EVALUATION OF NITROGEN PRODUCTS

APPLIED ON PERENNIAL RYEGRASS

DURING THE SPRING SEASON IN RIVERSIDE, CA

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I. SUMMARY

The objective of this study was to evaluate nitrogen products applied on perennial ryegrass during the spring season in Riverside, California. The study was conducted on a uniform 4.5-month old stand of Manhattan II perennial ryegrass, maintained under general turfgrass conditions. A total of 21 different nitrogen product treatments were evaluated for 4 months (February 10 to June 10) as follows: 15 treatments were applied once at 4 lb N/1,000 ft^2; 4 treatments were applied twice at 2 lb N/1,000 ft^2; and 2 treatments were applied 4 times at 1 lb N/1,000 ft^2. Visual turfgrass quality and clipping yields were measured on a biweekly schedule commencing 2 weeks and 1 month, respectively, after the initiation of the study.

Results showed that there were significant differences among the treatments on each rating date for visual turfgrass quality. Of the 15 products applied once at 4 lb N/1,000 ft^2, Multicote II (12-0-43) and (24-8-16), and Polyon (30-3-6) and (29-3-6) provided 4-month long acceptable visual turfgrass quality. The remaining products in this group provided acceptable visual turfgrass quality for varying durations. In general, the visual turfgrass quality scores of products applied 2 times at 2 lb N/1,000 ft^2 or 4 times at 1 lb N/1,000 ft^2 were similar to the products applied 1 time at 4 lb N/1,000 ft^2.

Clipping yields were significantly different among nitrogen treatments for each collection date. Nitrogen treatments also were different for rate of clipping yield production during the 4-month evaluation. That is, some treatments had a high production of clippings, followed by a rapid reduction, while other treatments produced a more even production of clippings during the 4 months. These data suggest nitrogen release rate differences among the treatments. In terms of the sum total clipping production for 4 months, there were significant differences among the treatments. However, there does not appear to be any major differences between products applied once, twice, or four times.

II. MATERIALS AND METHODS

A summary of the study is shown in Tables 1, 2, and 3. The study was conducted on a uniform 4.5-month stand of perennial ryegrass maintained under general turfgrass conditions. A total of 21 different nitrogen product treatments were evaluated for 4 months (February 10 to June 10) during the spring season in Riverside, California, as follows: 15 treatments were applied once at 4 lb N/1,000 ft^2; 4 treatments were applied twice at 2 lb N/1,000 ft^2; and 2 treatments were applied 4 times at 1 lb N/1,000 ft^2.

Visual turfgrass quality and clipping yields were measured on a biweekly schedule commencing 2 weeks and 1 month, respectively, after the initiation of the study. Environmental measurements were collected from a California Irrigation Management System (CIMIS) weather station located on the turfgrass plots (Table 4).

TABLE 1. MATERIALS AND METHODS OUTLINE.

CULTIVAR:

Manhattan II perennial ryegrass

LOCATION:

A fairly mature and very uniform field plot established on September 28, 1993 at the UCR Turfgrass Research Project. The soil is classified as a Hanford fine sandy loam. Analysis of the soil at the initiation of the study showed: pH = 7.5; TKN % = 0.042; P = 20 ppm; and K-Sol = 7.4 ppm.

EXPERIMENTAL DESIGN:

A randomized complete block design with 4 replications/treatment. Individual plot size was 4.5 X 6 feet = 27 ft^2.

NITROGEN TREATMENTS: (See Table 2).

MOWING:

Plots were mowed once per week with a walk-behind rotary mower set at 1-1/2 inches.

IRRIGATION:

Plots were irrigated as needed to prevent visual drought symptoms. Irrigation rates were calculated in accordance with an on-site CIMIS station.

MEASUREMENTS:

Visual turfgrass quality was taken biweekly beginning 2 weeks after initial treatment applications using a 1 - 9 scale with 1 = poorest, 5 = acceptable, and 9 = best perennial ryegrass.

Clipping yields were taken biweekly beginning 1 month after initial treatment applications. Yields which were from 7 days growth were collected from a single lengthwise pass per plot from a Great States model push reel mower. Clippings were dried for 48 hours in a forced air oven maintained at 70C. Clippings collected represent a 5.3 ft^2 subsample of the 27.0 ft^2 plots.

