# EVALUATION OF ULTRA-NARROW ROW COTTON IN SOUTH CAROLINA

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## Introduction

Over the last decade, the cost of producing a pound of cotton lint has significantly increased while yields per acre and the price received per pound of cotton lint has remained virtually unchanged. If this trend continues, many Southeast cotton producers will be forced to reduce the total number of cotton acres on their farms and begin producing other crops with lower production inputs and higher economic returns. Since a large percentage of the cotton production costs is associated with pest control, a production system that would maintain or increase yields and fiber quality while increasing earliness and reducing production costs is desperately needed by South Carolina cotton producers.

One production system that has received increased attention by industry, research personnel, and producers in recent years is ultra-narrow row (UNR) cotton production. Ultra-narrow row systems consist of planting cotton in narrow rows (15 inches or less) at extremely high populations (approximately 100,000 plants/A) and harvesting with a stripper harvester. Ultra-narrow row systems have the potential to increase earliness and reduce production costs due to the decreased plant size and shortened fruiting period that is associated with this system. Plants grown in ultra-narrow row systems reach full canopy closure earlier in the growing season and develop more of their bolls at first position sympodial fruiting sites located at lower nodal positions on the main stem compared to plants grown in conventional systems. Therefore, less time is required to set and mature a cotton crop with the UNR system, while yields should exceed or equal that of the conventional system. It is this earliness benefit and resulting reduction in input costs that is one of the main motivations for producer interest in ultra-narrow row systems in South Carolina.

Cotton performance in UNR systems was evaluated in the 1960's (Hughes and Tupper, 1965; Kirk et al., 1969; Parish et al., 1973; Tupper, 1966; Tupper and Hughes, 1964), and these studies showed UNR systems to be an acceptable alternative to conventional, wide-row cotton production. However, UNR systems failed to work consistently on commercial operations because of inconsistent yields, low cotton grades, weed control problems, and difficulty in controlling stalk growth. Since the late 1960's, new developments in production technology such as earlier-maturing cotton varieties with shorter stature, new plant growth regulators, improved over-the-top herbicide systems, the development of genetically engineered cotton varieties, and improvements in equipment technology have opened new possibilities for ultra-narrow row cotton systems. These new developments in production technology coupled with the continual economic pressure to lower production costs per pound of lint warrants re-evaluation of UNR systems in South Carolina.

Since cotton production is a highly complex system, changing to UNR systems will require the fine-tuning or adjustment of many management components. Management components that need evaluating include: planting dates, plant populations, varieties, defoliation programs, and plant growth regulators. Since the ideal plant density is one that provides maximum utilization of the environmental resources with a minimum of plant-to-plant competition for those resources, choosing the ideal plant population has a great potential to increase cotton yields. Recent developments in herbicide technology and biotechnology such as Staple, Buctril/BXN cotton, and Roundup Ready cotton can help contribute to successful weed control programs in a system that removes the possibility of cultivation and/or band application of herbicides. Planting short-statured, early-maturing varieties and using plant growth regulators appear to be important components of ultra-narrow row systems in order to control plant size and reduce trash and grade discounts. Stripper-harvesting is attractive to producers because the initial cost of the machine is about half the cost of spindle-pickers and maintenance is much less. However, reductions in grade and lint value due to trash and poor defoliation can offset any harvesting cost advantage. Good defoliation practices in UNR cotton is critical if these systems are to work for South Carolina cotton producers.

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## Research Objectives

To determine the feasibility of using transgenic cottons in ultra-narrow rows (15-in. rows or less) for cotton production in South Carolina; to evaluate the effectiveness of various row spacings, plant populations, varieties, defoliation programs, and mepiquat chloride management strategies for transgenic cottons in ultra-narrow row (UNR) systems; and to assess the effect of these various systems on cotton growth, maturity, and lint quantity/quality.

## Methods

**Location:** Pee Dee Research & Education Center, Florence, SC
**Three Field Studies:** Row Spacing x Variety Study; Row Spacing x Mepiquat Chloride Study; Row Spacing x Planting Date Study
**Replications:** 4
**Design:** Split Plot (Main Plots = Row Spacings; Subplots = Varieties, Mepiquat Chloride, Planting Dates)
**Plot Size:** 25 feet wide x 50 feet long

| Row spacing x Variety Study | Row Spacing x Mepiquat Chloride Study | Row Spacing x Planting Date Study |
|---|---|---|
| **Main Plots** | **Main Plots:** | **Main Plots:** |
| **(Row Spacings)** | **(Row Spacings)** | **(Planting Date)** |
| 1) 7.5 inch rows | 1) 7.5 inch rows | 1) April 20 |
| 2) 15 inch rows | 2) 15 inch rows | 2) June 1 |
| 3) 38 inch rows | 3) 30 inch rows | |
| | | |
| **Sub Plots:** | **Sub Plots:** | **Sub Plots:** |
| **(Varieties)** | **(Mepiquat Chloride)** | **(Row Spacing)** |
| 1) FM 832 | 1) untreated check | 1) 7.5 inch rows |
| 2) ST 474 | 2) four 4 oz/A appl. | 2) 38 inch rows |
| 3) ST BXN 47 | 3) two 8 oz/A appl. | |
| 4) SG 125 BR | 4) four 8 oz/A appl. | **Split-Split Plots:** |
| 5) PM 1220 BR | 5) four 12 oz/A appl. | **(Varieties)** |
| 6) DPL NuCotn 35B | | 1) DPL 655 BR |
| | | 2) FM 832 |
| | | 3) PM 1220BR |

