MARA Perennial Forage Research Report- Year 3

Introduction

These trials were initiated by applied research associations in Alberta to test perennial forage varieties to fill the knowledge gap of forage data available for livestock producers in the region. This trial was established in eight sites across the region following same protocol with the objective of collecting data on growth, yield, feed quality, nutrient content and to see ability to survive during winter across the region over years. This trial was started in 2016.

This project consists of three trials,

1. Legumes – 14 Varieties
2. Grasses – 11 Varieties
3. Legume-Grass mixture - 3 legumes and 3 grasses used to make the mixture (9 Combinations)

Materials and Methods

Varieties used under each trial are listed in Table 1 and Variety details are attached to Appendix I. Plots were seeded on July 6th 2016 using Fabro 6 row small plot seeder allowing seeds to barely cover with soil (Initially, plots were seeded at 0.5" on May 17th 2018 but seedlings did not emerge). This experiment was designed as a Complete Randomized Block Design (RCBD) with four replicates. Plot size is 10 m^2. Soil report recorded 2.4% organic matter content and pH as 6.4. Pre-seeding glyphosate burn down at 1.67 l/ac was applied for weed management at the start. Fertilizers were used according to soil test results and different fertilizer rates were used for each forage type as follows,

Grass only: 100 lbs/ac of 46-0-0

Legumes only: 40 lbs/ac of 11-52-0

Grass and Legume Mix: 40 lbs/ac of 11-52-0 and 60 lbs of 46-0-0

Parameters Measured: Plant height was measured at flowering selecting 3 plants from each plot, yield was measured using fresh and dry weights at late flowering stage (15th August 2018), after harvesting biomass within $1m^2$ from each plot using a Swift walk-behind Forage Harvester.

Biomass from Replicate 1 and 3 and Replicate 2 and 4 were combined to make two composite samples to analyse nutrients and feed quality of legumes and grasses using wet chemistry analysis method. Samples from legume and grass mix were not analysed for feed quality and nutrients since grass coverage was 99% in each mix plot and presence of legumes were < 1%.

Please Refer MARA 2016 annual report for more details of seedling establishment information and 2017 Annual Reports for 2nd year growth, yield and nutrient values of each perennial forage variety information.

Table 01: List of Forage Varieties and mixes used in MARA Perennial Forage Trial in Fort Vermilion (details in Appendix I)

No.	Legume Variety	Grass Variety	Grass & Legume Mix
1	Assalt ST Alfalfa	Fleet Meadow Brome	Fleet MB/ Yellowhead
2	Dalton Alfalfa	AC Admiral Hybrid Brome	Success HB/ Yellowhead
3	20—10 Alfalfa	Success Hybrid Brome	Knowles HB/Yellowhead
4	Halo Alfalfa	Knowles Hybrid Brome	Fleet MB/ Spredor 5
5	Rugged Alfalfa	Greenleaf Pubescent Wheatgrass	Success HB/ Spredor 5
6	Spredor 4 Alfalfa	Kirk Crested Wheatgrass	Knowles MB/ Spredor 5
7	Spredor 5 Alfalfa	AC Saltlander Green Wheat Grass	Fleet MB/ AC Mountainview
8	Yellowhead Alfalfa	Fojtan Festulolium	Success HB/ AC Mountainview
9	PV Ultima Alfalfa	Killarney Orchard Grass	Knowles MB/ AC Mountainview
10	44—44 Alfalfa	Courtney Tall Fescue	
11	AC Mountainview Sainfoin	Grinstat Timothy	
12	Nova Sainfoin		
13	Veldt Cicer Milk Vetch		
14	Oxley 2 Cicer Milk Vetch		

Data were statistically analysed using ARM (Agricultural Research Management 2019) Statistical Software. Significant level of test set at P = 0.05.

Table 02: Weather information recorded in MARA, Fort Vermilion 2018

Month	Monthly Precipitation (mm)	Avg. Air Temperature (°C)
April	18	-1
May	5.1	14
June	103.4	15
July	26.1	18
August	18	15

Results and Discussion

Legume Report

Plant height data was statistically analysed using ARM. An average plant height from 3 plants from each plot were used and number of replicates were four. Plant heights were not significantly different but in general the shortest legume variety was AC Mountainview Sainfoin and the tallest were Halo Alfalfa and Dalton Alfalfa (Figure 03). The second tallest legumes were 20-10 Alfalfa and Spredor 4 and 5 Alfalfa. Average plant heights were ranged from 88 cm – 109 cm. Weed competition for legumes at seedling stage was very high, but eventually legumes were able to establish a good stand.

