Double Row and Conventional Cotton in Tulare County, California

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Abstract

Studies were conducted in 2002 and 2003 to compare different plant densities in double row and single row seventy-five -centimeters bed cotton near Visalia, California. For 2002, the double row had final plant densities of 9, 14, and 20 thousand plants per hectare. The single row had 19, 30, and 33 thousand plants per hectare. Higher densities were attempted but there was approximately 40 percent stand loss using the Great Plains planter in 2002. In 2003, the double row had 18, 24, and 29 thousand plants per hectare using a “Monosem” planter. The single row had 12, 17, 24, and 32 thousand plants per hectare. Light readings showed that double row cotton intercepted more light early in the season and about 5-6 days ahead in terms of light interception. In 2002 there were not significant lint yield differences between double row cotton on 9, 14, or 20 thousand plants per hectare or single row seventy-five centimeters at 19 thousand plants per hectare. Single row densities of 29 or 33 thousand plants per hectare significantly reduced yields. In 2003, there were no significant differences between double row 30-centimeters cotton with densities from 18 to 29 thousand plants per hectare and single row 75-centimeters cotton with densities of 30 to 32 thousand plants per hectare. There were no significant differences between mepiquat chloride application treatments in either year.

Media Summary

Double row Acala cotton did not increase yields compared to conventional irrigated cotton on vigorous, high yielding location.

Key Words

Densities, spacing

Introduction

In an attempt to decrease production costs of cotton and perhaps raise yields, a unique variation of ultra narrow row production was initiated in Merced County in 1998. The planting configuration used two seed lines of cotton, seventeen to twenty five centimeters apart, on a 75-centimeters bed. More than 400 hectares of double row 75 centimeters cotton were planted in 2001 and 2002 at various locations in the San Joaquin Valley (mostly in the northern San Joaquin Valley) using either a “Great Plains” drill type planter or a “Monosem” brand planter designed to precisely place seeds in two lines as close as 17.5 centimeters apart, or variations on the sled planter used in the earlier years of field trials. Sites have been initiated at several other locations in the San Joaquin Valley in recent years also to investigate the potential utility of the double-row planting concepts. Similar studies were being conducted by the University of Arizona with double row systems on 38-centimeters rows.

Using the double row management approach assumes that with the high density planting: Cotton should more effectively compete with weeds and achieve earlier row closure and shading of beds and furrows than with single-row plantings, resulting in less need for cultivation and perhaps herbicides. Higher plant densities mean that fewer bolls are required per plant to achieve the same yield, as long as average boll size is not significantly affected. It was also assumed the higher rates of mepiquat chlorate would be needed in the double row system.

Previous University of California plant density studies on single row 95 to 100 centimeters beds have not shown any yield advantage to increasing populations greater than 18,000 plants per hectare. Generally top yields were obtained, as long plants were a minimum of one plant per foot of row on a uniform stand. Results of similar studies on 75-centimeters beds have been more variable but showing a similar trend.

Materials and Methods

Studies were conducted in 2002 and 2003 to compare different plant densities in double row and single row seventy-five-centimeters cotton near Visalia, California. Acala cotton variety Phytogen 29 was planted on April 12, 2002 and on April 8 in 2003. The plot size for both years was 6 meters by 1235 meters, replicated four times. The studies were harvested on October 17 and 18 in 2002 and November 17 in 2003. The studies had six plant populations. For 2002, the double row had final plant densities of 9, 14, and 20 thousand plants per hectare. The single row had 19, 30, and 33 thousand plants per hectare. Higher densities were attempted but there was up to 40 percent stand losses using the Great Plains planter. In 2002, the Great Plains 10 bed double row planter was used. A significant problem was how to maintain adequate moisture for both seed lines when planting two lines closer to the bed edge rather than one line down the center. In 2003, the Monosem 6 bed double row planter was provided by Monsanto. In 2003, the double row had 18, 24, and 29 thousand plants per hectare. The grower capped the double row by using a sweep down the furrow. This greatly improved the final stand compared to the previous year. The single row had 30, 17, 24, and 32 thousand plants per hectare.

In 2002, the trial received two applications of mepiquat chloride at 9 nodes and 13 nodes. Treatments were split with half of the treatment receiving the standard rate as determined by plant based measurements and the other half receiving a higher rate. In 2003, the trial received one application of mepiquat chloride at 9 nodes. By adding mepiquat chloride the 20 row plots were split into 10 row plots. In 2002, the first 10 rows of the 20 row plot received 295 mL of mepiquat chloride at 9 nodes and the last 10 rows received 89 mL at 9 nodes. Then at 13 nodes the first 10 rows received 177 mL of mepiquat chloride and the last 10 rows received 295 mL of mepiquat chloride. In 2003, the different plant population treatments were split with the first 10 rows received 89 mL of mepiquat chloride and the last 10 rows received 177 mL of mepiquat chloride.

