Peace Region Forage Cultivar Testing (PRFCT) Program

Coordinated by

Peace Region Forage Seed Association
and
Agriculture and Agri-Food Canada
Beaverlodge Research Farm, Alberta

Annual Report 2017

Prepared by

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Acknowledgments

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Barenbrug
Deutsche Saatveredelung AG
Foster's Seed & Feed Ltd
Imperial Seed
Limoges Forage & Grasses Ltd
Moore Seed Processors
Pure Seed

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Protocol for
Peace Region Forage Cultivar Testing (PRFCT) Program

Revised Jan., 17, 2018

1. Research Sponsorship

The research sponsorship of **$350 CAN/entry/year/location** is requested on an annual basis, as years of production will vary with the species being tested, and applies to the establishment year as well. The Peace Region Forage Seed Association will administer funds for the Peace Region Grass Seed Testing Program. The PRFSA General Manager will invoice each seed company annually.

2. Eligibility of Entries

Released and experimental lines of all tame and native grass species will be considered if they are of interest to commercial seed companies. We reserve the right not to initiate tests:

- if seed arrives late
- if there is lack of space in any year at a particular location
- if there are too few entries in any year for a particular location
- if the germination % of the forage crop seed less than 75%

3. Seed Requirements and Deadline for Seed Entry

The applicant will provide for **EACH TEST LOCATION**:

- 50 gm of bentgrass, Kentucky bluegrass or timothy
- 100 gm of orchardgrass; creeping red, chewings, hard, meadow, sheep or tall fescue; annual or perennial ryegrass
- 200 gm of meadow or smooth bromegrass, wheatgrasses
- -The germination % of each cultivar

Approved seed entries shall supply seed by **April 1st** of the establishment year and **will include the percent germination and relative maturity** (early, medium or late) of each cultivar. Please indicate whether the submission is **a forage or turf type**.

Please ship approved seed to*:

Peace Region Forage Seed Association
904 102 Ave
Dawson Creek, BC V1G 2B7

*** European companies submitting entries need to ship their seed to their US or Canadian head office then to the PRFSA. Seed shipped from the US to Canada needs to be accompanied by all phytosanitation paperwork to clear customs.**

4. Publication of Results

Data will undergo appropriate statistical analysis and each applicant will be provided with an annual report. Information on cultivars will be made available to seed producers upon request. Results will be posted by the end of the fiscal year on the research page of the website www.peaceforageseed.ca

All reasonable care will be taken to ensure a successful test; however, a guarantee cannot be made that a particular test will be successful. If required a test will be reseeded.

Some results in this report have been tested for one or two harvested years. It is advised not to use average yield figures to make cultivar comparisons for these years. Only after a minimum of two harvested years of creeping red fescue or three harvested years of timothy, meadow fescue, tall fescue, meadow bromegrass and smooth bromegrass as a recommended year for the test, the data should be considered as 90% reliable. In some cases, data may not be reported due to extreme variations that cannot be accounted for in the statistical design.

Disclaimer

Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement is implied.

5. Use of Seed

Seed submitted will only be used to establish the agreed upon trials. The seed will **NOT** be used for increase, selection or distribution.

Peace Region Forage Cultivar Testing (PRFCT) Program

2018 Application for Entry

Company: **Telephone:**

Contact person: **Fax:**

Mailing address: **Email:**

Species	Type Forage/turf	Cultivar name/code	% Germ	Relative maturity **early, medium, late**

Send application form no later than March 15, 2018 to:

Nityananda Khanal
Beaverlodge Research Farm
Agriculture and Agri-Food Canada
P.O. Box 29, 1 Research Road
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Executive Summary

Agriculture and Agri-Food Canada (AAFC) - Beaverlodge Research Farm and Peace Region Forage Seed Association (PRFSA) have established a long-term collaboration through a program known as the Peace Region Forage Seed Testing (PGRST) and various Agri-Innovation projects under Growing Forward 2 policy framework. This report presents the results of various forage and turf grass cultivars that were evaluated for seed yield for two to three perennial crop seasons from 2014 to 2017.

Various cultivars of creeping red fescue (*Festuca rubra* L. var. *rubra*), timothy (*Phleum pratense* L.), meadow fescue (*Festuca pratensis* Huds.), tall fescue (*Festuca arundinacea*), crested wheatgrass [*Agropyron cristatum* (L.) Gaertn.], northern wheatgrass [*Agropyron dasystachyum* (Hook.) Scribn.], meadow bromegrass (*Bromus riparius* Rehm.), smooth bromegrass (*Bromus inermis* Leyss) and hybrid bromegrass (*Bromus riparius* × *Bromus inermis*) were tested for their seed yield in comparison to popular cultivars of respective species in the region. One trial on creeping red fescue and one on timothy were concluded in the reporting period, while one trial each of creeping red fescue, meadow fescue, tall fescue, timothy, wheat grasses and bromegrasses underwent the evaluation for first crop year and is subjected to further evaluations in the coming seasons. The forage grass cultivars and the checks included in the trials were received from various Canadian and international seed companies and their foreign affiliates including Barenbrug, Deutsche Saatveredelung AG, Foster's Seed & Feed Ltd, Imperial Seed, Limoges Forage & Grasses Ltd, Moore Seed Processors, and Pure Seed.

Variable weather patterns in different years provided desirable test environment for examining the adaptability of the cultivars in the peace region. From the concluded trial of creeping red fescue, cultivar MSPO314 produced significantly higher cumulative seed yield than rest of the cultivars, exceeding the check cultivar Boreal by 21% on average. Boreal remained to be the second highest in seed yield. Likewise from the concluded trial of timothy, 7 out of 8 cultivars from Barenbrug USA, including Barfleo, Bor01025, Bor01033, Bor01037, Bor2005, Bor88060 and PHLR99 out-yielded the check cultivar Climax, with cumulative seed yield advantage ranging from 12 to 25% over the Climax for three crop years. Seed yield is the major trait of economic interest for creeping red fescue, provided the cultivars have similar end use quality – the turf. However in timothy, the end use value lies on the forage biomass quantity, quality and stand persistence. Based on the cumulative dry matter yield, climax could still be the cultivar of choice for forage biomass production for livestock.

INTRODUCTION

Endowed with extensive northern agricultural frontier with varied micro-climates, the Peace River region of Canada offers good potential to produce high quality seeds of forages and turf grass for the domestic and export market. About 25,000 metric tons (55 million lbs.) of forage and turf grass seeds are sold annually from this region. Use of regionally adapted cultivars with appropriate management practices conforming to the national and international standards are crucial factors underlying the successful seed industry. Weed, insect pests and disease management are continuous challenges for crop production in the changing climate.

In order to tackle the production constraints and foster the forage seed industry in this internationally reputed region, the Agriculture and Agri-Food Canada (AAFC) - Beaverlodge Research Farm has been collaborating with the Peace Region Forage Seed Association (PRFSA) through a long-term Peace Region Forage Seed Testing (PGRST) Program (originally known as Western Grass Seed Testing Program) and various Agri-Innovation projects under Growing Forward 2 policy framework of Canada. The primary objective of the PRGST program is to evaluate the adaptability, productivity and quality of the proprietary forage cultivars originated from U.S.-based and European companies for contract seed production in western Canada. Now the program name is further updated as Peace Region Forage Cultivar Testing (PRFCT) Program to include the broader scope of activities.

