Improving Nitrogen Fertilizer Management in Drip-Irrigated Cotton (Field 6A-F)
Kevin Bronson and James P. Bordovsky

Objective: To compare cotton lint yields and N fertilizer use efficiency between the N sources urea (20-0-0) and urea ammonium nitrate (32-0-0)

Methodology: In this study irrigation water flowed daily after first square at a rate of 26 L min^{-1} at 0.1 MPa. Drip tape was in the center of every other furrow at a depth of 12 in. We used a randomized complete block design, one-way factorial with three replications or blocks. Blocks consisted of 144, 30-in. rows that run 1000 feet long. Each block was divided into two, 72 row plots that were randomly assigned to either 20-0-0 or 32-0-0. Each 72-row plot has its own irrigation and fertilizer injection station. Nitrogen fertilizer rate was based on a 2 .5 bale/ac yield goal. Nitrate-N extracted in spring 2-acre grid soil samples (0-24 in) was subtracted from the 150 lb N/ac requirement to give a seasonal N fertilizer requirement of 67 lb N/ac. Nitrogen fertilizer was injected into the SDI system daily, between first square and peak bloom. Leaf samples for N analysis and biomass samples were taken at peak bloom. One hundred chlorophyll meter readings and spectral reflectance readings (36 inches above the crop row) were taken from each plot at early squaring as well. Red vegetative index was calculated as reflectance at 670 nm/reflectance at 780 nm. Green vegetative index was calculated as reflectance at 550 nm/reflectance at 780 nm.

Results: Nitrogen source did not affect chlorophyll meter readings, spectral reflectance ratios, leaf N, biomass, NH_4-N, or NO_3-N at early square (Table 1). Lint yields, which were less than the target yield, were not also affected by N source. Nitrogen mineralization from soil organic matter may have been a factor. The low amounts of NH_4 in the soil came as a surprise, as it indicates rapid nitrification of NH_4 from UAN. Apparently, UAN-N moves to the outward, drier ends of the wetting front surrounding the subsurface drip emitters. For the future direction of this research, we will test different timings of N fertilizer injection. Additionally, we will evaluate ammonium thiosulfate as a nitrification inhibitor in this SDI system.

The chlorophyll meter had a negative correlation with leaf N. Ratio indices from both the Cropscan and GreenSeeker radiometers related strongly to biomass but only weakly to lint yield. Leaf N was not related to red ratio indices, but was weakly correlated with the green vegetative index. With the Cropscan radiometer, the ratio that included a red band with a near infrared band related more strongly to biomass than the ratio with a green reflectance.

Table 1. Chlorophyll meter readings (SPAD), red vegetative index (RVI), green vegetative index (GVI) leaf N, soil NH_4, soil NO_3 and biomass at early squaring, and lint yield as affected by N source, Halfway, TX, 2003

N source	SPAD	RVI[1]	RVI[2]	GVI[2]	Leaf N	NH_4-N	NO_3-N	Biomass	Lint yield
					%	--------------------	lb/ac	--------------------	
Urea	42.4	0.16	0.18	0.23	4.1	1.3	24	5342	1259
UAN	41.7	0.17	0.19	0.23	4.0	1.8	25	5074	1310
F test	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS is not significant at P = 0.05, [1] GreenSeeker, [2] Cropscan MSR16