REGITNIG, PETER J.*and BRYAN R. AVISON, Lantic Inc., 5405 – 64th Street, Taber, Alberta, T1G 2C4. **Nitrogen rate x placement in sugar beets.**

ABSTRACT

In conventionally tilled sugar beets in Alberta the majority of nitrogen fertilizer applied is broadcast and incorporated with smaller percentages applied in narrow bands. With the advent of RTK-GPS guidance systems, banding of fall fertilizer under the future sugar beet row is now possible in a conventionally tilled field. Some sugar beet growers have reduced fertilizer rates when applying fertilizer under the row in a ridge tillage system; however, the efficiency of banding under the row versus broadcasting has never been directly compared in Alberta.

Four factorial trials were conducted between 2009 and 2012 to evaluate fall banded and broadcast nitrogen using rates of 0, 30, 60, 90, 120 and 150 lbs N/acre. Broadcast fertilizer applications in the form of urea were made using a hand-held spin spreader and were immediately incorporated approximately 4 inches deep. For band treatments, a tractor with RTK-GPS sub inch guidance was used to place urea fertilizer at 5-6 inch depth under future sugar beet rows using a zone tillage implement. The zone tillage implement remained in the soil for all treatments, but nitrogen fertilizer was only applied for banded treatments. Soil samples produced 4ft nitrate nitrogen values of 30, 75, 88 and 119 lbs/acre for the 4 individual trials.

There was a varying degree of sugar beet response to fertilizer nitrogen in these trials; however, the general trends for a number of the parameters measured were similar in all trials. When 4 trials were averaged, the plant stand for band and broadcast treatments were nearly identical. There were also no significant stand differences with fertilizer rate, indicating that higher nitrogen rates were not phytotoxic for either placement.

Significant early season plant vigor increases were observed in all individual trials as fertilizer rates increased. When 4 trials were averaged, vigor values began to plateau after 60 lbs/acre broadcast nitrogen was applied, whereas vigor increases continued to increase up to 120 lbs/acre of banded nitrogen. In 3 of 4 individual trials average early season plant vigor for banded nitrogen was significantly higher than the value for broadcast nitrogen.

Canopy color prior to harvest was nearly identical for banded and broadcast nitrogen when 4 trials were averaged. Color ratings on a 1-9 scale were 5.5 and 5.6 for band and broadcast nitrogen, respectively. In 1 of 4 individual trials canopy colour prior to harvest was significantly greener with banded nitrogen compared to broadcast nitrogen, although the actual differences in colour values were small. Increasing fertilizer rates resulted in a greener leaf canopy. In 3 of 4 individual trials increasing nitrogen rates resulted in significantly greener sugar beet leaves, with deep soil nitrogen below 4ft likely resulting in the lack of response in the 4th trial.

When 4 trials were averaged over both nitrogen placements, sugar beet root yield was increased by 4.11 tons/acre with 150 lb N/acre compared to no nitrogen application. Yield increases with fertilizer application were highly significant in 3 of 4 individual experiments. The degree of response in individual trials was not highly correlated to soil nitrate level. The highest root yield response of 5.25 tons/acre with 150 lbs N/acre occurred in a trial with 75 lbs nitrate N/acre to 4ft depth, while the lowest yield response of 2.6 tons/acre occurred where 88 lbs nitrate N/acre was measured to 4ft depth. Deep soil nitrogen below 4ft likely resulted in the lower response in the latter of these 2 trials. When 150 lbs N/acre was added to the site with the lowest soil nitrogen level (30 lbs nitrate N/acre to 4ft depth), the root yield response was 4.21 tons/acre

higher than the check treatment. When root yield was averaged over all nitrogen rates for 4 trials, treatments banded under the row were significantly higher than broadcast treatments by 0.95 tons per acre. In all individual trials root yield was higher for band than broadcast nitrogen; however, statistically significant increases with banding only occurred in 2 of 4 individual trials.

Extractable sugar per acre (ESA) values followed the trends observed for root yield. ESA increases with fertilizer application were highly significant in all individual experiments and when 4 trials were averaged ESA increased by 1329 lbs when 150 lbs N/acre was applied compared to no nitrogen application. When averaged over all fertilizer rates for 4 trials, ESA for banded treatments was significantly higher than broadcast treatments by 324 lbs/acre. In all individual trials ESA was higher for band than broadcast nitrogen; however, statistically significant increases with banding only occurred in 1 of 4 individual trials.

Sugar content was not responsive to nitrogen fertilizer or placement when 4 trials were averaged. Various factors including deep soil nitrogen, low soil nitrogen and fertilizer nitrogen available later in the season affected sugar content responses in individual trials. When 4 trials were averaged, molasses loss, amino nitrogen levels and sodium levels all increased with higher nitrogen fertilizer rates. Small but significant increases in sugar beet amino nitrogen levels for banded nitrogen compared to broadcast nitrogen were observed when 4 tests were averaged and in 2 of 4 individual tests.

Sugar beet vigor, root yield, ESA and amino nitrogen levels all suggested that banding nitrogen under the sugar beet row resulted in better utilization of the fertilizer than broadcasting and incorporating it.