

Sunrise soft red winter wheat

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Fowler, D. B. 2012. **Sunrise soft red winter wheat**. Can. J. Plant Sci. **92**: 195–198. Sunrise is a high-yielding soft red winter wheat (*Triticum aestivum* L.) cultivar that is registered in the Canada Western General Purpose (CWGP) wheat class for production in western Canada. The CWGP wheat class was created in 2008 to encourage the development of cultivars to fill the high energy demands of the biofuel and livestock feed markets. The grain yield of Sunrise is similar to the high-yielding hard red and soft white winter wheat cultivars registered in the CWGP class. It has good stem rust, stripe rust, and tan spot resistance and moderate leaf rust resistance. High grain yield potential of low protein concentration grain combined with good agronomic and disease packages make Sunrise a good fit for the CWGP class.

Key words: *Triticum aestivum* L., cultivar description, soft red, wheat (winter), Canada Western General Purpose

Fowler, D. B. 2012. **Le blé tendre roux de printemps Sunrise**. Can. J. Plant Sci. **92**: 195–198. Sunrise est une variété de blé de printemps (*Triticum aestivum* L.) tendre rouge à rendement élevé homologuée pour la classe « Blé à des fins générales de l'Ouest canadien » (CWGP) en vue de sa production dans l'ouest du Canada. Cette classe a été créée en 2008 pour favoriser la création de cultivars susceptibles de répondre à la demande pour des variétés très énergétiques destinées aux marchés des biocarburants et des aliments du bétail. Sunrise a un rendement grainier similaire à celui des cultivars de blé roux vitreux et de blé tendre blanc d'hiver à haut rendement homologués dans la même classe. La variété se caractérise par une bonne résistance à la rouille de la tige, à la rouille jaune et à la tache helminthosporienne, ainsi que par une résistance modérée à la rouille des feuilles. Le rendement grainier élevé et un grain à faible teneur en protéines combinés à de bons paramètres agronomiques ainsi qu'à la résistance à diverses maladies font de Sunrise un solide candidat pour la classe CWGP.

Mots clés: *Triticum aestivum* L., description de cultivar, tendre roux, blé (d'hiver), Blé à des fins générales de l'Ouest canadien

Sunrise soft 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 (Davidson 2007). Low grain protein concentration and a high grain yield potential made Sunrise a good fit for the CWGP wheat class. The Variety Registration Office, Plant Production Division, Canadian Food Inspection Agency issued registration no. 6682 for Sunrise on 2009 Dec. 02.

Pedigree and Breeding Method

Sunrise was selected from the progeny of a McClintock/CDC Ptarmigan cross made in the University of Saskatchewan phytotron in 1999. McClintock is a registered Canada Western Red Winter wheat cultivar. CDC Ptarmigan (Fowler 2010a) is a soft white winter

wheat cultivar that is registered in the CWGP wheat class. Doubled haploid lines were produced in the winter of 1999–2000 in a phytotron. They were then grown in 2001–2002 as rows in a field nursery inoculated with leaf (*Puccinia recondita* Rob. ex Desm.) and stem (*Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn) rust at Saskatoon where winter survival, straw strength, height, maturity, and disease reaction were evaluated. Sunrise was a row selection made in the fall of 2002 that was designated DH99-55-2. The agronomic performance and disease reactions of DH99-55-2 were assessed in yield trials grown in Saskatchewan in 2002–2003 and 2003–2004. DH99-55-2 was then evaluated in the Central Winter Wheat Cooperative (CWWC) Registration trials in 2004–2005, 2005–2006, and 2007–2008.

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 significant differences in the mean values of Sunrise compared with the check cultivars.

Sunrise is a soft red winter wheat cultivar with a grain yield potential (Table 1) similar to CDC Falcon

Table 1. Mean grain yield of Sunrise compared with CDC Falcon, Accipiter, and Peregrine. Data from the Central Winter Wheat Co-operative Registration trials 2004–2005, 2005–2006, and 2007–2008^z

Cultivar	Alberta	Saskatchewan	Saskatchewan Irrigation ^y	Southern Manitoba	Mean
CDC Falcon	6727	4436	6374	5222	5393
Accipiter	7036	4662	6924	5149	5585
Peregrine	6750	4760	6378	5550	5616
Sunrise	7029	4682	6630	5170	5563
LSD ($P=0.05$)	280.0	NS ^x	NS	NS	NS
No. of tests	6	10	3	8	27

^zAlberta locations included Lethbridge, Olds, and Lacombe. Saskatchewan locations included Saskatoon, Clair, Indian Head, Melfort, and Saskatoon (Irrigation). The Manitoba locations were Brandon, Winnipeg, and Carman.

^yRust nursery.

