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Plant Growth Regulators

Mepiquat-based plant growth regulators or PGRs (such as Pix Ultra, Mepex, Mepichlor, Mepiquat Chloride, Mepex GinOut, Stance, and others) have been available for many years. Companies are constantly enhancing formulations, but the main active ingredient in nearly all of these products is mepiquat chloride. Some premium products include various enhancements to mepiquat chloride or contain mepiquat pentaborate (Pentia).

- Mepiquat chloride (MC) reduces production of gibberellic acid in plant cells that in turn reduces cell expansion, ultimately resulting in shorter internode length. MC will not help the plants compensate for earlier weather or disease damage. It does not increase growth rate but essentially reduces plant size by reducing cellular expansion.
- It may, under good growing conditions, increase fruit retention, control growth and promote earliness. MC should not be applied if crop is under any stresses including moisture; weather; severe spider mite, insect, or nematode damage; disease stress; herbicide injury including herbicide damage (for example 2,4-D, dicamba, etc.) due to drift or from tank contamination; or fertility stress.
- Results from replicated testing indicates that a 5 to 20% reduction in plant height (compared to the control) can be obtained from 16 oz of 4.2% a.i. MC material applied in up to 4 sequential 4-oz/acre applications starting at match head square (MHS) and ending at early bloom. It is generally possible to reduce about one node from the growth of the main stem, which can result in about 3-5 days earlier cutout.
- Low rate multiple applications beginning at MHS have generally provided more growth control than later higher rate applications made at first bloom or later.

- Research trials have shown that statistically significant increases in yields are not generally obtained, but excellent growth control is consistently provided. Many times we don't see a lot of differences in performance of these products with respect to growth control.

Available Products

Mepiquat based products have been around for many years. Several generic PGRs based on the same active ingredient are now available. Refer to the product labels or contact company representatives to ensure you understand the correct use of these products.

Pix Ultra, Mepex, Mepichlor, Mepiquat Chloride and other generics

- Range from 3.9% to 4.2% active ingredient (a.i.)/gallon or 0.35 lb/gallon a.i.

Mepex Gin Out

- 4.2% a.i./gallon or 0.35 lb/gallon a.i. with 0.0025% Kinetin (a cytokinin).
- Cytokinins are plant hormones that promote cell division and growth and delay the senescence of leaves. This product has use guidelines similar to other MC materials.

Pentia

- Active ingredient has a different molecular structure than mepiquat chloride, and contains mepiquat pentaborate.
- 9.6% a.i./gallon or 0.82 lb/gallon a.i. Typically Pentia has similar use rates when compared to 4.2% MC products.

Stance

- Stance product is a MC based PGR, but it is a 4 to 1 ratio of MC and cyclanilide (0.736 lbs/gallon MC plus 0.184 lbs/gallon cyclanilide). Cyclanilide is an auxin synthesis and transport inhibitor. Auxins are compounds which have the capacity to induce cell elongation. The inhibition of auxins could reduce cell elongation and inhibit growth. Producers should be aware that the mepiquat chloride concentration in Stance is about twice as high as most of the other products, plus when considering the effect of the cyclanilide synergist, THERE IS A CORRESPONDING REDUCED USE RATE.

Considerations

- Consistent yield increases have not been observed from any of the MC materials we have investigated.
- A good boll load will normally help control plant growth. Fields with poor early-season fruit retention, excellent soil moisture, and high nitrogen fertility status may be candidates for poor vegetative/fruiting balance and should be watched carefully.

- Specifically, varieties with genetically vigorous growth potential and in general all others that have a high likelihood of excellent vegetative growth conditions should be considered for PGR applications. Conditions favoring high vegetative growth potential include low early season fruit retention, high nitrogen fertility, high irrigation capacity and/or high rainfall.
- For brush roll header stripper harvest, 28-32 inch tall plants optimize stripper-harvesting efficiency. If possible, target a maximum plant size of about 28-32 inches for varieties under high input irrigation (sub-surface drip or high capacity pivots). If plants get larger than 36 inches, harvest efficiency and productivity drop significantly.
- For spindle picker harvesters, larger plant size for high yielding cotton is not as much of a harvesting consideration. Pickers can handle higher yielding, taller plants with much greater ease than stripper harvesters, especially when the stalks are still alive (or "green"). However, if weather constraints at harvest time delay harvesting after freezing weather, the large brittle plants can result in picker harvesting difficulties.

Application Rates, Varieties, and Production Environment

- Determination of application rates is generally more "art" than "science" for these products.
- Applications should begin when 50% of the plants have one or more matchhead squares (see specific product label for more information). Labeled rates are typically 4-8 oz/acre.
- Fields should be scouted and if applications are necessary these can be done on 7-14 day intervals. Labeled application rates are typically 4-12 oz/acre, then 12-24 oz/acre beginning at bloom stage.
- It is best to manage high growth potential using higher rates pre-bloom if conditions favor excessive growth for an extended period of time.
- If lower rates are first used pre-bloom, that will help reduce the need for typically less effective higher rate or "firehose" applications at first bloom and later.
- Herein lies an important dilemma: It is unknown at that time as to how weather will affect the crop in July and into August. If 100+ degree temperatures with southwest winds at 30 mph and 10% relative humidity are encountered, those conditions will limit plant growth in many dryland fields or those with low irrigation capacity.
- Watch high growth potential varieties and fruit retention. If a high growth potential variety has been planted and has low fruit retention, then MC rate should begin early and be increased, especially under high water, fertility, and good growth conditions.
- Many newer varieties generally need aggressive management under high irrigation capacity and/or if heavy rainfall conditions are encountered. The situation that has arisen due to the release and availability of new genetics is challenging.
- Visit with your seed company representative to determine which varieties should be watched closely for MC needs under field-specific conditions.
- Use MC to limit plant size and adjust sequential applications to meet subsequent crop conditions and growth potential.
- Note that the maximum labeled rate per acre per application of these type products is typically 24 oz/acre. The maximum labeled rate per acre per season is 48 oz/acre. See specific product label for more information.

