CULTIVAR DESCRIPTION

AAC Raymore durum wheat

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Received 7 February 2014, accepted 7 May 2014. Published on the 19 May 2014.

Singh, A. K., Clarke, J. M., Knox, R. E., DePauw, R. M., McCaig, T. N., Cuthbert, R. D., Clarke, F. R. and Fernandez, M. R. 2014. **AAC Raymore durum wheat**. Can. J. Plant Sci. **94**: 1289–1296. AAC Raymore durum wheat [*Triticum turgidum* L. subsp. *durum* (Desf.) Husn.] is adapted to the durum production area of the Canadian prairies. AAC Raymore is the first solid stem durum genotype registered for production in Canada for protection against wheat stem sawfly, and combines high grain yield, grain protein concentration, test weight, and low grain cadmium concentration. AAC Raymore has similar straw strength, plant height, and days to maturity as Strongfield. AAC Raymore is resistant to leaf rust, stem rust, stripe rust, common bunt, is moderately susceptible to loose smut, and has improved resistance to common root rot compared with the check cultivars. AAC Raymore has end use quality suitable for the Canada Western Amber Durum class.

Key words: Durum wheat, cultivar description, solid stem, wheat stew sawfly, grain yield

Singh, A. K., Clarke, J. M., Knox, R. E., DePauw, R. M., McCaig, T. N., Cuthbert, R. D., Clarke, F. R. et Fernandez, M. R. 2014. **Le blé dur AAC Raymore**. Can. J. Plant Sci. **94**: 1289–1296. AAC Raymore est une variété de blé dur [*Triticum turgidum* L. ssp. *durum* (Desf.) Husn.] adaptée à la zone de culture du blé dur des Prairies canadiennes. AAC Raymore est le premier génotype de blé dur à tige pleine à être homologué au Canada pour la lutte contre le cèphe du blé. Cette variété se caractérise par un rendement grainier élevé, un grain très riche en protéines, un poids spécifique élevé et une faible teneur en cadmium dans le grain. AAC Raymore est équivalent à Strongfield pour ce qui est de la robustesse de la paille, de la hauteur du plant et du nombre de jours nécessaires pour parvenir à maturité. AAC Raymore résiste à la rouille de la feuille, à la rouille de la tige, à la rouille jaune et à la carie; la variété est modérément sensible au charbon nu et résiste mieux que les cultivars témoins au pourridié. La qualité de AAC Raymore pour l'usage final fait en sorte que la variété peut être classée «blé dur ambré de l'Ouest canadien».

Mots clés: Blé dur, description de cultivar, tige pleine, cèphe du blé, rendement grainier

AAC Raymore durum wheat was developed at the Semiarid Prairie Agricultural Research Centre (SPARC), Agriculture and Agri-Food Canada (AAFC), Swift Current, SK. Filing for Plant Breeders' Rights protection (12-7601) was accepted on 2012 Apr. 30, and AAC Raymore (DT818) received registration No. 7313 from the Variety Registration Office of Canadian Food Inspection Agency on 2013 Feb. 07.

Pedigree and Breeding Method

AAC Raymore (experimental names: DT818, A0302& AJ060) was selected from the cross 9675-AP2/DT732// Strongfield (designated A0302) made in 2003 at the Semiarid Prairie Agricultural Research Centre, Swift Current, SK. 9675-AP2 is a solid stemmed breeding line derived from the cross G9264-CK5E/DT665, where G9264-CK5E is derived from DT652/Biodur. Biodur is a solid stemmed durum genotype from Germany. DT732 is derived from DT663/DT677//AC Navigator, and also has stem solidness derived from Biodur. Strongfield is a Canadian durum cultivar selected from the cross AC Avonlea/DT665 (Clarke et al. 2005a). AAC Raymore was developed through a doubled haploid (DH) technique at SPARC using the wheat–maize pollen system (Knox et al. 2000). The production of a DH population is an on-going generative action but the DH lines are grown outdoors as subsets as they come out of the DH lab prior to the growing season. Between 2003 and 2004, two subsets of were produced with lot sizes of 139 and 98 DH lines. In the spring of 2004, the first subset consisting of 139 doubled haploid genotypes was grown near Swift Current in 1.5-m rows under irrigation. The seed was planted in 1.5-m-long rows spaced 23 cm apart with every second row planted with CDC Kestrel winter wheat (Fowler 1997), which is susceptible to leaf (*Puccinia triticina* Eriks.) and stem rust (*Puccinia graminis*

