CULTIVAR DESCRIPTION

Kanata hard white spring wheat

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Humphreys, D. G., Townley-Smith, T. F., Czarnecki, E., Lukow, O. M., Fofana, B., Gilbert, J., McCallum, B., Fetch, T. and Menzies, J. 2006. **Kanata hard white spring wheat**. Can. J. Plant Sci. **87**: 879–882. Kanata is an early-maturing hard white spring wheat (*Triticum aestivum* L.) that meets the end-use quality and kernel visual distinguishability specifications of the Canada Western Hard White Spring wheat class. Kanata was evaluated in the Central Bread Wheat Cooperative Test (1998–2000), and was found to be adapted to the wheat-growing regions of the Canadian prairies, particularly the shorter season areas. Kanata yielded less than check cultivars AC Majestic, AC Barrie, Harvest, and McKenzie but had similar grain yield compared with Neepawa and Roblin. In the Central Bread Wheat Cooperative Test, Kanata was resistant to the prevalent races of leaf rust, moderately resistant to stem rust, loose smut, and common root rot. Kanata is similar to Neepawa in its reaction to Fusarium head blight. End-use quality tests indicated that Kanata had similar grain and flour protein content as other check cultivars but had 1% less protein content compared to Roblin.

Key words: *Triticum aestivum* L., Canada Western Hard White, hard white spring wheat, cultivar description, yield, disease resistance

Humphreys, D. G., Townley-Smith, T. F., Czarnecki, E., Lukow, O. M., Fofana, B., Gilbert, J., McCallum, B., Fetch, T. et Menzies, J. 2006. **Blé blanc panifiable de printemps Kanata**. Can. J. Plant Sci. **87**: 879–882. Kanata est un blé blanc panifiable de printemps qui répond aux qualités d'utilisation finale et de différentiation visuelle du grain de la catégorie de blé blanc panifiable de printemps de l'ouest canadien. Kanata a été évalué lors des essais coopératifs centralisés pour la certification des blés panifiables (1998–2000) et s'est avéré acclimaté aux régions des prairies canadiennes de culture du blé, particulièrement les régions à courtes saisons. Kanata a démontré un rendement en grain inférieur à celui de AC Majestic, AC Barrie, Harvest, et McKenzie mais comparable à celui des variétés Neepawa et Roblin. Kanata est résistant à la rouille foliaire, légèrement résistant à la rouille de la tige, au charbon nu et à la pourriture racinaire. Kanata et Neepawa ont montré des réponses similaires vis-à-vis la fusariose. Les analyses de qualité pour l'usage final ont montré que le contenu protéique du grain et de la farine de Kanata est identique à celui de la plupart des variétés de référence à l'exception de Roblin.

Mots clés: *Triticum aestivum* L., blé blanc panifiable de printemps, description du cultivar, rendement, résistance aux maladies

Kanata, a hard white spring wheat (*Triticum aestivum* L.) was developed at the Cereal Research Centre, Agriculture and Agri-Food Canada, Winnipeg, MB. Kanata was granted interim registration on 2001 Aug. 30 (CFIA certificate # I-282) and interim status was extended on 2004 Aug. 30. Kanata received support for full registration from the Prairie Regional Recommending Committee for Grain on 2006 Feb. 23, and was granted permanent restricted registration (CFIA certificate # 6172) on 2006 Aug. 30. Kanata was granted Plant Breeder's Rights for 18 yr on 2004 Feb. 04 (CFIA PBR certificate # 1726).

Pedigree and Breeding Method

Kanata was selected from the cross: AC Domain/3/RL4137*6//Thatcher/Poso48, where AC Domain is a red spring wheat variety and the male parent was a white seeded isogenic line of the breeding line RL4137. Poso48 was the source of the white seed coat color. The final cross was made in 1994 at the Agriculture and Agri-Food Canada (AAFC), Cereal Research Centre in Winnipeg. Doubled haploid lines were produced from F_1 plants using the maize pollination procedure (Aung et al. 1995). Doubled haploid lines were evaluated in a disease and dormancy nursery in 1996, and 30 lines were entered into the Hard White B Test in 1997. One of these lines was RL 4861, which was subsequently entered into the Central Bread Wheat Cooperative Test in 1998 under the designation BW263. Kanata was tested in the Central Bread Wheat Cooperative Test in 1998, 1999 and 2000.

