

Infinity hard red spring wheat

R. M. DePauw, R. E. Knox, F. R. Clarke, T. N. McCaig, J. M. Clarke, and M. R. Fernandez

Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, Swift Current, Saskatchewan, Canada S9H 3X2 (e-mail: depauw@agr.gc.ca). Received 12 July 2005, accepted 16 January 2006.

DePauw, R. M., Knox, R. E., Clarke, F. R., McCaig, T. N., Clarke, J. M. and Fernandez, M. R. 2006. **Infinity hard red spring wheat**. Can. J. Plant Sci. **86**: 737–742. Infinity hard red spring wheat (*Triticum aestivum* L.) has exhibited adaptation to a wide range of growing season temperatures and moisture availability. Infinity averaged significantly more grain yield than most other presently registered cultivars, and its grain protein concentration was significantly higher than that of Superb in the Saskatchewan Advisory Council trials. It matured significantly earlier than Superb. The straw length and strength, and volume weight of Infinity was intermediate to the check cultivars. Its seed size was smaller than that of AC Barrie and Superb. Infinity expressed resistance to prevalent races of stem rust and loose smut, moderate resistance to leaf rust and common bunt, and susceptibility to fusarium head blight. Infinity is eligible for all grades of the Canada Western Red Spring (CWRS) wheat class.

Key words: *Triticum aestivum* L., cultivar description, adaptation, grain yield, grain protein, disease resistance

DePauw, R. M., Knox, R. E., Clarke, F. R., McCaig, T. N., Clarke, J. M. et Fernandez, M. R. 2006. **Le blé de force roux de printemps Infinity**. Can. J. Plant Sci. **86**: 737–742. Le blé de force roux de printemps Infinity (*Triticum aestivum* L.) tolère une vaste fourchette de températures et de teneurs en eau durant la saison végétative. Ce cultivar s'est caractérisé par un rendement grainier sensiblement plus élevé que celui de la plupart des autres variétés homologuées et son grain renfermait sensiblement plus de protéines que celui de Superb lors des essais du Saskatchewan Advisory Council. Infinity est sensiblement plus précoce que Superb. La longueur et la robustesse de sa paille et sa densité apparente se situent à mi-chemin des cultivars témoins. Ses graines sont plus petites que celles de AC Barrie et de Superb. Infinity résiste aux races prévalentes de rouille de la tige et de charbon nu, résiste modérément à la rouille de la feuille et à la carie, mais est sensible à la brûlure de l'épi causée par *Fusarium*. Infinity est admissible à tous les grades de la classe « blé roux de printemps de l'Ouest canadien ».

Mots clés: *Triticum aestivum* L., description de cultivar, acclimatation, rendement grainier, protéines dans le grain, résistance aux maladies

Infinity, hard red spring wheat (*Triticum aestivum* L.), was developed at the Semiarid Prairie Agricultural Research Centre (SPARC), Agriculture and Agri-Food Canada (AAFC), Swift Current, SK. It received registration No. 5864 from the Variety Registration Office, Plant Production Division, Canadian Food Inspection Agency on 2004 Sep. 23.

Pedigree and Breeding Method

Infinity derives from the cross Kulm/8405-JC3C//AC Elsa made in 1994 at the SPARC, AAFC, Swift Current. Kulm is a hard red spring wheat variety with high grain yield and protein concentration released by North Dakota Agriculture Experimental Station in 1993. The male parent of the top cross F₁, 8405-JC3C, is an experimental line with high grain yield and protein concentration that derives from the cross Neepwa/Columbus//BW90 and is a sister line to AC Barrie (McCaig et al. 1996). AC Elsa has both higher average grain yield and protein concentration than the standards (Clarke et al. 1997). A modified pedigree method was practiced in the development of Infinity. The F₂ seed was inoculated with 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), and grown as individual plants in a leaf rust (*Puccinia triticina* Eriks.) and stem rust (*P. graminis* Pers.:Pers. f.sp. *tritici* Eriks. & E. Henn.) epiphytotic nursery near Swift Current. The rust races used

