Starter Fertilizers for Corn Revisited: 2010 Summary

Purpose:

It has been long recognized that proper use of starter fertilizers can increase corn yields and net profits. Numerous options with regard to choice of product, placement and rate of starter fertilizers exist, with these choices having impacts on profits because of either the size of yield response and/or cost of application.

A multi-year study was initiated in 2008 designed to evaluate yield and economic response of corn to various starter fertilizer products, placement options and rates when bulk N fertilizer was either applied pre-plant or side-dress. This report summarizes results from 2010 for starter fertilizer treatments that were common across the various sites.

Methods:

At 2 of the trials (Elora 2010 and Bornholm 2010), different timing of N application (e.g. pre-plant or side-dress) were included to evaluate the impact that timing of N application may have on starter fertilizer response. The experimental design at these sites was a strip block design with 2 or 3 replicates. Starter fertilizer treatments which varied in product, placement (in-furrow vs. 2" by 2" band) and rate were randomly assigned to each replicate. Each replicate was split into 2 strips (i.e. front vs. back) to which 150 lb-N/ac of bulk N fertilizer was applied as either a pre-plant or side-dress application. Pre-plant bulk N was applied as broadcast urea or ammonium nitrate which was incorporated and side-dress N was applied as 28% which was knifed mid-row when corn was at the 6-8 leaf stage.

Figure 1: Research planter equipped with liquid and dry starter systems for making accurate treatment and rate comparisons.

The remainder of the sites summarized in this report just evaluated starter fertilizer response and the bulk N was applied side-dress as UAN that was knifed mid-row when corn was at the 6-8 leaf stage. The experimental design at these sites was a RCBD with 2 or 3 replicates.

Break even yield response is calculated for each of the starter fertilizers and is included in Table 1. The break even yield represents the grain corn yield response, after drying, required to cover the product cost of the starter fertilizer. The assumptions were: net corn price after drying of $4.80/bu; Alpine 6-24-6 at $4.75/US gal.; 10-34-0 at $4.37/US gal.; MAP at $0.29/lb; UAN (28%) at $1.58/US gal.; and 5-20-20 at $0.21/lb. The break even yield calculation does not consider equipment or time costs associated with starter fertilizer application.

Results:

Timing of bulk N fertilizer application did not significantly affect corn yield response to starter fertilizer at Elora 2010 and Bornholm 2010 sites. Therefore, yield response to starter fertilizer, summarized at these sites were averaged across N timing treatments.

In general, the 5-20-20 yielded highest at all sites. The 6-24-6 yielded second highest at 4 of the 5 sites. UAN alone yielded the lowest at most sites. Applying a starter that contains N, P and K in a 2” by 2” band produced yields that were greater than those produced when MAP and/or UAN was applied in a 2” x 2” band. Generally, sites which had large yield responses to starter fertilizer had soil K levels that were below 80 ppm.

Based on winter 2011 retail prices and expected after drying corn prices the break even corn yield response to starter is about 5 bu/ac for 5 US gal/ac of Alpine 6-24-66, 5 US gal/ac of 10-34-0, or 75 lb/ac of MAP and about 9 bu/ac for 200 lb/ac of 5-20-20 (Table 1). For the trials summarized in this report, starter fertilizers that contained K were more likely to produce yield responses that exceeded the break even yield when compared to starter fertilizers that contained only P and/or N on the low testing K sites. This occurred for both in-furrow and 2” x 2” starter placements. On higher soil test K sites the 5-20-20 treatment did not give the break even yield response required over the other treatments to pay for itself.

Figure 2: Corn with potassium deficiency symptoms from the Elora plots where no K was appplied (soils test K level was 75).

Table 1: Corn yield response to various starter fertilizers across 5 field trials conducted in 2010.