## Summary

**Variety x Row Spacing Study**

Results indicated significant differences in seedcotton, lint yield, and gin turnout existed among row spacings and varieties. Averaged across years, cotton grown in 7.5 and 38 inch rows (1337 and 1327 lbs/A, respectively) produced more seedcotton than 15 inch rows (1080 lbs/A). Suregrow 125BR, ST BXN 47, and DPL 35B produced more seedcotton (1386, 1371, and 1311 lbs/A, respectively) than ST 474 (1258 lbs/A), Fibermax 832 (1207 lbs/A), and PM 1220BR (957 lbs/A). However, a significant row spacing x variety interaction was found for seedcotton. Highest seedcotton yields were attained for SG 125BR (1757 lbs/A) and ST BXN47 in 1999, and for ST 474 and Fibermax 832 in 2000 when grown in 7.5 inch rows compared to the other row spacings. Delta and Pineland 35B produced more seedcotton in 2000 when grown in 38 inch rows compared to narrower row spacings. Gin turnout was significantly reduced by narrow row spacings, with 7.5 and 15 inch rows averaging approximately 37% lint. Gin turnout for 38 inch rows averaged 41%.

**Row Spacing x Mepiquat Chloride Study**

Cotton grown in 7.5, 15, and 30 inch rows produced 1646, 1227, and 1439 lbs of seedcotton/A, respectively, in 1999. However, gin turnout was significantly lower (37 % lint) for 7.5 and 15 inch rows compared to 30 inch rows (41% lint). These differences in percent lint among row spacings negated the potential yield advantage for the 7.5 inch row spacing, resulting in similar lint yields for the 7.5 inch rows (616 lbs/A) and the 30 inch rows (585 lbs/A) in 1999. Lint yield in 15 inch rows averaged only 457 lbs/A in 1999. In 2000, lint yield was higher for cotton grown in 30 inch rows compared to narrower row spacings. No yield advantage was found in applying mepiquat chloride to plants grown in any row spacing.

**Row Spacing x Planting Date Study**

Averaged across years, cotton planted earlier than normal (April 20) produced more lint in 7.5 inch rows (lint yield = 546 lb/A) than in 38 inch rows (lint yield = 464 lbs/A). Cotton planted later than normal (June 1) produced more lint in 38 inch rows (lint yield = 658 lbs/A) compared to 7.5 inch rows (596 lbs/A). No significant row spacing x variety interactions were found with seedcotton, lint yield or gin turnout.

Table 1. Row Spacing x Variety Study.

| Variable | Seedcotton (lb/A) | | Gin Turnout (%) | | Lint Yield (lb/A) | |
|---|---|---|---|---|---|---|
| **Row Spac. (in)** | **1999** | **2000** | **1999** | **2000** | **1999** | **2000** |
| 7.5 | 1579 | 1095 | 37.2 | 37.8 | 587 | 416 |
| 15.0 | 1234 | 925 | 37.0 | 37.0 | 457 | 346 |
| 38.0 | 1529 | 1125 | 40.7 | 42.1 | 623 | 474 |
| | 0 | n.s. | ** | ** | ** | n.s. |
| Variety | | | | | | |
| SG 125BR | 1588 | 1184 | 37.7 | 38.2 | 600 | 454 |
| DPL 35B | 1502 | 1119 | 37.7 | 37.0 | 566 | 421 |
| PM 1220BR | 1465 | 448 | 38.2 | 37.9 | 563 | 170 |
| ST BXN47 | 1418 | 1323 | 39.1 | 40.5 | 554 | 537 |
| ST 474 | 1335 | 1181 | 39.7 | 40.9 | 531 | 483 |
| FM 832 | 1376 | 1037 | 37.6 | 39.4 | 518 | 409 |
| | * | ** | ** | ** | n.s. | ** |

Table 2. Row Spacing x Mepiquat Chloride Study

| Variable Row Spac. (in.) | Seedcotton (lb/A) | | Gin Turnout (%) | | Lint Yield (lb/A) | |
|---|---|---|---|---|---|---|
| | **1999** | **2000** | **1999** | **2000** | **1999** | **2000** |
| 7.5 | 1646 | 1938 | 37.3 | 37.6 | 616 | 729 |
| 15.0 | 1227 | 2167 | 37.1 | 37.5 | 457 | 809 |
| 30.0 | 1439 | 2211 | 40.7 | 38.8 | 585 | 855 |
| | ** | * | ** | n.s. | n.s. | * |
| Mepiquat Chloride | | | | | | |
| Untreated | 1416 | 2201 | 40.3 | 39.5 | 572 | 866 |
| 4 @ 4 oz/A | 1466 | 2201 | 37.8 | 37.7 | 560 | 829 |
| 2 @ 8 oz/A | 1488 | 2040 | 38.1 | 37.6 | 563 | 767 |
| 4 @ 8 oz/A | 1360 | 2057 | 38.0 | 38.0 | 519 | 775 |
| 4 @ 12 oz/A | 1457 | 2026 | 37.6 | 37.2 | 547 | 751 |
| | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |

