# **AEC Mountaineer broadglumed wheatgrass**

B. A. Darroch<sup>1,2</sup>, S. N. Acharya<sup>3</sup>, and J. Woosaree<sup>1,4</sup>

<sup>1</sup>Alberta Research Council Inc., P.O. Bag 4000, Vegreville, Alberta, Canada T9C 1T4; <sup>3</sup>Agriculture and Agri-Food Canada, Lethbridge Research Centre, P.O. Box 3000, Lethbridge, Alberta, Canada T1J 4B1. Received 13 November 2000, accepted 10 May 2001.

Darroch, B. A., Acharya, S. N. and Woosaree, J. 2001. **AEC Mountaineer broadglumed wheatgrass.** Can. J. Plant Sci. **81**: 745–747. AEC Mountaineer broadglumed wheatgrass, *Elymus trachycaulus* subsp. *violaceus* (Horneman) A. & D. Love, is a cultivar developed for reclaiming and revegetating disturbed sites at high elevations. It is the first cultivar of broadglumed wheatgrass available in Canada. Its primary advantage over other subspecies of slender wheatgrass is its ability to grow rapidly and produce mature seed at elevations as high as 2300 m. Production of mature seed enables plants to propagate, thus increasing plant density and stand longevity in high stress, high elevation environments.

Key words: Broadglumed wheatgrass, slender wheatgrass, Elymus trachycaulus, reclamation, cultivar description

Darroch, B. A., Acharya, S. N. et Woosaree, J. 2001. **Froment des chiens latiglume AEC Mountaineer**. Can. J. Plant Sci. **81**: 745–747. Le froment des chiens latiglume AEC Mountaineer [*(Elymus trachycaulus* sous-esp. *violaceus* (Horneman) A. & D. Love] est un cultivar mis au point pour restaurer les terrains perturbés en altitude et en rétablir la végétation. Il s'agit du premier cultivar de froment des chiens latiglume disponible au Canada. Le principal avantage de ce cultivar sur les autres races plus élancées d'agropyre est qu'il pousse rapidement et produit des graines matures jusqu'à une altitude de 2 300 m. La plante peut donc se multiplier, ce qui accroît la densité et la longévité du peuplement dans les milieux où les agressions sont plus nombreuses, notamment à haute altitude.

**Mots clés**: Froment des chiens latiglume, agropyre à chaumes rudes, *Elymus trachycaulus*, restauration, description de cultivar

AEC Mountaineer (AG-144) broadglumed wheatgrass, Elymus trachycaulus, subsp. violaceus (Horneman) A. & D. Love, was released by the Alberta Environmental Centre (now Alberta Research Council), Vegreville, AB, in 1995 for reclaiming and revegetating disturbed sites at high elevations. It is the first cultivar of broadglumed wheatgrass, a subspecies of slender wheatgrass, available in Canada. AEC Mountaineer is more adapted to high elevations than either AEC Highlander slender wheatgrass [E. trachycaulus (Link) Gould in Shinners subsp. trachycaulus (Darroch and Acharya 1995)] or AEC Hillcrest awned slender wheatgrass [E. trachycaulus subsp. subsecundus (Link) Gould (Darroch and Acharya 1996)] and can grow and produce mature seed at elevations up to 2300 m. The availability of a broadglumed wheatgrass cultivar provides for an increase in plant diversity in reclamation seed mixes. AEC Mountaineer, like other cultivars of slender wheatgrass (Crowle 1970; Darroch and Acharya 1995, 1996), is short-lived (4 to 5 yr) when grown at the low elevations of the prairie region.

# **Origin and Breeding**

AEC Mountaineer was developed by the Alberta Environmental Centre, and was derived from a single plant collected in 1984 from a site (elevation 2200 m) in the Rocky Mountains south of Kananaskis Country, AB. It was part of a slender wheatgrass collection from 100 sites in the eastern slopes of the Rocky Mountains. The seed from this plant was multiplied and tested at three mountain and two plains locations through successive generations. At these locations, AEC Mountaineer was evaluated for seed production, growth, and vigour. Breeder seed was first bulked in 1989, in the third generation from collected plants.