^xNS, not significant.

(Fowler 1999), Accipiter (Fowler 2011), and Peregrine (Fowler 2010b). CDC Falcon was the high-yielding check in the CWWC Registration trials and Accipiter and Peregrine were more recent high-yielding cultivar releases in the CWGP wheat class. The time to heading for Sunrise falls between CDC Falcon and Accipiter and its time to maturity is similar to Accipiter, 1 d later than Peregrine, and 3 d later than CDC Falcon (Table 2). Sunrise is taller than CDC Falcon and Accipiter and shorter than Peregrine. It is more susceptible to lodging than CDC Falcon and Accipiter. The average protein concentration of Sunrise was lower than CDC Falcon, Accipiter, and Peregrine when data from 14 station years of replicated CWWC Registration trials were evaluated. In these trials, similar grain yield and a lower protein concentration resulted in a grain protein yield for Sunrise that was lower than CDC Falcon, Accipiter, and Peregrine.

The agronomic performance, kernel weight, protein concentration, and grain protein yield of Sunrise are similar to that of the soft white winter wheat CDC Ptarmigan (Table 3). Detailed wheat and flour analytical comparisons (Table 4) indicate that Sunrise has lower falling number, flour ash, starch damage, and a higher protein loss during milling, Farinogram absorption, Alveograph P and Alveograph W than CDC Ptarmigan.

Sunrise has moderately resistant to resistant stem rust and moderately susceptible to moderately resistant leaf rust ratings (Table 5). It has good resistance to stripe rust (*Puccinia striiformis* Westend) and tan spot (*Pyrenophora*

tritici-repentis Died) and has a very susceptible common bunt [*Tilletia tritici* (Bjerk) R. Wolff and *T. laevis* Kuhn in Rabenh.] rating. It has a powdery mildew [*Blumeria graminis* (DC.) E. O. Speer] reaction that is better than CDC Falcon, Accipiter, and Peregrine. Sunrise has a disease package (Table 5) that is superior to the soft white winter wheat CDC Ptarmigan, which had a 20-90S stem rust and a 10-60MS-S leaf rust rating when it was grown in the CWWC trials (Fowler 2010a).

Best management practices are employed in the CWWC Registration trials with the result that the level of winter damage experienced is normally very low. However, CDC Falcon, Accipiter, Peregrine, CDC Ptarmigan, and Sunrise were included in 2008–2009 and 2009–2010 regional trials planted on summerfallow fields with minimal snow trapping potential. The average winter survival of Sunrise (69%) was significantly higher than CDC Falcon (56%), similar to Accipiter (68%) and CDC Ptarmigan (68%), and significantly lower than Peregrine (79%) (LSD = 8.3, $P=0.05$) in seven of these trials where winter damage was recorded.

Other Characteristics

Plant. Winter growth habit; coleoptile colour light red; juvenile growth prostrate; leaves dark green; flag leaf dark green, narrow, short-medium, upright attitude; sheath and leaf blades glabrous; auricles light red, glabrous; tillers many; straw medium tall, internode hollow, culm neck slightly curved, anthocyanin coloration at maturity absent.

Table 2. Agronomic performance of Sunrise compared with CDC Falcon, Accipiter and Peregrine. Data from the Central Winter Wheat Co-operative Registration trials 2004–2005, 2005–2006, and 2007–2008

Character	CDC Falcon	Accipiter	Peregrine	Sunrise	LSD ($P=0.05$)	No. tests
Heading date (DOY) ^z	171	173	172	172	0.6	22
Maturity (DOY)	209	212	211	212	1.0	18
Plant height (cm)	76	84	99	91	1.9	24
Lodging (1–9) ^y	1.7	2.0	2.2	3.0	0.95	5
Protein (%)	12.3	11.9	11.7	11.2	0.27	14
Protein yield (kg ha ⁻¹)	584	596	594	542	38.4	14

^zDay of year.

^y1, all plants vertical; 9, all plants horizontal.

Table 3. Agronomic performance of Sunrise compared with CDC Ptarmigan. Mean values for six trials grown in Saskatchewan (2008–2010)

Character	CDC		LSD (<i>P</i> = 0.05)
	Ptarmigan	Sunrise	
Grain yield (kg ha ⁻¹)	5540	5478	NS
Heading Date (DOY) ²	179	177	NS
Maturity (DOY)	218	217	NS
Plant Height (cm)	90	89	NS
Kernel weight (mg kernel ⁻¹)	33.0	30.5	NS
Protein (%)	10.5	10.7	NS
Protein (kg ha ⁻¹)	582	586	NS

²Day of year.

