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When Banding, Fluids Are The Way To Go

Formulated to meet crop needs for macro-and micronutrients, with every drop having the same analysis, fluid fertilizers offer distinct advantages.

Summary: Research from the past decade verifies the improved efficiency gained from banding fertilizers. The use of this practice on a variety of crops will be reviewed as well as the advantages of using fluid fertilizers, owing to their superior handling qualities and practical efficiencies.

Four objectives usually involved in the placement of fertilizers are 1) increase the efficiency of fertilizer use by plants, 2) prevent or reduce environmental contamination, 3) prevent fertilizer salt injury to plants, and 4) provide an economical and convenient operation. Many factors, including banding, come into play to achieve all these objectives.

To a large extent, environmental conditions dictate whether or not precision placement of nutrients will be successful. Another factor includes soil conditions (pH, texture, organic matter content, cation exchange capacity, moisture content, and nutrient soil test levels). Generally, producers are more interested in final yield than crop cultural characteristics. However, the increased early growth experienced with precision placement has proven an advantage to maintaining an even crop and helping strengthen young plants against early season stresses brought about by numerous factors, including tillage and the environment.

Research has shown that if nitrogen and phosphorus are placed in a band together in proximity to the root system the plant will be better able to take up both nutrients. Research has further shown that fluid fertilizers offer distinct advantages in banding. They can be easily formulated to meet crop needs, with every drop the same analysis. They are easily pumped from transport vehicle to application machinery. A variety of equipment is available to band apply fluids. They are readily available to plants since they are predominantly in soluble forms.

We'll look at some of the positive responses reported by researchers from banding fluids.

Corn

Work on corn and nitrogen placement usually concentrates on volatilization characteristics of urea-based fertilizers. In 1993, Stecker et al. reported on the interactive effects of fertilizer application and placement method by applying UAN in no-till corn. The experimental design was a complete factorial of an application time (preplant and sidedress), placement method (knife, dribble, and broadcast), and rate (60, 120, and 180 lbs/A of N). Knife injected N increased yields relative to broadcast and dribble in five of eight site years. Yields from knifed N ranged from 4 to 20 percent more than dribble and 5 to 40 percent more than broadcast (Figure 1). In two site years, sidedress resulted in lower grain yields and application time had no effect on grain yield. No interaction of application was apparent, as knife injection was superior to broadcast and dribble at both application times. This suggested that N loss associated with surface application of urea-based N sources was similar for preplant and sidedress application times.

The researchers reported higher yields from injected N (relative to broadcast and dribble N) were likely due to reduced ammonia volatilization and immobilization losses. Dribble N on the soil surface did not result in a marked improvement in grain yield compared to broadcast. While others have shown improved grain yields from dribbling UAN onto the soil surface, relative to broadcast, data from this study did not indicate any consistent improvement in crop performance from this placement method.

Wheat

In Southern Great Plains wheat is a dual-purpose crop with winter pasture and grain production both being of great importance to farmers and ranchers. Therefore, fertilizer management to enhance early forage production is of near equal importance to practices that optimize grain yield. Late August through early October is typically a high rainfall period so wheat is planted early to optimize vegetative growth. This rapid early growth tends to deplete surface moisture. It is here where conventional fertilizer applications present a problem because of the concentration of nutrients at the surface. As the soil dries out, root activity decreases at the surface and access to non-mobile elements such as phosphorus is limited due to reduced root growth.

Beef cattle production is the largest agricultural enterprise in the Southern Great Plains. The potential for enhanced forage yields and the resultant increase in current capacity under drought conditions have very large implications. Approximately ten million acres of wheat are grazed annually in this region. The economic potential for a system to improve yields in high risk or dry years is enormous with respect to farmers, ranchers and the agricultural industry as a whole.

