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INTERACTION OF NITROGEN RATES AND MEPIQUAT CHLORIDE FOR COTTON FOLLOWING CORN IN ROTATION

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Abstract

Interest in higher nitrogen (N) rates for cotton in combination with plant growth regulators for cotton continues along with a renewed interest in crop rotations, especially rotations involving corn. Higher N rates for corn production could potentially lead to the buildup and carryover of N in the soil profile. This carryover could be exhibited as excess vegetative growth in subsequent cotton crops. A 4x2x2 factorial combination of N rates (60, 90, 120, and 150 lb/A), N application systems (preplant [PP] and preplant +sidedress [PP+SD]), and plant growth regulator (with and without PGR) was evaluated over a 3-year period (1999 - 2001) in the Mississippi Delta. Total lint yield in 1999 ranged from 1351 to 1544 lb/A with the highest numerical yield observed where 150 lb N/A was applied along with PIX Plus® plant growth regulator. When averaged across all other factors, PGR treatments were higher (34 lb/A, 2.4%) compared to the UTC. In 2000, there was no response to increasing N rates nor to N application systems but a significant increase in lint yields when PIX Plus was applied (91 lb lint/A, 8.8%). In 2001, there was also no yield response to increasing N rates with respect to total lint. At the first harvest in 2001, there was a significant reduction in lint yield with increasing N rates. However, the reverse was true with the second harvest. When the two harvests were added together, there was no difference between N rates. This occurrence suggests a delay in maturity which has been experienced in previous years with increasing N rates. In 2001, adverse weather conditions during boll development greatly limited the final yields due in part to the presence of boll rot. General field observations during the growing seasons would not suggest excessive growth of cotton following corn in a corn/cotton rotation. However, results from this study showed no significant response to increasing N rates above 60 lb/A in two of three years. Only in 1999, did 90 lb N/A produce higher yields than 60 lb N/A. PIX Plus plant growth regulator provided a significant yield increase in both years that could be measured.

Introduction

Increased nitrogen (N) rates have been proposed for many years as a means of increasing the productivity of most annual crops. However, with perennial crops grown as annuals, such as cotton, increasing N rates above recommended levels may not result in increased production and could lead to reduced yields and lower lint quality. The combination of increased N rates in conjunction with plant growth regulator applications has been proposed as a method for increasing lint production in the Mississippi Delta. It was thought that the excessive vegetative growth potential from high N levels could be controlled by plant growth regulators. Several studies were conducted throughout the Cotton Belt during the past three decades to measure cotton response to mepiquat chloride as a growth regulator for cotton. Early research in the Rio Grande Valley (Gausman et al., 1979; Heilman, 1981; Namken and Gausman, 1978) concentrated on the growth regulating component of PIX® (mepiquat chloride). Research results have shown reduced plant height, shortened internodes, and reduced leaf area. Results from these studies also indicated no significant effect on lint yields. PIX treatments resulted in no differences in earliness, boll size, seed weight, or lint quality.

Researchers in Arizona (Stedman et al., 1982) reported a 10% increase in petiole nitrate levels for PIX treated plants, with no apparent effect of N application on petiole nitrate levels, and a 2 to 3% increase in lint yield. In California (Kerby, 1985), 35 studies over a 5-year period showed an average lint yield of 1169 lb/A for PIX treated plots and 1160 lb/A for the untreated controls (UTC). Research in the Mid-south (Cathey and Meredith, 1988; Crawford, 1981; Hoskinson et al., 1980) had similar findings as other areas of the Cotton Belt. In Louisiana (Crawford, 1981), seedcotton yields were actually 3 to 9% lower where PIX was used, with reduced boll set under drought stress conditions reported. In Tennessee (Hoskinson et al., 1980), PIX use resulted in yield increases in only two of six studies with no adverse effect on fiber reported. Researchers in Mississippi (Cathey and Meredith, 1988) observed a lint yield decrease of 4.5% to a yield increase of 12.7%, depending on planting date. Later plantings were found to generally produce plants that grow faster and taller, with more vegetative growth and less reproductive growth, a situation in which PIX application should be beneficial. This relates directly to the same characteristics observed with excess N application.

Later research in the Mid-south (Ebelhar, 1991; Ebelhar et al., 1992; Ebelhar et al., 1994; Ebelhar et al., 1996; McCarty et al., 1990; Pettigrew et al., 1992; Wallace et al., 1993) and Texas (Livingston and Wilde, 1990) has examined low rate multiple applications of PIX. Results from these studies have been erratic with similar trends as other studies across the country. Studies which began in 1987 in Mississippi (Ebelhar, 1991; Ebelhar et al., 1992) showed no consistent lint yield response to increasing

N rates with various levels of mepiquat chloride. Other research in the Mississippi Delta (Wallace et al., 1993) showed the same erratic trends with respect to yield, but did measure increased boll retention with applications of mepiquat chloride. Early low-rate multiple applications of mepiquat chloride tended to have a greater effect on early growth parameters such as height, node number, and internode length while later bloom treatments tended to have greater effects on boll retention Little information was available with respect to the effects of increasing N rates on cotton quality (Meredith, 1990) or with the interaction effects of mepiquat chloride and N rates on both lint yield and quality in the Mid-south. However, research in the 1990's in the Mississippi Delta (Ebelhar et al., 1996) found that increasing N rates lowered micronaire at both first and second harvest. Fiber length and strength were not affected by N rates but length was slightly higher where PIX was applied. While increasing N tended to delay maturity, PIX applications tended to hasten maturity.

Corn production has increased in the Mississippi Delta, much of which has been rotated with cotton on the lioghter textured soils. Nitrogen rates on corn range from as little as 200 lb N/acre to more than 400 lb N/acre under irrigated conditions. Nitrogen which may remain in the soil profile could lead to excess vegetative growth in the following cotton crops. In most years, denitrification and other transformations remove most of the unused N. However, this is not always the case especially in dry, cold winters. Improved tilth following the corn crop may also lead to better cotton growth and development and a more abundant and prolific root system. Little information is available in the literature to help producers manage their N requirements in corn/cotton rotations in the Mid-south. The objectives of this study included: 1) to determine the interaction effects of N rates and PIX Plus on cotton yields in a corn/cotton rotation, and 2) to determine whether split applications of N could be used to optimize N use efficiency.

