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CULTIVAR DESCRIPTION

AAC Spitfire durum wheat

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Abstract: AAC Spitfire durum wheat [*Triticum turgidum L.* subsp. *durum* (Desf.) Husn.] is adapted to the durum production area of the Canadian prairies. Averaged over four years, AAC Spitfire yielded significantly more grain than Strongfield, AC Avonlea, and AC Navigator, but the protein concentration was significantly lower than AC Avonlea and Strongfield. AAC Spitfire had significantly shorter and stronger straw than Strongfield. AAC Spitfire is eligible for grades of Canada Western Amber Durum, and it has low grain cadmium concentration and higher yellow pigment concentration than the check cultivars.

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

Résumé : La variété de blé dur [*Triticum turgidum L.* subsp. *durum* (Desf.) Husn.] AAC Spitfire est acclimatée aux régions des Prairies canadiennes où l'on cultive le blé dur. Les données moyennes de quatre ans indiquent qu'AAC Spitfire produit sensiblement plus de grains que Strongfield, AC Avonlea et AC Navigator, mais la teneur en protéines du grain est passablement plus faible que chez AC Avonlea et Strongfield. AAC Spitfire a une paille nettement plus courte et plus robuste que celle de Strongfield. AAC Spitfire est admissible aux catégories « blé dur ambré de l'Ouest canadien » et son grain renferme moins de cadmium et plus de pigment jaune que les cultivars témoins. [Traduit par la Rédaction]

Mots-clés : Triticum turgidum, blé dur, description de cultivar, rendement grainier, pigment jaune, cadmium.

Introduction

AAC Spitfire durum wheat 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 No. 14-8292 was granted on 29 Apr. 2014, and AAC Spitfire received registration No. 7566 from the Variety Registration Office, Canadian Food Inspection Agency, on 11 July 2014.

Pedigree and Breeding Method

AAC Spitfire (experimental names: DT844, A0457-RA01) was selected from the cross Sachem/Strongfield//DT757 made in 2004 at the Swift Current Research and Development Centre, Swift Current, SK. Sachem is a durum cultivar from France. Strongfield (Clarke et al. 2005*b*) is a Canadian durum cultivar selected from the cross AC Avonlea/DT665. DT757 derives from the cross AC Avonlea/3/Kyle/Nile//Durex. AC Avonlea (Clarke et al. 1998) and Kyle (Townley-Smith et al. 1987) are Canadian durum cultivars. The parents were haplotyped with the sequence characterized amplified region (SCAR) marker *scOPC20* linked to *Cdu1* controlling cadmium uptake (Knox et al. 2009). Sachem expressed the molecular variant for the *scOPC20* indicating the line likely expressed high cadmium uptake, and Strongfield and DT757 expressed a null molecular variant regularly associated with low cadmium uptake. The *scOPC20* marker was applied to top cross F_1 seedlings and only the homozygous nulls were grown to maturity in the greenhouse.

In the spring of 2005, approximately 8000 seeds of the F_2 generation were space planted in 10 cm intervals within a row in an irrigated epiphytotic field nursery near Swift Current. Genotypes susceptible to prevalent

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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: QTHST (C25), RHTSK (C20), RKQSR (C63), RTHJT (C57), TMRTK (C10), and TPMKR (C53) (Roelfs and Martens 1988; Fetch 2005). 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 515 selected plants were grown in 2 m long rows in a contra season nursery near Lincoln, New Zealand, in 2005–2006. Based on plant height, days to maturity, and straw strength, 313 rows were selected, and the rows were harvested individually to produce the seed used for agronomic and disease trials in Canada. In 2006, the 313 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. Concurrently, a portion of the F_4 seed was used for evaluation of lines to *Fusarium graminearum* Schwabe [teleomorph *Gibberella zeae* (Schwein. Petch)] in a *Fusarium* head blight (FHB) nursery near Portage la Prairie, MB (Gilbert and Woods 2006). The scoring for FHB was based on a scale of 1 (low FHB incidence and severity) to 9 (all spikes infected with >90% spikelets infected). Five spikes per F_4 line from within plots grown near Swift Current were selected for plant height, straw strength, and leaf spotting primarily from 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, 48 F_4 lines were selected.

In 2006–2007, 205 F_5 lines (from the 48 $F_{4:5}$ families × 5 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, 135 $F_{5:6}$ lines were grown in 2007 under dryland conditions near Swift Current, SK, Regina, SK, and Lethbridge, AB, and in an FHB disease nursery at Portage la Prairie, MB. Twenty genotypes were selected based on agronomic performance, disease resistance, and quality traits assessed as described for the F_4 generation.

