

**Prepared for Arkansas Corn and Grain Sorghum Board
Brief Research Summary for 2004 Cropping Year**

Title: Improving Economic Efficiency of Corn Production in Arkansas by Evaluating New Soil Testing Methods for Predicting Nitrogen Fertilizer Requirements

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SIGNIFICANCE OF RESEARCH TO ARKANSAS GROWERS

Arkansas corn production has steadily increased from 180,000 acres in 2000 to nearly 360,000 acres in 2003. Nitrogen (N) fertilization is one of the largest variable input costs for corn production. Arkansas corn farmers spent approximately \$20 million on N fertilizer in 2003. Currently, corn N fertilization in Arkansas and several other states is based on the potential crop yield goal due to the lack of a better alternative. Unfortunately, this approach does not take into the consideration the amount and potential availability of native soil N and may result in over-application of N.

In recent years, the pre-sidedress soil nitrate test (PSNT) and amino sugar N test (ASNT) have shown the potential for identifying soils that will not respond to additional N application and/or predicting optimum N application rates. The objective of the studies reported here were to evaluate the response of corn grain yield to varying rates of sidedress N fertilizer. Data from 2004 and subsequent years will serve as a scientific database for correlating and calibrating the PSNT and ASNT for improving corn fertilization in Arkansas.

PROCEDURES

Six replicated field experiments were conducted at multiple locations on soils representing major corn producing counties of Arkansas. Nitrogen application rates were 0, 50, 100, 150, 200, and 250 lb N/acre. The experimental design was a randomized complete block design with four replications of each treatment. At all sites, 20 lb N/acre as ammonium sulfate was applied prior to or at planting and the remaining N balance was sidedressed as urea by hand about 5 to -8 weeks after corn emergence when soil conditions were suitable for field work. Soil samples were collected before planting and before sidedress application. Analysis of variance (ANOVA) was preformed to evaluate the effect of sidedress N application on corn yield for each site separately.

RESULTS AND DISCUSSION

Corn grain yield over four locations ranged from 55 to 94 bu/acre for the unfertilized control and 126 to 251 bu/acre for the highest N rate of 250 N/acre (Table 1). Yield results from the Independence and Jefferson county sites (remaining two locations) were flawed and discarded due to flooding and other unforeseen events, respectively. At all N rates, the highest yields were produced at Desha county and lowest yields were obtained at Jackson county. A low soil Ca/Mg ratio may have been responsible for low yield potential at the Jackson county. The results of this one year study at Desha county appears to support the current U of A recommendation of 250 lb N acre for attaining a yield of 225 bu/acre of corn. At the Mississippi county site, where the soil is mapped as a silty clay loam, yields significantly increased with increasing N rate and we did not observe a yield plateau. The actual yield potential at this site may have been higher than the 161 bu/acre achieved at 250 lb N /acre rate. We will include N rates higher than 250 lb/acre next year, since such information will be useful for delineating optimum N rates on heavy textured soils. At the Jackson and Lee county sites, corn grain yield no longer increased when more than 150 lb N /acre was applied. This data indicates that the optimum N rate varied among the sites (150-250 lb N acre) as corn yield potential varied. Thus, since all soils do not have the same yield potential, they should not have the same recommended N rate. A realistic yield potential goal should be set for each soil and no more N be applied than what is required to reach the optimum corn yield potential. This one year of data indicates that on silt loams, about 1 lb N/acre should be applied for every bu/acre of potential corn grain yield for realizing a realistic grain yield potential.

Table 1. Corn grain yields as affected by N application rate for four N rate trials conducted in Arkansas during 2004.

County/Site	N Application Rate (lbs N/acre applied)						LSD(0.05)
	0	50	100	150	200	250	
	----- bushels/acre -----						
Desha	55	115	172	192	206	251	18
Jackson	94	106	118	125	129	126	16
Lee	68	120	135	154	161	152	23
Mississippi	57	80	89	107	126	161	14