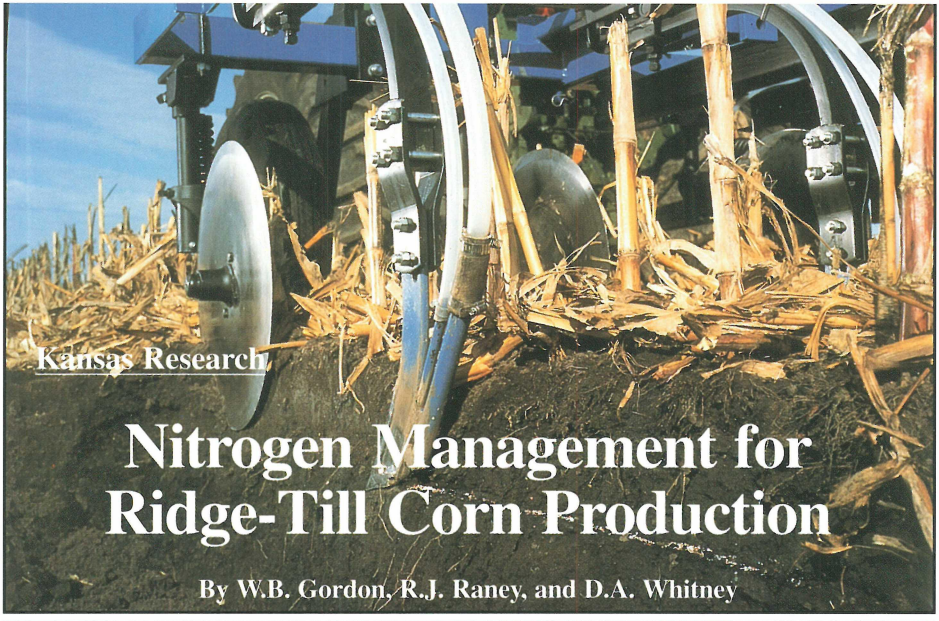

Kansas Research

Nitrogen Management for Ridge-Till Corn Production

By W.B. Gordon, R.J. Raney, and D.A. Whitney

While ridge-tillage has become a popular and effective practice for corn production, it poses some challenges in residue management and nitrogen (N) application. Research is answering some of the questions involved with this soil-conserving method.

MORE NOW THAN EVER, conservation tillage practices, including ridge-tillage, are being integrated into farming systems. This is due primarily to their effectiveness in conserving soil and water as well as their relationship to government programs. Ridge-tillage involves planting on a raised bed formed by cultivation from a previous growing season. Tillage is confined to a narrow strip on top of the ridge. This leaves large amounts of residue on the soil surface which can interact with N application methods and N fertilizers, causing immobilization, denitrification, and/or volatilization of N.

Design

This furrow-irrigated corn study was designed to assess the effectiveness of N rates (0, 50, 100, 200 lb/A N) and application methods of two N sources—anhydrous ammonia (AA) and 28 percent urea-ammonium nitrate solution (UAN), under ridge-till conditions.

Knifed AA and 28 percent UAN were applied 6 inches below the soil surface and midway between the old corn rows. Broadcast UAN was applied to the soil surface with flat fan nozzles. Dribble UAN treatments were applied at the base of the ridge on 30 inch centers. Split applications were applied half preplant and half when the corn was 12 to 15 inches high. Corn was planted at 25,500 seeds/A, using a Buffalo-Till planter with 10-inch sweeps for ridge clearing. Furrow irrigation totaled approximately 12 inches/year.

Results

When averaged over a 5-year period, corn grain yields were significantly higher for the preplant knifed AA and UAN

Table 1. Nitrogen application methods affected corn grain yield, 1987-1991.

Application method	5-year avg.,[1] bu/A
AA Preplant - Knifed	157 a
UAN Preplant - Broadcast	143 b
UAN Preplant - Knifed	156 a
UAN Preplant - Dribbled	145 b
UAN Split - Knifed	155 ab
UAN Split - Dribbled	150 ab

[1]Means followed by the same letter are not significantly different at the 5% level of probability.

Dr. Gordon is Superintendent, Irrigation Experiment Field, Courtland, KS; Mr. Raney is former Superintendent, Irrigation Experiment Field, Courtland KS; and Dr. Whitney is Agronomy Extension Leader, Kansas State University, Manhattan.

Table 2. Methods of N application had similar effects on grain N concentration and estimated total N uptake.

Application method	Grain N[1], %	Estimated total N uptake in grain, lb/A
AA Preplant - Knifed	1.39 a	127
UAN Preplant - Broadcast	1.33 b	110
UAN Preplant - Knifed	1.39 a	126
UAN Preplant - Dribbled	1.33 b	112
UAN Split - Knifed	1.39 a	125
UAN Split - Dribbled	1.37 a	119

[1]Means followed by the same letter are not different at the 5% level of probability.

applications (**Table 1**). Broadcast and dribble applications of UAN produced significantly lower yields. Dribble and broadcast UAN applications were essentially equal. Split applications of UAN knifed and dribbled were no better than applying all of the N preplant by these methods.

Preplant broadcast UAN was as effective as knifed UAN in only one of the five years of this study. Ammonia volatilization losses or residue immobilization of N during that year may have been minimized by a half-inch rainfall shortly after N application.

When averaged over all application methods and years, maximum grain yield was achieved with 153 lb/A of fertilizer N (**Figure 1**).

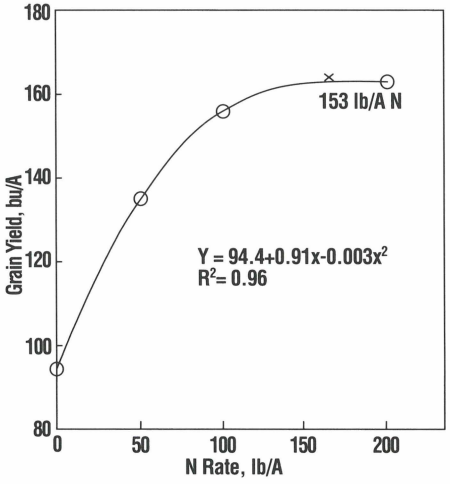

Figure 1. Corn grain yield as affected by applied N (avg. over application methods), 1987-1991. (Kansas)

Applying more N did not compensate for inefficient application methods.

Grain N concentration followed the same trends as grain yields (**Table 2**). Generally, preplant broadcast and dribble UAN produced significantly lower grain N concentrations. Knifed N applications resulted in a higher total N removal in the grain than other application methods. This is important environmentally, since an additional 10 to 15 lb/A N was removed in the grain, lowering residual soil nitrates.

Summary

Selection of N source and application method is an important management consideration in reduced tillage production systems. For ridge-till corn on this fine-textured soil:

- Knifing UAN produced higher grain yields and grain N concentrations than surface broadcasting or dribbling.
- Knifed UAN and AA produced about 13 bu/A higher yields than broadcast UAN.
- Dribbled UAN was essentially equal to broadcast applications.
- Split applications of knifed UAN did not improve yields or grain N concentrations over similar application of preplant N.
- Regardless of application system, maximum grain yield was achieved with 153 lb/A N.
- Knifed AA and UAN treatments had equal effects on grain yield or grain N concentration. ■