EVALUATION OF SEVERAL PLANT GROWTH REGULATORS IN LOUISIANA

E. P. Millhollon and J. C. Waters
Red River Research Station
Louisiana Agricultural Experiment Station
Bossier City, LA

Abstract

Field trials were conducted at Louisiana Agricultural Experiment Station's Red River Research Station in Bossier City, Louisiana, to examine the effects of the plant growth regulators Early Harvest, PGR IV, Maxon, and Stimulate applied at two manufacturer's recommended rates and timing schedules on cotton seedling growth, fruiting, and yield. Compared to an untreated control, none of the plant growth regulators had a significant effect on seedling height or weight. Although results indicated that some plant growth regulators had an effect on fruit retention, the effects were not consistent from one plant mapping date to the next and the final plant mapping indicated none of the plant growth regulators significantly increased fruit retention compared to the untreated control. However, four plant growth regulator treatments significantly reduced the plant height:node ratio at the final plant mapping. These treatments were PGR IV applied at 4 oz./A in-furrow at planting (IF), at pinhead square (PHS), and at early bloom (EB), Stimulate applied at 2 oz./A at IF, 3 oz./A at PHS, and 4 oz./A at EB, Stimulate applied at 4 oz./A at EB and EB plus 14 days, and Maxon applied at 4 oz./A at PHS and EB. None of the treatments had a significant effect on seed cotton yield compared to the untreated control.

Introduction

In an attempt to regulate the balance between vegetative and reproductive growth in cotton, plant growth regulators have been investigated for decades. In general, physiological response to plant growth regulators has been inconsistent. Nevertheless, these products continue to be marketed under various names with only slight differences in formulation with promises of enhanced plant vigor, increased fruit retention, and ultimately, yield. In 1996, the effects of four plant growth regulators on seedling growth, fruit retention, and yield were compared to an untreated control at Louisiana Agricultural Experiment Station's Red River Research Station in Bossier City, Louisiana.

Materials and Methods

Planting and Treatment Application

This experiment was conducted in field plots consisting of four forty-inch rows, forty-five feet in length, planted to the cotton cultivar Stoneville 474 on May 22, 1996. Treatments consisted of four plant growth regulators applied at two manufacturer's recommended rate and timing schedules and an untreated control. The rate and timing schedules are listed in Table 1. In-furrow treatments were applied at planting in a total volume of seven gallons per acre. Foliar applications were applied in a total volume of twenty gallons per acre.

Measurements

Seedling height and weight were taken from ten plants per plot on June 20, 1996. Height was measured from the ground surface to the plant terminal. The same seedlings were then harvested, including the root system, and transferred to the laboratory for measuring fresh weights.

On July 16 and August 5, 1996, ten plants from each plot were mapped, noting the presence or absence of fruiting structures at the first two fruiting positions, plant height from the cotyledonary node to the terminal, and the total number of main-stem nodes. Final yield was obtained on October 24, 1996, by harvesting the center two rows of each plot with a spindle picker.

Results and Discussion

None of the treatments had a significant effect on seedling height (Table 2), but PGR IV applied at application schedule 2 significantly increased seedling weight compared to Maxon applied at application schedule 2. Seedling weights from these two treatments were not significantly different from the others.

Plant mapping on July 16, indicated that Stimulate applied at application schedule 2 significantly increased the percentage of fruiting structures at the first-position (Table 3). PGR IV and Maxon applied at application schedule 1, and Early Harvest and Stimulate applied at application schedule 2, significantly increased the percentage of fruiting structures at the second fruiting position compared to Stimulate applied at application schedule 1 and PGR IV and Maxon applied at application schedule 2.

On this date, none of the plant growth regulators resulted in a significantly lower height:node ratio when compared to the untreated control (Table 3), although Early Harvest applied at application schedule 1 resulted in a significantly greater ratio.

Plant mapping on August 5, twenty days after the first plant mapping, indicated no significant differences among treatments in the percentage of fruit at the first-position (Table 4). PGR IV applied at application schedule 2 and the untreated control both had significantly more fruit at the second fruiting position compared to PGR IV at application schedule 1 and Stimulate at application schedule 2.

PGR IV and Stimulate applied at application schedule 1 and Maxon and Stimulate applied at application schedule 2

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1472-1474 (1997)
National Cotton Council, Memphis TN

resulted in significantly lower height:node ratios compared to Early Harvest applied at both application schedules and the untreated control (Table 4).

