

2025 Final Research Report (Year 2)
for the
Saskatchewan Barley Development Commission

Project Title: Enhanced Barley Variety Trials 2024-2025



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Abstract

Abstract/Summary:

Trials were conducted at Yorkton, Melfort, Indian Head, Scott and Swift Current in 2024 and 2025 to determine if the malt varieties AAC Prairie, CDC Churchill and feed varieties CDC Durango and AB Wrangler differ in their response to N Fertility, PGR and fungicide. There was some evidence to suggest the barley varieties evaluated in this study may differ in their response to some inputs. However, these differences or lack thereof, along with goals for producing malt vs feed must be considered together when determining how to manage the crop. In this study, the application of PGR frequently reduced crop height without substantial differences detected between varieties. PGR often reduced lodging, however CDC Durango lodged very little with or without PGR, indicating that the use of PGR was less economical for this variety. PGR only significantly increased yield at Yorkton (2024) with a corresponding drop in grain protein through dilution. However, PGR tended to reduce yield, particularly at droughted sites such as Swift Current (2025), where the most affected varieties were AAC Prairie and CDC Churchill. PGR frequently reduced test weight, kernel plumpness and 1000 kernel weight. The application of fungicide numerically reduced leaf disease at some site-years, but leaf disease levels were generally low. Despite the lack of significant differences, the application of fungicide increased yield at Yorkton (2024) by 14.8% and at Melfort (2024) by 4%. At Swift Current (2025), only yield of the malt varieties (ie: AAC Prairie and CDC Churchill) were significantly increased by fungicide. While the yield increase from fungicide at Yorkton could be attributed to a numeric reduction in leaf disease, the yield increases from fungicide at Melfort (2024) and Swift Current (2025) occurred despite any visual improvement in leaf diseases. The fungicide used was Trivapro and Sygenta claims the product can improve water use efficiency, which may be responsible for the improved yield, particularly for the droughted site at Swift Current. Occasionally in this study, the application of fungicide increased test weight but grain protein was largely unaffected. When PGR + Fungicide were applied, the yield increase at Yorkton (2024) was 28% and protein decreased by 1.9% due to dilution. This shows the effects of PGR and fungicide were additive at this location, as the yield increases from PGR and Fungicide alone were 11.4% and 14.8%, respectively. However, these benefits were not observed at any other location. Though not usually statistically significant, the application of PGR tended to reduce yield at many of the other site-years. The positive effects of fungicide at Melfort (2024) and Swift Current (2025) appear to have been eliminated when fungicide and PGR were both applied. Reductions in test weight, kernel plumpness, and 1000 kernel weight from applying both fungicide and PGR applications can likely be attributed to the PGR, as these reductions were also observed when the PGR was applied alone. Enhancing N rate significantly increased yield at Melfort (2024) by 3.3%, at Yorkton (2025) by 22% and decreased yields for the malt varieties at Swift Current (2025). Results from Swift Current (2025) should be “taken with a grain of salt” as the regrowth largely constituted the yield. Apart from Swift Current (2025), varieties did not significantly differ in their yield response to enhanced N. Grain protein was significantly increased by enhancing N at all locations except Swift Current in both years and Yorkton in 2025. Protein levels at Swift Current were very high due to drought and probably hit a plateau. While there was no evidence that the grain protein response to enhanced N varied between varieties, grain protein for AAC Prairie and AB Wrangler were significantly higher compared to CDC Churchill and CDC Durango when all site-years were combined. Durango also proved to be 4.6% higher yielding than the other varieties on average. The effects of enhancing N on seed quality (ie: test weight, kernel plumpness and 1000 kernel weight) were infrequent and inconsistent.

Project Identification

- 1. Project Number:**
- 2. Producer Group Sponsoring the Project:** SaskBarley
- 3. Project Location(s):** Yorkton, SK, Melfort, SK, Indian Head, SK, Scott, SK, Swift Current, SK
- 4. Project start and end dates (month & year):** April 2024 to April 2026
- 5. Project contact person & contact details:**

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Objectives and Rationale

6. Project objectives:

The broad objective is to determine if 2 malt and 2 feed barley varieties differ in response to N fertility, PGR and fungicide.

The malt varieties to be screened include AAC Prairie, CDC Churchill, and the feed varieties include CDC Durango and AB Wrangler. These varieties were selected because they are new varieties that are either increasing their area of production or have the characteristics to do so.

Since it is not logistically practical to assess all combinations of these factors. The trial has been designed to assess all varieties with the following combination of factors:

1. Standard N fertility, No PGR with Fungicide (leaf disease timing)
2. Enhanced N fertility, No PGR with Fungicide (leaf disease timing)
3. Standard N fertility, PGR with Fungicide (leaf disease timing)
4. Standard N fertility, No PGR with no Fungicide

Thus, the more specific objectives are to compare the barley varieties as follows:

- at standard and enhanced rates of N fertility, when sprayed with Fungicide (comparison 1 vs 2)
 - allows comparison of fertility rates without limitations of disease
- with and without PGR, at a standard N fertility and sprayed with Fungicide (comparison 1 vs 3)
 - allows comparison of PGR without limitations of disease
- with and without Fungicide, at a standard N fertility (comparison 1 vs 4)

- with and without a combination of PGR and Fungicide at a standard N fertility (comparison 3 vs 4)

Methodology and Results

7. Methodology:

In order, to keep costs down but still achieve the objectives of the study, the trial design is unusual but innovative. Table 1 lists the treatments established at each location in a split-plot design with 4 replications. The main-plot factor was “Barley Management” and the sub-plot factor was “Barley Variety”. However, the treatment list was analyzed as 4 separate split-plot trials. Management A acts as a check for managements B, C and D which helps to keep the trial size to a manageable level. The first-split plot analysis compared Management A vs B. This compared varietal response to standard vs enhanced N fertility when all varieties have received fungicide at flag but no PGR. Standard and Enhanced rates of N varied by location group based on historic yield potential (SCIC data). The groupings are as follows:

- Group 1 = low yield potential: Swift Current: 100 vs 125 lb N/ac of soil + added N
- Group 2 = mid-range yield potential: Indian Head, and Scott: 120 vs 150 lb N/ac of soil + added N
- Group 3 = high yield potential: Yorkton, and Melfort,: 130 vs 162 lb N/ac of soil + added N

If soil sampling to 24 inches was not possible, N available in a 12-inch depth was multiplied by 1.5 for an approximation of N present in a 24-inch depth. Phosphorous and potassium were applied evenly to all treatments in each trial at rates to be non-limiting, even at the highest rate of N.

The 2nd split-plot analysis compared Management A vs C to determine the varietal response to PGR, at a standard rate of N and fungicide at flag. The PGR applied was Moddus (trinexapac-ethyl) at GS30-32 (stem elongation). The 3rd split-plot analysis compared Management A vs D to determine the varietal response to fungicide applied at flag leaf. For this comparison, all varieties were compared at the standard rate of N and with no PGR. The fungicide applied was either Trivapro or Nexicor applied at flag leaf timing. Once a fungicide was selected, all locations used the same product, which was Trivapro. A 4th split-plot comparison was also made between Management C and D to determine the varietal response to a combination of PGR and fungicide for varieties fertilized at a standard rate of N.

Herbicide and possibly insecticide selection were at the discretion of the site manager to ensure pests are non-limiting to yield. All trials are considered “small plot”, but plot size varied between locations based on available equipment. Depending on plot width, either the whole plot or only 4

or 5 centre rows were harvested using a small plot combine. Seeding rates for each variety were based on TKW and germination tests to target 300 live seeds/m². Dates of operations for 2024 and 2025 are listed in tables 2-1 and 2-2.

#	Barley Management (A-D)	Barley Variety
1	A-Standard ¹ N Fertility – No PGR – Fungicide ³	AAC Prairie
2	A-Standard ¹ N Fertility – No PGR – Fungicide ³	CDC Churchill
3	A-Standard ¹ N Fertility – No PGR – Fungicide ³	CDC Durango
4	A-Standard ¹ N Fertility – No PGR – Fungicide ³	AB Wrangler
5	B-Enhanced ¹ N Fertility – No PGR – Fungicide ³	AAC Prairie
6	B-Enhanced ¹ N Fertility – No PGR – Fungicide ³	CDC Churchill
7	B-Enhanced ¹ N Fertility – No PGR – Fungicide ³	CDC Durango
8	B-Enhanced ¹ N Fertility – No PGR – Fungicide ³	AB Wrangler
9	C-Standard ¹ N Fertility – PGR ² - Fungicide	AAC Prairie
10	C-Standard ¹ N Fertility – PGR ² - Fungicide	CDC Churchill
11	C-Standard ¹ N Fertility – PGR ² - Fungicide	CDC Durango
12	C-Standard ¹ N Fertility – PGR ² - Fungicide	AB Wrangler
13	D-Standard ¹ N Fertility – No PGR – No Fungicide	AAC Prairie
14	D-Standard ¹ N Fertility – No PGR – No Fungicide	CDC Churchill
15	D-Standard ¹ N Fertility – No PGR – No Fungicide	CDC Durango
16	D-Standard ¹ N Fertility – No PGR – No Fungicide	AB Wrangler

¹Standard and Enhanced rates of N Fertility [soil (0-24”) + added N] varied between locations based on historic yield potentials obtained from SCIC data. Sites will fall into the following groupings:

- Group 1 = low yield potential: Swift Current: 100 vs 125 lb N/ac of soil + added N
- Group 2 = mid-range yield potential: Indian Head, Scott: 120 vs 150 lb N/ac of soil + added N
- Group 3 = high yield potential: Yorkton, Melfort: 130 vs 162 lb N/ac of soil + added N

All sites were fertilized with P and K levels so as to be not limiting, even for the high N rate based on soil test recommendations.

²PGR applied was Moddus (trinexapac-ethyl) at GS30-32 (stem elongation).

³Fungicide applied was either Trivapro or Nexicor applied at flag leaf

Table 2-1. Dates of operations in 2024 for Yorkton (ECRF), Melfort (NARF), Indian Head (IHARF), Scott (WARC), and Swift Current (WCA).					
Operation	Yorkton	Melfort	Indian Head	Scott	Swift Current
Soil Test		April 30	May 16		April 16
Pre-seed Herbicide	May 12 & May 19 (Roundup Transorb @ 0.66 L/ac)	May 14 (StartUp (Glyphosate 540) @ 1 L/ac)	May 14 & May 21 (Roundup Weathermax @ 0.67 L/ac)	May 9 (Glyphosate 540 @ 1L/ac & AIM @ 35 ml/ac)	May 13 (RT540 @ 1.6 L/ac)
Seeded Trial	May 17	May 27	May 16	May 14	May 28
Rolled	NA	NA	NA	May 14	NA
Emergence Counts	June 13 June 14	June 13	June 4	June 6	June 6
In-crop Herbicide	June 8 (Axial +AMS)	June 9 (Enforcer M @ 510 ml/ac)	June 14 (Prestige XL @ 0.95 L/ac + Axial @ 0.5 L/ac)	June 18 (Buctril M @ 0.4 L/ac & Axial Xtreme @0.5L/ac)	June 19 (Buctril M @ 0.4 L/ac)
	June 9 (Prestige)	June 9 (Axial @ 500 ml/ac)			
	June 15 (Axial +AMS)	July 4 (Enforcer M @ 510 ml/ac)			
Apply PGR at stem elongation Treatments 9 to 12	June 17 (Moddus)	July 4 (Moddus)	June 8 (Moddus @ 0.42 L/ac)	June 19 (trt 10 & 11) June 22 (trt 9 & 12)	July 1 (Moddus @ 0.42 L/ac)
Apply fungicide at flag leaf Treatments 1 to 12	July 3 (Trivapro)	July 9 (Trivapro)	July 7 (Trivapro A @ 0.4 L/ac + Trivapro B @ 0.12 L/ac)	July 5 (Churchill & Durango) July 11 (Prairie & sprayed trt 14 & 15 accidentally)	July 8 (Trivapro A @ 0.4L/ac & Trivapro B @ 0.12 L/ac)
Lodging (0-9)	July 12	September 10	August 9 (1-9 scale)	August 21	August 1
Height (cm) – average of 6 plants/plot	August 2	August 21	July 30	August 7	August 1

Percent leaf disease coverage of penultimate leaf. Rate 10 leaves/plot for treatments 1-4 and 13-16.	August 2	July 18	July 19	July 24	July 26
Seed Yield	August 22 (100s + 200s) August 23 (300s + 400s)	September 10	August 25 (Reps 3 & 4) August 26 (Reps 1 & 2)	August 26	August 13
Send 500g from every plot to CMBTC	October 1	September 18		October 29	October 2

Table 2-2. Dates of operations in 2025 for Yorkton (ECRF), Melfort (NARF), Indian Head (IHARF), Scott (WARC), and Swift Current (WCA).					
Operation	Yorkton	Melfort	Indian Head	Scott	Swift Current
Soil Test	April 25	October 29, 2024 May 7, 2025	May 10	April 30	April 11
Pre-seed Herbicide	None	May 15 (Avadex @ 1.2 L/ac & StartUp @ 670 ml/ac)	May 13 (Roundup Weathermax @ 0.67 L/ac)	May 9 (Glyphosate 540 @ 1 L/ac & AIM @ 35 ml/ac)	April 18 (Roundup Transorb @ 1 L/ac + AIM @ 47 ml/ac + Merge @ 1L/100L vol)
Seeded Trial	May 9 (no P)	May 12	May 11	May 10	April 25
Emergence Counts	May 30	May 28	June 2	May 29	May 9
In-crop Herbicide	June 12 (Prestige XL @ 900 ml/ac)	June 11 (Puma Advance @ 413 ml/ac)	June 9 (Prestige XL @ 0.95 L/ac + Axial @ 0.5 L/ac)	June 16 (Axial Xtreme @ 0.5 L/ac & Buctril M @ 0.4 L/ac)	June 4 (Liquid Achieve @ 0.2 L/ac + Buctril M @ 0.4 L/ac + Carrier @ 0.5L/100L)
	June 16 (Axial @ 500 ml/ac)	June 20 (Momentum @ 0.45 L/ac and MCPA @ 0.38 L/ac)			
	June 27 (Axial + AMS)				
Apply PGR at stem elongation Treatments 9 to 12	June 17 (Moddus @ 420 ml/ac)	July 1 (Moddus)	June 15 (Moddus @ 0.417 L/ac)	June 16 (Moddus)	June 11 (Moddus @ 420 ml/ac)
Apply fungicide at flag leaf Treatments 1 to 12	June 27 (Trivapro)	July 7 (Trivapro)	July 1 (Trivapro A @ 0.4 L/ac + Trivapro B @ 0.12 L/ac)	June 27 (Trivapro)	June 17 (Trivapro A @ 400ml/ac + Trivapro B @ 120 ml/ac)
Lodging (0-9)	August 21	September 8	August 13	August 18	August 14
Height (cm) – average of 6 plants/plot	August 7	August 5	July 29	July 31	August 14

Percent leaf disease coverage of penultimate leaf. Rate 10 leaves/plot for treatments 1-4 and 13-16.	July 25	July 18	July 18	July 10	June 25
Seed Yield	August 21	September 8	August 21	September 11	October 1
Send 500g from every plot to CMBTC	November 6	October 15			

8. Results:

In 2024, Growing season temperatures were near long-term averages at all sites. For all locations, June was unseasonably cool, but July and August were warmer than average (Table 3). Precipitation from May to June was above average at all locations. Wet conditions created difficulties during seeding for Prince Albert. July and August were drier than normal at all locations except Indian head where August was wetter than average. Yields averaged 125, 109, 28, 96, and 90 bu/ac at Melfort, Yorkton, Swift Current, Scott, and Indian Head, respectively. In 2025, All locations were warmer than their long-term averages except Swift Current where temperatures were near the long-term average (Table 3). July was cooler than average at all locations. Precipitation was substantially below average at Yorkton, and Indian Head. Every month from May to August was dry at Indian Head. At Yorkton, only August received above average rainfall. Precipitation was above average at Swift Current and Scott. However, June and most of July were very dry at Swift Current with most of the precipitation falling at the end of the month. This created 2nd growth and a lot of variability. Operators believe most of the yield came from the 2nd growth with much of the initial growth lost to shattering. While May was very dry at Scott, well above average precipitation fell in June. Near average precipitation fell at Melfort, however May and July were very dry. Yields in 2025, averaged 117, 95, 42, 75, and 126 bu/ac at Melfort, Yorkton, Swift Current, Scott, and Indian Head, respectively.