#### Plant Characteristics

AEC Mountaineer is a self-pollinated perennial bunch grass with a semi-decumbent growth habit. Plants are 25 to 45 cm tall and are shorter than other slender wheatgrass cultivars (Tables 1 and 2). Spikes of AEC Mountaineer plants are 8 to 14 cm long and culms are glabrous and green. Culms of both AEC Highlander and AEC Hillcrest are generally bluishgreen (Darroch and Acharya 1995, 1996) and leaf sheaths of the lower leaves of AEC Hillcrest plants are pubescent. Glumes are broad, scarious-margined and glabrous and have awned tips 1 to 3 mm long. Lemmas are pubescent with awned tips less than 2 mm long. Lemmas and glumes of AEC Highlander also have awned tips of similar lengths (Darroch and Acharya 1995). However, in AEC Hillcrest,

<sup>&</sup>lt;sup>2</sup>Current address: Department of Agriculture and Natural Resources, University of Tennessee at Martin, Martin, TN 38238 USA.

<sup>&</sup>lt;sup>4</sup>To whom correspondence should be addressed (e-mail: jay@arc.ab.ca).

	Year harvested	Cultivar	Cover (%)	Seed yield $(mg m^{-1})^{\mathbf{z}}$	Plant height (cm)
Location					
Columbia Icefields	1993	AEC Mountaineer	26	y	_
		AEC Hillcrest	11	_	_
		AEC Highlander	23	_	_
		Revenue	32	_	-
		SE $(n = 6, df = 35)$	4.7	-	_
	1994	AEC Mountaineer	25	_	_
		AEC Hillcrest	16	_	_
		AEC Highlander	45	_	_
		Revenue	44	_	_
		SE $(n = 6, df = 35)$	7.6	_	_
Mountain Park	1993	AEC Mountaineer	55	41	24
		AEC Hillcrest	49	7	37
		AEC Highlander	39	3	37
		Revenue	51	0	21
		SE $(n = 6, df = 35)$	4.1	5.7	3.7
	1994	AEC Mountaineer	97	163	25
		AEC Hillcrest	87	112	53
		AEC Highlander	82	19	39
		Revenue	89	125	38
		SE $(n = 6, df = 35)$	5.4	36.0	4.0
Overall mean		AEC Mountaineer	51	102	25
		AEC Hillcrest	41	60	45
		AEC Highlander	47	11	38
		Revenue	54	62	29
		SE <sup>x</sup>	3.3	21.7	3.0

Table 1. Performance of AEC Mountaineer broadglumed wheatgrass compared with AEC Hillcrest awned slender wheatgrass, and AEC Highlander and Revenue slender wheatgrass in small plot trials seeded in 1990 at Columbia Icefields (elevation 1860 m, Jasper National Park, AB) and Mountain Park (elevation 1800 m, south of Hinton, AB)

<sup>z</sup>Row spacing was 1 m.

<sup>y</sup>No or few flowering heads produced.

<sup>x</sup>Standard error was calculated from the mean square for the environment by cultivar interaction which was used to test the significance of the cultivar term in the combined analysis of variance; cover (n = 24, df = 21); seed yield (n = 12, df = 7); plant height (n = 12, df = 7).

lemma awns are 10 to 30 mm long and glume awns are 3 to 7 mm long (Darroch and Acharya 1996). Seeds of AEC Mountaineer are generally larger and heavier than seeds of other slender wheatgrass cultivars.

