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Commercially Available Cotton Height-Controlling PGRs in Arizona

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Mepiquat chloride (N, N-dimethylpiperidinium chloride) based plant growth regulators (PGR) have become a critical management tool for cotton production since the first one was introduced as Pix® by BASF in the 1980s. Mepiquat chloride (MC) suppresses the production of the plant hormone gibberellic acid, which is a growth stimulant that induces cell elongation. Suppression of gibberellic acid production results in decreased cell elongation and an overall decrease in the elongation of stems and branches (Kerby, 1985). Thus, MC excels in the control of plant height, altering the balance of vegetative and reproductive growth. This may result in a more open canopy, better spray penetration for crop chemicals, and improved defoliation.

Height-controlling cotton PGRs in Arizona include products containing MC, MC mixtures, or mepiquat pentaborate. A number of new formulations or generic MC products have been available since BASF patent expired in 1998 (Table 1). Pix Plus® is the second generation product from BASF that contains MC with addition of Bacillus cereus (strain BP01), a bacterium with claims of increasing cotton growth and lint yield. However, Arizona field research has shown that Pix Plus did not increase lint yield compared to MC alone (Norton and Clark, 2004). Mepex Plus® and Mepex Gin Out® are products with a blend of MC and kinetin, a cell division hormone, designed to control vegetative growth and enhance growth of fruiting forms through increased cell division. Stance® is a mixture of MC and cyclanilide, another PGR that reduces apical growth and increases lateral shoot formation. Pentia® is the most recent formulation released by BASF and contains the basic mepiquat compound with the chloride ion being replaced with the boron ion.

Research conducted in Arizona has shown consistent results in terms of plant height control by mepiquat-type cotton PGRs, but lint yield response has proven much more variable. Under conditions of high crop vigor and low fruit retention, increased yields may be possible (Norton, 2005; Norton and Borrego, 2006). However, in cases of low crop vigor, decreased yields are also possible. In most cases, no yield response is observed (Norton and Clark; 2004). A research effort that was conducted across the U.S. cottonbelt using MC (Mepex®), MC + kinetin (Mepex Gin Out), MC + cyclanilide (Stance), and mepiquat pentaborate (Pentia) showed that these PGRs all control plant height effectively and to a similar degree, but with yield benefits only about 10% of the time compared to the untreated control (Dodds et al., 2010). Use a PGR that is economically sound and best suits management practices and need to control plant height.

Determining when a PGR is needed can be a difficult decision. Using a feedback approach involving crop monitoring of height to node ratio trends and fruit retention levels for scheduling PGR applications demonstrated the highest potential for increased lint yield (Silvertooth, 2001a, 2001b, and 2001c; Norton and Silvertooth, 2000). PGR

Figure 1. Impact of height-controlling PGR applications on internode elongation. **A**, Untreated with internode distance = 3" (four fingers) **B**, PGR-treated with internode distance = 1.75" (2.5 fingers) and **C**, Overall plant canopy architecture with untreated on left vs. PGR-treated on right.

Table 1. Commercially available mepiquat-type cotton PGRs in Arizona

Product	Active ingredient (AI)	AI (lb/gallon)	Early season rate (oz/acre)	Late season rate (oz/acre)
Compact[15], Flat-Top MC[10], Mep Star[2], Mepex[13], Mepichlor 4.2% Liquid[3], Mepiquat[11], Mepiquat Chloride[6] , Mepiquat Chloride 4.2% Liquid[8,12], Mepit[1], Pix[14], Pix Ultra[3]	mepiquat chloride	0.35	8–16	24
Pix WSG[3]	mepiquat chloride	0.9*	0.4–0.8	1.2
Pix Plus[3]	mepiquat chloride +Bacillus cereus	0.35**	8–16	24
Mepex Gin Out[7,13], Mepex Plus[9]	mepiquat chloride + kinetin	0.35†	8–16	not specified
Stance[5]	mepiquat chloride + cyclanilide	0.736††	2–4	not specified
Pentia[4]	mepiquat pentaborate	0.82	8–24	24

Late season, near cut-out oz, ounces
*, lb/lb (dry formulation)
*, lb/lb (dry formulation)
**, 0.0058% Bacillus cereus
†, 0.0025% kinetin
††, 0.184 lb/gallon cyclanilide

1, AgSaver
2, Albaugh, Inc.
3, Arysta LifeScience North America
4, BASF
5, Bayer CropScience
6, Cropsmart
7, DuPont
8, Farmsaver.com
9, Griffin
10, J. Oliver Products
11, Loveland Products
12, MANA
13, Nufarm Americas
14, Tenkoz
15, Winfield Solutions

labeled rates are 0.022–0.044 lb AI of MC per acre depending on growth pattern of the crop. Near cut-out, up to 0.066 lb AI per acre may be used. Do not apply more than 0.132 lb AI MC or 0.31 lb AI mepiquat pentaborate per acre during the growing season.

References & Other Readings

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