

Commander durum wheat

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Key words: *Triticum turgidum* L. var *durum*, durum wheat, cultivar description, yield, gluten strength, disease resistance

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Mots clés: *Triticum turgidum* L. var. *durum*, blé dur, description de cultivar, rendement, fermeté du gluten, résistance aux maladies

Commander durum wheat (*Triticum turgidum* L. var. *durum*) was developed at the Agriculture and Agri-Food Canada Semiarid Prairie Agricultural Research Centre, Swift Current, Saskatchewan. It received registration No.5852 from the Canadian Food Inspection Agency on 2004. Aug. 13.

Pedigree and Breeding Method

Commander was selected from the cross W9260-BK03/AC Navigator//AC Pathfinder made in 1996 at the Semiarid Prairie Agricultural Research Centre, Swift Current, SK.

Line W9260-BK03 was derived from the cross DT471/DT617. AC Navigator (Clarke et al. 2000a) and AC Pathfinder (Clarke et al. 2000b) were developed at the Semiarid Prairie Agricultural Research Centre. Commander was developed using a modified pedigree technique. F₁ plants were grown in a winter nursery near Lincoln, New Zealand in 1996, from which seed was harvested and bulked. The F₂ was grown as individual plants under rainfed conditions near Swift Current in 1997. Individual heads from selected plants were sown in F₃ rows in a winter nursery near Irwell, New Zealand in October 1997. Rows selected on the

Table 1. Three-year averages for grain yield (kg ha⁻¹) of Commander and check cultivars in the Durum Cooperative Test, 2001 to 2003

	2001			2002			2003			2001–2002 Mean	2001–2003 Mean
	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean	Zone 1	Zone 2	Mean		
AC Avonlea	3700	2840	3180	3590	3550	3560	4310	2870	3460	3390	3470
Kyle	3290	2770	2980	3240	3540	3410				3220	
AC Melita	3300	2760	2980	3410	3440	3430				3230	
AC Morse	3700	2890	3220	3670	3590	3620	4590	2830	3560	3450	3540
AC Navigator	2860	2950	2910	3270	3540	3430	4280	3010	3540	3200	3370
Strongfield	4060	2970	3400	3540	3830	3710	4470	2970	3590	3580	3640
Commander	3130	2990	3050	3300	3840	3610	4580	3140	3730	3360	3540
LSD _{0.05}	470	250	280	420	330	260	560	210	260	210	190
No. tests	4	6	10	5	7	12	5	7	12	22	34

Zone 1: Glenlea, Brandon, Souris, Indian Head, Langdon (dropped 2001 due to high cv).

Zone 2: Lethbridge (dropped 2003 due to high cv), Regina, Saskatoon, Swift Current, Stewart Valley, Irricana, Lethbridge-irrigated (2002 and 2003), Lomond-irrigated (2003).

Table 2. Three-year averages for agronomic characteristics of Commander and check cultivars in the Durum Cooperative Test, 2001–2003

	Days to maturity			Height (cm)	Lodging (1–9)	Test weight (kg hL ⁻¹)			1000-kernel (g)
	Zone 1 ^z	Zone 2 ^y	Mean			Zone 1	Zone 2	Mean	
AC Avonlea	94	103	99	81	2.1	78.3	79.7	79.1	41.3
Kyle	94	104	99	90	4	78.7	78.9	78.8	40.5
AC Melita	92	103	98	86	2.1	77.9	79.3	78.6	40.9
AC Morse	93	103	98	76	1.8	77.3	78.9	78.2	40.2
AC Navigator	94	104	99	72	2.5	78	80.4	79.4	42.9
Strongfield	93	103	98	79	2.1	78.8	80	79.4	41.5
Commander	94	103	99	69	2.3	77.5	79.8	78.8	42.6
LSD _{0.05} ^x	3	1	1	2	0.5	1.1	0.7	0.7	1.1
LSD _{0.05} ^w	3	1	2	2	0.6	1.2	0.8	0.8	1.2
No. tests	11	15	26	35	14	15	21	36	36

^zZone 1: Glenlea, Brandon, Souris, Indian Head, Langdon.

^yZone 2: Lethbridge (dropped 2003 due to high cv), Regina, Saskatoon, Swift Current, Stewart Valley, Irricana, Lethbridge-irrigated (2002 and 2003), Lomond-irrigated (2003).

^xLSD for comparisons with AC Avonlea, AC Morse, AC Navigator, Strongfield.

