# FIELD EVALUATION OF NITROGEN AND ZINC RATES IN A COTTON/CORN ROTATION

**M. Wayne Ebelhar**
**Mississippi State University**
**Delta Research and Extension Center**
**Stoneville, MS**

## Abstract

Zinc deficiency symptoms in cotton including leaves that appear leathery and upturned have been observed in cotton and often appear in younger leaves in the upper canopy. While other symptoms may include short internodes (resetting) small or stunted leaves with interveinal chlorosis and a bronzed appearance. Zinc is not readily translocated in plant tissue and that leads to zinc deficiency symptoms in the younger leaves of corn. Typically a broad band of white to yellowish-white tissue occurs on both sides of the leaf midrib beginning at the base but may not reach all the way to the leaf tip. These symptoms have become more evident in recent years as the region has shifted from cotton to more grain crops. In an effort to look at both cotton and corn response to added zinc a multi-year study was initiated to evaluate the interaction of nitrogen (N) rates and zinc (Zn) rates for both cotton and corn grown in rotation. The treatment combinations for corn included a factorial (4x4) arrangement of N rates (160, 200, 240, and 280 lb N/acre) and Zn rates (0, 5, 10, and 15 lb Zn/acre) arranged in a randomized complete block (RCB) design with five replications. The cotton study was similar with the same Zn rates but lower N rates (30, 60, 90 and 120 lb N/acre). Nitrogen applications of urea-ammonium nitrate (UAN) solution followed corn planting with a uniform rate (120 lb N/acre) applied at planting and the remaining N applied as a sidedress application at the 5-6 leaf stage. For cotton, the early N was applied at either 30 or 60 lb N/acre with the remainder again applied as a sidedress. All N applications were band-applied to both sides of the row. Zinc was applied as zinc sulfate (35.5% Zn) dissolved in water and applied as a solution with the same liquid applicator as used for N.

Prior to the initiation of the study, soil samples indicated soil pH in the 5.4 to 5.9 range with some samples going as low as 4.8. Extractable phosphorus levels ranged from 95 to 164 and averaged 132 lb/acre. Potassium levels were 270 and 326 lb K/acre with organic matter at 0.45 or 0.62% depending on the test site. For both 2016 and 2017, no P or K was added. Zinc levels were as low as 0.6 lb/acre prior to the study initiation. Both corn and cotton were grown with uniform cultural practices across the field. The center two rows of each plot was harvested with commercial harvesters adapted to plot harvest. Grain samples and seedcotton samples were collected at the time of harvest and used to determine harvest moisture, bushel test weight, and Seed Index for corn. Seedcotton grab samples were ginned through a 10-saw micro-gin to determine the lint percentage and lint yields based on weight from the seedcotton harvest. All data were summarized and subjected to an analysis of variance with mean separation by Fisher's Protected Least Significant Difference (LSD).

There was no significant interaction between N rates and Zn rates in either 2016 or 2017 allowing for evaluation of main effects. In 2016, corn yields ranged from 183 to 186 bu/acre when averaged across Zn rates but the differences were not significant. In 2017, there was again no response to increasing N rates. With respect to Zn rates, there was no response to applied Zn in 2016 but a significant response was observed in 2017. Corn yields were 186, 193, 199, and 202 bu/acre for the Zn rates of 0, 5, 10, and 15 lb/acre, respectively. It should be noted that in the rotation between corn and cotton, the low N rates and Low Zn rates are the same giving an additive effect. For example, plots receiving the high Zn rate have received 30 lb Zn/acre in the two years while the low Zn plots have not received any.

Cotton yields in 2016 ranged from 780 to 1008 lb lint/acre with a significant response to increasing N rates. There was no additional yield response with the 30 lb N/acre increment. Like to corn in 2016, there was no significant response to increasing Zn rates but there was a trend observed. Cotton lint yields in 2017 were also significantly increased with N rates up to 60 lb N/acre but no response above 60 lb N/acre. Lint yields were 1172, 1309, 1335, and 1322 for the 30, 60, 90, and 120 lb N/acre rates, respectively. The first 5 lb Zn/acre increment significantly increased lint yield but additional Zn had no response.

After two year, soil test zinc is building while P levels and pH continue to decline. Prior to the 2018 growing season, 2 tons/acre of agricultural lime will be applied. It appears that low pH may be restrict corn production while having less influence on cotton but still limiting. Organic matter levels are slightly higher where corn has been grown. With P levels going down Zn availability may also be increased.