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Table 1. Grain yield (kg ha^{-1}) of AAC Raymore and check cultivars in the Durum Cooperative Test, 2008 to 2011 in Zones 1 and 2[z]

	2008			2009			2010			2011			2008–2011
	Zone 1	Zone 2	Mean[y]	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Mean
AC Avonlea	4515	4270	4359	6211	4279	4922	4466	3607	3895	4312	3700	3823	4270
AC Morse	4690	4256	4413	5961	4172	4771	4907	3746	4133	4245	3876	3949	4323
AC Navigator	4385	4483	4446	5772	4499	4921	3635	3631	3633	3793	3667	3692	4186
Strongfield	4321	4383	4359	6258	4405	5021	4658	3749	4053	4487	3886	4008	4387
Commander	4384	4561	4499	6244	4569	5128	4307	3767	3943	4164	3940	3983	4407
AAC Raymore	4435	4339	4377	5891	4354	4861	4240	3578	3798	4577	3858	4002	4290
$LSD^{x}_{0.05}$	429	267	250	525	215	249	445	338	279	907	207	231	194
No. tests	4	7	11	4	8	12	3	6	9	2	8	10	42
Mean of checks	4459	4391	4415	6089	4385	4953	4395	3700	3931	4200	3814	3891	4315

[z]Zone 1 (Black Soils): Indian Head (2010 excluded), Souris, Brandon (2008–2010), Langdon (2008–2010 Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon, Regina, Lethbridge, Bieseker (2008), Vulcan (2009–2011), Avonlea (2008), Moose Jaw (2009)–2011), Pense (2009), Scott (2011).
[y]Means are LS means obtained from PROC MIXED procedure of SAS.
[x]Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Pers.:Pers. f. sp. *tritici* Eriks. and E. Henn.). An irrigated leaf rust and stem rust epiphytotic nursery was established by planting genotypes susceptible to prevalent races of leaf and stem rust in every 12th plot and needle inoculating a sample of plants in each row with leaf rust and stem rust. Representative leaf rust races found the previous year were applied (McCallum and Seto-Goh 2006). Stem rust races used were: QTHST (C25), RHTSK (C20), RKQSR (C63), RTHJT (C57), TMRTK (C10), and TPMKR (C53) (Roelfs and Martens 1988; Fetch 2005). Based on response to rusts, pathogens causing leaf spots (natural infection), plant height, straw strength, and days to maturity, 118 DH lines were selected. Seed of each selected DH line was grown in 2-m rows near Leeston, New Zealand. In the fall of 2004, the second subset of 98 DH lines was harvested from the greenhouse and was grown out in 2-m-long rows in the same nursery near Leeston. Based on plant height, days to maturity and straw strength, 137 DH genotypes were selected from the two subsets, and the rows were individually harvested to serve as the seed source for agronomic trials in Canada. In 2005, the 137 DH genotypes were grown in a single replication four-row plot tests (with DH entries, parents and checks) near Swift Current and Regina, SK, and Lethbridge, AB. Twenty-four DH genotypes were selected based on agronomic performance, disease resistance (primarily leaf spots), visual stem solidness, and quality (protein concentration, yellow pigment concentration and gluten strength). From these, 15 DH genotypes including solid-stemmed A0302&AJ060 were grown in the 2006 Durum Western A-3 (DWA3) test as four-row plots in a two-replication lattice design near Swift Current, Regina, and Saskatoon, SK, and Lethbridge, AB, to assess agronomic performance. The other nine DH genotypes were grown in the 2006 Durum Central A (DCA) test as four-row plots in a two-replication lattice design near Swift Current, Regina, and Indian Head, SK, Brandon, MB, and Lethbridge, AB. Remnant seed from the yield trials was used to assess grain quality (protein concentration, yellow pigment concentration and gluten strength). Disease evaluations included response to loose smut [*Ustilago tritici* (Pers.) Rostr.] assessment with a mixture of races T26, T32 and T33 under field conditions near Swift Current, SK. Response to leaf rust and stem rust were evaluated in hill plots in a rust nursery near Glenlea, MB, using a mixture of races. Response to leaf spotting pathogens was assessed from within the yield plots under conditions of natural inoculums. Response to *Fusarium graminearum* Schwabe [teleomorph *Gibberella zeae* (Schwein. Petch)] was assessed in fusarium head blight nurseries near Portage la Prairie and Carman, MB, following the field inoculation protocols described by Gilbert and Woods (2006). No testing for deoxynivalenol was done, and plots were assessed for incidence (%) and severity (%) when a good differential reaction was observed among checks.