Figure 1: Alfalfa in MAY 15th 2018 in Fort Vermilion

Figure 2: Alfalfa in June 19th 2018 in Fort Vermilion

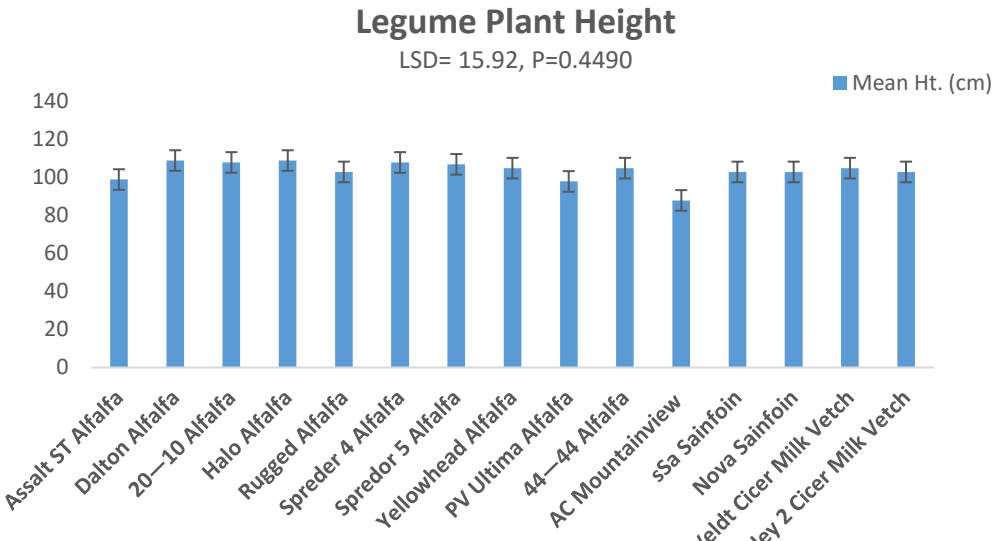

Figure 03: Mean height of legume varieties in their 3rd year of growth at Fort Vermilion, AB (P=0.05), Measured 20th July 2018.

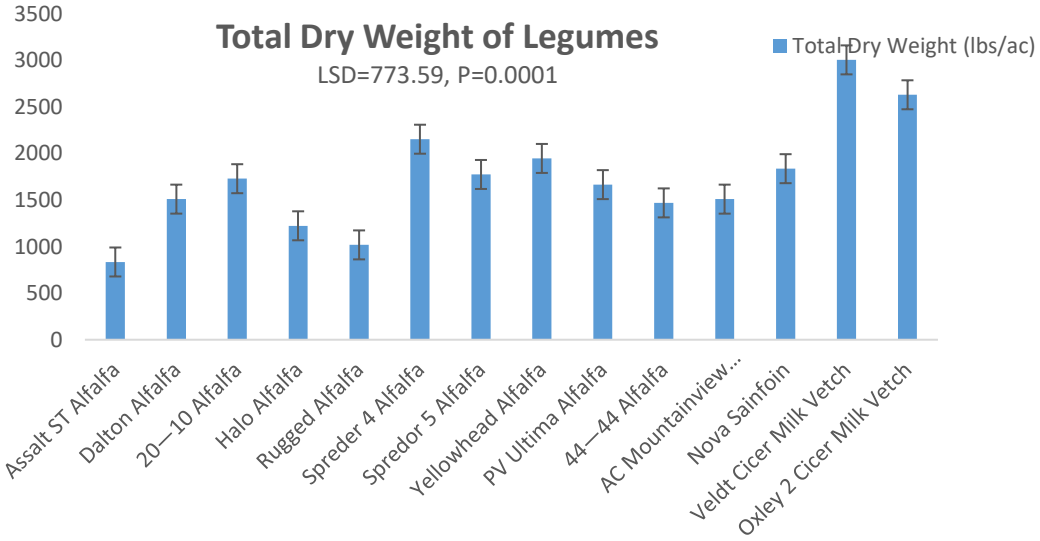

Figure 04: Total mean dry weight of legumes in their 3rd year of growth in MARA, Fort Vermilion, harvested on August 15th 2018.

