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CULTIVAR DESCRIPTION

AAC Jatharia Canada Western Red Spring wheat

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Abstract: AAC Jatharia (BW483) is a hollow-stemmed, high-protein, and high-yielding spring wheat (*Triticum aestivum* L.) for the longer growing season areas of the Canadian Prairies. AAC Jatharia was the highest yielding line in the Central Bread Wheat Cooperative (CBWC) Registration Tests performed in the eastern prairies in 2011, 2012, and 2013. Over 2 yr of testing (2011–2012), AAC Jatharia had grain yield 2.5% higher than Unity, 11.6% higher than 5603HR, 7.8% higher than McKenzie, and 19.2% higher than CDC Teal across all locations. In 2013, AAC Jatharia yielded 6.3% higher than Unity across all Manitoba and Saskatchewan locations. AAC Jatharia was resistant to leaf rust (*Puccinia triticina* Erikss.), and had intermediate resistance to stem rust (*Puccinia graminis* f. sp. *tritici*), stripe rust (*Puccinia striiformis* Westend), leaf spot complex, and Fusarium head blight (FHB) (*Fusarium graminearum*) infection, with lower FHB index and deoxynivalenol (DON) content compared with Unity. AAC Jatharia was resistant to infestation of the orange wheat blossom midge (*Sitodiplosis mosellana* Géhin) evaluated over 2 yr (2012 and 2013). It had higher kernel weight and test weight compared with all check cultivars, whereas its maturity was within the range of the check cultivars. AAC Jatharia is registered in the Canada Western Red Spring Wheat class for its premium quality attributes.

Key words: Triticum aestivum L., cultivar description, CWRS, grain yield, quality, disease resistance, orange blossom wheat midge, Fusarium head blight.

Résumé : AAC Jatharia (BW483) est une variété de blé de printemps (*Triticum aestivum* L.) à tige creuse, riche en protéines et au rendement élevé adaptée aux régions à plus longue période végétative des Prairies canadiennes où l'on cultive le blé. AAC Jatharia était la lignée la plus productive lors des essais d'homologation de la Central Bread Wheat Cooperative (CBWC) réalisés dans l'est des Prairies en 2011, 2012 et 2013. Lors de deux années d'essais (2011–2012), AAC Jatharia a enregistré un rendement grainier de 2,5 % supérieur à celui d'Unity, de 11,6 % supérieur à celui de 5603HR, de 7,8 % supérieur à celui de McKenzie et de 19,2 % supérieur à celui de CDC Teal, peu importe le site. En 2013, le rendement d'AAC Jatharia a dépassé celui d'Unity de 6,3 % partout au Manitoba et en Saskatchewan. AAC Jatharia résiste à la rouille de la feuille (*Puccinia triticina* Erikss.) et résiste modérément à celle de la tige (*Puccinia graminis* f. sp. *tritici*), à la rouille jaune (*Puccinia striiformis* Westend), au complexe de la tache foliaire et à la brûlure de l'épi causée par *Fusarium graminearum*. Le cultivar a été moins affecté par la brûlure de l'épi et renfermait moins de désoxynivalénol (DON) qu'Unity. AAC Jatharia a résisté aux infestations de cécidomyie du blé (*Sitodiplosis mosellana* Géhin) lors des deux années de son évaluation (2012 et 2013). Son grain est plus lourd et a un plus grand poids spécifique que celui des autres cultivars témoins, et sa précocité se situe dans la plage couverte par ces derniers. AAC Jatharia a été homologué dans la catégorie « blé roux de printemps de l'Ouest canadien » en raison de ses paramètres supérieurs sur le plan de la qualité. [Traduit par la Rédaction]

Mots-clés : Triticum aestivum L., description de cultivar, CWRS, rendement grainier, qualité, résistance à la maladie, cécidomyie du blé, brûlure de l'épi causée par Fusarium.

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Abbreviations: **CBWC**, Central Bread Wheat Cooperative; **CWRS**, Canada Western Red Spring; **DON**, deoxynivalenol; **FHB**, Fusarium head blight.

