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CULTIVAR DESCRIPTION

CDC Desire durum wheat

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Pozniak, C. J. 2013. **CDC Desire durum wheat**. Can. J. Plant Sci. **93**: 1265–1270. CDC Desire durum wheat is adapted to the durum production area of the Canadian prairies. This conventional height durum wheat cultivar combines high grain yield potential with high grain pigment and protein concentrations and low grain cadmium. CDC Desire is strong-strawed and is earlier maturing than all check cultivars. CDC Desire expresses disease resistance similar to the current check cultivars.

Key words: *Triticum turgidum* L. var *durum*, durum wheat, yield, yellow pigment, cadmium, cultivar description

Pozniak, C. J. 2013. **Le blé dur CDC Desire**. Can. J. Plant Sci. **93**: 1265–1270. La variété CDC Desire est adaptée à la zone de culture du blé dur des Prairies canadiennes. Ce cultivar de blé dur à taille ordinaire combine un rendement grainier potentiel élevé à une grande pigmentation du grain, ainsi qu'à une forte concentration et à une faible teneur en cadmium dans le grain. Avec sa paille robuste, CDC Desire est plus précoce que l'ensemble des cultivars témoins. La variété exprime une résistance aux maladies semblable à celle des cultivars témoins actuels.

Mots clés: *Triticum turgidum* L. var *durum*, blé dur, rendement, pigment jaune, cadmium, description de cultivar

CDC Desire, a spring durum wheat (*Triticum turgidum* L. var. *durum*), was developed at the Crop Development Center, University of Saskatchewan, and received registration No. 7285 from the Canadian Food Inspection Agency on 2012 Dec. 12.

Pedigree and Breeding Method

CDC Desire is derived from the cross "D40-2237/Strongfield" made at the Crop Development Centre (CDC), University of Saskatchewan in the summer of 2002. D40-2237 is a breeding line developed at the CDC and was developed from the inter-crossing of two CDC breeding lines D95116 and D95212. D95116 was selected from the three-way cross: D82328/D83464//D88252. D95212 was selected from the cross: D84328/Plenty//8562-DH5B. Strongfield is a registered Canadian cultivar (Clarke et al. 2005). The F_1 generation was increased in a contra-season nursery near Christchurch, New Zealand, and resulting F_2 plants were grown in a space-planted nursery at Saskatoon in 2003. Desirable F_2 plants were selected and bulked at harvest, and the F_3 seed increased near Christchurch, New Zealand. The F_4 generation was space planted in a leaf rust (caused by *Puccinia triticina* Eriks.) and stem rust (caused by *Puccinia graminis* Pers.: Pers. f.sp. *tritici* Eriks. & E. Henn.) nursery at Saskatoon in 2004, and approximately 300 single plants were selected and grown as F_5 head rows at Saskatoon in 2005. The rust races used in this nursery were representative of those found in disease surveys the previous year (McCallum and Seto-Goh 2008; Fetch 2009). The F_5 head row D02.68X.6B was identified as having acceptable yield, maturity and height in F_6 yield trials conducted at Saskatoon and Swift Current, Saskatchewan, in 2006. In the same year, reaction to Fusarium head blight (FHB) caused by *Fusarium graminearum* Schwabe was evaluated in an endemic nursery at Carman, Manitoba. Resistance to leaf and stem rust were assessed in the F6 and F_7 generations in an epiphytotic nursery at Saskatoon that was inoculated with mixtures of prevalent races (McCallum and Seto-Goh 2009; McCallum et al. 2010; Fetch et al. 2011). Grain protein and yellow pigment concentration were estimated using near infrared reflectance spectroscopy and gluten strength was estimated using the gluten index (Approved Method 38-12, American Association of Cereal Chemists 2000) on F_6 harvested grain. DNA marker testing was performed in the F_6 and F_{10} generations using *ScOpc20* and *usw47*, respectively (Wiebe et al. 2010, http://maswheat.ucdavis.edu/protocols/Cadmium/) and revealed that D02.68X.6B carried the desirable allele for reduced grain cadmium concentration.

