A COMPARISON OF NEW ORGANIC FERTILIZERS

W. Lee Berndt and P. E. Rieke
Crop and Soil Sciences, M.S.U.

INTRODUCTION

Biologically oriented organic turfgrass fertilizers (Ringer's Lawn Restore and Ringer's Lawn Keeper) were compared with soluble and slow release nitrogen carriers for evaluation of nitrogen response.

Methods of evaluation employed visual quality rating scores, percentage plant tissue nitrogen, total plant tissue chlorophyll concentration and plot clipping yield for irrigated Kentucky Bluegrass (Poa pratensis L.).

Mean values derived from these methods were subjected to linear correlation for analysis of variable association. A high degree of variable association should lend to operator precision in detecting differences.

Significant correlations were observed for all comparisons over dates. Significant treatment differences were apparent within all parameters, indicating differing degrees of nitrogen response.

As these were preliminary investigations, final conclusions are pending.

REVIEW OF LITERATURE

As management techniques for turf grasses become increasingly intricate, the need emerges for nitrogen carrier formulations of greater diversity. Proper carrier selection is influenced by a variety of factors such as cost per unit, level of management, turfgrass species present, irrigation, labor, etc. A major factor is the nitrogen source and its response effect.

Nitrogen response evaluations in turgrass areas involve various qualitative and quantitative methods of analysis including visual quality ratings, chlorophyll index measures, clipping analysis for percentage nitrogen, density measurements and yield (3,6,7,10,13). The methodology for evaluating turfgrasses should be determined by the treatments (13). Quantitative data are usually more precise but consume more resources. Qualitative observations require less time, permit larger sample size and involve minimal equipment expenditure. Qualitative methods are, however, usually less precise, less well defined and more dependent on researcher bias (6).

Visual quality rating of turf is largely subjective and is influenced by sward density and texture (1,7,11,12). Subjective visual assessments are

limited in validity to within experiment interpretation and have little year-to-year or station-to-station value (7,10). Researcher reliability may be attained with experience in assigning visual quality scores but researchers believe that evaluations based on assessing quality scores are inadequate, and call for biologically and statistically valid procedures (6,10). Still, visual quality ratings are the most widely used convention in turfgrass research.

Attempts to measure turf color objectively with a spectrophotometer (or amassing a chlorophyll index) have been somewhat successful (3,7,10). Turf color quantification thru mechanical means should provide objective comparisons, irrespective of time, location or personal preferences (3).

To provide an acceptable standard measure of turf color, it is necessary to examine the parameter values in relation to plant tissue nitrogen content (an established color influencing factor) (7,10). Cool season turfgrasses, growing at higher nitrogen levels, have a higher nitrogen content. Hence, it is not surprising that reports finding excellent relationships between concentrations of chlorophyll and nitrogen in turf clippings exist (7). The percent N values are directly related to yield, color, and chlorophyll values, but they are of marginal value as performance evaluators alone.

Inconsistencies among testing and evaluation procedures may exist at the national level (6). Studies also suggest the possibility that the same evaluation criteria are not used, resulting in questionable research collections in national and regional testing programs (6). Since most turfgrass evaluation trials employ conventional qualitative schemes, interpretations must be considered with caution (6). The need for standardization (or at least validation) of subjective procedures is apparent.

MATERIALS AND METHODS

Lawn Restore Study #1

Research was conducted on a seeded block of established Kentucky Bluegrass at the Hancock Turfgrass Research Center in East Lansing, Michigan. Soil texture was a moderately fine sandy loam containing adequate amounts of potassium and phosphorus. Soil reaction was 6.0. Irrigation was supplied as necessary to prevent wilting. Fungicides and insecticides were applied as needed. Plots were mowed two to three times weekly at 5.0 cm.

Treatments were Ringer's Lawn Restore, Ringer's Lawn Keeper, urea and sulfur coated urea, applied four times yearly yielding rates of 2, 4 and 6 lbs. N/M/yr. Treatments were arranged in a randomized complete block design having 3 replications. Products were mechanically applied with a 122 cm. Gandy drop spreader calibrated by a weight to area ratio. Data are presented in Tables 1-5.

