WHEAT

MANITOBA CROP ALLIANCE

OPTIMIZING NITROGEN FERTILIZER MANAGEMENT STRATEGIES FOR HIGH-YIELDING SPRING WHEAT IN MANITOBA

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KEY POINTS

- On average 2.25 lbs N (soil test nitrate-N +fert) per bushel target yield was required for economic optimum yield and protein levels
- Flag leaf split N applications and post-anthesis application increased grain protein content
- Dissolved urea resulted in higher grain yield and protein levels compared to UAN (as post-anthesis applications)
- ESN blends did not have an advantage in yield or protein over conventional urea

BACKGROUND

Current provincial N fertilizer guidelines are outdated and were developed with lower yielding varieties than currently being grown today. The current recommendation of 2-3 lbs N/bu yield potential creates large financial, environmental, and agronomic risks if applied using traditional methods. When high yields are achieved, protein content is at risk of being inadequate for milling purposes. Mid-season N fertilizer application may mitigate that risk, but minimal research has been done under MB growing conditions.

METHODS

- Two varieties: AAC Brandon (CWRS) and Prosper (CNHR)
- N rates: Increasing from 0 – 200 lbs N/ac, urea midrow banded at planting
- N rates: Urea and ESN blends at planting; foliar UAN and dissolved urea post-anthesis
- N application timings: planting, planting + stem elongation, planting + flag leaf, planting + post-anthesis

RESULTS

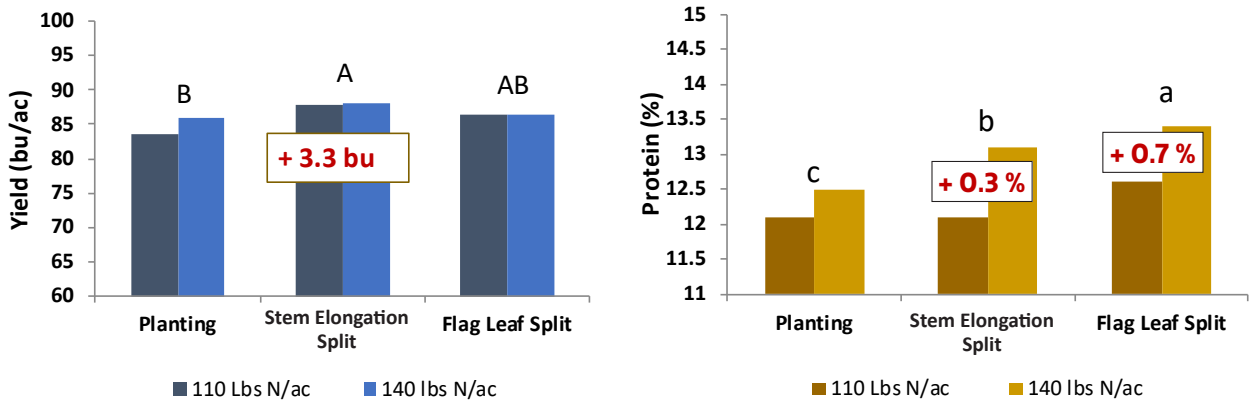

Figure 1. Grain yield (left) and protein content (right) responses to split N fertilizer applications compared to similar rates applied entirely at planting. Common letters at the top of each bar indicate statistically similar values for the average of the two N rates.

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RATE

AAC Brandon and Prosper responded similarly to increasing rates of N. Prosper consistently out-yielded AAC Brandon, while AAC Brandon had consistently higher protein content. The total N supply (soil test NO3 + N fertilizer) required to reach economic optimum yield and protein levels of both varieties ranged from 1.9-2.9 lbs N per bushel of yield.

APPLICATION TIMING

- **In Season:** Stem elongation and flag leaf split application yielded at least as much as application entirely at planting. Flag leaf split applications consistently increased grain protein content compared to equivalent rates applied entirely at planting. Protein increases ranged from 0.4-0.7%. Growing season precipitation is essential after N application to maximize efficacy and facilitate N uptake. These results indicate that there are opportunities under MB growing conditions to delay a portion of total N fertilizer to allow for rate adjustments based on the current season's yield potential.
- **Post-Anthesis:** Post-anthesis N (PAN) application increased grain protein content by 1.1-3.2%. Small (<4 bu/ac) yield reductions were occasionally reported. In general, PAN applications target protein increases under high yield potential, when risks of low protein levels are high. N requirements for yield should be met earlier in the season.

Read More:

https://mbcropalliance.ca/projects/optimum-nitrogen-fertilizer-management-strategies-for-high-yielding-spring-wheat-in-manitoba-1

SOURCE

- **Spring:** ESN blends produced yield and protein content similar to conventional urea. However, if conditions had been more favorable for early season N losses, there may have been a benefit to ESN blends over urea.
- **Post-Anthesis:** Dissolved urea resulted in a 4.1 bu/ac yield increase and a 0.6% protein increase over UAN. Leaf burn was present with both sources of N, but was lower with dissolved urea compared to UAN.

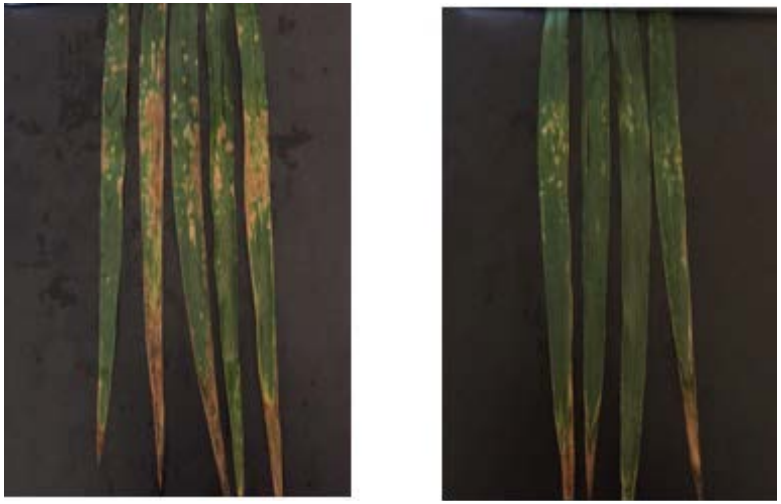

Figure 2. Leaf burn damage from post-anthesis foliar applications of UAN (left) and dissolved urea (right) at Carman in 2017.

RESEARCH CO-FUNDED BY: *Growing Forward 2 (GF2) Growing Innovation-Agri-Food Research and Development Program*

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FUNDING ACKNOWLEDGMENTS

Manitoba Crop Alliance gratefully acknowledges the funding support from the Government of Manitoba & Government of Canada through the CAP-Ag Action Manitoba program.