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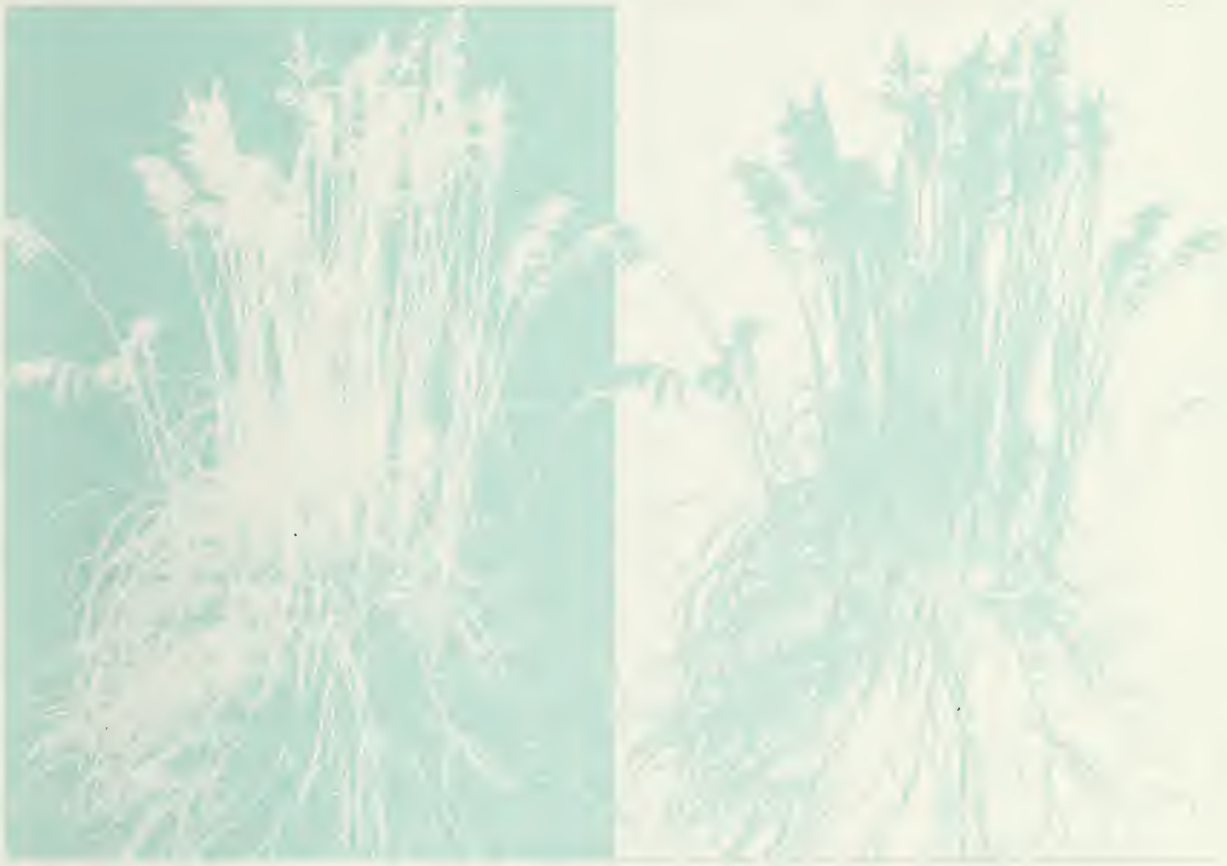
Meadow Bromegrass



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Meadow bromegrass

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Cover illustration
Typical plant of meadow bromegrass

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Le brome des prés

Contents

Introduction

Meadow bromegrass, *Bromus riparius* Rehm. (also called *B. erectus* Huds.), is a reduced creeping type of bromegrass with good ability for regrowth. It is native to southeastern Europe, the Caucasus, Turkey, and central Asia. Its use in North America began when the cultivar Regar was registered in the United States in 1966. Regar, derived from a Turkish introduction, was registered in Canada in 1980 and has been successfully used as pasture in Alberta and Saskatchewan. The higher seed-yielding cultivars, Paddock and Fleet, were released in 1987 from the Agriculture Canada Research Station, Saskatoon, Sask.

This booklet compares meadow bromegrass with the more widely grown smooth bromegrass, *B. inermis* Leyss. We note in particular the merits of meadow bromegrass as a pasture grass. Agriculture Canada research stations in Alberta and Saskatchewan provided performance data. Cattlemen and seed growers in these provinces provided further observations.

