TURFGRASS SOILS RESEARCH REPORT - 1988

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NITROGEN FERTILIZER EVALUATIONS

Several nitrogen fertilizer evaluation studies were initiated in 1988. One was established on Challenger Kentucky bluegrass at the Hancock Turfgrass Research Center. Treatments shown in Table 1 were applied at the rate of 1 pound nitrogen per 1000 sq ft on July 8. Plot size was 4 feet by 12 feet with 3 replications.

Fertilizers were provided by the following companies: N-Serve--Triazon Corporation; Sustane--Sustane Corporation; CIL--Canadian Industries, Limited; Anderson's--The Andersons; Turf Restore and Green Restore--Ringer Corporation; IBDU--Estech; Milorganite--Milwaukee Sewerage Commission; Lesco--LESCO; 18-4-10--Lebanon Chemical.

Turf quality ratings shown in Table 1 indicate IBDU and N-Sure responded somewhat more slowly than some other materials 12 days after application. IBDU continued to respond more slowly than several other carriers 21 days after application (July 29) but by August 16 all materials resulted in excellent turf quality. No practical differences occurred during August. By late October IBDU and two of the CIL experimentals ranked highest while most other materials performed well.

Clipping weights were taken in late July from this study on Challenger Kentucky bluegrass (Table 2) which demonstrated some differences in growth responses but there was enough variability to reduce the significance of differences which occurred. By late August all treatments gave similar clipping weights indicating there was little difference among treatments. This was consistent with the observations on turf quality ratings in Table 1.

Another nitrogen fertilizer evaluation study was established on two perennial ryegrasses at the Hancock Turfgrass Research Center. Treatments outlined in Table 3 were applied July 5. Plot size was 4 feet by 12 feet with 3 replications. Turf quality ratings are given in Table 3. At the .5 pound rate of nitrogen application, all materials demonstrated a relatively quick response except Milorganite, Turf Restore and Ward fertilizer. At the 1 pound rate of application, IBDU-coarse was a bit slower to respond than others which is to be expected. These plots were watered to prevent wilt but very little rainfall occurred during this study, especially over the first few weeks. Several carriers demonstrated good longevity of response in August but by October essentially all differences had disappeared.

In Table 4 clipping weights taken from the study on perennial ryegrass are given. While there are few significant differences among clipping weights for a given rate of nitrogen application, several materials resulted in longer term effects.

A third nitrogen fertilizer study was established on a Penncross creeping bentgrass putting green at the Hancock Turfgrass Research Center. Treatments as outlined in Table 5 were applied on June 21 and August 21. Plot size was 4

Table 1. 1988 Challenger Kentucky Bluegrass Nitrogen Carrier Study Quality Ratings. Hancock Turfgrass Research Center. Treatments applied as 1 pound of N per 1000 square feet on July 8, 1988. Numbers are averages of three replications.

Treatment	Date of Rating (1988)y				
	7/20	7/29	8/16	8/30	10/26
N - Sure	7.7c*	8.0abc	8.3ab	9.0a	7.3abcd
Sustane-Medium	9.0a	8.3ab	8.0ab	9.0a	7.3abcd
Sustane-Fine	8.3abc	7.7bc	8.3ab	9.0a	6.7bcd
Sustane-Superfine	8.3abc	7.7bc	8.0ab	9.0a	6.0d
CIL Experimental 1	9.0a	9.0a	9.0a	9.0a	7.7abc
CIL Experimental 2	8.7ab	8.7ab	8.3ab	8.7a	8.7a
CIL Experimental 3	9.0a	9.0a	8.7ab	8.7a	7.7abc
Pursell-Sulfur Coated Urea	8.0bc	8.0abc	8.3ab	9.0a	7.7abc
CIL Experimental 4	8.0bc	8.0abc	9.0a	9.0a	8.7a
CIL Sulfur Coated Urea	9.0a	8.3ab	8.7ab	9.0a	8.0ab
Andersons 9-3-6	9.0a	8.7ab	8.0ab	9.0a	6.7bcd
Andersons 20-0-0	9.0a	8.7ab	7.7b	8.7a	6.3cd
Turf Restore	8.3abc	8.7ab	8.7ab	9.0a	7.7abc
IBDU-Coarse	7.7c	7.0c	8.0ab	9.0a	8.3a
Milorganite	8.3abc	8.3ab	8.7ab	9.0a	8.0ab

