Turf Soils Research at Southern Illinois University-Carbondale

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Program Overview

I started my turf soils research program at Southern Illinois University Carbondale (SIUC) in the Fall of 1996. In the fall of 1998, Mr. Chang-Ho Ok completed his master degree at SIUC. He is my first graduate student majoring in turf soil research. Mr. Ok's thesis is entitled "*Physical and Chemical Properties of Rooting Mixtures Amended with Various Natural Organic Materials*." In the summer of 1997, Mr. Richard Boniak joined us as a graduate student working on the crumb rubber project funded by the Illinois Department of Commerce and Community Affairs. Most of the field work was completed under Mr. Boniak's hard work and assistance. In the spring of 1999, in order to advance my knowledge, I took a sabbatical leave to visit several turf research programs at various universities including Dr. Paul Rieke's program at Michigan State University. The sabbatical leave was an invaluable experience for me not only assisting in my teaching, but also broadening my research in the turf soil area.

In the fall of 1999, a new course entitled "Golf Course Green Installation and Maintenance" was established and taught at SIUC. The main objective of this new 4-credit hour course is to provide students with a sound understanding of the rooting material which controls turf development and growth. The subjects covered in this course mainly focus on the selection, requirements, establishment, and maintenance of the rooting medium for putting greens and disturbed soils. Presently, we have ten students enrolled in this class.

I would like to take this opportunity to express my sincere thanks to the ITF for their support in my research. This is the first year I received research funding provided by the ITF.

Presently we have four projects working on various turf soil research. These projects are:

Research Highlights in 1999

1. Nitrate and Phosphorous Leaching Study

This project was designed to help the golf course industry understand the fate of nitrate and phosphorous applied to putting greens. Twenty-four lysimeters were installed in the newly established turf field at the Horticulture Research Center at SIUC. The rooting mixes used in the lysimeters included treated steer manure, reed sedge peat moss, and the combination of the two at various rates. Data collection will begin in the spring of 2000, if funding for this project is available.

2. Green Root Zone Mixes Amended with Various Amendments

The main objective of this study is to evaluate and compare some new materials which are economically feasible and environmentally safe for green root zone mixture amendments. This research is mainly focused on the physical properties of the mixes. Amendments selected in this study include:

1. Earthworm castings.
2. Treated steer manure.
3. Sphagnum peat moss.
4. Shamrock Irish peat moss.
5. Aged saw dust.
6. Profile.
7. Ecolite.
8. Dakota peat moss.

3. Turf Quality Established on Soils Amended With Crumb Rubber.

This study was funded by IDCCA and began June 1, 1997. The experimental plots were installed and completed in the summer of 1998. The objectives of this project are (1) to determine the optimal grade and amount of crumb rubber for the construction of optimal turf on native high clay content soils, and (2) to evaluate the quality and performance of turf established on rooting mixes amended with crumb rubber. Laboratory results indicated that regardless of the grade, mixtures with less than 15% crumb rubber in a fine-textured soil had little influence on their physical properties. Macro-porosity, hydraulic conductivity, and air permeability increased as the amount of crumb rubber amended in the mixture increased. However, total porosity of the mixture was inversely related to the amount of crumb rubber added into the soil. Preliminary field data indicated that root mass, surface hardness and soil moisture retention capacity decreased as the amount of crumb rubber amended in the mixture increased. Results also indicated that mixtures with 6.5 mm crumb rubber at a 20% amendment rate had the highest clipping yields and best turf quality.

4. Anaerobic Soils on the Golf Course Greens.

This research was not only examining the effect of oxygen content in root zone on turf quality, but also studied the effect of cultivation on the enhancement of oxygen content in the root zone. This is an on-range study. The experiment was started in late summer of 1998 at the Hickory Ridge golf course, Carbondale, IL. This project was co-investigated by Dr. She-Kong Chong, Dr. Sam Indorante (USDA-NRCS), Mr. David Buschschulte (formerly Hickory Golf Course Superintendent) and Richard Boniak (Graduate assistant). In the experiment, nine greens were randomly chosen for conducting the experiment. On each green, five small plots (1 m in diameter) were selected for the assessment of the relationship between turf and rooting medium quality. Parameters measured on each small plot included turf quality, CO_2 content in the root zone, profile water content, infiltration rate and soil macro-porosity. Preliminary results indicated that greens with high water content (Figure 1) and poor infiltration rate (figure 3) possessed the highest CO_2 content in the root zone. Turf quality declined when CO_2 in the root zone reached above 5% during the summer season. Cultivation of greens could initially increase oxygen in the root zone, but the benefits of aeration decreased with time (Figure 2). In addition, a large variation in CO_2 content, infiltration, and water retention capacity were observed within a green. It is believed that more research should be focused on the management of spatial variability within a green in the future.

