BREDEHOEFT, MARK[1]*, S. ROEHL[1], J. FISCHER[1], J. LAMB[2], D. HUMBURG[3], D. LAMKER[4], C. RUSH[5]. [1]Southern Minnesota Beet Sugar Cooperative, Renville, MN 56284, [2]University of Minnesota Soil Science Dept., [3]South Dakota State University Agriculture Engineering, [4]Cargill Inc., and [5]Texas Experiment Station Pathology Dept. **Relationship of nitrogen rate on sugar beet yield, quality, and spectrum images in a spatial orientation.**

Soil testing for nitrogen needs of sugar beet has created some debate over the method and interpretation of soil testing. Nitrogen influence on sugar beet yield and quality has been researched extensively. However, the relationship of nitrogen rate, sugar beet yield, quality, and spectral images has not been researched extensively and there are questions that need addressing. Zones to best determine nitrogen needs by sugar beet has been questioned. The relationship of nitrogen requirement and nitrogen availability of sugar beet varies depending on the characteristics of these zones. Soil type, organic matter, pH, etc can determine zones. Nitrogen trials were established in a strip design, replicated multiple times at three sites. The strips were 70 feet wide by approximately 330 feet long. Soil tests were gathered at globally positioned locations within the strips approximately every 330 feet. These GPS locations were the basis for all data collected. Nitrogen was applied in strips at 0, 30, 60, 90, 120, 150 lb./acre. Aerial photography and satellite imagery was used to determine the spectrum of sugar beets at particular GPS location. Aerial photography will not be reported on at this time. Wavelengths considered with satellite imagery were NIR NDVI, Red NDVI, Green NDVI. NDVI is acronym for Normalized Difference Vegetation Index. Yield and quality was determined by subsampling at the GPS location of each soil test. Soil was sampled for Rhizomania at each location. The factors mentioned above in a spatial orientation are of great concern and interest to the sugar beet producer. Spectral images in a spatial orientation can determine many factors related to sugar beet production in a particular orientation. The knowledge of leaf foliage spectrum can also be very useful to the producer for production of future crops.

Results

Tons per acre were not influenced by amount of residual, regardless of position in soil profile, or applied nitrogen. However, sucrose and net revenue per acre (total revenue – fertilizer and sugar beet hauling cost) was influenced by nitrogen. Total nitrogen plus applied had the greatest influence and nitrogen at 0-2 feet had the least influence on sucrose and net revenue per acre.

Nitrate uptake in sugar beet leafs was best correlated to Green NDVI. The higher incremental separation of nitrate uptake by sugar beet leafs was better correlated to Green NDVI. The lowest incremental separation of nitrate uptake in sugar beet leafs that best correlated with Green NDVI was 25 pounds per acre nitrate uptake. There was a difference in the nitrate uptake correlation to Green NDVI between the two sites considered in this discussion due to the difference in total nitrate uptake in sugar beet leafs between the two sites.

Nitrate uptake in sugar beet leafs was also highly correlated to total applied plus residual nitrogen. Therefore, a model should be considered relating total applied plus residual nitrogen and Green NDVI to more accurately define nitrate uptake in sugar beet leafs.