EVALUATION OF PGR-IV IN SOUTH CAROLINA

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Abstract

Varied lint yield responses have been documented across the cotton belt with the use of the MicroFlo System consisting of PGR-IV and mepiquat chloride (MC) applications. South Carolina has some distinct weather patterns that make it unique to other southeastern states, but no replicated trials evaluating PGR-IV have been conducted in the state. Therefore, we compared the System to a standard MC treatment and an untreated control at four replicated locations plus two non-replicated locations. Early-season growth was enhanced by the System, as expressed in shoot dry weight and node of first fruiting branch. Plant height was lower for the System treatment, although the response was likely due to the MC included in the System treatment. The System treatment produced more fruiting sites per plant, although total bolls per plant were not affected. Boll size was larger for System-treated plants and was explained by higher seed weight per boll, rather than by a lint increase. Lint yield was not influenced by the System, although a consistent, numerical increase was detected for the System treatment at all four replicated locations. Fiber strength and trash content was increased for System-treated plants.

Introduction

Plant growth regulator use has increased in cotton (*Gossypium hirsutum* L.) in the last 20 years. New products are continually being evaluated and developed to manipulate the growth habit of the crop. Results of such testing typically indicates a high degree of variability caused predominantly by environmental conditions. Consequently, products are tested in many different environments in an attempt to characterize the effects on plant growth under various conditions.

Such has been the case with PGR-IV (MicroFlo Co., Lakeland, FL). Extensive testing has been conducted beltwide in recent years with varied results. However, no replicated field trials have been conducted in South Carolina, which has some environmental conditions uniquely different from even other southeastern states.

The objective of our trials was to compare the MicroFlo System, consisting of various applications of PGR-IV and mepiquat chloride (MC) at strategic growth stages, to a standard plant growth regulator program, consisting of 4 to 18 oz. of MC, as well as an untreated control. Additionally, at two locations we measured some plant growth parameters throughout the growing season.

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Materials and Method

Four replicated field trials were conducted to evaluate cotton response to PGR-IV applications via the MicroFlo System. Additionally, two non-replicated demonstrations were conducted on large-scale plots. Locations and other pertinent information from each site are listed in Table 1. Other cultural practices were followed according to Clemson University Cooperative Extension Service.

At Florence, the System treatment consisted of a seed treatment of PGR-IV, 4 oz. PGR-IV at pinhead square stage (PHS), 4 oz. MC at matchhead square stage (MHS), followed by a tank-mixed application of 4 oz. PGR-IV plus 8 oz. MC at early bloom stage (EB). The standard treatment had 8 oz. MC applied at EB, and the check remained untreated. All plots were mapped at MHS, EB, and at harvest. Dry weights were determined at pre-square to MHS. Fifty bolls were collected at harvest to determine boll size differences among treatments.

The Blackville location had a System treatment that included 1 oz. PGR-IV at second true leaf stage (2TL), 4 oz. PGR-IV at PHS, 6 oz. MC at MHS, and 4 oz. PGR-IV plus 6 oz. MC tank-mixed at EB. The standard treatment had 6 oz. MC at MHS followed by 6 oz. MC at EB. No untreated control was used at this location. Plant growth parameters were measured at EB and harvest.

The Dillon County location System treatment consisted of 1 oz. PGR-IV applied in-furrow at planting, followed by 4 oz. PGR-IV at PHS, 4 oz. PGR-IV at EB, and 4 oz. MC applied at EB. The standard treatment at this location consisted of 4 oz. MC applied at EB. No untreated control was used at this location. Pre-square plant heights were taken.

The Southern Crossing location in Hampton County compared an untreated control to a System treatment that included 1 oz. PGR-IV at 2TL, 4 oz. PGR-IV at MHS, 8 oz. MC at MHS+2 wk, 4 oz. MC at EB, 4 oz. PGR-IV at EB+4d, and 6 oz. MC at EB+6 d. This location had three replicates for the untreated control, and four replicates of the System treatment.

A non-replicated demonstration was established at two sites at Bush Farm in Hampton County. Site 1 had DP 20 and DP 51 treated with a modified version of the System (4 oz. MC at PHS, 8 oz. PGR-IV + 6 oz. MC at EB) compared to DP 20 and DP 51 treated with 4 oz. MC at PHS. Site 2 had DP 20 treated with two modified versions of the System (4 oz. MC at PHS, 4 oz. PGR-IV + 4 oz. MC at EB; 4 oz. MC

at PHS, 4 oz. PGR-IV + 4 oz. MC at EB, 4 oz. PGR-IV at mid-bloom) compared to 4 oz. MC applied at PHS.

