2024 POGA Milling Oats Trial: Increase the Oat Acres in Alberta by Finding a High-Yielding Oat Variety that Maximizes Producer Income and Meets the Demands of the Millers

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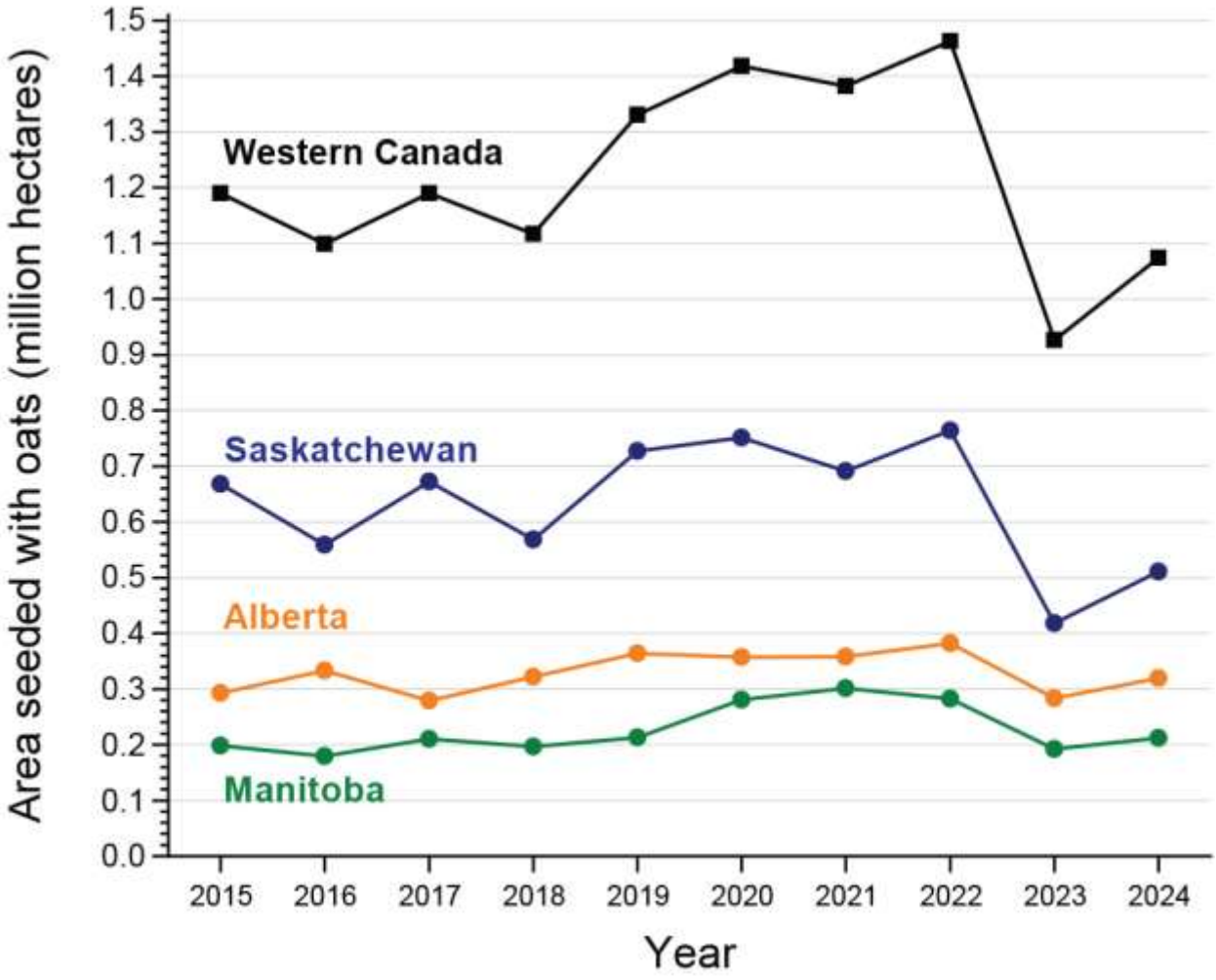
Abstract:

Since 2016, Gateway Research Organization (GRO) has collaborated with the Prairie Oat Growers Association (POGA) to conduct an in-depth evaluation of eleven approved oat milling varieties, focusing on their performance and beta-glucan content in central Alberta (Westlock) and the Peace Region (Falher). This ongoing initiative aims to provide valuable insights into how different oat varieties and regional growing conditions influence yield and the functional attributes associated with beta-glucan levels. Over the years, the study has consistently highlighted notable varietal differences in yield and beta-glucan content across the two regions. In 2024, the Westlock site experienced lower-than-average precipitation in May, which resulted in a delayed start to the growing season. Despite these challenges, at both locations, the overall crop yields were average and met the expectations of grain producers, reaffirming the resilience of the evaluated oat varieties.

