STOP #11

USING SOIL TESTS FOR DETERMINING PHOSPHORUS AND POTASSIUM NEEDS FOR TURF

Paul E. Rieke
Crop and Soil Sciences

Soil testing has been used for years to predict needs for phosphorus and potassium fertilizers on turf. As a tool in managing soil fertility soil testing has been considered valuable by some turf managers while others have given it little attention. For soil testing to be effective there are three prerequisites: a soil sample representative of the turf area, effective soil testing techniques, and meaningful interpretation of the results resulting in specific recommendations. Failure at any one of these steps would make soil testing ineffective.

In order to compare soil tests from year to year, always sample the soil to the same depth (preferably 3 inches of soil), utilize the same laboratory for analysis, and sample the soil at the same time of year (at least 4-6 weeks after any fertilizer application).

Soil testing can also be used as a tool in trouble shooting when turf problems exist. In most cases soil testing will merely prove that the fertilizer program is not the cause of the problem. On occasion, however, we have found nutrient level or balance is limiting turf growth or performance. Since the cost of soil testing is low this is a worthwhile means of ensuring against nutritional problems.

While most golf course turfs have very high phosphorus soil tests and low potassium tests there have been a few cases of phosphorus deficiency, particularly on new greens established on sandy mixes. The effort to keep phosphorus low to reduce the potential for annual bluegrass encroachment may be carried too far on new greens.

Many lawn care companies have utilized fertilizer programs with zero phosphorus. With this kind of program on turf which had received no phosphorus at establishment time there is great potential for phosphorus deficiency limiting turf response. This has occurred on two grounds sites with which we are familiar: one sodded and one seeded. Both have very poor turf. Soil tests reveal that phosphorus applied in a study set up on the sodded site has all stayed in the thatch (1.5 inch thick) and not penetrated to the underlying soil.

Correcting a phosphorus deficiency is easily accomplished. In most cases 2 pounds of P_2O_5 per 1000 sq. ft. will be sufficient to improve turf quality. Use special care along lakes and streams to apply P_2O_5 only when needed based on soil tests. This will prevent any leaching of phosphorus into these water bodies.

Potassium soil tests are most commonly low to medium indicating that the level applied is not adequate. Since potash has been shown to be so important in improving the tolerance of turf to stresses (moisture, high and low temperature, wear and diseases) we can not afford to have potassium be a limiting factor in turf performance. Potassium leaches readily from sands. Turfgrass clippings contain fairly high concentrations of potassium and where clippings are removed, the rate of soil potassium depletion is quite high.

On high traffic turfs we suggest applying 4 to 6 pounds K_2O per 1000 sq. ft. annually, especially on sands. This should be split in several applications throughout the season. Since potash fertilizers are salts apply them appropriately to prevent burn. On finer-textures soils where high potash rates are applied use soil testing every 3 years or so to watch for excessive potash levels. Since potassium will leach very little from a finer textured soil a nutrient imbalance could develop over time.

For turfs receiving modest traffic, following soil test recommendations should be adequate although somewhat higher rates of K_2O should not be harmful to soil or the environment.

To illustrate the effect of continued applications on soil tests note the data in Tables 10 and 11. These studies were initiated in September, 1983. P_2O_5 (Table 10) and K_2O (Table 11) were applied in two applications each year, in May and September. The grass is Penncross creeping bentgrass maintained under greens conditions. The soils are sand (dune sand established as a PURR-WICK green), sand/peat (80% 2NS sand with 20% reed-sedge peat worked into the surface 6 inches), and sandy loam (native topsoil).

Note the sand does not hold phosphorus very well and potassium is leached readily. This points out the need for regular potash applications on sands (perhaps monthly). Adding peat to sand dramatically increases the capacity of the soil mix to hold both nutrients. The native topsoil holds both nutrients very well.

Phosphorus deficiency is very evident on these sand soils with the deficiency being especially evident during cool weather and gradually becoming less apparent in late summer. Soil testing is the simplest means of determing if phosphorus is potentially deficient. If more than 3/4 inch of thatch is present we suggest taking two soil samples, one representing the thatch layer, the second from the soil below the thatch.

TABLE 10. Effect of phosphate applications on soil available phosphorus tests on 3 greens soils. Treatments initiated in September, 1983. Averages for 3 replications.

Annual P_2O_5 applied	Available Soil P test, lbs/A					
	Sand		Sand/peat		Sandy loam	
lbs/1000	1983	1986	1983	1986	1983	1986
0	37c	12c	36b	15d	117b	127c
0.5	47bc	19c	36b	44c	131b	159bc
1.0	59b	47b	46b	84b	145b	189b
2.0	76a	89a	83a	178a	187a	278a

TABLE 11. Effect of potash applications on soil available potassium test on 3 greens soils. Treatments initiated in September, 1983. Averages for 3 replications.

Annual K_2O applied	Available Soil K test, lbs/A					
	Sand		Sand/peat		Sandy loam	
lbs/1000	1983	1986	1983	1986	1983	1986
0	35cd	32a	86c	91c	124b	83c
0.5	51bc	35a	114bc	123bc	124b	112bc
1.0	66ab	40a	149b	144b	176ab	141b
2.0	84a	35a	250a	236a	260a	221a