Description of meadow bromegrass

Plants of meadow bromegrass have many basal leaves (see cover illustration), which, together with rapid recovery after grazing, make the grass useful for pasture. Regrowth rates are especially high in the initial stages of regrowth (0 – 20 days) compared to smooth bromegrass (Fig. 1). In meadow bromegrass, regrowth comes from existing tiller bases; in smooth bromegrass, regrowth is initiated from crowns and

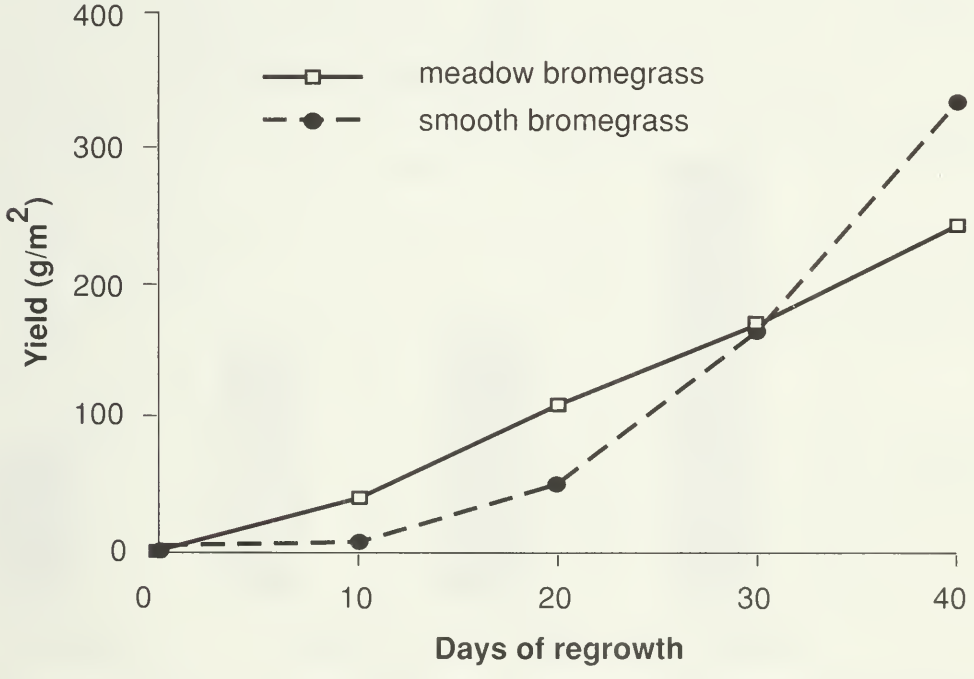

Fig. 1 Cumulative dry matter yield of meadow bromegrass and smooth bromegrass in greenhouse tests, Lacombe, Alta.

rhizomes beneath the soil surface. When cut or grazed frequently, the tillers in smooth bromegrass never attain rapid growth; in meadow bromegrass, rapid growth is readily achieved.

Meadow bromegrass has more uniform seasonal production than smooth bromegrass and is particularly superior in July and September (Fig. 2). Leaves also have better frost resistance than those of smooth bromegrass, which makes the grass suitable for grazing until mid October providing moisture conditions are favorable.

Rhizomes of meadow bromegrass are much shortened compared to those of smooth bromegrass. Plant diameters for 1-year old plants at Saskatoon averaged 42 cm compared to 77 cm for smooth bromegrass.

Leaves of meadow bromegrass are narrower than those of smooth bromegrass and have pubescence or short hairs, particularly noticeable on the margins of leaves (Fig. 3). Leaves also tend to droop, which can result in some loss from trampling by livestock. Stems and seeds also have varying degrees of pubescence. Seeds of meadow bromegrass have short awns 5 – 8 mm long whereas tip awns in smooth bromegrass do not exceed 2 mm. Seeds of meadow bromegrass weigh 5.0 – 6.0 g per 1000 seeds compared to 3.0 – 4.0 g per 1000 for smooth bromegrass.

Meadow bromegrass has a chromosome number of $2n = 70$ compared with $2n = 56$ for smooth bromegrass. Both grasses are cross-pollinated but meadow bromegrass has shown more self-fertility than smooth bromegrass.

Meadow bromegrass is resistant to brown leaf-spot *Pyrenophora bromi* Died., which causes severe losses in smooth bromegrass, especially in old stands with a low fertility status.

