The Concept of GDD And How It's Used

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At this time of the year, discussion of "growing degree days" is often synonymous with *Poa annua* seedhead control. Originally, growing degree-day (GDD) models were developed to predict when *Poa annua* seedheads would emerge and when their peak production period would occur.

The practical application for a *Poa annua* GDD model was to time mefluidide applications for seedhead control. Lately, the concept of GDD has been expanded and used for other PGR combinations. Since the idea of using GDD for *Poa annua* seedhead control originated more than 20 years ago, there has always been some degree of confusion of what they are and how they should be used. In this article, I hope to clarify (or add more confusion to) the concept of using GDD.

A degree day, also known as growing degree days and heat units, is a measure of heat above a threshold for one day. Growing degree accumulation is a reflection of the accumulated degree days, or growing degree days or heat units above a threshold for consecutive days.

The threshold temperature, or as it's commonly known as the base temperature, can vary depending on the organism or plant. However, the most common base temperature is 50 degrees Fahrenheit (10 Celsius).

A growing degree day can be calculated using various methods. One method is to use a sine curve as an approximation of a diurnal temperature curve (Baskerville and Emin, 1969; Danneberger and Vargas, 1984). Some of the weather stations on the market calculate GDD using this type of method or a version of it. However, the most common method for calculating GDD is:

GDD = (max + min)/2 - base

where
GDD = Growing Degree Day
max = maximum temperature for the given day
min = minimum temperature for the given day
base = base temperature

THERE HAS ALWAYS BEEN SOME CONFUSION SINCE THE IDEA OF USING GROWING DEGREE DAYS FOR *POA* SEEDHEAD CONTROL ORIGINATED

A sample calculation would look something like this:

maximum temperature of 66 F
minimum of 54 F,
base temperature of 50 F
GDD = (66 + 54)/2 - 50 = 10

In calculating GDD, keep in mind:

- There are no negative GDD. In other words, if you were to make a GDD calculation and the number was less than 0, the GDD for that day would equal 0.
- GDD from each day are summed up across the days. For example, if on day one the GDD was 10 and the following day the GDD for the day was five, then the accumulated total for the two days would be 15. If on the third day the GDD was 0, then the accumulated GDD's would still be 15.
- Fahrenheit and Celsius are not the same. Depending on which temperature units are used, the GDD accumulation will be different. The table to the left provides a comparison between calculating GDD on Fahrenheit or Celsius. Notice that the difference between the two grows dramatically.
- The base temperature remains constant throughout the length of the GDD season. For example, if 50 F is used, it's used for all the calculation. Also, the base temperature needs to be consistent with the temperature units either Fahrenheit or Celsius.
- GDD models have no units. The accumulated number is useful in determining phonological stages of plant growth or stages in an organism's development.

Hopefully, I've clarified a few things.

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