### Performance

In evaluation trials, AEC Mountaineer broadglumed wheatgrass was compared to AEC Hillcrest awned slender wheatgrass, and AEC Highlander and Revenue slender wheatgrass. All four cultivars are subspecies of slender wheatgrass but differences among the subspecies make direct comparisons difficult. AEC Mountaineer out-performed all other cultivars in mountain trials and produced the most seed in a trial at Mountain Park (Table 1). The poor seed yields for all cultivars at this site were due to the extremely harsh growing conditions. The trial was established on an abandoned coal tailings pile, which had very coarse soil with low water-holding capacity and low nutrient availability. The ability of AEC Mountaineer to grow and produce mature seed at such a site demonstrates its suitability for use in reclaiming disturbed sites at high elevations. AEC Mountaineer also outyielded other lines and cultivars in preliminary trials at Mountain Park and Columbia Icefields in 1989–1994 (data not shown). AEC Mountaineer matures approximately 1 mo earlier than other slender wheatgrass types at high elevations. At mountain sites, it was usually harvested in late July or early August, while plants of AEC Highlander and AEC Hillcrest were harvested in late August to early September. Plants of Revenue were harvested even later or did not mature within the growing season. The production of mature, viable seed is important for reclamation cultivars because seed production is the only way that this species can propagate, thus increasing plant density and stand longevity. AEC Mountaineer provided plant cover similar to other cultivars at the mountain sites, indicating that all were able to survive the harsh growing conditions found at the mountain sites (Table 1). At the plains sites, AEC Mountaineer had lower seed yields than AEC Highlander or Revenue (Table 2) but it still retained its early maturity. During the long growing season of lower elevations, AEC Mountaineer generally produces two flushes of heads, one very early, and one later in the season. When spring conditions were dry, harvest of AEC Mountaineer was often delayed until the second flush because of sparse heads in the first flush. When this occurred, harvest dates of AEC Mountaineer were similar to Revenue. The first flush of heads of AEC Mountaineer matured by the last week of June, approximately 4 wk earli-

		Seed	Time to	Plant
Location	ocation Cultivar		(days <sup>z</sup> )	(cm)
First year of s	eed production			
Vegreville	AEC Mountaineer	142	97	40
	AEC Hillcrest	767	104	84
	AEC Highlander	1310	96	85
	Revenue	1074	108	94
	SE $(n = 12, df = 7)^{y}$	105	4	6.6
Beaverlodge	AEC Mountaineer	715	96	46
-	AEC Hillcrest	629	116	83
	AEC Highlander	1023	97	82
	Revenue	904	110	96
	SE ( <i>n</i> = 12, df =7)	139	9	5.8
Second year of	f seed production			
Vegreville	AEC Mountaineer	307	96	46
	AEC Hillcrest	646	110	89
	AEC Highlander	1220	100	89
	Revenue	1052	119	102
	SE $(n = 12, df = 7)$	70	9	4.5
Beaverlodge	AEC Mountaineer	138	65	45
	AEC Hillcrest	335	115	77
	AEC Highlander	581	100	77
	Revenue	538	115	90
	SE $(n = 12, df = 7)$	54	7	2.2
Overall mean	AEC Mountaineer	326	88	44
	AEC Hillcrest	594	111	83
	AEC Highlander	1034	98	83
	Revenue	892	113	95
	SE $(n = 48 \text{ df} = 49)$	69	4	2.0

Table 2. Performance of AEC Mountaineer broadglumed wheatgrass compared to AEC Hillcrest awned slender wheatgrass, and AEC Highlander and Revenue slender wheatgrass in small plot trials at Vegreville (elevation 640 m) and Beaverlodge (elevation 730 m), AB

<sup>z</sup>Days from April 15 to maturity.

<sup>y</sup>Standard error was calculated from the mean square for the environment by cultivar interaction which was used to test the significance of the cultivar term in the combined analysis of variance. er than AEC Highlander and 5 to 6 wk earlier than AEC Hillcrest and Revenue.

## Maintenance and Distribution of Pedigreed Seed

Breeder seed of AEC Mountaineer will be maintained by the Alberta Research Council, Vegreville, Alberta. The multiplication and distribution of Foundation and Certified seed will be handled by Prairie Seeds Inc., 1805 B 8th Street, Nisku, Alberta, Canada T9E 7S8.

We thank R. Hermesh for his assistance in the development of this cultivar. The technical assistance of M. Pahl, B. James, D. Pewarchuk, and seasonal staff is gratefully acknowledged. We thank Dr. N. Fairey of Agriculture and Agri-Food Canada, Beaverlodge, AB, for his help, and gratefully acknowledge the financial support of Parks Canada and the Alberta Agricultural Research Institute.

Crowle, W.L. 1970. Revenue slender wheatgrass. Can. J. Plant Sci. 50: 748–749.

Darroch, B. A. and Acharya, S. N. 1995. AEC Highlander slender wheatgrass. Can. J. Plant Sci. 75: 699–701.

Darroch, B. A. and Acharya, S. N. 1996. AEC Hillcrest awned slender wheatgrass. Can. J. Plant Sci. 76: 345–347.

Can. J. Plant Sci. Downloaded from www.nrcresearchpress.com by 128.144.61.143 on 02/13/20 For personal use only.