Reducing Pesticide Use on Bentgrass Greens Using Environmental Modeling and Fans

1998 Report
to
The United States Golf Association

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November 24, 1998

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 will also 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.

Objectives:
1) Verify the utility of a weather-based disease advisory for turfgrass management.
2) Develop the system, hardware and software, to deploy advisories on golf courses.
3) Determine if fan usage can be modified using advisory information make the environment less favorable for turf diseases.
4) Determine if unnecessary fungicide applications can be reduced by using environmentally based spray schedules.

Progress to Date:
Funds were issued this spring. 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 turf grass research being conducted by Paul Lyford. Jasson started his MS program this fall in the Mechanical and Aerospace Engineering 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 in necessary to obtain images at right angles without the use of heavy machinery (i.e. cherry pickers) normally used for these types of studies.

We are very satisfied with the progress to date.