Snowbird hard white spring wheat

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Humphreys, D. G., Townley-Smith, T. F., Czarnecki, E., Lukow, O. M., McCallum, B., Fetch, T., Gilbert, J. and Menzies, J. 2007. **Snowbird hard white spring wheat**. Can. J. Plant Sci. **87**: 301–305. Snowbird is a 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. Snowbird was evaluated in the Central Bread Wheat Cooperative Test in 1998, 1999 and 2000, and was found to be adapted to the wheat-growing regions of the Canadian prairies. Snowbird yielded more than the check cultivars Neepawa, Roblin, AC Majestic, McKenzie, Harvest, and AC Barrie but less than McKenzie. Snowbird is resistant to the prevalent races of leaf rust and moderately resistant to stem rust, loose smut and common root rot. Snowbird and Roblin exhibited similar levels of resistance to tanspot, *Septoria tritici,* and *Septoria nodorum* while its reaction to Fusarium head blight was similar to that of AC Barrie. Snowbird has similar grain and flour protein content as other check cultivars but had 1% less protein 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., McCallum, B., Fetch, T., Gilbert, J. et Menzies, J. 2007. **Blé blanc panifiable de printemps Snowbird**. Can. J. Plant Sci. **87**: 301–305. Snowbird est un blé blanc panifiable de printemps qui répond aux qualités d'utilisation finale et de différentiation visuelles du grain de la catégorie du Blé blanc panifiable de printemps de l'ouest canadien. Snowbird a été évalué lors d'essais coopératifs centralisés pour la certification des blés panifiables en 1998, 1999 et 2000 et s'est avéré acclimaté aux régions des prairies canadiennes de culture du blé. Snowbird a été comparé aux variétés Neepawa, Roblin, AC Majestic, McKenzie, Harvest et AC Barrie. Son rendement en grain est supérieur à celui de toutes les variétés de référence à l'exception de McKenzie. Snowbird est résistant à la rouille foliaire, légèrement résistant à la rouille caulinaire, au charbon nu et à la pourriture racinaire. Snowbird et Roblin ont montré des niveaux de résistance similaires *vis-à-vis* de l'helminthosporiose, la tâche des glumes et la tâche foliaire, tandis que sa réaction à l'égard de la fusariose est semblable à celle de Neepawa. Les analyses de qualité pour l'usage final ont montré que le contenu en protéine du grain et de la farine de Snowbird est semblable à celle des autres variétés de référence mais Snowbird avait 1% moins de protéine que Roblin.

Mot clés: *Triticum aestivum* L., Blé blanc panifiable de printemps de l'ouest canadien, blé blanc panifiable de printemps, description du cultivar, rendement, résistance aux maladies

Snowbird, a hard white spring wheat (*Triticum aestivum* L.), was developed at the Cereal Research Centre, Agriculture and Agri-Food Canada, Winnipeg, MB. It received restricted registration No. 5858 from the Variety Registration office of the Canadian Food Inspection Agency on 2004 Sep. 17. Snowbird is adapted to the wheat-growing regions of the Canadian prairies and meets the kernel shape, kernel colour and end-use quality characteristics of the Canada Western Hard White Spring wheat class.

Pedigree and Breeding Method

Snowbird (BW 264) was selected from the cross of a white-seeded, isogenic line of RL4137 to AC Domain. The white-seeded, isogenic line of RL4137 derives from the cross: RL4137*6//Thatcher/Poso48, where Poso48 was the source of white seed colour. The final cross was made in 1994 at the Agriculture and Agri-Food Canada (AAFC), Cereal Research Centre in Winnipeg, MB. Doubled haploid lines were produced from F_1 plants using the maize pollen doubled haploid procedure (Aung et al. 1995). Doubled haploid lines were grown in a disease/dormancy nursery in 1996, and 30 lines were entered into the Hard White B test in 1997. One of these lines, designated RL 4871, was subsequently entered into the Central Bread Wheat Cooperative test in 1998 as BW 264. Snowbird was evaluated in the Central Bread Wheat Cooperative test from 1998 to 2000 under the designation BW 264.

Area of Adaptation

Snowbird is adapted to the wheat growing areas of the Prairie Provinces.

Performance

Snowbird is a white-seeded, hollow-stemmed wheat which has quality similar to the current CWRS class of wheat. In 3 yr of testing in the Central Bread Wheat Coop test

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

	Yield (kg ha^{-1})			Maturity (d)					Test	Kernel	Falling number (s)		Sprouting[y]
Cultivar	Zone 1	Zone 2	Overall mean	Zone 1	Zone 2	Overall mean	Height (cm)	Lodging[z] (1–9)	weight (kg hL^{-1})	weight (mg)	Field	Artificial	score (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
Snowbird	4240	3920	4080	92.0	99.7	96.3	101	2.7	78.3	29.0	315	366	5.2
LSD ($P < 0.05$)[x]	202	141	127	0.7	1.1	0.7	1.3	0.4	0.4	0.9	95.6	81	1.2
Station years	14	15	29	11	14	25	27	21	30	30	3	3	3

[z]Lodging scale: 1 = vertical; 9 = flat.
[y]Sprouting score: 1 = resistant; 9 = susceptible.
[x]LSD of means were based on the checks and Snowbird and calculated using the SAS Proc-Mixed procedure.

(1998–2000), Snowbird yielded 14.3% more grain than Neepawa and Roblin, 4.9% more than AC Majestic, 2.9% more than Harvest, 3.6% more than AC Barrie and 8.7% less than McKenzie (Table 1). Snowbird was shorter than Neepawa, but was taller than the other check cultivars. Snowbird had slightly better lodging resistance scores than Neepawa and McKenzie but higher lodging scores than the other check cultivars. Snowbird has maturity similar to AC Barrie. It matured 5 d later than Harvest, 3 d later than Roblin, 1 d later than Neepawa and McKenzie but was 1 d earlier than AC Majestic.

