

## Swainson hard red winter wheat

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Received 16 February 2013, accepted 24 June 2013. Published on the web 16 September 2013.

Fowler, D. B. 2013. Swainson hard red winter wheat. *Can. J. Plant Sci.* **93**: 1257–1259. Swainson is a medium tall, high-yielding, stem and leaf rust resistant winter wheat (*Triticum aestivum* L.) that is registered for production in western Canada. It is a hard red winter wheat cultivar that is eligible for grades of the Canada Western General Purpose (CWGP) wheat class, which was created in 2008 to encourage the development of cultivars to fill the high energy demands of the biofuel and livestock feed markets in western Canada. Its high yield potential has been particularly evident on dry land in Saskatchewan where its grain yield was 116% of CDC Buteo, the Canada Western Red Winter Wheat Class grain quality check cultivar, and 110% of Accipiter and 117% of CDC Falcon, the high-yielding check cultivars. High grain yield potential of low protein concentration grain and rust resistance make Swainson a good fit for the CWGP class.

**Key words:** *Triticum aestivum* L., cultivar description, Canada Western General Purpose

Fowler, D. B. 2013. Le blé rouge d'hiver Swainson. *Can. J. Plant Sci.* **93**: 1257–1259. Swainson est une variété de blé d'hiver (*Triticum aestivum* L.) de taille moyenne à haut rendement qui résiste à la rouille de la tige et des feuilles. Elle a été homologuée pour la culture commerciale dans l'ouest du Canada. Ce cultivar de blé rouge d'hiver est admissible à la classe « blé à des fins générales de l'Ouest canadien » (CWGP), créée en 2008 pour favoriser l'élaboration de cultivars capables de satisfaire à la demande de cultures très énergétiques pour la fabrication de biocarburants et l'alimentation du bétail dans l'Ouest canadien. Son rendement potentiel élevé est particulièrement évident sur les sols arides de la Saskatchewan où il a atteint 116 % du rendement grainier de CDC Buteo, le cultivar témoin pour la qualité du grain de la classe « blé rouge d'hiver de l'Ouest canadien », 110 % de celui d'Accipiter et 117 % de celui de CDC Falcon, le cultivar témoin pour le rendement élevé. Swainson se prête parfaitement à la classe CWGP en raison de son rendement potentiel élevé en grains à faible teneur en protéines et de sa résistance à la rouille.

**Mots clés:** *Triticum aestivum* L., description de cultivar, blé à des fins générales de l'Ouest canadien

Swainson hard red winter wheat (*Triticum aestivum* L.) was developed at the Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK. It is eligible for grades of the Canada Western General Purpose (CWGP) wheat class, which was introduced in 2008 to encourage the development and production of cultivars to fill the high energy demands of the biofuel and livestock feed markets. The developing ethanol market had a preference for cultivars with high starch yield and the livestock industry indicated a desire for wheat with a protein concentration of 10% or less to supply high levels of energy in animal diets. Low grain protein concentration and high grain yield potential make Swainson a good fit for the CWGP wheat class. The Variety Registration Office, Plant Production Division, Canadian Food Inspection Agency issued registration no. 7315 for Swainson on 2013 Feb. 07.

### Pedigree and Breeding Method

Swainson was selected from the F<sub>1</sub>-derived doubled haploid progeny of the cross TW96502/McClintock where TW96502 = TW86130 (Eka-Nova/Bez. 1//Fredrick)/AC Ron (Harus/Augusta) and McClintock = GN567/Norstar. McClintock is a registered Canada Western Red

Winter wheat cultivar. The F<sub>1</sub> cross was made in the University of Saskatchewan phytotron in 2001. Doubled haploid lines were increased in the phytotron in the winters of 2001–2002 and 2002–2003. These lines were grown in the field at Saskatoon in 2003–2004 as rows in a special nursery inoculated with leaf (*Puccinia recondita* Rob. ex Desm.) and stem (*Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn) rust where winter survival, straw strength, height, maturity, and disease reaction were evaluated. Swainson was a row selection made in the fall of 2004 that was designated DH01-25-135\*R. The agronomic performance and disease reactions of DH01-25-135\*R were assessed in yield trials grown in Saskatchewan in 2004–2005 and 2005–2006. DH01-25-135\*R was then evaluated in the Central Winter Wheat Cooperative (CWWC) Registration trials in 2006–2007, 2007–2008, 2008–2009 and 2009–2010.