Yield of legumes were assessed based on dry tonnage and total dry weights of legumes showed a significant difference among them. The highest dry weight (mean) recorded in Veldt Cicer Milk Vetch, which is 3000.63 lbs/ac and next highest yields were recorded from 2631 lbs/ac of Oxley 2 Cicer Milk Vetch and 2154.35 lbs/ac of Spredor 4 alfalfa (Table 03).

The lowest dry weight was recorded from Assalt ST Alfalfa as 835.18 lbs/ac. The legume plant heights were not significantly different among varieties.

Table 03: Analysis of Variance (ANOVA) of Plant height, total dry matter and dry matter percentage of Legume varieties 2018, P=0.05

Variety Name	**Mean Plant Height (cm)**	**Total Dry Weight (lbs/ac)**	**Dry Matter %**
Assalt ST Alfalfa	99.19	835.18 c	44.07
Dalton Alfalfa	109.08	1510.48 bc	47.02
20—10 Alfalfa	108.08	1730.03 bc	49.11
Halo Alfalfa	109.92	1223.93 c	51.22
Rugged Alfalfa	102.67	1018.90 c	49.73
Spreder 4 Alfalfa	108.17	2154.35 abc	44.41
Spredor 5 Alfalfa	106.75	1775.55 bc	43.84
Yellowhead Alfalfa	105.17	1947.75 bc	48.82
PV Ultima Alfalfa	98.00	1666.40 bc	54.48
44—44 Alfalfa	105.17	1470.13 bc	44.20
AC Mountainview Sainfoin	88.42	1510.35 bc	49.67
Nova Sainfoin	102.58	1837.58 bc	46.69
Veldt Cicer Milk Vetch	105.42	3006.63 a	48.24
Oxley 2 Cicer Milk Vetch	103.42	2631.63 ab	49.41
LSD	15.92	773.59	9.58
Standard Deviation	11.13	540.88	9.58
P Value	0.4491 NS*	0.0001 S*	0.6063NS*

*NS – Not Significant S- Significant

LSD (Least Significant Difference) – This allows direct comparison between two means. Any difference larger than this value considered as a significant result.

Standard Deviation – Measures the dispersion of a data set relative to its mean

P Value – shows the significance of each measuring, any P value greater than 0.05 considered as non-significant.

Letter group – “a” is given to the highest mean value and “b” is given to show the next higher level. According to table 02, c shows the lowest mean value. Letters are assigning to the means only when they are significantly different.

Table 04: ANOVA of legume feed quality parameters (protein, energy and relative feed values) in 3rd year, Harvested on 15th August 2018

Variety	CP	ADF	NDF	TDN	NELac	NEGain	NEMain	RFT
	%				MCal/Kg			
Assalt ST Alfalfa	12.24	46.04	56.00	52.32	1.18	0.53	1.25	88.10
Dalton Alfalfa	13.52a	47.08	57.72	48.22	1.17	0.51	1.23	84.19
20—10 Alfalfa	13.76a	46.03	56.81	50.72	1.19	0.53	1.25	89.00
Halo Alfalfa	12.60a	46.81	56.71	50.07	1.17	0.52	1.24	86.10
Rugged Alfalfa	10.97b	52.57	65.01	40.77	1.06	0.38	1.10	68.63
Spreder 4 Alfalfa	11.98b	47.50	58.27	48.38	1.16	0.50	1.22	82.87
Spredor 5 Alfalfa	14.38a	46.59	57.12	49.19	1.18	0.52	1.24	86.00
Yellowhead Alfa	12.12a	45.97	56.07	50.49	1.19	0.53	1.25	88.10
PV Ultima Alfa	10.92b	48.60	58.18	51.68	1.14	0.48	1.20	81.62
44—44 Alfalfa	12.51a	45.95	55.55	52.52	1.19	0.53	1.25	90.49
AC Mountain.Sain	12.60a	45.13	53.28	51.65	1.20	0.55	1.27	94.67
Nova Sainfoin	13.62a	46.00	54.95	52.65	1.18	0.53	1.25	90.27
Veldt Cicer M.V.	11.64b	46.84	55.77	52.49	1.17	0.52	1.24	87.48
Oxley Cicer M.V.	13.94a	47.38	55.94	52.98	1.16	0.50	1.22	86.78
LSD	1.944	4.903	8.123	7.139	0.096	0.113	0.113	18.80
Standard Deviation	0.90	2.27	3.76	3.31	0.04	0.05	0.05	8.70
P Value	0.032	0.333	0.496	0.142	0.397	0.353	0.353	0.535
Significance	S	NS	NS	NS	NS	NS	NS	NS

