

## Starter Phosphate Fertilizer Products Study on Sugarbeet, 2007

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### Introduction-

Traditional P nutrition on sugarbeet has been achieved through broadcast applications of P at rates of DAP (diammonium phosphate or 18-46-0) or MAP (monoammonium phosphate or 11-52-0) from 100 lb/a to 200 lb/a or more. Sims and Smith (2002, 2003) showed that 3 gal/a 10-34-0 (ammonium polyphosphate, or APP for short) produced similar sugar yields per acre as sugarbeet fertilized with high rates of broadcast P. These data raised several questions regarding 10-34-0 and its apparent sugar production advantages over broadcast application. It was asked if other products with starter P characteristics would have similar or enhanced benefits. This research is the third year of studies that examine different starter P products, compared to broadcast P and APP rates.

### Methods and Materials

This study was conducted at one site on a field operated by Chad Leech, about five miles southeast of Glyndon (Clay County, MN, Twn 138 N, R 46W, section 7, SE ¼ of SE ¼) on Elmville fine sandy loam soils. The experimental design was a randomized complete block with 17 treatments and 4 replications. The treatments are described in Table 1.

**Table 1. Treatments applied near Glyndon, MN as seed-placed starter fertilizer unless indicated.**

<u>Treatment number</u>	<u>Treatment description</u>
1	Check
2	10-34-0, 1 gal/a
3	10-34-0, 2 gal/a
4	10-34-0, 3 gal/a
5	10-34-0, 1 gal/a + 1.5% v/v Avail
6	10-34-0, 2 gal/a + 1.5% v/v Avail
7	10-34-0, 3 gal/a + 1.5 % v/v Avail
8	RiseR (7-17-3)* at 2.5 gal/a
9	UAP Black Label (6-22-0) at 1 gal/a
10	UAP Black Label (6-22-0) at 2 gal/a
11	150 lb/a 0-46-0 broadcast prior to final pre-seeding tillage
12	Nutra Flo 6-26-6 at 3 gal/a
13	Nutra Flo 6-26-6 at 5 gal/a
14	Nutra Flo 6-26-6 at 3 gal/a + RGS at 5 oz/a
15	Nutra Flo 6-26-6 +Zn, 3 gal/a
16	Nutr Flo 6-26-6 at 3 gal/a+ 1.5% v/v Avail
17	Plant-Prod In-Row + 2 foliar applications of FPF

\*RiseR also contains 0.07% Cu, 0.2% Fe, 0.6% Mn, and 0.95% Zn as zinc ammonium acetate, CuEDTA, FeHEDTA, MnEDTA and ZnEDTA.

Sugarbeet variety Beta 1305 was seeded May 1 at a 1.25 inch depth, with 5-inch seed-spacing into good seedbed moisture and 65°F air temperature. Plot dimensions were 30-feet long and six 22-inch rows wide. Twenty-five foot turn-rows separated each replication. Micro-rates were applied four times during the early-mid season for weed control. Two fungicide applications were conducted using Eminent and Headline tank-mix for Cercospora control.

Emergence stands for each plot were counted May 24. Harvest stand counts were made September 12, and harvest was conducted using a two-row field sugarbeet lifter, harvesting the middle two rows of each plot. Emergence and harvest data was analyzed in SAS 9.1 for Windows, using a spatial procedure in PROC MIXED to take out variability not accounted for with experimental blocking.

### Results and Discussion-

Stand was counted at emergence because starter fertilizers can reduce stand if rates are too high, especially if salt index or urea-N content of the fertilizer is excessive for the rate. Emergence stand was reduced the most by the 2 gal/a rate of APP and Black Label at 2 gal/acre. Harvest stand was lowest with the Nutra Flo 3 gal/a + RGS.

**Table 2. Emergence and harvest stands due to starter fertilizer treatments.**

Treatment	Emergence Stand, pl/100 ft.	Harvest Stand pl/100 ft.
Check	151 b	154 c
APP 1 gal/a	136 ab	129 bc
APP 2 gal/a	127 a	109 ab
APP 3 gal/a	159 b	143 c
APP 1 gal/a + Avail	130 ab	124 bc
APP 2 gal/a + Avail	150 ab	116 ab
APP 3 gal/a + Avail	156 b	141c
RiseR 2.5 gal/a	130 ab	103 ab
Black Label 1 gal/a	158 b	127 bc
Black Label 2 gal/a	127 a	113 ab
Broadcast P	154 b	142c
Nutra Flo 3 gal/a	162 b	136 bc
Nutra Flo 5 gal/a	153 b	125 bc
Nutra Flo 3 gal/a + RGS	146 ab	97 a
Nutra Flo+Zn 3 gal/a	152 b	129 bc
Nutra Flo + Avail	151 b	118 b
Prod in row + 2 foliar	140ab	106 ab
LSD 5%	24	20

