CULTIVAR DESCRIPTION

AC Domain hard red spring wheat

T. F. Townley-Smith and E. M. Czarnecki

Agriculture and Agri-Food Canada, Cereal Research Centre, 195 Dafoe Rd, Winnipeg, Manitoba, Canada R3T 2M9 (e-mail: ftsmith@agr.gc.ca). *Contribution no. 1928. Received 8 January 2007, accepted 15 November 2007.*

Townley-Smith, T. F. and Czarnecki, E. M. 2008. **AC Domain hard red spring wheat.** Can. J. Plant Sci. **88**: 347–350. AC Domain hard red spring wheat (*Triticum aestivum* L.) exhibited high levels of pre-harvest sprouting tolerance and is adapted to the Canadian prairies. In Manitoba, the grain yield of AC Domain was 3.4 to 7.4% higher than the check cultivars, while in Saskatchewan it was 3.3 to 8% lower. AC Domain had shorter, stronger straw than the check cultivars. AC Domain is eligible for all grades of the Canada Western Red Spring (CWRS) wheat class.

Key words: *Triticum aestivum* L., cultivar description, grain yield and protein, resistance to pre-harvest sprouting, leaf and stem rust

Townley-Smith, T. F. et Czarnecki, E. M. 2008. **Le blé roux vitreux de printemps AC Domain.** Can. J. Plant Sci. **88**: 347–350. La variété de blé roux vitreux de printemps (Triticum aestivum L.) AC Domain exprime une grande tolérance à la germination sur pied avant la récolte et est acclimatée à la région des Prairies canadiennes. Au Manitoba, le rendement grainier de AC Domain dépassait celui des cultivars témoins de 3,4 à 7,4 %, mais en Saskatchewan, il y était de 3,3 à 8 % inférieur. AC Domain a une paille plus courte et plus robuste que les cultivars témoins. AC Domain est admissible à toutes les catégories de la classe « blé roux de printemps de l'Ouest canadien».

Mots clés: *Triticum aestivum* L., description de cultivar, rendement grainier et protéines, résistance à la germination sur pied, rouille des feuilles et de la tige

AC Domain hard red spring wheat (*Triticum aestivum* L.) was developed at the Cereal Research Centre (CRC), Agriculture and Agri-Food Canada (AAFC), Winnipeg, MB. It received registration No. 3858 from the Variety Registration Office, Food Production and Inspection Branch, Agriculture Canada on 1993 Dec. 22.

AC Domain derives from the cross BW83/ND585 made in 1982 at the CRC. BW83 is an experimental line, highly tolerant to pre-harvest sprouting, developed at the CRC from the cross ND499/RL4137, where RL4137 is a line highly tolerant to pre-harvest sprouting, developed at the CRC from the cross Frontana/3/McMurachy Sel./Exchange//2*Redman/4/Thatcher*6/Kenya Farmer. ND585 is a breeding line with short stature and strong straw developed at North Dakota State University from the cross Butte*3//Waldron/RL4205, where RL4205 is a breeding line carrying leaf rust resistance gene *Lr9* and stem rust resistance gene *Sr8* that derives from the cross Pembina*6//Thatcher*3/Transfer/4/Pembina*6/3/Thatcher*2//Marquis*6/Red Egyptian. Heads of F_2 plants selected for disease resistance in an epiphytotic nursery were tested for sprouting tolerance in a rainfall simulator. F_3 and F_5 generations were grown in the greenhouse at CRC. Head rows were selected for disease and agronomic traits in F_4 and F_6 at Glenlea and F_6-derived lines were increased in New Zealand (F_7). Lines were yield tested in unreplicated trials as F_8 and in two replicate trials at two locations in each of Manitoba and eastern Saskatchewan as F_9. In 1988, one of these was designated RL4630 and evaluated in the Central Bread Wheat "B" test at six locations. From 1989 to 1991 it was evaluated in the Central Bread Wheat Cooperative (CBWC) test as BW148. The check cultivars in the CBWC test for the three years were Neepawa, Katepwa, Columbus and Roblin. The variables measured and the protocols followed in the CBWC test have been described by Graf and Fox (2000). Each year the data were analyzed using the S506 statistical program developed by the Statistical Research Services, AAFC. The LSD values for multi-location and multi-year comparisons were based on genotype by environment interactions.

