Mesotrione Safety at Seeding of Turfgrass Mixtures

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A study was conducted at the Washington State University Turfgrass and Agronomy Research Center (TARC) in Pullman, WA on a mixed stand of three different turfgrass species ('NuDestiny' Kentucky bluegrass, 'Treazure' chewings fescue, and 'Gallery' perennial ryegrass). The objective of this study was to evaluate the safety of mesotrione when applied at seeding and after the first mowing to a mixed turfgrass stand. A secondary objective was to evaluate the level of weed control provided by mesotrione and siduron treatments included in the study. The study area measured 36' x 70' with individual plots 9' x 10'. A 2:1:1 (by weight) mixture of 'NuDestiny' Kentucky bluegrass (KBG): 'Treazure' chewings fescue (CF): 'Gallery' perennial ryegrass (PRG) was planted at 4 lbs per 1000 ft^2. By seed number, this mixture was 80% KBG, 13% CF, and 7% PRG. The study was planted on 30 May 07. Weeds in the study area were naturally occurring. The following weeds were present in the study area: pigweed *Amaranthus spp.*, common lambsquarter *Chenopodium album*, prickly lettuce *Lactuca serriola*, pineappleweed *Matricaria matricarioides*, Canada thistle *Cirsium arvense*, mayweed chamomile *Anthemis cotula*, dandelion *Taraxacum officinale*, shepardspurse *Capsella bursa-pastoris*, witchgrass *Panicum capillare*, and barnyardgrass *Echinochloa crus-galli*. There were no weeds present at the time of planting. All treatments were applied with a CO_2-pressurized, bicycle-wheeled sprayer at 25 GPA using 11002 spray tips. The first application of mesotrione was made at planting on 30 May 07. A second application was made immediately following the first mowing on 3 July 07 (5 WAT). The treatments were arranged in a randomized complete block with four replications. Statistical analysis was performed using Analytical Software Statistix 8.0. Phytotoxicity and percent turfgrass establishment were rated at 1, 2, 3, 4, 6, and 8 weeks after first treatment (WAT). Phytotoxicity was rated on a scale of 0-10; 0 = no visual injury and 10 = dead

turf. Percent turfgrass establishment was visually rated as the percentage of the individual plot that was covered with the planted turfgrass species. Percent weed control and turfgrass quality was rated at 2, 3, 4, 6, and 8 WAT. Percent weed control was rated compared to the untreated control (UTC), and turfgrass quality was rated on a scale of 1-9; 9 = excellent turfgrass quality.

RESULTS

Phytotoxicity (Table 1): At 2 WAT, mesotrione at 280 g a.i. ha^{-1} caused significantly more phytotoxicity than any other treatment, although the level of phytotoxicity was acceptable in terms of turfgrass quality. Even though the 210 g a.i. ha^{-1} rate of mesotrione resulted in significantly more phytotoxicity than the remaining treatments, this level of phytotoxicity was very low. All other treatments did not produce phytotoxic effects. By 3 WAT, the turfgrass recovered from all phytotoxic effects produced by mesotrione. One week following the split application of mesotrione, at 6 WAT, both the 175 g a.i. ha^{-1} and the 210 g a.i. ha^{-1} rates produced phytotoxic effects considered marginal, but acceptable in terms of turfgrass quality. The 210 g a.i. ha^{-1} rate resulted in significantly more phytotoxicity than the 175 g a.i. ha^{-1} rate. Both treatments fully recovered from the phytotoxic effects of mesotrione by 8 WAT. Overall, all treatments were safe to apply on the specified mixed stand of turfgrass used in this trial.

Percent Establishment (Table 2): There were no significant differences in percent turfgrass establishment across treatments within any rating date. An observation was made between 6 and 8 WAT that suggested a lower percentage of CF germinated in plots treated with mesotrione compared to siduron and the UTC. Plots treated with mesotrione appeared more dark green than either the siduron or UTC. The higher amount of CF in the siduron and UTC made them look lighter green. Overall, neither mesotrione or siduron treatments included in this study inhibited or increased the rate of turfgrass establishment.

