

Regional Annual Silage Trials

Partners: Alberta Agriculture and Irrigation
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
North Peace Applied Research Association
McKenzie Applied Research Association
West-Central Forage Association
SECAN
Association of Albert Co-op Seed Cleaning Plants
Alberta Brand, Canadian Seed Growers Association
A & L Canada Laboratories
Imperial Seeds

The Annual Forage Trial (AFTs) began at LARA in 2008 with the purpose of comparing annual forage crops for whole-plant production when considering both yield and quality. Funding was obtained from the Alberta Beef Producers and the Ag and Food Council. The trial was seeded in four blocks of plots (barley, oats, triticale and alternatives) in three locations (Fort Kent, St. Paul and Lac La Biche).

The trial was expanded in 2009 to form the Regional Silage Trials, a provincial partnership between six applied research and forage associations with 11 plot sites across the province. The Alberta Beef Producers provided funding for this initiative and Alberta Agriculture helped coordinate seed. While many of the associations involved have been growing silage trials for a number of years, this is the first coordinated effort to standardize the protocol, variety selection and data reporting. Provincial protocol was established for five blocks of plots: barley, oats, triticale, pulse and late-seeded.

In 2023, the LARA Regional Annual Silage Trial included three blocks: barley (15 varieties), oats (7 varieties), and triticale/wheat (5 varieties).

In partnership with the Association of Alberta Co-op Seed Cleaning Plants and the Alberta Seed Growers Association, the Regional Annual Silage Trial information is annually printed in the Alberta's Seed Guide (seed.ab.ca). The Regional Silage Trial data for 2022 and 2023 have been printed in the most recent seed guide.

Regional Annual Silage Trial

Cereals

Partners: Sustainable Canadian Agriculture Partnership
Alberta Agriculture and Irrigation
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
West-Central Forage Association
Peace Country Beef and Forage Association
Guy Brousseau

Objectives:

1. To determine the best yielding cereal forage varieties (barley, oats, triticale and wheat) for whole plant forage production in Northeastern Alberta.
2. To determine the best quality cereal forage varieties (barley, oats, triticale and wheat) for cattle feed in Northeastern Alberta.

Background:

An important aspect of crop production is variety selection and, with new varieties continually becoming available, current and comprehensive forage variety yield and quality data is essential for Alberta producers. Previous experience with cereal production and the Regional Variety Trials has shown that there can be a 15% increase in production from selecting the best variety, which, on average, can be an increase of \$25/acre.

Through the use of experience, neighbors and publication such as the Alberta Seed Guide (seed.ab.ca), we make variety selection decisions to benefit producers. However, there has been a lack of whole-plant annual forage production information to aid us in making cropping decision for forage production.

The purpose of this trial is to supply producers with current and comprehensive annual forage variety yield and quality data for silage, greenfeed or swath grazing in Northeastern Alberta (crop zones 3 and 5) and across the province.

Method:

The silage trials were grown in three blocks of plots: barley, oats and triticale/wheat, in St. Paul. The trial blocks were seeded as a randomized complete block design (RCBD) with four replicates to reduce error. The plots measured 1.15 m by 6 m in area.

Agronomic information on the trials can be found in Table 2.1. The trials were seeded using the LARA five-row zero-till small plot drill and blend fertilizer was side-banded at the time of seeding. The trials were sprayed with a 3-point hitch sprayer once during the growing season.

Crop height and stage of maturity was recorded prior to harvest with the LARA alfalfa-Omega self-propelled forage harvester. The total plot weight was recorded and samples were taken to assess dry matter content. Additional composite samples were taken from each variety, frozen and sent to A & L Canada Laboratories for wet chemistry analysis.

The following varieties were grown in the Regional Annual Silage Trials in 2023:

Barley

- *CDC Austenson* – 2-row barley variety with semi-smooth awns, short and strong straw and high feed yield.
- *AB Standswell* – 6-row barley variety with high grain and forage yield.
- *AAC LARIAT* – 2-row hulled barley with excellent yield potential and good standability.
- *AB Maximizer* – 2-row hulled barley with good potential for forage production.
- *CANTU* – 2-row barley variety with excellent yield potential and good standability.
- *Bighorn* – 2-row feed barley variety with excellent yield potential.
- *CDC Durango* – 2-row barley variety with excellent grain yield and good agronomic performance.
- *AB Hauge* – 2-row hulled general purpose barley with potential for forage production, high protein, low NDF and ADF.
- *CDC Churchill* – high yielding 2-row malt barley variety with lower grain protein than AC Metcalfe and an overall excellent agronomic package.
- *AB Prime* – barley variety developed in Alberta.
- *Esma* – 2-row barley variety with strong yields and agronomic package.
- *Stockford* – hooded, 2-row barley variety suitable for grain production, hay, and forage.
- *CDC Renegade* – 2-row smooth awn, mid-height barley with excellent forage yield and great grain yield.
- *CDC Fraser* – 2-row malt variety that is multi-use with high grain and good forage yields.
- *KWS Kellie* – very short, strong strawed 2-row European barley with excellent grain yield.