### Performance

Analyses of variance were conducted using a mixed effects model where cultivars were considered as fixed and location years as random effects. The least significant difference (LSD) test was used to identify

**Table 1. Grain yield of Swainson compared to CDC Buteo, CDC Falcon, and Accipiter (kg ha<sup>-1</sup>). Central Winter Wheat Cooperative Registration Trials (2007–2010)<sup>z</sup>**

Cultivar	Alberta	Saskatchewan		Manitoba	Mean
		Dryland	Irrigation <sup>y</sup>		
CDC Buteo	6695	4344	5286	5713	5412
CDC Falcon	7121	4279	5674	5640	5521
Accipiter	7567	4565	6242	5782	5841
Swainson	7871	5022	6203	5794	6059
LSD ( $P=0.05$ )	468.6	379.7	557.6	NS <sup>x</sup>	208.5
No. of test	6	8	4	8	27

<sup>z</sup>Alberta locations included Lethbridge, Olds, and Lacombe. Saskatchewan locations were Saskatoon, Clair, Indian Head, Melfort, and Saskatoon irrigation. The Manitoba locations were Brandon, Winnipeg, and Carman.

<sup>y</sup>Stem and leaf rust nursery.

<sup>x</sup>NS, non-significant differences.

significant differences in the mean value of Swainson compared with the check cultivars.

Swainson demonstrated a high grain yield potential over the 4 yr of registration testing (Table 1). This advantage is particularly evident on dry land in Saskatchewan where its grain yield was 110% of Accipiter (Fowler 2011), 116% of CDC Buteo (Fowler 2010), and 117% of CDC Falcon (Fowler 1999). CDC Buteo was the CWWC Registration trial grain quality check cultivar starting in 2008 and the dominant cultivar grown by farmers in this region (2011 Canadian Wheat Board Variety Survey). CDC Falcon was the high-yielding check in the CWWC Registration trials and Accipiter was a more recent high-yielding check cultivar for the CWGP wheat class.

Time to heading for Swainson is between CDC Buteo and Accipiter (Table 2). Its maturity is similar to Accipiter, 1 d later than CDC Buteo and 2 d later than CDC Falcon. It is taller than CDC Buteo, CDC Falcon and Accipiter and more susceptible to lodging than CDC Falcon and Accipiter. The winter survival of Swainson falls within the range of the reference cultivars. Swainson has resistant stem and leaf rust ratings (Table 3) and a very susceptible common bunt (*Tilletia laevis* Kuhn in Rabenh. and *T. caries* [DC.] Tul. & C. Tul.) rating.

The average protein concentration of Swainson was lower than the reference cultivars when data from 15 station years of replicated CWWC trials were evaluated (Table 2). In these trials, high grain yield potential resulted in a grain protein yield that was higher for Swainson than CDC Buteo and similar to CDC Falcon and Accipiter. Detailed wheat and flour analytical comparisons (Table 4) indicated that Swainson had higher kernel weight, lower flour yield, higher flour ash and starch damage, poorer flour colour, improved farinogram absorption, lower farinogram dough development time and stability, lower remix loaf volume, and poorer crumb structure than CDC Osprey (Fowler 1997), the 2007 CWWC grain quality check cultivar. The quality profile of Swainson did not meet the standards for the Canada Western Red Winter Wheat Class and it was registered in the CWGP class.

### Other Characteristics

*Plant.* Winter growth habit; coleoptile colour reddish; juvenile growth intermediate to semi-prostrate; leaves medium green; flag leaf medium green, mid-wide, short to mid-long, intermediate to upright attitude; sheath and leaf blades glabrous; auricles light reddish, glabrous; tillers many; straw medium tall, internode hollow, culm neck straight, anthocyanin coloration at maturity absent.

**Table 2. Agronomic performance of Swainson compared with CDC Buteo, CDC Falcon, and Accipiter. Central Winter Wheat Co-operative Registration trials (2007–2010)**

Character	CDC Buteo	CDC Falcon	Accipiter	Swainson	LSD ( $P=0.05$ )	No. tests
Heading date (DOY) <sup>z</sup>	175	174	176	175	0.6	18
Maturity (DOY) <sup>z</sup>	216	215	217	217	1.1	21
Plant height (cm)	89	76	83	97	2.0	27
Lodging (1–9) <sup>y</sup>	2.9	1.7	1.6	2.9	0.68	11
Winter survival (%)	95	80	94	90	NS <sup>x</sup>	5
Protein (%)	11.9	12.0	11.6	11.3	0.29	15
Protein yield (kg ha <sup>-1</sup> )	551	593	594	622	34.6	15

<sup>z</sup>Day of year.

<sup>y</sup>1, all plants vertical; 9, all plants horizontal.

<sup>x</sup>NS, non-significant differences.

