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Identifying Herbicides for Use During Zoysiagrass Sprigging

Abstract

Weed control after planting warm-season grasses in the spring can be critical for acceptable establishment of the stand. However, many herbicide labels can be unclear on sprigging restrictions before or after the application of a product. Research was conducted on the growth effects of pre- and postemergence herbicides applied at or near the day of 'Innovation' zoysiagrass sprigging. Preliminary data from this study shows granular (Ronstar G) and liquid (Ronstar Flo) formulations of oxadiazon caused the least amount of injury to zoysiagrass.

Keywords

turf establishment, weed control

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Identifying Herbicides for Use During Zoysiagrass Sprigging

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Summary
Weed control after planting warm-season grasses in the spring can be critical for acceptable establishment of the stand. However, many herbicide labels can be unclear on sprigging restrictions before or after the application of a product. Research was conducted on the growth effects of pre- and postemergence herbicides applied at or near the day of 'Innovation' zoysiagrass sprigging. Preliminary data from this study shows granular (Ronstar G) and liquid (Ronstar Flo) formulations of oxadiazon caused the least amount of injury to zoysiagrass.

Rationale
There are limited preemergence herbicides labeled for application at the time of zoysiagrass (*Zoysia* spp. Willd) sprigging. To our knowledge, no research has been conducted to evaluate how pre- and postemergence herbicides affect the establishment of zoysiagrass when applied at or near the time of sprigging.

Objective
The objective of this field trial was to determine if commonly used preemergence herbicides influence the establishment of Innovation zoysiagrass sprigs.

Study Description
A field study was conducted at the Olathe Horticulture Research and Extension Center in Olathe, KS, in the summer of 2021 to investigate the effects of pre- and postemergence herbicides on Innovation zoysiagrass establishment. The experiment was arranged in a randomized complete block design with four replicates. Herbicide treatments included a nontreated, seven single active ingredient treatments, and two

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combination postemergence herbicide treatments applied after weed emergence in experimental plots, for a total of 40 individual experimental plots (Table 1). Zoysiagrass sod was cut on July 9, 2021, at a 1:10 ratio for sprigging with four equally spaced furrows created for sprigs to be evenly spread into each 4- × 8-ft experimental plot (Figure 1). Preemergence herbicide treatments (all containing a single active ingredient) were applied immediately after sprigging; while two postemergence treatments were applied on August 2, 2021, after grassy and broadleaf weed emergence. On July 30 and August 16, 2021, 1 lb of N/1000 ft^2 was applied to the entire study area using a 16-0-8 and 46-0-0 (N-P_2O_5-K_2O) fertilizer, respectively. Supplemental irrigation was applied on the study plots throughout the duration of the growing season to prevent stress. Data collection included: NDVI (normalized difference vegetation index) measurements, turfgrass vigor, percent establishment, and digital % green cover. Turfgrass vigor was a visual estimate of green color, stolon expansion, density, etc., that reflected the relative speed as the sprigged plot developed into mature sod. All data for each of the ratings were subjected to ANOVA in SAS (9.4) using the GLIMMIX procedure to determine those factors which were significant ($P \leq 0.05$) and means were separated according to Tukey's Honest Significant Difference (HSD).

Results

The data revealed many similarities among treatments for the last three rating dates. Zoysiagrass vigor rated at 33, 49, and 63 days after sprigging (DAS) had low to unacceptable vigor for all treatments (vigor ratings ranged from 2.75 to 5.25). At 77 DAS, sprigs treated with liquid oxadiazon resulted in turf with acceptable vigor, which was significantly better than untreated sprigs. By 63 DAS no treatment had reached > 50% cover of the experimental plot (Table 3); granular and liquid oxadiazon along with the two postemergence combination treatments had the highest establishment (33%, 29%, 29%, and 26%, respectively). Digital images were analyzed using SigmaScan to find the total amount of digital percent green cover in the middle of each experimental plot. Due to significant weed populations in untreated plots, percent green cover was significantly higher. SigmaScan analysis revealed an average digital % green cover of 19 and 15 in the granular oxadiazon and liquid oxadiazon experimental plots, respectively (Table 4). No other herbicide treatment reached > 14% mean green cover by 93 DAS. Considerable weed pressure in untreated plots affected vigor, establishment, and skewed the digital green cover data. Innovation zoysiagrass was slow to establish from sprigs, likely affecting preliminary results. Research is ongoing and results after complete establishment will be reported in the future.

