2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

COMPARISON OF CONVENTIONAL AND TWIN-ROW PRODUCTION SYSTEMS ON COTTON GROWTH AND DEVELOPMENT

W. James Grichar and Brent A. Besler
Beeville, TX
Robert G. Lemon and D. Joel Pigg
College Station, TX

Abstract

Due to an increase in interest in the twin-row system of production in other crops along the upper Texas Gulf Coast, a study was initiated at the Texas Agricultural Experiment Station research site near Yoakum,TX during the 2003 growing season to compare a conventional (36-inch) row spacing with a twin-row system (spaced 4 to 6-inch apart) on a single bed under rain-fed conditions for cotton (*Gossypium hirsutum* L.) development and yield. Seeding rates were 3.4 (49,400 seed/A), 5.2 (75,500 seed/A), and 6.9 (100,100 seed/A) seed per foot based on the planted area. Rainfall during the early part of the growing season was below normal; however, rainfall during July and August was above normal. A comparison of the conventional and twin-row system showed no difference in cotton plant height, total main stem nodes, percent fruit retention at first position, cotton yield, or percent cotton turnout between the two systems. Actual plant populations were 3.6, 4.2, and 5.3 plants per foot. No significant difference in plant height, total main stem nodes, percent fruit retention at first position, cotton yield, or percent cotton turnout was noted between plant populations.

Introduction

Research on ultra narrow cotton has been conducted for the past several years in various cotton production areas across the U.S. However, very little research has been conducted on the effects of a twin-row system (two rows spaced approximately 4 to 6-inch apart on a single bed) on cotton growth and yield along the upper Texas Gulf Coast. Several studies have demonstrated the benefit of decreased row spacing on early season canopy development in cotton, corn (*Zea mays* L.), and soybean [*Glycine max (*L.) Merr.] (Heitholt et al.,1992; Culpepper and York, 2000; Tharp and Kells, 2001; Reddy, 2001; Esbenshade et al., 2001). In peanuts (*Arachis hypogaea* L.), Jaaffar and Gardner (1988) reported that narrow and twin-row patterns had greater ground cover, leaf area indices, canopy light interception, crop growth rates, and ultimately higher pod yields when compared to a conventional row pattern.

Seedlings in close proximity to each other express phytochrome-mediated responses by developing narrow leaves, long stems, and less massive roots (Kasperbauer and Karlen, 1994). Planting a crop in a pattern that equalizes the spacing of plants within and between rows can increase plant biomass and leaf area index (Bullock et. al., 1988). Reduced row spacings increased the total interception of photosynthetic active radiation by the corn canopy and redistributed the radiation toward the top of the canopy (Ottman and Welch, 1989).

Reduced row spacings are also thought to increase weed control by increasing the competitiveness of a crop with weeds and by reducing light transmission to the soil surface (Tharp and Kells, 2001). Teasdale (1995) showed that reduced row spacing and increased corn populations decreased weed growth in the absence of herbicides and shortened the time of canopy closure by one week.

Materials and Methods

A field study was conducted during the 2003 growing season at the Texas Agricultural Experiment Station research site near Yoakum, TX. Soil type was a Denhawken-Elmendorf complex (fine, montmorillonitic, hyperthermic Vertic Ustochropts-Argiustolla) with a pH 6.8 and less than 1% organic matter. Field preparation consisted of fall subsoiling, disking, and bedding. In the spring, just prior to planting, beds were conditioned nearly flat to enable cotton planting in twin rows.

The test design was a randomized complete block design with four replications and treatments arranged factorially. Variables were row spacing (twin-row, conventional) and desired plant populations (3.4, 5.2, and 6.9 plants/ft). Plot size was 6 ft wide by 30 ft long. Row spacing for the conventionally planted cotton was 36 in apart while twin-rows were planted 4 to 6 in apart on a single bed. All plots were planted with ST4892RR cotton variety on April 22 using a Monosem precision planter (Monosem ATI, Inc; Lenexa, KS 66219). Desired plant populations were per planted foot. Weed control followed recommendations of the Texas Cooperative Extension.

Data collected included actual plant population counts, cotton plant heights, and yield data. Plant populations counts were taken approximately 4 wk after planting while plant height measurements were recorded approximately 14 wk after cotton planting. Cotton was handpicked from two rows by 15 ft long and cleaned of all debris. Weights were recorded and per acre

yields determined. Data were analyzed using analysis of variance, and means were separated using Fisher's Least Significant Differences Test at the 5% probability level.