2019 Cotton Variety Growth Habit and Maturity Descriptions (Based on Company Literature), and Anticipated Potential Growth Aggressiveness*

Company/Variety	Plant Height/Growth Habit Description in Company Literature	Maturity Description in Company Literature	Anticipated Potential Growth Aggressiveness* and PGR Management Considerations
Deltapine			
DP 1522 B2XF	Medium-Tall	Early-Medium	Moderate-High-Very High
DP 1549 B2XF	Tall	Full	Very High
DP 1612 B2XF	Medium	Early	Moderate-High
DP 1646 B2XF	Medium-Tall	Medium-Full	Moderate-High-Very High
DP 1820 B3XF	Medium-Tall	Early-Medium	Moderate-High-Very High
DP 1845 B3XF	Medium	Medium-Full	Moderate-High-Very High
DP 1822 XF	Medium to Medium-Tall	Early-Medium	Moderate-High-Very High
DP 1909 XF	Medium	Very Early	Moderate
Dyna-Gro			
DG 3402 B3XF	Medium	Early-Mid	Moderate-High
DG 3421 B3XF	Medium-Tall	Early-Mid	Moderate-High-Very High
DG 3109 B2XF	Medium-Tall	Early	Moderate-High-Very High
DG 3385 B2XF	Medium	Early-Mid	Moderate-High
FiberMax			
FM 1320 GL	Short/Compact	Very Early	Low
FM 2011 GT	Short/Compact	Early	Low
FM 1953 GLTP	Medium/Moderate	Early-Medium	Moderate-High
FM 1911 GLT	Short/Compact	Early-Medium	Low
FM 2007 GLT	Medium/Moderate	Early-Medium	Moderate-High
FM 1830 GLT	Medium/Moderate	Early-Medium	Moderate-High
FM 1888 GL	Medium/Moderate	Early-Medium	Moderate-High
FM 2498 GLT	Medium-Tall/Aggressive	Medium	Moderate-High-Very High
FM 2334 GLT	Medium/Moderate	Medium	Moderate-High
FM 2322 GL	Medium-Tall/Moderate	Medium	Moderate-High-Very High
FM 2484 B2F	Medium/Moderate	Medium	Moderate-High
FM 2574 GLT	Medium-Tall/Moderately Aggressive	Mid-Full	Moderate-High-Very High
NexGen			
NG 2982 B3XF	Medium	Early	Moderate
NG 3930 B3XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 3956 B3XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 3994 B3XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 4936 B3XF	Medium-Tall	Medium	Moderate-High-Very High
NG 3406 B2XF	Medium	Early-Medium	Moderate-High
NG 3517 B2XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 3699 B2XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 3780 B2XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 4545 B2XF	Tall	Medium	Very High
NG 4689 B2XF	Tall	Medium	Very High
NG 4777 B2XF	Tall	Medium	Very High
NG 3500 XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 3640 XF	Medium-Tall	Early-Medium	Moderate-High-Very High
NG 4792 XF	Medium-Tall	Medium	Moderate-High-Very High
PhytoGen			
PHY 230 W3FE	Short	Early	Low
PHY 250 W3FE	Short	Early	Low
PHY 300 W3FE	Medium	Early-Mid	Moderate-High
PHY 320 W3FE	Medium	Early	Moderate-High
PHY 330 W3FE	Medium	Early-Mid	Moderate-High
PHY 340 W3FE	Medium	Early-Mid	Moderate-High
PHY 350 W3FE	Medium-Tall	Early-Mid	Moderate-High-Very High
PHY 430 W3FE	Medium	Mid	Moderate-High
PHY 440 W3FE	Medium	Mid	Moderate-High
PHY 450 W3FE	Tall	Mid	Very High
PHY 480 W3FE	Medium-Tall	Mid	Moderate-High-Very High
PHY 490 W3FE	Tall	Mid	Very High
Stoneville			
ST 4747 GLB2	Medium/Moderate	Early-Medium	Moderate-High
ST 4848 GLT	Medium/Moderate	Early-Medium	Moderate-High
ST 4946 GLB2	Medium/Moderate	Early-Medium	Moderate-High
ST 4949 GLT	Medium/Moderate	Early-Medium	Moderate-High

***Disclaimer:**
This information is to be used as a general guide only. Some varieties are more responsive than others to PGR products. For questions concerning specific varieties and growing conditions, contact your local seed company agronomist. Aggressiveness is subjective and may change based upon field-specific growing conditions. Low fruit retention, high to excessive nitrogen fertility, and high moisture availability will typically result in larger plants with higher PGR rate needs and more intensive management requirements for a specific field.

Relative Ranking	PGR Considerations
Low	minimal PGR requirements anticipated under most conditions
Moderate	moderate pre-bloom, moderate to high post bloom PGR requirements
High	high pre-bloom, high post bloom PGR requirements
Very High	very high pre-bloom, very high post-bloom PGR requirements

Table provided by Dr. Randy Boman
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