Table 2. Agronomic characteristics of AAC Raymore and check cultivars in the Durum Cooperative Test, 2008–2011[z]

	Days to maturity[zy]			Test Weight (kg hL^{-1})[z]					
	Zone 1	Zone 2	Mean[x]	Zone 1	Zone 2	Mean	1000-kernel wt (g)[z]	Height (cm)[z]	Lodging (1–9)[w]
AC Avonlea	102.5	111.9	110.0	75.5	79.5	78.4	43.9	88.8	2.2
AC Morse	101.9	111.5	109.6	75.0	78.9	77.8	43.5	84.9	1.7
AC Navigator	103.5	113.0	111.0	75.9	80.2	78.9	46.3	78.7	2.4
Strongfield	102.1	111.5	109.6	76.3	80.4	79.2	44.6	87.3	2.4
Commander	102.2	112.2	110.2	74.8	79.4	78.1	46.6	76.0	2.2
AAC Raymore	101.7	111.3	109.4	76.4	80.2	79.1	46.4	86.7	2.4
$LSD^{v}_{0.05}$	1.6	0.7	0.7	1.1	0.5	0.6	1.1	1.8	0.4
# Tests	8	25	33	13	29	42	42	42	13

[z]Zone 1 (Black Soils): Indian Head (2010 excluded), Souris, Brandon (2008–1010), Langdon (2008–2010).
Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon, Regina, Lethbridge, Bieseker (2008), Vulcan (2009–2011), Avonlea (2008), Moose Jaw (2009–2011), Pense (2009), Scott (2011).
[y]All Zone 1 and Zone 2 locations, except Langdon (in Zone 1), Souris in 2010 and 2011, and Stewart Valley (in Zone 2).
[x]Means are LS means obtained from PROC MIXED procedure of SAS.
[w]Regina, Saskatoon (2008–2011), Souris (2008, 2010), Avonlea (2008), Brandon (2009), Swift Current (2010), Moose Jaw (2011).
[v]Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Table 3. Grain protein concentration (13.5% moisture basis) measured on grain samples bulked across replications at each location of AAC Raymore and checks from the 2008–2011 durum cooperative test

	Protein concentration (%)												
	2008			2009			2010			2011			
	Z1[z]	Z2	Mean[y]	Z1	Z2	Mean	Z1	Z2	Mean	Z1	Z2	Mean	4-yr mean
AC Avonlea	14.1	13.7	13.8	12.7	14.4	13.9	15.4	13.3	13.8	15.8	12.5	13.2	13.7
AC Morse	13.5	13.4	13.5	12.5	13.8	13.5	14.2	12.7	13.1	15.3	12.4	13.0	13.2
AC Navigator	13.7	13.0	13.2	12.6	13.4	13.2	14.7	12.5	13.1	14.5	12.0	12.5	13.0
Strongfield	14.4	13.7	13.9	13.1	14.1	13.9	15.8	13.4	14.0	15.4	12.4	13.0	13.7
Commander	13.9	13.0	13.3	12.7	13.3	13.1	14.8	12.8	13.3	14.9	11.8	12.4	13.0
AAC Raymore	14.6	13.7	14.0	13.5	14.5	14.2	16.3	13.7	14.3	15.3	12.5	13.1	13.9
$LSD^{x}_{0.05}$	0.6	0.5	0.4	0.5	0.4	0.3	0.9	0.5	0.4	0.9	0.4	0.4	0.2
No. tests	3	7	10	3	8	11	2	6	8	2	8	10	39

[z]Z1 = Zone 1 (Black Soils): Indian Head (2010 excluded), Souris, Brandon (2008–2010); Z2 = Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon,Regina, Lethbridge, Bieseker (2008), Vulcan (2009–2011), Avonlea (2008), Moose Jaw (2009–2011), Pense (2009), Scott (2011).
[y]Means are LS means obtained from PROC MIXED procedure of SAS.
[x]Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Table 4. Summary of disease reactions of AAC Raymore and check cultivars grown in the Durum Cooperative Test, 2008–2011

