

COTTON RESEARCH ANNUAL REPORT
Alabama Cotton Commission/Cotton Incorporated

QUARTER ENDING: December 31, 2005 (4th Quarter, Annual Report)

PROJECT TITLE: "COTTON SYSTEMS RESEARCH: EVALUATING HERBICIDE TECHNOLOGIES, TILLAGE SYSTEMS, AND ROW SPACINGS"

AGREEMENT NUMBER: 05-602AL

PRINCIPAL INVESTIGATOR(S):

Kipling S. Balkcom USDA-ARS Soils 411 S. Donahue Drive Auburn, AL 36832 Phone: (334) 844-4666 FAX: (334) 887-8597 EMAIL: balkcks@auburn.edu	Andrew J. Price USDA-ARS 411 S. Donahue Dr. Auburn, AL 36832	Francisco J. Arriaga USDA-ARS 411 S. Donahue Dr. Auburn, AL 36832	Dennis P. Delaney Department of Agronomy and 106 Extension Hall Auburn University, AL 36849
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PERFORMING INSTITUTION: USDA-ARS NSDL, Auburn, AL and Auburn University, Auburn, AL

PROJECT OBJECTIVE:

Evaluate the effects of two tillage systems, two row spacings and three cotton varieties on yield, fiber quality, soil moisture, weed management, and economic returns.

PLAN OF WORK:

Cotton varieties, tillage systems, and row spacings were implemented at the Field Crops Unit of the E.V. Smith Research and Extension Center near Shorter, AL. Treatments arranged in a split-split-plot design with 4 replications were:

Cotton Varieties

1. Conventional cotton – FM966®
2. RoundUp Ready – FM960 RR®
3. Liberty Link – FM966 LL®

Tillage Systems

1. Conventional tillage (fall chisel/disk, spring disk/level) with in-row subsoiling
2. No-tillage (fall paratilling)

Row Spacings

1. 40-inch
2. 15-inch

REPORT:

A rye cover crop was drilled across the experimental area on Nov. 8, 2004 at 90 lb ac⁻¹. All plots were paratilled (complete disruption) immediately following the cover crop planting operation to eliminate any shallow subsurface soil compaction. Typical spring in-row subsoiling prior to planting could not be administered to standard row (40-inch) cotton, because it would create a potential bias against 15-inch cotton.

On March 30, 20 lb N ac⁻¹, as NH₄NO₃, was applied to the cover crop to enhance biomass production. Biomass samples were collected from each plot on April 29, 2005, one day after chemical termination with RoundUp Ultramax® (32 oz/A). The average biomass production across the experimental site was 3040 lb ac⁻¹. All plots received 68 lb N ac⁻¹ as a starter in the form of NH₄NO₃ on May 13. All cotton varieties were planted on May 17, 2005 with an in-furrow application of Temik® (5 lb/A). Prowl® (32 oz/A) was applied pre-emergence to all

conventional tillage plots and conventional varieties immediately following planting. Two over-the-top applications of Roundup Weathermax® (23 oz/A), Ignite® (32 oz/A), and Staple® (1.2 oz/A) were applied to corresponding herbicide tolerant and conventional varieties at the 2 leaf (June 6) and 4 leaf (June 16) stage. A layby application of Envoke® (0.15 oz/A) was applied to all 15-inch cotton on July 13, while a layby application of Caparol® (32 oz/A) and MSMA® (42.6 oz/A) was applied on the same day to the 40-inch cotton. Initial plant populations were recorded on June 6, 2005. The cotton was sidedressed with 60 lb N ac⁻¹ on June 7. One soil moisture probe was placed in every plot across three replications on June 10, 2005. The probes were connected to data loggers set to collect data every 30 minutes, which continued throughout the growing season until September 13, prior to defoliation. On August 2, 8 oz/A Pix Plus® was applied to all plots.

On July 6, 2005, whole plant biomass (1 m²) were collected from each plot during squaring. This information was collected again from each plot on August 18, 2005. The second sampling time was planned for mid-bloom, but was delayed approximately one week. Unfortunately, access to a 15" spindle picker was not feasible, but cotton from sections within each plot were hand-harvested. Differences obtained for lint quality will likely be above typical averages, but any differences between treatments should be detectable. On September 28, the experiment was defoliated with Def 6® (1 pt/A), Prep (1.5 pt/A), and Dropp® (0.2 lb/A). Cotton was hand-harvested on October 11.

Measured plant populations were 25% higher in the 15-inch compared to the 40-inch cotton (Table 1). However, due to differences between the drill and traditional planter units, initial seeding rates were 32% higher for the 15-inch cotton. Lint yields from the 15-inch cotton were increased 8% compared to the 40-inch cotton, while the conventional and glyphosate tolerant varieties produced approximately 13% more lint than the glufosinate tolerant variety (Table 1).

