2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

COMPARISON OF MEPIQUAT PENATABORATE AND MEPIQUAT CHLORIDE EFFECTS ON DP555BR

Philip Jost
Univ. of Georgia
Statesboro, GA
Mike Dollar
Univ. of Georgia
Claxton, GA

Abstract

Mepiquat-containing plant growth regulators (PGRs) are used in cotton production to control vegetative growth. Reduction in vegetative growth is touted to promote earliness, reduce boll rot, increase ease of harvesting, and possibly enhance yields. Delta and Pineland Company has recently released cotton variety 'DP555BR', which is well adapted for production in the Southeastern U.S. One caveat with this variety is its aggressive growth habit. The objective of this study was to compare the vegetative growth control and yield response of DP555BR to applications of mepiquat chloride and varying rates of mepiquat pentaborate. At all three evaluation timings the treatments significantly reduced plant height compared to the untreated plots. There were no differences between the individual treatments. All treatments resulted in plants possessing significantly fewer nodes than the untreated check, by first bloom + 1 week, with no differences between the individual treatments. Nodes above white flower data indicated that there may have been an earliness advantage of 3 to 4 days due to the treatments. Plots receiving a "full" rate application of either Pentia or Mepichlor had yields significantly greater than the untreated plots and those receiving the 80% rate of Pentia. Although not statistically significant, both the untreated check and the treatment receiving an 80% rate of Pentia had a greater percentage of unharvestable bolls due to either boll rot or hard-lock in 2003, which could partially explain the yield increase.

Introduction

Mepiquat-containing plant growth regulators (PGRs) are used in cotton production to control vegetative growth. These products inhibit the synthesis of gibberellins, plant hormones which promote cell growth and stem elongation. Reduction in vegetative growth is touted to promote earliness, reduce boll rot, increase ease of harvesting, and possibly enhance yields. As with many other crop production chemicals, there is a wide selection of products available to accomplish this task. Mepiquat Chloride (MC) was the first PGR marketed to reduce and control vegetative growth. Other MC products have been developed which also contain reproductive growth enhancers such as the bacteria *Bacillus cereus*, and cytokinin-like hormones. All of these mepiquat-containing products have been proven to adequately control vegetative growth, yet yield enhancement is an erratic response. Mepiquat pentaborate has recently been developed by BASF and is sold under the trade-name Pentia. BASF has generated data demonstrating quicker absorption and increased efficacy with this product, suggesting that it may potentially be utilized at lower rates than other mepiquat-containing PGRs.

Delta and Pineland Company has recently released cotton variety 'DP555BR', which is well adapted for production in the Southeastern U.S. One caveat with this variety is its aggressive growth habit. Company representatives and University of Georgia Extension personnel have cautioned growers that mepiquat-containing PGRs need to be used with this variety more so than with others grown in Georgia.

The objective of this study was to compare the vegetative growth control and yield response of DP555BR to applications of MC and varying rates of mepiquat pentaborate.

Materials and Methods

Cotton variety 'DP555BR' was planted in irrigated commercial production fields in Evans County, GA in 2002 and 2003. PGR treated plots consisted of twenty, 36-inch rows 1700 and 1200 feet long, in 2002 and 2003, respectively. The untreated check plots consisted of six 36-inch rows. PGR treatments are listed in Table 1. The source of MC was Mepichlor, the source of mepiquat pentaborate was Pentia. All treatments were applied with a 20-row commercial sprayer calibrated to deliver 11.9 gallons per acre. Treatments were arranged in a Randomized Complete Block design with 4 replications.

Data Collection and Analysis

In both years, plant height and node counts were made at match-head square + 2 weeks, first bloom + 1 week, and mid-bloom. Nodes above white flower (NAWF) were documented when PGR treated plots had reached approximately 5 NAWF. Four 36-inch rows were harvested from the center of each plot. In 2003, boll distribution patterns and unharvestable boll numbers were documented from 10 plants in each plot.