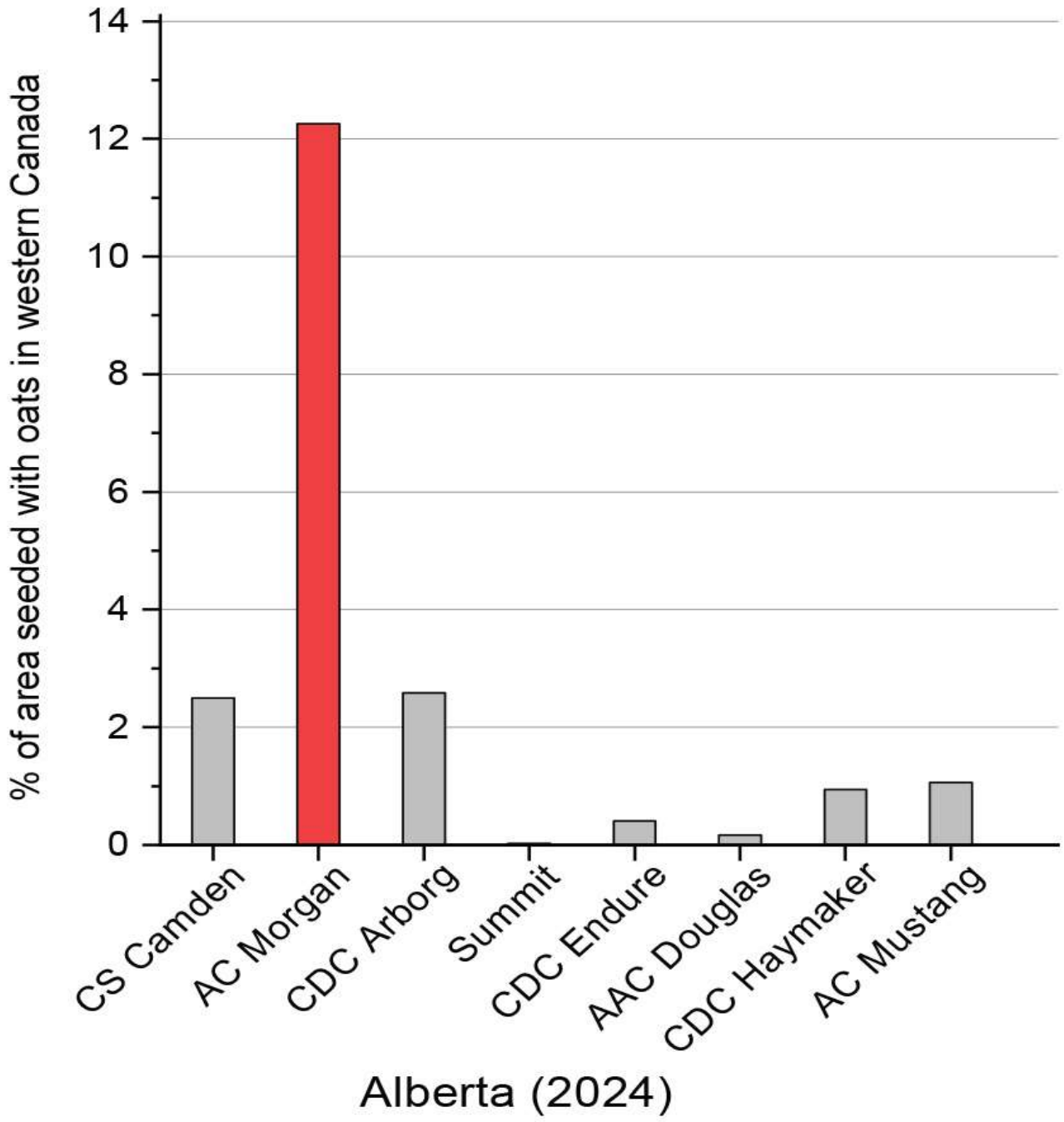
Project Background:

Oat acreage in Alberta experienced a decline in the early 2010s but has shown a consistent upward trend since 2018. While there was a slight decrease in 2023, the trend rebounded in 2024. According to Statistics Canada, total oat production in 2024 increased by 27.0%, reaching 3.4 million tonnes. This growth was driven by a 20.3% rise in harvested area, totaling 2.5 million acres, and a 5.7% improvement in yield, averaging 88.7 bushels per acre.



