Wisconsin Soils Report



Observations From Fertilizer Demonstrations

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Fertilizer demonstrations were conducted at the Yahara Hills Golf Course, Madison, Wisconsin, during the period 1988 to 1990. This is a brief summary of the results of these demonstrations.

Rough Area Study

The study was begun in the fall of 1987 in an area of rough seeded in 1964 and now dominated by creeping red fescue. The soil is a Virgil silt loam. Soil tests in 1987 revealed a soil pH of 6.6, 2.7% organic matter and 48 and 250 lb/A, respectively of Bray P-1 extractable P and K. The area received a uniform application of 4.4 lb P₂ O₅/M and 2.8 lb K₂2O/M in August, 1987. Weed control practices consisted of spring and fall applications of Trimec. Irrigation was performed by golf course personnel and was haphazard at best. Moisture stresses developed at some point in all three seasons. Thus, the over-all turfgrass maintenance level was low to medium and representative of many park lands, cemeteries, airports and athletic fields in the area.

Season average turfgrass color ratings (scale of 1 to 9) are presented in Table 1. Over the 3-year period, the fertilizers providing the best color responses were: Andersons 9-6-18, Brayton 30-4-8, Scotts 34-3-7, Milorganite, Brayton 18-5-9 and urea. Nitroform 38-0-0 fairly consistently provided the lowest color ratings.

FERTILIZER*	1988	YEAR 1989	1990	3-Year Average
Naturall 8-1-3			7.8	
Nutralene 40-0-0			7.6	
Sustane 5-2-4		6.9	7.2	
SCU 32-0-0	7.5	7.9		<u></u>
SCU 37-0-0	1		7.8	
Scotts 32-3-10	7.4	7.3	8.0	7.6
Brayton 30-4-8	7.4	7.4	8.2	7.7
Scotts 34-3-7	7.5	7.5	8.0	7.7
Milorganite	7.7	7.1	8.0	7.6
Brayton 18-5-9	7.3	7.2	7.9	7.5
ParEx 21-2-20	7.2	7.0	7.7	7.3
Nitroform 38-0-0	6.9	6.5	6.9	6.8
Spring Valley 25-2-5	7.0	6.8		<u></u>
Spring Valley 19-6-8	—		6.8	
ParEx 24-4-12	7.1	6.8	7.7	7.2
Urea	7.2	7.2	8.0	7.5
ParEx 31-0-0	7.3	6.8	7.6	7.2
Andersons 9-6-18	7.3	7.3	8.4	7.7
Ammonium Sulfate	7.1	7.2	_	
UFC Ammonium Sulfate	_	10-10	7.4	-
Lebanon 18-5-19	7.1	7.1	7.7	7.2
Blsd (years = replicates)				0.3

Rankings of the fertilizers based on turfgrass color ratings and tissue N concentration in 1990 (Table 2) reflect to a high degree relative performances of the fertilizers over the 3-year period. The six top-ranked fertilizers in 1990 were: Brayton 30-4-8; Anderson's 9-6-18; Scotts 34-3-7; Brayton 18-5-9; Scotts 32-3-10; and Milorganite.

	Rank Based On					
FERTILIZER	Color Rating	Tissue N	Overall Rank			
Naturall 8-1-3	9	7	8.0			
Nutralene 40-0-0	13	13	13.0			
Sustane 5-2-4	16	17	16.5			
SCU 32-0-0	8	9	8.5			
Scotts 32-3-10	6	5	5.5			
Brayton 30-4-8	2	1	1.5			
Scotts 34-3-7	3	3	3.0			
Milorganite	5	6	5.5			
Brayton 18-5-9	7	2	4.5			
ParEx 21-2-20	12	11	11.5			
Nitroform 38-0-0	17	16	16.5			
Spring Valley 19-6-8	18	18	18.0			
ParEx 24-4-12	11	12	11.5			
Urea	48	6.0				
ParEx 31-0-0	14	15	14.5			
Andersons 9-6-18	1	4	2.5			
UFC Ammonium Sulfate	15	14	14.5			
Lebanon 18-5-19	10	10	10.0			

Golf Tee Study

This study was begun in May, 1989, on a large golf tee constructed in 1963 from fill material. Although elevated, the tee is poorly drained. The turf on the tee is a mosaic of annual bluegrass and creeping bentgrass.

