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April 15, 2023

Growing Degree Days (GDD)

As of writing this article, Daviess County was five days into a warm, dry stretch with a forecast of sunshine all over the 7-day outlook. It has been a while since we've had a week in April like this, allowing tens of thousands of acres to get planted in only a few days. Rewind to a year ago when no crop was planted before the last few days of April. What a difference a year makes. Corn and soybeans planted into warm soils will emerge rapidly but no matter what, give a stand two weeks to emerge before even looking at it. I suspect we may see corn up in 7 days this week, especially if the field was tilled but there is really no point in evaluating emergence until after two weeks and final stand count no sooner than three weeks after planting.

With the heat, I thought of the term growing degree days, or growing degree units for this week's article. GDDs and GDUs refer to the same calculation based on air temperature. It is a scientific formula to estimate plant or insect development related to warming air temperatures throughout the growing season. Typically corn seed companies assume an average of 15 degree units accumulated each day on average. Some days we accumulate far fewer than 15, some days, such as in June and July, we may accumulate far more than 15. Nearly all corn hybrids provide the number of GDUs required from planting to black layer. We also recognize days to

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maturity for corn we choose to plant. The lower number of days to maturity requires less GDU's to reach black layer.

An example is the two AgriGold corn brands submitted for the Daviess County Yield demonstration plots last year. A643-52 is a 113 relative maturity corn that requires 2,820 accumulated GDUs to reach black layer. A645-16 is a 115 relative maturity corn that requires 2,850 accumulated. The 30 GDUs difference represents how AgriGold determined these corns to be 2 relative maturity days different, 15 GDU's for each day.

The number of days that are required for a hybrid to reach maturity depends on location, date of planting, and the weather during the growing season. A hybrid that is labeled as a 115 day hybrid may take from 110 to 120 days to mature depending on the above factors. Each day that a corn plant grows from emergence to maturity does not contribute equally to the development of the plant. Development is faster during warmer days than it is during cooler days. Although factors other than temperature may enter into determining rate of growth, the corn industry adopted the Growing Degree Days (GDD) system in 1970. This system uses a heat unit approach to the prediction of maturity that is more accurate than the old days-to-maturity ratings and is based on the number of heat units necessary for corn to reach physiological maturity.

Growing degree days are calculated by subtracting the base temperature (50°F) from the average of the maximum and minimum daily temperatures. Little or no corn plant growth occurs when the temperature drops below 50°F, and when the temperature rises above 86°F development is reduced. Consequently, a GDD is calculated according to the following equation:

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The maximum temperature is the highest temperature for the day (adjusted downward to 86°F, if necessary), and the minimum temperature is the lowest for the day (adjusted upward to 50°F, if necessary). For example, if the high temperature for the day is 90°F and the minimum is 60°F, the $GDD = (86 + 60)/2 - 50 = 23$ for that day. The University of Kentucky Agricultural Weather Center (AWC) starts recording GDDs for corn on April 1. These graphs are available at the following URL: <http://weather.uky.edu/iweb.php?address=daviess,KY>

By knowing the GDDs required for a particular hybrid to mature, one can determine from the ag weather center when a particular hybrid should mature from the date that it emerged. For example, if the corn emerged on April 15 and required 2,700 GDDs to mature, corn would reach physiological maturity about August 26. This assumes fairly normal weather. The same site can also tell you on August 26 how many GDDs has accumulated by that date. This information can be used to determine if a particular hybrid will mature before the average date of the first frost in the fall.

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