

Perennial Forage Project

Partners: Alberta Beef Producers
Alberta Agriculture and Forestry
Chinook Applied Research Association
Foothills Forage and Grazing Association
North Peace Applied Research Association
Gateway Research Organization
Battle River Research Group
West-Central Forage Association
Mackenzie Applied Research Association
SARDA Crop Research
Peace Country Beef and Forage Association

Objectives:

1. To provide unbiased, current and comprehensive regional data regarding the establishment, winter survival, yield and economics of specific species and varieties of perennial forage crops.
2. To identify perennial crop species/varieties that demonstrate superior establishment, hardiness, forage yield and nutritional quality characteristics in different eco-regions of Alberta.
3. To assess any benefits from growing mixtures of selected species.

Background:

Perennial forages include a diverse range of grasses and legumes that are utilized by livestock producers for a wide variety of purposes – from hay and greenfeed to summer pasture and winter grazing through stockpiled forage. They make up one of the largest sources of livestock feed on the prairies and the wide diversity in growth characteristics makes them ideal for many purposes.

According to the Alberta Agriculture's Agriprofits Benchmarks, two thirds the cost of maintaining a cow comprising pasture, stored feed and bedding. Consequently, managing the perennial forage supply and having access to high quality and high yielding forage varieties is extremely important to producers.

Historically there has been a gap in perennial forage production knowledge in Alberta and, in particular, regionally specific variety information. There is significant variation in Alberta's ecoregions and varieties that developed and tested in one location or region will likely not perform the same in another region such as those experienced in Northeastern Alberta.

To help bridge this gap in perennial forage information, the perennial forage trial was developed to test cultivars that have been recently developed but have had limited regional evaluation to provide producers with valuable, region specific data. The province wide project data will be available to all producers in Alberta.

Method:

The trial was seeded as three blocks of plots: legumes, grasses and grass/legume mixtures at the LARA Fort Kent Research Site (NE25-61-5-W4) in a randomized complete block design (RCBD) with four

replicates to reduce error. The legume and legume mixture trials were seeded on June 7, 2016 and the grass trial was seeded on June 2, 2016. Unfortunately, due to slow and patchy establishment, the grass and grass/legume trials were reseeded on June 19, 2017. Table 1 illustrates the forage varieties seeded in each trial.

Table 1. Perennial Forage Trial Varieties seeded, 2016-2017.

Grasses	Legumes	Grass/Legume Mixtures
Fleet Meadow Brome	20-10 Alfalfa	Fleet/Yellowhead
AC Admiral Hybrid Brome	44-44 Alfalfa	AC Knowles/Yellowhead
Success Hybrid Brome	Assalt ST Alfalfa	Success/Yellowhead
Knowles Hybrid Brome	Dalton Alfalfa	Fleet/Spredor 5
Greenleaf Pubsecent Wheatgrass	Halo Alfalfa	AC Knowles/Spredor 5
Kirk Crested Wheat Grass	PV Ultima Alfalfa	Success/Spredor 5
AC Saltlander Green Wheatgrass	Rangelander Alfalfa	Fleet/AC Mountainview
Tom Russian Wilde Rye	Rugged Alfalfa	AC Knowles/AC Mountainview
Killarney Orchard Grass	Spreader 4 Alfalfa	Success/AC Mountainview
Grinstad Timothy	Spredor 5 Alfalfa	
Fojtan Festulolium	Yellowhead Alfalfa	
Courtney Tall Fescue	AC Mountainview Sainfoin	
	Nova Sainfoin	
	Oxley 2 Cicer Milkvetch	
	Veldt Cicer Milkvetch	

Prior to seeding, soil tests were taken and a blend fertilizer was developed (30-22-10-12) and side-banded with the grass trial at seeding. Due to the nitrogen fixing ability of legumes, the legume and grass/legume trial was seeded with 50 lbs/ac of 11-52-0-0 side-banded at seeding. All legumes were inoculated prior to seeding and seeding took place with the LARA Fabro five-row zero-till small plot drill with 9" row spacing. Plots measured 1.15m x 6m in area.

To determine percent emergence and establishment, plant counts were conducted 7, 14 and 21 days after seeding as the number of plants in 3 separate ¼ m squared areas in each plot. Another count was taken 70 days after seeding.

No yield or quality data was taken on the trial in the year of establishment. Since the legume trial was established in 2016, yield and quality data were taken in 2017.

