

Control of Wild Celery in Low Maintenance Bermudagrass Turf

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Abstract

Herbicides applied for post-emergence control of wild parsley differed in turf injury and weed control. All products tested required multiple applications (21 days apart) to attain acceptable weed control levels. Weedone (2, 4-D) has the quickest, highest, and longest lasting amount of weed control. Weedone (2, 4-D) caused minimal injury to the common bermudagrass turf. Bromoxynil at the low rate of 2.0 lbs. ai/a caused minimal injury to the turf, but provided low levels of weed control. Bromoxynil at the high rate of 3.0 lbs. ai/a caused considerable injury to the turf and moderate to high weed control for about one month, followed by weed recovery. MCPP caused slight initial injury to common bermudagrass and moderate to good weed control (71%-92%) from 7 to 35 days after the second treatment. Weed control was slower to achieve than that of the Weedone treatments. Confront herbicide (trichlopyr and clopyralid) caused slight to moderate initial injury to the turf (more so at 2.0 than at 1.0 pint/product/acre) as well as noticeable necrosis and decreased color of the common bermudagrass up to 21 days after the second application. Confront at the 2.0 pint/acre rate reached weed control levels of 90%-97% at 21 and 35 days after the second application, respectively. At the low rate of 1.0 pint/acre, a maximum of 83% weed control was achieved at the close of the test. Quadmec (applied three weeks later at each respective application date than all other treatments) produced moderate necrosis in the bermudagrass after the initial application, which eventually recovered. However, the turfgrass color was lower in rank (lighter) than most other treatments and was similar to that of the untreated controls. Quadmec achieved 96% control by the close of the test on July 2, 1999 (14 days after the second application). All treatments include 0.5% v/v Silwet surfactant. When applied alone, Silwet produced a small level of weed control, which peaked at 36% at 14 days after the second treatment.

Introduction

Wild celery, also known as wild caraway or parsley piert, has become a problematic winter weed in turfgrass settings. This weed is listed as a biennial, or as an occasional perennial, in Weeds of the West. Its tolerance to low mowing and competitiveness in overseeded turfs make the weed a growing problem in the southwest. It can easily be established and can also become problematic in non-overseeded dormant winter turfs.

A field test was devised to control wild celery which was well established in a non-overseeded and non-dormant common bermudagrass turf. The weed was still active into the spring and summer, despite its supposed lack of warm weather tolerance. Thus, chemical control was warranted.

Materials and Methods

A field study was devised to evaluate commercially available products for the control of wild celery on a low maintenance common bermudagrass turf at the Tucson Airport Authority complex. The turf had a history of this weed

with ground cover averages of 35%-45%. The weed was actively growing in early May when plots were first set up for treatment applications. The following treatments were applied to the turf on May 7 with repeat applications on May 28; Bromoxynil 2.0 lbs. ai/a and 3.0 lbs. ai/a, Weedone 2.0 lbs. ai/a and 3.0 lbs. ai/a, MCPP 2.5 lbs. ai/a and 4.0 lbs. ai/a, and Confront at 1 pint product/acre, and 2 pints product/acre. All treatments included one half of 1% Silwet (a wetting agent) as the surfactant. A placebo (Silwet only) was also applied.

One additional treatment of Quadmec (including Silwet) applied at 5.0 ounce product/1000 feet was applied for the first time on May 28 and for the second time on June 18, 1999.

Each treatment appeared four times in a Randomized Complete Block Design (RCBD). Each individual plot contained a treated half and an untreated half. This was done to derive the best estimates of local weed pressure used for percent weed control. Plots were mowed weekly at 2.4 inches with a rotary mower and irrigated to prevent water stress. Plots were rated each week for percent weed infestation levels from May 12 to July 2, 1999. Plots were also rated for turfgrass color, percent turf injury, percent bermuda straw and percent green turf at selected dates when turfgrass responses were optimum. Percent weed control was calculated as $1 - (\text{Treatment}/\text{Control}) * 100$.

All data was analyzed using analysis of variance technique "PROC ANOVA" (SAS ver. 6). An LSD value was calculated for each response variable when the "treatment" main effect F ratio was significant at $P = 0.05$, or less. Single orthogonal polynomial contrasts were used to compare rate effects within and between products and for 2, 4-D vs. non 2, 4-D containing products.