Source: https://www.grainscanada.gc.ca/en/grain-research/grain-harvest-export quality/oats/2024/

However, many major millers would not accept oats from Alberta or look to Alberta only after Manitoba and Saskatchewan's supply is gone because Morgan is the main oat variety grown in Alberta.



Source: https://www.grainscanada.gc.ca/en/grain-research/grain-harvest-export quality/oats/2024/

A minimum of 4% β-glucan is required for companies to be able to label their products with the Heart Healthy Claim. Morgan is consistently at or below that amount. Therefore, oat producers in Alberta need an oat variety that can consistently meet or beat the yields of Morgan but that also has the higher β-glucan amounts that oat millers desire.

To emphasize this fact, since 2015 Grain Millers Canada Corp. has helped to fund this variety trial, hoping to identify oat varieties that will help Alberta producers access the milling market more consistently.

Oats are a valuable part of crop rotations and are therefore beneficial to producers. They provide disease and insect breaks for wheat, barley, and canola. Their rapid establishment and growth provide excellent weed suppression. Oats also work well as a “catch crop” for taking up and storing excess nitrogen, and the straw provides a nutrient source for the following year’s crop. The straw also protects against soil erosion and contributes to an increase in the soil's organic matter content (Campbell et al., 1991). Well-planned management and appropriate selection of varieties make oats a profitable crop due to their low input requirements and favorable effects on succeeding crops in a rotation.

Test weight is the most used indicator of grain quality. High test-weight varieties should be chosen by growers who intend to market oat grain. However, functional attributes such as β-glucan solubility and viscosity are the main criteria for the processing industry. Many studies have shown that oat β-glucan can lower blood cholesterol levels, glucose, and insulin response and therefore decrease the risk of cardiovascular diseases and aid in prevention of diabetes (Wang and Ellis, 2014).

Oats are regularly affected by crown rust in other parts of Western Canada, and this disease is moving west, towards Alberta. Morgan does not have crown rust resistance but selecting new disease-resistant varieties can overcome the problem. The information to assist a producer in choosing a newer and higher-yielding variety, specific to their region, is therefore, a particularly important step to staying profitable in oat production. The β-glucan content in oats may vary with changes in growing conditions (Perez Herrera et al., 2016). The current trial will provide valuable agronomic information for the producers in Alberta to grow oat varieties with higher yields and increased functional properties (β-glucan) attributes.

Objective

To investigate the impact of genotype and growing condition on the yield and β-glucan content of milling oat varieties in Alberta.

Methodology

In 2024, eleven milling oat varieties were evaluated. Fertilizers were applied according to soil fertility recommendations to ensure optimal growing conditions. Seeding rates for each variety were determined using a seed counter and calculated based on the 1,000-kernel weight, desired plant density, and germination percentage. A 9-inch spaced; six-row Fabro small plot seeder was used for planting. Each variety was sown in plots measuring 9.59 square meters (1.37 meters wide and 7 meters long), with four replications for statistical reliability.

The trial site was meticulously maintained weed-free through the application of herbicides. Harvesting was conducted using a Zurn 150 plot harvester equipped with a 5-foot header. Grain yields from each plot were recorded using electronic scales. Additionally, a clean composite sample of 500 grams was collected from each plot and submitted for β-glucan analysis.

Table 1: Soil Information - 2024

	Nitrogen (lbs/ac)	Phosphorus (lbs/ac)	Potassium (lbs/ac)	Sulphur (lbs/ac)	pH (0-14)	CEC (meq/100g)	Organic Matter (%)
Westlock	34	38	228	32	5.6	24.8	7.7
Peace Region	13	58	238	22	5.5	17.9	4.8

Table 2: Agronomic details for the POGA Trail 2024		
Location:	**Westlock**	**Peace Region**
Seeding Date:	May 15, 2024	May 08, 2024
Soil Temp:	9^0 Celsius	12.3^0 Celsius
Soil Moisture:	Excellent	Excellent
Seeding Depth:	1inch	¾ inch