Area of Adaptation

Kanata is adapted to the wheat growing areas of the Prairie Provinces, particularly the shorter season areas.

Performance

Kanata is a white-seeded, hollow-stemmed wheat which has end-use quality similar to the current CWRS wheat class. In 3 yr of testing in the Central Bread Wheat Cooperative Test

Table 1. Agronomic data for Kanata and check cultivars based on data collected in the Central Bread Wheat Cooperative Test (1998–2000)

Cultivar	Yield (kg ha^{-1})			Maturity (d)			Height	Lodging[x]	Test weight	Kernel weight	Falling number (s)		Sprouting[w] score
	Zone 1[z]	Zone 2[y]	Mean	Zone 1	Zone 2	Mean	(cm)	(1–9 scale)	(kg hL^{-1})	(mg)	Field	Artificial	(1–9 scale)
Neepawa	3430	3700	3570	90.5	98.7	95.1	104	3.2	76.7	29.8	312	240	4.9
Roblin	3540	3590	3560	89.6	96.8	93.6	97	2.2	75.9	32.2	169	152	8.2
AC Majestic	3820	3950	3890	91.4	101.7	97.1	98	2.4	77.5	31.2	432	367	1.7
McKenzie	4560	4380	4470	91.8	98.4	95.5	98	3.1	78.9	31.6	382	376	2.4
Harvest	4340	4070	4200	90.3	99.2	95.3	94	1.7	78.9	32.2	404	434	1.5
AC Barrie	3900	3970	3940	91.7	100.3	96.5	100	2.5	78.6	32.4	266	295	4.2
Kanata	**3560**	**3580**	**3570**	**89.7**	**98.9**	**94.8**	**94**	**1.9**	**78.5**	**30.5**	**284**	**315**	**4.1**
LSD ($P < 0.05$)[v]	202	141	127	0.7	1.1	0.7	1	0.4	0.4	0.9	96	81	1.2
Station years	14	15	29	11	14	25	27	21	30	30	3	3	3

[z]Zone 1 includes: Glenlea, Portage la Prairie, Morden, Brandon, and Elgin in Manitoba (Brandon 2000 not included).
[y]Zone 2 includes: Indian Head, Regina, Kernen, Kelvington, and Melfort in Saskatchewan.
[x]Lodging scale: 1 = vertical; 9 = flat.
[w]Sprouting score: 1= resistant; 9 = susceptible.
[v]LSD of means was based on the checks including Kanata and calculated using the SAS proc mixed procedure.

(1998–2000), grain yield of Kanata was comparable to that of Neepawa and Roblin, but 8.2% less than AC Majestic, 9.4% less than AC Barrie, and 20.1% less than McKenzie (Table 1). Kanata has maturity similar to Neepawa, McKenzie, and Harvest. It matured 1 d later than Roblin and 1 d earlier than AC Barrie and 2 d earlier than AC Majestic (Table 1). Kanata had plant height similar to Harvest but was 3–10 cm shorter than the other check cultivars. Kanata had similar lodging scores to Harvest, and was lower than the other check cultivars (Table 1).

Other Characteristics

SPIKE: Tapering, erect, glaucosity weak, white at maturity, short awns or awnlets present.

GLUMES: Midwide, midlong, glabrous, shoulders slightly sloping and midwide, beak short and slightly curved.

KERNEL: Hard, white kernel, midsize to small, midwide, oval kernel with rounded cheeks, midsize brush hairs, midsize and oval shaped embryo, midwide and middeep crease.