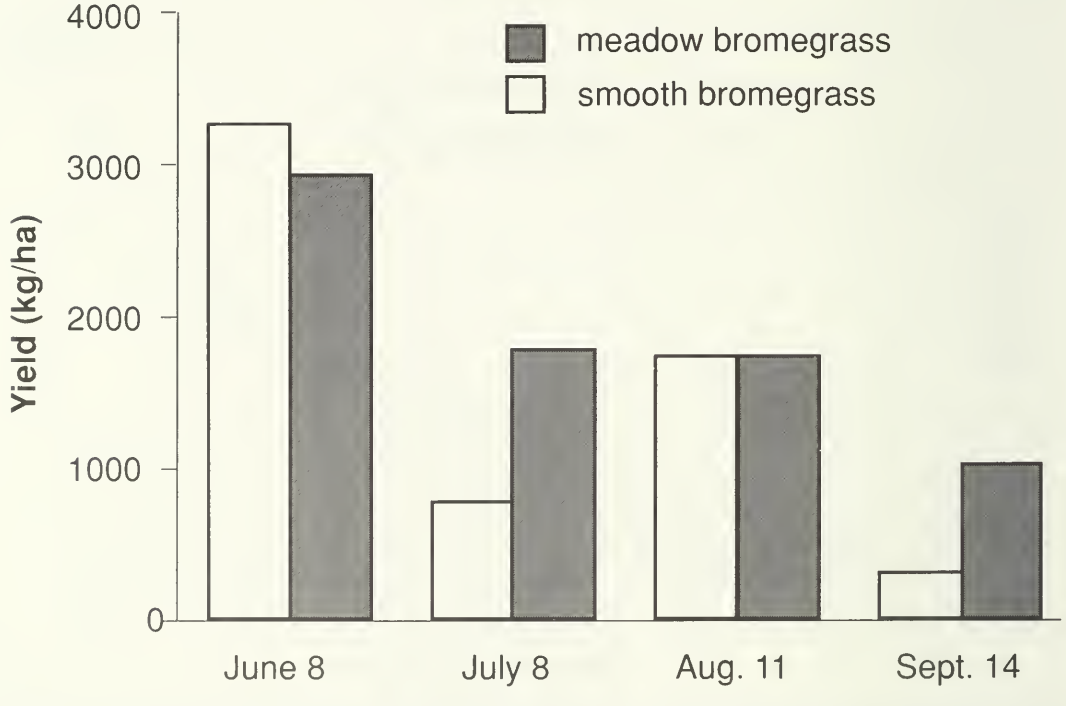

Fig. 2 Yield distribution of meadow bromegrass compared with smooth bromegrass in repeated cuts at four times per season, Lacombe, Alta.

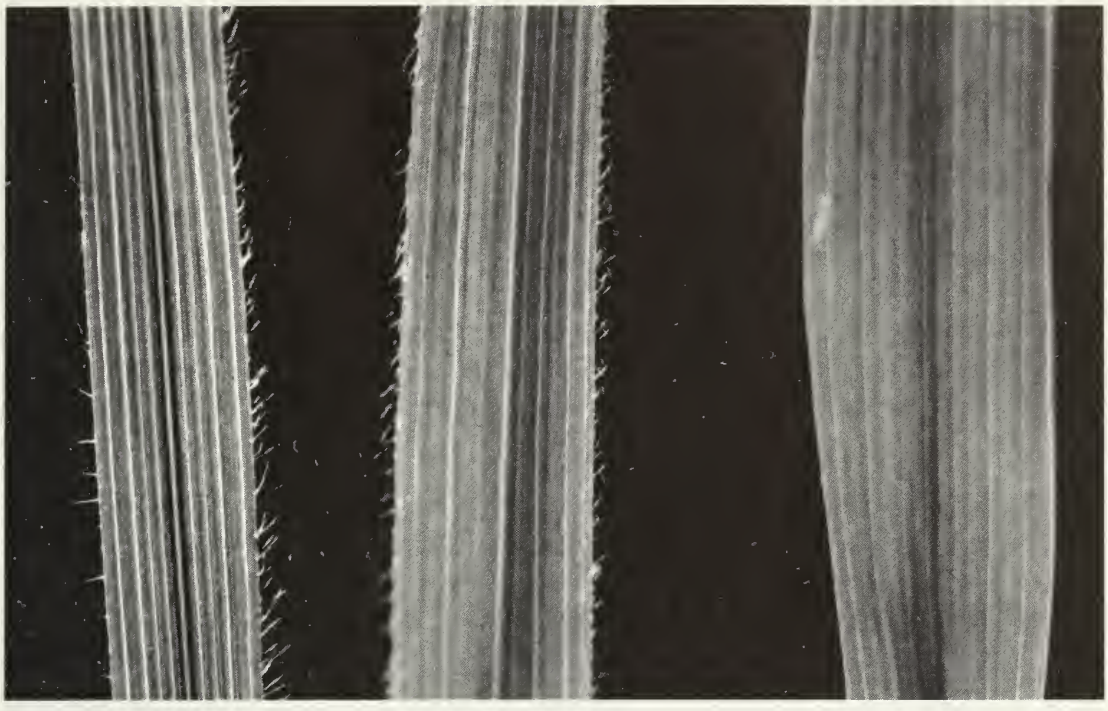

Fig. 3 Leaves of meadow bromegrass (*left*), smooth bromegrass (*right*), and their hybrid (*centre*) showing typical pubescence and relative leaf widths.