During the CBWC testing period, leaf and stem rust seedling infection types were assessed by pathologists at the CRC. Stem rust (*Puccinia graminis* f. sp. *tritici*) races used for one or more years were: QTHST (C25), RHTSK (C20), RKQSR (C63), RTHJT (C57), TMRTK (C10) and TPMKR (C53) (Roelfs and Martens 1988; Fetch 2003). Leaf rust (*Puccinia recondita* f. sp. *tritici*) races used were those multiplied from field collections made the previous year. Field evaluations of both leaf and stem rust reactions, using the same races as for the seedling tests, were measured in an epiphytotic nursery near Glenlea, MB. To determine the loose smut [caused by *Ustilago tritici* (Pers.) Rostr.] reaction type, a

Table 1. Agronomic performance of AC Domain compared to the check cultivars based on data from the Central Bread Wheat Cooperative test (1989–1991)[z]

	Yield (kg ha^{-1})							
	MB	SK	Mean	Maturity (d)	Height (cm)	Lodging (1–9)[x]	Kernel Mass (mg)	Volume Weight (kg hL^{-1})
Neepawa	3482	2858	3170	93.3	96.1	2.6	30.8	78.6
Katepwa	3583	2932	3258	92.9	96.5	3.1	31.9	79.0
Columbus	3456	2897	3176	96.3	100.8	2.3	33.2	79.4
Roblin	3593	2790	3191	91.5	89.8	1.5	33.9	78.3
AC Domain	3713	2697	3172	93.5	89.4	1.4	32.9	79.8
LSD[y]	213	133	130	0.6	1.9	0.5	0.6	0.4
No. tests	15	15	30	25	27	19	30	30

[z]Locations in the Central Bread Wheat Cooperative tests included: Brandon, Dauphin, Glenlea, Morden, Portage la Prairie and Shoal Lake in Manitoba and Indian Head, Ituna, Kelvington, Melfort, Saskatoon and Regina in Saskatchewan.
[y]Least significant difference. $P \leq 0.05$, based on the mean squares genotype by environment interaction.
[x]A rating scale of 1 to 9 with a rating of 1 indicating all plants in a plot were vertical and 9 indicating all plants in a plot were horizontal.

mixture of the prevalent races T2, T9, T10 and T39 (Nielsen 1987) was injected into florets at anthesis of plants under field conditions. A mixture of the common bunt [*Tilletia laevis* Kuhn in Rabenh., and *T. caries* (DC.) Tul. & C. Tul.] races L1, L16, T1, T6, T13 and T19 (Hoffmann and Metzger 1976) was used to

Table 2. Disease reactions of AC Domain and check cultivars, based on data from Central Bread Wheat Cooperative Test (1989–1991)

	Leaf rust[z]			Stem rust[z]		
	1989	1990	1991	1989	1990	1991
Neepawa	20RMR	20RMR	20MR	TMR	10MRMS	No Data
Katepwa	20RMR	10RMR	20MR	2RMR	10MR	No Data
Columbus	5R	10R	10R	10MS-20RMR	20MRMS	No Data
Roblin	10M	5VR	5M	TR	TR	No Data
AC Domain	10VR	5VR	5VR	TR	5R	No Data
	Common bunt[z]			Loose smut[z]		
	1989	1990	1991	1989	1990	1991
Neepawa	–	31I	21I	6R	2R	7R
Katepwa	15R	7R	3R	3R	–R	13MR
Columbus	7R–	3R	1R	0R	4MS	86HS
Roblin	44S	43S	36S	5R	18MR	6R
AC Domain	24I	1R–	13R+	0R	17MR	15MR
	Septoria tritici[z,y]			Root rot		
	1989	1990	1991	1989	1990	1991
Neepawa	S	S	4	36	33	35
Katepwa	S	S	4	35	35	31
Columbus	S	S	4	37	45	37
Roblin	S	MS	4	26	25	25
AC Domain	S	S	3	43	44	42
	Septoria nodorum[y]					
	1989	1990				
Neepawa	4	4				
Katepwa	4	4				
Columbus	4	4				
Roblin	3–	4				
AC Domain	4	4				