Table 3. Mean monthly temperatures and precipitation amounts for 2024 and 2025 along with long-term normals for Yorkton (ECRF), Melfort (NARF), Indian Head (IHARF), Scott (WARC), and Swift Current (WCA), Saskatchewan.

Location	Year	May	June	July	August	Avg. / Total
-----Mean Temperature (°C) -----						
Yorkton	2024	10.5	14.2	20.3	17.7	15.7
	2025	12.4	15.7	17.5	18.3	15.98
	Long-term	10.4	15.5	17.9	17.1	15.2
Melfort	2024	10.1	13.2	19.4	17.4	15.025
	2025	13.8	15.0	17.0	18.0	15.95
	Long-term	10.1	15.2	17.8	16.7	14.95
Indian Head	2024	10.6	13.6	19.5	17.9	15.4
	2025	12.7	15.3	17.0	17.8	15.7
	Long-term	10.8	15.8	18.2	17.4	15.6

Scott	2024	9.8	13.3	18.9	17.4	14.9
	2025	12.9	14.6	15.8	17.4	15.2
	Long-term	10.8	14.8	17.3	16.3	14.8
Swift Current	2024	10.6	14.3	21.3	19.4	16.4
	2025	13.1	15.9	18.0	19.0	16.5
	Long-term	11.5	16.3	19	18.6	16.4
----- Precipitation (mm) -----						
Yorkton	2024	56	120.4	22.9	42.3	241.6
	2025	23.60	63.40	36.80	71.20	195.0
	Long-term	51	80	78	62	271
Melfort	2024	73	84	36.1	31.9	225
	2025	4.8	93.2	25.9	113.5	237.4
	Long-term	33.4	79.5	69.6	45.9	228.4
Indian Head	2024	63.7	74.9	37.4	71.8	247.8
	2025	42.6	39.4	27.1	26.9	136.0
	Long-term	51.7	77.4	63.8	51.2	244.1
Scott	2024	74.2	112.0	26.7	42.8	255.7
	2025	11.8	103.7	28.7	64.5	273.2
	Long-term	38.9	69.7	69.4	48.7	226.7
Swift Current	2024	73.6	52.1	18.6	18.2	162.5
	2025	34.2	31.3	78.2	92.6	236.3
	Long-term	43.4	60.5	56.4	40.4	200.7

Scott 2024

At Scott there were a couple of issues regarding fungicide that created confounding when interpreting the data. Firstly, Trivapro was sprayed on CDC Churchill and CDC Durango on July 5 whereas, AAC Prairie and AB Wrangler were sprayed much later on July 11. Secondly, treatment 14 and 15 were accidentally sprayed with fungicide. While all results have been tabulated, any discussion of fungicide that involves management D has been omitted.

Swift Current 2025

At Swift Current, the season started out dry. However, precipitation late in the season created 2nd growth

and a lot of variability (CV=23). Operators believe most of the yield came from the 2nd growth with much of the initial growth was lost to shattering. So unusual results from this site are suspect.

Statistical analysis

Data were analyzed with the R statistical program, version 4.2.2 (R Core Team 2022), using the *lme4* package (Bates et al. 2015) for fitting mixed-effects models, the *lmerTest* package (Kuznetsova et al. 2017) for assessing model fit and treatment differences, and the *emmeans* package (Length 2023) for means separation. Data from all site-years were combined for a multi-site analysis. To assess the overall response across environments and determine the presence of significant site interactions, mixed effects models were fitted for each response variable (plant density, disease, height, lodging, yield, and protein) with fixed effects being Site, Variety and Management, all two-way interactions, and the three-way interaction. Random effects were Replicate within Site, and Management within Replicate within Site (Management was blocked in the split-plot design). If a significant three-way interaction was identified, then sites were analyzed separately, with Variety, Management, and the interaction as fixed effects, and Replicate and Management within Replicate (split-plot design) as random effects. Estimated marginal means were determined and if significant treatment effects were identified, means were separated using multiple pairwise comparisons with the LSD method for P-value adjustment and the Satterthwaite method for determining degrees of freedom. Treatments were considered significantly different at $P < 0.05$.

Study Results

Reference to tables with an “a” or “b” after the table number, are in the appendices.

Plant density

While plant densities differed between varieties at all locations (Table 2a), the relative ranking between varieties differed between locations (Tables 3a and 3b). However, there were some consistencies as the same seed lots were shared between sites. In 2024, CDC Durango had the highest emergence at all sites except at Swift Current, and AAC Prairie had the lowest emergence at all sites except Yorkton, where AAC Prairie and AB Wrangler were tied for the lowest emergence (Table 3a). The relatively low emergence of AAC Prairie could have had some mild agronomic effects at Melfort, Swift Current and Scott. In 2025, emergence for CDC Churchill was the highest at all sites but Swift Current. Varieties with the lowest emergence were either CDC Durango or AAC Prairie. Emergence was on the low side at Swift Current and Scott. However, with the dryer climate at Swift Current, low emergence was likely beneficial by reducing interplant competition for soil moisture. Overall, emergence was relatively consistent between varieties. Management did not have a significant main effect on emergence at any of the sites; however, interactions were detected at Yorkton (2024) and Scott (2025). While the relative emergence between varieties may have varied between levels of management at these

sites, the variance was still small and unlikely to have agronomic effects (Tables 3a and 3b).

Impact of PGR

Crop Height

Combined site-year analysis

When averaged across all site-years AB Wrangler (69.7 cm) was significantly taller than AAC Prairie (68.1 cm) which was significantly taller than CDC Churchill (66.1 cm) and CDC Durango (66.6 cm). The use of PGR (management C vs A) significantly reduced plant height from 69.1 cm down to 61.8 cm. Significant interactions with site were detected for both management and variety, indicating that the effect of these main effects should be evaluated on a site-by-site basis (Table 1a).

Individual site-year analysis

The use of PGR (management C vs A) significantly reduced crop height at all site-years except Swift Current (2025), Scott (2025), and Indian Head (2025) (Tables 4a, 5a, 5b; Figures 1a and 1b). However, with a p-value of 0.062 the reduction in crop height from using PGR was close to significant at Indian Head (2025). Swift Current (2025) and Scott (2025) were low yielding sites due to moisture stress, which may be the reason the height was less affected by PGR at these locations. No significant interactions between management and variety were detected at any site-year, indicating that the effect of PGR on plant height was similar between varieties.

Figure 1a. Effect of PGR on Barley Height 2024

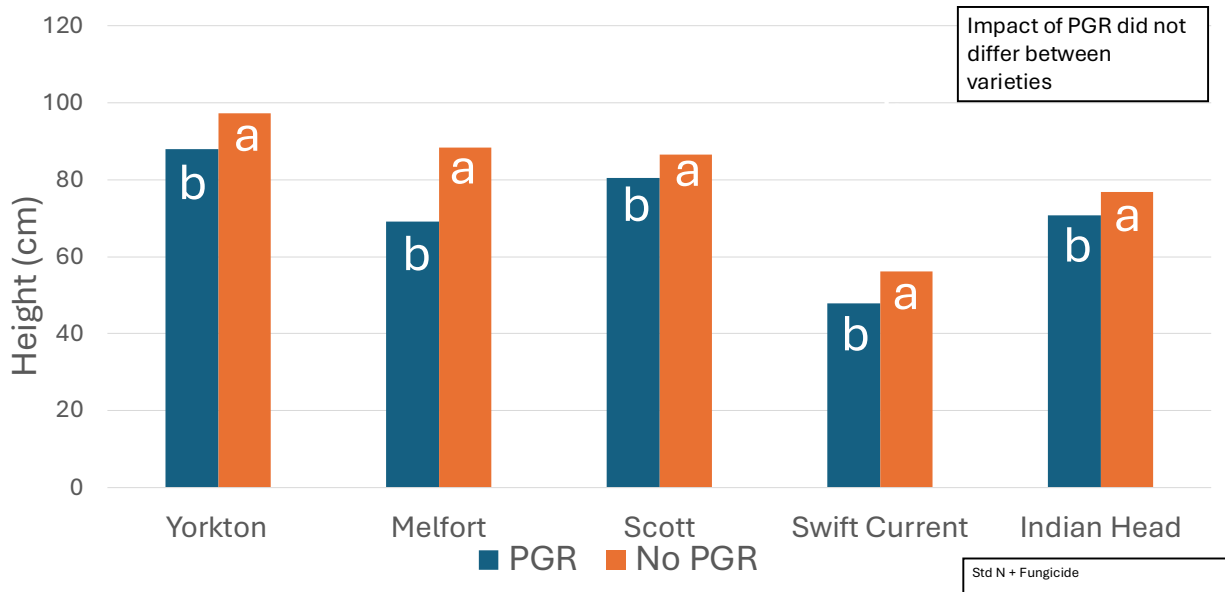
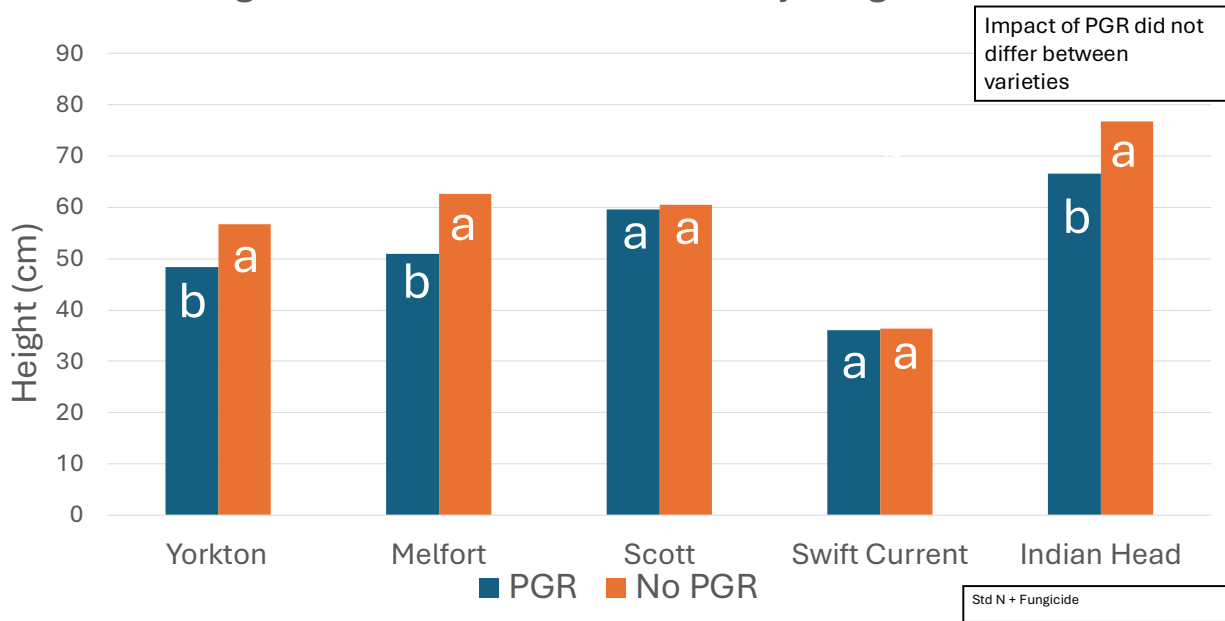


Figure 1b. Effect of PGR on Barley Height 2025



Lodging

Combined site-year analysis

Overall, levels of lodging, assessed on a scale from 0 to 9, were very low in this study. Averaged across site-years, the application of PGR (management C vs A) significantly reduced lodging. However, a significant interaction between management, variety and site indicated that these effects were not consistent between site-years (Table 1a).

Individual site-year analysis

Application of PGR (management C vs A) significantly reduced lodging at all site-years except Swift Current (2024 & 2025), Indian Head (2025) and Yorkton (2025) (Tables 7a and 7b). At Swift Current there was a drought in both years, and the crop was short and not prone to lodging. Lodging levels were also very low at Yorkton and Indian Head in 2025. At Scott (2024), application of PGR (management C vs A) significantly decreased lodging. Overall, AAC Prairie was less prone to lodging (Table 7a) which is incongruent with past study, as AAC Prairie only has a “fair” resistance rating to lodging. For the rest of the site-years to be discussed, the effect of PGR on lodging varied between varieties, as indicated by significant M x V interactions. At Scott (2025), the application of PGR (management C vs A) numerically reduced lodging for all varieties but AB Wrangler, for which lodging unexpectedly increased (Table 7b). A reason for this is unclear. At Indian Head (2024), the application of PGR reduced lodging for all varieties, however effects were only large enough to be statistically significant for CDC Churchill and AB Wrangler. While reduced effects of PGR on CDC Durango might be expected due to its “Very Good” resistance to lodging, it is unusual that lodging was not significantly reduced for AAC Prairie with only a “Fair” resistance to lodging. At Melfort (2024 & 2025) and Yorkton (2024), results were similar with PGR applications reducing lodging more for AAC Prairie and CDC Churchill compared to CDC Durango. This would be anticipated since Durango has “Very Good” resistance to lodging, whereas AAC Prairie and CDC Churchill have only “Fair” and “Good” resistance to lodging, respectively. While the application of PGR significantly reduced lodging for AB Wrangler at all these sites, the effect was much more pronounced at Melfort (2024). While the lodging rankings between varieties varied between site-years, CDC Durango rated to have “Very Good” resistance to lodging consistently had little lodging with or without PGR. Figure 2 shows an Aerial view of the Yorkton site in 2024. Blocks, outlined in black, were sprayed with PGR and are standing well, whereas the rest of the trial is lodging.

Figure 2. Aerial view of Yorkton site 2024. Areas traced in black received PGR.



Yield and Grain Protein

Combined site-year analysis

The application of PGR did not significantly affect yield or grain protein. However, the presence of significant interactions with site for both parameters indicates that effects differed between site-years and requires further investigation.

