

## AC Pathfinder durum wheat

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Clark, J. M., McLeod, J. G., DePauw, R. M., Marchylo, B. A., McCaig, T. N., Knox, R. E., Fernandez, M. R. and Ames, N. 2000. **AC Pathfinder durum wheat**. Can. J. Plant Sci. **80**: 347–349. AC Pathfinder durum wheat is adapted to the Brown and Dark Brown soil zones of the Canadian prairies. It combines high yield with strong gluten properties. It has shorter, stronger straw than Kyle.

**Key words:** *Triticum turgidum* L. var. *durum*, durum wheat, cultivar description, yield, protein, disease resistance

Clarke, J. M., McLeod, J. G., DePauw, R. M., Marchylo, B. A., McCaig, T. N., Knox, R. E., Fernandez, M. R. et Ames, N. 2000. **Nouveau cultivar de blé dur AC Pathfinder**. Can. J. Plant Sci. **80**: 347–349. AC Pathfinder est un cultivar de blé dur convenant à la culture dans les zones de sol bruns et brun foncé des Prairies canadiennes. Le rendement grainier est élevé et le grain possède un gluten ferme. Sa paille est plus courte et plus forte que celle de Kyle.

**Mots clés:** *Triticum turgidum* L. var *durum*, blé dur, description de cultivar, rendement, protéine, comportement à l'égard des maladies

AC Pathfinder durum wheat (*Triticum turgidum* L. var. *durum*) was developed at the Agriculture and Agri-Food Canada Semiarid Prairie Agricultural Research Centre, Swift Current, Saskatchewan, by the Arid Prairie Wheat Program. It received 1-yr interim registration No. I-245 from the Canadian Food Inspection Agency on 30 July 1998, and extended for a further 3 yr on 21 August 1999. AC Pathfinder was granted Plant Breeder's Rights by the Canadian Food Inspection Agency, certificate no. 0644, on 14 June 1999.

### Pedigree and Breeding Method

AC Pathfinder was selected from the cross Westbred 881/DT367 made in 1989. DT367 (McLeod et al. 1991) is a line from our program, and Westbred 881 (PI483458) was developed by Western Plant Breeders Ltd. AC Pathfinder was developed using a modified pedigree technique. The F<sub>2</sub> was grown as individual plants in a leaf rust [caused by *Puccinia recondita* f. sp. *tritici* Roberge ex Desmaz] and stem rust [caused by *P. graminis* f. sp. *tritici* Pers.: Pers.] epiphytotic nursery near Swift Current in 1990. The F<sub>3</sub>, F<sub>5</sub>, and F<sub>7</sub> were grown as head rows and bulk harvested in a winter nursery near Brawley, California to produce seed for yield tests. The F<sub>4</sub> was grown as single rows at Swift Current and selections were made on the basis of maturity and plant type. Yield trials of 80 F<sub>6</sub> and 43 F<sub>8</sub> lines were grown near Swift Current and Regina, each with two replications, in 1992 and 1993 and selected for agronomic performance, disease resistance, and quality (protein, pigment,

and gluten strength). Leaf and stem rust reactions were assessed in hill plots in the F<sub>4</sub>, F<sub>6</sub>, and F<sub>8</sub> generations in a leaf and stem rust epiphytotic nursery near Glenlea, Manitoba. The stem rust races used included QTH, TPM, TMR, RHT, and RKQ. The races of leaf rust used were those multiplied from collections made the previous year (Kolmer 1994). Races T26, T32 and T33 of loose smut [caused by *Ustilago tritici* (Pers.) Rostr.] and races L1, L16, T1, T6, T13, and T19 of common bunt [caused by *Tilletia laevis* Kuhn in Rabenh. and *T. caries* (DC.) Tul. & C. Tul.] were used for screening of the Durum Cooperative Test entries. The race designations are those described by Roelfs and Martens (1988) for stem rust, Long and Kolmer (1989) for leaf rust, Hoffman and Metzger (1976) for common bunt, and Nielsen (1987) for loose smut.

AC Pathfinder was evaluated for agronomic and quality traits, and for leaf rust, stem rust, and loose smut resistance in the Durum Western 'A' Test at five locations in 1994 and in the Durum 'B' Test at six locations in 1995. It was evaluated under the designation DT 671 in the Durum Cooperative Test in 1996–1998 for agronomic and quality traits, and for leaf rust, stem rust, loose smut, common bunt, leaf spot [caused by *Septoria nodorum* and *Pyrenophora tritici-repentis* (Died.) Drechs] and fusarium head blight [caused by *Fusarium* spp.] resistance. The 126 breeder lines grown in 3-m rows near Swift Current in 1995, and in 15-m rows near Indian Head, SK in 1996, originate from random plants from an F<sub>6</sub>-derived F<sub>11</sub> single plant progeny row.