Rainfall (mm)	221.2 mm	275 mm
Fertilizer Applied (Actual lb/acre)	**110 N*-35 P-60 K-15 S** (* In the fall of 2023, the producer applied 70 pounds per acre of actual nitrogen (N) as part of the nutrient management plan. The remaining 40 pounds per acre of actual nitrogen was subsequently applied at the time of seeding to ensure adequate nutrient availability for optimal crop growth.)	**93 N-20 P-15 K- 15 S**
Pre-emergence Herbicides Applied	None	Pre-emergence: Pre-Pass Flex @ 8.1 g/ac + Roundup @ 1 l/acre - May 11
In-crop Herbicides Applied	Partner @ 400 ml/ac + MCPA Ester 600 @ 320 ml/ac - June 10; Prestige A @710 ml/ac and Prestige B @ 600 ml/ac - June 24	Stellar XL @405 ml/ac - June 22
Insecticide Applied	None	None
Pre-harvest	Glyphosate @ 360 g ae/ac - Sept 03	None
Harvest Date:	September 20, 2024	Sept 11, 2024

In 2024, three new entries—CDC Byer, AAC Anthony, and AAC Neville—were incorporated into a trial. Simultaneously, prior entries, including Kalio, OReLevel 50, and OT 6024, were removed from consideration.

Table 3: Yield – 2024 Comparison

		Westlock			Peace Region		
	Variety Name	**% of AC Morgan**	**Yield bu/ac**		**% of AC Morgan**	**Yield bu/ac**	
1	AC Morgan	100%	178.5	cd	100%	184.3	-
2	CS Camden	104%	186.3	bc	94%	173.0	-
3	CDC Arborg	104%	185.8	bc	97%	179.3	-
4	CDC Endure	107%	190.3	b	99%	182.3	-
5	AAC Douglas	97%	173.3	d	94%	173.0	-
6	CDC Byer*	112%	199.3	a	98%	181.0	-
7	CDC Anson	101%	180.3	bcd	93%	171.5	-

8	CDC Ruffian	103%	184.3	bc	102%	188.0	-
9	AAC Wesley	96%	171.3	d	100%	184.5	-
10	AAC Anthony*	97%	173.0	d	100%	184.5	-
11	AAC Neville*	95%	169.3	d	96%	177.8	-

Means followed by the same letter do not significantly differ (P=.05, Student Newman - Keuls).

Across both regions, AC Morgan consistently achieves high yields, with slightly higher yields in the Peace Region compared to Westlock. In Westlock, CDC Byer and CDC Endure were the highest-yielding varieties for 2024, followed by CS Camden. In the Peace Region, CDC Ruffian demonstrated superior yield performance compared to the other entries in the trial.

Table 4: Other results from the POGA trial 2024 Westlock Site

Westlock											
	Variety Name	**Height cm**		**Lodging (1-9)**		**Bushel Weight lbs/bu**		**Test Weight kg/HL**		**TKW g**	
1	AC Morgan	90	b	1	na	44.3	ab	54.7	ab	41.9	b
2	CS Camden	89	b	1	na	43.5	abc	53.7	abc	40.3	bcd
3	CDC Arborg	95	a	1	na	45.2	a	55.7	a	40.9	bc
4	CDC Endure	90	b	1	na	44.4	ab	54.8	ab	39.6	bcd
5	AAC Douglas	85	bc	1	na	43.6	abc	53.8	abc	39.4	bcd
6	CDC Byer	83	c	1	na	44.5	ab	54.9	ab	38.4	cd
7	CDC Anson	74	d	1	na	43.5	abc	53.6	abc	39.7	bcd
8	CDC Ruffian	82	c	1	na	44.2	ab	54.6	ab	37.3	d
9	AAC Wesley	78	d	1	na	42.9	bc	53.0	bc	38.8	cd
10	AAC Anthony	88	b	1	na	42.0	c	51.8	c	46.3	a
11	AAC Neville	75	d	1	na	44.1	ab	54.5	ab	39.2	bcd
LSD P=.05		3.88		.		1.22		1.50		1.87	
Standard Deviation		2.69		0		0.84		1.04		1.29	
CV		3.19		0		1.92		1.92		3.22	

Means followed by the same letter do not significantly differ (P=.05, Student-Newman-Keuls).