Individual site-year analysis

The application of PGR (management C vs A) only significantly increased yield at Yorkton (2024) by 11.4%. In turn, this resulted in a numeric reduction in grain protein of 0.94% (Table 13a). A lack of a yield response to PGR was unanticipated at Melfort (2024), as PGR greatly reduced lodging at this location (Table 7a). Application of PGR reduced yield at Swift Current (2024) by 10%, however the difference was not statistically significant. At Swift Current (2025), the application of PGR significantly reduced yield by 24% on average (11b, Figure 4). However, a significant management by variety interaction revealed that the yield reductions only occurred for AAC Prairie and CDC Churchill. The reason for the difference between varieties is unclear. Surprisingly, a corresponding increase in grain protein for AAC Prairie and CDC Churchill were not observed despite the large reductions in yield. Reduction in crop yield from the application of PGR is frequently observed for crops under drought stress, which can also lead to an increase

in grain protein. While PGR significantly increased grain protein at Melfort in 2025 the reason for this is unclear as a corresponding reduction in yield was not observed. At Yorkton (2025), PGR significantly increased grain protein for CDC Churchill and CDC Durango. While not statistically significant, corresponding yield reductions for these varieties were observed (Table 11b)

Figure 3. Effect of PGR on Barley Yield 2024

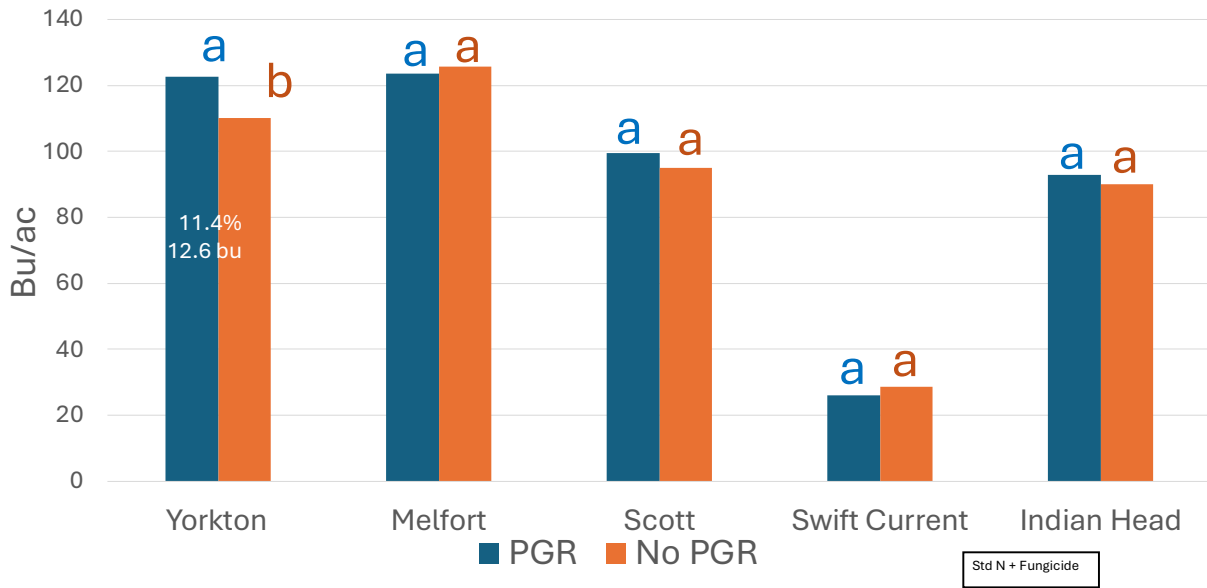
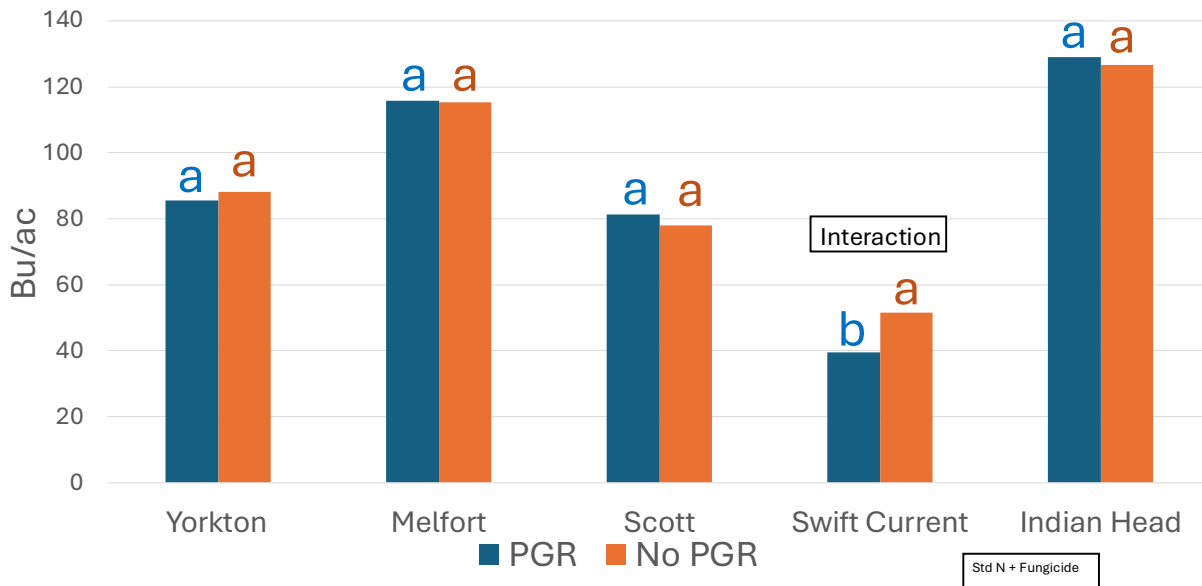


Figure 4. Effect of PGR on Barley Yield 2025



Test weight, kernel plumpness and 1000 kernel weight

Combined site-year analysis

Overall, the application of PGR (management C vs A) numerically reduced test weight, and significantly reduced kernel plumpness and 1000 kernel weight. For all 3 parameters many interactions with site indicated that effects need to be evaluated on a site-by-site basis.

Individual site-year analysis

The application of PGR (management C vs A) significantly reduced test weight at Melfort (2024), Melfort (2025), and Yorkton (2025) (Tables 16a and 16b). While PGR reduced test weight for all varieties at Melfort (2025), reductions were only significant for CDC Churchill and AB Wrangler. Similarly, PGR only reduced test weight at Yorkton (2025) for CDC Churchill. Kernel plumpness and 1000 kernel weight were only evaluated on the malt barley varieties AAC Prairie and CDC Churchill. The application of PGR significantly reduced kernel plumpness at Melfort in both years and Yorkton (2025). While PGR significantly reduced the kernel plumpness for both varieties, the effect at both Melfort and Yorkton in 2025 was more pronounced for CDC Churchill. AAC Prairie had significantly plumper kernels at all site-years except Swift Current in both years. The 1000 kernel weight was significantly reduced by PGR at Melfort in both years.

Impact of Fungicide

Leaf Disease

Combined site-year analysis

Percent leaf disease coverage on the penultimate leaf was very low in this study. However, when analysing all site-years together, the application of fungicide (Management D vs A) significantly reduced leaf disease coverage from 2.87% down to 1.9% (Table 1a). While the level of disease did not significantly differ between varieties, there was a significant management by variety by site interaction requiring further investigation ($p=0.067$).

Individual site-year analysis

The effect of fungicide on leaf disease was not significant when analysing each site-year independently (Table 8a), however application of fungicide substantially reduced leaf disease at Yorkton in 2024 ($p=0.061$) and in 2025 ($p=0.078$) (Tables 9a and 9b). A management by variety interaction at Yorkton was nearly significant in 2024 ($p=0.066$) and in 2025 ($p=0.084$). While the application of fungicide reduced the presence of leaf disease for all varieties (management A vs D), it was more effective on CDC Durango in both years at Yorkton (Table 9a and 9b).

Yield and Protein

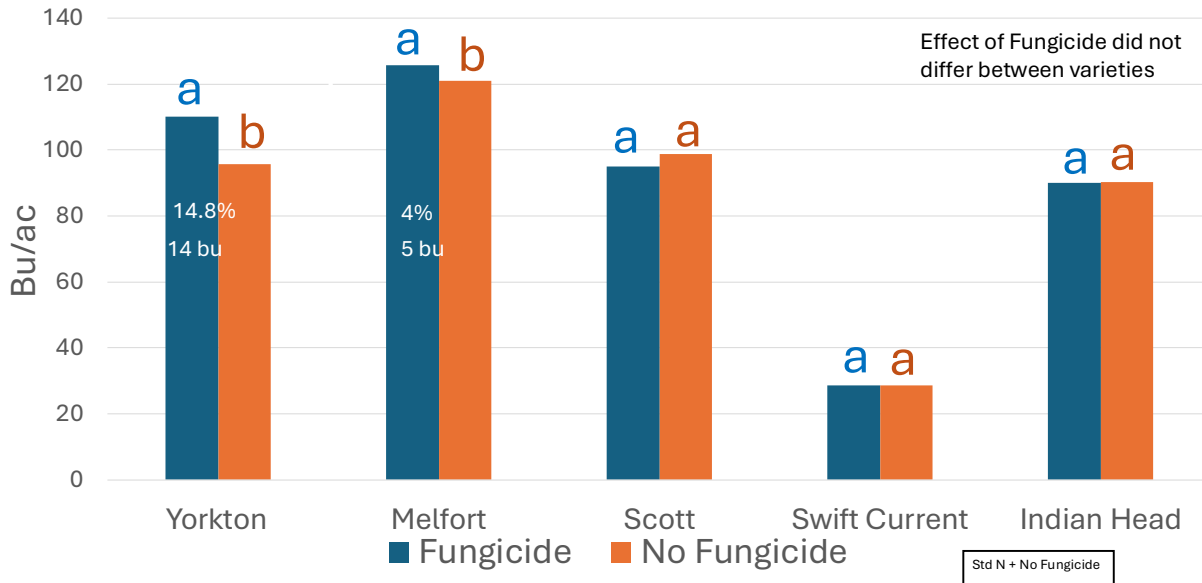
Combined site-year analysis

No significant effect of fungicide (management A vs D) on yield or grain protein were detected (data not shown). However, interactions with site-year indicate that results need to be evaluated on a site-by-site basis.

Individual site-year analysis

Significant yield increases from applying fungicide (management A vs D) were detected at Melfort (2024), Yorkton (2024), and Swift Current (2025) (Table 10a, Figure 5). However, the application of fungicide did not significantly affect grain protein at any site year (Tables 13a and 13b). While there was a large, albeit insignificant, reduction in leaf disease from the application of fungicide at Yorkton (2024), there were no similar reductions in leaf disease to support the significant yield increases observed at Melfort (2024) and Swift Current (2025) (Tables 11a and 11b). At Swift Current (2025), a significant interaction found yield increases to fungicide only occurred for AAC Prairie and CDC Churchill. Trivapro, the fungicide used in this study, is purported by Syngenta to have “plant health” benefits that go beyond the control of disease. The product may improve water use efficiency under drought, which was certainly the environment experienced by Swift Current. However, there was a lot of variability at this site ($CV=23$) which makes these results suspect. June and most of July were very dry at Swift Current with most of the precipitation falling at the end of the month. This created 2nd growth and a lot of variability. Operators believe most of the yield came from the 2nd growth with much of the initial growth lost to shattering.

Figure 5. Effect of Fungicide on Barley Yield 2024



Test weight, kernel plumpness and 1000 kernel weight

Combined site-year analysis

The application of fungicide (management A vs D) did not significantly affect test weight, kernel plumpness or 1000 kernel weight when all sites were analyzed together. However, several interactions with site require further investigation.

Individual site-year analysis

Fungicide significantly increased test weight at Indian Head (2025) (Tables 15a and 16b). Similarly, test weights for all varieties except CDC Durango were increased by fungicide at Yorkton (2024) (Table 16a). In contrast, the test weight of AAC Prairie was significantly reduced by fungicide at Melfort 2025 (Table 16b). Fungicide did not significantly affect the level of plumps at any site-year except at Swift Current, where plumps of AAC Prairie were decreased and the plumps of CDC Churchill were decreased (Table 18b). Effects of fungicide were only detected at Swift Current (2025). There, fungicide significantly decreased 1000 kernel weight for AAC Prairie (Table 20b) but not CDC Churchill.

Impact of Fungicide + PGR Combined

Yield and Protein

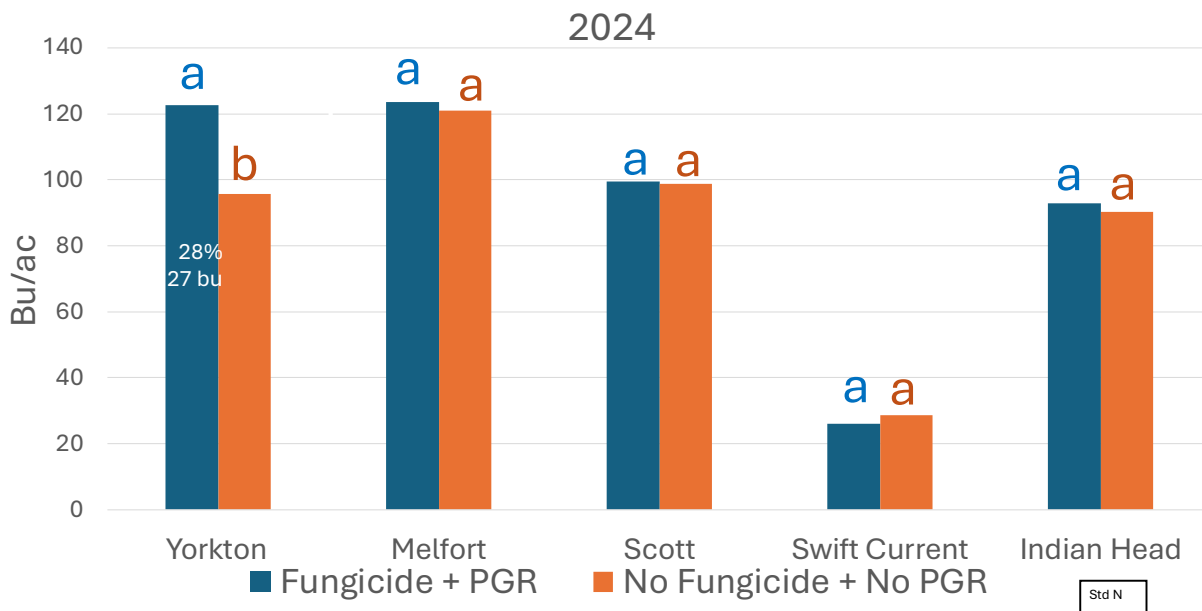
Combined site-year analysis

Combing Fungicide + PGR (management C vs D) did not significantly increase yield or grain protein. The beneficial effect of fungicide may have been cancelled out by the negative effects of PGR. However, interactions with site-year indicate that results need to be evaluated on a site-by-site basis.

Individual site-year analysis

The combination of Fungicide and PGR (management C vs D) significantly and substantially increased yield for Yorkton (2024) by 28% or 27 bu/ac (Figure 6, Tables 10a and 11a). This shows the effects of PGR and fungicide were additive at this location, as the yield increases from PGR and Fungicide alone were 11.4% and 14.8%, respectively. This is congruent with the reduction in leaf disease and lodging observed at this site. The large increase in yield from PGR + fungicide significantly reduced grain protein by 1.9% through dilution (Table 13a). The reduction in grain protein would have increased the likelihood of selection for the malt varieties. Significant increases in yield were not detected for any of the other site-years, including Swift Current (2025) and Melfort (2024) where positive yield responses to fungicide had been detected. At these locations, the positive yield benefits from fungicide were likely reduced by the negative effects of PGR on yield. Grain protein at Indian Head and Melfort in 2024 were significantly, albeit minorly increased by the application of fungicide and PGR (Table 14a). At Yorkton (2025), grain protein was significantly increased by PGR + Fungicide to varying degrees depending on the variety. For AAC Prairie and AB Wrangler, grain protein was increased by 0.7%, whereas CDC Durango and CDC Churchill were increased by 1.2 and 1.8%, respectively (Table 14b). The reason grain protein was increased by the combination is not completely clear, however it is likely the result of detrimental effects of the PGR. The combination of fungicide and PGR significantly reduced test weight, kernel plumpness and 1000 kernel weight at Melfort in both years and Yorkton (2025) (Tables 16a, 16b, 18a, 18b, 20a and 20b). These effects can mostly be attributed to the PGR as very similar effects were observed for PGR alone at these locations. At Melfort and Yorkton in 2025, significant interactions between management and variety were detected for test weight and kernel plumpness (Tables 17a and 19a). At Melfort (2025), the test weight was reduced for all varieties, but the magnitude was much greater for AAC Prairie and CDC Churchill (Table 16b). Kernel plumpness was also reduced with the effect being greater CDC Churchill vs AAC Prairie. At Yorkton (2025), test weight was only significantly reduced for CDC Churchill and AB Wrangler. In contrast to the general trend, kernel plumpness was increased for CDC Churchill. In contrast to these locations, PGR + fungicide significantly increased test weight at Swift Current (2024) (Table 16a) and 1000 kernel weight was increased at Yorkton (2024) (Table 20a).