This report presents the results of various forage and turf grass cultivars that were evaluated for seed yield for two to three perennial crop seasons from 2014 to 2017. Various cultivars of creeping red fescue (*Festuca rubra* L. var. *rubra*), timothy (*Phleum pratense* L.), meadow fescue (*Festuca pratensis* Huds.), tall fescue (*Festuca arundinacea*), crested wheatgrass [*Agropyron cristatum* (L.) Gaertn.], northern wheatgrass [*Agropyron dasystachyum* (Hook.) Scribn.], meadow bromegrass (*Bromus riparius* Rehm.), smooth bromegrass (*Bromus inermis* Leyss) and hybrid bromegrass (*Bromus riparius* × *Bromus inermis*) were tested for their seed yield in comparison to popular cultivars of respective species in the region. Adaptability and performance testing of cultivars of different geographical origin is very crucial for both seed companies and producers for making informed contractual decisions.

MATERIALS AND METHODS

The PRGST trials were conducted at AAFC's Beaverlodge Research Farm, AB (55° 11´ N, 119º 32´ W) from 2014 to 2017. A total of 79 proprietary entries of different forage and turf grass species from various origins were evaluated in this period. The number of entries included 51 of creeping red fescue, 12 of timothy, 2 of meadow fescue, 5 of tall fescue, 5 of wheatgrasses and 4 of bromegrasses were tested for seed yield in comparison to popular cultivar of respective species in the Peace region (Table 1). The forage grass cultivars and the checks included in the trials were originated or received from AAFC, and various Canadian and international seed companies and their foreign affiliates including Barenbrug, Deutsche Saatveredelung AG, Foster's Seed & Feed Ltd, Imperial Seed, Limoges Forage & Grasses Ltd, Moore Seed Processors, and Pure Seed.

Table 1 *List of forage and turf grass cultivars from various proprietors tested during the reporting period.*

Forage species	Year of seeding	Seed sources	No. of Entries	Cultivars	Year of evaluation
Creeping Red Fescue	2015	Imperial Seed	4	Reverent, DSV 15-01, DSV 15-02, DSV 15-03	2016 - 2017
		Pure Seed	7	4SHR, 4BEN, 4RUE-14, 4SP14, 4ED4, 4DR4, 4GRY	
		Moore Seed Processors	8	MSPO114, MSPO214, MSPO314, MSPO414, MSPO514, MSPO614, MSG0412, MSR0612	
		Barenbrug USA	2	Bridgeport II, BAR VV-VP3-CT	
		Foster's Seed & Feed	2	4CRD-8, ASC295	
	2016	Barenbrug USA	1	BAR FRR 15134	2017 - 2018
		Foster's Seed & Feed	3	C8-14-4ED4, Chanellor Chewings, C8-14-4BEN	
		Imperial Seed	3	DSV 15-01, DSV 15-02, DSV 15-03	
	2017	BrettYoung	4	BY-676, BY-369-13883, BY-2889, BY17-8070	2017- 2019
		Moore Seed Processors	7	MSP-03-17, MSP-06-17, MSP-07-17, MSP-08017, MSP-02-17, MSP-04-17, MSP-05-17	
		Foster's Seed & Feed	3	Fosters FX, Fosters FO & Boreal	
Timothy	2014	Moore Seed Processors	1	MST0513	2015 - 2017
		Barenbrug USA	8	PHL1R99, Bor01033, Bor2005, Bor01025, Bor88060, Bor01037, Barpenta, Barfleo	
	2017	Northstar Seed	3	NSE1701, NSE1723, NSE1730	2018 - 2020
Wheatgrass	2016	Limoges Forage & Grasses Ltd	4	Crested: Kirk, AC New Kirk, Fairway Northern: Elbee	2017 - 2019
		Barenbrug USA	1	BAR-GRL-CWG	
Bromegrass	2016	Barenbrug USA	2	BAR BCF 1FRRL (meadow bromegrass), BAR BIF 1GRL (smooth bromegrass)	2017-2019
		AAFC	2	S9356M (meadow bromegrass), AC Knowels (hybrid Bromegrass)	
Tall Fescue	2017	Foster's Seed & Feed	5	Titan Rx, Titan Ultra, Covenant, Rendition RX, Hudson	2018 - 2020
Meadow Fescue	2017	Barenbrug USA	2	BAR FP 32, Pradel	2017-2019

As perennial species, the forage seed crops comprised an establishment year followed by two to three consecutive harvest years, referred to as crop years. Creeping red fescue are evaluated for two crop years, while tall fescue, meadow fescue, timothy, wheatgrasses and bromegrasses are evaluated for three crop years. The testing site at Beaverlodge had been under pea-barley-wheat-canola crop sequences in the previous years prior to the trials. The trials were direct-seeded without tillage and fertilizers were applied in the fall on the basis of soil test results. Weeds were controlled by a combination of mechanical and chemical measures with the application of recommended herbicides. Individual experimental plots were comprised of four rows, each 6 m

long with row spacing of 30 cm apart. The yield samples were collected from the central two rows.
The experimental design for all PGRST trials was a randomized complete block with four replications. The data were analyzed by using GLIMMIX, CORR and Means Procedures of SAS® 9.4 System.

RESULTS

Weather effects on crops

The results included in this report were derived from trials that were established in 2014, 2015 and 2016. Despite some anomalies of the May and October temperatures over the reporting years from 2014 to 2017, the monthly maximum and minimum temperatures in other growing months displayed similar patterns with long-term average for last 30 years (Figure 1). However, the amount and distribution of precipitation showed noticeable monthly variation in growing seasons over the reporting period (Figure 2). In general, the growing season in 2015 and 2016 received higher amount of precipitation, with seasonally wettest months being July and August respectively, while 2014 and 2017 growing seasons remained much drier than the long-term average of 30 years. This condition results in variation in soils moisture regimes in growing season in different years causing fluctuations in productivity. Negligible precipitation in August of 2014 when most of the species would be undergoing reproductive processes could have negative effect on seed development. The 2015 growing season showed typical modal pattern of monthly precipitation favouring the moisture demand of the plants. The precipitation pattern in 2016 was also favourable for active growth period, except for a high terminal rainfall in August of 2016 that caused lodging and some impairment in the harvesting process. The 2017 growing season started with warmer and wetter spring followed by gradual decline in precipitation over the months causing some moisture stress during reproductive stage, while permitting favorable dry harvest conditions (Figure 2).

