Effect of Plant Growth Regulators On Lint Yield, Fiber Quality, and Boll Distribution of Cotton Varieties in Georgia

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INTRODUCTION:

Plant growth regulator (PGR) applications are often necessary in cotton to reduce vegetative growth and maintain a manageable crop. However, PGR sensitivity varies widely among varieties and environments. Some varieties need to be monitored closely and heavily managed while some are sensitive such that overuse may negatively impact yield.

METHODS:

Studies were initiated during 2012 in Tifton and Midville, GA on May 1st and June 8th, respectively. Treatments consisted of a factorial arrangement of eight cotton varieties (AM 1511 B2RF, DP 0912 B2RF, DP 1050 B2RF, DP 1137 B2RF, DP 1252 B2RF, PHY 499 WRF, FM 1740 B2RF and FM 1944 GLB2) and two PGR regimes. PGR regimes included cotton which was not treated with PGR and cotton treated with mepiquat chloride three times (applied at initiation of squaring at 12 oz/A, at first bloom at 16 oz/A, and two weeks after first bloom at16 oz/A, and two weeks after first bloom at 16 oz/A).

Plant mapping was conducted immediately prior to harvest documenting total number of bolls produced, boll distribution, plant height, and total number of main-stem nodes (nodes). Boll production data were grouped into node zones, by fruiting position and within main-stem nodes 4 to 8, 9 to 12, 13 to 16, 17 to 20, 21 to 24 and 25 and up.

Cotton was harvested, gin turnout was determined at the UGA Microgin and fiber quality was assessed at a USDA Classing office. Data were subjected to ANOVA using the PROC MIXED procedure of SAS to reflect the factorial arrangement of treatments. Means for significant main effects and interactions were separated with Fisher's Protected LSD at $P \leq 0.1$.

Table 1. Height, main-stem nodes, lint yield and gin turnout affected by PGR regime in Midville and Tifton.[1]

PGR Regime	Height		Main-stem Nodes		Lint Yield		Gin Turnout	
	Midville	Tifton	Midville	Tifton	Midville	Tifton	Midville	Tifton
	---- inches ----		------- no. -------		------- lbs/A ------		----- % -----	
No PGR	55.4 a	48.4 a	22.1 a	19.4 a	1453 b	1970 a	40.3 a	42.0 a
PGR	40.7 b	39.9 b	20.4 b	18.7 b	1521 a	1710 b	39.6 b	40.6 b

[1]Means within a column followed by same letter are not significantly different at P=0.1.

Table 2. Total number of bolls per plant, by fruiting position, and vegetative bolls affected by PGR regime in Tifton and Midville.[1]

PGR Regime	Total Bolls		1st Position		2nd Position		3rd Position		Vegetative	
	Midville	Tifton	Midville	Tifton	Midville	Tifton	Midville	Tifton	Midville	Tifton
	---------- bolls / plant ----------									
No PGR	16.9 a	6.6 a	9.0 a	5.5 a	4.7 a	0.6 a	1.8 a	0.03 a	1.4 b	0.5 a
PGR	17.6 a	5.4 b	8.2 b	4.6 b	5.1 a	0.4 b	1.8 a	0.02 a	2.5 a	0.4 a

[1]Means within a column followed by the same letter are not significantly different at P=0.1.

RESULTS

Interactions between variety and PGR regime were not observed. Data for main effects of variety and PGR regime were separated across locations because of location by treatment interactions. The main effect of variety was prevalent throughout the analyses, yet because no variety interactions were observed, this information was not presented.

The main effect of PGR regime affected many parameters analyzed in this experiment. As expected, PGRs reduced plant height and number of nodes in both locations (Table 1). Lint yields were reduced by PGRs in Tifton and increased in Midville.

and Tifton, respectively (Table 2). The large difference in bolls per plant was likely due to seeding rate which was higher in Tifton (4/ft) than Midville (2/ft) causing increased competition between plants decreasing bolls per plant. The total number of bolls per plant were not affected by PGRs in Midville, and were reduced in Tifton. PGRs reduced the total number of bolls on Position 1 and 2 in Tifton, while reducing the number of bolls on only Position 1 in Midville.