D02.68X.6B was evaluated in agronomic yield trials at Saskatoon, Lethbridge, Regina and Swift Current in the Durum Western Wheat A-test in 2007. Reaction to FHB was assessed in the Durum Western Wheat A-Test in a nursery near Portage la Prairie, MB, and for leaf and stem rust at nurseries established near Glenlea, MB. D02.68X.6B was evaluated as DT561 in the Durum Wheat Cooperative registration tests over 4 yr (2008–2011). The variables measured and the operating protocols followed

Abbreviation: **FHB**, Fusarium head blight

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in the Durum Wheat Cooperative test were those approved each year by the Prairie Recommending Committee for Wheat Rye and Triticale (current operating procedures can be found at http://www.pgdc.ca/committees_wrt.html). In cooperative trials, the stem rust races were TPMK, TMRT, RHTS, QTHS, RTHJ, RKQS, and MCCF (Roelfs et al. 1988; Fetch et al. 2011). The leaf rust inoculum comprised a mixture of prevalent races isolated from the western Canadian prairies as determined from yearly survey studies (McCallum et al. 2010; McCallum et al. 2011). Resistance to races T26, T32, and T33 of loose smut [*Ustilago tritici* (Pers.) Rostr.] (Nielsen 1987) and L1, L16, T1, T6, T13, and T19 of common bunt [*Tilletia laevis* Kuhn in Rabenh., and *T. tritici* (Bjerk.) G. Wint. In Rabenh.] (Hoffmann and Metzger 1976) were evaluated in the Durum Cooperative tests. Stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici*. Eriks) was evaluated in 2011 at Creston, British Columbia, and Lethbridge, Alberta. Both stripe rust nurseries relied on natural infection. Reactions to FHB were evaluated near Glenlea and Carman, MB.

For data presented here, an analysis of variance (ANOVA) was performed using PROC MIXED of SAS software (Littell et al. 2006), with replications, zones, locations, and years considered as random effects. Entries were considered as fixed effects. The *pdiff* command was used to estimate the standard error of the difference between entries, which in turn was used to estimate a F-protected least significant difference at a significance level of 5% ($LSD_{0.05}$). For end-use quality data, years were considered as replications.

To generate Breeder Seed, approximately 200 single spikes of CDC Desire were selected from a rogued F_8 increase grown at Saskatoon in 2008. Heads were then grown as single 1-m row plots in 2009 and off-type rows discarded. The remaining head rows were harvested individually and used to establish 149 individual rows, 27 m in length in 2010. In that year, off type rows were discarded to leave 136 rows. Because of poor weather conditions in 2010, remnant seed from 2009 was used to re-establish the 136 rows in 2011. Off type rows were discarded and the 119 remaining breeder lines were composited to form the Breeder Seed.

Performance

Agronomy

Averaged over 42 station-years, CDC Desire exhibited similar yield to all check cultivars (Table 1), but on average, matured significantly ($P<0.05$) earlier than all of the checks (Table 2). CDC Desire is a conventional height cultivar, similar in height to AC Avonlea and Strongfield, with lodging resistance within the range of the checks (Table 2). The kernel weight of CDC Desire was significantly less ($P<0.05$) than all of the checks, while test weight was better than AC Avonlea, AC Morse and Commander, and similar to AC Navigator and Strongfield (Table 2). Grain protein concentration

Table 1. Grain yield (kg ha^{-1}) of CDC Desire and check cultivars in the Durum Cooperative Test 2008–2011[z]

	2008			2009			2010			2011			4-yr mean		
	Zone1	Zone2	Mean	Zone1	Zone2	Mean	Zone1	Zone2	Mean	Zone1	Zone2	Mean	Zone1	Zone2	Mean
AC Avonlea	4517	4270	4359	6211	4279	4922	4466	3607	3895	4312	3700	3823	4966	3972	4270
AC Morse	4691	4256	4413	5961	4172	4771	4907	3746	4133	4245	3876	3949	5043	4009	4323
AC Navigator	4384	4483	4446	5772	4499	4921	3635	3631	3633	3793	3667	3692	4506	4060	4186
Strongfield	4322	4383	4360	6258	4405	5021	4658	3749	4053	4487	3886	4008	5012	4119	4387
Commander	4384	4561	4499	6244	4569	5128	4307	3767	3943	4164	3940	3983	4852	4219	4407
CDC Desire	4240	4634	4490	5890	4310	4804	4355	3789	3979	4308	3975	4040	4738	4187	4360
$LSD_{0.05}$	**430**	**267**	**250**	**525**	**215**	**249**	**445**	**338**	**279**	**907**	**208**	**231**	**413**	**191**	**204**
No. stations	4	7	11	4	8	12	3	6	9	2	8	10	13	29	42

[z]Zone 1 (Black soils): Indian Head, SK; Brandon and Souris, MB; Langdon, ND; Zone 2 (Brown and Dark brown soils): Avonlea, Moose Jaw, Pense, Regina, Scott, Saskatoon, Stewart Valley Swift Current, SK; Bieseker, Lethbridge, Vulcan, AB.

