



Mississippi Corn Promotion Board 2012 Progress Report

Project Title: Efficacy of UAN Placement on Total N Uptake and Corn Grain Yield as Influenced by Irrigation

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Project Summary (Issue/Response)

Nitrogen (N) management in cereal crops has been the subject of considerable research and debate for several decades. Nitrogen in the form of urea ammonium nitrate (UAN) solution is the most common fertilizer N used by Mississippi corn producers. Methods of application and placement of this solution in relation to the soil surface and corn row varies substantially. Current Mississippi corn production recommendations suggest producers apply N in the middle of the furrow to avoid damage to the root system. However, current management strategies may contribute in a reduction of N use efficiency (NUE), which has been shown to be as low as 30-40%. Research related to placement of UAN in corn production will help further our knowledge in this area, and possibly help increase NUE and maximize profit.

The objective of this project was to evaluate the effects of UAN solution placement on corn N uptake and grain yield as influenced by irrigation. In this study, we surface dribbled and subsurface banded 15N-labeled UAN solution at different distances from the corn row (6, 12, and 18" distances) in order to determine which placement strategy resulted in maximum NUE. This study was arranged as a randomized complete block design with four replicates and conducted for the 2011 and 2012 growing season. Fertilizer N was split-applied, with 50% applied at planting followed by 50% applied at the V5/V6 growth stage. Data collection included ear leaf samples at vegetative tasseling, and whole plant and grain samples at physiological maturity for determination of 15N recovery, total N uptake, and grain yield.

Project Results/Outcomes

Placement effects on corn grain yield from this study show yield declines as N fertilizer placement from the row increases. Both growing seasons resulted in a significant difference in grain yield between subsurface banded and surface dribbled placement. Results also indicate that furrow irrigation may increase the probability for N loss by denitrification if it is placed below the soil surface where oxygen may become



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Project Results/Outcomes (cont.)

limiting. This is supported by N uptake data from both growing seasons, which showed a most severe reduction in N uptake by corn for the 18" placement and subsurface banded placement distance from the row. Plant tissue and grain samples from this study show ^{15}N recovery increased as N placement proximity decreased from the corn row.

Results from this study show increased NUE, ^{15}N recovery, and grain yield as N fertilizer is placed in closer proximity to the planted row. In addition, results show that total ^{15}N recovery increased 22%; while grain yield increased 14% in both growing seasons as N fertilizer placement decreased from 18 to 6 in from the row. Results indicated an overall combination of fertilizer N placement distance at 6 in and subsurface banding resulted in greater fertilizer ^{15}N recovery, total N uptake, and corn grain yield both years.

Project Impacts/Benefits

This study provided an opportunity to identify and improve multiple N management strategies that may limit corn productivity in Mississippi. The data provided in this study showed definitive documentation to further optimize in field placement of N fertilizer and increase profitability. The evaluation of this research may also merit new Mississippi corn production N placement recommendations, which could result in less N loss and increase N uptake and NUE by the corn plant. In conclusion, the results shown in this research will help aid Mississippi corn producers with N management decisions that may help reduce N input cost and increase grain yields.

Project Deliverables

Presentations:

2012 American Society of Agronomy Southern Branch Annual Conference

Field Days:

2012 Mississippi State University Agronomic Field Day