Figure 6. Effect of Fungicide and PGR on Barley Yield



Enhancing N rate

Combined site-year analysis

Enhancing N rate (management B vs A) significantly increased crop height, lodging, and grain protein. Significant differences for yield, test weight, kernel plumpness and 1000 kernel weight were not detected. However, interactions with site-year behaves us to evaluate each site individually.

Individual site-year analysis

Enhancing N rate (Management B vs A) significantly increased yield at Melfort (2024) by 3.3% and at Yorkton (2025) by 22% (Tables 11a and 11b; Figures 7 and 8). At Swift Current (2025), enhancing N rate significantly reduced yield, but only for the malt varieties AAC Prairie and CDC Churchill (Figure 9). A reason for the decline in yield, specifically for the malt varieties, is unclear. However, as discussed earlier this was an unusual site where the second growth constituted most of the yield. Increasing N may have reduced yield potential by delaying maturity. Enhancing N rate did not significantly increase yield at any other location. Enhancing N only increased lodging at Indian Head (2024) (Table 7a). Enhancing N rate increased grain protein at all site-years except Swift Current in both years (Tables 13a and 13b). Due to drought grain protein was high and had likely plateaued in response to added N. The enhanced rate of N also increased grain protein at Yorkton (2025), but the effect was not statistically significant. Effects of enhancing N on test weight, kernel plumpness and 1000 kernel weight were infrequent and inconsistent. Enhancing N significantly increased test weight at Melfort (2025) and significantly decreased test weight at Scott (2025). At Melfort (2024) there was an M by V

interaction where enhancing N only significantly increased the test weight of AAC Prairie. Kernel plumpness was significantly increased at Swift Current (2024) and decreased at Scott (2025). At Swift Current (2025), enhancing N only decreased kernel plumpness for CDC Churchill. Enhancing N significantly reduced 1000 kernel weight at Scott (2025).

Figure 7. Effect of N rate on Barley Yield 2024

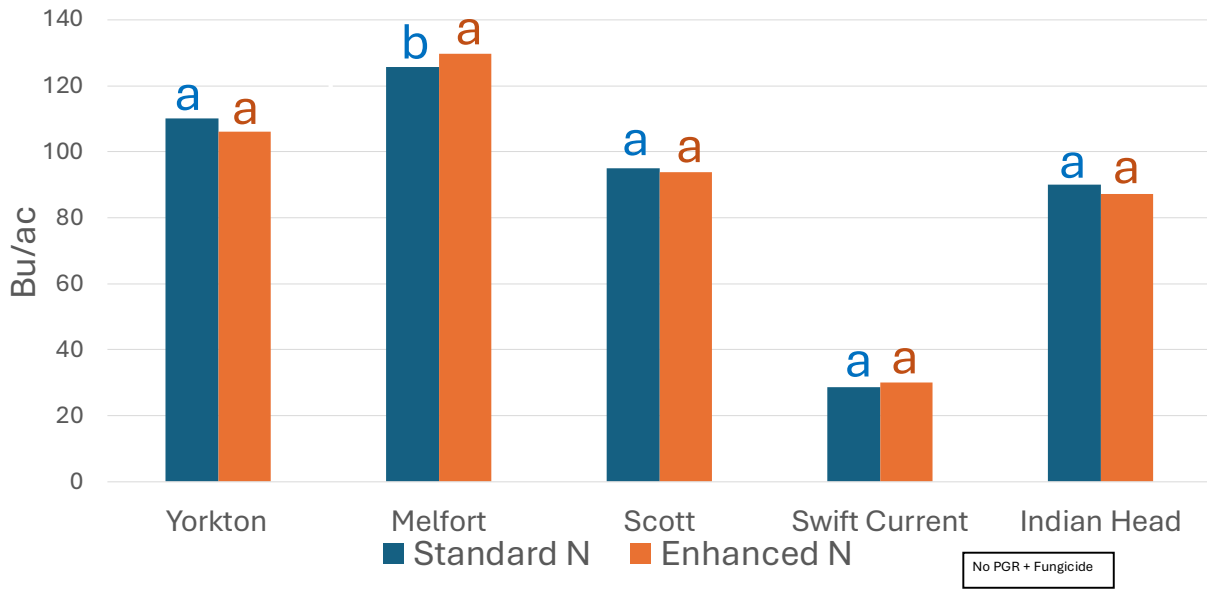


Figure 8. Effect of N rate on Barley Yield 2025

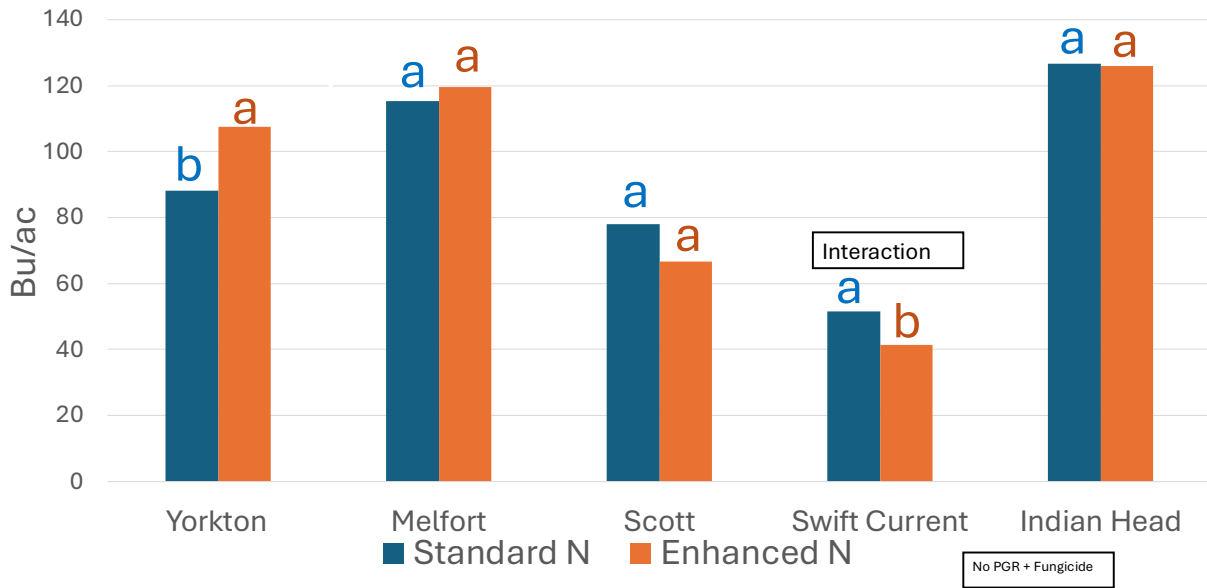
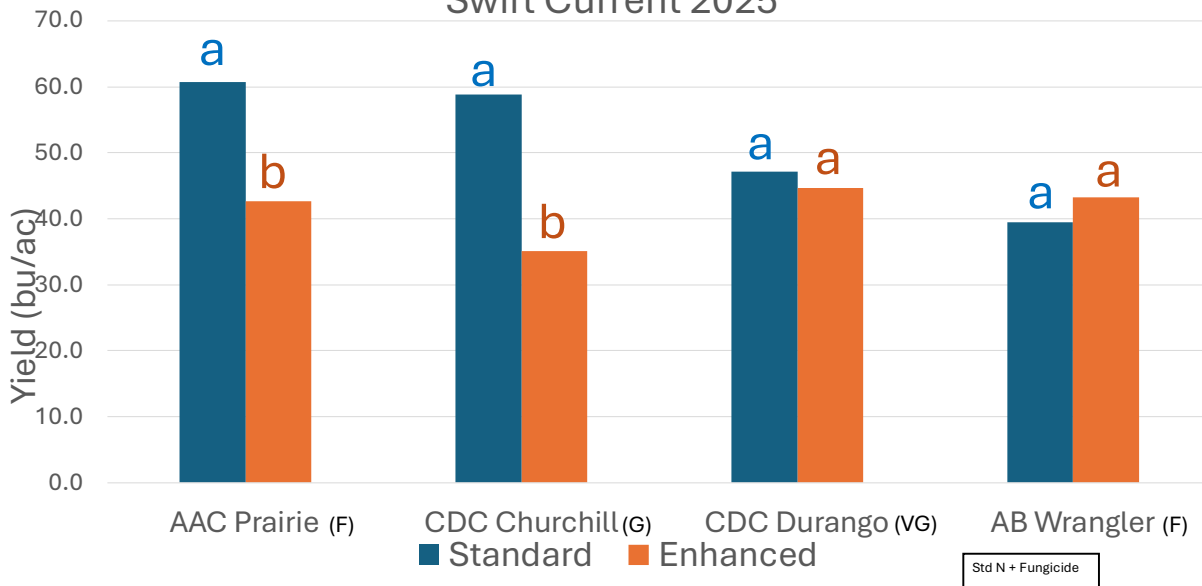


Figure 9. Effect of N rate on Barley Yield by Variety at Swift Current 2025



Variety-Yield and Grain Protein

Management by variety interactions for the yield and grain protein data were only detected at Swift Current (2025) and Yorkton (2025), respectively. With few interactions detected it is safe to generalize about the relative yield and grain protein rankings between varieties. A combined site-year analysis finds the yield of CDC Durango to be significantly higher than all other varieties which do not significantly differ from each other. On average, CDC Durango was 4.6% higher yielding, and this difference may be due in part to its greater resistance to lodging. For protein, AAC Prairie and AB Wrangler had highest levels at around 13.7% which was significantly higher than the protein level of 13.4% for CDC Churchill and CDC Durango.

9. Conclusions and Recommendations

PGR effectively reduced the height of all varieties and frequently reduced lodging. However, the use of PGR on CDC Durango is less likely to be economical due to its “Very Good” resistance to lodging. Yorkton 2024 was the only site where yield was increased by PGR and the increase of 11.4% had a corresponding drop in grain protein of 0.94% through yield dilution. If plants were drought stressed the application of PGR tended to reduce yield, test weight, kernel plumpness

and 1000 kernel weight. Disease levels were low in this study and while fungicide never significantly reduced leaf disease, some sizeable numeric reductions were observed. Fungicide significantly increased yield at Yorkton (14.8%) and Melfort (4%) in 2024 and for malt barleys at Swift Current in 2025. At Melfort and Swift Current the yield increases may have been the result of a “plant health benefit” as opposed to leaf disease reduction. The positive effects of Fungicide and PGR at Yorkton (2004) were additive, where yield increased by 28% and grain protein decreased by 1.9 percentage points. In some cases, the detrimental effects of PGR may have negated the yield benefits from fungicide. Reductions in test weight, kernel plumpness and 1000 kernel weight were likely resulting from the PGR portion of the combination. Enhancing N rate increased yield at a couple site-years and increased protein at many site-years. While yield and grain protein response didn’t usually differ between varieties, N still needs to be managed based on different risk tolerances for excessive protein between malt and feed barley. Overall, Durango was 4.6% higher yielding than the other varieties and grain protein was higher for AAC Prairie and AB Wrangler compared to CDC Churchill and CDC Durango.

Supporting Information

10. Acknowledgements:

This project was funded by SaskBarley.

Extension

A youtube video was created covering the final results of this study:

[Enhanced Barley Variety Trials 2024 to 2025](#)

Results were presented at Top Notch Farming (February 12, 2024) in Moosomin.

Trial was viewed and discussed at ECRF/Suncrest College research farm tour July 23, 2024 and July 24, 2025. Attendance was approximately 100 individuals in both years.

11. Appendices

Table 1a. F-test results of mixed-effects model analysis of crop response variables assessing the presence of site interactions with Management and Variety. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Plant density	Height	Lodging	Yield	Protein	Leaf disease	Test wt	Plump*	TKW*
<i>Fixed effects</i>									
	----- <i>Pr(>F)</i> -----								
Site-year (S)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Management (M)	0.010	<0.001	<0.001	0.105	<0.001	0.003	0.081	0.007	0.039
M x S	0.352	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Variety (V)	<0.001	<0.001	<0.001	<0.001	<0.001	0.876	<0.001	<0.001	<0.001
V x S	<0.001	<0.001	<0.001	<0.001	<0.001	0.606	<0.001	<0.001	<0.001
M x V	0.664	0.822	<0.001	0.300	0.169	0.118	0.056	0.928	0.517
M x V x S	0.144	0.459	<0.001	0.001	0.508	0.066	0.006	0.461	0.066

*Malt varieties only

Table 2a. F-test results of mixed-effects models of **plant density** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	0.167	0.629	0.241	0.076	0.374	0.519	0.82	0.165	0.783	0.783
Variety (V)	<0.001	0.029	<0.001	0.006	<0.001	0.063	<0.001	<0.001	<0.001	<0.001
M x V	0.841	0.471	0.033	0.074	0.622	0.184	0.609	0.009	0.572	0.930