Twenty F_7 genotypes were grown in the 2008 Durum A-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 A3 test were AC Avonlea, AC Morse, AC Navigator (Clarke et al. 2000), Commander (Clarke et al. 2005*a*), and Strongfield. Remnant seed from the yield trials 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 (%), when a significant differential reaction was observed among checks.

Three lines from the population designated A0457, including A0457-RA01, were tested in the 2009 Durum-B test in an alpha-lattice design with two replications and grown near Swift Current, Regina, Saskatoon, Floral, SK, Lethbridge, AB, and Brandon, MB, using the same check cultivars as in the 2008 Durum A3 test. 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 prepare a composite, using degrading factors as a consideration for suitability for inclusion in the composite, to assess the same end-use suitability parameters as in the Durum A-level test, by the Central Quality Lab, Cereal Research Centre, MB. This procedure identified the line A0457-RA01, which met all of the selection criteria at each stage of selection.

A0457-RA01 was advanced to the Durum Wheat Cooperative Test and evaluated as DT844 from 2010 to 2013. A fourth year of testing was necessitated due to excessively wet conditions and high disease pressure at all trial locations in 2010, resulting in the grain samples being unsuitable for assessment of end-use suitability. The Durum Wheat Cooperative Test was grown in four row plots at up to 12 locations annually in a 6 × 5 lattice design including five check cultivars, with two replications in two repetitions. The check cultivars were AC

Table 1. Grain yield (kg ha^{-1}) of AAC Spitfire and check cultivars in the Durum Wheat Cooperative Test, 2010–2013 in Zones 1[a] and 2.

	2010			2011			2012			2013			2010–2013		
	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 Avonlea	4466	3607	3895	4312	3700	3823	2947	3008	2991	4312	4363	4348	3963	3684	3768
AC Morse	4907	3746	4133	4245	3876	3949	2723	3352	3162						
AC Navigator	3635	3631	3633	3793	3667	3692	2138	3055	2780	3556	4540	4367	3190	3740	3599
Brigade										4891	5156	5108			
Commander	4307	3767	3943	4164	3940	3983	2794	3302	3152						
Strongfield	4658	3749	4053	4487	3886	4008	2934	3359	3232	4174	4816	4701	4046	3978	4007
Mean of checks	4395	3700	3931	4200	3814	3891	2707	3215	3063	4233	4719	4631	3733	3801	3791
AAC Spitfire	4593	4175	4318	4699	4206	4303	3315	3835	3677	5216	5019	5053	4355	4329	4341
$LSD_{0.05}$[b]	446	339	280	908	208	231	473	383	309	670	246	241	332	204	188
No. of tests	3	6	9	2	8	10	3	7	10	2	9	11	10	30	40

[a]Zone 1 (Black Soils): Indian Head (2011–2013), Souris (2010–2012), Brandon (2010, 2012, and 2013), Langdon (2010); Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley (2011–2013), Saskatoon, Regina (2010–2012), Lethbridge, Vulcan, Moose Jaw, Pense (2013), Scott (2011 and 2013), Vanguard (2013).
[b]Appropriate LSD to make comparisons of AAC Spitfire to AC Avonlea, AC Navigator, Strongfield, $P \leq 0.05$, includes the appropriate genotype by environment interaction.

Avonlea (grown from year 2010 to 2013), AC Morse (2010–2012), AC Navigator (2010–2013), Commander (2010–2012), Strongfield (2010–2013), and Brigade (2013) (Clarke et al. 2009). 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, SAS Institute Inc. 2003) was used to analyze the data annually and to perform a combined analysis over years, using a mixed model with environments and replications considered as random effects and genotypes considered as 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 Durum Wheat Cooperative Test entries were evaluated in inoculated nurseries near Glenlea, MB to determine the response to leaf rust, stem rust, and loose smut. *Fusarium* head blight was assessed in inoculated nurseries near Carman and Glenlea, MB, Ottawa, ON, and Charlottetown, PEI. Inoculum composition for leaf and 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.

Performance

In four years of cooperative testing, the grain yield of AAC Spitfire was significantly higher than the checks AC Avonlea, AC Navigator, and Strongfield (Table 1). AAC Spitfire had significantly higher grain yield than AC Avonlea and AC Navigator in both Zone 1 and Zone 2. AAC Spitfire had significantly higher grain yield than Strongfield in Zone 2. Averaged over zones, AAC Spitfire had days to maturity within the range of the checks and was significantly earlier than Brigade (Table 2). Averaged over both zones, the test weight (kg hL^{-1}) of AAC Spitfire was significantly heavier than AC Morse and Commander. The 1000 kernel weight (g) of AAC Spitfire was significantly larger than AC Avonlea and AC Morse, but similar to the other checks. AAC Spitfire had plant height significantly shorter than AC Avonlea, Brigade, and Strongfield, while being significantly taller than AC Navigator. Straw strength was significantly stronger than Strongfield. Grain protein concentration of AAC Spitfire was significantly less than AC Avonlea and Strongfield (Table 3).

