12W932-349 Soft red winter wheat

Author: Tamburic-Ilincic, Lily

Source: Canadian Journal of Plant Science, 102(2) : 484-487

Published By: Canadian Science Publishing

URL: https://doi.org/10.1139/CJPS-2021-0088

Canadian Science Publishing

CULTIVAR DESCRIPTION

12W932-349 Soft red winter wheat

Lily Tamburic-Ilincic

Abstract: 12W932-349 is a soft red winter wheat (*Triticum aestivum* L.) cultivar registered for Ontario, Canada. It has high grain yield with good pastry quality and is moderately resistant to Fusarium head blight. 12W932-349 is well adapted for the winter wheat growing areas of Ontario.

Key words: winter wheat, *Triticum aestivum* L., cultivar description, disease resistance.

Résumé : 12W932-349 est un cultivar de blé d'hiver tendre roux (*Triticum aestivum* L.) créé au campus Ridgetown de l'Université de Guelph. La variété a été enregistrée le 26 mars 2021 par le Bureau d'enregistrement des variétés (Division de la protection des végétaux et des produits végétaux) de l'Agence canadienne d'inspection des aliments sous le numéro 9239, pour la région de l'Ontario. Le cultivar 12W932-349 est admissible à la catégorie « blé tendre rouge d'hiver de l'Est canadien » (CESRW). [Traduit par la Rédaction]

Mots-clés : blé d'hiver, *Triticum aestivum* L., description de cultivar, résistance à la maladie.

Introduction

12W932-349 is a soft red winter wheat (*Triticum aestivum* L.) cultivar developed at the University of Guelph, Ridgetown Campus. It received Regional Registration for Ontario (No. 9239) by the Variety Registration Office, Plant Health and Production Division, Canadian Food Inspection Agency on 26 Mar. 2021. 12W932-349 is eligible for grades of Canada Eastern Soft Red Winter (CESRW).

Pedigree and Methods

12W932-349 was derived from the cross 'Marker/DH5-78' made at the University of Guelph in 2012 and developed through a doubled-haploid (DH) method (Devaux and Pickering 2005). Marker (Tamburic-Ilincic and Smid 2015) is a high yielding cultivar, well adapted to Ontario environmental conditions. The pedigree for DH5-78 is Emmit SRW × UGRC08 SRW.

12W932-349 was selected from among 105 DH lines developed from this cross and planted in Ridgetown in 2014 in 2 m long rows for seed increase. In 2015, the DH population was planted in Ridgetown and 12W932-349 was selected based on agronomic characteristics (winter survival, plant height, heading date) and leaf rust (*Puccinia triticina* Eriks.) resistance. 12W932-349 was planted in replicated, preliminary yield trials in Ridgetown (area 1) and Centralia (area 2), Ontario in 2016, where agronomic characteristics, disease resistance, and quality characteristics (test weight, protein concentration and kernel weight) were evaluated. In 2018 and 2019, 12W932-349 was evaluated, with designated checks Ava (a soft white wheat-sww) and Branson (a soft red wheat-srw), for yield and agronomic characteristics across different environments in the Ontario Orthogonal Trials (registration trials). 12W932-349 was evaluated for resistance to common leaf diseases [leaf rust (*Puccinia triticina* Eriks.), septoria tritici blotch (*Mycosphaerella graminicola* Fuckel J. Schrot) and powdery mildew (*Blumeria graminis* f. sp. *tritici* DC. Speer)] in Ontario under natural conditions (scale 0–9), where a rating of zero equates to no disease and a rating of nine implied that 90 percent of plant tissue showed visual symptoms of the disease. 12W932-349 was also evaluated for end-use quality characteristics, as part of the registration process, in the Agriculture and Agri-Food Canada lab in Ottawa. Resistance to fusarium head blight (FHB) for 12W932-349 and designated checks was estimated after inoculation with *Fusarium graminearum* (Schwabe) in three (Ottawa, Elora, and Ridgetown) Ontario Cereal Crop Committee (OCCC) organized FHB inoculated nurseries. The spray inoculum used was a suspension of four *F. graminearum* isolates (two 15-ADON and two 3-ADON chemotypes) with a spore concentration of 5×10^4 spores mL^{-1}. The suspension was produced as

Received 6 April 2021. Accepted 28 August 2021.

L. Tamburic-Ilincic. University of Guelph, Ridgetown Campus, Ridgetown, ON N0P 2C0, Canada.

Email for correspondence: Lily Tamburic-Ilincic (email: ltamburi@uoguelph.ca).