Oats

- *CDC Baler* – very leafy, forage oat variety.
- *CS Camden* – milling oat, excellent yield potential, great lodging resistance, short height, and big leaf biomass
- *CDC Arborg* – is a milling oat with good yield potential, early maturing, lodge resistant.
- *Ore BOOST (OT6037)* – light yellow hulled oat variety with excellent yield potential.
- *AAC WESLEY* – white hulled oat variety with good yield potential, early maturity and reduced height.
- *CDC Endure* – oat variety with excellent yield and standability.

- *AAC Douglas* - is a high β -glucan white hulled milling oat with high grain yield potential and excellent groat percentage.

Triticale and Wheat

- *AAC Paramount* – soft white spring wheat, midge tolerant, high grain protein, good fit for silage production
- *AB Stampeder* – new spring forage triticale variety with reduced awns, shorter stature and increased digestibility.
- *Alotta* – high yielding special purpose spring wheat with rust tolerance.
- *AC Sadash* – semi-dwarf soft white spring wheat variety with high yields, high quality and short, strong straw.
- *KWS Alderon* – high yielding special purpose red spring wheat, short stature, strong straw, late maturing, no awns, does well in cooler growing seasons.

Table 2.1. Agronomic Information 2023.

		# of	Seeding	Seeding	Fertility	Weed	Harvest	Accumulated
Trial	Site	Varieties	Date	Rate	(lbs/ac)	Control	Date	Precipitation
Barley	St. Paul	15	30-May-22	28 plants/ sq ft	92-34-69	Buctril M	16-Aug-23	173 mm
Oats	St. Paul	7	30-May-22	28 plants/sq ft	88-28--61	Buctril M	08-Aug-23	156 mm
Wheat/Triticale	St. Paul	5	30-May-22	33-35 plants/ sq ft	117-68-118	Buctril M	28-Aug-23	223 mm

Results:

Barley

The barley trials are aimed to be harvested at the soft dough stage. This year, we only had one barley site, which was in St. Paul County. We had a total of 15 barley varieties grown in the trails at this location. There were 6 new barley varieties (6- row; AB Standswell and 2-row; AAC Lariat, AB Maximizer, Cantu, Bighorn and CDC Durango) added to the trial this year. The trial was harvested at 76 days after seeding. We found significant differences among varieties when considering forage dry matter yield as % of check, Austenson (Table 2.2). A total of 9 varieties; CDC Durango, CDC Churchill, CDC Renegade, Bighorn, AB Hague, Cantu, KWS Kellie, AB Prime and AB Maximizer yielded 21, 19, 16, 15, 13, 8, 7, 7 and 5% higher than the check variety, respectively. Varieties such as., Stockford, AAC Lariat, Esma, CDC Fraser and AB Standswell yielded 1, 1, 8, 10 and 21% lower than the check variety, respectively.

For crude protein (CP), the general rule of thumb is 7-9-11 % for mid gestation, late gestation and after calving. Most of the varieties had CP content between 7-9%, adequate to meet the nutrient requirements from mid gestation to late gestation. Total digestible nutrients (TDN), which is the easiest method to estimate the amount of energy in the feed, was adequate to meet the nutritional requirements until late gestation, following the rules of 55-60-65. More information is available on <https://www.seed.ab.ca/variety-data/silage/>.



Table 2.2. Barley RST, 2023.