Table 3a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on plant density in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	245.9 ^{ab}	307.9 ^a	201.2 ^a	261.1 ^a	323.3 ^a
B. Enhanced N Fertility-No PGR-Fungicide	239.9 ^b	286.4 ^a	189.5 ^a	258.1 ^a	320.0 ^a
C. Standard N Fertility-PGR-Fungicide	242.6 ^{ab}	312.8 ^a	203.6 ^a	260.7 ^a	326.8 ^a
D. Standard N Fertility-No PGR-No Fungicide	266.8 ^a	312.9 ^a	209.0 ^a	264.0 ^a	314.8 ^a
SEM	8.39	9.76	7.57	4.38	8.48
Variety (V)					
AAC Prairie	207.7 ^c	293.6 ^b	141.8 ^b	209.6 ^c	261.6 ^d
CDC Churchill	245.9 ^b	311.3 ^a	217.1 ^a	257.6 ^b	306.3 ^b
CDC Durango	300.1 ^a	321.8 ^a	216.1 ^a	327.1 ^a	425.7 ^a
AB Wrangler	241.4 ^b	293.3 ^b	228.2 ^a	249.6 ^b	291.1 ^c
SEM	8.36	4.60	6.95	4.88	5.27
M x V					
Management A. - AAC Prairie	202.2 ^e	307.9 ^{cde}	147.9 ^c	208.2 ^d	265.3 ^{de}
Management A. - CDC Churchill	246.5 ^{bcde}	315.3 ^{bcd}	226.1 ^{ab}	257.6 ^b	299.8 ^{bc}
Management A. - CDC Durango	299.4 ^a	319.0 ^{bc}	219.0 ^{ab}	323.3 ^a	439.2 ^a
Management A. - AB Wrangler	235.4 ^{bcde}	289.3 ^{def}	212.1 ^{ab}	255.4 ^b	288.7 ^{cd}
Management B. - AAC Prairie	198.9 ^e	274.4 ^f	144.7 ^c	205.7 ^d	252.2 ^e
Management B. - CDC Churchill	228.8 ^{cde}	288.8 ^{ef}	198.0 ^b	243.1 ^{bc}	302.2 ^{bc}
Management B. - CDC Durango	308.4 ^a	300.0 ^{cdef}	191.2 ^b	340.8 ^a	418.7 ^a
Management B. - AB Wrangler	223.5 ^{de}	282.2 ^{ef}	224.3 ^{ab}	242.8 ^{bc}	306.8 ^{bc}
Management C. - AAC Prairie	216.9 ^e	307.9 ^{cde}	137.5 ^c	206.2 ^d	266.6 ^{de}
Management C. - CDC Churchill	233.8 ^{bcde}	305.8 ^{cde}	224.6 ^{ab}	267.0 ^b	320.7 ^b
Management C. - CDC Durango	279.3 ^{ab}	322.3 ^{abc}	224.6 ^{ab}	321.4 ^a	429.0 ^a
Management C. - AB Wrangler	240.3 ^{bcde}	315.3 ^{bcd}	227.6 ^{ab}	248.3 ^b	290.8 ^{bcd}
Management D. - AAC Prairie	212.8 ^e	284.3 ^{ef}	137.2 ^c	218.3 ^{cd}	262.5 ^{de}
Management D. - CDC Churchill	274.4 ^{abc}	335.1 ^{ab}	219.8 ^{ab}	262.8 ^b	302.6 ^{bc}
Management D. - CDC Durango	313.3 ^a	345.9 ^a	229.7 ^{ab}	323.1 ^a	415.8 ^a
Management D. - AB Wrangler	266.6 ^{abcd}	286.4 ^{ef}	249.0 ^a	252.0 ^b	278.1 ^{cde}
SEM	16.73	9.21	13.91	9.76	10.54

Table 3b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on plant density in 2025.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	187.0 ^a	292.8 ^a	200.0 ^a	213.4 ^a	261.1 ^a
B. Enhanced N Fertility-No PGR-Fungicide	175.7 ^a	270.9 ^b	197.3 ^a	200.3 ^a	259.7 ^a
C. Standard N Fertility-PGR-Fungicide	187.1 ^a	274.6 ^{ab}	191.4 ^a	212.5 ^a	256.1 ^a
D. Standard N Fertility-No PGR-No Fungicide	179.9 ^a	264.4 ^b	200.9 ^a	213.3 ^a	257.7 ^a
SEM	7.21	6.82	4.75	4.37	3.69
Variety (V)					
AAC Prairie	175.8 ^{bc}	279.7 ^a	206.6 ^a	196.8 ^c	244.4 ^b
CDC Churchill	190.9 ^a	291.7 ^a	190.7 ^b	227.7 ^a	279.9 ^a
CDC Durango	173.6 ^c	251.6 ^b	189.8 ^b	207.1 ^b	255.6 ^b
AB Wrangler	189.5 ^{ab}	279.6 ^a	202.5 ^{ab}	208.0 ^b	254.7 ^b
SEM	4.92	7.71	5.19	2.77	4.76
M x V					
Management A. - AAC Prairie	183.7 ^{a-d}	299.8 ^a	193.3 ^{abc}	201.5 ^{efg}	243.2 ^e
Management A. - CDC Churchill	210.8 ^a	294.1 ^a	188.2 ^{bc}	229.6 ^{ab}	282.6 ^{ab}
Management A. - CDC Durango	164.9 ^{cd}	278.7 ^{abc}	200.7 ^{abc}	212.4 ^{cde}	263.3 ^{a-e}
Management A. - AB Wrangler	188.6 ^{a-d}	298.6 ^a	217.7 ^{ab}	210.1 ^{cde}	255.5 ^{b-e}
Management B. - AAC Prairie	172.6 ^{bcd}	266.6 ^{a-d}	203.7 ^{abc}	188.8 ^{gh}	253.9 ^{c-e}
Management B. - CDC Churchill	183.7 ^{a-d}	286.7 ^{ab}	198.9 ^{abc}	225.4 ^{abc}	283.0 ^a
Management B. - CDC Durango	161.6 ^d	237.1 ^{cd}	180.1 ^c	204 ^{d-g}	253.0 ^{cde}
Management B. - AB Wrangler	184.9 ^{a-d}	293.3 ^a	206.4 ^{abc}	183 ^h	248.9 ^e
Management C. - AAC Prairie	175.1 ^{bcd}	305.1 ^a	222.5 ^a	191.2 ^{fgh}	242.0 ^e
Management C. - CDC Churchill	185.4 ^{a-d}	284.2 ^{ab}	178.4 ^c	236.2 ^a	279.7 ^{abc}
Management C. - CDC Durango	190.7 ^{abc}	264.2 ^{a-d}	177.8 ^c	207.9 ^{de}	246.9 ^e
Management C. - AB Wrangler	197.3 ^{ab}	244.9 ^{bcd}	187.0 ^c	214.6 ^{b-e}	255.9 ^{a-e}
Management D. - AAC Prairie	171.8 ^{bcd}	247.3 ^{bcd}	207.0 ^{abc}	205.5 ^{def}	238.7 ^e
Management D. - CDC Churchill	183.7 ^{a-d}	301.9 ^a	197.1 ^{abc}	219.5 ^{bcd}	274.4 ^{a-d}
Management D. - CDC Durango	177.1 ^{bcd}	226.4 ^d	200.4 ^{abc}	204.2 ^{d-g}	259.2 ^{a-e}
Management D. - AB Wrangler	187.0 ^{a-d}	281.8 ^{ab}	198.9 ^{abc}	224.2 ^{abc}	258.4 ^{a-e}
SEM	9.84	15.41	10.39	5.55	9.52

Table 4a. F-test results of mixed-effects models of **height** in assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	<0.001	0.002	<0.001	<0.001	0.837	<0.001	0.666	<0.001	0.062
Variety (V)	<0.001	<0.001	<0.001	0.004	<0.001	0.799	<0.001	<0.001	<0.001	<0.001
M x V	0.116	0.285	0.579	0.290	0.531	0.985	0.390	0.342	0.832	0.614

Table 5a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on height in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	88.3 ^a	97.4 ^a	56.2 ^a	86.6 ^a	76.8 ^a
B. Enhanced N Fertility-No PGR-Fungicide	87.9 ^a	96.4 ^a	57.1 ^a	88.7 ^a	78.0 ^a
C. Standard N Fertility-PGR-Fungicide	69.1 ^b	88.0 ^b	47.9 ^b	80.4 ^b	70.7 ^b
D. Standard N Fertility-No PGR-No Fungicide	87.0 ^a	97.9 ^a	57.0 ^a	86.1 ^a	78.0 ^a
SEM	0.927	1.366	0.569	0.879	0.701
Variety (V)					
AAC Prairie	84.0 ^b	98.4 ^a	53.9 ^b	87.4 ^a	76.5 ^b
CDC Churchill	79.8 ^d	93.0 ^b	56.5 ^a	83.1 ^b	74.2 ^c
CDC Durango	81.9 ^c	94.6 ^b	53.6 ^b	84.3 ^b	73.6 ^c
AB Wrangler	86.5 ^a	93.7 ^b	54.1 ^b	87.0 ^a	79.2 ^a
SEM	0.582	0.616	0.518	0.697	0.482
M x V					
Management A. - AAC Prairie	90.2 ^{ab}	100.8 ^{ab}	55.7 ^{cd}	88.4 ^{abc}	77.5 ^{cd}
Management A. - CDC Churchill	84.3 ^{de}	95.0 ^{cd}	59.4 ^a	85.4 ^{defg}	75.7 ^{def}
Management A. - CDC Durango	86.7 ^{cd}	98.0 ^{bcd}	53.6 ^d	85.8 ^{defg}	73.8 ^{fg}

Management A. - AB Wrangler	91.9 ^a	96.0 ^{cd}	56.0 ^{cd}	86.7 ^{cdef}	80.3 ^{ab}
Management B. - AAC Prairie	89.3 ^{abc}	100.0 ^{ab}	56.0 ^{cd}	91.1 ^{ab}	79.0 ^{abc}
Management B. - CDC Churchill	84.3 ^{de}	95.5 ^{cd}	59.0 ^{ab}	83.5 ^{efg}	76.2 ^{def}
Management B. - CDC Durango	88.0 ^{bc}	95.5 ^{cd}	56.0 ^{cd}	88.8 ^{abc}	76.2 ^{cdef}
Management B. - AB Wrangler	90.0 ^{abc}	94.5 ^d	57.3 ^{abc}	91.3 ^a	80.8 ^a
Management C. - AAC Prairie	68.2 ^g	90.8 ^e	46.6 ^f	82.2 ^{gh}	71.8 ^g
Management C. - CDC Churchill	68.2 ^g	86.0 ^f	49.7 ^e	78.5 ^h	69.0 ^h
Management C. - CDC Durango	66.3 ^g	86.5 ^f	48.0 ^{ef}	78.3 ^h	67.6 ^h
Management C. - AB Wrangler	73.9 ^f	88.8 ^{ef}	47.1 ^{ef}	82.9 ^{fg}	74.6 ^{ef}
Management D. - AAC Prairie	88.3 ^{bc}	102.3 ^a	57.3 ^{abc}	88.1 ^{abcd}	77.9 ^{bcd}
Management D. - CDC Churchill	82.5 ^e	95.5 ^{cd}	58.0 ^{abc}	85.1 ^{cdefg}	76.1 ^{def}
Management D. - CDC Durango	86.7 ^{cd}	98.3 ^{bc}	56.7 ^{abc}	84.2 ^{defg}	76.9 ^{cde}
Management D. - AB Wrangler	90.3 ^{ab}	95.5 ^{cd}	56.2 ^{bcd}	87.1 ^{bcde}	81.3 ^a
SEM	1.165	1.233	1.037	1.395	0.965

Table 5b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on height in 2025.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	62.6 ^a	56.8 ^b	36.4 ^a	60.5 ^a	69.8 ^a
B. Enhanced N Fertility-No PGR-Fungicide	64.0 ^a	63.1 ^a	37.2 ^a	59.2 ^a	70.1 ^a
C. Standard N Fertility-PGR-Fungicide	51.0 ^b	48.3 ^c	36.0 ^a	59.6 ^a	66.6 ^b
D. Standard N Fertility-No PGR-No Fungicide	62.8 ^a	60.2 ^{ab}	36.2 ^a	60.4 ^a	68.9 ^{ab}
SEM	1.01	1.60	0.95	0.87	0.85
Variety (V)					
AAC Prairie	58.5 ^b	57.0 ^b	35.8 ^a	61.4 ^a	68.1 ^b
CDC Churchill	58.2 ^b	56.7 ^b	36.5 ^a	56.6 ^c	66.5 ^c
CDC Durango	59.2 ^b	55.4 ^b	36.7 ^a	59.1 ^b	67.9 ^b
AB Wrangler	64.5 ^a	59.5 ^a	36.7 ^a	62.5 ^a	72.9 ^a
SEM	0.59	0.75	0.79	0.44	0.37
M x V					
Management A. - AAC Prairie	59.0 ^d	57.9 ^{cde}	36.7 ^a	62.0 ^{abc}	68.8 ^{de}
Management A. - CDC Churchill	60.3 ^{cd}	56.1 ^e	36.3 ^a	56.6 ^f	68.1 ^{def}

Management A. - CDC Durango	63.7 ^{bc}	56.1 ^e	35.8 ^a	59.8 ^{cd}	69.0 ^{de}
Management A. - AB Wrangler	67.4 ^a	57.2 ^{de}	36.6 ^a	63.7 ^a	73.5 ^{ab}
Management B. - AAC Prairie	63.4 ^c	62.1 ^{abc}	35.9 ^a	61.4 ^{a-d}	69.4 ^{cd}
Management B. - CDC Churchill	61.2 ^{cd}	61.4 ^{a-d}	38.4 ^a	56.4 ^f	67.9 ^{d-g}
Management B. - CDC Durango	62.2 ^{cd}	63.5 ^{ab}	37.5 ^a	57.0 ^{ef}	69.5 ^{cd}
Management B. - AB Wrangler	69.4 ^a	65.5 ^a	36.8 ^a	61.9 ^{abc}	73.7 ^a
Management C. - AAC Prairie	49.7 ^f	49.2 ^f	35.2 ^a	60.2 ^{cd}	66.1 ^{fg}
Management C. - CDC Churchill	50.5 ^f	48.6 ^{fg}	35.6 ^a	56.4 ^f	63.1 ^h
Management C. - CDC Durango	49.5 ^f	44.5 ^g	36.4 ^a	60.5 ^{cd}	65.9 ^g
Management C. - AB Wrangler	54.4 ^e	51.0 ^f	36.7 ^a	61.2 ^{bcd}	71.4 ^{bc}
Management D. - AAC Prairie	62.1 ^{cd}	58.7 ^{cde}	35.2 ^a	61.8 ^{abc}	68.2 ^{def}
Management D. - CDC Churchill	60.7 ^{cd}	60.6 ^{bcd}	35.6 ^a	57.0 ^{ef}	67.0 ^{efg}
Management D. - CDC Durango	61.5 ^{cd}	57.6 ^{de}	37.2 ^a	59.2 ^{de}	67.2 ^{efg}
Management D. - AB Wrangler	66.9 ^{ab}	64.2 ^{ab}	36.9 ^a	63.4 ^{ab}	73.2 ^{ab}
SEM	1.19	1.49	1.58	0.88	0.74

Table 6a. F-test results of mixed-effects models of **lodging** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	<0.001	0.003	NS	NS	NS	0.004	0.157	<0.001	0.087
Variety (V)	<0.001	<0.001	<0.001	NS	NS	NS	<0.001	0.017	<0.001	<0.001
M x V	<0.001	0.002	0.023	NS	NS	NS	0.862	0.015	<0.001	0.021

Table 7a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on lodging in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	4.19 ^a	4.31 ^a	1 ^a	2.4 ^a	2.1 ^b
B. Enhanced N Fertility-No PGR-Fungicide	4.00 ^a	5.75 ^a	1 ^a	2.6 ^a	3.9 ^a

