

Turfgrass Soil Management Research: 1989

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Nitrogen Carrier Evaluations

Several nitrogen carrier evaluation studies were conducted at the Hancock Turfgrass Research Center in 1989. Nitrogen carriers which were evaluated included the following. Sustane is a turkey manure natural organic fertilizer which is available in several particle size ranges (from the Sustane Corporation). The PCUs are experimental plastic coated urea fertilizers from Canadian Industries Limited (CIL). The sulfur coated ureas (labelled SCU in the tables) are also from CIL. The Andersons fertilizers are natural organic products from The Andersons. The Sierra fertilizers and Agriform are plastic coated products from the Sierra Co. Turf Restore and Greens Restore are natural organic based products from Ringers. Scotts fertilizers are methylene urea carriers as is the Nor-Am fertilizer. N-Sure is a liquid product containing triazones and urea from the Arcadian Corporation. Nitro 26 is a liquid fertilizer containing various methylene ureas from Growth Products. IBDU was provided by Estech, ureaformaldehyde by Nor-Am, Milorganite by the Milwaukee Sewerage Commission, 18-4-10 by the Lebanon Co., LESCO Elite by LESCO, Iron-S by Scotts, GS-1 by Emerald Isle, and Ferromec by PBI Gordon.

The first study was conducted on Challenger Kentucky bluegrass. Plot size was 4 feet by 12 feet with 3 replications. One pound of N was applied per 1000 sq ft on June 25, 1989. Turfgrass quality ratings were taken on seven dates during the growing season (Table 1). Clipping weights were collected on three dates from an area 22 inches wide by 10 feet, 2 inches long on each plot. Clippings were dried and weighed (Table 2).

Challenger Kentucky bluegrass has an inherently dark green color. As a result of this and the fact that most of the carriers performed well, there were few meaningful differences noted among carriers through much of the study (Table 1). Five months after application in November, the plastic coated fertilizers from Sierra and CIL seemed to have a little better residual effect than other carriers although all plots had lost significant color that late in the year.

Clipping weight data (Table 2) were somewhat variable so consistent conclusions were not evident. Some necrotic ring spot disease appeared randomly in the plot area in September.

A second nitrogen carrier study was established July 14, 1989 on Palmer and Citation II perennial ryegrasses. Nitrogen was applied at 1 or 3 lbs per 1000 sq ft. Plot size was 4 feet by 12 feet with 3 replications. Quality ratings were taken on six dates (Table 3) and clipping weights determined on two dates (Table 4).

One week after application (July 21) several products performed well including, among others, N-Sure, Nitro 26, Scotts 38-0-0, Lawn Restore, Andersons 9-3-6, Sustane and PCUI. Three weeks after application (August 4) good performers included Lawn Restore, Andersons 9-3-6, IBDU, Scotts 35-0-0,

Table 1. Effects of nitrogen on turfgrass quality ratings of Challenger Kentucky bluegrass. Hancock Turfgrass Research Center. Nitrogen applied at 1 lb. N per 1000 sq. ft. on June 26, 1989. Averages of 3 replications.