were representative of those found the previous year (McCallum and Seto-Goh 2003). Disease resistant F₂ plants were selected. The 327 F₃ progeny were grown out in 1.5-m-long rows near Swift Current in 1996. A rust epiphytotic nursery was established by planting genotypes lacking genes for resistance to prevalent races of leaf and stem rust in every 12th plot. These susceptible plants were inoculated with representative rust races. In the F₄ generation, 142 lines were screened for time to maturity, straw strength, plant height, grain yield and grain protein concentration using early generation screening procedures (DePauw et al. 1989). Yield potential was measured on grain harvested from four-row plots grown in replicated trials at one location and unreplicated at two other locations; grain protein concentration was assessed on a composite from each location, using near infrared reflectance spectroscopy (Williams 1979). Fifty F₅ families, 44 at four selections per family and six at three selections per family were grown as head rows to inbreed and multiply seed in a winter nursery near Christchurch, New Zealand. In the F₆ generation 144 lines from the 50 F₄-derived families were evaluated in trials similar to the F₄ generation. Forty-one F₇ families, 39 at four selections per family and two at five selections per family were grown as head rows to inbreed and multiply seed in a winter nursery near Christchurch, New Zealand. In the F₈ generation 96

Table 1. Grain yield (kg ha⁻¹) of Infinity compared with the check cultivars, based on data from the Western Bread Wheat Cooperative tests (2001–2003)

Cultivar	Zone 1 ^z			Zone 2			Zone 3			Mean ^y	
	2001	2002	2003	2001	2002	2003	2001	2002	2003	2002–2003	2001–2003
AC Abbey	2393	2880	1562	2419	2927	2463	3967	3460	4941	2928	2795
AC Barrie	2741	3118	1724	2555	3082	2610	4703	3852	4811	3075	2964
Infinity	2582	3215	2156	2720	3132	2675	4672	3950	5459	3216	3102
Katepwa	2664	2874	1801	2568	2758	2450	4593	3608	4958	2896	2846
Laura	2574	3113	1657	2608	3094	2489	4448	3758	5193	3048	2950
Superb ^x	–	3195	1664	–	3339	2604	–	3796	5580	3225	–
LSD ^w	176	339	236	199	453	216	320	506	688	172	157
No. tests	1	1	1	9	6	8	1	2	2	20	31

^zZone 1 = Southwestern Saskatchewan, Zone 2 = south-central Saskatchewan and southwestern Alberta, Zone 3 = Parkland.

^yAll means are weighted by the number of tests and years within a zone.

^xNot in the 2001 trial.

^wLeast significant difference. $P \leq 0.05$, includes variation from the genotype by environment interaction.

Table 2. Grain yield (kg ha⁻¹) of Infinity compared with registered cultivars, based on data from the Saskatchewan Advisory Council trials replicated three or four times at 12 and 10 sites in 2003 and 2004, respectively

Cultivar	Zone 1 ^z			Zone 2			Irrigation			Province		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
AC Barrie	2174	3646	2899	3231	4801	4011	4968	5904	5436	2939	4450	3688
CDC Go	2038	4084	3036	3286	4619	3947	4846	5150	4998	2901	4459	3667
CDC Imagine	2155	3737	2932	3131	4950	4024	4227	5710	4968	2815	4540	3660
CDC Osler	2153	3956	3038	3202	4917	4052	4037	5286	4661	2832	4568	3684
Harvest	2134	3629	2875	3251	5269	4247	4347	5506	4926	2876	4632	3738
Infinity	2429	4030	3220	3456	5560	4487	4825	5871	5348	3141	4972	4036
Journey	1919	3453	2679	3144	5005	4065	4406	5639	5023	2739	4444	3578
Lillian	2492	3934	3203	3208	4818	3998	4091	5496	4794	2979	4532	3745
Lovitt	2362	3653	3001	3123	5198	4144	4492	6062	5277	2920	4666	3776
Somersset	2097	3754	2912	3192	5018	4084	4896	5294	5095	2881	4538	3693
Superb	2022	4151	3060	3316	5078	4187	5190	5771	5481	2939	4774	3834
5601HR	2079	3510	2788	2965	4676	3800	4166	5809	4988	2694	4327	3496
5602HR	1961	3693	2812	2993	4543	3771	4544	6036	5290	2695	4357	3513
Mean	2155	3787	2958	3192	4958	4063	4541	5656	5099	2873	4558	3701
LSD ^y	254	319	373	260	427	396	634	628	731	192	278	187
No. of tests	5	4	9	6	5	11	1	1	2	12	10	22

^zZone 1: Regina, Scott, Stewart Valley, Swift Current, Watrous.

