

Annual Forage Dry Matter Trial

Background:

This project is part of a provincial initiative developed to evaluate the yield and quality potential of a number of annual crops grown for forage use. 2018 is the tenth year of this project which includes sites at several locations in the province. CARA's site in the Special Areas represents the brown soil zone. Data from the project sites in Alberta is summarized and included in the Alberta Seed Guide (Seed.ab.ca). The Summary tables as they appear in this guide are attached to this report. Project participants would like to thank Alexander Fedko, AAF for distributing seed, summarizing data and preparing the tables.

In addition to the traditional cereal trial, a group of alternative, non-traditional, crops were seeded for forage at a site within Special Area 3 near Oyen in 2018. These crops have potential to be a high nutritional quality addition to the annual feed supply for Alberta's cowherd.

Objective:

To evaluate the forage potential of various annual crops when grown under dryland conditions.

Cooperators: James Madge, Stanmore NE 20-30-11-W4 (Special Area 2)
Scory Estates, Oyen NW 35-27-04-W4 (Special Area 3)

Project Description:

Seeder: Henderson 500 plot drill with Morris contour openers

Seeding Rate: 18 plants per square foot for cereals
8 plants per square foot for peas

Previous Crop: Fallow

Seedbed Preparation: Glyphosate was applied prior to seeding

Seeding Depth: 2 - 2 ½ inches

Seeding Date: Cereals – May 18
Alternative Crops – May 25

Plot Size: 1.4 m by 5 m, replicated 4 times in randomized block design

Fertilizer: 100 lb A 26-18-5-3 on the cereals; 62 lb/A 11-52-0 on pulse mixes

Herbicides: MCPA Sodium

Site Information:

Table 1 **Soil Analysis**

Nutrient	Spring 2018
Nitrogen (0-24)	102 lb/A (marginal)
Phosphorus (0-6)	55 lb/A (optimum)
Potassium (0-6)	831 lb/A (optimum)
Sulfate (0-24)	421 lb/A (excess)
Soil Salinity (E.C.)	0.71 (good)
pH	7.3 (neutral)

Table 2 **Precipitation (inches)**

Month	Stanmore	Oyen
May	0.9	0.9
June	1.7	2.5
July	1.9	1.8
August	1.0	0.4
Total	5.5	5.6

Results:

Data was not collected from the traditional cereal blocks in 2018 (barley, oats and triticale) due to persistent, herbicide resistant kochia. The alternative forage crops were planted at a different site near Oyen. Growth was challenged by some weed pressure which required hand weeding. Table 3 summarizes the alternative crops included in the trial, the seeding rate, average yield and the range in yield. The range indicates the variability in production of these

crops in 2018 which is most likely due to weed competition. Herbicide selection is limited for these crops so none was applied. Tables 5 contains a summary of data collected between 2010 and 2017. Despite challenging growing conditions, several of the alternative crops have a very good nutritional profile. Analysis of the Japanese millet, forage brassica, radish (greens) and phacelia showed protein levels greater than 11 percent. Total digestible nutrients were as high as 70.00 percent (forage brassica). Calcium levels in the forage brassica, radish and phacelia were much higher than in the millets or sorghum sudan grass. These qualities indicate that these alternative forages may have a place within the annual feeding system for beef cattle, possibly filling a gap where high nutrient forage is required or for specific classes of cattle.

Table 3 Summary of Seed Rate (lb/A) and Yield (lb/A) – Alternative Forages 2018

	Seeding Rate (lb/A)	Average Dry Matter (lb/A)	Range (lb/A)
Chicory	5.3	0	
Forage Brassica	4	370	346 – 393
Japanese Millet	20	1234	648 – 1567
Phacelia	7	1124	675 – 1951
Plantain	9	0	
Proso Millet	20	2482	923 – 3036
Radish	4.5	1101	832 – 1674
Red Siberian Millet	20	3143	2867 – 3508
Sorghum Sudan Grass	14	1164	732 – 1668
Turnip	4	0	0

