No-Till Cotton in Arkansas

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INTRODUCTION

Studies conducted in Arkansas during the 1970s indicated that reduced post-plant tillage resulted in reduced cotton yields on certain soil types but not on others (Keisling et al., 1991). A summary of another study showed that winter cover crops tended to improve soil tilth in continuous cotton (Keisling et al., 1990).

Preliminary studies were instigated at Marianna, Arkansas, during the 1990 growing season. The primary objective was to obtain experience in various techniques of planting and machinery operations necessary for no-till cotton production.

MATERIALS AND METHODS

An area of Memphis silt loam soil that had been in cotton or fallow the year before was selected to establish plots. The conventional till portion of the test was disked twice then triple-Ked prior to bedding. On 25 May the beds were dragged off with a triple-K, and DPL-50 cotton was planted in all treatments. Soil fertilizer applications consisted of 0-45-90 applied preplant, 60-0-0 applied 14 June and 24-0-0 applied 16 July. Cotoran™ and Dual™ were applied preemerge at recommended rates. Temick™-Terrachlor™ was applied in furrow at planting at the 30-lb/acre rate. Fusilade™ was applied to the no-till plots for grass control on 3 July at 24 oz/acre. Lay-by was done using Lorox™ at 2 pt/acre. Foliar applications of fertilizer, insecticides, etc. are shown in Table 1. Tilled plots were mechanically cultivated on 14 June and 3 July. Plots werehandhoed on 15 July. The harvest consisted of a once over picking on 17 October. Data were collected on plant ontogeny, yield, tissue nutrient concentrations in the petioles and plant characteristics.

RESULTS AND DISCUSSION

Problems were encountered with equipment settings for no-till operations; however, the equipment was finally set so that it operated properly. There was a special problem with the planter. It was noted that the cotton in no-till plots seemed to grow especially slowly while small. In areas in which adverse problems existed with soil acidity or weeds, no-till tended to accentuate the problems.

University of Arkansas uses the node location of the uppermost white bloom for crop management. When this bloom is first located five nodes from the top, the harvestable crop is already set on the plant. This occurred on 13 August. There was no differential between no-tilled and conventionally tilled cotton.

Equivalent stands of about 3.4 plants/row-ft were established. Even though there was an apparent height differential between conventional and no-till early, the plants were the same height at maturity (Table 2). All of the other plant characteristics were similar regardless of tillage (Table 2).

Conventionally tilled cotton yielded better than no-till cotton at 152 more lb of lint/acre. The source

Table 1. Dates, rates and materials foliar-applied to No-Till Cotton test

Date	Rate	Material
	(lb/acre)	
June 29	7.0	21% Urea Solution
	0.1	Boron
	0.03	Baythroid™
July 6	7.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
July 16	7.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
July 20	10.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
July 27	10.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
August 3	10.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
August 16	0.1	Boron
	0.25	Karate™
August 23	9.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
August 31	9.0	21% Urea Solution
	0.1	Boron
	0.25	Karate™
September 6	0.1	Boron
	0.25	Karate™
September 13	0.1	Boron
	0.25	Karate™
September 25	2.0	Prep Def.

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of the reduced yield for the no-till cotton was a boll size reduction of 17% (Table 2). Visual observation during the growing season indicated a visual onset of drought symptoms in the no-tilled cotton earlier than in the tilled plots. Soil moisture analysis with a dual source probe failed to confirm a difference in soil moisture usage.

Tissue analysis showed more erratic N content of the petioles the first three weeks of bloom in the conventionally tilled plots than in the no-till plots (Fig. 1). Phosphorus was consistently lower the first three weeks of bloom in the no-till plots. Both K and S contents in the petioles showed little difference due to tillage methods. Tissue analysis was used for a guide of the nutrition in this test, and nutrients were applied to foliage to insure that lack of plant nutrients was not the cause of reduced yields.

Future plans are to investigate conservation tillage in conjunction with

1. Legume cover crops to fix N and reduce inputs;
2. Starter fertilizer (in cooperation with researchers in Tennessee who have shown substantial yield increases to N placed 2 x 2).
3. Narrowrows;
4. Limited in-the-row tillage.