Variety:	2023 Quality Results											
	DM Yield (% of Austenson)	CP (% DM)	ADF (% DM)	NDF (% DM)	TDN (% DM)	Starch (% DM)	WSCs (% DM)	IVTD-30hrs (% DM)	Ca (% DM)	P (% DM)	K (% DM)	Mg (% DM)
CDC DURANGO	121% a	7.7 de	35.6 a	47.7 a	60.6 a	21.6 a	7.8 a	65.4 a	0.51 abcd	0.26 a	2.97 a	0.31 a
CDC CHURCHILL	119% ab	7.6 de	35.1 a	47.8 a	61.1 a	21.2 a	7.6 a	66.6 a	0.50 bcde	0.26 a	2.80 a	0.29 a
CDC RENEGADE	116% ab	8.7 ab	33.8 a	47.3 a	62.5 a	18.4 a	11.2 a	69.6 a	0.54 ab	0.26 a	2.46 a	0.30 a
BIGHORN	115% abc	7.6 de	34.2 a	45.5 a	62.1 a	24.4 a	7.4 a	68.6 a	0.45 f	0.27 a	2.96 a	0.30 a
AB HAGUE	113% bcd	8.6 ab	34.1 a	48.8 a	62.2 a	21.0 a	8.0 a	67.9 a	0.50 bcdef	0.26 a	2.40 a	0.26 a
CANTU	108% cde	7.9 cde	34.0 a	43.4 a	62.3 a	25.3 a	7.5 a	70.0 a	0.46 ef	0.27 a	3.22 a	0.31 a
KWS KELLIE	107% cdef	8.5 abc	33.9 a	44.2 a	62.4 a	22.8 a	9.0 a	69.4 a	0.53 ab	0.26 a	2.80 a	0.30 a
AB PRIME	107% def	8.1 bcde	36.2 a	51.6 a	59.9 a	18.6 a	7.1 a	65.2 a	0.51 abcd	0.26 a	2.77 a	0.26 a
AB MAXIMIZER	105% efg	8.2 bcde	34.5 a	48.1 a	61.8 a	21.6 a	7.7 a	68.6 a	0.47 def	0.27 a	2.74 a	0.28 a
CDC AUSTENSON	100% fg	8.2 bcde	35.9 a	48.7 a	60.3 a	20.3 a	5.9 a	64.1 a	0.50 bcdef	0.27 a	3.21 a	0.31 a
STOCKFORD	99% g	8.9 a	34.4 a	47.5 a	61.9 a	19.2 a	8.8 a	69.2 a	0.55 a	0.27 a	2.96 a	0.30 a
AAC LARIAT	99% g	7.7 de	34.9 a	46.4 a	61.4 a	21.8 a	7.8 a	66.8 a	0.52 abc	0.26 a	2.86 a	0.29 a
ESMA	92% h	8.3 abcd	34.2 a	45.3 a	62.1 a	23.4 a	7.8 a	68.0 a	0.51 abcd	0.26 a	2.70 a	0.29 a
CDC FRASER	90% h	8.0 bcde	36.3 a	51.2 a	59.9 a	19.4 a	6.7 a	64.2 a	0.51 abcde	0.27 a	2.81 a	0.30 a
AB STANDSWELL	79% i	7.6 e	34.3 a	44.3 a	62.0 a	26.0 a	6.3 a	67.3 a	0.49 cdef	0.26 a	2.94 a	0.29 a
Average	13538	8.1	34.8	47.2	61.5	21.7	7.8	67.4	0.50	0.26	2.84	0.29
ANOVA	<.0001	0.0044	0.4496	0.3414	0.4497	0.0655	NS	0.2771	0.0046	0.1641	0.5497	0.3254
p-value	***	***	NS	NS	NS	NS	NS	NS	***	NS	NS	NS
CV%	4.25%	5.03%	4.21%	8.15%	2.54%	13.45%	20.39%	4.43%	5.23%	3.18%	14.35%	8.78%

For publication in the Alberta Seed Guide, at least six site years over two growing seasons are required prior to reporting yield data.

Please reference the January 2024 - Alberta Seed Guide for multi-site year data.

Values followed by different letters (i.e., a,b,c) are statistically different.

Values followed by the same letter are NOT statistically different (i.e., a = ab, or abc = bc).

ANOVA p-value indicates statistical significance. If the p-value is less than 0.05, then there are significant differences in the described trait.

i.e., ANOVA p-value of <0.0001 for yield means that at least one variety has a statistically different yield.

i.e., ANOVA p-value of > 0.05 means there are no statistical differences in the trait between any of the varieties.

Oats

The oats trials are aimed to be harvested at the milk stage. We had a total of 7 oats varieties grown in the trial this year in St Paul. There were 2 new varieties, ORe BOOST (OT6037) and AAC Wesley, added to the trials this year. The trial was harvested 68 days after seeding.

We found significant differences among varieties when considering forage dry matter yield as % of check, CDC Baler (Table 2.3). All varieties in this trial yielded lower than the check variety. The average CP and TDN contents in the 2023 oat variety trials were 9.8 and 60.0%, respectively. Majority of the varieties grown had CP and TDN contents sufficient to meet requirements until late gestation. More information is available on <https://www.seed.ab.ca/variety-data/silage/>.



Table 2.3. Oats RST, 2023.

