

# Annual Bluegrass Control in Fairway Height Creeping Bentgrass

J. A. Borger, M. B. Naedel, M. T. Elmore<sup>1</sup>

## Introduction

This study was conducted on a mature stand of 'Penneagle' 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 fairway conditions.

## Methods and Materials

This study was a randomized complete block design with three replications. Treatments were applied on June 11 (JUNE), June 25 (2 WAT), July 11 (4 WAT), August 4 (8 WAT), September 2 (12 WAT), October 16 (16 WAT), and October 30, 2008 (18 WAT) using a three foot CO<sub>2</sub> powered boom sprayer calibrated to deliver 40gpa using one, flat fan, 11004E nozzle at 40 psi. The test area was maintained at 0.5 inch using a five-plex reel mower. Turfgrass was irrigated on an as needed basis to prevent moisture stress. The study was fertilized prior to green up with 1 lb N/M from IBDU and again in May with 1 lb N/M from urea. The test area received maintenance fungicide applications to control disease.

The test site consisted of approximately 40 percent creeping bentgrass and 60 percent annual bluegrass at the initiation of the study. The annual bluegrass population was visually evaluated on May 27, 2008 and again on May 13, 2009, on a plot by plot basis, to determine the baseline population and percent change of the population in each plot.

## Results and Discussion

Creeping bentgrass phytotoxicity was rated ten times during the study (Table 1). No unacceptable turfgrass phytotoxicity was observed on any rating date.

Annual bluegrass phytotoxicity was rated ten times during the study (Table 2). No unacceptable turfgrass phytotoxicity was observed on any rating date except for the July 2<sup>nd</sup> date. On that date, annual bluegrass treated with Cutless plus Velocity or Primo MAXX plus Velocity applied June/2/16/18 WAT revealed unacceptable phytotoxicity.

Turfgrass quality was rated nine times during the study (Table 3). No unacceptable turfgrass quality was observed on any rating date.

Turfgrass green-up was rated three times during the study (Table 4). On the first and second dates, March 25, 2009 and April 8, 2009, Velocity plus Ferromec with an 18 WAT application timing had significantly more green up than non treated turfgrass. In contrast to turfgrass treated with Velocity plus V10142 with the 18 WAT application timing which had significantly less green-up. On the final rating date, April 22, 2009, only turfgrass treated with Velocity plus Cutless with the 18 WAT application timing had significantly less green-up than non treated turfgrass. It appears that the late application of materials can affect spring green-up.

The percent population change of annual bluegrass was rated on May 13, 2009 (Table 5). On this date, only turfgrass treated with Velocity plus Primo MAXX, Velocity alone with a 18 WAT application timing, Velocity plus V10142 with a 18 WAT application timing, Velocity plus Cutless with a 18 WAT application timing, and Velocity plus Primo MAXX with a 18 WAT application timing revealed a significant reduction in the annual bluegrass populations when compared to non treated turfgrass. Again, the additional late application of materials proved to be a positive in the reduction of the annual bluegrass population.

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<sup>1</sup> Instructor, Research Technician, and Turfgrass Science Student, Department of Crop and Soil Sciences, Penn State University, University Park, Pa, 16802

**Table 1.** Creeping bentgrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	(-----Bentgrass Phytotoxicity-----)				
				6/18	7/2	7/16	7/30	8/13
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.7	9.7	8.3	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.7	10.0	9.3	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.3	10.0	8.3	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.3	10.0	8.2	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT					
CHECK				10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	10.0	8.2	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.7	9.0	8.8	10.0	10.0
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	9.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	9.0	9.0	8.5	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	9.3	7.7	9.7	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	9.7	7.7	10.0	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT					

**Table 1 (continued).** Bentgrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	(-----Bentgrass Phytotoxicity-----)				
				8/27	9/10	9/24	10/8	10/22
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT					
CHECK				10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	8.2
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT					

**Table 2.** Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in a mixed fairway height sward of 'Penneagle' creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	(-----Poa Phytotoxicity-----)				
				6/18	7/2	7/16	7/30	8/13
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.0	9.0	7.8	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.7	10.0	8.2	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	7.3	10.0	7.8	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	7.7	9.7	8.0	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT					
CHECK				10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	6.8	9.3	7.8	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.3	8.3	8.3	10.0	10.0
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	9.3	10.0	8.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.0	8.3	8.3	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	7.3	6.3	7.8	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.3	6.7	8.7	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT					

