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CULTIVAR DESCRIPTION

AAC Cameron Canada western red spring wheat

S.L. Fox, S. Kumar, J.B. Thomas, D.G. Humphreys, J. Mitchell Fetch, D. Green, I. Wise, M. Smith, T. Fetch, J. Gilbert, B. McCallum, and J. Menzies

Abstract: AAC Cameron (BW485) is a hollow-stemmed high yielding spring wheat (*Triticum aestivum* L.) with good agronomic, disease, and end-use quality characteristics. AAC Cameron is best adapted to the eastern region of the Canadian prairies as represented in the Central Bread Wheat Cooperative (CBWC) Registration Tests in 2011, 2012, and 2013. AAC Cameron was significantly higher yielding than the best check Unity (5%), and 12% higher than 5603HR. AAC Cameron had moderate resistance to leaf rust (*Puccinia triticina* Eriks.), stem rust (*Puccinia graminis* f. sp. *tritici*), and *Fusarium* head blight (FHB) (*Fusarium graminearum*), with lower FHB index and deoxynivalenol (DON) content compared to the check cultivars. AAC Cameron expressed resistance to orange wheat blossom midge (*Sitodiplosis mosellana* Géhin) and common bunt (*Tilletia tritici*). AAC Cameron showed good lodging resistance (mean = 2.1) despite its tall (mean = 98 cm) plant ideotype. It had significantly higher kernel weight than all check cultivars, whereas maturity and test weight were similar to the check cultivars. AAC Cameron is registered under 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, common bunt.

Résumé : AAC Cameron (BW485) est une variété de blé de printemps (*Triticum aestivum* L.) à haut rendement. Ce cultivar à tige creuse se caractérise par des propriétés intéressantes sur les plans de l'agronomie, de la résistance à la maladie et de la qualité du grain en fonction de l'usage final. Il est le mieux acclimaté à la culture dans l'est des Prairies canadiennes, comme l'ont révélé les résultats des tests d'homologation de la Central Bread Wheat Cooperative (CBWC) réalisés en 2011, 2012 et 2013. Le rendement du cultivar dépassait significativement celui de la meilleure variété témoin, Unity (5 %), et celui du cultivar 5603HR de 12 %. AAC Cameron résiste modérément à la rouille de la feuille (*Puccinia triticina* Eriks.), à la rouille de la tige (*Puccinia graminis* f. sp. *tritici*) et à la brûlure de l'épi causée par *Fusarium* (FHB) (*Fusarium graminearum*), avec un indice FHB et une teneur en désoxynivalénol (DON) inférieurs à ceux des variétés témoins. AAC Cameron résiste à la cécidomyie du blé (*Sitodiplosis mosellana* Géhin) et à la carie (*Tilletia tritici*). La variété affiche une bonne résistance à la verse (moyenne de 2,1) malgré sa haute taille (moyenne de 98 cm). Ses grains sont significativement plus lourds que ceux des cultivars témoins, mais leur degré de maturité et leur poids spécifique sont semblables. AAC Cameron est homologué dans la classe « blé roux de printemps de l'Ouest canadien » (CWRS) en raison de ses qualités supérieures. [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*, carie.

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Abbreviations: CWRS, Canada Western Red Spring; **DON**, deoxynivalenol; **FHB**, *Fusarium* head blight.

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Introduction

AAC Cameron is a hard red spring wheat (*Triticum aestivum* L.) cultivar developed by Agriculture and Agri-Food Canada (AAFC), Cereal Research Centre (CRC), Winnipeg, Manitoba (MB). It was assigned registration number 7704 by the Variety Registration Office, Canadian Food Inspection Agency on 27 March 2015. AAC Cameron meets the end-use quality specifications of the Canada Western Red Spring (CWRS) wheat market class and is best adapted to eastern prairie Canadian growing conditions.

