6/23/2011	0.01	26.7	19.2
				5/24/2011	0.48	23	14.3	6/24/2011	0.08	24.9	16.3
				5/25/2011	0	22	13.7	6/25/2011	0.06	20.9	14.8
				5/26/2011	0	24.9	11.1	6/26/2011	0	18.6	11.4
				5/27/2011	0.18	27.8	15.5	6/27/2011	0	19.5	11.4
				5/28/2011	0.76	22.8	14.7	6/28/2011	0	22.5	9.1
				5/29/2011	0.02	24.4	14.3	6/29/2011	0	27.1	16.5
				5/30/2011	0	27.9	18.2	6/30/2011	0	22.8	11.4
				5/31/2011	0	30.2	17.4				

**Table 4 cont.** Precipitation rate, daily high temperatures, and daily low temperatures for the duration of the study in 2011.

<b>July</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>	<b>August</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>	<b>September</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>
7/1/2011	0	23.8	8	8/1/2011	0	28.7	11.7	9/1/2011	0	23.5	8
7/2/2011	0	26.1	7.2	8/2/2011	0.12	29.1	14.3	9/2/2011	0.07	23.3	14.1
7/3/2011	0	27.8	7.4	8/3/2011	0.01	28.4	13.8	9/3/2011	0	20.9	17.9
7/4/2011	0	27.6	16.2	8/4/2011	0.45	22.1	17.6	9/4/2011	0	29	18.8
7/5/2011	0	25.5	13.1	8/5/2011	0	25.2	18.6	9/5/2011	0.47	27.4	18.2
7/6/2011	0	28	13.1	8/6/2011	0	23.7	17.4	9/6/2011	0.78	19.3	12.1
7/7/2011	0	30.2	11.1	8/7/2011	0.42	23.8	17.7	9/7/2011	1.23	13.2	11.8
7/8/2011	0	28.4	14.1	8/8/2011	0.05	27.2	17.9	9/8/2011	1.96	15.3	12.1
7/9/2011	0.01	21.9	16.4	8/9/2011	0	27.3	16.1	9/9/2011	0.4	20.1	14.6
7/10/2011	0	28.4	12.2	8/10/2011	0.18	25.1	15.3	9/10/2011	0.05	22.4	16.3
7/11/2011	0	28.8	10.8	8/11/2011	0	24.1	12.7	9/11/2011	0.11	22.6	14.5
7/12/2011	0	30.7	14.2	8/12/2011	0	22.9	8.6	9/12/2011	0.01	21.2	11.9
7/13/2011	0	29.6	18.3	8/13/2011	0	24.6	6.4	9/13/2011	0.01	22.7	9.5
7/14/2011	0	26.6	12.9	8/14/2011	0.07	22.4	10.9	9/14/2011	0	25.2	10.1
7/15/2011	0	26.6	7.8	8/15/2011	1.33	24.2	14.4	9/15/2011	0.11	23.9	12.8
7/16/2011	0	26.3	9.8	8/16/2011	0.29	20.8	14.3	9/16/2011	0.35	15.7	2.8
7/17/2011	0	27.6	9.6	8/17/2011	0	26.3	12.4	9/17/2011	0	13.9	1.5
7/18/2011	0	30.1	13.8	8/18/2011	0	26.3	9.6	9/18/2011	0	14.2	5.7
7/19/2011	0	31	15.2	8/19/2011	0	26.4	13.7	9/19/2011	0	16.6	2.9
7/20/2011	0.3	31	20.2	8/20/2011	0.2	25.4	12.2	9/20/2011	0.22	16	5.3
7/21/2011	0	33.1	16.9	8/21/2011	0	26.1	12.4	9/21/2011	0.08	20.2	12.4
7/22/2011	0	34.9	16.6	8/22/2011	0.47	24.9	15.3	9/22/2011	0.01	20.8	13.7
7/23/2011	0	36.9	23.2	8/23/2011	0	21.1	8.8	9/23/2011	0	22.2	12.9
7/24/2011	0	32	19.8	8/24/2011	0	22.9	6	9/24/2011	0.24	18.8	12.6
7/25/2011	0	31	20	8/25/2011	0	23.9	12.8	9/25/2011	0	20.6	11.5
7/26/2011	1.03	26.1	17.7	8/26/2011	0.37	25.2	13.7	9/26/2011	0	22.4	13.9
7/27/2011	0.13	27.7	13.7	8/27/2011	0.01	25.5	11.2	9/27/2011	0	23.9	17.6
7/28/2011	0	27.1	10.6	8/28/2011	0.2	23.5	14.1	9/28/2011	1.04	20	16.1
7/29/2011	0.77	21.7	16	8/29/2011	0.65	21.6	8	9/29/2011	0.54	20.6	14
7/30/2011	0	30.6	18	8/30/2011	0	21.1	5.6	9/30/2011	0.07	16.9	9.2
7/31/2011	0	29.3	14.8	8/31/2011	0	24.3	5.4				

**Table 4 cont.** Precipitation rate, daily high temperatures, and daily low temperatures for the duration of the study in 2011.

<b>October</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>	<b>November</b>	<b>Precip. (in.)</b>	<b>Daily High (°C)</b>	<b>Daily Low (°C)</b>
10/1/2011	0.01	13.7	7.4	11/1/2011	0	5.5	-5.8
10/2/2011	0.4	7.4	3.3	11/2/2011	0	11	-4.5
10/3/2011	0.74	6	-0.3	11/3/2011	0	12.9	-5.1
10/4/2011	0.07	10.9	2.8	11/4/2011	0	15.1	-2.1
10/5/2011	0	13.9	4.6	11/5/2011	0	8.4	-2.7
10/6/2011	0.01	19.4	4.4	11/6/2011	0	8.1	-7.1
10/7/2011	0	17.9	-1.6	11/7/2011	0	10.6	-1.3
10/8/2011	0	19.9	1.2	11/8/2011	0	17	-5.5
10/9/2011	0	21.9	2.1	11/9/2011	0	18.5	-1.3
10/10/2011	0	24.8	4.1	11/10/2011	0	16.2	-1.6
10/11/2011	0	22	4.5	11/11/2011	0.05	10.4	-1
10/12/2011	0	19.1	5.5	11/12/2011	0	3.5	-3.4
10/13/2011	0.54	15.9	9.6	11/13/2011	0	13.3	-2.9
10/14/2011	0.29	15.8	10.1	11/14/2011	0	15.1	5.2
10/15/2011	0.28	15.9	6.1	11/15/2011	0.09	18.3	10.2
10/16/2011	0	12.5	7.3	11/16/2011	0.21	12	7.5
10/17/2011	0.18	16.3	6.2	11/17/2011	0.23	10.5	3.8
10/18/2011	0.01	15.3	3.9	11/18/2011	0	3.8	-3.1
10/19/2011	0	18.9	8				
10/20/2011	0.92	16.1	9.8				
10/21/2011	0.04	9.8	5				
10/22/2011	0	6.8	3.6				
10/23/2011	0	9.8	-0.6				
10/24/2011	0	13.2	-3.5				
10/25/2011	0.05	14.5	2.6				
10/26/2011	0	14.3	2.6				
10/27/2011	0	15.6	1.9				
10/28/2011	0.4	13.8	-1.3				
10/29/2011	0	4.4	-4.2				
10/30/2011	0.43	1.3	-6.1				
10/31/2011	0.21	5.4	-8.9				



*Figure 1: CO<sub>2</sub> powered boom sprayer used for application of liquid materials.*



*Figure 2: Untreated plot revealing 75% annual bluegrass coverage.  
Photo taken 7 WAT on June 7, 2011.*