Chilling Injury in Cotton

- Planting is a critical time for cotton production and careful evaluation of all factors can help in establishing a healthy, uniform cotton stand.
- Of the many factors that influence seed germination and emergence, temperature is the most important.\(^1\)
- Planting too early or when soils are too cold can result in chilling injury to the cotton seedling.

After a seed is planted, water is absorbed to transform the seed from a non-growing state to a growing organism. This is a critical time for a young cotton seedling, and cool temperatures can disrupt the correct growth and function of developing and changing cells. Cotton seeds are most sensitive to temperatures during imbition, when the seed absorbs water. If cold water is absorbed during this time, chilling injury can be so severe the seedling may die when the radical or the taproot does not form properly.\(^2\)

Germinating cotton seeds can be injured when soil temperatures fall below 50°F.\(^3\) Temperatures at or below 41°F will kill a seed during the hydration phase; however, the seed may survive if exposed to warm temperatures (88°F) prior to the chilling temperatures.\(^3\) Seeds/seedlings that do survive chilling injury may experience problems throughout the entire growing season including delayed emergence and reduced yield potential.

Under ideal situations, seedbeds should be moist and warm. Good seed-to-soil contact is essential for initial water uptake. Once the seed is planted, it takes 80 to 100 heat units for emergence. In most regions, emergence will take from 7 to 10 days under favorable temperatures. The following simple guidelines can help to increase the probability of a successful cotton crop.

**Items to Consider When Planting Cotton Seed Quality**

When choosing cotton seed, check the bag for seed viability information from Standard Germination Testing. The Standard Germination Test provides the estimated percentage of seeds likely to emerge under ideal, warm growing conditions. The Standard Germination Test percentage should be at least 80% under the standard conditions. For germination testing under less than ideal conditions, the Cool Germination Test results provide an estimate for the percent of germination when planting into cooler soils (near 65°F). To obtain Cool Germination Testing information, check with your seed supplier or send seed samples in for university or private testing. The Cool Germination Test results should be at least 50 to 60%. To obtain the standard (warm) and cool germination data for Deltapine® brand varieties, contact your dealer. They can obtain the germination data from the standard, cool, and state germination tests from Monsanto.

**Acceleron® Seed Treatment Products** can also help improve emergence and seedling health. Remember, early-planted cotton is more prone to seedling diseases due to cool temperatures, making additional disease prevention efforts valuable.

**Cotton Product Selection**

A cotton variety with proven high yield potential within a specific geography should be chosen. It is also important...
to consider the stability and quality characteristics of the cotton variety. Multiple cotton varieties with different maturities should be selected so cotton will not mature at the same time. Consider staggering planting dates when using the same variety.

**Soil Temperature**

Soil must be given time to warm up before cotton is planted. For optimum cotton germination, the soil temperature where the seed will be planted (1.5 to 2 inches deep depending on geography, soil type, and water availability) should be at least 65° F. Cotton is an oilseed crop of semi-tropical origins, so the energy supply for the growing embryo is very sensitive to cool temperatures. Cotton seed germination can be sporadic at soil temperatures less than 58° F. It is best to plant cotton according to soil temperature as opposed to calendar date.

**Favorable Weather Outlook**

Along with warm soil temperatures, it is important to plant cotton when there is a favorable 5-day weather forecast for warm temperatures. Cotton seed that does not receive favorable conditions in the first five days can potentially experience delayed emergence, reduced stands, yield loss, and an increased risk of seeding diseases.

Rainfall levels of 1 inch or more can drop soil temperatures as much as 5° F. After the cotton seed is planted, imbibition, or the uptake of water through the seed coat, occurs in 24 to 48 hours. Imbibition occurs as water moves from areas of higher concentration (the soil) to areas of lower concentration (the seed). Hydration of the seed is critical; however, if the seed is exposed to cooler temperatures due to irrigation or rain, imbibitional chilling injury can occur. Therefore, soil temperatures should be above 65° F and soil should be moist prior to planting. Avoid planting when air temperatures in the forecast are below 50° F for anytime during the first 5 days.

**Tillage**

Many cotton farmers are using no-till or reduced tillage for cotton production. Different tillage systems can alter how fast soils warm up in the spring. Cotton fields planted in no-till or reduced tillage systems will typically fall within the same planting calendar dates specific to a region. The speed at which the soil warms up will depend on soil texture, color, moisture, and ground cover. The same rule applies for cotton planted in conservation tillage systems as conventional; do not plant until soil temperature reaches the ideal temperature for your region.

In no-till systems, it is essential to obtain a good stand on the first try for a crop success. Replanting cotton in no-till systems can complicate weed control and result in an uneven stand.

**Key Planting Considerations to Avoid Cotton Chilling Injury**

- Plant quality seed as determined by germination tests.
- Plant into a 5-day warming trend.
- Soil temperature should be at least 65° F where seed will be planted.

---

**Sources:**


---

For additional agronomic information, please contact your Asgrow®, DEKALB® and Deltapine® Brands Seed Representative

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Acceloron® is a registered trademark of Monsanto Technology LLC. Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. ©2014 Monsanto Company. 04052014 CRB.