Pedigree and Breeding Methodology

AAC Cameron is derived from the complex cross of D1125/Alsen//BW346/3/BW370/99B60-EJ26, where Alsen (Frohberg et al. 2006) is a dark northern spring wheat variety developed at North Dakota State University and the remaining parents are hard red spring wheat breeding lines. The primary goal of this complex cross was to develop a high-yielding CWRS wheat variety adapted to western Canada, with broad resistance to leaf and stem rust, improved resistance to Fusarium head blight (FHB), and resistance to the orange wheat blossom midge (*Sitodiplosis mosellana* Géhin). The Alsen parent has the Chinese line Sumai-3 (PI481542) in its pedigree, which is a source of FHB resistance. The orange wheat blossom midge resistant parents Clark and RL4933 were part of the complex cross for AAC Cameron (McKenzie et al. 2002; Thomas et al. 2005). The lines BW346 (RL4802//(96MHN5295-1)BW174*2/Clark) and BW370 (N93-2260/Grandin(N96-2449)//AC Splendor) were developed to pyramid different sources of resistance to loose smut, common bunt, and leaf spot diseases. 99B60-EJ26 (BW205/RL4933) contained a recombination of *Lr16* with *Sm1* such that these two genes were in coupling (Thomas et al. 2005).

AAC Cameron was developed using the modified pedigree breeding method. The final cross was made in a growth cabinet in 2004, and F_1 seeds were grown under the name G0439 in a growth cabinet in 2005 at CRC in Winnipeg, MB. In 2005, six rows of F_2 progeny were grown in a nursery near Rosebank, MB in collaboration with Syngenta, Inc. Thirty-one lines of $F_{2:3}$ were grown in 2005–2006 near Palmerston North (PN), New Zealand as multi-seed hills. Selections for agronomic characteristics (height, lodging, maturity, and yield) and disease resistance (leaf rust, stem rust, and common bunt) were performed. In 2006, 12 lines of $F_{3:4}$ were grown in 1 m rows in a nursery near Portage la Prairie, MB. Selections were made based on agronomic parameters, resistance to diseases, and quality parameters (seed appearance, protein concentration, flour yield, and dough strength). In 2006–2007, five $F_{3:5}$ lines were grown near PN in 1.5 m rows and selection for agronomic characteristics and disease resistance were performed. Three $F_{3:6}$ lines were tested in 2007 in single replicate yield trials at four locations (MB: Brandon, Glenlea; SK: Saskatoon, Swift Current) and selection based on agronomic parameters, disease resistance, and quality parameters were performed. Approximately 30 spikes were advanced to the next generation. In 2007–2008, 23 lines at $F_{6:7}$ were grown near PN in 1.5 m rows and selections were made for agronomics and disease resistance. In 2008, three lines at $F_{6:8}$ were tested in single replicate yield plots at three locations (MB: Brandon; SK: Saskatoon, Melfort) and selection based on agronomics, disease resistance, and quality were performed. One line was advanced to the Central Bread Wheat "A" test in 2009. The yield test consisted of two replicates at five locations (MB: Glenlea, Brandon, Morden; SK: Indian Head, Melfort) and performance of the line was assessed on agronomic, disease, and quality parameters. The line G0439-3-NPNB-15-N at $F_{6:10}$ was advanced to Central Bread Wheat "B" test. The test consisted of three replicates at eight locations (MB: Glenlea, Brandon, Morden; SK: Indian Head, Regina, Melfort, Saskatoon; AB: Beaverlodge). The line G0439-3-NPNB-15-N was named BW485 and advanced into the Central Bread Wheat "C" (CBWC) registration test in 2011. BW485 was evaluated for three years as three replicates at 11 locations/year (MB: Glenlea, Portage la Prairie, Brandon, Morden, Souris, Dauphin; SK: Indian Head, Kamsack, Regina, Melfort, Saskatoon). The varieties McKenzie, CDC Teal, Unity, and 5603HR were used as agronomic checks for the 2011 and 2012 CBWC tests. In 2013, McKenzie and CDC Teal were replaced by Glenn and Carberry as agronomic checks.

Disease resistance tests were performed using inoculated field nurseries to determine reactions to leaf rust and stem rust at AAFC-CRC, Winnipeg 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) also were determined in the greenhouse. Disease severity and reaction to stripe rust (*Puccinia striiformis* Westend) 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 was recorded at the AAFC Lethbridge Research Centre 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

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Table 1. Yield (kg ha^{-1}) of AAC Cameron and check cultivars in the Central Bread Wheat Coop from 2011–2013.

