COTTON REPRODUCTIVE AND VEGETATIVE GROWTH AS INFLUENCED BY TRADITIONAL PLANT GROWTH REGULATORS AND MFX COMPOUNDS

Philip H. Jost and J.T. Cothren
Texas Agricultural Experiment Station, College Station, TX

Abstract

Vegetative and Reproductive growth of cotton (*Gossypium hirsutum*) was monitored in a seven cultivar by three plant growth regulator (PGRs) study over two years. The study was designed as a split-plot with the PGR treatments being the whole plots and the cultivars as sub-plots. Variety yields were erratic in the two years, but PGR yields averaged over varieties were quite consistent. The treatment showing increased yields, boll counts, and reproductive nodes was a mixture of foliar fertilizers applied throughout the season. This treatment increased boll counts at the first three positions on the first ten reproductive branches. This treatment, however, caused an increase in height compared to other PGR treatments receiving mepiquat chloride. Increased plant height may lead to a delay in maturity. Another study was conducted with MFX experimental compounds in 1996 only. This study showed that all MFX compounds had heights similar to mepiquat chloride. MFX-4294 and MFX 2294 at 8 oz/A had more reproductive nodes than the mepiquat chloride treatment. These nodes were produced prior to plant cutout, when boll production was at a maximum. A trend was also noted that these two compounds had more bolls at fruiting positions 1 through 3 than the mepiquat chloride treatment. These new MFX compound may help to produce a shorter plant that matures more quickly and does not sacrifice boll production.

Introduction

Plant growth regulators are commonly used in cotton production. Some PGRs, such as mepiquat chloride, are used to decrease vegetative growth and enhance earliness (Kerby, 1985). Others, such as PGR-IV, are utilized to promote vegetative growth (Cadena et al., 1994). The common goal is to increase yields by the use of these products. However, yields from studies evaluating these compounds have been erratic. The objectives of these studies were: 1) to document the overall effects of commonly used PGRs, and 2) to determine if the newer MFX compounds will have a fit in cotton production.

Materials and Methods

Field experiments were conducted in 1995 and 1996 at the Texas A&M Agronomy Field Laboratory near College Station, Texas. An experiment with PGRs and varieties was conducted in both years. An additional study with Microflo's experimental MFX compounds was conducted in 1996 only.

Cultural Information. Cotton was planted on April 10, 1995 and April 15, 1996. Agronomic inputs, including irrigation, were made to both studies as needed.

Study 1. Plant Growth Regulators x Varieties. The PGR treatments utilized in this study were as follows: 1) (Control), no PGR treatments, 2) (MFPGR), PGR-IV at 4oz/A applied at pinhead square and early bloom, along with mepiquat chloride applied as needed determined by the Mep-Stick, 3) (MEPRT), mepiquat chloride applied as needed as determined by the Mep-Stick. 4) (PBT), a combination of foliar fertilizers including; 2 oz/A Cytoplex and 2 lb/A Sol-U-Gro applied at the 5-leaf stage, 4 oz/A Cytoplex and 0.25 lb/A Microplex applied at match-head square, 6 oz/A Cytokin, 5 lb/A Nutrileaf, and 0.5 lb/A Microplex applied at first bloom, and finally 8 oz/A Cytokin and 5 lb/A Cotton Finisher applied at mid-bloom. All applications were made with a back-pack CO_2 sprayer equipped with 3 nozzles per row delivering 18 gallons of water per acre.

The varieties planted were Deltapine 50 (DP50), Deltapine 20 (DP20), Deltapine 90 (DP90), Stoneville 453 (ST453), Sure-Grow 501 (SG501), SPHINX, and Stoneville 132 (ST132). Data collected was plant mapping at harvest and yield. Plants were mapped using the Plant Mapping Analysis Program v. 3.7 (Landivar, 1993). Yields were obtained by machine harvesting the two center rows from each 4-row plot. Experimental design was a split plot with four replications. Whole plots were assigned to PGR treatments. Subplots were assigned to varieties which were randomized within the whole plot. Data were combined over years when possible. Means were separated using the Duncan's Multiple Range Test (DMRT) at a significance level of 5%.

