Response of Perennial Ryegrass to R.P. - EXP31130A and R.P. - EXP31598A

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Abstract

EXP31130A and EXP31598A were applied as repeat applications on June 5 and July 23, 1997 to perennial ryegrass maintained at 3.0 inches. Application rates were 0.18 and 0.36 lbs. AI/A (31130A) and 7.0 and 14.0 fl. oz/prod/A (31598A). Each treatment was applied with and without Sequestrene 338 iron chelate, at the rate of 0.1 oz/m^2. Untreated and iron-only controls were included in the test. Ryegrass was generally unaffected by either compound, under the conditions of this test. Inclusion of iron (in the tank mix) was more beneficial for EXP31598A, than for EXP31130A. Untreated controls generally had lower performance scores, than did turf which received either herbicide compound. Treatment effects for overall turfgrass quality were significant only on three of ten evaluation dates, and on one of ten evaluation dates for turfgrass color. In general both compounds appear safe to use on high cut perennial ryegrass turf under summer conditions in a desert environment.

Introduction

Two experimental herbicides, EXP31130A and EXP31598A were evaluated for herbicide tolerance on turf-type perennial ryegrass (Lolium perenne) after two summer applications in 1997. The major objectives were as follows: Turfgrass safety between herbicides and assessment of the effects of using chelated iron in tank mixes.

Materials and Methods

The two experimental herbicides were tested at two application rates, both with and without iron chelate. An untreated control and an iron-only treatment were included. The treatments were as follows.

1	Control	
2	EXP31130A	0.18 lb/A
3	EXP31130A	0.36 lb/A
4	EXP31130A	0.18 lb/A + 0.1 oz Fe/m^2
5	EXP31130A	0.36 lb/A + 0.1 oz Fe/m^2
6	EXP31598A	7.0 fl. oz/A
7	EXP31598A	14.0 fl. oz/A
8	EXP31598A	7.0 fl. oz/A + 0.1 oz Fe/m^2
9	EXP31598A	14.0 fl. oz/A + 0.1 oz Fe/m^2
10	Iron only	0.1 oz. Fe/m^2

All treatments were applied to a mature perennial ryegrass turf using a Co_2 back-pack sprayer, featuring a three nozzle boom (20 inch spacing). Applications were calibrated for 80 GPA (8004 nozzles). Plot size was 5x5, each

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replicated four times in a RCBD. The perennial ryegrass was mowed 2-3 times a week at 3.0 inches and irrigated to prevent stress. The plots received 2 ½ lbs. -N-/1000 ft^2 from January 1 to April 1, 1997, after which time all fertilization was discontinued.

Applications were made on June 4 and again (same treatments to same plots) on July 23, 1997. Treatments were allowed to dry for twelve hours before being irrigated with the previous days ET requirement.

Plots were evaluated for turfgrass color and quality at 1, 2, 3, 4 and 6 weeks after treatment (WAT), using the National Turfgrass Evaluation Program (NTEP) evaluation scale system. At no time after either application were there signs of injury (discoloration, tip burning, leaf sheath necrosis, turf yellowing or stunted growth) therefore, color and quality are reported. All data was analyzed using the least squares method of the analysis of variance technique, using SAS software. Mean separation was derived from Tukey's Honest LSD values, which are provided only when the treatment effect was significant at the P= 0.05 level, or less. Linear contrasts comparing treatment rates and iron effects are discussed when applicable.

Results and Discussion

(1 WAT/1) June 10, 1997
The overall treatment effect was significant for turfgrass color, but not for quality. Color score mean treatment values ranged from 5.5 (slightly light color green) to 7.3. Two treatments were slightly lighter in color than the untreated control. These included EXP31130A at the 0.36 lb/AI/A (high) rate, plus the same treatment with iron. The iron increased the color slightly, but not strongly. Note that the EXP31598A had greater color scores than the EXP31130A treated ryegrass, both with and without iron. Note also that the iron increased performance slightly for both chemicals (Table 1). The "iron-only" check had a mean score of 7.0, while the untreated control had a mean score of 6.0. The linear contrast of 'iron vs. no iron' for EXP31598A was significant, showing an overall improvement from iron for ryegrass color for this compound. The contrast for 'iron vs. no iron' for EXP31130A was not significant, demonstrating a lesser response to iron for this compound. For turfgrass quality, mean treatment values ranged from 5.8 to 7.3, but were statistically non-significant. Note that the control had the lowest mean quality score (5.8) which was greatly improved by the addition of iron (6.5), as the 'iron vs. no iron-check' contrast was significant, only (Table 2).