Results and Discussion

Application of these products at the rates evaluated did cause some injury to the turf. Likewise, weed control varied due to imposed treatments.

Application 1.

The first application was applied on May 7. Plots were rated for injury to the turf and for weed control on May 12, 21 and 28.

On May 12 (5 days after the first treatment), bromoxynil at 3.0 lbs. ai/a had injured the turf by burning the edges of the leaves. This was very evident and resulted in an average injury score of 4.5. MCPP out of a possible 6 (6=severe injury) at 4.0 lbs. ai/a. Confront at 1.0 pint product/acre caused slight injury in the form of twisting and some necrosis of the lower bermudagrass leaves. The Silwet wetting agent (applied alone) caused very slight but noticeable leaf firing in the form of leaf-tip necrosis (average injury score = 1.5). On May 21 (14 DAT/1), the turfs treated with bromoxynil at 3.0 lbs. ai/a recovered somewhat (average injury score = 2.3). All remaining treatments caused slight injury (1.8 - 2.3) with the exception of the lowest rate of bromoxynil (2.0 lbs. ai/a) which had no visible injury, but no weed control (discussed below).

On May 28 (21 DAT/1), the high rate applications of Weedone, MCPP and Confront caused noticeable injury to the turf. These treatments had average turf injury scores of 2.8, 2.8 and 3.3, respectively.

Application 2.

On May 28, identical treatments were applied to the same plots for the second time, and Quadmec was applied for the first time.

Turfgrass injury after the second application was evaluated as the amount of total plot cover (0-100%) which exhibited straw (or necrotic) turf.

From June 3 to July 2, percent plot straw ranged from 69% 7 days after treatment No. 2 (7DAT/2) for bromoxynil at the highest rate of 3.0 lbs. ai/a, to 6% for MCPP applied at the low rate of 2.5 lbs. ai/a.

Bromoxynil at 3.0 lbs. ai/a caused unacceptable injury at 7 and 14 days after the second treatment (69% and 35% straw, respectively).

Weedone at 3.0 lbs. ai/a resulted in 10% bermudagrass straw 14 DAT/2, which quickly recovered and then was

comparable to the untreated controls. MCPP at 4.0 lbs. ai/a resulted in essentially the same response.

Confront had medium levels of injury at 14 DAT/2, (15% and 20% straw, respectively).

The FIRST application of Quadmec caused significant injury at both 7 (June 3) and 14 (June 10) days after treatment (22% and 20%, respectively). This injury remained in double digits (14% and 16% on June 17 and 25).

Silwet alone (the surfactant) had 12% maximum necrotic turf at 14 DAT/2 (June 10), which was slightly higher than that of the background controls (un-treated turf).

There were noticeable amounts of necrotic turf from 7 to 21 days after the second treatment applications were made, depending on product and rate combinations. Note that the untreated controls also showed 5-7% necrotic turf (a low maintenance, but respectable ground cover of common bermudagrass).

Turfgrass color scores were assigned to all plots for the same time period and generally followed similar patterns in rank, as did percent plot necrosis. For example, bromoxynil applied at the high rate of 3.0 lbs. ai/a had very low average color scores of 2.0 and 2.8, and 69% and 35% injury on June 3 and June 10, respectively. The visual scale

for turf color is 1-9; 1 = dead, 5 = marginal, 6 = acceptable, 7 = moderately dark, 8 = very dark and 9 = forest green. Scores of 4.0 or less for plot color signified a poor turf condition.

The injury from Quadmec (now applied twice with the second application made on June 18) reflected lower injury and color scores on June 25 and July 2. Other treatments generally caused more severe turf responses from the “second applications,” whereas Quadmec produced the most severe reaction from the “first application.” Note that Quadmec was applied three weeks later than all other treatments in both sequences.

MCPP at both application rates produced acceptable low maintenance turf throughout the test, as did Confront when applied at the low rate of 1 pint/acre. Surprisingly, Quadmec produced turf with low color scores throughout the test. Again, note the difference in application dates for this product.

Note also that the untreated controls ranged in color from 4.5 to 5.8 throughout the test.