Zone 2: Indian Head, Kelvington, Lake Lenore, Lashburn, Loon Lake, Melfort

Irrigation: Outlook.

^yLeast significant difference. $P \leq 0.05$, includes variation from the genotype by environment interaction.

lines from the 41 F₆-derived families were evaluated in trials similar to the F₄ and F₆ generation. In the F₄, F₆, and F₈ generations, reaction to leaf and stem rust was assessed in an epiphytotic nursery near Glenlea, Manitoba. A subsample of seed from the yield trial composites was used to measure grain quality and kernel characteristics. Selected F₈ lines were screened for reaction to a mixture of races T2, T9, T10, and T39 of loose smut [*Ustilago tritici* (Pers.) Rostr.] (Nielsen 1987) and races L1, L16, T1, T6, T13 and T19 of common bunt. The above procedure resulted in an experimental line 9409-CU2C being identified, which met all of the selection criteria at each generation of selection. The designations are as follows: “9409” refers to the cross name, “CU” refers to the alpha character assigned sequentially to the 142 F₂-derived F₄ lines, “2” refers to the sequential selection number assigned to the F₄-derived F₆ line within the family “CU”, and “C” refers to the alpha character

assigned sequentially to the F₆-derived F₈ line within the family “CU2”.

The experimental line 9409-CU2C was evaluated in the Western Bread Wheat ‘A_3’ test in 2000, and as BW799 in the Western Bread Wheat Cooperative (WBWC) tests from 2001 to 2003. The check cultivars in the Western Bread Wheat Cooperative test were AC Abbey, AC Barrie and Katepwa for the 3 test years 2001 to 2003. AC Elsa was a check cultivar in 2001, but was replaced by Superb in 2002 and 2003. The variables measured and the protocols followed in the Western Bread Wheat Cooperative test have been described by Graf and Fox (2000). Each year the data were analyzed using the S506 statistical program developed by Statistical Research Services, AAFC. The PROC MIXED procedure was used to perform a combined analysis over years, using a mixed model with environments and replications considered random and genotypes considered

fixed (SAS Institute, Inc. 1999). The regional adaptation of Infinity was determined by growing it in the Saskatchewan Advisory Council wheat adaptation trials, which were replicated three or four times at 12 and 10 sites in 2003 and 2004, respectively. The data were analyzed using the PROC MIXED procedure (SAS Institute, Inc. 1999).

During the WBWC testing period, leaf and stem rust seedling infection types were assessed by pathologists at the Cereal Research Centre, AAFC, Winnipeg, MB. Stem rust races used each year were: QTHST (C25), RHTSK (C20), RKQSR (C63), RTHJT (C57), TMRTK (C10), and TPMKR (C53) (Roelfs and Martens 1988; Fetch 2003). Leaf rust races used each year were: MBDS (12-3), MBRJ (128-1), MGBJ (74-2), and TJJJ (77-2) (McCallum and Seto-Goh 2003). Field evaluations of leaf and stem rust reactions, using leaf rust races representative of those found the previous year and the same stem rust races as for the seedling tests, were measured in an epiphytotic nursery near Glenlea, MB. Reaction to fusarium head blight (caused by *Fusarium* spp.) was assessed in artificially inoculated field tests conducted near Winnipeg, MB, Ottawa, ON, and Charlottetown, PEI. To determine response to loose smut, a mixture of the prevalent races T2, T9, T10 and T39 was injected into florets at anthesis of plants grown in the field. To determine response to common bunt, a mixture of prevalent races L1, L16, T1, T6, T13 and T19 was used to inoculate the seed planted in mid-April of each year near Lethbridge, Alberta. Response to leaf spots [tan spot caused by *Pyrenophora tritici-repentis* (Died.) Drechs.; Stagonospora blotch caused by *Phaeosphaeria nodorum* (E. Muller) Hedjaroude; and Septoria blotch caused by *Mycosphaerella graminicola* (Fuckel) J. Schrot. in Cohn] was determined by scoring infection type and leaf area infected on naturally inoculated plots grown near Swift Current, Indian Head and Regina, SK. following procedures described by Fernandez et al. (1996). Response to *Cochliobolus sativus* (Ito & Kuribayashi) Drechs. ex Dastur, *Septoria tritici* Roberge in Desmaz. and *Stagonospora nodorum* (Berk.) Castellani & E.G. Germano was assessed in artificially inoculated nurseries near Glenlea, MB. End-

