Cotton Harvest Aid Application and Timing

- Carefully consider crop maturity, field conditions, and environmental conditions prior to making a harvest aid application.
- Defoliating a cotton crop too early or too late can have a negative impact on yield potential and fiber quality.
- Understanding the growth characteristics of a cotton variety can aid in the harvest decision-making process.

As a cotton plant matures, a physiological process takes place which separates the living tissue near the leaf petiole, called the abscission zone. Plant hormones regulate enzyme activity, causing the cell walls in the abscission zone to dissolve and the leaf to drop. This process can be controlled with the help of harvest aids to accelerate the leaf abscission process in order to preserve boll integrity and lint quality. Benefits of proper cotton defoliation include limiting the main sources of lint staining and trash (leaves), increasing harvest efficiency, straightening lodged cotton plants, accelerating boll opening, and reducing boll rot.

Determining When to Apply a Harvest Aid

There is as much art as science involved in making the decision to defoliate cotton. There are several methods producers can use to help determine the best time to apply a defoliant to their crop. One or more of the following methods may be used to help make this decision.

Percent open bolls. This is the most widely used method and is based on determining the total percentage of open bolls in a field. The most common recommendation for defoliant application is when 60% of bolls in a field are open. However, depending on crop maturity and boll distribution, maximum yields can be obtained with defoliation applications ranging from 42% to 81% open bolls.[1]

Nodes above cracked boll (NACB). This method is determined by locating the uppermost first position cracked boll with visible lint and counting the number of main-stem nodes to the uppermost harvestable boll. Defoliation is generally recommended at four NACB. For cotton with a lower plant population, defoliation is typically recommended at three NACB.[1]

Accumulated heat units after cutout. Defoliation is recommended after 850 heat units (DD60s) have accumulated, which is typically after cutout or five nodes above white flower (NAWF).[1] The main drawback to this method is that the amount of heat units required by each variety can vary. In addition, this method requires a determination of cutout, which can be different for every field.

Visual inspection. Growers may also choose to determine maturity by visual inspection. Bolls are generally considered mature when they are difficult to cut in a cross-section with a knife, fibers string out when the boll is cut, and the seeds have begun to form a brown or black seed coat. Once a dark seed coat has formed, defoliation should not adversely affect those bolls.

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Harvest Aid Selection

Part of the decision to defoliate a cotton crop should include understanding what the crop needs to finish cotton production adequately and efficiently. Harvest aid product selection should consider the state of the crop, the environmental conditions before and after application, and the yield potential of the crop.

There are four categories of harvest aids: boll openers, defoliants, desiccants, and regrowth inhibitors. **Boll openers** contain ethephon which accelerates the natural boll opening process. If boll openers are applied to cotton prior to maturity, micronaire and fiber length can be reduced. Using boll openers in combination with defoliants can enhance activity. **Defoliants** can be either herbicidal or hormonal. Herbicidal defoliants injure the leaves, upsetting the hormone balance to begin the abscission process. Hormonal defoliants increase ethylene synthesis in a plant, causing the leaves to fall off. Correct application rates are important, especially with herbicidal defoliants, as overapplication can cause the leaf to die before the abscission process, resulting in "stuck" leaves. Conversely, when too little defoliant is applied, the abscission process may not begin, resulting in no leaf defoliation. **Desiccants** are typically faster acting than defoliants but can lead to leaf stick. In high-yielding cotton, a desiccant may be applied after a defoliant to help speed up the plant drying process. **Regrowth inhibitors** are applied to prevent late-season foliar growth.[2] Some harvest aid products can defoliate as well as inhibit regrowth. Ginstar® EC Cotton Defoliant provides clean, consistent defoliation and regrowth inhibition, even in challenging weather conditions. Finish® 6 PRO Harvest Aid is a hormonal cotton defoliant and boll opener premix. This product quickly aids in boll opening, defoliation, and reduces terminal growth without the harsh side effects of a desiccant.

Factors Affecting Defoliation

When applying a defoliant, desiccant, or boll opener, many factors must be taken into consideration for successful application. Proper in-season growth management with plant growth regulator (PGR) applications can help contribute to the effectiveness of defoliants. Best results from an application occur when:

- Cotton has been managed for earliness and uniform maturity.
- Applications are made during warm, sunny weather. High humidity can also increase defoliant absorption into the plant.
- Soil and plant nitrogen levels are low.
- Cotton plants have at least 70% open bolls and few new leaves.[3]

Poor results from a defoliant application can occur when:

- Cotton plants are still in a vegetative growth stage and bolls are not mature.
- Applications are made during cool (below 60 °F), cloudy weather.
- Plants are severely stressed.
- High levels of soil nitrogen and moisture are present.[3]

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Figure 1. Cotton harvest.

Harvest Aid Application

Successful defoliation depends on sufficient leaf coverage during application. Higher sprayer volumes may be necessary to achieve adequate coverage. Volumes between 10 to 15 gallons per acre (GPA) are recommended for most situations.[1,3] It is also recommended to use flat-fan or hollow cone nozzles. These types of nozzles provide excellent spray coverage. Drift-reduction nozzles, while excellent at controlling drift and spray placement, have been shown to decrease coverage within the crop canopy.[5]

Harvest aids do not contribute to cotton yield potential or maturity and are used to defoliate the plant. It is also important to recognize that once a cotton plant is defoliated, fiber and seed development can slow or stop. If cotton is defoliated too early, bolls may not mature, which can limit fiber quality and yield potential. Defoliants should only be applied when a cotton crop has reached the desired maturity for harvest.

No one harvest aid, rate, or specific timing is the solution for every field. Selections should be based on prior experience, price, environmental and crop conditions, yield potential, and the value of the crop. Knowledge of the lint and growth characteristics of each individual variety is critical in finding the best harvest aid program, with respect to product and timing.

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Sources

[1] Miller, D., Stephenson, D., and Fromme, D. 2014. 2014 Cotton harvest aid guidelines for Louisiana. Louisiana State University Extension. Pub. 3194 https://www.lsuagcenter.com/NR/rdonlyres/4D483B1B-EE9E-40ED-ACA2-7ECA29525D61/98884/pub3194CottonHarvestAidGuidelines2014.pdf

[2] Wright, S.D., Hutmacher, R.B., and Vargas, R.N. 2013. Harvest aid chemicals. University of California. UC IPM Pest Management Guidelines: Cotton. Publication 3444. https://ipm.ucanr.edu/agriculture/cotton/harvest-aid-chemicals/.

[3] Defoliation general discussion. Mississippi State University Extension. http://extension.msstate.edu/content/defoliation-general-discussion.

[4] Stichler, C., Supak, J., Hake, K., and Warrick, B. The proper use of cotton harvest-aid chemicals. Texas Agricultural Extension Service. L-5142. http://publications.tamu.edu/COTTON/PUB_cotton_The%20Proper%20Use%20of%20Cotton%20Harvest-Aid%20Chemicals.pdf

[5] Siebert, J., Craig, C., Stewart, S., and Miller, D. 2006. Effect of carrier volume and nozzle type on cotton harvest-aid efficacy. The Journal of Cotton Science, 10:89-96. https://www.cotton.org/journal/2006-10/2/upload/jcs10-089.pdf

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