Materials and Methods

A multiple-year study was initiated in 1999 on a Bosket very fine sandy loam (Mollic Hapludalfs) and Dubbs silt loam (Typic Hapludalfs). The study had a 4x2x2 factorial arrangement of N rates (60, 90, 120, and 150 lb N/A), application systems (100% Preplant [PP] N or 50% PP plus 50% as a sidedress [SD] application), and mepiquat chloride (untreated control [UTC] or a variable rate system depending upon crop growth). Applications of mepiquat chloride were initiated between pinhead to matchhead square and first bloom and applied as needed depending on weather and growing conditions. The 16 treatments were arranged in a randomized complete block (RCB) design with four replications. Plots consisted of four 40-in rows, 215 feet long divided into two 100-ft lengths with a 15-ft alley. Nitrogen rates were applied as urea-ammonium nitrate solution (32% N) and "knifed" ten inches to both sides of the drill. Cotton ('STV 474' in 1999 and 'SureGrow 747' in 2000 and 2001) was planted in late-April to early-May. Emergence occurred approximately one week later. All cultural practices including weed control, insecticide applications, irrigation, and defoliation were held constant across all treatments. Mepiquat chloride application timing was based on plant growth characteristics and weather conditions. Defoliation occurred in early- to mid-September followed by a second defoliation treatment if needed. All plots were harvested twice with the first harvest occurring two to three weeks following defoliation.

Hand-grab samples of seedcotton were taken at each harvest and ginned through 1 10-saw micro-gin without cleaning to determine lint percent. Seedcotton yields were calculated based on the harvest from the two center rows of each 4-row plot. The plots were harvested with a commercial spindle picker adapted for plot harvest. Lint yields were then calculated from lint percent determined from the micro-gin for each individual plot. All yield data and components including seedcotton and lint yields from each harvest and the lint percents, were analyzed statistically using the Statistical Analysis Systems (SAS) with Fisher's protected LSD for mean separation. Main effect means were evaluated and presented when interactions were not significant at the 5% level.

Results and Discussion

1999 Field Study

Seedcotton and lint yields are presented for all treatments since both N rates and mepiquat chloride significantly affect lint percent. Seedcotton and lint yields are summarized in Tables 1 and 2 for the 1999 growing season. First harvest seedcotton yields ranged from 3179 to 3579 lb/A with second harvest seedcotton yields ranging from 167 to 318 lb/A. Total seedcotton yields ranged from 3349 to 3876 lb/A. First harvest lint yields ranged from 1294 to 1445 lb/A with second harvest lint yields ranging from 57 to 108 lb/A. Total lint yields in 1999 ranged from a low of 1351 to a high of 1544 lb/acre. The highest numerical lint yield in 1999 was obtained with 150 lb N/A plus mepiquat chloride. This treatment was significantly higher than the 150 lb N/A treatment alone (without mepiquat chloride).

The summaries of main effects are shown in Figure 1 (N rate), Figure 4 (N application system), and Figure 7 (plant growth regulator [PGR]). Interactions were not significant allowing for the calculation of main effect means. Discussion of main effects will be limited to lint yields. Increasing N rates have been shown to decrease the lint percent as determined from a 10-saw micro-gin (Ebelhar et al., 1996). Therefore, it is better to examine lint yields since they represent the marketable yield. Total lint yields

averaged 1382, 1461, 1475 and 1467 lb/A for the 60, 90, 120, and 150 lb N/A rates, respectively (averaged across N application systems, PGR rates, and subsamples). There was no significant yield response above 90 lb N/A. Second harvest lint yields were significantly higher at the 120 lb N/A rate, compared to the 60 and 90 lb N/A rate, with not additional response above 120 lb N/A. There was no difference between the two application systems (Figure 4) with total lint yields averaging 1436 and 1457 lb/A for the PP and PP+SD systems, respectively. Main effects for PIX Plus are shown in Figure 7. Total lint yields were significantly higher where PIX Plus (1463 lb/A) was applied compared to the UTC (1429 lb/A). The 34-lb/A difference represents a 2.4% increase.

2000 Field Study

Seedcotton and lint yields are summarized in Tables 3 and 4 for the 2000 growing season. A severe drought resulted in lower yields in 2000 compared to the 1999 growing season. Seedcotton yields were 545 lb/A (15%) lower and lint yields were 369 lb/A (25%) lower in 2000 compared to 1999. First harvest seedcotton yields ranged from 2638 to 3064 lb/A with second harvest seedcotton yields ranging from 173 to 231 lb/A. Total seedcotton yields ranged from 2845 to 3282 lb/A (Table 3). First harvest lint yields ranged from 924 to 1069 lb/A with second harvest lint yields ranging from 62 to 87 lb/A. Total lint yields in 2000 ranged from a low of 1000 to a high of 1144 lb/acre (Table 4) The highest lint yields in 2000 was obtained with 90 lb N/A plus mepiquat chloride.

The summaries of main effects are shown in Figure 2 (N rate), Figure 5 (N application system), and Figure 8 (PGR). Interactions were not significant allowing for the calculation of main effect means and discussion will again be limited to lint yields. Total lint yields averaged 1103, 1078, 1064 and 1065 lb/A for the 60, 90, 120, and 150 lb N/A rates, respectively (averaged across N application systems, PGR rates, and subsamples). There was no yield response to increasing N rates for either first, second, or total harvest lint yields. In 2000, there was no difference between the two application systems (Figure 5) with total lint yields averaging 1078 and 1077 lb/A for the PP and PP+SD systems, respectively. Main effects for PIX Plus applications are shown in Figure 8. Total lint yields were significantly higher where PIX Plus (1123 lb/A) was applied compared to the UTC (1032 lb/A). The 91-lb/A difference represents an 8.8% increase in lint production. The difference was also detectable in the first harvest but not in the second. Second harvest yields were low but useful in evaluating maturity.

