NRC Research Press

CULTIVAR DESCRIPTION

AAC Goldrush hard red winter wheat

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Abstract: AAC Goldrush is a hard red winter wheat (*Triticum aestivum* L.) cultivar eligible for grades of Canada Western Red Winter wheat. It was developed using a modified pedigree breeding method. AAC Goldrush was tested in replicated trials across western Canada for 6 yr: 2 yr for initial characterization followed by 4 yr of evaluation in registration trials. Based on 41 station–years of registration trial data, AAC Goldrush yielded significantly more grain than CDC Buteo and was similar to Flourish, Moats, and AAC Elevate. AAC Goldrush expressed very good winter survival, intermediate maturity, medium height straw with good lodging resistance, and average size kernels. Disease ratings at the time of registration were resistant to the prevalent races of leaf rust, moderately resistant to stem rust, intermediate in resistance to stripe rust and *Fusarium* head blight, and susceptible to common bunt. Leaf spot reactions were similar to the best check. The grain yield, agronomic characteristics, and disease resistance attributes of AAC Goldrush make it particularly well-suited to the eastern Prairie region of western Canada where CDC Buteo has been popular.

Key words: Triticum aestivum L., wheat (winter), cultivar description, grain yield, disease resistance, cold tolerance.

Résumé : AAC Goldrush est une variété de blé de printemps (*Triticum aestivum* L.) roux vitreux admissible aux classes « blé rouge d'hiver de l'Ouest canadien ». Le cultivar a été créé au moyen d'une méthode d'hybridation généalogique modifiée. La variété a été testée pendant six ans dans le cadre d'essais répétés, dans l'Ouest canadien, soit deux années pour la caractérisation initiale et quatre pour l'évaluation lors des essais d'homologation. Selon les 41 années–stations de données obtenues au moment de l'homologation, AAC Goldrush produit sensiblement plus de grain que CDC Buteo et son rendement ressemble à celui de Flourish, Moats et d'AAC Elevate. AAC Goldrush se caractérise par une très bonne survie à l'hiver, une précocité moyenne, une paille de hauteur moyenne qui résiste bien à la verse et des grains de calibre moyen. Lors de l'homologation, la variété résistait aux races courantes de la rouille des feuilles, résistait modérément à la rouille de la tige et à la rouille jaune ainsi qu'à la brûlure de l'épi causée par *Fusarium*, et était sensible à la carie. AAC Goldrush a réagi de la même façon que les meilleurs témoins à la tache foliaire. Le rendement grainier, les propriétés agronomiques et la résistance à la maladie d'AAC Goldrush indiquent que ce cultivar est particulièrement bien adapté à l'est de la région des Prairies, dans l'Ouest canadien, où CDC Buteo est populaire. [Traduit par la Rédaction]

Mots-clés : Triticum aestivum L., blé (d'hiver), description de cultivar, rendement grainier, résistance à la maladie, tolérance au froid.

Introduction

AAC Goldrush hard red winter wheat (*Triticum aestivum* L.) was developed at the Agriculture and Agri-Food Canada (AAFC) Lethbridge Research and Development Centre (LeRDC) in Lethbridge, AB. Tested as LL430 and W526, registration no. 8130 was granted by the Variety Registration Office, Plant Production Division, Canadian Food Inspection Agency on

Received 24 May 2017. Accepted 6 September 2017.

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*B.L. Beres currently serves as a Co-Editor-in-Chief; peer review and editorial decisions regarding this manuscript were handled by C.J. Willenborg.