Starter Treatment	Break Even+	Alma 2010	Elora 2010	Lucan 2010	Strathroy 2010	Bornholm 2010
	---------- bu/ac ----------					
No Starter		177	159	201	137	118
10-34-0 @ 5 gal/ac; IF	4.6	175	162	203	136	137
6-24-6 @ 5 gal/ac; IF	4.9	176	170	204	140	137
UAN @ 10 gal/ac; 2x2	3.3	177	155	202	143	128
MAP @ 75 lb/ac; 2x2	4.5	174	166	NI	NI	NI
MAP @ 75 lb/ac plus UAN @ 10 gal/ac; 2x2	7.8	170	160	204	140	NI
5-20-20 @ 200 lb/ac; 2x2	8.7	181	176	208	156	149
LSD (10%) ++		10.0	8.8	4.5	9.1	6.5
Soil Test P:K (ppm)		48:106	13:75	31:125	25:61	28:82

+ Break even yield response is the bushels per acre required to cover the starter fertilizer treatment. These calculations are based on the following pricing assumptions: net corn price after drying of $4.80/bu; Alpine 6-24-6 at $4.75/US gal.; 10-34-0 at $4.37/US gal.; MAP at $0.29/lb; UAN (28%) at $1.58/US gal.; and 5-20-20 at $0.21/lb. The break even yield response calculation only considered cost of product and did not include costs associated with equipment or timing.

++ LSD in the smallest yield difference required between starter treatments for a less than 10% chance that the observed yield difference was not due to effects other than the starter treatments.

IF - In furrow application of fertilizer.

NI - Starter treatment not included in trial.

Summary:

Over the 3 years of this study a wide range in yield responses and profits were obtained based on choice and rate of starter fertilizers applied (Table 1 & 2). The study has shown that on fields with medium to low soil P and K tests that profitable yield responses are more likely to occur when N, P and K based starters are applied when compared to starters that contain only N and P. The results of this study clearly suggest that for soils with less than adequate P and K levels that K should be included in the starter fertilizer regardless of position of application (i.e. in-furrow or in a 2” x 2” band). The study also clearly suggests that larger yield responses can be obtained by applying N, P & K dry fertilizer based starters in 2” x 2” bands when compared to in-furrow applications on soils with less than adequate P and K fertility. However, substantial (profitable) yield responses are also possible on less than adequate P and K fertility soils if the only starter option is to apply in-furrow N, P and K based starter fertilizers.

Table 2: The 2008 and 2009 starter fertilizer trial yield data

Starter Treatment	Break Even+	Alma 2008	Elora 2008	Ancaster 2008	Alma 2009	Elora 2009	Ancaster 2009	Bornholm 2009
	---------- bu/ac ----------							
No Starter		187	188	156	179	168	169	125
10-34-0 @ 5 gal/ac; IF[1]	5.4	195	195	174	179	169	163	116
6-24-6 @ 5 gal/ac; IF	5.4	201	204	170	181	177	181	128
UAN @ 10 gal/ac; 2x2	4.8	194	193	157	178	170	176	123
MAP @ 75 lb/ac; 2x2	5.6	192	198	179	180	165	175	114
MAP @ 75 lb/ac plus UAN @ 10 gal/ac; 2x2	10.4	193	199	184	171	163	178	114
5-20-20 @ 200 lb/ac; 2x2	11.4	NI	220	179	183	184	175	150
LSD (10%) [++]		8.6	8.6	11.2	ns	8.0	ns	13.5
Soil Test P:K (ppm)		60:100	11:62	14:57	35:77	8:68	16:77	18:80

[1] IF-= in furrow fertilizer application, NI – starter fertilizer not included, LSD see note in previous table,

Next Steps:

Similar starter trials will be conducted in 2011. Of particular interest is the relationship that has developed at the Elora site where broadcast application of K did not eliminate the need for K in the starter. This pattern will be explored at more sites in 2011. We will also continue to compare liquid fertilizer with K compared to dry fertilizers with K in terms of corn yield response and profitability.

Acknowledgements:

Support for the 2010 portion of this project was supplied by the Grain Farmers of Ontario, AAC FIP program. Technical assistance supplied by K. Janovicek, M. Ribey, Ryan Kucera and Jason Deen University of Guelph.

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