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AAC Congress Durum Wheat

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Abstract
Congress durum wheat (Triticum turgidum L. subsp. durum (Desf.) Husn.) is adapted to the durum production area of the Canadian prairies. Averaged over three years, AAC Congress yielded significantly more grain than Strongfield and AC Navigator. AAC Congress had protein concentration significantly lower than Strongfield but significantly higher than Brigade. AAC Congress is eligible for grades of Canada Western Amber Durum. It has lower grain cadmium concentration and higher yellow pigment concentration than the check cultivars, except AAC Cabri.

Keywords
Triticum turgidum, durum wheat, cultivar description, grain yield, yellow pigment, cadmium

Comments
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Cultivar Description

AAC Congress Durum Wheat

Short title: Ruan et al. – AAC Congress durum wheat

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Y. Ruan, A.K. Singh, R.M. DePauw, R.E. Knox, T.N. McCaig, R.D. Cuthbert, B. McCallum, T. Fetch, B. Beres. 20xx. AAC Congress durum wheat. Can. J. Plant Sci. xx:000-000. AAC Congress durum wheat (*Triticum turgidum* L. subsp. *durum* (Desf.) Husn.) is adapted to the durum production area of the Canadian prairies. Averaged over three years, AAC Congress yielded significantly more grain than Strongfield and AC Navigator. AAC Congress had protein concentration significantly lower than Strongfield but significantly higher than Brigade. AAC Congress is eligible for grades of Canada Western Amber Durum. It has lower grain cadmium concentration and higher yellow pigment concentration than the check cultivars, except AAC Cabri.

Key words: *Triticum turgidum*, durum wheat, cultivar description, grain yield, yellow pigment, cadmium

AAC Congress durum wheat (*Triticum turgidum* L. subsp. *durum* (Desf.) Husn.) was developed at the Swift Current Research and Development Centre (SCRDC), Agriculture and Agri-Food Canada (AAFC), Swift Current, SK. Plant Breeders' Rights, filing application #15-8635 was granted on 21 April 2015, and AAC Congress received registration No. #7778 from the Variety Registration Office, Canadian Food Inspection Agency, on 29 July 2015.

Pedigree and Breeding Method

AAC Congress (experimental names: DT856, A0703-EP01) was selected from the cross DT789/DT790 made in 2007 at the Semiarid Prairie Agricultural Research Centre, Swift Current, SK. DT789 (A0014-FF01) is a breeding line derived from a cross of 9561-

AJ3A/Strongfield. Strongfield (Clarke et al. 2005a) is a Canadian durum cultivar selected from the cross AC Avonlea/DT665. DT790 (A0014-FW04) is a breeding line derived from the same cross as DT789. In 2007, F1 seeds were increased in the greenhouse. In the spring of 2008, approximately 8000 seeds of the F_2 generation were space- planted at 10 cm intervals within a row in an irrigated epiphytotic field nursery near Swift Current. Genotypes susceptible to prevalent races of leaf rust (*Puccinia triticina* Eriks.) and stem rust (*Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks. and E. Henn.) were planted as disease spreaders every tenth row. Between the spreader rows, five rows of spring planted winter wheat were alternated with four rows of F_2 seed at a row spacing of 23 cm. The winter wheat cultivar CDC Kestrel (Fowler 1997), which is susceptible to leaf and stem rust, was used to contribute to the multiplication of rust inoculum. Spreader rows were inoculated by injecting, with a syringe and needle, a water suspension of leaf rust and stem rust spores into a sample of plants every 3 m. Representative leaf rust races found the previous year were applied (McCallum and Seto-Goh 2006). Stem rust races used were: QTHJF (C25), RHTSC (C20), RKQSC (C63), RTHJF (C57), TMRTF (C10), and TPMKC (C53) (Roelfs and Martens 1988; Fetch et al. 2015). Leaf spot diseases developed through natural infection. Individual plants were selected for plant height, straw strength, maturity, and resistance to leaf spot diseases, leaf rust, and stem rust.