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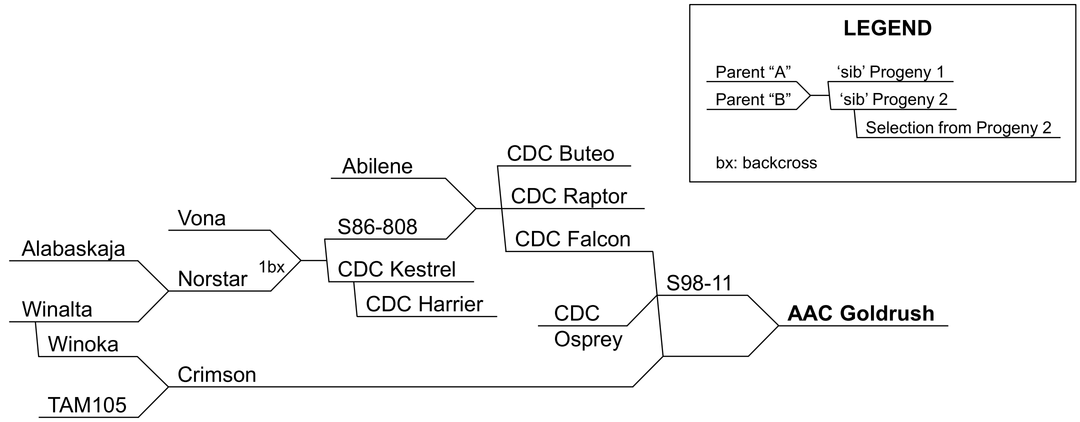
Fig. 1. Expanded ancestry of AAC Goldrush hard red winter wheat.



30 Nov. 2016. Application no. 16-9033 for Plant Breeders' Rights has been accepted for filing under the provisions set forth under the UPOV91 convention.

AAC Goldrush is well-adapted to western Canadian growing conditions, particularly in the eastern Prairie stem rust hazard region of Saskatchewan and Manitoba where CDC Buteo has been popular. The end-use quality profile of AAC Goldrush meets the specifications of the Canada Western Red Winter (CWRW) wheat class.

Pedigree and Breeding Methods

Early generation development and evaluation

AAC Goldrush originates from the cross S98-11//Crimson/CDC Falcon made in 2004 at the LeRDC, AAFC, in Lethbridge. S98-11 is a line developed at the Crop Development Centre, University of Saskatchewan, in Saskatoon, SK, with CDC Falcon/CDC Osprey parentage and tested in the Central Winter Wheat Cooperative Registration Trials from 2002 to 2004 (Fowler 1997, 1999). Crimson is a cultivar released by South Dakota State University, Brookings, SD, in 1997 that has Winoka/TAM105 parentage (Haley et al. 1998). An expanded ancestry of AAC Goldrush is shown in Fig. 1.

Following growth of the F_1 seeds in a greenhouse, about 2000 F_2 plants were grown in several sparsely seeded bulk plots at Lethbridge in 2006, from which 97 spikes were selected and planted as F_3 rows. In 2007, 87 spikes were selected from desirable rows based on winter survival, plant type and vigour, plant height, and straw strength. Each spike was planted as a row in an inoculated stem rust (*Puccinia graminis* Pers.: Pers. f. sp. *tritici* Eriks. & E. Henn.) and leaf rust (*P. triticina* Eriks.) nursery on the University of Manitoba campus in Winnipeg, MB; 92 spikes were selected from 50 resistant rows in 2008 and planted as $F_{4:5}$ observation rows in Lethbridge. In 2009, 38 rows were harvested and seeded in single-replicate preliminary trials in Lethbridge as well as the stem and leaf rust nursery in Winnipeg and a cold-tolerance screening nursery in Scott, SK. Promising agronomic characteristics, stem and leaf rust resistance, and initial end-use quality evaluation prompted replicated, multi-location testing of five lines in 2011 and two lines in 2012. Further examination of winter survival and resistance to stem rust, leaf rust, stripe rust (*P. striiformis* Westend.), *Fusarium* head blight (FHB) {caused by *Fusarium graminearum* Schwabe [teleomorph *Gibberella zeae* (Schwein.) Petch]}, and common bunt [*Tilletia tritici* (Bjerk.) Winter in Rabenh. and *T. laevis* Kühn in Rabenh.] was also conducted in one or both years. Following 10 site–years of replicated field tests across western Canada and 2 yr of full end-use quality analysis, a line designated LL430 entered the Western Canadian Winter Wheat Cooperative (WWWC) registration trial as W526 and was evaluated over 3 yr for registration purposes (2012/2013–2014/2015), plus one additional year (2015/2016).

