January 6, 2026

Strategic Field Program (SFP)
Project Progress Report

Completed reports must be returned by email to Evaluation.Coordinator@gov.sk.ca

Project Title:	Establishing nitrogen and seeding rate recommendations for composite yellow mustard production in Saskatchewan
SFP File Number:	20220377
Reporting Period:	April 2023 to January 2026

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Abstract

This project was conducted to determine optimal nitrogen fertilizer and seeding rates to maximize yield of composite yellow mustard (AAC Yellow 80) versus an open-pollinated variety (Andante). Small-plot research trials were carried out from 2023 to 2025 at Swift Current (Wheatland Conservation Area), Indian Head (Indian Head Agricultural Research Foundation), and Redvers (South East Research Farm), representing three major soil and climatic zones in Saskatchewan.

The study consisted of two separate trials including both mustard varieties. The nitrogen trial evaluated seven total nitrogen rates (soil residual plus applied urea): 0, 60, 80, 100, 120, 140, and 160 lb N/ac. The seeding rate trial evaluated five target seed rates (with balanced fertility): 108, 150, 194, 237, and 280 seeds/m^2. Data collected included plant density, plant height, lodging, days to maturity, and seed yield.

Across the three-year dataset, nitrogen uptake and yield response were strongly influenced by moisture availability. Despite consistently lower plant establishment, AAC Yellow 80 demonstrated superior nitrogen use efficiency and higher yields compared to Andante, particularly through increased branching at lower plant densities. Overall, results indicate that optimal seeding rates for composite yellow mustard may be lower than those currently recommended for open-pollinated variety Andante. However, producers should remain cautious and adjust seeding rates to account for expected seedling mortality, flea beetle pressure, and site-specific growing conditions.

Extension Messages

- AAC Yellow 80 composite yellow mustard consistently demonstrated higher yield potential and nitrogen use efficiency than Andante across all environments.
- Optimal nitrogen requirements varied by site and year, with highest yields achieved at total nitrogen rates of 120–160 lb N/ac under average moisture conditions, and 80–100 lb N/ac under drought stress.
- Optimal seeding rates for AAC Yellow 80 are likely lower than current recommendations for open-pollinated mustard (Andante).
- Higher seeding rates increased plant mortality, lodging risk, and moisture competition without providing yield benefits.

Introduction

Previous mustard fertility recommendations are based on data generated from the 1970s to early 2000s. Composite mustard (AAC Yellow 80) was not available during those studies; therefore, there was a need to revisit these recommendations. There is also increasing interest in plant protein uses, as well as value-added uses of fractionated mustard seed. Increased demand is anticipated in the near future for mustard. This research would help to maximize productivity on land and mitigate inefficient use of crop inputs such as seed, or nitrogen fertilizer. There is also anticipated uptake of composite mustard in the near future due to the threat of increased mustard production in regions outside of Canada (our competitors) by re-using the harvested seed from currently-registered AAFC mustard seed (i.e., bin-running). Composite seed reduces this threat, but does not eliminate it.

AAC Yellow 80 is the first commercially-available composite mustard (registered in 2020). Typically, mustard growers do not include canola in their rotation and as such are less familiar with the fertility and seeding rate requirements for crops with this increased vigor.

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Yellow mustard represents approximately 50–60% of total mustard production in Saskatchewan. Therefore, improvements in yellow mustard agronomy have the potential to impact a large proportion of provincial mustard acres and optimizing mustard productivity will directly contribute to Saskatchewan's 2020-2030 growth plan. Particularly in growing exports (greater output per area of land) by 50%, growing agri-food exports to $20 billion, increasing crop production to 45 million metric tonnes, engaging internationally to secure access and expand international markets (shifting to hybrid and composite varieties will combat bin running open-pollinated seed outside of Canada), and supporting the transformation of the economy through innovation and technology. In 2021, Saskatchewan exported $75,001,729 (70,323 metric tonnes) of mustard seed to the world and Saskatchewan is the leading Canadian exporter of mustard seed, accounting for 71% of total Canadian mustard seed exports.

Objectives and Progress

Objective	**Progress** *(i.e., completed/in progress)*
To establish nitrogen and seeding rate recommendations for composite yellow mustard in Saskatchewan.	Completed.
To understand nitrogen requirements for composite yellow mustard compared to Andante (open-pollinated) yellow mustard.	Completed.
To define upper limits of nitrogen fertilizer for composite yellow mustard.	Completed.
To specify the required seeding rate the producers can use to maximize yield, keeping seed costs in mind.	Completed.
To update the recommendation for Saskatchewan mustard producers (available via Sask Mustard's mustard production manual).	In progress.

Project Changes

- Plant height, days to maturity and lodging data were not collected at the Redvers site in the 2023 seed rate trial.
- The seed rate for the nitrogen trial was reduced from 237 seeds/m² (22 seeds/ft²) to 194 seeds/m² (18 seeds/ft²) in 2024 and 2025 based on results from the first year, which indicated the higher seed rate was excessive at all locations.

Methodology

Specific site operations are listed in table 14 (appendices).

Fertility: Side-banded, with the exception of Indian Head, where part of the Phosphorus requirements (35 kg monoammonium phosphate/ha) were placed in-furrow.

Experimental design: Two separate RCBD trials (nitrogen rates and seeding rates) with 4 replicates.

Locations: Swift Current (dry Brown), Indian Head (Black), & Redvers (black-long season)

Treatments: Part 1: (2 yellow mustard varieties x 7 Nitrogen Rates x 4 reps = 56 plots) and
Part 2: (2 yellow mustard varieties x 5 Seeding Rates x 4 reps = 40 plots)

Seed Rate Treatments: The seed rates treatments in this study assume 50% mortality. Therefore, seed rate calculations should be adjusted for your own region and soil conditions, and corrected for germination. Seed rates are listed in lbs/ac in table 15.

Part 1		
Mustard Variety	Seed Rate*	Residual + Applied Nitrogen (lb N/ac)
AAC Yellow 80	194 seeds/m^2	Soil N[Z]
AAC Yellow 80	194 seeds/m^2	60
AAC Yellow 80	194 seeds/m^2	80
AAC Yellow 80	194 seeds/m^2	100
AAC Yellow 80	194 seeds/m^2	120
AAC Yellow 80	194 seeds/m^2	140
AAC Yellow 80	194 seeds/m^2	160
Andante	194 seeds/m^2	Soil N[Z]
Andante	194 seeds/m^2	60
Andante	194 seeds/m^2	80
Andante	194 seeds/m^2	100
Andante	194 seeds/m^2	120
Andante	194 seeds/m^2	140
Andante	194 seeds/m^2	160
Part 2		
Mustard Variety	Seed Rate	Residual + Applied Nitrogen (lb N/ac)[Y]
AAC Yellow 80	108 seeds/m^2	100
AAC Yellow 80	150 seeds/m^2	100
AAC Yellow 80	194 seeds/m^2	100
AAC Yellow 80	237 seeds/m^2	100
AAC Yellow 80	280 seeds/m^2	100
Andante	108 seeds/m^2	100
Andante	150 seeds/m^2	100
Andante	194 seeds/m^2	100
Andante	237 seeds/m^2	100
Andante	280 seeds/m^2	100

[Z] soil nitrogen varied at each site (table 2).
[Y] applied nitrogen varied according to location (table 3).
***Seed rate (Nitrogen Trial) 237 seeds/m^2 (2023) and 194 seeds/m^2 (2024-2025).**

Data Collection:

- Composite soil samples (0-6”, 6-24”) submitted for residual nutrients and basic quality analyses (NO3-N, Olsen – P, K, S, micronutrients, OM, pH and CEC).
- Plant Emergence – Record the number of plants in a minimum of 2 x 1 m sections of crop row approximately 2-3 weeks after emergence is first noted.
- Lodging – Completed prior to harvest, rated on a scale of 1-9 where 1 is upright and 9 is flat.
- Days to Maturity – Approximately 60% of the seeds have turned color from green to brownish/red or yellow, depending on the mustard type.
- Plant Height – Averaged from two measurements at the front and the back of the plot (cm)
- Seed Yield – Corrected for dockage and to uniform moisture content of 9.5%.

Results and Discussions

General Environment and Soil Conditions

Growing season conditions from 2023 to 2025 were frequently characterized by above-average temperatures and below-average precipitation and overall yield potential was limited. Growing season temperatures and precipitation amounts for the 2023-2025 growing seasons (May-August) relative to long-term (10-year) averages are provided in table 1. At Swift Current early spring topsoil moisture conditions were generally dry and seeding was off to an early start. A hailstorm on July 22, 2023, impacted yield results due to pod shatter and plant mortality, resulting in an estimated 20% yield loss. Heavy winds were observed at Swift Current in 2024, but no crop damage was noted. Plots were typically flowering in extreme heat at this location with rapidly declining soil moisture conditions throughout the growing season. Flea beetles and grasshoppers were present, but pressure remained low. At Indian Head, the plots were sprayed for flea beetles in all three years, greatly reducing any potential damage. In 2025, late-season precipitation in July and August resulted in non-uniform plot maturity, leading to green or immature seed due to uneven pod fill and variable seed size and color. Redvers experienced a number of frost events after seeding in 2023, but no major damage was observed. At Indian Head, supplemental hand-weeding was completed to remove harder to control broadleaf weeds. In 2024 at Indian Head, lodging was quite severe creating challenges for harvest and increasing header losses, particularly in the heavier, more lodged plots.