Table 4 Summary of Nutrition Analysis – Alternative Forages 2018

	Select Nutrients (%)						
	CP	TDN	ADF	NDF	Ca	P	Mg
Japanese Millet	11.01	61.90	34.66	53.44	0.76	0.19	0.49
Proso Millet	8.49	63.59	32.49	53.62	0.45	0.2	0.36
Red Siberian Millet	7.16	59.05	383.32	57.24	0.37	0.16	0.36
Forage Brassica	11.64	70.99	22.99	35.71	1.76	0.26	0.7
Radish	11.81	53.49	45.46	50.22	1.05	0.23	0.54
Phacelia	11.81	55.64	42.7	48.28	2.54	0.2	0.97
Sorghum Sudan Grass	9.97	65.23	30.38	54.69	0.56	0.18	0.32

Table 5 Summary of Dry Matter Forage Yield at Stanmore 2010-2017

Average Yield as % Check		Average Yield as % Check	
Barley (CDC Austenson Check)		Oats (CDC Baler Check)	
CDC Coalition	96 (4)	AC Juniper	103 (5)
Sundre	93 (5)	AC Morgan	97 (7)
CDC Maverick	101 (4)	CDC Haymaker	108 (5)
Champion	108 (3)	AC Mustang	99 (7)
CDC Austenson	100 (6)	CDC S0-1	90 (5)
CDC Cowboy	100 (5)	CDC Baler	100 (7)
AC Ranger	114 (3)	Murphy	100 (7)
CDC Meredith	103 (3)	Waldern	80 (6)
Claymore	100 (2)	CDC Seabiscuit	91 (3)
Canmore	103 (3)	Derby	83 (3)
Amisk	100 (3)	Everleaf	76 (2)
Altorado	93 (2)	Foothill	89 (5)
Conlon	88 (3)	Jordan	97 (4)
Gadsby	92 (4)	Triticale & Wheat (Taza Check)	
Chigwell	90 (3)	AAC Chiffon	99 (7)
Busby	107 (3)	Taza	100 (8)
Ponoka	105 (3)	Sunray	97 (4)
Seebe	97 (3)	Tyndal	123 (8)
Trochu	94 (3)	Bunker	99 (7)
Xena	98 (3)	AC Ultima	182 (3)
Vivar	89 (3)	Companion	175 (3)
		Pronghorn	145 (3)

Ⓞ 2010 - 2017 data combined

Discussion:

Moisture conditions at the site in 2017 were less than half that of 2016 which resulted in lower yield for all varieties. There wasn't a large difference in yields within each crop block except for AAC Chiffon wheat leading the triticale varieties and the CDC Austenson/CDC Leroy combination out-yielding the other entries in the pulse mix block. Due to the variations in yield from year to year, the average yield as a percentage of the check variety is more meaningful for variety selection. AC Ranger and Champion barleys have the yielding average percentage yield (114 and 108% respectively). CDC Haymaker oats is leading the oat varieties at 108% of check over 5 years of trials. Tyndal triticale is 23% above the check over 8 years.

The variability of nutritional components between varieties points to the importance of feed testing when evaluating feed sources. Although adequate for a cow in mid-pregnancy, crude protein levels of some varieties included in the trial would require supplementation for other classes of cattle. Mineral supplementation may also be required with these cereals. With a feed analysis, the Cowbytes ration balancing program can assist in developing a feeding program which will meet requirements for various classes of cattle. Contact the CARA Center (403-664-3777) if you'd like assistance.

Note – the following summary and tables appear in the Spring 2019 Alberta Seed Guide

2018 Regional Silage Variety Trials

An important component of the annual feed supply for Alberta's cattle producers comes in the form of silage, green feed and swath grazing. The selection of annual crop varieties that produce high forage yield and/or nutritional quality can be a significant factor influencing profitability.

Participating Organizations

- Battle River Research Group, Forestburg, AB (780) 582-7308
- Chinook Applied Research Association, Oyen, AB (403) 664-3777
- Gateway Research Organization, Westlock, AB (780) 349-4546
- Lakeland Agricultural Research Association, Bonnyville, AB (780) 826-7260
- Mackenzie Applied Research Association, Fort Vermilion, AB (780) 927-3776
- North Peace Applied Research Association, Manning, AB (780) 836-3354
- Peace Country Beef and Forage, Fairview, AB (780) 836-3354
- Smoky Applied Research and Demonstration Association, Falher, AB (780) 837-2900
- West Central Forage Association, Entwistle, AB (780) 727-4447

Major Sponsors

- Alberta Agriculture and Forestry, AOF Program and CDC North
- A & L Canada Laboratories Inc.
- Davidson Seeds, Degenhardt Farms, Dyck Seed Farm, Kevin Elmy, Fabian Seeds, Lindholm Seed Farm, Mastin Seeds, Solick Seeds, H. Warkentin

Trial Information

Silage trials on varieties of barley, oat and triticale commonly used for silage, green feed and swath grazing, as well as pea/cereal and fall/spring cereal mixtures, have been conducted by several Applied Research Associations at sites across Alberta, from Oyen to Fort Vermilion. Nutritional analyses were conducted on all of the varieties and variety mixtures.

