Can We Increase Sugar Beet Yield with Lime, Cultivar Selection, and Fertilizer Applications?

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In the Red River Valley (RRV) of Minnesota and North Dakota, some areas with coarse-textured soils and with low soil organic matter content have experienced poor Sugar beet (*Beta vulgaris* L.) growth popularly known as “sand syndrome” (Franzen et al., 2001, 2003). Seedling-leaves of affected beets are usually curled inward more prominently than normal, with purple color of the leaf edge. Sometimes, researchers have linked this poor beet growth with inherent low nutrient availability in sandy soils and suggested spent lime and supplementary nutrient applications to overcome this condition (Sims, 2008; Overstreet et al., 2008). Spent lime, a sugar beet factory by-product, contains 22 to 26% calcium, 0.8 to 1.3% magnesium, 0.30 to 0.35% nitrogen, 0.35 to 0.70% phosphorus, and 0.1% potassium (Sims et al., 2010).

Materials and Methods

On-farm trials were conducted on fields with a previous history of sand syndrome, but no prior history of spent lime application to determine the effect of spent lime application, cultivar selection, and fertilizer application, in addition to recommended fertilizers on sugar beet yield and quality during 2015–2016 growing seasons in the RRV. Each year, trials were conducted at two sites located in the RRV of Minnesota and laid out in split-split plot randomized block design with four replications. The main plot factor was spent lime application at two levels: control (no lime) and spent lime broadcast at the rate of 10 tons/acre and incorporated with a cultivator in spring prior to planting. Subplot factor was Roundup-ready cultivars with a low-score (susceptible) and a high-score (resistant) performance ratings based on trials conducted at fields with previous history of sand syndrome (by American Crystal Sugar Company). Sub-subplot factor was fertilizer application in addition to recommended fertilizers: (i) control (only recommended NPK), (ii) NPK + muriate of potash (MOP) or MOP broadcasted at the rate of 60 lb K₂O/acre, and NPK+ in furrow applications of liquid starters, (iii) 3–18–18, (iv) 6–24–6, and (v) 9–18–9 each at the rate of 3 gal/acre.

All plots received recommended NPK fertilizers, determined based on initial soil test values (Table 1). Prior to planting, spent lime and dry fertilizers were broadcasted and incorporated within surface soil with a tiller and attached rotary basket. Sugar beet was planted with a John Deere Max Emerge II planter and individual