Table 3. Protein concentration (%) of Infinity compared with registered cultivars, based on data from the Saskatchewan Advisory Council trials replicated three or four times at 12 and 10 sites in 2003 and 2004, respectively

Cultivar	Protein concentration (%)		
	2003	2004	2-yr mean
AC Barrie	16.0	14.1	15.1
CDC Go	15.8	14.1	15.0
CDC Imagine	15.8	14.1	14.9
CDC Osler	15.5	14.0	14.8
Harvest	15.4	13.7	14.6
Infinity	16.0	14.1	15.0
Journey	16.6	14.5	15.5
Lillian	15.8	14.0	14.9
Lovitt	16.0	14.1	15.0
Somerset	16.0	13.8	14.9
Superb	15.6	13.5	14.5
5601HR	15.8	14.1	15.0
5602HR	16.6	14.1	15.4
Mean	15.9	14.0	15.0
LSD ²	0.3	0.3	0.2
No. tests	12	10	22

²Least significant difference. $P \leq 0.05$, includes variation from the genotype by environment interaction.

use suitability was determined on a composite made up of unequal quantities of grain samples from those sites that met the top grades and that would generate a composite with a protein concentration deemed to be representative of a hard red spring wheat crop. All end-use suitability analyses were performed by personnel at the Grain Research Laboratory, Canadian Grain Commission following protocols of the American Association of Cereal Chemists. Determination of kernel attributes and eligibility to meet grades of Canada Western Hard Red Spring class was done by personnel of the Inspection Division, Canadian Grain Commission.

Performance

Based on 31 replicated tests over 3 yr (2001 to 2003) in the Western Bread Wheat Cooperative tests, Infinity yielded 11 and 9% more grain ($P \leq 0.05$) than AC Abbey and Katepwa,

Table 4. Agronomic performance of Infinity compared with the check cultivars, based on data from the Western Bread Wheat Cooperative tests (2001–2003)

Cultivar	Maturity (d)		Height (cm)		Lodging ^z (1–9)		Test weight (kg hL ⁻¹)		Kernel size (mg)	
	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003
AC_Abbey	95.0 ^y	96.0	68.4	69.0	3.6	3.3	77.6	78.8	31.0	31.5
AC_Barrie	96.4	96.9	73.6	73.9	2.0	2.0	79.0	79.8	32.3	33.0
Infinity	96.1	96.6	72.9	73.4	2.7	2.6	78.3	79.2	30.0	30.2
Katepwa	96.2	96.7	74.2	75.0	2.4	2.5	77.7	78.8	30.0	30.4
Laura	97.3	97.8	75.9	75.0	3.5	3.2	78.0	79.1	30.3	31.0
Superb ^y	97.7		71.4		2.0		79.3		36.8	
LSD ^x _{0.05}	1.0	1.0	2.3	2.0	2.1	1.5	0.7	0.7	1.1	1.1
No. tests	18	27	18	27	4	5	20	30	20	30

^yAll means are weighted by the number of tests and years within a zone.

^yNot in the 2001 trial.

^xLeast significant difference. $P \leq 0.05$, includes variation from the genotype by environment interaction.

