Calculating growing degree days (GDDs)

What role does air temperature play in corn production?

Background

Corn development is correlated with the air temperature. Therefore, development varies from year to year if calendar days are only used to track progress. However, development becomes predictable within and across growing seasons when evaluated using thermal time. The time required for corn to progress from one developmental stage to another is based on the amount of heat accumulated. Thermal time represents the length of time the crop spends within a defined temperature range considered optimum for that crop. For example, shoot emergence occurs approximately 125 GDDs accumulate after emergence. The GDD calculation assumes that corn development is consistent and linear within the defined temperature range of 50–86°F.

Materials

- iPad
- Corn plant

Instructions

1. Use the accompanying iPad and go to the Growing Degree Day calculator at: **nutrien-ekonomics.com/tools-to-calculate-fertilizer-needs/calculators/gdd/** to determine the number of degree days for the test plot in question.
2. Enter the following information on the webpage:

   Location: _____
   Choose your crop: _____
   Start date: _____
   End date: current date
3. Hit "Calculate."
4. Use the growth stage chart to determine the approximate growth stage for the corn plant based upon your calculated GDDs.
5. Observe your corn plant and compare/contrast your calculated GDDs to your analysis of the plant's current growth stage. How do they compare?

Reflection

What environmental factors can impact the development of corn regardless of growth degree days?

Corn variety maturity	GDDs
85–100 days	2100–2400
101–130	2400–2800
131–145	2400–3200

Growth stage	GDDs
V2	200
V6	475
V12	870
VT (tasseling)	1135
R1 (silking)	1400
R6 (maturity)	2700

Vocabulary

- T_{min} = Minimum daily air temperature. If temperature is less than 50°F, use 50 as T_{min}.
- T_{max} = Maximum daily air temperature. If temperature is greater than 86°F, use 86 as T_{max}.

Equation and method

$$GDD = [(T_{max} + T_{min} / 2] - 50$$

GDDs are calculated from VE (emergence) and not the planting date. See the example below:

- Day 1: high 80°F, low 55°F
- Day 2: high 66°F, low 40°F (change 40°F to 50°F in the calculation)
- Day 3: high 92°F, low 72°F (change 92°F to 86°F in the calculation)

Calculations

Day 1: (80 + 55 / 2) – 50 = 17.5 DD
Day 2: (66 + 50 / 2) – 50 = 8 DD
Day 3: (86 + 72 / 2) – 50 = 29 DD

17.5 + 8 + 29 = 55 DD

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