The seeding rates of each variety are shown in table 2.

Table 2. Perennial Forage Trial Seeding Rates, 2016-2017.

Species	Variety	Seeding Rate (lbs/ac)
Meadow Brome	AC Armada	14
	Fleet	14
Hybrid Brome	Success	12
	Knowles	12
Wheatgrasses		
Pubescent	Greenleaf	10
Crested	Kirk	6
Green	Saltlander	9
Russian Wildrye	Tom	8
Fojtan Festulolium		20
Orchard Grass	Killarney	10
Tall Fescue	Courtney	9
Tmothy	Grinstad	4
Alfalfa	AC Grazeland	8
	Dalton	8
	20-10	8
	Halo	8
	Rangelander	8
	Rugged	8
	Spredor 4	8
	Spredor 5	8
	Yellowhead	8
	PV Ultima	8
	44-44	8
Sainfoin	AC Mountainview	30
	Nova	30
Cicer Milk Vetch	Veldt	13
	Oxley 2	13

Results:

The emergence counts and plant count results for the legume, grass and grass/legume mixture trials can be found in table 3, table 4 and table 5, respectively. The higher moisture experienced in 2017 allowed for excellent establishment of the grass and grass/legume trials. However, excessive moisture sitting on the legume site resulting in plots 113 and 114 dying out (Nova Sainfoin and AC Mountainview Sainfoin).

To assess winter survival, plant counts were taken on the legume trial on June 26, 2017 and the results are illustrated in table 3. The alfalfa variety Assalt ST showed the greatest impact of winter on plant survivability with a 56% decrease in plant stand from August of 2016 to June of 2017. Rangelander alfalfa showed a 35% decrease in plant stand while Yellowhead alfalfa and Oxley Cicer Milkvetch only showed a 6% and 8% decrease, respectively. The rest of the varieties showed an increase from 2016 to 2017.

Historically sainfoin has shown poor survivability in central and northern climates, but showed an 18% increase for the new AC Mountainview and a 76% increase for the older variety Nova.

Table 3. Perennial Forage Project Legume Emergence and Plant Counts, 2016-2017.

Variety	Emergence Counts (plants per 1/4 m)			Plant Count	Plant Count	Change
	21-Jun-16	28-Jun-16	05-Jul-16	26-Aug-16	26-Jun-17	(%)
20 - 10	0.00	1.45	3.99	4.92	5.83	18
44 - 44	0.09	1.15	4.32	4.67	7.17	54
Assalt ST	0.00	0.65	2.68	4.58	2.00	-56
Dalton	0.00	0.33	3.09	4.67	5.50	18
Halo	0.00	0.69	4.44	5.33	6.50	22
PV Ultima	0.00	1.02	4.38	5.83	6.42	10
Rangelander	0.10	1.50	3.74	5.50	3.58	-35
Rugged	0.04	0.99	2.97	4.67	6.17	32
Spreder 4	0.00	0.68	3.48	4.83	5.92	23
Spredor 5	0.00	0.43	5.02	5.25	5.58	6
Yellowhead	0.00	1.07	3.57	5.92	5.58	-6
AC Mountainview	0.00	0.79	4.61	5.50	6.50	18
Nova	0.00	1.12	2.72	3.50	6.17	76
Oxley 2	0.00	1.03	3.86	4.33	4.00	-8
Veldt	0.00	0.54	4.15	4.75	5.67	19

The emergence counts of the grass and grass/legume mixture trial are illustrated in table3 and table 4, respectively.

Table 4. Perennial Forage Project Grasses Emergence Counts, 2017.

Variety	Emergence Counts (pls per 1/4 m)		
	Day 7	Day 14	Day 21
Fleet MB	0.00	8.41	7.50
AC Admiral HB	0.00	5.58	5.50
Success HB	0.00	9.00	6.75
Knowles HB	0.00	7.33	4.58
Greenleaf PWG	0.00	10.50	7.58
Kirk CWG	0.00	4.85	1.50
AC Saltlander GWG	0.00	8.41	6.83
Tom RWR	0.00	9.00	13.08
Killarney OG	0.00	15.83	10.25
Grinstad Tim.	0.00	15.92	15.33
Fojtan Festulolium	0.00	28.83	26.58
Courtney TF	0.00	13.00	10.33

Table 5. Perennial Forage Project Grass/Legume Emergence, 2017.