Table 1. Mean monthly temperature and precipitation for the 2023–2025 growing seasons (May–August) at Swift Current, Indian Head, and Redvers, expressed relative to 10-year long-term averages.

Location	Year	May	June	July	August	Avg. / Total	% of LT
---------- *Mean Temperature (°C)* ----------							
Redvers	2023	15	20	18	18	17.4	109%
	2024	11	15	20	18	15.8	99%
	2025	13	16	18	18	16.2	101%
	Long-term	**11.1**	**16.2**	**18.7**	**18**	**16.0**	
Swift Current	2023	15	18	19	18	17.2	104%
	2024	11	14	21	19	16.4	99%
	2025	13.1	15.9	18.0	19.0	16.5	100%
	Long-term	**11.9**	**16.4**	**19.1**	**18.7**	**16.5**	
Indian Head	2023	14	19	17	18	17.0	109%
	2024	11	14	19	18	15.4	99%
	2025	13	15	17	18	15.7	101%
	Long-term	**10.8**	**15.8**	**18.2**	**17.4**	**15.6**	
---------- *Precipitation (mm)* ----------							
Redvers	2023	70	25	11	49	155	58%
	2024	92	156	13	39	301	112%
	2025	67	27	80	40	214	80%
	Long-term	**60**	**95**	**66**	**47**	**267**	
Swift Current	2023	49	34	77	48	207	105%
	2024	74	52	19	18	163	82%
	2025	34	31	78	93	236	119%
	Long-term	**47**	**56**	**56**	**38**	**198**	
Indian Head	2023	13	50	16	41	119	49%
	2024	64	75	37	72	248	102%
	2025	43	39	27	27	136	56%
	Long-term	**52**	**77**	**64**	**51**	**244**	

Selected soil test results for each site are provided in table 2. Swift Current generally had a lower soil pH with Redvers and Indian Head being similar. Organic matter varied and is consistently the lowest at Swift Current (2.4% to 2.6%) followed by Redvers (3.9% to 4.0%) and highest at Indian Head (3.9% to 6.1%). According to AgVise recommendations, residual N was low at Swift Current in 2023, but high in 2024 and 2025. Soil N was low at Indian Head in 2023 and 2025, with medium levels of residual nitrogen in 2024. Nitrogen levels at Redvers were high for 2023 and 2024, but low in 2025. Nitrogen rates were determined based on a spring soil test with the exception of Indian Head, where nitrogen fertilizer rates were based on a fall composite soil sample collected for the broader research site.

Table 2. Spring soil residual nutrients (0–6", 6–24") and soil quality parameters for all sites, 2023–2025.

Depth	pH	OM%	CEC (meq/100g)	N (lbs/ac)	P (lbs/ac)	K (ppm)	S (lbs/ac)	Cl (lbs/ac)	B (ppm)	Zn (ppm)	Cu (ppm)
Swift Current 2023											
0-6"	7.0	2.6	16	6	22	239	8	16	0.3	0.52	0.56
6-24"	7.9	-	-	12	-	-	24		-	-	-
Swift Current 2024											
0-6"	6.9	2.4	16.9	10	20	275	6	20	0.3	0.7	0.7
6-24"	8.1	-	-	54	-	-	18		-	-	-
Swift Current 2025											
0-6"	5.9	2.4	15.7	8	54	303	12	12	0.3	0.54	0.76
6-24"	7.8	-	-	48	-	-	30		-	-	-
Indian Head 2023											
0-6"	7.6	6.1	44.2	9	14	611	20	32	1.3	0.82	2.2
6-24"	8	-	-	13	-	-	40		-	-	-
Indian Head 2024											
0-6"	8	3.9	48.6	10	8	462	4	19.9	1.2	0.21	2.1
6-24"	8.2	-	-	24	-	-	12		-	-	-
Indian Head 2025											
0-6"	8	4.5	50.1	9	10	593	8	48	1.5	0.42	2.4
6-24"	8.2	-	-	15	-	-	24		-	-	-
Redvers 2023											
0-6"	7.6	4.0	33	16	14	254	20	-	-	1.62	-
6-24"	8.1	-	-	36	-	-	-	-	-	-	-
Redvers 2024											
0-6"	7.7	3.9	-	19	18	298	92	-	-	0.98	-
6-24"	8.1	-	-	36	-	-	-	-	-	-	-
Redvers 2025											
0-6"	8.2	2.7	-	5	10	227	26	-	-	0.56	-
6-24"	8.5	-	-	9	-	-	-	-	-	-	-

Table 4-15 are located in the Appendices with the specific treatment means.

Plant Densities & Vigor Ratings

Plant establishment trends observed in 2023 and 2024 persisted in 2025. Andante produced higher plant populations than AAC Yellow 80 across all nitrogen (table 4) and seeding rate treatments (table 5). Nitrogen rate often had minimal effects on establishment and higher seeding rates increased mortality, particularly under dry conditions. However, AAC

Yellow 80 maintained greater early-season vigor and canopy development at lower plant densities (visual vigor ratings not included).

In the seeding rate trial (across 3 site-years) with increasing seed rates by treatment, at Swift Current Andante resulted in 56-104 plants/m^2, while AAC Yellow 80 was 49-98 plants/m^2. Due to environmental and soil conditions, emergence rates were the lowest at Swift Current, but above and below the targeted plant stand. At Redvers, Andante resulted in 72-163 plants/m^2, while AAC Yellow 80 was 74-143 plants/m^2. Indian Head had the highest plant population with Andante resulting in 96-177 plants/m^2, while AAC Yellow 80 was 89-195 plants/m^2. Resulting emergence in each site-year indicates significantly higher mortality rates in drought conditions.

Height

In 2025, plant height increased with nitrogen rate up to moderate levels, consistent with previous years (table 6) and in the combined 3-year analysis, AAC Yellow 80 resulted in taller plants (75cm at Swift Current, 108cm at Indian Head, 113cm at Redvers) than Andante (72cm at Swift Current, 101cm at Indian Head, 109cm at Redvers).

Overall, plant height decreased slightly (by 3-5cm) with increasing seeding rate and AAC Yellow 80 resulted in taller plants than Andante (table 7).

Lodging

Lodging was measured using a scale of 1-9, where 9 is completely lodged, or flat. Nitrogen rates did not affect lodging at Swift Current, or Redvers (table 8). At Indian Head (2023) Andante was more prone to lodging (lodging, 2) compared to AAC Yellow 80 (lodging, 1) and increased with nitrogen rate. In 2024 at Indian Head, lodging was quite severe due to the heavy canopy and late-season wind damage, increasing with N rates up to a rating of 5.

In 2023, seed rate had no significant effect on lodging (only measured at Indian Head and Swift Current, table 9). However, in 2024 lodging at Indian Head increased with increasing seeding rates up to a rating of 7. Importantly, the seeding rates were also combined with high N fertility making this test generally more susceptible to lodging if conditions favoured it. Lodging pressure in 2025 was moderate, with increased lodging observed only at Indian Head under higher nitrogen and seeding rates.

Days to Maturity

Maturity ratings were largely affected by drought and high temperatures at each site, especially in 2023 with the plots maturing early (70 to 80 days) compared to the expected 84 days.[1] AAC Yellow 80 tended to mature an average of 1-2 days later than Andante yellow mustard and maturity was delayed when higher nitrogen (table 10) or low seed rates were applied (table 11). Maturity was non-uniform due to late season precipitation at Swift Current in 2025. Plots were desiccated, but green or immature seed (from uneven pod fill) and variable seed size and color resulted.

Seed Yield

[1] https://saskseed.ca/interactive-seed-guide/

Across all site-years (2023–2025), despite AAC Yellow 80 plant establishment being lower than Andante, AAC Yellow 80 consistently out-yielded Andante in both nitrogen (table 12) and seed rate trials (table 13). This demonstrates the vigorous nature and improved genetics of AAC Yellow 80 composite mustard. Mustard yield did increase with increasing nitrogen, but optimal rates varied by location. Yield response to nitrogen plateaued at lower rates under moisture stress and extended to higher nitrogen rates in seasons with higher precipitation, including 2025. However, yield potential was negatively affected by limited moisture and above average temperatures throughout the trial. Lower seeding rates (108–194 seeds/m^2) repeatedly produced equal or higher yields than higher seeding rates, particularly at Swift Current and Indian Head. The 2025 data further supported that a lower plant density decreased competition for moisture and nutrients.