TABLE 2. NITROGEN TREATMENTS EVALUATED DURING THE SPRING SEASON IN RIVERSIDE, CA.

		Lb N/1,000 FT^2				
PRODUCT	**APPLICATION DATE:**	**FEB. 10**	**MARCH 15**	**APRIL 19**	**MAY 10**	**TOTAL**
Multicote II (12-0-43)		4	--	--	--	4
Multicote II (24-0-24)		4	--	--	--	4
Multicote II (24-8-16)		4	--	--	--	4
Multicote II (40-0-0)		4	--	--	--	4
Osmocote (40-0-0)		4	--	--	--	4
Par Ex IBDU (31-0-0)		4	--	--	--	4
Par Ex IBDU (24-4-12)		4	--	--	--	4
SulfurKote II (38-0-0)		4	--	--	--	4
TriKote (39-0-0)		4	--	--	--	4
Polyon (43-0-0)		4	--	--	--	4
Polyon (30-3-6)		4	--	--	--	4
Polyon (29-3-6)		4	--	--	--	4
Scotts (43-0-0)		4	--	--	--	4
Multicote (18-3-18)		4	--	--	--	4
K-Power (16-4-16)		4	--	--	--	4
Best SCU (38-0-0)		2	--	2	--	4
S 8385 (25-3-10)		2	--	2	--	4
TriKote (39-0-0)		2	--	2	--	4
Scotts (43-0-0)		2	--	2	--	4
K-Power (13-0-44)		1	1	1	1	4
Turf Supreme (16-6-8)		1	1	1	1	4
Weeks after initial application:			(4.7)	(9.7)	(12.7)	

TABLE 3. CALENDAR OF THE NITROGEN PRODUCT EVALUATION STUDY DURING THE SPRING SEASON IN RIVERSIDE, CA.

DATE	ACTIVITY
February 10	Initial application of treatments.
February 24 to June 10	Biweekly ratings of visual turfgrass quality.
March 10 to June 9	Biweekly measurements of clipping yields.
March 15	Application of treatments that were applied once every month.
April 19	Application of treatments that were applied once every month and once every two months.
May 10	Application of treatments that were applied once every month.
June 10	Study completed.

TABLE 4. ENVIRONMENTAL MEASUREMENTS DURING THE NITROGEN PRODUCT EVALUATION STUDY DURING THE SPRING SEASON IN RIVERSIDE, CA.

DATE	ACCUMULATIVE WEEKLY ET_o (mm/week)	ACCUMULATIVE WEEKLY PRECIPITATION (mm/week)	AVERAGE DAILY SOLAR RADIATION (W/m^2/day)	AVERAGE DAILY TEMPERATURE (^oC)	AVERAGE DAILY SOIL TEMPERATURE (10.2 - CM DEPTH) (^oC)
2/6-2/12	18.01	25.00	137	12	12
2/13-2/19	17.42	23.00	136	12	11
2/20-2/26	18.76	8.00	170	12	12
2/27-3/5	22.63	0	170	16	14
3/6-3/12	19.47	17.00	141	14	15
3/13-3/19	31.06	28.00	214	18	16
3/20-3/26	20.62	16.00	178	12	15
3/27-4/2	28.71	0	217	16	16
4/3-4/9	25.90	4.00	212	15	17
4/10-4/16	33.93	0	260	18	17
4/17-4/23	29.98	0	227	18	19
4/24-4/30	20.30	11.00	182	12	16
5/1-5/7	27.19	1.00	204	15	19
5/8-5/14	26.38	4.00	221	17	20
5/15-5/21	26.95	5.00	227	15	19
5/22-5/28	29.48	0	234	18	20
5/29-6/4	37.35	0	269	22	22
6/5-6/11	39.53	0	302	21	23

ET_o = Reference evapotranspiration.