Adaptation

Meadow bromegrass is best adapted to the cooler, more moist areas within the wider adaptation region of smooth bromegrass. These areas include the Black and Gray Wooded soil zones and districts of the Dark Brown soil zone having better moisture. With irrigation it has also yielded well in the Brown soil zone. It has produced well on sands, loams, and clays.

At Saskatoon, meadow bromegrass has persisted for 10 years and longer with minimal weed control. Some tests have shown meadow bromegrass to persist better than smooth bromegrass on poor sandy soils with heavy grazing. In dry periods, leaves of meadow bromegrass turn brown sooner than those of smooth bromegrass but this browning does not affect its survival.

It is also sensitive to flooding and will die off if flooded for 10 days or more. Meadow bromegrass is less tolerant of salinity than is smooth bromegrass. When using meadow bromegrass on rolling land, overseed low wet areas with more tolerant species such as timothy for moist districts and smooth bromegrass for drier areas.

Meadow bromegrass is less winter-hardy than smooth bromegrass, suffering 50% damage to sods at –22°C, whereas a temperature of –28°C was needed to get equivalent damage to smooth bromegrass and –29 to –35°C for crested wheatgrass (Limin and Fowler 1987).

Comparative yields with other grasses

In trials on Black soils at Melfort and Gray Wooded soils near Melfort meadow bromegrass was compared with five other grasses including

smooth bromegrass (Tables 1 and 2). Under the four-cut system for pasture the yields of meadow bromegrass compared favorably with the other grasses on both soil types. Under the two-cut system for hay, meadow bromegrass yielded better than all except crested wheatgrass on the Gray Wooded soils. However, it yielded less than all except green needlegrass on the Black soils. On moist Black soils at Lacombe meadow bromegrass yielded 20% more forage than the average of crested wheatgrass, smooth bromegrass, orchardgrass, and meadow foxtail (Table 3). Meadow bromegrass provided forage for grazing as early as meadow foxtail. Its fall production and total regrowth were similar to those of orchardgrass. Similarly on Black soils at

Table 1 Simulated grazing yields of grass species at Melfort, Sask., when fertilized annually with N at 90 kg/ha and P at 22 kg/ha

	Annual dry matter yield for four cuts (kg/ha)	
Species (cultivar)	Black soils 1980 – 1986	Gray Wooded soils 1981–1986
Meadow bromegrass (Regar)	5432	2063
Smooth bromegrass (Carlton, Magna*)	5070	1881
Crested wheatgrass (Parkway)	5304	1896
Intermediate wheatgrass (Chief)	5994	1882
Russian wild ryegrass (Mayak)	4932	—
Green needlegrass (Lodorm)	4987	1807

* Magna on Gray Wooded soils only.

Table 2 Hay yields of grass species at Melfort, Sask., when fertilized annually with N at 90 kg/ha and P at 22 kg/ha

	Annual dry matter yield for two cuts (kg/ha)	
Species (cultivar)	Black soils 1980–1986.	Gray Wooded soils 1981–1986
Meadow bromegrass (Regar)	6251	2581
Smooth bromegrass (Carlton, Magna*)	7619	2457
Crested wheatgrass (Parkway)	7957	2684
Intermediate wheatgrass (Chief)	7166	2192
Russian wild ryegrass (Mayak)	6658	—
Green needlegrass (Lodorm)	6069	2220

* Magna on Gray Wooded soils only.

Table 3 Pasture yields of meadow bromegrass compared to other grasses, Lacombe, Alta., four cuts per season*, 1988–1991

Species	Cultivar	Average total yield (kg/ha)
Meadow bromegrass	Regar	12 114
	Paddock	11 702
	Fleet	11 972
Smooth bromegrass	Carlton	9 648
	Manchar	9 710
Crested wheatgrass	Kirk	10 095
	Parkway	10 332
Orchardgrass	Kay	9 759
Meadow foxtail	Common	10 284

* Fertilized after each cut to give annual totals for N of 244 kg/ha and P of 63 kg/ha.

Beaverlodge, meadow bromegrass withstood frequent defoliation better than smooth bromegrass and also showed greater production at low levels of N fertilization (Fairey 1991).

