

## Cotton Growth Regulators

William Hunter Frame, Assistant Professor, Field Crops Agronomist, Tidewater AREC

**Table 6.1 - Plant Growth Regulation (PGR)**

Objective	Chemical rate per acre	Product per acre	Remarks and Precautions
Plant growth regulation	Mepiquat chloride 0.35 lb or Mepiquat chloride + <i>Bacillus Cereus</i> or Kinetin 0.35 lb or Mepiquat pentaborate 0.82 lb	Pix, Mepex 4.0-8.0 oz or Pix Plus, Mepex 4.0-8.0 oz or Pentia 4.0-8.0 oz	Although plant growth regulator applications can be an important part of an overall cotton management program, they can result in reduced yields if applied while plants are undergoing stressful (especially moisture) conditions. Before applying plant growth regulators, variety, soil type, fertility, irrigation potential, and field history must be taken into consideration.

**Note:** Maximum of 48 oz of Mepiquat chloride may be applied/A/growing season.

### Timing Suggestions – the Modified Early Bloom Technique

The modified early bloom strategy involves the use of height to node ratios and the measurement of the most recently expanded internode length. The most recently expanded internode is measured by counting down the plant from the highest mainstem leaf (>quarter size) to the fourth leaf. Examine the internode above and below the fourth leaf and measure the larger of the two. This is a good indicator of the plant vigor over that past week or so. Long internodes will range between 2.5 to 3 inches while short internodes will be below 2.0 inches. The tables below are provided to aid in determining Pix application decisions using the modified early bloom strategy.

**Table 6.2 - Matchhead Square (MHS) (typically 3rd to 4th week in June)**

	Plant height		
	<17 in	17-20 in	>20 in
Height to node ratio >1.85 in	4 oz	6 oz	8 oz
Internode <sup>1</sup> >2.5 in	4 oz	6 oz	8 oz

Do not apply if soil moisture is poor.

<sup>1</sup>Most recently expanded internode (see measurement description above).

**Table 6.3 - Early Bloom – Use this chart if PGR was applied at MHS**

	Plant height			
	<24 in	24-27 in	27-30 in	>30 in
Internode <sup>1</sup> >2.5 in	0 oz	8 oz	10 oz	12 oz

Do not apply if soil moisture is poor.

Do not apply if nodes above the highest first position white bloom <7.

<sup>1</sup>Most recently expanded internode (see measurement description above).

## 6-2 Plant Regulators: *Cotton Growth Regulators*

**Table 6.4 - Early Bloom – Use this chart if no PGR has been applied**

	Plant height			
	<24 in	24-27 in	27-30 in	>30 in
Internode <sup>1</sup> >2.5 in	6 oz	8 oz	12 oz	16 oz

Do not apply if soil moisture is poor.

Do not apply if nodes above the highest first position white bloom <7.

<sup>1</sup>Most recently expanded internode (see measurement description above).

**Table 6.5 - 10 to 14 Days after Early Bloom**

	Pix applied at early bloom	
	<8 oz	>8 oz
Internode <sup>1</sup> <2.5 in	0 oz	0 oz
Internode 2.5-3.5 in	12 oz	8 oz
Internode >3.5 in	16 oz	12 oz

Do not apply if soil moisture is poor.

Do not apply if nodes above the highest first position white bloom <6.

<sup>1</sup>Most recently expanded internode (see measurement description above).

## Cotton Harvest Aids

William Hunter Frame, Assistant Professor, Field Crops Agronomist, Tidewater AREC