Varieties of Pea/cereal mixes and spring/fall cereal mixes have also been evaluated. Growing conditions at the trial sites in 2018 ranged from below average to excessive moisture.

The cereal trials, (barley, oats & triticale), were planted at recommended seeding density rates with recommended fertility. The pea/cereal mixture trials were conducted with the intent of increasing the nutritional value of the silage while potentially reducing future nitrogen requirements. These pea/cereal plots were seeded with 55 kg/ha (50 lbs/ac) of 11-52-0-0. The pea and cereal varieties were seeded at 75 and 50 percent of their recommended seeding rates, respectively. The spring/fall cereal mixtures were included in 2018 to evaluate options for fall grazing, as the winter cereal maintains vegetative growth after silage harvest, resulting in forage with high protein content later in the year. Target seeding rate of the spring component of the mix was 75 percent of the recommended rate while the winter cereal was seeded at 50 percent. These mixes were harvested at the soft dough stage of the spring cereal.

Data submitted in 2018 have been summarized by crop or crop mixture. Information collected since 2012 has been included in a separate summary below each table. The information is presented as compared to the check variety (**in bold**). Yield of the test varieties/mixtures are expressed as wet tons/acre (ie. 65% moisture which is typical of silage production). Data sets which did not meet minimum quality and experimental standards were excluded.

Test Yield Categories

The defined range for each Test Yield Category is provided in tons per acre. Variety/mixture yields are reported as average yields in Low, Medium and High Test Yield Categories. This allows for comparison with the check when growing conditions, management regimes and/or target yields are anticipated to be of low, medium or high productivity. Caution is advised when interpreting the data with respect to new varieties that have not been fully tested. It should also be noted that the indicated yield levels are those from small plot trials, which can be 15 to 20 per cent higher than yields expected under commercial production. When considering a variety for use alone or in a mixed silage blend, be sure to consider the disease resistance and other agronomic attributes that may also affect productivity.

Nutritional Analysis

Nutrition information was assessed using NIRS for macro-nutrient assessments and wet chemistry for the micro-nutrients. Full nutritional analysis was done on two sub-samples from each variety or mix from each location. Only six key nutritional categories are reported: crude protein (CP), total digestible nutrients (TDN) which is an estimation of energy, calcium (Ca), phosphorus (P), potassium (K) and magnesium (Mg).

BARLEY																
Variety	Overall Station Years of Testing	Overall Yield	Area:						Yield Category:			Nutritional Data:				
			2	3	4	5	6	Low < 9.0 (t/ac)	Medium 9.1 - 12.0 (t/ac)	High > 12.1 (t/ac)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2018 trials (Yield and agronomic data only directly comparable to CDC Austenson)																
CDC Austenson (t/ac)		10.6	9.3	12.1	11	11.3	8.7	7.1	11.4	14.7	10.3	67	0.3	0.2	1.4	0.2
CDC Austenson	45	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
AB Cattlelac	4	102	XX	XX	XX	99	109	106	XX	89	109	97	172	85	133	126
Altorado	26	102	102	92	99	103	103	106	98	101	100	99	102	101	102	93
Amisk	33	92	100	92	91	90	89	92	91	91	104	102	134	103	104	109
CDC Coalition	37	94	97	93	92	90	100	97	91	93	101	100	103	107	106	100
Canmore	26	100	101	99	93	102	100	104	95	100	99	99	120	101	98	103
Champion	26	102	103	97	100	103	102	106	99	101	99	101	105	99	104	99
Chigwell	23	92	80	95	87	91	96	94	91	88	102	100	158	99	105	118
Claymore	26	100	105	102	97	102	94	101	93	104	94	97	124	97	99	101
Conlon	31	87	83	95	86	85	89	84	88	90	98	102	129	112	99	104
Ranger	23	94	101	99	XX	94	88	93	96	87	100	99	157	104	121	126
Sundre	37	93	97	93	87	91	98	93	94	94	101	99	134	103	113	113

