Registration of ‘Glenn’ Wheat

‘Glenn’ (Reg. no. CV-974, PI 639273), is a hard red spring wheat (Triticum aestivum L.) developed at North Dakota State University (NDSU) and released by the North Dakota Agricultural Experimental Station (NAES) in July 2005. Glenn was released because it combines very high level of resistance to Fusarium head blight (FHB) [caused by Fusarium graminearunum Schwabe] [telemorph Gibberella zeae (Schwein.) Petch]], with high yield and grain volume, as well as excellent end-use quality for the domestic and export wheat markets.

Glenn, a sister line of the released germplasm ND 744 (Mergoum et al., 2005a), was derived from the cross ND 2831/'Steele-ND' (PI 634981) made at NDSU by Dr. R.C. Frohberg in 1997. ND 2831 is a hard red spring experimental line developed by the NDSU breeding program from the cross ‘Sumai 3’ (PI 481542) /’Wheaton’ (PI 469271) /’Grandin’ (PI 531005)/3/ ’Steele-ND’ (PI 634981) made at NDSU by Dr. R.C. Frohberg in 1997. Ten spikes were harvested, bulked, and planted in the greenhouse as an F3 in the fall of 1997. From the F3 population, 100 spikes were harvested, bulked, and grown as F3 in the greenhouse in the spring of 1998. Subsequently, 100 spikes selected from the F3 were threshed individually and sown as F3.3 hill plots in the FHB nursery at Prosper, ND, in the summer of 1998. The FHB nursery was inoculated with the FHB pathogen using the spray inoculation method (Rudd et al., 2001) and overhead mist irrigation to enhance disease development. Ten spikes from plants showing less than 10% FHB disease severity (Stack et al., 1997) were harvested, bulked, and advanced as F3.5 families in the New Zealand (NZ) off-season nursery during the 1998–1999 crop cycle. Spikes selected in the F2 and F3 generations were based on reaction to leaf rust (caused by Puccinia triticina Eriks.), and agronomic merits including plant vigor, height, and earliness. In NZ, selection was based mainly on visual uniformity, grain shattering, plant height, and lodging resistance. Glenn was further purified by selecting 200 heads from the F4.5 population in the greenhouse under artificial FHB inoculation conditions in 2001 and was harvested, threshed individually and seeded as head rows at Prosper in 2002. Nonuniform rows were discarded and the remaining rows were bulked to form Breeder seed.

In 31 site-years of testing in the NDVT, grain yield of Glenn (4381 kg ha⁻¹) was similar to ‘Alsen’ (PI 615543) (4300 kg ha⁻¹), ‘Parshall’ (PI 613587) (4347 kg ha⁻¹), and ‘Reeder’ (PI 613586) (4448 kg ha⁻¹) but lower (P < 0.05) than Steele-ND (4885 kg ha⁻¹). In the same trials grain yield of Glenn was 811 kg m⁻² significantly higher (P < 0.05) than 767, 768, and 776 kg m⁻² of Alsen, Parshall, and ‘Dapps’ (PI 633862), respectively. Protein content of Glenn (166 g kg⁻¹) was lower than Dapps (171 g kg⁻¹) but similar to Alsen (163 g kg⁻¹), Parshall (164 g kg⁻¹), and higher than Reeder (161 g kg⁻¹). On the basis of 36 locations of the URN conducted in 2003 and 2004, mean grain yield, grain volume weight, and protein content of Glenn were 4340 kg ha⁻¹, 794 kg m⁻³, and 154 g kg⁻¹, respectively, compared with Steele-ND (4515 kg ha⁻¹, 775 kg m⁻³, and 152 g kg⁻¹), ‘Pioneer 2375’ (4475 kg ha⁻¹, 777 kg m⁻³, and 143 g kg⁻¹), and ‘Verde’ (PI 592861) (4461 kg ha⁻¹, 762 kg m⁻³, and 142 g kg⁻¹).

Flour yield for Glenn from 13 trials grown in ND averaged 684 kg m⁻² compared with 692, 693, and 678 kg m⁻² for Alsen, Parshall, and Reeder, respectively. Water absorption was 65.9%, significantly higher than Reeder (64.8%), but not different from Alsen (65.1%), and Parshall (65.2%). The mixing tolerance of Glenn (20.9 min) was longer than all of the checks including Reeder (15.9 min), Alsen (16.4 min), and Parshall (17.0 min). Lowf volume was 1103 mL, comparable to Parshall (1090 mL) and Alsen (1076 mL), but superior to Reeder (1015 mL).

Glenn was tested for FHB in seven location–years in the FHB nursery grown at Prosper, ND, under artificial inoculation using overhead irrigation techniques. It was also evaluated in three environments under natural FHB infection and in four experiments under greenhouse conditions using the spray inoculation. On the basis of seven location–years of testing in the FHB nursery conducted under field conditions, the FHB incidence (Stack et al., 1997) recorded for Glenn (19%) was significantly higher than the most resistant line ‘2710’ (9%) developed by NDSU (Frohberg et al., 2004), but significantly lower than the incidence for the moderately resistant checks Alsen (29%) and Steele-ND (31%) and susceptible checks Reeder (59%) and ‘2398’ (42%). Similarly, on the basis of the three location–years of testing for FHB under natural infection conducted under field conditions, the FHB incidence recorded for Glenn was 8% compared with 2.7, 19, 26, and 42% scored for 2710, Alsen, Steele-ND, Reeder, and Pioneer 2375, respectively. Under greenhouse conditions, the FHB incidence of Glenn based on four tests was 16% compared with 9, 11, 25, 31, and 27% of the moderately resistant checks Alsen (29%), Steele-ND (31%), and susceptible checks Reeder (59%) and ‘2398’ (42%). Similarly, on the basis of the three location–years of testing for FHB under natural infection conducted under field conditions, the FHB incidence recorded for Glenn was 4.3% compared with 2.7, 19, 26, and 42% scored for 2710, Alsen, Steele-ND, Reeder, and Pioneer 2375, respectively. Under artificial inoculation, the DON level of Glenn (4 μg g⁻¹) was similar to ND 2710 (2.9 μg g⁻¹), Alsen (4.8 g g⁻¹), and Steele-ND (5.3 μg g⁻¹), but significantly lower than that of the DON levels of Pioneer 2375 (7.4 μg g⁻¹), Reeder (10.3 μg g⁻¹), and 2398 (9.9 μg g⁻¹). Alsen was released in 2000 as the first NDSU HRSW cultivar with resistance to FHB from the Chinese ‘Sumai 3’ (PI 481542) and has been widely grown in the northern plains since 2001. Steele-ND, a NDSU HRSW cultivar released in 2004 (Mergoum et al., 2005b), has resistance to FHB comparable to Alsen but has parentage different from the Chinese Sumai 3. Compared with ND 744, Glenn has similar FHB resistance and agronomic performance. However, ND 744 has harder kernels and lower protein content (10 kg g⁻¹ in average) and grain volume than Glenn.

Based on seedling and adult plant screening tests conducted under greenhouse conditions from 2000 to 2004, Glenn ex-