[z]Percent infection and type of reaction: T, trace; R, resistant, VR, very resistant; M, intermediate MR, moderately resistant; I, intermediate resistant; S, susceptible.
[y]1 (very resistant) to 5 (very susceptible) scale.

inoculate the seed planted in mid-April of each year near Lethbridge, AB. Response to *Septoria tritici* and *S. nodorum* was scored in tests grown near Glenlea, MB. End use quality was evaluated by the Grain Research Laboratory, Canadian Grain Commission, Winnipeg, MB, using American Association of Cereal Chemists methods.

Performance

Agronomic performance data are summarized in Table 1. In Manitoba the grain yield of AC Domain was about 3.5% higher than Katepwa and Columbus, 6.6% higher than Neepawa and 7.4% higher than Roblin. In Saskatchewan, it yielded 8% lower than Katepwa, 6.8% lower than Columbus, 5.4% lower than Neepawa and 3.3% lower than Roblin. Overall the grain yield of AC Domain was similar to Neepawa, Columbus and Roblin and 2.8% less than Katepwa. AC Domain had significantly shorter plant height and less lodging than Columbus, Katepwa and Neepawa. The maturity of AC Domain is similar to Neepawa and Katepwa; significantly earlier than Columbus, but significantly later than Roblin. The 3-yr average kernel mass of AC Domain was larger than Neepawa, Katepwa and Columbus, but smaller than Roblin. On average, the volume weight of AC Domain was higher than all of the check cultivars. In tests of artificially weathered mature spikes, AC Domain had Hagberg Falling Number (FNO) of 454 compared with 445 for Columbus, 294 for Neepawa, 273 for Katepwa and 198 for Roblin (LSD = 41) indicating that AC Domain is as tolerant to pre-harvest sprouting as Columbus and significantly more tolerant than the other check cultivars.

Other Characteristics

Spikes. Fusiform to oblong, mid-dense, short to mid-long, erect, apically awnleted; glumes are mid-wide to wide, short to mid-long, glabrous, white; glume shoulders are primarily square, although some tending to rounded, mid-wide to wide; glume beak is very short and slightly curved.

Kernel. Colour is red, medium size, mid-wide, mid-long, ovate to elliptical; cheeks rounded to angular; brush mid-size with mid-length hairs; embryo mid-size and oval to round.

Shattering. Resistant to seed shelling due to wind, assessed three weeks after maturity (data not shown).

Disease Reaction. Resistant to prevalent races of leaf and stem rust, moderately resistant to common bunt and loose smut and intermediate resistance to leaf spots (Table 2).

End-use Suitability. Based on 3 yr of testing in the Central Bread Wheat Cooperative Test (Table 3), AC Domain was rated equal to the check cultivars for grain

Table 3. Averages of end-use suitability[z] traits of AC Domain and check-cultivars based on Central Bread Wheat Co-operative test, (1989–1991)

	Wheat protein (%)	Flour protein (%)	Flour yield (%)	Flour ash (%)	Flour Colour[y]	Amylograph viscosity (BU)	Hagberg falling no. (s)
Neepawa	14.2	13.7	75.2	0.44	−1.2	675	415
Katepwa	14.3	13.6	75.5	0.43	−1.4	693	423
Columbus	14.8	14.4	76.3	0.45	−1.2	898	418
Roblin	15.4	14.9	75.8	0.42	−1.1	613	376
AC Domain	15.2	14.7	76.2	0.45	−0.9	818	438
LSD[u]	0.2	0.3	0.8	0.02	0.4	109	32

