

# Nitrogen Fertilizer Management for Corn

*J.H. Muir and J.A. Hedge*

## RESEARCH PROBLEM

Nitrogen (N) fertilizer programs for corn (*Zea mays* L.) generally include a preplant application followed by the remainder of the crop's N requirements supplied in a sidedress application to the young crop. A small quantity of N is sometimes applied with or near the seed as a starter fertilizer at planting. The early-spring planting dates required for production of optimal corn yields in Arkansas often expose corn seedlings to lower than optimal soil temperatures. The low soil temperatures may result in slow root growth and phosphorus (P) deficiency even though soil-test P is considered adequate. A starter fertilizer may benefit corn growth and yield in these situations. An application of N at tasseling has been used by some producers for many years. Little research data are available on N management for corn in recent years in Arkansas.

## BACKGROUND INFORMATION

Placing small amounts of starter fertilizer (usually N, P, or N and P) with or near the seed has increased early-season corn plant height and grain yield and decreased the number of days to silking in northeast Louisiana (Mascagni and Boquet, 1996). The majority of the corn crop's N requirement is generally split between a preplant and a sidedress application to reduce the risk of loss of N to denitrification or leaching under excess moisture conditions early in the growing season. No studies have been reported that have examined all aspects (i.e., starter, preplant and sidedress, and tasseling N fertilizer applications) of N fertilizer management together.

## RESEARCH DESCRIPTION

A study was initiated on the Pine Tree Branch Station located near Colt, AR, in 2002 to evaluate N as a starter fertilizer, several preplant/sidedress applied N combinations, and N applied at tasseling in a single experiment. Treatments included a) starter N at 0 and 15 lb N/acre as urea ammonium nitrate (UAN 32-0-0) applied 2 inches below and 2 inches to the side of the seed at planting, b) 210 lb N/acre as urea (46-0-0) applied in four preplant/sidedress ratios (0.33, 0.50, 1.00, and 3.00), and c) 0 and 50 lb N/acre as ammonium nitrate (33.5-0-0) at tasseling. The preplant N was applied on 9 April. The hybrid Pioneer 3223 was planted on 11 April. Sidedress and tasseling applications of N fertilizer were made on 23 May and 1 July, respectively. Treatments were arranged in a randomized complete block, 2 (starter N rate)  $\times$  4 (Preplant:sidedress ratio)  $\times$  2 (Tassel N rate) factorial design with 4 replications.

## RESULTS

There was no significant response to the different preplant/sidedress applications, N rate applied at tasseling, nor to any possible interaction among the main effects. Corn yield responded only to starter fertilizer rate in 2002 (Table 1). This is in line with results of trials evaluating various starter fertilizers during the previous three years (Tables 2 and 3). Starter fertilizer has produced a significant yield increase every year in these trials.

## PRACTICAL APPLICATIONS

Starter fertilizer continues to show promise in corn production. Further data are needed to fully evaluate the best ratio of preplant/sidedress N and to document

the benefits of N applications made at tasseling. Results to date consistently show a significant yield response to starter fertilizer on the order of 10 bu/acre or more. Producers should consider whether the cost of applying a starter fertilizer is worth the possible yield increase.

### LITERATURE CITED

- Mascagni, H.J., Jr., and D.J. Boquet. 1996. Starter fertilizer and planting date effects on corn rotated with cotton. *Agron. J.* 88:975-982.
- Muir, J.H. and J.A. Hedge. 2002. Corn response to phosphorus and potassium fertilization at different soil test levels. *In*: N.A. Slaton (ed.). Wayne E. Sabbe Arkansas Soil Fertility Studies 2001. University of Arkansas Agricultural Experiment Station Research Series 490:32-33. Fayetteville.

**Table 1. Influence of starter fertilizer on corn yield in a study conducted at the Pine Tree Branch Station during 2002.**

Starter N fertilizer rate (lb N/acre)	Corn grain yield (bu/acre)
0	113
15	125
LSD (0.05)	12

**Table 2. Influence of starter fertilizer on corn yields in a study conducted at Arkansas State University in Jonesboro during 1999.**

Corn hybrid	Starter fertilizer <sup>z</sup>	Plant population	Corn grain yield
		(×1000/acre)	(bu/acre)
P 3335	N	15,488	118
P 3335	NP	17,061	113
P 3245	P	16,698	111
P 3335	P	16,998	107
P 3245	N	15,730	106
NK 7590	NP	16,577	104
P 335	Control	15,730	103
NK 7590	Control	19,844	103
P 3245	Control	14,399	103
NK 454	Control	16,214	102
NK 7590	P	14,762	99
NK 454	N	15,125	99
NK 454	NP	17,424	98
P 3245	NP	12,705	95
NK 7590	N	15,609	94
NK 454	P	13,310	86
LSD (0.05)		3,598	23

<sup>z</sup> Starter fertilizers contained N (15.5 lb N /acre), P (25 lb P<sub>2</sub>O<sub>5</sub>/acre), or N and P.

**Table 3. Influence of starter fertilizer on corn grain yields in studies conducted at Arkansas State University, located in Jonesboro during 2000 and at the Pine Tree Branch Station located near Colt during 2001.**

Starter fertilizer <sup>z</sup>	Corn grain yield	
	2000	2001
	----- (bu/acre) -----	
P	147	111
N	127	114
NP	127	106
Control	114	92
LSD (0.05)	18	16

<sup>z</sup> Starter fertilizers contained N (15 lb N/acre), P (13 lb P<sub>2</sub>O<sub>5</sub>/acre), or N and P.