

NITROGEN AND POTASSIUM FERTILIZATION OF COTTON, 2004

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Introduction

Yield and earliness responses of contrasting varieties to nitrogen (N) and potassium (K) fertilization have not been evaluated in recent years under typical Tennessee no-till field conditions. Objectives of three interrelated studies conducted in 2004 were to evaluate effects of long-term N and K nutrition on lint yields and earliness of contrasting cotton cultivars grown with no tillage.

Methods

Three studies were conducted in long-term soil fertility plots in a no-tilled Memphis-Loring silt loam at the West Tennessee Experiment Station. The three experiments were: (1) cultivar response to K; (2) cultivar response to N at different K levels; and (3) response of an indeterminate cultivar to extremes of K fertility. Experiments #1 and #2 were RCB factorial designs with 6 and 3 replications, respectively. Experiment #3 was a RCB design with 5 replications. Weighed quantities of NH_4NO_3 and KCl were hand-spread before planting on designated 4-row plots to maintain N and K fertility levels. PM 1218 BG/RR and DP 555 BG/RR were planted in designated plots on 5 May 2004. The crop was managed following UT Extension guidelines for no-till RR cotton. Defoliants were applied per UT recommendations at 138 days after planting (DAP). No boll opening material was applied in order to measure earliness as percent of total yield picked at first harvest. Each plot was picked twice (at 145 and 173 DAP) with a spindle picker. Gin turnout of each treatment was determined using a 20-saw gin assembly with two lint cleaners.

Results and Discussion

Results in Table 1 indicate that neither K fertility nor cultivar significantly affected yield at first harvest, but both K and cultivar significantly affected total lint yield. PM 1218 yields were significantly higher at $120 \text{ lb K}_2\text{O ac}^{-1}$ than at $60 \text{ lb K}_2\text{O ac}^{-1} \text{ yr}^{-1}$. The higher rate of K tended ($p=0.10$) to delay maturity slightly with the formation of additional yield in late season. DP 555 BG/RR had higher total yields and matured later than PM 1218 BG/RR at either K rate.

Results in Table 2 indicate that N had no significant effect on lint yield or earliness in either cultivar, regardless of K rate. The higher K rate significantly increased lint yields at first harvest, and total lint yields of both cultivars. Earliness was not significantly influenced by N or K treatments in this part of the study. DP 555 BG/RR had higher total yields and matured later than PM 1218 BG/RR at either N or K rate.

Effects of extreme K rates on DP 555 BG/RR are shown in Table 3. Lint yields increased significantly with $30 \text{ lb K}_2\text{O ac}^{-1} \text{ yr}^{-1}$ relative to no K, but yield differences were not significant above the $30 \text{ lb K}_2\text{O}$ treatment. The 150 and 180 $\text{lb K}_2\text{O}$ treatments delayed maturity relative to 0 and $30 \text{ lb K}_2\text{O ac}^{-1} \text{ yr}^{-1}$ due to late season yield formation.

Table 1. Lint yield, earliness, and gin turnout of two cotton cultivars under two long-term potassium (K) fertilization regimes at WTES, Jackson TN, 2004.

K Fert. Tmt.	Cultivar	Lint Yield, Total	Lint Yield, 1st Harv.	First Harvest	Gin Turnout
lb K ₂ O ac ⁻¹ yr ⁻¹		lb/ac	lb/ac	%	%
60	DP 555 BG/RR	1986 ab	1585 a	80.2 bc	40.2
60	PM 1218 BG/RR	1766 c	1654 a	93.5 a	38.9
120	DP 555 BG/RR	2091 a	1559 a	74.5 c	39.2
120	PM 1218 BG/RR	1908 b	1678 a	87.8 ab	38.9
	Mean	1938	1619	84.0	39.3
	R-Square	0.750	0.468	0.608	
	Pr > F, K fert.	0.009	0.984	0.105	
	Pr > F, Cultivar	<0.001	0.158	0.001	

Soil: Irrigated, no-tilled Loring-Calloway silt loam. Trial managers: Carl Michaud & Clint Sharp.
 Test planted 5 May 2004. Defoliant applied 20 Sept 2004. Harvested 27 Sept and 25 Oct 2004.
 Analysis of variance by Proc. GLM. Separation of interaction means by pairwise T-tests at p=0.05.

Table 2. Lint yield, earliness, and gin turnout of two cotton cultivars under two long-term nitrogen (N) and potassium (K) fertilization regimes at WTES, Jackson TN, 2004.

N Fert. Tmt.	K Fert. Tmt.	Cultivar	Lint Yield, Total	Lint Yield, 1st Harv.	First Harvest	Gin Turnout
lb N ac ⁻¹ yr ⁻¹	lb K ₂ O ac ⁻¹ yr ⁻¹		lb/ac	lb/ac	%	%
80	30	PM 1218 BG/RR	1375 c	1282 bc	93.5 a	37.9
80	30	DP 555 BG/RR	1663 ab	1228 c	74.5 ab	38.4
80	90	PM 1218 BG/RR	1726 ab	1594 ab	92.3 a	39.5
80	90	DP 555 BG/RR	1914 a	1645 a	86.4 ab	38.2
160	30	PM 1218 BG/RR	1522 bc	1333 abc	87.7 ab	38.2
160	30	DP 555 BG/RR	1574 bc	1184 c	76.0 ab	38.0
160	90	PM 1218 BG/RR	1845 a	1645 a	89.4 ab	38.2
160	90	DP 555 BG/RR	1878 a	1279 bc	68.7 b	36.3
		Mean	1687	1399	83.6	38.1
		R-Square	0.804	0.660	0.552	
		Pr > F, N fert.	0.559	0.351	0.259	
		Pr > F, K fert.	<0.001	0.004	0.818	
		Pr > F, Cultivar	0.035	0.130	0.019	

Soil: Irrigated, no-tilled Loring-Calloway silt loam. Trial managers: Carl Michaud & Clint Sharp.
 Test planted 5 May 2004. Defoliant applied 20 Sept 2004. Harvested 27 Sept and 25 Oct 2004.
 Analysis of variance by Proc. GLM. Separation of interaction means by pairwise T-tests at p=0.05.
 Tennessee Agricultural Experiment Station data collected by C.O. Gwathmey. This study was supported in part by PPI/FAR.

Table 3. Lint yield, earliness, and gin turnout of DP 555 BG/RR at extremes of potassium (K) fertilization at WTES Jackson TN, 2004.

K Fert. Tmt. lb K ₂ O ac ⁻¹ yr ⁻¹	Lint Yield, Total lb/ac	Lint Yield, 1st Harv. lb/ac	First Harvest %	Gin Turnout %
0	1026 b	795 b	78.6 a	37.3
30	1630 a	1277 a	79.2 a	38.4
150	1857 a	1227 a	65.4 b	38.0
180	1920 a	1321 a	69.1 b	38.7
Mean	1608	1155	73.1	38.1
R-Square	0.809	0.681	0.828	
Pr > F, K fert.	0.001	0.014	0.011	
Low vs High K: contrast Pr > F	0.001	0.052	0.002	

Soil: Irrigated, no-tilled Loring-Calloway silt loam. Trial managers: Carl Michaud & Clint Sharp.
 Test planted 5 May 2004. Defoliant applied 20 Sept. Harvested 27 Sept and 25 Oct 2004.
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