ARKANSAS CORN AND GRAIN SORGHUM PROMOTION BOARD

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

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1. To determine economic benefits of starter fertilizer under different cropping systems.

A rate equivalent to 3lb N/A, 8lb P/A and 5lb K/A was applied "in- furrow" to assess the effect of starter fertilizer on initial stand establishment, maturity and yield components. Corn hybrid Dekalb 64-11 was seeded at CBS, with plots being 12 rows wide by 180 ft long. The described treatment was replicated 4 times. In addition to the starter fertilizer, gypsum at a rate of 500 lb/A was surface applied. Gypsum is a soil amendment that prevents soil crusting, in addition to being a source of sulfate.

No significant yield differences were observed between plots receiving starter fertilizer and those plots fertilized under conventional practices (Table 1).

Table 1. Corn yield response to starter fertilizer at CBS (15.5% seed moisture) during the 2003 season (P = 0.1).

Treatment	**Yield (bu/A)**
Check	182.93a (14.7)
Starter	180.12a (9.10)

Table 2. Yield response of corn (bu/A) to starter fertilizer at different locations during the 2001 season. Numbers followed by same letter are not statistically different at P=0.1.

	CBS	**PTS**		**RREC**	
	---------- Previous crop ----------				
Gal/A 11-37-0	**Cotton**	**Soybeans**	**Rice**	**Soybeans**	**Rice**
0	148b	210a	201a	127a	104b
5	167a	215a	212a	128a	138a
10	175a	206a	206a	141a	115b

Although no significant yield increases were observed, there was an obvious difference in plant

height early in the season. Increased seedling vigor may be of benefit under cold and wet conditions, which are a common occurrence in Arkansas.

As seen in table 2, yield responses to starter fertilizers tend to be inconsistent, with greater benefits expected under conditions conducive to nutrient competition, such as typical "rice" soils or to nutrient leaching such as "cotton" soils, or under reduced tillage production systems.

2. To evaluate the benefits of a pre-tassel N application.
Two or three hybrids, depending on location, were seeded at 30,000 to 32,000 plants per acre. Hybrids were chosen based on typical test weight ("low" and "high"). Treatments included a single application, a 2-way split, and 3-way (pre-tassel) N split application. Total N rate was based on soil test recommendations. The pre-tassel nitrogen treatment was applied 1 - 2 weeks before the VT stage (tasseling).

A series of test have been conducted to assess the yield response of selected corn hybrids to pre-tassel applications of nitrogen fertilizer, typically 46 lb N/A. Studies have been conducted under small plot settings as well as in commercial fields.

Table 3.Yield response of corn to pre-tassel application of 46 lb N a week prior to the tassel stage in a farmer's field in Clay county. Plots were 4 acres each, replicated 4 times. Seed moisture was adjusted to 15.5%.. Numbers with same letter are not statistically different at a 90% significance level.

Treatment	---------- **Yield bu/A per year** ----------		
	2001	**2002**	**2003**
Pre-tassel application	255.4 a	239.1a	247.8a
Conventional application	234.2 b	233.8 a	252.9a

Table 4 . Test weight of selected corn hybrids as affected by to pre-tassel application of 46 lb N a week prior to the tassel stage. Plots were 4 rows wide and 25 ft long, replicated 5 times. Seed moisture was adjusted to 15.5%.

	---------- Location ----------				
	SEREC	**NEREC**	**NEREC**	**SEREC**	**SEREC**
Treatment	**Pioneer 32H69**	**Dekalb 68-70**	**Pioneer 33R77**	**Pioneer 33R77**	**Pioneer 31G98**
	---------- Test Weight Lb/bu ----------				
Pre-tassel application	61a	57a	55a	60a	60a
Conv. Application	60a	56b	53b	58a	58b

Table 5. Yield response of selected corn hybrids to a pre-tassel application of 46 lb N one week prior to the tassel stage, during the 2003 season. Plots were 4 rows wide and 25 ft long, replicated 5 times. Seed moisture was adjusted to 15.5%

	Location				
	SEREC	**NEREC**	**NEREC**	**SEREC**	**NEREC**
Treatment	**Pioneer 32H69**	**Dekalb 68-70**	**Pioneer 33R77**	**Pioneer3 3R77**	**Pioneer 31G98**
	Yield bu/A				
Pre-tassel application	201a	245a	219a	188a	200a
Conv. Application	196a	200b	205a	199a	196a

More information is needed to better understand under which production conditions, including hybrid selection a yield increase is possible. In addition to yield responses observed under both, large and small plots, there appears to be a potential for an increase in test weight as shown in table 5, for some of the corn hybrids under testing. The inclusion of a larger number of corn hybrids, with different maturity characteristics, under contrasting soil conditions and crop rotations will help us develop recommendation packages that would allow producers to take advantage of this production practice.

3. To verify Zn deficiency in corn and formulate most economical sources.

The response of corn to selected Zn treatments was studied at several locations, under varying crop rotations. No significant responses were observed among the different treatments.

	CBS	**PTS**		**RREC**	
	Previous crop				
Zn	**Cotton**	**Soybeans**	**Rice**	**Soybeans**	**Rice**
0	183a	186a	142a	124a	90a
Low seed	182a	177a	137a	141a	108a
High seed	177a	190a	157a	117a	114a
10 lb/A	185a	179a	136a	127a	100a

Although Zn deficiency is not a widespread problem, it can certainly impair the yield potentials in those regions were this problem occurs. We currently lack a research-based recommendation for low-testing Zn soils, and it is of critical importance that recommendations be developed for corn. Zinc deficiencies are common under high soil pH and low Zn conditions (soil levels < 5-6 lb Zn/A).