SOILS RESEARCH - NITROGEN CARRIERS, POTASSIUM RESPONSES, AND HYDROPHOBIC SOIL STUDIES

Paul E. Rieke

The responses of turf to several nitrogen carrier treatments were evaluated again in 1973. The average quality ratings from the East Lansing study are given in Table 1. The nitrogen was applied at the rate of 4 pounds per 1000 square feet for the year. Applications were made in April, two-thirds in April and one-third in August, or one-third in each April, June, and August, according to treatment as outlined in Table 1. The 24-4-8 fertilizer contained one-third of the nitrogen in the IBDU form and two-thirds as water soluble nitrogen; the 24-4-12 contained one-half of each; the 24-0-12 contained two-thirds IBDU and one-third soluble nitrogen. The fine IBDU was in the 0.7-1.4 mm size range, while the coarse material was 0.7-2.0 mm. These materials were provided by the Swift's Agricultural Chemical Co. The 19-6-13 was a coated fertilizer provided by the Sierra Chemical Co. The 32-0-8 and 30-3-10 were O. M. Scott's Co. products. The sulfur-coated urea was provided by the Tennessee Valley Authority; Milorganite by the Milwaukee Sewerage Commission, and the ureaformaldehyde by DuPont.

The data in Table 1 indicate that all sources which contained appreciable slow-release nitrogen gave very poor responses in May from the April applications. Only the complete carriers which contained considerable water soluble nitrogen (as the 24-4-8 with 2/3 water soluble N) resulted in good color and growth responses in May. The unseasonably cool weather in May pointed out the need for some water soluble nitrogen in the spring, especially during a year such as 1973.

After the unusually poor quality ratings in May several of the treatments resulted in good quality turf the rest of the growing season (fine IBDU, coated 19-6-13, sulfur-coated urea). The sulfur-coated urea resulted in the best average quality ratings for the year as was observed in 1972.

After 4 years of uniform nitrogen treatments on Merion Kentucky bluegrass at Traverse City, the average visual quality ratings differed somewhat from the East Lansing results. In this study the nitrogen was applied at the rate of 8 pounds per 1000 square feet in one application in late April. The water soluble carriers (ammonium nitrate, urea, ammonium sulfate) were apparently leached out of the root zone by the end of the growing season on this well-irrigated sand, resulting in poorer average quality ratings than other carriers (Table 2). Milorganite gave the best average quality in 1973, followed by ureaformaldehyde, IBDU (fine), sulfur-coated urea, and 19-6-13 (coated), respectively.

Fertilization of a Cohansey bentgrass green with IBDU and coated with 19-6-13 was studied in 1973. It was necessary to core the green and work the fertilizer into the coring holes (with or without top-dressing soil) to prevent removal of the fertilizer with the greensmower. Some surface applied water soluble nitrogen will be needed with this fertilization technique to mask the "greening" pattern associated with the nitrogen concentrated in the coring holes.

After seven years of nitrogen treatments on sodded Merion Kentucky bluegrass (clippings removed) the soil potassium has been reduced to the point where potassium

deficiency has been observed. The higher the nitrogen rate, the more clippings removed, and the more severe the potassium deficiency observed. The deficiency was manifested by a grayish-blue color of the turf and wilting symptoms. There was also a definite thinning of the turf (Table 3). As potassium was applied, nitrogen rate had no effect on turf density when nitrogen was applied. Turfgrass quality ratings also reflected the need for more potassium at the higher nitrogen levels. These results substantiate the importance of following a good soil testing program on turf where clippings are removed. This is especially important in irrigated sands, such as greens, in which there is little cation exchange capacity to hold potassium in the soil.

The hydrophobic soil condition observed at Boyne Highlands in 1971 and 1972 continued in 1973. There was limited short-term turf recovery from coring and wetting agent treatments during 1972. For example, treatments applied in summer and early fall, 1972 increased soil moisture content during 1972, but turf recovery did not occur on these plots until spring and early summer, 1973. The hydrophobic soil condition continued in 1973 in spite of a wet spring season. Among the wetting agents studied earlier, Aqua-Gro and an experimental material from Colloidal Products, L-237, gave the most consistent wetting of soil under treated plots. These materials were selected for further study in 1973.

A series of treatments were applied on July 13, 1973 on a uniformly hydrophobic fairway. Several cultivation treatments were applied to the area: 1) coring with a greens coring unit using 5/8-inch tines; 2) coring with 1/2-inch tines; 3) one pass with a fairway coring unit; 4) two passes with a fairway coring unit; 5) two passes with a fairway spiker; and 6) no cultivation treatment. The soil cores were broken up with a light vertical mowing. Aqua-Gro and L-237 were each applied at rate of 16 and 32 ounces per 1000 square feet over each of the cultivation treatments. Each treatment was replicated 3 times.

The data are summarized in Tables 4 and 5. Both rates of both wetting agents resulted in increased moisture in soil one month after treatment (August 14) compared to the check. The L-237 was slightly more effective than Aqua-Gro although differences were small, especially at the 32 ounce rate. Turfgrass quality ratings on these plots in September and October substantiated these results and indicated a short-term (2 months) turfgrass recovery from the hydrophobic condition.

The more intensive coring with the 5/8-inch tine resulted in a higher percent water in the soil a month after treatment, but the 1/2-inch tines resulted in better turfgrass quality ratings observed in September and October. The other cultivation treatments were less effective. The hydrophobic soil condition causes the soil to become very hard and reduces penetration of standard coring units. When such a condition has developed it may be necessary to use a more intensive treatment, such as the greens coring unit, to improve moisture penetration.

Table 3. Effect of nitrogen rate and potassium treatment on sodded Merion Kentucky bluegrass density counts and visual turfgrass quality ratings in 1973. Averages of 3 replications.

Annual N Rate lbs/1000 sq. ft.	Relative Density Counts		Quality Ratings (1=best, 9.5=poor)	
	-K	+K	-K	+K
0	60	53	9.3	9.3
2	90	97	7.7	7.4
4	85	103	6.0	4.9
6	100	121	5.8	2.9
8	75	114	5.6	2.0
10	72	108	5.5	1.6
12	77	113	5.9	1.2
14	64	108	6.4	1.2