

On-Farm Evaluation of Mepiquat Formulations in Southeastern Arizona

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Abstract

A single field trial was conducted during the 2004 season to evaluate three different mepiquat formulations used to control vegetative plant growth. This project involved the evaluation of mepiquat formulations of Mepex Ginout (DuPont), Pix Ultra and Pentia (BASF). These three treatments, along with a control, were arranged in a randomized complete block design with four replications. Plots were 20, 36" wide rows and extended for a full one half mile irrigation run. Applications of all treatments were made on 22 July 2004 at a rate of 16 oz/acre for each formulation. Lint yields were determined at the end of the season by harvesting the center eight rows of each plot. The harvested seed cotton was weighed using a weigh wagon equipped with load cells. Sub samples were collected from each plot for fiber quality and lint percent determinations. No significant differences were observed among treatments with respect to any of the fiber quality parameters measured. The Mepex Ginout treatment produced the highest lint yield and also the highest percent lint. The control was not significantly different from the other two formulation treatments. Lint percent values had a major impact on lint yield. The control had the lowest seed cotton yield but because of the higher percent lint values, lint yield for the control was ultimately higher than both the Pentia and Pix Ultra treatments. This study demonstrates the positive effect of the PGR applications and also the effect that percent lint can have on final lint yield.

Introduction

Cotton production in the higher elevation of Arizona provides for some significant challenges with respect to maintaining a proper balance between vegetative and reproduction dry matter production. Because of the higher elevation fewer heat units (HU) are available to mature the crop. Under these conditions growers typically 'push' the crop in an attempt to mature as quickly as possible the fruit that is set early in the season. Because of the reduced growing season the fruit that is set during the primary or first fruiting cycle is critical for achieving good yields. Maintaining a proper balance between vegetative and reproductive dry matter production is critical. Plant growth regulators (PGRs) are commonly used to help in maintaining that proper balance.

There are several tools that can be used to aid in maintaining proper vegetative/reproductive balance in the crop. Optimum planting date will aid in maintaining a proper balance. Research has indicated that delayed planting will result in increased vegetative growth and decreased yields (Silvertooth and Norton, 2000). Proper management of water and fertilizer N will also have an influence on the vegetative/reproductive balance (Silvertooth et. al., 2001). Plant growth regulators such as mepiquat chloride (Pix – manufactured by BASF) have been used in cotton production for many years as a tool for controlling vegetative growth in cotton thus helping to maintain a proper ratio of reproductive to vegetative growth. Mepiquat chloride suppresses the production of the plant hormone gibberellic acid (GA) which is a growth stimulant that induces cell elongation. Suppression of GA production results in decreased cell elongation and overall decrease in the vertical and horizontal elongation of stems and branches (York, 1983; Kerby, 1985).

The PGR Pix was first introduced by BASF in 1980 and was the first product that significantly controlled plant height without inducing crop stress. Since the introduction of Pix (active ingredient mepiquat chloride) in the early 80's several new formulations have been developed by BASF in an attempt to improve the effectiveness and to increase yields. Pix Plus is the second generation product from BASF that

contained the original mepiquat chloride plus the addition bacillus cereus. The third generation of Pix introduced contained mepiquat chloride plus boron. The fourth and most recent formulation released is a new product called Pentia. Pentia contains mepiquat with the chloride ion being replaced with the boron ion resulting in mepiquat pentaborate.

The recent patent expiration has resulted in an increase in the availability of 'generic' mepiquat formulations. These formulations typically have the same basic active ingredient with a few slight modifications designed to enhance plant growth, development, and yield.

The objective of this on-farm field demonstration was to evaluate three commercially available formulations of the PGR mepiquat. These products included two from BASF (Pix Ultra and Pentia) and one from DuPont (Mepex Ginout). Mepex Ginout contains the same plant growth regulator as the BASF products (Mepiquat) but also contains a plant growth hormone, kinetin, one of a group of plant hormones classified as cytokinins. This plant hormone is designed to promote cell division in plants.

Materials and Methods

The evaluation was conducted on a grower-cooperator field in an effort to best simulate on-farm conditions. The field was planted to FiberMax FM991BR on 21 April 2004. The evaluation included four treatments that were arranged in a randomized complete block design with four replications. These treatments included (1) a control, receiving no PGR application; (2) the Mepex Ginout application (16 oz/acre); (3) the Pix Ultra application (16 oz/acre); and (4) the Pentia application (16 oz/acre). All treatments were applied on the same day (23 July 2004). All applications were made with a ground application rig (JD HiCycle 6000) with a carrier rate of 16 gallons per acre. Plots were 20, 36" wide rows and extended the full length of the irrigation run (approximately 2,500 feet). Lint yield was determined by harvesting eight rows from the center of the plot and weighing the harvested seedcotton with a cotton weigh wagon equipped with load cells. Sub samples were collected from two replications for fiber quality and percent lint determinations. All data was subjected to analysis of variance and means separation according to procedures outlined by the SAS Institute (2002).

Results

Lint yield and fiber quality results are presented in Table 1 for each of the four mepiquat formulation treatments. Lint yield results indicated a significant response to the mepiquat treatments at $P=0.1$. The Mepex Ginout treatment produced the highest lint yield. The Mepex Ginout treatment produced statistically higher yields than the other two mepiquat treatments (Pentia and Pix Ultra) but was not significantly higher than the control. The control was also not significantly different than the Pentia or Pix Ultra treatments.