Spikes. Tapering, lax, inclined, long, awned; glumes mid-wide, mid-long to long, glabrous to slightly pubescent, yellow; glume shoulders wanting, narrow; glume beak short to medium, acuminate.

Kernel. Red, soft, small to mid-size, elliptical; cheeks rounded; brush midsize to large, long; crease mid-wide, shallow; germ small to mid-size, oval.

Maintenance and Distribution of Pedigreed Seed

Sunrise has been maintained as the progeny from a single doubled haploid line. Seed of this line used in

Table 4. Wheat and flour analytical data² for Sunrise compared to CDC Ptarmigan

Character	CDC		LSD (<i>P</i> = 0.05)
	Ptarmigan	Sunrise	
Wheat protein (%)	8.5	9.2	NS ^w
Flour protein (%)	7.6	7.9	NS
Protein loss (%)	1.0	1.2	0.14
Falling number (s)	337	227	31.5
Flour yield (%)	74.0	73.0	NS
Flour ash (%)	0.47	0.42	0.03
Particle size index (%)	67.2	68.4	NS
Flour colour L-value (Minolta)	86.1	85.8	NS
Starch damage, UCD	11.8	10.9	0.83
Farinogram absorption (%)	46.7	48.6	1.19
Farinogram DDT ³ (min)	1.32	1.30	NS
Farinogram MTI ^x (BU)	107	101	NS
Farinogram stability (min)	1.9	2.0	NS
Alveograph length	173	173	NS
Alveograph P	21.4	25.6	2.39
Alveograph W	69.8	91.8	10.75
Cookie spread (mm)	80.8	80.8	NS
Cookie thickness (mm)	9.5	9.8	NS
Cookie ratio	8.5	8.2	NS

²End-use quality testing conducted by the Canadian International Grains Institute, Winnipeg, MB, on samples from the 2010 regional winter wheat trials grown at Sutherland, Indian Head and on dryland and irrigation at Saskatoon, SK. American Association of Cereal Chemists methods were followed for determining the various end-use suitability traits.

³Dough development time.

^xMixing tolerance index.

^wNS, not significant.

Table 5. Disease reactions² of Sunrise compared to CDC Falcon, Accipiter, and Peregrine

	CDC Falcon	Accipiter	Peregrine	Sunrise
<i>(a) Stem rust</i>				
2005W ³	30MS ^x	15MR/MS	5R	5R
2006W	15MS/S	5R/MR	5S	1R/MR
2006S	R	R	R	5MR
2008W	30MR	10R	5R	TrR
<i>(b) Leaf rust</i>				
2005W	5MR	20MR/MS	10MR	15MR
2006W	5MR	5MR/MS	5R/MR	10MR/MS
2008W	10MR	5MR	TrR	15MR/MS
<i>(c) Stripe rust</i>				
2006W (1–4)	2.8	1.5	1	1
2006La (%)	45	70	11	2
2006Le (1–9)	1	1.5	1	1
<i>(d) Powdery mildew</i>				
2005O (1–9)	4.1	4.7	4.4	3.9
2005Le (1–9)	3.7	4.0	5.9	2.6
2006Le (1–9)	4.0	4.0	4.0	3.0
<i>(f) Tan spot</i>				
2006Le (1–9)	5	5	1	1
<i>(g) Bunt</i>				
2005Le	68VS	72VS	72VS	82VS
2006Le	56VS	60VS	58VS	87VS
2008Le	52VS	55VS	63VS	73VS

²Data from artificial leaf and stem rust infections at the Department of Plant Sciences, University of Saskatchewan, Saskatoon SK, and the Plant Science Department, University of Manitoba, Winnipeg, MB, using epidemic mixtures supplied by Agriculture and Agri-Food Canada in Winnipeg, MB. Stripe rust ratings were supplied by the Plant Science Department, University of Manitoba, the Field Crop Development Centre, Alberta Agriculture, Lacombe, AB, and Agriculture and Agri-Food Canada, Lethbridge, AB. Powdery mildew ratings were supplied by the Field Crop Development Centre, Alberta Agriculture, Lacombe, and Agriculture and Agri-Food Canada, Lethbridge. Tan spot ratings were supplied by Agriculture and Agri-Food Canada staff at Lethbridge. Common bunt data are from trials inoculated by Agriculture and Agri-Food Canada, Lethbridge.

³S, Saskatoon; W, Winnipeg; La, Lacombe; Le, Lethbridge; O, Olds. ^xPercent infection and type of reaction: VS, very susceptible; S, susceptible; MS, moderately susceptible; MR, moderately resistant; R, resistant.

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. Western Canadian distribution and multiplication of pedigreed seed stocks are handled by Western Ag Innovations, 3-411 Downey Road, Saskatoon, Saskatchewan, Canada S7N 4L8.

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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