

IMPACT OF PLANTING PATTERN AND PLANTING POPULATION ON COTTON DEVELOPMENT, FRUIT DISTRIBUTION, YIELD, AND FIBER QUALITY

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Abstract

A study was conducted in 2 locations in Mississippi (Starkville and Stoneville) evaluating the impact of planting pattern and planting population on cotton development, fruit distribution, yield, and fiber quality. Phytogen 443 W3FE was planted at 4 populations: 37,065, 74,130, 111,195, and 148,260 seed per hectare (seed ha⁻¹) down the row in a solid and a 1x1 skip row configuration. Stand counts, bloom data and cracked boll data were all taken in order to evaluate maturity. Box mapping was done to assess fruit distribution as well as fiber quality throughout the plant. Yield data was taken to evaluate the effectiveness of each treatment.

Introduction

Traditionally cotton row spacings have been 97-102 cm. In recent years there has been a growing interest in 2 X 1 skip row planting configuration where every third row is left fallow in an effort to reduce input costs and mitigate disease (Gawthmey et al., 2008). There is very little research available on a more aggressive skip row configuration also known as ultra-wide row. Ultra-wide row is a 1 X 1 skip where every other row is left fallow. This would allow for even greater input cost reduction as well as allow more airflow through the canopy to mitigate diseases such as target spot.

Current recommended seeding rates in Mississippi are 99,000-111,000 seed/ha. Previous research by Jones et al., 1997 found that cotton has the ability to adapt to its environment. When seeding rates are reduced, the plant is able to grow laterally and produce more fruiting positions to compensate for the reduced seeding rate.

Methods

A study evaluating the impact of planting pattern and planting population on cotton development, fruit distribution, yield, and fiber quality will be conducted in Starkville (33° 28' 30.87" N 88° 46' 17.81" W) and Stoneville (33° 24' 41.35" N 90° 54' 20.94" W) Mississippi. Eight-row plots will be planted to a single cotton variety: Phytogen 443 W3FE (Corteva agriscience, P.O. Box 80735 Chestnut Run Plaza 735 Wilmington, DE). Plot dimensions will be 12.2 meters long with bed spacings of 97 and 102 cm in Starkville and Stoneville, respectively. Factor A will be planting pattern: solid and 1x1 skip-row, and Factor B will be planting population: 37,065, 74,130, 111,195, and 148,260 seed per hectare (seed ha⁻¹). Plots will be planted with a four-row Almaco cone planter (Almaco cone planter, 99 M Avenue Nevada, Iowa 50201-1558), modified for small plot research. Initial seeding rates will be 12,355 seed ha⁻¹ beyond the final objective and will then be manually thinned to the desired final plant population as indicated above. Cotton standcounts will be taken at 14 and 21 days after planting (DAP) from the middle two rows of each plot. Height, node, nodes above white flower (NAWF), and first fruiting branch (FFB) will be taken during the first week of bloom. Height, node, nodes above cracked boll (NACB), upper most harvestable boll, FFB, number of open and closed bolls will be evaluated immediately prior to cotton defoliation. Immediately prior to harvest, cotton will be box mapped following the guidelines set by Jenkins *et al.* (1990). All plants in a three row-meter section from row two of each plot will be cut and the total number of plants will be recorded. Each boll will be hand harvested and its node and position recorded with respect to its location on the plant. Each position will be weighed individually and each position with a seedcotton weight of greater than or equal to 75 grams will be ginned on a micro cotton gin. Lint yield will be obtained, and fiber samples will be sent to the USDA fiber quality testing lab in Memphis, Tennessee. Fiber quality will be analyzed by position and vertical distribution throughout the plant. Seedcotton will be harvested

from the center two planted rows of each plot with a 2-row bagging cotton picker (John Deere 9930, One John Deere Place Moline, IL 61265) that has been modified for small plot research. All data will be subjected to analysis of variance using the PROC MIXED procedure in SAS v 9.4. Means will be separated using Fisher's Protected LSD at an alpha-level of 0.05.

Results

When pooled across all locations and row spacings, Plant heights at pre-bloom were significantly lowest when plant population was 37,000 plants/ha although there were no significant differences in treatments of 74,000, 111,000, or 148,000 plants /ha. (Figure 1). This indicates that the plants were able to grow laterally due to increased spacing. When pooled across all locations and row spacings, there were no significant differences with respect to lint yield by population (Figure 2). 1 X 1 skip row planting pattern significantly out yielded solid planting pattern when pooled across all locations and plant populations (Figure 2).