2001 Field Study

Seedcotton and lint yields are summarized in Tables 5 and 6 for the 2001 growing season. First harvest seedcotton yields ranged from 2467 to 2806 lb/A with second harvest seedcotton yields ranging from 173 to 339 lb/A. Total seedcotton yields ranged from 2724 to 3113 lb/A. First harvest lint yields ranged from 882 to 1040 lb/A with second harvest lint yields ranging from 64 to 124 lb/A. Total lint yields in 2001 ranged from 983 to 1134 lb/acre. PIX Plus applications were not considered due to mis-application of the product. This problem should not have affected the N component based on previous experience. Yields suffered significant losses in 2001 due to boll rot resulting from excess rainfall and cloudy weather in August. The crop had a good fruitset and boll retention prior to the adverse weather conditions.

The summaries of main effects are shown in Figure 3 (N rate), and Figure 6 (N application system). Interactions were not significant allowing for the calculation of main effect means. Total lint yields averaged 1073, 1084, 1083 and 1036 lb/A for the 60, 90, 120, and 150 lb N/A rates, respectively (averaged across N application systems, PGR rates, and subsamples). First harvest lint yields decreased as N rates increased (Figure 2001-L1) again probably related to boll rot. Second harvest lint yields were higher at the 120 lb N/A rate with no additional response above 120 lb N/A. When the first harvest and second harvest were added together, there was no yield response to increasing N rates. As with previous years, there was no difference between the two application systems (Figure 6) with total lint yields averaging 1076 and 1062 lb/A for the PP and PP+SD systems, respectively.

Summary

General field observations during the growing seasons would not suggest excessive growth of cotton following corn in a corn/cotton rotation. However, results from this study showed no significant response to N applications in two of the three years. Only in 1999, which was the first year of the rotation study, was there an increase in lint yield (6.7%) from increasing N rates above 60 lb/A. PIX Plus applications in both 1999 and 2000 significantly increased lint yields compared to the UTC. The increases of 34 and 91 lb lint/A, while significant, may not be economical when the cost of the product plus the cost of application are considered.

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Table 1. Interaction of nitrogen rates, application systems, and mepiquat chloride. Seedcotton yields for 1999. Delta Research and Extension Center, Stoneville, MS.

Trt.	Nitrogen [1]				First		Second		Total	
No	Total	PP	SD	MC [2]	Harvest		Harvest		Harvest	
	------ (lb N/acre) ---				----------(lb seedcotton/acre) ----------					
1	60	60	0	0	317	f [3]	192	efg [3]	3370	fg [3]
2	90	90	0	0	330	c-f	253	b-e	3560	c-f
3	120	120	0	0	341	a-d	292	abc	3705	a-d
4	150	150	0	0	332	c-f	249	b-e	3577	cde
5	60	30	30	0	327	def	198	d-g	3471	efg
6	90	45	45	0	329	def	248	b-e	3543	d-g
7	120	60	60	0	340	a-d	301	ab	3702	a-d
8	150	75	75	0	333	c-f	318	a	3653	b-e
9	60	60	0	Var	318	ef	167	g	3349	g
10	90	90	0	Var	349	abc	250	b-e	3741	abc
11	120	120	0	Var	353	ab	286	abc	3822	ab
12	150	150	0	Var	341	a-d	271	abc	3689	a-d
13	60	30	30	Var	330	c-f	183	fg	3492	efg
14	90	45	45	Var	348	abc	238	c-f	3724	a-d
15	120	60	60	Var	337	b-e	258	a-d	3629	b-e
16	150	75	75	Var	357	a	297	abc	3876	a
	Overall Mean [4]				336		250		3619	
	LSD (0.05)				190		62		197	
	Prob > F				0.00		0.0001		0.0001	
	C. V. (%)				3.76		16.34		3.54	

[1] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.

[2] MC is mepiquat chloride (PIX Plus) applied 07/02/99 (4 oz/A) and 07/16/99 (4 oz/A).

[3] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.

[4] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

Table 2. Interaction of nitrogen rates, application systems, and mepiquat chloride. Cotton lint yields for 1999. Delta Research and Extension Center, Stoneville, MS.

Tr	Nitrogen [1]				First		Second		Total	
No	Total	PP	SD	MC [2]	Harvest		Harvest		Harvest	
	------ (lb N/acre) ------				----------(lb lint/acre) ----------					
1	60	60	0	0	1297.6	ef [3]	64.6	efg [3]	1362.2	fg [3]
2	90	90	0	0	1349.4	b-f	87.3	bcd	1436.7	b-f
3	120	120	0	0	1374.2	a-e	100.2	ab	1474.4	a-e
4	150	150	0	0	1332.3	def	84.2	b-e	1416.5	c-g
5	60	30	30	0	1334.9	c-f	66.8	d-g	1401.7	efg
6	90	45	45	0	1324.7	def	84.5	b-e	1409.2	d-g
7	120	60	60	0	1382.1	a-d	103.6	ab	1485.7	a-d
8	150	75	75	0	1339.3	c-f	108.5	a	1447.8	b-e
9	60	60	0	Var	1294.2	f	56.8	g	1351.0	g
10	90	90	0	Var	1411.3	abc	84.4	b-e	1495.7	ab
11	120	120	0	Var	1395.3	a-d	95.4	abc	1490.6	abc
12	150	150	0	Var	1365.5	b-f	95.9	abc	1461.4	b-e
13	60	30	30	Var	1353.3	b-f	60.0	fg	1413.3	d-g
14	90	45	45	Var	1423.5	ab	78.8	c-f	1502.3	ab
15	120	60	60	Var	1361.8	b-f	87.3	bcd	1449.1	b-e
16	150	75	75	Var	1444.9	a	99.2	abc	1544.1	a
	Overall Mean [4]				1361.5		84.8		1446.4	
	LSD (0.05)				78.7		20.9		77.2	
	Prob > F				0.0127		0.0001		0.0003	
	C. V. (%)				4.78		16.52		4.49	

[1] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.

