SOILS RESEARCH: NITROGEN CARRIERS, POTASSIUM STUDIES, AND REWETTING OF A HYDROPHOBIC SOIL

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In a comparison of slow-release nitrogen carriers at East Lansing sulfur-coated urea (from TVA) continued to perform well in providing both short and relatively long-term nitrogen response (see Table 1) as indicated by the 1973 data. Observations on nitrogen response in January and April of 1974 from these treatments indicate that IBDU (both fine and coarse grades) and the plastic-coated fertilizer gave the longest nitrogen responses.

In a short-term nitrogen response study at Traverse City ammonium nitrate, potassium nitrate and sulfur-coated urea provided the most rapid short-term response (Table 2). Ammonium sulfate did not perform as well as expected. As in past short-term nitrogen response studied in Michigan ureaformaldehyde gave poor response. From the long-term nitrogen carrier study at Traverse City, however, there appears to be little overall difference in turf response between Milorganite, ureaformaldehyde, and ammonium nitrate when the latter is applied in 3 applications during the year. The soluble ammonium nitrate is more subject to leaching in the sandy soil at Traverse City, which provides an advantage to the slower-releasing nitrogen carriers.

Returning turfgrass clippings will contribute to more efficient use of fertilizers. When clippings are removed regularly without other fertilization with P_2O_5 and K_2O, soil levels of these nutrients can be depleted to deficient levels. This occurred on both seeded and sodded Merion Kentucky bluegrass plots at East Lansing. Nutrient removal increased with higher nitrogen levels because more clippings are removed with higher nitrogen treatment. In addition, applying potassium at levels recommended based on soil tests was not sufficient to maintain adequate soil levels of potassium. One important result of depleted soil potassium levels is a high susceptibility of Kentucky bluegrass to wilting. As temperature and moisture stress increase the turf wilts readily and the density of plants is rapidly reduced. When clippings are removed K_2O recommendations based on soil tests will need to be increased over current recommendations. If clippings are returned the current recommendations are adequate. When clippings are removed regularly from turf (as on greens) higher rates and more frequent applications (2 or more times per year) of K_2O are suggested.

Hydro-Wet and Aqua-Gro continue to be the most effective wetting agents in improving a hydrophobic soil condition at Boyne Highlands on a sand soil. Treatments with these materials applied in August, 1974 showed decided improvement in turfgrass quality ratings in September and October (see Table 3). Hydro-Wet provides slightly more improvement of turf than Aqua-Gro when applied at equal rates. Mikroclean and Adjuvant-T showed very slight improvement in turf quality while other materials were ineffective in improving the turf. These conclusions are consistent with previous results.

Residual effects of treatments applied in July, 1973 were still apparent in September, 1974 (Table 4). Hydro-Wet has resulted in a wetter soil and slightly better turf quality ratings than Aqua-Gro. The 32 ounce treatment (applied one time only) has had a considerably longer influence on improvement of the hydrophobic condition than the 16 ounce treatment for both wetting agents. Cultivation treatments appear to have no significant long-term effects on rewetting of the soil nor on turf improvement (Table 4).

Table 1. Effect of nitrogen fertilizer carriers on Merion Kentucky bluegrass quality ratings at Traverse City. Applied on June 6, 1974 at the rate of 2 pounds per 1000 square feet. Averages of 3 replications.

Carrier	Visual Turfgrass Quality Rating (1=best;10=poor)				
	7/24	8/22	9/11	10/18	Average
Ammonium nitrate	2.8	1.0	3.0	2.5	2.3
Ammonium sulfate	5.5	2.3	3.3	4.3	3.8
Urea	3.5	1.3	2.8	3.3	2.7
Potassium nitrate	2.0	1.0	2.5	2.8	2.1
Milorganite	3.5	2.8	3.5	2.5	3.1
Ureaformaldehyde	4.3	5.3	4.3	6.0	4.9
Sulfur-coated urea	1.8	2.2	3.0	1.5	2.1
IBDU (0.7-1.4mm-fine)	3.8	3.5	2.0	1.3	2.6
IBDU (0.7-2.0mm-coarse)	3.0	4.3	3.0	2.2	3.1
Coated fertilizer	5.0	1.5	2.5	3.0	3.0

Table 2. Effect of nitrogen carriers on turfgrass quality ratings of Merion Kentucky bluegrass at East Lansing. Applied as 2.7 pounds nitrogen per 1000 square feet in April, 1.3 pounds in August. Averages of 3 replications.

Carrier	Visual Turfgrass Quality Ratings (1=best;10 poor)		
	1973 average	1/23/74	4/9/74
Sulfur-coated urea	2.3	2.8	4.0
Coated fertilizer	2.6	2.0	2.7
Milorganite	3.5	3.8	5.2
Ureaformaldehyde	4.0	5.3	6.5
IBDU (0.7-1.4mm-fine)	2.6	1.8	2.8
IBDU (0.7-2.0mm-coarse)	2.8	1.5	2.2
24-4-8 (8 units IBDU-N)	2.6	3.0	3.2
24-4-12 (12 units IBDU-N)	2.7	2.2	3.7
24-0-11 (16 units IBDU-N)	2.8	2.2	2.7

Table 3. 1974 wetting agent study - Boyne Highlands. Treatments applied August, 1974. Averages of 4 replications.

Treatment		Improvement in Turf Quality Rating	
Wetting Agent	Rate oz/1000 sq ft	Sept. 11	Oct. 18
None	--	-0.2	-0.2
Aqua-Gro	16	2.2	2.1
Aqua-Gro	32	2.5	2.9
Hydro-Wet	16	3.0	3.0
Hydro-Wet	32	3.6	3.8
Mikroclean	16	1.4	1.1
Adjuvant-T	16	0.7	1.2
Wetter Water	16	0.5	0.1
Turf Wetter	32	-0.1	0.1
Grozyme	16	-0.5	-0.4
Wex	16	-0.6	-0.1
National Chem.	16	-0.9	-0.6

Table 4. Residual effects of treatments on hydrophobic sand at Boyne Highlands. Treatments applied July, 1973. Evaluated September, 1974. Averages of 3 replications.

WETTING AGENT EFFECTS		Soil Moisture	Turfgrass quality
Wetting agent	Rate, oz/1000 sq ft		rating (1 = best)
None	--	5.4	4.2
Aqua-Gro	16	6.7	3.4
Aqua-Gro	32	7.0	2.0
Hydro-Wet	16	8.3	2.1
Hydro-Wet	32	9.4	1.3
CULTIVATION EFFECTS			
Cultivation treatment			
None		7.4	2.6
Fairway spiker - 2 passes		6.8	2.7
Fairway coring unit - 1 pass		7.3	2.8
Fairway coring unit - 2 passes		7.4	2.9
Greens coring unit - 1/2 inch tines		7.2	2.3
Greens coring unit - 5/8 inch tines		8.1	2.4