This difference in lint yield can be partially explained by the lower outturn percentage of the glufosinate tolerant variety (39.9%) compared to the conventional (41.1%) and glyphosate tolerant variety (41.0%). It should be noted that although not significant, measured plant populations for the glufosinate tolerant variety were numerically higher than the other two varieties. However, this increase in plants ac⁻¹ did not improve lint yields (Table 1). Row spacing and tillage system influenced plant weights measured at squaring (Table 2). The 15-inch cotton produced 17% more biomass than 40-inch cotton, while the no-tillage system produced 16% more biomass. However, an interaction was observed for plant weight at squaring between row spacing and tillage system (Table 2). Plant weights at squaring were similar for all row spacing and tillage combinations with the exception of no-tillage in the 15-inch row spacing (Fig. 1). Subsequent plant weights measured at mid-bloom were only affected by the row spacing with 15-inch cotton producing 17% more biomass than 40-inch cotton (Table 1). Fiber quality data and soil moisture data are still being summarized and analyzed statistically.

This experiment was showcased in a tour stop for an international delegation of researchers (~20) hosted by Tuskegee University on July 13, 2005.

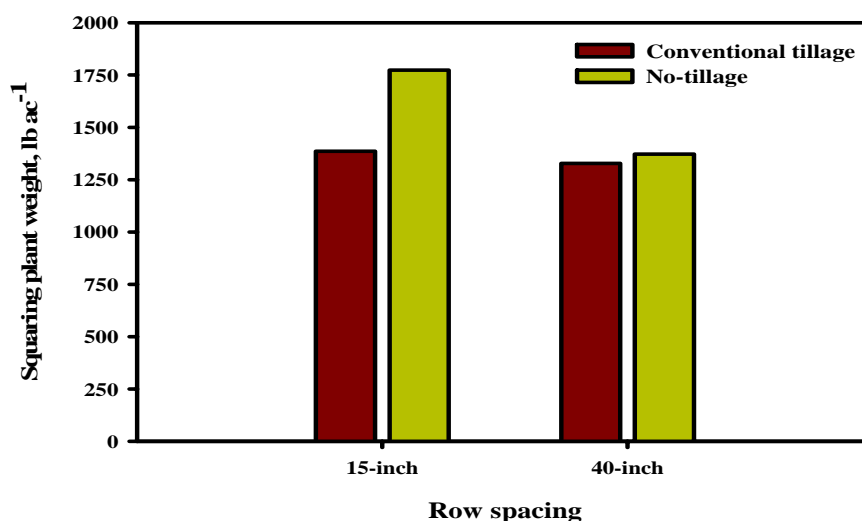


Figure 1. Plant weights measured at squaring from two row spacings and two tillage systems at the Field Crops Unit of the E.V. Smith Research and Extension Center near Shorter, AL in 2005.

Table 1. Plant populations, lint yield, outturn, squaring and mid-bloom plant weights measured across row spacings, varieties, and tillage systems in 2005 at the Field Crops Unit of the E.V. Smith Research and Extension Center near Shorter, AL.

	Row spacing		Variety			Tillage system	
	15''	40''	Conv	LL	RR	CT	NT
Population, plants ac ⁻¹	64,195	51,204	57,320	61,242	54,536	50,782	64,617
Lint, lb ac ⁻¹	1432	1321	1427	1270	1433	1372	1382
Outturn, %	40.9	40.4	41.1	39.9	41.0	40.7	40.6
Squaring plant weight, lb ac ⁻¹	1580	1350	1460	1494	1441	1357	1573
Mid-bloom plant weight, lb ac ⁻¹	7790	6676	7041	7131	7527	7394	7073

Table 2. Significance levels of plant populations, lint yield, outturn, squaring and mid-bloom plant weights for row spacings, varieties, tillage systems, and their interactions in 2005 at the Field Crops Unit of the E.V. Smith Research and Extension Center near Shorter, AL.

	Population	Lint	Outturn	Plant weights	
				Squaring	Mid-bloom
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Row Spacing	<.0001	0.0487	0.0221	0.0119	0.0014
Variety	NS†	0.0273	0.0002	NS	NS
Spacing*Variety	NS	NS	NS	NS	NS
Tillage	<.0001	NS	NS	0.0176	NS
Variety*Tillage	NS	NS	NS	NS	NS
Spacing*Tillage	NS	NS	NS	0.0552	NS
Spacing*Variety*Tillage	NS	NS	NS	NS	NS

† Not significant at 0.10 level of probability.