Received: 29 March 2022 | Accepted: 3 May 2022

DOI: 10.1002/cft2.20172

Crop, Forage & Turfgrass Management

BRIEF

Applied Turfgrass Science

Postemergence rescuegrass control in bermudagrass turf in Texas

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Assigned to Associate Editor James McCurdy.

1 | INTRODUCTION

Rescuegrass (*Bromus catharticus* Vahl.) is found primarily in the southern and western United States where it grows as a winter annual or weak perennial. Rescuegrass is noted for high salt tolerance, which may allow it to proliferate across much of the western United States (Allison et al., 1954). Its bunch-type growth habit and prolific seed production disrupt the functional and aesthetic qualities of turfgrasses (Holt, 1969).

Research evaluating postemergence selective herbicide rescuegrass control has focused on acetolactate synthase (ALS) inhibiting herbicides (Baughman, 1998; Edwards et al., 2010). Research in turfgrass systems is limited; one report (not peer-reviewed) indicates sulfosulfuron provided moderate control in Texas (Baughman, 1998). In other crops, nicosulfuron + metsulfuron-methyl (Pastora) controlled rescuegrass 89 to 99% (Edwards et al., 2010).

Acetolactate synthase-inhibiting herbicides such as flazasulfuron, foramsulfuron, metsulfuron, sulfosulfuron, thiencarbazone, and trifloxysulfuron are widely used in warm-season turfgrasses for selective weed control (Bhowmik, 2012; McElroy & Martins, 2013). One unique aspect of these herbicides is the varying turfgrass tolerance and wide range of efficacy against broadleaf and grassy weed species (McElroy & Martins, 2013). Flazasulfuron, trifloxysulfuron, and the premix dicamba + iodosulfuron + thiencarbazone-methyl (Celsius) are labeled for rescuegrass control; however, there are no published efficacy reports. Furthermore, other nonlabeled sulfonylurea herbicides may provide selective postemergence rescuegrass control. Therefore, the objective of this research was to evaluate single and sequential applications of several sulfonylurea herbicides for rescuegrass control in bermudagrass turf.

2 | EVALUATING POSTEMERGENCE HERBICIDES FOR RESCUEGRASS CONTROL

Replicate field experiments were conducted from 15 Dec. 2015 to 20 May 2016 and 17 Dec. 2020 to 21 May 2021. The 2015 to 2016 experiment site was common bermudagrass [*Cynodon dactylon* (L.) Pers] mowed at 2 in with a rotary mower at the Texas A&M AgriLife Center in Dallas, TX. This site consisted of a clay loam (Houston black clay; Fine, smectitic, thermic Udic Haplusterts) soil with a pH of 8.0. Rescuegrass had one to two tillers in December at the Dallas location. The 2020 to 2021 experiment site was a common bermudagrass golf course rough at Squaw Valley Golf Course in Glen Rose, TX. The area was only mowed once, and the soil was a sandy loam (Bastrop fine sandy loam; Loamy alluvium) soil with a pH of 7.5. Rescuegrass was slightly more mature in Glen Rose with two to five tillers in December.

Herbicide treatments (Table 1) were arranged in a randomized block design and replicated four times. A nontreated control was included for comparison. Herbicide treatments were applied either singly on 15 Dec. 2015 and 17 Dec. 2020 or sequentially on 16 Mar. followed by 7 Apr. 2016 and

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TABLE A. Useful conversions

To convert Column 1 to Column 2, multiply by	Column 1 suggested unit	Column 2 SI unit
0.304	foot, ft	meter, m
2.54	inch, in	centimeter, cm (10^{-2} m)
0.405	acre, ac	hectare, ha
0.405×10^3	acre, ac	square meter, sq m
3.78	gallon, gal	liter, L
5/9 (˚F − 32)	Fahrenheit, ˚F	Celsius, ˚C
0.454	pound, lb	kilogram, kg
454	pound, lb	gram, g
28.4	ounce, oz	gram, g

Core Ideas

- This is the first report describing rescuegrass control in turfgrass.
- Spring sequential sulfonylurea herbicide applications provide greater control than a fall single application.
- Dicamba + iodosulfuron + thiencarbazone-methyl and trifloxysulfuron applied in spring were most effective.
- A single fall application was less consistent; flazasulfuron was effective at this timing.

9 Mar. followed by 31 Mar. 2021. December and spring applications were applied on separate experimental units. A nonionic surfactant (0.25% v/v; Activator 90, Loveland Products) was included with certain treatments based on label recommendations. Plots sizes were 5 by 7 ft in Dallas and 3 by 5 ft in Glen Rose. Herbicides were applied using a CO_2–powered sprayer calibrated to deliver 44 gal ac^{-1} through three AIXR8002 nozzles at 40 PSI in Dallas and 40 gal ac^{-1} with one 8002EVS nozzle at 30 PSI in Glen Rose. Sites were irrigated by rainfall only. Rainfall did not occur within 48 h after any application at either location.