Percent Weed Control (Table 3): Weed control across all mesotrione treatments and rating dates ranged from 85 to 100%. Within each rating date, there were no significant differences in the level of weed control

provided by the mesotrione treatments. The mesotrione treatments always had a significantly higher level of weed control than the siduron treatment and the UTC. Even though, the siduron treatment resulted in higher levels of weed control then the UTC, this level of control was not acceptable. Overall, all mesotrione treatments provided excellent weed control, while siduron did not provide adequate weed suppression. In terms of weed control, a split application of mesotrione is not necessary.

Turfgrass Quality (Table 4): Generally, the differences in turfgrass quality were minimal until the split application of mesotrione was applied. One week following the split application, at 6 WAT, both the 175 and 210 g a.i. ha^{-1} treatments had significantly lower quality than all other treatments except the UTC. By 8 WAT, differences were nominal, and the 175 g a.i. ha^{-1} split application had the highest turfgrass quality of all treatments.

Conclusions: Mesotrione applied as a spray at planting to a mixed stand of cool-season turfgrasses appears to be safe at rates ranging from 175 to 280 g a.i. ha^{-1}. Split applications at rates of 175 and 210 g a.i. ha^{-1} resulted in increased phytotoxicity at 6 WAT only, but were not necessary for additional weed control. Siduron did not perform as well as any mesotrione treatment in terms of weed control. In addition, siduron did not produce any phytotoxic effects on the mixed stand of cool-season turfgrasses. From an applied standpoint, it appears that single spray applications of mesotrione made at planting using rates as low as 175 g a.i. ha^{-1} would be an effective way to control weeds in a mixed cool-season turfgrass stand with less than 13% chewings fescue.

Table 1. Phytotoxic effects of mesotrione and siduron when applied to a mixed (80% KBG : 13% CF : 7% PRG) stand of cool-season turfgrasses at planting and following first mowing.

				Phytotoxicity[†]					
Treatment	Rate (g a.i. ha^{-1})	NIS (% v/v)	App. Date[‡]	1 WAT	2 WAT	3 WAT	4 WAT	6 WAT	8 WAT
Mesotrione + NIS	175	0.25	1	0.0 a[§]	0.0 c	0.0 a	0.0 a	0.0 c	0.0 a
Mesotrione + NIS	210	0.25	1	0.0 a	0.3 b	0.0 a	0.0 a	0.0 c	0.0 a
Mesotrione + NIS	280	0.25	1	0.0 a	1.3 a	0.0 a	0.0 a	0.0 c	0.0 a
Siduron	6700	0	1	0.0 a	0.0 c	0.0 a	0.0 a	0.0 c	0.0 a
Mesotrione + NIS	175 + 175	0.25	1 & 2	0.0 a	0.0 c	0.0 a	0.0 a	2.25 b	0.0 a
Mesotrione + NIS	210 + 210	0.25	1 & 2	0.0 a	0.0 c	0.0 a	0.0 a	2.75 a	0.0 a
Check	0	0		0.0 a	0.0 c	0.0 a	0.0 a	0.0 c	0.0 a

[†] Phytotoxicity rated on a scale of 0-10; 10=plant death, <2=acceptable plant quality.
[‡]Application date 1 made at planting on 30 May 07; Application date 2 made on 3 July 07 immediately following first mowing at 5 WAT.
[§] Means within a column for each species followed by the same letter are not significantly different according to LSD (P=0.05).

Table 2. Percent establishment of a mixed stand (80% KBG : 13% CF : 7% PRG) of cool-season turfgrasses treated with mesotrione and siduron at planting and following first mowing.

