CULTIVAR DESCRIPTION

AC Foremost red spring wheat

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Key words: *Triticum aestivum* L., cultivar description, loose smut resistance, common bunt resistance, high yield, red spring wheat

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Mots clés: *Triticum aestivum* L., description de cultivar, charbon nu, carie commune, résistance, rendement, blé de printemps roux

AC Foremost, red spring wheat (*Triticum aestivum* L.), was developed jointly at the Agriculture and Agri-Food Canada Research Centres, in Lethbridge, Alberta, Swift Current, Saskatchewan, and Winnipeg, Manitoba. On 2 June 1995 the Food Production and Inspection Branch of Agriculture and Agri-Food Canada issued regional registration No. 4148 for AC Foremost.

Pedigree and Breeding Method

AC Foremost derives from the bulk of an F_4 plant from the cross HY320*5/BW553//HY320*6/7424-BW5B4. Drs. E. Czarnecki, J. J. Nielsen, and A. B. Campbell Cereal Research Centre, Winnipeg, Manitoba, backcrossed the resistance to loose smut (caused by *Ustilago tritici* (Pers.) Rostr.) from 7424-BW5B4 into HY320 (DePauw et al. 1987). Drs. J. B. Thomas, K. J. Degenhardt, and R. J. Morrisson, Lethbridge Research Centre, Lethbridge, Alberta, backcrossed the major gene, Bt10, which confers resistance to common bunt [caused by *Tilletia laevis* Kuhn in Rabenh. and *T. caries* (DC.) Tul. & C. Tul.] from BW553, developed by R. I. H. McKenzie (DePauw et al. 1981), into HY320.

F_2 seeds free of bunt from inoculated F_1 plants were planted in progeny rows in 1986 and harvested as F_1-derived bulks of F_3 seed. Individual kernels were planted as families in single seed hills in the winter nursery, near Brawley, California. Soft kernelled families were discarded based on particle size index of the remnant F_3 seed and about 1300 F_3-derived F_4s were returned based on plant appearance and vitreosity. These were evaluated for bunt resistance as progeny hills in 1987 and as F_3-derived F_5s in 1988. Two heads from each of 304 F_5 plants grown as hills that exhibited a low level of infection to common bunt were selected and grown as head-row plots in the winter nursery for seed multiplication. Reaction to loose smut and common bunt was assessed on remnant seed used to establish the winter nursery head-row. In 1989, F_7 seed was grown out in unreplicated plots near Lethbridge, Swift Current, and Portage La Prairie to assess agronomic adaptation. Remnant seed from the yield trials was used to evaluate grain quality and kernel characteristics. Alpha-amylase activity was measured on a ground sample of grain from Swift Current where the test had been exposed to about 100 mm of rain between 24 August and 10 September 1989, after the plants reached physiological maturity. In 1991–1993 pre-harvest sprouting

Table 1. Agronomic performance of AC Foremost compared to check cultivars (High Yielding Wheat Cooperative tests, 1991–1993)

Cultivar	Yield (t ha^{-1}) Zone 1[z]	Zone 2	Zone 3	Mean[y]	Maturity (d)	Plant height (cm)	Lodging[x] (1–9)	Test weight (kg hL^{-1})	Kernel weight (mg)
Neepawa	3.49	3.94	3.72	3.76	105.8	102	2.5	77.9	31.4
Genesis	3.58	5.22	4.66	4.63	110.4	98	4.7	76.1	34.6
Biggar	3.83	5.11	4.61	4.64	109.8	83	2.2	76.2	34.9
AC Taber	4.47	5.17	4.68	4.87	111.3	87	2.1	77.0	36.3
AC Foremost	4.41	5.02	4.58	4.75	108.9	81	2.0	76.9	38.4
LSD ($P < 0.05$)				0.2	0.7	1	0.4	0.6	1.1
No. of tests	12	21	9	42	33	53	24	50	50

[z]Zone 1, locations in Manitoba and southeastern Saskatchewan; Zone 2, locations in southern Alberta and western Saskatchewan; Zone 3, locations in Peace River and Parkland area.
[y]All means are weighted by the number of tests within a zone.
[x]1, all plants vertical; 9, all plants horizontal.

response was measured on intact spikes using the methods described by DePauw and McCaig (1991). An experimental line, designated as L8800-BM07A, was evaluated in the High Yield Wheat 'B' test in 1990, and, designated as HY392, in the High Yield Wheat Co-operative tests from 1991–1993.