AAC Spitfire was resistant to leaf rust, stem rust, stripe rust, and common bunt, and moderately susceptible to loose smut and leaf spots (Table 4). The FHB reaction and deoxynivalenol (DON) accumulation of AAC Spitfire was rated as susceptible (Table 5).

Table 2. Agronomic characteristics of AAC Spitfire and check cultivars in the Durum Wheat Cooperative Test, 2010–2013.[a]

	Days to maturity[b]			Test weight[a] (kg hL^{-1})			1000 Kernel weight[a] (g)	Height[a] (cm)	Lodging[c] (1–9)
	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean			
AC Avonlea	97.1	107.6	105.3	74.6	77.9	77.0	40.4	92.2	2.3
AC Morse	97.1	107.4	105.1	73.6	77.7	76.5	40.6	89.3	1.6
AC Navigator	97.5	108.5	106.1	73.2	79.0	77.4	43.6	79.6	2.3
Brigade	98.9	109.1	106.8	76.1	80.0	78.9	42.4	100.2	2.0
Commander	98.0	107.9	105.7	73.3	78.0	76.7	43.8	78.7	1.9
Strongfield	97.0	107.3	105.0	75.4	79.2	78.1	41.3	90.8	2.8
AAC Spitfire	97.3	107.6	105.3	75.2	78.6	77.7	42.1	88.9	1.7
$LSD_{0.05}$[d]	1.0	0.7	0.6	1.1	0.7	0.7	1.0	1.5	0.8
$LSD_{0.05}$[e]	1.1	0.8	0.6	1.2	0.7	0.7	1.1	1.6	0.8
$LSD_{0.05}$[f]	1.6	1.0	0.8	1.8	1.0	1.0	1.4	2.4	1.2
No. of tests	7	25	32	10	30	40	40	40	15

[a]Zone 1 (Black Soils): Indian Head (2011–2013), Souris (2010–2012), Brandon (2010, 2012, and 2013), Langdon (2010); Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley (2011–2013), Saskatoon, Regina (2010–2012), Lethbridge, Vulcan, Moose Jaw, Pense (2013), Scott (2011 and 2013), Vanguard (2013).

[b]All Zone 1 and Zone 2 locations, except Langdon (Zone 1), Souris in 2010 and 2011, and Stewart Valley (in Zone 2).

[c]Regina (2010–2012), Souris (2010 and 2012), Swift Current (2010), Moose Jaw (2011–2012), Saskatoon (2011–2012), Stewart Valley (2012–2013), Brandon (2013).

[d]Appropriate LSD to make comparisons of AAC Spitfire to AC Avonlea, AC Navigator, Strongfield, $P \leq 0.05$, includes the appropriate genotype by environment interaction.

[e]Appropriate LSD to make comparisons of AAC Spitfire to AC Morse, Commander, $P \leq 0.05$, includes the appropriate genotype by environment interaction.

[f]Appropriate LSD to make comparisons of AAC Spitfire to Brigade, $P \leq 0.05$, includes the appropriate genotype by environment interaction.

Table 3. Grain protein concentration (13.5% moisture basis) of AAC Spitfire and checks measured on grain samples bulked across replications at each location from the Durum Wheat Cooperative Test 2010–2013.[a]

	Protein concentration (%)												
	2010			2011			2012			2013			4 yr mean
	Zone 1[a]	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	
AC Avonlea	15.4	13.3	13.8	15.8	12.5	13.2	16.1	15.2	15.5	13.3	13.9	13.8	14.3
AC Morse	14.2	12.7	13.1	15.3	12.4	13.0	15.4	14.1	14.5				
AC Navigator	14.7	12.5	13.1	14.5	12.0	12.5	15.3	14.3	14.6	13.5	12.9	13.0	13.5
Brigade										12.7	12.7	12.7	
Commander	14.8	12.8	13.3	14.9	11.8	12.4	14.9	14.3	14.5				
Strongfield	15.8	13.4	14.0	15.4	12.4	13.0	16.2	14.9	15.3	14.7	13.6	13.8	14.2
Mean of checks	15.0	12.9	13.5	15.2	12.2	12.8	15.6	14.6	14.9	13.6	13.3	13.3	14.0
AAC Spitfire	15.7	13.1	13.8	15.3	12.0	12.7	15.8	14.3	14.7	13.4	13.2	13.2	13.8
$LSD_{0.05}$[b]	0.9	0.5	0.4	0.9	0.4	0.4	0.9	0.6	0.5	1.2	0.4	0.4	0.3
No. of tests	3	6	8	2	8	10	3	7	10	2	9	11	39

