



## Assessing Early Season Hail Damage in Cotton

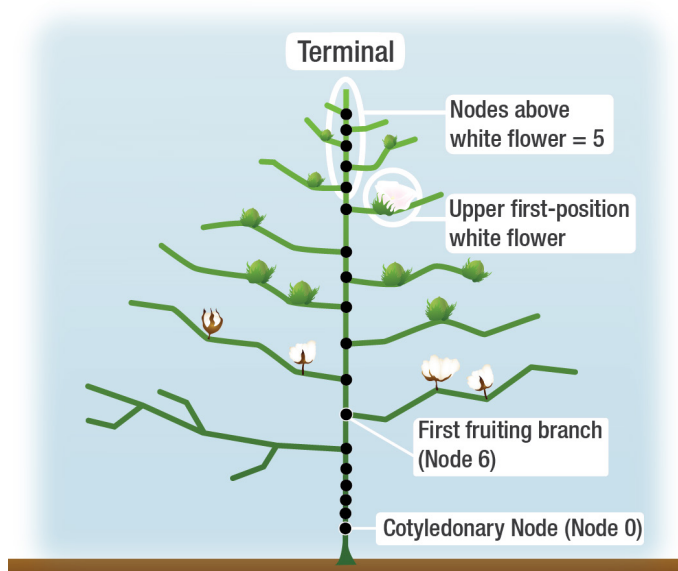
Every year, hail damage is likely to occur somewhere within the Cotton Belt. The intensity of a single hail event can vary from field to field, or even within a single field. The time of year the hail event occurs, and the growth stage of the crop can help determine whether or not replanting is necessary.

### What Should I Look For When Assessing Crop Condition Following a Hailstorm?

While growers might be concerned that their cotton crops “look bad” immediately after a hailstorm, extension experts recommend delaying assessment for at least three to five days following the storm.<sup>1,2</sup> This allows time for the crop to show some recovery. The speed and ability to recover from a hail injury can vary depending on weather conditions. Cloudy, cool, and damp weather can delay new growth and recovery or increase the possibility of disease infections that are favored by those conditions. Conversely, sunny, warm, and dry weather immediately following a hail event can lead to quicker growth of the remaining viable plant tissue, while plant tissue that was damaged may turn brown and allow for easier assessment of plant health.

If weather conditions are favorable after a hailstorm, cotton seedlings can make remarkable recoveries. This is due in part to a change in the root to shoot ratio. The root size will be the same as before the storm while the shoot and leaf area is reduced, so the root system is able to supply ample water and nutrients to the plant.<sup>2,3</sup>

When assessing crop condition, examine plants to determine what percent of plants have a healthy terminal (newest forming leaves at the top of the cotton plant, Figure 1), the percent that do NOT have a terminal, and the percent of plants that were cut off below the cotyledons. Plants cut off below the cotyledons will not survive and should not be counted when estimating population. Plants that are missing the apical meristem (terminal) will likely recover but will not have normal yield potential.



**Figure 1. Location of the terminal on a cotton plant.**

Stems should also be examined for bruising, which can negatively affect the plant’s ability to recover, especially in dry soil conditions. In addition, bruised stems can possibly increase the susceptibility of the plant to diseases and lodging later in the season.<sup>4</sup>

The loss of the terminal on small plants (two- to four-leaf growth stage) may cause the greatest reduction in yield potential. Research trials from 2015 to 2017 in Tennessee, Mississippi, and Missouri found that the removal of the two upper nodes in four-leaf cotton resulted in a yield reduction of 13%. If the upper four nodes were removed from 4-leaf cotton, yield reductions of up to 41% were observed. The cotton products tested, regardless of their relative maturity, did not vary in response to injury from damage.

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Plants can continue to grow and set fruit without a terminal, but the lack of a terminal can increase branching and delay maturity. Maturity might also be delayed if the hailstorm occurs midseason knocking off squares and bolls. If maturity is delayed, management of the crop may need to be adjusted as if it had been planted late.

Generally, cotton seedlings can survive if at least one of the two cotyledons is viable and if the terminal is preferably intact. If both cotyledons and the terminal are missing, potential yield loss can be expected. Research conducted in Georgia found that with simulated hail damage, approximately 35% yield loss occurred when both cotyledons and the terminal were removed (assuming all affected plants survived).<sup>5</sup>

## How Much Leaf Area Loss Can Young Cotton Plants Tolerate?

Young cotton seedlings (three- to eight-leaf growth stages) can tolerate leaf area losses of 50 to 75%, particularly if their terminal received little or no damage.<sup>1</sup> With an intact and healthy terminal, new leaves develop quickly in favorable weather conditions for a fast recovery.