Assessment for production and processing

The suitability of AAC Goldrush for commercial cultivation and end-use processing was assessed relative to CDC Buteo (Fowler 2010), Flourish (Graf et al. 2012), Moats (Fowler 2012), and AAC Elevate (Graf et al. 2015) in the WWWC registration trial grown across western Canada for 4 yr. The WWWC registration trial usually consists of 36 entries [4 CWRW checks, 3 Canada Western Special Purpose (CWSP) checks, 29 experimental lines] arranged as a 6 × 6 partially balanced lattice with three replicates grown at 13–15 locations per year. Testing in Alberta (Beaverlodge, Lacombe, Lethbridge "dry land", Lethbridge "irrigated", Lethbridge "evergreen", Olds, Warner), Saskatchewan (Indian Head, Kamsack, Melfort, Saskatoon, Swift Current), and Manitoba (Brandon, Carman, Portage la Prairie, Winnipeg) was accomplished through the collaborative efforts of AAFC, Alberta Agriculture and Forestry, the University of Manitoba, and Canterra Seeds Ltd. Analyses of variance were conducted using a combined mixed effects model where environments (years × locations) were considered random and genotypes were fixed. The least significant difference (LSD) test was used to identify significant differences from the check cultivars.

During registration testing, reactions to the major winter wheat diseases of economic importance in both the eastern and western prairies was assessed by AAFC, the University of Manitoba, and the agronomic trial collaborators when differential responses for various pathogens were observed. Supplementary checks were added as required to aid in making accurate assessments. The adult plant reactions to stem and leaf rust were determined in artificially inoculated field nurseries conducted by the University of Manitoba in Winnipeg using race composites supplied by the AAFC Cereal Research Centre, and reported using the modified Cobb scale (Peterson et al. 1948). The stem rust races used for one or more years included: MCCFR (P0001), QTHJT (P0005), RHTSK (P0002), RKQSR (P0003), RTHJT (P0007), TMRTK (P0006), and TPMKR (P0004) (Fetch et al. 2015). The leaf rust races were a representative mixture collected in western Canada during the previous field season (McCallum et al. 2013, 2016). Seedling reactions to individual races of stem and leaf rust prevalent in Canada were also determined under controlled-environment conditions. The races of stem rust were the same as those used in the field nurseries, whereas the leaf rust races used for one or more years included MBDS (12-3), MBRJ (128-1), MGBJ (74-2), TDBG (06-1-1), TJBJ (77-2), and TDBG (11-180-1). Stripe rust and common bunt reactions were rated in nurseries at LeRDC, AAFC. Both natural infection and artificial inoculation using spores collected in the previous year were used to promote localized stripe rust epiphytotics (Puchalski and Gaudet 2011). Common bunt resistance was estimated by inoculating seed with a race composite that included L1, L16, T1, T6, T13, and T19 (Hoffman and Metzger 1976; Gaudet and Puchalski 1989) prior to planting into cool soil at two locations in October. *Fusarium* head blight response was determined in a three-replicate, mist-irrigated field nursery conducted by the University of Manitoba in Carman. Each line was spray-inoculated twice, first at 50% anthesis and then 3–4 d later, with a 50 000 macroconidia mL^{-1} suspension of *F. graminearum* that included equal quantities of two 3-acetyldeoxynivalenol (3-ADON) and two 15-ADON producing chemotypes. Symptoms were typically well developed 18–21 d after anthesis and rated using a visual index (% incidence × % severity/100 (Gilbert and Woods 2006; Cuthbert et al. 2007). A 50-g grain sample from each inoculated row was used to determine the percentage of *Fusarium*-damaged kernels (FDK) and the deoxynivalenol (DON) content using enzyme-linked immunosorbent assays (Sinha et al. 1995; Sinha and Savard 1996). The reactions to powdery mildew [*Blumeria graminis* (DC.) Speer] and unspecified leaf spots, which may have included tan spot [*Pyrenophora tritici-repentis* (Died.) Drechs.], leaf blotch complex [*Zymoseptoria tritici* (Desm.) Quaed. and Crous and *Stagonospora nodorum* (Berk.) Castell. & Germano], and physiological leaf spot, were recorded at agronomic test sites expressing differential symptoms.