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Table 1. Herbicides evaluated for effects on zoysiagrass when sprigged the same day of application at the Olathe Horticulture Research and Extension Center in Olathe, KS

Trade name	Active ingredient	Rate per acre
Untreated control	---	---
Ronstar G	Oxadiazon	150 lb
Ronstar Flo	Oxadiazon	80.5 fl. oz.
Specticle Flo	Indaziflam	10 fl. oz.
Pennant Magnum	S-metolachlor	2.6 pt
Princep Liquid	Simazine	2 qt
Dimension 2EW	Dithiopyr	2 pt
Barricade	Prodiamine	2.3 lb
Q4	Quinclorac + sulfentrazone + 2,4-D + dicamba	7 pt
Acclaim Extra + SpeedZone	Fenoxaprop-p-ethyl + carfentrazone-ethyl + 2,4-D + MCPP + dicamba	13 fl. oz. + 4 pt

Table 2. Vigor of Innovation zoysiagrass at intervals after herbicide application on sprigs at the Olathe Horticulture Research and Extension Center, Olathe, KS, in 2021

	Vigor[a]			
Treatment[b]	33DAS[c]	49DAS	63DAS	77DAS
Untreated control	2.8c[d]	2.8cd	2.3e	3.3f
Granular oxadiazon	4.3a	4.0a	4.3bcd	5.0bcd
Liquid oxadiazon	3.5b	3.8a	5.3a	6.0a
Indaziflam	2.8c	2.5cd	4.3bcd	5.3abc
S-metolachlor	2.8c	2.3d	4.8ab	5.5ab
Simazine	3.0bc	2.3d	3.5d	4.0ef
Dithiopyr	3.0bc	3.5ab	3.8cd	4.5cde
Prodiamine	3.3bc	3.0bc	4.5bcd	5.3abc
Quinclorac + sulfentrazone + 2,4-D + dicamba	3.5b	4.0a	4.8ab	4.5cde
Fenoxaprop-ethyl + carfentrazone-ethyl + 2,4-D + MCPP + dicamba	3.3bc	3.5ab	3.8cd	4.3de

[a] Zoysiagrass vigor was rated on a 1 to 9 scale (1 = dead, 6 = acceptable, and 9 = maximum vigor).
[b]Preemergence herbicides (oxadiazon to prodiamine) applied immediately after sprigging on July 9, 2021. Combination herbicides applied on August 2, 2021.
[c]DAS = days after sprigging.
[d]Means followed by the same letter in a column are not significantly different according to Tukey's Honest Significant Difference ($P < 0.05$). Means are averages over replication, n = 4.

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Table 3. Establishment of Innovation zoysiagrass sprigs at intervals after herbicide application at the Olathe Horticulture Research and Extension Center, Olathe, KS, in 2021

	Establishment (%)[a]		
Treatment[b]	**33DAS[c]**	**49DAS**	**63DAS**
Untreated control	18a[d]	22a	6d
Granular oxadiazon	16ab	23a	33a
Liquid oxadiazon	13bc	18ab	29ab
Indaziflam	6de	9cd	13cd
S-metolachlor	5e	6d	10d
Simazine	6de	8cd	14cd
Dithiopyr	10cd	13bc	21bc
Prodiamine	10cd	11cd	21bc
Quinclorac + sulfentrazone + 2,4-D + dicamba	13bc	19a	29ab
Fenoxaprop-ethyl + carfentrazone-ethyl + 2,4-D + MCPP + dicamba	11c	18ab	26ab

[a] Establishment was rated visually on a 0 to 100% scale on which 0 = no establishment, and 100 = complete establishment of plot.
[b] Preemergence herbicides (from oxadiazon to prodiamine) applied immediately after sprigging on July 9, 2021. Combination herbicides applied on August 2, 2021.
[c] DAS = days after sprigging.
[d] Means followed by the same letter in a column are not significantly different according to Tukey's Honest Significant Difference ($P < 0.05$). Means are averages over replication, n = 4.
[e] Quinclorac + sulfentrazone + 2,4-D + dicamba applied on August 2, 2021.
[f] Fenoxaprop-ethyl + carfentrazone-ethyl + 2,4-D + MCPP + dicamba applied on August 2, 2021.

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Table 4. Mean digital percent green cover of herbicide treatments applied after sprigging Innovation zoysiagrass at the Olathe Horticulture Research and Extension Center, Olathe, KS, in 2021

	Digital % green cover[a]		
Treatment[b]	**63DAS[c]**	**79DAS**	**93DAS**
Untreated control	40a[d]	76a	81a
Granular oxadiazon	4b	9b	19b
Liquid oxadiazon	3b	7b	15bc
Indaziflam	1b	1b	1e
S-metolachlor	1b	1b	3e
Simazine	1b	1b	6de
Dithiopyr	2b	1b	4e
Prodiamine	2b	2b	2e
Quinclorac + sulfentrazone + 2,4-D + dicamba	3b	5b	9cde
Fenoxaprop-ethyl + carfentrazone-ethyl + 2,4-D + MCPP + dicamba	4b	7b	13bcd

[a] Digital percent green cover was evaluated in SigmaScan (Hue: 48–110, Saturation: 0–100) using digital images taken with a camera light box. Evaluations were on a 0 to 100% scale (0% = no green cover, and 100% = complete green cover in the image).
[b] Preemergence herbicides (from oxadiazon to prodiamine) applied immediately after sprigging on July 9, 2021. Combination herbicides (treatments 9 and 10) applied on August 2, 2021.
[c] DAS = days after sprigging.
[d] Means followed by the same letter in a column are not significantly different according to Tukey's Honest Significant Difference ($P < 0.05$). Means are averages over replication, n = 4.

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Figure 1. Experimental plots immediately after zoysiagrass sprigging on July 9, 2021, prior to herbicide application.

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