

Evaluating the Use of Bispyribac-Sodium with Plant Growth Regulators to Control Annual Bluegrass in Creeping Bentgrass Greens

Abstract

Acceptable annual bluegrass seedhead reduction in golf greens can occur with repeated application of plant growth regulators, but complete control of annual bluegrass has not been achieved. Bispyribac-sodium is labeled to control annual bluegrass in creeping bentgrass fairways but is not labeled for use on golf course greens due to turf injury. Field research plots (1.5 x 1.5 m) were treated weekly during spring 2007 with bispyribac-sodium (7.4 to 14.8 g ai/ha) alone and tank mixed with either trinexapac-ethyl (57 g ai/ha) or paclobutrazol (224 g ai/ha) and liquid fertilizer (5 kg N/ha and 1 kg FeSO₄/ha). Plots were rated for annual bluegrass control, turf quality, and turf phytotoxicity. Preliminary results of this study suggest that bispyribac-sodium alone and tank mixed with either trinexapac-ethyl or paclobutrazol and liquid fertilizer may provide acceptable annual bluegrass control in creeping bentgrass greens while maintaining acceptable turf quality and low turf phytotoxicity.

Introduction

Golf course superintendents have attempted to control annual bluegrass (*Poa annua* L.) in creeping bentgrass (*Agrostis stolonifera* L.) golf greens for many years. Annual bluegrass is a winter annual and is a prolific seed producer. These seedheads can be produced at greens mowing height and can cause objectionable turf color, reduced aesthetic appeal, reduced putting speed, and may adversely affect ball roll. Acceptable annual bluegrass seedhead reduction can occur with the repeated application of plant growth regulators, but complete control of annual bluegrass has not been achieved. Bispyribac-sodium (Velocity) is labeled to control annual bluegrass in creeping bentgrass fairways but is not labeled for use on creeping bentgrass golf course greens due to turf injury (Figure 1).

Objective

The objective of this research was to determine the effects of repeated applications of the herbicide bispyribac-sodium and the plant growth regulators paclobutrazol (Turf Enhancer), and trinexapac-ethyl (Primo Maxx) with and without the addition of N and Fe fertilizer for control of annual bluegrass in creeping bentgrass greens.

Materials and Methods

Field research plots (1.5 x 1.5 m) with 4 replications in a randomized complete block design were established at the Powderhorn Golf Club in Sheridan, WY in 2006 on a USGA specified 'SR1020' creeping bentgrass golf green with approximately 10% annual bluegrass infestation and was mowed at 3 mm daily (Figure 2). The following treatments were applied weekly during spring 2007 and will be repeated during spring 2008:

- Control
- Bispyribac-sodium at 7.4, 9.9, 12.4, and 14.8 g ai/ha tank mixed with and without fertilizer at 5 kg N/ha and 1 kg FeSO₄/ha
- Bispyribac-sodium at 7.4, 9.9, 12.4, and 14.8 g ai/ha tank mixed with 57 g ai/ha trinexapac-ethyl and fertilizer at 5 kg N/ha and 1 kg FeSO₄/ha
- Bispyribac-sodium at 7.4, 9.9, 12.4, and 14.8 g ai/ha tank mixed with 224 g ai/ha paclobutrazol and fertilizer at 5 kg N/ha and 1 kg FeSO₄/ha fertilizer

Treatments were evaluated weekly for turfgrass quality (1-9 scale where 1 = dead, 6 = acceptable, and 9 = excellent), annual bluegrass control (0-100%), and turfgrass phytotoxicity (1-9 scale where 1 = dead and 9 = no phytotoxicity).

Results and Discussion

Bispyribac-sodium alone provided up to 100% control of annual bluegrass 8 weeks after initial treatment (WAIT) with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3). Bispyribac-sodium tank mixed with fertilizer provided up to 90% control 8 WAIT with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3). Bispyribac-sodium tank mixed with trinexapac-ethyl and fertilizer provided up to 100% control of annual bluegrass 8 WAIT with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3). Bispyribac-sodium tank mixed with paclobutrazol and fertilizer provided up to 98% control of annual bluegrass 8 WAIT with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3).