		Stem rust			Common bunt		Loose smut		Leaf spot			
	Year	Rtn[z]	Rxn[y]	Leaf rust[x]	Rtn[z]	Rxn[y]	Rtn[z]	Rxn[y]	Glenlea	SK[w]	Stripe rust	Common Root rot (%)[v]
AC Avonlea	2008	5	R	R	13	MR	44	I	4.9 (MR)	7.5 (I)	–	15
	2009	5	R	R	1	R	90	S	24.0 (MR)	–	–	34
	2010	3	R	R	20	MS	51	I	10.0 (R)	7.2 (I)	–	0
	2011	5	R	R	1	MR	27	MR	37.0 (MS)	8.5 (MS)	25.0 (I)	–
AC Morse	2008	5	R	R	2	VR	60	MS	2.5 (R)	8.8 (MS)	–	5
	2009	5	R	R	0	R	75	MS	31.7 (MR)	–	–	11
	2010	1	R	R	7	R-MR	56	MS	19.0 (MR)	9.7 (S)	–	14
	2011	1	R	R	2	MR	70	MS	39.3 (MS)	10.5 (S)	11.7 (R)	–
AC Navigator	2008	2	R	R	2	VR	–	–	3.1 (R)	8.5 (MS)	–	10
	2009	10	R-MR	R	2	R	67	MS	28.0 (MR)	–	–	10
	2010	2	R	R	2	R-MR	29	MR	36.0 (MS)	8.5 (MS)	–	14
	2011	1	R	R	0	R	15	R	49.7 (S)	10.0 (S)	12.3 (R)	–
Strongfield	2008	2	R	R	4	VR	75	MS	3.1 (R)	7.0 (I)	–	15
	2009	5	R	R	2	R	70	MS	39.7 (I)	–	–	7
	2010	2	R	R	2	R-MR	52	I	17.0 (MR)	7.7 (I)	–	10
	2011	1	R	R	2	MR	26	MR	43.3 (S)	8.5 (MS)	13.7 (R)	–
Commander	2008	2	R	R	7	R	66	MS	3.8 (R)	7.3 (I)	–	5
	2009	1	R	R	1	R	100	S	50.3 (MS)	–	–	9
	2010	2	R	R	1	R-MR	41	I	28.0 (I)	7.7 (I)	–	7
	2011	1	R	R	0	R	9	R	41.0 (S)	9.8 (S)	16.0 (R)	–
AAC Raymore	2008	10	R-MR	R	4	VR	52	I	3.8 (R)	7.8 (I)	–	0
	2009	1	R	R	1	R	69	MS	44.7 (I)	–	–	4
	2010	2	R	R	12	I	45	I	24.7 (MR)	7.7 (I)	–	0
	2011	1	R	R	0	R	24	MR	42.7 (S)	10.0 (S)	12.3 (R)	–

[z]Rtn = rating as % infection.
[y]Rxn = reaction type: VR, very resistant; R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[x]Checks and AAC Raymore had 0% leaf rust infection in all 4 yr.
[w]Adult plant, McFadden scale (0 = no symptoms, 11 = severe symptoms) (McFadden 1991).
[v]Percentage of subcrown internodes with >50% of area discoloured.

Table 5. Response of AAC Raymore and check cultivars to fusarium head blight grown in the Durum Cooperative Test, 2008–2011 nurseries

