

Soil Temperatures for Cotton Planting

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Cotton can overcome many stresses if it has adequate soil and air temperatures for plant growth. However, growers in most regions of Texas plant before the onset of optimum temperature conditions to take advantage of early season moisture. Growers in the eastern part of the state prefer earlier plantings to avoid late season harvest problems, and growers in the western regions plant early in an attempt to lengthen their growing season. However, it is best to plant according to soil temperature – not the calendar. If planted too early, a crop may suffer stand loss and cold temperature stress, which reduce yield potential.

The seed is known as a “resting” structure. It is dehydrated, largely composed of storage tissue, and surrounded by the impervious seed coat. Basically, the seed is in a state of suspended animation, mainly due to a lack of water and oxygen. The process of germination begins with the absorption of water (imbibition), the reactivation of metabolism, and the initiation of growth. The seed contains an embryo. At one end of the embryo is the radicle, which will become the root and at the other end is the plumule, which will form the stem and leaves. The cotton seed also has two cotyledons, or seed leaves. These cotyledons are storage tissues and provide energy for the developing seedling.

Cotton seed germination is favored by high soil oxygen concentration, adequate soil moisture, and soil temperatures above 64°F. Based on work conducted by USDA-ARS researchers at Lubbock, the cotton plant requires more than 100 hours above

64°F at the seed level to emerge. Germination can begin when the mean daily temperature is 60°F at seeding depths, but growth will be slow at these temperatures.

The optimum planting target is to have a 10-day average soil temperature of 65°F at the 8-inch depth. If poor quality seed is planted, then 70°F may be a better target. This volume of soil underneath the seed can act as a potential short-term heat buffer to moderate seed zone temperatures if cool spells do occur after planting. This is due to the fact that soil temperatures in the seed zone will lag air temperatures by about 3-5 hours.



At a minimum, soil temperatures in the seed and root zone should exceed 60°F and the five day forecast for daytime maximum temperatures should exceed 80°F. Additionally, nighttime minimum temperatures should be forecast to be above 50°F for the following 5 days.

Cotton is a tropical plant and during the critical germination period soil temperatures below 50°F can cause chilling injury to germinating cotton. Chilling injury can result in malformed seedlings, loss of the taproot reduced vigor and stand establishment, and the increased likelihood of seedling disease problems.

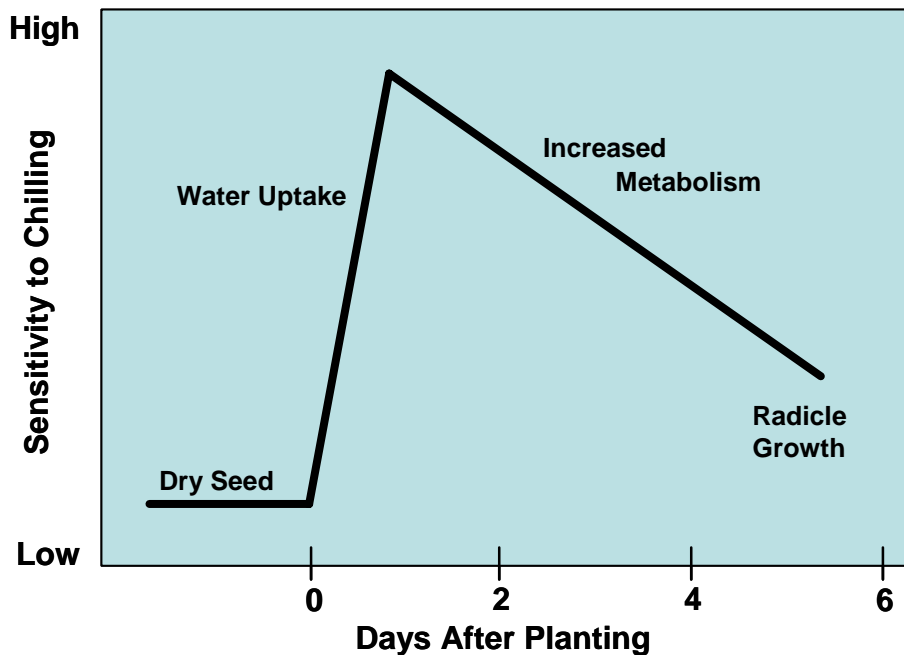
Emergence will generally occur after accumulation of 50-80 DD60 heat units after planting. Planting should be delayed if the 5-day forecast predicts the accumulation of less than 25 heat units after planting.

Due to cool spring conditions on the High Plains, the long-term average air temperatures and corresponding DD60s for various dates in May are listed below:

When considering long-term average temperatures for May, one should consider waiting until after at least May 1 to plant. By delaying planting until May 10, at least 8 DD60s per day would result in a total of about 40 over the next five days.

Day	High	Low	Average	DD60s per day (= average temp - 60)
May 1	79	51	65	5
May 10	82	54	68	8
May 20	84	57	70.5	10.5
May 30	87	60	73.5	13.5

Cotton Sensitivity to Cold Temperatures During the Germination Period



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