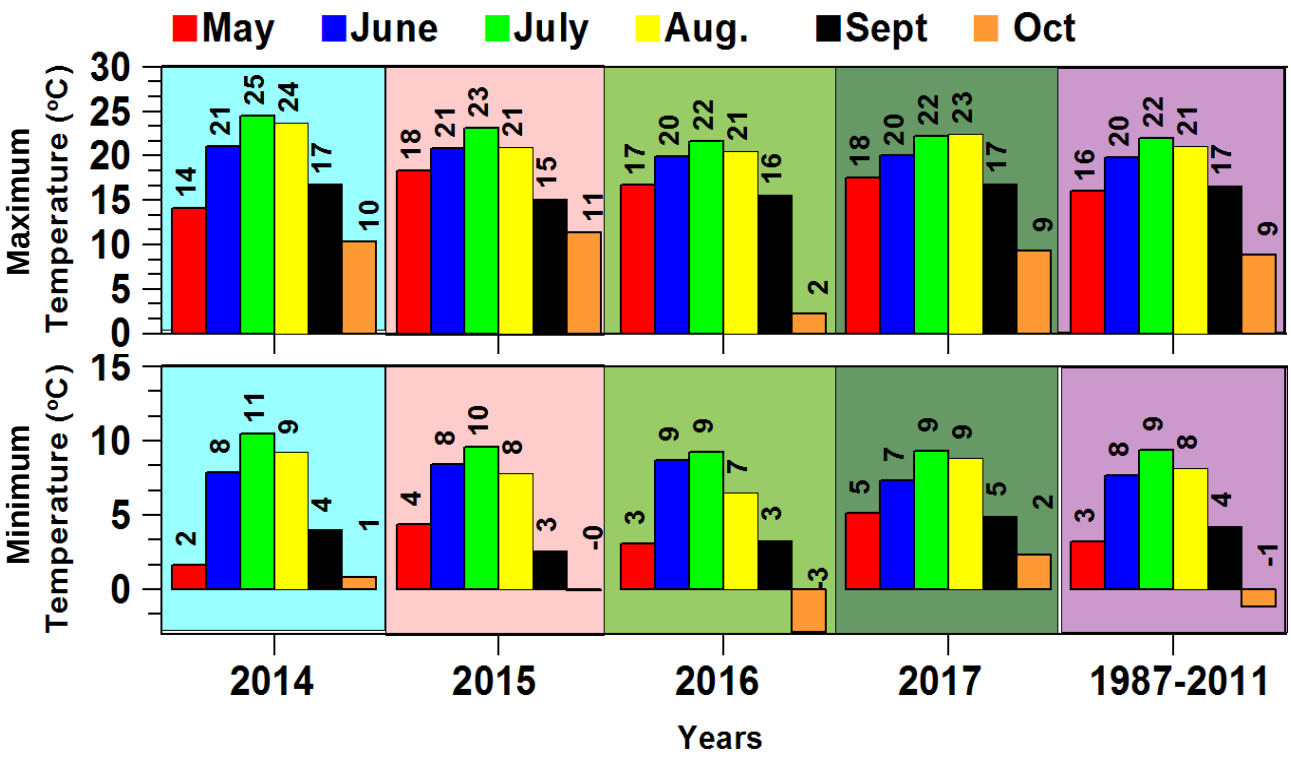

Figure 1 *Average monthly maximum and minimum temperature during the growing seasons of 2014 to 2017 compared with 30-years' monthly average at Beaverlodge, AB.*

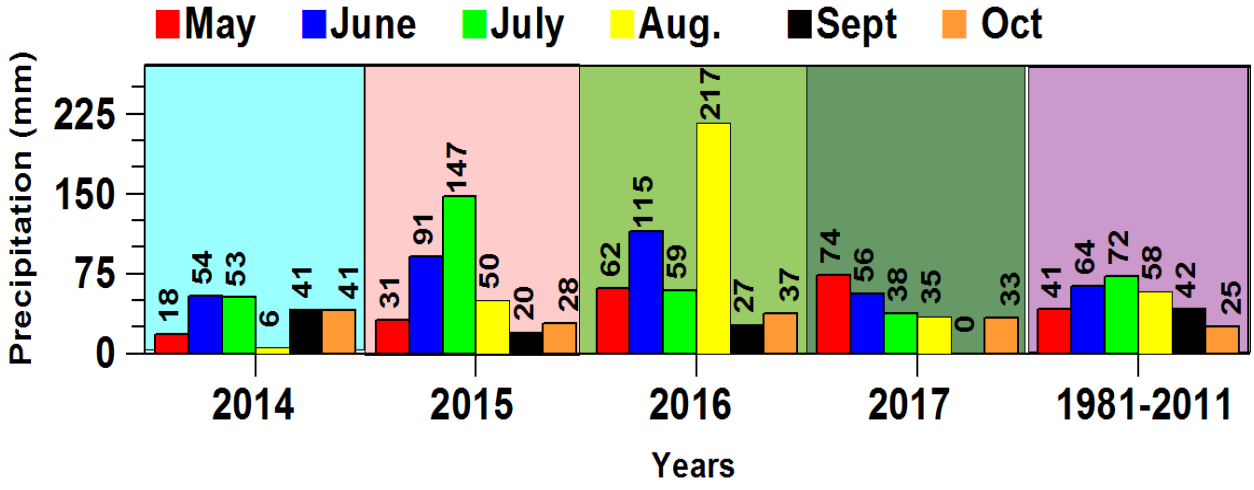

Figure 2 *Total monthly rainfall during the growing seasons of 2014 to 2017 compared with 30-years' monthly average at Beaverlodge, AB.*

Results of completed trials

Creeping red fescue

The experiment containing 24 cultivars of creeping red fescue was established in 2015. Figure 3 shows a pre-harvest snapshot of the trial in 2017. The test cultivars exhibited differences in seed yield, aerial dry biomass and plant height. There were large differences in seed yield between the cultivars within the same crop season ($P < 0.01$), with significant yield decline ($P < 0.01$) in the second crop year within the cultivars and significant cultivar by year interactions ($P < 0.01$) (Table 2). Average yield ranged from 119 to1083 kg ha^{-1} (106 to 967 lbs $acre^{-1}$) in the first crop year of 2016, and the cumulative seed yield over two crop years 2016 and 2017 ranged from 163 to 1624 kg ha^{-1} (145 to 1450 lbs $acre^{-1}$). Cultivar MSPO314 produced significantly higher cumulative seed yield than rest of the cultivars, exceeding the check cultivar Boreal by 21% on average. Boreal remained to be the second highest in seed yield. The yield differences between Boreal, MSPO214, MSPO114, MSG0412, DSV1501, MSPO614 and MSR0612 were not statistically significant, although Boreal had 5 to 20% higher cumulative yield than the latter. Cumulative two-year seed yields of 11 cultivars were higher than average yield of all 24 cultivars for the same period.