Results and Discussion

No significant differences were noted in cotton plant growth and development (Fig. 1 and 2) or yield (Fig. 3) between twin or conventional row spacing. Graterol et al. (1996) reported that soybean in the twin-row system had no yield advantage over the conventional single row system in a year with yield-limiting conditions. However, in a year with no yield-limiting conditions, the twin-row planting systems offered yield advantages over a single-row planting system. During the 2003 growing season, below average rainfall was received during May and June which may have accounted for slowed growth during this period. However, rainfall was above average for July and August.

Desired and actual plant populations were similar (Fig. 4). Plant populations did not have a significant effect on cotton growth and development (Fig. 5) or yield (Fig. 6). Buehring and Dobbs (2000) noted no difference in cotton development and yield when plant populations varied from 90,000 to 175,000 seed/A. Although our seeding rates were lower for the conventionally planted cotton (49,000 to 100,000 seed/A), when planted in the twin-row system the seeding rates were similar to those of Buehring and Dobbs (2000).

Literature Cited

Buehring, N. and R. Dobbs. 2000. UNR cotton plant effect on growth and yield. Proc. Beltwide Cotton Conf. 1:660.

Bullock, D. G., Nielsen, R. L., Nyquist, W. E. 1988. A growth analysis comparison of corn growth in conventional and equidistant plant spacing. Crop Sci. 28:254-258.

Culpepper, A. S. and York, A. C. 2000. Weed management in ultra narrow row cotton (*Gossypium hirsutum*). Weed Technol. 14:19-29.

Esbenshade, W. R., Curran, W. S., Roth, G. W., Hartwig, N. L., and Orzolek, M. D. 2001. Effect of row spacing and herbicides on burcumber (*Sicyos angulatus*) control in herbicide-resistant corn (*Zea mays*). Weed Technol. 15:348-354.

Graterol, Y. E., Elmore, R. W., Eisenhauer, D. E. 1996. Narrow-row planting systems for furrow-irrigated soybean. J. Prod. Agric. 9:546-553.

Heitholt, J. J., Pettigrew, W. T., Meredith, Jr., W. R. 1992. Light interception and light yield of narrow-row cotton. Crop Sci. 32:728-733.

Jaaffar, Z. and F. P. Gardner. 1988. Canopy development, yield and market quality in peanut as affected by genotype and planting pattern. Crop Sci. 28:299-305.

Kasperbauer, M. J. and Karlen, D. L. 1994. Plant spacing and reflected far-red light effects on photosynthesis allocation in corn seedlings. Crop Sci. 34:1564-1569.

Ottman, M. J. and Welch, L. F. 1989. Planting patterns and radiation interception, plant nutrient concentration, and yield in corn. Agron. J. 61:279-282.

Reddy, K. N. 2001. Broadleaf weed control in ultra narrow bromoxynil-resistant cotton. Weed Technol. 15:497-504.

Teasdale, J. R. 1995. Influence of narrow row/ high population corn (*Zea mays*) on weed control and light transmittance. Weed Technol. 9:113-118.

Tharp, B. E. and Kells, J. T. 2001. Effect of glufosinate- resistant corn (*Zea mays*) population and row spacing on light interception, corn yield, and common lambsquarters (*Chenopodium album*) growth. Weed Technol. 15:413-418.