[2] MC is mepiquat chloride (PIX Plus) applied 07/02/99 (4 oz/A) and 07/16/99 (4 oz/A).

[3] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.

[4] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

Table 3. Interaction of nitrogen rates, application systems, and mepiquat chloride. Seedcotton yields for 2000. Delta Research and Extension Center, Stoneville, MS.

Trt.	Nitrogen [1]				First		Second		Total	
No.	Total	PP	SD	MC [2]	Harvest		Harvest		Harvest	
	------ (lb N/acre) ------				----------(lb seedcotton/acre) ----------					
1	60	60	0	0	2848	abc [3]	183	[3]	3031	b-f [3]
2	90	90	0	0	2639	c	209		2848	f
3	120	120	0	0	2736	bc	195		2931	def
4	150	150	0	0	2704	c	209		2913	f
5	60	30	30	0	2842	abc	209		3051	a-f
6	90	45	45	0	2742	bc	206		2947	c-f
7	120	60	60	0	2682	c	231		2913	ef
8	150	75	75	0	2638	c	207		2845	f
9	60	60	0	Var	2996	a	173		3169	a-d
10	90	90	0	Var	3064	a	218		3282	a
11	120	120	0	Var	3034	a	196		3230	ab
12	150	150	0	Var	2986	a	213		3199	ab
13	60	30	30	Var	2968	ab	192		3161	a-e
14	90	45	45	Var	3020	a	198		3219	ab
15	120	60	60	Var	2961	ab	217		3179	abc
16	150	75	75	Var	3043	a	230		3273	ab
	Overall Mean [4]				2869		205		3074	
	LSD (0.05)				236		42		248	
	Prob > F				0.0004		0.3785		0.0012	
	C. V. (%)				6.23		15.99		5.57	

[1] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.

[2] MC is mepiquat chloride (PIX Plus) applied 06/06/00 (4 oz/A), 06/18/00 (4 oz/A), and 08/03/00 (4 oz/A).

[3] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.

[4] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

Table 4. Interaction of nitrogen rates, application systems, and mepiquat chloride. Cotton lint yields for 2000. Delta Research and Extension Center, Stoneville, MS.

Trt.	Nitrogen [1]				First		Second		Total	
No.	Total	PP	SD	MC [2]	Harvest		Harvest		Harvest	
	---- (lb N/acre) ----				----------(lb lint/acre) ----------					
1	60	60	0	0	1017.0	abc [3]	68.5	[3]	1085.5	a-d [3]
2	90	90	0	0	938.1	cd	77.7		1015.8	cd
3	120	120	0	0	944.0	cd	72.7		1016.7	cd
4	150	150	0	0	926.2	d	77.6		1003.8	cd
5	60	30	30	0	996.4	a-d	78.9		1075.3	a-d
6	90	45	45	0	963.3	bcd	77.2		1040.5	bcd
7	120	60	60	0	932.1	cd	86.7		1018.8	cd
8	150	75	75	0	923.6	d	75.9		999.5	d
9	60	60	0	Var	1050.1	ab	62.5		1113.2	ab
10	90	90	0	Var	1063.8	a	79.9		1143.7	a
11	120	120	0	Var	1054.1	a	72.2		1126.3	ab
12	150	150	0	Var	1042.3	ab	77.9		1120.1	ab
13	60	30	30	Var	1068.9	a	70.7		1139.6	a
14	90	45	45	Var	1039.7	ab	74.0		1112.7	ab
15	120	60	60	Var	1012.7	a-d	80.0		1092.7	abc
16	150	75	75	Var	1054.0	a	85.0		1139.0	a
	Overall Mean [4]				1001.7		76.0		1077.7	
	LSD (0.05)				89.2		16.5		92.6	
	Prob > F				0.0018		0.3960		0.0051	
	C. V. (%)				6.91		17.95		6.37	

[1] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.
[2] MC is mepiquat chloride (PIX Plus) applied 06/06/00 (4 oz/A), 06/18/00 (4 oz/A), and 08/03/00 (4 oz/A).
[3] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.
[4] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

Table 5. Interaction of nitrogen rates, application systems, and mepiquat chloride. Seedcotton yields for 2001. Delta Research and Extension Center, Stoneville, MS.

Trt. No.	Nitrogen [1]			MC [2]	First Harvest		Second Harvest		Total Harvest	
	Total	PP	SD							
	---- (lb N/acre) ----				----------(lb seedcotton/acre) ----------					
1	60	60	0	0	2568	[3]	174	h [3]	2743	de [3]
2	90	90	0	0	2757		234	b-e	2991	abc
3	120	120	0	0	2478		285	d-g	2762	cde
4	150	150	0	0	2688		234	d-g	2922	a-e
5	60	30	30	0	2689		197	gh	2886	a-e
6	90	45	45	0	2751		213	fgh	2964	a-d
7	120	60	60	0	2652		284	bcd	2937	a-e
8	150	75	75	0	2469		255	c-f	2724	e
9	60	60	0	Var*	2552		173	h	2725	e
10	90	90	0	Var*	2650		268	cde	2918	a-e
11	120	120	0	Var*	2806		307	abc	3113	a
12	150	150	0	Var*	2725		299	abc	3025	ab
13	60	30	30	Var*	2583		228	efg	2811	b-e
14	90	45	45	Var*	2554		227	efg	2781	cde
15	120	60	60	Var*	2651		339	a	2990	abc
16	150	75	75	Var*	2467		337	ab	2804	b-e
	Overall Mean [4]				2627		253		2881	
	LSD (0.05)				251		53		235	
	Prob > F				0.1539		0.0001		0.0288	
	C. V. (%)				6.95		14.87		5.94	

[1] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.
[2] MC is mepiquat chloride (PIX Plus) mis-applied* 06/13/01 (4 oz/A), 07/05/01 (4 oz/A), and 07/20/01 (4 oz/A).
[3] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.
[4] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

Table 6. Interaction of nitrogen rates, application systems, and mepiquat chloride. Cotton lint yields for 2001. Delta Research and Extension Center, Stoneville, MS.

