A Disease Management Program to Reduce Pesticide Use on Bentgrass Greens

North Carolina State University

Jack Bailey

Start Date: 1998
Number of Years: 3
Total Funding: $74,752

Objectives:

1. *Verify the utility of using microclimate information for scheduling the use of fans, irrigation and fungicides for disease management.*
2. *Develop the system, hardware and software, to monitor and analyze the microenvironment on golf courses.*
3. *Determine if unnecessary fungicide applications can be reduced by using microclimate-based information for disease management.*

Specially-designed weather stations will be used to monitor the microenvironment and analyze the data regarding the likelihood of disease outbreaks. This information will be constantly updated and displayed on a personal computer. Analyses will be automated using the most current research information on the relationship of the environment and disease. Results of these *disease advisories* will be used to alter the times and duration of fan and irrigation usage to minimize the rate of disease progress. Weather-based thresholds also will be used to time fungicide applications to minimize the unnecessary use of fungicides while maintaining turf quality.

Standard ANOVA and regression statistics will be used to describe the relationship between air speed, total rain/irrigation, and hours of disease favorable conditions. Fungicides applied on *standard* and advisory-based schedules will be compared regarding disease incidence, turf quality and cost of maintenance.

Weather-based disease advisory models can be utilized to minimize the unnecessary use of fungicides while minimizing the risks to turfgrass quality associated with reduced pesticide input. Golf course fans and irrigation can have positive and negative impacts on turf quality. This work would create an objective method of determining when and how long fans and irrigation systems should operate to maximize their efficiency while reducing the likelihood of disease outbreaks.

Progress to Date. Funds were issued this spring and a thorough search was made to find a graduate student candidate that had expertise both in agriculture and engineering sciences. Jasson Latta was selected and trained during the summer on soft money (non-USGA funds) to familiarize him with the turfgrass research being conducted by Paul Lyford. Jasson started his MS program this fall in the Mechanical and Aerospace Engineering (MAE) Program at NCSU. Dr. Bailey will serve as his principal advisor in the Department of Plant Pathology, with Dr. Chuck Hall serving as a co-advisor in MAE. In addition to his engineering training, Jasson will be taking his second plant pathology course this spring in preparation for collecting the biological information necessary for this work.

Jasson has built a seven-foot wingspan, electric, radio-controlled airplane to be used in this work. A camera has been mounted in the body of the aircraft to remotely sense turf stress, quality, and foliage moisture patterns. Work is underway to locate the digital analysis hardware and software to be used in evaluating the images collected in this manner. This device will be used for data collection on fan design and to assess the success of each fan design on experiment stations and golf courses. The airplane is necessary to obtain images at right angles without the use of heavy machinery (i.e. cherry pickers) normally used for these types of studies.

The Importance of Carbon Balance and Root Activity in Creeping Bentgrass Tolerance to Summer Stresses

Kansas State University

Bingru Huang

Start Date: 1998
Number of Years: 3
Total Funding: $75,000

Objectives:

Investigate the physiological factors that cause summer bentgrass decline, and specifically, examine how carbohydrate metabolism influences the decline in creeping bentgrass root activity and turf quality under low mowing and high temperatures.

It was proposed that imbalanced photosynthesis and respiration process and carbohydrate depletion could be the primary physiological factors contributing to bentgrass quality decline under high temperature and close mowing conditions. The overall objective of the project was to test this hypothesis in creeping bentgrass cultivars grown under close mowing and high temperature stresses. This project involved two studies, in which responses of turf quality, root growth, viability, and carbohydrate metabolic activities for four creeping bentgrass cultivars to high temperatures and close mowing conditions were examined in controlled environment growth chambers.

The first study investigated effects of differential shoot/root temperatures and mowing frequency on turf and root growth and carbohydrate metabolic activities to determine whether turf quality and carbon balance could be improved by modifying root temperatures. In this study, two widely grown bentgrass cultivars *CRENSHAW* and *PENNCROSS*, and two relatively new cultivars with promising summer performance under close mowing, *L-93* and *PENN A-4*, were examined. Grasses were exposed to differential shoot/root temperatures, including low