Lawn Restore Study #2

Turf cover at this site was established "Adelphi" Kentucky Bluegrass

Cultural practices were similar to those in study #1.

Treatments were Lawn Restore, Lawn Keeper and urea applied 1 time in August at rates of 0.5, 1 and 2 lbs. N/M. Arrangement was completely random with 3 replications. Data collection was similar to study #1 and is presented in Tables 6-8.

Rieke Lawn Restore Study

This study was designed as a randomized complete block having three replications. Turf type was established Kentucky Bluegrass sod. Treatments were Lawn Keeper, Lawn Restore and ammonium nitrate applied at rates of 4 lbs. N/M/yr. Visual quality scores were collected weekly. Data are presented in Table 9.

Nitrogen Carrier Study

This study, executed at the Hancock Turfgrass Research Center, was designed as a randomized complete block having 3 replications and 18 treatments (see table 10). Products were applied 1 time at a rate of 1.25 lbs. N/M/Yr, to established Kentucky Bluegrass. Visual quality scores were taken every 3 days from August 19 to September 2. Data are presented in Table 10.

Payne Lawn Restore Study

Arranged as a randomized complete block, this study compared Lawn Restore, Lawn Keeper and ammonium nitrate at rates of 4 lbs. N/M/Yr. Visual quality scores were taken at weekly intervals. Data re presented in Tables 11 and 12.

General Methods

Harvested clippings were oven dried at 60C for 24 hours and stored at 25C. Prior to analysis, clippings were made to pass a 40 mesh screen. Plant tissue nitrogen was determined via the micro-kjeldahl method for plant tissues. Values were collapsed over replications. Total chlorophyll concentrations were obtained colorimetrically. Linear regression techniques supplied values. All values were collapsed over replications. Linear correlations were derived from the least squares method. Mean separation was provided by Duncan's New Multiple Range Test (P=0.05).

RESULTS AND DISCUSSION

Because these were preliminary studies, results are not yet conclusive. Visual quality ratings, total plant tissue nitrogen, total chlorophyll concentration and clipping yield data values are presented in Tables 1-7 and 10-11. Correlation coefficients are presented in Tables 5 and 8.

Differences were found among treatments within all parameters. The parameters under investigation are influenced to a degree by common cultural practices and environmental factors. For example, mowing frequency, height of cut, supplemental irrigation, ambient temperature and precipitation rates give rise to physiological alterations within the turf plants not due to treatment effects. Future study replications will need stricter adherence to mowing frequency and desirable irrigation practices. Another major source of variation is in relation to mechanical (spreader) treatment application. Non-uniformity of product application should be solved by hand treatment application techniques.

Both Ringer products initially seem acceptable as turfgrass nitrogen carriers. Neither product is fully comparable to soluble carriers, as would be expected. The products are comparable to slow release carriers and show no differences in the initial release rate with activated sludge carriers. In comparing residual response, Lawn Keeper was slightly better than Lawn Restore.

Significant correlations were found for all parameter contrasts. This finding suggests a degree of validity in evaluation techniques and indicates reliability for parameters used to determine nitrogen response.

PRELIMINARY CONCLUSIONS

1) There are some differences between Lawn Restore and Lawn Keeper. For example, Lawn Keeper provided more plant tissue nitrogen.

2) Significant differences between the Ringer products and the soluble carriers are apparent.

3) Lawn Restore and Keeper are similar to sulfur coated urea on most variables, although some differences are noted.

4) Slight differences are seen between Lawn Keeper, Lawn Restore and the check at the low rate of application except in visual ratings.

5) Highly significant correlations were observed among all parameters under investigation.

6) There is no difference in the initial response rates between Lawn Keeper, Lawn Restore and Milorganite.

7) Lawn Restore is difficult to apply considering calibration of the spreader, wind drift and dustiness.

8) Both products show promise as turfgrass nitrogen carriers.

9) More research is needed to substantiate observations from this first year.

Table 1. Mean milligrams chlorophyll per gram fresh clippings. Lawn Restore Study #1 HTRC 1984.

