Degree-day Heat Unit Calculator

Degree-day heat units were developed as a tool to measure the heat units that drive plant growth and insect development. Degree-day models provide agricultural producers and crop consultants a way to estimate the variation in crop growth and pest development, based on recent weather conditions.

Each crop or insect has a unique lower and upper air temperature threshold. It is assumed that no growth occurs outside of this range. The temperature range will be lower for crops or insects that grow best in cool air temperatures and higher for those needing more heat for growth. For example, wheat has a lower temperature threshold of 32°F and an upper temperature threshold of 86°F. Cotton, a crop that needs much warmer weather for plant growth, has a lower temperature threshold of 60°F and an upper temperature threshold of 100°F.

Degree-day heat units are calculated for each day and the daily units added together to give a degree-day accumulation from a Start Date. For most crops, the Start Date will be the planting date. Default planting dates are listed in the table below.

The Oklahoma Mesonet uses the "Cutoff Method" to calculate degree-day values, based on the following formula:

$$\text{Degree-days} = \frac{(\text{Maximum Daily Air Temp} + \text{Minimum Daily Air Temp})}{2} - \text{Base Temp}$$

where: Maximum Daily Air Temp is capped at crop's Upper Temperature Threshold.

When the maximum daily air temperature is above a crop's upper temperature threshold, the maximum daily air temperature is set to the upper temperature threshold. When the degree-day value is negative, the degree-day value is set to zero.

The following are the lower and upper temperature thresholds for agronomic crops listed on the Oklahoma Mesonet AgWeather web site.

Crop	Default Planting Date	Base Temperature	Upper Temperature Threshold
Alfalfa	Feb 15	41°F (5°C)	86°F (30°C)
Corn	April 15	50°F (10°C)	86°F (30°C)
Cotton	May 15	60°F (15.6°C)	100°F (37.8°C)
Grass Hay	April 15	50°F (10°C)	86°F (30°C)
Peanut	May 15	55°F (12.8°C)	95°F (35°C)
Sorghum	May 15	55°F (12.8°C)	95°F (35°C)
Soybean	April 10	50°F (10°C)	95°F (35°C)
Wheat	October 1	32°F (0°C)	86°F (30°C)

References:

Degree-days and Phenology Models, University of California, Statewide Integrated Pest Management Program, http://www.ipm.ucdavis.edu/WEATHER/ddconcepts.html.

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