Trt.	Nitrogen [1/]				First		Second		Total	
No.	Total	PP	SD	MC [2/]	Harvest		Harvest		Harvest	
	---- (lb N/acre) -----				----------(lb lint/acre) ----------					
1	60	60	0	0	998.8	ab [3/]	66.0	hi [3/]	1064.8	a-d [3/]
2	90	90	0	0	1026.4	a	86.0	d-g	1112.5	ab
3	120	120	0	0	905.0	bcd	103.8	bcd	1008.8	cd
4	150	150	0	0	1004.7	ab	85.0	e-h	1089.8	abc
5	60	30	30	0	1037.5	a	74.5	ghi	1112.0	ab
6	90	45	45	0	1040.4	a	78.9	ghi	1119.3	ab
7	120	60	60	0	990.0	abc	102.8	b-e	1092.8	abc
8	150	75	75	0	891.4	cd	91.4	c-g	982.8	d
9	60	60	0	Var*	985.6	a-d	64.2	i	1049.6	a-d
10	90	90	0	Var*	980.6	a-d	98.4	c-f	1079.0	a-d
11	120	120	0	Var*	1023.5	a	110.4	abc	1133.9	a
12	150	150	0	Var*	959.5	a-d	107.7	abc	1067.2	a-d
13	60	30	30	Var*	979.9	a-d	84.1	e-h	1064.0	a-d
14	90	45	45	Var*	942.8	a-d	82.6	g-i	1025.4	bcd
15	120	60	60	Var*	975.0	a-d	123.9	a	1099.0	abc
16	150	75	75	Var*	882.3	d	121.4	ab	1003.6	cd
	Overall Mean [4/]				976.5		92.6		1069.0	
	LSD (0.05)				104.5		19.1		98.1	
	Prob > F				0.0615		0.0001		0.0870	
	C. V. (%)				7.34		14.84		6.29	

[1/] Nitrogen source was UAN solutiuon (32% N) applied preplant or preplant + sidedress.

[2/] MC is mepiquat chloride (PIX Plus) misapplied* 06/13/01 (4 oz/A), 07/05/01 (4 oz/A), and 07/20/01 (4 oz/A).

[3/] Mean of 4 replications and two subsamples. Means followed by the same letters are not significantly different at the 5% levels as determined by Fisher's Protected LSD. No letters are used where differences are not significant.

[4/] Overall mean determined across 4 reps, 16 treatments and 2 subsamples (n = 128).

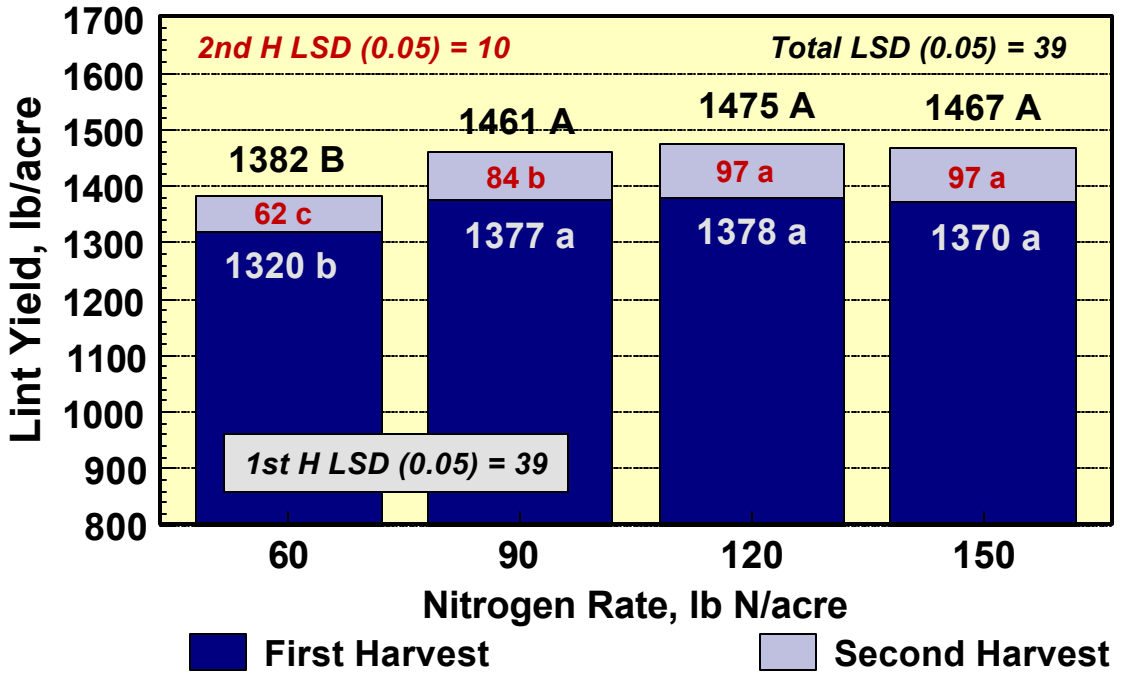

Figure 1. Summary of main effect lint yields for cotton following corn in rotation for nitrogen rates in 1999. Means are averaged across applications systems and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