Across all site-years (2023–2025) at Redvers, AAC Yellow 80 achieved the highest mean yield at a total nitrogen rate of 160 lb N/ac yielding 1530 lbs/ac, significantly higher than Andante mustard yield (1374 lbs/ac). Optimal seed rate at Redvers was inconsistent with very little effect, but generally a lower to moderate seed rate ranging from 108-194 seeds/m^2 was ideal. AAC Yellow 80 yield ranged from 1518 to 1548 lbs/ac and Andante yield ranged from 1389 to 1468 lbs/ac.

Indian Head was the highest yielding site with AAC Yellow 80 yielding significantly higher than Andante mustard. Across all site-years (2023–2025), AAC Yellow 80 yield consistently increased with nitrogen up to 160 lb N/ac (1878 lbs/ac). The highest Andante mustard yield resulted from 160 lb N/ac (1760 lbs/ac). However, yield decreased as seeding rate increased. This is likely a result of the frequently drier than normal weather and increased competition for moisture at the high seed rates. This result is more common at dry sites, such as Swift Current, but the 2023 growing season at Indian Head was unusually dry and 2024-2025 showed similar results. The combined site-year analysis showed highest yields resulted from both varieties seeded 108 seeds/m^2 (AAC Yellow 80, 1797 lb/ac and Andante, 1684 lb/ac). In an extreme drought year, the optimal seed rate may be lower than the rates evaluated in this study; however, possible insect pressure and typical seedling mortality, along with the crops ability to compete with weeds, must also be considered.

Swift Current being the driest and lowest yielding site did not utilize as much nitrogen as other locations, especially in the driest years. AAC Yellow 80 yields were directly correlated with the amount of precipitation received. In the more normal year like 2023 (105% of normal precipitation), AAC Yellow 80 yield increased up to 120 lb N/ac (1200 lbs/ac), and Andante yields increased up to 160 lb N/ac (1010 lbs/ac). In the driest year, 2024 (82% of normal precipitation), AAC Yellow 80 yields only increased up to 60 lb N/ac (798 lbs/ac), and Andante yield increased up to 80 lb N/ac (783 lbs/ac). In 2025, when precipitation was received late in the season (119% of normal), AAC Yellow 80 yield increased up to 140 lb N/ac (1507 lbs/ac) and Andante yield increased up to 120 lb N/ac (1216 lbs/ac). Plant establishment was very low in the spring of 2025 compared to previous years and late season precipitation allowed these plants to compensate and branch out very well. Other contributing factors to lower yields at Swift Current compared to other sites are differences in soil (low organic matter), low residual soil moisture and precipitation, and the hail storm in 2023. Seed mortality is especially high at Swift Current and even more so at the higher seeding rates. In the seed rate trial, the highest yields at Swift Current resulted from the lowest seed rate of 108 seeds/m^2 (AAC Yellow 80, 1104lbs/ac and Andante, 887lbs/ac) and yield generally decreased at higher seed rates, especially at the higher rates up to 237-280 seeds/m^2. In a year like 2025 with more precipitation than normal, a slightly higher seed rate (150 seeds/m^2) was also successful.

Conclusions and Recommendations

This project is intended to provide updated seeding rate and fertility recommendations for a newly available composite mustard, AAC Yellow 80, the first in the industry. The project was repeated at the three sites over the course of three growing seasons from 2023-2025 and all field components of this project were completed by the end of the 2025 growing season. Yield potential was negatively affected by limited moisture and above average temperatures across site -years. However, data from three site-years provides a robust basis for updating provincial mustard fertility and seeding rate recommendations and final recommendations will be incorporated into the Saskatchewan Mustard Production Manual and extension materials.

Despite AAC Yellow 80 composite mustard resulting in lower plant populations compared to the open-pollinated Andante, AAC Yellow 80 consistently demonstrated higher yield potential and nitrogen use efficiency than Andante across all environments. Average yields of AAC Yellow 80 are consistently and statistically higher than Andante in both nitrogen and seed rate trials. This demonstrates the vigorous nature and improved genetics of AAC Yellow 80 composite mustard. The optimum N rate was very dependent on environmental conditions, specifically precipitation. Yield response to nitrogen plateaued earlier under moisture stress and extended to higher nitrogen rates in seasons with improved precipitation, including 2025. Therefore, optimal nitrogen requirements varied by site and year, with highest yields achieved at total nitrogen rates of 120–160 lb N/ac under average moisture conditions, and 80–100 lb N/ac under drought stress. Although higher nitrogen rates on dry years did not usually decrease yield, there was little to no benefit.

Yields were expected to increase with seed rate as well, but higher than expected emergence led to increased competition for moisture and nutrients, and lower seeding rates (108–194 seeds/m²) repeatedly produced equal or higher yields than higher seeding rates, particularly at Swift Current and Indian Head. Optimal seeding rates for AAC Yellow 80 are likely lower than current recommendations for open-pollinated mustard. Higher seeding rates increased plant mortality, lodging risk, and moisture competition without providing yield benefits. The inclusion of 2025 data strengthens confidence in recommending reduced seeding rates and site-specific nitrogen management for composite yellow mustard in Saskatchewan.

Follow-up Work

NA

Patents/ IP generated/ Commercialized Products

NA

Sustainable Canadian Agricultural Partnership (Sustainable CAP) Performance Indicators

a) List of performance indicators

Sustainable CAP Indicator	Total Number
Scientific publications from this project (List the publications under section b)	
• Published	0
• Accepted for publication	0

HQPs trained during this project	
• Master's students	0
• PhD students	0
• Post docs	0
Knowledge transfer products developed based on this project (presentations, brochures, factsheets, flyers, guides, extension articles, podcasts, videos)[1]	5 (radio, in-person presentation, field day, webinar, newsletter)

[1] Please only include the number of unique knowledge transfer products.

b) List of scientific journal articles published/accepted for publication from this project.

Title	Author(s)	Journal	Date Published or Accepted for Publication	Link (if available)

c) List of knowledge transfer products/activities developed from this project.

Knowledge Transfer Product or Activity	Event/Location Where Knowledge Transfer Was Conducted	Estimated Number of Producers/Processors Participated In Knowledge Transfer	Link (if available)
"Walk the Plots" Amber Wall	Radio Show with Glenda Lee Allan on CKSW (570), June 20, 2023	Southwest SK	https://wheatlandconservation.ca/news-events/
Chris Holzapfel, IHARF Research Manager and Cory Jacob, Provincial Oilseed Specialist	Annual Indian Head Agricultural Research Foundation field day on July 18, 2023	160	
Rick Mitzel, Executive Director of Sask Mustard and Cory Jacob, Provincial Oilseed Extension Specialist	Annual Wheatland Conservation Area field day on July 27, 2023	80	
Lana Shaw, South East Research Farm	Annual Field Day on July 27, 2023	50	
Sam Marcino, Acting Provincial Oilseed Specialist	Sask Mustard AGM, Crop Production Show on January 12, 2024	100	
Amber Wall, Wheatland Conservation Area	Sask Mustard Newsletter, Spring 2024		Sask Mustard Newsletter, Spring 2024
"Walk the Plots" Amber Wall	Radio Show with Glenda Lee Allan (Country 94.1, Magic 97.1, CKSW 570) on June 4, 2024	Southwest SK	Walk the Plots recordings
Sam Marcino, Acting Provincial Oilseed Specialist	Wheatland Conservation Area Annual Field Tour on July 18, 2024	80	

Lana Shaw, South East Research Farm	Annual field day on July 24, 2024	50	
Amber Wall, Wheatland Conservation Area	Sask Mustard AGM, Crop Production Show on January 16, 2025	100	MUSTARD AGM PRESENTATION
Amber Wall, Wheatland Conservation Area	Sask Mustard Newsletter, Spring 2025		Mail out
Amber Wall, Wheatland Conservation Area	Crops Winter Webinars 2025, Government of Saskatchewan on March 27, 2025		
Lana Shaw, South East Research Farm	Annual field day on July 10, 2025	85	
Chris Holzapfel, IHARF Research Manager and Sam Marcino, acting Provincial Oilseed Specialist	Annual Indian Head Agricultural Research Foundation field day on July 15, 2025	157	
Rick Mitzel, Executive Director of Sask Mustard	Annual Wheatland Conservation Area field day on July 17, 2025	85	
Amber Wall, Wheatland Conservation Area	Sask Mustard AGM, Crop Production Show on January 15, 2026	100	

The final results from this project will be included in the mustard production manual and will be presented on where possible for future crop research updates.

Contributions and Support

Funded by the Government of Canada under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

- Cory Jacob, Provincial Specialist, Oilseed Crops, Saskatchewan Ministry of Agriculture.
- Shannon Chant, Crops Extension Specialist, Saskatchewan Ministry of Agriculture.
- Sam Marcino, Acting Provincial Oilseed Specialist, Saskatchewan Ministry of Agriculture.

Seed provided in kind by Saskatchewan Mustard Development Commission and Mustard 21.

- Rick Mitzel, Executive Director, Saskatchewan Mustard Development Commission.
- Howard Love, Senior Scientist, Mustard 21.

Acknowledgements

We acknowledge the support of the Ministry of Agriculture, the Canadian Agriculture Partnership (projects from 2017-2023) and the Sustainable Canadian Agriculture Partnership (projects from 2023-2028).