Photo synthetically active radiation (PAR) was measured between 11 A.M. and 1 P.M. One reading above the canopy and 4 readings beneath the canopy (ground level) were taken by placing the ceptometer vertical to the crop row. Percent light interception was calculated as the difference between PAR above and below the canopy: PAR = [(Above-below)/above] X 100.

Results and Discussions

In 2002, the grower had planting difficulties with the Great Plains planter; often one row in double row plantings came up very well, and the other row spotty. Weed control was not a major problem in field due to past work. The double row treatments were much slower to cultivate. Black nightshade was treated with prythiobac sodium and annual morningglory was treated with prometryn. The grower wished he had used a glyphosate tolerant variety which would have made weed control easier.

Plant populations achieved in 2002 was not consistently as high as those in other dbl-75 plantings, such as achieved by in Merced County studies. In 2003, the plant population was more consistent with other plantings. Capping on double row was done in 2003 and not in 2002. In 2003, double row plants started out slower than the single row plants. Harvest difficulties in 2002 slowed pickers speed (shallow furrows, rows closed and harder to see, guess rows), but in 2003 there were no harvest difficulties partly because a GPS system was used in all tillage and planting operations...

Double row cotton intercepted more light early in the season (Fig. 1). Treatment differences (double vs. single row was evident till July 10. On July 15 and later there were no treatment differences). Double rows were about 5-6 days ahead in terms of light interception.

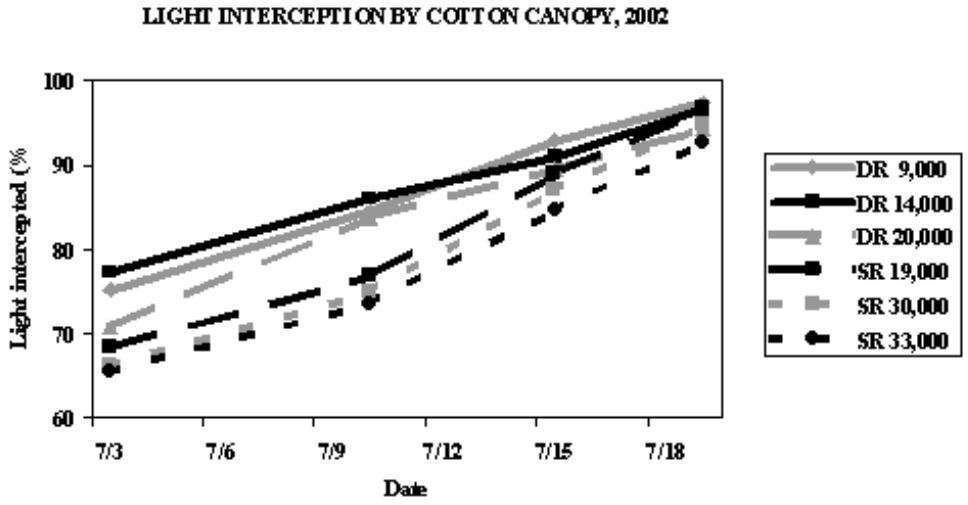

Figure 1. Effect of light intercept varying in plant densities in double (DR) and single (SR) rows

Differences were more evident in 2002 than in 2003 (Fig. 2). Few weeds were observed at end of the season so we could not tell what effect light interception had on the weeds. However, the comparison tests done to date with conventional varieties and a more traditional weed management program have shown similar potential for favorable yield responses and some cost savings, so herbicide-resistant transgenic cotton may be a good choice, but does not appear to be a requirement, for this system.

