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G86-796 Growing Degree Day Requirements and Freeze Risk as a Guide to Selecting and Planting Corn Hybrids

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Growing Degree Day Requirements and Freeze Risk as a Guide to Selecting and Planting Corn Hybrids

This NebGuide discusses the growing degree day requirements for Nebraska's four corn-growing regions, and how using these requirements can aid in planting date decisions.

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Variations between locations, between seasons at a particular location, between planting times at a particular location and season, and between the requirements of different hybrids result in differences in the number of days it takes for corn to mature. These variations in days are all closely related to differences in temperatures when the corn is being grown. For example, a 2700 growing degree day (GDD) hybrid* planted on April 25 near David City in East Central Nebraska normally would mature in 134 days. If planted May 20 when the temperature is warmer, the corn would grow faster and take only 124 days. Southeast Nebraska is the warmest region of the state. A 2700 GDD hybrid planted April 25 near Pawnee City in the southeast would be able to mature in 123 days -- 11 days sooner than at David City.

The temperature pattern decreases from southeast to northwest. Recent development of center pivot irrigation in the Sandhills of North Central Nebraska has produced a relatively new corn growing area. In this cooler region, a 2700 GDD hybrid planted April 25 near Ainsworth normally would take 156 days and would not mature until about September 27 when the autumn freeze probability has increased to 50 percent. Because of the cooler temperatures, fewer GDD, and earlier freeze dates, corn hybrids adapted to the southeastern half of Nebraska cannot be safely used in the Sandhills.

The "days to maturity" for different hybrids are closely related to their GDD requirements. For example, a hybrid requiring 2450 GDD planted April 25 near David City would be expected to mature in 121 days compared to 134 days for one requiring 2700 GDD. As for the year-to-year variation, the 1982 growing season was cooler than normal so corn growth was slower. A 2450 GDD hybrid planted April 25, 1982 took 129 days to accumulate its GDD requirement, eight days longer than normal. The 1983 season was warmer, so corn grew faster. During this season, corn planted April 25 accumulated 2450 GDD in only 117 days, 4 days sooner than normal and 12 days earlier than in 1982. These comparisons show why a "days to maturity" system of classifying corn hybrids is confusing and why more seed companies are using GDD.

The seasonal temperature of a region must be able to meet the GDD requirements of a hybrid or it will not be adapted. The GDD available for corn decreases as the time of planting is delayed, so the adaptability of different hybrids changes from the beginning to the end of the season. Furthermore, since the amount of GDD and the dates of the killing autumn freeze varies from year to year, planting dates have different freeze risks. *Figures 2-5* are presented to help farmers select corn hybrids, and to decide when to change hybrids when wet spells or other interruptions delay planting. These figures are based on analyses of growing seasons over a 70- to 80-year period, using daily weather records for selected stations representative of different regions of Nebraska.

Figure 1 shows different corn growing regions of Nebraska. *Region A* averages about 3100 GDD, a freeze-free season of 160 days, and the first autumn freeze about October 12. *Region B* has 2900 GDD, a 150-day freeze-free season, and the first autumn freeze about October 8. *Region C* averages 2600 GDD, a freeze-free season of 140 days, and its first autumn freeze about September 29. *Region D* has 2200-2300 GDD, a 130-day freeze-free season, and its first autumn freeze about September 25.

