Prepared for Arkansas Corn and Grain Sorghum Board
Brief Research Summary for 2005 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

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.

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 these studies will serve as a scientific database for correlating and calibrating two new soil tests for N recommendation for corn production in AR.

PROCEDURES AND RESULTS

Eight 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, 250, and 300 lb N/acre. The experimental design was a randomized complete block design with four replications of each treatment. Details on cultural practices are listed in Table 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 when corn plants were at 8-10 leaf stage. 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

There was a significant response to sidedress application N at all sites except 1. Corn grain yield ranged from 36-188 in check plots and 177 to 284 in 300 lb N/acre plots (Table 2). We did not observe any response to N application when soil Nitrate at 12-inch-depth was 79 lb/acre (Table 3). In general the maximum grain yield was obtained with N application of 200-250 lb/acre. At these rates corn grain yield was almost twice of the yield of the check (non-fertilized) plots.

Table 1. Selected cultural practices for corn N fertility experiments conducted in Arkansas in 2005.

Site	Previous crop	Cultivar	Tillage	Planting	Emergence	N Application		Harvest
County						1 st	2 nd	
Desha	soybean	6971 Dekalb	Conservation	1 April	11 April	18 April	24May	1 Sept
Jackson	soybean	Pioneer 33N56	Conservation	15 April	25 April	19 April	27 May	1 Sept
Jefferson	cotton	Pioneer 31N28	Conservation	13 April	14 April	15 April	23 May	31Aug
Lee-2	wheat	Pioneer 31G96RRBT	Conventional	20 April	5 May	none	31 May	16 Sept
Monroe	corn	Dekalb 6971	Conservation	5 April	12 April	19 April	26 May	15 Sept
Mississippi-1	soybeans	Dekalb 6971	Conservation	3 March	12March	4 March	21 Aprl	18 Aug
Mississippi-2	soybeans	Dekalb DKC6352	Conventional	18 April	2 May	18 May	3 June	13 Sept
St.Francis-1	cotton	Pioneer 31N 27	Conventional	4 April	14 April	5 April	12 May	17 Aug

Table 2. Effect of N application rate on corn grain yields at eight sites in Arkansas during 2005 cropping season

N rate	Desha	Jackson	Jefferson	Lee	Monro	Mississippi-1	Mississippi-2	St. Francis
lb/acre	Corn grain yield (Bu/acre)							
0	111	130	77	188	63	87	36	166
50	136	185	214	196	69	115	56	229
100	181	224	250	194	121	142	141	228
150	199	272	261	199	111	136	130	256
200	202	227	284	177	138	162	172	248
250	196	279	277	194	162	157	159	259
300	177	236	284	198	164	152	164	236
P value	<.0001	<.0001	<.0001	0.7	0.03	0.04	<.0001	<.004
MSD at 0.05	12	42	50	-	76	29	28	43
LSD at 0.1	11	35	44	-	55	24	25	34

Table 3. Chemical properties of soil samples from the top 12 inches of experimental sites before the sidedress application of N.

Site	pH	OM	NO_3-N	P	K	Ca	Mg	SO_4-S	Mn	Cu	Zn	B
		%	---------- lb/acre ----------									
Desha	6.3	1.3	12	140	243	2247	406	34	202	3.1	11	1.7
Jackson	6.2	1.1	16	61	233	1278	138	24	412	2.2	24	1.2
Jefferson	6.7	0.9	8	78	236	2480	406	22	108	3.1	5	1.8
Lee-2	5.7	1.6	79	80	197	2579	751	47	148	2.7	6	1.4
Monroe	4.9	1.1	9	118	207	653	129	45	356	1.4	9	1.0
Mississippi-1	6.0	1.5	15	129	239	2875	435	37	82	3.6	14	1.6
Mississippi-2	6.1	2.5	9	143	614	7131	1406	60	124	8.1	13	2.4
St. Francis	5.4	1.8	24	79	343	2626	642	84	134	2.1	7	1.6