Table 5. Disease reactions of Infinity and check cultivars, based on data from Western Bread Wheat Cooperative tests (2001–2003)

Cultivar	Leaf rust ^z			Stem rust ^z		
	2001	2002	2003	2001	2002	2003
AC Abbey	30 MRMS	50 M	70 S	TR	1 R	3 RMR
AC Barrie	40 MRMS	55 M	60 MR-MS	TR	15 MR	5 R
Infinity	3 MR	30 M	12 R-MR	2 RMR	5 RMR	1 R
Katepwa	35 MRMS	80 MSS	55 MS-S	2 R	3 R	7 RMR
Laura	Tr R	Tr R	1 R-MR	Tr R	1 R	1 RMR
Superb	–	–	47 MR-S	–	–	2 RMR

Cultivar	Bunt ^z			Loose Smut ^z		
	2001	2002	2003	2001	2002	2003
AC Abbey	3R	0	3 MR	–	7 R	40 I
AC Barrie	23MS	3	10 I	0R	50 I	29 MR
Infinity	10MR	Tr	5 MR	0R	9 R	10 R
Katepwa	22MS	Tr	1 R	0R	0 R	10 R
Laura	42S	16 S	46 HS	50I	13 MR	0 R
Superb	–	0	8 I	–	65 S	54 I

Cultivar	Fusarium head blight											
	2001			2002			2003					
	Glenlea		Reac ^x	Carman		Charlotte-town Index	Ottawa visual rating		Glenlea		Carman Index	Ottawa Index
	Index ^y	Index		Index	Reac		Inc (%)	Sev (%)	Index	Reac		
AC Abbey	34MS	90	S	33	S	36	6.5	6.5	77	S	56	80
AC Barrie	13MR	54	MS	26	MS	15	3.5	3.5	25	I	38	19
Infinity	43S	78	S	61	S	19	5.5	4.5	59	S	56	54
Katepwa	15MR	44	I	13	I	29	4.0	3.5	24	I	17	32
Laura	40MS	54	MS	26	MS	21	3.5	5.0	29	I	30	53
Superb	–	66	MS	15	I	29	5.0	5.5	36	MS	32	34

Cultivar	Leaf spot ^w			<i>C. sativus</i> ^s	Leaf spot ^t	<i>S. tritici</i> ^w	<i>S. nodorum</i> ^w	Leaf retention ^q
	2001		2002	2002		2001		2002
	Regina ^v	Indian Head ^u	Swift Current ^t	Glenlea		(0–11)	(0–11)	Regina
AC Abbey	8.5	11.0	8.2	70	–	10.3	10.3	7.7
AC Barrie	7.5	9.0	7.7	46	70	10.0	10.3	7.0
Infinity	7.0	8.5	7.3	25	35	10.0	10.0	7.0
Katepwa	7.3	9.5	7.5	34	70	11.0	10.3	7.0
Laura	6.8	8.8	8.2	21	22	10.0	10.0	7.0
Superb	–	10.8	7.7	22	40	–	–	7.7

^zPercent infection and type of reaction: Tr, trace; R, resistant; MR, moderately resistant; I, intermediate resistant; MS, moderately susceptible; S, susceptible; HS, highly susceptible.

^yDisease index = (% infected spikelets × % infected spikes)/100.

^xResponse category: I, intermediate resistant; MS, moderately susceptible; S, susceptible.

^wMcFadden scale; 5 = R; 6 = MR; 7 = I; 8–9 = MS; 10–11 = S.

^vPercent isolation of the main leaf spotting pathogens: *Pyrenophora tritici-repentis* = 25%, *Septoria tritici* = 36%, *S. nodorum* = 19%, *S. avenae* f. sp. *triticea* = 15%, *Cochliobolus sativus* = 5%.

^uIndian Head – *P. tritici-repentis* 49%, *S. nodorum* 24%, *S. tritici* 7%, *C. sativus* 20%.

^tSwift Current – *P. tritici-repentis* 17%, *S. nodorum* 74%, *S. tritici* 5%, *C. sativus* 4%.

^s*C. sativus* composite rating: percent of disease lesion coverage on flag and middle canopy leaves.

^rIn many cases in the natural inoculum nursery rating was only possible on the flag leaves.

