Assessing Differential Root Zone Mixes for Putting Greens Over Time Under Two Environmental Conditions

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Objectives:

1. Evaluate grow-in procedure effects on putting green establishment and performance and develop criteria and recommendations for new putting green readiness for play.
2. Determine grow-in procedure impacts on root zone physical and chemical properties.
3. Evaluate post grow-in cultural practice effects on putting green long-term performance.

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Project Duration: 5 years
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The suitability of root zone mixtures for turfgrass growth is commonly evaluated by laboratory testing of soil physical properties, and is frequently based on United States Golf Association sponsored research initiated in the 1950's.

Initial soil physical properties are measured in the laboratory and used as a critical estimate of future performance in the field. Very little information is available; however, regarding changes in soil physical properties of root zone mixtures as turf matures on recently constructed golf putting greens.

The objectives addressed in this report include: (1) determination of initial laboratory soil physical properties (K_{sat}, porosity, bulk density) of root zone mixtures differing in amendment source, (2) determination of soil physical properties of root zone mixtures collected from field plots of the same materials, (3) quantification of the changes in field soil physical properties from the initial laboratory results, and (4) assessment of the impact of field soil physical properties on turf performance.

Dr. Jim Murphy discusses the performance of a wide range of putting green rootzones established in two growing environments at Rutgers University.

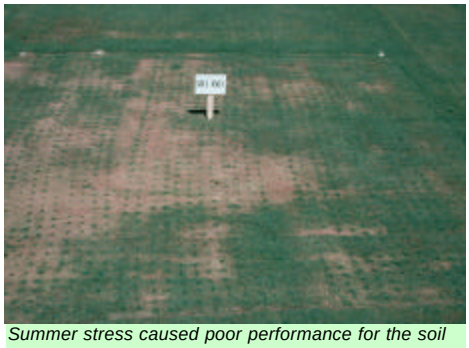
Physical property changes occurred in root zone mixtures within two growing seasons after turf establishment in the field. K_{sat} and air-filled porosity of the mixtures decreased; whereas, capillary porosity increased. The presence of roots in root zone samples was likely responsible for the shift in pore size distribution. However, other, not yet identified factors may also contribute.

Plots having an average seasonal turf quality rating of 7 and higher (9=best) were associated with a laboratory measurement of root zone capillary porosity of 25% or greater. Capillary porosity of root zone samples collected from these same field plots in 1999 was 27% and higher. Thus, higher turf quality has been observed on root zone mixtures that possess higher water holding capacity.

Saturated hydraulic conductivity (K_{sat}) of field samples has decreased for all root zone treatments compared to the initial K_{sat} value measured in the laboratory. However, amendment root zone treatments had K_{sat} values greater than 30 cm/hour (12 inches/hour).

It should be noted that air encapsulation in root zone samples was minimized before the measurement of K_{sat} in these tests. Thus, the K_{sat} values reported may appear rather high compared to those values reported by commercial laboratories. (See 1998 summary of research reported in Atlanta for more information on this issue.)

Microenvironment influenced plant rooting response within two growing seasons;



Summer stress caused poor performance for the soil putting green rootzone at Rutgers University.

less root mass was observed in the enclosed (lower) microenvironment.

Lower root mass in the enclosed microenvironment was associated with higher bulk density and lower total porosity in the root zone. Changes in soil physical properties will continue to be monitored. It is expected that changes in soil physical properties will continue. These changes may be important for long term performance of bentgrass grown as putting green turf.

Additional data for the amendment and sand size distribution studies are being summarized and will be reported in 2001.

Summary Points

- Root mass in top 2-3 inches contributes to a decrease in air filled porosity.
- Presence of roots in the root zone mixture is likely contributing to the shift in pore size distribution.
- Microenvironment location has a significant impact on root growth and turf quality.
- Field infiltration rates were lower than would be predicted by the lab analysis.
- Potential problems in laboratory testing methods were identified.