EFFECT OF SPENT LIME ON SUGAR PRODUCTION AND CROP YIELDS FOLLOWING SUGARBEET

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Introduction

Crushed limestone is used in the processing of sugarbeet to improve sugar recovery in factories. After processing, factories are left with many tons of "spent lime" which is stored in large piles near factory sites. Disposal of the sugarbeet spent lime has long been a concern of the sugar cooperatives. Recent research has indicated a benefit not only to sugarbeet affected by "sand syndrome," but also in increasing soil pH to alleviate the carryover of herbicides and reducing infection and severity of *Aphanomyces cochlioides* (Bresnahan et al, 1999; Windels et al., 2006). There are concerns however, that over-application of spent lime may have undesirable effects for other crops in the cropping rotation. The objective of this study was to determine whether spent lime material can be used on sandy soils with lower organic matter reduce sugarbeet root rot diseases, improve slow or poor growth and stand establishment, increase overall sugar production, reduce the size of spent lime piles in an environmentally safe manner and evaluate long term effects of spent lime on soil physical properties and subsequent crop production in the Red River Valley of the North.

Materials and Methods

Application of spent lime was made in the fall of 2001 and incorporated at rates of 0 (check), 2, 4, and 8 tons per acre on a beet field east of East Grand Forks on a Beardon Colvin Association soil type. The study was a randomized complete block design replicated six times. Plots are six rows wide (22-inch row spacing) and 30 feet long. Sugarbeet variety Beta 1305R was planted at a 4.7 inch spacing by the cooperator on April 28, 2007. All chemical applications were made by the cooperator. The middle two rows were harvested by hand on September 14, 2007. Sugarbeet were harvested from the East Grand Forks site in 2007 and soil samples were taken to 1 foot from one of the test replicates. Yield determinations were made and quality analysis was performed at American Crystal Sugar Quality Tare Lab, East Grand Forks, MN.

Results and Discussion

The yield data indicate no significant differences in yield and recoverable sugar per acre within the treatments. However the 8 ton per acre treatment had a 3.3 ton per acre yield increase, 581 lbs more recoverable sugar per acre, an increase of 17 harvestable beets per 100 foot of row and $65.00 more gross revenue per acre than the untreated check and 2 tons per acre lime treatment. No large differences in canopy and Aphanomyces ratings were observed on any of the treatments, although the 4 and 8 ton per acre lime treatments had higher harvestable beet populations indicating that the higher lime treatments may have provided additional seedling disease protection.

Table 1. Sugarbeet yield and quality data from spent lime application rates of 0, 2, 4, and 8 tons/a; tons = beet yield (tons/a); sugar = sucrose content (%); SLM = sugar loss to molasses (%); RSA = recoverable sugar per acre (lb sucrose/acre); RST = recoverable sugar per ton (lb sucrose/ton roots); Beets/100ft (beets per 100 ft of row); Gross/acre = gross profit per acre ($/acre)

Treatment	Tons	Sugar	SLM	RSA	RST	Beets/100ft	Gross$/acre
0	30.0282	15.17	2.1043	7729	261.3	136.7	708.99
2	29.5643	14.8633	2.1517	7514	254.2	130	676.65
4	30.6332	14.9733	2.1754	7802	256.0	147	704.79
8	32.8918	14.8167	2.1588	8310	253.2	147	741.90

Conclusions

This experiment has been continued since 2001 with different crops in rotation with no adverse effects observed with the high lime treatments. Similar studies have shown little detrimental effect from spent lime and decreased seedling disease of sugarbeet resulting in increased sugar production.

Literature Cited

Bresnahan, G.A., A.G. Dexter, and W.C. Koskinen. 1998. The effect of soil pH on sugarbeet yield and herbicide degradation. Sugarbeet Res. Ext. Report. 29: 82-88.

Windels, C.E., .R. Brantner, A.L. Sims, and C.A. Bradley. 2006. Spent lime effects on sugarbeet, root rot, microorganisms, and rotation crops. Sugarbeet Res. Ext. Report. 37: 208-219.