### USE OF CONVENTIONAL AND TRANSGENIC COTTON IN DIFFERENT TILLAGE SYSTEMS

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#### **OBJECTIVES**

- 1. To compare a conventional and transgenic cotton variety (ST 474 vs. SG 501 BRR) in conventional and strip tillage and herbicide programs for each
- 2. To compare economics of the different systems

#### **METHODS**

Two studies were conduced on a Dothan sandy loam (fine loamy siliceous, thermic Plinthic Kandiudult), at the North Florida Research and Education Center, Quincy, Fl in 2000. Both studies were planted after winter fallow. The experimental areas were fertilized with 5-10-15 N-P<sub>2</sub>O<sub>5-</sub>K<sub>2</sub>O at 500 lbs/A and sprayed with Roundup Ultra @ 1.0 qt/A on 22 May. On 30 May the conventional sections of the study were disc harrowed and s-tined harrowed and studies were planted with Stoneville ST 474 (conventional) and SureGrow SG 501 BRR (Roundup Ready) cotton in strip-till and conventional using a Brown Ro-till implement and KMC planters at 4 seeds per 1 ft of row. Each plot (35 ft by 24 ft and 200 ft 36 ft) consisted of 8 and 10 rows, respectively with 3 ft row spacing. The conventional tillage and herbicide sections planted with ST 474 were broadcast sprayed with Prowl @ 1 qt/A + Cotoran @ 1 qt/A on 30 May. The entire study in the first location was irrigated with 1" water on 2 June. On 16 June the transgenic cotton in strip tillage, SG 501 BRR cotton, was broadcast sprayed with Roundup Ultra @ 1.5 pt/A + Orthene 97 for thrips @ 0.5 lb/A. The conventional variety was sprayed with Cotoran @ 1 gt/A + MSMA @ 1 pt/A on 23 June. The transgenic, strip tilled, SG 501 BRR cotton was sprayed with Roundup Ultra @ 1.5 pt/A on 29 June and ST 474 cotton was direct sprayed with Bladex @ 1 qt/A + MSMA @ 2 qt/A + Induce @ 2 pt/100 gal water on 5 July. On 14 July cotton was sidedressed with 60 lbs N/A. The SG 501 BRR cotton was direct sprayed with Roundup Ultra @ 1.5 pt/A on 8 August. On 9 and 28 August cotton was broadcast sprayed with Pix @ 16 oz/A + Agridex @ 2 pt/A. Cotton was broadcast sprayed with Karate @ 4 oz/A on 11 September. On 20 October cotton was defoliated with Finish (a, 1.5 gt/A + Dropp (a, 0.1 lb/A. Cotton was picked with an International 782 plot picker on 3 November.

Data were analyzed using SAS (1989) analysis of a variance, and means were separated using Fisher's Least Significant Difference Test at the 5% probability level.

#### RESULTS

#### **First location**

There was no difference between varieties and tillage systems on plant population even though both systems and varieties were planted at the same population. The influence of variety and tillage on plant height, number of nodes, and plant ratio at 60, 90, and 120 days after planting were collected but only the data at 120 days is shown in Tables 1 - 3. There was no difference between varieties and tillage for the plant height of cotton at 60, 90, and 120 days after planting (DAP) (Table1). The number of nodes was not significantly different between varieties and tillage at 60 and 90 DAP (data not shown). At 120 DAP (Table 2) higher number of nodes was obtained from ST 474 than SG 501 BRR cotton and higher from strip than conventional tillage. The plant ratio (plant height / node number) was significantly higher for SG 501 BRR than ST 474 cotton at 60 DAP, 90 DAP, and 120 DAP (Table 3). There was no difference between tillage systems for plant height to node ratio at 60, 90, and 120 DAP.

Tables 4 and 5 show the influence of variety and tillage on boll number per plant. The number of bolls on the first position (Table 4) and the number of total bolls per plant (Table 5) were higher from SG501 BRR than ST 474 cotton, and higher from strip than conventional tillage. There was no difference between varieties and tillage for the number of bolls per plant on the second, third, and forth position.

There was no significant difference between varieties and tillage for the seed cotton yields (Tables 6).

#### Second location

There was no difference between varieties and tillage systems on cotton for the plant population, data not shown. The influence of variety and tillage on plant height, number of nodes, and plant ratio at 60, 90, and 120 days were collected and data at 120 days after planting is shown in Table 1. There was no difference between varieties and tillage for the plant height, node number, and plant ratio of cotton at 90 DAP or between varieties for the plant height, but plants were significantly taller from strip than conventional tillage at 120 DAP (Table1). The number of nodes was significantly higher from ST 474 than SG 501 BRR cotton, but no different for tillage systems (Table 2). Higher plant ratio was obtained from SG 501 BRR than ST 474 and higher from strip than conventional tillage (Table 3).