^wLSD for comparisons with Kyle and AC Melita.

Table 3. Summary of grain protein concentration (% expressed on 13.5% moisture basis) measured on location composites of Commander and checks from the 2001–2003 Durum Cooperative tests

	Grain protein %							
	2001		2002		2003		2001–2002 mean	2001–2003 mean
	Zone 1 ^z	Zone 2 ^y	Zone 1	Zone 2	Zone 1	Zone 2		
AC Avonlea	15.8	15.3	14.4	15.2	15	15.3	15.2	15.2
Kyle	15.3	15.3	14.8	15.1	–	–	15.1	–
AC Melita	15.1	14.7	14.0	14.5	–	–	14.6	–
AC Morse	14.9	14.8	14.0	14.5	14.5	15.2	14.6	14.7
AC Navigator	15.3	14.7	14.4	13.9	14.7	15	14.5	14.6
Strongfield	16.1	15.6	14.6	15.1	15.4	15.8	15.4	15.4
Commander	15.3	14.7	14.2	14.1	14.9	15.1	14.5	14.7
LSD _{0.05}	0.7	0.4	0.7	0.5	0.7	0.4	0.3	0.3
No. tests	4	6	4	7	4	8	21	33

^zZone 1: Glenlea, Brandon, Souris, Indian Head.

^yZone 2: Lethbridge (dropped 2003 due to high cv), Regina, Saskatoon, Swift Current, Stewart Valley, Irricana, Lethbridge-irrigated (2002 and 2003), Lomond-irrigated (2003).

Table 4. Semolina yellow pigment concentration, gluten index, Alveograph work input and pressure:length ratio (P/L) measured on yearly composites of Commander and checks from the 2001–2003 Durum Cooperative tests

	Pigment conc. ^z (µg ⁻¹)	Gluten index ^y (%)	Alveograph ^x	
			Work input (joules × 10 ⁻⁴)	P/L
AC Avonlea	8.3	29	128	0.6
AC Melita	7.7	76	225	0.7
AC Morse	8.0	61	177	0.8
AC Navigator	9.5	69	241	1.1
Strongfield	8.6	69	231	0.9
Commander	9.8	92	306	1.6
LSD _{0.05}	0.4	8	28	0.4
No. tests	3	3	3	3

^zMethod 14-50, AACC (2000).

^yMethod 38-12, AACC (2000).

^xStandard No 121, International Association for Cereal Chemistry and Technology (2001).

basis of plant appearance were bulk harvested, and the F₄ was grown in four-row plots in a two-replicate yield trial near Swift Current and in un-replicated yield trials in Regina and Lethbridge in 1998, and selected for agronomic performance and disease resistance. Protein and pigment concen-

tration were determined by near infrared reflectance spectroscopy (McCaig et al. 1992), and gluten strength was estimated by the gluten index test performed on whole grain meal (Method 38-12A, American Association of Cereal Chemists 2000). Five spikes per selected line were sown in individual head rows in the 1998–99 Irwell, New Zealand winter nursery. Un-replicated F₆ yield trials were grown near Swift Current, one rainfed and one sprinkler irrigated, Regina, Indian Head, and Lethbridge in 1999, and selected for agronomic performance, disease resistance, and processing quality as above. An F₄-derived F₇ line designated as 9667B-AA3 was advanced to the Durum B Test grown at six locations in 2000. From 2001 to 2003, it was assessed in the Durum Cooperative Test as DT722.

Leaf and stem rust reactions were assessed in hill plots in the F₄ generation, and while in the Durum B and Cooperative tests, in a rust nursery near Glenlea, Manitoba. The stem rust (*Puccinia graminis* Pers.:Pers.) races used were: QFC(C75), QTH (C25), TPM (C53), TMR (C10), TMR (C95), RTH (C57), RRQ (C63) and RKQ (C63). The races of leaf rust (*Puccinia triticina* Eriks.) used were: MCDS, MBDS, MBR, MBRJ, MGB, TJB, TJB, TGB, and 128-1 (74-2) (Kolmer 1999, 2001). Races L1, L16, T1, T6, T13, and T19 of common bunt [*Tilletia laevis* Kuhn in Rabenh., and *T. tritici* (Bjerk.) G.