Figure 3 *Photograph taken in 2017 of the creeping red fescue trial established in 2015 at Beaverlodge, AB.*

Table 2 *Seed yield of creeping red fescue cultivars in 2016 and 2017 from the trial established in 2015 at Beaverlodge, AB. The trial was seeded on May 13, 2015 and harvested for two crop years on July 27th and July 24th in 2016 and 2017 respectively.*

Company	Cultivar	Plant height		Dry matter yield			Seed yield						
		2016	2017	2016	2017	Total	2016	2017	Total	2016	2017	2016	2017
		(cm)		(kg ha^{-1})			kg ha^{-1}			lb ac^{-1}		% of Boreal	
Pure Seed	4BEN	59	64	2914	3903	6816	420	264	684	375	236	47	59
	4DR4	54	65	2604	3897	6501	382	200	583	341	179	43	45
	4ED4	55	59	2532	3576	6108	523	383	906	467	342	59	86
	4GRY	60	64	2521	3350	5870	326	192	519	291	172	37	43
	4PUE14	55	61	3258	3333	6591	457	278	735	408	248	51	62
	4SHR	58	72	1968	2387	4355	255	252	506	228	225	29	57
	4SP14	55	61	2018	3687	5705	273	306	580	244	273	31	69
Imperial Seed	Reverent	77	75	3503	3366	6869	768	246	1014	685	219	86	55
	DSV1501	74	72	3252	2712	5964	776	379	1154	692	338	87	85
	DSV1502	74	81	2728	3210	5938	640	332	972	571	296	72	75
	DSV1503	73	73	2690	3010	5700	609	185	794	543	165	68	42
Moore Seed Processors	MSG0412	69	69	3139	3723	6862	680	479	1159	607	428	76	107
	MSPO114	73	77	3350	3395	6746	886	320	1206	790	286	99	72
	MSPO214	76	78	3419	3745	7164	852	422	1274	760	377	95	95
	MSPO314	**74**	**75**	**3188**	**4147**	**7335**	**1083**	**541**	**1624**	**966**	**483**	**121**	**121**
	MSPO414	66	66	2817	3839	6655	586	364	949	523	325	66	82
	MSPO514	68	63	2138	2283	4421	119	43	163	106	39	13	10
	MSPO614	54	64	2323	3032	5355	628	509	1138	560	455	70	114
	MSR0612	63	66	3233	3322	6556	864	255	1119	771	227	97	57
Barenbrug USA	BARVVVP3CT	59	71	2314	3144	5458	221	294	515	197	262	25	66
	Bridgeport	71	81	2796	3317	6113	294	225	519	262	201	33	51
Foster's Seed	4CRD8	57	63	2535	3456	5991	416	363	779	371	324	47	82
	ASC295	75	76	3071	3324	6395	505	287	792	451	256	57	64
Check	Boreal	70	77	3169	2749	5918	893	446	1339	797	398	100	100
CV%		5	5	14	16	11	18	21	15				
LSD $_{0.05}$		7	7	642	1065	1228	204	128	256				

Seed yield stability of the cultivars from first crop year to second crop year was highly different, showing sharp declining trends by higher yielding cultivars and steady to increasing trends by the rest. All cultivars that produced higher than average seed yields showed 26 to 70% decline in yields in the second crop year (Table 2; Figure 4). Therefore, the seed yield ranks were not consistent for most of the cultivars for two successive growing seasons (Figure 4).

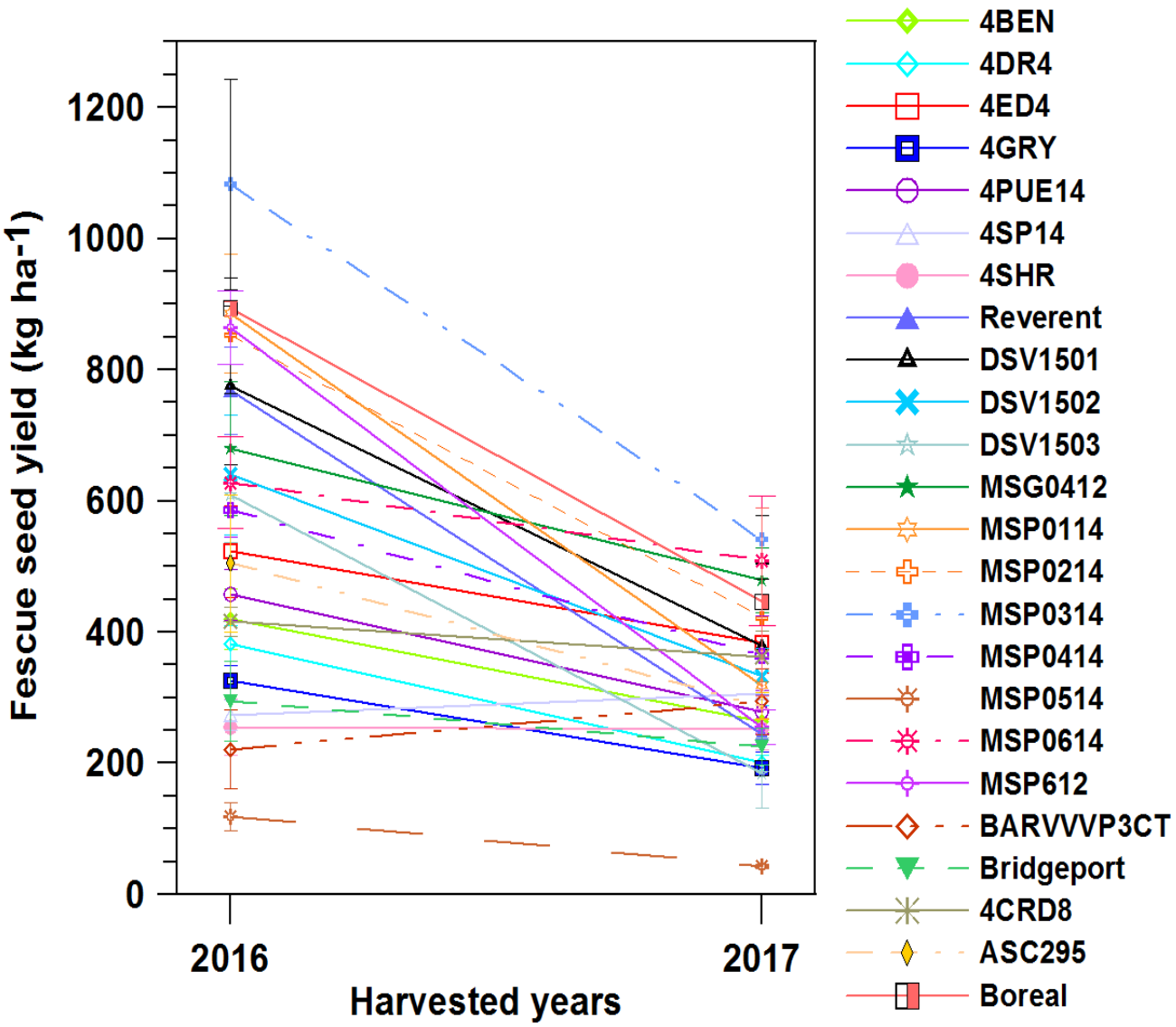

Figure 4 *Seed yield trend of creeping red fescue cultivars in two consecutive crop seasons of 2016 and 2017 from the trial established in 2015 at Beaverlodge, AB.*

Cumulative dry biomass yield of the cultivars ranged from 4,355 to 7,335 kg ha^{-1} (3,885 to 6,562 lbs acre^{-1}), with significant differences in yield within and between years ($P < 0.01$). The highest seed yielder MSPO314 also had highest biomass yield, while Boreal was among the medium biomass yielder. Most of the cultivars produced higher biomass in the second crop year.