		Fusarium head blight							
		Carman		Glenlea (GL)		PEI (Index[z])		DON (ppm)	ISD[x]
	Year	Indx[z]	Rxn[y]	Indx[z]	Rxn[y]	Early	Late	GL	GL
AC Avonlea	2008	44.2	MS	24.5	S	–	17.0	25.5	13.6
	2009	25.8	MS	48.8	S	31.7	55.3	23.9	13.8
	2010	64.5	S	37.7	S	86.3	100.0	41.0	20.1
	2011	–	–	17.3	MS	54.8	95.0	7.8	6.3
AC Morse	2008	50.1	S	17.0	MS	–	16.0	20.5	10.6
	2009	33.6	MS	54.2	S	47.3	65.7	36.9	19.2
	2010	68.1	S	20.7	I	75.4	97.5	38.1	18.2
	2011	–	–	25.2	S	53.5	90.0	11.4	7.8
AC Navigator	2008	60.7	S	19.7	MS	–	8.0	39.5	18.6
	2009	35.5	MS	41.3	S	20.7	47.3	35.6	18.2
	2010	58.6	S	43.0	S	70.8	98.8	40.2	20.2
	2011	–	–	21.0	S	53.7	100.0	16.2	9.7
Strongfield	2008	54.0	S	22.7	S	–	13.3	30.5	15.5
	2009	38.4	MS	59.2	S	24.3	39.7	27.3	15.6
	2010	60.7	S	44.0	S	79.6	91.3	49.0	23.7
	2011	–	–	15.0	I	31.3	80.0	7.8	6.0
Commander	2008	61.8	S	15.8	MS	–	18.0	36.9	17.8
	2009	28.6	MS	56.9	S	38.0	61.0	27.2	15.4
	2010	60.8	S	58.7	S	81.8	98.8	52.4	25.6
	2011	–	–	15.3	MS	27.0	87.5	16.7	9.6
AAC Raymore	2008	53.5	S	30.7	S	–	14.3	26.9	14.4
	2009	30.7	MS	58.0	S	37.0	66.7	39.0	20.2
	2010	58.3	S	63.3	S	70.0	100.0	44.5	22.6
	2011	–	–	25.0	S	54.0	75.3	8.0	6.5

[z]Fusarium head blight index: [(mean percent incidence × mean percent severity)/100].
[y]Rxn = reaction type: I, intermediate; MS, moderately susceptible; S, susceptible.
[x]ISD [incidence, severity, deoxynivalenol (DON)] is calculated as (0.3 × AvgIncidence) + (0.3 × AvgSeverity) + (0.4 × DON) for a given entry.

Nine DH lines from population A0302 including A0302&AJ060 were tested in the 2007 Durum-B test in an alpha-lattice design with two replications near Swift Current, Regina, Saskatoon, and Floral, SK, Lethbridge, AB, and Brandon, MB. Response to diseases was measured using protocols similar to that for the A-level tests described above. Remnant seed from the yield trials was used to assess end-use suitability by the Central Quality Lab, Cereal Research Centre, MB, and included protein, pigment, milling properties, gluten strength, and Hagberg Falling Number. This procedure identified DH line A0302&AJ060 as having met all of the selection criteria at each stage of selection.

A0302&AJ060 was advanced to the Durum Cooperative Test and evaluated as DT818 from 2008 to 2011. The Durum Cooperative test was grown as a four-row plot test at up to 12 locations annually in a 6 × 5 lattice design including five checks, with two replications in two repetitions. The check cultivars were AC Avonlea (Clarke et al. 1998), AC Morse, AC Navigator (Clarke et al. 2000), Commander (Clarke et al. 2005a), and Strongfield (Clarke et al. 2005b). The Durum Wheat Cooperative test operating protocols are described in the Prairie Recommending Committee for Wheat Rye and Triticale operating procedures (link can be found at http://www.pgdc.ca/committees_wrt.html). The durum wheat cooperative test entries were evaluated in inoculated nurseries to determine the response to leaf rust, stem rust, and loose smut near Glenlea, MB. Fusarium head blight was assessed in inoculated nurseries near Carman and Glenlea, MB, Ottawa, ON, and Charlottetown, PEI. Stem rust inoculum consisted of races of TPM, TMR, QTH, RKQ, RHT, RTH, which comprised select historical races representing a range of virulence genes (Fetch 2005), whereas the leaf rust inoculums was representative of recently occurring races (McCallum and Seto-Goh 2006). The loose smut inoculum consisted of races T26, T32 and T33. Response to common bunt caused by *Tilletia laevis* Kuhn in Rabenh., and *T. tritici* (Bjerk.) G. Wint. in Rabenh., was assessed from a nursery grown near Lethbridge, AB, using prevalent races in a mixture of the races T-1, T-6, T-13, T-19, L-1 and L-16 (Gaudet and Puchalski 1989). The race designations are those described by Roelfs and Martens (1988) for stem rust, Long and Kolmer (1989) for leaf rust, Hoffmann and Metzger (1976) for common bunt, and Nielsen (1987) for loose smut. Leaf spot reaction was determined with natural infestation at Saskatchewan and Manitoba locations. Common root rot reaction was determined near Swift Current, SK. Reaction to stripe rust (*Puccinia striiformis* f. *tritici* Eriks) was determined in a nursery in 2011 near Lethbridge, AB. Stem solidness