* - numbers followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range Test.
y - 9 = excellent 1 = poor

Table 2. 1988 Challenger Kentucky Bluegrass Nitrogen Carrier Study Clipping Yields. Hancock Turfgrass Research Center. Treatments applied as 1 pound N per 1000 square feet on July 8, 1988. Numbers are averages of three replications.

Treatment	Date of Clipping Collection(1988)y	
	7/29	8/30
N-Sure	10.69ab*	16.27a
Sustane-Medium	11.41ab	14.88a
Sustane-Fine	9.15b	14.86a
Sustane-Superfine	8.39b	13.96a
CIL Experimental 1	12.82ab	17.66a
CIL Experimental 2	15.23a	16.84a
CIL Experimental 3	12.55ab	14.02a
Pursell-Sulfur Coated Urea	8.68b	14.29a
CIL Experimental 4	9.00b	16.29a
CIL Sulfur Coated Urea	11.46ab	14.51a
Andersons 9-3-6	9.78ab	15.02a
Andersons 20-0-0	12.29ab	15.57a
Turf Restore	11.83ab	14.55a
IBDU-Coarse	7.67b	15.08a
Milorganite	13.08ab	15.31a

* Means followed by the same letter are not significantly different at the 5% level using Duncan's New Multiple Range Test.

y Clipping yields expressed as grams per square meter.

Table 3. 1988 Effects of fertilizer treatments on perennial ryegrass quality ratings. Quality rating scale 9 = best. Hancock Turfgrass Research Center.

Treatment					
Material	Rate (N/M)	Quality Ratings			
	7/12	7/29	8/15	10/26	
Sustane Medium	.5	7.0abcd*	6.7cd	6.3bc	6.2abc
Sustane Fine	.5	7.3abcd	7.3abcd	7.0abc	5.3c
Sustane Superfine	.5	6.3cd	7.0bcd	6.7abc	6.0abc
Milorganite	.5	6.0d	7.3abcd	6.7abc	5.3c
Turf Restore	.5	6.0d	7.0bcd	6.7abc	6.2abc
CIL Experimental 1	.5	6.6bcd	7.4abcd	6.7abc	5.7bc
CIL Experimental 2	.5	7.7abc	8.0abc	7.7ab	6.3ab
CIL Experimental 3	.5	8.0ab	7.7abc	7.3abc	6.2abc
Pursell-Sulfur Coated Urea	.5	6.7bcd	7.3abcd	7.0abc	6.3ab
CIL Experimental 4	.5	6.7bcd	7.3abcd	7.3abc	6.3ab
CIL Sulfur Coated Urea	.5	7.0abcd	7.3abcd	6.7abc	5.8abc
Andersons 9-3-6	.5	7.3abcd	7.3abcd	6.7abc	6.5ab
Andersons 20-0-0	.5	7.3abcd	7.3abcd	7.3abc	5.8abc
N-Sure	.5	6.3cd	7.3abcd	7.3abc	6.0abc
Sustane Medium	1.0	8.0ab	7.3abcd	7.0abc	5.8abc
Sustane Fine	1.0	7.7abc	7.3abcd	6.7abc	6.2abc
Sustane Superfine	1.0	7.7bcd	7.7abc	7.3abc	6.2abc
Milorganite	1.0	6.7bcd	8.0abc	7.3abc	6.5ab
Turf Restore	1.0	7.3abcd	8.0abc	7.3abc	6.3ab
CIL Experimental 1	1.0	8.3a	8.3ab	7.7ab	6.5ab
CIL Experimental 2	1.0	8.3a	8.3ab	7.7ab	6.7a
CIL Experimental 3	1.0	8.4a	8.5a	8.0a	6.5ab
Pursell Sulfur Coated Urea	1.0	6.9abcd	8.1abc	8.0a	6.7a
CIL Experimental 4	1.0	6.3abcd	7.7abc	8.0a	6.5ab
CIL Sulfur Coated Urea	1.0	7.3abcd	7.3abcd	7.0abc	6.0abc
Andersons 9-3-6	1.0	8.0ab	7.3abcd	6.7abc	5.8abc
Andersons 20-0-0	1.0	8.3a	7.7abc	6.7abc	6.0abc
IBDU - Coarse	1.0	6.3cd	8.3ab	7.3abc	6.2abc
IBDU - Fine	1.0	6.7bcd	7.3abcd	7.0abc	5.8abc
IBDU - Sprayable	1.0	7.0abcd	7.7abc	6.7abc	6.3ab
N-Sure	1.0	8.0ab	8.3ab	7.3abc	6.2abc
Urea	1.0	7.7abc	7.7abc	6.7abc	6.3ab
Ward	.5	6.3cd	6.0d	6.3bc	6.2abc
Ward	1.0	7.3abcd	7.0bcd	6.0c	5.8abc
Check	0.0	6.3cd	7.0bcd	6.3bc	6.3ab