Table 5: Other results from the POGA trial 2024 Peace site

Peace Region											
	Variety Name	**Height cm**		**Lodging (1-9)**		**Bushel Weight lbs/bu**		**Test Weight kg/HL**		**TKW g**	
1	AC Morgan	87	abc	1	na	44.6	a	55.1	a	43.0	b
2	CS Camden	84	cd	1	na	43.0	c	53.0	c	42.5	b
3	CDC Arborg	88	ab	1	na	44.6	a	55.0	a	42.5	b
4	CDC Endure	91	a	1	na	43.2	bc	53.4	bc	44.9	a
5	AAC Douglas	86	bc	1	na	42.5	cd	52.5	cd	42.3	b
6	CDC Byer	81	d	1	na	44.6	a	55.1	a	39.2	e
7	CDC Anson	71	f	1	na	43.4	bc	53.6	bc	41.0	c
8	CDC Ruffian	82	d	1	na	44.2	ab	54.5	ab	39.8	de
9	AAC Wesley	77	e	1	na	42.6	cd	52.6	cd	40.7	cd
10	AAC Anthony	87	abc	1	na	41.8	d	51.5	d	45.0	a
11	AAC Neville	77	e	1	na	45.0	a	55.5	a	40.3	cd
LSD P=.05		3.08		.		0.83		1.02		0.82	
Standard Deviation		2.13		0		0.57		0.71		0.57	
CV		2.57		0		1.32		1.32		1.35	

Means followed by the same letter do not significantly differ (P=.05, Student-Newman-Keuls).

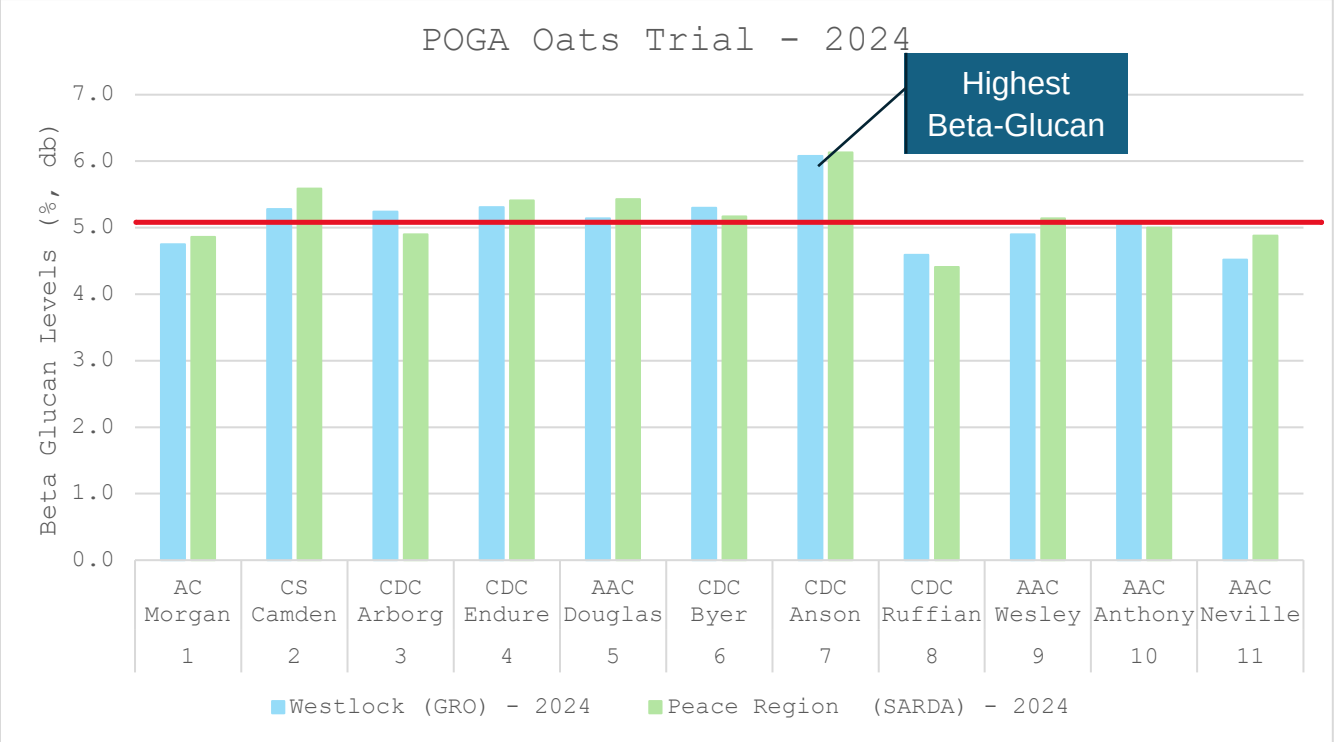
Test weight is a vital parameter in assessing the milling quality of grain, particularly oats. A higher test weight typically correlates with better processing characteristics, reduced waste, and improved end-product quality, making it an essential metric for both producers and processors in the oat industry.