Carrier	Turfgrass Quality Rating (9 = Ideal)									
	7/10	7/18	8/3	8/15	9/19	10/3	11/26	average		
Sustane Med 5-2-4	8.2a*	7.7a	7.3ab	6.2 c	6.5 c	6.8 c	5.5abc	6.8 c		
Sustane Fine 5-2-4	8.3a	7.7ab	6.7 b	6.2 c	7.0abc	7.1 bc	5.5abc	7.0 bc		
CIL PCU1 44.6%	8.5a	7.7ab	7.7a	6.5 c	7.0abc	7.2 bc	5.3 bc	7.1 bc		
CIL PCU 2 44.2%	8.5a	7.7ab	8.0a	6.8abc	7.3abc	7.7ab	5.5abc	7.4ab		
CIL SCU 32%	8.5a	8.0a	7.5ab	6.8abc	7.0abc	7.3 bc	6.2ab	7.3ab		
CIL SCU 37%	8.5a	7.2a	7.7a	6.7 bc	6.8abc	7.0 bc	5.5abc	7.0 bc		
Anderson 9-3-6	8.5a	7.5ab	7.3ab	6.7 bc	7.2abc	7.5abc	5.7abc	7.2abc		
Anderson 10-2-4	8.2a	7.5ab	7.2ab	6.5 c	7.2abc	7.2 bc	5.7abc	7.0 bc		
Sierra 34-0-7	8.3a	7.7ab	8.0a	7.3a	7.7ab	7.5abc	6.3a	7.6a		
Sierra 25-0-0	8.3a	7.5ab	7.8a	7.2ab	7.8a	8.2a	6.2ab	7.6a		
Scott's 38-0-0	8.5a	8.0a	7.7a	6.8abc	6.7 bc	7.0 bc	5.3 bc	7.3abc		
Turf Restore 10-3-4	8.2a	7.5ab	7.7a	6.8abc	7.0abc	6.9 bc	5.2 c	7.0 bc		
Nor-Am Methylene Urea	8.3a	7.3ab	7.3ab	6.3 c	7.2abc	7.5abc	5.7abc	7.1 bc		
N-Sure 28%	8.5a	7.8ab	7.7a	6.7 bc	7.0abc	7.3 bc	5.5abc	7.4ab		
Urea 46%	8.5a	7.0 b	7.7a	6.8abc	7.5abc	7.3 bc	5.8abc	7.2abc		

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

Table 2. Effect of nitrogen carriers on dry clipping weights of Challenger Kentucky bluegrass. Hancock Turfgrass Research Center. Nitrogen applied at 1 lb. N per 1000 sq. ft. on June 26,1989. Averages of 3 replications.

Carrier	Clipping weight, grams meter <sup>-2</sup>		
	7/28	8/23	9/26
Sustane Med 5-2-4	22.8a*	9.7 cd	32.5abc
Sustane Fine 5-2-4	31.8a	10.4 bcd	29.1 bc
CIL PCU1 44.6%	43.8a	19.0a	41.2abc
CIL PCU2 44.2%	30.6a	20.8a	35.2abc
CIL SCU 32%	46.6a	13.9abcd	40.6abc
CIL PCU 37%	30.6a	22.2a	42.5ab
Anderson 9-3-6	18.6a	13.9abcd	45.3a
Anderson 10-2-4	50.7a	12.7abcd	34.8abc
Sierra 34-0-7	31.1a	13.4abcd	33.6abc
Sierra 25-0-0	50.3a	19.6ab	32.4abc
Scott's 38-0-0	43.7a	13.2abcd	34.0abc
Turf Restore 10-3-4	30.8a	8.6 d	29.8 bc
Nor-Am Methylene Urea 40%	28.9a	15.2abcd	27.8 c
N-Sure 28%	41.4a	19.6ab	40.2abc
Urea 46%	50.7a	17.3abcd	39.1abc

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

Table 3. Effect of nitrogen carrier and rate on turfgrass quality rating of perennial ryegrass. Hancock Turfgrass Research Center. Nitrogen applied at 1 or 3 lbs per 1000 sq. ft. on July 14, 1989. Averages of 3 replications.