The F_3 seeds from individual spikes from 241 selected plants were grown in 2 m long rows in a contra season nursery near Lincoln, New Zealand, in 2008-2009. Based on plant height, days to maturity, and straw strength, 123 rows were selected, and the rows were harvested individually to produce the seed used for agronomic and disease trials in Canada. In 2009, the 123 F_4 lines, their parents, and other check cultivars were grown in unreplicated 2.74 m^2 four-row plot experiments near Swift Current and Regina, SK. The traits grain yield, height,

time to maturity, straw strength, and leaf spots based on natural infection were assessed. Seven spikes per F_4 line from within plots grown near Swift Current were selected for plant height, straw strength, and leaf spotting disease symptoms caused primarily by 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]. The grain quality traits protein concentration, yellow pigment concentration, gluten strength, and volume weight were assessed on grain harvested from field trials. Based on this suite of agronomic, disease, and quality traits, 41 F_4 lines were selected.

In 2009-10, 287 F_5 lines (from the 41 $F_{4:5}$ families at 7 heads per F_4 line) were grown in 2 m rows near Leeston, New Zealand and selected primarily on plant height, straw strength, and days to maturity. After selection, 192 $F_{4:6}$ lines were grown in 2010 under dryland conditions near Swift Current and Regina, SK, and under irrigation near Lethbridge, AB, and in a Fusarium head blight (FHB) disease nursery at Portage la Prairie, MB. Twenty-eight genotypes were selected based on agronomic performance, disease resistance, and quality traits assessed as described for the F_4 generation.

Thirteen F_7 genotypes were grown in the 2011 Durum A6-level test as a two replicate lattice design with four-row plots planted near Swift Current, Regina, and Indian Head, SK, Lethbridge, AB, and Brandon, MB, to assess agronomic performance as described for the F_4 generation. Check cultivars in the Durum A6 test were AC Avonlea (Clarke et al.1998), AC Morse, AC Navigator (Clarke et al. 2000), Brigade (Clarke et al. 2009), Commander (Clarke et al.2005b), and Strongfield. Remnant seed from the yield trials was bulked over replications within a location and a subsample from each location that graded better than #3 CWAD was used

to assess end-use suitability by the Central Quality Lab, Cereal Research Centre, Winnipeg, MB, and included grain protein concentration, yellow pigment concentration, milling properties, gluten strength, and Hagberg Falling Number. Response to loose smut [*Ustilago tritici* (Pers.) Rostr.] was tested with a mixture of races T26, T32, and T33 (Nielsen 1987) under field conditions near Swift Current. Response to leaf rust and stem rust were evaluated in hill plots in a rust nursery near Glenlea, MB, using a mixture of races similar to that in the F_2 rust nursery. Response to leaf spotting pathogens was assessed from within the yield plots under conditions of natural inoculum. Response to *Fusarium graminearum* Schwabe (teleomorph *Gibberella zeae* (Schwein. Petch) was assessed in FHB nurseries near Portage la Prairie and Carman, MB. Plots at Carman were scored for incidence (%) and severity (%), and at Portage la Prairie the plots were scored on a 1 to 9 scale on increments of 10% incidence and severity symptoms. Scoring for FHB was performed when a significant differential reaction was observed among checks. These procedures identified the line A0703-EP01, which met all of the selection criteria at each stage of selection.

A0703-EP01 was advanced to the Durum Wheat Cooperative Test and evaluated as DT856 from 2012 to 2014. The Durum Wheat Cooperative Test was grown in four row plots at up to 12 locations annually in a 5 x 6 lattice design including five check cultivars, except 2014 which had four checks, with two replications in two repetitions. The check cultivars were AC Avonlea (grown from year 2012 and 2013), AC Morse (2012), AC Navigator (2012 to 2014), Commander (2012), Strongfield (2012 to 2014), Brigade (2013 and 2014), and AAC Cabri (2012 to 2014) (Singh et al. 2017). The Durum Wheat Cooperative Test operating protocols are described in the Prairie Recommending Committee for Wheat Rye and Triticale operating procedures (http://www.pgdc.ca/committees_wrt.html). The PROC MIXED procedure in SAS