Figure 05: Poor Sainfoin Stand in 15th May

Crude protein among different legumes showed a slight significant difference whereas the highest percentage, 14.38% was recorded from Spredor 5 Alfaalfa and the lowest level 10.97% and 10.92% were recorded from Rugged Alfalfa and PV Ultima Alfalfa respectively (Table 04). However, the difference between the highest and the lowest crude protein percentage is 3.5% only. Total digestible nutrients, fibre content and energy values did not show a significant difference among different legume varieites. Fibre contents as a percentage ranged between 40 % – 60 % whereas Total digestible nutrient percentage varied from 41% - 53%.

There was no significant difference in mineral levels among different legumes except S (Sulphur) and Zn. The highest S percentage was recorded in Spredor 5 Alfalfa and the highest Zn content was reported in 20-10 Alfalfa (Table 05).

Table 05: ANOVA of legume feed quality parameters (mineral nutrient values) in 3rd year, Harvested on 15th August 2018

Variety	**Ca**	**P**	**K**	**Mg**	**S**	**Cu**	**Fe**	**Zn**	**Mn**	**Cl**
	%									
Assalt ST Alfalfa	1.75	0.17	2.42	0.42	0.18ab	3.27	223.31	16.80b	61.34	0.61
Dalton Alfalfa	1.65	0.14	1.51	0.27	0.15ab	2.92	183.42	11.38b	33.88	0.63
20—10 Alfalfa	1.66	0.25	1.76	0.28	0.17ab	4.19	210.12	32.47a	54.16	0.65
Halo Alfalfa	1.54	0.14	1.52	0.24	0.13b	2.70	158.74	10.72b	31.42	0.56
Rugged Alfalfa	1.45	0.12	1.15	0.26	0.11b	1.96	160.06	11.95b	45.29	0.58
Spreder 4 Alfalfa	1.63	0.12	1.19	0.20	0.13b	2.39	177.98	7.12b	25.75	0.52
Spredor 5 Alfalfa	2.38	0.18	1.73	0.28	0.22a	3.76	248.82	13.85b	40.02	0.59
Yellowhead Alfa	1.53	0.15	1.57	0.28	0.14ab	2.71	173.11	15.33b	30.86	0.53
PV Ultima Alfa	1.62	0.15	1.71	0.29	0.14ab	2.61	245.91	11.77b	46.22	0.39
44—44 Alfalfa	1.61	0.14	1.56	0.25	0.15ab	3.12	223.44	13.64b	38.67	0.48
AC Mountainview	1.71	0.14	1.32	0.30	0.14ab	2.18	216.94	13.41b	50.43	0.45
Nova Sainfoin	1.63	0.16	1.72	0.30	0.15ab	2.44	192.20	14.17b	50.19	0.44
Veldt Cicer M.V.	1.26	0.15	1.97	0.28	0.12b	2.47	176.58	13.52b	44.10	0.51
Oxley CicerM.V.	1.82	0.18	2.43	0.39	0.17ab	2.71	261.08	13.05b	52.58	0.36
LSD	0.52	0.05	0.96	0.21	0.05	1.93	131.01	9.36	35.30	0.25
Standard Deviation	0.24	0.02	0.07	0.50	0.16	0.10	0.13	4.33	0.17	0.12
P Value	0.09	0.28	0.24	0.74	0.02	0.57	0.78	0.02	0.66	0.54
Significance	NS	NS	NS	NS	S	NS	NS	S	NS	NS

Grass Report

Three grass varieties; Fojtan Festulolium, Killarney Orchard Grass, Courtney Tall Fescue were not survived in 2017 winter. Therefore, those plots were covered with grass weeds and did not collect data in 2018.

Figure 06: Plots with Grasses showing poor winter survival, May 15th 2018, Fort Vermilion.