In 2013 and 2015, end-use quality analyses were conducted at the Grain Research Laboratory (GRL), Canadian Grain Commission (CGC), Winnipeg, MB, using protocols of the American Association of Cereal Chemists (2000). Following CGC determination of grain grade and protein concentration for the check cultivars at the agronomic test locations with statistically acceptable grain yield data, a common site blending formula for the checks and all experimental lines was provided so as to produce composite samples where the mean protein concentration of the checks was approximately 12.5%. Grain from test sites with serious down-grading factors was not included in the quality composites. In 2014, quality analyses were not conducted due to severe preharvest sprouting and insufficient quantities of grain from acceptable sites to create sufficiently large composite samples of reliable quality. Preregistration trial data generated in 2011 and 2012 by the AAFC Cereal Quality Laboratory relative to several common checks were considered with the request for registration in early 2016.

Performance

Grain yield and agronomics

The agronomic performance of AAC Goldrush, relative to the approved check cultivars for the CWRW wheat class (CDC Buteo, Flourish, Moats, AAC Elevate), was established from data collected at 41 sites over 4 yr across the Canadian prairies. Data for CDC Falcon, a predominant winter wheat cultivar in the eastern prairies from 2002 to 2013 and check for the CWSP wheat class, are also reported but not considered in the discussion.

The overall mean grain yield of AAC Goldrush across western Canada over 4 yr was 102.9% of the CWRW check mean (NS) (Table 1). Relative to specific checks, AAC Goldrush produced significantly more grain ($p \leq 0.05$) than CDC Buteo (107.2%) and was similar to Flourish (102.1%), Moats (102.3%), and AAC Elevate (100.4%). On a regional basis, AAC Goldrush displayed superior grain yield to CDC Buteo and AAC Elevate in the eastern prairie rust-hazard region (Zone 4) ($p \leq 0.05$), but differences from the checks were not significant in southern Alberta (Zone 1), the parkland region (Zone 2), and the semi-arid prairie site (Zone 3). Provincially, AAC Goldrush produced more grain than the checks in both Saskatchewan and Manitoba. The responses in Saskatchewan were significant except from AAC Elevate; in Manitoba, no differences were significant. In Alberta, AAC Goldrush was marginally superior over CDC Buteo and similar to marginally lower yielding than the remaining checks ($P \leq 0.058$).

AAC Goldrush exhibited excellent winter survival that was within the range of the check cultivars (Table 2).

Table 1. Grain yield of AAC Goldrush and the check cultivars (t ha^{-1} and percent of check mean, %CK), Western Canadian Winter Wheat Cooperative registration trials (2013–2016).

Cultivar	2013	2014	2015	2016	Grand mean t ha^{-1}	Grand mean % check	Alberta t ha^{-1}	Alberta % check	Saskatchewan t ha^{-1}	Saskatchewan % check	Manitoba t ha^{-1}	Manitoba % check	Zone 1[a] t ha^{-1}	Zone 1[a] % check	Zone 2[a] t ha^{-1}	Zone 2[a] % check	Zone 3[a] t ha^{-1}	Zone 3[a] % check	Zone 4[a] t ha^{-1}	Zone 4[a] % check
CDC Buteo	5.42	5.61	4.31	4.85	4.98	96	4.86	93	4.69	97	5.61	101	4.58	93	5.17	95	4.56	97	5.26	99
Flourish	5.82	5.76	4.50	5.10	5.23	101	5.36	102	4.76	99	5.56	100	5.15	104	5.35	98	4.60	98	5.35	101
Moats	5.64	5.72	4.77	4.99	5.22	101	5.29	101	4.82	100	5.63	101	4.83	98	5.67	104	4.77	101	5.38	101
AAC Elevate	5.93	5.48	4.51	5.49	5.32	103	5.44	104	5.02	104	5.46	98	5.20	105	5.68	104	4.91	104	5.29	99
CDC Falcon	5.42	5.65	4.44	5.18	5.11	98	5.22	100	4.68	97	5.43	98	4.95	100	5.37	98	4.68	99	5.17	97
CWRW check mean[b]	5.70	5.64	4.52	5.11	5.19	100	5.24	100	4.82	100	5.56	100	4.94	100	5.47	100	4.71	100	5.32	100
AAC Goldrush	6.25	5.57	4.43	5.26	5.34	103	5.15	98	5.37	111	5.71	103	4.92	100	5.38	98	4.93	105	5.72	108
LSD ($p \le 0.05$)	0.517	0.279	0.410	0.433	0.229	—	0.294	—	0.501	—	0.425	—	0.378	—	0.421	—	1.103	—	0.397	—
No. of tests	11	7	12	11	41	—	20	—	12	—	9	—	13	—	9	—	3	—	16	—

