

Evaluation of the Herbicide Velocity for Selective Removal of Annual Bluegrass from Creeping Bentgrass

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Summary

The herbicide Velocity SP was tested for its effects on annual bluegrass removal from a Penn A-4 Creeping Bentgrass nursery maintained at putting green height. At the double rate (62g/ha), complete eradication of the annual bluegrass was obtained. At the single and half rate, control was also achieved (greater than 80% reduction). Some discolouration, which was an indication of toxicity to the plants from the product, was evident at all three rates of application. However, there were no long term toxic affects as colour ratings were unaffected four weeks after the final application. Eight weeks after the final application of product, cold hardiness levels were assessed. There were no significant differences between the three treatments and the untreated control.

Background

The product, Velocity SP Herbicide (active ingredient bispyribac-sodium), has been licensed for use in Canada to remove annual bluegrass (*Poa annua*) from creeping bentgrass that is mowed higher than 9mm. Unfortunately, the majority of bentgrass grown in western Canada is for use on golf course putting greens which is typically mowed at 3-5mm in height.

This study was developed in order to test the effectiveness of the herbicide Velocity SP for reduction of annual bluegrass in creeping bentgrass when mowed at putting green height. In addition, the toxicity of the product (also called phytotoxicity) and its effect on the cold hardiness levels were determined. Research has shown that plants that are under stress will not reach full levels of cold hardiness.

Methodology

During the summer of 2008 a test was conducted at the Carstairs Community Golf Course (Carstairs, Alberta) to determine the effectiveness of Velocity SP Herbicide on Penn A-4 Creeping Bentgrass mowed at putting green height. Plot sizes were 0.5 X 0.5 meters and were replicated four times in a randomized complete block design. Weekly applications were made for four weeks beginning on August 7. Rates of application were equivalent to 0, 0.5, 1.0 and 2.0 times the recommended application rate (31g/ha) for gradual removal of annual bluegrass.

In order to determine the product effect on reduction of annual bluegrass, the number of spots in each plot was counted and the percent of area infested was determined through a visual evaluation. Annual bluegrass has a bunch type growth habit and therefore, infestations are circular in appearance and are relatively easy to determine.

Discolouration of the creeping bentgrass, which is an indication of toxicity to the plant from the herbicide, was determined using an adapted 0-5 scale from the Expert Committee on Weeds (ECW) Table 1.

Table 1 - Rating scale for phytotoxicity of Velocity as measured by discolouration.

Value	Visible signs observed
0	No turf discolouration evident.
1	Negligible discoloration, distortion and/or stunted growth not evident.
2	Slight discoloration, distortion and/or stunted growth clearly evident.
3	Moderate discoloration and damage, marked distortion and/or stunted growth. Recovery expected.
4	Substantial discoloration and damage, substantial distortion and/or stunted growth, some damage irreversible.
5	Majority of plants discoloured and damaged, most irreversible. Some plant mortality (<40%), substantial necrosis and distortion.

The relative cold hardiness of the treated bentgrass was determined using a laboratory freeze test. On November 14, 2008, ten turf plugs were collected from each of the plots. The plugs were arranged into trays and placed in an incubator (Revco Freezer/incubator B0D 30A) at 4°C for an additional 3 days prior to the commencement of the freeze test.

A low temperature programmable freezer (Forma Model 8270/759M Freezer with a Watlow 982 programmable controller) was used for the freeze test. In order to prepare the individual plugs for the freeze test, a piece of moist paper towel was placed beneath each plug to act as a nucleator. Plugs were then allowed to acclimatize in the freezer for 12 hours at -2°C. Following acclimatization, the temperature of the freezer was decreased in a step-wise fashion by 2°C/hour. When the temperature was in the selected range, the predetermined turf plugs were removed. The temperature was further decreased by 2°C and the next series of turf plugs were removed. This process continued until all the test temperatures were reached. Following the freeze test, the turf plugs were thawed for 24 hours at 4°C in the incubator prior to being transplanted in segmented plastic trays containing an artificial potting media. The plug trays were then transferred to a growth chamber for four weeks at 18°C/10°C day/night temperatures with supplemental lighting. After four weeks, plant re-growth was rated for survival in order to establish the relative cold hardiness (LT₅₀ values) of the treated bentgrass.

Results

At the double rate of application there was complete eradication of spots of the annual bluegrass (Table 1). At the single rate and the half rate eradication was almost complete. It appeared that the rate of eradication was much slower for the half rate application as it took the full eight weeks for the reduction to occur. At eight weeks the three treatments were all statistically similar and had significantly less annual bluegrass than did the untreated control.

Table 2 – Number of spots of annual bluegrass per plot.

