EFFECTS OF MANGANESE APPLICATIONS ON TURFGRASS QUALITY

Among the micronutrient required for plant growth, iron is used most widely on turfgrasses to improve turf color even though an iron deficiency has not been observed in Michigan. Manganese is suggested as another micronutrient to which turfgrasses might be responsive under certain conditions. In Michigan, many soils test moderately low to low in available manganese, particularly some of the finer-textured soils in eastern Michigan which have Ph levels well above 7.0. A few companies which sell fertilizers recommend the application of manganese on many turfs in Michigan. With these points in mind, we initiated a study at the Hancock Turfgrass Research Center to evaluate the effect of applications of manganese on a Penncross creeping bentgrass green. Treatments applied are given in Table 3. Manganese sulfate was applied at the rate of 1 or 2 ounces per 1000 sq. ft. on the dates shown. For comparison purposes, ferrous sulfate was applied at 2 ounces on the same dates. There was also an untreated check. Plot size was 4 feet by 6 feet. There were 3 replications of each treatment.

Applications of iron consistently provided the best quality turf. On some dates there were no differences among treatments. There appeared to be no consistent benefit from the application of manganese on this putting green.

A separate study was established in August on the putting green to determine if there was any phytotoxicity caused by the application of manganese. In this case treatments were not watered in. Data in Table 4 indicate there was no phytotoxicity from the manganese applications. Buy contrast, 2 ounces of ferrous sulfate caused some phytotoxicity. While foliar applications of iron sulfate have been used for years to improve turf quality, it is clear that too frequent use or applications at too high rates can result in reduced turf quality. When using iron to improve turf color, watch for leaf tip burn in particular.

TOPDRESSING STUDIES

A topdressing study was established in 1986 on a Penncross creeping bentgrass green at the Hancock Turfgrass Research Center. Treatments applied are outlined in Table 5. Materials applied are sand; 80% sand with 20% peat; and 60% sand with 20% peat and 20% loam soil. Each was applied under two topdressing programs: either twice annually (spring and fall) at the rate of 12 cu. ft. per 1000 sq. ft. (referred to as heavy and infrequent) or at 3 cu. ft. per 1000 sq. ft. every 3 weeks during the growing season (referred to light and frequent program). One other set of plots was aerified both spring and fall followed by application of sand at the 12 cu. ft. rate. There was also an untreated plot (Check). There were 3 replications of each treatment.

After 5 years of treatment, generally consistent patterns in turf quality ratings continue to occur. Most years turf quality has improved after topdressing whether for the light and frequent

Table 5 Great Lakes Topdressing Study
Initiated 1986
Clipping Yields per Square Meter

Treatment	Rate	Frequency	7/18	10/21
Sand	3 ft^3	3 Weeks	34.64ab	5.1 b
Sand	12 ft^3	Spring/Fall	30.88 b	6.0 b
80 sand 20 Peat	3 ft^3	3 Weeks	40.50ab	6.5 b
80 Sand 20 Peat	12 ft^3	Spring/Fall	38.95ab	6.1 b
60 Sand 20 Peat 20 Soil	3 ft^3	3 Weeks	33.02ab	6.5 b
60 Sand 20 Peat 20 Soil	12 ft^3	Spring/Fall	46.56a	7.2 b
Sand and Aerified	12 ft^3	Spring/Fall	30.62 b	7.0 b
Check	-----		36.00ab	11.46a

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

has improved after topdressing whether for the light and frequent program or for the spring and fall program. The data in 1990 were similar for the most part. The most consistent turf quality ratings were for the light and frequent programs which is consistent with previous years. At times the Check plots ranked equal to other treatments, but for several dates the Check plots had clearly inferior ratings. The thatch accumulation in the Check plots resulted in puffy conditions and scalping at times during the season. The light and frequent programs have produced uniform soil conditions as well in the layer developed since the initiation of the study. Plots receiving spring and fall topdressings at the higher rate have developed layers as would be expected with infrequent topdressing at heavy rates. On some dates in other years plots receiving some soil in the topdressing material have rated as good or better than when sand alone was applied. This did not occur in 1990, however. On two dates, clipping weights were collected (data not shown). There were no meaningful differences observed in clipping weights. This study will continue for 2 more years to determine the longer term impact of these treatments. Over the short term (3 years or so) almost any topdressing program might be reasonably successful. In most cases, it is only after many years that the true effect of a topdressing program would begin to appear.

CULTIVATION STUDIES

A study to evaluate the effect of timing of cultivation of annual bluegrass fairway turf was initiated in 1989 at the Hancock Turfgrass Research Center. Dates of cultivation are given in Table 6. Our hypothesis is that cultivation after seedhead production may enhance rooting while cultivation in mid-summer may be increase susceptibility to stress. Plot size is 6 ft. by 10 ft. with 3 replications. Turf quality ratings indicate there were no meaningful differences in the appearance of the turf in 1990. We will be evaluating thatch and rooting responses in future years. This is a cooperative study with J. M. Vargas, Jr.

Another cultivation study on the effect of cultivation programs on turf quality and thatch conditions was established in 1987 on a block of Ram-I Kentucky bluegrass at the Hancock Turfgrass Research Center. The turf had a significant thatch layer at the initiation of the study. Treatments include solid and hollow tine cultivation aerification with large, medium and small equipment. Because of stones in the soil no soil density or pore size distribution measurement will be taken, but effects on thatch will be determined. Samples were obtained from each plot in the fall of 1990. Data are not yet available from these samples. Visual examination of the thatch layer reveals that when aggressive core cultivation with hollow tines leaves the thatch well intermixed with soil. Solid tine cultivation brings no soil to the surface so the thatch layer is intact on plots aerified with solid tines.