

Annual Bluegrass Control in Greens Height Creeping Bentgrass

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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 populations after applications in two consecutive growing seasons under simulated golf course greens conditions.

Methods and Materials

This study was a randomized complete block design with three replications. Treatments were applied on May 25 (POA), June 2 (7 DAT), June 13 (14 DAT), June 17 (21 DAT), July 7 (42 DAT), and July 27, 2011 (63 DAT) and again on May 31 (POA), June 7 (7 DAT), June 13 (14 DAT), June 22 (21 DAT), July 25 (42 DAT), and August 13, 2012 (63 DAT) using a three foot CO₂ powered boom sprayer (Figure 1) calibrated to deliver 87.12gpa using one, flat fan, TP9508EVS nozzle at 40 psi. Turfgrass was irrigated on an as needed basis to prevent moisture stress. Additionally, the test area received maintenance fungicide applications to control disease.

The test site (Figure 2) consisted of approximately 40 percent creeping bentgrass and 60 percent annual bluegrass at the initiation of the study in 2011 and contained approximately 50 percent creeping bentgrass and 50 percent annual bluegrass at the resumption of the study in 2012.

Results and Discussion

In 2011, creeping bentgrass phytotoxicity was rated four times during the study (Table 1). On every rating date there was at least one instance of unacceptable phytotoxicity observed. It should be noted that turfgrass treated with Xonerate at 3 oz/A plus Agridex at 0.25% v/v revealed unacceptable phytotoxicity on every rating date. It appears there may be a trend that earlier applications at lower rates have no unacceptable phytotoxicity. In 2012 there was no phytotoxicity found (Table 2).

In 2011 annual bluegrass phytotoxicity was rated four times during the study (Table 3). All treated annual bluegrass revealed some level of phytotoxicity. This would be expected as the objective of the study was to eliminate the weed. In 2012, no phytotoxicity was found (Table 4).

Turfgrass color was rated once on July 7, 2011 (Table 5). Turfgrass treated with Xonerate at 1 oz/A, Agridex at 0.25% v/v plus Trimmit applied four times during the study produced a darker green colored turfgrass.

A turfgrass quality rating was taken on August 2, 2011 (Table 6). The quality rating included the following factors; turfgrass color, turfgrass density, and uniformity of the turfgrass stand. All turfgrass treated with Trimmit alone or in combination with Xonerate at 1 oz/A and Agridex at 0.25% v/v applied four times during the study were rated with less than acceptable quality.

A spring rating to determine the annual bluegrass population change will be conducted in early 2013. There were two ratings of the amount of annual bluegrass control taken one early 2011 and one spring 2012 (Table 7). There was very little change in the populations from one rating date to another in 2011 and 2012. This trend remained in 2013 as no significant difference in population change was found..

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Table 1. ‘Penncross’ creeping bentgrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2011.

Treatment	Form	Rate oz/A	Timing	(------Bentgrass Phytotoxicity-----)			
				6/1/11	6/22/11	7/18/11	8/2/11
XONERATE	70WDG	1	POA/7/14/21 DAT	9.7	6.2	10.0	10.0
AGRIDEX	L	0.25% v/v	POA/7/14/21 DAT				
XONERATE	70WDG	2	POA	8.0	10.0	10.0	10.0
AGRIDEX	L	0.25% v/v	POA				
XONERATE	70WDG	3	POA	7.0	10.0	10.0	9.3
AGRIDEX	L	0.25% v/v	POA				
XONERATE	70WDG	4	POA	5.8	10.0	10.0	9.5
AGRIDEX	L	0.25% v/v	POA				
CHECK				10.0	10.0	10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	7.5	8.3	6.0	6.2
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
TRIMMIT	2SC	0.25 lb ai/A	POA	7.7	8.0	6.8	7.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	9.2	10.0	10.0	8.0
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	1.0	POA/21/42/63 DAT	8.5	9.3	7.8	7.8
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	3.0	POA/21/42/63 DAT	6.3	6.5	4.8	5.2
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	1	POA	8.2	10.0	10.0	9.7
AGRIDEX	L	0.25% v/v	POA				
TRIMMIT	2SC	0.125 lb ai/A	POA				
XONERATE	70WDG	1.0	POA/21/42/63 DAT	7.2	7.8	6.0	6.2
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT				

Table 2. ‘Penncross’ creeping bentgrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2012.