Treatment	Rate		Turfgrass Quality Rating ( 9 = Ideal)					
	(lbs	N/M)	7/21	8/4	8/15	9/14	10/3	11/26
CIL PCU1 44%	1		5.5ghi*	5.2ghi	6.0efghi	6.5hijkl	6.7cdef	5.8cd
CIL PCU1 44%	3		6.7abcd	7.2abcd	7.3ab	7.2defghij	6.7cdef	6.0bcd
CIL PCU2 44.2%	1		5.5ghi	5.5ghi	6.2defg	7.2defghij	6.7cdef	5.7d
CIL PCU2 44.2%	3		5.8efgh	6.8abcdef	7.3ab	9.0a	7.7ab	5.8cd
CIL SCU 32%	1		5.0ij	5.2ghi	5.2ijkl	7.2efghij	6.3def	5.8cd
CIL SCU 32%	3		5.8efgh	6.8abcdef	7.5a	8.5ab	7.3abc	6.2bcd
CIL SCU 37%	1		5.2hji	5.3ghi	6.0efghi	7.0efghijk	6.5cdef	6.0bcd
CIL SCU 37%	3		6.2defg	6.8abcdef	7.7a	8.2abcd	6.5cdef	6.0bcd
Sustane Medium	1		5.2hij	5.5ghi	5.3hijkl	5.8l	6.0f	5.8cd
Sustane Medium	3		6.5bcde	6.8abcdef	6.2defg	6.7ghijkl	6.2ef	5.7d
Sustane Fine	1		5.5ghi	5.5ghi	5.0jkl	6.3ijkl	6.2ef	5.8cd
Sustane Fine	3		6.5bcde	7.0abcde	6.5bcdef	6.8fghijkl	6.5cdef	5.8cd
Sustane Super Fine	1		5.5ghi	5.3ghi	5.2ijkl	6.3ijkl	6.0f	5.8cd
Sustane Super Fine	3		6.3cdef	6.3bcdefg	6.3cdefg	6.8fghijkl	6.2ef	5.8cd
Sierra 24-6-10	1		5.2hij	5.3ghi	4.7l	6.0kl	6.3def	6.0bcd
Sierra 24-6-10	3		6.5bcde	7.5ab	7.2abc	7.7bcdefg	7.0bcde	6.5b
Sierra 25-0-0	1		5.5ghi	5.0hi	5.3hijkl	6.8fghijkl	7.0bcde	6.0bcd
Sierra 25-0-0	3		6.3cdef	5.7fghi	6.5bcdef	8.0bcde	8.0a	7.2a
Agriform 34-0-7	1		5.2hij	5.3ghi	5.8fghij	7.0efghijk	6.3def	5.8cd
Agriform 34-0-7	3		5.8efgh	6.0defghi	7.0abcd	7.5cdefgh	7.3abc	6.3bc
Anderson 9-3-6	1		5.7fghi	5.8efghi	5.3hijkl	6.2jkl	6.3def	6.0bcd
Anderson 9-3-6	3		7.2ab	7.2abcd	6.2defgh	7.0efghijk	6.5cdef	5.7cd
Anderson 10-2-6	1		5.0ij	4.8i	4.7l	6.2jkl	6.0f	5.8cd
Anderson 10-2-6	3		6.2defg	6.2cdefgh	6.0efghi	7.0efghijk	7.2abcd	6.0bcd
Lawn Restore	1		5.7fghi	6.3bcdefg	5.5ghijkl	6.3ijkl	6.2ef	6.2bcd
Lawn Restore	3		7.0abc	7.3abc	6.8abcd	7.3defghi	6.2ef	6.0bcd
Scott's 35-0-0	1		5.3hij	5.8efghi	5.7fghijk	7.0efghijk	6.8bcdef	5.8cd
Scott's 35-0-0	3		6.5bcde	7.2abcd	7.5a	8.3abc	7.3abc	6.5b
Scott's 38-0-0	1		6.2defg	6.2cdefgh	5.5ghijkl	6.3ijkl	6.2ef	6.0bcd
Scott's 38-0-0	3		7.0abc	7.0abcde	6.8abcde	7.7bcdefg	6.2ef	6.0bcd
IBDU 31-0-0	1		4.7j	6.3bcdefg	5.5ghijkl	6.3ijkl	6.2ef	5.8cd
IBDU 31-0-0	3		5.2hij	7.2abcd	7.5a	7.2efghij	6.7cdef	5.8cd
Nor-Am M.U. 40%	1		5.5ghi	5.5ghi	5.2ijkl	7.0efghijk	6.2ef	5.8cd
Nor-Am M.U. 40%	3		6.2defg	7.3abc	7.0abcd	7.8bcdef	6.5cdef	6.0bcd
U.F. 38-0-0	1		5.2hij	6.3cdefg	4.7l	6.2jkl	6.5cdef	5.8cd
U.F. 38-0-0	3		5.7fghi	5.8efghi	6.0efghi	7.2defghij	6.5cdef	6.0bcd
N-Sure 28-0-0	1		5.7fghi	5.7fghi	5.3hijkl	6.2jkl	6.2ef	5.8cd
N-Sure 28-0-0	3		7.3a	7.7a	7.3ab	7.0efghijk	6.8bcdef	6.0bcd
Nitro-26 26%	1		6.3cdef	6.0defghi	5.7fghijk	6.5hijkl	6.5cdef	5.8cd
Nitro-26 26%	3		7.0abc	7.3abc	6.8abcde	6.7ghijkl	6.3def	5.8cd