**Table 2 (continued).** Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in a mixed fairway height sward of 'Penneagle' creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	(-----Poa Phytotoxicity-----)				
				8/27	9/10	9/24	10/8	10/22
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT					
CHECK				10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	10.0	10.0	10.0	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	8.8
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	10.0	10.0	10.0	10.0	10.0
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT					

**Table 3.** Turfgrass quality ratings on a scale of 0-9 where 0 = poor quality, 6 = acceptable, and 9 = excellent quality, in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	-----Quality-----				
				7/2	7/16	7/30	8/13	8/27
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	8.0	8.2	8.5	8.5
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	8.5	8.5	8.8	8.5
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	8.2	8.3	8.5	8.5
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	8.0	8.0	8.3	8.5
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT					
CHECK				9.0	8.3	8.2	8.5	8.5
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	9.0	8.0	8.2	8.7	8.5
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.8	8.3	8.3	8.3	8.5
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	9.0	8.5	8.5	8.7	8.5
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.7	8.3	8.2	8.5	8.5
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	7.7	8.2	8.2	8.0	8.5
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT					
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.0	8.7	8.5	8.5	8.5
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT					

**Table 3 (continued).** Turfgrass quality ratings on a scale of 0-9 where 0 = poor quality, 6 = acceptable, and 9 = excellent quality, in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2008.

Treatment	Form	Rate g ai/A	Timing	-----Quality-----			
				9/10	9/24	10/8	10/22
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.3	8.3	8.2	7.8
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.5	8.2	8.3	8.2
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT				
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.5	8.3	8.5	8.2
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT				
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.2	8.2	8.2	8.5
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT				
CHECK				8.3	8.2	8.2	8.2
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	8.5	8.5	8.3	8.5
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT				
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.0	8.2	8.0	8.0
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.5	8.2	8.5	8.3
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT				
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.0	8.2	8.2	7.7
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT				
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.2	8.0	8.2	7.7
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT				
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	8.5	8.0	8.2	7.8
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT				

**Table 4.** Percent green turfgrass cover from spring green-up of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2009.

Treatment	Form	Rate g ai/A	Timing	(-----% Green Up <sup>1</sup> -----)		
				3/25	4/8	4/22
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	53.3b	80.0bc	100.0a
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	53.3b	78.3bc	100.0a
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT			
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	56.7b	83.3bc	100.0a
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT			
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	53.3b	86.7abc	100.0a
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT			
CHECK				56.7b	78.3bc	100.0a
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	60.0b	91.7ab	100.0a
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT			
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	40.0c	73.3cd	100.0a
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	81.7a	98.3a	100.0a
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT			
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	30.0d	61.7de	96.7ab
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT			
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	23.3de	55.0e	95.0b
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT			
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	20.0e	58.3e	100.0a
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT			

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

**Table 5.** Percent population change of annual bluegrass in a mixed fairway height sward with ‘Penneagle’ creeping bentgrass in 2009.

Treatment	Form	Rate g ai/A	Timing	(-----% Change <sup>1</sup> -----)
				5/13/09
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	24.4bc
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	2.8bc
FERROMECC	L	5 oz/M	JUNE/4/8/12 WAT	
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	26.7bc
V10142	75WG	0.29 lb ai/A	JUNE/4/8/12 WAT	
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	22.4bc
CUTLESS	50W	12 oz/A	JUNE/4/8/12 WAT	
CHECK				0.0c
VELOCITY	17.6SG	10	JUNE/4/8/12 WAT	31.0b
PRIMO MAXX	1MEC	11 oz/A	JUNE/4/8/12 WAT	
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	61.1a
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	18.9bc
FERROMECC	L	5 oz/M	JUNE/2/16/18 WAT	
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	73.9a
V10142	75WG	0.29 lb ai/A	JUNE/2/16/18 WAT	
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	79.6a
CUTLESS	50W	12 oz/A	JUNE/2/16/18 WAT	
VELOCITY	17.6SG	10	JUNE/2/16/18 WAT	80.0a
PRIMO MAXX	1MEC	11 oz/A	JUNE/2/16/18 WAT	

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