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A Look At Seed-safe Applications Of Fluids

Multi-Year study looks at how well fluid fertilizers fit in with concept of placing fertilizer close to seed at planting.

Grower interest in use of banded fluid fertilizer at planting is increasing. This renewed interest is due, in part, to frequent observations that banded fertilizer increases crop growth and subsequent yield. Compared to the once popular 2x2 placement (commonly called starter fertilizer), there are now several inexpensive attachments that can be added to planters to place fertilizer in a band near the seed at the time of planting. These attachments provide an easy way for fluids to be placed close to the seed while allowing for some soil between the seed and fertilizer. A multi-row planter can be easily modified to apply banded fertilizer near the seed for a relatively low cost.

Research funded by the Fluid Fertilizer Foundation in the mid-'90s showed that relatively high rates of fluids (10-34-0, 4-10-10, 7-21-7) could be applied in direct contact with corn seed at planting with no negative impact on either emergence or yield if soils were not sandy or dry. The soybean crop was less tolerant of seed-placed fertilizer. Recent research in Iowa has documented the positive benefits of several fluids placed near, but not in contact with, or very close to corn and soybean seed at planting.

More recent research in northwestern Minnesota has shown that 10-34-0 applied at low rates in contact with seed has very positive effects on both yield and quality of the sugarbeet crop. Because of the ease of handling and the accuracy of calibration, placement near the seed is an ideal fit for the use of fluid fertilizers. Therefore, this study was conducted to evaluate the effect of placement of fluid fertilizers near the seed on emergence and yield of corn, soybeans, and sugarbeets.

SUMMARY

This study was designed to evaluate the effect of placement (with seed, on top of seed, and below seed) of three fluid grades (10-34-0, 4-10-10, and 3-18-18) at two rates on emergence and yield of corn, soybeans, and sugarbeets. Fluid placement had little effect on corn emergence on silty clay loam sites, but did have an effect where the soil texture was a loamy fine sand. High N rates caused an emergence reduction on sandy soil. Generally, these materials reduced emergence when placed close to the seed. Use of 10-34-0 at a low rate in the sandy soil improved yield when band was placed so that there was some soil between seed and fertilizer. In general, 4-10-10 and 3-18-18, either in contact with or near the seed, improved yield when both rates were applied in the sandy soil. In soybeans, largest reduction in emergence occurred with 10-34-0 and least with 3-18-18. A reduction of 37 percent was associated with placement of 10-34-0 with the seed. While all factors had a significant effect on soybean emergence, there was no effect on soybean yield. Sugarbeet emergence was not significantly affected by treatment, possibly because two lower starter rates were used and the sugarbeet was coated, thus protecting the seed from fertilizer damage.

Emergence

Corn. Results varied with soil texture (Table 1). The fluid material, rate of application, and placement had no significant effect on corn emergence at the site with the silty clay loam texture. The soil at this

site was moist at planting and fluid fertilizer placed near the seed had no effect on emergence. When averaged over rate (5 and 10 gal/A) and placement, use of 10-34-0 produced a substantial reduction in emergence from a soil with a loamy fine sand texture, especially when placed with the seed at 10 gal/A. Emergence was nearly equal when 4-10-10 (5 and 10 gal/A) and 3-18-18 (3.4 and 6.8 gal/A) were placed close to the seed. Higher rates of N near the seed reduced emergence.

Soybean. When averaged over rate and placement, the largest reduction in emergence was associated with 10-34-0 and the least with 3-18-18. As would be expected, the highest rate produced

Table 1. Corn emergence as affected by fluid material, rate, and placement in soils with two contrasting soil textures, 2005.

	Texture, Placement, Rate											
	Silty clay loam						Loamy fine sand					
	with seed		top of seed		below seed		with seed		top of seed		below seed	
Material	high	low	high	low	high	low	high	low	high	low	high	low
	plants/A											
10-34-0	32,017	32,670	31,145	31,799	32,017	30,710	20,691	28,532	21,127	28,967	20,909	26,136
4-10-10	32,581	30,492	31,363	30,274	33,017	32,452	28,532	32,234	27,661	31,581	28,314	31,363
3-18-18	32,670	31,581	33,541	32,452	31,794	30,274	29,185	32,670	31,363	32,888	27,878	32,017

Control (no fluid fertilizer applied) = 31,106 and 30,710 for silty clay loam and loamy fine sand sites.