Treatment	6/12	6/23	7/12	7/31
RX2#N/M/Yr[a]	7.25 CD[b]	10.12 D	6.43 D	6.74 C
RX4	8.15 BC	10.77 D	6.21 D	7.01 BC
RX6	8.29 BC	11.71 ABCD	7.09 BCD	7.33 ABC
LK2	8.09 BC	11.04 CD	7.15 BCD	7.70 ABC
LK4	7.73 BCD	11.62 ABCD	7.95 ABCD	7.37 ABC
LK6	8.41 BC	12.64 ABC	9.23 A	9.10 A
UR2	7.03 CD	11.14 BCD	6.60 CD	7.61 ABC
UR4	9.89 A	13.01 A	7.55 ABCD	7.06 BC
UR6	9.04 AB	12.57 AB	8.67 AB	8.62 AB
SCU2	7.04 CD	10.86 D	7.23 BCD	6.29 C
SCU4	7.78 BCD	10.15 D	7.27 BCD	6.72 C
SCU6	8.86 AB	11.47 ABCD	8.44 ABC	8.10 ABC
CK	6.44 D	8.51 E	6.46 D	6.38 C

[a]RX=Lawn Resore; LK=Lawn Keeper; UR=urea; SCU=sulfur coated urea.

[b]Means followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 1 (cont.)

Treatment	8/19	8/31	9/17
RX2#N/M/Yr	4.98 AB	6.92 B	7.20 A
RX4	5.47 AB	7.87 AB	7.93 A
RX6	6.58 AB	7.41 AB	7.83 A
LK2	5.53 AB	7.75 AB	7.39 A
LK4	5.88 AB	7.87 AB	7.22 A
LK6	6.36 AB	8.85 AB	8.75 A
UR2	6.01 AB	7.18 AB	7.11 A
UR4	5.60 AB	8.99 AB	7.98 A
UR6	5.61 AB	8.44 AB	8.71 A
SCU2	5.23 AB	8.62 AB	7.94 A
SCU4	5.16 AB	8.42 AB	8.63 A
SCU6	5.60 AB	7.30 AB	8.56 A
CK	4.90 B	7.09 AB	7.80 A

Table 2. Mean percentage plant tissue nitrogen. Lawn Restore Study #1 HTRC 1984.

Treatment	6/12	6/23	7/12	7/31
RX2#N/M/YR[a]	3.68 DE[b]	3.59 DE	3.03 IJ	3.15 H
RX4	3.70 DE	3.80 D	3.19 HI	3.44 G
RX6	3.96 BCD	4.35 C	3.61 DE	3.83 DE
LK2	3.83 CDE	3.81 D	3.33 FGH	3.38 G
LK4	3.96 BCD	3.81 D	3.74 CD	3.75 EF
LK6	4.24 AB	5.01 B	4.01 B	4.29 B
UR2	3.72 DE	4.31 C	3.50 EF	3.60 FG
UR4	4.28 A	5.08 B	3.87 BC	4.03 CD
UR6	4.24 AB	5.64 A	4.27 A	4.55 A
SCU2	3.65 E	3.80 D	3.24 GHI	3.41 G
SCU4	3.72 DE	3.87 D	3.43 FGH	3.61 EFG
SCU6	4.09 ABC	4.43 C	3.78 CD	4.17 BC
CK	3.57 E	3.40 E	2.89 J	2.97 H

[a]RX=Lawn Resore; LK=Lawn Keeper; UR=urea; SCU=sulfur coated urea.

[b]Means followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 2 (cont.)