**Table 3. Disease reactions<sup>z</sup> of Swainson compared with CDC Buteo, CDC Falcon, and Accipiter**

	CDC Buteo	CDC Falcon	Accipiter	Swainson
<i>(a) Stem rust</i>				
2008W <sup>y</sup>	30MR <sup>x</sup>	30MR	10R	Tr-R
2009W	20MR-30S	20MR	5R-MR	5R
2009S	R	R	R	R
2010W	5MR	5MR	5R-MR	Tr-R
2010S	R	R	R	R
<i>(b) Leaf rust</i>				
2008W	5MR	10MR	5MR	Tr-R
2009W	15MR-MS	20MR-MS	15MR-MS	2R
2009S	R	R	R	R
2010W	5R-MR	15MR	5MR	5R-MR
2010S	R	20MR	R	R
<i>(c) Bunt</i>				
2007Le		69VS	37S	54VS
2008Le	61VS	52VS	55VS	68VS
2009Le	68VS	53VS	45VS	51VS
2010Le	62VS	34VS	62VS	47VS

<sup>z</sup>Data from artificial leaf and stem rust infections at the Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK, and the Plant Science Dept. University of Manitoba, Winnipeg, MB, using epidemic mixtures supplied by Agriculture and Agri-Food Canada in Winnipeg, MB. Common bunt data are from trials inoculated by Agriculture and Agri-Food Canada staff at Lethbridge, AB.

<sup>y</sup>S, Saskatoon; W, Winnipeg; Le, Lethbridge.

<sup>x</sup>Percent infection and type of reaction: VS, very susceptible; S, susceptible; MS, moderately susceptible; MR, moderately resistant; Tr-R, trace/resistant, R, resistant.

*Spikes.* Oblong, lax, inclined, mid-long to long, awned; glumes mid-wide, mid-long to long, glabrous to slightly pubescent, white; glume shoulders wanting, narrow; glume beak long, acuminate.

*Kernel.* Red, hard, mid-size to large, mid-long to long, mid-wide, ovate; cheeks slightly angular; brush midsize, mid-long; crease mid-wide to wide, shallow to mid-deep; germ small to mid-size, oval.

**Maintenance and Distribution of Pedigreed Seed**

Swainson has been maintained as the progeny from a single doubled haploid line. Seed of this line used in evaluation and selection trials has been produced in special increases to prevent admixtures. Seed originating from these special increases has also been used to produce Breeder seed. Breeder seed will be maintained by the Department of Plant Sciences, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 5A8. Swainson is a public release by the Department of Plant Sciences, University of Saskatchewan.

**Table 4. Wheat and flour analytical data<sup>z</sup> for Swainson compared with CDC Osprey**

Character	CDC Osprey	Swainson
Test weight (kg hL <sup>-1</sup> )	81.7	81.4
Kernel weight (mg)	31.2	37.4
Wheat protein (%)	11.2	11.3
Flour protein (%)	10.5	10.4
Protein loss (%)	0.7	0.9
Falling number (sec)	405	415
Amylograph peak viscosity (BU)	870	745
Flour yield (% corrected to 0.50 ash)	76.8	75.8
Flour ash (%)	0.38	0.41
Flour colour (Agtron)	89	82
Starch damage (%)	5.6	8.5
Particle size index (%)	60	52
Farinogram absorption (%)	55.3	63.6
Farinogram DDT <sup>y</sup> (min)	9.0	3.3
Farinogram Stability (min)	21.5	3.0
Farinogram MTT <sup>x</sup> (BU)	15	60
Remix loaf volume (cm <sup>3</sup> )	745	625
Loaf volume unit <sup>-1</sup> protein	71.0	60.1
Crumb structure	4.8	4.0
Crumb colour	5.3	5.0
Test bake absorption (%)	55	56
Test bake mixing time (min)	2.5	1.9

<sup>z</sup>End-use quality testing conducted by the Grain Research Laboratory of the Canadian Grain Commission on composite samples from the 2007 Central Winter Wheat Co-operative Registration Trials. American Association of Cereal Chemists methods were followed for determining the various end-use suitability traits.

<sup>y</sup>Dough development time.

<sup>x</sup>Mixing tolerance index.

The assistance provided by the many students and technicians (especially R. Hankey, G. Schellhorn, T. Krug, and K. Smith) who have worked on this program is gratefully acknowledged. Appreciation is also expressed to the co-operators who have contributed to the database of the CWWC Registration trials. This project was made possible by grants from the Saskatchewan Agriculture Development Fund, Western Grains Research Foundation, and Ducks Unlimited Canada.

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