**Table 3. Sugarbeet yield and quality with starter P treatments.**

Treatment Number	Net Sugar%	SLM %	Tons/a	RST lb/ton	RSA lb/a	Gross \$ per ton	Gross \$ per acre
1 Check	13.9 a	1.21 a	22.6 a	279 a	6318 b	33.74 a	765.53 a
2 APP 1	14.2 ab	1.18 a	22.1 a	284 ab	6280 b	35.12 a	776.56 a
3 APP 2	14.0 ab	1.29 ab	22.4 a	279 a	6290 b	33.90 a	768.74 a
4 APP 3	14.8 b	1.18 a	24.1 ab	295 b	7154 bc	37.74 b	921.07 b
5 APP 1Av	14.8 b	1.15 a	21.0 a	295 b	6224 b	37.80 b	797.74 ab
6 APP 2Av	14.5 b	1.18 a	21.3 a	291 b	6258 b	36.74 ab	796.09 a
7 App 3Av	14.3 ab	1.20 a	21.3 a	287 ab	6160 b	35.69 ab	772.34 a
8 RiseR	13.9 a	1.23 ab	18.8 a	278 a	5188 a	33.55 a	621.30 a
9 BL 1	13.8 a	1.30 b	26.7 b	276 a	7451 c	32.97 a	903.78 b
10 BL 2	13.5 a	1.32 b	22.9 a	271 a	6202 b	31.78 a	729.16 a
11 Bdcst P	14.1 ab	1.31 b	25.3 ab	283 ab	7220 bc	34.76 ab	895.72 ab
12 NF 3	14.7 b	1.26 ab	21.2 a	293 b	6264 b	37.28 b	802.55 a
13 NF 5	14.1 ab	1.27 ab	24.1 ab	281 ab	6817 bc	34.36 a	837.47 a
14 NF 3RGS	14.8 b	1.24 ab	21.8 a	297 b	6593 bc	38.21 b	861.80 a
15 NF Zn	14.6 b	1.28 ab	23.7 ab	291 b	7244 bc	36.76 ab	923.06 b
16 NF Av	14.6 b	1.16 a	23.7 ab	291 b	6930 bc	36.78 ab	879.79 ab
17 PL Prod	14.2 ab	1.35 b	23.2 ab	284 ab	6668 bc	34.98 ab	830.73 a
LSD 5%	0.6	0.09	3.1	12	1000	3.09	148.00

Higher net sugar was achieved with 3 gal APP, 1 gal APP + Avail, Nutra Flo at 3 gal/a, Nutra Flo at 3 gal/a + RGS, Nutra Flo + Zn at 3 gal/a, and Nutra Flo at 3 gal/a + Avail. There was higher sugar loss to

molasses (SLM) with Black Label at 1 gal/a and 2 gal/a, broadcast P, and Prod In-Row with 2 foliar applications of FPF.

Highest tons/a were achieved with Black Label at 1 gal/a. Highest recoverable sugar per ton was produced with APP at 3 gal/a, APP at 1 gal/a + Avail, APP at 2 gal/a + Avail, Nutra Flo at 3 gal/a, Nutra Flo at 3 gal/a + RGS, and Nutra Flo at 3 gal/a + Avail.

Black Label at 1 gal/a had the highest recoverable sugar per acre. Lowest recoverable sugar per acre was the RiseR treatment.

Highest gross revenue per ton was achieved with the 3 gal APP, 1 gal APP + Avail, Nutra Flo at 3 gal/a, and Nutra Flo at 3 gal/a + RGS. Highest gross revenue per acre was produced with the 3 gal APP, Black Label at 1 gal/a, and the Nutra Flo 3 gal/a + Avail treatments. Treatments that were not significantly different from the highest revenue-grossing treatments were 1 gal/a APP + Avail, Broadcast P, and Nutra Flo at 3 gal/a + Avail.

Similar to the 2006 trial (Franzen et al., 2006), there has been no consistently high revenue product. The 10-34-0 at 3 gal/a was higher in revenue per acre than most other treatments, however the 1 and 2 gal/a treatments were not, even when Avail was added. The Black Label starter fertilizer/humate treatment at 1 gal/a was higher in revenue than the check, but the 2 gal/a treatment was not. The Nutra Flo 6-24-6 treatment at 3 gal/a + Zn was higher than the check, but the other Nutra Flo treatments were not. One would not expect, based on other Zn research conducted in the area, that adding Zn would be enough to single out a product as superior to others. If that were the case, one would also expect the RiseR treatment to be exceptional, but it was not.

Part of the problem with consistency may be due to disease pressure at the sites in both 2006 and 2007. Sand syndrome was present in both 2006 and 2007. Although the use of spatial statistics was helpful in sorting out some of the spatial differences not attributed to treatment, variability due to the sand syndrome effect within the plot area could not be removed entirely. Current plans are to move the trial to an area with low P, but with no history of sand syndrome in 2008.

## References

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