BARLEY continued

Variety	Overall Station Years of Testing	Overall Yield	Area:					Yield Category:			Nutritional Data:					
			2	3	4	5	6	Low < 9.0 (t/A)	Medium 9.1 - 12.0 (t/A)	High > 12.1 (t/A)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Previously tested varieties																
Busby	19	93-	91	98	71	96	88	86-	95	97	105	99	128	100	100	103
CDC Cowboy	33	101	101	103	98	102	101	105	99	100	96	99	117	110	108	117
Gadsby	33	99	95	106	94	99	100	101	101	98	96	100	127	100	96	101
CDC Maverick	35	104	105	96	96	104	107+	110+	102	102	96	99	122	108	95	116
CDC Meredith	22	100	108	106	93	98	103	101	102	100	95	98	99	101	102	94
Muskwa	13	90-	101	93	XX	86-	91	86-	91	91-	114	100	167	107	121	127
Ponoka	19	96	90	100	100	96	95	96	94	97	101	99	148	103	104	115
Ranger	13	95	104	99	XX	96	88	85-	97	99	109	98	171	101	128	131
Seebe	19	96-	95	103	92	95-	95	95	96	97	109	96	136	109	113	103
Trochu	18	88-	XX	91	73	91-	85-	82-	89	92-	103	101	139	107	109	119
Vivar	19	93-	95	99	78	92-	93	90-	98	93	108	100	144	99	104	123
Xena	19	95-	87	101	84	92-	101	96	90	95	106	99	111	105	102	106

OAT																
Variety	Overall Station Years of Testing	Overall Yield	Area:					Yield Category:			Nutritional Data:					
			2	3	4	5	6	Low < 8.0 (t/A)	Medium 8.1 - 10.0 (t/A)	High > 10.1 (t/A)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2018 trials (Yield and agronomic data only directly comparable to CDC Baler)																
CDC Baler (t/A)		10.6	9.6	9.6	14.4	11.2	8.2	6	10	14.8	9.5	61.4	0.3	0.2	1.9	0.2
CDC Baler	43	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
AC Juniper	33	93	96	94	94	86	103	103	81	91	101	101	95	107	101	105
AC Morgan	42	100	105	100	94	96	109	104	95	100	99	101	100	112	99	97
CDC Haymaker	38	99	106	98	99	97	100	103	97	98	99	100	100	103	101	99
CDC Seabiscuit	16	99	88	103	107	98	101	97	97	102	99	101	96	99	96	98
CDC SO-1	43	96	88	103	90	95	98	99	93	95	102	102	97	102	98	103
Murphy	37	102	104	105	101	102	102	104	101	102	93	96	96	98	101	98
ORe3542M	4	99	XX	97	96	84	119	97	119	90	110	103	100	118	89	98
Waldern	36	102	98	104	98	100	110	104	106	99	95	99	107	101	95	99
Previously tested varieties																
AC Mustang	39	98	99	97	95	99	99	96	99	99	101	99	99	103	101	99
Derby	6	96	100	XX	106	89	94	89	93	101	89	100	98	99	100	110
Everleaf	5	94	XX	113	106	72	XX	108	76	67	96	98	105	97	110	92
Foothills	21	99	103	95	101	99	103	99	96	102	99	98	103	103	102	100
Jordan	20	100	107	92	88	100	121	102	102	96	97	100	96	105	97	112

TRITICALE																
Variety	Overall Station Years of Testing	Area:						Yield Category:			Nutritional Data:					
		Overall Yield	2	3	4	5	6	Low	Medium	High	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
								< 10.0 (t/A)	10.1 - 12.5 (t/A)	> 12.6 (t/A)						
Varieties tested in the 2018 trials (Yield and agronomic data only directly comparable to Taza)																
Taza (t/A)		10.9	11	11.7	13.2	10.6	9.8	7.3	11.3	15.4	9.1	62.6	0.2	0.2	1.4	0.1
Taza	49	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Bunker	41	100	100	91	107	101	101	103	98	99	102	99	109	96	96	115
Sunray	42	101	99	99	103	102	103	102	102	100	103	103	105	103	103	109
T256	5	102	XX	98	96	105	XX	105	XX	98	95	100	107	107	90	127
Tyndal	48	100	101	102	107	99	98	102	99	100	103	100	101	103	96	106
Previously tested varieties																
94I043057	7	100	103	XX	110	93	101	89	103	100	106	102	91	102	90	108
AAC Chiffon	15	104	119	111	118	92-	107	108	103	103	107	100	87	94	109	111
AAC Innova	8	104	121	119	123	83	102	95	107	107	108	100	87	106	109	107
AAC Ryley	8	97	108	104	87	87	110	86	100	101	103	100	95	106	89	117
AC Ultima	7	103	104	98	120	100	XX	109	100	104	110	100	101	93	97	122
Pasteur	8	94	110	96	97	84	103	91	99	91	107	103	96	99	107	117
Pronghorn	21	102	107	103	114	99	101	108+	99	103	103	100	102	99	109	106
Sadash	8	102	111	102	109	91	121	101	108	97	99	99	88	91	110	105