Variety:	2023 Quality Results											
	DM Yield (% of CDC Baler)	CP (% DM)	ADF (% DM)	NDF (% DM)	TDN (%)	Starch (% DM)	WSCs (% DM)	IVTD-30hrs (% DM)	Ca (% DM)	P (% DM)	K (% DM)	Mg (% DM)
CDC BALER	100% a	9.6 a	37.84 a	65.1 a	58.2 d	6.8 e	13.6 a	65.3 bc	0.44 c	0.20 a	1.10 a	0.18 b
CDC ENDURE	91% b	10.4 a	36.71 ab	63.9 a	59.4 cd	10.1 cd	7.3 c	64.8 bc	0.49 ab	0.22 a	1.10 a	0.20 ab
AAC WESLEY	78% c	9.4 a	34.08 d	56.0 b	62.2 a	14.6 a	9.7 bc	70.1 a	0.50 a	0.23 a	1.38 a	0.23 a
CDC ARBORG	77% c	9.6 a	37.04 ab	60.6 ab	59.1 cd	12.3 b	8.7 bc	64.6 bc	0.51 a	0.22 a	1.47 a	0.21 a
ORe BOOST (OT6037)	73% c	10.0 a	37.30 ab	63.9 a	58.8 cd	9.4 d	7.1 c	63.3 c	0.50 a	0.21 a	1.12 a	0.20 ab
AAC DOUGLAS	61% d	9.4 a	34.52 cd	58.4 b	61.8 ab	12.0 bc	13.2 a	70.0 a	0.45 bc	0.22 a	1.02 a	0.22 a
CS CAMDEN	53% e	10.0 a	35.87 bc	60.3 ab	60.3 bc	10.7 bcd	11.2 ab	67.3 ab	0.51 a	0.22 a	1.00 a	0.22 a
Average	12549	9.8 a	36.2	61.2	60.0	10.8	10.1	66.5	0.49	0.22	1.17	0.21
ANOVA	<0.0001	0.5568	0.0037	0.0213	0.0037	0.0001	0.0036	0.0037	0.0309	0.4122	0.5969	0.0442
p-value	***	NS	**	*	**	*	**	**	*	NS	NS	*
CV%	5.06%	7.08%	2.75%	4.76%	1.77%	10.99%	18.18%	2.86%	5.69%	6.52%	30.08%	7.06%

Single site years of data are often an unreliable indicator of variety performance.

For publication in the Alberta Seed Guide, at least six site years over two growing seasons are required prior to reporting yield data.

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i.e., ANOVA p-value of > 0.05 means there are no statistical differences in the trait between any of the varieties.

Triticale and Wheat

The triticale and wheat trials are targeted to be harvested at the late milk stage. This year, the triticale and wheat silage variety trials were in St. Paul County. There were 4 wheat varieties and 1 triticale variety in the trial. Alotta was a new variety that was included in the silage trail this year. The results can be found in Table. 2.4. Harvest occurred 88 days after seeding. We found significant differences among varieties when considering forage dry matter yield as % of check, AC Sadash (Table 2.4). All varieties in this trial yielded higher than the check variety.

The average CP and TDN in the 2023 trials were 8.0 and 60.6%, respectively. Most of the varieties grown in the trials had CP and TDN contents adequate to meet nutritional requirement for mid gestation to late gestation but not for post calving. More information is available on <https://www.seed.ab.ca/variety-data/silage/>.



Table 2.4. RST Wheat and Triticale, 2023.

Variety:	2023 Quality Results												
	DM Yield (% Sadas)	CP (% DM)	ADF (% DM)	NDF (% DM)	TDN (% DM)	Starch (% DM)	WSCs (% DM)	IVTD-30 hrs (% DM)	Ca (% DM)	P (% DM)	K (% DM)	Mg (% DM)	
ALOTTA	131% a	9.2 a	34.7 b	47.7 bc	61.5 a	19.5 bc	10.0 a	65.8 a	0.52 a	0.26 b	2.32 a	0.26 a	
KWS ALDERON	131% a	9.1 a	34.5 b	48.3 bc	61.8 a	21.5 b	7.2 a	64.7 ab	0.51 ab	0.28 a	2.77 a	0.27 a	
AAC PARAMOUNT	122% b	7.4 b	36.7 a	53.4 ab	59.5 b	20.8 b	5.8 a	60.6 c	0.43 d	0.27 ab	2.39 a	0.24 a	
AB STAMPEDER	115% b	7.6 b	37.9 a	56.3 a	58.1 b	16.7 c	8.2 a	59.2 c	0.48 abc	0.24 c	2.25 a	0.24 a	
ACSADASH	100% c	7.3 b	33.4 b	43.3 c	63.0 a	26.3 a	7.9 a	66.6 a	0.46 bcd	0.27 b	2.16 a	0.28 a	
Average	18990	8.0	35.6	50.0	60.6	21.1	7.7	63.1	0.47	0.26	2.39	0.26	
ANOVA	<.0001	0.0010	0.0004	0.0187	0.0004	0.0078	0.0861	0.0043	0.0106	0.0003	0.2100	0.0945	
p-value	***	***	***	*	***	**	NS	**	*	**	NS	NS	
CV%	3.63%	6.46%	2.28%	7.40%	1.43%	10.46%	18.59%	3.07%	5.81%	2.50%	11.65%	7.14%	

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