

EVALUATION OF ASSET™ AND ASSET RTU™ AS IN-FURROW APPLICATIONS TO ENHANCE COTTON GROWTH AND YIELD

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RESEARCH PROBLEM

Cotton (*Gossypium hirsutum* L.) is often planted in the mid-South under unfavorable planting conditions (e.g., cool, wet soils). Producers have therefore been interested in plant growth regulator (PGR) or fertilizer additives to enhance seedling growth and increase yield. Earlier growthroom studies showed enhanced root growth and seedling vigor from using in-furrow seed treatment with PGR-IV (Oosterhuis and Zhao, 1994) and also with ASSET (Steger *et al.*, 2000). However, field studies have been less than conclusive often with variable results. The current study is an ongoing field test evaluating chemical additives at planting to enhance seedling growth and increase yield.

BACKGROUND INFORMATION

The use of PGRs as an in-furrow treatment at planting has shown promise for increasing root growth in controlled environment studies but field results of this practice have been inconsistent (Steger and Oosterhuis, 1997). PGR-IV (MicroFlo Company, Memphis, TN) and Early Harvest (Griffin Corp., Valdosta, GA) are PGRs with the potential to influence seedling growth and yield. ASSET™ and ASSET RTU™ (Helena Chemical Company, Memphis, TN) are fertilizer additives with growth promoting capabilities that have been shown in growthroom studies to promote root growth and seedling vigor (Steger *et al.*, 1997), but field studies have been less conclusive (Robertson, 1998). The objective of this study was to continue comparisons of commercially available plant growth promoters as in-furrow or seed applications at planting and observe their effect on seedling development and yield of field-grown cotton.

RESEARCH METHODS

The field study was conducted at the Southeast Research and Extension Center, Rohwer, in 1997, 1998, and 1999 on a moderately well-drained Hebert silt loam. The cultivar Suregrow 125 was seeded in early May in plots consisting of four rows spaced 38 inches apart and 40 ft in length. The trial was furrow irrigated as needed. Weeds, insect control, and fertilizer management were according to Arkansas cotton produc-

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tion recommendations. The statistical design was a randomized complete block with six replications. The experiment included five treatments (Table 1): (1) an untreated control, (2) ASSET applied at 6 oz/acre in-furrow, (3) ASSET RTU applied at 1 pt/acre in-furrow, and (4) PGR-IV applied at 2 oz/acre in-furrow, and Early Harvest applied at 5 oz/100 lb seed. All in-furrow applications were made using spray equipment calibrated to deliver 5 gal solution/acre.

Measurements included stand counts at 7 and 10 days after planting (DAP), number of lateral roots and root weight from core samples taken at 14 and 31 DAP, plant height and number of main-stem nodes at pinhead square and first flower, petiole analysis at first flower, and 30 boll grab samples prior to harvest for boll weight and fiber quality (HVI). Final lint yield was determined by mechanically harvesting the center two rows of each plot.

RESULTS AND DISCUSSION

Seedling emergence was not significantly ($P=0.05$) increased by any of the treatments compared to the untreated control (data not shown). All treatments increased the number of lateral roots 14 DAP compared to the untreated control, but there were no differences between treatments at 31 days (Table 1). There was no significant effect of any treatment on root weight at 14 or 31 DAP. Petiole nutrient concentrations at first flower were not affected by any treatment compared to the control (data not shown). There was no clear trend for treatment effect on plant height or number of main-stem nodes (Table 2). At pinhead square, plants in the control treatment were significantly taller than those in the ASSET and PGR-IV treatments. There were no difference in plant height between treatments and the control at first flower. The number of main-stem nodes did not differ between treatments at the pinhead square stage, except for ASSET-RTU, which had fewer nodes than the control. At first flower the ASSET treatment had a significantly higher main-stem node count, and the ASSET RTU had a lower node number compared to that of the control. Early Harvest and PGR-IV had no effect on node number at first flower.

Yield, gin turnout, and boll weight were not significantly affected by treatment (Table 3). However, we did observe that the control gin turnout and lint yield were numerically lower compared to any of the in-furrow treatments. The highest and second highest lint yields were recorded from the PGR-IV and ASSET treatments, respectively. There were no significant treatment effects on micronaire, uniformity, strength, length, or elongation at the final harvest (data not shown). The lack of clear, significant yield differences may have been associated with the extremely hot and dry conditions that were present from the mid-to-late growing season in 1999.

PRACTICAL APPLICATION

The primary objective of this study was to provide field data evaluating the effect of an in-furrow application of chemical growth promoters (PGRs or fertilizer additives) on the early growth and yield of field-grown cotton. The 1999 study failed to show a definite, positive effect of in-furrow or seed applications on growth and yield.

We surmise that the climatic stress experienced during boll development had a negative influence on potential treatment effects. This study will be repeated in 2000 at additional locations.

REFERENCES

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Table 1. Lateral root number and root weight at 14 and 31 DAP. Rowher, Arkansas 1999.

	14 DAP		31 DAP	
	Lateral	Root	Lateral	Root
	Roots	Weight	Roots	Weight
	#	g/sample ^z	#	g/sample
Untreated control	18 ^y c ^x	0.032 ^y a	199 a	0.313 a
ASSET @ 6 oz/acre in-furrow	32 b	0.033 a	168 ab	0.334 a
ASSET RTU @ 1 pt/acre in-furrow	35 ab	0.031 a	148 a	0.291 a
PGR4 @ 2 oz/acre in-furrow	45 a	0.033 a	159 ab	0.312 a
Early Harvest @ 5 oz/100 lb seed	35 ab	0.031 a	155 ab	0.293 a

^z Core samples 5 cm diameter and 25 cm deep were taken over the decapitated root system.

^y Mean of one root from each of two outside rows per plot and three replications.

^x Means within a column followed by the same letter are not significantly different (P=0.05).

Table 2. Plant height and number of main-stem nodes at pinhead square and first flower. Rowher, Arkansas 1999.

Treatment	Pinhead Square		First Flower	
	Plant Height	Nodes	Plant Height	Nodes
	cm	#	cm	#
Untreated control	29.0 a ^z	7.8 a	75.1 a	13.8 b
ASSET @ 6 oz/acre in-furrow	25.8 b	7.7 ab	74.6 a	14.2 a
ASSET RTU @ 1 pt/acre in-furrow	26.5 b	7.3 b	70.9 a	13.1 b
PGR4 @ 2 oz/acre in-furrow	26.5 b	7.8 a	73.9 a	13.7 ab
Early Harvest @ 5 oz/100 lb seed	27.6 ab	7.6 ab	74.0 a	13.1 b

^z Means within a column followed by the same letter are not significantly different (P=0.05).

Table 3. Effect of in-furrow or seed treatments on lint yield of field-grown cotton in 1998 and 1999.

Treatment	1998	1999
	----- lb lint/acre -----	
Untreated control	1211	1380
ASSET @ 6 oz/acre in-furrow	1117	1444
ASSET RTU @ 1 pt/acre in-furrow	1092	1425
PGR4 @ 2 oz/acre in-furrow	1172	1466
Early Harvest @ 5 oz/100 lb seed	1162	1424
LSD (0.05)	NS ^z	NS

NS = non significant (P=0.05)