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“Degree-Day and IPM”

**Dr. Joe Russo and Dennis Watkins*

This issue is dedicated to Integrated Pest Management or IPM. The success of most IPM programs depends, in part, on the availability of timely, accurate information on the development and interaction of a pest with its host crop. There are many variables defining the information needs of IPM, but most popular is the concept of “degree-day.” The degree-day is derived from temperature observations. Dating back to the 18th century, it is probably the oldest variable used to track the development of pests and crops. Today, the degree-day is in many forms, such as growing degree-days, and heat-units.

When degree-days are summed or “accumulated” over time, they are a measure of the thermal requirements of an organism in order to reach successive “phenological” or life stages. Since the amount of heat varies from day-to-day, accumulated degree-days provide a more accurate unit than summed calendar days to account for the impact of weather on an organism’s development and growth. In its simplest “arithmetic” form, a degree-day is calculated by subtracting an average daily temperature from an organism-specific base value. It is then accumulated daily over the organism’s lifetime. For most crops, the base is 50 °F. For most insects, bases range from 40 to 55 °F. Other computational forms can be used to calculate daily and accumulated degree-days, such as the “sine-wave,” which is also known as the “Allen” method. These more sophisticated forms usually employ an upper limit, which

accounts for the fact that an organism’s growth is retarded when the environment becomes too warm. A typical upper limit for many agricultural pests is 95 °F.

From the perspective of the sports field manager, degree-days play an important role in turf IPM. By watching the changes in the degree-day-driven phenologies, a manager can identify the best “window” for controlling a pest or amending turfgrass. Diseases such as anthracnose, gray leaf spot (ryegrass), and summer patch can be specifically monitored by degree-day accumulations. Degree-days can be used to track crabgrass emergence and its seasonal development. They can help a manager focus applications for both pre and post weed control at the most favorable dates. The timing of weed and other pest controls can vary as much as three weeks from season to season.

The degree-day approach in decision-making removes much of the guesswork that can result in poor control and put a manager’s job in jeopardy. The degree-day approach quantifies the timing of turf and pest events and provides a temporal framework for IPM practices. The use of degree-day-based IPM is some of the best evidence to an employer, the public, and regulatory agencies, that an individual has taken an informed, professional approach to sports field management. ▲

**Dr. Joe Russo is president of ZedX, Inc., and information technology company located in Bellefont, Pa. he has a Ph.D in Agricultural Meteorology. Dennis Watkins is a Turfgrass agronomist located in Loards Valley, Pa.*