Rescuegrass control was evaluated visually on a 0 (i.e., no control) to 100 (i.e., complete control) percent scale relative to the nontreated control from January to May in 2016 and 2021. Control data were subjected to analysis of variance in R (v4.1.3; R Core Team) using the 'aov' function in the '*agricolae*' package (v.1.3-5). Data from each evaluation date were analyzed separately; however, December and spring applications were analyzed together. Fisher's protected least significant difference test ($\alpha = .05$) was then conducted using the 'LSD.test' function to separate means of significant effects.

TABLE 1 Herbicide treatments and application rates for rescuegrass (*Bromus catharticus*) control. Herbicide treatments were applied either as a single application in December 2015 and 2020 or sequential applications in March and April 2016 and 2021

Herbicide	Application rate
	lb a.i. ac^{-1}
Dicamba + iodosulfuron + thiencarbazone-methyl[a,b]	0.159
Flazasulfuron	0.047
Foramsulfuron	0.026
Metsulfuron-methyl	0.037
Sethoxydim	0.281
Sulfosulfuron	0.094
Trifloxysulfuron	0.025

[a]Celsius WG premix.
[b]Nonionic surfactant included with Celsius, flazasulfuron, metsulfuron, sulfosulfuron, and trifloxysulfuron herbicides at 0.25% (v/v).

3 | HERBICIDE SELECTION AFFECTS RESCUEGRASS CONTROL

Data were analyzed and presented separately (Tables 2 and 3) due to a significant year × herbicide × application timing interaction ($p < .0001$). In each year, a significant herbicide × application timing interaction was present on each rating date ($p < .05$; Tables 2 and 3). Percent rescuegrass control tended to be greater in 2021 compared with 2016; however, there were similar trends among the herbicides and application timings. The Dallas experiment was on a stand of rescuegrass mown weekly but not within 3 d of the herbicide application, whereas the Glen Rose site was mown only once in spring during the experiment. Additionally, daily maximum air temperature at Glen Rose was 9 to 22 ˚F greater than Dallas for 6 d following the December applications and may be the reason greater control was observed in Glen Rose (Hutto et al., 2008). Regular mowing may also have reduced control by reducing leaf surface area available for herbicide absorption and promoting rescuegrass tillering.

In Dallas, dicamba + iodosulfuron + thiencarbazone-methyl, sulfosulfuron, and trifloxysulfuron controlled rescuegrass more when applied in spring compared with fall at both late-April and May evaluations, whereas spring applied-flazasulfuron provided more control than the fall application on 21 April only. In Glen Rose, a single fall or sequential spring applications of dicamba + iodosulfuron + thiencarbazone-methyl, flazasulfuron, sulfosulfuron, or trifloxysulfuron provided statistically similar control. However, there was a trend of spring-applied dicamba + iodosulfuron +

TABLE 2 Rescuegrass (*Bromus catharticus*) control following a single herbicide application in fall on 15 Dec. 2015 or sequential applications in spring on 16 Mar. and 7 Apr. 2016 at Texas A&M AgriLife Center (Dallas, TX)

Herbicide	Application	Rescuegrass control		
		1 April[a]	21 April	20 May
		%		
Dicamba + iodosulfuron + thiencarbazone-methyl[b,c]	Fall	30	35	25
Flazasulfuron		43	56	55
Foramsulfuron		0	11	15
Metsulfuron		0	10	0
Sethoxydim		5	13	26
Sulfosulfuron		28	45	8
Trifloxysulfuron		53	40	51
Dicamba + iodosulfuron + thiencarbazone-methyl	Spring	30	91	77
Flazasulfuron		28	70	36
Foramsulfuron		5	5	0
Metsulfuron		3	0	3
Sethoxydim		48	74	39
Sulfosulfuron		28	95	44
Trifloxysulfuron		45	90	88
$LSD_{.05}$[d]		18	32	31

[a]1 April, 15 wk after fall application and 2 wk after initial spring application.
[b]Nonionic surfactant included with Celsius, flazasulfuron, metsulfuron, sulfosulfuron, and trifloxysulfuron herbicides at 0.25% (v/v).
[c]Celsius WG premix.
[d]Fisher's Protected Least Significant Difference ($P = .05$).

TABLE 3 Rescuegrass (*Bromus catharticus*) control following a single herbicide application in fall on 17 Dec. 2020 or sequential applications in spring on 9 and 31 Mar. 2021 at Squaw Valley Golf Course (Glen Rose, TX)

Herbicide	Application	Rescuegrass control		
		31 March[a]	21 April	14 May
		%		
Dicamba + iodosulfuron + thiencarbazone-methyl[b,c]	Fall	84	78	75
Flazasulfuron		66	79	81
Foramsulfuron		0	0	0
Metsulfuron		5	3	5
Sethoxydim		53	23	63
Sulfosulfuron		75	73	86
Trifloxysulfuron		93	88	95
Dicamba + iodosulfuron + thiencarbazone-methyl	Spring	60	85	95
Flazasulfuron		36	71	73
Foramsulfuron		15	31	31
Metsulfuron		15	21	56
Sethoxydim		55	59	66
Sulfosulfuron		16	79	74
Trifloxysulfuron		75	90	91
$LSD_{.05}$[d]		21	20	31