The tallest grass was Greenleaf Pubescent Wheat Grass (125 cm) and the shortest was Kirk Crested Wheat Grass (89 cm). There was no significant difference observed in total dry weight/yield of grass varieties (Table 06). The variation among recorded total dry weights were very high due to weed competition with replicates 3 and 4.

Figure 07: Grass varieties at flowering in June 19th 2018(1st plot on left showing Fleet Meadow Broom)

Table 06: ANOVA of Perennial Grass Height, Total Dry Weight and Dry Matter Percentage in Fort Vermilion 2018, P = 0.05

Treatment Name (Grass Variety)	Mean Plant Ht. (cm)	Total Dry Weight (lbs/ac)	Dry Matter %
Fleet Meadow Brome (MB)	103.67 abc	1563.53	60.46
AC Admiral Hybrid Brome (HB)	115.08 ab	2296.64	57.70
Success HB	116.83 ab	1562.03	58.93
Knowles HB	105.83 abc	1631.42	64.38
Greenleaf Pubescent Wheat Grass (WG)	124.83 a	1431.32	53.61
Kirk Crested WG	88.91 c	1810.49	60.23
AC Saltlander Green WG	94.92 bc	1516.85	65.04
Fojtan Festulolium	-	-	-
Killarney Orchard Grass	-	-	-
Courtney Tall Fescue	-	-	-
Grinstad Timothy	100.92 abc	1452.53	52.05
LSD	16.00	823.02	12.68
Standard Deviation	10.89	6.51t	7.23
P Value	0.002 S	0.448	0.358

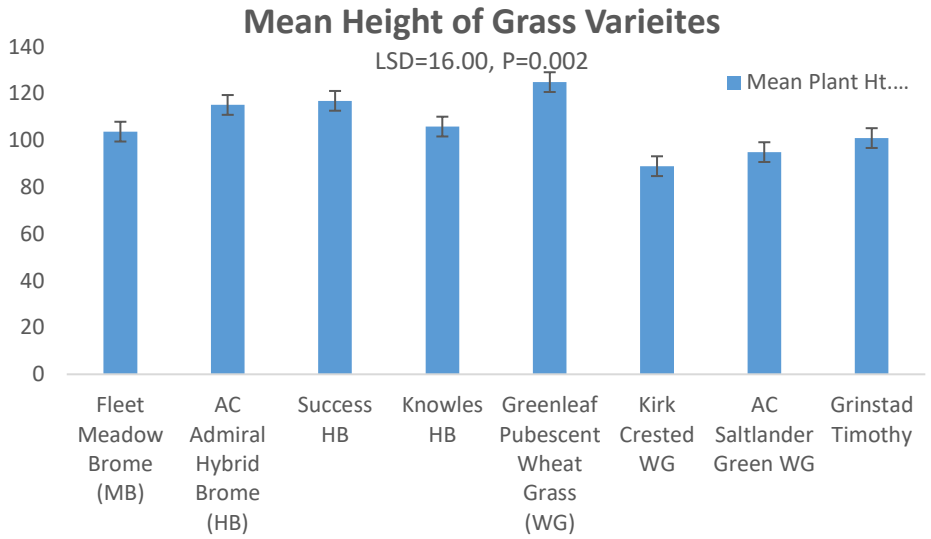

Figure 08: Mean height of Different Grass Varieties in their 3rd year of growth in MARA, Fort Vermilion site, measured on August 2nd 2018.

