

# Late Season Nitrogen Fertilizer for Cotton

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## **Abstract**

*Field experiments were conducted during the 1996 and 1997 growing seasons in Mohave Valley to determine the effect of late season nitrogen (N) fertilizer applications on top crop yield potential of upland cotton. A long season production system utilizing late season nitrogen (N) applications through peak bloom (August) was compared to a short season production system in which N was applied through mid-bloom (June). Mid-season N applications were based on UA guidelines utilizing plant mapping and petiole nitrate data for the short season production system.*

## **Introduction**

Nitrogen (N) demand of a cotton crop starts out very low early in the season, begins to pick up starting at pin-head square, reaches a peak demand at peak bloom, and gradually declines as the crop approaches cut-out. Nitrogen fertilizer must be available to the cotton plant in a timely fashion to meet crop demand. Split N applications coinciding with actual crop demand allow growers to apply adequate but not excessive amounts of fertilizer. A recommended window for N fertilizer applications begins at the pinhead square growth stage and ends just prior to peak bloom.

A rough estimate of the total N requirements during this period based on realistic yield goals can be estimated using a factor of 60 lbs actual N per bale of cotton. A typical program for N fertilizer application based on a 3 bale yield potential might consist of 60 lbs N/acre applied at pinhead square on or about June 1, 60 units applied at first flower on or about June 15, and 60 units applied at mid-bloom on or about July 1. This program would meet the N demand of a 3 bale crop harvested in October. However, a crop taken full season through December to realize the full benefit of a top crop will usually require an additional N application in mid- to late-July.

University of AZ (UA) guidelines use a feedback approach to determine the actual need for and amount of N fertilizer requires at various growth stages from pinhead square through peak bloom. Fruit retention (FR) measurements are a reliable indicator of fruit load. Height to node ratio (HNR) measurements are a reliable indicator of crop vigor. When N is excessive, HNRs will trend toward or above recommended baselines which is an indication of high crop vigor, and FR levels will often drop. When N is deficient, HNRs often trend below recommended baselines indicating low crop vigor. The crops actual N fertility status can be estimated using petiole nitrate laboratory analysis.

## **Materials and Methods**

Field experiments were conducted in the same field borders during 1996 and 1997 in Mohave Valley (located in southwestern Mohave County) to compare UA nitrogen best management practices (BMPs) for a short season production system to typical N management practices required for a full season cotton production. The test was conducted on a silt loam soil. Nitrogen applications to the short season production system consisted of 225 lbs/acre 18-46-0 (41 lbs N) broadcast preplant, 25 gal/acre UAN 32 (89 lbs N) sidedressed at pinhead square on or about June 1,

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and 15 gal/acre UAN 32 (53 lbs N) sidedressed at mid-bloom on or about July 1, to total 183 lbs N/acre. Nitrogen applications to the full season production system consisted of 225 lbs/acre 18-46-0 (41 lbs N) broadcast preplant, 25 gal/acre UAN 32 (89 lbs N) sidedressed at pinhead square on or about June 1, and 25 gal/acre UAN 32 (53 lbs N) sidedressed at mid-bloom on or about July 1, and 10 gal/acre UAN 32 (35 lbs N) water run at peak bloom on or about August 1, to total 254 lbs N/acre. Mid-season N applications on June 1, July 1, and August 1 were at approximately 1050, 1700, and 2400 heat units after planting (HUAP), respectively.

Following pinhead square, 10 plants were selected at random within each plot and measurements taken to calculate height to node ratios and fruit retention. Thirty to 40 petioles were also sampled from each plot and analyzed for nitrate-N concentration by Stanworth's Crop Consultants (Blythe, CA). Plant measurements and petiole samples were taken on June 14, June 21, July 8, August 3, August 10, and August 22, 1996 at 1393, 1559, 1984, 2729, 2901, and 3230 HUAP, respectively. In 1997, plant measurements and petiole samples were taken on July 16, August 13, and September 9 at 2168, 2921, and 3500 HUAP, respectively.

The two treatments were replicated 4 times in a randomized complete block experimental design. Each plot was a border within the field and was approximately 80 rows (267 feet) wide by the length of the irrigation run (850 feet), or 5.2 acres. Each plot was picker harvested and kept in separate modules which were ginned at the Mohave Valley Cotton Gin. In 1996, Deltapine 5415 cotton was planted on April 4 and harvested December 21. In 1997, Deltapine 33B was planted on April 15 and harvested December 27.

## **Results and Discussion**

In the 1996 study, late season nitrogen (N) fertilizer applications did not increase Deltapine 5415 cotton lint yields, compared to check plots that did not receive late N applications (Table 1). Late season N applications resulted in higher petiole nitrate-N levels, higher height to node ratios, and lower fruit retention levels, compared to the check (Figures 1-3). No top crop yield potential was realized, nor did higher lint yields result from late season N fertilizer applications that cost the grower \$20.74 per acre more, compared to plots that did not receive late season N fertilizer applications. Cotton exhibited high plant vigor and rank vegetative growth, coupled with high Lygus and late season pink bollworm pressures, resulting in below average lint yields. Nitrogen was not the major limiting factor for optimum cotton lint yield in this field study.

In 1997, late season N fertilizer applications resulted in lower Deltapine 33B lint yields, compared to check plots that did not receive late N applications (Table 1). Late season N applications resulted in higher petiole nitrate-N levels, higher height to node ratios, and lower fruit retention levels, compared to the check (Figures 4-6). Again, top crop yield potential was low in this field during the 1997 growing season. Therefore, late season N applications resulted in excessive plant vigor and vegetative growth of the cotton plants at the expense of fruit load.

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Table 1. Lint yield of Deltapine 5415 cotton grown in the 1996 study and Deltapine 33B grown in the 1997 study with and without late season nitrogen applications.

Seasonal Nitrogen Applied (lbs N/acre)	Cost of Nitrogen Applications (\$/acre)	1996 Lint Yield (bales/acre)	1997 Lint Yield (lbs/acre)
183 (UA)	72.04	1.56 a	2.32 a
254 (Grower)	92.78	1.44 a	2.20 b