	Manitoba[a]				Saskatchewan[b]				All sites			
Cultivar	2011	2012	2013	Mean	2011	2012	2013	Mean	2011	2012	2013	2011–2013 Mean
Mckenzie	4651	3542	—	—	4867	3592	—	—	4771	3567	—	—
CDC Teal	4482	3161	—	—	4606	3121	—	—	4551	3141	—	—
Unity VB	4798	3569	6558	4975	5243	4036	5549	4943	5045	3803	6053	4967
5603HR	4831	3108	6331	4757	4854	3538	5238	4543	4844	3323	5784	4650
Glenn	—	—	6702	—	—	—	5448	—	—	—	6075	—
Carberry	—	—	6258	—	—	—	5033	—	—	—	5645	—
AAC Cameron	**5539**	**3678**	**7085**	**5434**	**5217**	**4041**	**5741**	**5000**	**5360**	**3859**	**6413**	**5211**
LSD 0.05	669[c]	196[c]	346[d]	—	313[c]	184[c]	190[d]	—	337[c]	134[c]	197[d]	178[e]
No. of tests	4	5	5	14	5	5	5	15	9	10	10	29

Note: $P \leq 0.05$, includes the appropriate genotype by environment interaction.
[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 Cameron to McKenzie, CDC Teal, Unity VB and 5603HR.
[d]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn and Carberry.
[e]Appropriate LSD to make comparisons of AAC Cameron to Unity VB and 5603HR.

prepared based on protein content and grade of the check cultivars from test locations.

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

Performance and Adaptation

The performance and adaptation data was analyzed and is presented considering changes in check cultivars in 2013. Based on 29 station years from 2011 to 2013 tests, the yield of AAC Cameron was significantly higher than all check cultivars (Table 1). The grain yield of AAC Cameron was 5.2% higher than Unity and 12.3% higher than 5603HR. AAC Cameron was one day earlier maturing than 5603HR and one day later than Unity VB in three years of testing (Table 2). Over three years of testing, AAC Cameron was taller but had similar or better lodging resistance than all checks except Glenn and Carberry, which were introduced in the third year of CBWC tests (Table 2). It had higher test weight than CDC Teal and 5603HR, and kernel weight was significantly greater compared to all checks (Table 3). AAC Cameron had improved resistance to FHB, with moderately resistant reactions and lower DON levels compared to the check cultivars (Table 4). It had moderate resistance to the prevalent western Canadian races of leaf rust, stem rust, and common bunt (Tables 5 and 6). The stripe rust, leaf spot complex, and loose smut reactions of AAC Cameron ranged between susceptible to moderately susceptible (Tables 5 and 6). During two years of testing (2012–2013), AAC Cameron had better midge resistance than all susceptible checks and more than 75% of the wheat heads tested remained undamaged by orange wheat blossom midge (Table 6).

End-use quality assessment by the Canadian Grain Commission determined that AAC Cameron met CWRS quality standards needed for milling and baking performance. The grain protein (%) was intermediate compared to the checks (Table 7). The farinograph absorption was similar to checks in the CWRS class of wheat (Table 7), with the exception of slightly higher flour protein loss and higher Canadian Short Process (CSP) mixing time compared to the checks.

Other Characteristics

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

Seedling characteristics

Coleoptile colour: light red
Juvenile growth habit: erect
Seedling leaves: medium green, glabrous
Tillering capacity (at low densities): moderately high

Adult plant characteristics

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

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Table 2. Summary of agronomic traits of AAC Cameron and check cultivars in the Central Bread Wheat Coop from 2011–2013.

	Maturity (d)				Height (cm)				Lodging[a] (1–9)			
Cultivar	2011	2012	2013	2011–2013 Mean	2011	2012	2013	2011–2013 Mean	2011	2012	2013	2011–2013 Mean
Mckenzie	97	92	—	—	94	94	—	—	4.1	2.7	—	—
CDC Teal	99	92	—	—	93	91	—	—	2.5	1.6	—	—
Unity VB	98	92	96	95	94	94	101	96	4	3.2	3.8	3.7
5603HR	100	94	98	97	94	94	103	97	3.1	2.3	2.3	2.6
Glenn	—	—	99	—	—	—	95	—	—	—	1.7	—
Carberry	—	—	100	—	—	—	86	—	—	—	1.5	—
AAC Cameron	**99**	**93**	**97**	**96**	**95**	**96**	**103**	**98**	**2.5**	**1.5**	**2.4**	**2.1**
LSD 0.05	1.0[b]	0.6[b]	0.6[c]	1.0[d]	2.0[b]	2.0[b]	1.5[c]	2.0[d]	0.5[b]	0.5[b]	0.6[c]	1.1[d]
No. of tests	9	10	10	29	9	10	10	29	9	10	10	29

