EFFECT OF POTASSIUM FERTILIZER ON SUGAR PRODUCTION

Norman R. Cattanach and Laura Overstreet,

Research Specialist and Assistant Professor
Department of Soil Science, North Dakota State University

Introduction

The objective of this study was to determine optimum rates of broadcast potassium fertilizer for maximizing yield, quality, and profitability of sugarbeet crops, on sandy soil types low in organic matter. Evaluations were also made of the role of potassium fertility in reducing sugarbeet root rot diseases, stand establishment, reduced growth resulting from sand syndrome effect, and overall plant vigor, sugar quality and production, in the Red River Valley of the North.

Materials and Methods

A field experiment was established on a Wyndmere fine sandy loam on a grower-cooperator's farm in Glyndon, MN. Initial soil test levels taken just prior to planting at the site indicated that potassium levels were at 46 ppm, which is classified as low for sugarbeet production. Standard recommendations for sugarbeet production indicate that 80 lb K_20/A should be broadcast in order to reduce production losses due to potassium deficiency. Potassium rate treatments were applied as KCl and consisted of an untreated check, 40, 80 and 160 lbs of potassium fertilizer per acre. Planting was arranged in a randomized complete block design with four replications. Individual treatment plots measured 11 feet wide and 30 feet long.

Sugarbeet variety Beta 1305 (a rhizomania resistant variety) was planted at a 22-inch row spacing on April 27, 2006, with a John Deere MaxEmerge2 planter. Seeds were placed at a depth of 1.25 inches with 3 inch in-row spacing and later thinned to a population of 175 beets per 100 feet of row. Counter was surface band applied at 11.9 lbs/a, and incorporated with drag chain at planting. Four post emergence micro-rate herbicides, two cultivations and hand labor was used as needed for weed control. Three fungicide applications, Eminent, Supertin and Headline were applied for Cercospora leafspot control.

Sugarbeet plots were harvested September 27, 2006. The middle two rows of each 6-row plot were harvested. Yield determinations were made and quality analysis performed at American Crystal Sugar Quality Tare Lab, East Grand Forks, MN.

Results and Discussion

The 80 and 160 lbs/a treatments of potassium fertilizer resulted in a highly significant increase in root yield, recoverable sugar per acre, and gross $ return per acre. Compared to the untreated check, the highest potassium application rate (160 lb K/a) resulted in yield increases of 8.8 tons roots/a, 2346 lbs/a recoverable sugar, and $270 gross return per acre. No significant difference was obtained in net sucrose percent, recoverable sugar per acre, or gross $ return per ton with increased rates of potassium fertilizer. Rhizoctonia root rot disease and sand syndrome effect moved into the plots during late summer and may have had an impact on data results. It appears that higher rates of potassium may offer some protection from disease and sand syndrome effect.

With the initial damp, cool soil temperatures following planting, it was expected that plant vigor and treatment responses would be evident. Early visual effects were noticed in the plots with the highest rates of potassium applied. Plants in the 80 and 160 lb/a potassium treatments were much more vigorous than those in the 40 lb/a, or untreated check.

The data indicate that applying and incorporating higher rates of potassium fertilizer at planting may be a good method of maximizing sugarbeet crop production on sandy textured soil types. Similar results were seen in a lime study the previous season using twice the recommended rate of potassium. This research will be established again in 2007 at several locations in the Red River Valley using sugarbeet grower fields low in soil test potassium in order to determine whether similar results can be duplicated. Data presented is based on a single site year.

Table1. Effect of Potassium Fertilizer on sugarbeet root yield, sucrose percentage, recoverable sugar production, harvest population and gross $ return. Rhizomania Site. Glyndon, MN. 2006.

Treatment	Root Yield Tons/A	Net Sucrose Percent	Rec Sugar Lbs/Acre	Rec Sugar Lbs/T	Harvest Beets /100 FT	Gross Return $/A	Gross Return $/T
Untreated Check	15.5	14.5	4475	289	153	560.76	36.18
40 lbs/a	18.0	14.4	5205	287	153	650.27	35.78
80 lbs/a	23.5	14.1	6652	281	151	813.90	34.22
160 lbs/a	24.2	14.1	6821	281	148	831.13	34.21
LSD (.05)	2.9	NS	872	NS	NS	118.52	NS