EFFECT OF FOLIAR NITROGEN ON SUGARBEET PRODUCTION

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Introduction:

Rising fertilizer prices have many Michigan sugarbeet producers considering foliar nitrogen (N) applications to improve production efficiencies and to reduce the risk of excessive levels of soil N adversely affecting sugarbeet quality. Foliar N applications are purportedly more efficient than higher rates of granular N application resulting in lower rates of application. Growers continue to question the effects of foliar N on sugarbeet yield and quality and whether or not to reduce base N application rates by 10-20%, supplemented with foliar N applications.

Methods:

A field trial was conducted in 2011 and 2012 in Michigan to determine if foliar N affects sugarbeet yield or quality and whether base nitrogen applications could be reduced by 10-20%, supplemented with foliar N applications. The study was arranged as a randomized complete block with four replications of the treatments. Both studies were conducted on a clay loam. In 2011 the organic matter was 2.8; 7.7 pH; 40ppm P; 189 ppm K. In 2012 the organic matter was 2.9; 7.8 pH; 40ppm P; 183 ppm K. Planting dates were May 4, 2011 and April 5, 2012 and harvest dates were October 4 and 5 respectively. In both years, the sugarbeet variety consisted of hilleshög 9042 RR and was seeded at a 4.25 in spacing with row spacing at 30 in. The treatments included total N rates of 0, 80, and 120 lb N a^{-1} applied as urea (46-0-0). The 80 and 120 lb N a^{-1} rates were each reduced by both 10 and 20 lb N a^{-1} with this amount later supplied via three applications of foliar delayed-release N fertilizer (10 and 20 gal a^{-1}, 30-0-0) spaced two weeks apart. Measureables included chlorophyll meter readings, tissue total N analysis, leaf biomass, and sugarbeet yield and quality.

Results and Discussion:

Results from 2011 indicated a 10-40% reduction in brei nitrate levels with foliar N applications. However, foliar N treatment brei nitrate levels were less than 100 ppm potentially indicating that N limited overall sugar production. Data showed no significant impacts on yield or sugar content though at the higher total N rate, supplemental foliar N applications began to show some positive yield and sugar responses (table 1&2). Data suggest N foliar applications may not result in an increased presence of N in tissue. However an increase in chlorophyll reading occurred in the July reading of both years, the 120 lb rate with 10 lbs being applied at the foliar timing (table 1.) Foliar applications did enhance the color of green among the beets, however no yield or quality enhancements were observed (table 1.) Applying more than 10 lbs foliar N did not give any yield or quality increase (table 2&3).

Past research has indicated potential benefits to foliar N applications only when soil moisture conditions are favorable. The dry growing conditions of 2012 likely limited the probability for positive response to any mid-summer foliar N applications (table 2.) In both

years, at the N rates tested foliar applications of N did not significantly impact yield, RWSA RWST, % sugar, and % CJP (table 2&3). All treatments did produce significantly greater yield and RWSA than the untreated control (data not shown).

Table 1. **Sugarbeet Chlorophyll and %N Measurements, 2011-2012.**										
N Trt. Total lbs N/A	**Side Dress (2-4lf)**	**Foliar N (lbsN/A)**	**2011**				**2012**			
			June		**July**		**June**		**July**	
			SPAD	**%N**	**Spad**	**%N**	**SPAD**	**%N**	**Spad**	**%N**
80[a]	**40**	**0**	46.6	4.4	52.9	3.0	53.6	4.6	62.1	3.4
120	**80**	**0**	45.8	4.6	52.7	3.0	54.3	5.2	63.1	3.5
80	**30**	**10**	46.1	4.5	51.9	2.5	51.5	4.5	67.1	3.3
80	**20**	**20**	45.8	4.2	51.3	3.0	51.5	4.5	63.7	3.4
120	**70**	**10**	44.8	4.5	55.0	3.1	52.6	4.9	65.0	3.6
120	**60**	**20**	45.1	47.7	55.1	2.7	54.2	4.7	63.1	3.6
$LSD_{(0.10)}$[b]	**----**	**----**	**NS**	**0.4**	**2.1**	**NS**	**1.9**	**0.4**	**4.0**	**NS**

[a] All plots received 40 lbs. N/A as starter.
[b] LSD, least significant difference between means within a column at ($\alpha = 0.10$).

Table 2. **Sugarbeet Yield and Quality, 2011.**									
N Trt. Total lb. N/A	**Side dress (2-4 lf)**	**Foliar N (lb. N/A)**	**RWSA**	**RWST**	**Tons/A**	**% Sugar**	**% CJP**	**NH2**	**Amino-N**
80[a]	**40**	**0**	9800	307	31.9	20.5	95.1	106	6.3
120	**80**	**0**	9277	305	30.4	20.4	95.2	118	6.8
80	**30**	**10**	9223	303	30.3	20.2	95.3	77	4.7
80	**20**	**20**	8613	301	28.6	20.1	95.4	63	3.8
120	**70**	**10**	9420	299	31.6	20.0	95.2	78	4.7
120	**60**	**20**	9792	303	32.3	20.4	94.9	102	6.0
$LSD_{(0.10)}$[b]	**----**	**----**	NS	NS	NS	NS	NS	34	2.0

[a] All plots received 40 lbs. N/A as starter.
[b] LSD, least significant difference between means within a column at ($\alpha = 0.10$).

Table 3. **Sugarbeet Yield and Quality, 2012.**

N Trt. Total lb. N/A	Side dress (2-4 lf)	Foliar N (lb. N/A)	RWS A	RWS T	Tons/A	% Sugar	% CJP	NH2	Amino-N
80[a]	**40**	**0**	8758	290	30.2	19.8	94.5	167	9.9
120	**80**	**0**	9165	282	32.5	19.3	94.3	183	11.0
80	**30**	**10**[c]	8554	288	29.7	19.6	94.5	193	11.8
80	**20**	**20**[d]	8850	295	30.0	19.9	94.7	164	9.6
120	**70**	**10**[c]	8992	281	32.0	19.5	93.6	228	14.0
120	**60**	**20**[d]	9472	296	32.0	20.1	94.6	163	9.8
LSD$_{(0.10)}$[b]	**----**	**----**	**----**	10	3.3	0.5	0.5	56	3.5

[a] All plots received 40 lbs. N/A as starter.

[b] LSD, least significant difference between means within a column at ($\alpha = 0.10$).