LITERATURE CITED

1. Keisling, T.C., R.F. Ford and H.D. Scott. 1991. Tillage system for cotton on Mississippi River delta and loessial plains soils. Soil and Tillage Research (submitted).

2. Keisling, T.C., H.D. Scott, B.A. Waddle, W. William and R.E. Frans. 1990. Effects of winter cover crops

Table 2. Yield, stand and mature plant characteristics for the 1990 No-Till Cotton test at Marlanna, Arkansas.

Yield or growth characteristics	Conventional tillage	No-till
Yield (lb/acre)	888 a*	736 b
Stand (plants/row-ft.)	3.4	3.3
Nodes below first sympodia	6	5
Monopodia with fruit	0	0
Plant height (in)	30	31
No. effective Sympodia	9	10
No. of Sympodia	11	11
Total nodes per plant	17	16
Ave. internode length (in)	1.8	1.9
Total bolls per plant	13	12
% First position bolls	71	68
% Second position bolls	25	28
% Other position bolls	4	4
% Second axil bolls	0	0
% Bolls position 1 retained	70	75
% Bolls position 2 retained	32	31
Boll size (g/boll)	8.6	7.1

*Numbers in the same row followed by different letters are significantly different at the 1% level according to LSD.

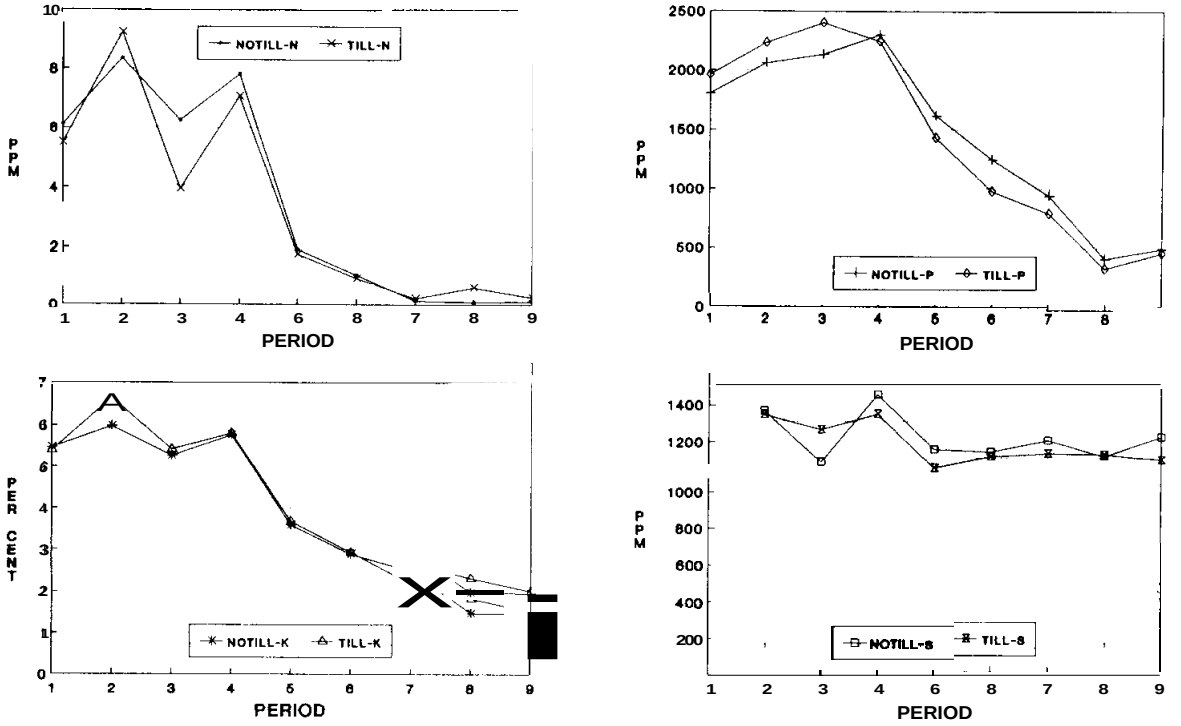

Fig. 1. Petiole analysis for nitrate-N, P, K and sulfur.