All data were analyzed using PROC GLM with the SAS statistical software.

Results and Discussion

Data for plant height, node counts, NAWF, and yield are discussed as averages of 2002 and 2003, as there were no significant year by treatment interactions.

Plant Height and Node Counts

At all three evaluation timings the PGR treatments significantly reduced plant height compared to the untreated plots. There were no differences between the individual PGR treatments (Table. 2). All PGR treatments resulted in plants possessing significantly fewer nodes than the untreated check, by first bloom + 1 week. There were no differences observed between the individual PGR treatments (Table 2).

Nodes Above White Flower

When the untreated check had approximately 6 NAWF the treated plots averaged 5 (Table 3). This data indicates that there may have been an earliness advantage of 3 to 4 days due to the PGR treatments.

Yield

Plots receiving a "full" rate application of either Pentia or Mepichlor had yields significantly greater than the untreated plots and those receiving the 80% rate of Pentia (Table 3).

Boll Distribution

The distribution of bolls on the plants did not provide any significant evidence to explain the observed differences in yield (data not shown).

Unharvestable Boll Counts

Although not statistically significant, both the untreated check and the treatment receiving an 80% rate of Pentia had a greater percentage of unharvestable bolls due to either boll rot or hard-lock (Table 3).

Conclusions

All PGR treatments resulted in nearly identical effects on vegetative growth. The yield enhancement observed for the "full" rates of Pentia and Mepichlor could partially be explained by the observation that unharvestable boll numbers tended to be greater in untreated plots and those receiving an 80% rate of Pentia in 2003. Boll weights were not documented, and could account for the remainder of the difference. The question still remains as to why vegetative growth was similar among all PGR treatments yet yield was enhanced with "full" PGR rates only.

Acknowledgements

The authors thank Kenneth Durrence for providing the land and labor required for conducting this study, and Nathan Tyson for technical assistance. In addition, thanks is expressed to Sandy Newell of BASF for providing the test materials, and financial support of this study.

Table 1. Ounces of PGR applied to DP555BR at specific growth stages in 2002 and 2003.

	2002			2003			
	MHS[a]	+2W	+4W	MHS	+2W	+6W	+8W
	oz/A						
Mepichlor	8	8	8	8	4	8	10
Pentia (80%)	6.4	6.4	6.4	6.4	3.2	6.4	8
Pentia	8	8	8	8	4	8	10
UTC	0	0	0	0	0	0	0

[a] Match-Head Square

Table 2. Plant height and total nodes at specific growth stages as affected by PGR treatments, 2002-2003.

	Plant Height			Total Nodes		
	MHS[a] +2W	FB[b] +2W	Mid-Bloom	MHS +2W	FB +2W	Mid-Bloom
	cm plant^{-1}			no. plant^{-1}		
Mepichlor	53.6 b[c]	77.1 b	98.2 b	12.9 a	16.6 b	20.6 b
Pentia (80%)	55.3 b	79.8 b	100.0 b	13.2 a	16.8 b	20.7 b
Pentia	52.5 b	77.0 b	96.8 b	13.2 a	16.8 b	20.3 b
UTC	60.0 a	93.1 a	120.0 a	13.4 a	17.5 a	21.7 a

[a] Match-Head Square
[b] First Bloom
[c] Means followed by the same letter are not different at p=0.05.

Table 3. Nodes Above White Flower and yield (2002 and 2003), and percent unharvestable bolls (2003) as affected by PGR treatments.

	NAWF[a] no. plant^{-1}	Lint Yield lbs A^{-1}	Unharvestable Bolls %
Mepichlor	5.1 b[b]	1110 a	12.1 a
Pentia (80%)	4.6 b	1041 b	13.8 a
Pentia	4.6 b	1125 a	12.2 a
UTC	5.9 a	1016 b	13.3 a

[a] Nodes Above White Flower
[b] Means followed by the same letter are not different at p=0.05.