Table 3. Row Spacing x Planting Date Study.

| Variable | Seedcotton (lb/A) | | Gin Turnout (%) | | Lint Yield (lb/A) | |
|---|---|---|---|---|---|---|
| **Planting Date** | **1999** | **2000** | **1999** | **2000** | **1999** | **2000** |
| April 20 | 1448 | 1181 | 37.8 | 39.6 | 546 | 464 |
| June 1 | 1681 | 1670 | 36.4 | 38.2 | 609 | 645 |
| | n.s. | n.s. | * | n.s. | n.s. | n.s. |
| Row Spac. (in.) | | | | | | |
| 7.5 | 1703 | 1452 | 35.8 | 37.0 | 610 | 537 |
| 38.0 | 1425 | 1399 | 38.4 | 40.8 | 547 | 571 |
| | * | n.s. | * | ** | n.s. | n.s. |
| Variety | | | | | | |
| DPL 655BR | 1666 | 1547 | 35.6 | 37.8 | 590 | 581 |
| PM 1220BR | 1686 | 1253 | 38.6 | 40.1 | 647 | 501 |
| FM 832 | 1340 | 1475 | 37.1 | 38.9 | 496 | 580 |
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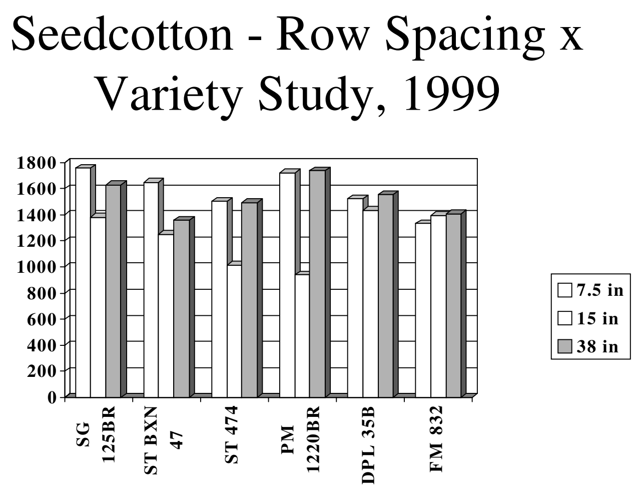


Figure 1. Seedcotton yeilds as influenced by variety and row spacing in 1999, PDREC, Florence, SC.

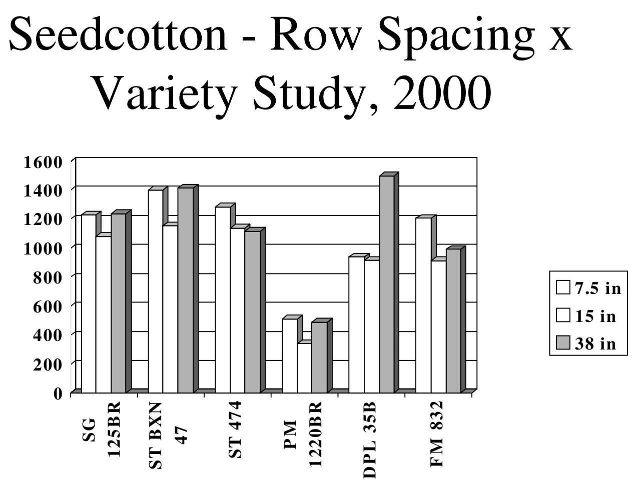


Figure 2. Seedcotton yeilds as influenced by variety and row spacing in 2000, PDREC, Florence, SC.

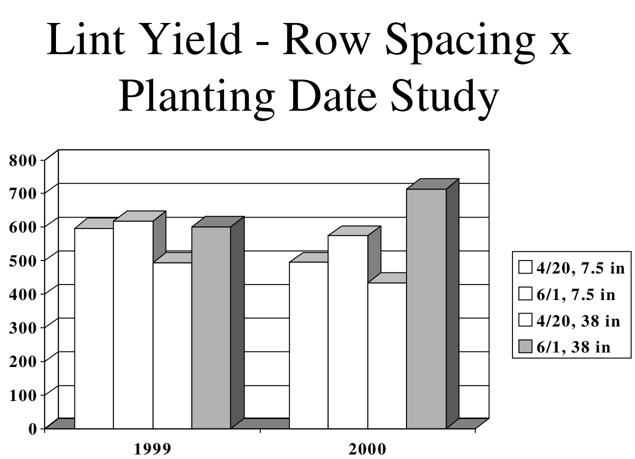


Figure 3. Lint yield as influenced by row spacing and planting date, PDREC, Florence, SC.