Under drier conditions at Saskatoon in the Dark Brown soil zone meadow bromegrass yielded less than smooth bromegrass both when cut as hay and as pasture (Table 4). At Scott, the two grasses gave equivalent yields when cut as hay although smooth bromegrass gave superior pasture yields. The advantages of meadow bromegrass in this zone were more rapid regrowth after cutting and better fall greenness, or quality. Usually in this soil zone only two to three pasture cuts could be obtained compared to four cuts in the Black soil zone.

Table 4 Yields for grasses as hay and pasture at Saskatoon and Scott, Sask., on Dark Brown soils, with no fertilizer applied

	Annual yield (kg/ha)			
	Saskatoon, 1975–1983		Scott, 1975–1980	
Species (cultivar)	Hay	Pasture	Hay	Pasture
Meadow bromegrass (Paddock)	2082	1996	2859	1398
Smooth bromegrass (Carlton)	2841	2178	2834	1608
Crested wheatgrass (Fairway)	2218	1466	2548	1672
Intermediate wheatgrass (Chief)	3819	2534	3270	1585
Russian wild ryegrass (Mayak)	2311	1941	2633	1388

Source: Knowles 1987.

Cultivars of meadow bromegrass

Regar has been a useful pasture grass under irrigation in Idaho, Wyoming, and Montana. It also has performed well in Alberta and Saskatchewan. Its main defect is that its low yield of seed results in high prices for seed.

Paddock was derived from an introduction from Krasnodar, USSR, to the Saskatoon Research Station in 1969. Paddock was registered in 1987 and assigned in an exclusive release by SeCan to Newfield Seeds Ltd., Nipawin, Sask.

Fleet also was developed by the Saskatoon Research Station and registered in 1987. It was developed from the interpollination of eight strains from Europe and Asia including plants of Regar and Paddock. Selection was made especially for plants with good seed yields, reduced awn development, and less shattering. This variety was a general release by SeCan to its members for foundation and certified seed production. The main attributes of the Canadian cultivars Paddock and Fleet are much higher seed yields and equivalent forage yield compared to Regar.

Performance of cultivars

Tests of pasture yields of cultivars, determined by clipping in May followed by monthly clippings, showed little difference in yields of the three meadow bromegrass cultivars (Table 5). Under drier conditions at Saskatoon, there was more browning of leaves in Regar than in Paddock or Fleet. At Lacombe, with moister conditions, Regar had better spring vigor.

Hay yields including aftermath were similar for the three cultivars (Table 6), although Fleet was tested at only one of the four locations involved.

In tests of seed yields at three locations, Paddock and Fleet produced much better than did Regar (Table 7). Yields in the 3rd and 4th years were better maintained in Paddock and Fleet than with Regar (Table 8). Seed yields of meadow bromegrass generally declined more with years of production than those of smooth bromegrass.

Table 5 Pasture clipping yields of meadow bromegrass cultivars

		Annual yield (kg/ha)		
Station (tests)	Years	Paddock	Fleet	Regar
Saskatoon, Sask. (6 tests)	1980–1987	3 278	3 265	2 994
Lacombe, Alta. (3 tests)	1981–1988	8 656	—	8 411
Brandon, Man. (1 test)	1982–1983	5 960	5 895	6 130
Lethbridge, Alta. (1 test*)	1986–1988	—	10 900	10 900

* Irrigated; other tests not irrigated.

Table 6 Hay yields of meadow bromegrass cultivars, including aftermath

Station (tests)	Years	Annual yield (kg/ha)		
		Paddock	Fleet	Regar
St. Claude, Man. (3 tests)	1982–1986	5 832	—	5 514
Saskatoon, Sask. (2 tests)	1981–1990	3 729	3 679	3 601
Melfort, Sask. (1 test)	1979–1986	5 408	—	5 401
Lacombe, Alta. (2 tests)	1983–1988	13 084	—	12 632

Table 7 Seed yields of meadow bromegrass cultivars

Station (tests)	Years	Annual yield (kg/ha)		
		Paddock	Fleet	Regar
Saskatoon, Sask. (5 tests)	1981–1989	379	447	210
Melfort, Sask. (1 test)	1985–1988	351	360	229
Arborg, Man. (3 tests)	1982–1988	663	—	417

Table 8 Seed yields of meadow bromegrass cultivars at Saskatoon by year of harvest and for wide (90 cm) and narrow (30 cm) row spacings, seeded in 1984, and fertilized annually with N at 50 kg/ha

Cultivar	Seed yield (kg/ha)				
	1985	1986	1987	1989	Ave.**
	Wide row spacing				
Regar	179	494	301	154	282
Paddock	310	818	543	427	524
Fleet	295	798	661	491	561
Carlton*	233	608	488	559	472
	Narrow row spacing				
Regar	378	283	55	50	192
Paddock	716	438	126	98	345
Fleet	702	530	197	172	400
Carlton*	416	480	309	261	367

* Smooth bromegrass control.