Table 6. Solidness of AAC Raymore and check cultivars from 2006 to 2011 Durum tests grown near Swift Current

	Year	Solidness score and description[z]	
AC Avonlea	2008		Hollow
	2009		Hollow
	2010		Hollow
	2011		Hollow
AC Navigator	2008		Hollow
	2009		Hollow
	2010		Hollow
	2011		Hollow
Strongfield	2008		Hollow
	2009		Hollow
	2010		Hollow
	2011		Hollow
AAC Raymore	2006	5.0	Solid
	2007	5.0	Solid
	2008	NA	Solid (visual)
	2010	4.9	Solid
	2011	5.0	Solid

[z]Solidness scale 1–5 visual score: 1 = hollow, 5 = solid; 2008–2011 from four-row plots: if solidness present, three stems rated at each internode. If hollow, no rating assigned (rating = 1).

of DT818 and checks was determined from four-row plots grown under irrigation near Swift Current, SK, 2008 to 2011 by splitting stems longitudinally and visually rating them on a scale of 1 (hollow) to 5 (solid) at each internode (Clarke et al. 2002). In 2011, 10 stems (first five internodes) from separate plants were scored for check cultivars and DT818.

Performance

In 4 yr of cooperative testing, grain yield of AAC Raymore was not significantly different from the checks AC Avonlea, AC Morse, AC Navigator, Strongfield, and Commander (Table 1). Days to maturity of AAC Raymore was similar to Strongfield in both soil zones (Zone 1 = Black Soils; Zone 2 = Brown and Dark Brown Soils) and significantly earlier than AC Navigator (Table 2). Test weight (kg hL^{-1}) of AAC Raymore was

Table 7. Stem solidness rating[z] of each of five internodes of AAC Raymore and check cultivars on plants grown near Swift Current, 2011

	Internode 1	Internode 2	Internode 3	Internode 4	Internode 5
AC Avonlea	3.4	2.5	1.6	1.2	1.0
AC Navigator	2.0	2.0	1.1	1.0	1.0
Strongfield	3.7	2.4	1.6	1.3	1.0
AAC Raymore	4.9	5.0	5.0	5.0	5.0
$LSD^{y}_{0.05}$	0.3	0.2	0.2	0.1	0.1

[z]Solidness rated on a scale of 1 (stem cavity hollow and thin walled) to 5 (stem cavity completely filled with pith) scale. Mean of solidness rating based on a subsample of 10 plants per entry.
[y]Least significant difference, $P \leq 0.05$.

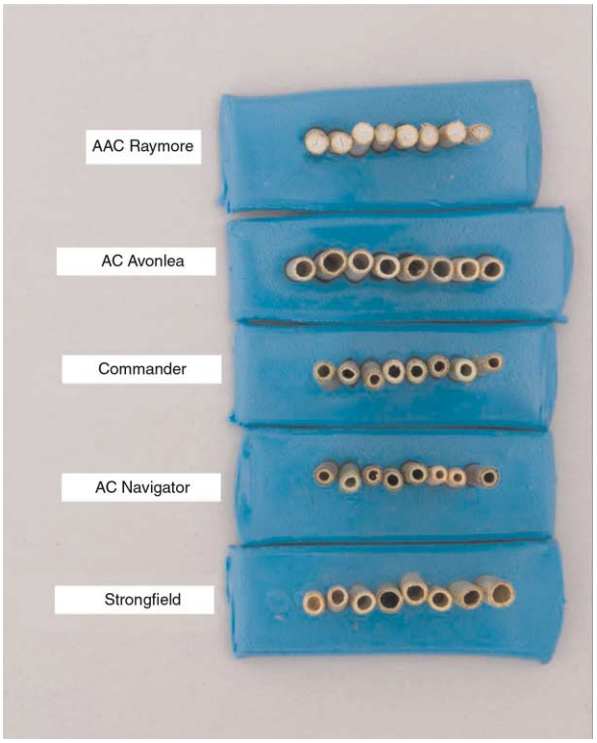

Fig. 1. Stem solidness in internode cross section of AAC Raymore and check cultivars.

