Q&A with Pamela Sherratt

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PGRs and GDDs

Q: After many years of consideration and discussions with colleagues from around the country, we are finally going to start into a Primo program. I've gotten fairly consistent thoughts on rates, but application frequency has become a more interesting topic. It's been recommended to base intervals on growing degree days rather than calendar days. That absolutely makes sense to me. My question is, how many actual growing degree days should be the basis? Is there a chart to base this off? And does it differ based on species of turf? In our few test applications this fall, we've seen significantly different response from the KBG (which is the vast majority of our field) compared with rye (in wear areas) and *Poa*.
Wes Ganobcik, Columbus Clippers

A: Wes, as you quite rightly point out, it's difficult to predict plant growth based on the *calendar* because temperatures can vary greatly from location to location, year to year. Growing Degree Days (GDD) are considered more precise because they are based on local, daily air temperatures.

To review, GDDs are used to estimate the growth and development of plants and insects during the growing season. The basic concept is that development will only occur if the temperature exceeds some minimum development threshold, or base temperature. The base temperatures are determined experimentally and are different for each organism. In essence then, GDD modeling will vary among location and also plant species. Plant growth responses are monitored and correlated with the accumulated GDD. For example, GDD modeling for applications of plant growth regulator are created by monitoring turf growth suppression and rebound following a plant growth regulator application.

GDD modeling has been used in the green industry since 1958 when it was first used to predict corn harvest times. Since then there has been much research done in relation to turfgrass maintenance & GDD, including the timing of growth regulators for *Poa* seedhead suppression, the timing of pre-emergent herbicides for crabgrass control, and timing of amine or ester formulations of herbicides. The most recent GDD model for turf management is in relation to growth regulator applications.

Applications of the growth regulator trinexapac-ethyl (TE) are becoming more commonplace in sports turf management and the advantages have been long reported. A reduction in clipping yield was the original goal but there are many other added benefits that can be used to improve sports fields, like an increase in tillering and lateral shear strength, and improved turf quality. Applications of TE have historically been made on bi-weekly or monthly intervals at the recommended label rate. The goal is to suppress grown evenly and to avoid the "rebound" effect that occurs if a timely re-application isn't made. The efficacy of TE is dependent on air temperature. This means that applications of TE made in the summer months may not give the suppression duration that's expected. Research by Dr. Branham found that turfgrass plants break down TE faster as air temperatures increase, leading to a reduction in suppression over the summer period. This variability in TE efficacy during hot weather means that calendar based TE re-application intervals are not efficient at maintaining consistent growth suppression.

The most recent published research on using GDD to apply TE has been developed by Dr. Bill Kreuser and Dr. D.J. Soldat. As an STMA member, you can access their research report on Michigan's Turfgrass Library (https://tic.msu.edu). They found that re-applying TE every 200 GDD (base 0C) maintained season-long yield suppression (no rebound) and good turf quality regardless of season. Their model of TE at 200 GDD, based on a 0 Celsius base may confuse some people but it can be adapted to fit your own needs. The 0 Celsius base is used because it is most convenient not to have to subtract a base temperature. Once the application of TE has been made, the model is reset to 0. So as an example, the accumulation of GDD starts with the first application of TE in the spring and when 200 GDD is reached a subsequent application is made. At this point GDD is reset to 0 and accumulation starts again. The method used to calculate GDD in their report is the "Average Method": the actual daily GDD calculation is the average daily temperature minus the base (0C). Keep in mind that this model of 200 GDD is specific to creeping bentgrass putting greens (and likely *Poa annua*. Other species like Kentucky bluegrass and perennial ryegrass are still being determined experimentally. They are currently evaluating GDD models for low-mow Kentucky bluegrass culitivars and Dr. Kreuser had the following to say: "The ideal interval is roughly 250 GDD with a base of 0C. Generally, plant growth regulator application intervals for greens are shorter than they are for higher mowed turf."

Using the 200 GDD model, application frequency will differ greatly from a traditional 7-day, 14-day or 1 x month application schedule. For example, 200 GDD may occur in 14 days in the month of May and as frequently as every 9 days in July. During a heatwave with high temperatures of 100°F and lows around 75°F (average daily 89°F) 200 GDD occurs in 7 days or less. This reiterates

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