[a]Zone 1 (Black Soils): Indian Head (2011–2013), Souris (2010–2012), Brandon (2010, 2012, and 2013), Langdon (2010); Zone 2 (Brown and Dark Brown Soils): Swift Current, Stewart Valley (2011–2013), Saskatoon, Regina (2010–2012), Lethbridge, Vulcan, Moose Jaw, Pense (2013), Scott (2011 and 2013), Vanguard (2013).

[b]Appropriate LSD to make comparisons of AAC Spitfire to AC Avonlea, AC Navigator, Strongfield, $P \leq 0.05$, includes the appropriate genotype by environment interaction.

AAC Spitfire has low grain cadmium concentration similar to Strongfield (Table 6). The semolina yellow pigment concentration, pasta b* colour of AAC Spitfire was desirably high relative to the checks.

Other Characteristics

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

Table 4. Summary of disease reactions to stem rust, leaf rust, stripe rust, common bunt, loose smut, leaf spots, and common root rot of AAC Spitfire and check cultivars grown in the Durum Wheat Cooperative Test, 2010–2013.

		Stem rust		Leaf rust[a]	Common bunt		Loose smut		Leaf spot				Stripe rust				Common root rot
									GL[b,c]		SC[c,d]		LB[b,c]		CT[b,c]		
	Year	Rtn[b]	Rxn[a]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]	Rxn[a]	Rtn[b]
AC Avonlea	2010	3	R	R	20	MS	51	I	10.0	R	7.3	I					0
	2011	20	MR	R	1	MR	27	MR	37.0	MS	7.8	I	25	I			—
	2012	20	MR	R	1	R	37	MR	4.6	R	8.5	MS	4	R			—
	2013	5	MR	R	3	R	19	MR			8.0	I	5	R	25	MR	
AC Morse	2010	1	R	R	7	MR	56	MS	19.0	MR	9.7	S					14
	2011	10	MR	R	2	MR	70	MS	39.3	MS	7.5	I	12	R			—
	2012	10	MR	R	0	R	69	MS	3.4	R	9.8	S	3	R			—
	2013																
AC Navigator	2010	2	R	R	2	R	29	MR	36.0	MS	8.5	MS					14
	2011	5	R	R	0	R	15	R	49.7	S	7.8	I	12	R			—
	2012	30	I	R	0	R	44	I	12.2	I	10.0	S	1	VR			—
	2013	5	MR	R	1	R	35	MR			9.3	MS	60	S	15	R	
Brigade	2013	1	R	R	1	R	0	R			8.3	MS	15	R	15	R	
Commander	2010	2	R	R	1	R	41	I	28.0	I	7.7	I					7
	2011	1	R	R	0	R	9	R	41.0	S	7.8	I	16	R			—
	2012	5	R	R	1	R	71	MS	13.0	I	9.5	S	3	R			—
Strongfield	2010	2	R	R	2	R	52	I	17.0	MR	7.7	I					10
	2011	1	R	R	2	MR	26	MR	43.3	S	7.3	I	14	R			—
	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	
AAC Spitfire	2010	2	R	R	12	I	69	MS	38.3	MS	8.8	MS					11
	2011	1	R	R	0	R	16	MR	30.3	MS	8.0	I	16	MR			—
	2012	15	MR	R	1	R	74	MS	4.7	R	8.8	MS	0	VR			—
	2013	1	R	R	3	R	21	MR			8.5	MS	15	R	45	MS	

[a]Rxn, Reaction type; VR, very resistant; R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible; checks and AAC Spitfire had 0% leaf rust infection in all four years.

[b]Rtn, rating as % infection.

[c]GL, Glenlea; SC, Swift Current; LB, Lethbridge; CT, Creston.

[d]Adult plant, rated mid-grainfill at Swift Current McFadden scale (0 = no symptoms and 11 = severe symptoms; McFadden 1991).

Table 5. Summary of response to *Fusarium* of AAC Spitfire and check cultivars grown in the Durum Wheat Cooperative Test, 2010–2013.