** Does not include 1988 when drought precluded all seed production.

Stand establishment

Growers have found it more difficult to establish stands of meadow bromegrass than those of smooth bromegrass. This problem occurs partly because meadow bromegrass lacks the aggressive creeping root habit of smooth bromegrass; therefore stands do not "fill in." Seeds of meadow bromegrass are larger than those of smooth bromegrass so a higher seeding rate is needed. Unless meadow bromegrass seed is processed to remove the tip awns and hairs, bridging of seed occurs in seed drills.

Recommended seeding rates are 12 kg/ha either seeded alone or in a mixture. Seed alfalfa in a mixture at rates of 1–3 kg/ha. In moister areas, drop the seeding rate of alfalfa to 0.5 – 0.75 kg/ha to reduce the proportion of alfalfa and so lessen the danger of bloat. Alternative nonbloating legumes are birdsfoot trefoil, which may be seeded at 2 kg/ha, or cicer milkvetch seeded at 5 – 6 kg/ha.

For stands intended for pasture and hay use row spacings of 15 – 30 cm. For seed production, use spacings of 30, 60, and 90 cm.

Companion crops of cereals, commonly used in the year of seeding, greatly reduce the vigor of meadow bromegrass in the year following seeding. This loss of vigor delays grazing the following year until the grass becomes properly established. For seed production, we recommend seeding meadow bromegrass without any companion crop.

Pasture use

Meadow bromegrass is well accepted by cattle. They will graze it selectively in mixtures sown with some other forage species, although some initial rejection may occur until they adjust to it. If left ungrazed until seed set, palatability of meadow bromegrass is reduced but not as severely as experienced with crested wheatgrass and smooth bromegrass. At low to moderate rates of stocking, patch grazing may occur, leading to overgrazing and undergrazing of individual plants. There are some reports that sheep prefer smooth bromegrass to meadow bromegrass.

Meadow bromegrass has a growth pattern that suits it to short-duration, high-intensity grazing. With cross-fencing several paddocks can be provided, which can be grazed and then rested to allow the meadow bromegrass to regrow before being grazed again. Allow meadow bromegrass to grow to 20 –25 cm in height before grazing the pasture. Apply sufficient grazing pressure to graze the meadow bromegrass to a 10-cm height quickly, preferably in 7 –12 days. In a longer grazing period animals begin to graze regrowth, which weakens individual plants. Allow the pasture to rest for 30 – 60 days between grazings depending on the season of the year and rainfall. Using rotational grazing it is possible to obtain two or three grazings per year. Arrange to graze meadow bromegrass pasture to a 10-cm height prior to snowfall to prevent matting of leaf growth and disease.

Meadow bromegrass can be considered a dual-purpose, hay–pasture, forage crop. Paddocks that are not required for spring grazing can be

cut for hay in late June and then allowed to regrow for fall grazing. Paddocks that are grazed lightly in early June will allow for grazing or hay production in late July or early August.

Seed stalks are seldom produced when meadow bromegrass regrows after the first complete grazing. Seed stalk production also is greatly reduced in older stands with reduced fertility. Light spring grazing reduces seed stalk formation and stimulates more leaf production.

Meadow bromegrass commences growth early in the spring and is ready to graze 10 days before smooth bromegrass. Crested wheatgrass is ready for grazing 5–7 days before meadow bromegrass and is therefore better suited for very early spring grazing; it is also more tolerant of heavy, intensive spring grazing. Meadow bromegrass is noted for fall grazing because it grows well under cool temperatures. Used in a complementary manner with other cultivated and native grasses, it can provide grazing when other grasses such as smooth bromegrass are less productive in late summer and fall.

On new stands with fertilization, each animal unit month (AUM) may require only 0.12 ha of grazing, whereas on older stands each AUM may need 0.24 ha. Animal gains have varied from 0.72 to 0.86 kg/day depending on soil fertility, rainfall, and management. The Melfort Research Station compared animal gains for meadow and smooth bromegrass in a continuous grazing system (Table 9). Gains were comparable for the two grasses from June 15 to August 11, but from August 11 to October 15 gains were clearly superior for meadow bromegrass.

Table 9 Liveweight gains of comparable groups of heifers grazing meadow bromegrass and smooth bromegrass, Melfort, Sask., 1987

	Daily liveweight gains (kg/ha)	
Grazing period	Meadow bromegrass	Smooth bromegrass
June 15–July 14	6.9	6.7
July 14–August 11	3.5	3.5
August 11– September 18	3.7	2.9
September 18– October 5	1.4	0.3
Total (kg/ha)	458	404

Hay use

Under a haying system meadow bromegrass usually yields less than smooth bromegrass. However, following haying meadow bromegrass recovers better and provides late summer and fall grazing. This dual use of meadow bromegrass is better suited to areas of higher rainfall.