Study 2. MFX Compounds. The treatments used in this study were MFX 2294-P at4 oz/A, MFX 2494-P at 4oz/A, MFX 4294-P at 4oz/A, mepiquat chloride at 4oz/A, and MFX 2294-P at 8oz/A. All treatments were initiated at match-head square (MHS) and continued every 10 days until MHS + 40 days. Plant heights and mainstem node counts began 6 days after initial treatment and continued at weekly intervals until the cotton was at approximately 2 weeks past cutout. Yields were collected by hand picking 10 feet out of the two center rows from each 4-row plot. Plants were also mapped at this time. This study was designed as a randomized complete block. Means were separated using DMRT at a 5% significance level.

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Results and Discussion

Study 1. PGR x Cultivar Study. Due to a variety by year interaction, yields could not be combined over years for varieties (Table 1). PGR treatments, however, performed uniformly in spite of the variability observed with the cultivars. Therefore, the data reported for the PGRs is combined over years. The PBT treatment yielded 24 and 41 more pounds of lint per acre than the control and MEPRT treatment, respectively (Figure 1).

Plant mapping at harvest helped to explain where the yield difference between PGR treatments may have occurred. Individually the following data is not statistically significant; however, some important trends are evident. The PBT treatment averaged at least 0.4 more bolls per plant than the control and MEPRT treatment (Figure 2). Further evaluation indicated that these additional bolls were located at fruiting positions 1 through 3 (Figure 3). In addition, the number of fruiting sites present on reproductive branches 1 through 10 were numerically greater for the control and the PBT treatment compared to the MEPRT treatment (Figure 4). Subsequently, boll retention at positions 1 through 3 on branches 1 through 10 was numerically greater for the PBT treatment (Figure 5). Reproductive node numbers were also greater for the PBT treatment compared to the MEPRT treatment (Table 2).

In light of the positive reproductive trends observed with the PBT treatment, all treatments were at least 8 cm taller than the MEPRT treatment (Table 2). Excessively tall plants can cause a delay in maturity, while a reduction in height can lead to earlier maturation of the crop, (Kerby, 1985). The ideal situation would be a plant with stature similar to that of the MEPRT treatment with the reproductive qualities of the PBT treatment. This combination of responses would need to provide reproductive nodes and fruiting sites which are generated early- or mid-season when boll production is at a maximum.

Study 2. MFX Compounds. The MFX compounds showed trends that suggest the aforementioned combination of responses may be a possibility. While there were no differences in yield, positive growth habits were observed.

With no significant differences in height (Figure 6), MFX-4294 and MFX-2294 at 8 oz/A, had significantly more reproductive nodes than the mepiquat chloride treatment (Figure 7). Node production occurred at an optimum time during the season. From MHS+10 days until mid-bloom, all treatments except 8 oz/A MFX-2294 produced more nodes than the mepiquat chloride treatment (Figure 8). In the time interval of MHS+10 days until cutout, the difference was even more dramatic.

Boll counts at positions 1 through 3 showed a trend for two of the MFX compounds to have numerically more nodes than the mepiquat chloride treatment (Figure 9). All of the MFX compounds averaged more total fruiting sites on branches 1 through 10 than mepiquat chloride (Figure 10).

Conclusions

The data from these studies suggests that the application of some commonly used PGRs may enhance yield. Others cause more favorable growth habits such as reduced height. A combination of these two responses, however, has not been realized in the past. The MFX experimental PGRs revealed trends of contributing both of these effects, a plant of shorter stature yet still having the reproductive qualities desired. Further research needs to be conducted to determine optimal rates and application timings of the MFX experimental compounds. In these studies harvesting by position should be done to document locations of additional boll production and boll size.

References

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Landivar, J.A. 1993. PMAP, A Plant Map Analysis Program for Cotton. Texas Agricultural Experiment Station. MP. 1740. Texas Agricultural Experiment Station, College Station, TX.

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Table 1. Variety yields 1995 and 1996.

