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Summary

When turfgrass stands are under renovation, a common problem is removing weeds prior to seeding because seedling turf does not emerge and compete well with weeds that are present. However, most herbicide labels recommend waiting for a defined period of time prior to seeding. If seeding is done prior to the date prescribed on the herbicide label, seed germination and seedling growth may be inhibited. A greenhouse study was conducted to determine the effects of irrigation prior to seeding on seedling growth after herbicide application. Overall, irrigation had no influence on the impact of herbicides on shoot or root growth in these greenhouse experiments. Our results suggest delaying seeding by more than 3 days after the application of 2,4-D + MCPP + dicamba (Trimec Classic) may not be necessary.

Rationale

A previous study found that tall fescue emergence in plots seeded at 7 or 14 days after dithiopyr (Dimension 2EW) application could have been increased if frequent irrigation, which began at 0 days after treatment (DAT), enhanced herbicide breakdown prior to seeding at 7 or 14 DAT. Ongoing high levels of soil moisture can elevate microbial degradation of herbicides and may reduce their influence on seedling emergence.

Objective

The objective of this greenhouse study was to evaluate the influence of irrigation for its potential to lessen the effects of pre- and postemergence herbicides on emergence and growth of tall fescue seeded after application.

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Study Description

A greenhouse study was conducted in the Throckmorton Plant Science Center at Kansas State University, Manhattan, KS, from January to March, 2020, (Experiment 1) and May to July, 2020 (Experiment 2) to determine the effects of irrigation on seedling growth after herbicide application. The experiment was arranged in a completely randomized design with four replicates and a three-way factorial treatment structure to evaluate the effect of herbicide (noted below), seeding interval (0, 3, 7, and 14 DAT), and irrigation (irrigated after herbicide application or irrigated at the time of seeding). Herbicide treatments were a nontreated; 2,4-D+MCPP+Dicamba (Trimec Classic) at 0.99 lb, 0.27 lb, and 0.11 lb a.e./ac^{-1}, respectively; quinclorac (Drive 75) at 0.75 lb a.i./ac^{-1}; halosulfuron-methyl (SedgeHammer) at 0.06 lb a.i./ac^{-1}; and dithiopyr (Dimension) at 0.50 lb a.i./ac^{-1}. Each herbicide was applied to the soil surface of the pots using a CO_2-pressurized hand-held spray boom equipped with four TeeJet8003 flat-fan nozzles on 9.8-inch spacing calibrated to deliver 43 gal/a. Tall fescue was harvested 42 days after each seeding interval. Shoots were collected by cutting at the soil surface, and then weighed. Rootzone material from the pot was placed on a sieve and soil was washed from roots. Root volume was determined by the amount of water displaced after being submerged in a graduated cylinder with a known amount of water. Roots and shoots were placed in an electric drying oven for 48 hours then weighed.

Results

The herbicide treatment's main effect was significant for tall fescue shoot fresh and dry weights, but neither irrigation nor seeding interval was impactful. SedgeHammer- and Dimension-treated soil reduced the weights of fresh tall fescue shoots in Experiment 1 compared to the nontreated soil. Dimension was the only herbicide that reduced the weight of dry tall fescue shoots in Experiment 1. All herbicides reduced fresh shoot weight compared to the nontreated soil in Experiment 2 (Table 1). All herbicides reduced dry shoot weight compared to the nontreated soil in Experiment 2, with a greater reduction in SedgeHammer- and Dimension-treated soil compared to that treated with Trimec Classic or Drive (Table 1). All herbicides reduced root volume compared to nontreated soil at 0 DAT in Experiment 1 (Table 2). In Experiment 2, tall fescue seeded into Drive-treated soil at 0 DAT, along with SedgeHammer- and Dimension-treated soil at 0, 3, 7, and 14 DAT, had reduced root volume compared to nontreated soil (Table 2). In Experiment 1, all herbicides reduced root dry weight compared to nontreated soil seeded 0 DAT; however, no herbicide affected root dry weight compared to nontreated soil at 7 and 14 DAT (Table 3). In Experiment 2, tall fescue seeded into Drive-treated soil at 7 DAT, along with SedgeHammer and Dimension at 0, 3, 7, and 14 DAT, had reduced dry root weight compared to nontreated soil. Overall, irrigation had no influence on the impact of herbicides on shoot or root growth in these greenhouse experiments. The results align with previous studies that concluded post-treatment irrigation practices might not be an important factor in affecting herbicide residue in soil.