(version 9) was used to analyze the data annually and to perform a combined analysis over years, using a mixed model with environments and replications considered random effects and genotypes considered fixed effects (Littell et al. 2006). Least significant differences were calculated using appropriate mean squares and degrees of freedom, and differences were declared significant at the 5% probability level. The Fusarium head blight variables, disease index, and DON, for all cultivars within a location-year, were standardized using the formula x* = (x - m)/std (Introduction to SAS 2017). Where m is the mean of x, and sd is the standard deviation of x. Because Fusarium head blight symptoms are subject to high nursery to nursery fluctuations, standardization within individual nurseries achieved a nursery mean of 0 and a standard deviation of 1. Subsequently, the standardized values were presented graphically.

The Durum Wheat Cooperative Test entries were evaluated in inoculated disease nurseries near Glenlea to determine the response to leaf rust, stem rust, and loose smut. Fusarium head blight was assessed in inoculated nurseries near Carman, Glenlea, and Morden MB, Ottawa, ON, and Charlottetown, PEI. Inoculum composition for leaf rust, stem rust, and loose smut was as described above. Response to common bunt caused by *Tilletia laevis* Kuhn in Rabenh., and *T. tritici* (Bjerk.) G. Wint. in Rabenh., was assessed in a nursery grown near Lethbridge, using a mixture of prevalent races: T-1, T-6, T-13, T-19, L-1, and L-16 (Hoffmann and Metzger 1976, Gaudet and Puchalski 1989). Leaf spot reaction was determined based on natural infection at Saskatchewan and Manitoba locations.

A sample of grain of DT856 and the check cultivars from each location was submitted to the Canadian Grain Commission to determine grain grade and protein concentration. End-use suitability was determined on a composite sample made up from sites with grain samples representative only of the top durum wheat grades available. The quantity of grain from a

location was adjusted to achieve a final composite protein concentration approximating that of the average for the crop that year. A consistent quantity of grain within a location for all experimental lines was used to make up the composite each year. All end-use suitability analyses were performed by personnel at the Grain Research Laboratory, Canadian Grain Commission, Winnipeg, MB following protocols of the AACC (American Association of Cereal Chemists, 2000).

Performance

Averaged over three years of cooperative testing, the grain yield of AAC Congress was significantly higher than the checks AC Navigator and Strongfield in both Zone 1 and Zone 2 (Table 1). Averaged over zones, AAC Congress had days to maturity significantly later than Strongfield and significantly earlier than Brigade (Table 2). Averaged over both zones for two years, the test weight (kg hL^{-1}) of AAC Congress was within the range of the checks. The 1000-kernel weight (g) of AAC Congress was significantly lighter than AC Navigator and Brigade. AAC Congress had plant height significantly taller than AC Navigator and significantly shorter than Brigade. Straw strength was within the range of the checks. Grain protein concentration of AAC Congress was significantly less than Strongfield, and significantly more than Brigade (Table 3).

AAC Congress was resistant to leaf rust, stripe rust, and common bunt, moderately resistant to stem rust and loose smut, and moderately susceptible to leaf spot diseases (Table 4). The FHB rating and deoxynivalenol (DON) accumulation of AAC Congress was rated as moderately susceptible, whereas Strongfield and AC Navigator were rated as susceptible (Table 5). The standardized disease index and DON graphically places the cultivars (Fig 1a and 1b). The upper left hand segment represents below average disease index while having above average

DON accumulation. The upper right hand segment represents above average disease index while having above average DON accumulation. The lower right hand segment represents above average disease index while having below average DON accumulation. The lower left hand segment represents below average disease index while having below average DON accumulation. AAC Congress has lower DON than AC Navigator and Strongfield.

AAC Congress had low grain cadmium concentration similar to Strongfield (Table 6). The semolina yellow pigment concentration and pasta b* colour of AAC Congress was significantly higher than Strongfield.

Other Characteristics

SPIKES: strong glaucosity, parallel-sided in profile, dense, erect attitude; off-white at maturity; awns longer than spike, white at maturity.

KERNEL: colour amber; kernel size large, elliptical, short brush hairs.

LOWER GLUME: medium long length, medium width; glabrous.