Variety	1995	1996
	lbs lint/A	
DP50	955 AB	810 B
DP20	952 AB	749 C
DP90	873 C	900 A
ST453	905 BC	750 C
SG501	916 BC	812 B
SPHINX	992 A	750 C
ST132	775 D	512 D

alpha = .05

Table 2. Effect of PGRs on reproductive node numbers and height, alpha =.05..

PGR	Reproductive Nodes	Height (cm)
Control	20.7	97 B
MFPGR	20.5	97 B
MEPRT	20.0	89 C
PBT	21.1	101 A

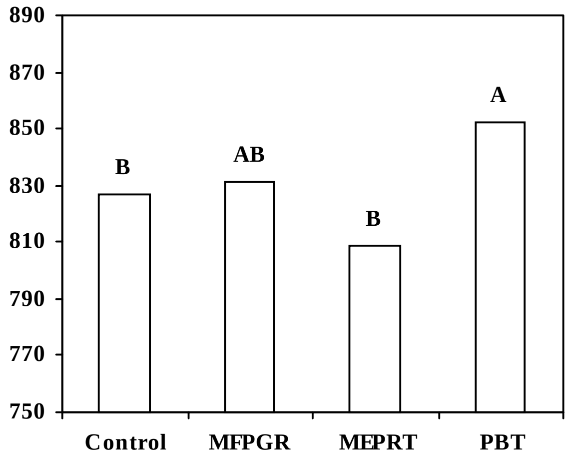

Figure 1. Effect of PGRs on lint yield in lbs lint/A, alpha = 0.1.

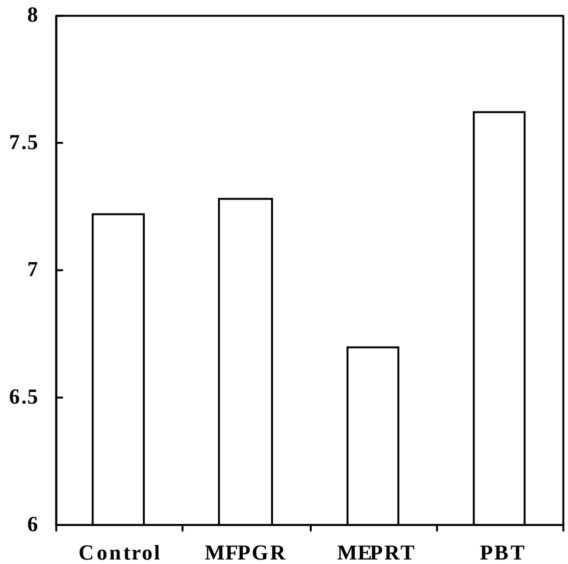

Figure 2. Effect of PGRs on total boll counts per plant.

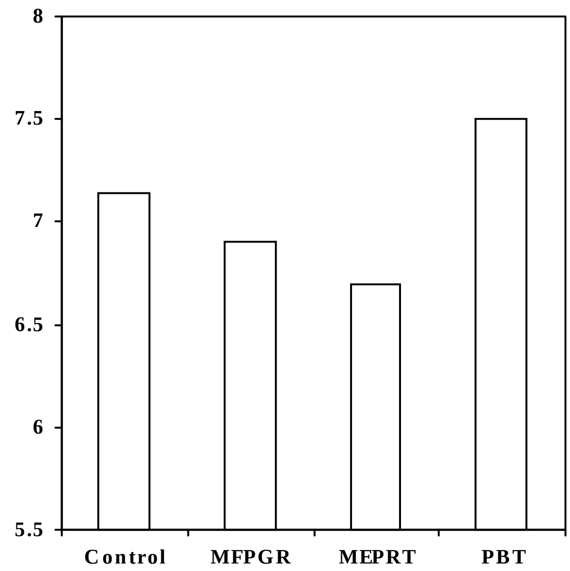

Figure 3. Effect of PGRs on boll counts per plant at fruiting positions 1 through 3.