Fiber quality measurements revealed no significant differences among mepiquat formulation treatments (Table 1). However, significant differences were observed in percent lint turnout among the mepiquat formulation treatments (Table 1). The Mepex Ginout treatment produced significantly higher lint turnout than the other two mepiquat treatments but not significantly different than the control. Figure 1 illustrates the effect of percent lint on final lint yield. The control treatment had the lowest seedcotton yield but with the high turnout for the control it ended up with the second highest lint yield. The Mepex Ginout treatment appeared to have a significant impact on lint turnout and ultimately lint yield.

Literature Cited

Kerby, T.A. 1985. Cotton response to mepiquat chloride. *Agron. J.* 77:515-518.

SAS Institute. 2002. SAS procedures guide. Version 9. SAS Inst., Cary, NC.

Silvertooth, J.C., E.J. Norton, and E.R. Norton. 2001. Summary of Nitrogen Management Experiments in Irrigated Cotton. Cotton, A College of Agriculture and Life Sciences Report, University of Arizona. Series P-???

Silvertooth, J.C. and E.R. Norton. 2000. Planting date effects on soil temperature, crop growth, and yield of Upland cotton. P. 7-18. Cotton, Univ. of Arizona Rep. P-121.

York, A.C. 1983. Cotton cultivar response to mepiquat chloride. *Agron.J.* 75:663-667.

Table 1. Lint yield and fiber quality results with associated analysis of variance data from the on-farm mepiquat formulation evaluation conducted in Safford, AZ, 2004.

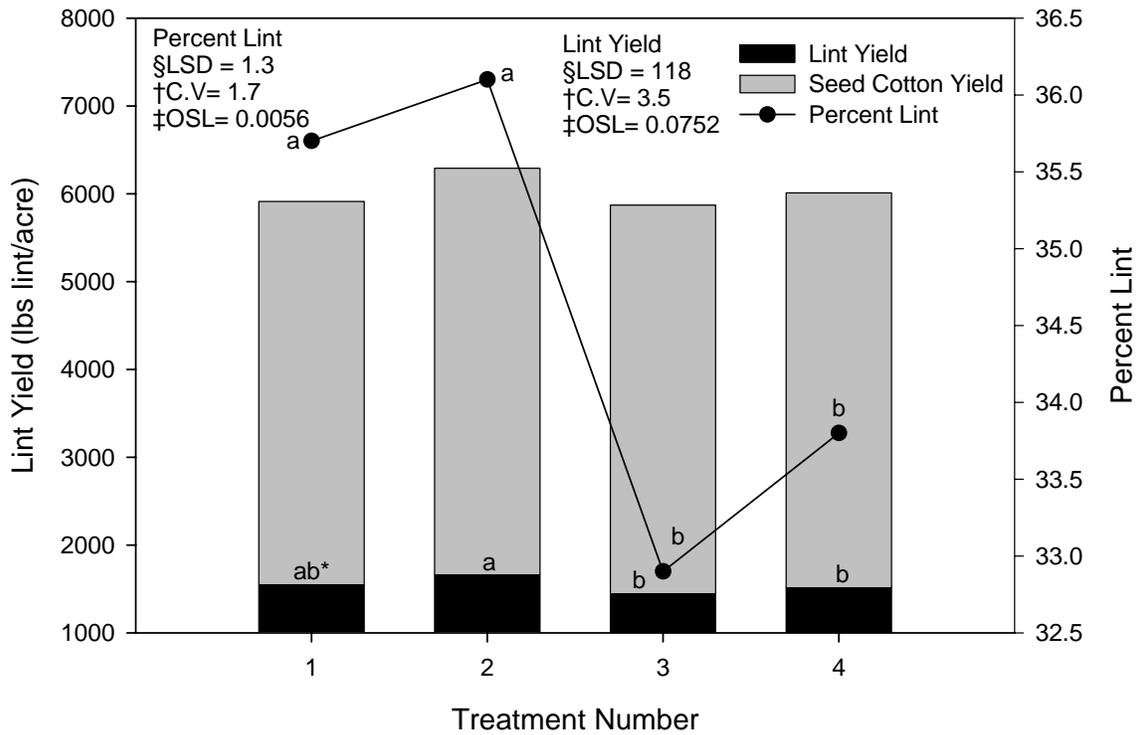
Treatment	Yield lbs. lint/acre	Percent Lint	Micronaire	Fiber Length (100ths)	Staple Length (32nds)	Fiber Strength (g/tex)	Uniformity Index	Leaf Grade
1	1559 ab	35.7 a	4.2 a	116.75 a	37 a	31.4 a	81.5 a	2.5 a
2	1672 a	36.1 a	4.3 a	114.25 a	36.5 a	31.55 a	81 a	2.5 a
3	1456 b	32.9 b	4.2 a	116.5 a	37.25 a	31.05 a	82 a	2.5 a
4	1522 b	33.8 b	4.2 a	113.75 a	36.5 a	30.78 a	81 a	2.5 a
§LSD	118	1.3	NS	NS	NS	NS	NS	NS
†CV	3.5	1.7	3.85	1.45	1.45	4.37	0.98	21.08
‡OSL	0.0752	0.0056	0.79	0.068	0.19	0.85	0.29	1

*Means followed by the same letter are not statistically different according to a Fisher's LSD means separation test.

§Least Significant Difference

†Coefficient of Variation

‡Observed Significance Level



*Means followed by the same letter are not statistically different according to a Fisher's LSD means separation test.
 §Least Significant Difference
 †Coefficient of Variation
 ‡Observed Significance Level

Figure 1. Seedcotton yield, lint yield, and percent lint results from the on-farm mepiquat formulation evaluation, Safford, AZ, 2004.