Table 1. Mean yield (t·ha^{-1}) for 12W932-349 and checks Branson and Ava in Ontario Winter Wheat Orthogonal (Registration) Trials (2017, 2018 and 2019).

	Yield (t·ha^{-1})				
Cultivar	2017	2018	2019	2017–2019	% of check means
12W932-349	6.95	6.27	6.46	6.38a	104
Branson	6.28	6.19	6.75	6.23a	101
Ava	6.17	6.28	6.21	6.07a	99
Mean of checks	6.22	6.23	6.48	6.15	100
LSD ($P = 0.05$)	1.32	0.39	1.34	0.65	—
CV	4.75	5.29	9.44	4.60	—
No. stations	2	7	3	12	—

Note: Means followed by same lowercase letter do not significantly differ ($P = 0.05$, Student–Newman–Keuls).

Table 2. Mean winter survival, plant height, heading date, and field disease data for 12W932-349 and checks Branson and Ava across locations in Ontario Winter Wheat Orthogonal (Registration) Trials (2017–2019).

Cultivar	Winter survival (%)	Plant height (cm)	Heading date (days)[a]	Powdery mildew (0–9)[b]	Leaf rust (0–9)[b]	Septoria tritici blotch (0–9)[b]
12W932-349	82	82	161	3.3	1.5	4.3
Branson	84	81	160	3.4	3.0	4.8
Ava	91	98	164	4.1	6.0	3.9
Mean of checks	88	89	162	3.8	4.5	4.4
LSD ($P = 0.05$)	15	6.3	0.5	1.2	2.9	1.2
Locations	6	10	8	4	2	3

[a]Days after Jan. 1.
[b]On a scale from 0–9, 0 = no disease; 9 = 90 percent of plant tissue showed visual symptoms of the disease.

Table 3. Fusarium head blight index (FHBI) and deoxynivalenol (DON) level for 12W932-349 and checks included in Ontario Registration trials (2018 and 2019).

		Ottawa		Elora		Ridgetown	
Cultivar	Year	FHBI (%)	DON (ppm)	FHBI (%)	DON (ppm)	FHBI (%)	DON (ppm)
12W932-349	2018	26	0.9	—	—	2	0.5
Emmit[a]	2018	40	2.1	—	—	12	0.7
12W932-349	2019	18	0.1	19	4.4	22	2.2
CM614[a]	2019	22	0.6	26	11.8	27	4.3
12W932-349	Mean	22	0.5	19	4.4	12	1.4
	(SD)	5.4	0.5	—	—	11	1.2
(MS) checks	Mean	30.8	1.4	26	11.8	19	2.5
	(SD)	12.7	1.1	—	—	15	2.5

[a]Designated moderately susceptible (MS) checks by Ontario Cereal Crop Committee (OCCC).

Table 4. Kernel characteristics for 12W932-349 and checks Branson and Ava for grain collected in Ontario in 2018 and 2019.

Cultivar	Test weight kg·hL^{-1}	Kernel weight g/1000 kernels	Kernel hardness[a] PSI	Grain protein %	Grain ash %	Falling number s
12W932-349						
2018	79.8	36.7	75.8	10.6	1.48	343
2019	77.3	33.2	78.5	11.0	1.58	331
Branson						
2018	80.0	36.4	77.8	11.1	1.44	334
2019	76.8	33.3	79.3	11.2	1.55	328
Ava						
2018	80.9	36.2	77.8	10.8	1.50	303
2019	77.6	31.4	79.8	9.9	1.57	309

Note: Five locations bulked to give a composite in 2018: Woodsle, Elora, Chatham, Palmerston, and Ridgetown and three locations bulked to give a composite in 2019: Woodsle, Elora, and Palmerston.

[a]Single kernel characterization system (SKCS) method.

Table 5. End-use quality characteristics for 12W932-349 and checks Branson and Ava for grain collected in Ontario in 2018 and 2019.

Cultivar	Flour yield %	Flour protein %	Protein difference[a] %	Cookie spread cm	Cookie width/ Thickness[b] cm
12W932-349					
2018	77.8	9.49	1.13	7.89	8.69
2019	76.0	9.61	1.40	8.00	8.77
Branson					
2018	74.7	9.87	1.18	7.86	8.05
2019	73.6	9.80	1.41	7.94	7.83
Ava					
2018	75.1	9.42	1.38	7.71	8.47
2019	73.7	8.60	1.26	7.13	7.86

Cultivar	Alveograph peak (mm)	Length (mm)	Energy
12W932-349			
2018	26	145	72
2019	26	164	78
Branson			
2018	29	170	91
2019	29	161	96
Ava			
2018	23	143	60
2019	23	122	57

Note: Five locations bulked to give a composite in 2018: Woodsle, Elora, Chatham, Palmerston, and Ridgetown and three locations bulked to give a composite: Woodsle, Elora, and Palmerston.

