

TIMING OF EARLY SEASON NITROGEN FERTILIZATION OF COTTON¹

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RESEARCH PROBLEM

The recommended timing of early-season N fertilizer to meet the needs of a developing cotton (*Gossypium hirsutum* L.) crop has not been well established (Bonner, 1995). Recommended N rates vary with soil test results, field history, and the development of the crop. The objective of these studies is to determine when is the optimum time for early-season N applications to cotton.

BACKGROUND INFORMATION

Arkansas cotton producers have traditionally met early-season N requirements of the cotton crop with a pre-plant N application. The first soil application of N fertilizer to cotton is sometimes delayed until stand establishment because of inclement weather or seedling disease pressure (M. Applebury, personal communication). It is speculated that delaying the first N application might result in early-season N deficiency and possible yield loss.

RESEARCH DESCRIPTION

A study of early-season soil-applied N fertilization and irrigation of cotton is being utilized to determine the impact of delaying N fertilization. Five soil-applied N splits of 100 lb N/acre and a 0 lb N/acre control are being tested. The experiment was duplicated under both furrow-irrigated and dryland conditions. First, N applications were made approximately 2-4 weeks before planting. The second N applications were made after the crop emerged (2-4 true leaves). The third application was made when the crop reached first square.

RESULTS

Yields were slightly higher under irrigated conditions than under dryland in 1995 but much greater than in 1996 and 1998. This trend was reversed in 1997 due to stand-

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ing water in the irrigated block. Although, yields were very high in 1997, greatest yields were found in the dryland block (data not shown).

Trends in the response to the N treatments were similar in the irrigated and dryland blocks in 1995, in the irrigated block in 1996 and 1998, and in both blocks again in 1997 (Table 1). Treatments did not significantly affect yields in dryland cotton in 1996 or 1998. As expected, the unfertilized control was the lowest-yielding treatment. Generally, the 100 lb N/acre pre-plant treatment was the next lowest-yielding treatment and not significantly different from the unfertilized control in 1995. The other four treatments were not significantly different in yield.

A trend of higher yield was observed with treatments that included a first-square N application. This trend was consistent with small yield increases from the 100 lb N/acre pre-plant treatments. A possible explanation for the ineffectiveness of the pre-plant treatments are spring weather conditions. Rainy, wet weather probably increased the likelihood of denitrification and leaching of nitrate. These two processes, denitrification and leaching, remove N from the soil and reduce plant uptake, and may have caused the pre-plant treatments to be less effective than N-fertilizer applied later in the growing season.

PRACTICAL APPLICATIONS

These results indicate that early-season N applications shortly after emergence and at first square were more effective in meeting the N nutritional needs of cotton than pre-plant N applications. Presumably, later applications of N fertilizer allow less time for leaching and denitrification to occur, and coincide with increasing plant demand for N.

ACKNOWLEDGMENTS

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LITERATURE CITED

Bonner, C.M. 1995. 1995 Cotton production recommendations. University of Arkansas Cooperative Extension Service AG422-4-95.

Table 1. Lint yield response of cotton grown with early-season soil-applied nitrogen (N) treatments under furrow irrigation and dryland conditions in 1995 and 1998.

| PP ² | Soil N rate | | 1995 | | 1996 | | 1997 | | 1998 | |
|-----------------------|-----------------|-----------------|------|-----|------|------|------|------|------|-----|
| | AE ² | FS ² | Irr | Dry | Irr | Dry | Irr | Dry | Irr | Dry |
| ----- lb N/acre ----- | | | | | | | | | | |
| 0 | 50 | 50 | 1068 | 909 | 1747 | 1308 | 1699 | 2011 | 1478 | 711 |
| 50 | 0 | 50 | 990 | 877 | 1721 | 1263 | 1634 | 1967 | 1545 | 825 |
| 0 | 0 | 100 | 1086 | 915 | 1602 | 1293 | 1565 | 1947 | 1551 | 741 |
| 0 | 100 | 0 | 1020 | 869 | 1475 | 1203 | 1524 | 1958 | 1538 | 720 |
| 100 | 0 | 0 | 714 | 718 | 1267 | 1336 | 1379 | 1811 | 1522 | 806 |
| 0 | 0 | 0 | 707 | 681 | 983 | 1069 | 952 | 1153 | 929 | 714 |
| LSD _(1,05) | | | 158 | 145 | 173 | NS | 261 | 173 | 169 | NS |

²Pre-plant (PP), After Emergence (AE), and First Square (FS).