Registration of ‘Alsen’ Wheat

‘Alsen’ (Reg. no. CV-997, PI 615543), is a hard red spring wheat (HRSW) (Triticum aestivum L.) developed at North Dakota State University (NDSU) and released by the North Dakota Agricultural Experiment Station (NDAES) in July 2000. Alsen was released because it combines resistance to Fusarium head blight (FHB) [caused by Fusarium graminearum Schwabe (teleomorph Gibberella zeae (Schwein.) Petech)], high grain yield, and excellent end-use quality for the domestic and export wheat markets.

Alsen was derived from the ‘ND674/ND2710 (PI 633976)/ND688’ cross made at NDSU in the spring of 1995. ND674 (‘Grandin’ (PI 531005)*2/’Glupro’ (PI 529759)) and ND688 (Grandin/31AS20/4/H567.71/Amidon’ (PI 527682)) are two hard red spring experimental lines that have good adaptation to North Dakota wheat growing conditions and good end-use quality. ND674 is derived from Glupro, a HRSW cultivar released in 1989 by the NDAES for its very high grain protein content derived from Triticum dicoccoides (Koern. ex Asch. & Graebner) Aarons. ND2710 (Frohberg et al., 2004) is a hard red spring germplasm developed from the cross ND2603/Grandin made in 1991. Grandin is a HRSW cultivar released by the NDAES in 1989 and ND2603 was developed from the cross ‘Suma3’ (PI 481542)/’Wheaton’ (PI 469271) made in 1987. Suma3, a spring wheat from China, is arguably the most used source of resistance to FHB in the world (Wilcoxson, 1993; Rudd et al., 2001).

The F1 seeds from the cross leading to Alsen were grown in the field at Prosper, ND, in summer of 1995 and the F2 population was grown in the greenhouse in the fall of 1995. From the F2 population, 200 spikes were harvested, threshed individually, and advanced to obtain F3 seed, which were then grown in the field at Prosper, ND, in summer of 1995 and the F2 population was grown in the greenhouse in the spring of 1996. The single seed descent method. Selection in the F2 and F3 generations was based on reaction to leaf rust (caused by Puccinia triticina Eriks.) and agronomic techniques. It was also evaluated in four environments under natural FHB infection and in three experiments under greenhouse conditions using the spray inoculation. On the basis of six trials conducted under artificial inoculation and field conditions, the FHB severity (Stack et al., 1997) for Alsen (42%) was significantly higher than the most resistant line ND2710 (31%) but significantly lower than the susceptible checks Grandin (69%), Gunner (60%), 2710 (63%), and the very susceptible checks ‘B331’ (90%) and ‘Pioneer 2398’ (87%). Similarly, on the basis of the four location-years of testing for FHB under natural infection and field conditions, the FHB severity for Alsen was 10% compared with 2, 24, 13, 20, 44, and 36% scored for 2710, Grandin, Gunner, 2375, B331, and Pioneer 2398, respectively. Under greenhouse conditions, the FHB incidence of Alsen based on three tests was 14% compared with 5, 39, and 73% for 2710, Grandin, and B331, respectively. Alsen was also evaluated for the levels of the triketohexene mycoxin doxynivalenol (DON) produced by FHB in four naturally and two artificially infected field tests. Under natural infection, the DON level of Alsen was 0.8 g kg⁻¹ compared with 1.7, 2.9, 0.8, 1.8, and 2.9 g kg⁻¹ for 2710, Grandin, Gunner, 2375, B331, and Pioneer 2398, respectively. Under artificial inoculation, the DON level of Alsen (10 g kg⁻¹) was significantly higher (P < 0.05) than ND2710 (2.9 g kg⁻¹) but significantly lower than the DON levels of Grandin (21.2 g kg⁻¹), Gunner (12.2 g kg⁻¹), 2375 (30.5 g kg⁻¹), B331 (55.7 g kg⁻¹), and Pioneer 2398 (25 g kg⁻¹). Under greenhouse conditions, the DON levels of Alsen were 9.8 g kg⁻¹ compared with 1.4, 27.3, and 10 g kg⁻¹ for 2710, Grandin, and B331, respectively.

Seedling and adult plant screening tests conducted under greenhouse conditions from 1997–1999 showed that Alsen exhibited a medium level of resistance to pathotype THBL, the predominant race of leaf rust (caused by Puccinia triticina Eriks.) in the region. Alsen was evaluated from 1997 to 1999 at the USDA-ARS, Cereal Crop Research Unit, Fargo, ND, for resistance to stem rust (caused by Puccinia graminis Pers.)