Average plant heights of the cultivars ranged from 54 to 77 cm in the first crop season and 63 to 81 cm in the second crop season, with most of the cultivars showing higher values in the successive harvest season (Table 2). For plant heights, there were significant differences between the cultivars ($P < 0.01$) and between the years within the cultivars ($P < 0.01$), with significant cultivar by year interactions ($P < 0.01$). The cultivars could be statistically differentiated in the order of tall (DSV1502, MSPO214, Bridgep, Reveren, MSPO114, ASC295, MSPO314, Boreal, DSV1503 and DSV1501), medium (MSG0412, MSPO414, MSPO514, 4SHR, MSR0612 and

BARVVVP) and dwarf (4GRY, 4BEN, 4CRD8, 4DR4, MSPO614, 4PUE14, 4SP14 and 4ED4) with corresponding ranges of 73 – 78 cm, 64 – 69 cm and 56 – 62 cm average heights. Plant heights increased significantly in the second crop year ($P < 0.01$) (Table 2). The seed yield, dry biomass and plant heights showed moderately positive (r = 0.22 to 0.27), but significant correlations (P <0.01) in creeping red fescues (Figure 5).

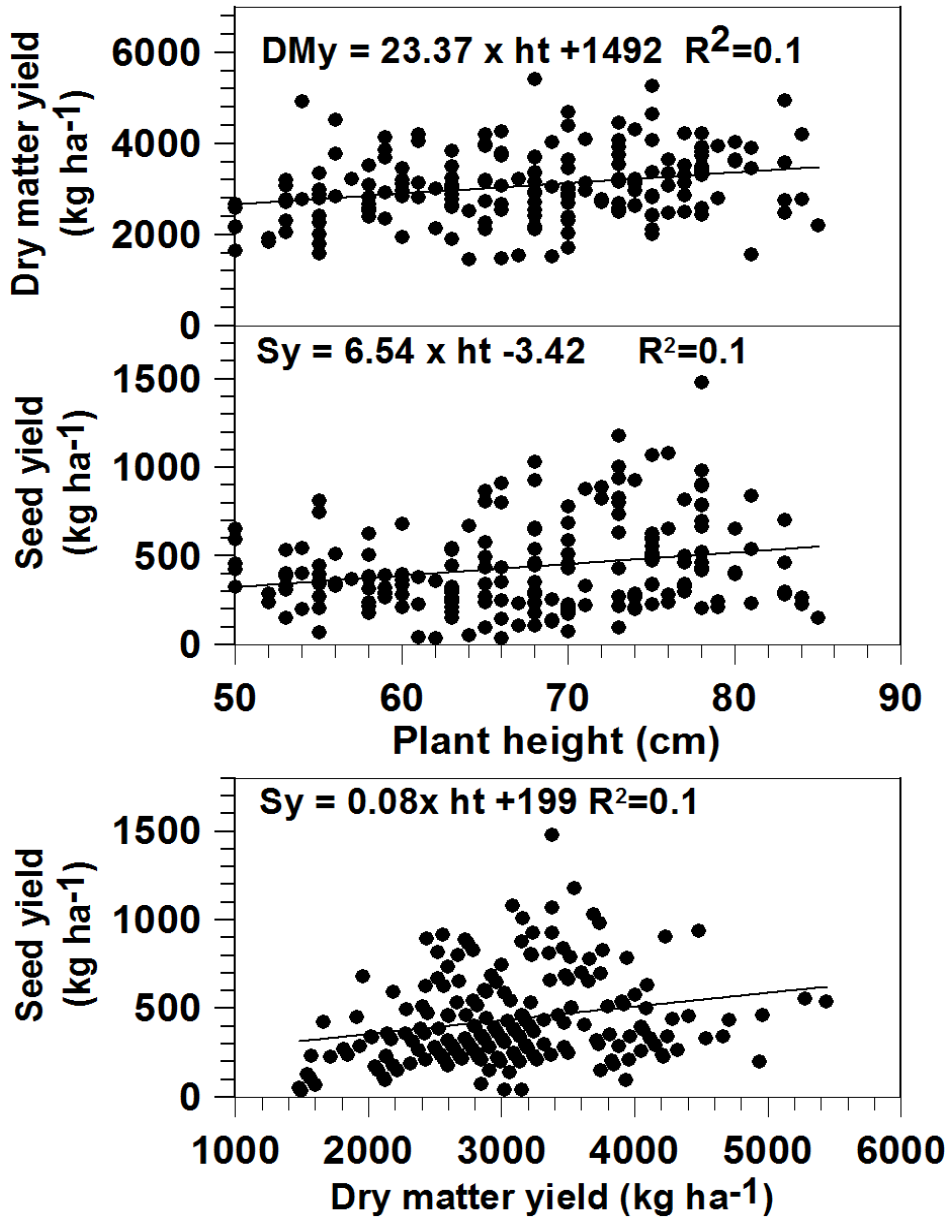

Figure 5 *Correlations between plant height (ht), dry matter (DMy) and seed yield (Sy) of creeping red fescue in 2016 and 2017 from the cultivar trial established in 2015 at Beaverlodge, AB. Abbreviations: CRF = creeping red fescue; DMy = Dry matter yield; Sy = Seed yield; ht = plant height.*

Timothy

The timothy trial established in 2014 comprised 10 cultivars of which 8 cultivars were from Barenbrug USA, 1 from Moore Seed Processors and a check cultivar, Climax. A photograph of the Timothy trial taken in 2017 is presented in Figure 6. There were significant differences between the cultivars ($P < 0.01$) and between the years within the cultivars ($P < 0.01$), with significant cultivar by year interactions ($P < 0.01$). In the contrasting seasonal rainfall amount and distribution pattern from 2015 to 2017, 7 out of 8 cultivars from Barenbrug USA, including Barfleo, Bor01025, Bor01033, Bor01037, Bor2005, Bor88060 and PHLR99 out-yielded the check cultivar Climax, with cumulative yield advantage ranging from 12 to 25% over the Climax (Table 3) for three crop years. Bor01025, with 25% higher cumulative seed yield then Climax, had statistically significant yield advantage over Climax, MST0513 and Barpenta. Bor01025, Bor88060, PHLR99, Bor2005, Bor01037, Bor01033 and Barfleo stood statistically at par for cumulative seed yield for 3 years. The differences in seed yield between the cultivars were more pronounced in the first and the third crop years (Table 3 and Figure 7).

Figure 6 *Photograph taken in 2017 of the Timothy trial established in 2014 at Beaverlodge, AB.*

Table 3 *Seed yield of Timothy cultivars in 2015, 2016 and 2017 from the trial established in 2014 at Beaverlodge, AB. The trial was seeded on May 16, 2014 and harvested for three crop years on August 10th August 12th, and August 10th in 2015, 2016 and 2017 respectively.*

Company	Cultivar	Seed yield				Seed yield				Seed yield			
		2015	**2016**	**2017**	**Total**	**2015**	**2016**	**2017**	**Total**	**2015**	**2016**	**2017**	**Total**
		(kg ha^{-1})				**(lb ac^{-1})**				**% of Climax**			
Barenbrug USA	Barfleo	1145	1251	645	3040	1022	1116	576	2715	123	115	131	119
	Barpenta	824	444	336	1603	735	396	300	1431	88	41	68	63
	Bor01025	1287	1242	763	3293	1148	1108	681	2941	138	115	154	125
	Bor01033	1235	1113	716	3064	1102	993	639	2736	132	103	145	116
	Bor01037	1147	1117	806	3070	1023	997	720	2742	123	103	163	112
	Bor2005	1223	1129	737	3089	1091	1007	658	2758	131	104	149	117
	Bor88060	1229	1249	701	3178	1096	1114	626	2838	132	115	142	123
	PHLR99	1231	1263	675	3010	1098	1127	603	2688	132	117	137	124
Moore Seed Processors	MST0513	903	1039	737	2679	806	927	658	2392	97	96	149	96
Check	Climax	933	1084	494	2511	832	967	441	2242	100	100	100	100
CV%		10	8	8	8								
LSD $_{0.05}$		230	186	111	465								

The cultivars differed significantly ($P = 0.02$) for biomass production, where Climax was the highest and MST0513 the lowest producer. Biomass yield of Bor88060, Bor01025 and PHLR99 did not differ significantly from Climax, while rest of the cultivars yielded significantly less than Climax (Table 4). All cultivars had significantly higher biomass yield in second crop year than the first and third crop years ($P < 0.01$).