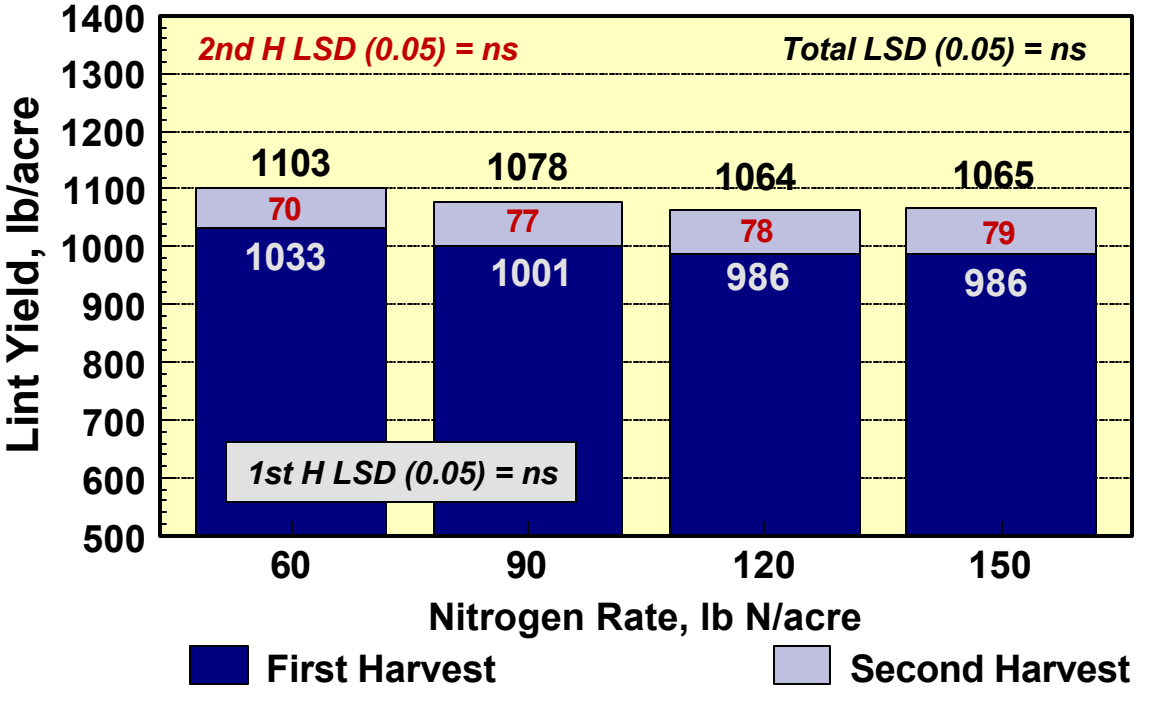

Figure 2. Summary of main effect lint yields for cotton following corn in rotation for nitrogen rates in 2000. Means are averaged across applications systems and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

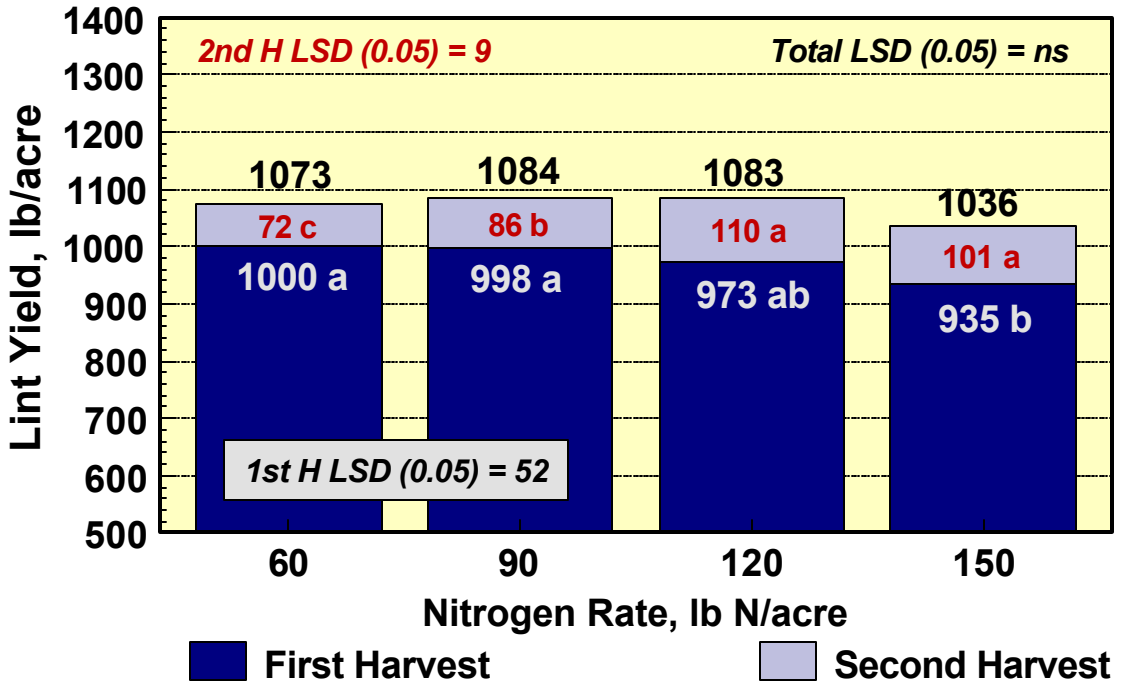

Figure 3. Summary of main effect lint yields for cotton following corn in rotation for nitrogen rates in 2001. Means are averaged across applications systems and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