In recent evaluations, CDC Arborg demonstrated the highest test weight at the Westlock location, showcasing its superior grain density and potential for high milling yield in that region. Similarly, AAC Neville outperformed other varieties in test weight at the Peace region site, highlighting its adaptability and quality performance under the specific conditions of that area. These results underscore the importance of selecting oat varieties with optimal test weight characteristics to maximize economic returns and ensure consistent milling quality.

Table 6: The Beta-Glucan Results from the POGA Trial of 2024

	Westlock	Peace Region

		(GRO) - 2024		(SARDA) - 2024	
Treatment #	**Variety Name**	**Hull percentage (%)**	**Flour BG (%, db)**	**Hull percentage (%)**	**Flour BG (%, db)**
1	AC Morgan	24.9	4.75	24.5	4.86
2	CS Camden	26.0	5.28	26.3	5.59
3	CDC Arborg	24.3	5.24	23.9	4.90
4	CDC Endure	22.5	5.31	22.0	5.41
5	AAC Douglas	24.9	5.14	25.7	5.43
6	CDC Byer	24.3	5.30	24.6	5.17
7	CDC Anson	23.2	6.08	22.2	6.13
8	CDC Ruffian	21.1	4.59	21.3	4.41
9	AAC Wesley	23.8	4.90	22.3	5.14
10	AAC Anthony	26.8	5.06	26.5	5.00
11	AAC Neville	27.2	4.52	26.7	4.88



All the oat varieties present in the trial, exceed the industry's minimum standard of 4% beta-glucan content, ensuring they meet the required nutritional benchmarks. The entries placed above the red line represent the top-tier quality, as they not only meet but surpass the established criteria for premium oats. These exceptional varieties are distinguished

by their superior beta-glucan levels, positioning them as ideal candidates for products that prioritize high nutritional value and health benefits, such as those making heart health or cholesterol-lowering claims.

Crop Year	Top 3 Varieties for Beta Glucan at Westlock		
2024	CDC Anson	CDC Endure	CDC Byer
2023	AAC Douglas	CDC Anson	AAC Wesley
2022	CDC Endure	OT3112	AAC Douglas
2021	OT3112	CDC Endure	CDC Skye
2020	OT3112	CDC Endure	CDC Skye
2019	CDC Endure	CDC Arborg	AC Morgan
2018	CDC Endure	CDC Arborg	Triactor
2017	CS Camden	Akina	CDC Ruffian
2016	CDC Seabiscuit	CDC Ruffian	CDC Orin
	Top 3 Varieties for Beta Glucan at Peace Region		
	CDC Anson	CS Camden	AAC Douglas
2023	CDC Anson	CDC Endure	OT 6024
2022	CDC Endure	OT 6024	CDC Arborg
2021	OT3112	CDC Endure	CDC Skye
2020	CDC Skye	OT3112	CDC Endure
2019	CDC Seabiscuit	CDC Arborg	CS Camden
2018	Triactor	AC Morgan	CDC Endure
2017	CDC Ruffian	CS Camden	CDC Orin
2016	CDC Ruffian	AC Morgan	CDC Seabiscuit

****CDC Anson is the official name of OT 3112*

Results and Discussion

The environment played a significant role in shaping outcomes this year. The Westlock site experienced below-average rainfall, receiving only 75% of the annual norm, while the

Peace region recorded rainfall levels consistent with a typical year. This disparity largely explains why the average yield at the Westlock site did not surpass 200 bushels per acre. The average crop yield in Westlock reached 181 bu/ac—lower than a normal year—but slightly higher than the Peace region's average of 180 bu/ac. However, this difference was not statistically significant.

All tested varieties demonstrated excellent lodging resistance, with no lodging incidents reported across either location. Plant height also showed no notable variation between the Westlock and Peace regions. In terms of test weights, the Westlock site exhibited a minor variation of up to 3.9 kg/hL between minimum and maximum values, while the Peace region showed a slightly higher difference of 4 kg/hL. Hull percentages were consistent across both sites, with CDC Ruffian consistently achieving the lowest hull percentage in both locations.

This comprehensive study highlights the potential of modern genetics to deliver robust performance in terms of both yield and quality. For instance, CDC Anson, a newer cultivar, consistently ranked among the top three varieties over two years for beta-glucan content, demonstrating its strong genetic potential.

In conclusion, both cultivar selection and location significantly influence crop yield and beta-glucan levels. Environmental factors remain critical in determining a variety's productivity and quality traits, underscoring the importance of continued research to optimize performance under varying conditions.