[a]Difference between grain and flour protein content.

[b]Average ratio of cookie width to thickness.

described by Tamburic-Ilincic et al. (2007). Due to differences in flowering date, each line was sprayed when the wheat spikes were at 50% anthesis (ZGS 65, Zadoks et al. 1974). After inoculation, the rows were irrigated with an overhead mist system delivering about 7.5 mm of water each day until 3 d after the last inoculation. Visual symptoms were recorded 21 d after inoculation as incidence (percentage of heads infected) and severity (percentage of infected spikeletes). FHB index (FHBI) was calculated as incidence × severity/100 (Tamburic-Ilincic et al. 2007). Deoxynivalenol (DON) was quantified by the ELISA method (Sinha and Savard 1996) with the commercially prepared EZ-Quant® Vomitoxin ELISA kit from Diagnostix (Mississauga, ON, Canada). The lower DON detection limit for the kit was 0.5 ppm.

Performance

12W932-349 is well adapted for the winter wheat growing areas of Ontario. Although 12W932-349 was not statistically different from the checks for yield, it was numerically higher yielding than Ava in 2017 and 2019, and Branson in 2017 and 2018 (Table 1). 12W932-349 is shorter than Ava and earlier to head than both checks ($P < 0.05$) (Table 2). 12W932-349 expressed higher resistance to leaf rust than the checks but was similar for powdery mildew and septoria leaf spots (Table 2). The FHB index and DON levels for 12W932-349 were lower than the moderately susceptible checks (Emmit, CM614) at all nursery sites over the two years of testing (Table 3). 12W932-349 had a higher falling number than Ava and was very similar to Branson (Table 4). The flour yield of 12W932-349 was higher than the checks (Table 5).

Other Characteristics

Seedling characteristics

Coleoptile color: absent.
Juvenile growth habit: winter annual, erect.
Pubescence on leaf sheath and blade: glabrous.
Tillering capacity: high.

Adult characteristics

Flag leaf colour: green.
Flag leaf attitude: intermediate.
Plant height: medium.

Mature spike characteristics

Spike: white, awnlets present.
Spike attitude: inclined to nodding.
Spike shape/size: tapering/long.
Density: medium.
Glume shoulder: slightly sloping.

Straw characteristics

Anthocyanin colouration at maturity: absent.
Straw pith: very thin.

Kernel characteristics

Length and width: medium.
Colour: medium red.
Hardness: soft.
Size: medium.

Maintenance and Distribution of Seed

Breeder seed of 12W932-349 was produced when 200 heads were hand harvested at maturity and individually threshed, planted as head rows, rogued and harvested. Ten head rows were discarded. The seed will be maintained by the University of Guelph, Ridgetown Campus, Ridgetown, Ontario, N0P 2C0. Canadian Representative/Distributor is University of Guelph.

Acknowledgements

This study was financially supported by the Grain Farmers of Ontario, the University of Guelph and the Ontario Ministry of Agriculture, Food and Rural Affairs. The technical assistance of Jonathan Brinkman and Todd Phibbs and numerous summer students is gratefully acknowledged. Thanks, are also extended to the Ontario Cereal Crop Committee (OCCC) and trials coordinators for registration data (www.gocereals.ca).

References

Devaux, P., and Pickering R. 2005. Haploids in the improvement of Poaceae. In Haploids in Crop Improvement II. D. Palmer, W. Keller, and K. Kasha, eds. Springer, Heidelberg. pp. 215–242.

Sinha, R.C., and Savard, M.E. 1996. Comparison of immunoassay and gas chromatography methods for the detection of the mycotoxin deoxynivalenol in grain samples. Can. J. Plant Pathol. **18**: 233–236. doi:10.1080/07060669609500617.

Tamburic-Ilincic, L., Schaafsma, A.W., and Falk, D.E. 2007. Indirect selection for lower deoxynivalenol (DON) content in grain in a winter wheat population. Can. J. Plant Sci. **87**: 931–936. doi:10.4141/P06-024.

Tamburic-Ilincic, L., and Smid, A. 2015. Marker, soft red winter wheat. Can. J. Plant Sci. **95**(5): 1029–1031. doi:10.4141/cjps-2015-063.

Zadoks, J.C., Chang, T.T., and Konzak, C.F. 1974. Decimal code for growth stages of cereals. Weed Res. **14**: 415–421. doi:10.1111/j.1365-3180.1974.tb01084.x.