

## CDC Buteo hard red winter wheat

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Fowler, D. B. 2010. CDC Buteo hard red winter wheat. Can. J. Plant Sci. 90: 707–710. CDC Buteo is a hard red winter wheat (*Triticum aestivum* L.) cultivar that is eligible for grades of the Canada Western Red Winter Wheat class. It is an intermediate height cultivar with moderate stem and leaf rust resistance and good winter hardiness and grain yield potential. It is adapted to the western Canadian prairies where its agronomic and disease package combined with an excellent grain quality profile has resulted in wide commercial acceptance in Saskatchewan. CDC Buteo was made the wheat quality standard for the Central Winter Wheat Co-operative Registration Trials in 2008.

**Key words:** *Triticum aestivum* L., cultivar description, wheat (winter)

Fowler, D. B. 2010. Le blé roux d'hiver CDC Buteo. Can. J. Plant Sci. 90: 707–710. CDC Buteo est une variété de blé roux d'hiver (*Triticum aestivum* L.) admissible à la catégorie « blé rouge d'hiver de l'Ouest canadien ». Ce cultivar de taille moyenne résiste modérément à la rouille de la tige et des feuilles et se caractérise par une bonne rusticité et un bon rendement grainier potentiel. La variété est adaptée aux prairies de l'Ouest canadien. Ses caractères agronomiques et sa résistance aux maladies, combinés à une excellente qualité du grain, expliquent sa vaste utilisation dans le commerce, en Saskatchewan. CDC Buteo a été choisi pour devenir l'étalon de qualité lors des essais d'homologation de la Central Winter Wheat Co-operative en 2008.

**Mots clés:** *Triticum aestivum* L., description de cultivar, blé (d'hiver)

CDC Buteo hard red winter wheat (*Triticum aestivum* L.) was developed at the Crop Development Centre, University of Saskatchewan, Saskatoon, SK. The Variety Registration Office, Plant production Division, Canadian Food Inspection Agency issued registration no. 5441 for CDC Buteo on 2002 Apr. 11.

### Pedigree and Breeding Method

CDC Buteo was selected from the progeny of a cross S86-808/Abilene where S86-808 = Norstar\*2/Vona (Welsh et al. 1978; Grant 1980; Roberts 1989). The final cross was made in 1988. The F<sub>1</sub> and F<sub>2</sub> generations were produced in a greenhouse. F<sub>2</sub>-derived F<sub>3</sub> lines and F<sub>3</sub>-derived F<sub>4</sub> lines were grown in a field nursery in Saskatoon in 1989 and 1990 where winter hardiness, height, straw strength, disease reaction, and plant kernel type were evaluated. Single plant selections were made in the fall of 1990. These selections were grown as head rows under irrigation in a special nursery inoculated with leaf (*Puccinia recondita* Rob. ex Desm.) and stem (*Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn) rust at Saskatoon. Single plant selections were made in the fall of 1991 and grown as head rows in the irrigated rust nursery in 1991–1992. This procedure was repeated each year from 1992–1993 to 1994–1995. Head rows selected in 1993 and 1994 rust nurseries were also evaluated in yield trials grown in Saskatoon in

1993–1994 and 1994–1995. Based on disease reaction and agronomic performance in yield trials, single rows were selected in the 1995 disease nursery. One these rows was later designated S96-33. The agronomic performance, disease reactions and grain quality of S96-33 were then evaluated in trials grown in Saskatchewan in 1995–1996 and 1996–1997. S96-33 was entered into the Central Hard Red Winter Wheat Cooperative Registration Trials in 1997–1998, 1998–1999, and 1999–2000 and it was registered for production in 2002.

Analyses of variance were conducted to determine the level of significance of differences due to cultivars and location years. The least significant difference (LSD) test was used to identify significance differences in the mean value of CDC Buteo compared with the check cultivars.