In 1998, Miller showed that deep placing phosphorus provided growers from this region with an additional risk management tool for winter wheat. Nitrogen and phosphorus were injected six to eight inches deep on eight- to ten-inch centers. N at 50 lbs/A and P_2O_5 at 40 lbs/A were applied. Wheat was planted from mid September to early October on ten-inch centers. The results showed forage dry matter yield response was greatest with deep-banded P relative to surface-incorporated P in the dry years (Figure 2). At two sites (Wichita 1995 and Abilene 1997), where drought drastically limited grain yield, no response occurred with N alone or N plus surface-incorporated P. During a very wet growing season in Abilene in 1995, note how the band vs surface response was reversed.

Vegetable

Phosphorus placement in relation to root proximity is as important to vegetable crops as it is to grain crops.

Mortley, et al. studied the effects of fertilizer placement on tomato growth, fruit yield, and elemental concentrations. They found that banding significantly increased yields and nutrient uptake over broadcast treatments. Fertilizer was broadcast at two rates, or banded in two bands at two widths, or at four bands, or applied in combinations of sidedressing or broadcasting, plus banding of N, P, and K at rates of 50, 100, or 200 lbs/A of each. Total fruit yield for the 100 lbs/A banded was 24 percent higher than that for the same rate broadcast, and similar to the yield for the 200 lbs/A broadcast (Table 1). Treatments involving combined placements, wider bands, or four bands produced similar yields to that for the 100-lb/A banded rate, but the 50 lbs/A banded with two sidedressings at 50 lbs/A each had the highest yield. Leaf concentrations and plant contents of N, P, and K (in percentage of recovery of quantities applied) were generally higher in treatments involving banding or sidedressing, when compared to broadcasting.

Cotton

Research with cotton suggests that starter fertilizer will not turn a poor crop into a good crop, but can improve yields of good crops. Applications of starters in a two-by-two band, in a three- to four-inch surface band over the seed furrow and in-furrow at planting appeared to be most effective.

Bednarz et al. performed an agronomic and economic analysis of cotton starter fertilizers. They set out to examine if cotton grown on coastal plains in South Georgia would respond to different starters and also if use of starters would result in an economic gain.

Three locations were employed with starters from five sources applied two inches beside and two inches below the seed drill at planting time. Lint yields were significantly increased for starters at two locations in 1997 when the crop was exposed to an extended period of cool weather immediately after planting.

Table 1. Fertilizer placement effects on yield responses of 'Count 11' tomatoes, 1986-88.

Treatment*	Total yield (ton/A)	Fruit wt oz	Large fruit oz	Ripe fruit %	Vine wt (ton/A)
Control	27.2	4.2	39.3	31.9	3.6
100 Br	27.4	3.8	28.1	32.3	3.9
100 Ba	33.9	4.0	29.8	34.5	4.2
200 Br	31.4	3.8	26.3	32.8	4.5
50 Br/50 Ba	32.0	3.9	29.2	34.6	4.6
50 Ba/50 Sd1	31.7	3.8	26.1	32.6	3.9
50 Ba/50 Sd2	35.4	4.0	25.7	30.0	4.7
100 Wba	33.9	4.0	31.7	31.9	4.4
100 4Ba	34.8	4.1	35.3	33.4	4.7

*NPK rate in lbs/A.
Br = broadcast, Ba = banded, Sd1 = sidedress once, Wba = wide Bands, 4Ba = four bands, two on each side.

Table 2. Net return above treatment costs from starter tests conducted at Midville, Plains, and Tifton, Georgia, 1997 and 1998.

Treatment	Midville 1997	Midville 1998	Midville Avg.	Plains 1997	Plains 1998	Plains Avg.	Tifton 1997	Tifton 1998	Tifton Avg.
	$/A								
10-34-0 +32-0-0	762	514	638	587	633	610	759	691	725
10-34-0	776	511	643	668	674	671	763	669	716
32-0-0	864	483	674	525	684	605	833	688	761
28-0-0-5S	896	532	714	535	682	608	833	727	780
9-0-0-11Ca	752	528	640	575	690	632	810	725	768
Untreated	672	442	557	549	678	613	798	675	737

Net return is cotton income (price times yield) minus ginning, warehousing, and treatment costs.

Products employed were 10-34-0 + 32-0-0, 10-34-0 alone, 32-0-0 alone, 28-0-0-5S, and 9-0-0-11Ca.