DISEASE REACTION: As part of the cooperative testing, leaf rust (caused by *Puccinia triticina* Eriks.) and stem rust (caused by *Puccinia graminis* Pers. f. sp. *tritici* Eriks. E. Henn.) reactions were evaluated in an epiphytotic nursery. Kanata was moderately resistant to the prevalent races of leaf rust, and moderately resistant to stem rust, loose smut [caused by *Ustilago tritici* (Pers.) Rostr.], and common root rot. Kanata was susceptible to common bunt [caused by *Tilletia laevis* Fuhn in Rabenh and *T. tilletia* (Bjerk.) R. Wolf] and was similar to the checks in its reaction to tan spot [caused by *Pyrenophora tritici-repentis* (Died.) Drechs.]. Kanata displayed similar disease response to Fusarium head blight as AC Majestic, Mckenzie and AC Barrie (Table 2).

The leaf rust races used were those multiplied from collections made the previous year (Kolmer 1999, 2001; McCallum and Seto-Goh 2002). The stem rust races included: TPMKR, TMRTK, RKQSR, QFCSH, RTHJT, and QTHST (Fetch 2003). The races of loose smut included: T2, T9, T10, and T39 (Menzies et al. 2003) and the races of common bunt included: L7, L16, T1, T6, T13, and T19 (Gaudet and Puchalski 1989a, b). Race designations are described by Roelfs and Martens (1988) for stem rust, Neilsen (1987) for loose smut, and Hoffman and Metzger (1976) for common bunt.

END-USE SUITABILITY. Kanata is eligible for all grades of the Canada Western Hard White Spring wheat class (Table 3), exhibiting on average 1% less grain and flour protein compared to Roblin but similar to other check cultivars. Kanata had a higher falling number than Neepawa, Roblin, McKenzie, and AC Barrie but was lower than other check cultivars. Kanata had higher starch gelatinization properties than Neepawa, Roblin, McKenzie, and AC Barrie but was lower than AC Majestic and Harvest, as indicated by the amylograph (Table 3).

Maintenance and Distribution of Pedigreed Seed

The breeder lines were derived from heads taken at random from a third generation (DH3) increase plot. These heads were grown in isolation as rows at Glenlea, MB in 1998 and as breeder plots at Lincoln, New Zealand 1999–2000. Kanata breeder seed was generated from a bulk of 103 breeder's lines. Breeder seed is maintained by the AAFC Seed Increase Unit, Indian Head, SK. Distribution and multiplication of pedigree seed stocks is the responsibility of FarmPure Seeds Ltd., 418B Macdonald St., Regina, Saskatchewan, Canada S4N 6E1.

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Table 2. Disease reactions for Kanata and check cultivars from the Central Bread Wheat Cooperative Test, 1998–2000

	Stem rust[z]			Leaf rust[y]			Root rot			Loose smut[x]			Common bunt[w]			Fusarium head blight index[v]		
Cultivar	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000
Neepawa	3 R	5 RMR	tr R	50 MR-S	60 MS	50 S	11	57	-	0 R	0 R	0 R[a]	23 I	29 MS	22 I	40 MS	10 MR	20 MR
Robin	1 R	tr R	0 R	5 M	10 MR	40 MS	20	44	-	18 MR	0 R[a]	9 R	39 S	39 S+	44 S	70 S	62 S	42 S
AC Majestic	1 R	tr R	0 R	30 MRMS	40 MR	15 MRMS	15	68	-	43 MS	3 R	23 MR	8 R	8 MR	10 R	34 MS	13 MR	24 I
McKenzie	5 R	tr R	0 R	tr R	tr R	tr R	9	53	-	33 MR	0 R[a]	38 I	3 R	2 R	52 S	39 MS	18 MR	30 I
AC Barrie	5 R	5 R	0 R	30 MRMS	40 MRMS	20 MRMS	21	83	-	3 R	0 R[a]	3 R	16 IR	25 MS	2 VR	29 I	13 MR	22 I
Kanata	30 MRMS	15 MRMS	tr R	tr R	10 RMR	5 MR	29	67	-	17 MR[a]	45 MR	61 MR	35 S	34 S	38 S	34 MS	25 I	23 I