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Table 2. Agronomic performance and grain protein concentration (%) of CDC Desire and check cultivars in the Durum Cooperative test (2008–2011)

	Maturity (d)[z]			Test wt. (kg hL^{-1})[z]			Kernel wt. (mg)	Height (cm)	Lodge (1–9)	% Protein[z]		
	Zone1	Zone2	Mean	Zone1	Zone2	Mean	Mean	Mean	Mean	Zone1	Zone2	Mean
AC Avonlea	102	112	110	75.5	79.5	78.4	43.9	89	2.2	14.4	13.5	14.0
AC Morse	102	112	110	75.0	78.9	77.8	43.5	85	1.7	13.8	13.1	13.2
AC Navigator	104	113	111	75.9	80.2	78.9	46.3	79	2.4	13.8	12.7	13.0
Strongfield	102	112	110	76.3	80.4	79.2	44.6	87	2.4	14.6	13.4	13.7
Commander	102	112	110	74.8	79.4	78.1	46.6	76	2.2	14.0	12.7	13.0
CDC Desire	100	111	108	76.0	80.4	79.1	41.6	87	2.1	14.4	13.2	13.5
$LSD_{0.05}$	**2**	**1**	**1**	**0.9**	**0.4**	**0.5**	**0.9**	**2**	**0.4**	**0.4**	**0.3**	**0.2**

[z]Zone 1 (Black soils): Indian Head, SK; Brandon and Souris, MB; Langdon, ND; Zone 2 (Brown and Dark brown soils): Avonlea, Moose Jaw, Pense, Regina, Scott, Saskatoon, Stewart Valley Swift Current, SK; Bieseker, Lethbridge, Vulcan, AB.

of CDC Desire was slightly less than Strongfield, but higher than AC Morse, AC Navigator and Commander (Table 2).

Disease

CDC Desire is resistant to prevalent races of leaf and stem rust, and has excellent common bunt resistance, like the checks (Table 3). Leaf spot reaction was similar to AC Avonlea. The FHB reaction of CDC Desire was in the range of the check cultivars in the Carman nursery. The deoxynivalenol (DON) levels of CDC Desire were in the range of the check cultivars except in 2010, when CDC Desire was higher than the checks. Reaction to loose smut was variable, but CDC Desire expressed reaction similar to Strongfield. CDC Desire showed a resistant reaction to stripe rust when assessed under natural infection in 2011 at Lethbridge and Creston.

End-use Suitability

Grain protein concentration of CDC Desire was similar to Strongfield in Zone 1 and Zone 2 (Table 2) and in quality composite samples (Table 4). CDC Desire has low cadmium concentration like Strongfield, but expressed yellow pigment higher than all of the check cultivars. The high yellow pigment was reflected in greater pasta b^* values than the checks (Table 4). The average falling number of CDC Desire was within the range of the check cultivars, similar to Strongfield and AC Avonlea (Table 4). Semolina milling yield and semolina ash content were within the range of the check cultivars. Averaged over all years of testing, CDC Desire showed similar semolina protein concentration to Strongfield. CDC Desire is a conventional gluten strength type, with gluten index and alveograph parameters similar to Strongfield.

Other Characteristics

SPIKES: Spikes of CDC Desire are parallel sided, dense, long and erect, with waxy bloom less than Strongfield. Spikes express white awns that are longer than the spike; the width of the lower glumes is narrow, while the length of the glumes is mid-long and they are glabrous; glume shoulders are slightly sloping and are narrow; the glume beak is slightly curved; the lemma beak is straight.

KERNELS: Kernels are amber in color, midsize, and elliptical; cheeks are angular; crease is shallow, and mid-wide; brush is short; embryo is mid-sized.

END-USE SUITABILITY: CDC Desire is eligible for grades of the Canada Western Amber Durum wheat class.

Maintenance and Distribution of Pedigreed Seed

CDC Desire consists of a composite of 119 $F_{8:10}$ breeder lines. Breeder seed will be maintained by the Crop Development Centre, University of Saskatchewan, Saskatoon,

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Table 3. Disease Reactions of CDC Desire and check cultivars grown in the Durum Cooperative test (2008–2011)