The researchers concluded that starters would be an efficient method of sulfur application on the soils studied. Also, an economic analysis showed that there were greater dollar returns even though some of the yield increases were not statistically significant (Table 2).

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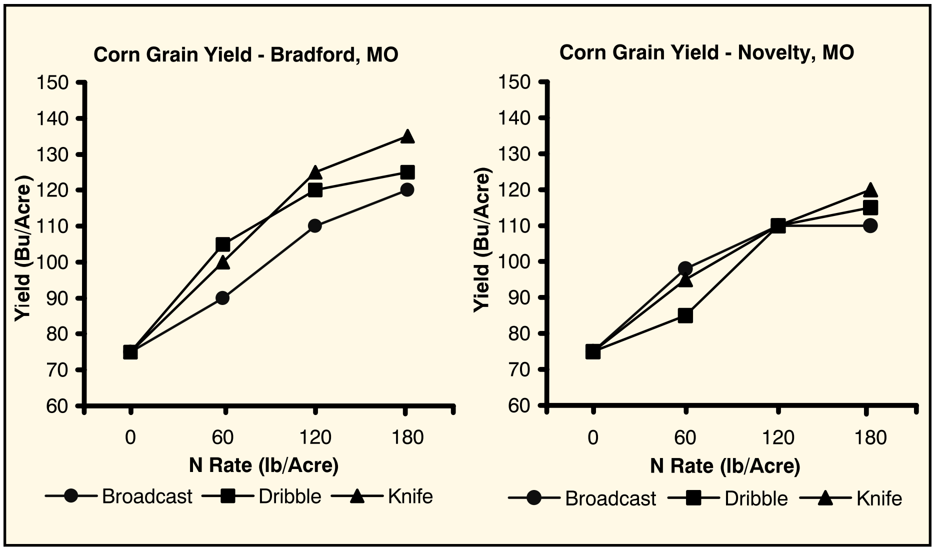

Figure 1. Yield response of corn to different methods of preplant UAN application, means of three years, Stecker et al., 1993.

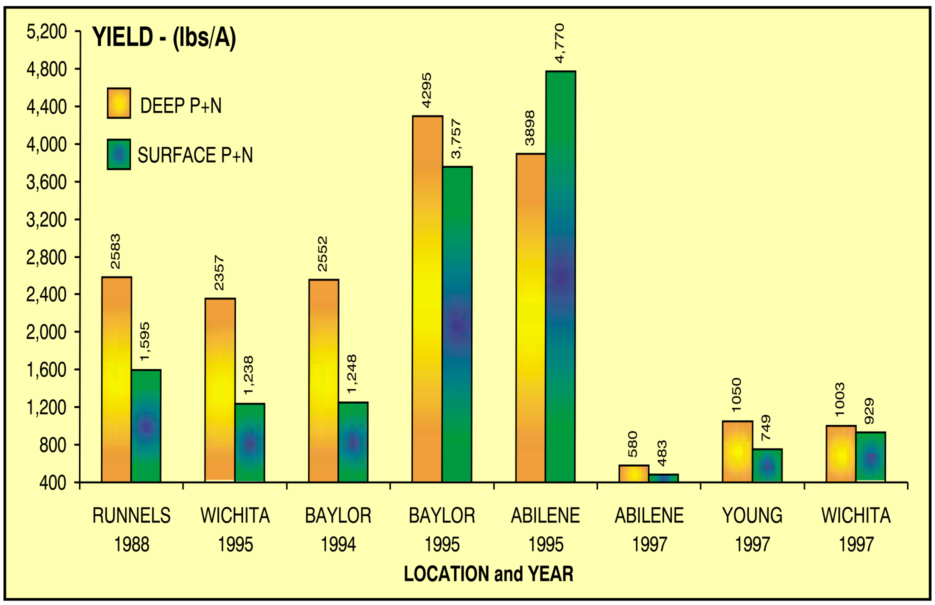

Figure 2. Response of wheat forage to fertilizer placement (50 lbs/A of N and 40 lbs/A of P_2O_5), Texas Rolling Plains.