Treatment	Emergence Counts (plants per 1/4 m)					
	Day 7		Day 14		Day 21	
	Grasses	Legumes	Grasses	Legumes	Grasses	Legumes
Fleet MB/Yellowhead	0.00	0.00	3.08	3.17	5.83	2.08
AC Knowles/Yellowhead	0.00	0.00	2.67	3.33	3.75	3.50
Success HB/Yellowhead	0.00	0.00	4.58	4.00	4.67	3.42
Fleet MB/Spredor 5	0.00	0.00	4.67	2.67	4.50	2.50
AC Knowles MB/Spredor 5	0.00	0.00	3.67	2.08	3.42	3.75
Success HB/Spredor 5	0.00	0.00	3.75	3.17	3.58	3.17
Fleet MB/AC Mountainview	0.00	0.00	3.00	2.75	2.58	4.17
AC Knowles HB/AC Mountainview	0.00	0.00	4.16	1.66	2.58	3.08
Success HB/AC Mountainview	0.00	0.00	3.00	2.88	2.67	3.58

The legume trial was harvested on June 14, 2017 at an average moisture content of 76%. The yield and quality results can be found in table 6. The highest yielding variety in the trial was AC Rangelander alfalfa at 3.32 ton/acre followed closely by Dalton alfalfa at 3.24 ton/acre. Overall, the alfalfa varieties yielded significantly higher than the Cicer Milkvetch varieties and the Sainfoin Varieties.

Table 6. Perennial Forage Legume Trial Yield and Quality Data, 2017.

Variety	DM Yield (ton/acre)		Height (cm)	Moisture (%)	2017 Quality Data							
					CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
	Rangelander	3.32	a	92	75	16.26	41.13	50.86	56.86	1.45	0.22	2.81
Dalton	3.24	a	87	74	14.55	44.42	54.09	54.30	1.20	0.18	2.13	0.17
44-44	3.13	ab	87	78	15.96	41.99	49.66	56.19	1.26	0.24	3.05	0.21
Yellowhead	3.11	ab	84	76	15.80	42.35	50.33	55.91	1.23	0.16	2.20	0.22
Spredor 5	3.09	ab	88	73	12.08	49.39	60.03	50.43	0.95	0.18	2.41	0.16
20 - 10	3.05	ab	83	75	18.85	41.45	49.65	56.61	1.10	0.25	2.92	0.19
Rugged	2.89	ab	88	74	15.16	44.69	56.23	54.09	1.12	0.20	2.61	0.18
Assalt ST	2.81	ab	95	78	14.21	48.39	57.66	51.20	0.99	0.13	2.02	0.14
PV Ultima	2.70	ab	86	76	17.51	38.83	46.45	58.65	1.60	0.16	2.18	0.21
Spredor 4	2.61	ab	91	74	17.85	40.45	48.08	57.39	1.34	0.21	2.28	0.19
Halo	2.46	abc	86	77	17.18	40.16	49.96	57.62	1.33	0.19	2.24	0.24
Oxley	2.25	bc	87	78	18.88	32.52	38.68	63.57	1.47	0.21	2.41	0.26
Veldt	1.82	cd	84	74	13.33	44.80	55.06	54.00	1.05	0.16	2.05	0.22
Nova	1.48	d	92	79	16.05	39.07	46.27	58.46	1.36	0.19	2.59	0.26
AC Mountainview	1.41	d	78	73	17.78	37.13	45.84	59.98	1.32	0.20	2.42	0.24
Average	2.62		87	76	16.10	41.78	50.59	56.35	1.25	0.19	2.42	0.21
CV	15.31											

The highest yielding Cicer Milk Vetch variety was Oxley at 2.25 ton/acre while Veldt yielded significantly lower at 1.82 ton/acre. Historically, use of Cicer Milk Vetch varieties in Alberta has been limited mainly because it can be difficult and slow to establish and has moderate productivity when compared to alfalfa. However, once established, the stand can last longer than those of alfalfa and it has a significant advantage in pasture due to its non-bloat characteristics.

Similar to the Cicer Milk Vetch, Sainfoin has also been minimally used in Alberta due to its historically poor establishment and longevity. However, recent research and the release of new varieties has slowly increased the number of acres seeded to sainfoin mixtures. It is considered a bloat-safe legume and is gaining in popularity for use in pastures to help mitigate the risks of bloat. The newly released sainfoin variety, AC Mountainview, did yield slightly lower than the more well-known Nova, although not significantly so.