CULTIVAR DESCRIPTION

AC Cadillac hard red spring wheat

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DePauw, R. M., Thomas, J. B., Knox, R. E., Clarke, J. M., Fernandez, M. R., McCaig, T. N. and McLeod, J. G. 1998. **AC Cadillac hard red spring wheat.** Can. J. Plant Sci. **78**: 459–462. AC Cadillac, a hard red spring wheat (*Triticum aestivum* L.), is adapted to the Canadian Prairies. It combines high grain yield with high grain protein concentration, heavy kernel and volume weights. It has improved resistance to leaf spots compared with the check cultivars, and resistance to prevalent races of leaf rust, stem rust, loose smut, and common bunt. AC Cadillac is eligible for grades of Canada Western Red Spring wheat.

Key words: *Triticum aestivum* L., red spring wheat, yield, protein, disease resistance, volume weight

Depauw, R. M., Thomas, J. B., Knox, R. E., Clarke, J. M., Fernandez, M. R., McCaig, T. N. et McLeod, J. G. 1998. **Cultivar de blé de printemps roux vitreux AC Cadillac**. Can. J. Plant Sci. **78**: 459–462. AC Cadillac est un nouveau blé de printemps roux vitreux (*Triticum aestivum* L.) qui convient aux conditions de culture des Prairies canadiennes. Très productif, son grain lourd possède une teneur en protéine et un poids spécifique élevés. Par rapport aux cultivars témoins, il manifeste une meilleure résistance aux taches foliaires ainsi qu'un bon niveau de résistance aux races courantes de la rouille des feuilles, de la rouille noire, du charbon nu et de la carie commune. Il est admissible à la catégorie des blés de printemps roux de l'ouest canadien.

Mots clés: *Triticum aestivum* L., blé de printemps roux, rendement protéine, résistance aux maladies, poids spécifique

AC Cadillac, hard red spring wheat (*Triticum aestivum* L.), was developed jointly by Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, Swift Current, SK, and the Lethbridge Research Centre, Lethbridge, AB. AC Cadillac received registration No. 4376 from the Food Production and Inspection Branch of Agriculture and Agri-Food Canada on July 17, 1996.

Pedigree and Breeding Method

AC Cadillac derives from the cross BW90*3/BW553 made in 1987 at the Lethbridge Research Centre. BW90 is a line selected from the cross BW15/BW38//BW40/RL4353 (Campbell 1984). BW553, a line developed by H. McKenzie (DePauw and Townley-Smith 1981), carries the *Bt*10 gene which confers resistance to common bunt [caused by *Tilletia laevis* Kuhn in Rabenh. and *T. caries* (DC.) Tul. & C. Tul.]. The cross was made to recombine the *Bt*10 gene, the CWRS gluten strength, and the kernel type of BW553 with the high yield potential and the high protein concentration of BW90. The F_1 seeds from the first backcross were inoculated with the T19 race of bunt (avirulent on *Bt*10), and all bunt-free plants were crossed again with BW90. Further inoculation of BC_2F_1 and BC_2F_2 plants with T19 was conducted to identify bunt-free BC_2F_1-derived populations presumably carrying *Bt*10. The F_3 seed of several hundred bunt-free BC_2F_2-derived representatives of the best BC_2F_1-derived families were screened for bunt in field nurseries at Lethbridge and Swift Current. Bunt-free plants were selected and multiplied as BC_2F_2-derived BC_2F_4 bulks in a winter nursery near Brawley, California. The BC_2F_5 bulks were screened for quantitative and qualitative traits using early generation screening procedures. We practised simultaneous selection for grain yield potential and grain protein concentration: grain yield potential was measured by growing replicated trials at two locations; grain protein concentration was assessed on a composite of the two replications from each location using near infrared reflectance spectroscopy. Reaction to leaf rust (caused by *Puccinia recondita* Roberge ex Desmaz.) and stem rust (caused by *P. graminis* Pers.:Pers. f. sp. *tritici* Eriks. & E. Henn.) was measured in an epiphytotic disease nursery near Glenlea, MB. Reaction to bunt was done in a special nursery. Bunt-free plants were used to establish head-to-row progeny in a winter nursery in 1989–1990. Remnant seed from the yield trials was used to assess grain quality and kernel characteristics. The BC_2F_5-derived BC_2F_7 was handled in the same manner as the BC_2F_5 except that BC_2F_7 lines, selected on the basis of agronomic performance, protein concentration and reaction to rust, were screened for reaction to loose smut (caused by *Ustilago tritici* [Pers.] Rostr.) and common bunt. An experimental line, designated as L8900-AL2A10, was evaluated in the Western Bread Wheat 'A' Test in 1991, and the Western Bread Wheat 'B' Test in 1992. It was designated BW689 and evaluated in the Western Bread Wheat Cooperative Test from 1993 to 1995.