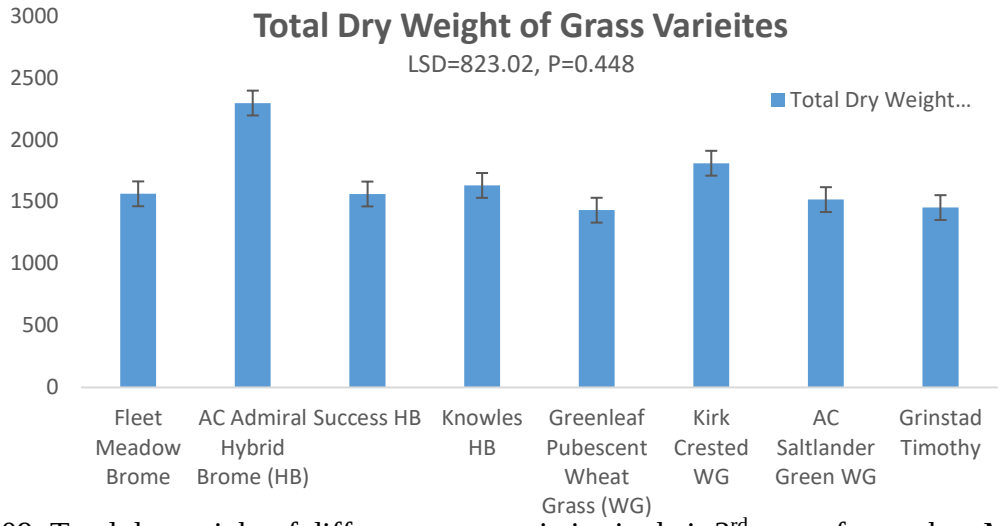

Figure 09: Total dry weight of different grass varieties in their 3rd year of growth at MARA site, Fort Vermilion in 2018

Table 07: Nutrient analysis results for different grass varieties 2018 in 3rd year, Harvested on 15th August 2018

Variety	**CP**	**ADF**	**NDF**	**TDN**	**NELac**	**NEGain**	**NEMain**	**RFT**
	%				**MCal/Kg**			
Fleet MB	7.98b	51.86	71.87	48.69	1.07	0.40	1.12	62.76
AC Admiral HB	8.00b	50.10	70.35	52.63	1.11	0.43	1.16	65.94
Success HB	9.58ab	49.33	68.83	51.00	1.12	0.45	1.17	68.20
Knowles HB	9.28ab	50.85	71.04	51.66	1.09	0.42	1.14	64.52
Greenleaf WG	11.29a	46.06	64.72	54.91	1.18	0.52	1.25	76.54
Kirk Crested WG	9.66ab	47.37	67.24	55.37	1.16	0.50	1.22	71.93
AC Saltlander WG	8.50b	49.33	70.78	54.31	1.12	0.45	1.17	66.39
Grinstad Timothy	11.40a	46.91	65.07	58.44	1.16	0.51	1.23	74.92
LSD	1.90	4.92	10.23	7.58	0.10	0.11	0.11	14.91
Standard Deviation	0.78	2.08	2.67	3.20	0.04	0.05	0.05	0.04
P Value	0.02	0.21	0.61	0.23	0.28	0.22	0.22	0.38
Significance	S	NS	NS	NS	NS	NS	NS	NS

Feed quality parameters (protein, energy and relative feed values)

Greenleaf wheat grass and Grinstad Timothy (Table 07) showed the highest percentage of Crude Protein (11%), whereas the lowest percentage was recorded from Fleet Meadow Brome, AC Admiral Hybrid Brome and AC Saltlander Wheat Grass (around 8%). Energy content, digestibility and relative feed values did not differ significantly among different grass varieties. The mineral content analysis of grass varieties (Table 08) did not show any difference across eight varieties tested.

Table 08: Results of Grass feed quality parameters (mineral nutrient values) in 3rd year, Harvested on 15th August 2018

Variety	**Ca**	**P**	**K**	**Mg**	**S**	**Cl**	**Fe**	**Zn**	**Cu**	**Mn**
	%									
Fleet MB	0.56	0.11	1.85	0.19	0.11	0.53	145.58	11.44	1.61	87.02
AC Admiral HB	0.43	0.10	1.27	0.12	0.11	0.51	140.34	9.28	1.24	78.48
Success HB	0.37	0.09	1.09	0.11	0.11	0.51	90.15	10.30	2.22	59.34
Knowles HB	0.56	0.12	1.65	0.16	0.13	0.56	303.15	14.00	2.18	107.08
Greenleaf WG	0.64	0.13	2.09	0.23	0.14	0.59	133.09	11.32	2.36	77.03
Kirk Crested WG	0.41	0.11	1.34	0.12	0.14	0.56	118.06	12.27	1.32	65.32
AC Saltlander WG	0.54	0.12	1.77	0.16	0.11	0.49	155.53	10.99	1.13	111.85
Grinstad Timothy	0.88	0.17	2.87	0.27	0.19	0.54	149.67	18.02	2.65	113.53
LSD	0.56	0.10	1.53	0.21	0.07	0.19	164.56	10.11	2.27	79.82
Standard Deviation	0.25	0.32	0.10	0.63	0.26	0.08	0.18	0.13	0.96	35.28
P Value	0.58	0.36	0.31	0.63	0.32	0.53	0.50	0.46	0.65	0.84
Significance	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Legume and Grass Mix Report