Appendices

Table 4. Nitrogen rate and variety effect on plant emergence for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (plants/m2), Nitrogen Rate x Variety (2023-2025)																			
emergence (plants/m^2)		Swift Current								Indian Head								Redvers							
		3 site years		2023		2024		2025		3 site years		2023		2024		2025		3 site years		2023		2024		2025	
Variety																									
AAC Yellow 80		83	a	84	b	103	a	62	a	162	b	171	b	174	b	140	b	105	b	128	b	85	ns	113	a
Andante		87	a	90	a	109	a	63	a	174	a	189	a	186	a	148	a	113	a	154	a	81	ns	105	a
LSD		4		5		7		7		4		5		2.1		5.0		6		9		9		10	
Nitrogen Rate																									
Soil N		88	ab	86	a	111	ab	66	a	172	a	181	a	183	a	152	a	119	a	154	a	88	ns	114	a
60N		91	a	89	a	118	ab	64	a	171	a	182	a	182	a	149	a	115	ab	143	ab	88	ns	113	a
80N		90	a	89	a	121	a	60	ab	167	ab	179	a	179	a	143	ab	111	ab	138	ab	87	ns	108	ab
100N		90	a	91	a	116	ab	63	a	169	ab	185	a	186	a	136	b	118	ab	141	ab	87	ns	125	a
120N		87	ab	89	a	106	bc	65	a	168	ab	178	a	181	a	144	ab	107	bc	143	ab	87	ns	90	bc
140N		82	b	84	a	97	c	65	a	166	ba	174	a	179	a	144	ab	99	c	139	ab	75	ns	82	c
160N		70	c	83	a	74	d	53	b	163	b	176	a	170	a	143	ab	97	c	131	b	67	ns	92	bc
LSD		7		9		13		9		7		14		4		9		11		16				18	
Variety x Nitrogen Rate																									
AAC Yellow 80	Soil N	84	ef bc	88	de	104	d	61	ef	167	d	176	d	175	bcd	150	c	113	de	147	c	76	ns	117	bc
AAC Yellow 80	60N	89	d	90	cd	117	ab	60	fg	164	de	177	d	174	cd	142	de	103	fg	125	ef	78	ns	105	de
AAC Yellow 80	80N	90	bc	84	f	121	a	64	cde	162	ef	174	d	166	d	145	d	105	f	121	f	94	ns	101	ef
AAC Yellow 80	100N	86	de	84	f	112	bc	62	def	164	de	175	d	185	ab	133	h	114	de	110	g	97	ns	136	a
AAC Yellow 80	120N	88	cd	92	bc	104	d	67	bc	161	ef	165	ef	181	abc	137	fg	110	e	136	d	94	ns	99	ef
AAC Yellow 80	140N	81	f	80	g	96	e	66	bc	155	g	162	f	167	d	135	gh	92	i	131	de	75	ns	70	h
AAC Yellow 80	160N	66	h	74	h	69	g	56	h	159	f	168	e	167	d	142	de	98	gh	130	de	80	ns	83	g
Andante	Soil N	92	ab	86	ef	117	ab	72	a	177	ab	186	c	190	a	155	ab	124	ab	161	b	101	ns	110	cd
Andante	60N	92	ab	88	de	120	a	68	b	178	a	186	c	190	a	156	a	127	a	161	b	97	ns	122	b
Andante	80N	92	ab	95	ab	120	a	57	gh	172	c	184	c	191	a	140	ef	117	cd	156	b	81	ns	115	bc
Andante	100N	94	a	98	a	120	a	65	bcd	174	bc	195	a	187	a	140	ef	121	bc	172	a	78	ns	114	c
Andante	120N	86	de	86	ef	109	cd	64	cde	175	abc	192	ab	181	abc	152	bc	104	f	149	c	80	ns	82	g
Andante	140N	84	ef	88	de	98	e	65	bcd	177	ab	187	bc	191	a	152	bc	105	f	147	c	76	ns	94	f
Andante	160N	73	g	91	cd	79	f	50	i	167	d	183	c	174	cd	144	d	96	hi	131	de	54	ns	101	e
LSD		3		3		5		3		3		5		6		3		4		9				7	
CV%		16.2		12.6		15.0		17.2		8.7		9.5		6.3		7.0		21.9		14.1				21.1	

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Table 5. Seed rate and variety effect on plant emergence for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (plants/m^2), Seed Rate x Variety (2023-2025)																
emergence (plants/m^2)		Swift Current					Indian Head					Redvers				
		3 site years	2023		2024		2025	3 site years	2023		2024		2025	3 site years	2023		2024		2025
Variety																			
AAC Yellow 80		71 b	70 a		101 b		43 b	145 b	129 b		161 b		146 a	111 b	123 b		108 a		103 a
Andante		78 a	73 a		108 a		53 a	163 a	146 a		192 a		152 a	118 a	135 a		110 a		110 a
LSD		4	6		5		5	5	7		8		8	5	8		9		11
Seed Rate																			
108 seeds/m^2		52 e	56 c		65 e		36 c	94 e	89 d		108 e		83 e	73 e	83 e		75 c		61 d
150 seeds/m^2		62 d	60 c		86 d		40 c	131 d	120 c		147 d		125 d	93 d	102 d		88 c		88 c
194 seeds/m^2		74 c	71 b		102 c		48 b	158 c	142 b		181 c		152 c	117 c	129 c		110 b		113 b
237 seeds/m^2		85 b	81 ab		120 b		53 b	184 b	168 a		208 b		177 b	139 b	158 b		133 a		126 b
280 seeds/m^2		101 a	89 a		150 a		64 a	205 a	169 a		240 a		207 a	153 a	172 a		141 a		145 a
LSD		8	10		9		7	8	11		12		12	9	13		15		18
Variety x Seed Rate																			
AAC Yellow 80	108 seeds/m^2	49 h	59 e		59 h		29 f	89 i	83 h		100 j		85 h	74 g	83 i		82 g		58 f
AAC Yellow 80	150 seeds/m^2	58 g	58 ef		83 f		34 e	121 g	109 f		134 h		120 g	87 f	98 h		82 g		81 e
AAC Yellow 80	194 seeds/m^2	69 f	65 d		102 d		42 d	150 e	136 d		168 f		146 e	118 d	125 f		118 d		112 c
AAC Yellow 80	237 seeds/m^2	83 d	82 bc		119 c		48 c	172 c	156 b		187 r		173 c	136 c	148 d		127 c		132 b
AAC Yellow 80	280 seeds/m^2	98 b	87 ab		143 b		64 a	195 b	161 b		218 c		206 a	143 b	161 c		134 bc		132 b
Andante	108 seeds/m^2	56 g	53 f		71 g		42 d	98 h	96 g		117 i		81 h	72 g	83 i		68 h		65 f
Andante	150 seeds/m^2	66 f	62 de		90 e		46 c	141 f	130 e		161 g		131 f	98 e	106 g		94 f		95 d
Andante	194 seeds/m^2	78 e	77 c		102 d		55 b	167 d	148 c		195 d		158 d	116 d	134 e		102 e		113 c
Andante	237 seeds/m^2	87 c	81 c		121 c		57 b	196 b	179 a		228 b		181 b	142 b	168 b		138 b		120 c
Andante	280 seeds/m^2	104 a	91 a		157 a		64 a	215 a	177 a		261 a		208 a	163 a	184 a		148 a		157 a
LSD		3	5		4		3	3	5		5.0		5	4	6		7		11
CV%		18.5	16.8		9.6		17.6	10.4	9.8		7.9		9.6	15.5	11.5		15.9		17.8