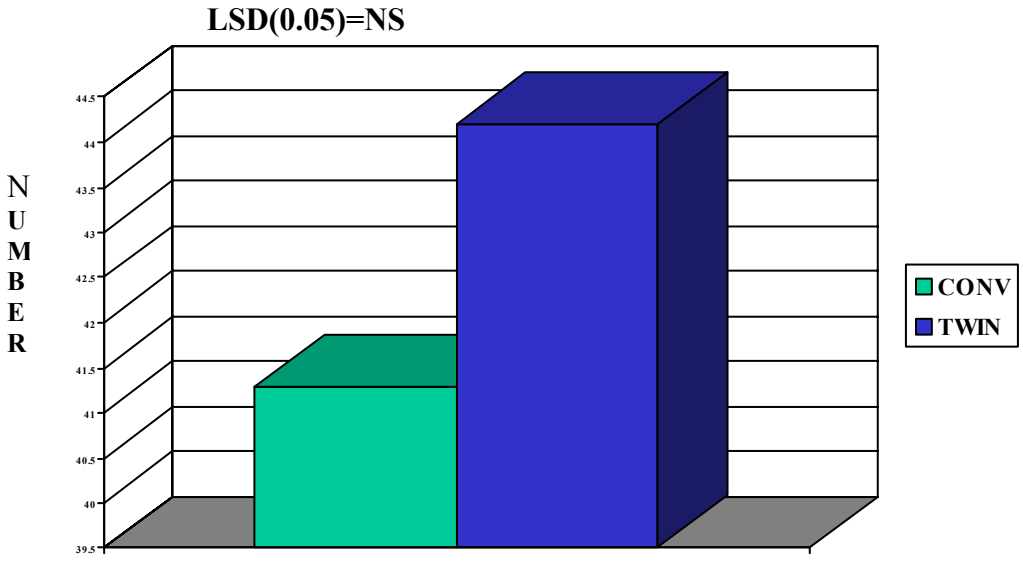

Figure 1. Total Number of Main Stem Nodes.

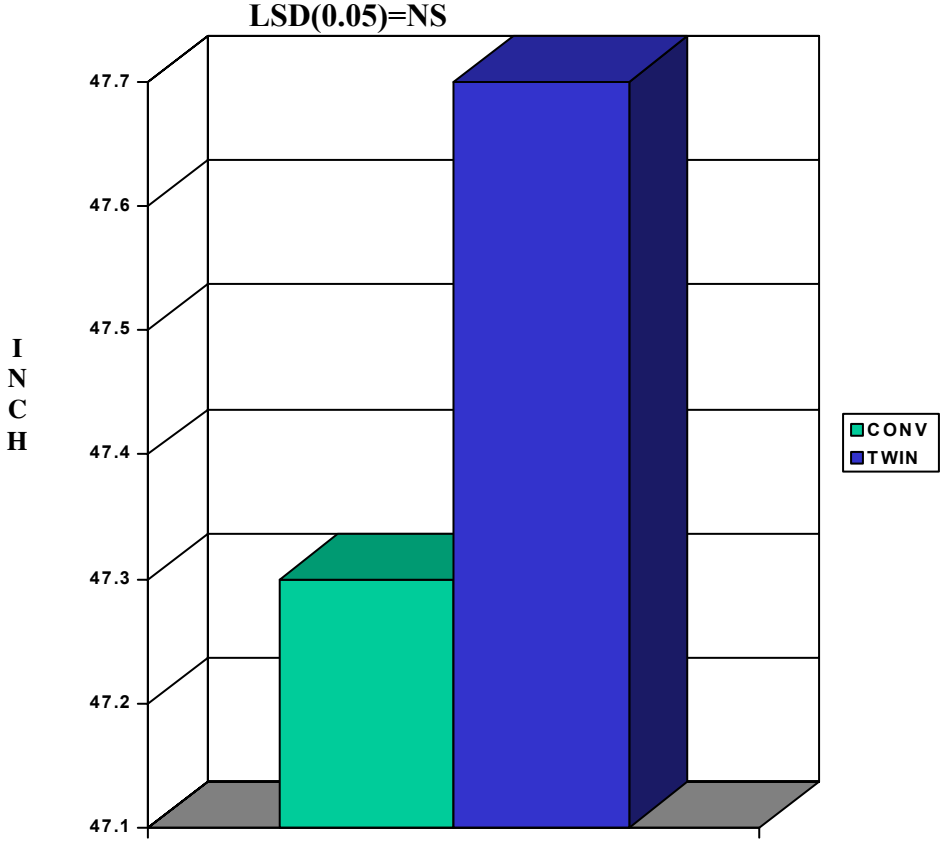

Figure 2. Plant Height Taken 16 wks after Planting.