## Is Replanting Necessary?

Three key parameters in making replant decisions following an early season hailstorm are:

1. The population of plants that appear healthy.
2. The consistency of plant spacing.
3. Calendar date of the storm

A population of 20,000 healthy plants with few, if any, skips can maintain good yield potential. However, since cotton cannot compensate well for large skips in the plant stand, replanting might be justified if a field has a population of about 30,000 plants per acre in which more than half of the planted area has skips of three feet or more.

From 2016 to 2018 a research team of Midsouth Cotton Specialists evaluated how planting date and plant population can affect yield potential. They determined that the yield potential of cotton planted in late April to early May declined when populations fell below 30,000 plants per acre (plants/acre).

The data further suggested that a uniform stand of about 20,000 plants/acre planted in early May had nearly equal yield potential compared to a stand of 40,000 plants/acre planted after May 20th.<sup>4</sup>

Plant population can be determined by measuring a distance in the row equivalent to 1/1000 of an acre, based on the planted row width (Table 1), and counting the number of plants.

Row width (inches)	Row Length to equal 1/1000 <sup>th</sup> of an acre (feet, inches)
7.5	69' 8"
15	34' 10"
20	26' 2"
22	23' 9"
30	17' 5"
36	14' 6"
38	13' 9"
40	13' 1"

Experiments conducted by Texas A&M University from 2012 through 2014 examined the effects of simulated stand reduction on lint yield of cotton in dryland and irrigated trials. Plant stands in the dryland trial were reduced by 18%, 34%, 56%, 75%, and 84% from a target population of about 31,500 plants per acre. The average yield loss across the three years was 28%, which was observed when 84% of the stand was removed.<sup>6</sup>

In the irrigated trial, stands were reduced by 16%, 31%, 52%, 75%, and 81% from a target population of just under 30,000 plants/acre. The lint yield results were inconsistent over the years of the trial. No significant yield loss was observed in 2012 across all stand reduction treatments. In 2013, yield reductions of 25% and 28% occurred at stand losses of 75% and 81%, respectively. And in 2014, yields were reduced by 36% following a stand reduction of 81%.<sup>6</sup>



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## Do Best Management Practices Change Due to Hail Damage?

Management practices for cotton following a damaging hailstorm may be similar to those used in late planting situations. If hail damage occurs in small cotton (less than seven or eight leaves) plants have the ability to produce multiple vegetative branches. These branches still have the potential to produce flowers and bolls, but plant maturity will be delayed. The use of plant growth regulators may be warranted in helping manage these growth habits to produce acceptable yields. Additionally, when maturity is delayed, strategies to control insect pests like armyworms, and budworm/bollworm increase in importance.

## Sources:

- <sup>1</sup>Hutmacher, R.B. and Sosnoskie, L.M. 2019. Hail damage and your cotton crop. University of California Agriculture and Natural Resources. <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=30359>
- <sup>2</sup>What should I do about hail damaged cotton stands? Mississippi State University. <http://extension.msstate.edu/content/what-should-i-do-about-hail-damaged-cotton-stands#:~:text=Cotton%20can%20really%20come%20back,node%20will%20probably%20not%20recover>.
- <sup>3</sup>Hail damage. Mississippi State University. <http://extension.msstate.edu/content/hail-damage>
- <sup>4</sup>Raper, T. 2022. Making the decision to replant and assessing injury from hail. University of Tennessee. <https://news.utcrops.com/2022/05/making-the-decision-to-replant-and-assessing-injury-from-hail/>
- <sup>5</sup>Collins, G. and Edmisten, K. 2019. Late planting & evaluating hail damage. North Carolina State University Extension. <https://cotton.ces.ncsu.edu/2019/06/late-planting-evaluating-hail-damage-collins-edmisten/>
- <sup>6</sup>McGinty, J., Morgan, G. and Mott, D. 2019. Cotton response to simulated hail damage and stand loss in Central Texas. The Journal of Cotton Science. 23: 1–6. <https://www.cotton.org/journal/2019-23/1/upload/JCS23-001.pdf>

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**Performance may vary**, from location to location and from year to year, as local growing, soil and environmental conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on their growing environment.

The recommendations in this material are based upon trial observations and feedback received from a limited number of growers and growing environments. These recommendations should be considered as one reference point and should not be substituted for the professional opinion of agronomists, entomologists or other relevant experts evaluating specific conditions.

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