		Fusarium head blight													
		Carman		Glenlea		Portage		PEI (Indx[a])		Ottawa	DON (ppm)			ISD[c]	
	Year	Indx[a]	Rxn[b]	Indx[a]	Rxn[b]	Indx[a]	Rxn[b]	Early	Late	Indx[a]	Glenlea	Ottawa	PEI	Score	Rxn[b]
AC Avonlea	2010	65	S	38	S			86	100	98	41				
	2011			17	MS			55	95	62	5			5.0	MS
	2012	34	I	23	S			60		83	11		3	24.6	S
	2013	49	MS	11		21	MS	69		90		7	17		
AC Morse	2010	68	S	21	I			75	98	54	38				
	2011			25	S			54	90	80	11			7.5	S
	2012	55	MS	24	S			41		88	29		3	37.3	S
AC Navigator	2010	59	S	43	S			71	99	90	40				
	2011			21	S			54	100	83	11			7.8	S
	2012	66	S	10	I			40		85	34		1	33.2	S
	2013	51	MS	9		21	MS	73		73		17	17		
Brigade	2013	23	MR	7		17	I	48		48		12	15		
Commander	2010	61	S	59	S			82	98	53	52				
	2011			15	S			27	88	58	14			8.4	S
	2012	79	S	26	S			47		72	43		2	48.9	S
Strongfield	2010	61	S	44	S			80	91	72	49				
	2011			15	I			31	80	73	8			5.9	MS
	2012	55	MS	12	I			45		90	13		2	21.8	I
	2013	30	I	10		17	I	72		90		9	22		
AAC Spitfire	2010	65	S	48	S			62	93	40					
	2011			16	MS			18	75	10				6.6	S
	2012	32	I	11	I			45		17			6	25.3	S
	2013	34	I	10		16	I	69				11	17		

[a]*Fusarium* head blight index: [(percent incidence × percent severity)/100].
[b]Rxn, reaction type; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[c]ISD (incidence, severity, DON) is calculated as 0.3 × Avg incidence + 0.3 × Avg severity + 0.4 × Avg DON for a given entry.

Table 6. End-use suitability[a,b,c] measured on yearly composite samples of AAC Spitfire and check cultivars evaluated from 2011 to 2013 in the Durum Cooperative Test.

	Cd	FN	Test weight	HVK	Milling	Semo	Semo	Wht	Semo	GI		W	Semo	Pasta colour 85 °C	
	(mg kg^{-1})	(sec)	(kg hL^{-1})	(%)	Yld (%)	Yld (%)	Ash (%)	Prot (%)	Prot (%)	(%)	P/L	(ergs)	YP (mg kg^{-1})	b*	a*
AC Avonlea	0.21	437	82.5	88.7	75.4	67.7	0.68	13.9	13.0	17	0.37	92	9.08	65.6	4.8
AC Navigator	0.22	457	82.7	85.5	76.5	68.2	0.69	12.9	12.0	64	0.84	185	9.96	66.1	6.3
Strongfield	0.08	432	82.9	91.6	75.6	67.1	0.63	13.7	12.6	58	0.62	164	9.14	64.7	4.9
Mean of Checks	0.17	442	82.7	88.6	75.8	67.7	0.67	13.5	12.5	46	0.61	147	9.39	65.5	5.3
AAC Spitfire	0.08	438	81.8	87.7	75.0	66.5	0.67	13.1	12.1	60	0.40	146	12.23	68.7	6.5
Std. Dev.[d]	0.001	5			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 8–9 locations each year.

[b]Cd, grain cadmium concentration; FN, Hagberg falling number; sec, seconds; HVK, hard vitreous kernel; Yld, yield; Semo Yld, semolina yield; Wht Prot, wheat protein; Semo Prot, semolina protein; GI, gluten index. Alveograph parameters: P, air pressure; L, extensibility; W, deformation energy; YP, yellow pigment; spectrophotometer colour b* = yellowness; a* = redness on the International Commission on Illumination CIE scale. Wheat protein and semolina protein are expressed on a 13.5% moisture basis.

[c]Means are from 2011, 2012, and 2013 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.

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

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

LOWER GLUME SHOULDER: narrow width; strongly elevated with second point present to elevated shape.

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

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

Maintenance and Distribution of Pedigreed Seed

The 86 Breeder Lines originate from random $F_{4:9}$ single plants of A0457-RA01 grown as 108 pre-Breeder-Lines in 3 m long rows in isolation near Swift Current, SK in 2011, and again as 15 m rows near Indian Head, SK in 2012 and 2013. Breeder Seed will be maintained by the Seed Increase Unit of the Research Farm, Indian Head, SK S0G 2K0, Canada. Distribution and multiplication of pedigreed seed stocks will be handled by SeCan, 400-300 Terry Fox Drive, Kanata, ON K2K 0E3, Canada (https://www.secan.com/).

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