significantly higher than AC Avonlea, AC Morse and Commander and similar to AC Navigator and Strongfield (Table 2), while the 1000-kernel weight (g) was significantly greater than AC Avonlea, AC Morse and Strongfield and similar to AC Navigator and Commander. AAC Raymore was 2 cm shorter than AC Avonlea and had similar plant height to Strongfield, with straw strength similar to AC Avonlea, AC Navigator and Strongfield, and significantly weaker than AC Morse (Table 2). Grain protein concentration of AAC Raymore was 0.2% units higher than the highest protein checks, AC Avonlea and Strongfield, and significantly higher than other checks (Table 3).

AAC Raymore was resistant to leaf and stem rust, and common bunt (Table 4). AAC Raymore was moderately susceptible to loose smut and similar to Strongfield (Table 4). AAC Raymore has leaf spot reaction (field rating of natural infection, primarily tan spot [*Pyrenophora tritici-repentis* (Died.) Drechs., anamorph *Drechslera tritici-repentis* (Died.) Shoemaker], and stagonospora nodorum blotch [*Phaeosphaeria nodorum* (E. Müll.) Hedjaroude, anamorph *Stagonospora nodorum* (Berk.) Castell. & E.G. Germano] similar to AC Avonlea and Strongfield and slightly better than AC Morse (Table 4). AAC Raymore expressed resistance to stripe rust similar to Strongfield and slightly better than other checks (Table 4). AAC Raymore has better resistance to common root rot compared with the check cultivars. The fusarium head blight reaction and

Table 8. End-use suitability[zyx] of AAC Raymore and check cultivars from 2008, 2009 and 2011 Durum cooperative tests

	FN	Test wt.	HVK	Cd	Semo Yld	Semo Ash	Wht Prot	Sem Prot	GI	P/L	W	Sem YP	Colour				Cooking peak force	
	(s)	(kg hL^{-1})	(%)	(mg kg^{-1})	(%)	(%)	(%)	(%)	(%)		(ergs)	(ppm)	70C b^*	90C b^*	70C a^*	90C a^*	70C (g)	90C (g)
AC Avonlea	378	82.8	87	0.22	67.1	0.62	13.3	12.4	11	0.52	121	8.19	61.5	60.1	1.6	5.1	896	963
AC Morse	425	81.4	87	0.19	66.8	0.63	13.1	12.0	49	0.99	193	7.99	58.3	59.2	1.6	4.9	897	967
AC Navigator	428	82.9	87	0.25	68.1	0.64	12.7	11.7	62	1.26	233	9.21	67.3	65.4	3.7	7.5	861	952
Commander	442	82.2	86	0.26	67.7	0.60	12.5	11.6	92	2.02	305	9.58	69.1	66.3	3.4	7.0	888	919
Strongfield	383	83.0	90	0.08	67.3	0.60	13.4	12.3	57	0.88	199	8.61	59.7	58.7	1.9	5.6	883	976
AAC Raymore	417	83.0	90	0.09	66.6	0.61	13.6	12.4	79	1.43	271	8.54	60.7	60.4	2.0	5.7	923	979
Mean of Checks	411	82.5	87	0.20	67.4	0.62	13.1	12.1	45	0.91	186	8.72	63.2	61.9	2.4	6.0	885	955
Std. dev.[w]	7	–	–	0.003	0.3	0.008	0.04	0.05	3	0.04	8	0.04	–	–	–	–	–	–

[z]American Association of Cereal Chemists methods were followed by the Grain Research Laboratory (GRL), Canadian Grain Commission (CGC) for determining the various end-use suitability traits on a composite of eight to nine locations each year.
[y]FN = Hagberg falling number; HVK = hard vitreous kernel; Cd = grain cadmium; Semo Yld = semolina yield; GI = gluten index; P/L and W values determined through Alveograph; YP = yellow pigment; spectrophotometer color b^* = yellowness; a^* = redness on the CIE scale.
[x]Mean of checks is from 2008, 2009 and 2011 durum composites, except colour (70 and 90°C) and cooking peak force, which are mean from 2008 and 2009. Except Wht prot, Sem prot, GI, P/L and W (which are mean of AC Avonlea, AC Morse, AC Navigator, Strongfield) all traits are mean of the five checks.
[w]Std. dev. is the standard deviation based on repeated testing of check samples with replicate tests carried out over an extended period of time each season, provided by GRL, CGC.

deoxynivalenol accumulation of AAC Raymore was similarly susceptible as the checks (Table 5).