	N Rate	YEAR		
FERTILIZER	Ib/M	1989	1990	Average
Nitrazine 59-0-0	4	7.7	7.6	7.6
Agriform 34-0-7	5	7.8	7.8	7.8
Nitroform 38-0-0	6	7.6	7.9	7.8
Johnsons 37-0-0	4	7.5	7.6	7.6
Lebanon 32-0-0	4	7.6	7.7	7.6
ParEX 31-0-0	4	7.9	8.0	8.0
Scotts 22-0-16	4	7.7	7.6	7.6
Sta-Green 15-0-30	4	7.6	7.5	7.6
Sta-Green 21-0-21	4	7.6	7.8	7.7
Milorganite 'F'	4	7.8	7.8	7.8
Sustane 5-2-4	4	7.9	7.6	7.8
Sta-Green 17-2-10	4	7.8	7.7	7.8
Johnsons 18-3-12	4	7.9	7.6	7.8
Scotts 32-3-10	4	7.9	-	—
Spring Valley 5-1-10	4	-	7.7	10000
Nutralene 40-0-0	4		7.6	_
Spring Valley 21-3-12	4	-	7.8	_
Blsd (dates = replicates	.)	0.3	0.2	0.2

There were few significant differences among the season average color ratings of the various treatments (Table 3).

Between the two full-season fertilizers, Nitrazine 59-0-0 and Agriform 34-0-7, the latter produced better results and was comparable to several other fertilizers applied three times during the season. Unlike in the improperly irrigated rough area, Par Ex 31-0-0 was one of the best fertilizers in the tee demonstration.

Table 4. Relative Responses of an Annual Bluegrass Infested Golf Tee to Various Fertilizers in 1990						
	RANKING BASED ON					
Fertilizer Applied	N Rate lb/M	No. Appl.	Color Rating	Tissue N	Overal Rank	
Nitrazine 59-0-0	4	1	11	13	12.0	
Agriform 34-0-7	5	1	1	1	1.5	
Nitroform 38-0-0	6	3	3	2	2.5	
HOJO 37-0-0	4	3	10	2	6.0	
Lebanon 32-0-0	4	З	6	5	5.5	
ParEX 31-0-0F	4	3	1	3	2.0	
Scotts 22-0-16	4	3	10	11	10.5	
Sta-Green 15-0-30	4	3	14	10	12.0	
Sta-Green 21-0-21	4	3	5	7	6.0	
Milorganite 'F'	4	3	4	4	4.0	
Sustane 5-2-4	4	3	13	6	9.5	
Sta-Green 17-2-10	4	3	8	9	8.5	
HOJO 18-3-12	4	3	12	8	10.0	
S. Valley 5-1-10DQ	4	3	7	12	10.5	
Nutralene 40-0-0	4	3	9	14	11.5	
S. Valley 21-3-12	4	3	4	15	9.5	

Because of problems arising in color ratings from plots that vary in annual bluegrass populations, 1990 rankings considered tissue N concentration as well as color rating (Table 4). Although color and tissue N rankings were sometimes very similar, some large differences were noted. For example, HOJO (Howard Johnson's) SCU 37-0-0 had a color ranking of 10 but a tissue N ranking of 2. Thus, in this particular study, tissue N was likely a better measure of performance than was color rating.

Based on tissue N, the top-performing fertilizers in 1990 were: Agriform 34-0-7; HOJO 37-0-0; Nitroform 38-0-0; Par Ex 31-0-0; and Milorganite 'F'. With the exception of HOJO 37-0-0, these fertilizers also produced excellent color ratings over the two years of the study.

Nitrazine N-59 Study

Nitrazine N-59 is a granulated product comprised of 27.9% urea – N and 72.1% melamine – N. Urea provides for rapid turfgrass response while melamine is the SRN component. Biological release of significant amounts of N from melamine does not begin until about two months after application. Thus, during the second month after application turfgrass response declines as the urea is depleted and before melamine – N is released at a rate that satisfies turfgrass needs.