Rust reaction was evaluated in an epiphytotic nursery near Glenlea, Manitoba. The races of stem rust (caused by *Puccinia graminis* Pers. :Pers.) used where: QCC (1991 only), QTH, RHT, RKQ, TMR, and TPM. The races of leaf rust rust (caused by *P. recondita* Roberge ex Desmaz.) used where those derived from collections made in the previous year (Kolmer 1993, 1994a,b). Races T2, T10 and T39 of loose smut (T9 was added in 1993), and races L1, L16, T1, T13, and T19 of common bunt were used for screening. The race designations are those described by Roelfs and Martens (1988) for stem rust, Hoffmann and Metzger (1976) for common bunt and Nielsen (1987) for loose smut.

Table 2. Agronomic performance of AC Foremost compared to check cultivars (High Yielding Wheat Irrigated Cooperative tests, 1991–1993)

Cultivar	Yield (t ha^{-1})	Maturity (d)	Height (cm)	Lodging (1–9)[z]
Neepawa	4.76	110.0	110	4.1
Genesis	5.79	113.4	104	5.6
Biggar	6.10	113.4	88	3.0
AC Taber	6.41	114.4	94	1.8
AC Foremost	5.97	114.6	85	2.1
LSD ($P < 0.05$)	0.42	2.8	2	2.1
No. of tests	6	6	6	4

[z]1, all plants vertical; 9, all plants horizontal.

Table 3. Disease reactions of AC Foremost and check cultivars (High Yielding Wheat Cooperative tests, 1991–1993)

Cultivar	Year	Leaf rust[z] (%)	Stem rust[z,y] (%)	Common bunt[z] (%)	Loose smut[z,x] (%)	Common root rot[w] (%)	Leaf spots[v]
Neepawa	1991	30MR		22 I	7 R	39	7.0
	1992	50MR	20MR	16 I	– R	16	8.0
	1993	40MR	10R	16 I	9 R	4	7.0
Genesis	1991	40MR		56 S	67 S	40	5.3
	1992	30RMR	20RMR	58 S	83 HS	21	4.0
	1993	20MR	20RMR	43 S	67 HS	9	6.0
Biggar	1991	20MR		56 S	83 HS	43	7.8
	1992	30R	30RMR	65 S	43 HS	22	5.5
	1993	5R	10R	38 S	88 HS	10	6.0
AC Taber	1991	10R		3 R	93 HS	38	4.7
	1992	10R	30RMR	6 R	85 HS	25	4.0
	1993	5R	10RMR	0 R	0 HS	15	6.0
AC Foremost	1991	5R		6 R	0 R	42	5.3
	1992	10RMR	30RMRMS	5R	0 MR	24	3.8
	1993	5R	20R	3R	82 MR	11	5.8

[z]Percent infection and type of reaction: R, resistant; MR, moderately resistant; I, intermediate resistant; MS, moderately susceptible; S, susceptible; HS, highly susceptible.
[y]No stem rust data available for 1991.
[x]Loose smut percent infection based on artificial inoculation; loose smut descriptive reaction based on data from all years.
[w]Percentage of plants with moderate to large lesions on the subcrown internode.
[v]Field leaf spot reaction assessed at the soft dough stage at locations near Glenlea, Indian Head and Swift Current.
– No data.

Table 4. Measurements of kernel hardness, flour attributes, gluten strength, and bread-loaf volume for AC Foremost and Canada Prairie Spring check cultivars (High Yielding Wheat Co-operative tests, 1992–1993)

	Starch damage (Farrand units)		Flour yield (%)		Flour ash (%)		Flour colour (Kent-Jones)	
	1992	1993	1992	1993	1992	1993	1992	1993
Neepawa	32	32	74.5	75.9	0.46	0.47	–2.0	–1.1
Genesis	24	20	75.3	76.4	0.44	0.53	–1.0	0.1
Biggar	25	27	76.0	74.2	0.47	0.51	–1.5	–0.7
AC Taber	28	31	76.2	76.7	0.45	0.51	–1.3	0.6
AC Foremost	25	27	75.5	75.3	0.44	0.51	–1.6	–0.7

	Farinograph					
	Absorption (%)		Dough development (min)		Stability (min)	
	1992	1993	1992	1993	1992	1993
Neepawa	63.1	64.3	3.75	4.50	8.00	8.50
Genesis	60.4	59.8	3.25	2.75	4.50	3.50
Biggar	59.8	60.1	3.75	4.00	5.00	5.50
AC Taber	60.4	61.9	6.00	5.00	9.00	6.50
AC Foremost	61.1	61.2	4.25	4.25	6.50	5.50

	Flour protein (%)		Baking strength index		Remix loaf volume (cm^3)	
	1992	1993	1992	1993	1992	1993
Neepawa	11.1	12.2	98.3	95.5	700	760
Genesis	10.2	10.1	84.6	88.6	555	575
Biggar	9.9	10.6	100.8	103.1	640	705
AC Taber	10.9	10.8	99.3	101.7	700	710
AC Foremost	9.8	10.7	102.7	103.5	645	715

American Association of Cereal Chemists methods were followed for determining the various end-use suitability traits.