A second non-replicated demonstration was conducted at Cummings in Hampton County, where a modified version of the System (6 oz. PGR-IV + 6 oz. MC at EB, 10 oz. MC at late bloom) was compared to 6 oz. MC at EB, followed by 10 oz. MC at late bloom.

Small plots were used at Florence and Blackville, but all other locations were on-farm, large-plot trials. Each location utilized high-clearance sprayers to apply materials. Yields were determined from seedcotton weights and an assumed 38% lint turnout, except for the Florence location, which was ginned and actual lint yield reported.

Results

Dry Weights

The System treatment significantly increased shoot dry weight accumulation at MHS and EB stages at Florence compared to the untreated control (the 8 oz. MC at EB treatment was considered untreated control for these measurements) (Table 2). Dry weight of the shoot was not significantly influenced by the System treatment prior to squaring.

Plant Height and Height-to-Node Ratio

Plant heights measured at Dillon County prior to squaring did not indicate a treatment difference; however, the System treatment plants were significantly taller than the untreated control plants at MHS, but significantly shorter than the untreated control and MC treatments at harvest (Table 3). At Blackville, MC-treated plants were significantly taller at EB compared to the System-treated plants, but plant height did not differ at harvest.

Height-to-node ratio (HNR) did not differ between treatments at MHS or EB at Florence, but at harvest, System-treated plants had HNR=1.4, while untreated plants and MC-treated plants had HNR=1.8, which was statistically different (Table 4). Plants treated with the System at Blackville had significantly lower HNR compared to the MC-treated plants at EB, but HNR did not differ at harvest (Table 4).

Fruiting Characteristics

The System-treated plant initiated the first fruiting branch on a lower node compared to the MC-treated plants at Blackville (Table 5). Node of the first fruiting branch did not differ among treatments at Florence.

Total fruiting sites were significantly higher for control plants compared to System-treated plants at harvest at Florence (Table 6). Total fruiting forms did not differ at any stage at Florence, although percent fruit retention did not differ among treatments (Table 6).

Boll Size

System-treated plants at Florence had significantly larger bolls (Table 7). The size difference was due primarily to significantly higher seed weight per boll for System-treated plants.

Lint Yield

No response was detected for lint yield at any replicated trial location (Table 8). However, averaged over all four replicated sites, the system treatment numerically enhanced lint yield by 38 lbs/A compared to the standard MC treatment, and by 54 lbs/A compared to the untreated control.

Fiber Quality

The System treatment significantly improved fiber strength but significantly increased the amount of trash in the lint (Table 9). No other fiber quality parameter was affected by any treatment.

Summary

The System treatment had a significant early-season growth response expressed in shoot dry weight and the node of the first fruiting branch. Plant height differences detected in the System treatment were likely due to the MC included in that PGR program, although our data cannot support that hypothesis. At harvest, System-treated plants had fewer fruiting sites; total bolls and retention did not differ, however. Boll size was significantly larger for System-treated plants, although the size difference was caused by the seed weight per boll, rather than by an increase in lint weight per boll. Despite differences in plant growth and fruiting characteristics, lint yield differences were not detected in the four replicated trials. Means over all four trials, however, indicated a consistent, numerical increase of lint yield of System-treated plots by 38 lbs/A over the standard MC treatment, and by 54 lbs/A over the untreated control. Fiber strength was increased by the System treatment, but trash content was increased as well.

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Table 1. Pertinent information for PGR-IV trials in SC in 1995.

Location	Cultivar	Planting Date	Harvest Date	Harvest Method	Replicates
Florence	DP 5409	15 May	9 Oct	picker	6
Blackville	CB 407	8 May	1 Nov	picker	5
Dillon Co.	CB 1135	15 May	17 Oct	hand	5
Southern Crossing	DP 90	24 April	20 Oct	picker	3
Bush Farm	DP 20 & 50	23 May	15 Nov	picker	1
Cummings	DP 50	28 May	27 Nov	picker	1

Table 2. Shoot dry weight (g/plant) at Florence, SC in 1995.

	Treatment‡	
Stage†	UTC	System
Pre-square	5.3	5.3
MHS	30.8b¶	38.5a
EB	187.7b	215.5a

† MHS=matchead square; EB=early bloom.
‡ UTC=untreated control.
¶ Values followed by the same letter within the same row do not differ at the 5% probability level.