While in the Cooperative Test, reaction to leaf and stem rust was measured in an epiphytotic disease nursery near

Table 1. Agronomic performance of AC Cadillac and check cultivars, based on data from the Western Bread Wheat Cooperative Test, 1993–1995

Name	Yield (kg ha^{-1})			Maturity (d)			Height	Lodging	Test weight	Kernel weight
	Zone 1[z]	Zone 2	Mean[y]	Zone 1	Zone 2	Mean	(cm)	(1–9)[x]	(kg hL^{-1})	(mg)
Neepawa	3270	3910	3800	102.7	105.7	105.3	100	1.9	80.1	32.8
Katepwa	3310	3920	3810	103.3	105.7	105.4	100	1.8	80.0	32.8
Laura	3400	4250	4100	105.0	108.5	108.1	98	2.7	80.3	33.4
AC Eatonia	3230	3840	3730	103.5	107.2	106.7	98	3.2	80.9	33.6
AC Cadillac	3480	4240	4120	103.9	106.5	106.2	103	2.3	82.3	37.5
LSD ($P < 0.05$)			133			0.8	1.5	0.4	0.5	0.5
# tests	6	27	33	3	22	25	29	18	32	32

[z]Zone 1 locations included Swift Current and Stewart Valley, SK in the Brown soil zone; Zone 2 locations included Elrose, Indian Head, Kernen, Melfort, Regina, Scott, and Watrous, SK and Acme, Ellerslie, and Lethbridge, AB in the Dark Brown soil zone.
[y]All means are weighted by the number of tests within a zone.
[x]1, all plants vertical; 9, all plants horizontal.

Table 2. Disease reactions of AC Cadillac and check cultivars, based on data from Western Bread Wheat Cooperative Test 1993–1995

Cultivar	Year	Leaf rust[z]	Stem rust[z]	Common bunt[z]	Loose smut[z,y]	Common root rot[x]	Leaf spots[w]				FHB[u]
							SC[v]	G1	Kn	Reg	
Neepawa	1993	20MR	10R	11R	9R	3	6.5	7	–	–	–
	1994	30MR	10RMR	14I	6R	22	7.5	–	8.5	–	–
	1995	70MRMS	40RMR-5MS	12I	8R	0	8.2	–	–	9.3	52
Katepwa	1993	30MR	10R	17I	4R	3	6.5	6	–	–	–
	1994	30MR	5R	4R	0R	21	7.3	–	9	–	–
	1995	60MRMS	30RMR	2R	15R	0	8.7	–	–	9.8	44
Laura	1993	5M	5VR	31S	17S	17*	6.5	6	–	–	–
	1994	10M	5R	43S	52S	10	9	–	3.5	–	–
	1995	TR	20RMR	24S	82HS	0	9.3	–	–	9.3	57
AC Eatonia	1993	30MR	10MRMS	2R	19MS	13	6.3	3	–	–	–
	1994	30MR	15RMR	2R	0MS	14	7.5	–	5	–	–
	1995	30M	40MRMS	1R	19MR	0	7.8	–	–	9.3	–
AC Cadillac	1993	10R	5R	5R	7MR	0	6.5	5	–	–	–
	1994	20M	3R	2R	0R	15	7.5	–	2	–	–
	1995	TR	20RMR	0R	0R	0	8	–	–	8.7	45

[z]Percent infection and type of reaction: T, trace: VR, very resistant; R, resistant; MR, moderately resistant; I, intermediate resistant; MS, moderately susceptible; S, susceptible; HS, highly susceptible.
[y]Ratings are based on data from current and previous years.
[x]Percentage of plants with moderate to large lesions on the subcrown internode; * denotes disease index values, within a year, that differ from those for Neepawa at the 5% significance level using Duncan's multiple range test.
[w]Rated at the milk dough stage, using a scale of 0–9 (all locations in 1993 and Kernen in 1994) and 0–11 (Swift Current in 1994, and Swift Current and Regina in 1995). 0 = no symptoms and 9 or 11 = all leaves heavily infected.
[v]SC = Swift Current, SK; G1 = Glenlea, MB; Kn = Kernen, SK; and Reg = Regina, SK.
[u]Fusarium Head Blight index = (% infected spikelets × % infected spikes) / 100.

Glenlea, MB. The stem rust races used were QTH (C25), TPM (C53), TMR (C10), TMR (C95), RHT (C57), RKQ (C63). The races of leaf rust used were CGB, KBG, MCR, MFB, MFM, TBD, TBG, and TDT (Kolmer 1996). Races T2, T9, T10 and T39 of loose smut and races L1, L16, T1, T13, and T19 of Common bunt were used for screening. The race designations are those described by Green (1965) and Roelfs and Martens (1988) for stem rust, Hoffman and Metzger (1976) for common bunt, and Nielsen (1987) for loose smut. Response to leaf spots was scored following procedures described by Fernandez et al. (1996).

