



Managing lodging with agronomic inputs in wheat

CATEGORY [agronomy](#) | July 14, 2022

Low plant density, split nitrogen, and PGR application all showed potential to reduce lodging risk without reducing grain yield or protein concentration.

Today's high yielding spring wheat varieties bring with them the potential for lodging under high nitrogen inputs. The objectives of this study were to determine the effect of plant density, split nitrogen (N) application, and application of a plant growth regulator (PGR) on early-season CWRS wheat vegetative growth and lodging risk. In addition, the research also looked at how canopy biomass alterations influence crop N uptake and remobilization for grain N yield in CWRS wheat.

Field trials were conducted at the University of Manitoba Ian N. Morrison Research Farm in Carman, Manitoba, and in a commercial field near Manitou, Manitoba in 2018 and 2019. AAC Brandon was seeded with an small plot air seeded on 8 inch (20.3 cm) row spacing at around 1 inch (2.5 cm) deep. AC Brandon is a semi-dwarf CWRS wheat variety with very good lodging resistance.

Seed placed phosphorus was applied as mono-ammonium phosphate (11-52-0) at a rate of 17.5 lbs P_2O_5 /ac (19.6 kg P_2O_5 /ha). Herbicides were applied as necessary. Twinline fungicide was applied at flag leaf timing to control leaf diseases, and Prosaro-XTR fungicide was applied at anthesis to reduced Fusarium head blight disease

Three seeding rates were compared. A low seeding rate targeting 15 plants/ft² (150 plants/m²) as a canopy management strategy to reduce lodging. The medium seeding rate of 25 plants/ft² (250 plants/m²) is the current provincial recommendation. The high seeding rate of 35 plants/ft² (350/m²) represents the trend to using higher seeding rates for better uniformity across the field.

Two N fertilizer treatments were included. The N fertilizer rate of 140 lbs N/ac (156 kg/ha) was either applied all as urea in a mid-row band at seeding, or as a split treatment of one-half at seeding and the other half broadcast as SUPER U at flag leaf growth stage.

All combinations of seeding rates and N treatments were tested with and without Manipulator PGR at the onset of canopy elongation (Zadoks GS31-32).

During the two years, growing season precipitation was 64 to 78% of the long term average. In general, 2018 growing season was wetter and warmer than 2019.

Effect on grain yield

One of 4 site years had significantly higher grain yield as influenced by seeding rate. At Carman in 2018, the highest seeding rate yielded 5.3 bu/ac (357 kg/ha) higher than the low seeding rate and 6.4 bu/ac (429 kg/ha) higher than the medium seeding rate.

Grain yield ranged from 68 to 86 bu/ac (4.592 to 5821 tonnes/ha) across the 4 site-years.

Grain yield was not significantly affected by N fertilizer treatments. However, grain protein increased from 13.9% to 14.5% when N fertilizer was applied as a split application between seeding and flag leaf growth stage. This led to a significant increase in grain N yield from 111 lbs N/ac to 124 lbs N/ac (125 to 139 kg N/ha).

PGR application significantly increased yield by 3% across all treatments, for an average increase of 2.4 bu/ac (158 kg/ha).

Lodging risk was low

The average canopy height ranged from 28 inches to 30 inches (72.2 to 76.2 cm), which was 2 to 3.5 inches (5 to 9 cm) shorter than normal. Plant height was slightly higher at the low plant density by about 0.75 inches (1.9 cm) compared to the high plant density. PGR application reduced canopy height by an average of 1.4 inches (3.5 cm) across all treatments.

Nitrogen treatments did not significantly affect canopy height, and did not have a significant effect on stalk strength at anthesis or maturity.

The lowest seeding rate had the highest stalk strength measured at both anthesis and maturity. PGR application did not have a significant effect on stalk strength.

With lower than average precipitation, lodging risk was low. Low plant densities had minimal lodging, but lodging increased with medium and high seeding rates. Averaged across treatments, PGR application significantly reduced lodging ratings from 1.17 to 0.28 on a scale of 0 to 9. At medium and high seeding rates, PGRs significantly reduced lodging.

The researchers indicated that, while there was low lodging pressure, that the application of a PGR is a valuable in season tool to reduce lodging when high lodging risk conditions are present and management practices such as high plant densities and high N fertilizer rates are used.

Overall, the canopy management practices showed potential to reduce lodging risk without compromising grain yield or protein. However, further research is required to assess these practices with other spring wheat varieties and under higher-yielding conditions across the Prairie.

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Mrs. Amy Rose Mangin, Dr. Anita Brule-Babel, Dr. Donald N. Flaten, Dr. Jochum Wiersma, and Dr. Yvonne Lawley. Canopy management: The balance between lodging risk and nitrogen use for spring wheat production in the Canadian Prairies. *Canadian Journal of Plant Science*. **Just-IN**

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