Tables 4-5 show the number of bolls per plant. There was no difference between varieties and tillage systems for the number of bolls per plant on the first position, or the total number of bolls (Tables 4-5). The number of bolls per plant on the forth position was not different for variety, but it was higher for strip than conventional tillage (Data not shown).

The seed cotton yields are shown in Table 6. There was an interaction of the variety and tillage on the yields of cotton. The ST 474 cotton performed better in strip than conventional

tillage, and SG 501 BRR cotton performed better in conventional than strip tillage. There was no significant difference between varieties or tillage systems for the yields of cotton.

Table 7 shows the economic comparison of strip vs. conventional tillage per acre. Generally, the overall cost was about 8% higher for conventional than strip tillage, mainly due to the cost of land preparation and herbicide applications. When all factors are considered, strip till resulted in about \$8/A more profit than conventional tillage while the transgenic cotton resulted in about \$8 more profit than the conventional variety in these two trials. Overall ease of farming and labor were reduced by strip tillage and transgenic varieties of cotton. However, both systems over both trails performed very similar.

### **First Location**

Table 1. Influence of variety and tillage on plant height (inch) (120 DAP) - Plant map  $-1^{st}$  location.

| Variety    | Tillage system |              | Avaraga |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 34.26          | 34.26        | 34.26   |
| SG 501 BRR | 35.16          | 33.78        | 34.47   |
| Average    | 34.71          | 34.02        | -       |

 $LSD_{(0.05)}$  for variety = NS

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

## Table 2. Influence of variety and tillage on number of nodes per plant (120 DAP) - Plant map $-1^{st}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 16.20          | 16.10        | 16.15   |
| SG 501 BRR | 16.15          | 14.10        | 15.13   |
| Average    | 16.18          | 15.10        | -       |

 $LSD_{(0.05)}$  for variety = 0.942

 $LSD_{(0.05)}$  for tillage = 0.942

 $LSD_{(0.05)}$  for interaction = 1.332

## Table 3. Influence of variety and tillage on plant ratio (height/number of nodes) (120 DAP) - Plant map $-1^{st}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 2.15           | 2.15         | 2.15    |
| SG 501 BRR | 2.20           | 2.41         | 2.31    |
| Average    | 2.18           | 2.28         | -       |

 $LSD_{(0.05)}$  for variety = 0.124

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

## Table 4. Influence of variety and tillage on boll number per plant on the first position (120 DAP) - Plant map $-1^{st}$ location

| Tillage system |   | Avorago  |
|----------------|---|--|
| Strip till     | Conventional                              | Avelage  |
| 6.20           | 5.40                                      | 5.80   |
| 7.25           | 5.75                                      | 6.50   |
| 6.73           | 5.58                                      | -  |
|                | Tillage   Strip till   6.20   7.25   6.73 | Tillage system   Strip till Conventional   6.20 5.40   7.25 5.75   6.73 5.58 |

 $LSD_{(0.05)}$  for variety = 0.638  $LSD_{(0.05)}$  for tillage = 0.638

 $LSD_{(0.05)}$  for interaction = NS

## Table 5. Influence of variety and tillage on total boll number per plant (120 DAP) - Plant map $-1^{st}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Average |
| ST 474     | 10.80          | 9.95         | 10.38   |
| SG 501 BRR | 13.65          | 10.85        | 12.25   |
| Average    | 12.23          | 10.40        | -       |

 $LSD_{(0.05)}$  for variety = 1.65

 $LSD_{(0.05)}$  for tillage = 1.65

 $LSD_{(0.05)}$  for interaction = NS

### Table 6. Influence of variety and tillage on seed yield of cotton $(lb/A) - 1^{st}$ location

| Variety    | Tillage system |              | Augraga |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 2087.8         | 2159.6       | 2123.7  |
| SG 501 BRR | 2139.7         | 2170.9       | 2155.3  |
| Average    | 2113.8         | 2165.3       | -       |

 $LSD_{(0.05)}$  for variety = NS

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

### **Second Location**

### Table 1. Influence of variety and tillage on plant height (inch) (120 DAP) - Plant map $-2^{nd}$ location

| Variety    | Tillage system |              | Average |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Average |
| ST 474     | 33.60          | 29.04        | 31.32   |
| SG 501 BRR | 35.16          | 29.64        | 32.40   |
| Average    | 34.98          | 29.34        | -       |

 $LSD_{(0.05)}$  for variety = NS

 $LSD_{(0.05)}$  for tillage = 1.792  $LSD_{(0.05)}$  for interaction = NS

# Table 2. Influence of variety and tillage on number of nodes per plant (120 DAP) - Plant map $-2^{nd}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 18.50          | 17.20        | 17.85   |
| SG 501 BRR | 15.60          | 15.60        | 15.60   |
| Average    | 17.05          | 16.40        | -       |