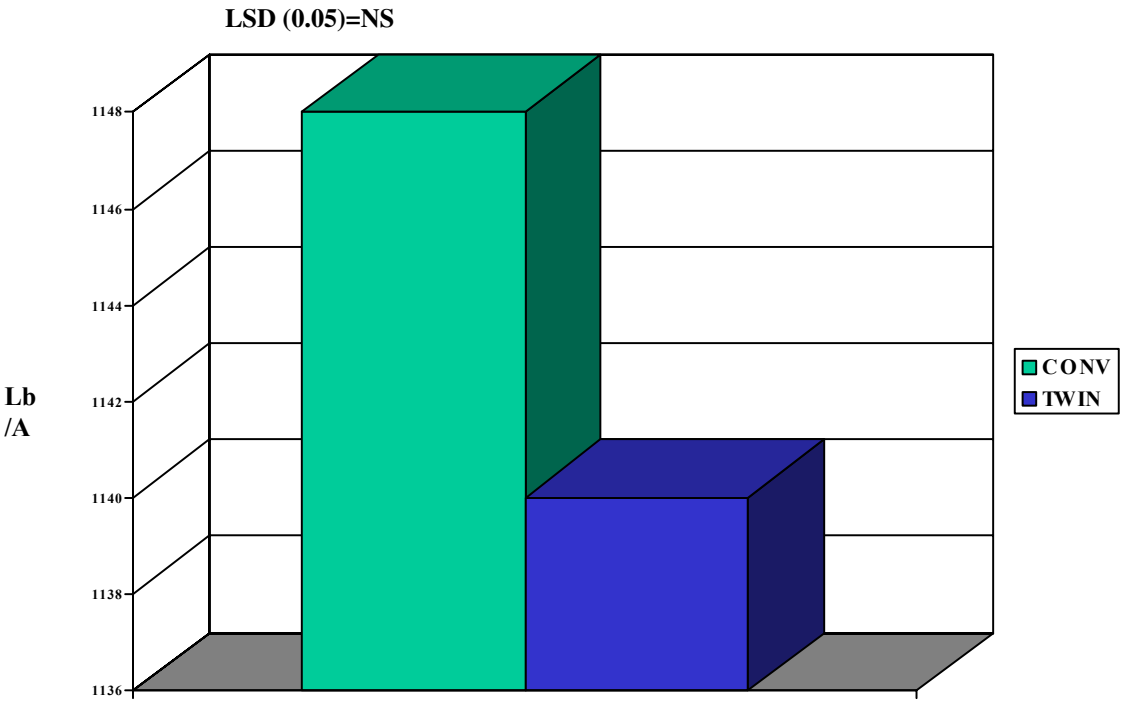

Figure 3. Lint Yield Comparison of Conventional and Twin Rows.

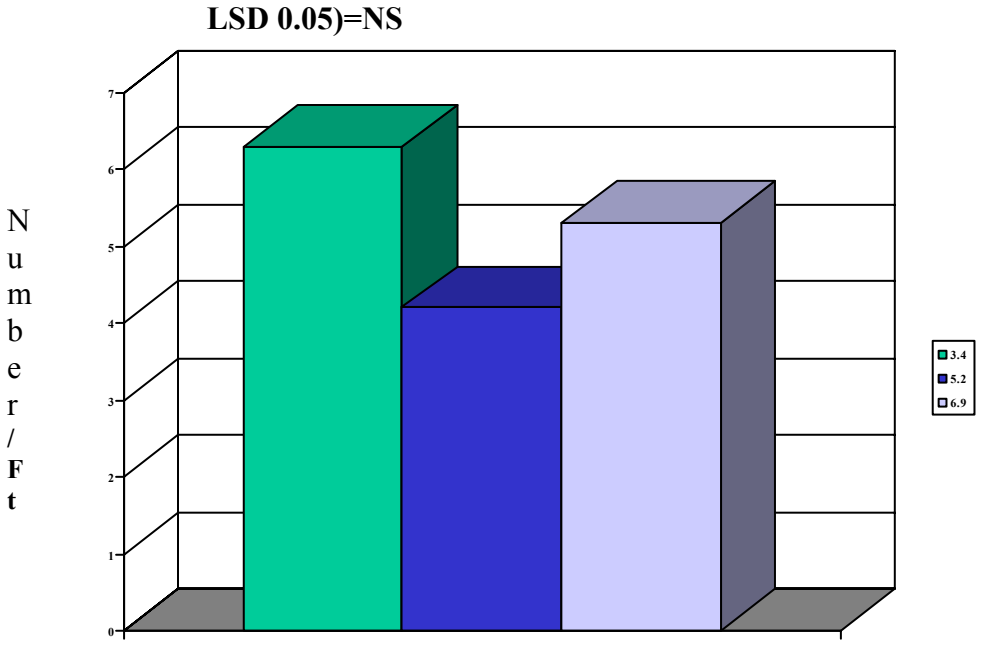

Figure 4. Desired and Actual Plant Populations.