Introduction

AAC Jatharia is a hard red spring wheat (*Triticum aestivum* L.) cultivar developed by Agriculture and Agri-Food Canada (AAFC) at the Brandon Research and Development Centre (BRDC), Brandon, MB, Canada. It was assigned registration number 7735 by the Variety Registration Office, Canadian Food Inspection Agency on 5 Feb. 2016. AAC Jatharia meets the end-use quality specifications of the Canada Western Red Spring (CWRS) wheat market class and is best adapted to Canadian eastern prairie growing conditions.

Pedigree and Breeding Method

AAC Jatharia is derived from the complex cross of Kane/99B60-EJ2G, where Kane was used as the female parent and 99B60-EJ2G (McKenzie//Grandin*2/Caldwell) was the male parent (Fox et al. 2007). McKenzie hard red spring wheat is the first doubled haploid wheat cultivar registered in Canada (Graf et al. 2003). Grandin, which was derived from the cross Len//Butte*2//ND507/ND593, was released by the Agricultural Experiment Station at North Dakota State University, Fargo, ND. Grandin was determined to have seedling resistance genes *Lr2a*, *Lr3*, and *Lr10*, and was heterogeneous for *Lr16* (Liu and Kolmer 1997). Grandin has been one of the most popular spring wheat cultivars grown in North Dakota. Caldwell (Patterson et al. 1982) likely has the seedling resistance gene *Lr14a*, the adult plant resistance gene *Lr12*, and an uncharacterized adult plant resistance gene that conditions an intermediate level of effective resistance in field plots (Kolmer 2009). Kane is a hard red spring wheat with good pre-harvest sprouting resistance and high flour extraction rate. This complex cross was developed to generate a high-yielding, high-protein CWRS wheat variety adapted to eastern Canadian prairies, with broad resistance to leaf and stem rust, improved resistance to Fusarium head blight (FHB), and resistance to the orange wheat blossom midge.

AAC Jatharia was developed using the modified pedigree breeding method. The final cross was made in a growth cabinet in 2004, and F_1 plants were grown in short rows near Leeston, New Zealand. F_2 plants were grown near Glenlea, MB in 2005 under the designation BD110 and about 200 spikes were collected. Following treatment in a rain simulator, spikes that did not exhibit pre-harvest sprouting damage were advanced as F_3 to be increased in a growth cabinet. The F_4 short rows were grown in Portage la Prairie, MB and screened for leaf rust, stem rust, and FHB resistance in an inoculated irrigated nursery. The selected F_4 row was harvested and increased as an F_5 row in the 2006–2007 off-season nursery near Palmerston North (PN), New Zealand. The F_5 lines harvested in New Zealand were yield tested as an F_6 line in 2006 at four locations (Brandon, Glenlea, Saskatoon, and Swift Current). Spikes were collected from the yield plots and increased as F_7 rows in the 2007–2008 off-season nursery near Palmerston North, New Zealand. The F_7 line was harvested and evaluated as an F_8 line at three locations in western Canada. The line was advanced as an F_9 to the Central Bread Wheat (CBW) "A1" test, and in 2010 it was evaluated in the CBW "B" test. In 2011, the line was given the designation BW483 and entered into the Central Bread Wheat Cooperative test, where it was evaluated over 3 yr (2011–2013). A more detailed description of the breeding history is given in Table 1.

Disease resistance tests were performed using inoculated field nurseries to determine reactions to leaf rust and stem rust at the AAFC Cereal Research Centre (AAFC-CRC), Winnipeg, MB using the modified Cobb scale (Peterson et al. 1948). Seedling reactions for leaf rust races MBDS (12-3), MGBJ (74-2), TJBJ (77-2), and MBRJ (128-1) (McCallum and Seto-Goh 2006) and stem rust races TMRTF (C10), RKQSC (C63), TPMKC (C53) RTHJF (C57), QTHJF (C25), and RHTSC (C20) (Fetch 2005; Jin et al. 2008) were also determined in the greenhouse. Disease severity and reaction to stripe rust was evaluated using natural field infection in stripe rust nurseries near Lethbridge (Randhawa et al. 2012). Tolerance to FHB was recorded at Glenlea and Carman, MB in field nurseries spray-inoculated with a macroconidial spore suspension, and visual index (% incidence × % severity/100) was recorded as described by Gilbert and Woods (2006). A composite of races T2, T9, T10, and T39 was used to estimate resistance to loose smut (*Ustilago tritici* (Pers.) Rostr.) (Menzies et al. 2003). Resistance to common bunt (*Tilletia tritici*) was recorded at the AAFC Lethbridge Research Centre (AAFC-LFC) using a composite of races L1, L16, T1, T6, T13, and T19, and planting inoculated seed into cold soil (Gaudet and Puchalski 1989; Gaudet et al. 1993).

