Registration of Spring Wheat Germplasm ND 652 Resistant to Common Root Rot, Leaf, and Stem Ruts

ND 652 (Reg. no. GP-783, PI 639177) is a hard red spring wheat (Triticum aestivum L.) developed at North Dakota State University (NDSU), Fargo, ND, USA. ND 652 was released in January 2005 by the North Dakota Agricultural Experiment Station (NDAES) for its high level of resistance to common root rot (CRR) (caused mainly by Cochliobolus sativus (Ito et Kurib) Dresch. ex Dastur [anamorph: Bipolaris sorokiniana (Sacc.) Shoem., syn: Helminthosporium sativum P.K. & B]) and its adaptation to the northern spring wheat region of the United States. ND 652 is also resistant to the prevalent pathotypes of stem rust (caused by Puccinia graminis Pers.:Pers. f. sp. tritici Eriks. & E. Henn) in the region and to leaf rust (caused by Puccinia triticina Eriks.).

ND 652 was derived from the cross of ‘Stoa’ (PI 520297) and ‘Amidon’ (PI 527682) made at NDSU by Dr. R.C. Frohberg in 1981. Stoa and Amidon are hard red spring wheat (HRSW) cultivars developed by NDSU and released by NDAES in 1984 and 1988, respectively. The F1 seeds from the original cross were grown in the greenhouse in the winter of 1982 and the F2 population was grown in the field at Prosper, ND, in the summer of 1982. Two hundred spikes were selected from the F2 population and advanced as F3 derived head-row families at the NDSU Agronomy Seed Farm at Casselton, ND, in the summer of 1983. Ten spikes were harvested from each of selected F3 head-rows, thresher in bulk and sown as F4 head-row plots at Prosper, ND, in the summer of 1984. Subsequently, ten selected spikes from each of the F4 head-row plots were harvested, thresher individually, and grown as F5 families in 1.2-m head-row plots at Prosper, ND, in the summer of 1985. ND 652 was produced from a bulk of one of the selected F5 head-row plots. Selection in the early segregating populations (F2 to F3) was based on high levels of resistance to leaf rust, stem rust, and good agronomic merits including plant vigor, height, and earliness. ND 652 was entered into yield trials as an F5 breeding line at Casselton and Prosper, ND, in 1986 and, subsequently, was tested in advanced (F4) and elite (F5) yield trials at four locations in North Dakota in 1987 and 1988. ND 652 was then tested for agronomic and quality traits in 14 location–years in 1988 and 1989 in the North Dakota State Trials and in 31 location–years in the Hard Red Spring Wheat Uniform Regional Nursery (HRSWURN) conducted in the states of North Dakota, Minnesota, South Dakota, Nebraska, Montana, Wyoming, Washington, and Manitoba, Canada (Bush and Mitchell, 1988; Bush and Linkert, 1989). ND 652 was initially tested in the CRR trials conducted at Fargo, ND, from 1988 to 1990 (Stack, 1994). ND 652 was one of the few HRSW genotypes that showed high levels of resistance to CRR. Hence, it was included as an improved resistant HRSW check in the CRR trials conducted at Fargo, ND (1993, 1994, and 1997); Carrington and Minot, ND (1996 and 1997); and Williston, ND (1996 and 1997; 2002; 2005; 2006).

ND 652 was also tested for resistance to leaf rust in the CRRI (Common Root Rot Index) recorded for Grandin (78 cm), 4 cm shorter than Stoa and Amidon, and more resistant to leaf rust in the CRRI recorded for Grandin (47%) and Len (68%), in 1996 and 1997. ND 652 was evaluated at the USDA-ARS, Cereal Crop Research Unit at Fargo, ND, in 2002 and 2003 for resistance to stem rust. ND 652 was found to be highly resistant to all stem rust pathotypes: Pgt-QCCI, -QTHJ, -QSA, -TPMK, -RHTS, and -HPHJ. ND 652 was very resistant to the MCDL, THBJ, TCKK, and SCKK races of leaf rust at the seedling stages and to the SD 940 races in the field at adult plant stage (Bush and Linkert, 1989).

ND 652 is an awned, medium-maturing, and semidwarf wheat (Triticum aestivum L. (Eriks. & E. Henn) in the region and to leaf rust and stem rusts in North Dakota State Trials. In the same trials, the number of kernel per spike of ND 652 (31%) was significantly lower (P < 0.05) than the average of Grandin (47%) and Len (68%), with over 14 locations in the field at adult plant stage (Bush and Linkert, 1989).

In the HRSW trials, the yield of ND 652 was 2331 kg ha⁻¹ compared with 2380 kg ha⁻¹ for Stoa and ‘Chris’ (CIT 13751), respectively. Grain weight per volume of Amidon and Stoa was 757 kg m⁻³ and 754 kg m⁻³, respectively, in the same trials. In 1987 and 1988, ND 652 was tested for agronomic and quality traits in 14 location–years of North Dakota State Trials and in 31 location–years in the Hard Red Spring Wheat Uniform Regional Nursery (HRSWURN) conducted in the states of North Dakota, Minnesota, South Dakota, Nebraska, Montana, Wyoming, Washington, and Manitoba, Canada (Bush and Mitchell, 1988; Bush and Linkert, 1989). ND 652 was initially tested in the CRR trials conducted at Fargo, ND, from 1988 to 1990 (Stack, 1994). ND 652 was one of the few HRSW genotypes that showed high levels of resistance to CRR. Hence, it was included as an improved resistant HRSW check in the CRR trials conducted at Fargo, ND (1993, 1994, and 1997); Carrington and Minot, ND (1996 and 1997); and Williston, ND (1996 and 1997; 2002; 2005; 2006).

Based on 14 location–years of North Dakota State Trials, the average yield of ND 652 was 2264 kg ha⁻¹ compared to 2358 kg ha⁻¹ for Stoa and ‘Chris’ (CIT 13751), respectively. Grain weight per volume of Amidon and Stoa was 757 kg m⁻³ and 754 kg m⁻³, respectively, in the same trials. In the HRSW trials, the grain weight per volume of ND 652 was 722 kg m⁻³ and 737 kg m⁻³ for Stoa and ‘Chris’ (CIT 13751), respectively.

ND 652 is of interest to many breeders in the USA and worldwide where CRR disease is a problem of wheat. It is resistant to common root rot (CRR) (caused mainly by Cochliobolus sativus (Ito et Kurib) Dresch. ex Dastur [anamorph: Bipolaris sorokiniana (Sacc.) Shoem., syn: Helminthosporium sativum P.K. & B]) and its adaptation to the northern spring wheat region of the United States. ND 652 is also resistant to the prevalent pathotypes of stem rust (caused by Puccinia graminis Pers.:Pers. f. sp. tritici Eriks. & E. Henn) in the region and to leaf rust (caused by Puccinia triticina Eriks.).

References

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