To overcome this second-month available N deficit, the recommendation is that Nitrazine N-59 be applied in conjunction with a more conventional SRN. In 1989, several SRN's were tested for this purpose. Among the four SRN's examined (SCU, Nitroform UF, IBDU and Sustane), the results with IBDU were outstanding. This observation led to single-season applications in 1990 of Nitrazine N-59 with various proportions of IBDU on creeping red fescue-dominated turf at rates of 2 and 4 lb/M/season. The 2 lb N rate was insufficient as far as turfgrass N requirements in late season were concerned. Therefore, the discussion that follows focuses on the 4 lb N/M rate.

Before reviewing the results of this study, one point needs to be made very clear. The site of the study was in the rough at the Yahara Hills Golf Course. Irrigation was made available, but only periodically. Moisture stresses occurred between June 15 and August 15 and again in September. The stress was most severe in early August and the turfgrass actually began to enter dormancy.

Color ratings and tissue N concentrations (Table 5) clearly indicated that the 1/2 Nitrazine 1/2 IBDU combination was superior to the other two Nitrazine-IBDU combinations and to Agriform 34-0-7. The lowest color ratings (Table 5) were recorded August 15, which preceded reinitiation of irrigation in preparation for an August 29 Wisconsin Turfgrass Association Field Day. During this period of severe moisture stress only the 1/2 Nitrazine 1/2 IBDU treatment proved capable of maintaining turfgrass color ratings above the minimally acceptable level of 7.0.

Table 5	Turfgrass Color Ratings and Tissue N Concentrations at a Season N Rate of 4 lb/M					
Fertilizer	Color R	atings	Tissue Nitrogen (%)			
	Range	Average	Range	Average		
1/3 Nitrazine -						
2/3 IBDU	6.69.0	7.8	2.30-4.18	3.17		
1/2 Nitrazine -						
1/2 IBDU	7.2-8.7	8.0	2.84-4.09	3.36		
⅔ Nitrazine -						
⅓ IBDU	6.4-8.5	7.4	2.45-3.28	2.89		
Agriform 34-0-7	6.4-9.0	7.6	2.62-3.52	3.15		
Blsd		0.3		0.31		

Changes in turfgrass color ratings during the season are shown in Figure 1. The most erratic color responses were those observed for the 1/3 Nitrazine 2/3 IBDU combination and Agriform 34-0-7. Greatest color stability was achieved with the 1/2 Nitrazine 1/2 IBDU combination. This combination was notably superior to all other fertilizer treatments in terms of turfgrass recoloration after the severe mid-August period of moisture stress.

In summary, the combination of $\frac{1}{2}$ Nitrazine-N and $\frac{1}{2}$ IBDU-N appeared to hold considerable promise as a fullseason turfgrass fertilizer. In essence, this amounted to application of 0.86 lb WS + urea-N, 1.44 lb. Melamine-N, and 1.70 lb IBDU-N. Testing of this N combination under more favorable moisture conditions and on different turfgrass species is highly recommended.

Influences of Fertilizer Grade on Soil Test P and K Levels

The rough area fertilizer demonstration provided the opportunity to observe changes in soil test P and K when turf was fertilized with various grades of fertilizer. The amounts of P and K applied over the three-year period ranged from zero to 8.3 lb P and zero to 25 lb K per 1,000 ft². By relating changes in soil test P and K to rates of application, it becomes possible to estimate the annual rates of these nutrients required to maintain initial soil test levels.

Regressions of changes in soil test P and K (lb/A) on the amounts applied over the three-year period yielded the following equations:

P = 7.33 + 1.11 Fertilizer P (lb/A) R² = 0.859

K = 40.9 + 0.436 Fertilizer K (lb/A) R² = 0.920

Thus, to maintain the original soil test P level of 108 lb/A, one would have to apply 6.6 lb P/A over three years. This translates into 0.11 lb $P_2O_5/M/season$. Similarly, the maintenance fertilizer K level was 0.86 lb $K_2O/M/season$.





Over the duration of the study, the amount of N applied was 12.5 lb/M, or an average of 3.75 lb N/M/season. Combining this information with the estimated annual maintenance P_2O_5 and K_2O levels, one comes up with an N:P_2O_5:K_2O combination of 3.75: 0.11: 0.86. Thus, for this particular situation, the "ideal" fertilizer ratio from a soil P and K maintenance perspective was 34:1:7.8.



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