

COTTON YIELD RESPONSE TO TILLAGE SYSTEMS ON A LEEPER SILTY CLAY LOAM SOIL

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ABSTRACT: A tillage study initiated in 2003 to further evaluate reduced tillage systems for cotton production was continued in 2004. The objective was to evaluate no-till in comparison to reduced tillage systems of one [fall bed-roller or spring Prepmaster®(bed-renovator)] or two pass operations [fall paratill (deep under-row tillage) followed by (Fb) bed-roller] for land preparation on soils with 0.5% or less slope. After 2 years of no-till on old beds which had been formed in the fall of 2001 with a paratill-bed roller system, the beds became flat. The cotton was planted no-till in late April of 2003 and 2004 on beds which were 1 to 2 inches in 2003 and flat in 2004. The no-till treatment had lower plant population than all other reduced tillage treatments in 2003 but not in 2004. Both years, no-till showed less early season growth, less seed cotton and lint yield, and was shorter in height at harvest. The bed-roller, paratill + bed-roller applied in January 2003 and the fall of 2003, and the Prepmaster treatment applied in early April 2003 and 2004 showed no difference in yield and all produced more lint yield than the no-till system. This study will be continued in 2005 to determine long term tillage effects on cotton growth and yield.

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KEYWORDS: Cotton, reduced tillage

MATERIALS AND METHODS: A study was initiated in 2003 to further evaluate reduced tillage systems in comparison to no-tillage on a Leeper silty clay loam soil with a 0.25 to 0.5% slope. The study was conducted as a randomized complete block with 4 replications. Plot size was 4 rows (38 inch) by 500 ft long.

All tillage treatments (fall bed-roller, fall paratill + bed roller) except Prepmaster were applied in January 2003 (due to wet fall in 2002) and October 2003. The Prepmaster treatment was applied 4/02/03 and 4/01/04. Prepmaster is a preplant herbicide incorporator manufactured by Bigham Brothers, Lubbock, Texas. This implement was equipped with a 16-inch sweep positioned on the center of the bed, a small buster sweep (reshape bed), a rolling cutter bar, a rolling basket, and smooth metal roller. This implement was operated at 6 to 7 mph and creates a smooth wide surface bed that was 4 to 6 inches in height. The implement could be used just prior to planting or 2 to 3 weeks before planting. It creates a smooth bed for planting at a uniform depth.

Recommended agronomic practices were used in the study for a 2-bale cotton yield goal. DP 215BR variety was planted no-till on all plots on 4/29/03 and 4/27/04. Potassium and phosphorus fertilizers were applied based on soil test recommendation. Nitrogen fertilizer at 90 lb N/ac was applied as a UAN (32%N) solution, with a coulter-knife system that placed the fertilizer approximately 6 inches from the row and 2 inches deep. The nitrogen fertilizer was applied to cotton in the pinhead square stage of growth. Pentia (mepiquat pentaborate) applications were made in 2003 and 2004 to control rank cotton growth. Both years CoRoN (10-0-10, 0.5%B) at 1 gpa was applied as a foliar application at first bloom with a repeat application 10 days later.

The study was defoliated in September of each year when cotton was in the 4 nodes above cracked boll stage of maturity. The center 2 rows of the study were harvested in mid to late September with a 2-row spindle picker equipped for plot harvest. Grab samples were pulled from seed cotton samples from each plot. Seed cotton samples were ginned with an 8-saw laboratory gin (no dryer, seed cotton cleaners, or lint cleaners) to determine percent lint turnout. Data collected were plant stands 4 weeks after planting (WAP); plant height at early bloom 8 WAP, mid bloom, 11 WAP, and at harvest; nodes/plant at 11WAP; seed cotton yield; percent lint turnout; and lint yield. The data were subjected to Analysis of Variance and means were separated using Fisher's Protected LSD calculated at the 5% significance level.

RESULTS AND DISCUSSION: The 2004 environmental growing season was highly variable with 114 to 153% of normal rainfall in May and June followed by no rainfall from mid-July through mid-August. The old beds with continuous no-till cotton were 1 to 2 inches tall in 2003 and flat in 2004. The Prepmaster applied in early April; continuous fall bed-rollers; continuous fall paratill + bed-roller; and the fall bed roller in 2002 Fb paratill+ bed roller in fall of 2003 resulted in plants with more nodes 11 WAP; taller plants at 8 and 11 WAP, and at harvest; and greater lint yield than continuous no-till (Table 1). These tillage systems showed no differences in early season plant height, nodes/plant, and height at harvest. All tillage systems showed no differences in plant population 4 WAP. Yields in 2003 and 2004 indicated no-till lint yields were lower than all other treatments (Table 2). In 2003 no-till was the only treatment which had a lower lint turnout than continuous fall bed roller treatments. Lint turnout from all other treatments were equal to the continuous fall bed roller treatment. However, in 2004, percent lint turnout was not different between treatments. After 2 years of no-till production on old beds, the old beds became flat. The results also indicated deep-under-row tillage may not be necessary for maximum yield. However, the data indicated a raised bed (bed-roller or Prepmaster) is essential for high yield on the Leeper silty clay soil. The study will be continued to determine long-term tillage effects on cotton growth and yield.

COOPERATORS: None

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Table 1. Tillage effect on population and cotton growth on a Leeper silty clay loam soil in 2004, Verona, MS.

Tillage system ²	Tillage time	Pl/ac	Plant ht	Nodes/ plant	Height (in)	Harv. height (in)
		x 1000 4 WAP ¹	8 WAP ¹	11 WAP ¹	11 WAP ¹	
1. Prepmaster	04/01/04	43.8	30	12	44	41
2. Fall bed-roller	10/24/03	46.1	30	12	45	42
3. Fall paratill + bed roller	10/24/03	45.0	28	12	45	44
4. Fall bed-roller 2002 Fb Fall paratill + bed-roller 2003	10/24/03	42.1	30	12	46	45
5. No-till	-----	44.4	25	10	38	40
	Mean	44.3	29	12	44	42
	LSD.05	NS	2	1	5	3
	% CV	11.8	4	6	7	5

¹WAP means weeks after planting.

²Tillage systems for 2003 and 2004 followed a fall 2001 paratill + bed roller system.

Table 2. Tillage effect on lint yield and percent lint turnout on a Leeper silty clay loam soil in 2003 and 2004, Verona, MS.

Tillage system ¹	Tillage time	Lint	%	Lint	%
		lb/ac	lint	lb/ac	lint
		----- 2004-----		-----2003-----	
1. Prepmaster	4/1/2004	1144	38.2	1149	43.0
2. Fall bed-roller	10/24/2003	1134	39	1102	43.7
3. Fall paratill + bed roller	10/24/2003	1152	37.9	1099	42.5
4. Fall bed-roller 2002 Fb fall paratill + bed-roller 2003	10/24/2003	1122	38.3	1154	42.6
5. No-till	-----	947	38.6	879	41.9
	Mean	1100	38	1077	42.7
	LSD.05	90	NS	78	1.3
	% CV	5	2.8	5	2.0

¹Tillage systems for 2003 and 2004 followed a fall 2001 paratill + bed-roller system.