Evaluation of end-use quality was performed by the Grain Research Laboratory, Canadian Grain Commission, in Winnipeg, MB. Composite samples were prepared based on protein content and grade of the check cultivars from test locations.

Estimation of significant improvement of agronomic characteristics between AAC Jatharia and the check cultivars was analysed using a least significant difference (LSD) test using the PROC MIXED module (SAS, version 9.3, Cary, NC) with years, environments, and their interactions treated as random effects and cultivar as a fixed effect. The end-use quality data had no replicated observations within years.

Performance

The Central Bread Wheat Cooperative (CBWC) registration trial checks underwent a review in 2013. McKenzie and CDC Teal were replaced by Glenn and Carberry, whereas Unity and 5603HR were retained as checks. The performance and adaptation data was analyzed and is presented considering changes in check cultivars in 2013. Based on 29 station-years from tests in 2011–2013,

Table 1. Breeding history (activity, population size, location) at each generation leading to the registration of AAC Jatharia (BW483) hard red spring wheat.

Name	Generations	Year	Breeding history
BD110	F_0	2004	Final cross made in a growth cabinet
BD110	F_1	2004–2005	30 F_1 seeds grown in a pair of 1.5 m rows near Leeston, NZ
BD110	F_2	2005	Approximately 4000 seeds distributed over 100 3 m rows, ~40 seeds per row grown near Glenlea, MB, from which 200 spikes were selected for sprouting resistance tests. Spikes that did not produce germinating seed after exposure to artificial rain were advanced
BD110B-POR-215	$F_{2:3}$	2005–2006	80 lines were grown in a growth cabinet where 6–12 plants per line were harvested as individuals
BD110B-POR-215-C-8	$F_{3:4}$	2006	208 lines were grown in a 1 m row nursery near Portage la Prairie, MB. Selection for agronomics, seed appearance, resistance to rusts and common bunt, protein concentration, flour yield, and mixograph
BD110B-POR-215-C-8-1-P	$F_{3:5}$	2006–2007	25 lines were grown near PN in 1.5 m rows. Selection for agronomics and leaf rust resistance
BD110B-POR-215-C-8-1-PN	$F_{3:6}$	2007	15 lines were tested in an unreplicated yield test at four locations (MB: Brandon, Glenlea; SK: Saskatoon, Swift Current). Selection based on agronomics, disease resistance, and quality performance. Approximately 30 spikes were selected per line
BD110B-POR-215-C-8-1-PNB-13	$F_{6:7}$	2007–2008	104 lines were grown near PN in 1.5 m rows. Selection for agronomics and leaf rust resistance
BD110B-POR-215-C-8-1-PNB-13-N	$F_{6:8}$	2008	36 lines were tested in unreplicated yield tests at three locations (MB: Brandon, Glenlea, Portage la Prairie; SK: Saskatoon, Melfort). Selection based on agronomics, disease resistance, and quality
BD110B-POR-215-C-8-1-PNB-13-N	$F_{6:9}$	2009	9 lines in the Central Bread Wheat "A1" test. Yield test, two replicates at five locations (MB: Glenlea, Brandon; SK: Indian Head, Melfort, Regina)
BD110B-POR-215-C-8-1-PNB-13-N	$F_{6:10}$	2010	4 lines (2 each from 2 families) in the Central Bread Wheat "B" test. Yield test, three replicates at eight locations (MB: Glenlea, Brandon, Morden; SK: Indian Head, Regina, Melfort, Saskatoon; AB: Beaverlodge)
BW483	$F_{6:11–13}$	2011–2013	3 lines in the Central Bread Wheat "C" registration test. Yield test, three replicates at 11 locations per year (MB: Glenlea, Portage la Prairie, Brandon, Morden, Souris, Dauphin; SK: Indian Head, Kamsack, Regina, Melfort, Saskatoon). Two lines completed 3 yr of testing
Breeder seed production			
BW483	$F_{6:11}$	2011	Breeder seed spikes: 250 random spikes were selected from a rogued increase plot grown at Indian Head, SK. Of these spikes, 10 were discarded due to shrivelled seed or having few seeds
BW483	$F_{6:12}$	2012	Breeder seed isolation rows: 240 lines were grown in 1 m rows near Glenlea, MB, with a 10 m isolation distance from any other wheat. Forty-one lines were discarded prior to harvest due to lack of uniformity. After harvest, an additional 23 lines were discarded due to low seed amounts (<30 g)
BW483	$F_{6:13}$	2013	Breeder seed rows: 15 m rows grown at Indian Head, SK, with 10 m isolation distance from other wheat. One hundred and seventy-six rows were grown. Lines were rogued for uniformity and approximately 270 kg of breeder was produced