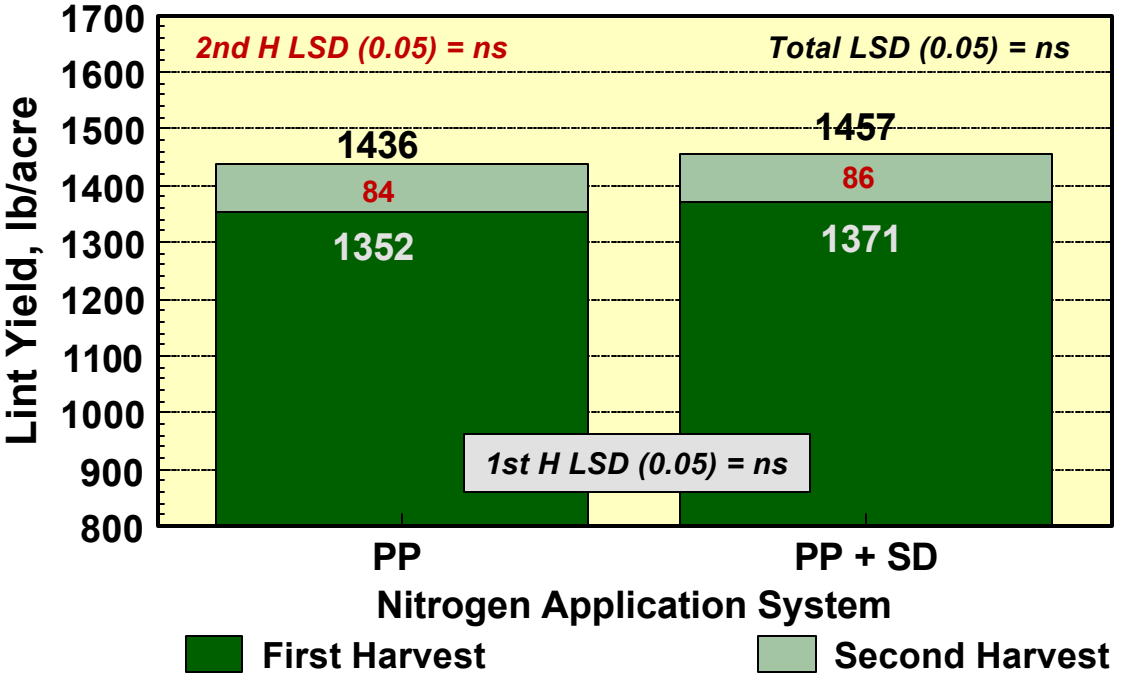

Figure 4. Summary of main effect lint yields for cotton following corn in rotation for application system in 1999. Mean are averaged across nitrogen rates and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

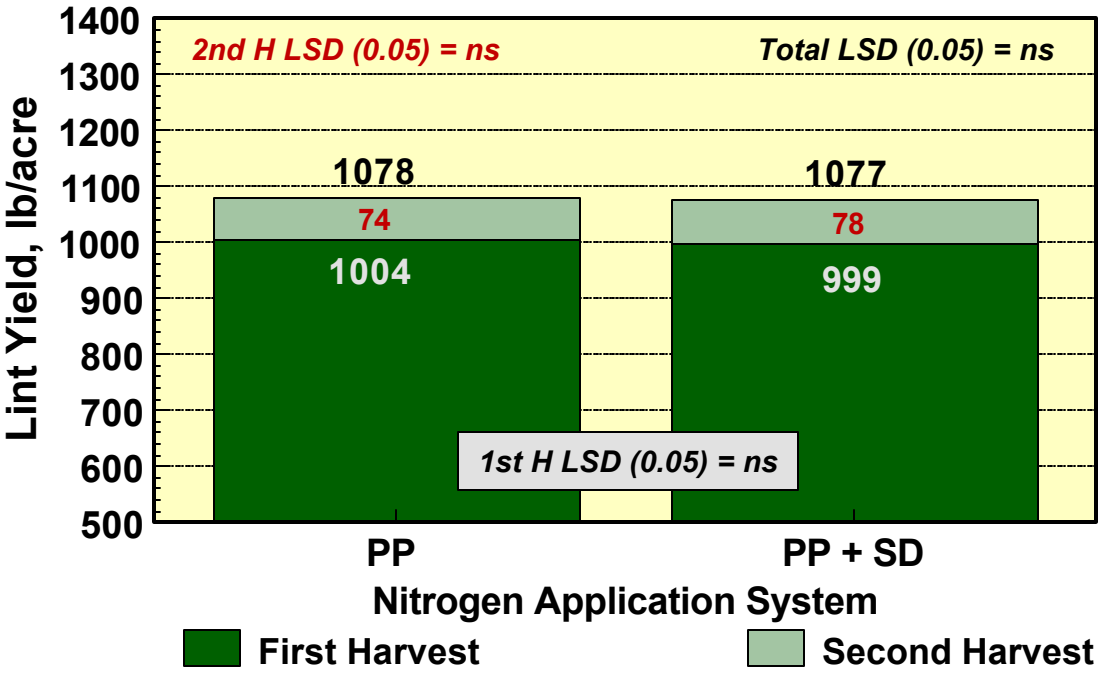

Figure 5. Summary of main effect lint yields for cotton following corn in rotation for application system in 2000. Mean are averaged across nitrogen rates and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

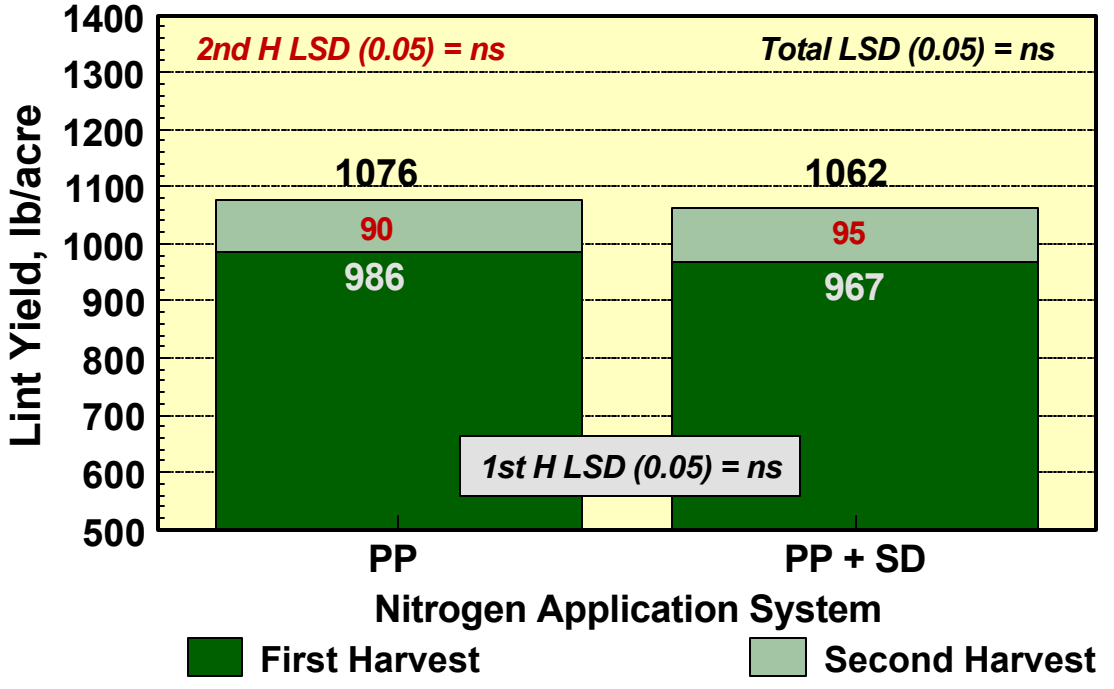

Figure 6. Summary of main effect lint yields for cotton following corn in rotation for application system in 2000. Mean are averaged across nitrogen rates and plant growth regulator rates. Delta Research and Extension Center, Stoneville, MS.