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Table 6. Nitrogen rate and variety effect on plant height for individual years and combined site-year analysis (2023-2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (cm), Nitrogen Rate x Variety (2023-2025)																
height (cm)		Swift Current					Indian Head					Redvers				
		3 site years	2023	2024	2025		3 site years	2023	2024	2025		3 site years	2023	2024	2025	
Variety																
AAC Yellow 80		75 a	74 a	86 a	66 a		108 a	112 ns	120 a	98 a		113 a	127 a	98 a	113 a	
Andante		72 b	72 a	79 b	65 a		101 b	95 ns	114 b	95 b		109 b	121 b	94 b	111 a	
	LSD	2	1	2	4		1		2	1.0		2	2	3	3	
Nitrogen Rate																
Soil N		69 d	64 c	76 c	67 a		88 e	83 ns	98 c	83 d		93 d	113 d	73 c	92 d	
60N		70 cd	71 b	77 c	62 a		101 d	98 ns	111 b	94 c		106 c	120 c	91 b	107 c	
80N		73 bc	75 a	78 c	65 a		105 c	100 ns	119 ab	98 b		112 b	127 ab	98 ab	112 bc	
100N		73 b	75 a	82 b	63 a		108 b	129 ns	123 a	99 a		115 ab	125 bc	102 a	118 a	
120N		76 ab	76 a	83 b	69 a		109 ab	103 ns	124 a	101 a		115 ab	125 bc	102 a	118 a	
140N		76 ab	75 a	85 ab	68 a		110 ab	105 ns	124 a	101 a		116 a	128 ab	101 a	117 ab	
160N		77 a	76 a	87 a	67 a		111 a	106 ns	127 a	100 ab		118 a	132 a	103 a	119 a	
	LSD	3	2	3	7		2		2 a	2		3	6	8	5	
Variety x Nitrogen Rate																
AAC Yellow 80	Soil N	71 e	66 h	80 e	67 b		90 i	86 ns	101 d	84 i		94 g	114 g	75 h	93 h	
AAC Yellow 80	60N	72 de	72 f	80 e	63 c		105 f	103 ns	116 bc	96 g		108 e	121 ef	93 f	110 f	
AAC Yellow 80	80N	74 c	75 cd	81 e	67 b		108 d	106 ns	118 bc	100 cd		112 d	127 cd	100 cd	111 ef	
AAC Yellow 80	100N	73 cd	76 bc	84 cd	60 d		110 c	161 ns	125 ab	102 ab		117 b	129 bc	103 b	120 a	
AAC Yellow 80	120N	76 b	76 bc	84 cd	67 b		112 b	108 ns	126 ab	101 bc		117 b	130 b	103 b	119 ab	
AAC Yellow 80	140N	76 b	76 bc	87 b	68 b		113 b	109 ns	127 ab	103 a		117 b	131 b	101 bc	118 ab	
AAC Yellow 80	160N	80 a	79 a	89 a	72 a		116 a	112 ns	133 a	103 a		123 a	140 a	109 a	120 a	
Andante	Soil N	67 g	62 i	72 g	67 b		85 j	79 ns	95 d	82 j		92 h	111 h	72 I	92 h	
Andante	60N	69 f	70 g	75 f	62 cd		97 h	94 ns	106 cd	91 h		104 f	120 f	88 g	104 g	
Andante	80N	71 e	75 cd	75 f	63 cd		103 g	94 ns	119 bc	96 g		112 d	127 cd	96 e	113 de	
Andante	100N	73 cd	74 de	80 e	66 b		105 f	98 ns	121 ab	97 fg		113 d	121 ef	102 bc	115 cd	
Andante	120N	77 b	76 bc	83 d	71 a		107 de	99 ns	121 ab	102 ab		112 d	120 f	100 cd	117 bc	
Andante	140N	76 b	74 de	83 d	68 b		107 de	101 ns	121 ab	99 de		115 c	126 d	101 bc	117 bc	
Andante	160N	74 c	74 de	85 c	62 cd		106 ef	99 ns	120 ab	98 ef		113 d	123 e	98 de	119 ab	
	LSD	1	1	1	2		1		3	1		1	2	2	2	
	CV%	8.0	5.3	4.9	12.0		4.9		4.6	3.0		6.4	6.4	6.8	5.7	

Table 7. Seed rate and variety effects on plant height for individual years and combined site-year analysis (2023-2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (cm), Seed Rate x Variety (2023-2025)																
height (cm)		Swift Current					Indian Head					Redvers				
		3 site years	2023		2024		2025	3 site years	2023		2024		2025	2 site years	2023	2024		2025	
Variety																			
AAC Yellow 80		77	a	78	a	86	a	65	a	118	a	113	a	139	a	100	a	115	a	-	107	a	122	a
Andante		72	b	77	a	81	b	58	b	111	b	102	b	133	b	96	b	108	b	-	104	a	113	b
LSD		2		3		2		3		1		2		2		2		2		-	3		3	
Seed Rate																			
108 seeds/m^2		78	a	78	a	88	a	66	a	117	a	111	a	140	a	100	a	112	ab	-	106	a	118	ab
150 seeds/m^2		78	a	80	a	88	a	66	a	115	ab	107	a	137	a	100	a	114	a	-	106	a	121	a
194 seeds/m^2		73	b	77	a	83	b	59	b	114	bc	107	a	137	a	99	ab	112	ab	-	106	a	117	ab
237 seeds/m^2		73	b	78	a	81	bc	59	b	112	c	107	a	133	b	96	b	111	a	-	105	a	117	ab
280 seeds/m^2		71	b	75	a	78	c	58	b	112	c	107	a	133	b	96	b	109	b	-	103	a	115	b
LSD		2		5		3		4		2		4		3		3		3			4		5	
Variety x Seed Rate																			
AAC Yellow 80	108 seeds/m^2	79	a	78	b	90	a	69	a	121	a	117	a	143	a	105	a	116	a	-	109	a	124	a
AAC Yellow 80	150 seeds/m^2	80	a	83	a	91	a	67	ab	117	b	110	b	139	ab	101	b	116	a	-	109	a	124	a
AAC Yellow 80	194 seeds/m^2	77	b	77	b	88	b	64	c	117	b	112	b	140	ab	100	bc	114	b	-	107	ab	120	bc
AAC Yellow 80	237 seeds/m^2	76	b	78	b	85	d	64	c	115	c	112	b	136	bc	98	de	114	b	-	106	bc	121	ab
AAC Yellow 80	280 seeds/m^2	72	c	75	c	79	e	63	c	117	b	115	a	137	bc	99	cd	113	c	-	105	bc	120	bc
Andante	108 seeds/m^2	76	b	77	b	87	bc	64	c	113	d	104	c	137	bc	96	fg	108	e	-	104	cd	111	ef
Andante	150 seeds/m^2	76	b	77	b	86	cd	65	bc	113	d	105	c	134	ccd	99	cd	111	d	-	104	cd	117	cd
Andante	194 seeds/m^2	70	d	77	b	78	ef	55	d	111	e	101	d	134	cd	97	ef	109	e	-	104	cd	114	de
Andante	237 seeds/m^2	70	d	78	b	78	ef	54	d	109	f	101	d	131	de	95	g	109	e	-	105	bc	113	ef
Andante	280 seeds/m^2	69	d	75	c	77	f	54	d	107	g	99	d	129	e	93	h	106	f	-	102	d	110	f
LSD		1		2		1		2		1		2		4.0		1		1			2		3	
CV%		6.8		6.9		4.6		8.3		3.7		4.2		2.4		3.7		4.7			5.1		4.7	

Table 8. Nitrogen rate and variety effect on lodging for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (lodging 1-9), Nitrogen Rate x Variety (2023-2025)													
lodging (1-9, 9=flat)		Swift Current				Indian Head				Redvers			
		3 site years	2023	2024	2025	3 site years	2023	2024	2025	3 site years	2023	2024	2025
Variety													
AAC Yellow 80		1 a	1 a	1 a	1 a	2 b	1 ns	3 ns	2 b	1 a	1 a	1 a	2 a
Andante		1 a	1 a	1 a	1 a	3 a	2 ns	3 ns	3 a	1 a	1 a	1 a	2 a
	LSD	0	0	0	0		0	0	0	0	0	0	0
Nitrogen Rate													
Soil N		1 a	1 a	1 a	1 a	1 e	1 ns	2 ns	1 d	1 b	1 a	1 a	2 a
60N		1 a	1 a	1 a	1 a	2 d	1 ns	2 ns	2 c	1 b	1 a	1 a	2 a
80N		1 a	1 a	1 a	1 a	2 d	1 ns	3 ns	2 c	1 b	1 a	1 a	2 a
100N		1 a	1 a	1 a	1 a	2 d	2 ns	3 ns	3 b	2 a	1 a	1 a	2 a
120N		1 a	1 a	1 a	1 a	3 c	2 ns	3 ns	3 b	1 b	1 a	1 a	2 a
140N		1 a	1 a	1 a	1 a	3 c	2 ns	4 ns	3 b	1 b	1 a	1 a	2 a
160N		1 a	1 a	1 a	1 a	4 a	2 ns	5 ns	4 a	2 a	1 a	1 a	2 a
	LSD	0	0	0	0	0	0	0	0	0	0	0	1
Variety x Nitrogen Rate													
AAC Yellow 80	Soil N	1 a	1 a	1 a	1 a	1 d	1 ns	1 ns	1 d	1 b	1 a	1 a	1 c
AAC Yellow 80	60N	1 a	1 a	1 a	1 a	2 c	1 ns	2 ns	2 c	1 b	1 a	1 a	2 b
AAC Yellow 80	80N	1 a	1 a	1 a	1 a	2 c	1 ns	3 ns	2 c	1 b	1 a	1 a	2 b
AAC Yellow 80	100N	1 a	1 a	1 a	1 a	2 c	1 ns	3 ns	3 b	1 b	1 a	1 a	2 b
AAC Yellow 80	120N	1 a	1 a	1 a	1 a	3 b	1 ns	4 ns	3 b	1 b	1 a	1 a	2 b
AAC Yellow 80	140N	1 a	1 a	1 a	1 a	3 b	2 ns	5 ns	3 b	1 b	1 a	1 a	2 b
AAC Yellow 80	160N	1 a	1 a	1 a	1 a	4 a	2 ns	5 ns	4 a	1 b	1 a	1 a	2 b
Andante	Soil N	1 a	1 a	1 a	1 a	2 c	1 ns	2 ns	1 d	1 b	1 a	1 a	2 b
Andante	60N	1 a	1 a	1 a	1 a	2 c	2 ns	2 ns	2 c	2 a	1 a	1 a	3 a
Andante	80N	1 a	1 a	1 a	1 a	2 c	2 ns	3 ns	2 c	1 b	1 a	1 a	2 b
Andante	100N	1 a	1 a	1 a	1 a	3 b	2 ns	3 ns	3 b	2 a	1 a	1 a	3 a
Andante	120N	1 a	1 a	1 a	1 a	3 b	3 ns	3 ns	3 b	2 a	1 a	1 a	3 a
Andante	140N	1 a	1 a	1 a	1 a	3 b	3 ns	4 ns	3 b	1 b	1 a	1 a	2 b
Andante	160N	1 a	1 a	1 a	1 a	4 a	3 ns	5 ns	4 a	2 a	1 a	1 a	3 a
	LSD	0	0	0	0	0	0	0	0	0	0	0	0
	CV%	7.7	0.0	0.0	0.0	24.3	24.5	19.2	20	42.4	0.0	0.0	39.3