Table 7: Overall Summary of the Trial - Yields from 2016 to 2024 at Westlock, Alberta

	Yield	Overall Average	2024	2023	2022	2021	2020	2019	2018	2017	2016
Milling Oats	**% of AC Morgan**	**Yield (Bu/Ac)**	**Yield (Bushel/Acre)**								
AC Morgan	100%	206	179	257	192	161	203	243	226	212	178
CS Camden	99%	204	186	257	189	150	211	241	206	226	167
CDC Ruffian	100%	205	184	239	208	147	206	219	207	245	193
CDC Arborg	102%	210	186	263	198	150	208	244	221	-	-
CDC Endure	101%	207	190	252	195	143	194	249	226	-	-
CDC Anson - OT3112	95%	196	180	254	195	140	213	-	-	-	-
AAC Douglas	94%	194	173	261	193	148	-	-	-	-	-
AAC Wesley	97%	200	171	230	199	-	-	-	-	-	-
CDC Byer	97%	199	199	-	-	-	-	-	-	-	-
AAC Anthony	84%	173	173	-	-	-	-	-	-	-	-
AAC Neville	82%	169	169	-	-	-	-	-	-	-	-
Kalio	93%	191	-	252	180	141	-	-	-	-	-
ORE Level 50	99%	205	-	227	182	-	-	-	-	-	-
OT 6024	106%	217	-	241	193	-	-	-	-	-	-
AC Summit	92%	189	-	-	-	121	178	245	203	217	167
CDC Skye	91%	188	-	-	-	115	211	237	-	-	-
ORE3541M	56%	115	-	-	-	115	-	-	-	-	-
CDC Seabiscuit	102%	211	-	-	-	-	205	239	212	208	189
ORE3542M	97%	199	-	-	-	-	183	214	201	-	-
CDC Norseman	101%	208	-	-	-	-	190	222	213	-	-
Triactor	103%	212	-	-	-	-	-	238	229	208	172

Akina	100%	206	-	-	-	-	-	-	221	222	176
CDC Orrin	98%	202	-	-	-	-	-	-	218	221	168
Souris	85%	175	-	-	-	-	-	-	-	194	155
Kara	97%	199	-	-	-	-	-	-	-	222	175
CDC Minstrel	91%	188	-	-	-	-	-	-	-	202	174

Table 8: Overall Summary of the Trial - Yields from 2016 to 2024 at Peace Region, Alberta

	Yield	**Overall Average**	**2024**	**2023**	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**
Milling Oats	**% of AC Morgan**	**Yield (Bu/Ac)**	**Yield (Bushel/Acre)**								
AC Morgan	100%	193	184	187	235	20	211	224	252	220	203
CS Camden	98%	190	173	192	265	29	183	232	217	226	190
CDC Ruffian	102%	197	188	188	259	21	207	203	241	249	218
CDC Arborg	99%	192	179	194	269	28	199	236	237	-	-
CDC Endure	97%	186	182	184	240	25	206	225	243	-	-
CDC Anson - OT3112	85%	164	172	177	268	23	180	-	-	-	-
AAC Douglas	82%	158	173	185	254	20	-	-	-	-	-
AAC Wesley	111%	214	185	190	266	-	-	-	-	-	-
CDC Byer	94%	181	181	-	-	-	-	-	-	-	-
AAC Anthony	96%	185	185	-	-	-	-	-	-	-	-
AAC Neville	92%	178	178	-	-	-	-	-	-	-	-
Kalio	78%	151	-	184	248	22	-	-	-	-	-
ORE Level 50	104%	200	-	181	219	-	-	-	-	-	-
OT 6024	116%	223	-	196	250	-	-	-	-	-	-
AC Summit	90%	173	-	-	-	19	181	227	228	210	173
CDC Skye	74%	143	-	-	-	20	196	213	-	-	-

ORE3541M	14%	27	-	-	-	27	-	-	-	-	-
CDC Seabiscuit	115%	221	-	-	-	-	196	240	242	224	203
ORE3542M	108%	209	-	-	-	-	197	205	225	-	-
CDC Norseman	111%	214	-	-	-	-	190	214	238	-	-
Triactor	118%	227	-	-	-	-	-	224	256	240	189
Akina	112%	215	-	-	-	-	-	-	242	214	190
CDC Orrin	110%	211	-	-	-	-	-	-	239	227	168
Souris	93%	180	-	-	-	-	-	-	-	191	169
Kara	108%	208	-	-	-	-	-	-	-	226	190
CDC Minstrel	101%	194	-	-	-	-	-	-	-	196	192

Table 9: Overall Summary of the Trial - Beta-glucan (%) contents in milling oats from 2017 to 2024

