

Effect of Rootzone Material and Depth on Moisture Retention Problems in Undulating USGA Putting Greens

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Objectives:

1. To investigate if altering the rootzone depth will increase the water content near the soil surface in high areas and decrease the water content of the rootzone in low areas of putting green.
2. To investigate the effects of different rootzone materials (sand, sand/peat, and sand/soil) on water flow and soil moisture content in an undulating USGA putting green.

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Project Duration: 3 years

Total Funding: \$75,000

The USGA introduced guidelines for constructing putting greens over thirty years ago and since then the USGA green has become the standard for golf course putting greens. Two problems that have commonly been encountered on greens are "localized dry spot" (LDS) and "black layer". These problems are primarily associated with extremes in soil moisture in the rootzone of the green.

Localized dry spot is a condition characterized by irregular areas of stressed turf which is the result of a lack of available water for plant uptake. The cause of this condition is not well understood, but studies have shown that this condition is caused by a hydrophobic coating of soil particles.

Black layer is the term used to describe a black banding of the rootzone in sand-based putting greens. The blackening of the soil is the result of metal sulfides produced by sulfur reducing bacteria.

Specifications for a USGA putting green require that the sandy rootzone mixture be



By altering the rootzone depth decreased soil moisture content at the 0-4 inch depth in low areas of the green and increased soil moisture content in high areas of the green.



At Michigan State University, sloping greens with constant or variable sand rootzone mixtures were developed to study water movement through bentgrass putting greens.

placed at a uniform depth of 30 cm (12"), across the entire surface of the green. The uniform rootzone mix depth does not account for the lateral flow of water in a sloping rootzone. Lateral flow occurs in sloping soil profiles when gravitational and surface tension forces acting on the water become larger than the attraction of water to the soil. This lateral flow causes lower water contents in high areas of the putting green resulting in dry soil conditions and susceptibility to LDS. Water flows laterally to the lower parts of the green causing higher water contents closer to the surface in the same green. This is the location where black layer most frequently occurs.

Greens were constructed at the Hancock Turfgrass Research Center with the standard USGA depth rootzone, 12", and variable depth rootzone mix, 16" in low areas and 8" in high areas. Three different rootzone mixes were used: sand/peat (80:20), sand/soil (80:20), or straight sand.

After two years of data collection, our results indicate that decreasing the depth of the rootzone in the higher areas of the putting green increases soil moisture content near the surface of the green and increasing the depth of the rootzone in the low areas decreases soil moisture content near the surface of the green.

The results of the research have the potential to revolutionize the construction of sand-based golf greens and thereby minimize water related problems such as LDS and black layer on undulated putting greens.

Summary Points

- Decreasing the depth of the rootzone in the higher areas of the putting green increases soil moisture content near the green surface.
- Increasing the rootzone depth in the low areas decreases soil moisture content near the green surface.