ARKANSAS CORN AND GRAIN SORGHUM BOARD PROPOSAL
2006 Season

Title: **Optimizing Soil Fertility Requirements for Corn**

Investigators: **Leo Espinoza, Soils Specialist**
Jason Kelley, Wheat and Feed Grains Specialist

1. To evaluate the benefits of a pre-tassel N application.

Four hybrids varying on their relative maturity were seeded at 30,000 to 32,000 plants per acre, depending on the location. Corn was planted at the NEREC, near Keiser with total N rate being 250 lb N/acre. Site 2 was located at the Lonn Mann Cotton Branch Station (LMCBS) near Marianna on a soil classified as a Memphis silt loam.

Treatments consisted of the following

At LMCBS and NEREC

1. 2-way split ½ at planting and ½ at V6
2. 3-way split 100 lb N/acre at planting/emergence, 100 lb/acre at V6 and 45 lb N/acre at 1 week prior to tassel.
3. 3-way split 100 lb N/acre at planting/emergence, 100 lb/acre at V6 and 45 lb N/acre at V8
4. 3-way split 100 lb N/acre at planting/emergence, 100 lb/acre at V6 and 45 lb N/acre at tassel
5. 3-way split 100 lb N/acre at planting/emergence, 100 lb/acre at V6 and 45 lb N/acre at 1 week after to tassel
6. 3-way split 100 lb N/acre at planting/emergence, 100 lb/acre at V6 and 45 lb N/acre at 2 weeks after tassel

Before harvest, ten plants from 3 replications at each location were hand-harvested, ear length was measured and the weight of 100 kernels was collected.

Plots consisted of 4 rows wide by 25 ft long, treatments were replicated 4-5 times and were arranged in a randomized complete block design. A plot combine equipped with a weigh system was used to harvest the plots. Resultant yield was corrected at 15.5% moisture content and statistical significance was assessed at the 95% level with the Duncan procedure.

Results

Average yields for the Hybrid 6381 were not significantly different when the nitrogen was applied on split applications (Table 1). This follows the observed lack of response to late nitrogen applications when yields are below 160 bushels per acre. For the rest of the

hybrids, yields appeared to be maximized when a supplemental application of nitrogen as applied around the tassel stage.

Table 1. Average yield response to varying timings of N applications at NEREC. Yields followed by the same letter are not statistically different at alpha = 0.9.

	Corn Hybrid			
	DK 6971	**P 33R81**	**P 31N26**	**6381**
Treatment				
f. 3-way 2 weeks post VT	205.6 ab	180.4 bc	195.8 cb	144.9 a
e. 3-way 1 week post VT	203.2 abc	187.1 ab	197.2 b	141.3 a
d. 3-way Tassel	**212.1 a**	**190.8 a**	**215.9 a**	148.6 a
c. 3-way 1 week before VT	195.5 bc	170.4 c	195.1 cb	150.8 a
b. 3-way V10-V12	194.1 bc	170.7 c	171.6 d	141.2 a
a. 2-way (check)	192.6 c	169.9 c	182.3 cd	136.7 a

Cob length and test weight were not influenced by the timing of nitrogen applications, while kernel weight appeared to follow a trend similar to that of grain yield.

LonnMann Cotton Branch Station (Memphis silt loam)

Corn yields at this location may have been affected by abnormal rainfall patterns experienced during the 2006 growing season (Table 2). No significant difference among corn yields were observed as a result of the timing of supplemental nitrogen applications, with the exception of the hybrid P 32B29.

Table 2. Average yield response to varying timings of N applications at LMCRS. Yields followed by the same letter are not statistically different at alpha = 0.9.

	Corn Hybrid			
	DK 6971	**P 33R81**	**P 32B29**	**6381**
Treatment				
f. 3-way 2 weeks post VT	192.3 a	170.2 a	191.5 ab	169.6 a
e. 3-way 1 week post VT	189.1 a	173.2 a	**197.0 a**	171.1 a
d. 3-way Tassel	**189.7 a**	**162.9 a**	191.0 ab	178.2 a
c. 3-way 1 week before VT	182.3 a	167.6 a	186.8 ab	167.7 a
b. 3-way V10-V12	192.6 a	164.6 a	193.4 ab	181.2 a
a. 2-way (check)	182.9 a	162.7 a	180.7 b	177.1 a

When yields were averaged across hybrids, yields appeared to be maximized when supplemental nitrogen was applied around the tassel stage at the NEREC site (Table 3), which is consistent with previous observations.

Table 3. Average yield response to varying timings of N applications across hybrids. Yields followed by the same letter are not statistically different at alpha = 0.9.