Note: All means are weighted by the number of tests. LSD, least significant difference, includes variation from the appropriate genotype by environment interaction.
[a]Zone 1, Southern Alberta sites (Lethbridge "dry land", Lethbridge "irrigated", Lethbridge "evergreen" (dry land + foliar fungicide), Warner); Zone 2, Parkland sites (Beaverlodge, Lacombe, Melfort, Olds); Zone 3, Semi-arid prairie site (Swift Current); Zone 4, Eastern prairie rust-hazard sites (Brandon, Carman, Indian Head, Kamsack, Portage la Prairie, Saskatoon, Winnipeg).
[b]CDC Falcon was not a CWRW wheat check and is therefore not included in the mean and percent of check calculation.

Heading date was later than all of the checks, ranging from 3 d later than Flourish to 1 d later AAC Elevate ($p \le 0.05$). Maturity was equal to all of the checks except Flourish, which was 2 d earlier maturing ($p \le 0.05$). AAC Goldrush was similar in height to AAC Elevate, 5–6 cm shorter than CDC Buteo and Moats, and 5 cm taller than Flourish ($p \le 0.05$). Lodging resistance was superior to CDC Buteo and Moats, similar to Flourish, but inferior to AAC Elevate ($p \le 0.05$). The test weight of AAC Goldrush was within the range of the checks. Kernel weight was higher than CDC Buteo and Moats, and lower than Flourish and AAC Elevate ($p \le 0.05$). The grain protein concentration of AAC Goldrush was within the range of the checks, higher than CDC Buteo and AAC Elevate ($p \le 0.05$), similar to Flourish, and lower than Moats ($p \le 0.05$). Grain protein yield per hectare was greater than CDC Buteo ($p \le 0.05$) and similar to Flourish, Moats, and AAC Elevate.

Disease and pest resistance

Three years of disease ratings (2013–2015) for AAC Goldrush were summarized by the Prairie Recommending Committee for Wheat, Rye and Triticale (PRCWRT) Disease Evaluation Team as follows: resistant to leaf rust, moderately resistant to stem rust, intermediate in resistance to stripe rust and FHB, and susceptible to common bunt. The data from 2016 confirmed these assessments (Tables 3 and 4). AAC Goldrush had a mean leaf spot rating equal to the best check (Moats) and showed powdery mildew infection within the range of the checks. The disease resistance characteristics exhibited by AAC Goldrush make it well suited for production in the eastern Prairie rust-hazard region (Area 4), particularly when its excellent yield performance in this area is considered.

End-use quality

Four years of end-use quality testing: 2 yr (2011, 2012) at the AAFC Cereal Quality Laboratory (data not presented) and 2 yr (2013, 2015) at the GRL, CGC allowed the PRCWRT Quality Evaluation Team to establish that AAC Goldrush had milling and baking quality eligible for grades of the CWRW wheat class (Tables 5 and 6). AAC Goldrush exhibited higher falling numbers than all of the checks except Moats and higher amylograph peak viscosity than all of the checks. Similar to other cultivars of the CWRW wheat class, AAC Goldrush exhibited excellent milling characteristics, with high flour yield of low ash concentration. Farinograph, extensograph, and remix-to-peak mixing energy measurements indicated strong gluten properties. Water absorption, as indicated by the farinograph and remix-to-peak bake method, was slightly lower for AAC Goldrush than the check mean. The loaf volume and other baking attributes were well within the CWRW wheat class parameters as established by the range of the checks.

Table 2. Agronomic and seed characteristics of AAC Goldrush and the check cultivars, Western Canadian Winter Wheat Cooperative registration trials (2013–2016).