Note: $P \leq 0.05$, includes the appropriate genotype by environment interaction.
[a]Lodging scale: 1 = vertical, 9 = flat.
[b]Appropriate LSD to make comparisons of AAC Cameron to McKenzie, CDC Teal, Unity VB, and 5603HR.
[c]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn, and Carberry.
[d]Appropriate LSD to make comparisons of AAC Cameron to Unity VB and 5603HR.

Table 3. Summary of agronomic traits of AAC Cameron and check cultivars in the Central Bread Wheat Coop from 2011–2013.

	Test weight (kg hL^{-1})				Kernel weight (mg kernel^{-1})			
Cultivar	2011	2012	2013	2011–2013 Mean	2011	2012	2013	2011–2013 Mean
Mckenzie	79.2	78.0	—	—	31.6	31.1	—	31.4
CDC Teal	78.1	75.3	—	—	33.6	31.3	—	32.5
Unity VB	79.8	78.3	79.2	79.1	33.0	31.3	34.7	33.0
5603HR	79.1	77.1	77.9	78.0	31.9	30.4	32.7	31.7
Glenn	—	—	81.4	—	—	—	34.8	—
Carberry	—	—	80.1	—	—	—	34.8	—
AAC Cameron	**79.4**	**77**	**78.9**	**78.4**	**36.6**	**32.4**	**39.0**	**36.0**
LSD 0.05	0.5[a]	0.9[a]	0.9[b]	0.8[c]	1.0[a]	1.3[a]	1.9[b]	2.6[c]
No. of tests	9	10	10	29	9	10	10	29

Note: $P \leq 0.05$, includes the appropriate genotype by environment interaction.
[a]Appropriate LSD to make comparisons of AAC Cameron to McKenzie, CDC Teal, Unity VB, and 5603HR.
[b]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn, and Carberry.
[c]Appropriate LSD to make comparisons of AAC Cameron to Unity VB and 5603HR.

Table 4. *Fusarium* head blight severities and ratings[a], with percent deoxynivalenol (DON) for AAC Cameron (BW485) and check cultivars in Central Bread Wheat Cooperative (2011–2013) tests.

	Carman			Glenlea			Ottawa			DON			
Cultivar	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011[b]	2012[b]	2013[c]	2013[d]
Unity VB	35 I	38 I	38 I	4 R	6 MR	15 I	37	37	31	1.9	3.8	8.8	—
5603HR	21 I	48 MS	44 MS	4 R	8 MR	13 I	23	33	27	1.1	3.5	2.8	29.0
McKenzie	38 MS	45 MS	—	4 R	9 MR	—	33	28	—	2.7	3.6	—	—
CDC Teal	64 S	87 S	—	19 MS	13 I	—	72	72	—	5.4	7.6	—	—
Glenn	—	—	25 MR	—	—	17 I	—	—	18	—	—	5.0	33.0
Carberry	—	—	23 MR	—	—	15 I	—	—	31	—	—	12.6	—
AAC Cameron	**52 S**	**22 MR**	**18 MR**	**3 R**	**8 MR**	**14 I**	**20**	**22**	**18**	**0.8**	**2.6**	**4.8**	**18.0**

[a]The numbers represent severity and the disease rating class is represented as: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately, susceptible; S, susceptible. For the Ottawa location, only FHB severity is reported as ratings were not assigned.
[b]Glenlea.
[c]Ottawa.
[d]Carman.

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Table 5. Percent disease severity and ratings[a] of AAC Cameron (BW485) and check cultivars to leaf, stem, and stripe rust infection in Central Bread Wheat Cooperative (2011–2013) tests.