Table 9. Seed rate and variety effect on lodging for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (1-9, 9=flat to ground), Seed Rate x Variety (2023-2025)																	
lodging (1-9, 9=flat)		Swift Current								Indian Head							
		3 site years		2023		2024		2025		3 site years		2023		2024		2025	
Variety																	
AAC Yellow 80		1	a	1	ns	1	a	1	a	3	b	2	ns	4	b	3	b
Andante		1	a	1	ns	1	a	1	a	4	a	2	ns	5	a	4	a
	LSD	0		0		0		0		0		0				0	
Seed Rate																	
108 seeds/m^2		1	a	1	ns	1	a	1	a	2	c	2	ns	3	d	3	b
150 seeds/m^2		1	a	1	ns	1	a	1	a	3	b	2	ns	4	c	3	b
194 seeds/m^2		1	a	1	ns	1	a	1	a	3	b	2	ns	5	b	3	b
237 seeds/m^2		1	a	1	ns	1	a	1	a	4	a	2	ns	5	b	4	a
280 seeds/m^2		1	a	1	ns	1	a	1	a	4	a	2	ns	6	a	4	a
	LSD	0		0		0		0		0		0		0		0	
Variety x Seed Rate																	
AAC Yellow 80	108 seeds/m^2	1	a	1	ns	1	a	1	a	2	d	1	ns	3	e	2	d
AAC Yellow 80	150 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	1	ns	4	d	3	c
AAC Yellow 80	194 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	1	ns	4	d	3	c
AAC Yellow 80	237 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	2	ns	5	c	4	b
AAC Yellow 80	280 seeds/m^2	1	a	1	ns	1	a	1	a	4	b	2	ns	6	b	4	b
Andante	108 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	2	ns	3	e	3	c
Andante	150 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	2	ns	4	d	3	c
Andante	194 seeds/m^2	1	a	1	ns	1	a	1	a	3	c	2	ns	5	c	3	c
Andante	237 seeds/m^2	1	a	1	ns	1	a	1	a	4	b	2	ns	6	b	4	b
Andante	280 seeds/m^2	1	a	1	ns	1	a	1	a	5	a	2	ns	7	a	5	a
	LSD	0				0		0		0				0		0	
	CV%	14.7				1.0		1.0		20.9				0.8			

Yellow Mustard Individual Means (1-9, 9=flat to ground), Seed Rate x Variety (2023-2025)									
lodging (1-9, 9=flat)		Redvers							
		2 site years		2023		2024		2025	
Variety									
AAC Yellow 80		1	b	-		1	a	2	a
Andante		2	a	-		1	a	2	a
	LSD	0				0		0	
Seed Rate									
108 seeds/m^2		1	b	-		1	a	1	a
150 seeds/m^2		1	b	-		1	a	2	a
194 seeds/m^2		1	b	-		1	a	2	a
237 seeds/m^2		2	a	-		1	a	2	a
280 seeds/m^2		2	a	-		1	a	2	a
	LSD	0				0		0	
Variety x Seed Rate									
AAC Yellow 80	108 seeds/m^2	1	b	-		1	a	1	c
AAC Yellow 80	150 seeds/m^2	1	b	-		1	a	2	b
AAC Yellow 80	194 seeds/m^2	1	b	-		1	a	1	c
AAC Yellow 80	237 seeds/m^2	2	a	-		1	a	2	b
AAC Yellow 80	280 seeds/m^2	2	a	-		1	a	2	b
Andante	108 seeds/m^2	1	b	-		1	a	2	b
Andante	150 seeds/m^2	1	b	-		1	a	2	b
Andante	194 seeds/m^2	2	a	-		1	a	3	a
Andante	237 seeds/m^2	2	a	-		1	a	2	b
Andante	280 seeds/m^2	2	a	-		1	a	2	b
	LSD	0				0		0	
	CV%	37.0				0.0		38.9	

Table 10. Nitrogen rate and variety effect on days to maturity for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (days), Nitrogen Rate x Variety (2023-2025)																			
Maturity (days)		Swift Current								Indian Head								Redvers							
		3 site years		2023		2024		2025		3 site years		2023		2024		2025		3 site years		2023		2024		2025	
Variety																									
AAC Yellow 80		84	a	78	a	79	a	96	a	81	a	77	a	81	a	85	a	84	a	70	a	91	a	89	a
Andante		84	a	78	a	79	a	94	b	80	b	75	b	81	a	85	a	83	b	70	a	91	a	89	a
LSD		1		1		1		0		0		0		0		0		0		0		1		0	
Nitrogen Rate																									
Soil N		83	c	79	a	77	a	95	bc	79	e	75	c	80	d	82	e	82	c	70	a	89	d	88	b
60N		83	c	77	a	79	a	91	d	80	d	76	b	80	d	83	d	83	bc	70	a	90	cd	88	b
80N		83	c	77	a	78	a	95	bc	80	d	76	b	81	c	84	c	83	bc	70	a	91	bc	89	ab
100N		83	c	77	a	79	a	94	c	81	c	76	b	81	c	85	b	83	bc	70	a	91	bc	89	ab
120N		85	ab	79	a	81	a	96	b	81	c	77	a	82	b	85	b	83	bc	70	a	91	bc	90	a
140N		85	ab	79	a	81	a	96	b	82	b	77	a	82	b	88	a	84	ab	71	a	92	ab	89	ab
160N		86	a	78	a	81	a	98	a	83	a	77	a	83	a	88	a	85	a	71	a	93	a	90	a
LSD		1		2		4		1		0		0		0		0		1		1		1		1	
Variety x Nitrogen Rate																									
AAC Yellow 80	Soil N	83	d	80	a	77	f	96	c	79	e	76	c	80	d	82	h	82	d	70	b	90	d	88	d
AAC Yellow 80	60N	83	d	77	c	78	e	94	e	80	d	77	b	80	d	84	f	83	c	70	b	91	c	89	c
AAC Yellow 80	80N	83	d	78	bc	78	e	95	d	81	c	77	b	81	c	85	e	83	c	70	b	91	c	88	d
AAC Yellow 80	100N	83	d	77	c	79	c	94	e	81	c	77	b	81	c	86	d	83	c	70	b	91	c	89	c
AAC Yellow 80	120N	85	b	78	bc	81	a	96	c	82	b	77	b	82	b	85	e	84	b	70	b	91	c	90	b
AAC Yellow 80	140N	86	a	79	ab	81	a	97	b	83	a	78	a	83	a	88	b	84	b	71	a	91	c	90	b
AAC Yellow 80	160N	86	a	78	bc	81	a	100	a	83	a	78	a	83	a	88	b	85	a	71	a	93	a	91	a
Andante	Soil N	83	d	78	bc	77	f	94	e	79	e	75	d	80	d	82	h	82	d	70	b	89	e	88	d
Andante	60N	83	d	77	c	79	c	89	f	79	e	75	d	80	d	83	g	82	d	70	b	89	e	87	e
Andante	80N	84	c	77	c	79	c	96	c	80	d	75	d	81	c	84	f	83	c	70	b	90	d	89	c
Andante	100N	83	d	78	bc	79	c	94	e	80	d	76	c	81	c	84	f	83	c	70	b	90	d	89	c
Andante	120N	85	b	79	ab	81	a	96	c	81	c	76	c	81	c	85	e	83	c	70	b	90	d	89	c
Andante	140N	85	b	79	ab	80	b	95	d	82	b	76	c	82	b	87	c	84	b	70	b	92	b	89	c
Andante	160N	85	b	78	bc	80	b	96	c	83	a	76	c	83	a	89	a	84	b	71	a	92	b	90	b
LSD		0		1		0		0		0		0		0		0.00		0		0		0		0	
CV%		2.1		2.9		1.3		1.2		1.0		1.0		0.9		1.0		1.4		1.0		1.6		9.6	