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

Table 4. Effect of nitrogen carrier and rate on dry clipping weights of perennial ryegrass. Hancock Turfgrass Research Center. Nitrogen applied at 1 or 3 lbs per 1000 sq. ft. on July 14, 1989. Averages of 3 replications.

Treatment	Rate		Clipping weights, grams meter <sup>-2</sup>	
	(lbs	N/M)	7/31	9/20
CIL PCU1 44%	1		30.5abcdef*	13.0 cdef
CIL PCU1 44%	3		31.8 bcde	23.8ab
CIL PCU2 44.2%	1		18.6 ef	12.3 cdef
CIL PCU2 44.2%	3		31.2 bcdef	18.1abcdef
CIL SCU 32%	1		18.8 ef	14.8abcdef
CIL SCU 32%	3		29.0 bcdef	19.8abcde
CIL SCU 37%	1		25.4 cdef	11.2 def
CIL SCU 37%	3		32.7 bcdef	22.4abc
Sustane Medium	1		27.7 bcdef	11.1 def
Sustane Medium	3		37.9abcdef	15.8abcdef
Sustane Fine	1		20.5 ef	11.7 def
Sustane Fine	3		48.8abc	11.9 def
Sustane Super Fine	1		25.8 cdef	9.6 f
Sustane Super Fine	3		25.6 cdef	15.7abcdef
Sierra 24-6-10	1		25.2 cdef	12.4 def
Sierra 24-6-10	3		37.3abcdef	11.7 def
Sierra 25-0-0	1		18.9 ef	12.6 cdef
Sierra 25-0-0	3		27.0 bcdef	18.7abcdef
Agriform 34-0-7	1		16.8 f	13.7 cdef
Agriform 34-0-7	3		24.2 def	20.7abcd
Anderson 9-3-6	1		30.4 bcdef	13.5 cdef
Anderson 9-3-6	3		41.5abcde	17.2abcdef
Anderson 10-2-6	1		14.1 f	13.1 cdef
Anderson 10-2-6	3		30.6 bcdef	24.3a
Lawn Restore	1		31.9 bcdef	12.7 cdef
Lawn Restore	3		58.6a	20.0abcde
Scott's 35-0-0	1		23.0 ef	14.8abcde
Scott's 35-0-0	3		36.2abcdef	19.5abcdef
Scott's 38-0-0	1		35.6 bcdef	18.9abcdef
Scott's 38-0-0	3		50.0ab	22.4abc
IBDU 31-0-0	1		20.2 ef	11.7 def
IBDU 31-0-0	3		36.4abcdef	15.3abcdef
Nor-Am M.U. 40%	1		30.4 bcdef	11.2 def
Nor-Am M.U. 40%	3		47.7abcd	18.4abcdef
U.F. 38-0-0	1		19.4 ef	16.4abcdef
U.F. 38-0-0	3		19.4 ef	14.6abcdef
N-Sure 28-0-0	1		26.4 bcdef	14.0 bcdef
N-Sure 28-0-0	3		37.7abcdef	15.8abcdef
Nitro-26 26%	1		30.4 bcdef	12.3 def
Nitro-26 26%	3		31.4 bcdef	15.4abcdef

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

Scotts 38-0-0, Nor-Am methylene urea, N-Sure and Nitro 26.

One month after application (Aug 15) good performers included the plastic coated ureas (PCU) from CIL, sulfur coated urea, Agriform, Scotts 35-0-0, IBDU and N-Sure. After two months (Sept. 14) the best performers were one of the experimental plastic coated ureas (PCU2), sulfur coated ureas, the Sierra plastic coated ureas, Scotts 35-0-0, and Nor-Am methylene urea. After almost three months (Oct 3) most of the plastic coated fertilizers performed well, along with sulfur coated urea and Scotts 35-0-0. After four and a half months (Nov. 26) differences were small with some of the coated materials showing a bit better quality ratings.