(2 WAT/1) June 20, 1997
By two weeks after the first treatments were applied, there was no statistical treatment effect for color, or quality. Turfgrass quality scores ranged from 5.7 to 7.3, with EXP31598A at the 14 oz. rate having the largest numerical mean score (Table 2). However, note that there was no relationship between rate or iron applications here, for either chemical. Color scores ranged from 5.7 to 6.5 (Table 1). Essentially, all turfs appeared similar in appearance.

(3 WAT/1) July 1, 1997
All ryegrass plots were similar in turfgrass color and quality. Again, the treatment effect was not statistically significant. Quality scores ranged from 5.8 to 6.8. Iron containing plots ranked similar, or just slightly higher than the same rate/chemical combination without the additional iron (Table 2). However, note that for overall quality, there was no rate dependent response. Color scores ranged from 5.5 to 6.5, with the iron-only control having a color mean score of 6.5, along with EXP31130A 0.36 lb. AI/A, plus iron (Table 1).

(4 WAT/1) July 7, 1997
Perennial ryegrass plots showed a significant treatment effect for overall turfgrass quality, but not for color. At this time (July 7), the perennial ryegrass had been showing a decline in clipping production and some loss of color from heat stress. The overall quality scores ranged from 4.7 (control) to 7.5 for EXP31598A/14 ounce/iron. Without iron, the same turf received a quality of 7.0 (Table 2). The ryegrass seemed to benefit from EXP31598A as increased rates of this compound resulted in better quality turf. Color scores ranged from 6.0 to 7.5. At the higher rate of EXP31598A 14 ounce/product/acre, color was decreased compared to the 7 ounce/product/acre rate. But, the difference was not statistically different (Table 1).

(6 WAT/1) July 18, 1997
At the final evaluation before the second application, perennial ryegrass exhibited significant differences in overall turfgrass quality, but not for color. Color scores ranged from 6.0 to 6.8 (Table 1). Quality scores ranged from 4.7 to

6.5 (Table 2). The untreated control had the poorest quality (4.7) while the iron-only control had a mean score of 6.5, identical to EXP31598A/14 ounce/iron and EXP31130A/.36 lbs. AI/A plus iron. Again, EXP31598A responded positively with slightly improved quality with the increase in application rate, both with and without iron.

The second repeat applications were made on July 23, 1997.

(1 WAT/2) July 30, 1997
Application treatments were not significant for turfgrass color, but were for quality. Color scores ranged from 5.3 (for the untreated control), to 7.0 (for the iron-only control). However, plot to plot variation from natural summer stress was a large contributor to experimental error and so statistical significance could not be demonstrated (Table 1). The treatment of EXP31598A/14 ounce had a light color (5.5), while the same treatment with iron, as well as the low rate of 7 ounces, either with or without iron, had color scores of 6.3 to 6.8. Generally, EXP31598A caused a slightly darker color turf then EXP31130A (Table 1).

Turfgrass quality scores ranged from 5.0 to 7.5. EXP31598A produced better quality turf at both rates when iron was applied, than compared to both rates without iron. In general, EXP31598A produced a slightly improved quality turf over EXP31130A (Table 1).

(2 WAT/2) August 6, 1997
By two weeks after the second applications, neither color or quality responses proved significant among treatments. Color scores ranged from 5.5 to 7.0 (Table 1), with quality scores ranging 5.5 to 7.0 as well (Table 2). However, note that EXP31598A at the 14 ounce rate produced the highest numerical color score (7.0) when iron was included and the lowest numerical color score when iron was not included at the 14 ounce rate (mean = 5.5). For overall turfgrass quality, EXP31598A treated plots had mean quality scores of 6.0 to 7.0 except for the 7 ounce rate with iron.

(3 WAT/2) August 13, 1997
Similar responses occurred at 3 WAT/2. The treatment effect was not significant for color or quality. Color scores ranged from 5.0 to 6.5 (Table 2), while quality scores ranged from 5.0 to 6.8 (Table 2). The iron-only control ranked first for both color and quality. Note that the untreated control ranked low for both color and quality. Perhaps degradation of the herbicides (if they contain nitrogen?) may have slightly enhance turfgrass color and performance.

