NITROGEN STUDIES AND SOIL MIXES

Turfgrass Soils Research Report

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Nitrogen studies continue at East Lansing and Traverse City as reported at field days and past conferences. In 1971 two mowing heights, 3/4 inch and 1½ inches were begun on several of the nitrogen rate studies at East Lansing. The quality rating data for 1971 are given in Tables 1, 2, and 3. Generally the higher height of cut resulted in higher quality turf, although this may be a result of the turf having been established in 1966 and mowed uniformly at 1½ inches until 1971. As has been observed before, Pennlawn red fescue continues to respond to higher nitrogen levels (up to 6 pounds per 1000 square feet annually) while Wintergreen seems to perform just as well at 3 to 4 pounds nitrogen per year. Mowing height had little effect on the nitrogen effects.

Nitrogen responses of Kentucky bluegrass (Tables 2 and 3) are similar to past reports. The maximum response occurs between 4 and 6 pounds of nitrogen for these grasses with Windsor (Table 2) responding up to the 6 pound rates and Merion to as high as 8 pounds nitrogen. The 12 and 14 pound nitrogen treatments showed somewhat reduced quality compared to intermediate rates. This occurred for the first time in 1971.

In a study of carriers and timing of nitrogen application on Merion at East Lansing, treatments which received soluble nitrogen in November or February compared very favorably with plots receiving nitrogen during spring or spring and summer. There has been no apparent increase in winter injury problems from these treatments in this study. There is, of course, concern about the potential for leaching of nitrate nitrogen during the winter and early spring when the soil is not frozen and before the turf plant begins growth. We are still cautious about winter (or dormant) nitrogen applications because of the potential for winter injury and nitrate leaching which exist under Michigan conditions.

Table 1. Effect of annual nitrogen rate and mowing height on quality of Pennlawn and Wintergreen red fescues. 1971 East Lansing data (1 = best, 9 = poor). Average of 3 replications and 7 dates.

Nitrogen rate lbs/1000 sq ft	Pennlawn		Wintergreen	
	3/4 inch	1½ inches	3/4 inch	1½ inches
0	4.94	4.33	5.16	4.88
1	4.05	3.76	3.94	3.66
1/5	3.91	3.62	3.77	3.66
2	3.69	3.40	3.72	3.28
2.5	3.58	3.07	3.86	3.21
3	3.38	2.92	3.61	2.92
4	3.05	2.71	3.55	3.14
6	2.69	2.28	3.63	2.95
2-April	3.63	3.52	4.22	3.57
2-August	3.77	3.47	4.27	3.78
2-Apr,Aug	3.77	3.42	3.97	3.42

Table 2. Effect of annual nitrogen rate and mowing height on quality of four Kentucky bluegrasses. 1971 East Lansing data (1 = best, 9 = poor.) Average of 3 replications and 7 dates.

Nitrogen rate lbs/1000 sq ft	Mowing height inches	Quality Ratings			
		Delta	Windsor	Common	Newport
0	3/4	4.13	3.86	4.22	3.87
0	1½	3.50	3.42	3.80	3.78
2	3/4	3.41	3.33	3.80	3.33
2	1½	2.90	2.90	3.35	3.10
4	3/4	2.86	3.11	3.47	3.29
4	1½	2.56	2.95	3.04	2.89
6	3/4	2.80	2.91	3.41	3.25
6	1½	2.38	2.62	2.76	2.82

Table 3. Effects of annual nitrogen rate and mowing height on quality of sodded and seeded Merion Kentucky bluegrass. 1971 East Lansing data (1=best, 9 = poor). Average of 3 replications and 7 dates.

Nitrogen rate	Sodded		Seeded	
lbs/1000 sq ft	3/4 inch	1½ inches	3/4 inch	1½ inches
0	5.36	5.33	6.25	6.12
2	4.36	4.07	4.80	4.62
4	3.27	3.00	3.44	3.26
6	2.83	2.66	2.91	2.76
8	2.72	2.57	2.83	2.66
10	2.72	2.59	2.72	2.57
12	2.88	2.66	3.02	2.85
14	2.94	2.69	3.02	2.90

With so much emphasis on pollution concerns today we should be extremely careful in the turfgrass field to keep our potential contribution to pollution to a minimum because so many of our turfgrass areas are in or near high density population centers.