* - Means followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range Test.

Table 4. 1988 Effects of fertilizer treatments on perennial ryegrass clipping weights in grams per square meter. Hancock Turfgrass Research Center.

Treatment Material	Rate (N/M)	Clipping Yield 8/1	Clipping Yield 8/25
Sustane Medium	.5	2.45abcde*	1.36cdefg
Sustane Fine	.5	2.19abcde	1.20defg
Sustane Superfine	.5	1.96abcde	1.40cdefg
Milorganite	.5	2.12abcde	1.17defg
Turfrestore	.5	1.85bcde	1.38cdefg
CIL Experimental 1	.5	2.07abcde	1.09defg
CIL Experimental 2	.5	2.40abcde	1.58abcdefg
CIL Experiental 3	.5	2.53abcde	1.96abcde
Pursell-Sulfur Coated Urea	.5	2.18abcde	1.49bcdefg
CIL Experimental 4	.5	2.63abcde	1.69abcdef
CIL Sulfur Coated Urea	.5	3.08ab	1.99abcd
Andersons 9-3-6	.5	2.97abc	1.84abcdef
Andersons 20-0-0	.5	2.15abcde	1.74abcdef
N-Sure	.5	2.38abcde	1.47bcdefg
Sustane Medium	1.0	2.93abcd	1.61abcdefg
Sustane Fine	1.0	2.28abcde	1.61abcdefg
Sustane Superfine	1.0	2.06abcde	1.42cdefg
Milorganite	1.0	2.74abcde	2.42a
Turf Restore	1.0	2.61abcde	2.01abcd
CIL Experimental 1	1.0	2.51abcde	1.69abcdef
CIL Experimental 2	1.0	3.14ab	1.90abcdef
CIL Experimental 3	1.0	2.92abcde	2.26abc
Pursell-Sulfur Coated Urea	1.0	2.80abcde	1.56abcdefg
CIL Experimental 4	1.0	2.62abcde	1.31defg
CIL Sulfur Coated Urea	1.0	2.76abcde	1.65abcdef
Andersons 9-3-6	1.0	2.46abcde	1.63abcdef
Andersons 20-0-0	1.0	2.17abcde	1.61abcdefg
IBDU - Coarse	1.0	3.48a	2.34ab
IBDU - Fine	1.0	2.68abcde	2.23abc
IBDU - Sprayable	1.0	2.35abcde	1.34cdefg
N-Sure	1.0	3.01abc	2.00abcd
Urea	1.0	2.36abcde	1.82abcdef
Ward	.5	1.36e	1.07efg
Ward	1.0	1.40de	1.00fg
Check	0.0	1.51cde	0.71g

* - Means followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range Test.

Table 5. 1988 fertilizer quality effects on a Penncross bentgrass green. Treatments applied June 21 and August 11, 1988. 9 = highest quality. Hancock Turfgrass Research Center.