(4 WAT/2) August 22, 1997
Color and quality responses were not significantly affected by the treatments at 4 WAT/2. Quality scores ranged from 5.0 (control) to 7.0 (EXP31598A/14 ounce/iron) (Table 1). Although statistically non-significant, EXP31598A with iron at the 14 ounce rate again showed a marked difference compared to the same 14 ounce rate without iron (7.0 vs. 5.0, respectively for color). As before, the EXP31130A was slightly lighter in color than EXP31598A. Often, at 3-4 weeks after application of herbicides, turfgrass color or quality is slightly enhanced as a latent response to treatment. This may be the cause of the response of EXP31598A at the 14 ounce (high) rate, being beneficially enhanced by the addition of iron.

(6 WAT/2) September 8, 1997
Neither color or quality responses were significant from the treatments at the close of the test. Color scores ranged from 5.3 (control) to 6.5 for the iron-only control (Table 1). Turfgrass color scores overall showed lighter color at this time (September 8) from accumulated heat stress and humid conditions in August. The control had the lowest numerical score for quality (4.8) with the iron-only control showing a final score of 5.5. The treatments which had mean quality scores of 6.0 or greater included three of the four EXP31598A treatments as well as EXP31130A at 0.18 lbs. AI/A plus iron (Table 2).

Conclusions

1. EXP31130A caused minimal effects on turf-type perennial ryegrass when applied at 0.18 lbs. AI/A and at 0.36 lbs. AI/A.

2. Applications of Sequestrene 338 Iron at 0.1 oz./product/m^2 slightly enhanced the color of EXP31130A at

the application rates and timings evaluated here.

3. Three weeks after treatment, most EXP31130A treated ryegrass had a darker color than the untreated control. This trend carried through to the end of the test, following the second application (repeat) sequence as well.

4. EXP31598A resulted in a minimal response from perennial ryegrass.

5. The addition of iron to EXP31598A at the high rate of herbicide (14 fl. oz./A), increased turfgrass color to acceptable levels for up to six weeks after the first treatment.

6. After the second (repeat) application of EXP31598A, the color enhancement from iron was noticed more at the 14 oz/prod/A rate, than at the 7 oz/prod/A rate. The difference was subtle, but noticeable.

7. Overall stress from summer conditions caused a decrease in plot performance, as untreated plots generally had low color and quality scores, especially in late July, August and into early September.

8. Overall turfgrass quality scores for perennial ryegrass were not especially improved by the addition of iron for EXP31130A at either the 0.18 or 0.36 lbs. AI/A rates.

9. Both EXP products generally had a better quality turf than the untreated controls. This could be from degradation of the herbicides or a temporary growth regulator effect (not determined).

10. EXP31598A and EXP31130A appear safe on perennial ryegrass under conditions of this test.

FN:RPRYE.97 DIR:Q497
SAS = RYETOL97.SAS

Table 1. Mean turfgrass color[1] scores of turf-type perennial ryegrass after applications[2] of EXP31130A and EXP31598A herbicides with and without iron. University of Arizona, 1997.