^qModified McFadden scale 1 = R and 9 = S.

respectively (Table 1). It yielded 5.1% more grain ($P \leq 0.1$) than Laura, and 4.6% more ($P \leq 0.1$) than AC Barrie. Based on 20 replicated tests over 2 yr (2002 and 2003), Infinity yielded 9.8 and 11.1% more grain ($P \leq 0.05$) than AC Abbey and Katepwa, respectively. It yielded 5.5 and 4.6% more grain ($P \leq 0.1$) than Laura and AC Barrie, respectively, and similar to Superb.

The growing season of 2003 was characterized by excellent to good soil moisture at the majority of the sites in the spring for emergence and early crop growth. Above-average

temperatures from late June through to late August adversely affected plant development during the stem elongation and heading phases. Soil moisture reserves were not adequate at most test-sites for kernel filling as this stage was characterized by above-average temperatures and below-average rainfall. Averaged over replicated trials at 12 to 25 locations and 12 yr in the Saskatchewan Advisory Council trials, the grain yield of AC Barrie measured 13% less than the 1993–2004 mean of 3488 kg ha⁻¹. Under these conditions of a “hot dry” finish in 2003, Infinity yielded 7 to 16%

Table 6. Averages of end-use suitability^z traits of Infinity and check-cultivars, based on Western Bread Wheat Cooperative tests (2001–2003)

Cultivar	Wheat protein (%)		Flour protein (%)		Flour yield (%)		Flour colour Agtron	
	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003
AC Abbey	15.0	14.8	14.7	14.4	74.7	75.5	79.5	79.7
AC Barrie	15.3	15.1	14.8	14.5	76.2	76.6	77.0	77.2
Infinity	15.2	15.0	14.5	14.2	75.4	75.7	83.0	83.3
Katepwa	14.8	14.7	14.3	14.1	74.1	74.6	76.0	76.0
Laura	15.2	15.1	14.5	14.4	73.8	74.4	81.8	82.3
Superb	15.0		14.4		75.1		70.8	
SD ^y	0.05	0.05	0.05	0.05	0.34	0.34	0.9	0.9
	Flour ash (%)		Amylograph viscosity (BU)		Hagberg falling no. (s)		Starch damage (megazm)	
	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003
AC Abbey	0.44	0.44	678	683	390	393	6.2	6.4
AC Barrie	0.42	0.42	760	737	403	410	7.2	7.2
Infinity	0.41	0.40	753	757	403	407	7.2	7.1
Katepwa	0.43	0.43	620	633	395	400	7.7	7.6
Laura	0.42	0.41	545	598	355	373	6.6	6.5
Superb	0.43		740		398		7.9	
SD	0.005	0.005	5	5	15	15	0.08	0.08
Farinograph								
	Absorption (%)		DDT ^x (min.)		MTI (BU)		Stability (min.)	
	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003
AC Abbey	67.3	67.5	6.8	6.8	17.5	15.0	23.5	22.0
AC Barrie	65.2	65.2	8.0	7.6	15.0	18.3	13.8	13.0
Infinity	67.2	67.0	8.4	7.8	10.0	11.7	26.5	25.0
Katepwa	66.9	67.0	6.1	5.8	22.5	21.7	9.8	9.7
Laura	67.1	67.1	10.0	9.3	10.0	11.7	23.5	20.8
Superb	68.6		7.8		15.0		20.3	
SD	0.17	0.17	0.4	0.4	2.6	2.6	1.4	1.4
Canadian short process								
	Loaf Volume (cc)		Mixing time (min.)		Absorption (%)			
	2002–2003	2001–2003	2002–2003	2001–2003	2002–2003	2001–2003		
AC Abbey	1208	1208	5.9	7.0	71.0	71.3		
AC Barrie	1145	1128	8.7	10.4	69.5	69.3		
Infinity	1150	1157	8.5	9.3	71.0	71.0		
Katepwa	1165	1143	6.8	7.7	70.5	70.7		
Laura	1155	1170	8.2	8.9	71.5	71.3		
Superb	1115		8.7		72.5			
SD	45	45	0.3	0.3	0.0	0.0		

^zAmerican 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.

