### Cotton Defoliation: Application and Timing

- When making the decision to defoliate cotton, careful consideration must be made with relation to crop maturity, field conditions, and environmental conditions.
- Defoliating a cotton crop too early or too late may have a negative impact on yield potential and fiber quality.
- Cotton fiber quality and yield can be maintained by paying close attention to maturity and understanding the growth characteristics of a variety.

#### Defoliation

Cotton defoliation is the use of chemicals to help prepare a cotton crop for harvest. Benefits of proper cotton defoliation can include: reduction in the main sources of stain and trash (leaves), increased harvest efficiency, quicker drying of dew, straightening of lodged cotton plants, potential for increased boll opening, and a reduction of boll rots.

#### Defoliation Process

As a cotton plant matures, a physiological process takes place which separates the living tissue near the leaf petiole, an area referred to as the abscission zone. Hormones within a plant regulate enzyme activity which causes the cell walls in the abscission zone to dissolve and eventually causes the leaf to drop.

There are two types of defoliants. A herbicidal defoliant can be used to cause injury to the leaf, which upsets the hormone balance and starts the abscission process. The application of a hormonal defoliant increases the ethylene synthesis in a plant, causing the leaves to fall off. Correct application rates are important, especially with herbicidal defoliants, since too much chemical 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.

#### Factors Affecting Defoliation

When applying a defoliant, desiccant, or boll opener, many factors must be taken into consideration for successful application. Best results from an application occur when:

- Cotton has been managed for earliness and uniform maturity.

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<th>Poor results from a defoliant application can occur when:</th>
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<td>Applications are made during warm, sunny weather. High humidity can also increase defoliant absorption into the plant.</td>
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<tr>
<td>Soil and plant nitrogen levels are low.</td>
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<td>Cotton plants have at least 70 percent open bolls and few new leaves.</td>
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The use of plant growth regulators (PGRs) during the growing season can also influence the efficacy of defoliants.
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PGRs work to reduce vegetative growth and slow the development of new nodes, which can help plants mature early and prepare for defoliation. In high-yielding cotton, a desiccant may be applied after a defoliant to help speed up the plant drying process. Boll openers may also be used in combination with defoliants to enhance activity. Boll openers increase ethylene production within a boll to hasten opening and speed up dry out. If applied to cotton prior to maturity, micronaire and fiber length can be reduced.

Defoliation Application

Successful defoliation depends on sufficient leaf coverage by the chemical. Each leaf must receive enough chemical to begin the abscission process. Higher sprayer volumes may be recommended to achieve adequate coverage to all plant leaves. Volumes between 10-15 GPA are recommended for most situations. For most defoliant applications, it is also recommended that flat-fan or hollow cone nozzles be used. 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.

Timing Defoliant Application

There is as much art as science involved in making the decision to defoliate cotton. By paying close attention to individual fields, defoliation can be achieved while maintaining fiber quality and yield potential. 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.

Defoliation Timing Methods:

- **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 given field are open. Research has shown that maximum yields can be obtained with defoliation applications ranging from 42% up to 81% open bolls.
- **Nodes Above Cracked Boll (NACB)** – this method focuses on the un-opened portion of the crop. NACB is determined by locating the uppermost first-position boll that is cracked open with visible lint, and counting the number of main-stem nodes to the uppermost harvestable boll. Most recommendations call for a defoliation application at 4 NACB. With low plant population and skip-row cotton, most recommendations call for a defoliation application at 3 NACB.
- **Accumulated Heat Units After Cutout** — this method is based upon the unopened portion of the crop. A defoliation application is recommended after an accumulation of 850 heat units (DD60s), which is typically after cutout or 5 Nodes Above White Flower (NAWF=5). The main drawback to this method is that the amount of heat units required by each variety can vary. In addition, using this method requires a determination of cutout, which is often a moving target and can be different for every field.
- **Visual Inspection** — Producers 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.

No one defoliant or 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.

Defoliants do not contribute any to cotton yield potential or maturity, but are chemicals used to remove leaves from the plant. It is also important to recognize that problems can occur from the use of defoliants. 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 reduces fiber quality and yield potential. Defoliants should be applied only when a cotton crop has reached the desired maturity for harvest.

Sources:

4. Siebert, J.D., Chism, C., Stewart, S., and Miller, D. Cotton defoliant efficacy: Effect of carrier volume and nozzle type. Louisiana State University and University of Tennessee. www.utextension.utk.edu

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology, Development, & Agronomy by Monsanto.

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.

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