C. Standard N Fertility-PGR-Fungicide	0.00 ^b	0.68 ^b	1 ^a	1.5 ^b	1.1 ^c
D. Standard N Fertility-No PGR-No Fungicide	4.93 ^a	5.87 ^a	1 ^a	1.6 ^b	1.8 ^b
SEM	0.324	0.763	NA	0.186	0.204
Variety (V)					
AAC Prairie	3.22 ^c	5.06 ^a	1 ^a	1.6 ^b	1.3 ^c
CDC Churchill	5.28 ^a	5.31 ^a	1 ^a	2.1 ^a	2.8 ^b
CDC Durango	0.06 ^d	2.44 ^c	1 ^a	2.1 ^a	1.3 ^c
AB Wrangler	4.56 ^b	3.81 ^b	1 ^a	2.4 ^a	3.5 ^a
SEM	0.249	0.333	NA	0.138	0.140
M x V					
Management A. - AAC Prairie	4.38 ^{ef}	6.50 ^{ab}	1 ^a	2.3 ^{bcd}	1.3 ^{gh}
Management A. - CDC Churchill	6.25 ^{a-d}	6.00 ^b	1 ^a	2.5 ^{abc}	2.6 ^{de}
Management A. - CDC Durango	0.00 ^g	2.00 ^{efg}	1 ^a	2.3 ^{bcd}	1.3 ^{gh}
Management A. - AB Wrangler	6.12 ^{bcd}	2.75 ^{def}	1 ^a	2.8 ^{ab}	3.4 ^c
Management B. - AAC Prairie	3.38 ^f	5.50 ^{bc}	1 ^a	2.0 ^{bcd}	2.1 ^{def}
Management B. - CDC Churchill	7.25 ^{ab}	8.00 ^a	1 ^a	2.8 ^{ab}	5.4 ^b
Management B. - CDC Durango	0.00 ^g	4.00 ^{cd}	1 ^a	2.5 ^{abc}	1.9 ^{efg}
Management B. - AB Wrangler	5.38 ^{cde}	5.50 ^{bc}	1 ^a	3.3 ^a	6.3 ^a
Management C. - AAC Prairie	0.00 ^g	1.00 ^{fgh}	1 ^a	1.0 ^e	1.0 ^h
Management C. - CDC Churchill	0.00 ^g	1.00 ^{fgh}	1 ^a	1.5 ^{de}	1.0 ^h
Management C. - CDC Durango	0.00 ^g	0.00 ^h	1 ^a	1.8 ^{cde}	1.0 ^h
Management C. - AB Wrangler	0.00 ^g	0.75 ^{gh}	1 ^a	1.8 ^{cde}	1.5 ^{fgh}
Management D. - AAC Prairie	5.12 ^{de}	7.25 ^{ab}	1 ^a	1.0 ^e	1.0 ^h
Management D. - CDC Churchill	7.63 ^a	6.25 ^{ab}	1 ^a	1.8 ^{cde}	2.3 ^{def}
Management D. - CDC Durango	0.25 ^g	3.75 ^{cde}	1 ^a	1.8 ^{cde}	1.1 ^{gh}
Management D. - AB Wrangler	6.75 ^{abc}	6.25 ^{ab}	1 ^a	2.0 ^{bcd}	2.8 ^{cd}
SEM	0.499	0.666	NA	0.277	0.280

Table 7b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on lodging in 2025.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
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A. Standard N Fertility-No PGR-Fungicide	0.9 ^b	0	0	1.3 ^a	0.0 ^{ab}
B. Enhanced N Fertility-No PGR-Fungicide	0.7 ^b	0	0	1.1 ^a	0.1 ^a
C. Standard N Fertility-PGR-Fungicide	0.1 ^c	0	0	1.2 ^a	0.0 ^b
D. Standard N Fertility-No PGR-No Fungicide	1.5 ^a	0	0	1.3 ^a	0.0 ^{ab}
SEM	0.15	NA	NA	0.08	
Variety (V)					
AAC Prairie	0.8 ^b	0	0	1.1 ^b	0.0 ^b
CDC Churchill	0.7 ^b	0	0	1.1 ^b	0.0 ^b
CDC Durango	0.1 ^c	0	0	1.1 ^b	0.0 ^b
AB Wrangler	1.6 ^a	0	0	1.5 ^a	0.2 ^a
SEM	0.12	NA	NA	0.09	
M x V					
Management A. - AAC Prairie	1.0 ^{cde}	0	0	1.5 ^{abc}	0.0 ^b
Management A. - CDC Churchill	0.8 ^{def}	0	0	1.5 ^{abc}	0.0 ^b
Management A. - CDC Durango	0.0 ^g	0	0	1.2 ^{bc}	0.0 ^b
Management A. - AB Wrangler	2.0 ^b	0	0	1.0 ^c	0.1 ^b
Management B. - AAC Prairie	1.0 ^{cde}	0	0	1.0 ^c	0.0 ^b
Management B. - CDC Churchill	0.2 ^{fg}	0	0	1.0 ^c	0.0 ^b
Management B. - CDC Durango	0.0 ^g	0	0	1.0 ^c	0.0 ^b
Management B. - AB Wrangler	1.5 ^{bc}	0	0	1.2 ^{bc}	0.5 ^a
Management C. - AAC Prairie	0.0 ^g	0	0	1.0 ^c	0.0 ^b
Management C. - CDC Churchill	0.2 ^{fg}	0	0	1.0 ^c	0.0 ^b
Management C. - CDC Durango	0.0 ^g	0	0	1.0 ^c	0.0 ^b
Management C. - AB Wrangler	0.0 ^g	0	0	1.8 ^{ab}	0.0 ^b
Management D. - AAC Prairie	1.2 ^{cd}	0	0	1.0 ^c	0.0 ^b
Management D. - CDC Churchill	1.5 ^{bc}	0	0	1.0 ^c	0.0 ^b
Management D. - CDC Durango	0.5 ^{efg}	0	0	1.2 ^{bc}	0.0 ^b
Management D. - AB Wrangler	2.8 ^a	0	0	2.0 ^a	0.1 ^b
SEM	0.24	NA	NA	0.19	

Table 8a. F-test results of mixed-effects models of **leaf disease** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

Melfort	Yorkton	Swift Current	Scott	Indian Head
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	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	1	0.097	0.061	0.078	0.181	0.747	0.147	0.382	0.085	0.589
Variety (V)	0.114	0.076	0.747	0.792	0.825	0.017	0.841	<0.001	<0.001	0.001
M x V	0.212	0.459	0.066	0.084	0.621	0.587	0.721	0.310	0.551	0.084

Table 9a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on leaf disease in 2024.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	0.018 ^a	3.16 ^a	0.29 ^a	5.3 ^a	1.31 ^a
B. Enhanced N Fertility-No PGR-Fungicide	N/A	N/A	N/A	N/A	N/A
C. Standard N Fertility-PGR-Fungicide	N/A	N/A	N/A	N/A	N/A
D. Standard N Fertility-No PGR-No Fungicide	0.018 ^a	7.01 ^a	0.41 ^a	3.6 ^a	1.56 ^a
SEM	0.012	0.926	0.051	0.596	0.069
<u>Variety (V)</u>					
AAC Prairie	0.00 ^b	5.19 ^a	0.41 ^a	5.3 ^a	1.25 ^b
CDC Churchill	0.03 ^{ab}	5.41 ^a	0.38 ^a	3.9 ^a	2.31 ^a
CDC Durango	0.05 ^a	4.71 ^a	0.39 ^a	4.1 ^a	1.13 ^b
AB Wrangler	0.00 ^b	5.05 ^a	0.22 ^a	4.6 ^a	1.06 ^b
SEM	0.011	0.323	0.109	0.819	0.134
<u>M x V</u>					
Management A. - AAC Prairie	0.00 ^b	2.88 ^{bc}	0.48 ^a	6.9 ^a	0.93 ^c
Management A. - CDC Churchill	0.05 ^{ab}	4.03 ^b	0.38 ^a	3.7 ^a	2.37 ^a
Management A. - CDC Durango	0.03 ^{ab}	1.90 ^c	0.18 ^a	5.0 ^a	1.06 ^c
Management A. - AB Wrangler	0.00 ^b	3.88 ^b	0.13 ^a	5.6 ^a	0.88 ^c
Management B. - AAC Prairie	N/A	N/A	N/A	N/A	N/A

Management B. - CDC Churchill	N/A	N/A	N/A	N/A	N/A
Management B. - CDC Durango	N/A	N/A	N/A	N/A	N/A
Management B. - AB Wrangler	N/A	N/A	N/A	N/A	N/A
Management C. - AAC Prairie	N/A	N/A	N/A	N/A	N/A
Management C. - CDC Churchill	N/A	N/A	N/A	N/A	N/A
Management C. - CDC Durango	N/A	N/A	N/A	N/A	N/A
Management C. - AB Wrangler	N/A	N/A	N/A	N/A	N/A
Management D. - AAC Prairie	0.00 ^b	7.50 ^a	0.35 ^a	3.6 ^a	1.56 ^{bc}
Management D. - CDC Churchill	0.00 ^b	6.80 ^a	0.38 ^a	4.1 ^a	2.25 ^{ab}
Management D. - CDC Durango	0.08 ^a	7.53 ^a	0.60 ^a	3.3 ^a	1.19 ^c
Management D. - AB Wrangler	0.00 ^b	6.23 ^a	0.33 ^a	3.6 ^a	1.25 ^c
SEM	0.022	0.647	0.219	1.638	0.268

Table 9b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on leaf disease in 2025.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	0.81 ^a	4.8 ^a	0.5 ^a	2.2 ^a	0.6 ^a
B. Enhanced N Fertility-No PGR-Fungicide	NA	NA	NA	NA	NA
C. Standard N Fertility-PGR-Fungicide	NA	NA	NA	NA	NA
D. Standard N Fertility-No PGR-No Fungicide	1.11 ^a	11.4 ^a	0.4 ^a	2.4 ^a	0.7 ^a
SEM	0.09	1.79	0.14	0.14	0.09
Variety (V)					
AAC Prairie	1.4 ^a	7.8 ^a	0.2 ^b	2.2 ^b	1.0 ^a
CDC Churchill	1.0 ^{ab}	7.7 ^a	0.8 ^a	1.5 ^b	0.8 ^{ab}
CDC Durango	0.8 ^b	9.1 ^a	0.4 ^b	1.8 ^b	0.4 ^c
AB Wrangler	0.8 ^b	7.8 ^a	0.5 ^{ab}	3.8 ^a	0.5 ^{bc}
SEM	0.12	0.77	0.08	0.20	0.07
M x V					
Management A. - AAC Prairie	1.0 ^b	6.2 ^{cde}	0.2 ^c	2.6 ^{bc}	0.8 ^{bc}

Management A. - CDC Churchill	0.9 ^b	4.5 ^e	0.9 ^a	1.4 ^d	0.9 ^{ab}
Management A. - CDC Durango	0.7 ^b	3.2 ^e	0.4 ^{abc}	1.6 ^{cd}	0.4 ^d
Management A. - AB Wrangler	0.7 ^b	5.1 ^{de}	0.6 ^{ab}	3.4 ^{ab}	0.4 ^{cd}
Management B. - AAC Prairie	NA	NA	NA	NA	NA
Management B. - CDC Churchill	NA	NA	NA	NA	NA
Management B. - CDC Durango	NA	NA	NA	NA	NA
Management B. - AB Wrangler	NA	NA	NA	NA	NA
Management C. - AAC Prairie	NA	NA	NA	NA	NA
Management C. - CDC Churchill	NA	NA	NA	NA	NA
Management C. - CDC Durango	NA	NA	NA	NA	NA
Management C. - AB Wrangler	NA	NA	NA	NA	NA
Management D. - AAC Prairie	1.8 ^a	9.4 ^{bcd}	0.3 ^{bc}	1.9 ^{cd}	1.2 ^a
Management D. - CDC Churchill	1.0 ^b	10.9 ^{ab}	0.8 ^{ab}	1.6 ^{cd}	0.6 ^{bcd}
Management D. - CDC Durango	0.8 ^b	14.9 ^a	0.4 ^{abc}	2.0 ^{cd}	0.4 ^d
Management D. - AB Wrangler	0.9 ^b	10.5 ^{abc}	0.4 ^{bc}	4.2 ^a	0.6 ^{bcd}
SEM	0.24	1.55	0.16	0.40	0.13

Table 10a. F-test results of mixed-effects models of **grain yield** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	0.002	0.002	0.006	0.060	0.13	0.008	0.261	0.104	0.247	0.405
Variety (V)	<0.001	<0.001	0.044	0.686	<0.001	0.628	<0.001	<0.001	<0.001	0.287
M x V	0.421	0.421	0.332	0.106	0.256	0.005	0.489	0.733	0.172	0.513

Table 11a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on grain yield in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	6757 ^b	5919 ^b	1532 ^{ab}	5113 ^a	4839 ^a

B. Enhanced N Fertility-No PGR-Fungicide	6983 ^a	5706 ^{bc}	1619 ^a	5044 ^a	4693 ^a
C. Standard N Fertility-PGR-Fungicide	6648 ^{bc}	6595 ^a	1392 ^b	5355 ^a	5000 ^a
D. Standard N Fertility-No PGR-No Fungicide	6501 ^c	5152 ^c	1542 ^{ab}	5309 ^a	4856 ^a
SEM	57.8	205.1	60.1	119.5	97.9
Variety (V)					
AAC Prairie	6659 ^b	5865 ^{ab}	1567 ^b	5096 ^b	4917 ^{ab}
CDC Churchill	6421 ^c	5654 ^b	1699 ^a	5171 ^b	4756 ^{bc}
CDC Durango	6977 ^a	6198 ^a	1356 ^d	5502 ^a	5064 ^a
AB Wrangler	6832 ^{ab}	5655 ^b	1464 ^c	5053 ^b	4651 ^c
SEM	81.7	148.8	28.9	70.0	60.4
M x V					
Management A. - AAC Prairie	6735 ^{b-f}	6044 ^{bcd}	1522 ^{bc}	4911 ^{de}	4867 ^{bc}
Management A. - CDC Churchill	6638 ^{b-f}	5229 ^{d-g}	1741 ^a	4985 ^{cde}	4695 ^{cde}
Management A. - CDC Durango	6782 ^{b-e}	6381 ^{abc}	1315 ^{de}	5451 ^{ab}	5098 ^{ab}
Management A. - AB Wrangler	6871 ^{bcd}	6023 ^{bcd}	1552 ^{bc}	5106 ^{bcde}	4697 ^{cde}
Management B. - AAC Prairie	7032 ^{ab}	6515 ^{c-f}	1656 ^{ab}	4859 ^e	4969 ^{abc}
Management B. - CDC Churchill	6422 ^{def}	5482 ^{d-g}	1769 ^a	5048 ^{cde}	4424 ^e
Management B. - CDC Durango	7458 ^a	5930 ^{b-e}	1505 ^{bc}	5528 ^a	4928 ^{bc}
Management B. - AB Wrangler	7019 ^{ab}	5699 ^{c-f}	1547 ^{bc}	4743 ^e	4450 ^{de}
Management C. - AAC Prairie	6506 ^{c-f}	6597 ^{ab}	1555 ^{bc}	5329 ^{abc}	4840 ^{bc}
Management C. - CDC Churchill	6327 ^{ef}	6962 ^a	1533 ^{bc}	5355 ^{abc}	5096 ^{ab}
Management C. - CDC Durango	6909 ^{bc}	6754 ^{ab}	1206 ^e	5460 ^{ab}	5284 ^a
Management C. - AB Wrangler	6850 ^{bcd}	6066 ^{bcd}	1275 ^{de}	5276 ^{a-d}	4779 ^{bcd}
Management D. - AAC Prairie	6363 ^{ef}	5106 ^{efg}	1533 ^{bc}	5285 ^{a-d}	4993 ^{abc}
Management D. - CDC Churchill	6295 ^f	4941 ^{fg}	1753 ^a	5296 ^{a-d}	4810 ^{bc}
Management D. - CDC Durango	6758 ^{b-f}	5728 ^{cdef}	1398 ^{cd}	5570 ^a	4945 ^{abc}
Management D. - AB Wrangler	6588 ^{b-f}	4833 ^g	1482 ^c	5086 ^{b-e}	4676 ^{cde}
SEM	163.4	297.5	57.8	140.0	120.9