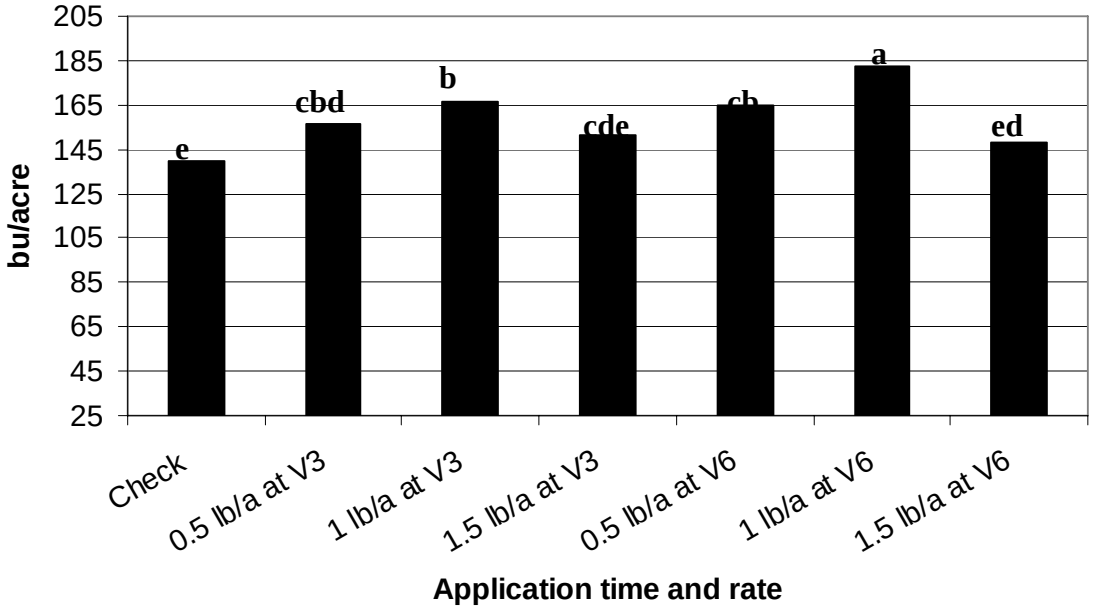
	Location	
	NEREC	**LMCRS**
Treatment		
f. 3-way 2 weeks post VT	184.8 a	182.3 a
e. 3-way 1 week post VT	181.6 ab	181.2 a
d. 3-way Tassel	189.3 a	180.4 a
c. 3-way 1 week before VT	178.5 ab	176.1 a
b. 3-way V10-V12	169.4 b	183.1 a
a. 2-way (check)	170.5 b	175.9 a

2. To evaluate the yield response to Zn fertilization.

A zinc deficiency situation was artificially created at the Cotton Research Station to investigate the response of corn to Zn fertilization. Treatments included:

a. Check;
b. 0.5 lb/a at the V3 stage
c. 1 lb/a at the V3 stage
d. 1.5 lb/a at the V3 stage
e. 0.5 lb/a at the V6 stage
f. 1 lb/a at the V6 stage
g. 1.5 lb/a at the V6 stage

Fig. 1. Yield response to varying rates and timings of Zn fertilization.



Yields were maximized with applications of 1 lb zinc per acre, particularly when zinc was applied at the V6 stage. Under the conditions of this study, the 1.5 lb/a resulted on leaf burning and appeared to have adversely affected yields.

3. To evaluate the yield response to varying nitrogen rates under varying tillage systems.

A study to evaluate the response of corn to varying nitrogen rates, grown under no-till, conventional, and stale seed bed tillage was established at the Lon Mann Station. Table 4 shows the average yield observed for the various treatment combinations. Higher yields were observed when corn was grown under a stale seed bed system. Yields were maximized around the 240 lb/a treatment for corn grown under no-till and stale seed bed, and around the 320 lb/a treatment for corn grown under conventional tillage. These results do not follow common trends observed, but we believe significant soil temperature differences between conventional and no-till and stale seedbed systems, particularly the wider temperature fluctuations observed, may have been a contributing factor (Fig 2).

Table 4. Average yield of corn to varying nitrogen rates and tillage systems. Yields

N rate Lb/acre	Conventional Yield Bu/acre	No-till Yield Bu/acre	Stale seedbed Yield Bu/acre
0	95.1 d	90.4 d	124.2 d
80	146.7 c	144.9 c	154.4 c
160	165.7 b	174.5 b	177.7 b
240	166.4 b	186.9 a	200.5 a
320	185.2 a	185.1 a	203.2 a

followed by the same letter are not statistically different at alpha = 0.9.

Fig 2. Soil temperature (Celsius) observed 2 inches deep for corn grown under conventional and stale seedbed.