				% Establishment[†]					
Treatment	Rate (g a.i./ha)	NIS (% v/v)	App. Date[‡]	1 WAT	2 WAT	3 WAT	4 WAT	6 WAT	8 WAT
Mesotrione + NIS	175	0.25	1	0.0 a[§]	9.25 a	20.0 a	42.5 a	72.5 a	88.8 a
Mesotrione + NIS	210	0.25	1	0.0 a	9.75 a	25.0 a	51.3 a	77.5 a	93.0 a
Mesotrione + NIS	280	0.25	1	0.0 a	9.25 a	21.3 a	46.3 a	73.8 a	88.0 a
Siduron	6700	0	1	0.0 a	7.25 a	18.8 a	41.3 a	71.3 a	93.0 a
Mesotrione + NIS	175 + 175	0.25	1 & 2	0.0 a	9.25 a	25.0 a	52.5 a	77.5 a	93.0 a
Mesotrione + NIS	210 + 210	0.25	1 & 2	0.0 a	7.25 a	18.8 a	37.5 a	66.3 a	88.8 a
Check	0	0		0.0 a	7.25 a	22.5 a	47.5 a	73.8 a	93.5 a

[†] Percent establishment visually rated as percent of individual plot area covered with desired turfgrass species.

[‡]Application date 1 made at planting on 30 May 07; Application date 2 made on 3 July 07 immediately following first mowing at 5 WAT.

[§] Means within a column for each species followed by the same letter are not significantly different according to LSD (P=0.05).

Table 3. Percent weed control in a mixed stand (80% KBG : 13% CF : 7% PRG) of cool-season turfgrasses treated with mesotrione and siduron at planting and following first mowing.

Treatment	Rate (g a.i./ha)	NIS (% v/v)	App. Date[‡]	% Weed Control[†] 2 WAT	3 WAT	4 WAT	6 WAT	8 WAT
Mesotrione + NIS	175	0.25	1	91.3 a[§]	92.5 a	95.0 a	96.3 a	99.3 a
Mesotrione + NIS	210	0.25	1	85.0 a	95.0 a	93.8 a	96.8 a	99.3 a
Mesotrione + NIS	280	0.25	1	87.5 a	95.0 a	95.0 a	98.8 a	100.0 a
Siduron	6700	0	1	52.5 b	28.8 b	12.5 b	15.0 b	20.0 b
Mesotrione + NIS	175 + 175	0.25	1 & 2	90.0 a	95.0 a	93.8 a	98.8 a	100.0 a
Mesotrione + NIS	210 + 210	0.25	1 & 2	91.3 a	95.0 a	95.0 a	100.0 a	100.0 a
Check	0	0		0.0 c	0.0 c	0.0 c	0.0 c	0.0 c

[†] Percent weed control as compared to the check plot.

[‡]Application date 1 made at planting on 30 May 07; Application date 2 made on 3 July 07 immediately following first mowing at 5 WAT.

[§] Means within a column for each species followed by the same letter are not significantly different according to LSD (*P*=0.05).

Table 4. Turfgrass quality of a mixed stand (80% KBG : 13% CF : 7% PRG) of cool-season turfgrasses treated with mesotrione and siduron at planting and following first mowing.

Treatment	Rate (g a.i./ha)	NIS (% v/v)	App. Date[‡]	Turfgrass Quality[†] 2 WAT	3 WAT	4 WAT	6 WAT	8 WAT
Mesotrione + NIS	175	0.25	1	6.3 ab[§]	6.0 a	5.5 a	6.8 a	5.8 ab
Mesotrione + NIS	210	0.25	1	6.0 bc	6.0 a	5.5 a	6.5 a	6.0 ab
Mesotrione + NIS	280	0.25	1	6.0 bc	6.0 a	5.8 a	6.5 a	5.8 ab
Siduron	6700	0	1	5.8 c	6.0 a	5.8 a	6.0 ab	5.3 b
Mesotrione + NIS	175 + 175	0.25	1 & 2	6.3 ab	6.0 a	6.3 a	4.8 c	6.5 a
Mesotrione + NIS	210 + 210	0.25	1 & 2	6.3 ab	6.0 a	5.5 a	4.5 c	5.5 ab
Check	0	0		6.5 a	6.0 a	5.8 a	5.3 bc	5.3 b

[†] Turfgrass quality rated visually; 1-9, 9 = best turfgrass quality.

[‡]Application date 1 made at planting on 30 May 07; Application date 2 made on 3 July 07 immediately following first mowing at 5 WAT.

[§] Means within a column for each species followed by the same letter are not significantly different according to LSD (*P*=0.05).