Table 2. Yield (kg ha^{-1}) of AAC Jatharia (BW483) and check cultivars in the CBWC from 2011–2013.

	Manitoba[a]				Saskatchewan[b]				All sites			
									2011–2012		2013	
Cultivar	2011	2012	2013	Mean	2011	2012	2013	Mean	kg ha^{-1}	% Unity	kg ha^{-1}	% Unity
Unity	4798	3569	6558	4972	**5243**	4036	5549	4959	4400	100.0	6053	100.0
5603HR	4831	3108	6331	4746	4854	3538	5238	4555	4039	91.8	5784	95.5
McKenzie	4651	3542	—	—	4867	3592	—	—	4183	95.1	—	—
CDC Teal	4482	3161	—	—	4606	3121	—	—	3782	86.0	—	—
Glenn	—	—	6702	—	—	—	5448	—	—	—	6075	100.3
Carberry	—	—	6258	—	—	—	5033	—	—	—	5645	93.3
AAC Jatharia	**5177**	**3822**	**7140**	**5375**	5065	**4121**	**5731**	**4979**	**4511**	**102.5**	**6435**	**106.3**
Mean of Checks	4691	3345	6463	—	4893	3572	5317	—	4101	—	5889	—
LSD (0.05)	669[c]	196[c]	346[d]	—	313[c]	184[c]	190[d]	—	191[c]	—	197[d]	—
No. of tests	4	5	5	—	5	5	5	—	19	—	10	—

Note: Bold indicates highest value among all cultivars.
[a]Manitoba test locations: 2011 — Glenlea, Dauphin, Portage la Prairie, Souris; 2012 and 2013 — Glenlea, Dauphin, Portage la Prairie, Souris, Brandon.
[b]Saskatchewan test locations: 2011 and 2012 — Kamsack, Kernen, Indian Head, Melfort, Regina; 2013 — Kamsack, Kernen, Indian Head, Melfort, Pense.
[c]Appropriate LSD to make comparisons of AAC Jatharia to McKenzie, CDC Teal, Unity, and 5603HR.
[d]Appropriate LSD to make comparisons of AAC Jatharia to Unity, 5603HR, Glenn, and Carberry; $P \leq 0.05$, includes the appropriate genotype × environment interaction.

Table 3. Summary of agronomic traits of AAC Jatharia (BW483) and check cultivars in the CBWC (2011–2013) tests.