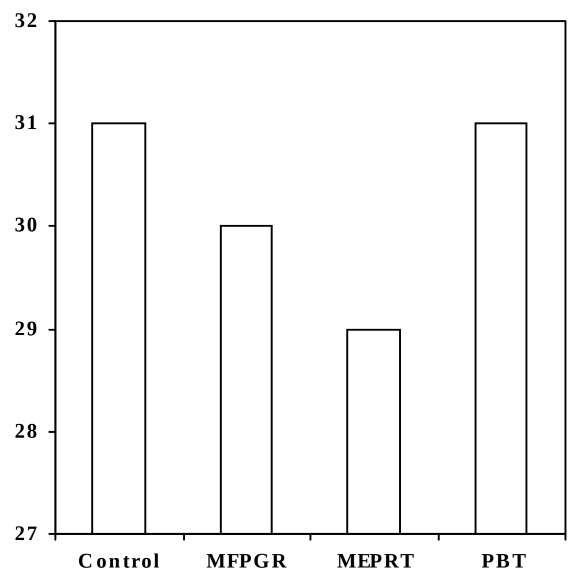

Figure 4. Effect of PGRs on the number of fruiting sites on branches 1 through 10.

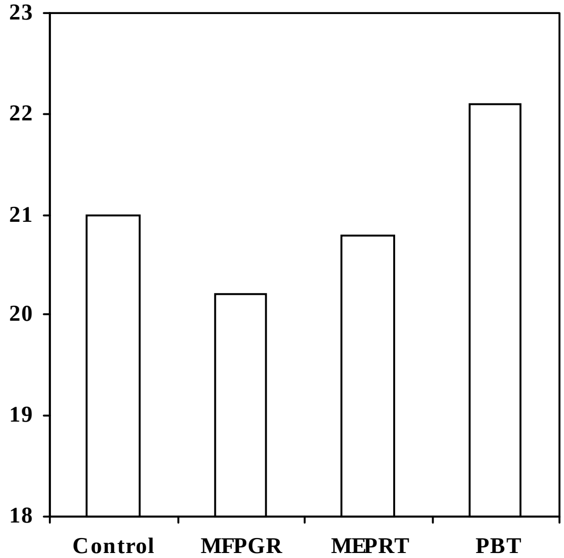

Figure 5. Effect of PGRs on percent boll retention at branches 1 through 10, positions 1 through 3.

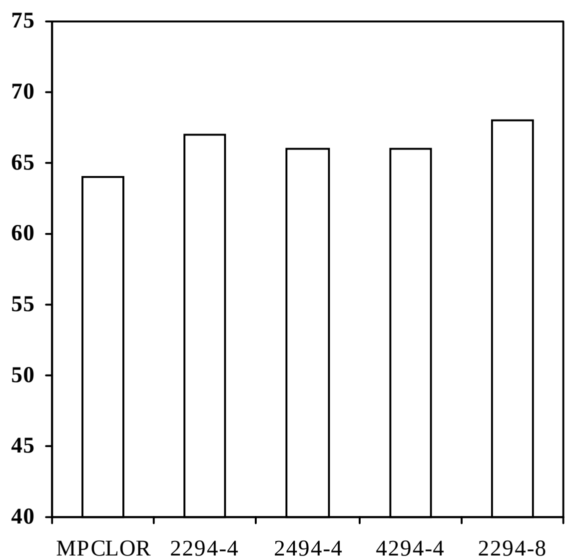

Figure 6. Effect of MFX compounds on plant height.

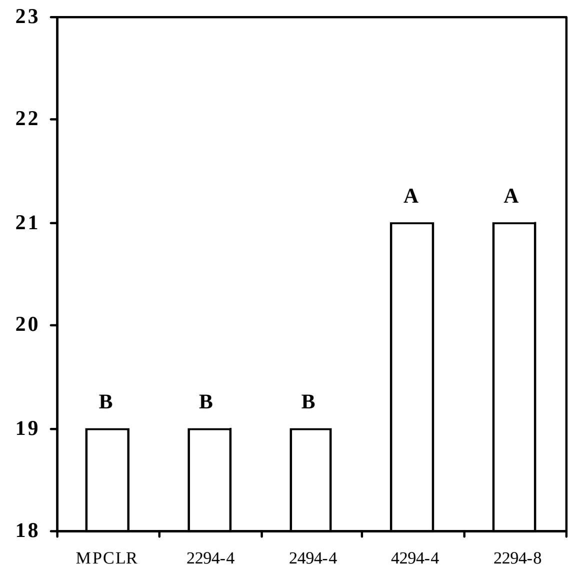

Figure 7. Effect of MFX compounds on numbers of reproductive nodes, alpha=0.1.