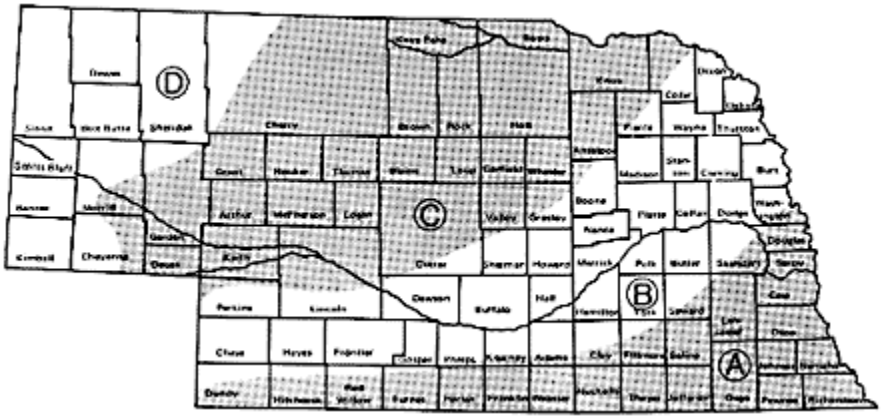


Figure 1. Growing degree day (GDD) regions in Nebraska.

Figures 2, 3, 4 and *5* show, for different regions, the probabilities at different planting dates that different hybrids may not receive sufficient GDD to mature. This may happen because of an untimely early autumn freeze or because the season becomes so cool that the plant ceases to grow even though a freeze has not yet occurred. These figures can be used to select a maturity class for planting, and for deciding when a maturity change should be made if planting becomes delayed. For example, assume that a corn grower in Stanton County (*Region B*) expects to complete planting by May 10. A vertical line from May 10 through the curves for different hybrids shows that the freeze probabilities for all maturities requiring 2600 GDD or less are below 10 percent if they are planted before this date. The freeze probability for a 2700 GDD hybrid increases to 15 percent by May 10, a 2800 GDD hybrid to 23 percent, a 2900 GDD hybrid to 33 percent, and the 3000 GDD hybrid to 46 percent. When sufficient GDD are available, later maturing corn hybrids usually yield more than earlier ones. Now assume that a 10 percent chance of freeze (1 year in 10) is an acceptable level of risk for a grower in Buffalo County (*Region B*). A horizontal line through the curves at 10 percent shows that a 2700 GDD hybrid should be planted by April 30, a 2600 GDD hybrid by May 15, a 2500 GDD hybrid by May 23, a 2400 GDD hybrid by May 30. If planting is not possible until after May 30, a very early maturing corn or sorghum hybrid requiring only 2300 or 2200 GDD, or perhaps early soybeans, should be considered.

Producers should also consider drying costs for hybrids that push the maturity in a given zone. If a hybrid that matures a few days earlier is used, both risk of freeze before maturity and cost of drying can be reduced.

Figure 2. Region A freeze probabilities for different corn hybrids.