Treatment	Rate (lbs N/M)	Date of Rating (1988) 6/24	6/30	7/8	7/26	8/11	8/23	10/26
Milorganite	1	4.5hji*	4.0k	6.3bcd	6.7cd	6.3cd	5.3f	5.8bcd
Sustane-Medium	1	6.7bc	4.8ij	6.0cd	6.3cd	6.0d	6.0ef	4.3e
Sustane-Fine	1	5.7ef	5.0hi	5.7d	6.0d	6.0d	5.7ef	4.7de
Sustane-Superfine	1	6.2cde	4.8ij	6.0cd	6.3cd	6.3cd	6.3de	4.3e
IBDU-fine	1	4.5hji	6.2efg	7.7ab	8.7ab	7.3ab	8.0b	7.0ab
IBDU-sprayable	1	4.7hi	5.7gh	7.7ab	7.3bcd	6.3cd	8.0b	6.8ab
Lesco-SCU-Elite	1	6.0def	5.8fg	6.7bcd	7.0cd	6.7bcd	7.0cd	6.0bcd
Andersons 9-3-6	1	5.7ef	5.0hi	6.0cd	6.0d	6.0d	6.3de	5.2cde
N-Sure 28%	1	4.0j	5.7gh	6.3bcd	6.3cd	6.0d	6.3de	5.0cde
Milorganite	2	5.0gh	6.5def	7.7ab	8.7ab	7.8a	7.8bc	7.0ab
Sustane-Medium	2	8.0a	7.7ab	6.7bcd	6.7cd	6.7bcd	8.0b	6.3bc
Sustane-Fine	2	7.2b	7.2bcd	6.7bcd	6.3cd	6.7bcd	7.8bc	6.0bcd
Sustane-Superfine	2	7.2b	6.7cde	7.0bcd	7.3bcd	6.7bcd	7.7bc	5.7bcde
Green Restore	1	4.3ij	4.2jk	6.7bcd	7.0cd	7.0abc	7.0cd	5.7bcde
Green Restore	2	4.5hji	7.7ab	8.3a	9.0a	7.5ab	9.0a	8.0a
Andersons 9-3-6	2	6.3cd	7.3abc	7.3abc	7.7abc	7.0abc	8.0b	6.7b
N-Serve 28%	2	4.0j	8.0a	8.3a	7.7abc	7.0abc	7.8bc	6.0bcd
18-4-10	1	5.5fg	4.5ijk	5.7d	6.0d	6.0d	5.7ef	4.3e

* - Means followed by the same letter are not significantly different at the 1% level using Duncan's Multiple Range Test.

feet by 6 feet with 3 replications. Sustane, an organic fertilizer produced from turkey waste, gives a quicker response than Milorganite but the length of response was of shorter duration than Milorganite. IBDU responded slowly as expected but provided excellent longevity.

The study outlined in Table 6 was initiated on July 6. Turf quality ratings for the Kentucky bluegrass turf indicated considerable variability in the data caused reduced significance in the data taken July 19 and August 5. On August 15 and September 26 turf quality reflected the effect of nitrogen rate with few differences caused by carrier. Roots were washed from soil samples taken in September, then dried and weighed. Samples were also taken in September to determine the amount of thatch in each plot. Data are shown in Table 7. There was a tendency for lower root weights with higher rate of nitrogen application and with higher rate of potassium application but differences were not consistent. No differences occurred in the amount of thatch as a result of these treatments.

WETTING AGENT EVALUATIONS

Several wetting agent treatments were applied to a Penncross creeping bentgrass putting green at the Hancock Turfgrass Research Center to evaluate effects on localized dry spots, dew and frost formation and phototoxicity. Plot size was 4 feet by 6 feet. Plots were not irrigated to determine the potential for phytotoxicity. Data in Table 8 indicate Hydroflo L (liquid) and LescoWet were more phytotoxic than AquaGro liquid. While some minor injury was detected with the higher rate of Hydro Wet this proved the safest of the liquid materials evaluated. The Hydroflo and AquaGro granular materials resulted in no injury to the turf. LescoWet II was considerably less injurious than LescoWet. In terms of dew reduction the order of effectiveness was Hydroflo L > LescoWet > AquaGro > HydroWet = LescoWet II > AquaGro granular = Hydroflo G.