TREATMENT	RATE HERB	RATE IRON	JUNE 10 1 WAT/1	JUNE 20 2 WAT/1	JULY 1 3 WAT/1	JULY 7 4 WAT/1	JULY 18 6 WAT/1	JULY 30 1 WAT/2	AUG 6 2 WAT/2	AUG 13 3 WAT/2	AUG 22 4 WAT/2	SEPT 8 6 WAT/2
Untreated	--	--	6.0	6.3	5.5	6.0	6.0	5.3	6.0	5.5	5.8	6.5
EXP31130A	.18 lb/AI/A	--	6.5	6.0	5.8	6.8	6.0	5.8	6.8	5.8	6.8	6.0
EXP31130A	.36 lb/AI/A	--	5.5	6.5	6.3	6.5	6.3	6.0	6.3	6.0	6.3	6.0
EXP31130A	.18 lb/AI/A	0.1 oz/m^2	6.5	6.0	6.0	6.3	6.8	6.0	6.8	6.3	6.3	5.7
EXP31130A	.36 lb/AI/A	0.1 oz/m^2	5.8	6.0	6.5	7.0	6.3	6.0	6.3	6.0	6.0	5.8
EXP31598A	7 fl. oz/A	--	6.5	6.5	6.0	7.0	6.8	6.8	6.8	6.0	5.8	5.8
EXP31598A	14 fl. oz/A	--	6.0	5.7	5.8	6.3	6.0	5.5	5.5	5.0	5.5	5.8
EXP31598A	7 fl. oz/A	0.1 oz/m^2	7.3	6.5	6.3	7.5	6.0	6.3	5.8	5.8	6.0	5.8
EXP31598A	14 fl. oz/A	0.1 oz/m^2	6.0	6.5	6.0	6.0	6.5	6.5	7.0	6.5	7.0	6.0
Iron Only	--	0.1 oz/m^2	7.0	6.0	6.5	6.5	6.5	7.0	6.5	6.5	6.0	5.3
TEST MEAN[3]			6.3	6.2	6.0	6.6	6.3	6.1	6.4	5.9	6.1	5.8
LSD VALUE[4]			1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

[1]Color (1-9). 1 = dead, 6 = acceptable, 9 = best possible, darkest color. Values are the mean of four replications.
[2]Applications made on June 5 and again on July 23, 1997.
[3]Test Mean = Mean of all treatments on each evaluation date.
[4]LSD Value = Treatment mean separation statistic. Treatments with numerical differences greater than the LSD value are significantly different from each other, P = 0.05 level.

Table 2. Mean turfgrass quality[1] scores of turf-type perennial ryegrass after applications[2] of EXP31130A and EXP31598A herbicides with and without iron. University of Arizona, 1997.

TREATMENT	RATE HERB	RATE IRON	JUNE 10 1 WAT/1	JUNE 20 2 WAT/1	JULY 1 3 WAT/1	JULY 7 4 WAT/1	JULY 18 6 WAT/1	JULY 30 1 WAT/2	AUG 6 2 WAT/2	AUG 13 3 WAT/2	AUG 22 4 WAT/2	SEPT 8 6 WAT/2
Untreated	--	--	5.8	5.7	5.8	4.7	4.7	5.0	5.5	5.5	5.0	4.8
EXP31130A	.18 lb/AI/A	--	7.3	6.3	5.8	6.5	5.0	6.3	5.5	5.8	6.0	5.8
EXP31130A	.36 lb/AI/A	--	7.0	6.3	6.5	6.3	6.0	6.5	5.5	6.3	5.8	5.7
EXP31130A	.18 lb/AI/A	0.1 oz/m^2	6.3	6.0	5.8	5.8	5.5	6.0	5.8	5.0	5.8	6.3
EXP31130A	.36 lb/AI/A	0.1 oz/m^2	6.5	6.0	6.8	6.5	6.5	6.5	5.8	6.3	5.3	5.5
EXP31598A	7 fl. oz/A	--	6.8	6.3	6.0	5.8	5.5	6.3	6.5	5.8	6.3	6.0
EXP31598A	14 fl. oz/A	--	6.8	7.3	5.8	7.0	6.3	5.8	6.3	6.3	5.0	6.3
EXP31598A	7 fl. oz/A	0.1 oz/m^2	6.8	6.8	6.3	6.8	6.0	6.8	5.8	5.8	5.8	6.0
EXP31598A	14 fl. oz/A	0.1 oz/m^2	6.0	6.5	6.0	7.5	6.5	7.5	6.0	6.0	7.0	5.3
Iron Only	--	0.1 oz/m^2	6.5	6.5	6.5	7.0	6.5	7.5	7.0	6.8	6.0	5.5
TEST MEAN[3]			6.6	6.3	6.1	6.4	5.9	6.4	6.0	5.9	5.8	5.7
LSD VALUE[4]			NA	NA	NA	1.3	0.9	1.3	NA	NA	NA	NA

[1]Quality (1-9). 1 = dead, 6 = acceptable, 9 = best possible. Values are the mean of four replications.
[2]Applications made on June 5 and again on July 23, 1997.
[3]Test Mean = Mean of all treatments on each evaluation date.
[4]LSD Value = Treatment mean separation statistic. Treatments with numerical differences greater than the LSD value are significantly different from each other, P = 0.05 level.