Treatment	8/19	8/31	9/17
RX2#N/M/YR	3.93 CD	3.22 FG	2.96 F
RX4	3.85 D	3.37 EF	3.04 DEF
Rx6	4.27 ABC	3.49 CDE	3.23 BCD
LK2	3.86 D	3.36 EF	3.03 DEF
LK4	3.95 CD	3.46 DE	3.19 CDE
LK6	4.25 BC	3.66 B	3.28 ABC
UR2	3.88 D	3.35 EF	3.12 CDEF
UR4	4.21 CD	3.60 BCD	3.22 BCDE
UR6	4.60 A	3.94 A	3.44 A
SCU2	4.01 CD	3.24 FG	3.02 EF
SCU4	4.16 CD	3.57 BCD	3.22 BCDE
SCU6	4.55 AB	3.62 BC	3.40 AB
CK	3.52 E	3.12 G	2.98 F

Table 3. Mean visual quality ratings. Lawn Restore Study #1 HTRC 1984.
(9 = dark green; 1 = yellow)

Treatment	6/7	6/20	6/28	7/7	7/12	7/27	8/8
RX2 1bsN/M/YR[a]	7.0 BC[b]	6.8 DE	6.8 FG	7.0 GH	6.8 E	6.8 G	6.8 F
RX4	7.6 B	6.8 DE	7.3 CDEF	7.2 FGH	7.3 DE	7.5 DEF	7.5 DE
RX6	7.6 B	7.8 BC	7.6 BCD	8.0 CD	8.0 BC	8.0 C	7.8 CD
LK2	7.5 B	6.8 DE	7.2 DEF	7.2 FGH	7.5 CD	7.3 EF	7.2 EF
LK4	7.2 BC	7.3 CD	7.5 CDE	7.6 DE	8.0 BC	7.8 CD	7.6 CD
LK6	7.8 B	7.8 BC	7.8 ABC	8.5 B	8.5 AB	8.5 B	8.2 BC
UR2	7.6 B	7.3 CD	7.3 CDEF	7.5 EF	7.5 CD	7.6 CDE	7.8 CD
UR4	7.6 B	8.2 AB	8.2 AB	8.2 BC	8.5 AB	8.5 B	8.5 B
UR6	8.8 A	8.6 A	8.3 A	9.0 A	9.0 A	9.0 A	9.0 A
SCU2	7.2 B	6.8 DE	7.0 EFG	6.8 HI	6.8 E	7.2 FG	7.0 F
SCU4	6.8 B	7.0 DE	7.5 CDE	7.3 EFG	7.3 DE	7.5 DEF	8.0 C
SCU6	7.2 B	7.8 BC	7.6 BCD	8.0 CD	7.8 CD	8.0 C	8.2 BC
CK	6.2 C	6.3 E	6.5 G	6.5 I	6.0 F	6.0 H	6.2 G

[a]RX=Lawn Resore; LK=Lawn Keeper; UR=urea; SCU=sulfur coated urea.

[b]Means followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 3 (cont.)

Treatment	8/19	8/28	9/8	9/17	9/24
RX2	7.3 D	6.6 FG	7.0 G	7.2 B	6.6 F
RX4	7.6 BCD	7.0 EFG	7.6 DEF	7.5 AB	6.8 EF
RX6	7.8 BCD	7.5 CDE	7.8 CDE	7.6 AB	7.5 CD
LK2	7.5 CD	6.8 EFHG	7.3 EFG	7.3 AB	7.2 DE
LK4	7.6 BCD	7.3 DEF	8.0 BCD	7.6 AB	7.5 CD
LK6	8.3 AB	7.8 BCD	8.3 BC	7.8 AB	7.8 BC
UR2	7.6 BCD	7.5 CDE	7.5 DEFG	7.3 AB	8.2 B
UR4	8.2 BC	8.2 ABC	8.5 AB	8.0 A	8.6 A
UR6	8.8 A	8.8 A	9.0 A	8.0 A	9.0 A
SCU2	7.5 CD	7.0 EFG	7.5 DEFG	7.3 AB	7.5 CD
SCU4	8.3 AB	7.8 BCD	7.5 DEFG	7.6 AB	7.8 BC
SCU6	8.2 BC	8.3 AB	8.5 AB	8.0 A	7.6 BCD
CK	6.5 E	6.5 G	7.2 FG	7.6 AB	6.2 G

Table 4. Mean clipping yield in grams/plot. Lawn Restore Study #1 HTRC 1984.