	Leaf rust			Stem rust			Stripe rust		
Cultivar	2011	2012	2013	2011	2012	2013	2011	2012	2013
Unity VB	0.3 R	5 R	10 R	20 I	25 MR	40 I	S	40 I	50 S
5603HR	1 R	22 MR	38 I	20 I	20 I	20 MR	S	15 I	60 S
McKenzie	1 R	5 MR	—	20 I	10 MR	—	S	40 I	—
CDC Teal	1 R	23 MR	—	7 I	35 I	—	I	20 MS	—
Glenn	—	—	23 MR	—	—	10 R	—	—	20 MR
Carberry	—	—	4 R	—	—	5 R	—	—	15 R
AAC Cameron	**0.3 R**	**22 MR**	**17 MR**	**20 I**	**30 MR**	**1 R**	**S**	**20 I**	**60 S**

[a]The numbers represent severity and the disease rating class is represented as: R, resistant, MR, moderately resistant; I, intermediate; MS, moderately, susceptible, S, susceptible.

Table 6. Common bunt, loose smut, and leaf spot ratings[a] and midge evaluations[b] of AAC Cameron (BW485) and check cultivars in Central Bread Wheat Cooperative (2011–2013) tests.

	Common bunt			Loose smut			Leaf spots (Melfort)[c]			Wheat midge		
Cultivar	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013
Unity VB	1 R	5 R	1 R	17 MR	44 I	38 I	10.0 S	9.7 S	8.3 MS		15:1:14	—
5603HR	3 R	13 MR	3 R	0 R	40 I	50 I	9.3 MS	7.3 I	8.0 I		0:30:00	—
McKenzie	5 R	4 R	—	36 I	62 MS	—	9.7 S	7.7 I	—		0:29:01	—
CDC Teal	25 I	34 MS	—	47 I	49 I	—	9.7 S	7.3 I	—		0:29:01	—
Glenn	—	—	4 R	—	—	23 MR	—	—	7.0 I		—	—
Carberry	—	—	0 R	—	—	8 R	—	—	8.3 MS		—	0:11:19
AAC Cameron	**2 R**	**6 R**	**4 R**	**0 R**	**87 S**	**63 MS**	**9.0 MS**	**7.3 I**	**8.3 MS**		**7:0:23**	**5:0:25**

[a]The numbers represent severity and the disease rating class is represented as: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately; susceptible; S, susceptible.
[b]Midge evaluations were performed on harvested spikes. The evaluations were recorded as resistant:susceptible:undamaged.

Spike characteristics

Shape: parallel sided
Length: medium
Density: medium
Attitude: erect
Colour: creamy white
Awns: awned; awns equal in length to spike

Spikelet characteristics

Glumes: white at maturity; medium length and width; glabrous; medium width rounded shoulder, medium length beak with acuminate shape
Lemma: slightly curved

Kernel characteristics

Type: Hard, Red in colour
Size: large; long, medium width; elliptical shape; rounded cheeks; medium length brush hairs; heavy; narrow, medium crease depth
Embryo: medium oval

Maintenance and Distribution of Pedigreed Seed

Breeder seed ($F_{6:11}$) of AAC Cameron was produced by collecting 250 random spikes from a rogued increase plot grown at Indian Head, Saskatchewan (2011). Of all the spikes collected, ten 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, Manitoba (2012). Six lines were culled prior to harvest due to lack of uniformity. An additional 52 lines were discarded post-harvest due to low seed amounts (<30 g). One hundred and fifty-two breeder seed rows ($F_{6:13}$) were grown as 15 m rows maintaining 10 m isolation distance from other wheat at Indian Head, Saskatoon (2013) and 15 non-uniform rows were discarded. Approximately 270 kg of conditioned breeder seed was produced. Multiplication and distribution of all other pedigreed seed classes will be handled by Canterra Seeds, 1475 Chevrier Boulevard, Winnipeg, Manitoba, Canada (www.canterra.com). AAC Cameron is a 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

JBT designed the initial cross. SLF and performed the breeding work. SK analysed the registration trials data,

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Table 7. Wheat and flour analytical data for AAC Cameron (BW485) and check cultivars from the Central Bread Wheat Cooperative (2011—2013) tests. End-use quality testing was performed by the Grain Research Lab of the Canadian Grain Commission on a composite sample of each cultivar.

