

by Drs. Albert L. Sims and Larry J. Smith

Using Starters to Reduce Broadcast Applications of P in Sugar Beets

Studies show P starters produced yields equal to or exceeding those produced by larger rates of P applied through broadcasting.

Summary: Results of the 2002 growing season are similar to what has been observed in previous years (2000 and 2001). Application of a small amount of a fluid phosphorus (P) fertilizer banded in the furrow with the seed produced yields similar to or exceeded those yields obtained with a much larger rate of granular P broadcast.

Phosphorus fertilizer is a significant investment in the production of sugar beets. If mismanaged, it can cause environmental problems. The philosophy of P fertilization varies with individuals and organizations. One philosophy recommends building soil test levels into the upper medium and high ranges followed by annual applications of P fertilizer to replace P removed by the crop and maintain soil P tests. The University of Minnesota recommends 1) annual soil testing to determine soil test P levels and 2) applying recommended P fertilizer rates to optimize production levels. While the university does not recommend building soil test levels, strict adherence to university

recommendations will lead to a gradual buildup of soil test P. However, this gradual buildup will be accounted for with annual soil testing, and P fertilizer recommendations will be adjusted accordingly.

Some growers have reported that three to five gallons of 10-34-0 banded in the furrow with the seed at planting yielded satisfactory results without any additional granular broadcast P. Three to five gallons of 10-34-0 supplies 12 to 20 lbs/A of P_2O_5 . This is considerably less P than recommended broadcast rates of granular that might range from 60 to 80 lbs/A of P_2O_5 in a low P-testing soil. Banding reduced rates of fluid P

fertilizer compared to granular broadcast rates will probably not build soil test P levels and thus could be more environmentally safe. The question is whether it will sustain optimum sugar beet production to allow growers the production levels they need to stay in business. Thus, the reason for conducting experiments to see how sugar beet production is affected when comparing banding reduced rates of fluid P in the furrow with the seed to broadcasting granular P at higher rates.

Final Yield

Generally, sugar beet root yield and sucrose concentration were lower in the 2002 growing season compared to the previous years (2000 and 2001) of this experiment. Part of this was due to 1) planting on May 15, compared to early May or late April in previous years, 2) delayed emergence due to cold, dry conditions, and 3) several heavy rainfalls during critical times of the growing season. Nevertheless, comparisons of treatments are valid.

Root yield. Sugar root yield in the check plot (no P fertilizer) was about 13.5 tons/A and increased to nearly 20 tons/A with 60 lbs/A of P_2O_5 broadcast as granular

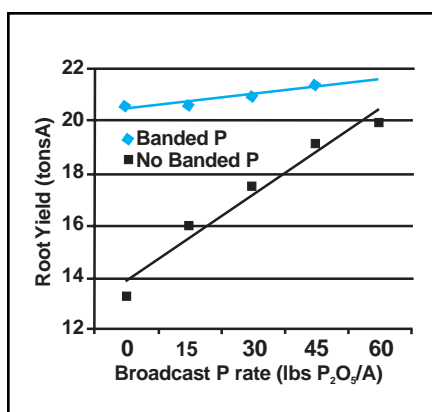


Figure 1. Sugar beet root yield response to broadcast dry P fertilizer (11-52-0) with and without banded liquid P (10-34-0).

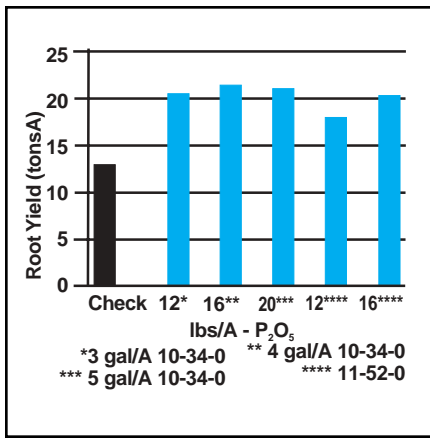


Figure 2. Sugar beet root yield response to various rates and sources of banded P fertilizer.

0-44-0. However, the significant interaction between sugar beet response to rates of dry broadcast P and liquid banded P is obvious from the total lack of response to dry broadcast P when 10-34-0 was banded in the furrow with the seed (Figure 1). Banding 3 gal/A of 10-34-0 yielded nearly 20 tons/A when no granular P was

broadcast and nothing more when granular P was broadcast. This verifies the improved efficiency of banding liquid P relative to broadcasting dry. Banding 3 gal/A of 10-34-0 supplied about 12 lbs/A of P_2O_5 and resulted in a sugar beet root yield similar to that observed with 60 lbs/A of P_2O_5 broadcast as granular 0-44-0.

Growers have raised questions about whether dry P fertilizers can be substituted for liquid 10-34-0. Sugar beet root yields with banded dry fertilizer (11-52-0) were similar to liquid fertilizer, but only at higher application rates. Figure 2 illustrates sugar beet root yield differences among the various banded P fertilizer sources and rates. This was consistent with 2001 results where 11-52-0 at 11 to 12 lbs/A of P_2O_5 resulted in yields of 1.5 to 2 tons/A less than 3 gal/A of 10-34-0.

Sucrose. Recoverable sucrose followed similar trends because of little or no effect of banded P on net sucrose concentration. We have not been able to get a response of sucrose concentration or loss to impurity (referred to as loss to molasses or LOM) with any P fertilizer treatment either broadcast or band.

Summary

Our 2002 data suggest that banded dry fertilizers are effective, but may require a higher rate than liquid fertilizers. We are currently examining new ways of doing in-season work.

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