



VARIETAL RESPONSES OF COTTON TO NITROGEN FERTILIZATION¹

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RESEARCH PROBLEM

Growth and yield response of cotton (*Gossypium hirsutum* L.) varieties to nitrogen (N) fertilization is an ongoing concern of cotton producers in Arkansas (Maples and Frizzell, 1985). New varieties, both genetically engineered and traditional, are continually introduced into Mississippi Delta production systems. Advantages of these new varieties include enhanced pest resistance, superior lint quality, faster maturity, and other new characteristics. The objective of this study was to determine the responses of new varieties to N fertilization.

BACKGROUND INFORMATION

Development and release of new cotton cultivars have increased the diversity of cotton in the Delta. Varieties now available for use in the Delta may possess genetically engineered traits for pest resistance as well as superior yield, rapid maturity, and improved fiber properties. The genetic variability of currently available varieties indicates that crop growing practices, such as fertilization, might differ to achieve optimal yields. Optimizing N fertilization for individual cotton varieties is a possible way of tailoring production practices to achieve optimal economic returns.

RESEARCH DESCRIPTION

Evaluation of responses of cotton varieties to N fertilization began at the Southeast Branch Experiment Station in 1989 (McConnell et al., 1993). The varieties tested

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change as new varieties are introduced into the Delta region. Four years of data, 1997 through 2000, are available from the current test. Varieties under evaluation from 1997 to 1999 were Deltapine 20, Deltapine 5415, Stoneville 474, and Nucot 32B. Deltapine 20 was replaced with Deltapine 747, a rapid-maturing variety, for the 2000 growing season. Fertilizer treatments ranged from 0 to 150 lb urea-N/acre in 50 lb N/acre increments. The N fertilizer treatments were split applied. These tests were furrow-irrigated.

The measurements taken on the cotton varieties included seedcotton yield, lint fraction, plant height, and plant population. All data were analyzed using the Statistical Analysis System (SAS). The experimental design was a randomized complete block. Differences among treatments were identified by least significant differences (LSD) calculated at the $\alpha=0.05$ level of probability.

RESULTS

The N fertilizer rate that tended to produce near optimal seedcotton yields for all four varieties and over all years was 100 lb N/acre (Table 1). The N fertilization rate necessary to produce maximal yield was 100 lb N/acre for Deltapine 20 and Stoneville 474. Although a trend of higher yield was observed with greater N rates, the differences were not significant ($P=0.05$) from the 100-lb N/acre treatment. In 1998, Stoneville 474 yields declined when N was increased from 100 to 150 lb N/acre. Yield trends with Deltapine 5415 and Nucot 32B differed slightly from the two faster-maturing varieties. A trend of increasing yield with more N was observed for Deltapine 5415 and Nucot 32B but the differences were not always significantly greater than the 100-lb N/acre treatment.

PRACTICAL APPLICATION

The results from this test are preliminary, and final conclusions should not be drawn from these data. The yield response of all cultivars seemed to maximize near 100 lb N/acre. Generally, yields did not increase significantly with N rates above 100 lb N/acre.

LITERATURE CITED

- Maples, R. and M. Frizzell. 1985. Effects of varying rates of nitrogen on three cotton cultivars. University of Arkansas, Agricultural Experiment Station Bulletin 882, Fayetteville.
- McConnell, J.S., W.H. Baker, D.M. Miller, B.S. Frizzell, and J.J. Varvil. 1993. Nitrogen fertilization of cotton cultivars of differing maturity. *Agron. J.* 85:1151-1156.

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Table 1. Lint yields of four cotton varieties – Deltapine 20 (DP20), Stoneville 474 (ST474), Deltapine 5415 (DP5415), and Nucot 32B (NU32B) – grown with 0, 50, 100, and 150 lb urea-N/acre at the Southeast Branch Experiment Station near Rohwer, AR, during 1998 and 1999. Deltapine 747 (DP 747), Stoneville 474 (ST 474), Deltapine 5415 (DP 5415), and Nucot 32B (NU32B) were used in 2000.

N-Rate lb N/acre	Varieties			
	DP 20	ST 474	DP 5415	NU 32B
1998				
0	687	691	548	615
50	992	1,130	1,049	1,084
100	1,097	1,321	1,241	1,216
150	1,218	1,247	1,159	1,217
LSD _(0.05) =104				
1999				
0	726	686	609	614
50	1,021	1,022	1,000	1,026
100	1,145	1,255	1,156	1,246
150	1,207	1,393	1,213	1,298
LSD _(0.05) =118				
N-Rate lb N/acre	Varieties			
	DP 747	ST 474	DP 5415	NU 32B
2000				
0	1,822	1,304	1,284	1,496
50	2,709	2,528	2,473	2,775
100	3,107	3,419	3,044	3,120
150	3,227	3,469	3,259	3,390
LSD _(0.05) =165				

^z Lint yield may be estimated by dividing the seedcotton yield by 3.