Table 11b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on grain yield in 2025.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	6206.8 ^a	4741.2 ^b	2771.0 ^a	4198.0 ^{ab}	6813.2 ^a
B. Enhanced N Fertility-No PGR-Fungicide	6430.3 ^a	5783.0 ^a	2218.1 ^b	3582.7 ^b	6773.6 ^a
C. Standard N Fertility-PGR-Fungicide	6221.3 ^a	4604.0 ^b	2117.4 ^b	4376.2 ^a	6939.2 ^a
D. Standard N Fertility-No PGR-No Fungicide	6352.5 ^a	5255.9 ^{ab}	1939.9 ^b	3999.2 ^{ab}	6646.1 ^a
SEM	185.5	284.4	131.6	205.8	116.2
<u>Variety (V)</u>					
AAC Prairie	5991.0 ^b	5014.0 ^a	2312.6 ^a	3860.7 ^b	6711.9 ^a
CDC Churchill	6430.1 ^a	5108.9 ^a	2130.3 ^a	3996.0 ^b	6854.9 ^a
CDC Durango	6509.7 ^a	5077.7 ^a	2337.5 ^a	4474.0 ^a	6795.2 ^a
AB Wrangler	6280.0 ^{ab}	5183.4 ^a	2266.0 ^a	3825.3 ^b	6810.1 ^a
SEM	101.1	99.8	120.8	63.9	52.3
<u>M x V</u>					
Management A. - AAC Prairie	5580.5 ^c	4642.5 ^{fgh}	3267.4 ^a	3882.9 ^{def}	6710.9 ^{cd}
Management A. - CDC Churchill	6460.1 ^{ab}	4893.2 ^{efg}	3162.9 ^{ab}	4185.7 ^{b-e}	6989.1 ^{abc}
Management A. - CDC Durango	6595.8 ^a	4801.1 ^{fgh}	2532.2 ^{bc}	4677.2 ^a	6810.0 ^{a-d}
Management A. - AB Wrangler	6190.7 ^{ab}	4627.9 ^{fgh}	2121.6 ^{cd}	4046.4 ^{c-f}	6742.9 ^{bcd}
Management B. - AAC Prairie	6242.4 ^{ab}	5536.3 ^{bcd}	2293.3 ^c	3486.9 ^{gh}	6701.1 ^{cd}
Management B. - CDC Churchill	6532.1 ^{ab}	5645.6 ^{abc}	1885.2 ^{cd}	3401.7 ^h	6874.4 ^{a-d}
Management B. - CDC Durango	6553.4 ^a	6120.7 ^a	2404.5 ^c	4140.8 ^{b-f}	6752.6 ^{a-d}
Management B. - AB Wrangler	6393.3 ^{ab}	5829.6 ^{ab}	2289.5 ^c	3301.6 ^h	6766.4 ^{bcd}
Management C. - AAC Prairie	5965.0 ^{bc}	4909.4 ^{efg}	2155.9 ^{cd}	4227.1 ^{bcd}	6844.0 ^{a-d}
Management C. - CDC Churchill	6135.2 ^{abc}	4469.5 ^{gh}	1544.1 ^d	4421.7 ^{ab}	6805.9 ^{a-d}
Management C. - CDC Durango	6320.3 ^{ab}	4247.2 ^h	2443.3 ^c	4686.4 ^a	7012.3 ^{ab}
Management C. - AB Wrangler	6464.5 ^{ab}	4789.8 ^{fgh}	2326.3 ^c	4169.5 ^{b-e}	7094.4 ^a
Management D. - AAC Prairie	6176.0 ^{ab}	4967.8 ^{d-g}	1533.8 ^d	3846.1 ^{efg}	6591.6 ^d
Management D. - CDC Churchill	6593.1 ^a	5427.3 ^{b-e}	1929.0 ^{cd}	3975.0 ^{def}	6750.2 ^{bcd}
Management D. - CDC Durango	6569.4 ^a	5141.9 ^{c-f}	1970.2 ^{cd}	4,391.7 ^{abc}	6606.0 ^d
Management D. - AB Wrangler	6071.7 ^{abc}	5486.5 ^{bcd}	2326.6 ^c	3783.9 ^{fg}	6636.7 ^d
SEM	202.2	199.6	241.5	127.9	104.6

Table 12a. F-test results of mixed-effects models of **grain protein** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	0.002	0.004	0.062	0.590	0.903	0.025	0.044	0.007	0.006
Variety (V)	<0.001	0.302	0.151	<0.001	<0.001	0.087	0.001	<0.001	<0.001	<0.001
M x V	0.219	0.159	0.545	0.010	0.989	0.094	0.776	0.464	0.582	0.316

Table 13a. Means, P-values, and LSD separations for the main and interaction effects of management and variety on grain protein in 2024.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	11.39 ^{bc}	13.27 ^{bc}	19.89 ^a	13.21 ^b	13.77 ^{bc}
B. Enhanced N Fertility-No PGR-Fungicide	12.10 ^a	14.26 ^a	19.38 ^a	13.87 ^a	14.80 ^a
C. Standard N Fertility-PGR-Fungicide	11.54 ^b	12.33 ^c	20.08 ^a	12.93 ^b	14.16 ^{ab}
D. Standard N Fertility-No PGR-No Fungicide	11.32 ^c	14.20 ^{ab}	20.05 ^a	12.86 ^b	13.37 ^c
SEM	0.060	0.305	0.397	0.203	0.215
<u>Variety (V)</u>					
AAC Prairie	11.86 ^a	13.58 ^{ab}	20.26 ^a	13.16 ^b	14.25 ^{ab}
CDC Churchill	11.25 ^b	13.80 ^a	19.20 ^b	13.04 ^b	14.02 ^b
CDC Durango	11.84 ^a	13.22 ^b	19.14 ^b	13.06 ^b	13.31 ^c
AB Wrangler	11.39 ^b	13.45 ^{ab}	20.79 ^a	13.60 ^a	14.53 ^a
SEM	0.072	0.175	0.194	0.100	0.174
M x V					

Management A. - AAC Prairie	11.80 ^{cd}	13.50 ^{bc}	20.40 ^{abc}	13.35 ^{bcd}	14.08 ^{bcd}
Management A. - CDC Churchill	11.05 ^{fg}	13.98 ^{ab}	19.20 ^{def}	12.98 ^{de}	13.60 ^{cde}
Management A. - CDC Durango	11.53 ^{de}	12.70 ^{cd}	19.23 ^{def}	13.13 ^{cde}	13.28 ^{de}
Management A. - AB Wrangler	11.18 ^{efg}	12.90 ^{cd}	20.75 ^{ab}	13.38 ^{bcd}	14.15 ^{bcd}
Management B. - AAC Prairie	12.35 ^a	14.33 ^{ab}	19.90 ^{b-e}	13.60 ^{bc}	14.93 ^{ab}
Management B. - CDC Churchill	11.80 ^{cd}	14.38 ^{ab}	18.85 ^{ef}	13.85 ^{ab}	14.85 ^{ab}
Management B. - CDC Durango	12.23 ^{ab}	14.10 ^{ab}	18.45 ^f	13.68 ^{bc}	14.00 ^{bcd}
Management B. - AB Wrangler	12.03 ^{abc}	14.23 ^{ab}	20.30 ^{a-d}	14.35 ^a	15.43 ^a
Management C. - AAC Prairie	11.83 ^{bcd}	12.43 ^d	20.63 ^{ab}	12.88 ^{de}	14.50 ^{abc}
Management C. - CDC Churchill	11.38 ^{ef}	12.13 ^d	19.25 ^{def}	12.65 ^e	14.67 ^{ab}
Management C. - CDC Durango	11.83 ^{bcd}	12.40 ^d	19.38 ^{c-f}	12.88 ^{de}	13.00 ^e
Management C. - AB Wrangler	11.13 ^{efg}	12.35 ^d	21.05 ^a	13.33 ^{bcd}	14.50 ^{abc}
Management D. - AAC Prairie	11.48 ^{de}	14.05 ^{ab}	20.13 ^{a-d}	12.83 ^{de}	13.50 ^{de}
Management D. - CDC Churchill	10.78 ^g	14.72 ^a	19.50 ^{c-f}	12.70 ^e	12.98 ^e
Management D. - CDC Durango	11.80 ^{cd}	13.70 ^{bc}	19.50 ^{c-f}	12.58 ^e	12.98 ^e
Management D. - AB Wrangler	11.23 ^{ef}	14.33 ^{ab}	21.08 ^a	13.35 ^{bcd}	14.03 ^{bcd}
SEM	0.144	0.351	0.388	0.201	0.348

Table 14b. Means, P-values, and LSD separations for the main and interaction effects of management and variety on grain protein in 2025.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	11.09 ^c	11.85 ^{ab}	15.34 ^a	12.97 ^b	11.12 ^b
B. Enhanced N Fertility-No PGR-Fungicide	12.25 ^a	12.14 ^a	15.22 ^a	14.03 ^a	11.92 ^a
C. Standard N Fertility-PGR-Fungicide	11.84 ^{ab}	12.03 ^a	15.19 ^a	12.95 ^b	11.18 ^b
D. Standard N Fertility-No PGR-No Fungicide	11.47 ^{bc}	10.94 ^b	15.37 ^a	13.23 ^{ab}	11.33 ^b
SEM	0.149	0.292	0.202	0.250	0.126
<u>Variety (V)</u>					
AAC Prairie	11.74 ^a	11.84 ^{ab}	15.45 ^{ab}	13.07 ^c	11.34 ^b
CDC Churchill	11.53 ^a	11.45 ^c	15.55 ^a	13.02 ^c	11.14 ^c
CDC Durango	11.79 ^a	12.02 ^a	15.11 ^{ab}	13.33 ^b	11.42 ^b
AB Wrangler	11.58 ^a	11.65 ^{bc}	15.01 ^b	13.77 ^a	11.64 ^a

SEM	0.111	0.084	0.169	0.056	0.054
M x V					
Management A. - AAC Prairie	10.83 ^h	11.99 ^{bcd}	15.76 ^{ab}	12.85 ^{hij}	11.06 ^{ef}
Management A. - CDC Churchill	11.02 ^{gh}	11.41 ^{efg}	15.21 ^{abc}	12.64 ^{ij}	10.82 ^f
Management A. - CDC Durango	11.39 ^{e-h}	12.03 ^{bcd}	15.03 ^{bc}	13.02 ^{fgh}	11.07 ^{ef}
Management A. - AB Wrangler	11.10 ^{fgh}	11.98 ^{bcd}	15.35 ^{abc}	13.37 ^{de}	11.56 ^{cd}
Management B. - AAC Prairie	12.29 ^{ab}	12.46 ^{ab}	15.77 ^{ab}	13.65 ^{cd}	11.91 ^{ab}
Management B. - CDC Churchill	12.04 ^{a-d}	11.81 ^{cde}	14.95 ^{bc}	13.79 ^{bc}	11.62 ^{bc}
Management B. - CDC Durango	12.56 ^a	12.18 ^{abc}	15.94 ^{bc}	14.02 ^b	11.97 ^a
Management B. - AB Wrangler	12.11 ^{abc}	12.11 ^{abc}	15.22 ^{abc}	14.66 ^a	12.17 ^a
Management C. - AAC Prairie	12.32 ^{ab}	11.81 ^{cde}	15.35 ^{abc}	12.85 ^{hij}	11.13 ^{ef}
Management C. - CDC Churchill	11.92 ^{b-e}	12.18 ^{abc}	15.90 ^{ab}	12.60 ^j	11.08 ^{ef}
Management C. - CDC Durango	11.49 ^{c-g}	12.55 ^a	15.10 ^{bc}	13.04 ^{fgh}	11.30 ^{de}
Management C. - AB Wrangler	11.63 ^{c-g}	11.61 ^{def}	14.43 ^c	13.33 ^{def}	11.21 ^e
Management D. - AAC Prairie	11.52 ^{c-g}	11.11 ^{gh}	14.94 ^{bc}	12.94 ^{ghi}	11.26 ^{de}
Management D. - CDC Churchill	11.17 ^{fgh}	10.41 ⁱ	16.12 ^a	13.03 ^{fgh}	11.06 ^{ef}
Management D. - CDC Durango	11.74 ^{b-f}	11.32 ^{fgh}	15.36 ^{abc}	13.25 ^{efg}	11.35 ^{cde}
Management D. - AB Wrangler	11.46 ^{d-h}	10.91 ^h	15.06 ^{bc}	13.73 ^{bc}	11.63 ^{bc}
SEM	0.222	0.168	0.338	0.112	0.109

Table 15a. F-test results of mixed-effects models of **test weight** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	<0.001	0.129	0.016	0.05	0.908	0.565	0.028	0.202	0.153
Variety (V)	<0.001	<0.001	<0.001	<0.001	0.003	0.144	<0.001	<0.001	<0.001	<0.001
M x V	0.179	0.003	0.027	0.013	0.472	0.423	0.106	0.292	0.172	0.794

Table 16a. Means, P-Values and LSD separations for the main and interaction effects of management and variety on test weights in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	334.0 ^a	304.6 ^a	275.6 ^{ab}	299.4 ^a	278.9 ^{ab}
B. Enhanced N Fertility-No PGR-Fungicide	336.6 ^a	303.1 ^{ab}	283.2 ^a	297.4 ^a	273.6 ^b
C. Standard N Fertility-PGR-Fungicide	328.4 ^b	296.5 ^{ab}	280.0 ^a	301.7 ^a	276.4 ^{ab}
D. Standard N Fertility-No PGR-No Fungicide	335.7 ^a	293.2 ^b	271.6 ^b	305.2 ^a	281.4 ^a
SEM	0.910	3.434	2.581	3.954	2.440
Variety (V)					
AAC Prairie	335.2 ^b	298.4 ^b	280.0 ^a	307.3 ^a	281.6 ^b
CDC Churchill	330.9 ^c	292.1 ^c	278.3 ^a	288.8 ^c	267.8 ^c
CDC Durango	337.7 ^a	314.2 ^a	279.7 ^a	307.1 ^a	292.5 ^a
AB Wrangler	330.9 ^c	292.8 ^c	272.5 ^b	300.7 ^b	268.3 ^c
SEM	0.854	1.722	1.482	1.883	1.253
M x V					
Management A. - AAC Prairie	337.6 ^{abc}	304.5 ^b	278.7 ^{abc}	300.8 ^{cdef}	283.8 ^{cd}
Management A. - CDC Churchill	332.5 ^{defg}	292.6 ^{def}	274.3 ^{bcd}	284.6 ^{gh}	265.6 ^{fg}
Management A. - CDC Durango	335.1 ^{bcde}	321.7 ^a	280.9 ^{ab}	306.1 ^{abcde}	293.4 ^{ab}
Management A. - AB Wrangler	330.9 ^{efg}	299.6 ^{bcde}	268.6 ^{de}	306.3 ^{abcde}	272.8 ^{ef}
Management B. - AAC Prairie	337.0 ^{abcd}	303.1 ^{bc}	284.8 ^a	301.2 ^{cdef}	278.0 ^{de}
Management B. - CDC Churchill	334.9 ^{bcde}	298.0 ^{bcde}	284.3 ^a	282.9 ^h	261.7 ^g
Management B. - CDC Durango	341.3 ^a	318.2 ^a	283.5 ^a	310.0 ^{abc}	292.0 ^{ab}
Management B. - AB Wrangler	333.2 ^{cdef}	292.9 ^{def}	280.3 ^{abc}	295.5 ^{ef}	262.5 ^g
Management C. - AAC Prairie	327.7 ^{gh}	294.6 ^{cde}	284.5 ^a	312.8 ^{ab}	277.7 ^{de}
Management C. - CDC Churchill	324.2 ^h	295.4 ^{bcde}	280.8 ^{ab}	292.5 ^{fgh}	271.7 ^{ef}
Management C. - CDC Durango	333.4 ^{cde}	301.9 ^{bcd}	277.6 ^{abc}	303.0 ^{bcdef}	290.4 ^{abc}
Management C. - AB Wrangler	328.3 ^{fgh}	294.1 ^{cdef}	277.0 ^{abcd}	298.7 ^{def}	265.7 ^{fg}
Management D. - AAC Prairie	338.3 ^{ab}	291.2 ^{efg}	271.9 ^{cde}	314.3 ^a	286.9 ^{bc}
Management D. - CDC Churchill	332.1 ^{efg}	282.2 ^g	273.8 ^{bcd}	295.3 ^{fg}	272.2 ^{ef}
Management D. - CDC Durango	341.1 ^a	314.9 ^a	276.7 ^{abcd}	309.1 ^{abcd}	294.1 ^a
Management D. - AB Wrangler	331.2 ^{efg}	284.6 ^{fg}	264.1 ^e	302.2 ^{bcdef}	272.3 ^{ef}
SEM	1.708	3.445	2.964	3.766	2.506