[z]Caused by *Puccinia graminis* Pers. f. sp. *tritici* Eriks. E. Henn. Races used include TPMKR, TMRTK, RKQSR, QFCSH, RTHJT, and QTHST (Roelfs and Martens 1988; Fetch 2003); rating is % severity and infection type, respectively.
[y]Caused by *Puccinia triticina* Eriks. Inoculum was a composite of all leaf rust races multiplied from collections made the previous year (Kolmer 1999, 2001; McCallum and Seto-Goh 2002); rating is percent severity and infection type, respectively.
[x]Caused by *Ustilago tritici* (Pers.) Rostr. Races include T2, T9, T10, and T39 (Nielsen 1987; Menzies et al. 2003); rating is % infection.
[w]Caused by *Tilletia laevis* Kuhn in Rabenh and *T. tritici* (Bjerk.) R. Wolf. The inoculum used was a composite of races T1, T6, T13, and T19 of *T. tritici* and L1, L16 of *T. laevis* mixed (vol/vol) in a 1:1:1:1:2:2 ratio (Gaudet and Puchalski 1989a) and represents the virulence spectrum of bunt isolates in western Canada (Gaudet and Puchalski 1989b); rating is percent infection.
[v]Fusarium head blight index is equal to (% incidence × % severity)/100.

Table 2. Continued

	Tan Spot[u]			*Septoria nodorum* MKW reduction			*Septoria nodorum* score			*Septoria tritici* MKW reduction			*Septoria tritici* score[s]		
Cultivar	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000
Neepawa	9.7	5.0	–	–1.4	21.5	11.5	10.0	9.8	9.0	–6.38	–	11.4	10.3	2.0	11.0
Robin	10.3	5.0	–	0.3	6.5	15.7	10.0	9.8	8.7	–5.54	–	16.7	10.3	2.0	11.0
AC Majestic	10.0	5.0	–	–4.9	13.1	12.4	10.0	9.3	8.3	–10.53	–	10.0	10.0	2.0	11.0
McKenzie	10.0	5.0	–	–1.3	10.2	8.9	9.7	9.5	9.0	–5.97	–	8.8	9.3	2.0	11.0
AC Barrie	10.0	5.0	–	0.2	7.7	1.4	9.7	9.5	8.0	–2.53	–	2.3	10.3	1.0	11.0
Kanata	10.0	5.0	–	10.3	13.3	6.8	10.3	10.0	8.7	1.07	–	6.7	10.0	2.0	11.0

[u]Caused by *Pyrenophora tritici-repentis* (Died.) Drechs.
[s]McFadden's scale <5 = R; 6 = MR; 7 = I; 8–9 = MS; 10–11 = S.

Table 3. Wheat and flour analytical data for Kanata and check cultivars based on end-use testing[z] from the Central Bread Wheat Cooperative Test (1998–2000)

Cultivar	Test weight (kg hL^{-1})	Kernel weight (mg kernel^{-1})	Grain protein (%)	Flour protein (%)	Protein loss	Falling number (s)	Amylo-graph (BU)	Flour yield (%)	Flour ash (%)	KJ color[y] (A)	Agtron color (%)	Starch damage (%)	Particle size index (%)
Neepawa	80.3	32.1	14.5	13.7	0.8	395	608	74.3	0.46	–2.3	77	6.3	55
Roblin	79.8	34.8	15.3	14.6	0.7	338	428	74.5	0.44	–2.0	75	5.2	58
AC Majestic	80.9	33.3	14.7	14.0	0.7	432	1042	75.6	0.44	–2.2	75	6.3	53
McKenzie	81.9	33.6	14.4	13.7	0.7	395	692	75.8	0.45	–2.2	76	7.1	51
Harvest	81.5	34.6	14.2	13.5	0.7	447	837	75.8	0.47	–1.9	73	7.1	51
AC Barrie	81.9	34.7	14.3	13.5	0.7	400	698	76.2	0.44	–2.3	78	6.2	55
Kanata	**81.2**	**31.8**	**14.7**	**13.9**	**0.8**	**417**	**813**	**76.4**	**0.45**	**–2.0**	**76**	**6.7**	**51**
LSD ($P < 0.05$)	0.7	1.1	0.2	0.2	–	41.7	149.8	0.5	–	–	2	0.3	1
Station years	3	3	3	3	3	3	3	3	3	2	3	3	3