AAC Raymore is a solid stemmed genotype (Tables 6 and 7; Fig. 1) that provides protection to cutting by the wheat stem sawfly damage (*Cephus cinctus* Norton) (Holmes and Peterson 1961a, b).

AAC Raymore has low grain cadmium concentration similar to Strongfield (Table 8). Hagberg Falling Number of AAC Raymore was higher than AC Avonlea and Strongfield, while the hard vitreous kernel count was highest for AAC Raymore and similar to Strongfield. Semolina yield of AAC Raymore was lower than the checks. AAC Raymore has strong gluten properties similar to AC Navigator. Yellow pigment grain concentration of AAC Raymore was greater than AC Avonlea and AC Morse, and slightly less than Strongfield. AAC Raymore had better pasta pigment at both 70°C and 90°C cooking temperatures compared with Strongfield. Pasta cooking quality as indicated by firmness (peak cooking force) was better in AAC Raymore than all checks.

Other Characteristics

Spikes: Tapering, mid-dense to dense, erect to incline; awned; black awns; glumes mid-wide, mid-long, glabrous.

Kernel: Colour amber; kernel large, elliptical; cheeks angular; crease mid-deep to deep and mid-wide to wide; brush short; germ size mid to small; germ shape oval.

End-use suitability: Eligible for the grades of Canada Western Amber Durum wheat market class.

Stem solidness: First solid stemmed durum cultivar registered in Canada for protection against wheat stem sawfly.

Maintenance and Distribution of Pedigreed Seed

In 2008, 144 single plants were individually harvested, and constituted seed source for short rows grown in 2009 near Swift Current, SK. Seed from these plants were planted in 108 single 3-m rows in 2009 near Swift Current. From these, 103 rows deemed to be most uniform were grown in 2010 as paired breeder rows near Indian Head, which led to the identification of 96 uniform breeder rows of A0302&AJ060 (DT818). Breeder seed will be maintained by the Seed Increase Unit, Agriculture and Agri-Food Canada, Indian Head, Saskatchewan, Canada S0G 2K0. Distribution and multiplication of pedigreed seed stocks will be handled by SeCan, 501-300 March Road, Kanata, Ontario, Canada K2K 2E2.

We gratefully acknowledge the financial support of Secan and the Producer funded Wheat Check-off (administered by the Western Grains Research Foundation); J. Ross for statistical analysis support; D. Niziol and J. Fehr of AAFC, Cereal Research Centre (Winnipeg, MB) for providing end-use quality analyses; J. Gilbert of AAFC, Cereal Research Centre for leaf spotting and fusarium head blight reactions; T. Fetch and B. McCallum of AAFC, Cereal Research Centre for providing

rust reactions; J. Menzies of AAFC, Cereal Research Centre for loose smut evaluation; D. Gaudet and T. Despins of AAFC, Lethbridge Research Centre for providing reaction to common bunt; Stephen Fox, Gavin Humphreys and Doug Brown of AAFC, Cereal Research Centre for agronomic assessment and fusarium head blight nursery at Portage la Prairie; Anita Brûlé-Babel of University of Manitoba for fusarium head blight evaluations at Carman; B. X. Fu and L. Schlichting of the Grain Research Laboratory, Canadian Grain Commission, Winnipeg, MB, for end-use quality assessment; D. Gehl of AAFC Seed Increase Unit, Indian Head, SK, for multiplication of Breeder seed; M. Olfert, J. Ross, L. Oakman, G. McClare, J. Powell, H. Campbell, S. Friesen, T. Greenwood and all members of the wheat genetic enhancement group at AAFC, Swift Current; M. Knelsen, AAFC Regina, SK; O. Thompson, AAFC Indian Head, SK; and B. Beres and R. Dyck, AAFC, Lethbridge, AB, for their assistance in conducting field trials.

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