COTTON RESPONSE TO PRE PLANT INCORPORATED UREA AND ENVIRONMENTALLY SMART NITROGEN IN A REPRESENTATIVE ARKANSAS SILT LOAM

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Extended Abstract

Nitrogen fertilization will increase cotton (*Gossypium hirsutumn* L.) yields in many Arkansas soils. Relatively high N fertilizer rates are required to produce economically sustainable crop yields in Arkansas, because the soil organic matter content of many of the Arkansas agricultural soils is low (< 2.0%) and applied fertilizer-N can be lost from the plant root zone by leaching and/or denitrification. Reducing N-fertilizer loss to the environment will increase the growers' profit margins and reduces potential environmental risks associated with excessive N application. The objective of this study was to evaluate seedcotton yield response to an enhanced efficiency N fertilizer, marketed under the trade name Environmentally Smart Nitrogen (ESN), and urea in a typical Arkansas agricultural soil.

The replicated field experiment was conducted in 2014 on a soil mapped as a Loring silt loam at the University of Arkansas Lon Mann Cotton Research Station in Marianna, Arkansas. The experimental design was a randomized complete block design with a factorial arrangement of four urea-ESN combinations, each applied at five N-rates ranging from 30 to 150 lb N/acre (at 30 lb N/acre increments) and a no N control. The four urea- and ESN-N combinations were: 100% urea-N; 50% urea-N plus 50% ESN-N; 25% urea-N plus 75% ESN-N, and 100% ESN-N. Each treatment was replicated six times. All other soil amendments were applied to ensure that N was the only plant nutrient limiting seedcotton yield. Urea and ESN were hand applied onto the soil surface and incorporated immediately. The main effect of N source and N rate both significantly ($P \leq 0.0530$) influenced seedcotton yield, but the N source × N rate interaction did not influence seedcotton yield ($P > 0.10$). The significant N source effect suggests that ESN-N was more available for plant uptake than conventional urea in 2014 when the amount of early season rainfall was above normal and conducive to early-season N loss. Seedcotton yield for the cotton that did not receive any N was 1990 lb/acre, which was numerically (25%) lower than the yield of cotton that received the lowest N rate of 30 lb N/acre, averaged across N sources. Averaged across the five N rates, cotton fertilized with 100%-urea-N produced significantly lower seedcotton yield (2675 lb/acre) than cotton fertilized with 25%-urea-N plus 75% ESN-N (2892 lb/acre) or cotton that received 100%-ESN-N (2815). Averaged across the four urea and ESN blends, application of 90 lb N/acre significantly maximized seedcotton yield. When urea was the sole N source, maximal numeric seedcotton yield was produced by application of 120 lb N/acre, but when ESN was the sole source of N, maximal numeric yield was produced with application of 90 lb N/acre. The results suggest that in a year with above average precipitation when the potential for N loss via leaching and denitrification is high, ESN is a more efficient source of N and thus it is a suitable alternative to urea. Additional research under a wide range of climate, soil, and production practices are needed to confirm or deny the reproducibility of these results.