### Performance

CDC Buteo is a hard red winter wheat cultivar with good yield potential (Table 1), intermediate plant height (Table 2), moderate stem and leaf rust resistance (Table 3), and excellent grain quality (Table 4). It is eligible for grades of the Canada Western Red Winter Wheat (CWRWW) class. At the time of its evaluation for registration, CDC Kestrel, CDC Clair (Fowler 1997a, b), CDC Falcon (Fowler 1999a), CDC Harrier (Fowler 1999b) and CDC Raptor (Fowler 2002) were the dominant cultivars, accounting for more than 95%

**Table 1. Grain yield (kg ha<sup>-1</sup>) of CDC Buteo compared with CDC Kestrel, CDC Clair, CDC Osprey, CDC Falcon, CDC Raptor and CDC Harrier. Data from the Central Winter Wheat Co-operative Registration Trials (1998–2003)<sup>z</sup>**

Cultivar	Alberta		Saskatchewan			Southeast	
	Southwest	Central	Brown soils	Parkland	Irrigation <sup>y</sup>	Manitoba	Mean
CDC Kestrel	4740	7228	3880	3761	6203	6058	4942
CDC Clair	4667	7344	3829	3788	6122	5822	4916
CDC Osprey	4530	7001	3747	3655	5734	5528	4709
CDC Falcon	4743	7516	3767	3378	7075	6091	4960
CDC Raptor	4650	7299	3827	3728	6934	5965	5010
CDC Harrier	4980	6998	3880	3660	6348	6110	4951
CDC Buteo	4467	7105	3623	3588	6676	5940	4868
LSD ( $P < 0.05$ )	NS <sup>x</sup>	NS	NS	199.3	587.3	323.7	151.7
No. of tests	3	5	9	14	5	9	45

<sup>z</sup>All means are weighted by the number of tests within a zone. Alberta locations included Lethbridge (Southwest), Olds and Lacombe (Central). Saskatchewan locations included Elrose and Saskatoon (Brown soils); Clair, Indian Head, Melfort, and Yorkton (Parkland); and Saskatoon (Irrigation). The Manitoba locations were Winnipeg and Carman.

<sup>y</sup>Rust nursery.

<sup>x</sup>NS, non-significant differences.

of the western Canadian winter wheat acreage in 1999 and 2000 (Canadian Wheat Board 2009). With the exception of CDC Clair in the Parkland region of Saskatchewan, the grain yield of CDC Buteo was not significantly ( $P > 0.05$ ) different from the members of this group of cultivars (Table 1). The heading date of CDC Buteo fell in the middle of the range for these cultivars and its time to maturity was 2 d later than CDC Falcon and similar to the remaining cultivars (Table 2). CDC Buteo was intermediate in height and more susceptible to lodging than CDC Falcon and CDC Raptor. When 28 station-years of data from replicated Central Winter Wheat Co-operative Registration Trials were considered, high grain protein concentration and average grain yield combined to give CDC Buteo a grain protein yield that was at the high end of this group of cultivars. CDC Buteo had MR/MS stem and leaf rust reactions and was rated very susceptible to common bunt [*Tilletia laevis* Kuhn in Rabenh. and *T. caries* (DC.) Tul. & C. Tul.] (Table 3).

Best management practices are employed in the Central Winter Wheat Co-operative Registration Trials with the result that the level of winter damage

experience is normally very low. CDC Buteo and CDC Osprey were also included in regional trials planted on summerfallow and on stubble fields with minimal snow trapping potential. The average survival of CDC Buteo and CDC Osprey was the same (82%) for eight of these trials where significant winter damage was observed.

While CDC Kestrel, CDC Clair, CDC Harrier, CDC Falcon, and CDC Raptor were widely accepted by farmers and were eligible for CWRWW grades when CDC Buteo was supported for registration, they were judged as not having met Canadian Wheat Board (CWB) market targets and in 2004 they were designated as non-select and priced lower than the select cultivars. CDC Osprey (Fowler 1997c) was the grain quality standard in the Central Winter Wheat Co-operative Registration trials and it was considered the standard for the CWB market. When compared with CDC Osprey, CDC Buteo was significantly ( $P < 0.05$ ) shorter with similar straw strength (Table 2). It had a significantly higher ( $P < 0.05$ ) test weight, kernel weight, and Farinogram absorption, and a harder kernel texture than CDC Osprey (Table 4). The protein concentration of CDC Buteo, CDC Clair, and CDC Osprey were

**Table 2. Agronomic performance of CDC Buteo compared with CDC Kestrel, CDC Clair, CDC Osprey, CDC Falcon, CDC Raptor and CDC Harrier. Data from the Central Winter Wheat Co-operative Registration Trials (1998–2003)**