^ySD is the standard deviation based on repeated testing of Allis mill check samples, and standard bake flour sample with replicate tests carried out over an extended period of time each season, provided by GRL, CGC.

^xDDT is the Farinograph dough development time; MTI is Farinograph mixing tolerance index expressed in Brabender Units.

more grain ($P \leq 0.05$) than all of the other registered cultivars, and 5% more ($P \leq 0.1$) than Lillian (Table 2).

The growing season of 2004 was characterized by very contrasting conditions to that of 2003. Soil moisture in the spring was excellent for emergence and early crop growth. The growing season was characterized by above-average rainfall and below-average temperatures from June through to late August, which delayed plant development. A killing frost (-2.2°C) occurred on the morning of Aug. 20 in the Regina area and another killing frost occurred in early September over a wider range. Frost damage to the grain resulted in down-grading and these sites were not included in the Saskatchewan Advisory Council data set. Averaged

over 10 locations, the grain yield of AC Barrie in 2004 was 23% more than the 1993–2004 AC Barrie mean of 3488 kg ha⁻¹. Under these conditions of a cool wet growing season, Infinity yielded 7 to 15% more grain ($P \leq 0.05$) than all of the other registered cultivars, and 4% more ($P \leq 0.1$) than Superb (Table 2). Averaged over all trials in 2003 and 2004, Infinity yielded 5 to 15% more grain ($P \leq 0.05$) than all cultivars.

Averaged over 12 tests in 2003 and 10 tests in 2004 in the Saskatchewan Advisory Council trials, Infinity expressed protein concentration similar to AC Barrie and significantly more than Superb, which had the next highest grain yield (Table 3). Infinity was the only cultivar that had significant-

ly greater grain yield than the mean of all cultivars and protein concentration equal to the mean of all the cultivars (Tables 2 and 3), that is it was in the upper right hand of the regression of protein concentration on grain yield (data not shown).

Infinity matured on average 1.1 d and 1.6 d earlier ($P \leq 0.05$) than Laura and Superb, respectively, and was intermediate to AC Barrie and Katepwa (Table 4). The straw length of Infinity was shorter than all checks except AC Abbey and Superb. The straw strength of Infinity as indicated by the lodging score was similar to Katepwa, and tended to be stronger than Laura and AC Abbey. Infinity had test weight intermediate to that of the checks and seed size less than AC Barrie and Superb.

Other Characteristics

SPIKES: Oblong to tapering, with some fusiform, mid-dense, mid-long, erect to slightly nodding, and apically awnleted; glumes are mid-wide, short to mid-long, glabrous, and white; glume shoulders are primarily square, although some tending to oblique, rounded, and elevated, mid-wide to wide; glume beak is short.

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

SHATTERING: Resistant to seed shelling due to wind.

DISEASE REACTION: Resistant to prevalent races of stem rust and loose smut, moderately resistant to leaf rust and common bunt, intermediate resistance to leaf spots, and susceptible to fusarium head blight (Table 5). Infinity has more resistance to leaf rust, loose smut and leaf spots than Superb.

END-USE SUITABILITY: Based on 3 yr of testing in the Western Bread Wheat Cooperative test (Table 6), Infinity was rated equal to the check cultivars for grain quality by the Quality Evaluation Team of the Prairie Registration Recommending Committee for Grain. Infinity is eligible for all grades of the Canada Western Red Spring wheat class.

Maintenance and Distribution of Pedigreed Seed

Infinity consists of a composite of 132 Breeder Lines selected from F_6 -derived F_{10} random single plants grown out as 144 pre-Breeder Lines in 3-m-long rows in isolation near Swift Current in 2002, and again as 15-m rows near Indian Head in 2003. Breeder Seed will be maintained by the Seed Increase Unit of the Research Farm, Indian Head, Saskatchewan, Canada S0G 2K0. Application for Plant Breeders' Rights has been filed. The variety will be added to the OECD list of Cultivars. Infinity has been released for distribution and multiplication to Canterra Seeds Ltd., 201-1475 Chevrier Blvd., Winnipeg, Manitoba, Canada R3T 1Y7.

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