Table 2. Corn yield as affected by fluid material, rate and placement in soils with two contrasting soil textures, 2005

	Texture, Placement, Rate											
	Silty clay loam						Loamy find sand					
	with seed		top of seed		below seed		with seed		top of seed		below seed	
Material	high	low	high	low	high	low	high	low	high	low	high	low
	bu/A											
10-34-0	211.6	203.6	213.8	208.9	213.6	209.6	154.9	176.8	170.5	190.6	151.7	199.3
4-10-10	204.7	196.9	210.3	208.4	203.0	210.3	192.8	203.7	188.4	208.7	201.3	190.9
3-18-18	201.0	212.2	215.3	209.3	211.0	206.7	189.3	207.8	205.7	203.5	201.1	204.4

Control (no fluid fertilizer) = 208.7 and 185.5 bu/A for silty clay loam and loamy fine sand sites, respectively.

the largest stand reduction. When averaged over material and rate, placement with the seed produced the largest stand reduction. There was less damage when fertilizer was placed on top of the seed than when placed below. As with corn, stand reduction appeared to be related to the added N in the 10-34-0.

Sugarbeet. Sugarbeet emergence was not significantly affected by treatment. There are two possible explanations for this observation.

- Lower application rates
- The sugarbeet seed was coated and this coating may have protected the seed from fertilizer damage.

Yield

Corn. The impact of treatment on corn yield varied with soil texture (Table 2). Treatment had no significant effect on yield at the site with the silty clay loam texture. Yield was affected by both material and rate at the site with the loamy fine sand texture. This is consistent with the effect of these factors on emergence. Compared to the control, both rates of 10-34-0 applied in contact with the seed reduced yield. This is attributed to a reduction in stand associated with the corresponding treatments. Use of 10-34-0 at the low rate improved yield when the band was placed so that there was some soil between seed and fertilizer. In general, application of 4-10-10 and 3-18-18 either in contact with or near the seed improved yield when both rates were applied. The yields were equivalent for both rates applied. There was no significant interaction between fluid grade and rate of application.

Soybean. Although all factors included in the study had a significant effect on emergence, there was no effect on yield (Table 3). There is general agreement that reductions in soybean stands do not necessarily correspond to reductions in yield. With fewer plants, each plant produces more branches and, subsequently, more pods per plant.

Sugarbeets. Fluid grade had a significant effect on sugarbeet yield (Table 4). When averaged over rate and placement, yield was highest when 10-34-0 was used. Application of 4-10-10 and 3-18-18, regardless of rate and placement, had no positive effect on yield.

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Table 3. Soybean yield as affected by fluid material, rate, and placement, 2005.

	Placement and rate					
	with seed		top of seed		below seed	
Material	high	low	high	low	high	low
	bu/A					
10-34-0	61.9	65.0	63.3	64.5	62.3	64.2
4-10-10	65.3	65.1	63.4	64.9	65.6	62.5
3-18-18	62.7	68.1	66.7	64.4	63.4	64.2

Control (no fluid fertilizer) = 63.1 bu/A
10-34-0 and 4-10-10, 3 and 6 gal/A; 3-18-18, 2 and 4 gal/A

Table 4. Sugarbeet yield as affected by fluid material, rate, and placement in a soil with silty clay loam texture, 2005.

	Placement and rate					
	with seed		top of seed		below seed	
Material	high	low	high	low	high	low
	tons/A					
10-34-0	28.1	29.1	27.2	29.4	29.1	30.2
4-10-10	24.3	27.4	28.8	26.8	29.8	27.8
3-18-18	23.0	29.9	26.7	28.0	25.9	23.8

Control (no fluid fertilizer) = 28.9 tons/A