AGRONOMIC POTENTIAL OF SLOW RELEASE NITROGEN ON SUGARBEET YIELD AND QUALITY

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Introduction:

Volatile fertilizer prices, increasingly unpredictable spring weather conditions, and degradation of water quality in the Great Lakes have placed greater emphasis on improving nitrogen (N) management strategies that more closely synchronize N availability with peak sugarbeet N demand. Currently, many sugarbeet producers apply the bulk of N fertilizer pre-plant incorporated. Though convenient, this method may not be the most efficient use of N fertilizer. Polymer-coated urea (PCU) limits N availability by releasing N over a longer period of time as compared to soluble N fertilizers potentially increasing nitrogen use efficiency and reducing environmental N losses.

Methods:

Field trials were conducted in 2013 and 2014 at the Saginaw Valley Research and Extension Center in Richville, MI. Both studies were conducted on a clay loam with 2.7% organic matter, 7.8 pH, 38 ppm P, and 203 ppm K in 2013 and 2.7% organic matter, 8.0 pH, 41 ppm P, and 162 ppm K in 2014. Planting dates were 2 May 2013 and 6 May 2014 with harvest dates of 18 Oct. 2013 and 16 Oct. 2014.Sugarbeet variety was Crystal RR059 seeded at a 4.25 inch spacing on Studies were arranged as a randomized complete block design with four replications. The optimal rate of N for these fields was 160 lbs N/A. All treatments received 40 lbs N as 28%, 20 lbs P_2O_5, 50 lbs K_2O and 2 lbs Mn/A as a starter, placed 2x2 on planting date. PCU and urea were applied in 5 blending ratios consisting of 100:0, 75:0, 50:50, 25:75 and 0:100 (% PCU:% urea) for a total of 160 lbs N/A as 2x2 starter). All treatments containing PCU (and the associated percentage of urea) were applied pre-plant incorporated the day of planting. The source of PCU was ESN, Environmentally Smart Nitrogen.

Results and Discussion:

Blending ratio did not result in any significant differences in chlorophyll meter readings (Table 1). 100% PCU and 100% urea produced similar root yields in 2013 and 2014 with blending ratios consistently producing lower yield than either PCU or urea applied individually (Table 2 and 3). 100% PCU and 100% urea produced similar sugar quality parameters including percent sugar, recoverable white sugar per ton, and recoverable white sugar per acre (Table 2 and 3). The 100% PCU treatment did produce lower amino-N concentrations in 2013 as compared to treatments including urea but no significant differences were found in 2014.

Slow emergence and delayed spring plant development in 2013 may have hindered treatment differences as a few additional weeks of bulking may have added significant tonnage to further separate out treatment differences (Table 2). One explanation for the poor sugarbeet response to PCU application could be a lack of excessive rainfall in the latter half of 2013 and only four rainfall events greater than one inch occurred during the 2014 growing season. Typically significant N loss conditions must occur in order to see a benefit from slow-release sources of N fertilizer. Few biologically significant differences were observed between treatments regardless of blending ratio. No significant advantage nor disadvantage occurred to including PCU in 2013 and 2014 sugarbeet N applications. The use of a product such as PCU may depend upon the amount of risk a grower wants to assume with their N applications as positive responses may depend upon the amount and timeliness of precipitation received.

***Table 1*. SPAD Chlorophyll Meter Readings, 2013-2014.**

160 lb N/A Total (%PCU:%Urea)[a]	**2013**		**2014**	
	June	**July**	**June**	**July**
	SPAD	**SPAD**	**SPAD**	**SPAD**
100:0	42.2	53.4	44.0	44.3
75:25	41.4	53.7	43.0	42.7
50:50	41.2	52.7	41.9	44.3
25:75	40.4	53.8	43.8	43.2
0:100	40.5	51.8	43.5	43.2
LSD (0.10)[b]	NS	NS	NS	NS

[a] All treatments received 40 lbs N as 28%, 20 lbs P_2O_5, 50 lbs K_2O and 2 lbs Mn/A as a starter, placed 2x2.

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

Table 2. **Sugarbeet Yield and Quality, 2013.**							
160 lb N/A (%PCU:%Urea)[a]	**RWSA**	**RWST**	**Tons/A**	**% Sugar**	**% CJP**	**NH2**	**Amino-N**
100:0	9112	289	31.6	19.3	95.3	95	5.6
75:25	7884	282	28.0	19.2	94.4	154	9.2
50:50	7394	276	26.8	18.9	94.2	137	8.2
25:75	7899	268	29.5	18.5	93.9	137	8.5
0:100	8337	287	29.7	19.4	94.8	144	8.7
LSD (0.10)[b]	1365	13	4.7	0.6	0.8	45	2.7

[a] All treatments received 40 lbs N as 28%, 20 lbs P_2O_5, 50 lbs K_2O and 2 lbs Mn/A as a starter, placed 2x2.
[b] LSD, least significant difference between means within a column at ($\alpha = 0.10$).

Table 3. **Sugarbeet Yield and Quality, 2014.**							
160 lb N/A (%PCU:%Urea)[a]	**RWSA**	**RWST**	**Tons/A**	**% Sugar**	**% CJP**	**NH2**	**Amino-N**
100:0	11095	281	39.5	18.5	96.3	79	4.9
75:25	10806	283	38.4	18.4	96.5	81	5.0
50:50	10835	288	38.3	18.5	96.6	69	4.3
25:75	10650	277	38.2	18.4	96.1	99	6.1
0:100	11448	280	40.7	18.5	96.3	99	4.4
LSD (0.10)[b]	NS	NS	NS	NS	0.3	13	0.6

[a] All treatments received 40 lbs N as 28%, 20 lbs P_2O_5, 50 lbs K_2O and 2 lbs Mn/A as a starter, placed 2x2.
[b] LSD, least significant difference between means within a column at ($\alpha = 0.10$).