Treatments that had high initial injury, percent plot straw damage, and low color scores had darker color turf at 28 and 35 days after the second applications were made. Examples include bromoxynil at the high rate of 3.0 lbs. ai/a and Confront at the high rate of 2 pints/product/acre. This is typical of turf which “rebounds” back after injury from herbicide or Plant Growth Regulator (PGR) applications. Bromoxynil when applied at the low rate of 2.0 lbs. ai/a had low initial injury and maintained turf performance very similar to that of the untreated controls on most evaluation dates.

Weedone was consistent for acceptable turfgrass tolerance throughout this test. Even when Weedone was applied at the high rate of 3.0 lbs. ai/a, turf tolerance was fully acceptable throughout the test.

The percent plot green turf was assigned as visual ratings to plots (0-100%) at the close of the test on July 2. Among herbicide treated turfs, mean percent green ground cover ranged from 65% to 96%. Note that the untreated control had only 46% mean ground cover (remainder was straw or open soil) and the Silwet surfactant only had a 51% mean turf cover. This concurs with increases in color (following regrowth from herbicide applications) as mentioned above. Those treatments ending with 90% ground cover included Weedone (at both 2 and 3 lbs. ai/a rates), MCPP at 2.5 lbs. ai/a, and Confront at 1 pint/product/acre. Both bromoxynil treatments had the least amount of ground cover at the end of the test among herbicide treated turfs. Note the low percent cover of the untreated checks, however.

Weed Control

Weed control was nil at both 5 and 14 days after the initial application, made on May 7, and showed the greatest effect on May 28 (21 days after treatment). Percent weed control ranged from 7% to 59% at 21 DAT/1 (May 28). Weedone applied at 3.0 lbs. ai/a ranked highest numerically for percent weed control of wild parsley (59%), followed by Confront at 1.0 pint/product/acre (44%). Weedone (at 2.0 lbs. ai/a) and MCPP at the lower rate of 2.5 lbs. ai/a both ranked next highest with 38% mean percent weed control. The initial application of the Silwet surfactant alone resulted in 1%-6% weed control. Note that there were no significant differences between herbicide treatments on the three evaluation dates after the first applications were made.

Following the second sequential repeat application made on May 28, (all treatments applied twice at this time except for Quadmec, which was applied once only) weed control became greatly accelerated.

At seven days after the second application (June 3), percent weed control reached essentially 90% for Weedone at 3.0 lbs. ai/a and bromoxynil at 3.0 lbs. ai/a. MCPP had 34% and 65% mean percent weed control at the 2.5 and 4.0 lbs. ai/a rates at 7DAT/2. Confront was slower to act at this time and showed 41%-45% control. Both the Silwet surfactant applied alone and the initial application of Quadmec had 14% weed control.

On June 10, bromoxynil at the low application rate of 2.0 lbs. ai/a reached its seasonal maximum weed control of 52%. (Bromoxynil at 3.0 lbs. ai/a also peaked for weed control at this time showing an 88% control of wild parsley.) All remaining treatments (with the exception of slower acting Confront treatments) displayed 88%-96% weed control. Confront treatments had 67% and 75% control for the 1 and 2 pint per acre treatments, respectively, on June 10. Quadmec (applied once) had 58% control at this time.

On June 17 (21 days after the second application) both Weedone treatments had 97% (2 lb ai/n) - 98% (3 lb ai/n) control followed by Confront at 2 pints/acre (90%) and both MCPP treatments (85% at 2.5 lb ai/n and 89% at 4.0 lb/ai/n).

On June 25 (28 DAT/2) bromoxynil treated turfs had decreased to less than half previous weed control levels of June 10 and now showed 9% and 48% for the 2.0 and 3.0 lbs. ai/a rates, respectively. Weedone maintained high levels of excellent weed control (96% 2 lb ai/n-97% 3lb ai/n) while MCPP and Confront provided 81%-94% control, both products showing a rate dependent response. Quadmec now provided 85% control (7 days after its second sequential repeat application).

On July 2 (35 days after the second application) five treatments had 92%-97% weed control. These included both rates of Weedone, MCPP at the high rate of 4.0 lbs. ai/a, Confront at 2.0 pints/products/acre and Quadmec (14 days after its second application).

