Effects of Nitrogen on New Varieties of Upland and Pima Cotton

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Summary

Nitrogen fertilization of two varieties each of Upland and Pima cotton indicated that Upland cotton with early square stage petiole nitrate values as high as 20,000 ppm can respond to application of nitrogen fertilizer at that time. However, application of nitrogen fertilizer at that growth stage showed Pima variety S-5 responded negatively to early nitrogen application. The new Pima variety, 79-106, with petiole nitrate value at the same date of 10,000 ppm, was not adversely affected by nitrogen fertilization. Nitrogen fertilization of Pima cotton probably should be delayed until petiole nitrate values are below 6,000 ppm nitrate-N. Lower levels of petiole nitrate are more adequate in Pima than Upland.

An experiment comparing yield and petiole nitrate values for two varieties of Upland and two of Pima cotton was conducted in 1980 on the Cotton Research Farm. On April 14, Upland varieties DPL-61 and DPL-70, and Pima varieties S-5 and a new strain presently designated as 79-106 were planted on 40-inch rows on the south end of a field which was hoped to afford a site with comparatively low soil residual nitrogen. Three nitrogen variables were: control (no nitrogen fertilizer applied), 75 and 150 pounds of nitrogen per acre as urea on June 12, with each treatment replicated three times.

Soil nitrate in the surface foot was approximately 7 ppm NO_3-N. The first set of petioles was collected by replications at early square growth stage on June 12, the day nitrogen fertilizer was side-dressed. By varieties, petiole nitrate values at that time were: for DPL-61 - 18,800 ppm; for DPL-70-10,250; for S-5 - 10,250; and for 79-106 - 11,000 ppm. Normally these values would be too high to justify nitrogen fertilization at that time. But to obtain data relating behavior of the various varities studied, nitrogen variables were imposed according to plan.

Figures 1 and 2 show the values found for nitrate-N concentration in petioles sampled after fertilizer was applied. There was no difference between varieties of Upland cotton, and petiole nitrate values were highly correlated with yield data shown in Table 1. The first increment of nitrogen fertilizer resulted in yield increases of about 16%, but the higher rate of nitrogen side-dressed did not significantly increase either petiole nitrate or yield. Petiole nitrate values for all rates dropped below 1,000 by mid-August, and defoliation was uniformly effective.

The two varieties of Pima cotton reacted quite differently to nitrogen fertilizer application. Petioles of the new, early termination variety, 79-106 (Figure 2), were higher in nitrate concentration than those of S-5 through mid-July. Table 2 shows that yield of S-5 was adversely affected by increasing available nitrogen at the first square stage of growth.

Since neither Pima variety benefited from nitrogen application, petiole nitrate values above 7,000 ppm at first square growth stage appeared adequate. A mid-July petiole nitrate value of 2,000 ppm would not indicate a need for nitrogen fertilizer for S-5, but 79-106 should respond to fertilizer application at petiole nitrate values in the 2000 - 5000 ppm range.

The final irrigation for 1980 was applied on August 28. A later irrigation might have changed the picture considerably, because of the unusually long 1980 season. Many unopened bolls were seen at the time of November 4 harvest, especially on S-5 plots. Gleaning of Pima plots approximately a month after harvest showed that additional side-dressed nitrogen fertilizer left 29% less seed cotton on fertilized S-5 plants than on the control, but 23% more cotton on 79-106 plants than on control plants.

Table 1. Yield of seed contton for two Upland varieties for three nitrogen fertilizer rates.

Treatment	Upland Variety DPL-61	DPL-70
	pound seed cotton per acre	
Control	3630 a*	3610 a
75 lb. N/A	4180 b	4210 b
150 lb. N/A	4570 b	4570 b

*Values for respective varieties not significant at .05 level if followd by the same letters.

Table 2. Yield of seed contton for two Pima varieties for three nitrogen fertilizer rates.

Treatment	Pima Variety S-5	79-106
	pounds seed cotton per acre	
Control	3540 b*	3400 a
75 lb. N/A	3020 ab	3780 a
150 lb. N/A	2500 a	3700 a

*Values for respective varieties not significant at .05 level if followed by the same letters.

Figure 1. Petiole Nitrate Concentration on Four Dates in 1980, Upland Cotton

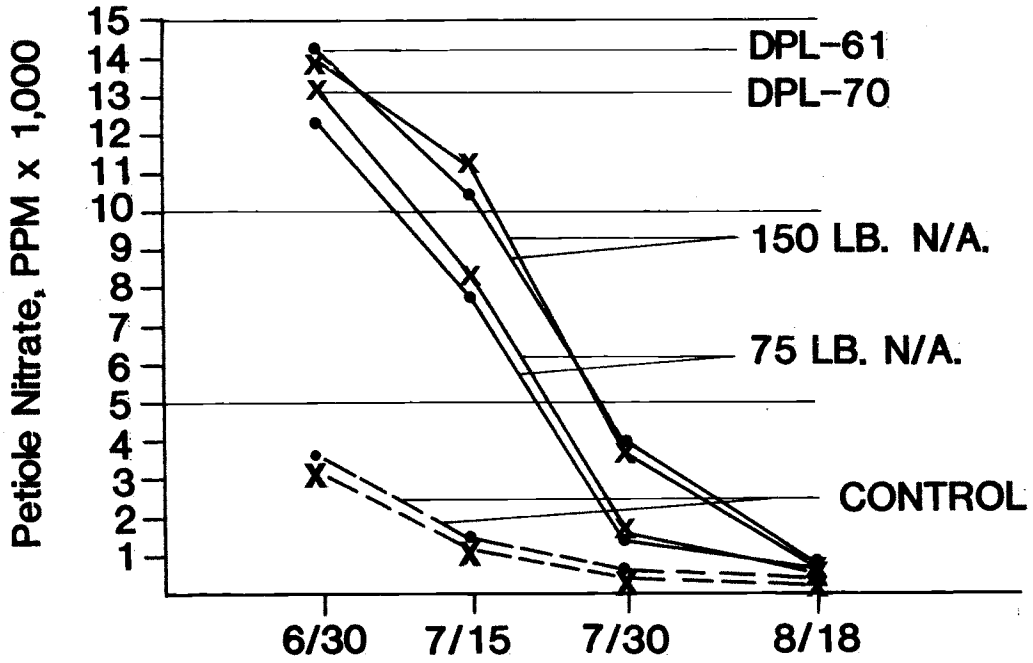

Figure 2. Petiole Nitrate Concentration on Four Dates in 1980, Pima Cotton