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Alternatives To Fall N Applications Via Fluids

Study looks at different application timing under two distinctly different corn tillage systems.

Summary: *Due to favorable weather conditions, corn yields exceeded 200 bu/A. In a one-pass field cultivate system, greatest yields were obtained when 40 lbs/A of N as UAN was dribbled at planting or broadcast preemergence ("weed and feed") in combination with 60 lbs/A of N sidedressed at the V3 stage. Lowest yields occurred when 20 to 40 lbs/A of N as UAN was dribbled next to the row at planting in combination with 80 or 60 lbs/A of N applied as anhydrous ammonia in the fall. In the strip-till system, highest yields were obtained when all of the N was sidedressed as UAN or split between 40 lbs/A of N as UAN broadcast ("weed and feed") during preemergence and 60 lbs/A of N sidedressed as UAN. Lowest yields occurred when 40 lbs/A of N as UAN was applied close to the seed row at planting in combination with 60 lbs/A of N sidedressed as UAN.*

Fall application of nitrogen (N) is under severe scrutiny throughout the Corn Belt largely because of greater potential for N loss in the spring before crop uptake. Numerous studies have documented significant loss of nitrate-N in subsurface tile drainage water during February through June. Some long-term studies show that 65 to 70 percent of the annual drainage discharge and nitrate losses occur in April, May, and June. These early-season losses are being associated with development of the hypoxic zone in the Gulf of Mexico. For these reasons, fall application of N is being questioned and is in jeopardy throughout much of the Mississippi River Basin.

Soil erosion and sediment delivery to surface water bodies are also burning issues as society looks for improved water quality. Agriculture has a significant role to play in this process and for years has advocated the use of conservation–till practices to minimize erosion and sediment loss to surface water bodies.

Two different conservation-till systems involving no primary tillage after soybeans were used in this project.

One, and the newer of the two, is a strip-till system that spaces strips on 30-inch centers tilled about 8 inches deep with knives mounted on a tool bar much like an anhydrous ammonia applicator. The knife tills an area 4 to 6 inches wide and leaves a 1- to 2-inch berm of residue-free soil. The inter-strip area is left untilled and is covered with residue. Placement of fertilizer, especially P and K, about 6 inches deep at the time of strip preparation is considered to be an agronomic and environmental benefit of strip-till.

The other is a one-pass system that involves a full-width field cultivator just prior to planting corn. This is a popular system that creates a favorable, weed-free seed bed and is extremely suitable for incorporating spring preplant fertilizers and herbicides.

The objectives of this study were to determine the effect of planting time and sidedress applications of UAN as alternatives to traditional single fall and spring preplant N treatments on corn after soybean in two different tillage systems.

YIELDS AT 200+

One-pass, field cultivate. Corn yields for 2002 in Table 1 exceeded 200 bu/A for some N treatments. These high yields were due in part to favorable rainfall (20.18 inches) during the May to September growing season, especially in August (6.08 inches). Also contributing was 6 percent above-normal growing degree units (GDU) for the growing season, which ended on September 24. Wet conditions during June (7.15 inches) caused some leaching and denitrification.

In general, greatest yields were obtained with:

- UAN split-applied between planting and sidedress
- Fall-applied anhydrous ammonia in combination with 20 or 40 lbs/A of N sidedressed as UAN.
- Fall-applied anhydrous ammonia with N-Serve
- Single preplant applications of anhydrous ammonia, urea or UAN.

Lowest yields occurred for split treatments of fall anhydrous ammonia plus either 20 or 40 lbs/A of N as UAN dribbled on the soil surface near the row at planting.

Strip-till. Corn yields for 2002 shown in Table 2 were very similar to those obtained in the one-pass, field cultivate system. Highest yield was obtained when all of the UAN was sidedressed, whereas lowest yields occurred when UAN was split between 40 lbs/A of N applied near the row at planting and 60 lbs/A of N sidedressed. Lower yield with dribbled UAN was similar to that found in the one-pass tillage system.

Other high-yielding treatments included:

- Fall and preplant anhydrous ammonia
- Preplant urea
- Split applications of UAN with 20 lbs/A of N at planting and 80 lbs/A of N applied sidedress
- Preemergent broadcast of 40 lbs/A of N as a "weed and feed," followed by 60 lbs/A of N sidedressed.

The lowest yielding treatment occurred where 40 lbs/A of N was dribbled on the soil surface next to the seed row at planting, followed by 60 lbs/A of N sidedressed.

METHODOLOGY

Location was at the Southern Research and Outreach Center in Waseca, MN.

Soil was a Webster clay loam.

Tile lines were spaced 75 feet apart and all rows were perpendicular to the tile lines.

N treatments, except the control, received 100 lbs/A of N. This is about 15 percent below what the University of Minnesota recommends for an expected corn yield of 150 to 174 bu/A, but we felt we could more clearly identify differences in applications with this lower N rate.

Plot. Each plot measured 10 feet wide (four 30-inch rows) by 50 feet long.

Hybrid used was Pioneer 37H27, Bt LL stack.

Plant density was 33,000 plants per acre on May 2. Plots were then thinned to a uniform population of 31,000 plants per acre.

Weed control was obtained with a broadcast application of *Surpass* on May 8, followed by a broadcast application of *Liberty* on June 14.

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Table 1. Corn grain yield in a one-pass, field cultivate system as affected by time of N application and N source, 2002.

Source/timing				Yield
Fall	Spring preplant	Planting	Sidedress*	bu/A
N source and lbs/A of N				
0	0	0	0	142
		UAN		
AA+NS/100				196
AA+NS/80		20 dribble		180
AA+NS/80			20	198
AA+NS/60		40 dribble		181
AA+NS/60			40	200
	AA/100			195
	AA+NS/100			194
	U/100/BI			196
	UAN/100/BI			197
		40 dribble	60	209
		40 spray	60	206

* All sidedress treatments coulter injected midway between rows. AA = anhydrous ammonia, NS = N-Serve, U = urea, UAN = urea ammonium nitrate, and BI = broadcast and incorporated.

Table 2. Corn grain yield in a strip-till system as affected by time of N application and N source, 2002.

Source/timing				Yield
Fall	Spring preplant	Planting	Sidedress*	bu/A
N source and lbs/A of N				
0	0	0	0	131
AA+NS/100				193
AA/100				193
	AA/100			198
	U/100			193
	U/80	20 dribble		186
			100	204
		20 dribble	80	189
		20 coulter	80	197
		40 dribble	60	182
		40 coulter	60	182
		40 spray	60	200

* All sidedress treatments are coulter injected midway between rows.