Longer Term Assessment of Putting Green Rootzone Mixes Under Two Microenvironments

James A. Murphy
Rutgers University

Objectives:

1. To assess acceptable ranges of sand particle size distribution and depth of the rootzone.
2) To assess the utility of various composts, peats and inorganic materials as amendments for mixes.
3) To measure the physical, chemical, and biological changes that occur as greens mature, and
4) To evaluate the potential to reduce inputs for managing putting greens.

Start Date: 2001
Project Duration: 2 years
Total Funding: $60,000

A three-year investigation (3rd through the 5th post grow-in years of research plots) was initiated to identify factors that contribute to the success or failure of putting greens. Longer-term evaluation of the physical, chemical, and biological characteristics of the more than 30 rootzone mixes in this project is critical to ensure that recommendations generated from the research represent what can be expected over the life span of a typical putting green.

Data was collected in 2001 for turf quality, brown patch disease incidence, algae incidence, soil and clipping tissue phosphorus, clipping yield, root mass distribution, irrigation requirement, soil hardness and strength, and physical properties of the 0 to 7.6-cm depth zone. Much of the data is currently being summarized.

Physical property changes have occurred in rootzone mixes within two growing seasons after establishment. Air-filled porosity of the field plots decreased, whereas capillary porosity increased compared to initial laboratory values. The presence of roots within the mixtures is likely contributing to the overall shift in pore size distribution. Greater water retention (greater capillary porosity) in a rootzone has improved bentgrass performance during the first three growing seasons.

The enclosed microenvironment reduced rooting of all rootzone mixes within two growing seasons. The lower root mass in the enclosed microenvironment appeared congruent with the greater bulk density and lower total porosity of rootzones in that microenvironment. Further evaluation of turf performance, root development, and rootzone physical properties will establish the longer-term relationships between soil physical properties and turf responses. Soil and clipping tissue phosphorus content is being analyzed to develop sufficiency level data that can used to generate recommendations for phosphorus fertilization of sand-based rootzones.

Longer-term evaluation of the physical, chemical, and biological characteristics of the more than 30 rootzone mixes in this project is critical to ensure that recommendations generated from the research represent what can be expected over the life span of a typical putting green.

Irrigation requirements of each plot were assessed from April through October, 2001 through the metering of hand watering that was based on soil-water content. Although data is still being summarized, it is apparent from a cursory review of the dataset that substantial differences in irrigation frequency exits among rootzones. Rootzones with a capillary porosity of 30% or more appear to have lower irrigation requirements under the climatic conditions of New Jersey. Data on irrigation requirement will be collected in 2002.

Data for turf quality, brown patch disease incidence, algae incidence, irrigation requirement, and soil hardness and strength has been collected in 2001 and is being summarized.

Variation in sample water content before any saturation event in the ASTM method (F-1815) results in different encapsulated air contents of the sample, which subsequently can affect K_{sat}, bulk density, and porosity of the material. The ASTM F-1815 method evaluates samples that are more accurately described as satiated (contain encapsulated air) rather than saturated. Variation in sample antecedent water content likely contributes to some of the variation in K_{sat} observed when the same material is tested at different laboratories. Procedures that ensure a consistent bias caused by antecedent sample water content are needed.

Investigations of the effect of air encapsulation as influenced by antecedent water content in commercial testing laboratories are needed. Vacuum saturation removes encapsulated air from sand rootzone laboratory samples; however, vacuum saturation can dramatically impact pore size distribution of samples.

Summary Points

- Physical property changes have occurred in rootzone mixes within two growing seasons after establishment. Air-filled porosity of the field plots decreased, whereas capillary porosity increased compared to initial laboratory values.
- Rootzones with a capillary porosity of 30% or more appear to have lower irrigation requirements under the climatic conditions of New Jersey.