

# *Spatial Distribution of Organic Matter and Soil Properties in the Rootzones of Aging Putting Greens*

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## **Objectives:**

1. To evaluate the soil chemical properties such as CEC, mineralizable N, and pH as affected by treatments during the grow-in period and age of the putting green.
2. To analyze the decomposition of soil organic matter (lignin and cellulose) using FTIR method, and to understand its spatial distribution and the effects on soil chemical properties.

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**Project Duration:** two years

**Total Funding:** \$6,000

The chemical and physical properties of a putting green rootzone can be largely altered by the changes of organic matter over time. Meanwhile, spatial distribution and decomposition of organic matter, both quantity and quality, may be reflected from the soil fertilities. Also, the fate of chemicals are affected by the status of soil properties. Environment and cultural practices influence the dynamics of soil properties. However, little information is available for the soil organic matter with depth based on analysis of putting green rootzone mixtures.

The objective of this study was to characterize vertical distribution of soil organic matter as affected by putting green establishment and age. The study consists of two parts. The first part is aimed at investigating space variations of selected soil properties which are used as measures (indicators) of soil organic matter. The second part focused on testing the potential of using FTIR in predicting soil properties.

Soil samples in this study were collected in 2006 from four experimental putting greens that were constructed in sequential years from 1997 to 2000 at the University of Nebraska. Putting green age was 6, 7, 8, and 9 years-old. Treatments are consisted of two rootzone mixtures: a sand/sphagnum peat mixture at 80:20 (v/v) and a sand/sphagnum peat/soil mixture at 80:15:5 (v/v/v). Two nutritional programs during the year of establishment were also included.

Four-inch deep cores of soil samples were collected from each plot and subdivided evenly into 12 layers. Soil pH, cation exchange capacity (CEC), total C, total N, and mineralizable N were measured in each layer. CEC was estimated by



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ammonium acetate extraction method at pH 7. Total N, organic C of samples were analyzed by the dry combustion method. The 7-day short-term anaerobic incubation method was used to measure mineralizable N. Lignin and cellulose content of the top layer was quantified by modified gravimetric method.

Result to date suggested a significant putting green age effect on lignin and cellulose content in the top layer. For CEC value, establishment effect was not significant, however, age effect was significant. Two-way interactions between establishment and age were also significant. CEC was observed to increase with putting green age due to organic matter accumulation. No significant effect of treatment was observed for pH and mineralizable N.

All the subsamples had been subjected to FTIR analysis. Data analysis of this part is in progress. However, preliminary results showed a good potential to predict some selected properties of putting green rootzones.

## **Summary Points**

- Generally, soil pH increases and soil CEC and mineralizable N decreases from the top to the bottom of the soil profile across years and treatments.
- The soil CEC and pH dynamics in different years after the establishment of putting greens are correlated to accumulation of organic matter.
- No significant difference was observed on mineralizable N among different putting green ages due probably to the balance of N immobilization and mineralization. Mineralizable N as an indicator of labile organic matter will be discussed later.
- Establishment treatments (accelerated and control) had little effect on CEC, pH, and mineralizable N.
- Significant age effect of putting greens was observed for lignin and cellulose content in the top layer. Lignin and cellulose increased in the upper rootzone as the age of putting greens increase.