

**UPDATE ON COTTON PRODUCTION MANAGEMENT
WITH NITROGEN RATES AND PLANT GROWTH REGULATORS**

M. Wayne Ebelhar

Davis R. Clark

Mississippi State University

Delta Research and Extension Center

Stoneville, MS

Abstract

Over the past several years various plant growth regulators systems have been evaluated across different nitrogen (N) management systems at the Delta Research and Extension Center near Stoneville, MS. Since grain production has been on the increase and cotton production on the decline more and more crop rotation is being practiced across the region. The logical choice has been corn for grain and managed with supplemental irrigation. Both corn and cotton have been shown to be responsive to irrigation with greater yield stability evident for both crops. Higher N rates needed for optimum corn production could lead to a buildup of residual N in the soil profile if biological processes do not decrease the pool or plant uptake and removal does not deplete the reserve. Generally, denitrification leads to a decline in the N pool, thus little residual remains after the fall, winter, and spring rains. However, the potential residual N pool along with above recommended levels of fertilizer N could lead to excessive growth in the cotton crop following corn in the rotation. The excess growth may be regulated with some type of plant growth regulator (PGR), lower N rates or combinations of both depending on the economic implications. The research to be covered has cotton following corn in a one:one cotton/corn rotation. The most recent research has involved application of mepiquat pentaborate (Pentia[®] from BASF) at varying nitrogen rates with the PGR application initiated at the pin-head square (PHS) growth stage. Product literature suggested that the PGR resulted in improved boll retention, faster uptake, earlier maturing cotton, and superior height control. However, some of the earlier research with PGR application delayed until first bloom, actually resulted in decreased lint yields. Increasing N rates and increased PGR rates have both been shown to further reduce the lint percent. Other research on-going at the same time, suggested that initial applications at PHS were better than the delayed applications. The research that followed with initiation at PHS revealed a significant response to mepiquat pentaborate applications, but no need for additional N. The optimum N rates remained the same or were lower than recommended when corn was included in the rotation.

To further refine potential PGR application recommendation, a new study was initiated in 2010 at the Delta Research and Extension Center on a Bosket very fine sandy soil and Dubdee silt loam soil in a corn/cotton rotation. The treatments were arranged in a 5x3 factorial with a randomized complete block design and six replications. The N rates were 60, 90, 120, 150, and 180 lb N/acre and three PGR rates. The PGR rates included an untreated control, 16 oz product/acre applied as two 8-oz/acre applications initiated at PHS, and 16 oz product/acre applied in as four 4-oz/acre application. The applications were timed at 10-14 day intervals beginning at PHS. The range in application dealt primarily with growing conditions. If temperature and moisture conditions favored rapid growth, then subsequent applications were closer together. If conditions favored slow growth, then the applications were spread. Fertilizer N was applied as a split application with a constant rate (60 lb N/acre) applied just prior to planting and the remainder applied as a sidedress application at PHS. The uniform N rate at the outset insured equal growth up until the time of the first PGR application. The N source was urea-ammonium nitrate solution (32% N) “knifed” to both sides of the row. Each plot was harvested with a commercial spindle picker adapted for individual plot harvest. Grab-samples were taken at the time of harvest and ginned through a 10-saw microgin to determine the lint percent and subsequent lint yields. All data was then analyzed with the Statistical Analysis System (SAS Institute, Cary, NC) utilizing Analysis of Variance with mean separation by Waller-Duncan K-ratio t-test and Fisher’s Protected Least Significant Difference (LSD).

Lint cotton yields in ranged from a low of 1227 lb/acre with 60 lb N/acre and 16 oz PGR/acre applied at 4 oz/acre/application. The highest yields were obtained with 120 lb N/acre with no advantage to higher N rates. In 2010, PGR applications were never better at any N rate and resulted in lower yields at the lower N rates. The N rate by PGR rate interaction was not significant (Prob > F = 0.9246), therefore main effects were summarized. When averaged across the PGR systems, lint yields were 1295, 1362, 1515, 1555, and 1570 lb/acre for the 60 to 180 lb N rates, respectively. There was no yield response of the 120 lb N/acre rate. When averaged across N rates, the addition of mepiquat pentaborate lower yields and was significantly lower when the 16 oz/acre rate was applied as

four 4-oz/acre applications. The yields were 1488, 1461, and 1429 lb lint/acre for the UTC, 8 oz/acre (2X) and 4 oz/acre (4X) systems, respectively.

The 2011 yields were lower than the previous year with a range from 1129 to 1218 lb lint/acre. There were no significant treatment effects in 2011 including no response to N rates. With a dry winter, residual N may have been higher than normal and masked the applied N treatment effect. This lack of N response was observed in several studies in 2011. When the main effects were determined (no interaction), there was no N rate effect or PGR effect. In both 2010 and 2011, lint percent as determined from grab-samples taken at harvest, decreased with increasing N rates. This has been evident from many other studies and illustrates the need to examine lint data rather than seedcotton data.

In summarizing the data collected to date, PGR applications have resulted in decreased yields, no yield response, and increased yields. Fairly consistent results have been obtained with 12 to 16 oz of product per acre with half applied at PHS to match head square (MHS) and the second application following in 14-21 days or more depending on the weather. Increasing N rates has not resulted in increased yields and offers the potential for more disadvantages than advantages. Increased production costs without additional yields or reduced costs elsewhere results in greater expenses and less profitability. With no response in 2011 from the current set of treatment, the study will on-going for 2012.