Except for the cultivar Barpenta which showed progressively declining seed yield over the crop years, rest of the cultivars had stable yield for first two crop years with about 29 to 47% yield decline in the third crop year (Table 3 and Figure 7).

The plant heights differed significantly between the cultivars ($P <0.01$) and between the years within the cultivars ($P <0.01$), with no cultivar by year interaction. Climax had significantly taller plants followed by Bor88060, Barfleo, Bor01033 and Bor2005 (Table 4). The plant heights showed quadratic trend with the significant increase in the second crop year and decrease in the third crop year (Figure 7).

The seed yield of timothy is moderately correlated with biomass yield ($r = 0.42517$; $P <.01$) and plant height ($r = 0.64191$; $P <.0001$) (Figure 8). This means that the cultivar with high seed yield will also have high end use quality.

Table 4 *Plant height and aerial dry matter yield at maturity of timothy cultivars in 2015, 2016 and 2017 from the trial established in 2014 at Beaverlodge, AB. The trial was seeded on May 16, 2014 and harvested for three crop years on August 10th August 12th, and August 10th in 2015, 2016 and 2017 respectively.*

Company	Cultivar	Plant height			Dry matter yield			
		2015	2016	2017	2015	2016	2017	Total
		cm			(kg ha^{-1})			
Barenbrug USA	Barfleo	117	124	102	10011	14126	8526	32662
	Barpenta	109	112	100	7296	14001	10176	31473
	Bor01025	111	117	100	9211	15554	9474	34238
	Bor01033	114	119	97	8675	14289	8256	31220
	Bor01037	112	114	99	8039	14190	8523	30752
	Bor2005	114	115	100	8737	14212	8802	31750
	Bor88060	120	123	103	9605	15599	9411	34615
	PHLR99	110	116	96	10156	14689	9109	33954
Moore Seed Processors	MST0513	108	113	98	8685	12234	8113	29031
Check	Climax	126	127	104	11733	16546	9450	37728
CV%		5	6	3	8	7	13	7
LSD $_{0.05}$		12	14	6	1502	2093	2435	4909

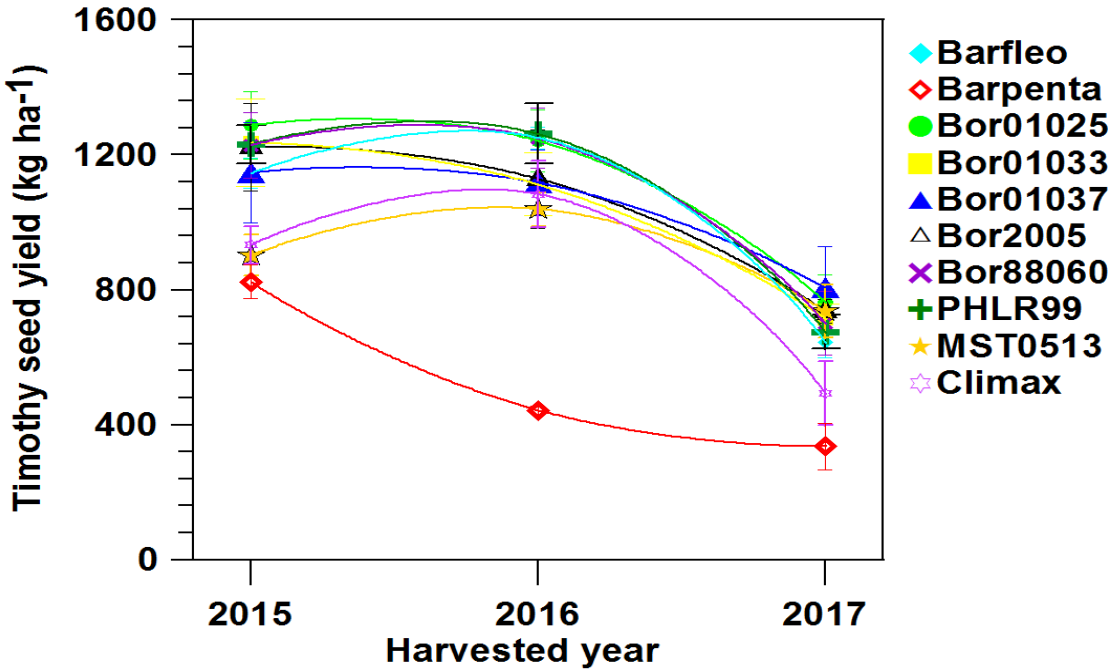

Figure 7 *Seed yield trend of timothy cultivars for three crop years in 2015, 2016 and 2017 from the trial established in 2014 at Beaverlodge, AB.*