III. RESULTS AND DISCUSSION

Visual turfgrass quality ratings were significantly different among nitrogen treatments for each rating date during the 4-month evaluation (Table 5). In terms of the 15 products applied once at 4 lb N/1,000 ft^2, there were differences among them for the duration they produced acceptable visual quality (≥ 5.0). Products that provided 4-month long acceptable visual turfgrass quality included Multicote II (12-0-43) and (24-8-16), and Polyon (30-3-6) and (29-3-6). The other products produced acceptable visual quality for varying durations. Applying 4 lb N/1,000 ft^2 in one application may not be that commonly practiced. However, these data may represent differences among the 15 products for nitrogen release rates.

In general, the visual turfgrass quality scores of products applied 2 times at 2 lb N/1,000 ft^2 or 4 times at 1 lb N/1,000 ft^2 were similar to the products applied 1 time at 4 lb N/1,000 ft^2.

Clipping yields were significantly different among nitrogen treatments for each collection date (Table 6). In terms of the products applied once at 4 lb N/1,000 ft^2, there were striking differences among the products for the rate of clipping yield production during the 4-month evaluation. That is, several products started with a relatively high production of clippings, followed by a rapid reduction, while other products produced a more even production of clippings during the 4 months. The above observation most likely represents an indirect indicator of nitrogen release rate differences among the products. One also can note differences among the products for total clipping yields which may be an indirect indicator of the amount of nitrogen released and then absorbed by the turf.

In terms of the products applied 2 times at 2 lb N/1,000 ft^2 or 4 times at 1 lb N/1,000 ft^2, one can observe several products with a relatively even production of clippings during the 4-month evaluation, while the clipping production of other products was not as even. In terms of total clipping production for 4 months, there does not appear to be any major differences between products applied once, twice, or four times.

TABLE 5. VISUAL TURFGRASS QUALITY OF PERENNIAL RYEGRASS TREATED WITH 21 NITROGEN FERTILIZERS[z].

	WEEKS AFTER INITIAL APPLICATION								
TREATMENTS	**2**	**4.6**	**7.1**	**9.6**	**11.1**	**13.1**	**15.1**	**17.1**	**Overall**
4 lb N/1,000 ft^2 (1x)									
Multicote II (12-0-43)	5.4	6.5	5.9	5.4	5.9	5.5	6.4	7.0	6.0
Multicote II (24-0-24)	4.6	5.9	6.0	5.5	5.5	4.7	5.7	5.6	5.5
Multicote II (24-8-16)	5.0	6.4	6.0	5.7	5.7	5.1	5.7	5.5	5.7
Multicote II (40-0-0)	4.5	6.0	5.9	5.9	5.4	4.7	5.4	5.5	5.4
Osmocote (40-0-0)	4.6	6.7	6.1	5.5	5.5	4.1	5.0	4.2	5.2
Par Ex IBDU (31-0-0)	4.7	6.4	6.1	5.5	5.5	4.6	5.5	5.1	5.4
Par Ex IBDU (24-4-12)	7.1	6.7	5.9	4.6	5.2	4.2	5.0	4.0	5.4
SulfurKote II (38-0-0)	8.0	6.9	5.2	4.6	4.7	3.9	4.6	4.2	5.3
TriKote (39-0-0)	6.2	6.9	5.6	4.6	5.1	3.7	5.1	4.2	5.2
Polyon (43-0-0)	4.5	5.2	6.0	6.1	5.9	5.6	5.9	5.5	5.6
Polyon (30-3-6)	5.2	6.1	6.3	5.9	5.9	5.5	5.7	5.6	5.8
Polyon (29-3-6)	5.6	6.4	6.2	5.7	5.7	4.9	5.5	5.2	5.7
Scotts (43-0-0)	5.4	5.6	5.2	4.4	4.7	4.6	5.5	5.7	5.2
Multicote (18-3-18)	8.0	6.7	5.6	4.8	4.6	3.9	4.5	4.0	5.3
K-Power (16-4-16)	8.2	6.6	5.4	4.4	4.4	3.9	4.9	4.0	5.2
2 lb N/1,000 ft^2 (2x)[y]									
Best SCU (38-0-0)	7.0	6.4	5.5	4.5	6.4	5.6	6.0	5.4	5.8
S 8385 (25-3-10)	5.5	6.2	5.2	4.5	6.4	5.6	6.2	5.6	5.7
TriKote (39-0-0)	5.4	6.4	5.2	4.2	5.2	5.6	6.4	5.6	5.5
Scotts (43-0-0)	4.9	5.4	4.5	4.1	4.7	4.6	5.5	5.7	4.9
1 lb N/1,000 ft^2 (4x)[x]									
K-Power (13-0-44)	5.6	5.9	6.0	4.2	5.9	6.0	7.0	6.0	5.8
Turf Supreme (16-6-8)	5.4	6.0	6.2	4.1	6.5	5.6	6.7	5.6	5.8
Check	3.6	4.4	3.0	3.7	3.5	3.0	4.0	3.0	3.5
LSD, $P = 0.05$	0.9	0.7	0.7	0.5	0.7	0.6	0.5	0.4	0.3