	Maturity (d)		Height (cm)		Lodging[a] (1–9)		Test weight (kg hL^{-1})		Kernel weight (mg kernel^{-1})		Protein (%)	
Cultivar	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013
Unity	95	96	94	101	**3.5**	**3.8**	79.0	79.2	32.1	34.7	14.8	12.9
5603HR	**97**	98	93	**103**	2.5	2.3	78.0	77.9	31.1	32.7	14.5	12.9
McKenzie	94	—	**95**	—	3.2	—	78.6	—	31.3	—	14.7	—
CDC Teal	95	—	92	—	2.0	—	76.6	—	32.4	—	**15.5**	—
Glenn	—	99	—	95	—	1.7	—	**81.4**	—	34.8	—	13.5
Carberry	—	**100**	—	86	—	1.5	—	80.1	—	34.8	—	13.6
AAC Jatharia	95	98	**95**	102	2.3	2.4	**80.3**	80.4	**32.6**	**36.6**	14.8	**13.7**
Mean of Checks	95	98	94	96	2.8	2.3	78.1	79.7	31.7	34.3	14.9	13.2
LSD (0.05)	1[b]	0.6[c]	1[b]	1.5[c]	0.8[b]	0.6[c]	1.2[b]	0.9[c]	2.0[b]	1.9[c]	0.7[b]	0.4[c]
No. of tests	16	10	19	10	11	10	2	1	2	1	2	1

Note: Bold indicates highest value among all cultivars.
[a]Lodging scale: 1 = vertical, 9 = flat.
[b]Appropriate LSD to make comparisons of BW483 to Unity, 5603HR, McKenzie, and CDC Teal.
[c]AAC Jatharia to Unity, 5603HR, Glenn, and Carberry. $P \leq 0.05$, includes the appropriate genotype × environment interaction.

AAC Jatharia yielded higher than Unity except in Saskatchewan in 2011 (Table 2). For the same period and locations, AAC Jatharia was always higher yielding than the mean yields of the checks (Table 2). Over 2 yr of testing at all sites (2011–2012), AAC Jatharia had grain yield 2.5% higher than Unity, 11.6% higher than 5603HR, 7.8% higher than McKenzie, and 19.2% higher than CDC Teal (Table 2). In 2013, AAC Jatharia yielded 6.3% higher than Unity across the Manitoba and Saskatchewan locations.

Over a 2 yr period (2011–2012) at all locations, AAC Jatharia, Unity, and CDC Teal had similar days to maturity, whereas 5603HR matured 2 d later and McKenzie 1 d earlier. In 2013, AAC Jatharia matured earlier than the Glenn and Carberry checks (Table 3). AAC Jatharia was taller than all checks, but had similar or better lodging resistance than all checks except Glenn and Carberry, which were introduced in the third year of the CBWC trials (Table 3).

Table 4. Fusarium head blight index,[a] rating class,[b] and DON[c] for AAC Jatharia (BW483) and check cultivars in the CBWC (2011–2013) tests.

	Carman FHB							Glenlea FHB							Ottawa FHB				Portage FHB	
	2011		2012		2013			2011			2012			2013	2011	2012	2013		2013	
Cultivar	Index	Class	Index	Class	Index	Class	DON	Index	Class	DON	Index	Class	DON	Index	Index	Index	Index	DON	Index	Class
Unity	35	I	38	I	38	I	—	4	R	1.9	6	MR	3.8	10	37	37	31	8.8	15.0	I
5603HR	21	I	48	MS	44	MS	29	4	R	1.1	8	MR	3.5	9	23	33	27	2.8	13.3	I
McKenzie	38	MS	45	MS	—	—	—	4	R	2.7	9	MR	3.6	—	33	28	—	—	—	—
CDC Teal	64	S	87	S	—	—	—	19	MS	5.4	13	I	7.6	—	72	72	—	—	—	—
Glenn	—	—	—	—	25	MR	33	—	—	—	—	—	—	22	—	—	18	5.0	17.3	I
Carberry	—	—	—	—	23	MR	—	—	—	—	—	—	—	20	—	—	31	12.6	14.7	I
AAC Jatharia	28	I	36	I	21	MR	16	9	MR	1.8	11	I	3.3	17	28	17	25	5.8	13.3	I

[a]FHB Index: (percentage of infected heads × percentage of diseased florets on infected heads)/100.
[b]Disease rating class: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[c]DON, Deoxynivalenol.

AAC Jatharia had higher test weight compared with all checks except Glenn. Kernel weight was significantly greater compared with all checks, and grain protein was higher compared with all checks except CDC Teal.