LOWER GLUME SHOULDER: very narrow to narrow width; sloping to straight shape.

LOWER GLUME BEAK: short to medium length, slightly to moderately curved shape.

END-USE SUITABILITY: eligible for the grades of Canada Western Amber Durum wheat market class.

Maintenance and Distribution of Pedigreed Seed

The 105 Breeder Lines originated from random $F_{4:8}$ single plants of A0703-EP01 grown as 108 pre-Breeder Lines in 3 m long rows in isolation near Swift Current in 2013, and again as 15 m rows near Indian Head in 2014. Breeder Seed will be maintained by the Seed Increase Unit of the

Research Farm, Indian Head, SK, S0G 2K0. Distribution and multiplication of pedigreed seed stocks will be handled by Canterra Seeds, 201 - 1475 Chevrier Boulevard, Winnipeg, MB R3T 1Y7. www.canterra.com.

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Table 1. Grain yield (kg ha^{-1}) of AAC Congress and check cultivars in the Durum Cooperative Test, 2012-2014 in Zones[a] 1 and 2.

	2012			2013			2014			2013 – 2014			2012 – 2014		
	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean
AC Navigator	2138	3055	2780	3556	4540	4367	4045	3349	3490	3798	3955	3937	3220	3668	3551
Brigade				4891	5156	5108	5170	4173	4375	5031	4678	4751			
Strongfield	2934	3359	3232	4174	4816	4701	4896	3748	3978	4561	4283	4346	3997	3978	3970
AAC Cabri	3070	3822	3595	4619	4951	4891	5078	3874	4113	4849	4417	4507	4213	4236	4206
Mean of Checks	2714	3412	3202	4310	4866	4767	4797	3786	3989	4560	4333	4385	3967	4089	4043
AAC Congress	3410	3841	3712	4749	5256	5165	5045	3728	3993	4888	4504	4588	4396	4289	4295
$LSD^{b}_{0.05}$	472	383	308	670	245	241	770	356	334	647	321	294	348	266	234
No. of tests	3	7	10	2	9	11	2	8	10	4	17	21	7	24	31

[a] Zone 1 (Black Soils): Indian Head, Brandon, Souris (2012); Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon, Regina (2012), Lethbridge, Vulcan, Moose Jaw (2012-2013), Pense (2013-2014), Scott (2013-2014), Vanguard (2013-2014).
[b] Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Table 2. Agronomic characteristics of AAC Congress and check cultivars in the Durum Cooperative Test, 2012-2014.

	Days to maturity[a,b]			Test Weight (kg hL^{-1})[a]			1000-kernel	Height	Lodging
	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	wt(g)[a]	(cm)[a]	(1-9)[c]
AC Navigator	101.7	104.8	104.3	74.2	78.6	77.8	43.6	80.0	2.1
Brigade	102.5	106.9	106.1	76.0	79.5	78.9	42.7	103.7	2.1
Strongfield	99.5	103.4	102.8	76.2	78.4	78.0	41.2	94.7	2.8
AAC Cabri	101.2	105.0	104.3	77.0	79.2	78.8	40.1	97.7	3.1
AAC Congress	101.0	104.8	104.1	76.3	78.7	78.3	40.0	96.5	2.8
$LSD^{d}_{0.05}$	2.9	1.6	1.2	-	0.8	0.7	1.3	2.0	1.1
No. of tests	3	13	16	3	17	20	20	21	10

[a] Zone 1 (Black Soils): Indian Head, Brandon (2013).
Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon, Lethbridge, Vulcan, Moose Jaw (2013), Pense, Scott, Vanguard.
[b] All Zone 1 and Zone 2 locations except Stewart Valley (in Zone 2).
[c] Straw strength rated on a scale of 1 indicating that all plants in plot are erect to 9 indicating that all plants in a plot are lying horizontal. Regina (2012), Souris (2012), Swift Current (2014), Moose Jaw (2012), Saskatoon (2012 and 2014), Stewart Valley, Brandon (2013), Pense (2013-2014), Vanguard (2013-2014), Indian Head (2014).
[d] Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Table 3. Grain protein concentration (13.5% moisture basis) of AAC Congress and check cultivars measured on grain samples bulked across replications at each location of the durum cooperative test, 2012-2014 in Zones[a] 1 and 2.