Table 11. Seed rate and variety effect on days to maturity for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (days), Seed Rate x Variety (2023-2025)													
Maturity (days)		Swift Current				Indian Head				Redvers			
		3 site years	2023	2024	2025	3 site years	2023	2024	2025	2 site years	2023	2024	2025
Variety													
AAC Yellow 80		82 a	74 a	78 a	95 a	82 a	78 a	82 a	87 a	89 a	-	88 a	90 a
Andante		82 a	74 a	78 a	95 a	81 b	76 b	82 a	86 b	88 a	-	87 a	90 a
	LSD	2	4	1	1	0	0	0	0	1	-	1	0
Seed Rate													
108 seeds/m^2		82 a	70 b	80 a	96 a	83 a	78 a	83 a	88 a	88 a	-	87 a	90 a
150 seeds/m^2		82 a	70 b	79 ab	96 a	82 b	77 b	82 b	87 ab	89 a	-	88 a	90 a
194 seeds/m^2		83 a	76 ab	78 bc	94 b	82 b	77 b	82 b	87 ab	89 a	-	88 a	90 a
237 seeds/m^2		84 a	77 a	78 bc	95 ab	81 c	77 b	81 c	86 bc	89 a	-	87 a	90 a
280 seeds/m^2		83 a	77 a	77 c	95 ab	81 c	76 c	81 c	85 c	88 a	-	86 a	90 a
	LSD	2	6	1	1	0	0	0	1	1		2	1
Variety x Seed Rate													
AAC Yellow 80	108 seeds/m^2	82 bc	70 b	80 a	96 a	83 a	78 a	83 a	88 a	89 ab	-	88 a	90 b
AAC Yellow 80	150 seeds/m^2	82 bc	70 b	78 c	96 a	83 a	78 a	83 ab	88 a	90 a	-	89 a	91 a
AAC Yellow 80	194 seeds/m^2	83 ab	76 a	78 c	95 ab	82 c	77 b	82 ab	88 a	89 ab	-	88 a	90 b
AAC Yellow 80	237 seeds/m^2	83 ab	77 a	78 c	95 ab	82 c	77 b	81 ab	86 c	89 ab	-	88 a	90 b
AAC Yellow 80	280 seeds/m^2	83 ab	76 a	77 d	95 ab	81 d	77 b	81 b	86 c	88 bc	-	86 b	90 b
Andante	108 seeds/m^2	81 c	69 b	79 b	96 a	83 a	77 b	83 ab	88 a	87 bc	-	86 b	89 c
Andante	150 seeds/m^2	82 bc	68 b	80 a	96 a	82 b	77 b	82 ab	86 c	89 ab	-	88 a	90 b
Andante	194 seeds/m^2	82 bc	76 a	78 c	94 b	81 d	76 c	81 b	87 b	89 ab	-	88 a	90 b
Andante	237 seeds/m^2	84 a	78 a	78 c	95 ab	81 d	76 c	81 b	86 c	88 bc	-	87 ab	90 b
Andante	280 seeds/m^2	83 ab	77 a	77 d	95 ab	80 e	76 c	82 ab	84 d	88 bc	-	86 b	90 b
	LSD	1	3	0	1	0	0	0	0	1		1	0
	CV%	6.1	8.9	1.9	1.4	1.0	0.5	11.3	3.7	2.1		2.7	0.8

Table 12. Nitrogen rate and variety effect on seed yield for individual years and combined site-year analyses (2023–2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (lbs/ac), Nitrogen Rate x Variety (2023-2025)																			
yield (lbs/ac)		Swift Current								Indian Head								Redvers							
		3 site years		2023		2024		2025		3 site years		2023		2024		2025		3 site years		2023		2024		2025	
Variety																									
AAC Yellow 80		1029	a	1102	a	762	a	1223	a	1493	a	1616	a	1286	a	1578	a	1145	a	1189	a	986	a	1258	a
Andante		911	b	870	b	731	b	1133	b	1404	b	1539	b	1176	b	1498	b	1063	a	1159	a	842	b	1187	b
	LSD	48		54		30		89		21		40		38		35		108		59		56		65	
Nitrogen Rate																									
Soil N		795	d	705	d	682	b	997	d	805	f	838	e	832	f	745	g	672	f	862	f	489	d	665	f
60N		897	c	902	c	764	a	1023	d	1199	e	1336	d	1071	e	1190	f	898	e	996	e	711	c	986	e
80N		974	b	973	bc	789	a	1161	cd	1371	d	1489	c	1193	d	1431	e	1031	d	1098	d	867	b	1128	d
100N		991	b	1024	ab	754	a	1194	bc	1544	c	1732	b	1295	c	1605	d	1150	c	1151	c	1039	a	1261	c
120N		1028	ab	1084	a	755	a	1245	ab	1645	b	1789	b	1371	b	1775	c	1248	b	1302	b	1034	a	1408	b
140N		1069	a	1095	a	743	a	1368	a	1760	a	1922	a	1409	ab	1950	b	1276	b	1332	b	1094	a	1400	b
160N		1037	ab	1117	a	736	ab	1257	ab	1819	a	1938	a	1448	ab	2071	a	1452	a	1480	a	1166	a	1711	a
	LSD	76		101		57		166		66		75		71		66		76		110		106		122	
Variety x Nitrogen Rate																									
AAC Yellow 80	Soil N	848	f	822	f	699	f	1023	gh	815	l	784	k	926	i	733	k	690	k	856	g	530	h	686	h
AAC Yellow 80	60N	956	de	1035	c	798	a	1035	g	1243	j	1413	h	1098	g	1219	i	981	i	1071	e	761	f	1110	f
AAC Yellow 80	80N	1024	c	1116	b	794	a	1162	ef	1442	h	1588	g	1227	e	1513	g	1030	h	1093	e	873	e	1125	f
AAC Yellow 80	100N	1021	c	1101	b	766	bc	1196	def	1568	f	1715	f	1353	d	1635	e	1206	f	1213	d	1124	b	1281	e
AAC Yellow 80	120N	1082	b	1200	a	772	bc	1274	c	1666	d	1776	de	1410	c	1812	c	1270	d	1272	c	1114	b	1423	c
AAC Yellow 80	140N	1160	a	1214	a	759	cd	1507	a	1843	b	2022	a	1479	b	2027	a	1305	c	1337	b	1143	b	1435	c
AAC Yellow 80	160N	1112	b	1225	a	744	de	1366	b	1878	a	2015	a	1509	a	2109	a	1530	a	1484	a	1360	a	1746	a
Andante	Soil N	742	g	589	h	666	g	971	h	795	l	891	j	737	j	756	k	654	l	868	g	449	l	645	h
Andante	60N	837	f	770	g	731	e	1011	gh	1155	k	1259	i	1045	h	1161	j	815	j	921	f	661	g	863	g
Andante	80N	924	e	830	f	783	ab	1160	ef	1300	i	1389	h	1160	f	1350	h	1031	h	1102	e	860	e	1131	f
Andante	100N	960	d	947	e	742	de	1192	def	1520	g	1749	e	1237	e	1575	f	1094	g	1089	e	954	d	1240	e
Andante	120N	975	d	969	e	739	de	1216	cde	1624	e	1803	cd	1332	d	1737	d	1226	ef	1332	b	953	d	1393	cd
Andante	140N	977	d	975	de	727	e	1230	cd	1677	d	1821	c	1338	d	1873	b	1247	de	1328	b	1046	c	1366	d
Andante	160N	962	d	1010	cd	728	e	1148	f	1760	c	1862	b	1388	c	2032	a	1374	b	1475	a	971	d	1675	b
	LSD	34		38		21		63		29		28		27		25		29		42		40		46	
	CV%	16.3		12.7		9.0		16.7		9.5		5.9		6.9		5.0		14.5		11.1		13.7		11.8	

Table 13. Seed rate and variety effect on seed yield for individual years and combined site-year analyses (2023-2025). Means within a column followed by the same letter do not significantly differ.