Treatment	Form	Rate oz/A	Timing	-----Bentgrass Phytotoxicity-----			
				6/22/12	6/29/12	7/6/12	
<u>7/20/12</u>							
XONERATE	70WDG	1	POA/7/14/21 DAT	10.0	10.0	10.0	10.0
XONERATE	70WDG	2	POA	10.0	10.0	10.0	10.0
XONERATE	70WDG	3	POA	10.0	10.0	10.0	10.0
XONERATE	70WDG	4	POA	10.0	10.0	10.0	10.0
CHECK				10.0	10.0	10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	10.0	10.0	10.0	10.0
TRIMMIT	2SC	0.25 lb ai/A	POA	10.0	10.0	10.0	10.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	10.0	10.0	10.0	10.0
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0	10.0
XONERATE	70WDG	1	POA	10.0	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA				
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT				

Table 2(cont). ‘Penncross’ creeping bentgrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2012.

Treatment	Form	Rate oz/A	Timing	----Bentgrass Phytotoxicity----		
				8/3/12	8/17/12	8/31/12
XONERATE	70WDG	1	POA/7/14/21 DAT	10.0	10.0	10.0
XONERATE	70WDG	2	POA	10.0	10.0	10.0
XONERATE	70WDG	3	POA	10.0	10.0	10.0
XONERATE	70WDG	4	POA	10.0	10.0	10.0
CHECK				10.0	10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	10.0	10.0	10.0
TRIMMIT	2SC	0.25 lb ai/A	POA	10.0	10.0	10.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	10.0	10.0	10.0
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0
XONERATE	70WDG	1	POA	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA			
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT			

Table 3 Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2011.

Treatment	Form	Rate oz/A	Timing	(-----Annual Bluegrass Phytotoxicity-----)			
				6/1/11	6/22/11	7/18/11	8/2/11
XONERATE	70WDG	1	POA/7/14/21 DAT	8.8	7.0	10.0	10.0
AGRIDEX	L	0.25% v/v	POA/7/14/21 DAT				
XONERATE	70WDG	2	POA	7.0	10.0	10.0	10.0
AGRIDEX	L	0.25% v/v	POA				
XONERATE	70WDG	3	POA	6.8	10.0	10.0	9.2
AGRIDEX	L	0.25% v/v	POA				
XONERATE	70WDG	4	POA	6.2	10.0	10.0	9.3
AGRIDEX	L	0.25% v/v	POA				
CHECK				10.0	10.0	10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	7.0	8.0	6.3	6.3
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
TRIMMIT	2SC	0.25 lb ai/A	POA	6.7	7.0	6.8	7.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	7.3	10.0	10.0	7.5
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	1.0	POA/21/42/63 DAT	7.5	9.0	8.0	7.7
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	3.0	POA/21/42/63 DAT	6.7	7.2	5.0	5.0
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
XONERATE	70WDG	1	POA	7.0	10.0	10.0	9.3
AGRIDEX	L	0.25% v/v	POA				
TRIMMIT	2SC	0.125 lb ai/A	POA				
XONERATE	70WDG	1.0	POA/21/42/63 DAT	6.5	7.0	6.2	6.3
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT				
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT				

Table 4 Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2012.

Treatment	Form	Rate oz/A	Timing	(-----Annual Bluegrass Phytotoxicity-----)		
				6/22/12	6/29/12	7/6/12
<u>7/20/12</u>						
XONERATE	70WDG	1	POA/7/14/21 DAT	10.0	10.0	10.0
XONERATE	70WDG	2	POA	10.0	10.0	10.0
XONERATE	70WDG	3	POA	10.0	10.0	10.0
XONERATE	70WDG	4	POA	10.0	10.0	10.0
CHECK				10.0	10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	10.0	10.0	10.0
TRIMMIT	2SC	0.25 lb ai/A	POA	10.0	10.0	10.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	10.0	10.0	10.0
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0
XONERATE	70WDG	1	POA	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA			
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT			

Table 4 (cont). Annual bluegrass phytotoxicity on a scale of 0-10, where 0 = dead turf, 7 = acceptable, and 10 = no phytotoxicity in 2012.

Treatment	Form	Rate oz/A	Timing	(-----Annual Bluegrass Phytotoxicity-----)	
				8/3/12	8/17/12
<u>8/31/12</u>					
XONERATE	70WDG	1	POA/7/14/21 DAT	10.0	10.0
XONERATE	70WDG	2	POA	10.0	10.0
XONERATE	70WDG	3	POA	10.0	10.0
XONERATE	70WDG	4	POA	10.0	10.0
CHECK				10.0	10.0
XONERATE	70WDG	2	POA/21/42/63 DAT	10.0	9.0
TRIMMIT	2SC	0.25 lb ai/A	POA	10.0	10.0
XONERATE	70WDG	0.5	POA/21/42/63 DAT	10.0	10.0
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	9.7
XONERATE	70WDG	1	POA	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA		
XONERATE	70WDG	1.0	POA/21/42/63 DAT	10.0	10.0
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT		

Table 5. Turfgrass color on a scale of 0-10, where 0 = poor color, 7 = acceptable, and 10 = dark green of a mixed sward of greens height ‘Penncross’ creeping bentgrass and annual bluegrass in 2011.