	2012			2013			2014			2013-2014	2012-2014
	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Mean	Mean
AC Navigator	15.3	14.3	14.6	13.5	12.9	13.0	12.8	13.3	13.2	13.1	13.8
Brigade				12.7	12.7	12.7	12.8	13.0	12.9	12.9	
Strongfield	16.2	14.9	15.3	14.7	13.6	13.8	13.5	13.9	13.8	13.9	14.5
AAC Cabri	16.0	14.2	14.8	13.9	13.1	13.3	13.5	13.9	13.8	13.5	14.1
AAC Congress	15.9	14.4	14.8	13.4	13.0	13.1	14.1	13.8	13.8	13.4	14.1
$LSD^{b}_{0.05}$	0.9	0.6	0.5	1.2	0.4	0.4		0.6	0.6	0.4	0.3
No. of tests	3	7	10	2	9	11	1	8	9	20	30

[a] Zone 1 (Black Soils): Indian Head, Brandon (2012-2013), Souris (2012); Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley, Saskatoon, Regina (2012), Lethbridge, Vulcan, Moose Jaw (2012-2013), Pense (2013-2014), Scott (2013-2014), Vanguard (2013-2014).
[b] Least significant difference, $P \leq 0.05$, includes the appropriate genotype by environment interaction variation.

Table 4. Summary of disease reactions to stem rust, leaf rust, stripe rust, common bunt, loose smut, and leaf spots of AAC Congress and check cultivars grown in the Durum Cooperative test, 2012-2014.

		Stem rust				Leaf rust	Common Bunt		Loose smut		Leaf spot				Stripe rust			
		Garden[a]		Brandon							GL[f]		SC[f]		LB[f]		CT[f]	
	Year	Severity (%)[b]	Rating[c]	Severity (%)[b]	Rating[c]	Rating[c]	Incidence (%)[d]	Rating[c]	Incidence (%)[e]	Rating[c]	Infection response[g]	Rating[b]	Infection response	Rating	Severity (%)[h]	Infection response[i]	Severity (%)	Infection resonse[i]
AC Navigator	2012	30	I			R	0	R	44	I	12.2	I	10	S	1	VR		
	2013			5	MR	R	1	R	35	MR			9.3	MS	60	S	15	R
	2014			7	MR	R	1	R	7	R			9.8	S	5	R	15	
Brigade	2013			1	R	R	1	R	0	R			8.3	MS	15	R	15	R
	2014			7	MR	R	1	R	3	R			8.5	MS	25	MR	25	
Strongfield	2012	15	MR			R	2	R	33	MR	6.6	MR	7.8	I	3	R		
	2013			1	R	R	7	R	8	R			8.3	MS	15	R	5	R
	2014			1	R	R	1	R	11	MR			8.8	MS	5	R	5	
AAC Cabri	2012	25	MR			R	3	R	33	MR	2.6	R	8	I	0	VR		
	2013			1	R	R	4	R	14	R			7.8	I	10	R	5	R
	2014			10	MR	R	0	R	8	R			8.5	MS	20	MR	15	
AAC Congress	2012	20	MR			R	2	R	18	MR	7.4	MR	9.3	MS	0	VR		
	2013			1	R	R	8	R	0	R			9	MS	10	R	5	R
	2014			10	MR	R	4	MR	5	R			9.5	S	5	R	0	

[a] In 2012 the garden nursery was in Winnipeg and in Brandon in 2013 and 2014.
[b] Severity is a percentage of the stem infected with stem rust using the Modified Cobb Scale.
[c] Rating is the reaction type: VR, very resistant; R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[d] Percentage of spikes with common bunt symptoms.
[e] Percentage of plants with loose smut symptoms.
[f] GL, Glenlea; SC, Swift Current; LB, Lethbridge; CT, Creston.
[g] Adult plant, rated mid-grainfill at Swift Current McFadden scale (0=no symptoms, 11=severe symptoms) (McFadden 1991).
[h] Dominant pustule reaction of yellow rust;
[i] Categories: VR= very resistant, R= resistant, MR= moderately resistant, I= intermediate, MS= moderately susceptible, S=susceptible.

