EARLY SEASON NITROGEN FERTILIZATION OF COTTON

J. S. McConnell and W. H. Baker
University of Arkansas
Monticello and Marianna, AR

Abstract

Nitrogen (N) fertilization is a critical component of successful cotton (*Gossypium hirsutum* L.) production. Nitrogen deficient cotton typically undergoes chlorosis, has reduced leaf area and utilizes water poorly. These conditions reduce growth, cause fruit shedding and result in substantial yield loss. Pre-plant N fertilization is used to meet early season N requirements. Arkansas guidelines recommend that producers fertilize split-apply large amounts of N fertilizer to increase the N uptake by the crop. The recommended split is about half the total amount applied before planting and the remaining portion applied before first bloom. The first soil application of nitrogen is frequently delayed due to inclement weather until after planting and sometimes after emergence, or lost through denitrification or leaching. These conditions might result in early season N deficiency and possible yield loss. Stand loss of cotton due to disease or drowning and subsequent replanting with soybeans may also eliminate the need for N fertilization.

The objective of these studies were to evaluate the effect of delayed N fertilizer application on cotton yield under irrigated and dry land production conditions. Further, the impact of the timing of early season N fertilization was evaluated on petiole NO_3^--N concentrations and node development.

Delaying N fertilization from pre-plant (PP) until the crop reached the two true leaves after emergence (AE) or until first square (FS) was investigated as a method for increasing N uptake. Studies were conducted for three years (1995 - 1997) at the Southeast Branch Experiment Station near Rohwer, AR on an Hebert silt loam soil (fine-silty, mixed, thermic Aeric Ochraqualfs). Nitrogen rates tested were 0- and 100-lb N/acre with full rates and split applications (50 lb N/acre per application) made PP, AE, and FS. Node development of cotton was evaluated using nodes above squaring node (NASN) and nodes about white flower (NAWF).

Yields were not significantly reduce any year by delaying the N application. Lint yield was significantly increased by delaying N fertilization past pre-plant when conditions that facilitate denitrification and leaching occurred. Yields in cotton grown with 100 lb N/acre PP were significantly lower than cotton that received AE and FS N all three years with irrigation and two of three years under dry land conditions. Greatest differences in lint yield due to N treatments were observed in irrigated cotton.

Plant height was greatest with treatments that included a FS N application. Plants that received no N tended to be shortest but differences in the dry land test were not significant. Petiole NO_3^--N trends were similar between the irrigated and dry land tests. Petiole NO_3^--N was initially high with minimal differences early in the growing season. As the season progressed petiole NO_3^--N declined irregularly in all treatments. The two treatments that included 50 lb N/acre at FS tended to have the highest concentrations of petiole NO_3^--N.

Early season differences in NASN were minimal and values were small under both irrigated and dry land conditions. Near first flower, N treatments began to significantly influence NASN and NAWF means under irrigated conditions. Treatments that included a FS N application had greater NAWF values later into the season. The 100 lb N/acre AE treatment was intermediate, while the 100 lb N/acre PP and the unfertilized control were lowest. Dry land cotton exhibited no significant differences in NAWF and tended to have lower values than found in the irrigated test. This is assumed to have occurred because of limited growth due to drought stress.

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