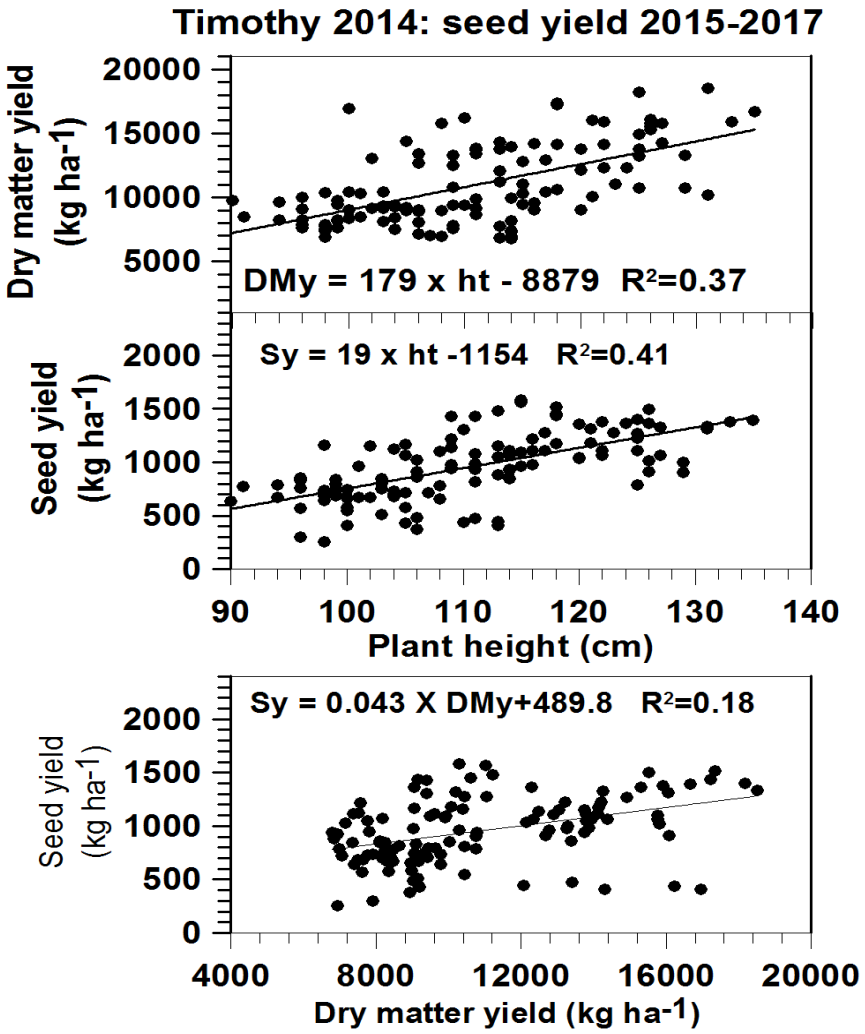

Figure 8 *Correlations between plant height (ht), dry matter (DMy) and seed yield (Sy) of timothy from 2015 to 2017 crop years in the cultivar trial established in 2014 at Beaverlodge, AB.*

Conclusions of completed trials

Seed yield is the major trait of economic interest for creeping red fescue, provided the cultivars have similar end use quality – the turf. Based on the seed yield performance of two crop seasons, MSPO314 cultivar from Moore Seed Processors stood out to be promising in the Peace Region. Other five cultivars from Moore Seed Processors (MSPO214, MSPO114, MSG0412, MSPO614 and MSR0612) and one cultivar from Imperial Seed (DSV1501) also yielded comparably to popular check Boreal. The differential yield stability of the cultivars implicates that producers will have options to choose cultivars for a single or more harvest years, and that there is opportunity to improve this attribute through population improvement.

The end use value in timothy lies on the forage biomass quantity, quality and stand persistence. Based on seed yield responses, there are promising alternatives to Climax for the adaptability to Peace region. However, based on the cumulative dry matter yield, climax could still be the cultivar of choice for forage biomass production for livestock. All cultivars had higher biomass yield in second crop year than the first and third crop years. This may be related to both developmental physiology and the soil moisture availability during the growth period of the crop.

Results of on-going trials

Creeping red fescue

The creeping red fescue trial established in 2016 has results of one crop year in 2017 and is planned to be evaluated for second crop year in 2018. Figure 9 shows a snapshot of the trial. Final results will be presented in 2018 report. The trial included seven proprietary cultivars being compared with the check – Boreal. Boreal remained to be the winner in seed yield followed closely by Chanellor from Foster Seed & Feed, yielding 3% less than the former, which is not statistically significant. Other three cultivars lagged far behind in seed yield as compared to Boreal (Table 5).

Figure 9 *Photograph taken in 2017 of the creeping red fescue trial established in 2016 at Beaverlodge, AB.*

Table 5 *Seed yield, plant height and dry matter yield of creeping red fescue cultivars in 2017 from the trial established in 2016 at Beaverlodge, AB. The trial was seeded on May 26, 2016 and harvested July 24, 2017.*

Company	Cultivar	Plant height	Dry matter yield	Seed yield		
		cm	kg ha^{-1}	kg ha^{-1}	lb ac^{-1}	% of check
Barenbrug USA	BAR FRR 15134	66.75	3068	995	888	84
Foster seed & feed	C814-4BEN	68.50	3223	562	502	47
	C8-14-4EDN	64.25	3252	776	693	65
	Chanellor	80.00	4265	1152	1028	97
Imperial Seed	DSV1501	76.50	3861	896	800	76
	DSV1502	75.00	3527	709	633	60
	DSV1503	78.50	4083	987	882	83
Check	Boreal	80.50	4263	1185	1058	100
	CV%	2	6	8.6		
	LSD $_{0.05}$	3.6	443	162.9		

Tall fescue trial

The tall fescue trial established in 2016 has results of one crop year in 2017 and is due to be evaluated for second and third crop years in 2018 and 2019 respectively. Final reports will ensue after the evaluation in 2018 and 2019. Figure 10 is a snapshot of the trial in 2017.

Figure 10 *Photograph taken in 2017 of the tall fescue trial established in 2016 at Beaverlodge, AB.*

The trial included four cultivars from Barenbrug being compared with the check – Courtenay. The test cultivars showed poorer adaptability to Peace region compared to Courtenay for the seed yield (Table 5). BAR FA 14173-11 suffered more severe winter injury, but exhibited satisfactory growth recovery in the spring producing a quarter the amount of Courtenay. Other three cultivars produced lower seed yield as compared to the check Courtenay.

Table 6 *Seed yield, plant height and dry matter yield of tall fescue cultivars in 2017 from the trial established in 2016 at Beaverlodge, AB. The trial was seeded on May 26, 2016 and harvested July 27, 2017*

Company	Cultivar	Plant height	Dry matter yield	Seed yield		
		cm	kg ha^{-1}	kg ha^{-1}		% of check
Barenbrug USA	BAR FA 11701	101	5530	824	736	68
	BAR FA 14173-11	75	1697	317	283	26
	BAR FA 14173-15	73	1685	330	294	27
	Bariane	106	5123	815	728	67
Check	Courtenay	116	6110	1217	1086	100
	CV%	2..8	6	8		
	LSD $_{0.05}$	7.2	619	142		

Meadow fescue

A meadow fescue trial established in 2016 included two new cultivars originated from Barenbrug, USA and a check cultivar Preval (Table 7). The new cultivars produced statistically comparable seed and biomass yield to Preval and matured earlier than the creeping red fescue. Meadow fescues have much taller growth form than the creeping red fescue, with heights ranging from 97 to 102 cm. The trial will continue for two more crop years.

Figure 11 *Photograph taken in 2017 of the meadow fescue trial established in 2016at Beaverlodge, AB.*

Table 7 *Seed yield, plant height and dry matter yield of meadow fescue cultivars in 2017 from the trial established in 2016 at Beaverlodge, AB. The trial was seeded on May 26, 2016 and harvested on July 20, 2017.*

Company	Cultivar	Plant height	Dry matter yield	Seed yield		
		cm	kg ha^{-1}	kg ha^{-1}	lb ac^{-1}	% of check
Barenbrug USA	**BAR FP 32**	97	5190	991	885	94
	Pradel	98	5031	1046	934	99
Check	**Preval**	102	5229	1056	943	100
	CV%	3.6	4.5	3.9		
	LSD $_{0.05}$	8.7	564.1	98.5		

Wheatgrasses

The wheatgrasses trial established in 2016 comprised 4 proprietary entries that included 4 cultivars of crested wheatgrass and 1 cultivar of northern wheat cultivars being compared with Fairway cultivar of wheatgrass as a check. Figure 12 is a photograph of the trial in the crop year 2017.