Yellow Mustard Individual Means (lbs/ac), Seed Rate x Variety (2023-2025)															
yield (lbs/ac)		Swift Current				Indian Head				Redvers			
		3 site years	2023	2024	2025	3 site years	2023	2024	2025	3 site years	2023	2024	2025
Variety													
AAC Yellow 80		1023 a	910 a	770 a	1389 a	1709 a	1736 a	1466 a	1926 a	1529 a	1576 a	1313 a	1698 a
Andante		822 b	677 b	763 a	1026 a	1640 b	1680 b	1346 b	1895 a	1438 b	1594 a	1197 b	1523 b
	LSD	52	53	15	111	31	62	46	40	57	92	62	91
Seed Rate													
108 seeds/m^2		995 a	896 a	780 a	1309 a	1741 a	1765 a	1498 a	1958 a	1483 a	1576 a	1287 a	1585 a
150 seeds/m^2		986 a	811 b	770 a	1376 a	1711 a	1734 ab	1457 ab	1942 a	1493 a	1610 a	1277 a	1593 a
194 seeds/m^2		916 ab	806 bc	777 a	1164 ab	1659 b	1672 ab	1409 bc	1918 a	1500 a	1644 a	1278 a	1578 a
237 seeds/m^2		879 b	732 bc	770 a	1144 ab	1658 b	1714 ab	1342 cd	1896 ab	1473 a	1557 a	1210 a	1651 a
280 seeds/m^2		838 b	723 c	735 b	1046 b	1606 c	1654 b	1325 d	1838 b	1468 a	1537 a	1222 a	1646 a
	LSD	82	84	23	175	49	98	72	63	90	146	98	144
Variety x Seed Rate													
AAC Yellow 80	108 seeds/m^2	1104 a	1033 a	770 d	1508 b	1797 a	1817 a	1590 a	1983 a	1518 a	1527 c	1360 a	1667 b
AAC Yellow 80	150 seeds/m^2	1115 a	908 b	772 cd	1664 a	1753 b	1777 ab	1536 b	1945 b	1518 a	1558 bc	1330 a	1667 b
AAC Yellow 80	194 seeds/m^2	999 b	923 b	789 ab	1284 c	1710 c	1696 de	1492 c	1941 b	1533 a	1677 a	1329 ab	1593 bc
AAC Yellow 80	237 seeds/m^2	963 bc	828 c	780 bc	1282 c	1666 d	1743 bc	1359 e	1895 c	1528 a	1557 bc	1261 cd	1766 a
AAC Yellow 80	280 seeds/m^2	935 c	862 c	739 f	1206 c	1623 de	1648 f	1354 ef	1866 d	1548 a	1558 bc	1285 bc	1800 a
Andante	108 seeds/m^2	887 d	760 d	790 a	1109 d	1684 d	1713 cd	1406 d	1933 b	1448 bc	1625 a	1215 e	1504 cd
Andante	150 seeds/m^2	857 de	717 e	767 de	1087 d	1670 d	1692 def	1378 de	1939 b	1468 b	1661 a	1223 de	1519 cd
Andante	194 seeds/m^2	833 e	689 e	765 de	1044 de	1608 ef	1648 f	1326 fg	1851 d	1468 b	1612 ab	1228 de	1563 cd
Andante	237 seeds/m^2	794 f	618 f	759 e	1005 e	1650 d	1685 ef	1324 fg	1940 b	1417 cd	1557 bc	1159 f	1536 cd
Andante	280 seeds/m^2	740 g	602 f	732 f	886 f	1589 f	1660 ef	1297 g	1809 e	1389 d	1516 c	1158 f	1492 d
	LSD	37	38	9	78	22	44	32	28	40	65	44	91
	CV%	18.6	12.5	2.1	17	6.1	6.8	6.0	3.9	10.2	10.9	9.2	10.5

Table 14. Site operations at Swift Current, Indian Head and Redvers, (2023-2025). NOTE: SR=Seed Rate Trial. NR=Nitrogen Rate Trial.

Location	Swift Current	Indian Head	Redvers
Year	**2023**		
Stubble	Durum	Canary Seed	Barley
Seed Date	15-May	24-May	31-May
Seeded plot size	17.25m^2	22m^2	20m^2
Row Spacing	8.25 inches	12 inches	12 inches
Seed	**AAC Yellow 80** (5.5 g TSW, 99% germ), and **Andante** (6.3 g TSW, 99% germ)		
Seed rate trial	100N - 62P - 0K - 49S	120N - 36P - 10K - 10S	110N - 20P - 0K - 10S
	Seed rate varied by treatment		
Nitrogen rate trial	62P - 0K - 49S	36P - 10K - 10S	38P - 10K - 15S
	Nitrogen rate varied by treatment. All plots seeded at 237 seeds/m^2		
Plant Density	08-Jun	09-Jun	30-Jun
Herbicide	Centurion/Amigo	Contender II/1% IPCO MSO	Arrow All In
Insecticide	Decis	Decis	-
Fungicide	-	Lance WDG	-
Height	01-Aug	10-Aug	12-Aug
Lodging	21-Aug	10-Aug	-
Desiccation	-	Roundup Weathermax	-
Harvest Dates	24-Aug	16-Aug	01-Sep
Location	**Swift Current**	**Indian Head**	**Redvers**
Year	**2024**		
Stubble	Durum	Canary Seed	Mixed Forage
Herbicide	Glyphosate 540/AIM	Roundup Weathermax	Roundup/Authority
Seed Date	11-May	17-May	May 17 (NR), May 21 (SR)
Seeded plot size	17.25m^2	22m^2	9m^2
Row Spacing	8.25 inches	12 inches	12 inches
Seed	**AAC Yellow 80** (5.5 g TSW, 99% germ), and **Andante** (6.3 g TSW, 99% germ)		
Seed rate trial	100N - 50P - 35K - 30S	120N - 36P - 10K - 10S	100N - 60P - 0K - 49S
	Seed rate varied by treatment from 108-280 seeds/m^2		
Nitrogen rate trial	50P - 35K - 30S	36P - 10K - 10S	31P - 0K - 0S
	Nitrogen rate varied by treatment. All plots seeded at 194 seeds/m^2		
Plant Density	28-May	31-May	21-Jun
Herbicide	Assurell/Suremix	Poast Ultra/Merge	Arrow All In
Insecticide	Decis	-	-
Fungicide	-	Lance WDG/Headline EC	-
Height	06-Aug	07-Aug	15-Aug
Lodging	06-Aug	18-Jul	15-Aug
Desiccation	-	Roundup Weathermax	-
Harvest Dates	08-Aug	19-Aug	30-Aug
Location	**Swift Current**	**Indian Head**	**Redvers**
Year	**2025**		
Stubble	Durum	Canary Seed	Oat
Herbicide	Glyphosate 540/AIM	Roundup Weathermax	Roundup/Authority
Seed Date	02-May	13-May	24-May
Seeded plot size	17.25m^2	22m^2	11.2m^2
Row Spacing	8.25 inches	12 inches	12 inches
Seed	**AAC Yellow 80** (5.5 g TSW, 99% germ), and **Andante** (6.3 g TSW, 99% germ)		
Seed rate trial	100N - 50P - 35K - 30S	122N - 36P - 39K - 13S	80N - 37P - 0K - 7S
	Seed rate varied by treatment from 108-280 seeds/m^2		
Nitrogen rate trial	50P - 35K - 30S	36P - 39K - 13S	37P - 0K - 7S
	Nitrogen rate varied by treatment. All plots seeded at 194 seeds/m^2		
Plant Density	28-May	03-Jun	13-Jun
Herbicide	Assurell/Suremix	Poast Ultra/Merge	Centurion ADV
Insecticide	Decis	Decis	Decis
Fungicide	-	Lance WDG	-
Height	08-Aug	17-Jul	19-Aug
Lodging	08-Aug	08-Aug	19-Aug
Desiccation	Reglone Ion/LI700	Roundup Weathermax	-
Harvest Dates	22-Sep	25-Aug	10-Sep

Table 15. Seed rate conversions from seeds/m² to lb/ac are presented. All site-years used the same seed lot. Treatment seed rates ranged from 10 to 26 seeds/ft²; 6 seeds/ft² is included for informational purposes only.

Andante (TSW=6.3 grams, or 0.0138891 lbs/1000 seeds)											
Target plant stand		**Seed rate assuming 50% emergence**								**Seed weight per acre**	
3	plants/ft^2	6	seeds/ft^2	or	65	seeds/m^2	or	263,046	seeds/ac	3.7	lbs/ac
5	plants/ft^2	10	seeds/ft^2	or	108	seeds/m^2	or	437,061	seeds/ac	6.1	lbs/ac
7	plants/ft^2	14	seeds/ft^2	or	150	seeds/m^2	or	607,029	seeds/ac	8.4	lbs/ac
9	plants/ft^2	18	seeds/ft^2	or	194	seeds/m^2	or	785,091	seeds/ac	10.9	lbs/ac
11	plants/ft^2	22	seeds/ft^2	or	237	seeds/m^2	or	959,106	seeds/ac	13.3	lbs/ac
13	plants/ft^2	26	seeds/ft^2	or	280	seeds/m^2	or	1,133,121	seeds/ac	15.7	lbs/ac
AAC Yellow 80 (TSW=5.5 grams, or 0.0121254 lbs/1000 seeds)											
Target plant stand		**Seed rate assuming 50% emergence**								**Seed weight per acre**	
3	plants/ft^2	6	seeds/ft^2	or	65	seeds/m^2	or	263,046	seeds/ac	3.2	lbs/ac
5	plants/ft^2	10	seeds/ft^2	or	108	seeds/m^2	or	437,061	seeds/ac	5.3	lbs/ac
7	plants/ft^2	14	seeds/ft^2	or	150	seeds/m^2	or	607,029	seeds/ac	7.4	lbs/ac
9	plants/ft^2	18	seeds/ft^2	or	194	seeds/m^2	or	785,091	seeds/ac	9.5	lbs/ac
11	plants/ft^2	22	seeds/ft^2	or	237	seeds/m^2	or	959,106	seeds/ac	11.6	lbs/ac
13	plants/ft^2	26	seeds/ft^2	or	280	seeds/m^2	or	1,133,121	seeds/ac	13.7	lbs/ac