**Table 1. Grain yield (t ha<sup>-1</sup>) of AC Pathfinder and check cultivars in the Durum Cooperative Test, 1996, 1997 and 1998**

Cultivar	1996			1997			1998			3 yr mean	
	Zone 1 <sup>z</sup>	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2
Hercules	3.90	3.62	3.73	3.83	3.53	3.65	4.27	3.95	4.08	3.99	3.67
AC Avonlea	4.26	3.96	4.08	4.30	4.03	4.14	4.82	4.47	4.61	4.43	4.14
Kyle	3.91	4.09	4.02	3.86	4.01	3.95	4.16	4.39	4.30	3.93	4.17
AC Morse	4.26	3.88	4.04	4.14	4.00	4.06	4.55	4.38	4.45	4.28	4.08
AC Pathfinder	3.92	3.78	3.84	3.67	3.97	3.85	4.37	4.46	4.42	3.96	4.06
LSD <sub>.05</sub>	0.49	0.31	0.28	0.49	0.21	0.26	0.47	0.23	0.24	0.47	0.39
No. tests	5	5	10	5	7	12	4	6	10	14	18

<sup>z</sup>Zone 1 (1996): Elgin, Brandon, Indian Head, Glenlea, Morden; (1997): Elgin, Brandon, Indian Head, Langdon (North Dakota), Portage La Prairie; (1998): Elgin, Brandon, Indian Head, Glenlea. Zone 2 (1996): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley; (1997): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley, Regina, Irricana; (1998): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley, Regina.

**Table 2. Average agronomic performance of AC Pathfinder and check cultivars in the Durum Cooperative Test, 1996, 1997 and 1998**

Cultivar	Maturity (d)			Lodging (1-9) <sup>y</sup>	Height (cm)	Test weight (kg hL <sup>-1</sup> )	1000-kernel wt (g)
	Zone 1 <sup>z</sup>	Zone 2	Mean				
Hercules	92	100	96	3.2	97	79.5	41.1
Kyle	95	103	99	5.1	102	79.6	40.1
AC Avonlea	94	102	98	2.3	92	79.4	41.6
AC Morse	94	102	98	1.9	86	78.5	41.3
AC Pathfinder	93	101	97	3.6	93	79.6	41.2
LSD <sub>.05</sub>	3	2	2	1.2	4	1.0	1.9
No. tests	13	13	26	18	30	34	34

<sup>z</sup>Zone 1 (1996): Elgin, Brandon, Indian Head, Glenlea, Morden; (1997): Elgin, Brandon, Indian Head, Langdon, Portage La Prairie; (1998): Elgin, Brandon, Indian Head, Glenlea. Zone 2 (1996): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley; (1997): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley, Regina, Irricana; (1998): Lethbridge, Saskatoon, Elrose, Swift Current, Stewart Valley, Regina.

<sup>y</sup>1 = all plants vertical, 9 = all plants horizontal.

**Table 3. Summary of disease reactions of AC Pathfinder and check cultivars grown in the Durum Cooperative Tests, 1996, 1997 and 1998, one test per year except leaf spots**

Cultivar	Year	Stem rust <sup>z</sup>	Leaf rust <sup>z</sup>	Loose smut <sup>z</sup>	Common bunt <sup>z</sup>	Septoria nodorum <sup>y</sup>	Leaf spots <sup>x</sup>	FHB index <sup>w</sup>	Common root rot (%) <sup>v</sup>
Hercules	1996	1R	TR-R	MR	R+	7.7	8.4	–	11
	1997	1R	TR	MS	R+	–	9.3	64	12
	1998	1R	VR	HS	R+	10	8.6	34	16
AC Avonlea	1996	1R	TR-R	HS	R+	7.7	8.3	–	8
	1997	1R	TR	HS	R+	–	8.6	69	13
	1998	1R	VR	R	R+	9	8.3	53	36
Kyle	1996	1R	TR-R	MR	R+	6.5	9.2	–	7
	1997	1R	TR	R	R+	–	9.4	74	12
	1998	1R	VR	S	R+	9.7	8.8	30	25
AC Morse	1996	1R	TR-R	HS	R	6.8	9.8	–	3
	1997	1R	TR	HS	R+	–	10.7	82	9
	1998	1R	VR	–	R+	10	9.4	42	28
AC Pathfinder	1996	1R	TR-R	HS	R	8.5	9.6	–	5
	1997	1R	TR	S	R	–	10.6	66	5
	1998	1R	VR	HS	R	9.7	9.3	60	23

<sup>z</sup>Percent infection and type of reaction: TR, trace resistant; VR, very resistant; R+, highly resistant; MR, moderately resistant; R, resistant; MS, moderately susceptible; S, susceptible; HS, highly susceptible.