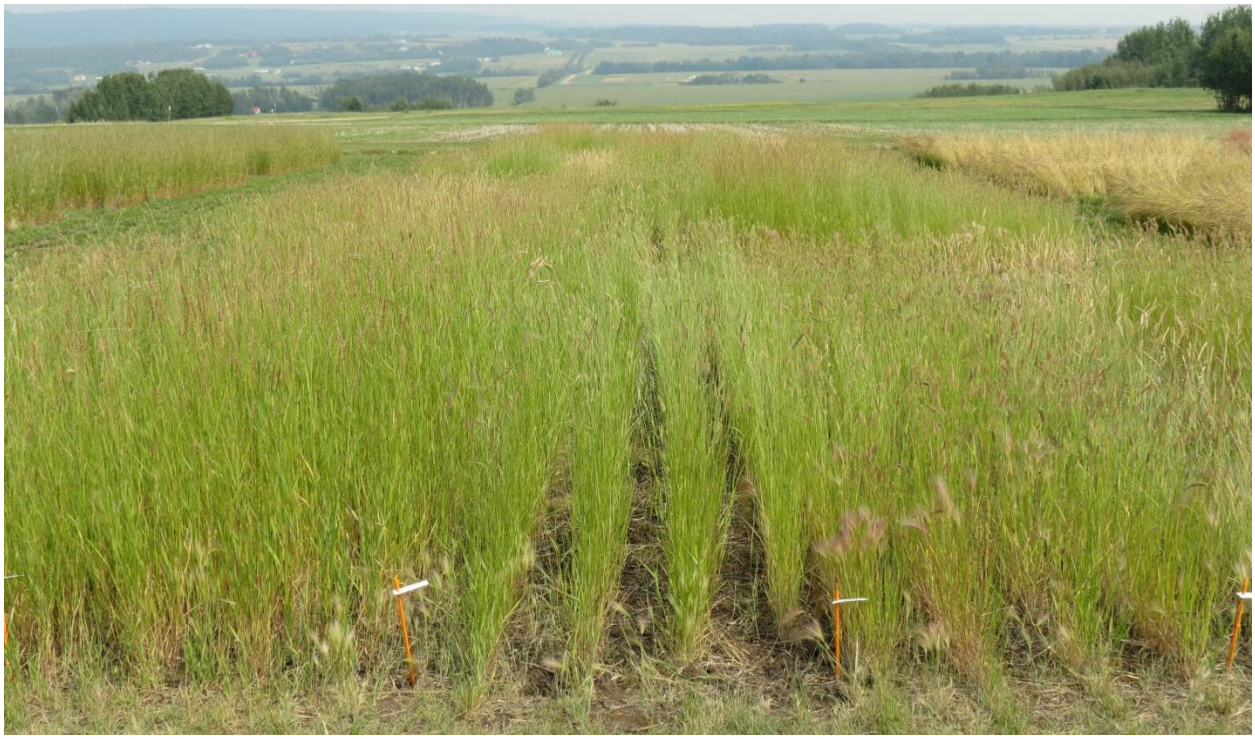

Figure 12 *Photograph taken in 2017 of the crested wheatgrass trial established in 2016 at Beaverlodge, AB.*

The cultivar Kirk produced statistically comparable seed yield to the Check – Fairway. Rest of the test cultivars yielded significantly lower than Fairway. With tallest plants, BAR-GRL-CWG had significantly higher biomass yield, while northern wheatgrass cultivar Elbee had the lowest biomass yield (Table 8). The trial will continue for two more crop years.

Table 8 *Seed yield, plant height and dry matter yield of crested wheat cultivars in 2017 from the trial established in 2016 at Beaverlodge, AB. The trial was seeded on May 26, 2016 and harvest on July 27, 2017 (Elbee) and August 3, 2017 (rest of the entries).*

Company	Crop	Cultivar	Plant height	Dry matter yield	Seed yield		
			cm	(kg ha^{-1})	kg ha^{-1}	lb ac^{-1}	% of check
Limoges Forage & Grasses Ltd	Crested wheat	Kirk	85	3095	204	182	98
	Crested wheat	AC New Kirk	89	3230	138	123	66
	Northern wheatgrass	Elbee	74	1087	163	145	78
Barenbrug USA	Creeping wheatgrass	BAR-GRL-CWG	99	4069	167	149	80
	check	Fairway	69	2604	209	186	100
		CV%	3.9	6.4	7.2		
		LSD $_{0.05}$	7.1	393.1	27.6		

Bromegrasses

The bromegrass trial established in 2016 comprised 4 proprietary entries that included 1 cultivar of meadow bromegrass and 1 of smooth bromegrass and 2 cultivars of hybrid bromegrass, where Fleet and Carlton were used as the meadow bromegrass and smooth bromegrass checks respectively. Figure 13 is a photograph of the crop year 2017 of the bromegrass trial established in 2016. The trial will continue for two more crop years.

In the first crop year 2017, the meadow bromegrass BAR BCF 1FRRL and the hybrid bromegrass AC Knowles produced higher seed yields than Fleet by 11 and 3% respectively, and then Carlton by 204 and 190% respectively. However, the yield differences between BAR BCF 1FRRL, AC Knowles, S9356M and Fleet were not statistically significant (Table 9).

Both smooth bromegrass cultivars produced significantly lower seed yields than meadow and hybrid bromegrass cultivars. Bromegrasses are one of the most popular forages for pasture and hay production for livestock. Therefore, end-use value of bromegrasses lies in the biomass quantity, quality and stand persistence. For biomass production Carlton, S9356M and AC Knowles remained at par with significantly higher yield than that of Fleet. The yield differences between BAR BCF 1FRRL, BAR BIF 1GRL and Fleet were not significant statistically (Table 9).

Figure 13 *Photograph taken in 2017 of the bromegrass trial established in 2016 at Beaverlodge, AB.*

Table 9 *Seed yield, plant height and dry matter yield of bromegrasses in 2017 from the trial established in 2016 at Beaverlodge, AB. The trial was seeded on May 26, 2016 and harvested on August 2, 2017.*

Company	Crop species	Cultivar	Plant height	Dry matter yield	Seed yield			
			cm	(kg ha^{-1})	kg ha^{-1}	lb ac^{-1}	% of Fleet	% of Carlton
AAFC	Hybrid bromegrass	S9356M§	122	5624	523	467	88	162
		AC Knowles	119	5291	612	546	103	190
Barenbrug USA	Meadow bromegrass	BAR BCF 1FRRL	120	4689	658	588	111	204
	Smooth bromegrass	BAR BIF 1GRL	117	5192	155	139	26	48
	Meadow bromegrass	Fleet - Check 1	118	4581	593	529	100	184
	Smooth bromegrass	Carlton – Check 2	113	6276	322	287	54	100
	CV%		2.2	8.8	21.6			
	LSD $_{0.05}$		5.6	993.6	219.5			

Conclusions

One trial on creeping red fescue and one on timothy were concluded in the reporting period, while one trial each of creeping red fescue, meadow fescue, tall fescue, timothy, wheat grasses and bromegrasses underwent the evaluation for first crop year and is subjected to further evaluations in the coming seasons. Variable weather patterns in different years provided desirable test environment for examining the adaptability of the cultivars in the peace region. Creeping red fescue being an amenity grass, seed yield is the major performance indicator in the PGRST. However, for other forage species, biomass yield will also be duly considered in the evaluation. Forage nutritive value is also an important consideration to be pursued in the future studies.