Milling Oats	**Average**		**2024**		**2023**		**2022**		**2021**		**2020**		**2019**		**2018**		**2017**		**2016**	
	WL	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**	**WL**	**PR**
AC Morgan	3.80	3.85	4.75	4.86	3.21	3.36	3.3	3.7	3.5	3.5	3.9	3.8	3.9	3.7	3.9	3.4	3.8	4.2	3.9	4.1
CS Camden	4.32	4.47	5.28	5.59	4.2	4.61	3.8	4.2	4	4	4.7	4.3	4.4	5.2	4.4	3.8	4.4	4.6	3.7	3.9
CDC Ruffian	3.67	3.76	4.59	4.41	3.51	3.3	3.6	5.1	3.3	3.9	4.3	3.5	3.6	3.7	3.6	2.7	3.8	3.9	2.7	3.3
CDC Arborg	4.38	4.39	5.24	4.90	4.25	4.41	4.2	5.5	3.8	4.2	4.6	3.6	4.2	4.3	4.4	3.8	-	-	-	-
CDC Endure	4.75	4.92	5.31	5.41	4.52	5.04	4.9	6	4.1	4.5	5.2	4.6	4.5	4.7	4.7	4.2	-	-	-	-
CDC Anson	5.43	5.31	6.08	6.13	5.19	5.12	4.9	5.4	4.9	5.1	6.1	4.8	-	-	-	-	-	-	-	-
AC Douglas	4.87	4.71	5.14	5.43	5.85	4.11	4.8	5.2	3.7	4.1	-	-	-	-	-	-	-	-	-	-
AAC Wesley	4.59	4.93	4.90	5.14	4.88	4.35	4	5.3	-	-	-	-	-	-	-	-	-	-	-	-
CDC Byer	5.30	5.17	5.30	5.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AAC Anthony	5.06	5.00	5.06	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AAC Neville	4.52	4.88	4.52	4.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kalio	4.01	3.67	-	-	3.84	3.11	4.6	4.1	3.6	3.8	-	-	-	-	-	-	-	-	-	-
ORE Level 50	4.43	4.28	-	-	4.16	3.35	4.7	5.2	-	-	-	-	-	-	-	-	-	-	-	-

OT 6024	4.53	5.37	-	-	4.76	4.83	4.3	5.9	-	-	-	-	-	-	-	-	-	-	-	-
AC Summit	4.12	4.05	-	-	-	-	-	-	3.4	3.4	4.8	4.5	4.3	4.6	4.3	3.7	4.3	4.4	3.6	3.7
CDC Skye	4.47	4.73	-	-	-	-	-	-	4	4.2	4.9	5	4.5	5	-	-	-	-	-	-
ORE 3541M	3.60	3.80	-	-	-	-	-	-	3.6	3.8	-	-	-	-	-	-	-	-	-	-
CDC Seabiscuit	4.36	4.04	-	-	-	-	-	-	-	-	4.6	4	4.5	4.2	4.4	3.7	4.6	4.6	3.7	3.7
ORE3542M	4.07	3.83	-	-	-	-	-	-	-	-	4.4	3.8	3.8	4.2	4	3.5	-	-	-	-
CDC Norseman	4.67	4.27	-	-	-	-	-	-	-	-	4.8	4.6	4.7	4.4	4.5	3.8	-	-	-	-
Triactor	4.10	4.13	-	-	-	-	-	-	-	-	-	-	4.1	4.3	4.4	4	4.4	4.5	3.5	3.7
Akina	4.53	4.20	-	-	-	-	-	-	-	-	-	-	-	-	4.8	4	5	4.9	3.8	3.7
CDC Orrin	3.90	3.70	-	-	-	-	-	-	-	-	-	-	-	-	4.1	3.4	4.4	4	3.2	3.7
Souris	4.25	4.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	4.4	3.6	4.4
Kara	3.95	4.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	5	3.6	3.7
CDC Minstrel	3.40	3.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	4.3	2.9	3.5

Acknowledgments: We would like to thank the **Prairie Oat Growers Association (POGA) and Grain Millers Canada** for their full financial assistance. Special thanks to **Paul Richter** (Oat Breeder at General Mills) for contributions to lab analysis for this trial.

We would like to thank Alliance Seed, Canterra Seeds, Canada Seed Depot, FP Genetics, and SeCan for their generous seed donations for the trial. This information is presented with the understanding that no product discrimination is intended, and neither endorsement of any variety/product mentioned, nor criticism of the named variety/products is implied.