

**THE OPTIMUM PLANT GROWTH
REGULATION SYSTEM FOR
SOUTHEASTERN COTTON PRODUCERS,
YEAR 2**

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Abstract

During the 1995 growing season, 42 professional cotton consultants in the Southeast took part in Year Two of Project 95, a program of sequential plant growth regulator applications and follow-up crop monitoring and plant measurements at Early Bloom and Preharvest. This System is designed to optimize plant growth and development, initiate and hold more fruiting sites, while maintaining proper Height to Node (H/N) Ratio with sufficient vigor to achieve high yields. This System of PGR IV and mepiquat chloride (Pix[®] or Mepichlor[®]) was compared to the local mepiquat chloride standard treatments as prescribed by the participating consultant.

Application and Timing

Application protocol was based on effective test work completed through the past four years under the direction of Livingston (Texas A&M, 1994); and Oosterhuis (Arkansas, 1993 and 1994), Landivar (Texas A&M, 1995), and Zhao, et al. (Arkansas, 1994).

- (1) One oz. of PGR IV applied In-Furrow or applied to the seed prior to filling planter hoppers.
- (2) A second PGR IV application of 4 oz. [2 oz. banded] was applied at PHS. Timing of this application was at 5 to 7 nodes above cotyledon.
- (3) Four to Eight oz. of mepiquat chloride was applied broadcast at ten to fourteen days after the Pin Head Square PGR IV application.
- (4) Four oz. of PGR IV was then applied at Early Bloom (EB).
- (5) Mepiquat chloride was then used on an "as needed" basis for height control through mid bloom. MEPRT was used by many in the group to identify mepiquat chloride rates. MEPRT is a computer model developed by Texas A&M (Landivar, 1995).

Methods and Protocol

Each consultant chose two participating growers and field sites. Variety, irrigation, and cultural practices were identical for both System and Standard plots at each site. Each location was a split field, row to row comparison. Some, but not all, were replicated. These criteria were maintained to give Project 95 "on farm" validity under a variety of conditions. All applications were made by the grower. All measurements were made by the consultant.

Crop Measurements

Scouting techniques and plant measurement criteria included First Fruiting Branch, NAWF, Mainstem Nodes and Total Plant Height to learn the H/N Ratio were taken at 70-80 days after emergence (DAE). Then at Preharvest Height and Nodes were taken with the addition of Green, Open and Total Boll Counts. Consultants obtained yield from all sites reported here with harvest rows being near the demarcation line between the plots to maintain the same soil types. By increasing square retention and increasing the number of harvestable bolls (Oosterhuis, 1993), the grower increases the probability of increased yields.

Corresponding Benefits to Applications

- (1) The participating consultants and growers noted the "in furrow" or "seed treatment" applications increased root mass, seedling vigor, leaf size, and plant health. This was documented by Zhao - Oosterhuis, et al., (1994) and Oosterhuis (1994) to affect plant yield.
- (2) The objective of the Pin Head Square PGR IV application is square retention. This application of PGR IV increases the plant's ability to set and hold fruit (Hickey, 1991). Yield increases from this application have been tied to increased nutrient partitioning and uptake (Oosterhuis, 1992) that occurs during this early season stage.
- (3) Mepiquat chloride was used at MHS to initiate the correct concentration for controlled growth and to ensure H/N Ratio stayed near optimum. This maintained proper balance of vegetative to reproductive growth in the central part of the plant (nodes 9-14) which is responsible for a majority of final yield.
- (4) The Bloom application of PGR IV was applied during the first 3 weeks of Bloom to revitalize the declining root system and increase the translocation of carbohydrates needed for boll fill. As bolls start to form and fill, the carbohydrate sink changes from root and stem growth toward that of boll fill (Hickey, J.A., 1994). Root growth declines as bolls form and develop, consequently, new and vigorous roots are needed at this time to provide ample nutrient and moisture uptake to fill the plant's increasing fruit load.

(5) Consultants were given authority over protocol for use of mepiquat chloride as needed to meet height objectives of the consultant and grower during mid to late bloom. Amounts and timing of mepiquat chloride applied varied from site to site because of weather, nitrogen, and other unique factors. Mepiquat chloride applied to System plots ranged from none to 14 oz. per acre. Fifty eight percent of the System plots received no additional mepiquat chloride past the MHS protocol application.