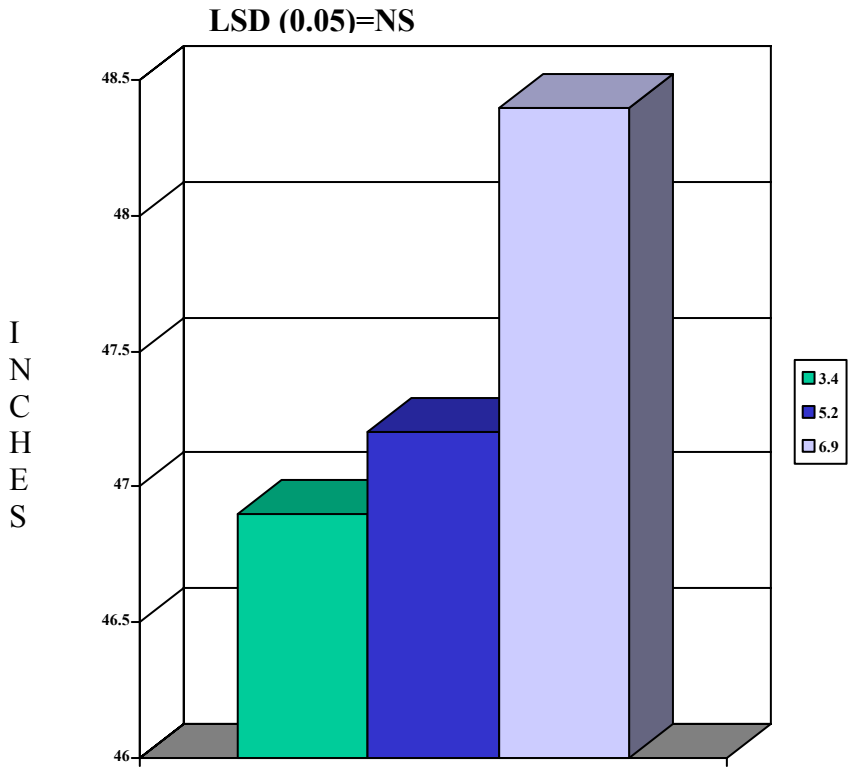

Figure 5. Plant Height with Desired Plant Populations.

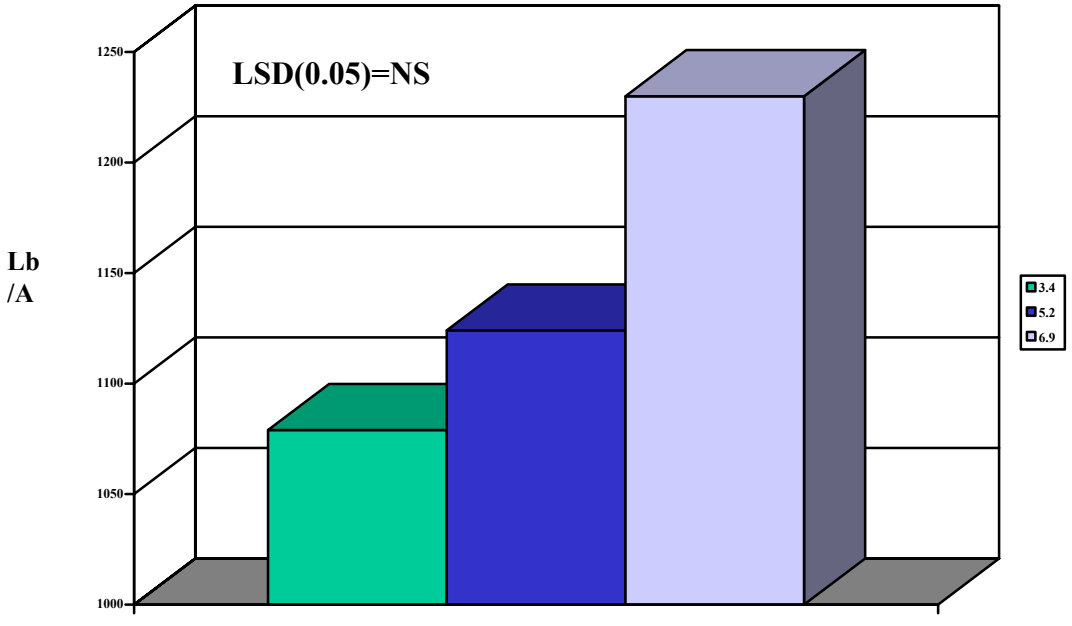

Figure 6. Cotton Lint Yield with the Desired Plant Populations.