[z] Visual turfgrass quality rated on a 1 to 9 scale: 1 = worst, 9 = best, and 5 = acceptable perennial ryegrass.
[y] Initial application date was February 10, and the second application was 9.7 weeks later.
[x] Initial application date was February 10, and subsequent applications were made 4.7, 9.7, and 12.7 weeks later.

The effect of N source on visual turfgrass quality of Perennial Ryegrass.

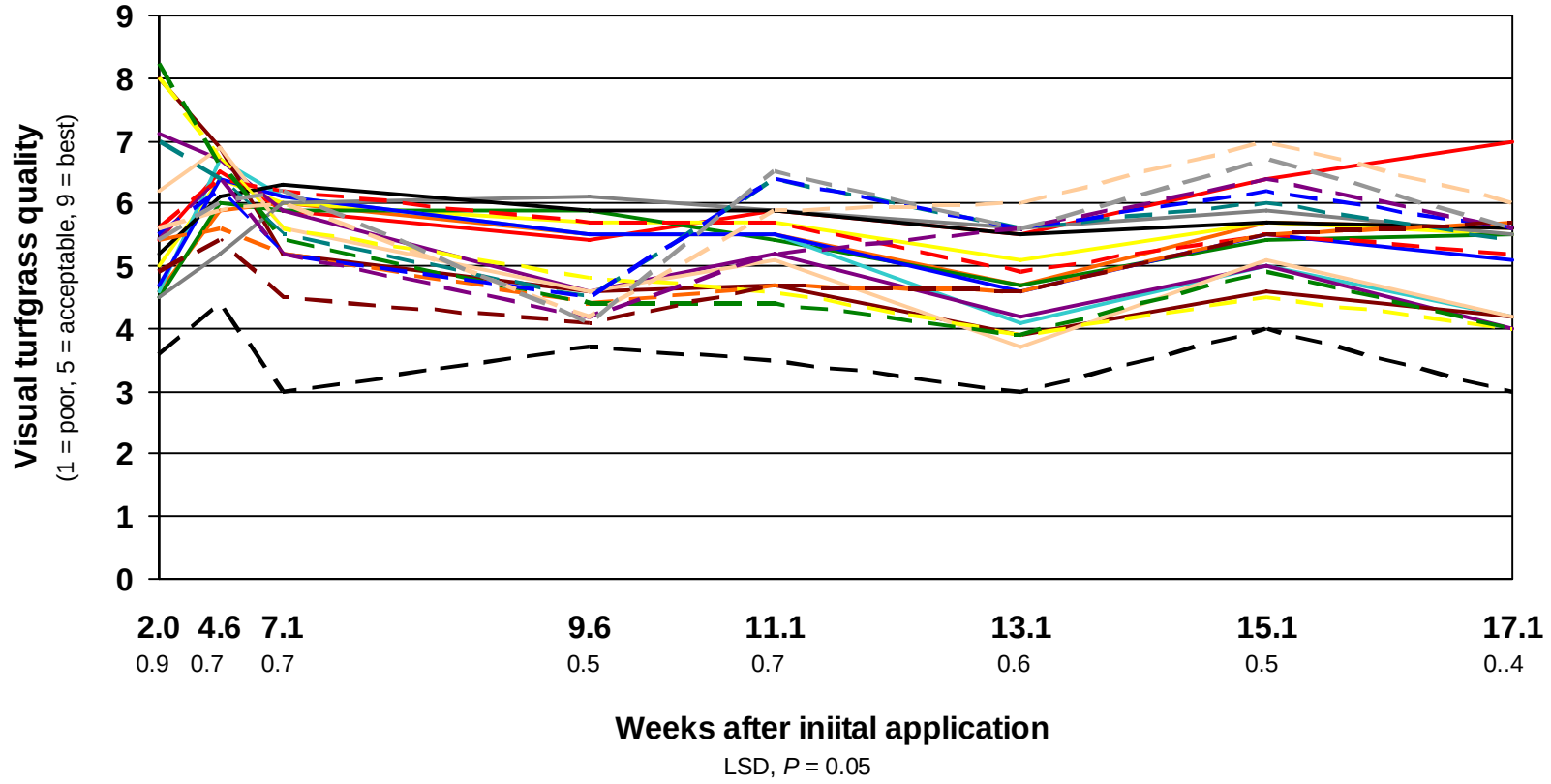

TABLE 6. CLIPPING YIELDS OF PERENNIAL RYEGRASS TREATED WITH 21 NITROGEN FERTILIZERS (g/5.3 ft^2/7 days).

	WEEKS AFTER INITIAL APPLICATION							
TREATMENTS	**4.0**	**7.0**	**9.0**	**11.0**	**13.0**	**15.0**	**17.0**	**TOTAL**
4 lb N/1,000 ft^2 (1x)								
Multicote II (12-0-43)	21.9	15.7	10.8	9.7	7.6	13.7	10.3	89.8
Multicote II (24-0-24)	10.6	16.8	11.7	10.1	6.5	11.8	8.0	85.0
Multicote II (24-8-16)	15.7	20.2	14.5	9.2	5.7	11.7	7.9	75.1
Multicote II (40-0-0)	10.8	22.0	17.5	8.9	5.3	11.0	7.0	82.6
Osmocote (40-0-0)	17.6	32.2	15.4	6.4	5.1	9.1	6.1	91.8
Par Ex IBDU (31-0-0)	12.7	17.6	15.0	10.2	6.7	10.1	6.8	79.0
Par Ex IBDU (24-4-12)	28.9	12.2	8.7	5.6	5.5	9.5	6.5	76.9
SulfurKote II (38-0-0)	36.0	15.2	6.3	4.3	4.4	9.7	5.7	81.6