[a]31 March, 15 wk after fall application and 3 wk after initial spring application.
[b]Nonionic surfactant included with Celsius, flazasulfuron, metsulfuron, sulfosulfuron, and trifloxysulfuron herbicides at 0.25% (v/v).
[c]Celsius WG premix.
[d]Fisher's Protected Least Significant Difference ($P = .05$).

thiencarbazone-methyl controlling rescuegrass more than the fall application. Baughman (1998) reported moderate rescuegrass control with sulfosulfuron. The main difference between the two locations was sulfosulfuron not being as effective in Dallas as Glen Rose at the May rating date. Foramsulfuron and metsulfuron provided poor control at both locations and timings. Pastora herbicide (nicosulfuron + metsulfuron-methyl) successfully controlled rescuegrass (Edwards et al., 2010), which suggests nicosulfuron and not metsulfuron is effective for rescuegrass control. However, nicosulfuron is not registered for turfgrass use. Sethoxydim was more effective in spring than fall, and spring applications were statistically similar to dicamba + iodosulfuron + thiencarbazone-methyl and trifloxysulfuron on most rating dates. However, sethoxydim is not registered for use in bermudagrass turf as it would cause severe injury (Johnson, 1992).

4 | PROGRAMS FOR RESCUEGRASS CONTROL

Dicamba + iodosulfuron + thiencarbazone-methyl, flazasulfuron, sulfosulfuron, and trifloxysulfuron were the most effective herbicides. Two sequential spring applications of dicamba + iodosulfuron + thiencarbazone-methyl and trifloxysulfuron resulted in the greatest control at both locations. For turfgrass practitioners who cannot tolerate the presence of rescuegrass throughout the winter and want to make fall applications, this research cannot provide clear guidance due to differences in air temperatures between locations. Single December applications of dicamba + iodosulfuron + thiencarbazone-methyl, flazasulfuron, sulfosulfuron, and trifloxysulfuron were effective at one location but provided poor to moderate control at the other location. Future research should explore pre-emergent herbicide efficacy and timing in addition to postemergent applications at an earlier postemergence timings in fall as well as other herbicides used in turfgrass (e.g., imazosulfuron, metribuzin, and pinoxaden).

AUTHOR CONTRIBUTIONS

Eric H. Reasor: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing. Matthew T Elmore: Conceptualization; Investigation; Methodology; Project administration; Writing – original draft; Writing – review & editing.

CONFLICT OF INTEREST

Eric H. Reasor is an employee of PBI-Gordon corporation who is the manufacturer of Katana herbicide used in this experiment.

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REFERENCES

Allison, L. E., Brown, J. W., Hayward, H. E., Richards, L. A., Bernstein, L. F., Pearson, M. G. A., Wilcox, L. V., Bower, C. A., Hatcher, J. T., & Reeve, R. C. (1954). Plant response and crop selection for saline and alkali soils. In Richards, L. A. (Ed.). *Diagnosis and improvement of saline and alkali soils* (pp. 55–68). United States Department of Agriculture.

Baughman, T. A. (1998). *Rolling plains research and extension agronomy reports* (Vernon Center Technical Report No. 98-2). Texas A&M University.

Bhowmik, P. C. (2012). Introduction to the symposium: History of sulfonylurea herbicide use in turfgrass environments. *Weed Technology*, *26*, 575–578. https://doi.org/10.1614/WT-D-11-00165.1

Edwards, M. T., Meredith, J. H., Smith, J. D., & Hammes, G. H. (2010). Grass and broadleaf weed control in bermudagrass pastures with DuPont® Pastora™ herbicide. In *2010 Southern Weed Science Society* (Vol. 63, No. 152). Southern Weed Science Society.

Holt, E. C. (1969). Turfgrasses under warm, humid conditions. In Hanson, A., & Juska, F. V. (Eds.). *Turfgrass Science, Agronomy Monograph* (pp. 513–528). ASA. https://doi.org/10.2134/agronmonogr14.c20

Hutto, K. C., Taylor, J. M., & Byrd, J. D. (2008). Soil temperature as an application indicator for perennial ryegrass control. *Weed Technology*, *22*, 245–248. https://doi.org/10.1614/WT-06-158.1

Johnson, B. J. (1992). Common bermudagrass (*Cynodon dactylon*) suppression in Zoysia spp. with herbicides. *Weed Technology*, *6*, 813–819.

McElroy, J. S., & Martins, D. (2013). Use of herbicides on turfgrass. *Planta Daninha*, *31*, 455–467. https://doi.org/10.1590/S0100-83582013000200024

How to cite this article: Reasor, E. H., & Elmore, M. T. (2022). Postemergence rescuegrass control in bermudagrass turf in Texas. *Crop, Forage & Turfgrass Management*, *8,* e20172. https://doi.org/10.1002/cft2.20172