Untreated controls had 37% weed cover at the close of the test on July 2. This demonstrates the persistence of this weed which seems to be extending its growth season as viewed by empirical observation as well as clientele requests for control practices to eliminate this weed during the summer.

Conclusion

1. Herbicides applied for post-emergence control of wild parsley differed in turf injury and weed control.
2. All products tested required multiple applications (21 days apart) to attain acceptable weed control levels.
3. Weedone (2, 4-D) has the quickest, highest, and longest lasting amount of weed control.
4. Weedone (2, 4-D) caused minimal injury to the common bermudagrass turf.
5. Bromoxynil at the low rate of 2.0 lbs. ai/a caused minimal injury to the turf, but provided low levels of weed control.
6. Bromoxynil at the high rate of 3.0 lbs. ai/a caused considerable injury to the turf and moderate to high weed control for about one month, followed by weed recovery.
7. MCPP caused slight initial injury to common bermudagrass and moderate to good weed control (71%-92%) from 7 to 35 days after the second treatment. Weed control was slower to achieve than that of the Weedone treatments.
8. Confront herbicide (trichlopyr and clopyralid) caused slight to moderate initial injury to the turf (more so at 2.0 than at 1.0 pint/product/acre) as well as noticeable necrosis and decreased color of the common bermudagrass up to 21 days after the second application.
9. Confront at the 2.0 pint/acre rate reached weed control levels of 90%-97% at 21 and 35 days after the second

application, respectively. At the low rate of 1.0 pint/acre, a maximum of 83% weed control was achieved at the close of the test.

10. Quadmec (applied three weeks later at each respective application date than all other treatments) produced moderate necrosis in the bermudagrass after the initial application, which eventually recovered. However, the turfgrass color was lower in rank (lighter) than most other treatments and was similar to that of the untreated controls.
11. Quadmec achieved 96% control by the close of the test on July 2, 1999 (14 days after the second application).
12. All treatments include 0.5% v/v Silwet surfactant. When applied alone, Silwet produced a small level of weed control, which peaked at 36% at 14 days after the second treatment.

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Table 1. Mean degree of injury scores to common bermudagrass infested with wild parsley after a single treatment with post emergence herbicides. University of Arizona, 1999.

TREATMENT	RATE	12 MAY (5 DAT/1)	21 MAY (14 DAT/1)	28 MAY (21 DAT/1)
Bromoxynil	2.0 lb. ai/a	1.5	1.0	1.0
Bromoxynil	3.0 lb. ai/a	4.5	2.3	1.5
Weedone	2.0 lb. ai/a	1.5	2.0	1.8
Weedone	3.0 lb. ai/a	1.3	2.0	2.8
MCP	2.5 lb. ai/a	2.0	2.0	1.3
MCP	4.0 lb. ai/a	2.5	2.3	2.8
Confront	1 pint/A	2.3	1.8	1.8
Confront	2 pint/A	1.5	1.8	3.3
Quadmec	5 ounce/M/A	--	--	--
Stilwet (only)	0.5% v/v	1.5	1.0	1.0
Control	--	1.0	1.0	1.0
TEST MEAN		2.0	1.8	1.9
LSD VALUE		1.0	0.7	1.2

Table 2. Mean degree of injury scores to wild parsley in common bermudagrass turf after two applications of post emergence herbicides. University of Arizona, 1999.

TREATMENT	RATE	03 JUNE (DAT/2)	10 JUNE (DAT/2)	17 JUNE (DAT/2)	25 JUNE (DAT/2)	02 JULY ()
Bromoxynil	2.0 lb. ai/a	2.7	2.5	1.8	1.3	1.5
Bromoxynil	3.0 lb. ai/a	6.0	3.5	2.5	1.0	1.5
Weedone	2.0 lb. ai/a	4.2	5.0	5.8	6.0	4.8
Weedone	3.0 lb. ai/a	5.3	5.8	6.0	6.0	6.0
MCP	2.5 lb. ai/a	4.2	3.5	4.5	3.0	3.5
MCP	4.0 lb. ai/a	4.5	4.5	5.3	5.5	3.5
Confront	1 pint/A	3.5	3.0	3.8	3.8	1.5
Confront	2 pint/A	4.0	4.2	5.3	5.5	6.0
Quadmec	5 ounce/M/A	3.5	4.3	4.5	5.5	6.0
Stilwet (only)	0.5% v/v	2.0	1.0	1.0	1.3	1.3
Control	- -	1.2	1.0	1.0	1.0	1.0
TEST MEAN		4.0	3.7	4.0	3.9	3.6
LSD VALUE		1.0	1.1	1.2	0.7	1.8

Table 3. Percent plot straw turf, turfgrass color and final percent plot green turf of common bermudagrass after two applications of post emergence herbicides for control of parsley piert. University of Arizona, 1999.