				Stripe rust					FHB index[x]		
Year	Entry	Stem rust[z]	Leaf rust[z]	Lethbridge	Creston	Common bunt[z]	Loose smut[z]	Leaf spots[y]	Carman	Glenlea	DON (mg kg^{-1})[w]
2008	AC Avonlea	R	R	–	–	MR	I	7.5	44	24	25.5
	AC Morse	R	R	–	–	VR	MS	8.8	50	17	20.5
	AC Navigator	R	R	–	–	VR	–	8.5	61	20	39.5
	Strongfield	R	R	–	–	VR	MS	7.0	54	23	30.5
	Commander	R	R	–	–	R	MS	7.3	62	16	36.9
	CDC Desire	R	R	–	–	VR	MS	7.3	64	53	27.3
	$LSD_{0.05}$								10	14	
2009	AC Avonlea	RMR	R	–	–	R	S	–	26	49	23.9
	AC Morse	R	R	–	–	R	MS	–	34	54	36.9
	AC Navigator	RMR	R	–	–	R	MS	–	36	41	35.6
	Strongfield	R	R	–	–	R	MS	–	38	59	27.3
	Commander	R	R	–	–	R	S	–	29	57	27.2
	CDC Desire	R	R	–	–	R	MS	–	39	76	35.6
	$LSD_{0.05}$								14	15	
2010	AC Avonlea	R	R	–	–	MS	I	7.2	55	38	41.0
	AC Morse	R	R	–	–	R/MR	MS	9.7	69	21	38.1
	AC Navigator	R	R	–	–	R/MR	MR	8.5	74	43	40.2
	Strongfield	R	R	–	–	R/MR	I	7.7	53	44	49.0
	Commander	R	R	–	–	R/MR	I	7.7	59	59	52.4
	CDC Desire	R	R	–	–	R/MR	I	7.2	71	72	62.4
	$LSD_{0.05}$								15	22	
2011	AC Avonlea	MR	R	25	30	MR	MR	7.5	–	17	7.8
	AC Morse	MR	R	12	20	MR	MS	7.9	–	25	11.3
	AC Navigator	R	R	12	Trace	R	R	8.8	–	21	16.2
	Strongfield	R	R	14	10	MR	MR	7.3	–	15	7.8
	Commander	R	R	16	0	R	R	7.8	–	15	16.7
	CDC Desire	R	R	12	0	R	MS	8.0	–	37	8.2
	$LSD_{0.05}$									**12**	

[z]VR, very resistant; R, Resistance; MR, moderately resistant; I, iIntermediate resistance; MS, moderately susceptible; S, susceptible.
[y]Adult plant rated at mid-grain fill at Swift Current, using the McFadden Scale where $<5=6$, $6=$MR, $7=$I, 8–9 =MS, and S = 10–11.
[x]Fusarium head blight index: (% infected spikelets × % infected heads)/100. Indices are averages from replicated trials at Carman and Glenlea, MB.
[w]Deoxynivalenol measured on composites of replications at Glenlea, MB.

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Saskatchewan, Canada S7N 5A8. A Plant Breeders' Rights application has been filed. CDC Desire will be added to the OECD list of cultivars. Distribution and multiplication of pedigreed seed stocks will be handled by Syngenta, 300-6700 MacLeod Trail South, Calgary, Alberta, Canada T2H 0L3. Commercial launch of CDC Desire is anticipated in 2014/2015.

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Table 4. Average values for quality traits measured on yearly composite samples of CDC Desire and check cultivars evaluated in the 2008, 2009, 2011[z] Durum Cooperative tests

	Grain protein (%)	FN[y] (s)	Yellow pigment (mg kg^{-1})	Semolina					Pasta b*	GI[x] (%)	Alveograph				Grain Cd (mg kg^{-1})
				Protein (%)	b*	a*	Yield (%)	Ash (%)			P	W	L	P/L	
AC Avonlea	13.3	378	8.2	12.4	32.70	4.50	67.1	0.62	62.96	11	50	121	100	0.52	0.222
AC Morse	13.1	425	8.0	12.0	32.04	4.26	66.7	0.64	61.97	49	78	193	80	0.99	0.186
Strongfield	13.4	383	8.6	12.3	33.02	5.03	67.2	0.60	61.72	57	73	199	87	0.88	0.084
AC Navigator	12.7	428	9.2	11.7	33.64	6.46	68.1	0.64	67.07	62	95	233	76	1.26	0.254
Commander	12.5	442	9.6	11.6	34.44	5.86	67.7	0.60	67.91	92	128	305	65	2.02	0.260
CDC Desire	13.1	385	10.4	12.2	35.83	5.55	66.8	0.64	64.32	69	81	212	79	1.08	0.084
$LSD_{0.05}$	**0.4**	**35**	**0.3**	**0.3**	**0.44**	**0.68**	**0.4**	**0.02**	**2.01**	**5**	**8**	**22**	**12**	**0.27**	**0.013**

[z]Quality data from 2010 was not used for deliberations by the Quality Evaluation Team because of the poor grade of composite samples.
[y]Falling number.
[x]Gluten index.

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