COTTON RESPONSE TO TILLAGE IN A CORN ROTATION SYSTEM

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ABSTRACT: Seven tillage methods in continuous cotton and cotton following ridge-tillage corn in a rotation were evaluated on a Marietta silt loam soil in the 2001 growing season. Rainfall during the growing season was highly variable with below normal rainfall in early to mid May and mid July to early August. Yields in 2001 were as much as 1000 lb lower in 2001 than 2000. Rotation had no effect on seedcotton yield in 2001. The mean rotation yield (averaged over tillage systems) was 2293 lb/ac compared to 2171 lb/ac for continuous cotton. The fall chisel-harrow + paratill-bed/roller + doall (implement equipped with a rolling cutter-bar, drag harrow, and drag board) fall paratill-bed/roller + doall, and fall disk + bed-roller + doall at planting produced higher seedcotton yield than conventional tillage and the fall paratill-bed/roller with no doall. The fall paratill-bed/roller without a doall application at planting to remove dry soil from the bed resulted in delayed seedling emergence until rainfall occurred 15 days after planting. This resulted in 360 lb/ac lower yield (averaged over rotation) than the fall paratill-bed/roller + doall at planting.

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MATERIALS AND METHODS: A field study was established in the fall of 1998 on a Marietta silt loam soil at Verona, Mississippi. The experimental design was a randomized complete block with 4 replications. Plot size was 8 (30-inch) rows by 85 ft long. Duplicate treatments of corn-cotton rotation were maintained so rotation data is acquired each year. Fertilizer (N, P, K) were applied based on soil test recommendations for a 2 bale/ac cotton yield and corn yield of 150 bu/ac. Soil test analysis indicated high levels of P with medium K levels. Potash (K_2O) at 200 lb/ac was applied broadcast to the soil surface 10/12/00. Nitrogen as UAN solution (32% N) was applied as a sidedress application (6 inches from row and 2 inches deep) at 160 lb N/ac to 6 to 8 leaf corn (5/04/01) and 80 lb N/ac to cotton in the pinhead square stage of growth (6/14/01).

All tillage treatments were applied in the fall except treatments 7 and 14 (Table 1). Treatments 1 and 8 also received a field cultivation 4/23/01 and then were rebedded 4/23/01. The corn following cotton treatments were planted no-till and received one ridge-till cultivation (5/15/01) during the growing season. Corn hybrid Pioneer 3223 was planted no-till 3/28/01 at 28,000 seed/ac. Lorsban 15G (chlorpyrifos) at 1.3 lb ai/ac was applied in-furrow at planting. All corn plots received a preemergence application of atrazine at 2.0 lb ai/ac.

A burndown application of Glyphos (glyphosate) + Weedar 64 (2,4-D amine) at 0.50 + 0.95 lb ai/ac was applied to all cotton treatments on 4/02/01 except treatments 1 and 8 (Table 1). All cotton plots, except treatments 5 and 12, were doalled prior to planting cotton on 5/04/01. Treatments 5 and 12 were planted no-till. Cotton cultivar Delta and Pineland DP 20B was seeded at 3 seed/ft (30-inch row) of row. Temik 11G (aldicarb) and Ridomil (mefenoxam) at 0.45 and 0.88 lb ai/ac were applied in-furrow at planting. A preemergence application of Gramoxone (paraquat) + Dual (metolachlor) + Meturon (fluometuron) + Staple (pyrithiobac) + surfactant at 0.75 + 1.5 + 1.0 + lb ai/ac + 0.5 oz ai/ac + 0.5 pt/ac was made on 5/04/01.

MSMA (monosodium methanearsonate) + Meturon at 2.0 + 0.8 lb ai/ac were applied as a post direct broadcast application to treatments 2 through 6 and 9 through 13 on 6/13/01. Treatments 1 and 8 were cultivated and received a 13-inch band application of MSMA + Meturon at 0.9 + 0.35 lb ai/ac on 6/13/01and repeated on 6/26/01. Ridge-till cultivation with a post direct band (13-inch) application of MSMA + Meturon at 0.9 + 0.35 lb ai/ac was applied to treatments 7 and 14 on 6/13/01 and repeated 6/26/01. MSMA + Meturon at 2.0 + 0.8 lb ai/ac was applied to treatments 2 through 6 and 9 through 13 as post direct broadcast applications on 6/13/01 and 6/26/01.