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Table 1. Main effects of herbicide treatment on weights of dry and fresh tall fescue shoots 42 days after herbicide application in Experiment 1 and 2

	Fresh weight[a] (oz.)		Dry weight[b] (oz.)	
Treatment[c]	Exp. 1	Exp. 2	Exp. 1	Exp. 2
Nontreated	0.13a[d]	0.17a	0.03a	0.04a
Trimec Classic	0.13a	0.14b	0.04a	0.03b
Drive 75	0.14a	0.13b	0.03a	0.03b
SedgeHammer	0.11b	0.10c	0.04a	0.02c
Dimension 2EW	0.00c	0.00d	0.00b	0.00d

[a] oz = ounces.
[b] Dry weights recorded after 48-hour oven dry down period at 150°F.
[c] Herbicides were applied on January 20, 2020 (Experiment 1), and May 18, 2020 (Experiment 2).
[d] Means followed by the same letter in a column are not statistically different ($P \leq 0.05$) according to Fisher's LSD. Means are averages over seeding intervals, n = 16.

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Table 2. Interaction of herbicide treatment by seeding interval on tall fescue root volume 42 days after herbicide application in Experiment 1 and 2

	Root volume (in.^{3})[a]			
	Days after treatment (DAT)[b]			
	Experiment 1			
Treatment[c]	0	3	7	14
Nontreated	2.86A[d]	1.33CD	1.33CD	0.82EFGHI
Trimec Classic	2.09B	1.11CDEF	1.31CDE	0.99DEFG
Drive 75	1.53C	1.24CDE	1.14CDEF	0.93DEFGH
SedgeHammer	0.47HIJ	0.55GHI	0.72FGHI	0.34IJ
Dimension 2EW	0.00J	0.00J	0.00J	0.00J

	Root volume (in.^{3})[a]			
	Days after treatment (DAT)[b]			
	Experiment 2			
	0	3	7	14
Nontreated	0.88AB	0.93A	0.91AB	0.82ABCD
Trimec Classic	0.80ABCDE	0.80ABCDE	0.84ABC	0.76BCDE
Drive 75	0.68E	0.69DE	0.71CDE	0.88AB
SedgeHammer	0.29G	0.32FG	0.32FG	0.46F
Dimension 2EW	0.00H	0.00H	0.00H	0.00H

[a] in.^{3} = cubic inches.
[b] DAT = days after treatment.
[c] Herbicides were applied on January 20, 2020 (Experiment 1), and May 18, 2020 (Experiment 2).
[d] Means followed by the same capital letter are not statistically different with rows or columns under each experiment according to Fisher's LSD ($P \leq 0.05$). Means are averages over treatment replications, n = 4.

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Table 3. Interaction of herbicide treatment by seeding interval on tall fescue root dry weight 42 days after herbicide application in Experiment 1 and 2

	Dry weight (oz.)[a,b]			
	Days after treatment (DAT)[c]			
	Experiment 1			
Treatment[d]	0	3	7	14
Nontreated	0.63A[e]	0.21C	0.11CDEF	0.10DEF
Trimec Classic	0.40B	0.18CD	0.11CDEF	0.10DEF
Drive 75	0.36B	0.15CDE	0.10DEF	0.10DEF
SedgeHammer	0.04F	0.06EF	0.03F	0.02F
Dimension 2EW	0.00F	0.00F	0.00F	0.00F

	Dry weight (oz.)[a,b]			
	Days after treatment (DAT)[c]			
	Experiment 2			
	0	3	7	14
Nontreated	0.08A	0.07AB	0.05CD	0.06BC
Trimec Classic	0.05CD	0.05CD	0.04DE	0.04DE
Drive 75	0.04DE	0.04CDE	0.03FE	0.04DE
SedgeHammer	0.01GH	0.02FG	0.01GH	0.02FG
Dimension 2EW	0.00H	0.00H	0.00H	0.00H

[a] oz = ounces.
[b] Dry weights recorded after 48-hour oven dry down period at 150°F.
[c] DAT = days after treatment.
[d] Herbicides were applied on January 20, 2020 (Experiment 1), and May 18, 2020 (Experiment 2).
[e] Means followed by the same capital letter are not statistically different within rows or columns under each experiment according to Fisher's LSD ($P \leq 0.05$). Means are averages over treatment replications, n = 4.

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Figure 1. Differences in rooting of tall fescue 42 days after seeding into Trimec Classic (left) and SedgeHammer (right) at 0 days after treatment in March 2020.

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