Character	CDC Kestrel	CDC Clair	CDC Osprey	CDC Falcon	CDC Raptor	CDC Harrier	CDC Buteo	LSD ( $P < 0.05$ )	No. tests
Heading date (DOY) <sup>z</sup>	170	171	170	169	171	172	170	0.6	33
Maturity (DOY) <sup>z</sup>	212	211	210	209	212	212	211	1.0	31
Plant Height (cm)	93	88	90	75	83	94	85	2.0	44
Lodging (1–9) <sup>y</sup>	2.8	3.3	2.7	1.8	1.7	2.8	3.5	0.96	6
Protein (%)	11.2	12.2	12.3	12.6	12.3	11.4	12.6	0.25	28
Protein yield (kg ha <sup>-1</sup> )	470	513	493	520	538	479	523	25.0	28

<sup>z</sup>Day of year.

<sup>y</sup>1, all plants vertical; 9, all plants horizontal.

**Table 3. Disease reactions of CDC Buteo compared with CDC Kestrel, CDC Clair, CDC Osprey, CDC Harrier, CDC Falcon and CDC Raptor. Data from artificial rust infections at the University of Saskatchewan, Saskatoon (a and b) and the Plant Science Dept. University of Manitoba (W) using epidemic mixtures supplied by Agriculture and Agri-Food Canada in Winnipeg. (C). Common bunt data is from trials inoculated by Agriculture and Agri-Food Canada staff at Lethbridge, AB**

	CDC Kestrel	CDC Clair	CDC Osprey	CDC Harrier	CDC Falcon	CDC Raptor	CDC Buteo
<i>(a) Stem rust</i>							
1998a	40MS <sup>Z</sup>	60M	60MS	40MR	10MR	5M	20MR
1998b	20MS	65S	65S	5MR	0R	0R	15MS
1998W	10MS	20MS/S	50S	20R/MR	10MR/MS	5R	30MS
1999a	40MS	60MS	40MS	20MR	10R/MR	5R	10M
1999b	5MS	80S	70S	5R/MR	10MR	10R/MR	10MR
1999W	30MS/40S	40S	50S	30MR/MS	10MR	10MR	40MR/S
2000a	40MS	60MS	40MS	10MR	10M	10MR	40MS
2000b	30M	35MS/S	60S	0R	0R	0R	10MR/MS
2000W	10MS/S	70S	70S	5MS	10MS	5MR	10MR/MS
2001a	55S	65S	60S	30MS	15MR	15MR	40MR/MS
2001b	10MS/S	50S	35S	0R	0R	0R	5MS
2001W	70MS/S	80MS/S	70S	50MS/S	50MR/MS	50MR/MS	60MR/MS
2002W	60MS/S	80S	60S	30MR/MS	20MR	10R/MR	60MR/MS
2003W	40MS/S	70MS/S	90S	15MR	15R/MR	5R	10R/MR
<i>(b) Leaf rust</i>							
1998a	20MS	20M	20MS	40MS	TR	TR	10MR
1998b	40MS	40S	40S	20MS	5MR	10MR	5MR
1998W	35MS/S	55S	60S	60S	40S	10MR	10MR/MS
1999a	20MS	20M	40MS	40M	10MR	10MR	20M
1999b	0R	50S	65S	15MS	5MR	10MR	10MR/MS
1999W	60MS/S	35MS/S	75S	40MS	5MR	5MR	5MR/MS
2000W	5MS	5-10MS/S	15-20S	5MS	Tr R/MR	Tr R/MR	Tr R/MR
2001W	30MS/S	40S	40S	20MR/MS	5R/MR	5R/MR	5R/MR
2002W	5MS	10MS	10S	30S	5R/MR	TR/R	10MR/MS
2003W	30MS	20MS	30MS	40MS/S	5MR	5R/MR	5MR
<i>(c) Common bunt</i>							
2001	83VS	67VS	60S	80VS	45S	93VS	92VS
2003	78S	70S	68S	63S	70S	73S	80S

<sup>Z</sup>Percent infection and type of reaction: VS, very susceptible; S, susceptible; MS, moderately susceptible; MR, moderately resistant; TR, trace; R, resistant.