Legume and grass mix trial appeared as a grass variety trial in its third year of growth due to less competitiveness of legumes. Sainfoin variety (AC Mountainview) was not survived in their third year with Fleet MB and Success HB but one or two plants were observed in Knowles HB plots. Few Alfalfa plants were observed in grass mix but number of plants did not exceed three to four in each plot. As a percentage, grass coverage in mix plots was over 90%. Table 8 shows the yield and plant height results within mix plots. However, dry weights in this trial is also mainly representing yield of grasses, instead of grass and legume mix yield (Table 09).

Figure 10: Grass-Legume Mix plots in Fort Vermilion June 19th 2018

Table 09: Results of Total Dry weight (lbs/ac), Grass Height (cm) and Legume Height (cm) of Legume/grass mix trial in Fort Vermilion 2018

Variety Mix	Total Dry Weight (lbs/ac)	Grass Height (cm)	Legume Height (cm)
Fleet MB/ Yellowhead Alfa.	1668.23 b	117.78	97.75 ab
Success HB/ Yellowhead Alfa.	3275.63 a	124.75	101.48 ab
Knowles HB/ Yellowhead Alfa.	1617.03 b	121.40	112.65 ab
Fleet MB/ Spredor 5	2439.65 ab	127.00	117.51 a
Success HB/ Spredor 5	1753.25 b	125.43	89.88 b
Knowles HB/ Spredor 5	2140.88 ab	118.05	111.28 ab
Fleet MB/ AC Mountainview	1824.60 b	112.83	-
Success HB/ AC Mountainview	1801.10 b	122.85	-
Knowles HB/ AC Mountainview	2616.23 ab	110.65	120.76 a
LSD	855.24	15.26	13.33
Standard Deviation	586.02	10.46	8.65
P Value (P=0.05)	0.007	0.349	0.013

Conclusions

Overall in legumes, establishment of Alfalfa and Milk Vetch were successful compared to Sainfoin in Fort Vermilion. The highest yielding legume varieties were Veldt Cicer Milk Vetch (3000.63 lbs/ac), Oxley 2 Cicer Milk Vetch (2631 lbs/ac) and Spredor 4 alfalfa (2154.35 lbs/ac). There wasn't a huge difference among protein, energy, feed quality/digestibility and mineral values among different legume varieties except S and Zn. Sainfoin showed a poor establishment and need further studies to learn how to grow them successful in Northern Alberta, as Sainfoin has a value in cattle feed due to its anti-bloating properties.

Grass varieties showed a successful establishment in their 1st year of growth but Courtney Tall Fescue, Killarney Orchard grass and Fojtan Festulolium could not survive in 2017 winter. There for, these 3 grass varieties may not be suitable for Northern Alberta as a Perennial grass variety. Crude protein content was high in Grinstad Timothy and Greenleaf wheat grasses whereas all the other nutrient and feed quality values and mineral content did not differ significantly among grass varieties. During the spring 2018 Fort Vermilion received a good precipitation to help all the perennial forages to establish a good plant stand.

Two composite replicates were tested for nutrients and mineral contents instead of 4 replicates. Replicate 3 and 4 of all trials had more weed pressure compared to 1 and 2, which could also have an impact on feed quality results.

Legume and grass mix trial was not very successful due to less competitiveness of legumes/poor stand establishment. Reduced grass seeding rates and increased legume seeding rates possibly can overcome this issue in future trials and check the ability of legume establishment in a legume/grass mix.

Appendix I

The following is a summary of the types of forage plants included in the Perennial Forage Trials. Information in this table was obtained from the Alberta Forage Manual (Alberta Agriculture, 2009).