<sup>y</sup>Septoria nodorum field rating (0 = no symptoms, 10 = severe symptoms).

<sup>x</sup>Adult plant, rated mid-grainfill at two locations (1 = no symptoms, 11 = severe symptoms).

<sup>w</sup>Fusarium head blight index: (% infected spikelets × % infected heads)/100.

<sup>v</sup>Percent root infected, mean of three replications.

## Performance

AC Pathfinder yielded about 1% less than Kyle, averaged over all sites in 1996 to 1998 (Table 1). AC Pathfinder yielded approximately the same as AC Morse and about 3%

less than Kyle and AC Avonlea in the main durum growing area (Brown and Dark Brown soil zones, Zone 2). In Zone 1 (non-durum area), AC Pathfinder yielded the same as Kyle, 11% less than AC Avonlea, and 7% less than AC Morse.

**Table 4.** Mean grain protein concentration of AC Pathfinder and check cultivars in the 1996, 1997 and 1998 Durum Cooperative Test (determined on individual locations by near infrared reflectance) and mean grain yellow pigment, Alveograph work input (W) and pressure/length ratio (P/L) for the 1996, 1997 and 1998 Durum Cooperative Test quality composites

	% Protein			Mean	Yellow pigment <sup>z</sup> (ppm) mean	Alveograph <sup>z</sup>	
	1996	1997	1998			W (joules × 10 <sup>-4</sup> ) mean	P/L mean
Hercules	13.3	13.2	13.9	13.4	7.5	111	0.26
AC Avonlea	14.4	13.7	14.6	14.2	9.0	120	0.35
Kyle	13.7	13.1	14.1	13.6	7.8	115	0.39
AC Morse	13.9	13.0	14.4	13.7	8.9	181	0.65
AC Pathfinder	13.5	12.7	13.7	13.3	8.7	270	0.82
LSD <sub>0.05</sub>	0.5	0.4	0.4	0.4	0.3	29	0.18
No. tests	10	11	11	32	3	3	3

<sup>z</sup>Data from Wheat, Rye and Triticale Subcommittee Quality Evaluation Team minutes, 1996–1998.

Maturity of AC Pathfinder is 1 d earlier than AC Avonlea and AC Morse, and 2 d earlier than Kyle (Table 2). AC Pathfinder has shorter, stronger straw than Kyle. AC Pathfinder has high test weight, similar to Kyle and AC Avonlea and greater than AC Morse.

#### Other Characteristics

**SPIKES.** Fusiform to oblong, dense, mid long, erect, awned; glumes mid wide, mid long, glabrous, white; glume shoulders oblique to square, some slightly elevated; glume beak short to mid long, acute.

**KERNEL.** Colour medium amber, mid-size, mid-wide, mid-long, elliptical; cheeks rounded to angular; crease mid-wide, mid deep; brush mid-size mid long; embryo mid-size.

**DISEASE REACTION.** Resistant to prevalent race of common bunt, leaf rust and stem rust, highly susceptible to loose smut races prevalent in western Canada, and susceptible to leaf spots and fusarium head blight (Table 3).

**PHOTOPERIOD RESPONSE.** Sensitive.

**END-USE SUITABILITY.** AC Pathfinder has grain protein concentration similar to the statutory check, Hercules, and has yellow pigment concentration similar to AC Morse, and stronger, less extensible gluten than the checks as measured by the Alveograph (Table 4). AC Pathfinder is eligible for grades of the Canada Western Amber Durum wheat class.

#### Maintenance and Distribution of Pedigreed Seed

Breeder seed will be maintained by the Agriculture and Agri-Food Canada Seed Increase Unit, Indian Head, Saskatchewan S0G 2K0. Distribution and multiplication of pedigreed seed stocks will be handled by Saskatchewan Wheat Pool, 2625 Victoria Ave., Regina, Saskatchewan S4T 7T9.

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