AAC Jatharia reaction to FHB ranged from moderately resistant to intermediate, with lower DON levels compared with the check cultivars except 5603HR (Table 4). It had resistance to the prevalent western Canadian races of leaf rust and intermediate resistance to stem rust, stripe rust, and the leaf spot disease complex, but it was moderately susceptible to common bunt and susceptible to loose smut disease (Tables 5 and 6). During 2 yr of testing (2012–2013), AAC Jatharia had better midge resistance than all susceptible checks, and all of the wheat heads tested were classified as resistant or undamaged by orange wheat blossom midge (Table 6).

Samples of AAC Jatharia and the check cultivars from various test sites under the registration trials were submitted to the Grain Research Laboratory, Canadian Grain Commission for the determination of protein concentration and grain grade. End-use quality assessment (American Association of Cereal Chemists 2002) by the Canadian Grain Commission was performed on a composite sample made up from test sites with grain samples representative of the top hard red spring wheats grades available. A consistent quantity of final grain amount per location was adjusted by varying the amount of samples per test site to achieve the final protein concentration approximating the average for the crop in the given year. AAC Jatharia met CWRS quality standards needed for milling and baking performance. The grain protein (%) was intermediate compared with the checks (Table 7). The flour ash (%) was lower than the checks and the farinograph absorption was similar to checks for the CWRS class of wheat (Table 8).

Other Characteristics

The morphological characteristics were recorded on experimental field plots grown in 2014 and 2015 at Saskatoon, SK.

SEEDLING CHARACTERISTICS
Coleoptile colour: absent or very weak
Juvenile growth habit: semi-erect
Seedling leaves: medium green, glabrous
Tillering capacity (at low densities): moderately high

ADULT PLANT CHARACTERISTICS
Growth habit: semi-erect
Flag leaf attitude: intermediate
Flag leaf: dark green, recurved curvature, glabrous, slightly waxy blade, long length and medium width, medium-strong sheath glaucosity, leaf auricle with absent to very weak anthocyanin and glabrous margins
Culm: glabrous

SPIKE CHARACTERISTICS
Shape: parallel sided

Table 5. Rust disease severities and ratings of AAC Jatharia (BW483) and check cultivars in the CBWC (2011–2013) tests.

	Leaf rust[a]			Stem rust[b]			Stripe rust[c]			UG99[b]	
Cultivar	2011	2012	2013	2011	2012	2013	2011	2012	2013	2012	2013
Unity	0 R	5 R	10 R	20 I	25 MR	40 I	S	40 I	50 S	30 MS	30 MS
5603 HR	1 R	22 MR	38 I	20 I	20 I	20 MR	S	15 I	60 S	20I	15I
McKenzie	1 R	5 MR	—	20 I	10 MR	—	S	40 I	—	60 MS	40 MS
CDC Teal	1 R	23 MR	—	7 I	35 I	—	I	20 MS	—	30 MS	20 MS
Glenn	—	—	23 MR	—	—	10 R	—	—	20 MR	20 I	10 MS
Carberry	—	—	4 R	—	—	5 R	—	—	15 R	15 I	10 MR
AAC Jatharia	0 R	8 R	2 R	40 I	30 I	40 I	I	30 I	30 MR	30 I	

[a]Severity is the percentage of leaf or stem area affected by rust. Reaction is the descriptive classification of disease based on percent severity. Disease rating class: R, resistant (1%–10%); MR, moderately resistant (11%–30%); I, intermediate (31%–39%); MS, moderately susceptible (40%–60%); S, susceptible (>60%).

[b]Severity is the percentage of stem infected with stem rust using the Modified Cobb Scale. Disease response category: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.

[c]Severity is the percentage of leaf area affected by rust. Dominant pustule reaction for stripe rust. Disease response category: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.

Table 6. Bunt, loose smut, leaf spot ratings, and midge ratings of AAC Jatharia (BW483) and check cultivars in the CBWC (2011–2013) tests.

