COTTON RESPONSE TO POLYMER COATED UREA IN MISSISSIPPI

B.R. Golden
J.R. Nichols
M.W. Ebelhar
Mississippi State University
Delta Research and Extension Center
Stoneville, MS

Abstract

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. Enhanced-Efficiency fertilizers could potentially reduce N loss in Mid-South cotton production systems. The research objective was to evaluate cotton lint yield and fiber quality as affected by polymer-coated urea applied alone or blended with urea compared to application of urea alone. Experiments were established during 2011 and 2012 at the Delta Research and Experiment Station near Stoneville, MS. Environmentally Smart Nitrogen (ESN), Urea, or ESN:Urea blends were applied at 4 N rates ranging from 0 to 134 kg ha^{-1} immediately prior to planting (AP) Stoneville '5288 B2F' or at the 4-leaf (4LF)stage of cotton growth. Nitrogen applications were incorporated at both application times with a furrow cleaner. Seedcotton yield was determined by mechanically harvesting the middle two rows of each plot. Lint yield and fiber quality data were based on hand harvest 50 boll samples from each. The experiment was arranged as a randomized complete block with an 8 (N Strategy) × 3 (N Rate) factorial treatment structure and compared to an unfertilized control (0 kg N ha^{-1}). Siteyear was considered random for analysis. To determine the nitrogen release rate of ESN fertilizer, Prills of ESN (6) were weighed, placed in mesh bags, and buried immediately following cotton seeding. Each bag contained 38-44 mg N. Bags were unearthed every 7 d after burial beginning 7 d after and ending 56 d after burial. The recovered bags were placed in sealed plastic bags, transported on ice, and refrigerated until analysis. Prills were removed from each bag, counted, and the total-N remaining was determining by combustion.

At 7 d after burial, 95 to 100% of the initial N remained compared to 7.5 to 20% remaining by 56 d. Nitrogen release from ESN was nonlinear in across time, and could be described by the following equation $y=114.59-4.61x+0.054x^2$ were y = % nitrogen remaining in prills and x = time after burial. In general, the N release from ESN would have been nearly complete by the first major N demand period of cotton growth and development near the time of square initiation. Cotton Lint yield was not influenced by the main effect of N rate (p=0.9894), however was influenced by the main effect of N Strategy (p=0.0034). Lint yield from the untreated control averaged 1229 kg lint ha^{-1}(not included in analysis). Averaged across N rates, cotton lint yield from treated plots ranged from 1232 (1/3 ESN-AP) to-1417 (1/3 ESN-4LF) kg lint ha^{-1}. 1/3 ESN-AP yielded statistically similar to urea-4LF and 2/3 ESN-AP treatments. Fiber quality parameters were unaffected by N Strategy, N rate, or their interaction. Environmentally Smart Nitrogen shows promise as an N management tool, however additional research is needed to determine the appropriate rate of Environmentally Smart N or ESN:Urea blends are suitable N management strategies for optimal Mid-South cotton lint yield production.