The Evolution of Disease Forecasting

BY KARL DANNEBERGER

Turfgrass disease forecasting models predict the occurrence and/or change in severity of a disease for the purpose of aiding in disease management decisions. The parameters described by the disease triangle (susceptibility of host, conducive environmental conditions and presence of pathogen) are the keys by which disease forecasting is based.

Disease forecasting has evolved from rather humble origins to applications on a global scale. The first turfgrass disease models were created in the late 1970s and early 1980s for warm-weather pythium blight. At the time, pythium blight was a devastating and difficult disease to control. The ability to predict when pythium blight would occur was — and is — a critical factor in timing chemical control practices.

These models were based on weather conditions with the assumptions that the host was susceptible and the pathogen was present in numbers high enough to cause disease. The pythium models (Hall, 1978; Nutter et al., 1983) developed were correlated with temperature and relative humidity. Nutter's model predicted pythium blight when the maximum daily temperature was higher than 30 degrees Celsius followed by at least 14 hours of relative humidity greater than 90 percent, provided the maximum temperature was higher than 20 C (1983).

Using similar techniques, dollar spot forecast models were developed in the 1980s (Hall, 1984; Mills & Rothwell, 1982). However, these models failed in larger geographical testing (Burpee and Goulty, 1986). Forecast models also began to include additional environmental measurements like leaf wetness and other climatic factors to account for more diverse conditions. The models evolved into more complicated mathematical forms. For example, one model that predicted foliar anthracnose occurrence on *Poa annua* was a second-order equation that was developed using multiple regression analysis (Danneberger, et al., 1984).

The instrumentation for gathering weather data to create and use the disease forecast model was labor intensive. A hygrothermograph, which was placed on site, would record the temperature and atmospheric humidity on a single continuous graph. Normally, one would then replace the graph paper and record or store the values either into a computer or in some other tabulation form. Then this information would be the values for the disease model.

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During the 1980s, attempts were made to incorporate the disease forecast models with more technologically advanced weather-gathering equipment. Neogen Corp. developed one of the self-contained disease prediction units specifically for golf courses. The unit would be set along a fairway or practice green where the superintendent could check periodically for the disease forecast. Unfortunately, Neogen, which is a successful company, is no longer in the disease forecasting business. However, disease forecast models were successfully incorporated into other forms of weather-gathering equipment.

In the last few years, computers with the ability to access global weather data or through the use of various weather models can predict the likelihood of turf disease globally. Two Web sites, one in the United States (www.greencastonline.com) and the other in the United Kingdom (www.greencast.co.uk), gather weather data from numerous locations to generate disease prediction maps.

Turfgrass disease forecast models do not come with a 100 percent guarantee because most do not account for host susceptibility, and/or the pathogen's presence, virulence and population level. However, under continual development, testing and evaluation, disease forecast models should be an integral part of the decision process in one's disease management program.

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