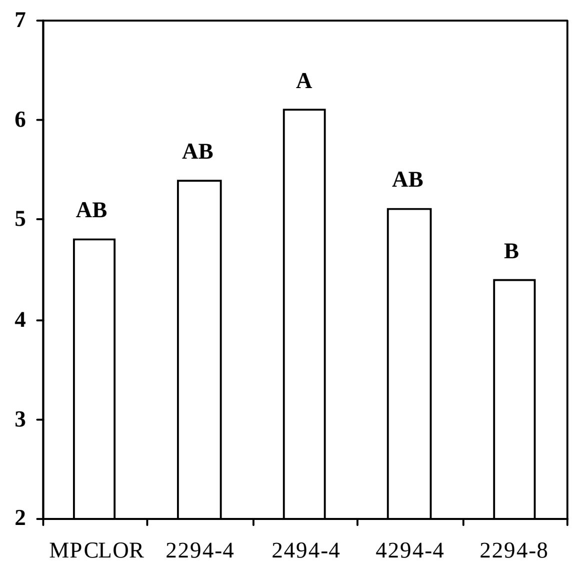

Figure 8. Effect of MFX compounds on node production from MHS + 10 days through mid-bloom.

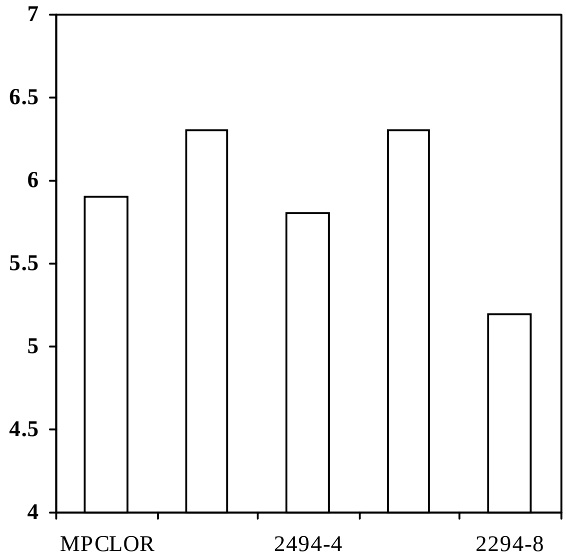

Figure 9. Effect of MFX compounds on boll counts at fruiting positions 1 through 3.

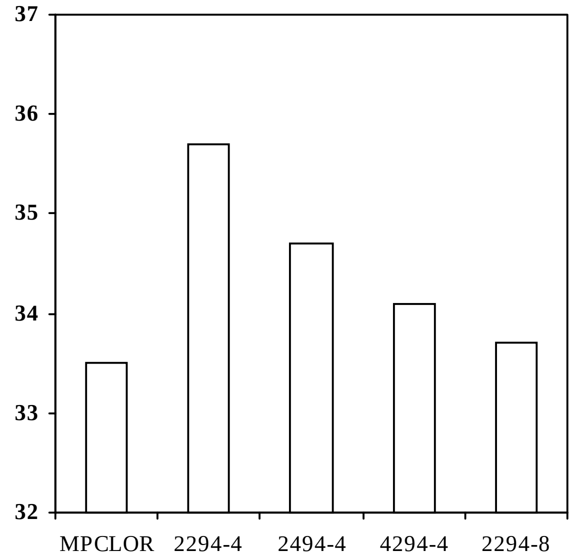

Figure 10. Effect of MFX compounds on total fruiting sites branches 1 through 10.