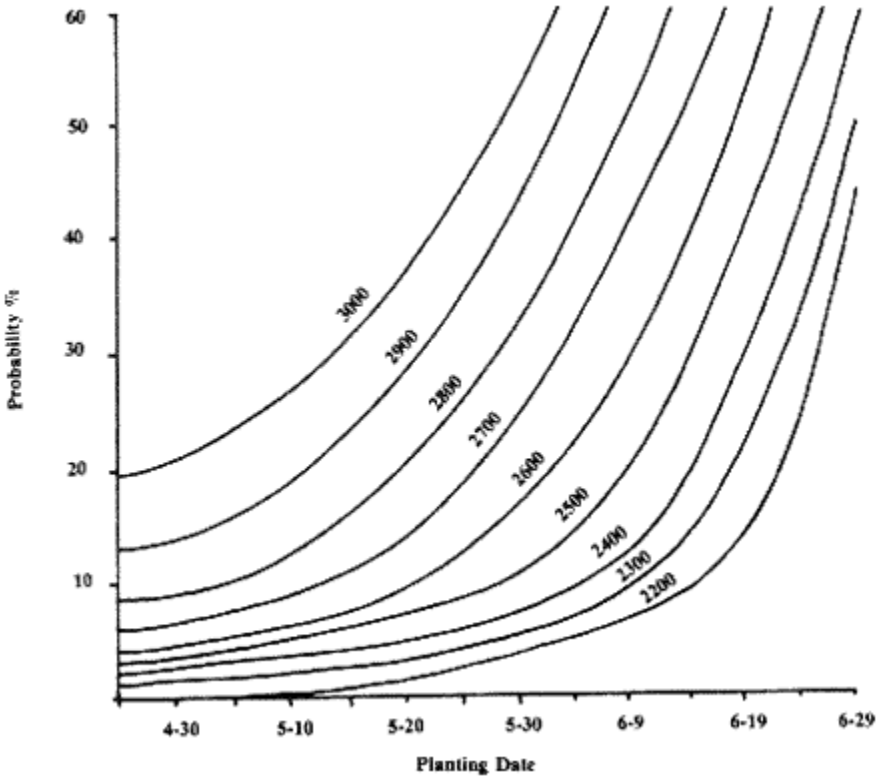


Figure 3. Region B freeze probabilities for different corn hybrids.

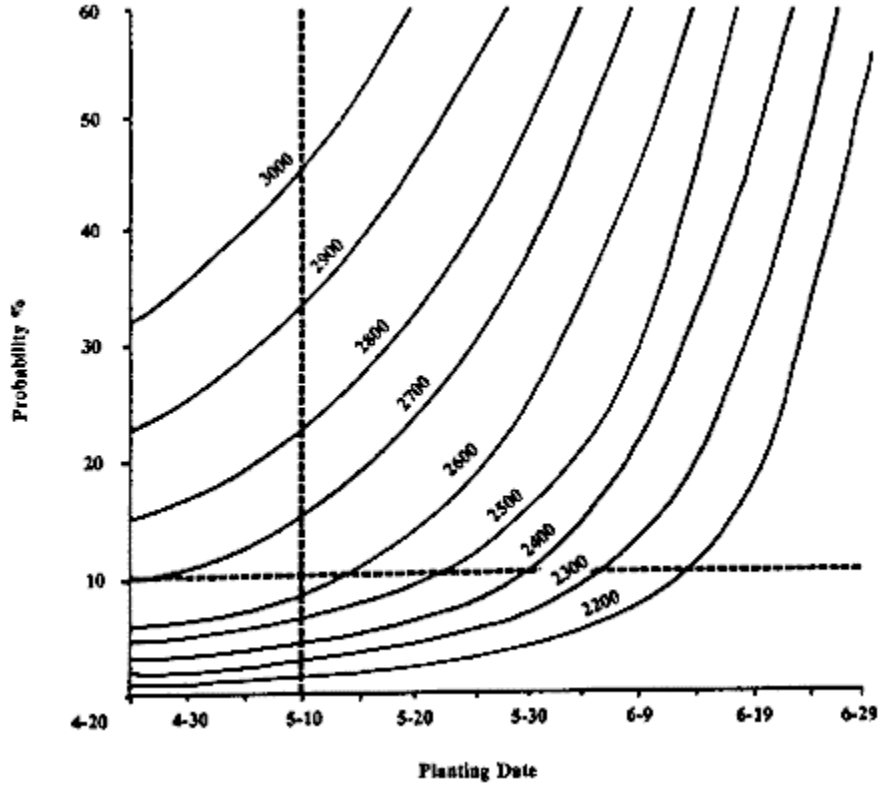


Figure 4. Region C freeze probabilities for different corn hybrids.