Performance

In the Western Bread Wheat Cooperative Test from 1993 to 1995, AC Cadillac yielded significantly more than all the checks, except Laura (Table 1). In Zone 1, AC Cadillac averaged 6.4% more grain than Neepawa, 5.1% more than Katepwa, 7.7% more than AC Eatonia, and 2.3% more than Laura. In Zone 2, it yielded 8.4% more grain than Neepawa, 8.2% more than Katepwa, 10.4% more than AC Eatonia. Averaged over both zones, AC Cadillac matured about 2 d earlier than Laura and about 1 d later than Neepawa and Katepwa. It was about 3 cm taller than Neepawa and Katepwa and 5 cm taller than Laura. AC Cadillac had straw strength intermediate to Katepwa, Neepawa and Laura, and significantly stronger than AC Eatonia. AC Cadillac had significantly heavier volume weight and kernel weight than all checks. It expressed resistance to common bunt, loose smut, leaf rust and stem rust (Table 2). Its protein concentration was equal to that of Laura and AC Eatonia, and greater than that of Neepawa and Katepwa (Table 3). AC Cadillac had Hagberg Falling Number values larger than all of the checks except Katepwa, and lower levels of wheat alpha amylase activity than any of the checks.

Table 3. End-use suitability[z] traits of AC Cadillac and check cultivars, averages for the Western Bread Wheat Cooperative Test 1993–1995

	Wheat protein (%)	Flour protein (%)	Flour yield (%)	Flour color (KJ)	Ash (%)	Wheat amylase (EU)	Amylograph viscosity (BU)	Hagberg falling no. (s)
Neepawa	13.4	12.9	76.3	–1.5	0.44	5.2	628	383
Katepwa	13.3	12.7	75.9	–1.7	0.43	5.3	632	393
Laura	13.6	12.9	76.0	–2.3	0.44	5.3	633	367
AC Eatonia	13.8	13.4	77.0	–1.5	0.43	8.5	668	347
AC Cadillac	13.7	13.2	77.0	–1.3	0.45	1.3	710	413

	Starch damage Farrand units	Farinograph				Remix to peak 1993	
		Absorption (%)	DDT (min)	MTI (BU)	Stability (min)	LV (cc)	Time (min)
Neepawa	35	65.5	4.5	32	8.7	770	2.3
Katepwa	34	65.3	4.8	32	8.7	750	2.4
Laura	27	65.4	7.5	23	17.2	850	1.9
AC Eatonia	31	64.3	3.8	30	7.7	780	1.5
AC Cadillac	33	67.1	6.3	22	13.2	850	1.8

	S&D				CSP			
	LV		Time		LV		Time	
	1994 (cc)	1995 (cc)	1994 (min)	1995 (min)	1994 (cc)	1995 (cc)	1994 (min)	1995 (min)
Neepawa	2290	2110	6.7	7.3	2240	1070	8.3	6.1
Katepwa	2290	2020	7.3	6.6	2240	1013	8.7	5.9
Laura	2530	2230	6.6	7.3	2360	1060	10.4	8.1
AC Eatonia	2410	2285	4.4	4.9	2210	1090	6.3	4.9
AC Cadillac	2260	2115	6.1	6.4	2160	1058	8.8	7.9

[z]American Association of Cereal Chemists methods were followed by the Grain Research Laboratory, Canadian Grain Commission for determining the various end-use suitability traits on a composite of 4 to 7 locations each year.

Other Characteristics

SPIKES. Oblong to fusiform, mid-dense, mid-long, incline to erect, apically awnleted; glumes mid-wide, mid-long, glabrous, white; glume shoulders primarily square, some oblique, some rounded, and some wanting, mid-wide; glume beak short and acute.

KERNEL. Red colour, mid-large size, mid-wide, mid-long, ovate; cheeks rounded to slightly angular; brush hairs mid-long to long; embryo mid-size, oval to elliptical.

SHATTERING. Resistant, similar to Katepwa.

DISEASE REACTION. Resistant to prevalent races of leaf rust and stem rust, common bunt, and loose smut; moderately susceptible to leaf spots (caused by *Pyrenophora tritici-repentis*. [Died.] Drechs., Stagonospora blotch caused by *Phaeosphaeria nodorum* [E. Muller] Hedjaroude and Septoria blotch caused by *Mycosphaerella graminicola* [Fuckel] J. Schrot. in Cohn), and moderately resistant to common root rot (caused primarily by *Bipolaris sorokiniana* [Sacc.] Shoemaker) (Table 2).

PHOTOPERIOD RESPONSE. Sensitive.

END-USE SUITABILITY. Based on 3 yr of testing in the Western Bread Wheat Cooperative Test AC Cadillac was rated equal to Neepawa for grain quality and it is eligible for grades of Canada Western Red Spring.

Maintenance and Distribution of Pedigreed Seed

The 127 Breeder Lines were selected from BC_2F_5-derived BC_2F_{10} random single plants in 1993. They were grown in 3-m rows in isolation near Swift Current in 1994 and again as 15-m rows near Indian Head in 1995. Breeder Seed will be maintained by the Seed Increase Unit, Research Farm, Agriculture and Agri-Food Canada, Indian Head, SK, S0G 2K0. Plant Breeders' Rights has been filed. AC Cadillac has been released for distribution and multiplication to Value-Added Seeds, P.O. Box 2000, Lumsden, SK, S0G 3C0.

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