Meadow Bromegrass

Meadow bromes are winter hardy bunching type grasses that tolerate drought but do not do well in areas with poor drainage. Leaves mostly grow from the bottom of the plant meaning that regrowth points are lower down on the plant allowing them to recover quickly and tolerate multiple grazings. Meadow brome can grow well together with other species, but may outcompete after grazing or haying because of their vigorous regrowth abilities. They are a grazing type grass, haying is possible but it is recommended they be hayed once early in the season and then grazed at the end of summer and fall. *Varieties in MARA Perennial Forage Trials: Fleet, AC Admiral*

Hybrid Bromegrass

Hybrid bromegrass is a cross between meadow brome and smooth brome and is used as a dual purpose grass for both hay and grazing. It is more winter hardy that meadow brome, but less hardy than smooth brome. As a slightly creeping grass, hybrid brome is less invasive and less sod-forming than smooth brome and can compete with other species similarly to meadow brome. Hybrid brome's plant structure is in between meadow and smooth brome with leaves distributed in the both the top and lower parts of the plant which makes it easy for haying. Feed quality is usually similar to meadow and smooth brome and yields have been recorded as usually higher than meadow brome but slightly lower than smooth brome. *Varieties in MARA Perennial Forage Trials: Success, AC Knowles*

Crested Wheatgrass

Wheatgrasses are extremely windy hardy grasses, with very fibrous root systems. Out of all the tame grasses in Alberta, they are the highest yielding in dryland areas but based on only one harvest per season. Regrowth in wheat grasses is fair in the spring but slow in the summer and fall. *Varieties in MARA Perennial Forage Trials: Kirk*

Pubescent Wheatgrass

Pubescent wheat grasses are similar to crested wheatgrasses but longevity in the stand is not as strong. They tolerate are saline tolerant however and establish very quickly. *Varieties in MARA Perennial Forage Trials: Greenleaf*

Green Wheatgrass

This type of wheatgrass has been bread for saline tolerance and for remaining green longer into the fall than other wheat grass types. *Varieties in MARA Perennial Forage Trials: AC Saltlander*

Orchard grass

Orchard grass is a bunch grass that is most commonly used for pasture but can be hayed. It has excellent regrowth, particularly later in the season. Orchard grass is competitive with other species, but will grow well alongside alfalfa. It is not a very winter hardy grass however and requires warmer temperatures than the other grasses listed here to initiate growth. *Varieties in MARA Perennial Forage Trials: Killarney*

Timothy Grass

Timothy is a winter hardy grass that thrives in wet soils, but does not handle drought well. It is not a competitive plant and it grows well alongside other species. It usually can only tolerate one haying per season, and it is easy to dry. *Varieties in MARA Perennial Forage Trials: Grinstat*

Tall Fescue

Tall fescue is a highly nutritious, high yielding grass which is usually used in pasture and regrows well after grazing. While frost tolerant and a good option for stockpile grazing, it is not very winter hardy. *Varieties in MARA Perennial Forage Trials: Courtney*

Fojtan Festulolium

Fojtan Festulolium is a cross between tall fescue and Italian Ryegrass. It establishes easily, and has higher energy concentrations than fescue. It is tolerant to both drought and flooding, but similar to tall fescue and Italian ryegrass, is not very winter hardy.

Alfalfa

Alfalfa is the most popular legume grown for forage in Alberta, because of its high nutritional content and excellent tonnage. Alfalfa has a deep taproot, allowing it to be drought tolerant and as a legume, fixes nitrogen in its nodules. Usually a very winter hardy plants, alfalfa survives well in winter as long as the plants have had time to build a strong crown structure. Issues with alfalfa are that plants may cause bloat in cattle, and reseeding an alfalfa stand can be difficult as alfalfa sometimes demonstrates autotoxicity, where it releases chemicals in the soil that inhibit new alfalfa plants from growing. *Varieties in MARA Perennial Forage Trials: AC Grazeland, Dalton, 20-10, Halo, Rangelander, Rugged, Spredor 4, Spredor 5, Yellowhead, PV Ultima, 44-44*

Sainfoin

Sainfoin is a legume that is not as competitive or productive as alfalfa, but contains compounds (tannins) which help prevent bloat in cattle. New varieties such as AC Mountainview have been bred to better withstand competition from alfalfa. Sainfoin is known for having good drought tolerance and frost tolerance. *Varieties in MARA Perennial Forage Trials: AC Mountainview, Nova*

Cicer Milk Vetch

Cicer milkvetch is another non-bloating legume with excellent winter hardiness that grows well with other pasture species. It is a low growing plant that is very slow to emerge and may not produce as much as alfalfa, but responds well to frequent, light, grazing. *Varieties in MARA Perennial Forage Trials: Veldt, Oxley 2*

References:

Alberta Agriculture (2009), Alberta Forage Manual. Agdex 120/20-1, Alberta Agriculture, Edmonton.