PULSE MIXTURES																
Variety	Overall Station Years of Testing	Overall Yield	Area:						Yield Category:			Nutritional Data:				
			2	3	4	5	6	Low	Medium	High	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
								< 8.0 (t/ac)	8.1 - 10.0 (t/ac)	> 10.1 (t/ac)						
Varieties tested in the 2018 trials (Yield and agronomic data only directly comparable to CDC Austenson)																
CDC Austenson (t/ac)		8.6	5.3	XX	XX	9.4	8.4	6.1	8.9	11.6	10.3	65.3	0.3	0.2	1.5	0.2
CDC Austenson	12	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CDC Baler	12	108	111	XX	XX	102	114	101	114	97	96	96	107	107	117	114
Taza	12	106	110	XX	XX	96	117	107+	109	94	96	96	76	113	96	83
CDC Austenson/CDC LeRoy	7	88	XX	XX	XX	88	89	104	87	82	124	98	186	119	114	129
CDC Austenson/CDC Meadow	12	100	105	XX	XX	98	102	102	102	92	113	90	172	106	110	140
CDC Baler/CDC LeRoy	7	97	XX	XX	XX	97	98	75	107	90	105	96	136	108	121	111
CDC Baler/CDC Meadow	12	103	105	XX	XX	99	108	96	110	87	107	98	153	108	114	131
Taza/CDC LeRoy	7	96	XX	XX	XX	89	106	96	104	80	114	96	171	112	98	118
Taza/CDC Meadow	12	100	99	XX	XX	94	107	100	107	78	109	97	183	111	102	129
Previously tested varieties																
CDC Austenson/CDC Horizon	5	105	109	XX	XX	100	107	108	102	XX	101	97	156	102	111	133
CDC Baler/CDC Horizon	5	101	111	XX	XX	102	96	113	94	XX	109	94	173	101	123	145
Taza/CDC Horizon	5	108	96	XX	XX	105	119	104	111	XX	116	96	179	106	106	137

WINTER - SPRING CEREAL MIXTURES

Variety	Overall Station Years of Testing	Overall Yield	Yield Category:					Nutritional Data:					
			3	5	Low < 8.0 (t/A)	Medium 8.1 - 10.0 (t/A)	High > 10.1 (t/A)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2018 trials (Yield and agronomic data only directly comparable to CDC Austenson)													
CDC Austenson (t/A)		11.5	8.6	14.4	8.6	XX	14.4	8.3	60.4	0.3	0.1	2.1	0.1
CDC Austenson	2	100	100	100	100	100	100	100	100	100	100	100	100
CDC Baler	2	93	95	91	95	XX	91	124	101	104	121	112	124
Taza	2	68	43	94	43	XX	94	149	109	109	227	152	130
AC Radiant/CDC Austenson	2	110	115	104	115	XX	104	111	102	91	140	104	106
AC Radiant/CDC Baler	2	86-	82	89	82	XX	89	116	103	98	141	113	118
AC Radiant/CDC Taza	2	100	106	94	106	XX	94	112	100	69	156	94	90
Metzger/CDC Austenson	2	97	106	89	106	XX	89	105	104	96	134	94	100
Metzger/CDC Baler	2	89	74	105	74	XX	105	110	101	86	131	105	106
Metzger/Taza	2	86-	82	90	82	XX	90	119	104	78	144	96	96
Prima/CDC Austenson	2	95	82	107	82	XX	107	110	101	115	136	104	133
Prima/CDC Baler	2	81	64	99	64	XX	99	111	98	96	121	115	116
Prima/CDC Taza	2	103	112	94	112	XX	94	118	103	69	142	93	104