Figure 1. Phytotoxicity caused by bispyribac-sodium application to creeping bentgrass greens in a prior study.



Table 1. Annual bluegrass control in a creeping bentgrass golf green with bispyribac-sodium tank mixed with and without fertilizer and plant growth regulators.

Treatment ¹	Rate g ai/ha	Spring 2007				
		WAIT ²				
		2	4	6	8	% control
Control	0.0	0 c ³	0 b	0 c	0 b	
BPS	7.4	23 abc	52 ab	58 ab	87 a	
BPS	9.9	20 abc	57 ab	82 ab	73 ab	
BPS	12.4	35 abc	77 a	92 a	100 a	
BPS	14.8	45 a	73 a	88 a	100 a	
BPS + Fert	7.4	13 abc	70 a	77 ab	68 ab	
BPS + Fert	9.9	17 abc	77 a	93 a	90 a	
BPS + Fert	12.4	38 ab	77 a	90 a	65 ab	
BPS + Fert	14.8	38 ab	63 a	95 a	73 ab	
BPS + Primo + Fert	7.4	23 abc	70 a	70 ab	72 ab	
BPS + Primo + Fert	9.9	20 ab	77 a	90 a	77 ab	
BPS + Primo + Fert	12.4	5 bc	77 a	80 ab	100 a	
BPS + Primo + Fert	14.8	38 ab	65 a	90 a	100 a	
BPS + TE + Fert	7.4	20 abc	82 a	92 a	95 a	
BPS + TE + Fert	9.9	30 abc	75 a	90 a	98 a	
BPS + TE + Fert	12.4	17 abc	65 a	83 ab	87 a	
BPS + TE + Fert	14.8	33 abc	53 ab	93 a	97 ab	

¹ WAIT = weeks after initial treatment.

² Treatments were applied weekly from 15 May to 15 June 2007. BPS = bispyribac-sodium, Fert = fertilizer applied at 5 kg N/ha and 1 kg FeSO₄/ha, Primo = trinexapac-ethyl applied at 57 g ai/ha, and TE = paclobutrazol applied at 224 g ai/ha.

³ Means in a column followed by the same letter are not significantly different ($P \leq 0.05$) according to Tukey's protected least significant difference test.

Table 2. Turfgrass quality of a creeping bentgrass golf green treated with bispyribac-sodium tank mixed with and without fertilizer and plant growth regulators for the control of annual bluegrass.

Treatment ¹	Rate g ai/ha	Spring 2007				
		WAIT ²				
		2	4	6	8	% control
Control	0.0	8.0 a ³	7.7 a	0 a	7.3 ab	
BPS	7.4	7.0 a	7.0 a	7.0 a	7.7 ab	
BPS	9.9	7.0 a	7.3 a	7.0 a	7.3 ab	
BPS	12.4	6.3 a	7.0 a	7.0 a	7.3 ab	
BPS	14.8	6.0 a	7.0 a	7.0 a	8.0 ab	
BPS + Fert	7.4	7.3 a	7.3 a	7.3 a	7.3 ab	
BPS + Fert	9.9	7.3 a	7.0 a	7.7 a	7.3 ab	
BPS + Fert	12.4	7.0 a	7.3 a	7.7 a	7.3 ab	
BPS + Fert	14.8	7.0 a	7.3 a	8.0 a	8.0 ab	
BPS + Primo + Fert	7.4	7.7 a	7.0 a	7.3 a	7.7 ab	
BPS + Primo + Fert	9.9	8.0 a	7.3 a	8.0 a	8.7 a	
BPS + Primo + Fert	12.4	7.7 a	7.0 a	7.3 a	7.3 ab	
BPS + Primo + Fert	14.8	6.7 a	7.0 a	7.3 a	7.3 ab	
BPS + TE + Fert	7.4	7.7 a	7.0 a	8.0 a	7.0 ab	
BPS + TE + Fert	9.9	8.0 a	7.0 a	8.0 a	7.3 ab	
BPS + TE + Fert	12.4	7.7 a	7.0 a	7.7 a	7.0 ab	
BPS + TE + Fert	14.8	6.7 a	7.0 a	7.3 a	7.7 ab	

¹ Turfgrass quality was rated on a 1-9 scale where: 1 = dead, 6 = acceptable, and 9 = excellent.