Treatment	6/12	6/23	7/12	7/31
RX2#N/M/YR[a]	53.46 D[b]	53.83 A	36.98 D	28.38 EF
RX4	52.92 D	65.56 A	55.16 D	44.24 CDE
RX6	88.12 ABCD	105.05 A	85.08 C	61.53 B
LK2	66.99 CD	70.12 A	50.42 D	41.19 DE
LK4	78.27 BCD	81.05 A	96.00 BC	71.55 B
LK6	112.57 AB	117.59 A	137.02 A	92.42 A
UR2	63.40 CD	43.97 A	51.67 D	57.94 BC
UR4	88.39 ABCD	104.24 A	114.35 AB	71.92 B
UR6	128.15 A	88.93 A	140.43 A	97.34 A
SCU2	68.78 CD	52.12 A	36.80 D	34.21 E
SCU4	49.79 D	53.64 A	48.63 D	56.51 BCD
SCU6	97.35 ABC	100.30 A	102.60 BC	66.27 B
CK	64.57 CD	55.43 A	29.82 D	16.38 F

[a]RX=Lawn Resore; LK=Lawn Keeper; UR=urea; SCU=sulfur coated urea.

[b]Means followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 4 (cont.)

Treatment	8/19	8/31	9/17
RX2#N/M/YR	62.96 DE	37.97 EF	26.51 FG
RX4	87.49 ABC	48.18 DE	38.78 DEF
RX6	86.69 ABC	58.63 CD	38.51 DEF
LK2	75.49 CDE	44.33 DEF	31.16 EFG
LK4	95.64 ABC	58.66 CD	47.19 BCD
LK6	94.66 ABC	77.91 AB	53.29 ABC
UR2	73.70 CDE	49.88 DE	39.31 DEF
UR4	104.06 A	66.09 BC	46.39 BCD
UR6	102.00 AB	85.79 A	59.82 A
SCU2	77.73 BCD	45.23 DEF	34.39 DEFG
SCU4	97.70 ABC	57.13 CD	43.34 CDE
SCU6	87.67 ABC	78.81 AB	58.21 AB
CK	52.66 E	31.25 F	24.54 G

Means followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 5. Coefficients of linear correlation comparing parameter means. Lawn Restore Study #1 HTRC 1984.

Contrast	6/12	6/23	7/12	7/31	8/19	8/31	9/17	X	SD
CHL. VS. %N	.88**	.87**	.86**	.81**	.40*	.54**	.69**	.72	.19
CHL. VS. CLIP. WT.	.62**	.75**	.87**	.82**	.46*	.50**	.66**	.67	.16
CHL. VS. VIS. RAT.	.62**	.89**	.66**	.73**	.40*	.49**	.72**	.64	.16
%N VS. CLIP. WT.	.87**	.66**	.95**	.96**	.72**	.95**	.95**	.87	.13
%N VS. VIS. RAT.	.67**	.95**	.96**	.95**	.90**	.94**	.84**	.89	.10
CLIP. WT. VS. VI. RAT.	.69**	.75**	.93**	.95**	.88**	.93**	.80**	.85	.10

** Denotes significance at P = 0.01
* Denotes significance at P = 0.05

CHL = Mean chlorophyll in mg/g clippings
%N = Mean percentage nitrogen plant tissue
CLIP. WT. = Mean clipping weight in grams/plot
VIS. RAT. = Mean visual quality scores

Table 6. Mean visual quality ratings. Lawn Restore Study #2 HTRC 1984. (9 = dark green)

Treatment	Rate	8/20	8/28	9/8	9/17	9/25
	lbs N/M					
1) Lawn Restore	0.5	7.0 C[a]	7.2 E	6.5 DE	7.0 E	6.5 D
2) Lawn Restore	1.0	8.2 ABC	7.8 CD	7.0 DE	7.3 DE	6.8 CD
3) Lawn Restore	2.0	8.3 AB	8.3 BC	7.2 CDE	8.2 BC	7.6 BC
4) Lawn Keeper	0.5	7.3 BC	7.2 E	6.5 DE	6.8 E	6.3 D
5) Lawn Keeper	1.0	7.8 ABC	7.3 DE	6,4 DE	7.3 DE	6.8 CD
6) Lawn Keeper	2.0	7.8 ABC	7.8 CD	7.5 BCD	7.8 CD	8.0 AB
7) Urea	0.5	8.8 A	8.2 C	8.2 ABC	8.2 BC	7.8 B
8) Urea	1.0	9.0 A	8.8 AB	8.3 AB	8.6 AB	8.5 AB
9) Urea	2.0	9.0 A	9.0 A	9.0 A	9.0 A	8.8 A
10) Check	0	7.5 BC	7.0 E	6.2 E	7.2 DE	6.5 D

