



# COTTON FUNDAMENTALS

## Plant Growth Regulator Management

The plant growth regulator (PGR), mepiquat chloride (the original product was called Pix<sup>®</sup>, and it remains the most common name-brand description still used today), has been used in cotton culture for about 40 years, yet misconceptions remain about what it does and doesn't do to cotton plants.



### MODE OF ACTION

**M**epiquat chloride (MepC) is an anti-gibberellin, which reduces the production of gibberellic acid in cotton plants. Gibberellic acid is a plant hormone primarily responsible for cellular expansion. An application of MepC reduces cellular growth, thereby reducing internode length (mainstem and fruiting branches) and making the plant shorter and having more compact architecture. Also, leaves will be smaller, thicker and have a darker green color. Some research shows higher levels of calcium, magnesium, and phosphorus in leaves and higher levels of potassium and phosphorus in roots.

Cotton plants typically produce a new node every three to four days and each new internode continues to grow longer and wider over the next 14 days, depending on growing conditions (temperature, moisture, fertility, etc.). The most rapid growth occurs the first 6 to 10 days after the nodal appearance.

Mepiquat chloride is readily absorbed by leaves and is translocated to plant growing points. It reduces cellular expansion in the upper-most three to four internodes of the main stem. It is not metabolized by the plant, but it is "bio-diluted" as the plant gets larger. The effective concentration in the plant is about 10 to 12 ppm, so as the plant grows and gets larger it requires additional applications to continue suppression of cellular expansion in new internode growth. It does not shrink existing internodes. Cotton in the pre-bloom stage is more sensitive to MepC than after the plant starts blooming. Once it is well into bloom, it becomes even less sensitive.

### ENVIRONMENTAL AND AGRONOMIC INFLUENCE

**S**tudies have shown a typical seasonal MepC program will reduce total mainstem nodes by about one node, which could hasten maturity by 3 to 5 days. If the crop has good soil moisture, there's no reason to be fearful of "shutting the plant down." However, under stressful conditions application of MepC can add another stress factor. It is a good idea to check the weather forecast for the following 10 days to ensure the crop will not be under extremely hot and dry conditions (especially if soil moisture is in question). Moisture/heat stress can reduce vegetative growth and fruiting, allowing the existing boll load to capture a high amount of the available carbohydrate resources. This can lead to earlier cutout, thus "shutting the plant down" sooner than normal and reducing yield potential.

- **Conditions favoring a more aggressive approach** – tall, aggressive growing variety, strong soil, good soil moisture/irrigated conditions, high nitrogen fertility, low fruit retention, high plant density, late planting
- **Conditions favoring a more cautious approach** – dryland environments, variety with shorter, more compact growth habit, weaker soil, low soil moisture/heat stress, very heavy boll load (retained bolls are the best plant growth regulator), plant stress/injury from disease, nematodes, insects, mites, herbicides, weather, etc.

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## VARIETY RESPONSE

Not all varieties are created equal when it comes to MepC response. Some varieties possess a very aggressive growth habit (e.g. NG 5711 B3XF, NG 3956 B3XF, NG 3729 B2XF and NG 3500 XF) and may not be as responsive to MepC. Others, like NG 4098 B3XF, NG 3930 B3XF and NG 2982 B3XF have less aggressive growth potential and are also much more responsive to MepC applications.

## APPLICATION STRATEGIES

Most practitioners will initiate MepC low rate applications at match-head square stage (Figure 1), followed by higher rates at the late-vegetative to first-bloom stage. It should be noted that sometimes due to low moisture conditions dryland fields may require little if any PGR management. Typically, the most rapid plant growth (linear growth phase) begins about 40 days after emergence and continues into the bloom stage (80 days after emergence). This initial growth surge would be about the 9th to 10th node (match-head square stage). Suggested rates herein are based on a 4.2% MepC product, so if you are using a higher concentration product be sure to adjust rates accordingly. In addition, Stance® is a MepC product that also contains cyclanilide (inhibits gibberellic acid synthesis and auxin transport) and is formulated as 8.4% MepC so it is used at reduced rates.

Figure 1. Cotton Square Stages of Development

(Image credit to Dr. J.C. Banks, Oklahoma State Cooperative Extension Service)



Here are some different approaches/guidelines that can be used, but regional/local environmental, agronomic, and cultural factors will dictate potential timing and rate structures. **The most important thing to remember is regardless of these factors, timing is more critical than rate. The application made prior to, or at first bloom is key to subsequent MepC management.** In very aggressive growth situations, it is best to limit any one application to 24 fl oz. (although 32 fl oz. is commonly used, the maximum labeled rate is 24 fl oz.) and assess the growth condition about a week later.

### STANDARD DRYLAND STRATEGY

- 2 to 4 fl oz. – match-head square
- 8 to 12 fl oz. – just prior to bloom or at first bloom (**don't be late**)
- 8 to 16 fl oz. – follow-up as needed

### STANDARD IRRIGATED STRATEGY

- 4 to 8 fl oz. – match-head square
- 8 to 20 fl oz. – just prior to bloom or at first bloom (**don't be late**)
- 16 to 24 fl oz. – follow-up as needed

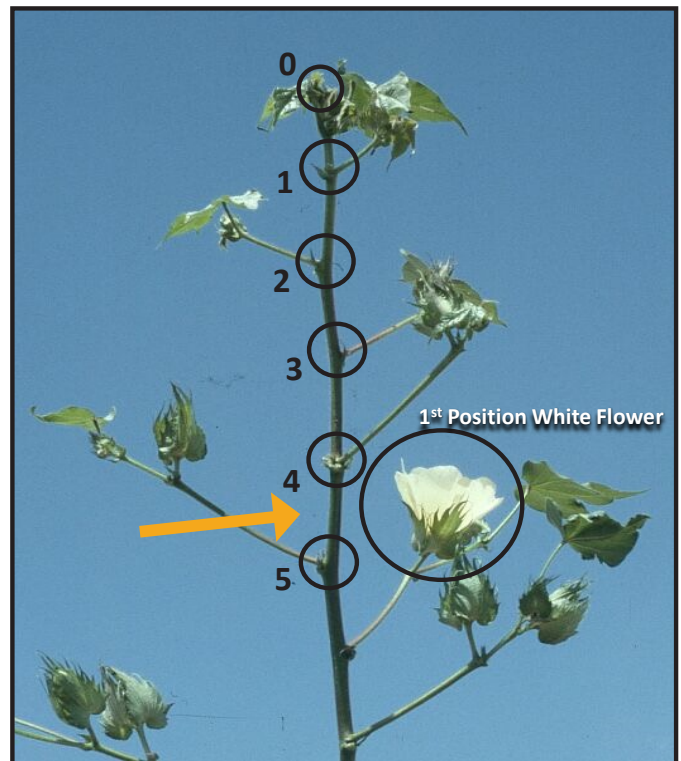
### PLANT-BASED INTERNODE LENGTH

- Measure the internode length between the 4th and 5th nodes from the terminal, counting the terminal node as zero (Figure 2).
- < 2" – no application needed
- 2.5" to 3" (about the width of four fingers) – application likely justified, especially with good growth conditions
- > 3.0" – growth is at a high rate and an application is needed
- If the internode length between the 3rd and 4th nodes is greater than the internode length between the 4th and 5th nodes, this indicates a very aggressive growth rate and an application is necessary

### CUTOUT STAGE

- In some regions it has become common to apply 24 fl oz. at cutout (4 to 5 nodes above white flower). Although this approach has not been shown to increase yield, it can reduce late season vegetative growth and help prevent "buggy whipping", improving harvest conditions.

Figure 2. Cotton Nodes



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