In alfalfa mixtures for hay, the proportion of alfalfa appears dependent on rainfall. Under low rainfall conditions at Saskatoon, meadow bromegrass maintains a better balance with alfalfa as compared to smooth bromegrass. Under moister conditions at Lacombe, meadow bromegrass competes strongly with alfalfa in mixtures. In the dual hay–pasture system, the rapid regrowth of meadow bromegrass in alfalfa mixtures is desirable because it allows a better balance of grass to alfalfa and so reduces the danger of bloat.

Forage quality

Forage quality of meadow bromegrass is marginally lower than that of smooth bromegrass (Table 10). Extensive feed analyses have been

Table 10 Forage quality of meadow bromegrass and smooth bromegrass at four stages of development of initial growth, Lacombe, Alta., 1987–1989

	Growth stages*			
Grass	Vegetative	Preboot	Preanthesis	Anthesis
	In vitro digestibility (%)			
Meadow bromegrass	78.6	75.5	66.2	63.8
Smooth bromegrass	78.4	76.1	66.1	58.1
	Crude protein (%)			
Meadow bromegrass	24.7	19.3	13.8	11.6
Smooth bromegrass	27.2	21.3	15.4	12.2
	Neutral detergent fiber (%)			
Meadow bromegrass	51.2	57.8	66.8	64.0
Smooth bromegrass	49.0	53.8	65.9	64.5
	Acid detergent fiber (%)			
Meadow bromegrass	21.2	24.3	33.0	32.3
Smooth bromegrass	19.2	22.0	31.8	33.4
	Lignin (%)			
Meadow bromegrass	2.2	2.2	3.8	3.3
Smooth bromegrass	1.9	1.9	3.8	3.6

* Vegetative state: Vegetative and preboot represent first grazing of a year; preanthesis and anthesis represent stages for hay production.

carried out at the Lacombe Research Station for four stages of initial growth and three stages of fall regrowth. Initial spring growth and prebud growth showed slightly lower protein and higher fiber constituents for meadow bromegrass than for smooth bromegrass (Table 10). These differences became less at preanthesis and anthesis (hay) stages. In vitro digestibility differences between smooth and meadow bromegrass were small for the first three stages, but at anthesis meadow bromegrass had higher digestibility. The results suggest that meadow bromegrass growth can be stockpiled for later use more successfully than can smooth bromegrass.

Regrowth during August and September again showed slightly lower protein and higher fiber components for meadow bromegrass than for smooth bromegrass (Table 11). Digestibilities of the two grasses were comparable. Despite the slightly lower quality of meadow

Table 11 Forage quality of meadow bromegrass and smooth bromegrass regrowth during August and September, after August 1 clipping at Lacombe, Alta., 1987–1989

	Weeks after clipping		
Grass	2	4	6
	In vitro organic matter digestibility (%)		
Meadow bromegrass	75.1	72.4	72.9
Smooth bromegrass	76.1	73.3	72.6
	Crude protein (%)		
Meadow bromegrass	25.0	19.9	17.9
Smooth bromegrass	28.5	23.8	20.8
	Neutral detergent fiber (%)		
Meadow bromegrass	61.8	61.2	57.6
Smooth bromegrass	54.3	58.5	56.2
	Acid detergent fiber (%)		
Meadow bromegrass	26.6	28.3	27.1
Smooth bromegrass	22.2	24.0	23.5
	Lignin (%)		
Meadow bromegrass	1.8	2.8	2.2
Smooth bromegrass	2.1	2.0	2.1

bromegrass at pasture stages its feeding value would not appear to limit cow–calf or stocker cattle production.

Seed production

Seed yields of meadow bromegrass are less reliable than those of smooth bromegrass. Regar in particular, has low seed yields and shows a rapid decline after two seed harvests (Table 8). Paddock and Fleet have given seed yields of 400 kg/ha until the fourth harvest when seeded in rows 90 cm apart. At narrow spacings of 30 cm seed yields were high for the first two seed crops followed by declining yields for the third and fourth seed harvests.

In 1991, following a very dry fall the previous year, almost all meadow bromegrass seed fields in Saskatchewan showed poor heading compared with smooth bromegrass. Only new stands and irrigated fields gave normal seed production.

When growing meadow bromegrass for seed, we suggest spring seeding it on clean land without a companion crop. This action maximizes the crop's tendency to yield best in the 1st and 2nd years of production. Growers have used spacings of 30, 60, and 90 cm for seed production. At wide spacings, cultivate both in spring and fall to control weeds and volunteer growth.