Cultivar	Grain protein (%)	Flour protein (%)	Protein loss (%)	Falling number (s)	Amylo-graph (BU)	Clean flour yield (%)[c]	Flour yield (ash) (%)	Flour ash (%)	Starch damage (%)	Particle size index (%)[d]
Unity VB	14.3	13.5	0.8	452.5	824	76.6	76.5	0.46	8.9	55.5
5603HR	14.2	13.4	0.75	447.5	624	76.1	76.7	0.45	8.6	56
McKenzie	14.7	13.9	0.75	458	643	75.8	76.8	0.45	9.1	54.5
CDC Teal	15.5	14.9	0.6	450	595	75.3	76	0.47	7.4	60
Glenn	14.7	13.0	0.5	435	1010	75.5	79	0.4	9.6	—
Carberry	15.5	13.1	0.9	420	580	75.1	78.5	0.41	8.5	—
AAC Cameron	**14.1**	**13.2**	**1.0**	**436.5**	**722.5**	**76.4**	**78**	**0.43**	**8.8**	**55.5**
LSD 0.05[a]	0.9	0.6	0.28	18	140	1.3	0.8	0.02	0.5	1.6
LSD 0.05[b]	0.9	0.4	0.3	20	160	1.3	0.9	0.03	0.55	—
Station Years	3	3	3	3	3	3	3	3	3	3

	Farinograph[e]			
Cultivar	Absorption (%)	Dough develop time (min)	Mixing tolerance index (BU)	Stability index (min)
Unity VB	69.25	6.05	30	8.3
5603HR	66.4	6.3	24	11.4
McKenzie	68.5	5.6	28	8.8
CDC Teal	67.6	9.5	18	17.3
Glenn	70.4	9.25	15	23
Carberry	68.7	6.25	20	10
AAC Cameron	**68.7**	**6.6**	**20.0**	**19.2**
LSD 0.05[f]	2.4	2.1	1.6	6.9
LSD 0.05[g]	2.5	2.1	2.4	7.9
Station Years	3	3	3	3

	Canadian short process (150 ppm ascorbic acid)[h]						
Cultivar	Loaf volume (cm^3)	Loaf appearance[k]	Crumb structure[k]	Crumb colour[k]	Absorption (%)	Mixing energy (W h kg^{-1})	Mixing time (min)
Unity VB	1067	7.7	6.1	7.8	70	5.5	5.7
5603HR	1100	7.6	6.4	7.7	68.5	6.4	6.2
McKenzie	1090	7.5	6	7.7	68	3.7	7
CDC Teal	1193	7.8	6	7.7	67	3.6	7.2

(*continued*).

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Table 7. (*concluded*).

	Canadian short process (150 ppm ascorbic acid)[h]						
Cultivar	Loaf volume (cm^3)	Loaf appearance[k]	Crumb structure[k]	Crumb colour[k]	Absorption (%)	Mixing energy (W h kg^{-1})	Mixing time (min)
Glenn	1085	—	—	—	74	12.3	6
Carberry	1090	—	—	—	73	10.1	4.7
AAC Cameron	**1099**	**7.7**	**6.1**	**8**	**68**	**8.1**	**7.7**
LSD 0.05[i]	93	0.7	0.6	0.4	2	0.7	2.9
LSD 0.05[j]	80	—	—	—	2.5	1.5	2.5
Station Years	3	3	3	3	3	3	3

[a]Appropriate LSD to make comparisons of AAC Cameron to McKenzie, CDC Teal, Unity VB. and 5603HR. $P \leq 0.05$.

[b]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn. and Carberry. $P \leq 0.05$.

[c]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.

[d]Particle size index data was only available for 2011 and 2012.

[e]American Association of Cereal Chemists (2002).

[f]Appropriate LSD to make comparisons of AAC Cameron to McKenzie, CDC Teal, Unity VB, and 5603HR.

[g]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn, and Carberry. $P \leq 0.05$, includes the appropriate genotype by environment interaction.

[h]Preston et al. (1982).

[i]Appropriate LSD to make comparisons of AAC Cameron to McKenzie, CDC Teal, Unity VB, and 5603HR. $P \leq 0.05$, includes the appropriate genotype by environment interaction.

[j]Appropriate LSD to make comparisons of AAC Cameron to Unity VB, 5603HR, Glenn, and Carberry. $P \leq 0.05$, includes the appropriate genotype by environment interaction.

[k]Load appearance, crumb structure, and crumb colour data was only available for 2011 and 2012.

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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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