IMPACT OF DIFFERENT NITROGEN RELEASE FERTILIZERS ON WHEAT YIELD AND PROTEIN

While yield production of spring wheat is improved by intensified agricultural strategies and novel genetic varieties, optimal soil N release and precise N uptake by crops is still an ambiguous question. This experiment focuses on exploring N-enhanced efficiency fertilizers (EEF) set at different rates and banded at different development stages. The goal is to observe if a certain EEF can improve overall yield of CWRS wheat.

Alberta Grains

Key Points:

- **No significant differences in wheat height, yield, or protein content regardless of fertilizer rate or EEF type**
- **At other research sites, EEFs contributed to higher protein content**

UREA

SUPERU

ESN

Task	Timeline	Details
Seeding	May 28	129 lb/ac 1" depth
Maintenance	May 20 - June 20	Urea /SuperU/ESN variable S15 80 lb/ac Glyphosate (pre-seed) 1 L/ac Fluroxypur 240 mL/ac Clopyralid 84 mL/ac MCPA Ester 281 mL/ac
Harvest	Sept. 26	Straight-cut

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In Fairview, the fertilizer type significantly impacted plant height ($p < 0.001$). The plots treated with Super U exhibited the shortest plants across all treatments at this location, particularly at the 1.5 times yield target. Falher consistently showed the tallest plants, while Fairview had the shortest, indicating that site-specific environmental or soil fertility factors may affect plant growth.

Across all sites, using ESN at the 100% N rate resulted in the highest overall mean plant height of 62.1 cm at the 1.5 times yield target. However, applying higher N levels (at 1.5 times) did not increase plant height, suggesting that the maximum height potential may have already been reached at the 1.0 times N level. Furthermore, applying 70% of the target N rate did not significantly affect plant height at any location, implying that efficient nitrogen uptake occurs even with a lower application rate.

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At the 1.5x yield target, grain yields in North Star, Fort Vermilion, and Fairview were similar across fertilizer types, with no significant differences between Urea, ESN, and Super U. However, in Falher, there were significant differences, with Super U at 70% N having notably lower yields (~59.7 bu/ac) than ESN and Urea. There was a negligible difference in the overall mean grain yield between Urea and ESN at both 100% and 70% N dose application, suggesting that Urea and ESN had similar impacts on yield. At the 1x target, similar patterns were observed, with no significant differences observed between fertilizer types and N doses across locations. Looking at the overall mean across locations, the reduction of N dose from 100% to 70% resulted in a 15% yield reduction, the largest among the three fertilizer types. This suggests that Super U may require a higher N dose to achieve optimal yield, particularly in conditions that may limit the fertilizer's effectiveness at lower rates. Overall, this indicates that N dose and fertilizer type can influence grain yield under certain conditions, with slow-release fertilizers like Super U possibly needing higher N doses to maximize yield potential.

There was a significant effect of fertilizer type on Fort Vermilion and Fairview, N level in North Star, Fairview and Falher, and N dose on Falher. The two-way interaction effect of N-type by N dose was significant in Falher, suggests that the impact of fertilizer type on protein content depended on the yield target. Regardless of N level and dosage of applied N, ESN and Super U resulted in the highest protein content (~21.1–21.4%), while Urea had a slightly lower protein content (~20.3–20.7%) in Fort Vermilion. In contrast, Urea application resulted in a higher protein content than ESN and Super U in Fairview. This suggests that slow-release fertilizers (ESN and Super U) may have improved nitrogen availability for protein synthesis in some conditions. In Falher, reducing the N dose to 70% significantly reduced protein content for the slow-release fertilizers (ESN and Super U) regardless of N level. This suggests that a lower N supply may have limited nitrogen availability for protein synthesis, reducing the effectiveness of ESN and Super U in maintaining high protein levels.