² WAIT = weeks after initial treatment.

³ Treatments were applied weekly from 15 May to 15 June 2007. BPS = bispyribac-sodium, Fert = fertilizer applied at 5 kg N/ha and 1 kg FeSO₄/ha, Primo = trinexapac-ethyl applied at 57 g ai/ha, and TE = paclobutrazol applied at 224 g ai/ha.

⁴ Means in a column followed by the same letter are not significantly different ($P \leq 0.05$) according to Tukey's protected least significant difference test.

Table 3. Turfgrass phytotoxicity of a creeping bentgrass golf green treated with bispyribac-sodium tank mixed with and without fertilizer and plant growth regulators for the control of annual bluegrass.

Treatment ¹	Rate g ai/ha	Spring 2007				
		WAIT ²				
		2	4	6	8	% control
Control	0.0	8.3 a ³	7.7 a	7.3 abc	8.3 a	
BPS	7.4	7.3 a	7.3 a	6.7 abc	7.7 a	
BPS	9.9	7.3 a	7.3 a	6.7 abc	8.3 a	
BPS	12.4	6.7 a	7.3 a	6.3 bc	8.3 a	
BPS	14.8	7.0 a	7.0 a	6.3 bc	8.3 a	
BPS + Fert	7.4	7.0 a	7.7 a	7.7 abc	8.0 a	
BPS + Fert	9.9	7.3 a	7.7 a	7.7 abc	8.0 a	
BPS + Fert	12.4	7.3 a	7.7 a	8.0 a	8.7 a	
BPS + Fert	14.8	7.7 a	7.7 a	8.0 a	8.7 a	
BPS + Primo + Fert	7.4	8.0 a	7.7 a	7.3 abc	8.7 a	
BPS + Primo + Fert	9.9	8.3 a	7.7 a	8.0 a	8.7 a	
BPS + Primo + Fert	12.4	8.0 a	7.3 a	7.7 abc	8.3 a	
BPS + Primo + Fert	14.8	7.3 a	7.3 a	7.3 abc	8.3 a	
BPS + TE + Fert	7.4	7.3 a	7.3 a	7.7 abc	8.0 a	
BPS + TE + Fert	9.9	7.3 a	7.3 a	8.3 a	7.7 a	
BPS + TE + Fert	12.4	7.7 a	7.3 a	7.3 abc	8.0 a	
BPS + TE + Fert	14.8	7.7 a	7.3 a	7.3 abc	8.3 a	

¹ Turfgrass phytotoxicity was rated on a 1-9 scale where: 1 = dead and 9 = no phytotoxicity.

² WAIT = weeks after initial treatment.

³ Treatments were applied weekly from 15 May to 15 June 2007. BPS = bispyribac-sodium, Fert = fertilizer applied at 5 kg N/ha and 1 kg FeSO₄/ha, Primo = trinexapac-ethyl applied at 57 g ai/ha, and TE = paclobutrazol applied at 224 g ai/ha.

⁴ Means in a column followed by the same letter are not significantly different ($P \leq 0.05$) according to Tukey's protected least significant difference test.

Results and Discussion Continued

Bispyribac-sodium tank mixed with trinexapac-ethyl and fertilizer provided up to 100% control of annual bluegrass 8 WAIT with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3). Bispyribac-sodium tank mixed with paclobutrazol and fertilizer provided up to 98% control of annual bluegrass 8 WAIT with acceptable turf quality and low turf phytotoxicity (Tables 1, 2, and 3).

Conclusions

Bispyribac-sodium is labeled for annual bluegrass control in creeping bentgrass fairways (25 to 112 g ai/ha), but is not currently labeled for use on creeping bentgrass golf course greens due to bentgrass injury and turf phytotoxicity. Preliminary results of this study suggest that lower rates of bispyribac-sodium (7.4 to 14.8 g ai/ha) may provide acceptable annual bluegrass control in creeping bentgrass greens while maintaining acceptable turf quality and low turf phytotoxicity.

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