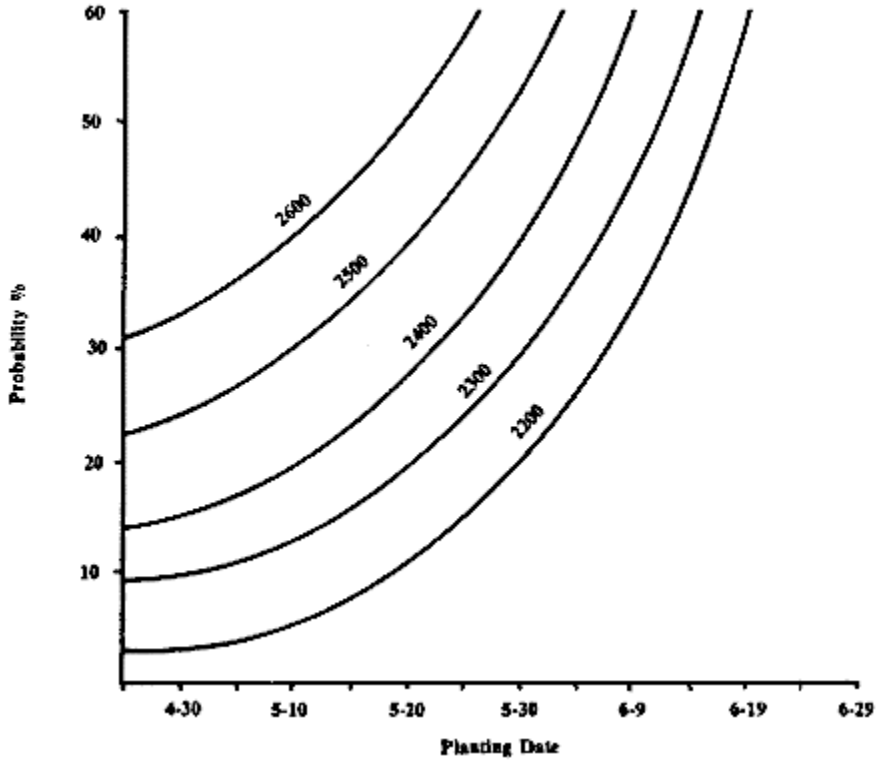
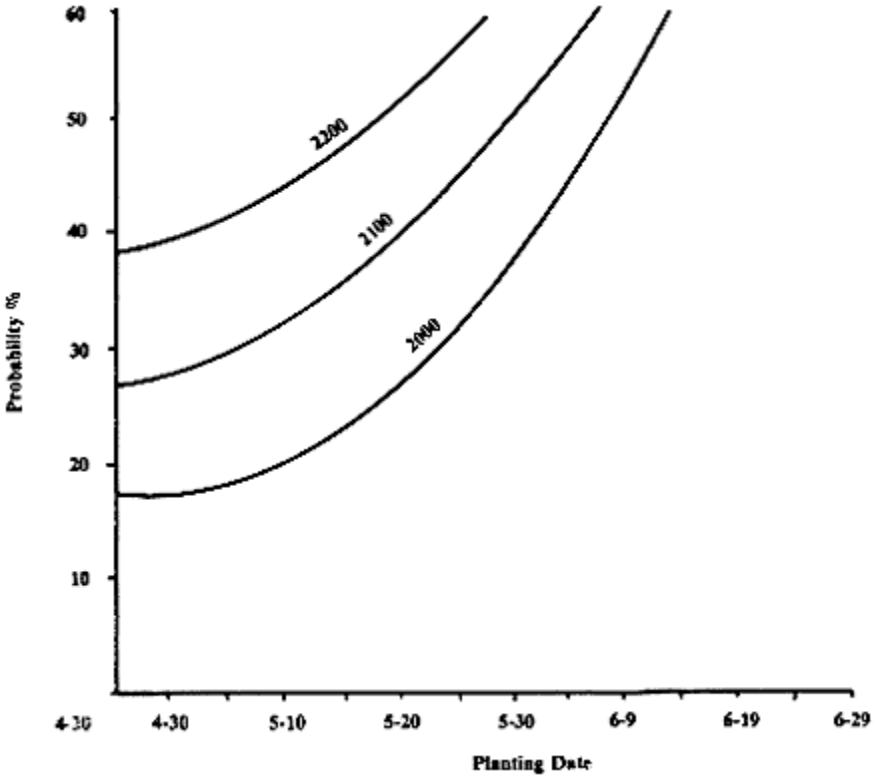


Figure 5. Region D freeze probabilities for different corn hybrids.



*GDD are the temperature requirements for different corn hybrids.

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