Yield response to treatment with the different plant growth regulators is presented in Table 5. Cotton yields in this test, as in most fields in Northwest Louisiana, were atypically low in 1996. This was primarily due to July rainfall that was three times the 15-year average and heavy boll weevil pressure in late July and early August. It is not known whether or not these conditions contributed to the fact that there were no significant differences in yield among the different plant growth regulator treatments.

Table 1. Plant growth regulators and application times and rates used in this study.

Treatment[1]	Application Time[2]	Rate (oz. per acre)
Early Harvest 1	IF, PHS, EB	2, 3, 4
PGR IV 1	IF, PHS, EB	4, 4, 4
Maxon 1	IF, PHS, EB	1, 3, 3
Stimulate 1	IF, PHS, EB	2, 3, 4
Early Harvest 2	2-5LF, PHS, EB	2, 3, 3
PGR IV 2	2-5LF, PHS, EB	1, 4, 4
Maxon 2	PHS, EB	4, 4
Stimulate 2	EB, EB+14	4, 4
Control		

[1]Numbers 1 and 2 denote different application rates and schedules.
[2]IF=in-furrow, 2-5LF = 2 – 5-leaf, PHS=pinhead square, EB = early bloom, EB+14 = early bloom + 14 days.

Table 2. Effect of plant growth regulators on cotton seedling height and weight.

Treatment	Plant Height (Inches)[1]		Plant Weight (Grams)[1]	
Early Harvest 1	10.88	a	8.47	ab
PGR IV 1	11.08	a	8.38	ab
Maxon 1	10.86	a	9.16	ab
Stimulate 1	11.45	a	8.22	ab
Early Harvest 2	11.09	a	9.04	ab
PGR IV 2	11.08	a	9.57	a
Maxon 2	11.03	a	8.08	b
Stimulate 2	11.36	a	9.46	ab
Control	11.23	a	9.03	ab

[1]Numbers within a column followed by the same letter are not significantly different (DMRT, $P \leq 0.05$)

Table 3. Effect of plant growth regulators on the percentage of first- and second-position fruiting sites with fruit and the height:node ratio on July 16, 1996.

Treatment	Percent of Sites with Fruit				Height to Node Ratio	
	Position 1		Position 2			
Early Harvest 1	48.9	b	32.7	ab	2.21	a
PGR IV 1	48.7	b	36.5	a	1.91	d
Maxon 1	45.4	b	37.3	a	1.92	cd
Stimulate 1	48.6	b	29.9	bc	2.02	bcd
Early Harvest 2	49.2	b	37.2	a	2.01	bcd
PGR IV 2	45.9	b	29.4	bc	2.16	ab
Maxon 2	46.7	b	25.8	c	2.02	bcd
Stimulate 2	56.4	a	37.6	a	2.10	abc
Control	46.2	b	35.7	ab	2.02	bcd

[1]Numbers within a column followed by the same letter are not significantly different (DMRT, $P \leq 0.05$).

Table 4. Effect of plant growth regulators on the percentage of first- and second-position fruiting sites with fruit and the height:node ratio on August 5, 1996.

Treatment	Percent of Sites with Fruit				Height to Node Ratio	
	Position 1		Position 2			
Early Harvest 1	40.4	a	41.3	ab	2.90	ab
PGR IV 1	40.8	a	40.3	b	2.70	c
Maxon 1	38.9	a	45.6	ab	2.83	abc
Stimulate 1	44.3	a	46.0	ab	2.70	c
Early Harvest 2	43.0	a	43.6	ab	2.95	a
PGR IV 2	40.1	a	46.8	a	2.74	bc
Maxon 2	38.9	a	44.5	ab	2.65	c
Stimulate 2	37.2	a	40.0	b	2.68	c
Control	40.2	a	47.0	a	2.91	ab

[1]Numbers within a column followed by the same letter are not significantly different (DMRT, $P \leq 0.05$).

Table 5. Effect of plant growth regulators on seed cotton yield.

Treatment	Yield (lbs. seed cotton/acre)[1]
Early Harvest 1	747.8
PGR IV 1	595.3
Maxon 1	678.8
Stimulate 1	762.3
Early Harvest 2	885.7
PGR IV 2	853.1
Maxon 2	842.2
Stimulate 2	802.2
Control	882.1

[1]Yields were not significantly different (DMRT, $P \leq 0.05$).