Table 5. Summary of response to *Fusarium* of AAC Congress and check cultivars grown in the Durum Cooperative Test, 2012-2014.

		Fusarium Head Blight										DON[c] (ppm)					ISD[a]					
		Carman		Glenlea		Morden		PLP[b]		PEI[b]	OT[b]						GL[b]		MD		CM	
	Year	Indx[d]	Rating[e]	Indx	Rating	Indx	Rating	Indx	Rating	Indx	Score[f] (0 - 100)	Glenlea	Carman	Morden	Ottawa	PEI[b]	Score	Rating[e]	Score	Rating[e]	Score	Rating[e]
AC Navigator	2012	66	S	10	I					40	85	34				1	33	S				
	2013	51	MS	9				21	MS	73	73				17	17						
	2014	56	S			89	S			49	90		42	118	19	87			74	S	28	S
Brigade	2012																					
	2013	23	MR	7				17	I	48	48				12	15						
	2014	19	I			16	R			46	37		30	101	5	47			62	S	20	S
Strongfield	2012	55	MS	12	I					45	90	13				2	22	I				
	2013	30	I	10				17	I	72	90				9	22						
	2014	40	MS			42	I			52	53		35	80	26	56			51	MS	24	S
AAC Cabri	2012	57	S	28	S					37	27	10				4	28	MS				
	2013	34	I	15				17	I	46	45				16	21						
	2014	32	MS			41	I			47	27		32	72	14	44			46	I	22	S
AAC Congress	2012	34	I	22	S					41	77	11				7	27	MS				
	2013	32	I	16				19	I	56	77				12	16						
	2014	30	I			33	MR			52	76		32	97	8	33			60	S	22	S

[a] ISD (incidence, severity, DON) calculated as (0.2*mean incidence) + (0.2*mean severity) + (0.6* DON) for a given entry.
[b] CM, Carman; GL, Glenlea; MD, Morden; PLP, Portage La Prairie, MB; OT, Ottawa, ON; PEI, Prince Edward Island.
[c] DON is deoxynivalenol.
[d] Fusarium head blight index: [(mean percent incidence x mean percent severity)/100].
[e] Rating: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[f] Score is based on a 1 to 100 scale of spikes infected with fusarium head blight.

Table 6. End-use suitability[a,b,c] measured on yearly composites of AAC Congress and check cultivars from 2012 to 2014 in the Durum Cooperative Test.

	FN (sec)	Test Weight ($kg.hL^{-1}$)	HVK (%)	Cd ($mg\ kg^{-1}$)	Milling yld (%)	Semo yld (%)	Semo ash (%)	Wht prot (%)	Semo prot (%)	GI (%)	P/L	W (ergs)	Semo YP ($mg\ kg^{-1}$)	Pasta colour b*	Pasta colour a*
AC Navigator	412	81.7	79.8	236	76.4	67.8	0.70	13.0	12.1	78	0.91	205	10.2	64.0	6.2
Brigade	375	81.8	73.5	70	74.7	65.9	0.66	12.6	11.6	97	0.94	264	10.3	64.8	3.9
Strongfield	365	81.7	82.2	80	75.0	66.3	0.63	13.8	12.8	70	0.76	183	9.2	62.9	4.7
AAC Cabri	393	82.3	84.6	65	75.6	66.7	0.65	13.5	12.4	67	0.52	162	10.3	65.5	5.3
AAC Congress	352	81.8	78.6	82	75.5	67.2	0.65	13.4	12.4	83	0.63	199	10.5	65.6	4.8
Std Dev[d]	5			0.001	0.4	0.4	0.006	0.06	0.05	3	0.04	6	0.04	0.3	0.1

[a] 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 8 to 9 locations each year.

[b] FN = Hagberg falling number; HVK = hard vitreous kernel; Cd = grain cadmium; Semo yld = semolina yield; Wht prot = wheat protein; GI = gluten index; P/L and W values determined through Alveograph; Semo YP = semolina yellow pigment; spectrophotometer colour b* = yellowness; a* = redness on the CIE scale.