In order to study the movement of nitrates under turf, soil samples were taken at 0-6, 6-12, 12-18, 18-24 inch depths from plots receiving nitrogen treatments at East Lansing on a fine sandy loam and at Traverse City on heavily irrigated sand. The 1970 data were reported at last year's conference. This year the nitrate levels in the soil were lower than observed in 1970, especially at East Lansing. Little movement downward was observed at East Lansing which received moderate irrigation during a very dry summer. Only the plots receiving soluble nitrogen (as ammonium nitrate) contained appreciable nitrates even in the 0-6 inch depth. It is possible that the nitrogen was not leached into the soil but stayed in the thatch layer which was discarded during sampling.

At Traverse City the plots receiving soluble nitrogen had somewhat higher soil nitrate levels in June while ureaformaldehyde and IBDU treated plots were higher in August. The plots receiving the soluble nitrogen in one heavy application in the spring (8 pounds nitrogen per 1000 square feet in April) exhibited some downward movement of nitrogen with some movement to the 18-24 inch depth. On a heavily irrigated sand we would always suggest light and frequent nitrogen applications, especially with water soluble sources. The data from this study support the recommendations we have been making. Moderation in irrigation practices in order to reduce the amount of water passing through the soil which can cause leaching would also be helpful.

The tendency for soil nitrate levels to increase during the late summer, especially at Traverse City where clippings are returned help to explain the quality of the check plots during late summer. Those plots receiving no nitrogen often have acceptable quality turf during this season. This response is apparently due to the effect of returning clippings which allows nitrogen to be recycled and used by the turf. This is another reason that summer nitrogen fertilization should be done sparingly on turf where clippings are returned.

Results from the nitrogen studies at Traverse City are similar to those reported in the past. On this sandy soil multiple applications of nitrogen are preferred. Higher nitrogen generally gives higher quality turf primarily because of the tendency for leaching under these conditions. Higher nitrogen treatments continue to increase the percentage of Merion Kentucky bluegrass in a mixed stand of Merion and Pennlawn red fescue. Under the lower nitrogen rates the red fescue predominates.

In a typical response to nitrogen on Cohansey bentgrass at East Lansing higher nitrogen rates decreased the intensity of dollarspot infestation. In September there were an average of 135 spots on plots receiving 3 pounds nitrogen per 1000 square feet annually; and 82, 75, and 56 spots when 6, 9, and 12 pounds nitrogen were applied, respectively.

A study on the effects of applying pulverized tree leaves to turf was initiated in the fall of 1970. Table 5 shows quality rating data for 1971 for these plots. The higher rates of leaf applications were very heavy to determine the effect of excessive leaf applications. As leaf rate increased turfgrass quality decreased. Applying supplemental nitrogen at the time of leaf application improved turf quality. Visual examination of residual leaf material in the fall of 1971 suggested that additional nitrogen tended to increase the rate of decomposition of the leaves. The higher height of mowing

resulted in higher quality ratings. In the spring the turfgrass density was reduced somewhat by the heavier leaf rates but these effects were not apparent by the fall of 1971.

Table 4. Effect of supplemental nitrogen, mowing height, and rate of pulverized leaves on Kentucky bluegrass turf quality. 1971. East Lansing. (1 = best; 9 = poor).

Nitrogen rate lbs/1000 sq ft	Leaf rate lbs/1000 sq ft	Quality ratings 3/4 inch	Quality ratings 1½ inches
0	0	4.40	4.50
0	114	4.63	4.80
0	229	5.10	4.70
0	458	5.66	-
1	0	4.06	3.95
1	114	4.30	4.10
1	229	4.43	4.20
1	458	4.90	-
2	0	4.06	-
2	114	4.33	
2	229	4.70	-
2	458	4.93	-