Tarnish plant bug (*Lygus lineolaris*), cotton bollworm (*Helicoverpa zea*), and budworm (*Heliothis virescens*) were the major cotton insect pests with light infestations in the 2001 growing season. The following insecticides were applied when insect pests reached or exceeded threshold levels with a twice weekly scouting program. All insecticides were applied with TXVS-4 nozzles at 5 gpa carrier volume. Bidrin (dicrotophos) at 0.5 lb ai/ac was applied 6/12/01, 6/25/01, and 7/10/01. Ammo (cypermethrin) at 0.1 lb ai/ac was applied on 8/03/01.
All cotton plots were defoliated with Finish (ethephon + cyclanilide) + Dropp (thidiazuron) at 1.0 + 0.125 + 0.083 lb ai/ac on 9/20/01. The center 2 rows of each 8-row plot were harvested 10/04/01 with a spindle picker modified for plot harvest. The plot seedcotton weights were recorded. All seedcotton yield samples were ginned with a mini-gin (a state of art small scale cotton gin) to determine the percent lint turnout and lint yield. All data was subjected to statistical analysis using Fisher's Protect LSD at the 5% probability level to separate treatment means.

RESULTS AND DISCUSSION: Environmental conditions during the 2001 growing season were highly variable with normal temperature and below normal rainfall during mid July to early August. This resulted in as much as 1000 lb/ac lower seedcotton yield in 2001. The study mean yield for continuous cotton and cotton following corn in a rotation was 2177 and 2293 lb seedcotton/ac, respectively. There was no significant difference due to rotation and no tillage by rotation interaction. Tillage, however, had an effect on yield. Averaged over rotation, the fall disk + bed + doall, fall + paratill-bed/roller + doall, and fall chisel + paratill-bed/roller + doall had higher yield than conventional tillage and fall paratill-bed/roller with no doall. The fall paratill-bed/roller without a doall application at planting (to remove the dry soil from the bed-seedling emergence zone) resulted in delayed germination until rainfall occurred 15 days after planting. This resulted in 360 lb/ac lower yield than where the doall had been applied.

Table 1 Seedcotton yield response to tillage and rotation on a Marietta silt loam soil in 2000 and 2001, Verona, MS.

Rotation/fall tillage	Seedcotton 2000	2001
	----------lb/ac----------	
A. Continuous Cotton		
1. Conventional tillage: disk + chisel – harrow + bed + spring rebed + do-all[1] (CT)	2956	2027
2. Disk + bed with rollers + do-all	2770	2343
3. Disk + paratill – bed/rollers + do-all	2922	2204
4. Chisel-harrow + paratill-bed/rollers + do-all	2981	2387
5. Paratill-bed/rollers + do-all	2814	2338
6. Paratill-bed/rollers	2901	1982
7. Ridge-tillage + doall	2675	1958
Mean	2860	2177
Cotton following ridge tillage corn		
8. CT	3258	2179
9. Disk + bed/rollers + do-all	3350	2478
10. Disk + paratill–bed/rollers + do-all	3416	2445
11. Chisel-harrow + paratill-bed/rollers + do-all	3373	2342
12. Paratill-bed/rollers + do-all	3266	2324
13. Paratill-bed/roller	3125	1961
14. Ridge-tillage + doall	3102	2320
Mean	3270	2293
Rot. LSD (0.05)	410	NS
Till LSD (0.05)	NS	228
Rot x Till LSD (0.05)	NS	NS
% CV	6	10

[1] Doall applied prior to planting.

Table 2. Ground residue cover as influenced by rotation and tillage in cotton production systems on a Marietta silt loam soil in 3/14/01, Verona, MS.

Rotation/fall tillage	Cotton		
	Continuous	After corn	Mean
	% ground residue cover		
1. Conventional tillage; disk + chisel – harrow + bed + spring rebed + do-all[1] (CT)	1	15	14
2. Disk + bed with rollers + do-all	13	12	12
3. Disk + paratill – bed/rollers + do-all	12	14	13
4. Chisel-harrow + paratill-bed/rollers + do-all	14	17	15
5. Paratill-bed/rollers + do-all	16	21	18
6. Paratill-bed/rollers	14	20	17
7. Ridge-tillage + doall	25	42	34
Mean	15	20	
Rot LSD.05 = NS Till LSD.05 = 6 Rot x till LSD.05 = NS % CV = 36			

[1] Doall applied prior to planting.