Banding Means Higher Yields and Better Return On Investment

Surface band provides better soil contact, higher nutrient concentrations in bands, diminished nutrient fixation, and greater availability for plant uptake.

Flexibility in placement of fluids has been an agronomic advantage of fluid use for over 30 years. One method of placement that has been documented in research and field use of both clear liquids and suspensions as especially advantageous is surface banding. This article will explore those advantages.

FORMS OF BANDING

Dribbling is a term that has frequently been associated with surface applications of nitrogen solutions (UAN) or combinations of UAN and other nutrients on grass and established wheat. Dribble applications also take the form of sidedressed surface bands of N or N-S solutions on corn, grain sorghum, and other row crops where fluid is placed close to the row. The term side banding refers to a postplant sidedress of N or N-S but also can be used to describe a fluid starter placement to the side of, or to the side and below the seed.

Strip banding has gradually developed to refer more to surface applications of suspensions, particularly in regard to fall or early winter applications of heavy rates of P and K. The term is not captive to use for fall applications for crops such as corn and soybeans but tends to be used more in conjunction with those cropping systems. However, the term "strip banding" is also associated with at-planting, over-the-row starter applications of N and P for cotton, corn, and occasionally grain sorghum, plus other crops.

Let's consider some of the reasons these methods of fluid placement for specified nutrients are agronomically sound.

NITROGEN

Advantages of surface banding of N for both warm and cool season grasses and for wheat have been amply demonstrated by land grant universities (Table 1). Improved performance of banded UAN has been attributed to: a) better solution penetration of surface residues to the soil surface, b) diminished volatilization of ammonia from urea in the solution, c) less N tie-up by plant residues, d) higher concentrations of nutri-

TABLE 1. SURFACE BANDING ON UAN IMPROVES GRASS RESPONSES TO N

Application Method	Fescue lb/A	Fescue lb/A	Fescue lb/A	Brome lb/A	Brome lb/A	Fescue lb/A
No N	3220	3020	2766	1257	4707	—
Broadcast	5906	6544	3534	4758	6412	3842
Surface band	6791	7147	4432	5787	6925	4549

Kansas, 1973-1985

TABLE 2. SURFACE BANDING IMPROVES N USE EFFICIENCY FOR REDUCED TILLAGE ROW CROPS

Application Method	Corn-IA bu/A	Corn-MO bu/A	Grain Sorghum-KS lb/A	Corn-MD bu/A	Corn-MD bu/A
Broadcast	188	111	6496	135	99
Surface Band	201	128	7336	158	120
	Cartersville Elev.	U. of MO	Kansas State U.	U. of MD	

ents at specific points in the soil, and e) subsequently greater N use efficiency.

Benefits of surface banding N for reduced-till row crops (Table 2) have been verified by university research and grower experiences. The same factors affect N use from surface banding in these high-residue systems and result in better crop responses to N.

Surface banding can result in reduced leaf burn, especially in spring wheat and summer crops. Depending on date of application, leaf burn can be a problem but is usually more cosmetic than yield damaging.

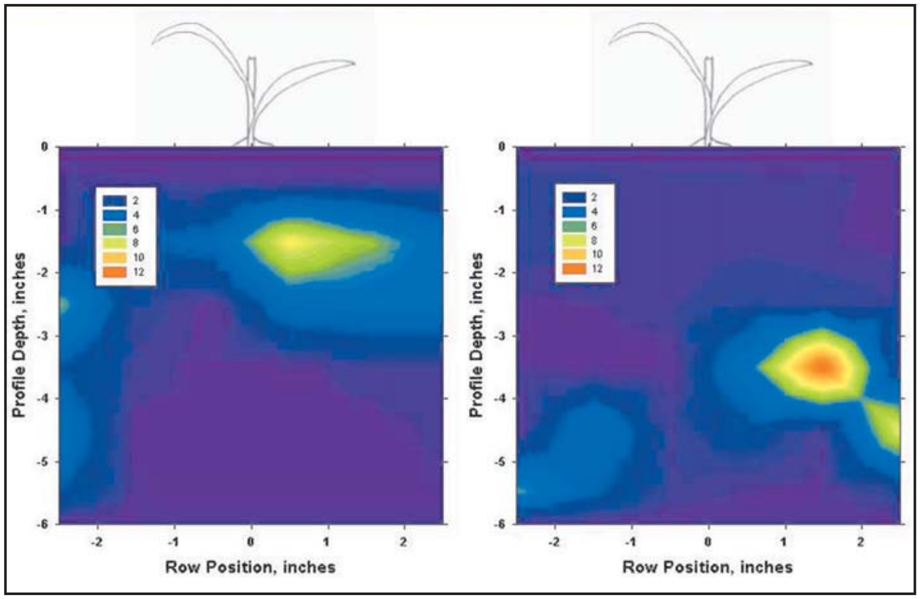

Figure 1. Profile distribution of bio-available P 68 days after dribbling 15-30-10 (left) and 60-30-10 (right) two inches to side of corn row.