[c] Means are from 2012, 2013 and 2014 durum composites.

[d] 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.

Figure captions

Figure 1a. Standardized disease index (13 data points) and DON (8 data points) of AAC Congress, AC Navigator, Strongfield and AAC Cabri from FHB nurseries at Carman, Glenlea, Morden, Portage La Prairie, MB, Ottawa, ON, and Charlottetown, PEI 2012 -2014. Source of data is in Table 5.

Figure 1b. Standardized disease index (9 data points) and DON (6 data points) of AAC Congress, AC Navigator, Brigade, Strongfield and AAC Cabri from FHB nurseries at Carman, Glenlea, Morden, Portage La Prairie, MB, Ottawa, ON, and Charlottetown, PEI 2013-2014. Source of data is in Table 5

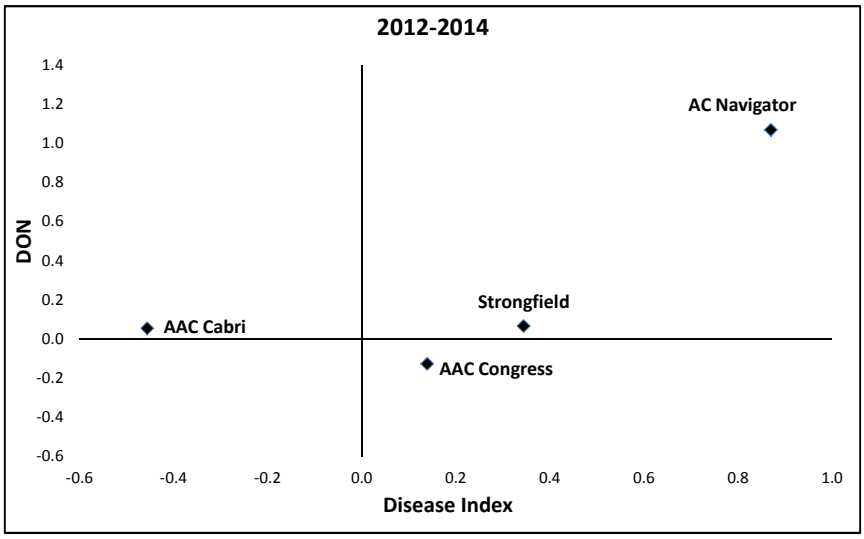

Fig. 1a

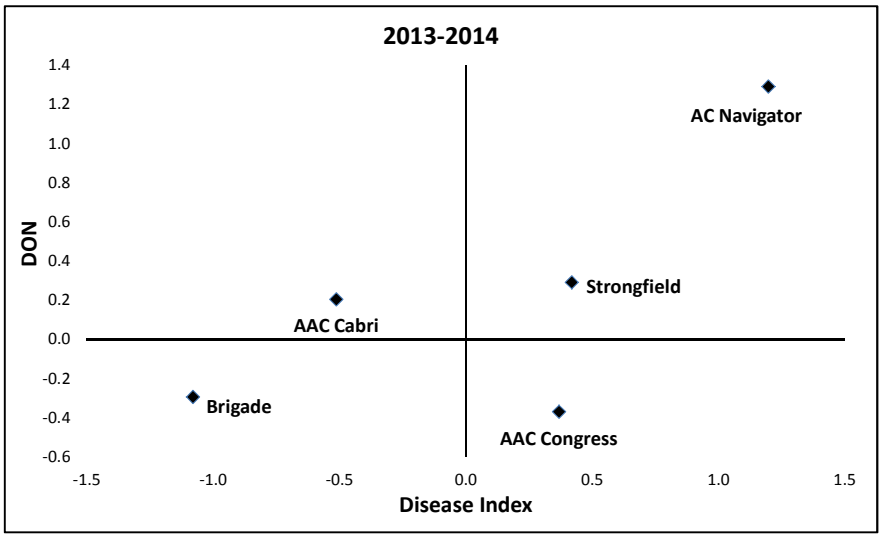

Fig. 1b