A second wetting agent study was begun October 6 to evaluate wetting agent effects on formation on dew and frost. Data are given in Tables 9 and 10 for dew and frost ratings, respectively. Generally, Hydroflo was most effective in reducing dew formations followed by LescoWet and AquaGro. Other materials reduced dew compared to the check on some dates. Granular wetting agents responded slowly and over the month of this study did not prove of longer effect than liquid applications. Effects of wetting agents on frost formation (Table 10) were less clearly defined although good differences occurred on the October 20 rating date.

One of the objectives of these studies was to evaluate the effect of wetting agents on preventative or curative effects on localized dry spots on putting greens on sandy soils. Although treatments were applied, no significant development of localized dry spot developed adequately to permit separation of treatment effects. A modest problem with localized dry spot began to develop in mid-July but rains promptly corrected the condition.

GREENS TOPDRESSING STUDIES

The long term sand topdressing study begun in 1982 was continued through 1988. Treatments shown in Table 11 give the quality ratings taken during the year. As observed in the past the higher nitrogen (6 pounds N per 1000 sq ft

Table 6. 1988 Kentucky Bluegrass fertility study quality ratings. Hancock Turfgrass Research Center. Treatments applied in equal amounts July 6, July 25, August 18 and September 26, 1988. Averages for three replications.

Treatment	Rate	Rate	Date of Rating (1988)y			
	Lbs N/M/YR)	(K2O/M/YR)	7/19	8/5	8/15	9/26
Urea	2.0	0	8.3a*	8.0a	7.0b	7.0d
Urea	4.0	0	9.0a	9.0a	8.3a	8.7ab
Andersons 9-3-6	1.8	0	6.7a	7.0a	6.0c	7.2d
Andersons 9-3-6	3.6	0	8.3a	8.0a	6.3bc	8.3ab
Urea/KCl	4.0	1	7.3a	7.0a	8.7a	8.3ab
Urea/KCl	4.0	2	8.3a	8.3a	8.3a	8.5ab
Urea/K2SO4	4.0	1	6.7a	6.3a	8.7a	8.8a
Urea/K2SO4	4.0	2	8.0a	7.7a	8.0a	8.5ab
Andersons 20-0-0	2.0	0	8.0a	8.0a	7.0b	7.0d
Andersons 20-0-0	4.0	0	6.7a	6.3a	8.0a	8.0bc
Sustane-Medium	4.0	0	6.7a	7.0a	7.0b	7.5cd

* - Means followed by the same letter are not significantly different at the 5% level using Duncan's New Multiple Range Test.

y - 9 = excellent 1 = poor

Table 7. 1988 Kentucky bluegrass fertilizer effects on root and thatch weights. Root weights expressed as kilograms per cubic meter of soil. Thatch weights expressed as kilograms per square meter. Fertilizer treatments were applied in equal amounts on July 6. July 25, August 18 and September 26, 1988. Hancock Turfgrass Research Center.

Treatment	Rate	Rate	September 1988		
	(Lbs N/M/YR)	(K2O/M/YR)	Root Weights 0-2"	Root Weights 2-8"	Thatch Weights
Urea	2.0	0	2.69ab*	0.26ab	2.24a
Urea	4.0	0	2.19abc	0.25ab	2.12a
Andersons 9-3-6	1.8	0	2.64ab	0.31a	2.22a
Andersons 9-3-6	3.6	0	2.42abc	0.24ab	2.00a
Urea/KCl	4.0	1	2.15bc	0.23ab	2.05a
Urea/KCl	4.0	2	1.87bc	0.31a	1.76a
Urea/K2SO4	4.0	1	1.76c	0.22ab	2.13a
Urea/K2SO4	4.0	2	1.88bc	0.14b	2.15a
Andersons 20-0-0	2.0	0	3.04a	0.32a	2.00a
Andersons 20-0-0	4.0	0	2.42abc	0.34a	2.38a
Sustane-Med	4.0	0	2.51abc	0.30a	2.12a

* - Means followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range test.