Clipping weight data were again somewhat variable (Table 4) but trends similar to those for quality ratings were still evident. Two weeks after application higher clipping weights were observed for Scotts 38-0-0, Lawn Restore, Anderson 9-3-6, Nor-Am methylene urea and some of the Sustane products. After two months (Sept. 20) products giving higher clipping weights included Scotts 38-0-0, Scotts 35-0-0, Andersons 10-2-6, and Agriform.

A late fall nitrogen fertilization study was initiated November 11, 1988 on a Penncross creeping bentgrass green at the Hancock Turfgrass Research Center. Plot size was 4 feet by 6 feet with three replications. In late January, Scotts Iron-S performed best while in early March Greens Restore, Scotts Iron-S and GS-1 performed well. A similar trend was still apparent in mid-April although other treatments were improving. By early May differences were small although Greens Restore and GS-1 still ranked highest. After that time there were no meaningful differences.

In this late fall study the performance of the Iron-S when applied at 1/2 lb N per 1000 sq ft was better than or equal to other materials applied at a full pound of N. This reflected the presence of iron in the fertilizer giving good turf color through late winter and early spring. A similar trend occurred for GS-1. Greens Restore provided good turf ratings during early spring.

Based on studies conducted several years ago, it was surprising that urea and 18-4-10 did not perform better in this study applied in early November. For most slow release carriers an earlier application date would be preferred for best late fall uptake and utilization of nitrogen. Thus most of the slow release carriers did not perform especially well in this study. If later fall applied nitrogen is to be taken up by the turf and utilized in building up carbohydrates through photosynthesis, it should be applied in late October to early November. Our recommendations at this point are to use a carrier which has soluble nitrogen (60-80% soluble) during this time period. Apply at the rate of 1/2 to 1 pound nitrogen per 1000 sq ft on grass which is green and has been properly fertilized earlier in the fall (September). On sandy soils use caution to limit the potential for leaching of nitrates by using lower N rates, more slow release N or eliminating this application entirely. A late fall application should be timed to be made about the time fall growth stops when roots are still active. Do not apply in the late fall if the grass is totally dormant or brown.

Table 5. Effect of late fall fertilization on quality ratings of a Penncross creeping bentgrass green. Treatments applied November 11, 1988. Averages of 3 replications.

Treatment						
Carrier	Rate	Turfgrass Quality Rating (9 = Ideal)				
	lb N/M	1/27	3/5	4/17	5/9	6/8
Urea	1.0	5.0ab*	5.0 c	5.0 c	5.0 c	5.0a
Milorganite	1.0	5.0ab	5.0 c	5.0 c	5.0 c	4.0 b
Sustane Medium	1.0	4.5 b	5.0 c	5.5 bc	6.0ab	4.0 b
Sustane Fine	1.0	4.5 b	5.0 c	5.5 bc	6.0ab	4.0 b
Anderson 9-3-6	1.0	4.0 b	4.0 d	5.0 c	5.5 bc	4.5ab
Emerald Isle GS-1	0.5	5.0ab	6.0 b	6.0 b	6.5a	4.5ab
Lebanon 18-4-10	1.0	5.0ab	4.0 d	5.5 bc	5.5 bc	4.5ab
IBDU Fine	1.0	4.0 b	4.5 cd	5.5 bc	6.0ab	4.5ab
Lesco Elite	1.0	5.0ab	4.5 cd	5.5 bc	5.5 bc	4.5ab
Scott's Iron-S	0.5	7.0a	6.0 b	6.0 b	6.0ab	5.0a
Ferromec	0.1	4.0 b	4.5 cd	5.0 c	5.0 c	4.5ab
Ferromec + Urea	0.1+0.5	5.0ab	5.0 c	5.5 bc	6.0ab	4.0 b
Greens Restore	1.0	3.0 b	7.0a	7.0a	6.5a	4.5ab

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