Table 3. Plant height (inches) at Dillon Co. (pre-square), Florence (MHS, EB, and harvest), and Blackville (EB and harvest) in 1995.

	Treatment‡		
Location/Stage†	UTC	System	MC
Dillon Co.			
Pre-square	4.9	5.8	---
Florence			
MHS	10.0b¶	11.5a	---
EB	27.5	23.9	---
Harvest	35.8a	26.3b	33.5a
Blackville			
EB	---	38.2b	41.3a
Harvest	---	51.4	51.8

† MHS=matchead square; EB=early bloom.
‡ UTC=untreated control; MC=mepiquat chloride.
¶ Values followed by the same letter within the same row do not differ at the 5% probability level.

Table 4. Height-to-node ratio (inches/node) at Florence and Blackville, SC in 1995.

	Treatment‡		
Location/Stage†	UTC	System	MC
Florence			
MHS	0.9	1.0	---
EB	1.7	1.5	---
Harvest	1.8a¶	1.4b	1.8a
Blackville			
EB	---	2.1b	2.2a
Harvest	---	2.3	2.3

† MHS=matchead square; EB=early bloom.
‡ UTC=untreated control; MC=mepiquat chloride.
¶ Values followed by the same letter within the same row do not differ at the 5% probability level.

Table 5. Node of first fruiting branch at Florence and Blackville, SC in 1995.

	Treatment†		
Location	UTC	System	MC
Florence	6.8	6.6	6.6
Blackville	---	6.6b‡	7.5a

† UTC=untreated control; MC=mepiquat chloride.
‡ Values followed by the same letter within the same row do not differ at the 5% probability level.

Table 6. Total fruiting forms (no./plant) fruiting sites (no./plant), and fruit retention (%) at Florence, SC in 1995.

	Treatment‡		
Parameter/Stage†	UTC	System	MC
Total fruiting forms			
MHS	7.4	8.2	---
EB	23.4	25.3	---
Harvest	9.9	8.5	8.5
Total fruiting sites			
MHS	7.4	8.2	---
EB	25.0	26.0	---
Harvest	36.9a¶	29.5b	34.2ab
Fruit retention			
MHS	99.6	99.6	---
EB	94.6	97.7	---
Harvest	26.8	28.9	25.5

† MHS=matchead square; EB=early bloom.
‡ UTC=untreated control; MC=mepiquat chloride.
¶ Values followed by the same letter(s) within the same row do not differ at the 5% probability level.

Table 7. Boll size (g/boll) at Florence, SC in 1995.

	Treatment†		
Component	UTC	System	MC
Seed cotton	4.54b‡	4.74a	4.55b
Lint	1.97	2.03	1.96
Seed	2.57b	2.70a	2.59b

† UTC=untreated control; MC=mepiquat chloride.
‡ Values followed by the same letter within the same row do not differ at the 5% probability level.

Table 8. Lint yields from PGR-IV trials across SC in 1995.

Location/Treatment†	Lint Yield (lbs/A)‡
Florence	
UTC	638
System	676
MC	624
Blackville	
System	691
MC	680
Florence & Blackville combined	
System	683
MC	650
Dillon Co.¶	
System	551
MC	501
Southern Crossing¶	
UTC	807
System	876
Bush Farm¶	
Site 1 DP20, System	702
DP20, MC	475
DP51, System	805
DP51, MC	848
Site 2 DP20, 4 oz PGR-IV @ EB	762
DP20, 4+4 oz PGR-IV @ EB+MB	731
DP20, MC	730
Cummings¶	
MC (6 oz EB)	1048
MC (6 oz EB + 10 oz LB)	1153
System	1087

† UTC=untreated control; MC=mepiquat chloride; EB=early bloom; MB=mid- bloom; LB=late bloom.
‡ None of the trials indicated treatment differences in lint yield.
¶ These locations assumed 38% lint turnout from seedcotton yields.

Table 9. Fiber strength (g/tex) and trash content (% area) determined by HVI analysis for samples from Florence, SC in 1995.

Treatment†	Strength	HVI Trash
UTC	28.3 b‡	0.9b
System	30.0a	1.7a
MC	28.0b	0.8b

† UTC=untreated control; MC=mepiquat chloride.
‡ Values followed by the same letter within each column do not differ at the 5% probability level.