	Common bunt[a]			Loose smut[b]			Leaf spots[c]			Midge[d]	
Cultivar	2011	2012	2013	2011	2012	2013	2011	2012	2013	2012	2013
Unity	1 R	5 R	1 R	17 MR	44 I	38 I	10.0 S	9.7 S	8.3 MS	15:1:14	—
5603 HR	3 R	13 MR	3 R	0 R	40 I	50 I	9.3 MS	7.3 I	8.0 I	0:30:0	—
McKenzie	5 R	4 R	—	36 I	62 MS	—	9.7 S	7.7 I	—	0:29:1	—
CDC Teal	25 I	34 MS	—	47 I	49 I	—	9.7 MS	7.3 I	—	0:29:1	—
Glenn	—	—	4 R	—	—	23 MR	—	—	7.0 I	—	0:6:24
Carberry	—	—	0 R	—	—	8 R	—	—	8.3 MS	—	0:11:19
AAC Jatharia	40 MS	29 MS	17 MR	0 R	93 S	0 R	9.3 MS	7.7 I	7.7 I	21:0:9	6:0:24

Note: Disease rating class: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.

[a]Bunt data represented as severity (percentage of spikes with bunt symptoms) and ratings.

[b]Loose smut data represented as severity (percentage of plants with loose smut symptoms) and ratings.

[c]Leaf spot data represented as severity (percentage of leaves with leaf spot symptoms) and ratings.

[d]Midge rating R:S:U (resistant:susceptible:undamaged).

Length: long
Density: dense
Attitude: erect
Colour: yellow
Awns: awned; equal in length to spike

SPIKELET CHARACTERISTICS

Glumes: lower glumes white at maturity; medium length and width; pubescent; narrow width and slightly sloping to straight shoulder shape, beak is short in length with strongly curved shape

Lemma: slightly curved

KERNEL CHARACTERISTICS

Type: hard, dark red in colour

Size: medium large, medium long, medium width; oval shape; rounded to slightly angular cheeks; short brush hairs; medium wide and medium deep crease

Embryo: oval

Maintenance and Distribution of Pedigreed Seed

Breeder seed ($F_{6:11}$) of AAC Jatharia was produced by collecting 250 random spikes from a rogued increase plot grown at Indian Head, SK (2011). Of all the spikes collected, 10 lines were discarded due to shrivelled seed or having few seeds. Isolation rows for breeder seed ($F_{6:12}$) were grown in 1 m rows with 10 m isolation distance from any other wheat near Glenlea, MB (2012). Forty-one lines were culled prior to harvest due to lack of uniformity. An additional 23 lines were discarded post-harvest due to low seed amounts (<30 g). One hundred and seventy-six breeder seed rows ($F_{6:13}$) were grown in 15 m rows maintaining 10 m isolation distance from other wheat at Indian Head, SK (2013). Approximately 270 kg of conditioned breeder seed was produced. Multiplication and distribution of all other pedigreed seed classes will be handled by SeCan, Box 13, Elstow, SK S0K 1M0, Canada (www.secan.com). AAC Jatharia is a

Table 7. Wheat and flour analytical data for AAC Jatharia (BW483) and check cultivars from the CBWC (2011–2013) tests. End-use quality[a] testing was performed by the Grain Research Laboratory of the Canadian Grain Commission on a composite sample of each cultivar.

	Grain protein (%)		Flour protein (%)		Protein loss (%)		Falling number (s)		Amylo-graph (BU)		Clean flour yield (%)[b]		Flour yield (0.50 ash) (%)		Flour ash (%)		Starch damage (%)	
Cultivar	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013
Unity	14.8	13.8	14.0	13.0	0.8	0.8	440	**465**	**743**	905	76.4	**76.8**	76.5	76.5	0.46	**0.45**	8.6	9.2
5603HR	14.5	13.8	13.8	13.0	0.7	0.8	435	460	623	625	76.1	76.0	76.3	77.0	0.46	0.44	8.4	8.8
McKenzie	14.7	—	13.9	—	0.8	—	**458**	—	643	—	75.8	—	76.8	—	0.45	—	**9.1**	—
CDC Teal	**15.5**	—	**14.9**	—	0.6	—	450	—	595	—	75.3	—	76.0	—	**0.47**	—	7.4	—
Glenn	—	13.5	—	13.0	—	0.5	—	435	—	**1010**	—	75.5	—	79.0	—	0.40	—	**9.6**
Carberry	—	**13.9**	—	**13.1**	—	**0.9**	—	420	—	580	—	75.1	—	78.5	—	0.41	—	8.5
Mean of Checks	14.8	13.8	14.2	13.0	0.73	0.8	445	463	651	765	75.9	76.4	76.4	76.8	0.46	0.44	8.8	9.0
AAC Jatharia	14.8	13.6	13.9	12.8	**0.9**	0.8	420	435	590	625	**76.5**	76.7	**78.3**	**80.0**	0.42	0.38	8.9	8.7
SD	0.38	0.16	0.45	0.11	0.11	0.15	14.6	18.9	62.1	194	0.49	0.74	0.90	1.44	0.02	0.03	0.66	0.44

Note: Bold indicates highest value among all cultivars.