Cultivar	Winter survival (%)	Heading[a] (d)	Maturity[a] (d)	Height (cm)	Lodging score[b] (1–9)	Test weight (kg hL^{-1})	Kernel weight (mg)	Grain protein[c] (%)	Grain protein yield (kg ha^{-1})
CDC Buteo	84	168	215	91	4.2	80.2	32.5	12.1	600
Flourish	86	167	213	81	2.7	78.1	34.5	12.4	651
Moats	83	168	215	92	3.8	79.7	32.4	12.5	660
AAC Elevate	86	169	215	85	2.6	77.8	36.3	11.8	631
CDC Falcon	83	167	213	76	3.1	78.0	29.7	11.9	614
CWRW check mean[d]	85	168	215	87	3.3	79.0	33.9	12.2	635
AAC Goldrush	86	170	215	86	3.0	78.5	33.2	12.3	657
LSD ($p \leq 0.05$)	5.6	0.5	0.7	1.3	0.41	0.49	0.69	0.20	28.1
No. of tests	19	36	34	40	29	38	38	38	38

Note: LSD, least significant difference includes variation from the appropriate genotype × environment interaction.
[a]Days to heading and maturity expressed as day of the year.
[b]Lodging scale: 1 = all plants vertical, 9 = all plants horizontal.
[c]Grain protein concentration determined using whole-grain near-infrared spectroscopy analysis.
[d]CDC Falcon was not a CWRW wheat check and is therefore not included in the mean.

Table 3. Disease reactions of AAC Goldrush and the check cultivars, Western Canadian Winter Wheat Cooperative registration trials (2013–2016).

	Year	CDC Buteo	Flourish	Moats	AAC Elevate	CDC Falcon	AAC Goldrush
Stem rust	2013	40 MS/20 S	20 MR	5 R	10 I	20 MR	30 MR
	2014	10 I	20 MR	tr R	tr R	10 R-MR	40 MR
	2015	50 I	30 MR	tr R	20 MR	30 MR	20 MR
	2016	40 MS-60 S	30 I	10 R	25 I	40 MS	30 MR
Leaf rust	2013	5 I	5 I	tr R-MR	10 I	tr R-MR	5 MR
	2014	tr MR-5 MS	tr R-MR	tr R	15 MS-S	10 I	5 I
	2015	10 MR	tr R	tr R-MR	5 R-MR	5 R-MR	tr R
	2016	20 MR	15 I	5 R-MR	25 MS	25 I	15 MR
Stripe rust	2013	13 I	2 R	0 VR	13 MR	4 R	1 VR
	2014	70 S	40 MS	0 R	25 I	40 MS	15 MR
	2015	60 S	20 I	2 R	70 S	20 I	25 I-MS
	2016	75 VS	60 S	3 R	50 S	65 S	20 MR-I
Common bunt	2013	—	—	—	—	—	—
	2014	29 MS	8 R	24 I	22 I	29 MS	61 VS
	2015	30 MS	17 MR	18 MR	19 MR-I	28 I-MS	34 S
	2016	35 VS	10 MR	16 I	3 R	31 VS	50 VS
Leaf spots[a,b]	2013	4.1	2.8	2.2	2.6	3.6	2.1
	2014	2.2	3.2	2.8	2.0	3.0	2.3
	2015	4.8	4.6	4.1	5.2	5.7	4.6
	2016	3.2	2.3	2.6	2.9	3.4	2.7
	Mean	3.6	3.2	2.9	3.2	3.9	2.9
Powdery mildew[b]	2013	4.0	2.7	3.0	3.3	3.7	3.3
	2014	3.0	2.8	2.3	2.5	2.0	1.5
	2015	3.0	4.2	2.7	3.2	2.5	3.0
	2016	3.7	3.7	2.0	4.3	4.3	3.3
	Mean	3.4	3.3	2.5	3.3	3.1	2.8

Note: Percent infection and type of reaction: tr, trace; VR, very resistant; R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible; VS, very susceptible.
[a]Specific leaf spotting pathogens were not determined.
[b]Rated using a 1–9 scale: 1 = disease free, 9 = very severe symptoms.