Table 5. Measurements of alpha amylase activity of naturally weathered grain and percentage of spikes with visible evidence of sprouting of AC Foremost and check cultivars

	1989	1990		1991		1993	
Entry	AA[z] ($EU\ g^{-1}$)	Time 1[y] (%)	Time 2[w] (%)	Time 1 (%)	Time 2 (%)	Time 1 (%)	Time 2 (%)
Neepawa	0.048	7	67	80	93	10	37
Genesis	0.311	93	97	96	100	73	91
Biggar	0.102	53	80	100	100	47	100
AC Taber	–	7	83	100	100	70	100
AC Foremost	0.037	13	40	83	96	53	64
LSD	0.06	28	32	29	14	26	24

[z]Alpha amylase activity measured on grain samples which had been exposed to about 100 mm rain between 24 August and 10 September after reaching physiological maturity.
[y]A sample of 10 spikes collected at about 16% moisture (Time 1) and subjected to artificial rain simulation.
[w]Time 2 is 10 days after Time 1.

Performance

In 3 yr of testing in the High Yielding Wheat Co-op, AC Foremost yielded 23–27% more grain than Neepawa (Table 1). AC Foremost yielded 15% more than Biggar and 23% more than Genesis in the Black Soil Zone, and 1 to 3% less than both in the other soil zones. AC Foremost yielded about 2% less than AC Taber across the Prairies. Other features of AC Foremost are: (i) maturity about 1 d earlier than Biggar, 1.5 d earlier than Genesis, and 2.4 d earlier than AC Taber, and 3.1 d later than Neepawa; (ii) shorter straw than all of the check cultivars; (iii) significantly greater lodging resistance than Genesis and Neepawa; (iv) heavier test weight than Biggar and Genesis; and (v) larger seed weight than all of the check cultivars. It exhibited suitable performance under irrigated conditions (Table 2). AC Foremost has resistance to prevalent races of common bunt, leaf rust, and stem rust (Table 3). It has resistance to the loose smut races T2, T10, and T39 of loose smut but is susceptible to the new race T9 (the 1993 results were based on reaction to T2, T10, T39 and T9). AC Foremost has improved leaf spot resistance relative to Biggar and Neepawa.

AC Foremost is eligible for grades of the Canada Prairie Spring (red) wheat class. It has exhibited quality similar to Biggar (Table 4), and significantly lower indices of alpha-amylase activity and sprouting of kernels in intact heads which are indicators of preharvest sprouting resistance (Table 5).

Other Characteristics

SPIKES. Oblong to fusiform, mid-dense, mid-long, inclined to erect, awned; glumes mid-wide, mid-long, glabrous, white; glume shoulders variable square, rounded, oblique, and wanting, narrow to mid-wide; glume beak mid-long, tending to acuminate.

KERNEL. Colour red; large; mid-long to long; mid-wide to wide; elliptical; cheeks angular to rounded; brush hairs mid-long; crease mid-wide to wide, mid-deep; germ mid-size, elliptical.

SHATTERING. Resistant, similar to AC Taber.

DROUGHT RESPONSE. Tolerant to heat and drought, similar to AC Taber.

DISEASE REACTION. Resistant to prevalent races of stem rust, leaf rust, common bunt and loose smut except the new race T9; moderately resistant to leaf spots [caused by *Pyrenophora tritici-repentis* (Died.) Drechs. and *Septoria* spp.], moderately resistant to moderately susceptible to common root rot (caused primarily by *Bipolaris sorokiniana* (Sacc.) Shoemaker).

PHOTOPERIOD RESPONSE. Day length insensitive.

END-USE SUITABILITY. Eligible for grades of the Canada Prairie Spring (red) wheat class.

Maintenance and Distribution of Pedigreed Seed

Breeder Seed consists of 120 Breeder Lines. They were selected from F_5-derived F_9 random single plants, and were grown as 15-m rows near Indian Head in 1993. Breeder Seed will be maintained by the Seed Increase Unit of the Indian Head Research Farm, Indian Head, Saskatchewan, Canada S0G 2K0. Distribution and multiplication of pedigreed seed stocks will be handled by SECAN Association, 200-57 Auriga Drive, Nepean, Ontario, Canada K2E 8B2.

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