TREATMENT	RATE	% PLOT STRAW ¹					COLOR ²					% GREEN ³
		03 JUNE (7 DAT/)	10 JUNE (14 DAT/)	17 JUNE (21 DAT/)	25 JUNE (28 DAT/)	02 JULY (35 DAT/)	03 JUNE (7 DAT/)	10 JUNE (14 DAT/)	17 JUNE (21 DAT/)	25 JUNE (28 DAT/)	02 JULY (35 DAT/)	02 JULY (35 DAT/)
Bromoxynil	2.0 lb. ai/a	16	18	9	9	4	4.0	4.0	4.5	5.5	5.2	65
Bromoxynil	3.0 lb. ai/a	69	35	12	7	5	2.0	2.8	5.3	6.3	6.5	79
Weedone	2.0 lb. ai/a	5	14	6	7	4	4.8	5.0	6.3	6.8	6.5	90
Weedone	3.0 lb. ai/a	3	10	6	6	5	5.5	4.8	6.0	7.0	6.8	95
MCP	2.5 lb. ai/a	1	6	6	6	4	5.0	4.8	5.0	6.5	6.5	96
MCP	4.0 lb. ai/a	3	11	8	8	6	4.5	4.0	5.3	6.0	6.3	85
Confront	1 pint/A	5	15	13	8	3	4.5	4.0	4.5	6.3	6.5	93
Confront	2 pint/A	8	20	10	9	5	3.8	3.5	5.0	6.3	7.0	88
Quadmec	5 ounce/M/A	22	20	14	16	6	3.8	3.3	4.8	4.0	5.3	88
Stilwet (only)	0.5% v/v	5	12	6	8	6	5.0	4.5	5.3	5.8	5.5	51
Control	- -	5	8	6	7	7	5.3	4.9	4.8	5.1	5.0	46
TEST MEAN		14	16	9	8	5	4.3	4.0	5.2	6.0	6.2	83
LSD VALUE		13	14	NA	5	NA	1.0	1.2	1.1	1.1	1.0	18

Table 4. Percent weed control of Parsley Piert in common bermudagrass turf after applications of post emergence herbicides. University of Arizona, 1999.

TREATMENT	RATE	PERCENT WEED CONTROL ¹							
		12 MAY (DAT/1)	21 MAY (DAT/1)	28 MAY (DAT/1)	03 JUNE (7 DAT/2)	10 JUNE (14 DAT/2)	17 JUNE (21 DAT/2)	25 JUNE (28 DAT/2)	02 JULY (35 DAT/2)
Bromoxynil	2.0 lb. ai/a	0	0	7	41	52	28	9	7
Bromoxynil	3.0 lb. ai/a	12	27	13	90	88	72	48	41
Weedone	2.0 lb. ai/a	0	10	38	74	91	97	96	92
Weedone	3.0 lb. ai/a	21	5	59	89	96	98	97	97
MCP	2.5 lb. ai/a	0	12	38	34	71	85	81	86
MCP	4.0 lb. ai/a	4	17	31	65	89	89	89	92
Confront	1 pint/A	1	7	44	41	67	70	81	83
Confront	2 pint/A	0	10	30	45	75	90	94	97
Quadmec	5 ounce/M/A	--	--	--	14	58	60	85	96
Stilwet (only)	0.5% v/v	1	1	6	14	36	3	0	3
Control	--	(32%)	(34%)	(44%)	(42%)	(33%)	(40%)	(33%)	(37%)
TEST MEAN		10	11	33	51	72	69	68	69
LSD VALUE		NA	NA	NA	26	14	18	25	13