Table 4. *Fusarium* head blight (FHB) reaction of AAC Goldrush, check cultivars, and supplementary checks, Western Canadian Winter Wheat Cooperative registration trials (2013–2016).[a]

	Visual rating[b] (index and response)							DON[c] (ppm)			ISD index[d]			FDK (%)[e]		
	2013		2015		2016		Mean	2013	2016	Mean	2013	2016	Mean	2013	2016	Mean
CDC Buteo	31	I	28	MR	2	MR	20	40	18	29	26	19	23	27	6	17
Flourish	79	S	87	S	34	S	67	53	57	55	35	58	47	41	38	40
Moats	48	MS	42	I	5	MR	32	30	17	24	21	20	21	20	5	13
AAC Elevate	23	MR	47	I	14	I	28	27	24	26	18	29	24	20	17	19
CDC Falcon	49	MS	78	MS	7	I	45	42	20	31	28	22	25	29	10	20
AAC Goldrush	36	I	46	I	5	MR	29	20	17	19	14	20	17	13	8	11
Supplementary checks[f]																
DH00W32C*17	12	R	4	R	1	R	6	4	7	6	16	8	12	2	4	3
FHB148	16	MR	19	MR	2	R	12	11	10	11	23	11	17	5	6	6
DH01W43I*18	34	I	19	MR	5	MR	19	18	14	16	35	17	26	14	6	10
Freedom	34	I	34	I	9	I	26	24	18	21	38	22	30	14	9	12
Caledonia	63	S	79	S	30	S	57	43	46	45	57	50	54	33	30	32
Hanover	68	S	92	S	30	S	63	49	51	50	62	53	58	40	33	37

Note: Disease response categories: R, resistant; MR, moderately resistant; I, intermediate; MS, moderately susceptible; S, susceptible.
[a]2014 data were unavailable due to winterkill of the nursery.
[b]Visual rating index = % incidence × % severity/100.
[c]DON, deoxynivalenol content.
[d]ISD, incidence severity DON index = [(% incidence × 0.2) + (% severity × 0.2) + (DON × 0.6)].
[e]FDK, *Fusarium*-damaged kernels = damaged kernel weight/total weight × 100.
[f]Supplementary checks were chosen to differentiate resistance levels based on long-term data collection.

Table 5. Protein concentration, milling, and extensograph characteristics of AAC Goldrush and check cultivars, Western Canadian Winter Wheat Cooperative registration trials (2013, 2015).

									Extensograph		
Cultivar	Wheat protein (%)	Flour protein (%)	Protein loss (%)	Hagberg falling no. (s)	Amylograph peak viscosity (BU)	Flour yield (0.5% ash)	Flour ash (%)	Starch damage (%)	Area (cm^2)	R_{max} (BU)	Length (cm)
CDC Buteo	12.3	11.5	0.9	348	290	82.5	0.35	6.2	86	376	18.3
Flourish	12.6	11.8	0.9	393	615	81.3	0.38	6.0	124	513	19.7
Moats	12.7	12.0	0.7	398	520	80.3	0.40	7.2	106	475	18.1
AAC Elevate	12.0	11.1	1.0	380	433	81.8	0.37	6.4	80	388	16.7
Check mean	12.4	11.6	0.9	379	464	81.4	0.37	6.4	99	438	18.2
AAC Goldrush	12.6	11.6	1.0	413	700	81.0	0.38	6.0	126	641	16.3
SD[a]	0.1	0.1	0.1	15	5	0.3	0.01	0.1	NA	NA	NA

Note: American Association of Cereal Chemists methods were followed by the GRL, CGC for determining the various end-use quality characteristics on a composite of several locations per year. NA, not available.

[a]SD, standard deviation is based on repeated testing of Allis-Chalmers mill check samples and standard bake flour samples with replicate tests performed over an extended period of time each year. Values provided by the GRL, CGC.

Table 6. Farinograph and remix-to-peak bake characteristics of AAC Goldrush and check cultivars, Western Canadian Winter Wheat Cooperative registration trials (2013, 2015).

	Farinograph[a]				Remix-to-peak bake				
	Water absorption (%)	DDT (min)	Stability (min)	MTI (min)	Baking absorption (%)	Peak time (min)	Mixing energy (Wh kg^{-1})	Loaf volume (cm^3)	Loaf volume unit flour $protein^{-1}$
CDC Buteo	59.0	5.75	8.0	35	57	2.1	3.7	820	71.6
Flourish	59.0	7.13	10.3	30	58	1.7	3.7	893	76.0
Moats	59.6	7.13	9.8	28	58	2.2	4.0	920	76.7
AAC Elevate	57.4	6.00	7.8	45	55	1.9	3.0	803	72.3
Check mean	58.7	6.50	8.9	34	57	2.0	3.6	859	74.1
AAC Goldrush	57.1	6.50	11.3	23	56	2.2	4.8	863	74.7
SD[b]	0.2	0.4	1.4	2.6	0.0	0.1	0.3	14	NA

Note: American Association of Cereal Chemists methods were followed by the GRL, CGC for determining the various end-use quality characteristics on a composite of several locations per year. NA, not available.