TriKote (39-0-0)	32.0	14.2	8.6	4.7	5.2	9.4	5.9	80.0
Polyon (43-0-0)	8.1	17.2	15.7	12.4	6.1	11.3	7.8	78.7
Polyon (30-3-6)	10.3	15.6	14.8	10.2	6.0	11.4	8.3	76.7
Polyon (29-3-6)	16.0	15.2	15.2	8.7	5.1	10.2	7.4	77.7
Scotts (43-0-0)	10.4	9.1	8.2	5.6	5.8	12.4	9.0	60.6
Multicote (18-3-18)	35.5	10.6	8.0	4.3	4.7	9.6	5.1	77.8
K-Power (16-4-16)	37.6	9.0	4.7	2.7	4.8	9.7	4.9	73.4
2 lb N/1,000 ft^2 (2x)[z]								
Best SCU (38-0-0)	23.8	9.7	5.4	11.0	10.3	11.8	7.9	80.0
S 8385 (25-3-10)	12.3	10.1	8.3	9.9	8.4	12.3	8.3	69.7
TriKote (39-0-0)	15.0	10.3	7.0	6.6	9.8	14.4	8.6	71.8
Scotts (43-0-0)	10.2	7.0	6.5	6.2	5.8	12.6	9.3	57.6
1 lb N/1,000 ft^2 (4x)[x]								
K-Power (13-0-44)	11.7	18.8	7.3	9.1	7.7	16.9	8.9	80.4
Turf Supreme (16-6-8)	9.8	17.2	9.1	9.9	8.0	15.6	9.7	79.3
Check	4.2	4.8	4.9	3.1	4.1	8.1	3.3	32.5
LSD, $P = 0.05$	6.0	3.4	2.6	2.3	1.5	1.1	1.2	10.3

[z] Initial application date was February 10, and the second application was 9.7 weeks later.
[x] Initial application date was February 10, and subsequent applications were made 4.7, 9.7, and 12.7 weeks later.

The effect of N source on clipping yields of Perennial Ryegrass.