**Table 6.6 - Cotton Harvest Aids**

	Defoliation Only, Field Cutout	Defoliation with Regrowth Anticipated	Defoliation and Boll Opening	Defoliation and Boll Opening With Regrowth Anticipation
Def 6/Folex 6EC	1.33-1.5 pt			
Def 6/Folex 6EC + Dropp SC		1.0-1.5 pt + 1.6-6.4 (9.6 NTE fl oz) <sup>1</sup>		
Def 6/Folex 6EC ethephon 6EC <sup>2</sup>			1.0-1.5 pt + 5.3 fl oz	
Def 6/Folex 6EC ethephon 6EC <sup>2</sup> Dropp SC				1.0-1.5 pt + 5.3 fl oz + 1.6-6.4 (9.6 NTE fl oz) <sup>1</sup>
ethephon 6EC <sup>2</sup>			1.33-2.67 pt	
Finish 6SC	1.3-2.0-2.67 pt temperature related		1.3-2.0-2.67 pt temperature related	
Finish 6SC + Dropp SC		1.3-2.0 pt + 1.6-6.4 (9.6 NTE fl oz) <sup>1</sup>		1.3-2.0 pt + 1.6-6.4 (9.6 NTE fl oz) <sup>1</sup>
Finish 6SC + Def 6/Folex 6EC			1.3-2.0 pt + 1.0-1.5 pt	
FirstPick	3.0-3.5 qt		3.0-3.5 qt	
FirstPick + Dropp SC		1.5-2.0 qt + 0.8-3.2 fl oz		1.5-2.0 qt + 0.8-3.2 fl oz
FirstPick + Def 6/Folex 6EC			1.5-2.0 qt + 4.0-12.0 fl oz	
Dropp SC		1.6-6.4 (9.6 NTE fl oz) <sup>1</sup>		
Dropp SC + ethephon 6EC <sup>2</sup>			1.6-6.4 (9.6 NTE fl oz) <sup>1</sup> + 1.33-2.67 pt	1.6-6.4 (9.6 NTE fl oz) <sup>1</sup> + 1.33-2.67 pt

<sup>1</sup>NTE = not to exceed

<sup>2</sup>The active ingredient Ethephon is available as 6EC formulations as a number of trade name products such as Prep, Ethephon, Super Boll, etc.

<sup>3</sup>COC = crop oil concentrate

### Defoliation Materials

**Def 6, Folex:** These phosphate-based compounds have been a standard defoliant for many years and provide good defoliation of older, more mature leaves in well cutout cotton. These products provide minimal regrowth inhibition and are typically mixed with other products (e.g. ethephon-Prep, Super Boll, etc.). They are similar in efficacy and will perform well over a wide range of environmental conditions. However, the high end of the labeled rate performs best in cool conditions. Leaf drop is fast and they only require a rain-free period of two hours. The activity of these compounds improves with increased cutout of the crop. The addition of surfactants or crop oils can increase activity under adverse conditions. The pungent odor of these products may be a consideration in populated areas.

**Dropp 50 WP and SC, Freefall 50 WP, etc. (thidiazuron):** Dropp and Freefall defoliate mature leaves, have excellent activity on juvenile leaves, and suppress or delay regrowth. A minimum of 0.1 pound per acre WP or 1.6 fl. ounces per acre is needed for 10 to 14 days of regrowth inhibition. Higher rates will result in longer periods of regrowth inhibition. Thidiazuron alone is usually equal to or better than other defoliant in drought-stressed situations where leaves have thick cuticles. Dropp and Freefall are somewhat slower acting than other defoliant and their activity is temperature dependent. Temperatures less than 65°F will reduce activity; however, the addition of crop oil concentrate or a phosphate-type defoliant will help the activity of thidiazuron under cooler conditions. The addition of 2 to 4 ounces per acre of Def or Folex will shorten the 24-hour required rain-free period. The

## 6-4 Plant Regulators: *Cotton Harvest Aids*

label provides specific tank clean-out procedures when using thidiazuron-containing materials to avoid premature defoliation when the sprayer is used the following year. When thidiazuron is tank mixed with a phosphate defoliant or insecticide, the label recommends a surfactant to aid in tank clean out. When using the WP formulation, thorough rinsing is critical.

**Ginstar:** Ginstar is a premix emulsifiable concentrate of thidiazuron (active ingredient in Dropp and Freefall) and diuron. Ginstar has been found to be more active under cool conditions than most thidiazuron-containing materials. Ginstar is a strong inhibitor of terminal regrowth. It is more likely to cause unwanted desiccation and sticking of cotton leaves than thidiazuron alone. Tank mixing and higher rates increase the potential for leaf sticking. Labeled rates are 6.4 to 16 ounces per acre and growers are cautioned not to exceed 8 ounces with this product until more information is available from Virginia. Growers are cautioned that rates in excess of 10 ounces have shown a tendency to desiccate leaves. The label does not allow mixing with phosphate type defoliant (Def, Folex). However, ethephon-containing materials (Prep, SuperBoll, Finish, CottonQuik, etc.) can be tank mixed at low rates for enhanced defoliation. The use of adjuvants with Ginstar is not recommended. Pay close attention to rotational restrictions on the label. Research in Virginia with this product is limited. Pay attention to label for Virginia; some other state labels differ greatly. Pay close attention to rotational restrictions on the label.

