Assessing Maturation of Putting Green Rootzone Mixes Under Two Microenvironments

James A. Murphy
Rutgers University

Objectives:

1. To identify characteristics that have the potential to reduce inputs and costs associated with construction and/or maintenance of putting green turf.

Start Date: 2004
Project Duration: three years
Total Funding: $75,000

Researchers at Rutgers University the K_{sat} of rootzones varying in amendment at the 0- to 7.6-cm depth (without thatch/mat layer) have not changed dramatically over time (1999-2001). However, K_{sat} through the surface 0- to 5.1-cm depth (including thatch/mat layer) was dramatically lower than the rootzone mix itself in 2003.

A three-year investigation (6th through the 8th post grow-in years of research plots) was initiated in 2004 to assess the maturation of rootzones and identify longer-term factors that contribute to the success or failure of putting greens. Evaluation of the physical, chemical, and biological characteristics of maturing rootzone mixes is critical to corroborate or refute findings from shorter-term research.

Rootzones were constructed in two microenvironments to assess 1) physical properties effects on turf without the confounding effect of chemical differences, 2) differences among composts, peats and inorganic materials as amendments to sand, and 3) physical, chemical, and biological changes that occur as greens mature. An overall goal is to identify characteristics that have the potential to reduce inputs and costs associated with construction and/or maintenance of putting greens.

Similar to observations from the sand size distribution (physical properties) study in 2002 (last year's report), the K_{sat} of rootzones varying in amendment at the 0- to 7.6-cm depth (without thatch/mat layer) have not changed dramatically over time (1999-2001). However, K_{sat} through the surface 0- to 5.1-cm depth (including thatch/mat layer) was dramatically lower than the rootzone mix itself in 2003. The minimum K_{sat} observed for undisturbed 0- to 7.6-cm deep rootzones samples without thatch/mat was classified as either within or above the accelerated range (30 to 60 cm h^{-1}) previously recommended by the United States Golf Association.

K_{sat} values of 0- to 5.1-cm core samples that included thatch/mat were much lower and ranged from 21 to 37 cm h^{-1}. Moreover, field water infiltration rates were considerably lower (7 to 13 cm h^{-1}) than what might be expected based on K_{sat} values of extracted (non-disturbed) cores for the same depth zone. The reason(s) for this discrepancy was not apparent; however future work will strive to determine any cause(s).

Bulk density and air-filled and capillary porosities among samples did not clearly explain the differences in water flow between samples that included thatch/mat versus samples that did not. For example, samples that included thatch/mat had lower K_{sat} and bulk density, similar air-filled porosity, and greater capillary porosity than samples that did not contain thatch/mat.

While the turf performance data for 2004 is currently being analyzed, it appears that differences in turf performance among treatments have become more subtle. Additionally, some of the more water retentive rootzones have more persistent development of algae on the surface. These observations could be an indication that the organic matter (thatch/mat) that has accumulated above the initial rootzone is becoming more dominant in its impact on turf performance.

The current plan of work focuses on documenting the biomass accumulation above sand-based rootzones, which is believed to dramatically affect water flow and retention of a putting green as it matures, as well as the properties of the underlying rootzone. Results are expected to clearly separate the thatch/mat layer from the original rootzone mixture and determine the physical properties of both zones.

Summary Points

- K_{sat} of rootzones varying in amendment at the 0- to 7.6-cm depth (without thatch/mat layer) have not changed dramatically over time (1999-2001). However, K_{sat} through the surface 0- to 5.1-cm depth (including thatch/mat layer) was dramatically lower than the rootzone mix itself in 2003.
- Bulk density and air-filled and capillary porosities among samples did not clearly explain the differences in water flow between samples that included thatch/mat versus samples that did not.
- The current plan of work focuses on documenting the biomass accumulation above sand-based rootzones which is believed to dramatically affect water flow and retention of a putting green as it matures, as well as the properties of the underlying rootzone.