Table 16b. Means, P-Values and LSD separations for the main and interaction effects of management and variety on test weights in 2025.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	339.0 ^b	317.2 ^a	294.7 ^a	329.7 ^a	345.3 ^a
B. Enhanced N Fertility-No PGR-Fungicide	342.8 ^a	318.6 ^a	297.9 ^a	326.4 ^b	344.1 ^{ab}
C. Standard N Fertility-PGR-Fungicide	332.6 ^c	311.8 ^b	295.7 ^a	330.8 ^a	343.6 ^{ab}
D. Standard N Fertility-No PGR-No Fungicide	340.4 ^{ab}	317.1 ^a	295.5 ^a	330.2 ^a	343.1 ^b
SEM	1.003	1.234	3.271	0.899	0.625
<u>Variety (V)</u>					
AAC Prairie	337.8 ^{bc}	314.7 ^b	290.2 ^b	328.4 ^b	344.0 ^b
CDC Churchill	339.1 ^b	310.4 ^c	296.3 ^{ab}	328.2 ^b	340.9 ^c
CDC Durango	341.8 ^a	324.2 ^a	298.9 ^a	330.0 ^a	347.2 ^a
AB Wrangler	336.0 ^c	315.4 ^b	298.6 ^a	330.4 ^a	344.0 ^b
SEM	0.828	0.793	2.906	0.435	0.349
<u>M x V</u>					
Management A. - AAC Prairie	334.1 ^{ef}	315.6 ^{cde}	286.3 ^{bc}	328.2 ^{c-f}	344.9 ^{cd}
Management A. - CDC Churchill	341.9 ^{abc}	315.1 ^{c-f}	299.6 ^{abc}	327.4 ^{d-g}	342.7 ^{efg}
Management A. - CDC Durango	342.6 ^{ab}	323.6 ^a	296.1 ^{abc}	331.1 ^{ab}	348.5 ^a
Management A. - AB Wrangler	337.4 ^{cde}	314.7 ^{c-f}	297.0 ^{abc}	332.1 ^a	345.1 ^{bcd}
Management B. - AAC Prairie	344.2 ^a	316.0 ^{cd}	285.4 ^c	326.4 ^{fg}	344.2 ^{def}
Management B. - CDC Churchill	345.3 ^a	312.4 ^{def}	298.7 ^{abc}	325.5 ^g	341.2 ^{gh}
Management B. - CDC Durango	343.6 ^a	327.1 ^a	306.4 ^a	327.1 ^{efg}	346.6 ^{abc}
Management B. - AB Wrangler	338.0 ^{b-e}	318.8 ^{bc}	301.3 ^{abc}	326.4 ^{fg}	344.5 ^{de}
Management C. - AAC Prairie	331.5 ^{fg}	311.3 ^{ef}	293.1 ^{abc}	329.1 ^{b-e}	343.2 ^{def}
Management C. - CDC Churchill	328.2 ^g	301.6 ^g	295.4 ^{abc}	330.9 ^{ab}	340.3 ^h
Management C. - CDC Durango	338.8 ^{b-e}	323.5 ^a	290.6 ^{abc}	331.3 ^{ab}	347.0 ^{ab}
Management C. - AB Wrangler	331.8 ^{fg}	310.9 ^f	303.7 ^a	331.8 ^a	343.9 ^{def}
Management D. - AAC Prairie	341.2 ^{a-d}	315.8 ^{cde}	296.0 ^{abc}	329.8 ^{a-d}	343.7 ^{def}
Management D. - CDC Churchill	341.2 ^{a-d}	312.5 ^{def}	291.4 ^{abc}	329.0 ^{b-e}	339.6 ^h

Management D. - CDC Durango	342.3 ^{ab}	322.8 ^{ab}	302.4 ^{ab}	330.5 ^{abc}	346.6 ^{abc}
Management D. - AB Wrangler	336.7 ^{de}	317.4 ^c	292.3 ^{abc}	331.4 ^{ab}	342.4 ^{fg}
SEM	1.656	1.587	5.812	0.870	0.698

Table 17a. F-test results of mixed-effects models of **kernel plumpness** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if P<0.05 and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	<0.001	0.457	0.001	0.044	0.761	0.074	0.005	0.081	0.238
Variety (V)	0.026	<0.001	0.007	<0.001	0.709	0.775	<0.001	<0.001	0.034	<0.001
M x V	0.723	<0.001	0.205	0.077	0.941	0.005	0.586	0.276	0.646	0.119

Table 18a. Means, P-Values and LSD separations for the main and interaction effects of management and malt varieties on kernel plumpness in 2024.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	97.02 ^a	77.21 ^a	15.02 ^b	61.51 ^{ab}	52.89 ^{ab}
B. Enhanced N Fertility-No PGR-Fungicide	96.54 ^a	77.81 ^a	24.11 ^a	57.97 ^b	45.37 ^b
C. Standard N Fertility-PGR-Fungicide	89.78 ^b	79.07 ^a	11.82 ^b	61.63 ^{ab}	49.73 ^{ab}
D. Standard N Fertility-No PGR-No Fungicide	96.42 ^a	72.96 ^a	15.25 ^b	70.03 ^a	59.50 ^a
SEM	0.3799	1.924	1.857	2.011	2.381
Variety (V)					
AAC Prairie	95.39 ^a	79.28 ^a	16.26 ^a	68.06 ^a	54.89 ^a
CDC Churchill	94.49 ^b	74.25 ^b	16.84 ^a	57.51 ^b	48.85 ^b
SEM	0.252	1.107	1.074	1.670	1.793
M x V					

Management A. - AAC Prairie	97.52 ^a	81.83 ^a	15.29 ^b	64.98 ^{bc}	57.21 ^{ab}
Management A. - CDC Churchill	96.53 ^{ab}	72.59 ^{bc}	14.74 ^b	58.05 ^{cd}	48.58 ^{bc}
Management B. - AAC Prairie	96.71 ^{ab}	78.59 ^{ab}	23.98 ^a	62.36 ^{bcd}	50.26 ^{bc}
Management B. - CDC Churchill	96.39 ^{ab}	77.03 ^{ab}	24.24 ^a	53.59 ^d	40.47 ^c
Management C. - AAC Prairie	90.18 ^c	79.75 ^a	11.53 ^b	69.58 ^{ab}	50.55 ^{abc}
Management C. - CDC Churchill	89.37 ^c	78.40 ^{ab}	12.10 ^b	53.68 ^d	48.91 ^{bc}
Management D. - AAC Prairie	97.16 ^{ab}	76.96 ^{ab}	14.22 ^b	75.33 ^a	61.56 ^a
Management D. - CDC Churchill	95.68 ^b	68.96 ^c	16.27 ^b	64.73 ^{bc}	57.44 ^{ab}
SEM	0.504	2.215	2.149	3.340	3.587

Table 18b. Means, P-Values and LSD separations for the main and interaction effects of management and malt varieties on plumpness in 2025.

<u>Management (M)</u>	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	98.83 ^a	95.23 ^a	86.14 ^a	96.82 ^a	96.05 ^a
B. Enhanced N Fertility-No PGR-Fungicide	98.96 ^a	94.24 ^a	83.27 ^a	94.37 ^b	94.98 ^a
C. Standard N Fertility-PGR-Fungicide	96.42 ^b	90.15 ^b	85.54 ^a	97.07 ^a	93.84 ^a
D. Standard N Fertility-No PGR-No Fungicide	98.85 ^a	95.99 ^a	85.27 ^a	96.21 ^a	94.87 ^a
SEM	0.094	0.506	1.405	0.296	0.490
<u>Variety (V)</u>					
AAC Prairie	98.69 ^a	95.09 ^a	85.15 ^a	97.06 ^a	96.40 ^a
CDC Churchill	97.84 ^b	92.72 ^b	84.96 ^a	95.17 ^b	93.47 ^b
SEM	0.078	0.300	0.458	0.179	0.291
<u>M x V</u>					
Management A. - AAC Prairie	98.84 ^{ab}	96.16 ^a	83.84 ^{cd}	97.51 ^a	97.00 ^a
Management A. - CDC Churchill	98.81 ^{ab}	94.29 ^{bc}	88.43 ^a	96.14 ^{bc}	95.10 ^{bc}
Management B. - AAC Prairie	99.13 ^a	95.33 ^{ab}	83.40 ^d	95.75 ^c	96.10 ^{ab}
Management B. - CDC Churchill	98.79 ^{ab}	93.15 ^{cd}	83.13 ^d	92.99 ^d	93.85 ^c
Management C. - AAC Prairie	97.69 ^c	92.36 ^d	86.33 ^{abc}	97.86 ^a	96.22 ^{ab}
Management C. - CDC Churchill	95.15 ^d	87.94 ^e	84.75 ^{bcd}	96.28 ^{bc}	91.46 ^d

Management D. - AAC Prairie	99.11 ^a	96.49 ^a	87.01 ^{ab}	97.13 ^{ab}	96.29 ^{ab}
Management D. - CDC Churchill	98.59 ^b	95.49 ^{ab}	83.52 ^{cd}	95.28 ^c	93.46 ^c
SEM	0.157	0.601	0.917	0.359	0.583

Table 19a. F-test results of mixed-effects models of **1000 kernel weight** assessing the presence of Management and Variety interactions at each site individually. Effects are considered significant if $P < 0.05$ and significant effects are bolded for emphasis.

	Melfort		Yorkton		Swift Current		Scott		Indian Head	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
<i>Fixed effects</i>										
Management (M)	<0.001	<0.001	0.123	0.126	0.166	0.781	0.070	0.123	0.269	0.539
Variety (V)	<0.001	0.002	0.079	<0.001	0.399	0.012	<0.001	0.002	0.035	<0.001
M x V	0.886	0.286	0.501	0.678	0.286	0.043	0.743	0.139	0.187	0.025

Table 20a. Means, P-Values and LSD separations for the main and interaction effects of management and malt varieties on thousand kernel weights in 2024.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	49.1 ^a	38.7 ^{ab}	25.5 ^a	32.3 ^{ab}	30.2 ^a
B. Enhanced N Fertility-No PGR-Fungicide	49.3 ^a	39.0 ^{ab}	26.8 ^a	31.6 ^b	29.1 ^a
C. Standard N Fertility-PGR-Fungicide	44.6 ^b	39.3 ^a	27.2 ^a	33.8 ^{ab}	30.2 ^a
D. Standard N Fertility-No PGR-No Fungicide	48.8 ^a	36.0 ^b	25.1 ^a	34.7 ^a	31.1 ^a
SEM	0.286	0.676	0.491	0.533	0.477
Variety (V)					
AAC Prairie	49.1 ^a	39.1 ^a	26.0 ^a	34.5 ^a	30.7 ^a
CDC Churchill	46.8 ^b	37.4 ^a	26.3 ^a	31.6 ^b	29.6 ^b
SEM	0.264	0.623	0.197	0.332	0.319

M x V					
Management A. - AAC Prairie	50.3 ^a	40.5 ^a	25.7 ^{bc}	33.4 ^b	31.2 ^a
Management A. - CDC Churchill	47.9 ^b	37.0 ^{ab}	25.3 ^c	31.1 ^{cd}	29.2 ^{bc}
Management B. - AAC Prairie	50.7 ^a	39.7 ^a	26.6 ^{ab}	32.9 ^{bc}	30.1 ^{abc}
Management B. - CDC Churchill	47.9 ^b	38.3 ^{ab}	27.1 ^a	30.4 ^d	28.1 ^c
Management C. - AAC Prairie	45.6 ^c	39.2 ^a	27.3 ^a	35.5 ^a	29.9 ^{abc}
Management C. - CDC Churchill	43.6 ^d	39.5 ^a	27.1 ^a	32.0 ^{bcd}	30.5 ^{ab}
Management D. - AAC Prairie	49.8 ^a	37.1 ^{ab}	24.6 ^c	36.3 ^a	31.6 ^a
Management D. - CDC Churchill	47.8 ^b	34.9 ^b	25.6 ^{bc}	33.0 ^{bc}	30.7 ^{ab}
SEM	0.529	1.247	0.395	0.665	0.639

Table 20b. Means, P-Values and LSD separations for the main and interaction effects of management and malt varieties on thousand kernel weights in 2025.

Management (M)	Melfort	Yorkton	Swift Current	Scott	Indian Head
A. Standard N Fertility-No PGR-Fungicide	49.8 ^{ab}	43.5 ^{ab}	36.8 ^a	46.1 ^a	47.1 ^a
B. Enhanced N Fertility-No PGR-Fungicide	51.0 ^a	43.6 ^{ab}	36.1 ^a	45.0 ^b	47.0 ^a
C. Standard N Fertility-PGR-Fungicide	46.0 ^c	41.4 ^b	36.7 ^a	45.9 ^{ab}	46.6 ^a
D. Standard N Fertility-No PGR-No Fungicide	49.5 ^b	44.4 ^a	37.1 ^a	45.3 ^{ab}	46.0 ^a
SEM	0.277	0.562	0.469	0.232	0.402
Variety (V)					
AAC Prairie	49.7 ^a	44.5 ^a	35.9 ^b	46.2 ^a	47.4 ^a
CDC Churchill	48.4 ^b	41.9 ^b	37.4 ^a	44.9 ^b	45.9 ^b
SEM	0.241	0.248	0.356	0.246	0.199
M x V					
Management A. - AAC Prairie	50.2 ^{abc}	44.6 ^{ab}	34.9 ^d	46.6 ^a	47.1 ^{ab}
Management A. - CDC Churchill	49.4 ^{bc}	42.4 ^c	38.8 ^a	45.6 ^{ab}	47.2 ^{ab}
Management B. - AAC Prairie	51.4 ^a	45.1 ^a	35.1 ^{cd}	45.0 ^{bc}	47.7 ^a
Management B. - CDC Churchill	50.6 ^{ab}	42.1 ^c	37.1 ^{abc}	45.0 ^{bc}	46.3 ^{bc}

Management C. - AAC Prairie	47.2 ^d	43.0 ^e	36.3 ^{bcd}	46.8 ^a	48.0 ^a
Management C. - CDC Churchill	44.7 ^e	39.9 ^d	37.1 ^{abc}	45.1 ^{bc}	45.2 ^{cd}
Management D. - AAC Prairie	50.2 ^{abc}	45.5 ^a	37.4 ^{ab}	46.5 ^{ab}	47.0 ^{ab}
Management D. - CDC Churchill	48.8 ^c	43.3 ^{bc}	36.7 ^{a-d}	44.0 ^c	45.0 ^d
SEM	0.483	0.497	0.712	0.492	0.398