**Aim, ET, Blizzard, and Resource:** These products have different active ingredients (carfentrazone, pyraflufen, fluthiacet, and flumiclorac, respectively) but similar modes of action. They are all contact herbicidal defoliant that do not appear to be extremely temperature sensitive. Research indicates they can cause excessive desiccation at high rates under warm condition where rank, juvenile growth is not present. They perform best in well-cutout cotton and can be beneficial when used as a second application. They provide regrowth control but have no residual activity and are good morningglory desiccants. These products can be mixed with most other defoliant/boll openers. See labels for adjuvant requirements and use restrictions.

**Finish:** Finish contains the active ingredient in Prep (ethephon) and a synergist (cyclanilide) that aids in defoliation. Finish tends to open bolls more rapidly than Prep alone and thus shortens the time to harvest. It is less temperature sensitive than most products. In situations where regrowth or added defoliation is needed, thidiazuron (Dropp, Freefall, etc) and/or Def/Folex should be added to the tank.

**FirstPick:** FirstPick weighs 12.45 pounds per gallon and contains 2.28 pounds of ethephon (Prep) and 7.30 pounds of a synergist (AMADS). Like Finish, it is an excellent boll opener. Acceptable defoliation with FirstPick typically occurs within 7 days in well-cutout cotton containing mature leaves. FirstPick also provides limited control of terminal regrowth. Where thick regrowth is a concern, add thidiazuron (Dropp, Prep, etc.). Def/Folex may be added to enhance defoliation of juvenile or rank growth. Thorough rinsing of the tank is recommended following application.

**Roundup (glyphosate, many formulations):** Glyphosate can be applied as a harvest aid material. Tank mixed with defoliant or ethephon, it provides regrowth inhibition in conventional (non-Roundup Ready) cotton. It also provides excellent control of perennial grasses. Check specific product labels for registrations as a harvest aid.

### ***Boll-opening Materials***

Although some boll openers are used to enhance the activity of defoliant, they are typically used to hasten the maturity of boll opening. Boll openers are meant to open mature bolls and can alter micronaire and fiber length if applied too early. They are not systemic, making thorough coverage essential. Boll openers are most beneficial for cotton that needs to be picked between 7 to 14 days following application. The active ingredient in Prep, ethephon, is also found as a premix in several products but is below the boll-opening rate. Check labels to make sure the boll-opening rate is applied, if this is the objective.

**Ethephon 6, Prep, Super Boll, FirstPick, Finish (ethephon):** With adequate spray coverage, ethephon products expedite natural boll opening. While ethephon can enhance defoliation, tank mixing with defoliation products (Def, Folex, Dropp, Freefall, Ginstar, ET, Blizzard, and/or Aim) is necessary for acceptable defoliation and/or regrowth control. Allow at least 7 days following application before harvest for optimum boll-opening effect. If cotton is not picked for more than 14 days following application, there is likely no advantage to ethephon use. FirstPick and Finish are combinations of ethephon and a synergist to increase defoliation and speed boll opening over ethephon alone. Bolls that are not mature at the time of application have little chance of opening in 14 days regardless of ethephon use. Do not mix with sodium chlorate due the potential for toxic fume formation.

**Gramoxone SL (paraquat):** Paraquat can enhance defoliation of juvenile growth when applied in combination with other defoliant although it will not inhibit regrowth. It can stimulate boll opening. High rates may result in excessive desiccation and “freezing” of closed bolls. It also can be used as a spot treatment for weed desiccation. It should not be applied at weed desiccation rates before cotton is at least 90% open and the remaining 10% are mature. It is necessary to pick within 7 days following paraquat application to avoid bark contamination. Consult label for use rates and pay close attention to precautions.