Phosphorus movement and uptake in Bermudagrass putting greens

Research at Auburn University was initiated to determine the effect of P rate and P placement on P uptake, extractable soil P, and turf performance in two hybrid Bermudagrass (cv TifEagle) putting greens. The study found:

• In both years of the study, Mehlich extractable soil test results indicate, according to those recommendations (P at 130 lb P2O5 acre-1), additional P fertilizer was needed three to five months after the initial P application.
• Application of P in excess of recommendations (195 and 260 lb P2O5 acre-1) didn’t appear to be prone to downward movement (0-12 inch sampling) within the one-year evaluation.
• Shoot density, dry weight of roots (0- to 3-inch depth), clipping yield, and P uptake by Bermudagrass all increased as P rate increased, typically up to a P fertilization rate of 195 lb P2O5 acre-1.
• The method of P application (band or broadcast) rarely affected extractable soil P, and the only agronomic factor that was affected was P uptake by Bermudagrass. In that case, Bermudagrass growing in plots which received banded P had greater uptake of P than Bermudagrass growing in pots with broadcast P.
• Phosphorus fertilization of sand-based greens shouldn’t be neglected, and slightly higher rates (or more frequent application) than that recommended by current AL soil-test recommendations might be warranted. Additional research is needed in this area to make sure long-term environmental impacts via P accumulation don’t develop.

Saturated hydraulic conductivity of coarse-textured, root-zone mixes

To be qualified as a USGA green, construction requires total porosity (P), air-filled porosity (P') and saturated hydraulic conductivity (Ksat) of the sand mix meet specific values. Reports indicate that Ksat of the same material measured by different technicians and laboratories resulted in large variations that limit the utility of the data. The objective of this study was to develop a procedure for measuring Ksat of coarse-textured rooting mixes.

A new permeameter was developed. The saturation tank and permeameter was combined into a single system, hence, the soil column could be kept submerged in water at all times to avoid air re-entry into the sample.

Soil-moisture-density curves of sand and sand mixes showed the optimum sand mix moisture content for packing the sample was between 0.06 and 0.07 g g-1. Research also indicated if peat moss is used as an amendment, the application rate shouldn’t be more than 0.02 g g-1 of sand.

When packing the soil column, the three-layer approach, as described in the Proctor’s test, was adopted and modified for column construction.

Both Ksat and bulk density of soil columns constructed by one-, two-, and three-layer approaches were evaluated statistically. Results indicated that the two- and three-layer approaches could generate adequate firmness comparable to a severely compacted putting green and provide consistent and uniform soil columns for Ksat measurement. For practical purposes, the two-layer approach was suggested for soil column construction to save time and labor.

No differences were found in bulk density and Ksat between sand columns packed by 1.32- or 3.02-kg hammers. Because a larger soil sample (76 mm in diameter) was suggested for measuring Ksat, the 3.02-kg hammer should be used in packing soil columns.

The developed procedure was tested by laypersons using the same sand mix and the results showed only about 10 percent differences in Ksat compared to Ksat measured by technicians.