Table 3. Continued

	Farinograph				Canadian Short Process (150 ppm Ascorbic Acid)						
Cultivar	Absorption (%)	Dough development time (min)	Mixing tolerance index (BU)	Stability index (min)	Loaf volume (cm^3)	Loaf appearance	Crumb structure	Crumb color	Absorption (%)	Mixing energy (W h kg^{-1})	Mixing time (min)
Neepawa	65.9	4.42	33	6.50	1147	8.0	5.9	7.9	69	10.1	7.4
Roblin	66.4	7.58	22	17.00	1150	7.7	6.2	8.0	71	15.5	12.6
AC Majestic	66.9	5.08	37	6.33	1115	7.8	6.1	8.2	70	13.2	9.7
McKenzie	67.4	5.08	37	7.00	1072	7.7	6.1	8.1	71	11.8	9.3
Harvest	68.0	5.33	33	7.33	1073	7.6	6.1	8.1	71	12.1	9.3
AC Barrie	63.8	5.67	37	9.33	1115	7.7	6.2	8.0	68	13.1	10.2
Kanata	65.6	5.50	28	9.33	1067	7.4	6.2	8.0	70	15.9	12.6
LSD ($P < 0.05$)	0.9	0.58	5	2.59	26	0.2	-	-	1	2.3	1.2
Station years	3	3	3	3	3	3	3	3	3	3	3

[z] American Association of Cereal Chemist methods were followed by the Grain Research Laboratory, Canadian Grain Commission for evaluating the various end-use suitability traits on a composite of grain generated each year (1998–2000) from the Central Bread Wheat Cooperative test.
[y] KJ Color data were not collected in 2000.

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Aung, T., Howes, N. K., McKenzie, R. I. H. and Townley-Smith, T. F. 1995. Application of the maize pollen method for wheat double haploid (DH) generation in western Canadian spring wheat breeding programs. Annual Wheat Newsl. **41**: 70.

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

Gaudet, D. A. and Puchalski, B. L. 1989a. Status of bunt resistance in western Canadian spring wheat and triticale. Can. J. Plant Sci. **69**: 797–804.

Gaudet, D. A. and Puchalski, B. L. 1989b. Races of common bunt (*Tilletia caries* and *T. foetida*) in western Canada. Can. J. Plant Pathol. **11**: 415–418.

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.

Kolmer, J. A. 1999. Physiologic specialization of *Puccinia triticina* in Canada in 1997. Plant Dis. **83**:194–197.

Kolmer, J. A. 2001. Physiologic specialization *of Puccinia triticina* in Canada in 1998. Plant Disease **85**: 155–158.

McCallum, B. D. and Seto-Goh, P. 2002. Physiologic specialization of wheat leaf rust (*Puccinia triticina*) in Canada in 1999. Can. J. Plant Pathol. **24**: 205–210.

Menzies, J. G., Knox, R. E., Nielsen, J. and Thomas, P. L. 2003. Virulence of Canadian isolates of *Ustilago tritici*; 1964–1998, and the use of the geometric rule in understanding host differential complexity. Can. J. Plant Pathol. **25**: 62–72.

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 recondita* f.sp. *tritici* and *Puccinia graminis* f.sp. *tritici*. Phytopathology **78**: 525–533.