Within the first fruiting position more bolls existed on nodes 4 to 8 in PGR treated cotton while more bolls existed on nodes 17 to 20 and 21 to 24 in non-treated cotton in Midville (Table 3). In Tifton, non-treated cotton had more bolls on nodes 9 to 12 and 13 to 16 than PGR treated cotton. On the second fruiting position cotton treated with PGRs had more bolls on nodes 4 to 8 and 9 to 12, and fewer bolls than non-treated cotton on nodes 13 to 16 and 17 to 20 in Midville. In Tifton, PGR treated cotton had fewer bolls on nodes 9 to 12 and 13 to 16 than non-treated plants. On the third position, PGR treated cotton had more bolls on nodes 4 to 8 in both locations and fewer bolls on nodes 13 to 16 and 17 to 20 in Midville.

Table 3. Boll production per plant affected by PGR regime within main-stem node zones and fruiting position in Tifton and Midville.[1]

Fruiting Position	Main-stem Node	Midville		Tifton	
		No PGR	PGR	No PGR	PGR
		------- bolls / plant -------			
1st	4-8	1.7 b	2.0 a	2.1 a	2.0 a
	9-12	2.4 a	2.4 a	2.3 a	2.0 b
	13-16	2.6 a	2.7 a	1.0 a	0.6 b
	17-20	2.0 a	1.2 b	0.04 a	0.01 a
	21-24	0.2 a	0.1 b	--	--
	25+	--	--	--	--
2nd	4-8	1.2 b	1.6 a	0.2 a	0.2 a
	9-12	1.6 b	2.1 a	0.33 a	0.17 b
	13-16	1.5 a	1.2 b	0.09 a	0.01 b
	17-20	0.4 a	0.2 b	--	--
	21-24	--	--	--	--
	25+	--	--	--	--
3rd	4-8	0.5 b	0.7 a	0.02 a	0.00 b
	9-12	0.6 a	0.7 a	0.01 a	0.02 a
	13-16	0.7 a	0.4 b	--	--
	17-20	0.13 a	0.01 b	--	--
	21-24	--	--	--	--
	25+	--	--	--	--

[1] Means within a row followed by the same letter are not significantly different at P=0.1.

CONCLUSIONS:

In this study, both variety and PGR regime affected lint yield, boll production and boll distribution yet no interaction of variety and PGR regime was observed. This was somewhat unexpected since previous work by authors has indicated significantly different responses to PGRs among varieties.

Also, this work indicates the unpredictable effect PGRs have on cotton lint yield, where yields were increased and decreased by PGRs. However, the effect of PGRs on boll production and on distribution data may explain the different responses in lint yield and are somewhat similar.

In Midville, overall boll production was not altered, but it was shifted to lower nodes in the plant canopy by PGRs. Untreated cotton compensated by producing more bolls higher in the plant canopy, yet due to planting date those bolls were likely much smaller therefore explaining increased yields from PGRs. In Tifton, where yields were negatively impacted by PGRs, overall boll production was negatively impacted on the upper and outer fruiting position. This was due to reduced plant growth associated with PGR applications, and likely associated reduction in fruiting positions. Since plant population was relatively high and boll production per plant was much lower in Tifton than Midville, bolls were probably much larger and that reduction in boll production resulted in lower yields observed from PGR applications in Tifton.

The ability of PGRs to affect yield, maturity, boll production and distribution reinforce the notion that careful considerations should be taken when making PGR decisions, such as variety needs, environment, planting date, fertility and other factors.

ACKNOWLEDGEMENTS:

Support for this project was provided by The Georgia Cotton Commission

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