		Farinograph[w]			Canadian short process		
	Starch damage[x]	Absorption (%)	DDT (min)	MTI (BU)	LV[v] (cc)	Time (min)	Absorption (%)
Neepawa	32	65.8	4.3	30.0	2168	6.0	68.8
Katepwa	33	65.4	4.4	35.3	2192	6.6	68.8
Columbus	30	67.4	4.8	32.5	2152	7.2	70.5
Roblin	24	66.9	7.5	10.0	2265	8.6	69.5
AC Domain	31	67.4	5.2	36.3	2070	5.2	70.8
LSD	3.9	1.1	0.9	6.8	117	1.1	1.2

[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 6 to 10 locations each year.
[y]Kent Jones Colour Grade.
[x]Starch damage is expressed in Farrand units.
[w]DDT is the Farinograph dough development time; MTI is Farinograph mixing tolerance index expressed in Brabender units (BU).
[v]LV is loaf volume.
[u]Least significant difference. $P \leq 0.05$, based on the mean squares genotype by environment interaction.

quality by the Quality Evaluation Team of the Prairie Registration Recommending Committee for Grain. AC Domain is eligible for all grades of the Canada Western Red Spring wheat class.

Maintenance and Distribution of Pedigreed Seed

AC Domain consists of a composite of 126 Breeder Lines, developed from single plants selected at random out of the line RL4630, which were grown out as Pre-Breeder Lines in 2-m-long rows in isolation near Glenlea in 1990, and again as 15-m rows near Indian Head in 1991. Breeder Seed will be maintained by the Seed Increase Unit of the Research Farm, Indian Head, Saskatchewan, Canada, S0G 2K0. The variety will be added to the OECD list of Cultivars. AC Domain has been released for distribution and multiplication to SeCan Association, 501-300 March Road, Kanata, Ontario, Canada K2K 2E2.

Appreciation is expressed to the following: K. R. Preston and B. Morgan, Grain Research Laboratory, Canadian Grain Commission, Winnipeg, MB, and J. S. Noll, Cereal Research Centre, AAFC, Winnipeg, MB, for end-use suitability analysis; A. M. Tekauz and J. A. Gilbert for assessing reaction to *Septoria* species, P. L. Thomas for determining reaction to loose smut, and D. E. Harder and J. A. Kolmer for assessing reaction to stem and leaf rust, all from the CRC, AAFC, Winnipeg, MB; D. A Gaudet and B. J. Puchalski, Research Centre, AAFC, Lethbridge, AB, for assessing reaction to common bunt; and R. D. Tinline, H. H. Harding and K. L Bailey, Research Centre, AAFC, Saskatoon, SK, for assessing reaction to root roots; and D. Kirkpatrick and B. Adams from the CRC, AAFC, Winnipeg, MB for their expert technical assistance in developing AC Domain.

Fetch, T. G., Jr. 2003. Physiologic specialization of *Puccinia graminis* on wheat, barley, and oat in Canada in 2000. Can. J. Plant Pathol. **25**: 174–181.

Graf, R. J. and Fox, S. L. 2000. Subcommittee on wheat rye and triticale draft operating procedures. Pages 32–49 *in* Wheat rye and triticale subcommittee report. Prairie Registration Recommending Committee for Grain.

Hoffmann, J. A. and Metzger, R. J. 1976. Current status of virulence genes and pathogenic races of the wheat bunt fungi in the northwestern USA. Phytopathology **66**: 657–660.

Nielsen, J. 1987. Races of *Ustilago tritici* and techniques for their study. Can. J. Plant Pathol. **9**: 91–105.

Roelfs, A. P. and Martens, J. W. 1988. An international system of nomenclature for *Puccinia graminis* f. sp. *tritici*. Phytopathology **78**: 525–533.