Conversely, the Standard [control] protocol was the participating consultant's prescribed rates and timings of mepiquat chloride for the specific field. Rates and timings varied from site to site with rates ranging from 4 oz. to 45 oz.

Results

Primary objectives of plant manipulation, increased boll numbers and yield were achieved on most field sites despite the adverse and very unusual weather in 1995. Early increases in root and plant mass, along with an increased numbers of fruiting sites joined to promote uniform and steady plant growth. This also combined for stable and consistent plant height, H/N Ratios and increased yield. Due to the adverse weather though, many sites mapped with fruit forms in July showed scars at some of these sites at harvest. Plants in some locations were unable to hold the larger amounts of fruit stuck during May and June. Average lint yield increase figures are shown (Table 1) for each state. Average lint yield increases as percentages are also shown by state (Table 2). Percent increases in 1995 were very near the 1994 figures in all states except South Carolina, where severe weather problems plagued growers from early April through July. Some test sites were lost due to hurricanes, drought and/or insects in Georgia and Alabama.

There was no significant difference in 1995 in plant height, total nodes or H/N Ratio when viewing the entire data collection. Several reporting locations did show differences in these measurements. Significant differences in fiber length were documented in by Lege' [1995 Clemson], and Baker [1995 Univ. of GA]. Micronaire in these two university tests also stayed in the 4.7 to 4.8 range, while the Standard MC treated cotton ranged from 4.53 to 5.0 (Table 3).

An interesting factor surfaced in the 70-80 DAE measurements where seed were treated with PGR IV prior to planting or sprayed in-furrow. The first fruiting branch was nearly always lower (84% of plots). This significant difference allowed System plots to start the fruiting time period with a head start on total fruiting branches. Setting fruit earlier proved to be an advantage in many plots, but where insect pressure was extremely heavy and treatments failed to control the pests, fruit was lost lower in the plant.

Later set fruiting positions on insect devastated plants proved to have more affect on yield in these fields.

Measurements taken at 70-80 DAE showed the System plots with .5 more NAWF at this critical time. Yield potential was assumed to be higher when plants conform to Type I plant measurements of NAWF of 8 - 10 at Early Bloom (Klein, et al, 1994). The System plots averaged 16.4 mainstem nodes at 70-80 DAE compared to the standard plot's average of 15. 6 mainstem nodes.

The Project 95 System of sequential treatments of PGR IV and Mepichlor outperformed the local prescribed plant growth regulator (mepiquat chloride alone) treatments. The plants were more easily managed for height control, held up better under stress conditions and in most cases matured and defoliated more evenly than the standard control sites.

Yield was greater in 87% of the test sites where the PGR IV and Mepichlor System was used versus mepiquat chloride used alone. Yields varied from 482# to 1421# showed the System worked over a wide range of environmental conditions.

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Table 1: Two Year Comparison of Lint Yield Increase of PGR IV and Mepichlor Systems Approach over the Standard Mepiquat Chloride

<i>STATE</i>	<i>1994</i>	<i>1995</i>
Alabama	112	90
Georgia	137	144
North Carolina	124	86
South Carolina	144	76
Average of All Sites	129	99

Table 2: Two Year Comparison of Percent Increase in Lint Pounds of PGR IV Systems Approach over the Standard Mepiquat Chloride

<i>STATE</i>	<i>1994</i>	<i>1995</i>
Alabama	11 %	12 %
Georgia	13 %	15 %
North Carolina	12 %	9 %
South Carolina	14 %	7 %
Averages All Sites	12.5 %	10.8 %

Table 3: Fiber Quality Results, 1995

Strength g/tex	SYSTEM	Standard	Untreated
Pee Dee R&Ed Center, Lege'	29.98	27.97	28.33
Univ. of GA, Baker #1	34.40	32.50	31.40
Univ. of GA, Baker #2	33.00	32.50	31.40
Micronaire	SYSTEM	Standard	Untreated
Pee Dee R&Ed Center, Lege'	4.7	4.55	4.53
Univ. of GA, Baker #1	4.8	5.00	5.00
Univ. of GA, Baker #2	4.8	5.00	5.00