Other Characteristics

Spike. Tapering, lax to medium, erect, short, waxy bloom weak to absent, white at maturity, awnless, glumes are medium width, medium length, glabrous, lower glume shoulders are slightly sloping and narrow, glume beak is short and slightly curved; glumes are white at maturity.

Kernel. Colour is white, medium size, mid-long, mid-wide, oval, rounded cheeks; mid-size brush hairs; midsize and oval embryo; mid-wide and mid-deep crease.

Disease Reaction. As part of the cooperative testing, leaf and stem rust reactions were evaluated in an epiphytotic nursery. Snowbird is resistant to the prevalent races of leaf rust, moderately resistant to stem rust, loose smut and common root rot, showed similar response to tanspot, *Septoria tritici* and *Septoria nodorum* compared with Roblin, and displayed intermediate resistance in reaction to Fusarium head blight (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 [caused by *Ustilago tritici* (Pers.) Rostr.] included: T2, T9, T10 and T39 (Menzies et al. 2003) and the races of common bunt [caused by *Tilletia laevis* Kuhn in Rabenh and *T. tritici* (Bjerk.) Wint.] included: L1, L16, T1, T6, T13 and T19 (Gaudet and Puchalski 1989a, 1989b). 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. Snowbird cannot be excluded from grades of the Canada Western Hard White wheat class (Table 3), exhibiting on average 1% less grain protein compared with Roblin and was similar to other check cultivars. Snowbird has a falling number higher than Neepawa, Roblin, McKenzie and AC Barrie but lower than Harvest, AC Majestic and Mckenzie. Snowbird has been described as a partially waxy wheat as indicated by the amylograph viscosity (Table 3).

Maintenance and Distribution of Pedigreed Seed

The breeder lines were derived from heads taken at random from a third generation increase plot. These heads were grown in isolation as rows at Glenlea in 1998, as plots at

Table 2. Disease reactions of Snowbird and check cultivars in 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 MR	tr R	50 MR-S	60 MS	50 S	11	57	–	0 R	0 R	0 R	23 I	29 MS	22 I	40 MS	10 MR	20 MR
Roblin	1 R	tr R	0 R	5 M	10 MR	40 MS	20	44	–	18 MR	0 R	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	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	3 R	16 IR	25 MS	2 VR	29 I	13 MR	22 I
Snowbird	20MR	5 MRMS	tr R	tr R	5 R	5 MR	21	67	–	13 R[a]	24 MR	33 MR	8 R	27 MS	10 R	26 I	22 I	27 I

	Tan spot			*Septoria. nodorum* MKW reduction			*Septoria nodorum*[u] score			*Septoria tritici* MKW reduction			*Septoria tritici*[t] score		
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
Roblin	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
AC 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
Snowbird	9.7	5.0	–	17.5	16.5	6.2	10.3	9.3	8.3	9.16	–	11.4	10.0	2.0	11.0

[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).
[y]Caused by *Puccinia triticina.* Inoculum was a composite of all leaf rust races multiplied from collections made the previous year (Kolmer 1999, 2001; McCallum and Seto-Goh 2002).
[x]Caused by *Ustilago tritici* (Pers.) Rostr. Races include T2, T9, T10 and T39 (Nielsen 1987; Menzies et al. 2003).
[w]Caused by *Tilletia laevis* Kuhn in Rabenh and *T. tritici* (Bjerk.) Wint. 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).
[v]Caused by *Fusarium graminearum.*
[u]Assessment made on less than 10 plants.
[t]McFadden'scale <5 = R; 6 = MR; 7 = I; 8–9 = MS; 10–11 = S.

Table 3. Wheat and flour analytical data for Snowbird and check cultivars based on data from the Central Bread Wheat Cooperative test (1998–2000). End-use quality testing was performed by the Grain Research lab of the Canadian Grain Commission on a composite from each year of the Central Bread Wheat Cooperative test

Cultivar	Test weight (kg hL^{-1})	Kernel weight (mg)	Grain protein (%)	Flour protein (%)	Protein loss	Falling number (s)	Amylograph (BU)	Flour yield (%)	Flour ash (%)	KJ colour[z] (A)	Agtron colour (%)	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
Snowbird	81.5	34.1	14.3	13.6	0.6	408	1067	75.4	0.44	–2.6	79	6.2	55
LSD ($P < 0.05$)	0.7	1.1	0.2	0.2	0.1	42	150	0.5	0.02	0.4	2	0.3	1
Station years	3	3	3	3	3	3	3	3	3	2	3	3	3

	Farinograph				Canadian short process (150 ppm ascorbic acid)						
Cutlivar	Absorption (%)	Dough development time (min)	Mixing tolerance index (BU)	Stability index (min)	Loaf volume (cm^3)	Loaf appearance	Crumb structure	Crumb colour	Absoption (%)	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
Snowbird	66.2	5.42	35	7.33	1073	7.4	6.0	8.1	69	14.0	11.1
LSD ($P < 0.05$)	0.9	0.6	5	2.59	26	0.2	0.2	0.2	1	2.3	1.2
Station years	3	3	3	3	3	3	3	3	3	3	3

[z]KJ Colour data was not collected in 2000.

Lincoln, New Zealand in 1998–1999 and again as plots at Indian Head in 1999. The Snowbird breeder seed was generated from a bulk of 135 breeder's lines. Breeder seed will be 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, SK, Canada, S0G 2K0.

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