not significantly different ( $P > 0.05$ ) for the three Central Winter Wheat Co-operative Registration Trial composites analyzed by the Grain Research Laboratory, Canadian Grain Commission, Winnipeg, Manitoba (Table 4). However, the average protein concentration of CDC Buteo was significantly ( $P < 0.05$ ) higher than both CDC Clair and CDC Osprey when 28 station years of replicated Central Hard Red Winter Wheat Co-operative Registration Trials were evaluated (Table 2). In these trials, high grain yield potential and protein concentration combined to give CDC Buteo a grain protein yield that was higher than CDC Osprey. CDC Buteo had leaf and stem rust reactions that were superior to CDC Osprey (Table 3) and this advantage was reflected in higher grain yields in the high rust hazard area of Manitoba and artificial rust epidemics under irrigation in Saskatchewan (Table 1). The remainder of the grain-quality (Table 4) and agronomic performance measurements (Table 1 and 2) gave similar values for CDC Buteo and CDC Osprey.

CDC Buteo is adapted to the western Canadian prairies. An excellent quality profile resulted in

general acceptance in Saskatchewan where CDC Buteo accounted for 58% of the acres seeded to winter wheat in 2008 (Canadian Wheat Board 2009). CDC Buteo was made the wheat-quality standard for the Central Winter Wheat Co-operative Registration Trials in 2008.

**Other Characteristics**

*Plant.* Winter growth habit; coleoptile colour reddish; juvenile growth prostrate; leaves dark green; flag leaf dark green, mid-wide, short to mid-long, intermediate to upright attitude; sheath and leaf blades glabrous; auricles light red, slightly pubescent; tillers many; straw medium length, internode hollow, culm neck straight, anthocyanin coloration at maturity absent.

*Spikes.* Tapering, mid-dense, inclined, mid-long, awned; glumes mid-wide, mid-long to long, glabrous, white; glume shoulders square, narrow; glume beak mid-long to long, acuminate.

*Kernel.* Red, hard, mid-size, mid-long, mid-wide, elliptical to ovate; cheeks rounded; brush hairs mid-size; crease

**Table 4. Wheat and flour analytical data<sup>2</sup> for CDC Buteo compared to CDC Clair and CDC Osprey. American Association of Cereal Chemists methods were followed for determining the various end-use suitability traits**

Character	CDC Clair	CDC Osprey	CDC Buteo	LSD ( $P < 0.05$ )
Test weight (kg hL <sup>-1</sup> )	81.9	82.4	84.7	0.46
Kernel weight (mg)	33.0	32.0	34.8	1.32
Wheat protein (%)	11.1	11.4	11.7	NS <sup>3</sup>
Flour protein (%)	10.2	10.6	10.7	NS
Protein loss (%)	0.9	0.8	1.0	0.09
Falling number (sec)	402	393	407	NS
Amylograph peak viscosity (BU)	827	807	778	NS
Flour yield (%)	74.2	75.9	75.6	NS
Flour ash (%)	0.41	0.39	0.38	NS
Particle size index (%)	59.0	61.0	57.3	0.75
Remix loaf volume (cm <sup>3</sup> )	772	805	860	85.5
Test bake absorption (%)	60	58	59	NS
Test bake mixing time (min)	4.0	4.3	3.9	NS
Farinogram absorption (%)	58.1	56.3	59.4	1.23
Farinogram DDT (min)	5.28	6.73	5.70	NS
Farinogram MTI (BU)	43	30	42	13.0
Farinogram Stability (min)	9.34	10.52	8.39	NS

<sup>2</sup>End-use quality testing conducted by the Grain Research Laboratory of the Canadian Grain Commission on composite samples from each of the 1998, 1999, and 2000 Central Winter Wheat Co-operative Registration Trials.

<sup>3</sup>NS, non-significant differences.

mid-wide, shallow to mid-deep; germ small to mid-size, ovate.

#### Maintenance and Distribution of Pedigreed Seed

CDC Buteo originated from a single F<sub>7</sub>-derived F<sub>8</sub> line that was increased as part of the Breeder Seed production program at the Crop Development Centre, University of Saskatchewan, Saskatoon, Saskatchewan,

Canada S7N 5A8. Breeder seed will be maintained by the Crop Development Centre, University of Saskatchewan. Western Canadian distribution and multiplication of pedigreed seed stocks are handled by SeCan Association, 501-300 March Rd., Kanata, Ontario, Canada K2E 2E2.

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