[a]Means within columns followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 7. Mean percentage plant tissue nitrogen and mean chlorophyll concentration in mg/g of plant tissue. Lawn Restore Study #2 HTRC 1984.

Treatment	Rate	9/17		9/30	
		%N	mg/g*	%N	mg/g*
	lbs N/M				
1) Lawn Restore	0.5	3.5 C[a]	7.9 AB	3.4 C	7.9 B
2) Lawn Restore	1.0	3.6 BC	7.6 B	3.6 BC	8.4 B
3) Lawn Restore	2.0	3.8 BC	8.9 AB	3.8 BC	9.3 AB
4) Lawn Keeper	0.5	3.6 C	7.5 B	3.7 BC	8.9 AB
5) Lawn Keeper	1.0	3.6 BC	8.0 AB	3.7 BC	9.1 AB
6) Lawn Keeper	2.0	3.7 BC	8.6 AB	3.8 B	9.4 AB
7) Urea	0.5	3.7 BC	9.1 AB	3.8 B	8.6 AB
8) Urea	1.0	4.0 B	9.4 AB	3.8 B	9.2 AB
9) Urea	2.0	4.5 A	10.2 A	4.2 A	9.9 A
10) Urea	0.0	3.4 C	7.9 AB	3.5 BC	8.4 B

[a]Means within columns followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 8. Coefficients of linear correlation. Lawn Restore Study #2. HTRC 1984.

Contrast	9/17	9/30	X	S.D.
CHL. VS. %N	.91**	.93**	.92	.01
CHL. VS. VIS. RATE.	.97**	.75**	.86	.16
%N VS. VIS. RATE.	.88**	.80**	.84	.06

** Denotes Significance at P=0.01

CHL. = Mean chlorophyll in mg/g clippings
%N = Mean percentage nitrogen plant tissue
VIS. RATE = Mean visual quality scores

Table 9. Mean visual quality ratings. Lawn Restore Study, Rieke Lawn, 1984. (9 = dark green)

Treatment	5/19	5/22	5/31	6/9	6/28	7/5
RX4#N/M/YR[a]	7.2 C[b]	6.2 C	6.6 C	6.2 D	6.8 A	6.6 C
RX2+AM NIT2	8.2 B	7.3 B	7.2 BC	7.2 BC	7.3 A	8.0 AB
LK2+AM NIT2	8.0 B	7.3 B	7.7 AB	8.0 B	8.0 A	8.3 A
AM NIT4	9.0 A	8.8 A	8.2 A	9.0 A	7.0 A	7.6 AB
LK4	6.2 D	6.2 C	7.2 BC	7.3 BC	7.7 A	8.2 A
RX2+LK2	6.3 D	6.0 C	6.8 C	6.8 CD	6.8 A	7.3 BC

[a]RX=Lawn Restore; LK=Lawn Keeper; AM NIT = ammonium nitrate.

[b]Means within columns followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 9 (cont.)

Treatment	7/16	7/27	8/12	8/27	9/8	9/24
RX4#N/M/YR	7.5 A	8.0 AB	8.3 A	7.8 B	8.0 A	7.8 AB
RX2+AM NIT2	7.7 A	8.2 AB	8.2 A	8.3 AB	7.8 A	7.7 AB
LK2+AM NIT2	8.0 A	8.3 A	8.5 A	8.2 AB	8.3 A	7.8 AB
AM NIT4	8.0 A	8.2 AB	8.5 A	8.7 A	8.7 A	8.5 A
LK4	8.0 A	8.2 AB	8.3 A	7.8 B	8.0 A	8.0 AB
RX2+LK2	7.7 A	7.7 B	8.3 A	7.8 B	8.0 A	8.2 AB