Application Rate	Prior to Treatment	1 week	2 weeks	3 weeks	4 weeks
2 x rate (0.625g/100m ²)	1.2a*	1.2a	0.7a	0.7a	0.7c
1 x rate (0.312g/100m ²)	2.0a	2.0a	1.7a	1.2a	1.0bc
½ x rate (0.156g/100m ²)	2.0a	1.7a	2.2a	2.2a	2.0ac
untreated	2.2a	2.2a	2.2a	2.2a	2.2a
LSD _{0.05} =	n/s	n/s	n/s	n/s	1.1

Application Rate	5 weeks	6 week	7 weeks	8 weeks
2 x rate (0.625g/100m ²)	0.7a	0.7a	0.2b	0.0b
1 x rate (0.312g/100m ²)	1.0a	0.7a	0.5b	0.2b
½ x rate (0.156g/100m ²)	1.2a	1.2a	1.0ab	0.2b
untreated	2.0a	2.0a	2.0a	1.5a
LSD _{0.05} =	n/s	n/s	1.1	0.7

* Values that have the same letter as a suffix are not considered significantly different from each other.

Small percentages of annual bluegrass were evident in each plot prior to the initiation of this test. By week eight, population numbers for all three of the treatments were significantly lower than the untreated control. The full and half rate treatments still had 0.5% annual bluegrass, while the double rate had no annual bluegrass remaining.

Table 3 – Percent of area covered by annual bluegrass in plots.

Application Rate	Prior to Treatment	1 week	2 weeks	3 weeks	4 weeks
2 x rate (0.625g/100m ²)	2.0a*	2.7a	1.5a	2.0a	1.0a
1 x rate (0.312g/100m ²)	2.5a	3.0a	2.5a	2.2a	2.0a
½ x rate (0.156g/100m ²)	2.7a	2.7a	3.5a	3.7a	3.0a
untreated	3.7a	4.2a	4.2a	4.5a	4.7a
LSD _{0.05} =	n/s	n/s	n/s	n/s	n/s

Application Rate	5 weeks	6 week	7 weeks	8 weeks
2 x rate (0.625g/100m ²)	1.0b	0.7b	0.7b	0.0b
1 x rate (0.312g/100m ²)	1.2b	1.2b	1.0b	0.5b
½ x rate (0.156g/100m ²)	2.5ab	2.0b	1.2b	0.5b
untreated	4.5a	4.5a	4.2a	3.7a
LSD _{0.05} =	2.2	2.3	2.3	1.5

* Values that have the same letter as a suffix are not considered significantly different from each other.

Discolouration (phytotoxicity) was evident one week after application. The greatest amount of discolouration existed three weeks after the initiation of the study. All

treatments had completely recovered eight weeks after the initial application. The double rate created the greatest discolouration and it lasted for the longest period of time.

Table 4 – Phytotoxicity as measured by adapted ECW rating scale.

Application Rate	Prior to Treatment	1 week	2 weeks	3 weeks	4 weeks
0 – 5 scale					
2 x rate (0.625g/100m ²)	0.0a*	1.7a	1.5a	2.7a	2.2a
1 x rate (0.312g/100m ²)	0.0a	1.7a	1.2a	2.5ab	1.7a
½ x rate (0.156g/100m ²)	0.0a	1.7a	1.2a	2.0b	1.0b
untreated	0.0a	0.0b	0.0b	0.0c	0.0c
	LSD _{0.05} =	0.9	0.7	0.6	0.6

Application Rate	5 weeks	6 week	7 weeks	8 weeks
0 – 5 scale				
2 x rate (0.625g/100m ²)	2.0a	2.0a	1.0a	0.0a
1 x rate (0.312g/100m ²)	1.7a	1.0a	0.0a	0.0a
½ x rate (0.156g/100m ²)	0.7b	0.0b	0.0a	0.0a
untreated	0.0c	0.0b	0.0a	0.0a
	LSD _{0.05} =	0.5	0.4	n/s

* Values that have the same letter as a suffix are not considered significantly different from each other.

Late in the season, approximately eight weeks after the final application of herbicide, cold hardiness levels of the creeping bentgrass within individual treatments was assessed. It was found that there was no affect from the herbicide on cold hardiness (Table 5). This is an important consideration for use of this product in our northern climate.

Table 5 - Relative cold hardiness of creeping bentgrass as measured by freeze test.

Application Rate	LT ₅₀ value °C
1 x rate (0.625g/100m ²)	-25.5a
½ x rate (0.312g/100m ²)	-24.5a
¼ x rate (0.156g/100m ²)	-26.0a
untreated	-25.5a
	LSD _{0.05} =
	n/s

* Values that have the same letter as a suffix are not considered significantly different from each other.