 $LSD_{(0.05)}$  for variety = 0.972

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

# Table 3. Influence of variety and tillage on plant ratio (height/number of nodes) (120 DAP)- Plant map $-2^{nd}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 1.82           | 1.70         | 1.76    |
| SG 501 BRR | 2.27           | 1.91         | 2.09    |
| Average    | 2.05           | 1.80         | -       |

 $LSD_{(0.05)}$  for variety = 0.132

 $LSD_{(0.05)}$  for tillage = 0.132

 $LSD_{(0.05)}$  for interaction = NS

# Table 4. Influence of variety and tillage on boll number per plant on the first position (120 DAP) - Plant map $-2^{nd}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 5.80           | 6.70         | 6.25    |
| SG 501 BRR | 6.10           | 7.30         | 6.7     |
| Average    | 5.95           | 7.00         | -       |

 $LSD_{(0.05)}$  for variety = NS

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

# Table 5. Influence of variety and tillage on total boll number per plant (120 DAP) - Plant map $-2^{nd}$ location

| Variety    | Tillage system |              | Auoraga |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Average |
| ST 474     | 12.00          | 11.70        | 11.85   |
| SG 501 BRR | 12.80          | 12.50        | 12.65   |
| Average    | 12.40          | 12.10        | -       |

 $LSD_{(0.05)}$  for variety = NS  $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = NS

### Table 6. Influence of variety and tillage on seed yield of cotton $(lb/A) - 2^{nd}$ location

| Variety    | Tillage system |              | Avorago |
|------------|----------------|--------------|---------|
|            | Strip till     | Conventional | Avelage |
| ST 474     | 1505.8         | 1356.4       | 1431.1  |
| SG 501 BRR | 1306.4         | 1613.7       | 1460.0  |
| Average    | 1406.1         | 1485.1       | -       |

LSD<sub>(0.05)</sub> for variety = NS

 $LSD_{(0.05)}$  for tillage = NS

 $LSD_{(0.05)}$  for interaction = 323.0

| Treatment              | Unit  | Quantity  | Price      | Cost in \$    |              |
|------------------------|-------|-----------|------------|---------------|--------------|
|                        |       |           |            | Strip tillage | Conventional |
| Seed                   | lb    | 10        | 0.75/lb    | 7.50          | 7.50         |
| Fertilizer             |       |           |            |               |              |
| Nitrogen (N)           | lb    | 85        | 0.32/lb    | 27.20         | 27.20        |
| Phosphate $(P_2O_5)$   | lb    | 50        | 0.23lb     | 11.50         | 11.50        |
| Potash ( $K_20$ )      | lb    | 75        | 0.15/lb    | 11.25         | 11.25        |
| Fertilizer Spreader    | acre  |           |            | 4.00          | 4.00         |
| Spray Roundup 4L Ultra | qt    | 1         | 32.00/gal  | 8.00          | 8.00         |
| Spray Roundup 4L Ultra | qt    | (3 x 1.5) | 32.00/gal  | 36.00         | -            |
| Orthene 97             | lb    | 0.5       | 12.00/lb   | 6.00          | -            |
| Brown Ro-till          | acre  |           |            | 15.00         | -            |
| Disc harrowed          | acre  | 2 x       | 10.00/A    | -             | 20.00        |
| Ripper Planter         | acre  |           | 15.00/A    | -             | 15.00        |
| Prowl 3.3E             | qt    | 1         | 25.62/gal  | -             | 6.41         |
| Cotoran 4L             | qt    | 2         | 40.40/gal  | -             | 20.20        |
| Bladex 4L              | qt    | 1         | 27.00/gal  | -             | 6.75         |
| MSMA                   | qt    | 2         | 19.00/gal  | -             | 9.50         |
| Induce                 | pt    | 2         | 15.00/gal  | -             | 3.80         |
| Pix                    | oz    | 16        | 0.90/oz    | 14.40         | 14.40        |
| Agridex                | pt    | 2         | 20.00/gal  | 5.00          | 5.00         |
| Karate                 | OZ    | 4         | 600.00/gal | 19.00         | 19.00        |
| Finish                 | qt    | 1.5       | 81.00/gal  | 31.00         | 31.00        |
| Dropp Ultra            | lb    | 0.1       | 56.00/lb   | 5.60          | 5.60         |
| Direct Spray           | times | 2 x       | 6.00/A     | 12.00         | 12.00        |
| Sprayer                | times | 5 x       | 3.00/A     | 15.00         | 15.00        |
| International Spindle  | 0.070 |           |            | 70.00         | 70.00        |
| Picker                 | aure  |           |            | /0.00         | /0.00        |
| Truck                  | mi.   | 50.00     | 0.17/mi    | 8.50          | 8.50         |
| Total costs            |       |           |            | 306.05        | 331 71       |
| 10101 00515            |       |           |            | 300.93        | JJ1./1       |

Table 15. Economic comparison of strip vs. conventional tillage per acre