Demonstrating 4R Nitrogen in Canola

Nitrogen is the most commonly limiting nutrient in annual crop production and often accounts for one of the most expensive crop nutrients, particularly for crops with high N requirements like wheat and canola. The objective of this trial is to demonstrate canola response to varying rates of N along with different combinations of formulations, timing and placement methods relative to side-banded, untreated urea as a control. The proposed field trial design encompasses all four considerations (rate, form, placement and timing) for 4R nutrient management.

The demonstration was arranged as a randomized complete block design with four replicates at Scott 2017. The treatments consisted of fertilizer N rate, fertilizer placement and product to result in a total of ten treatments. Prior to seeding, soil samples were collected. The trial was sown on wheat stubble using an R-tech drill with 10-inch row spacing. The canola variety was Liberty Link 140P and was seeded at 115 seeds/m^2. Weeds and disease were controlled using registered herbicide and foliar fungicide applications.

In this study, the highest protein contents correlated to the highest yields (r = 0.82) when the greatest rate of nitrogen was applied (P= 0.0153) (Figure 1). Plant density at each nitrogen rate tended to increase up to the full recommended rate with a slight decline when nitrogen exceeded the recommended rate. Excessive nitrogen can reduce plant stand as a result of seed damage caused through salt injury and ammonia toxicity (Canola Council of Canada, 2015a).

Plant density was not significantly influenced by either nitrogen rate (P=0.2425), placement (P=0.9837), product (P=0.707) or any combination of these factors.

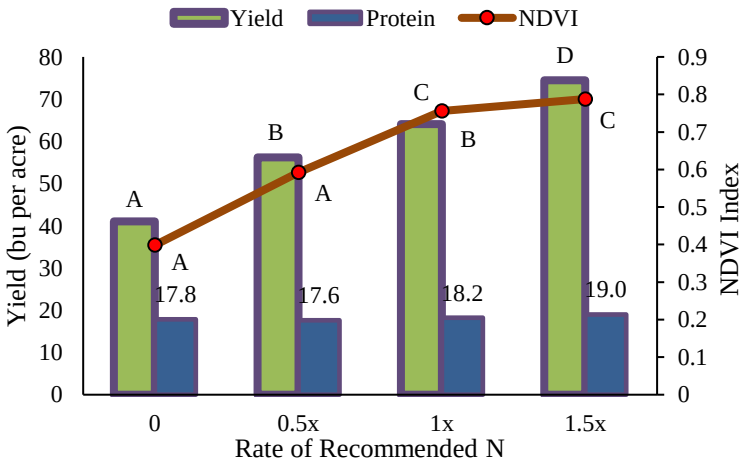

Figure 1. Nitrogen response rate applied at 0, 0.5x, 1x and 1.5x recommended rate to plant biomass measured via NDVI, yield (bu per acre), and seed protein content on canola, Scott, SK 2017

However, several trends can be concluded from the data set due to the change in plants per sq. meter. Sideband and broadcast applications produced greater plant growth (11%) and higher yields (4%) compared to split broadcast applications (Figure 2). Although yield declined with split broadcast applications, yield in general greatly responded to nitrogen fertilizer applications (+ 24 bu per acre) compared to the unfertilized canola check (Figure 2).

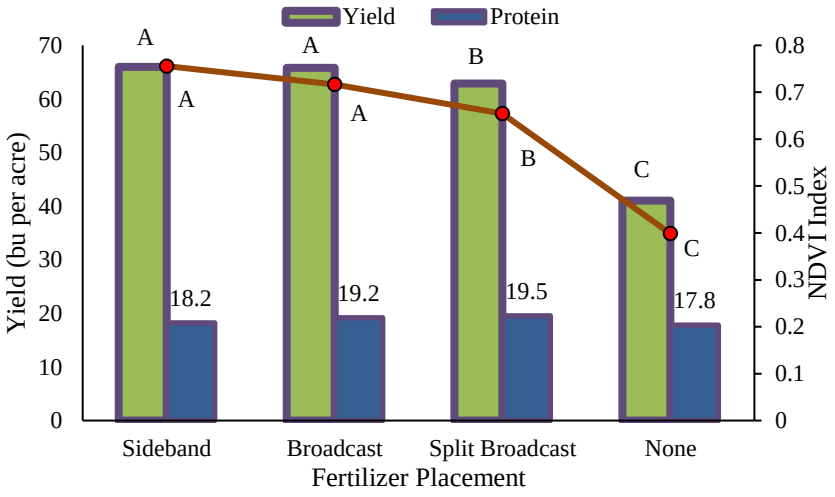

Figure 2. Fertilizer placement effect on plant biomass measured via NDVI, yield (bu per acre), and seed protein content on canola, Scott, SK 2017.

NDVI strongly correlated to yield and protein, in which NDVI, yield and protein increased with the highest available nitrogen. High nitrogen rates are required to achieve maximum yield and proteins; however, excessive applications can cause substantial nitrogen losses, reduced nitrogen-use efficiency, and lodging. A significant interaction for product type and placement occurred, indicating that greater losses were recorded for split broadcast applications of urea compared to the enhanced- efficiency fertilizer applications. Fertilizer placement (sideband ≥ broadcast > split broadcast) in general played a significant role in plant growth (NDVI, P=0.0003) and seed production (yield, P=<0.0001). In general, these results indicate that utilizing the proper rate, source and placement can influence overall plant growth and seed production. In order to reduce the risk nitrogen losses caused by unfavourable conditions, producers should utilize the 4Rs (Right Rate, Right Time, Right Source, Right Place).

Full report at:

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