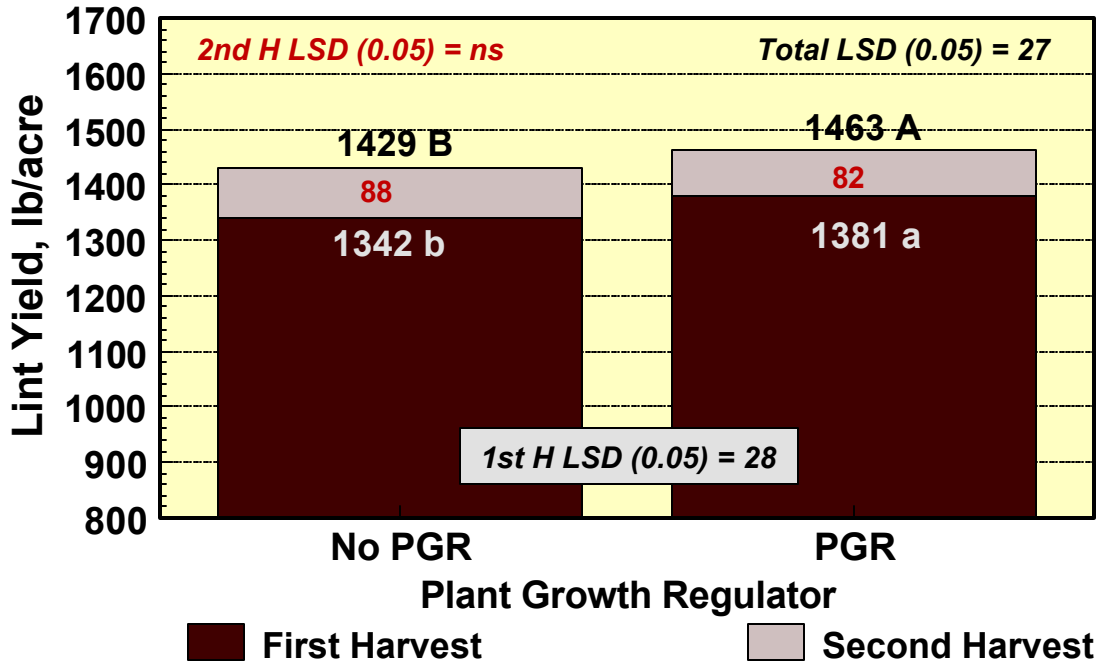

Figure 7. Summary of main effect lint yields for cotton following corn in rotation for plant growth regulator system in 1999. Mean are averaged across nitrogen rates and application system. Delta Research and Extension Center, Stoneville, MS.

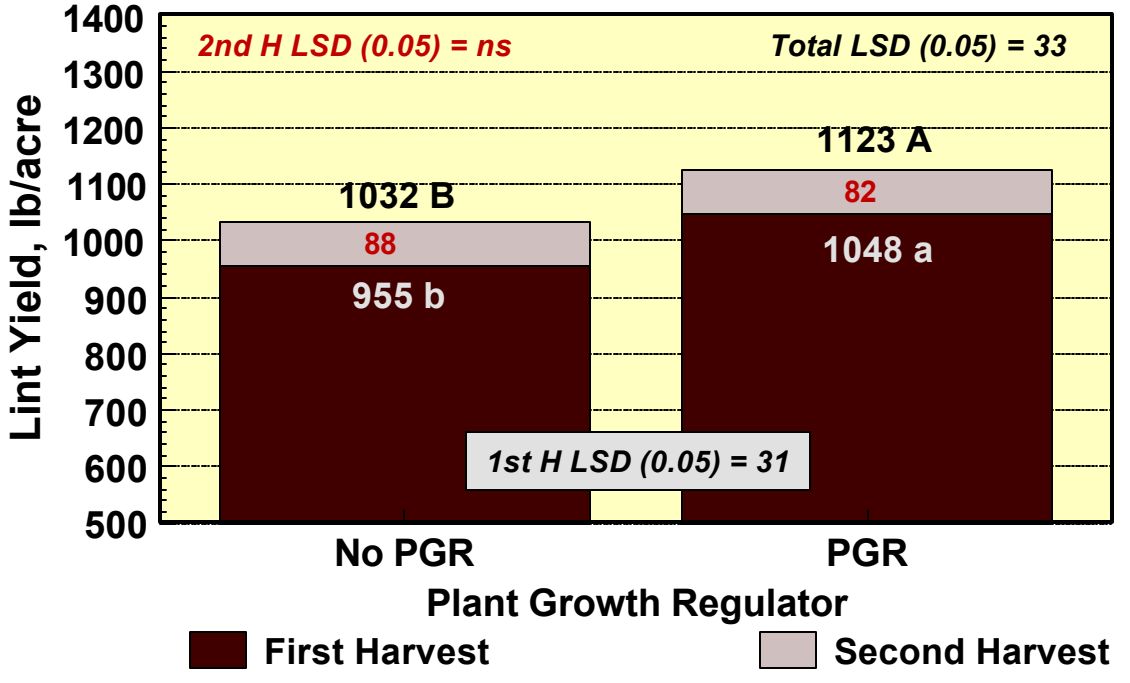

Figure 8. Summary of main effect lint yields for cotton following corn in rotation for plant growth regulator system in 2000. Mean are averaged across nitrogen rates and application system. Delta Research and Extension Center, Stoneville, MS.