Table 5. Summary of disease reactions of Commander and check cultivars grown in the Durum Cooperative Test, 2001–2003

Cultivar		Stem rust ^z	Leaf rust ^z	Common bunt ^z	<i>Stagonospora nodorum</i> ^y	Leaf spots ^x	FHB index ^{zw}
AC Avonlea	2001	R	R	R	10	7	36 MS
	2002	R	R	–	– ^y	9.2	69 S
	2003	R	R	R	–	–	58 S
Kyle	2001	R	R	R	10	7	55 S
	2002	R	R	–	–	8.9	64 MS
AC Melita	2001	R	R	R+	10.7	7.8	51 S
	2002	R	R	–	–	9.3	73 S
AC Morse	2001	R	R	R+	10	7	51 S
	2002	R	R	–	–	9.8	83 S
	2003	R	R	VR	–	–	71 S
AC Navigator	2001	R	R	R+	10.7	7.8	76 S
	2002	RMR	R	–	–	9.8	70 S
	2003	R	R	R	–	–	79 S
Strongfield	2001	R	TR	R	10	6.8	59 S
	2002	R	VR	–	–	9.1	73 S
	2003	R	R	R	–	–	75 S
Commander	2001	R	R	R	10.7	8	55 S
	2002	R	R	–	–	10	90 S
	2003	R	R	VR	–	–	72 S

^zPercent infection and type of reaction: TR, trace resistant; VR, very resistant; R+, highly resistant; R, resistant; MR, moderately resistant; MS, moderately susceptible; S, susceptible.

^y*Stagonospora nodorum* field rating on a scale of 0 (no symptoms) to 11 (severe symptoms).

^xAdult plant, rated mid-grainfill at 2 Swift Current and Indian Head (1 = no symptoms, 11 = severe symptoms).

^wFusarium head blight index: (% infected spikelets × % infected heads)/100 and relative ratings.

^zMissing data – no common bunt and *Stagonospora nodorum* data available for 2002; AC Melita not in the 2000 trial.

Wint. in Rabenh.] were used for screening of the Durum Cooperative Test entries. The race designations are those described by Roelfs and Martens (1988) for stem rust, Long and Kolmer (1989) for leaf rust, and Hoffmann and Metzger (1976) for common bunt.

Performance

Commander yielded about 5% more than AC Navigator and was similar to the other checks in 3 yr of cooperative testing (Table 1). Time to maturity of Commander was similar to AC Avonlea, Kyle and AC Navigator, and 1 d later than AC Morse and Strongfield (Table 2). Commander is a strong-strawed semidwarf, similar to AC Navigator. Test weight of Commander was similar to the checks. Average grain protein concentration of Commander was similar to AC Morse, AC Melita and AC Navigator, and significantly lower than the other checks (Table 3). Commander had high grain pigment concentration, similar to AC Navigator, and significantly higher gluten index, Alveograph work input and Alveograph P/L than all the checks (Table 4). The high P/L ratio indicates that Commander has less extensible gluten than the checks, in keeping with the preferred quality for extra strong gluten durum.

Other Characteristics

SPIKES: Tapering, dense, short, erect, black awns; glumes wide, long, glabrous, white; glume shoulders rounded to square; glume beak straight to moderately curved.

KERNEL: Colour amber; midsize, elliptical; cheeks rounded; crease shallow to middeep, mid wide; brush midsize, short; embryo oval, midsize to large.

DISEASE REACTION: Resistant to prevalent races of, leaf rust and stem rust, resistant to common bunt races prevalent in western Canada, and susceptible to leaf spots [caused mainly by *Pyrenophora tritici-repentis* (Died.) Drechs. and *Stagonospora nodorum* (Berk.) Castellani & E.G. Germano] and fusarium head blight (caused by *Fusarium graminearum* Schwabe.) (Table 5); susceptible to loose smut (data not shown).

END-USE SUITABILITY: Commander has very strong gluten properties, excellent milling yield, and strong yellow pasta colour. It is eligible for grades of the Canada Western Amber Durum wheat class, and will be grown in an identity-preserved contract system to segregate it from conventional strength durum.

Maintenance and Distribution of Pedigreed Seed

The 140 breeder lines originate from 144 plant rows grown in 2002, which in turn originate from a single F₄-derived F₈ plant grown in 2001. Breeder seed will be maintained by the Agriculture and Agri-Food Canada Seed Increase Unit, Indian Head, Saskatchewan, Canada S0G 2K0. Plant Breeders' Rights have been requested. Distribution and multiplication of pedigreed seed stocks will be handled by Saskatchewan Wheat Pool, 2625 Victoria Ave., Regina, Saskatchewan, Canada. S4T 7T9.

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