[a]Farinograph parameters: DDT, dough development time; MTI, mixing tolerance index.

[b]SD, standard deviation is based on repeated testing of Allis-Chalmers mill check samples and standard bake flour samples with replicate tests performed over an extended period of time each year. Values provided by the GRL, CGC.

Other Characteristics

Seedling: faint red coleoptile pigmentation.

Plant: juvenile growth semi-prostrate to prostrate, leaves medium green; tillering capacity medium high, intermediate growth habit at tillering; flag leaf medium to dark green, glabrous, slightly waxy, medium long, medium wide, strongly recurved, upright; flag leaf sheath glabrous, strong waxiness; auricle anthocyanin colouration strong, margins glabrous; culm neck straight, hollow, glabrous, medium waxiness, light-yellow at maturity.

Spike: awned, tapering, medium dense, medium length, medium waxiness, light-yellow, inclined to nodding at maturity; awns white to light yellow, strongly spreading; glumes medium to long, narrow, glabrous, yellow; glume shoulders wanting to oblique, narrow; glume beak medium long, acuminate; rachis margins strongly pubescent; resistant to shattering.

Kernel: medium red, texture medium hard, medium size.

Maintenance and Distribution of Pedigreed Seed

Breeder Seed development of AAC Goldrush was initiated in the fall of 2014 by planting 168 random spike selections on irrigated land under isolation in Lethbridge. The spikes were collected from rogued $F_{4:10}$ increase plots grown in Lethbridge. In 2015, a large majority of these individual head-rows showed good uniformity within and among the rows; however, a severe wind/rain storm about 3 wk prior to harvest resulted in lodging of a substantial portion of the nursery, which prompted the elimination of about half of the breeder lines as purity could no longer be ensured. Accordingly, 73 rows were harvested and sent to the AAFC Seed Increase Unit at Indian Head, SK, for planting in the fall of 2015. In 2016, six of the 73 lines were eliminated: one that was slightly taller and later maturing and five based on variable height. The remaining 67 breeder lines were inspected, harvested in bulk, and cleaned to produce 1418 kg of Breeder Seed, which became available in the fall of 2016. Breeder Seed of AAC Goldrush will be maintained by the AAFC Seed Increase Unit in Indian Head. Select, Foundation, Registered, and Certified seed classes will derive from the initial lot of Breeder Seed and will be multiplied and distributed by FP Genetics, 426 McDonald Street, Regina, SK S4N 6E1, Canada; Tel: 1-877-791-1045; Fax: 1-877-791-1046; www.fpgenetics.ca.

Acknowledgements

Sincere appreciation is expressed to the dedicated technical staff at the AAFC LeRDC who contributed to the development of AAC Goldrush winter wheat, in particular: D. Quinn, B. Postman, J. Prus, M. Fast, L. Kneeshaw, B. Puchalski, T. Despins, and E. Amundsen. We also acknowledge the scientific and technical support provided by numerous AAFC personnel working at research sites in Lethbridge, Swift Current, Scott, Saskatoon, Indian Head, Brandon, Winnipeg, Morden, and Ottawa; the provision of an inoculated stem and leaf rust selection nursery by A. Brûlé-Babel and M. Meleshko at the University of Manitoba; and all contributors to the Western Canadian Winter Wheat Cooperative registration trials. Appreciation is extended to H. Naeem and staff of the AAFC Seed Increase Unit at Indian Head for their care and attention in producing and maintaining the Breeder Seed of AAC Goldrush. In addition to funding from AAFC, financial assistance from the following producer and industry groups is gratefully recognized: the Western Grains Research Foundation producer check-off on wheat, the Western Winter Wheat Initiative (Ducks Unlimited Canada, Bayer CropScience, Richardson International, the Mosaic Company Foundation), the Alberta Crop Industry Development Fund, the Alberta Wheat Commission, the Saskatchewan Winter Cereals Development Commission, and Winter Cereals Manitoba.

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