

Objective:

The objective of this trial is to demonstrate the feasibility of various N management strategies and overall N rate response using spring wheat as a test crop. The management strategies will vary with regard to timing, placement, and formulation. The proposed demonstration encompasses all four considerations for 4R nutrient management.

Methodology:

A field demonstration with CWRS AAC Brandon spring wheat was established in the spring of 2019 at Scott, Saskatchewan with fertilizer treatments applied in the fall of 2018. The demonstration was managed as two separate studies for ease of management. For the first component of the demonstration, all nitrogen will be side-banded urea at seven varying rates. The second component focusses on nitrogen management options and consisted of a factorial combination of three timing/placement options and four nitrogen sources. The fall broadcast treatments were applied October 19th while the spring broadcast treatments were applied prior to seeding.

Table 1. Proposed treatments in ADOPT-Fertilizer Canada 4R N Management Trials

Trial #1: Right Rate*	#2: Right Time, Right Place, Right Form
0x (no added N fertilizer) **	Fall Broadcast – untreated urea
0.5x (68 kg total N/ha)	Fall Broadcast – ESN [®]
0.75x (94 kg total N/ha)	Fall Broadcast – Agrotain [®] treated urea
1.0x (125 kg total N/ha)	Fall Broadcast – SuperU [®]
1.25x (156 kg total N/ha)	Side-band – untreated urea
1.50x (188 kg total N/ha)	Side-band – ESN [®]
1.75x (219 kg total N/ha)	Side-band – Agrotain [®] treated urea
	Side-band – SuperU [®]
	Spring Broadcast – untreated urea
	Spring Broadcast – ESN [®]
	Spring Broadcast – Agrotain [®] treated urea
	Spring Broadcast – SuperU [®]
	0x rate (soil + fert = 125 kg N/ha) in all trts

Key Findings:

- Crop establishment best occurred under proper fertilization rates but declined with each increase in nitrogen rate. Stand reductions occurred through ammonia toxicity and salt injury occurred at the highest application rates.

The full report will be available at: www.warc.ca. This project was co-funded by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Government of Saskatchewan and the Government of Canada under the Canadian Agricultural Partnership and Fertilizer Canada.

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- Early season vigor was reduced at both the highest N rates due to a reduced plant stand while the unfertilized spring wheat plants were starved of the essential nutrients required for growth and development.
- The importance of utilizing the right rate were clear as over applying N caused greater early season damage than if no fertilizer was applied at all. The spring wheat crop was able to compensate for the reduced plant densities and lower crop vigor at the highest N application rate
- Fertilizing the spring wheat in excess of the recommended rate (125 kg N/ac) resulted in the highest yields. However, the difference between the highest yield and highest N rate to the recommended N rate was only 4 bu/ac.
- Reducing the fertilizer rates by half had a 10 bu/ac yield loss that would not be economically profitable. Additionally, applying too low of a nitrogen rate can deplete soil nutrient reserves to ultimately result in future yield losses.
- Protein was not significantly influenced by product or placement but a general trend can be noted. The protein levels amongst the four different fertilizers were slightly elevated for ESN> Agrotain> urea > SuperU. The lower protein recorded for SuperU is likely a function of the inverse relationship between yield and protein

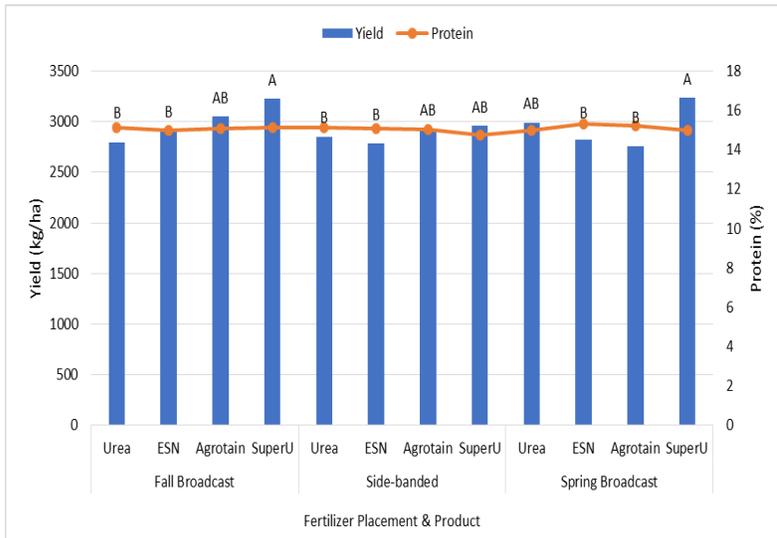


Figure 1. Comparison of yield (kg/ha) and protein (%) between fertilizer products (ESN, Urea, SuperU and Agrotain) and application timing (fall vs. spring).

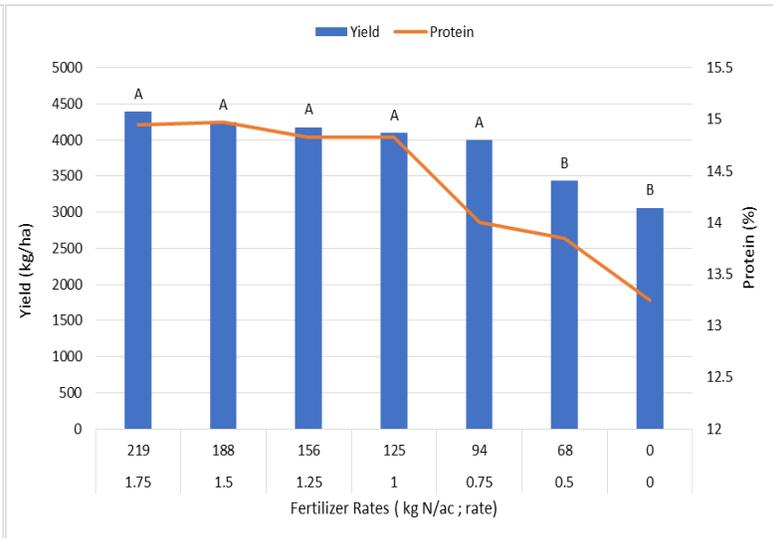


Figure 2. Comparison of yield (kg/ha) and protein between fertilizer rates (0x, 0.5x, 0.75x, 1x, 1.25x, 1.5x and 1.75x) of the soil test adjusted rate of 125 kg/ha total nitrogen (residual NO₃-N + fertilizer N).

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