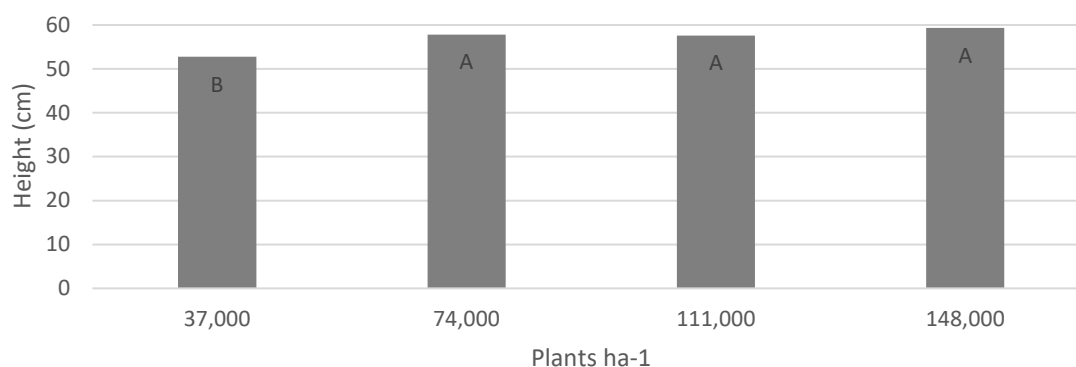


Figure 1. Plant Height by Population

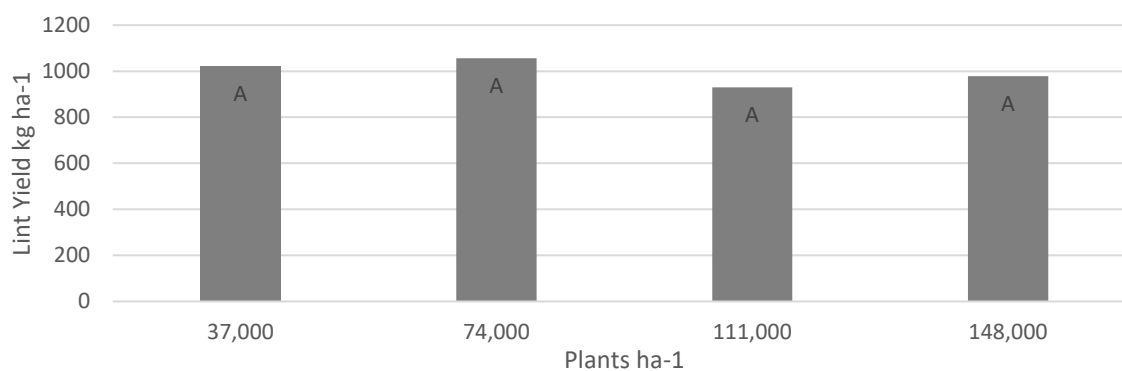


Figure 2. Yield by population.

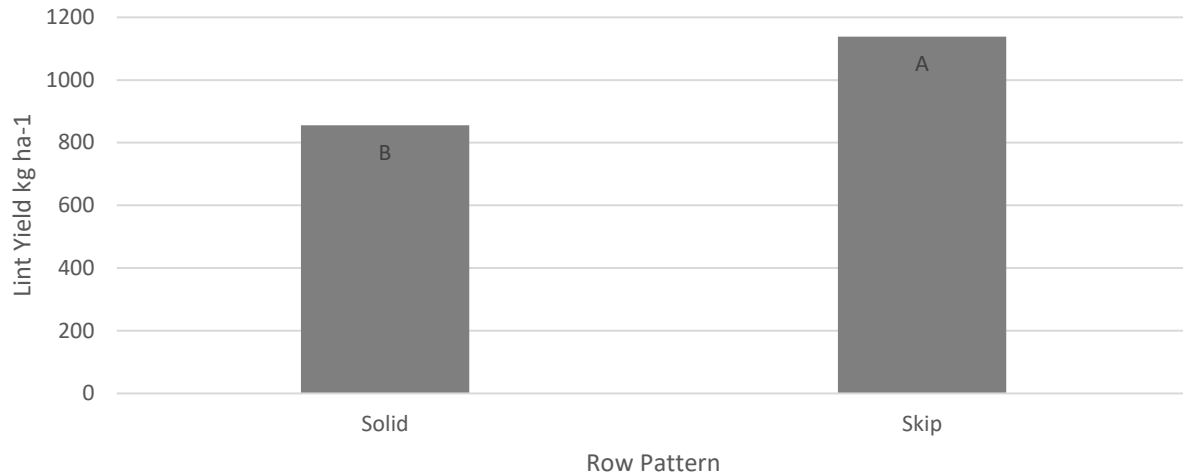


Figure 3. Yield by row pattern.

Summary

Results show that there is no positive yield response due to plant population which is similar to what was found by Jones et al. in 1997. This would suggest that growers could reduce seeding rates from the current recommendation of 99,000 – 111,000 seed/ha. This could prove to increase overall profit margins.

Research from the first year of this study shows that a 1 X 1 skip row configuration out yielded the solid planted configuration. This was an unexpected result. Previous research found by Gawthmey et al. 2008 showed that skip row cotton may be more profitable but not out yield solid planted cotton. More research needs to be done before the recommendation can be made. However, the 1 X 1 skip row configuration does seem to have some benefits over solid configurations.

Box mapping data have been collected but have not yet been analyzed. These data will be essential to decipher the fruit distribution and yield of various planting patterns and populations.

References

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Jones, M. A., & Wells, R. (1997). Dry matter allocation and fruiting patterns of cotton grown at two divergent plant populations. *Crop science*, 37(3), 797-802.