Treatment	Form	Rate oz/A	Timing	(-Color-) 7/6/11
XONERATE	70WDG	1	POA/7/14/21 DAT	8.3
AGRIDEX	L	0.25% v/v	POA/7/14/21 DAT	
XONERATE	70WDG	2	POA	8.0
AGRIDEX	L	0.25% v/v	POA	
XONERATE	70WDG	3	POA	8.0
AGRIDEX	L	0.25% v/v	POA	
XONERATE	70WDG	4	POA	8.2
AGRIDEX	L	0.25% v/v	POA	
CHECK				8.2
XONERATE	70WDG	2	POA/21/42/63 DAT	8.5
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
TRIMMIT	2SC	0.25 lb ai/A	POA	8.8
XONERATE	70WDG	0.5	POA/21/42/63 DAT	8.0
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	1.0	POA/21/42/63 DAT	8.2
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	3.0	POA/21/42/63 DAT	8.5
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	1	POA	8.3
AGRIDEX	L	0.25% v/v	POA	
TRIMMIT	2SC	0.125 lb ai/A	POA	
XONERATE	70WDG	1.0	POA/21/42/63 DAT	9.0
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT	

Table 6. Turfgrass quality on a scale of 0-10, where 0 = poor quality, 7 = acceptable, and 10 = high quality of a mixed sward greens height 'Penncross' creeping bentgrass and annual bluegrass in 2011.

Treatment	Form	Rate oz/A	Timing	(--Quality--) 8/2/11
XONERATE	70WDG	1	POA/7/14/21 DAT	9.0
AGRIDEX	L	0.25% v/v	POA/7/14/21 DAT	
XONERATE	70WDG	2	POA	9.0
AGRIDEX	L	0.25% v/v	POA	
XONERATE	70WDG	3	POA	8.8
AGRIDEX	L	0.25% v/v	POA	
XONERATE	70WDG	4	POA	8.8
AGRIDEX	L	0.25% v/v	POA	
CHECK				9.0
XONERATE	70WDG	2	POA/21/42/63 DAT	7.2
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
TRIMMIT	2SC	0.25 lb ai/A	POA	6.8
XONERATE	70WDG	0.5	POA/21/42/63 DAT	8.5
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	1.0	POA/21/42/63 DAT	8.5
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	3.0	POA/21/42/63 DAT	5.0
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
XONERATE	70WDG	1	POA	8.8
AGRIDEX	L	0.25% v/v	POA	
TRIMMIT	2SC	0.125 lb ai/A	POA	
XONERATE	70WDG	1.0	POA/21/42/63 DAT	6.8
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT	
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT	

Table 7. Percent control of annual bluegrass in a mixed greens height sward with ‘Penncross’ creeping bentgrass in 2011, 2012 and 2013.

Treatment	Form	Rate oz/A	Timing	(-----% Control ¹ -----)		
				11/2/11	4/12/12	5/6/13
XONERATE	70WDG	1.0	POA/7/14/21 DAT	24.4c	29.1b	10.4 a
AGRIDEX	L	0.25% v/v	POA/7/14/21 DAT			
XONERATE	70WDG	2.0	POA	22.2c	24.4bc	19.4 a
AGRIDEX	L	0.25% v/v	POA			
XONERATE	70WDG	3.0	POA	33.7bc	35.3b	19.5 a
AGRIDEX	L	0.25% v/v	POA			
XONERATE	70WDG	4.0	POA	7.1d	24.2bc	12.1 a
AGRIDEX	L	0.25% v/v	POA			
CHECK				0.0d	0.0e	0.0 a
XONERATE	70WDG	2.0	POA/21/42/63 DAT	39.9b	35.0b	0.0 a
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT			
TRIMMIT	2SC	0.25 lb ai/A	POA	22.5c	29.7b	14.1 a
XONERATE	70WDG	0.5	POA/21/42/63 DAT	22.0c	28.2b	6.7 a
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT			
XONERATE	70WDG	1.0	POA/21/42/63 DAT	38.1b	31.3b	10.0 a
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT			
XONERATE	70WDG	3.0	POA/21/42/63 DAT	2.2d	4.8de	27.4 a
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT			
XONERATE	70WDG	1.0	POA	8.9d	14.0cd	24.2 a
AGRIDEX	L	0.25% v/v	POA			
TRIMMIT	2SC	0.125 lb ai/A	POA			
XONERATE	70WDG	1.0	POA/21/42/63 DAT	66.0a	61.2a	22.9 a
AGRIDEX	L	0.25% v/v	POA/21/42/63 DAT			
TRIMMIT	2SC	0.125 lb ai/A	POA/21/42/63 DAT			

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



Figure 1: CO₂ powered boom sprayer used for application of liquid materials.



Figure 2: Overview of the test area. Photo taken 10/1/12.