NPKS

Surface banding of NP, NPK, NS, and NPKS combinations brings some real advantages to nutrient-use efficiency for grasses, wheat, alfalfa, cotton, corn, grain sorghum, and other crops. In addition to the benefits to N use efficiency described earlier, P is the nutrient that probably benefits the most from the special conditions produced by surface banding.

Phosphorus availability declines as soon as it is applied, particularly on high pH or very acidic soils where P fixation is a greater problem. Surface banding or banding of any type produces higher concentrations of P in or on the soil, which tends to slow or offset P fixation.

But higher concentrations alone are not enough to maintain the highest levels of P availability. If surface bands of P remain on the soil without incorporation, the possibility of positional unavailability may work against adequate plant uptake of applied P. Positional unavailability is particularly affected by dry soils that limit root absorption of applied nutrients.

Fluid Fertilizer Foundation (FFF) supported research has shown how preplant band applications of N and P improve P uptake and subsequently crop yields as long as ammonium-N concentrations in those bands are high. High concentrations of ammonium-N in soil P retention zones slow P fixation reactions keeping the P in a form that plants can readily absorb. Purdue University research in the 1950s showed how ammonium-N affects the physiology of P movement into plant roots.

Many positive things go on at once to affect P availability. High concentrations of banded P slow P fixation. High concentrations of banded ammonium-N slow fixation even more and extend P availability. Banded ammonium-N exerts a physiological influence on P uptake. High concentrations of urea from UAN tend to slow hydrolysis of polyphosphates in 10-34-0 and high urea and ammonium concentrations slow nitrification.

Addition of ammonium thiosulfate to the mixture has been shown to slow urea hydrolysis, slow nitrification, decrease ammonia losses, and extend the presence of ammonium-N, which subsequently extends P availability in the P retention zone.

University and provincial agency research has shown that surface banding starters containing at least a 1:1 $N:P_2O_5$ ratio has performed just about as well for corn and wheat as conventional banding to the side and below the seed. We have always *assumed* that P does not move vertically. Starter response was not due to just N, was not very good when only 10-34-0 was used, and occurred on soils when soil test P levels were high. Why?

USDA researchers at the National Soils Tilth Lab in Ames, Iowa, have shown us why these surface bands are effective sources of starter nutrients. Plotting the distribution of P beneath these bands, they have shown that P movement to depths of around 4 inches is possible in silt loam soils in the presence of high ammonium concentrations (Figure 1). Water is likely a necessary component of such movement.

This helps us understand better why surface banding P does work and provides corn and sorghum producers with more flexibility in starter placement and gives growers the opportunity to use large planters that are not equipped for usual starter placement.

What about potassium (K) in these surface starter bands? Purdue research has shown that surface banded K followed by tillage can be highly effective and more efficient than broadcast, even at modest K rates. We don't have much information on just how effective starter surface banding is for K but we do know that K in starters with conventional placement under reduced-till even on high K-testing soils is very important in helping offset early-season stresses. Maybe high ammonium concentrations can offset K adsorption by clays and enhance K mobility. That's a guess! Information is scarce on this subject. However, for the small investment in K that can go in a high-N starter, keep it in the mix even with surface bands with no incorporation.

FALL SURFACE BANDING

Fall surface banding of suspensions (or clear liquids) for corn and beans represents another means of achieving the benefits of P banding along with applications of large amounts of K (suspensions).

Purdue research (mentioned above) provided the foundation for this type of placement and demonstrated improved availability of both P and K under Corn Belt conditions. It is interesting to speculate if high concentrations of K, plus some ammonium-N, could have synergistic effects on slowing P fixation reactions in such bands and possibly influence vertical P movement. Certainly, concentrations of nutrients are higher in these retention zones. In any event, this method of P and K application has proven to be highly effective and is a proven means of improving corn and bean yields. ❑