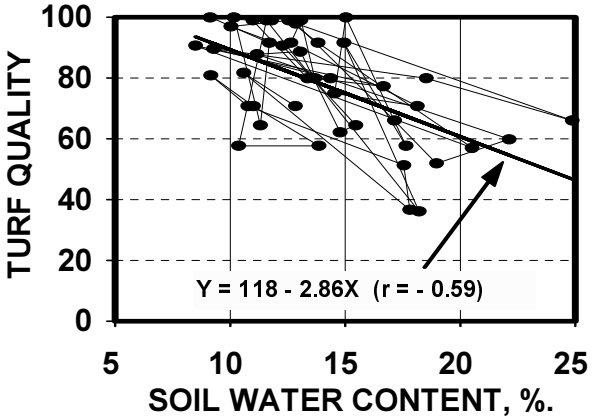


Figure 1. Relationship between turf quality and water content retained in the profile.

Figure 2. Relationship between CO_2 content and infiltration rate of the root zone.

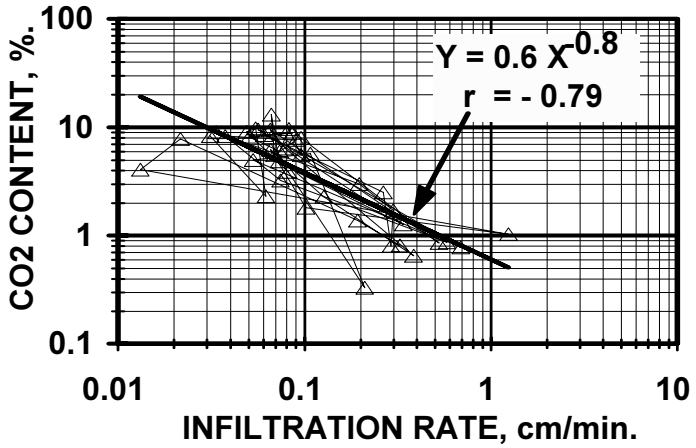


Figure 3. Relationship between turf quality and CO_2 content in the root zone. Results indicated that turf quality decreased in the summer when CO_2 increased above 5%.

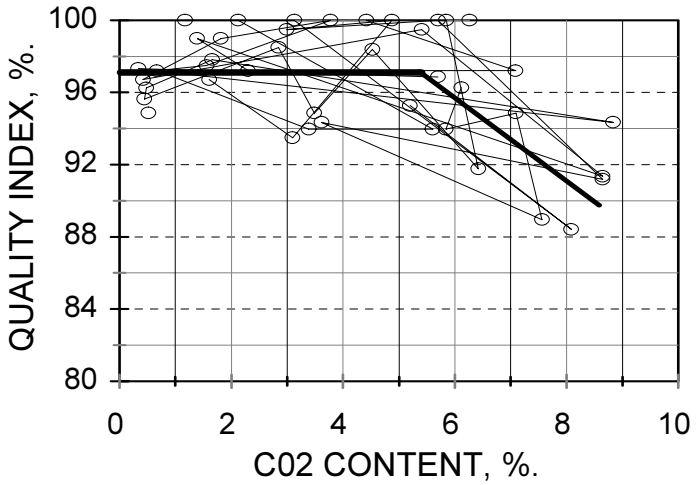
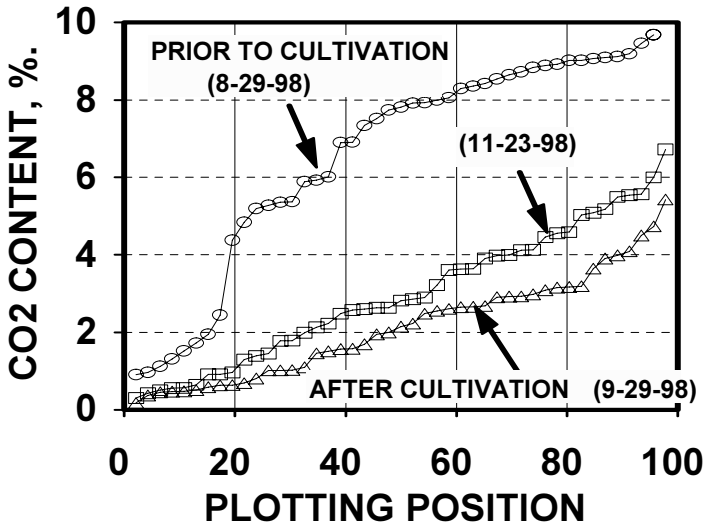


Figure 4. Changes in CO_2 content in the profile after cultivation by a 10-cm hollow tine.



For more information on this study, feel free to contact Dr. She-Kong Chong at (618) 453-1793, Fax (618) 453-7457, or e-mail: skchong@siu.edu