Longer Term Assessment of Putting Green Rootzone Mixes Under Two Microenvironments

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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.
4) To evaluate the potential to reduce inputs for managing putting greens.

Start Date: 2001
Project Duration: three years
Total Funding: $120,000

The third year of a three-year investigation is being conducted to identify factors that contribute to the success or failure of putting greens that were constructed in 1997 and seeded May, 1998. Physical, chemical, and biological characteristics of rootzone mixes are being assessed in this project.

Rootzone treatments were built in two microenvironments to assess 1) acceptable ranges of sand particle size distribution and depth of the rootzone, 2) utility of various composts, peats, and inorganic materials as amendments for mixes, 3) physical, chemical, and biological changes that occur as greens mature, and 4) the potential to reduce inputs.

Data were collected in 2003 for turf quality, soil nutrient content, irrigation requirement, field water infiltration rate, and physical properties at the surface 0- to 50-mm (0- to 2-inch) depth zone. Collected data is being summarized and tabulated.

Intact soil cores collected from the 0- to 76-mm (0- to 3-inch) depth zone indicate that physical properties of the rootzone mixes have changed. Air-filled porosity of the field plots decreased and capillary porosity increased compared to initial laboratory values. Changes in physical properties of the rootzone, however, do not appear sufficient to fully explain the reduced water infiltration characteristics observed empirically during hand watering of plots. Thus, a constant head, double-ring water infiltration system was built to assess field water infiltration rates.

Contrary to common assertions, the K_{sat} of rootzones at the 0- to 76-mm depth (without thatch/mat layer) have not changed dramatically over time. However, water flow through the surface 0- to 50-mm depth (including turf) was dramatically lower than the rootzone mix itself in 2002. The minimum K_{sat} observed for these undisturbed field samples was classified as either within or above the accelerated range (30 to 60 cm h^{-1}) recommended by the United States Golf Association (1993).

Researchers at Rutgers University are testing the performance of more than 30 putting green rootzone mixes in both an open microenvironment (top) and an enclosed microenvironment (bottom) to better understand the interactive effects of microenvironment and rootzone characteristics on putting green quality.

Field water infiltration rates were considerably lower than what might be anticipated based on K_{sat} results, and rootzone mix had minimal effect on infiltration. Air-filled porosity of the 0- to 50-mm depth in 2002 was dramatically lower than air-filled porosity of rootzone mix without thatch and mat. The 0- to 50-mm zone also had much greater potential to retain water than the rootzone mix.

Biomass accumulation above the rootzone is substantial (data not shown) and has a greater influence on water flow characteristics of a putting green as the green matures than changes in the physical properties of the rootzone. Ongoing work is assessing further the impact of biomass accumulation on putting green characteristics.

Summary Points

- Over time, the accumulated thatch/mat layer above the rootzone has become the limiting feature of the putting green profile that dominates the water infiltration characteristics rather than the underlying rootzone material
- The physical quality of the thatch/mat layer developing above the rootzone may be affecting water infiltration more than the total quantity of accumulated organic matter in the thatch/mat layer.
- Air-filled porosity of the 0- to 50-mm depth in 2002 was dramatically lower than air-filled porosity of rootzone mix without thatch and mat. The 0- to 50-mm zone also had much greater potential to retain water than the rootzone mix.
- The driest rootzones required approximately three times as much hand watering as plots that retained the greatest quantity of water.
- Biomass accumulation above the rootzone is substantial and has a greater influence on water flow characteristics of a putting green as the green matures than changes in the physical properties of the rootzone. Ongoing work is assessing further the impact of biomass accumulation on putting green characteristics.