Some loss in seed yields of meadow bromegrass may result from the presence of "white heads" ("Silver-Top"), which affects several grasses, although usually not smooth bromegrass. We have observed damage in up to 20% of panicles at Saskatoon in second and later seed crops of meadow bromegrass.

Head smut has caused some serious seed losses in meadow bromegrass (Fig. 4). This problem results from the infection of the original seed used to establish the stand. Major loss generally occurs in the first seed crop, which usually is one of the better seed years. Later seed crops show reduced damage because nonaffected plants predominate. When seed is suspected of carrying smut and is intended for further seed production, have it checked for the presence of smut spores (see Appendix).

Shattering of seed is more common in meadow bromegrass than in smooth bromegrass. Despite this danger, some growers prefer to direct combine the crop and then use the stubble for feed or for grazing.

Meadow bromegrass seed needs more processing of seed than that of smooth bromegrass. Processing removes hairs and tip awns from seeds and improves the flow of seed in seed drills (Fig. 5).

The possible hybridization of meadow bromegrass and smooth bromegrass from adjacent stands has been a concern of the Canadian Seed Growers' Association. Recent experiments at the Research Station in Saskatoon give no evidence of intercrossing when seed of adjacent stands was used in progeny tests. Although 20% hybridization can be obtained in controlled crosses in the greenhouse, hybrids appear not to occur in the field. The flowering of meadow bromegrass 6–10 days prior to flowering of smooth bromegrass in the field appears responsible.

Fig. 4 Head smut in meadow bromegrass panicles.

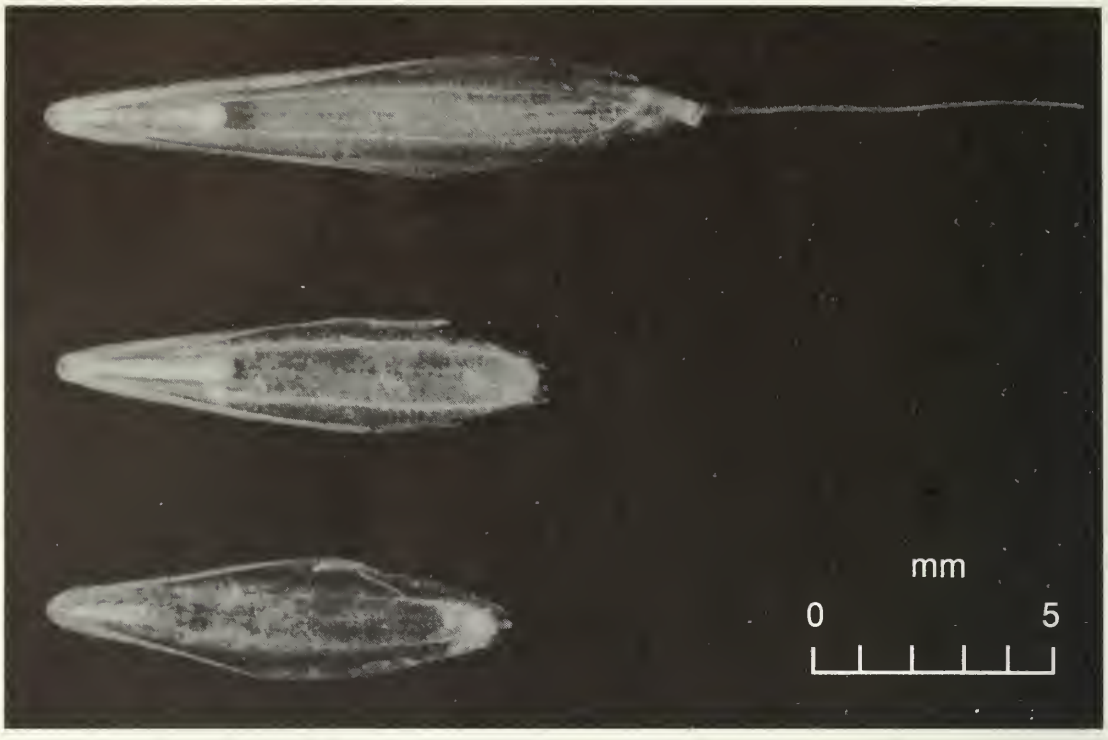

Fig. 5 Unprocessed seeds of meadow bromegrass (*top*) and smooth bromegrass (*bottom*), and processed seeds of meadow bromegrass (*centre*).

Additional reading

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Appendix

Growers wanting seed samples tested for head smut at a cost of $29.00 (1992) should send 250 g seed together with their seed growers identification number to

Dr. J. Sheppard
Agriculture Canada
Seed Biology Laboratory
Plant Products Building, No. 22
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