Means within columns followed by the same letters are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 10. Mean visual quality ratings. Nitrogen carrier study. HTRC 1984. (9 = dark green)

Formulation	8/21	8/23	8/25	8/27	8/29	8/31	9/2
Urea	8.5 AB	8.3 A	8.2 ABC	8.5 ABC	7.7 BC	7.8 AB	8.0 ABC
Ammonium Nitrate	8.5 AB	7.7 BC	8.2 ABC	8.5 ABC	7.2 CD	7.6 ABC	7.8 BCD
Lawn Restore	8.2 AB	6.8 D	7.2 EFG	7.8 DE	7.3 BC	7.7 ABC	7.2 EFG
Lawn Keeper	8.0 B	7.2 CD	7.2 EFG	8.0 CDE	7.5 BC	7.5 BC	6.8 F-I
Fish Brand	8.8 A	7.7 BC	8.2 ABC	8.5 ABC	8.0 AB	8.2 A	8.5 A
SuperNitro 26	8.3 AB	8.0 AB	8.0 BC	8.2 BCD	7.3 BC	7.3 BCD	7.5 CDE
Green Magic	8.3 AB	8.3 A	8.3 AB	9.0 A	8.0 AB	7.8 AB	8.3 AB
Strengthen/Restore	8.7 AB	8.5 A	8.7 A	8.8 A	8.3 A	8.2 A	8.3 AB
Sul. Coated Urea	8.3 AB	7.2 CD	7.3 DEF	7.5 EFG	7.2 CD	7.2 CDE	6.8 F-I
IBDU	8.3 AB	7.3 CD	7.2 EFG	7.2 FGH	6.3 E	6.8 DE	6.5 HI
Oxamide	8.0 B	7.3 CD	7.7 CDE	7.7 DEF	7.2 CD	7.3 BCD	7.0 E-H
Milorganite	8.3 AB	7.0 D	7.2 EFG	7.5 EFG	7.2 CD	7.3 BCD	7.2 EFG
Fluf	8.2 AB	7.7 BC	7.8 BCD	7.8 DE	7.2 CD	7.2 CDE	7.0 E-H
18-5-9	8.2 AB	8.0 AB	7.7 CDE	8.0 CDE	7.0 CD	7.3 BCD	7.3 DEF
Powder Blue	8.2 AB	7.2 CD	7.0 FG	6.8 H	6.5 DE	6.8 DE	6.7 GHI
Urea + Iron	8.3 AB	8.0 AB	8.0 BC	8.7 AB	7.5 BC	7.8 AB	8.2 AB
41-0-0	8.5 AB	8.0 AB	7.8 BCD	8.2 BCD	7.2 CD	7.3 BCD	7.5 CDE
Check	8.0 B	6.8 D	6.7 G	7.0 GH	6.5 DE	6.7 E	6.3 I

Means within columns followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 11. Mean visual quality ratings. Lawn Restore study, Payne lawn. 1984. (9 = dark green) N applied at 4 pounds per 1000 ft annually.

Treatment	5/22	5/31	6/20	6/18	7/7	7/16
A.N. 4#N/M[a]	8.8 A[b]	8.5 A	8.8 A	8.6 A	9.0 A	8.5 A
A.N. + RX	7.0 B	7.7 AB	8.5 A	8.3 A	8.5 B	8.2 A
RX	4.7 C	7.0 B	6.8 B	7.2 B	6.7 C	7.2 B

[a]A.N. = ammonium nitrate; RX = Lawn Restore

[b]Means within columns followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

Table 11 (cont.)

Treatment	7/27	8/12	8/25	9/24
A.N. 4#N/M	8.5 A	8.7 A	8.8 A	8.2 A
A.N. + RX	8.7 A	8.7 A	8.3 A	7.3 B
RX	7.3 B	7.5 B	7.0 B	7.2 B

Means within columns followed by the same letter are not significantly different by Duncan's New Multiple Range Test (P=0.05).

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