EFFECTS OF PHOSPHORUS AND POTASSIUM APPLICATIONS ON SOIL TEST AND TURF RESPONSE

In an ongoing study at the Hancock Turfgrass Research Center application rates of P_2O_5 and K_2O are made as shown in Tables 6 and 7, respectively to Penncross creeping bentgrass growing on three different soils. These soils are a dune sand (built to PurrWick specification), a 2NS sand with 25% peat mixed into the surface 4 inches; and a native sandy loam soil. The ability to hold applied phosphorus (Table 6) is evident in the sandy loam and sand/peat soils. There is already a high phosphorus level in the untreated sandy loam soil while the phosporus test in the sand/peat untreated soil is only 10 pounds per acre. This should be low enough to result in a lack of growth although this is not evident on the plots. The sand does not hold the phosphorus as well and some leaching has obviously occurred. It has become evident that more frequent applications of phosphorus at lighter rates are necessary on sands.

A similar response has occurred with potassium (Table 7) except the sand holds essentially no potassium. There is no difference in soil potassium tests between the untreated check and the highest K_2O rate. What is applied is either being removed with the clippings or is leached due to very low cation exchange capacity. The addition of some peat to sand dramatically increase the potassium holding capacity of the soil. For those turf managers growing turf on pure sands or where sand topdressing is building a sand layer, potash should be applied several times a year, just as with nitrogen.

Phosphorus deficiency can also occur on fine textured subsoils. A study was initiated in 1984 on an apartment complex in Novi to determine the phosphorus response on a soil testing very low in phosphorus. Phosphorus was applied as 0-46-0 at rates shown in Table 8. Initially there was visual evidence of response to the phosphorus with improved density and growth but the data collected did not indicate significant differences. Extra nitrogen was applied in 1986 after which the turf quality ratings and density ratings were significantly improved (see August and September ratings). Soil tests did not reflect a significant increase in available soil phosphorus levels even at the 8 pounds per 1000 square feet application rate. The thatch was discarded before testing was done. Since the thatch is very thick on the site (over 1 inch) the phosphorus is likely still in the thatch layer. Obviously, further study is necessary. The bottom line is that lawn care companies and others who are treating sodded turfs on compacted subsoils should be sure to include some phosphorus in their fertility programs. We cannot afford to have poor turf response to nitrogen because phosphorus or some other element is deficient.

Table 6. Effect of phosphorus applications on phosphorus soil tests of three soils maintained under greens conditions. Treatments initiated in 1983. Hancock Turfgrass Research Center. Averages of 3 replications.

P_2O_5 annually	Phosphorus soil tests, lbs/acre		
lbs/1000	sand	sand/peat	sandy loam
0	12	10	116
0.5	18	45	136
1.0	47	94	173
2.0	89	166	290

Table 7. Effect of potash applications on potassium soil tests of three soils maintained under greens conditions. Treatments initiated in 1983. Hancock Turfgrass Research Center. Averages of 3 replications.

K_2O annually	Potassium soil tests, lbs/acre		
lbs/1000	sand	sand/peat	sandy loam
0	32	91	83
0.5	35	123	112
1.0	40	144	141
2.0	35	236	221

Table 8. Effect of phosphorus applications on Kentucky bluegrass sod growing on a compacted clay loam subsoil testing very low in phosphorus.

Treatment P rate lbs/1000	Turf quality rating (9=best) 7/3	8/19	9/26	Turf density (9=best) 7/3	8/19
0	4.8 a	5.2 b	5.5 b	6.5 a	5.3 b
1	5.7 a	8.8 a	8.2 a	6.8 a	8.8 a
2	6.7 a	8.8 a	8.7 a	7.7 a	9.0 a
4	6.5 a	8.5 a	8.2 a	7.3 a	8.7 a
8	6.3 a	8.5 a	8.7 a	7.7 a	9.0 a