Plant Population Evaluation for Upland Cotton

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Introduction

One of the most important and critical stages in the production of a cotton crop is the establishment of a good vigorous stand early in the season. An integral part of having a healthy, vigorous stand that will enhance the potential of maximum yield is that of plant population, which is one aspect of a production system under the control of the producer. Current recommendations for plant populations in Arizona for both Upland and Pima cotton is in the range of 20,000-60,000 plants per acre (ppa) with an optimum of 25,000-45,000 ppa. Plant populations that are less than 15,000 ppa or more than 60,000 ppa can cause problems in management and greatly decrease the yield potential of the crop. A cotton plant has a tremendous ability to compensate for varying populations and not experience a reduction in yield, which is why the recommendations have such a wide range of populations. When planting a crop and trying to achieve an optimum plant population several things must be considered. With the large selection of varieties pounds of seed/acre is no longer sufficient in determining an optimum planting rate to achieve a desired plant population. Seed size, growth pattern, percent germination, seedling vigor, and soil conditions must be taken into account when planting occurs. Warm and cool germination tests can help in determining the number of seeds that need to be planted per row-foot in order to acheive approximately 2-3 plants per row-foot. Once the desired planting rate is accomplished and the stand is established it is recommended that stand counts are taken in order to get an idea of what the actual population is. Stand counts are relatively easy to take and can provide an important piece of information for management decision making. Table 1 shows the length of row that equals 1/1000 of an acre, depending on row width. Measuring this distance and counting the number of plants in this length of row then multiplying that number by 1,000 results in the number of plants per acre.

Materials and Methods

In an effort to confirm the recommendations contained in this bulletin an experiment was conducted during the 1993 growing season near Coolidge, AZ. The study was set up with three treatments: high, low, and optimum population. The three treatments were replicated four times in four row plots. Plant populations were taken at the beginning of the season and also at the end of the season (post harvest). Yield data was collected from the four rows of each plot from which yields per acre were calculated. Table 2 outlines the plant populations for each of the three treatments.

Results

Lint yields are presented in table 3. Overall yields on this study were lower than the average for that area due to early season vigor problems. We were however able to establish treatments of varying populations which revealed a decrease in yield due to the decrease in plant population. The field conditions did not provide for the establishment of a treatment that represented the extreme high populations.

Table 1. Row lengths equal to 1/1000 of an acre for several row spacings.

Row Spacing (in.)	Row length equal to 1/1000 acre
40"	13'1"
38"	13'9"
36"	14'6"
30"	17'5"

Table 2. Plant populations for test conducted in Coolidge, AZ, 1993.

Treatment	Plant population	
	Early Season	End of Season
	----------ppa----------	
1	37485 a*	30205 a*
2	27970 b	21952 ab
3	19717 b	16450 b
$LSD_{0.05}$	9415	9392
OSL**	0.0106	0.019
C.V.(%)§	19.17	49.26

*Means followed by the same letter are not sognificantly different according to a Fisher's LSD.
**Observed Significance Level.
§Coefficient of variation.

Table 3. Lint yield for population test conducted in Coolidge, AZ, 1993

Treatment	Yield (lbs lint/acre)
1	977 a*
2	757 ab
3	656 b
$LSD_{0.05}$	242.5
OSL**	0.0444
C.V.(%)§	17.58

*Means followed by the same letter are not significantly different according to a Fisher's LSD.
**Observed Significance Level.
§Coefficient of variation.