Evaluation Of Polymer Coated Urea For Use In Southern Row Crop Agriculture

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1 Urea ammonium nitrate (UAN) is the predominate N source utilized in Louisiana cotton [Gossypium hirsutum L.] and corn [Zea Mays L.] production systems. Nitrogen loss via denitrification, volatilization, and/or leaching can be great (50% of total-N applied) due to environmental conditions at application or if N applications are mismanaged. Use of controlled-release fertilizers in row-crop agriculture can potentially improve fertilizer nutrient use efficiency and reduce the risk of fertilizer nutrient movement in the landscape. Environmentally Smart N (ESN, 440 g N kg-1, Agrium Inc.) is a polymer-coated urea fertilizer being used for the production of row crops in the Midwest. The research objective was to evaluate ESN-N as an alternative N source for Midsouth cotton and corn production.

1Cotton and corn experiments were established during 2010 at the Red River Research Station on a Caplis very fine sandy loam under dryland and irrigated environments. Soybean [Glycine max L.] and cotton was the previous crop grown for the corn and cotton experiments, respectively. For cotton trials, ESN was broadcast by hand at five total-N rates ranging from 0 to 120 lbs N acre-1 immediately prior to seeding Phytogen 375 WRF at 40,000 seed acre-1. Urea ammonium nitrate was coulter-knife injected at identical total N rates as ESN. At the four true-leaf stage of cotton growth, identical total-N rates of ESN or UAN were applied to plots that did not receive N fertilizer at planting. Seedcotton yield was determined by harvesting the middle two rows of each plot with a Case 1822 picker fitted with a load cell. Approximately 2 lbs of seedcotton was collected from each plot to determine lint percent and fiber quality. Each experiment (dryland or irrigated) was arranged as a randomized complete block with 2 (N source) x 2 (application time) x 4 (N rate) factorial treatment structure and compared to an unfertilized control (0 lbs N acre-1). Each treatment was replicated four times. For analysis, each N source and application time were combined to constitute an N fertilization strategy.

For corn trials, ESN was hand applied at four total-N rates ranging from 0 to 210 lbs N acre-1 immediately prior to seeding Terral TV25BR23 at 30,000 seed acre-1. Urea ammonium nitrate was coulter-injected at identical total N rates as ESN applications to plots designated for UAN treatments. At the four to five-leaf stage of corn growth, identical rates of ESN or UAN were applied to plots that did not receive N fertilizer at planting. Corn grain yield was determined by harvesting the middle two rows of each plot with a small plot combine and adjusted to a uniform moisture of 15.5% for analysis. Each experiment (dryland or irrigated) was arranged as a randomized complete block with a 2 (N source) x 2 (application time) x 3 (N rate) factorial treatment structure and compared to an unfertilized control. Each treatment was replicated four times. All statistical analysis was performed using SAS version 9.1.

Cotton lint yield was unaffected by the N-strategy × N rate interaction, and the main effect of N strategy for cotton cultivated in an irrigated environment. The main effect of N rate positively influenced cotton lint yield. Averaged across N sources, cotton lint yields increased linearly as N rate increased. The greatest numerical lint yield (1506 lbs lint acre-1) was achieved from plots receiving 120 lbs N acre-1. However, N application rates of 60, 90, and 120 lbs N acre-1 produced statistically similar cotton lint yields. Nitrogen application at any N rate (30-120 lbs N acre-1) produced significantly more lint than the unfertilized control (0 lbs N acre-1). Regression analysis indicated that the rate of yield increase per unit of added N fertilizer was uniform among N strategies (1.3 lbs lint/lb N applied). Dryland cotton lint yields were unaffected by the main effects of N strategy, N rate or their significant interaction.

Corn grain yield was not influenced by the N strategy x N rate interaction, or the main effect of N rate when cultivated under dryland conditions. Dryland grain yield was significantly affected by the main effect of N strategy. Averaged across N rates, grain yields followed the numerical order of ESN applied at planting > ESN applied at V4 > UAN applied at planting > untreated control > UAN applied in a split-application. ESN applied at planting produced the greatest overall mean grain yield of all N sources, but mean grain yields were not statistically different from either ESN application at V4 or UAN applied at planting. Corn grain yield produced under an irrigated environment was not influenced by the main effects of N strategy, N rate, or their significant interaction.

Limited responses to N application were observed in both cotton and corn trials cultivated in either dryland or irrigated environments. In general, application of ESN produced similar cotton lint or corn grain yields when compared to UAN applied at similar total-N rates. Additional research is needed to determine if ESN is suitable as an alternative N source for Midsouth cotton and corn producers. Δ

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