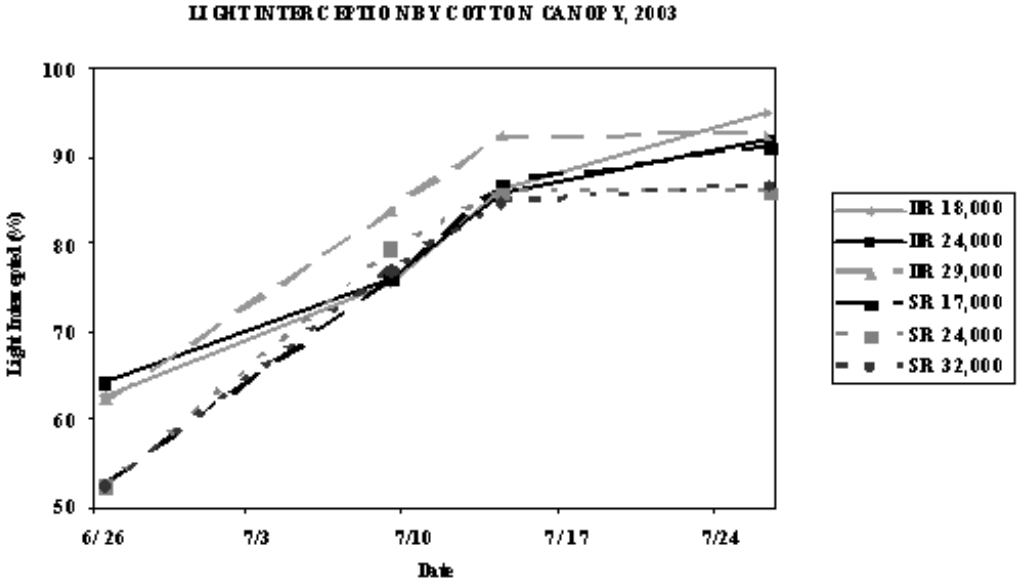

Figure 2. Effect of light intercept varying in plant densities in double (DR) and single (SR) rows

In 2002 there were no significant yield differences between double row cotton on 9, 14, or 20 thousand plants per hectare or single row seventy-five centimeters at 19 thousand plants per hectare. Single row densities of 30 or 33 thousand plants per hectare significantly reduced yields (Fig.3).

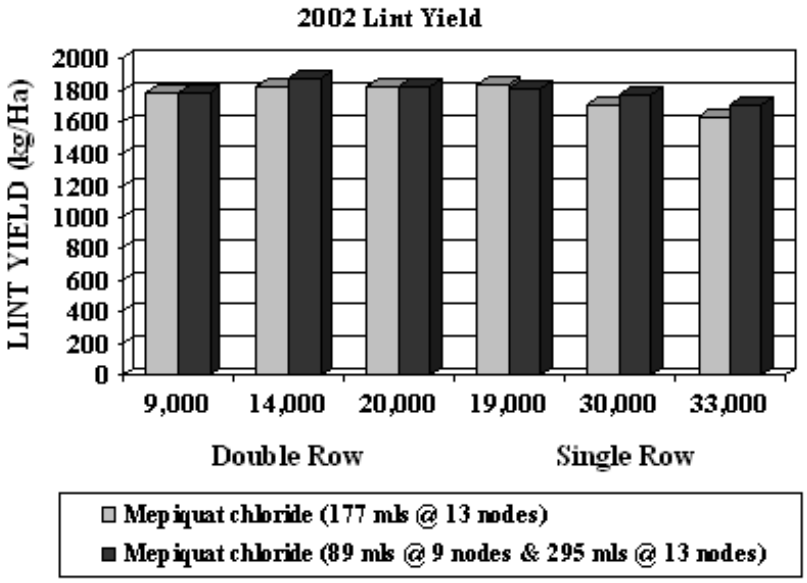

Figure 3. Effect of varying plant densities in double (DBL) and single (SGL) rows

There were no significant differences between mepiquat chloride treatments. In 2003, there were no significant differences between double row 30-centimeters cotton with densities from 18 to 29 thousand plants per hectare and single row 75-centimeters cotton with densities of 30 to 32 thousand plants per hectare. There were no significant differences between mepiquat chloride treatments (Fig.4).

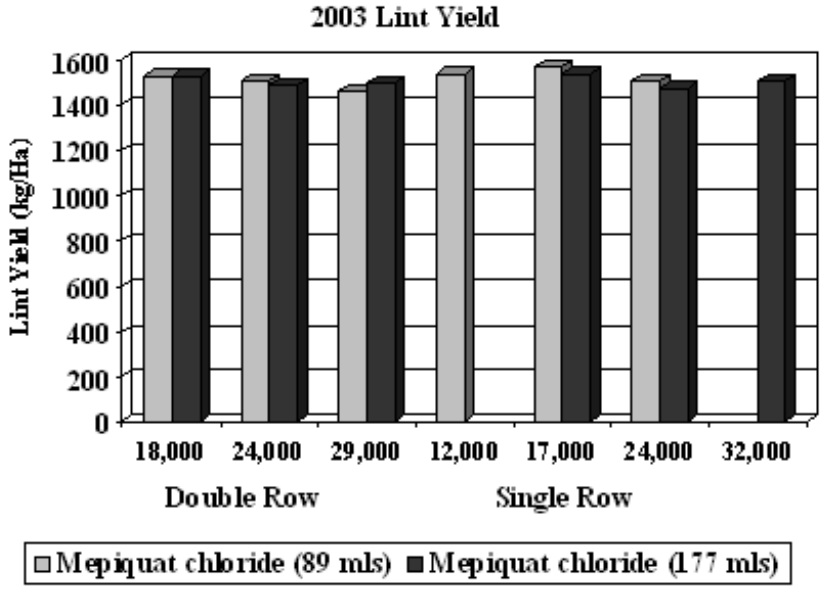

Figure 4. Effect of varying plant densities in double (DBL) and single (SGL) rows