[a]American Association of Cereal Chemists methods were followed by the Grain Research Laboratory, Canadian Grain Commission for determining the various end-use quality traits on a composite of 6–10 locations each year.

[b]Dexter and Tipples (1987). All millings at the Canadian Grain Commission's Grain Research Laboratory are performed in rooms with environmental control maintained at 21 °C and at 60% relative humidity. Common wheat is milled on an Allis-Chalmers laboratory mill using the GRL sifter flow as described by Black et al. (1980). Flour yield is expressed as a percentage of cleaned wheat on a constant moisture basis.

Table 8. Dough properties for AAC Jatharia (BW483) and check cultivars from the CBWC (2011–2013) tests.

	Farinograph								Extensograph						Canadian short process (150 ppm ascorbic acid)[d]							
	Abs (%)[a]		DDT (min)[b]		MTI (BU)[c]		Stability (min)		EXT area		EXT R_{max}		EXT length		Loaf volume (cm^3)		Abs (%)		Mixing energy (W h kg^{-1})		Mixing time (min)	
Cultivar	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013	2011–2012	2013
Unity	68.3	70.2	6.13	6.00	**30**	**30**	7.5	9.0	—	65	—	279	—	18.1	1113	1020	67	73	3.7	7.2	7.6	3.7
5603HR	65.6	67.2	6.63	6.00	23	25	11.3	11.5	—	72	—	362	—	16.0	1090	**1110**	66	71	**4.1**	8.6	**8.6**	4.1
McKenzie	**68.5**	—	5.63	—	28	—	8.8	—	—	—	—	—	—	—	1090	—	**68**	—	3.7	—	7.0	—
CDC Teal	67.6	—	**9.50**	—	18	—	**17.3**	—	—	—	—	—	—	—	**1193**	—	67	—	3.6	—	7.2	—
Glenn	—	**70.4**	—	**9.25**	—	15	—	**23.0**	—	**133**	—	**650**	—	17.0	—	1085	—	**74**	—	**12.3**	—	**6.0**
Carberry	—	68.7	—	6.25	—	20	—	10.0	—	91	—	339	—	**20.8**	—	1090	—	73	—	10.1	—	4.7
Mean of checks	67.5	69.1	6.97	6.88	25	23	11.2	13.4	—	90	—	408	—	18.0	1122	1076	67	73	3.8	9.6	7.6	4.6
AAC Jatharia	67.7	68.5	6.50	8.00	23	**30**	12.0	11.0	—	88	—	352	—	19.5	1123	1050	**68**	73	4.0	8.2	7.4	4.3
SD	1.15	1.32	1.52	1.46	4.7	6.5	3.78	5.73	—	26	—	145	—	1.92	42.34	35.8	0.84	1.1	0.22	1.9	0.63	0.89

Note: Bold indicates highest value among all cultivars.
[a]American Association of Cereal Chemists (2002).
[b]DDT: Farinograph Dough Development Time measured in minutes.
[c]MTI: Farinograph Mixing Tolerance Index expressed in Brabender Units (BU).
[d]Preston et al. (1982).

midge resistant variety and to maintain the effectiveness of the *Sm1* gene against wheat orange blossom midge, the certified seed will include Carberry (DePauw et al. 2011) as a 10% interspersed susceptible refuge.

Contributions

S.L. Fox designed the initial cross and performed the breeding work. S. Kumar analysed the registration trials data, generated varietal identification data for Variety Registration and Plant Breeders' Rights including the necessary documentation, and wrote the manuscript. The other authors contributed agronomic and disease evaluation data from the registration trials.

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