Registration of Four Durum Germplasms Carrying Glutenin Allele Glu-D1d on a 1AS.1AL-1DL Translocation Chromosome

Four durum (Triticum turgidum L. var. durum) germplasms carrying Glu-D1d on a 1AS.1AL-1DL translocation chromosome have been released in October 2004 by the USDA-ARS Northern Crops Science Laboratory, Fargo, ND, and North Dakota State University. The germplasms are identified as L092 (Reg. no. GP-796, PI 636498), L252 (Reg. no. GP-797, PI 636499), S99B33 (Reg. no. GP-798, PI 636500), and S99B34 (Reg. no. GP-799, PI 636501). The gene Glu-D1d encodes for high molecular weight (HMW) glutenin subunits 1Dx5 and 1Dy10 (5+10) (Payne and Lawrence, 1983); and these subunits are highly desirable for superior bread-baking quality. The germplasms were produced in an effort to develop dual-purpose (good pasta and bread-baking quality) durum wheats.

The crosses used for developing the germplasms were made by Joppa et al. (1998). The Glu-D1d allele was transferred from the hexaploid wheat ‘Len’ (Citr17790) to a tetraploid background by crossing to Langdon 1D(1A) and backcrossing to the hexaploid wheat ‘Len’ (Citr17790) to a tetraploid background. After examining chromosome pairing at metaphase I of meiosis to select double-monosomic (13 chromosome 1A. After examining chromosome pairing at metaphase I of meiosis to select double-monosomic (13

The pedigree Langdon 1D(1A)/Len//Langdon/3/2*Renville.

The double-monosomic F1 plants were selfed. In the F2, plants with 14" were selected and testcrossed to Langdon double-ditelsomic 1A to identify plants carrying a 1A.1D translocation. In the testcrosses, metaphase I chromosome pairing configurations of 13" + t1" + t’ indicated that a spontaneous homeologous translocation had occurred in the double-monosomic BC1F1 plant. The final selections of L092 and L252 were from F4 plants, and S99B33 and S99B34 were derived from F5 plants.

The translocated segment in all four genotypes should be identical since all trace back to the same BC1F1 plant, and hence the same translocation event in the BC1F1. The size of the translocated 1D segments in S99B34 and L252 were characterized by fluorescent genomic in situ hybridization as comprising 31% of the distal end of the translocated arm (Xu et al., 2005). The translocation breakpoint in S99B34 and L252 were also mapped by Xu et al. (2005) to an interval of less than 7.0 cM between microsatellite markers Xgwm135 and Xgwm357 (Röder et al., 1998).

In agronomic trials (five location-years) conducted in North Dakota from 2000 to 2002, grain yields of Renville, S99B33, and S99B34, respectively, were 710.7, 709.3, and 695.9 kg m-2, and L252 had significantly lower tillering than Renville, averaging 710.7, 709.3, and 695.9 kg m-2, respectively. Heading dates of S99B33 and S99B34 were 31.7, 30.3, 30.2, and 30.2 g, and L252 and L092 had thousand kernel weights of 31.7, 30.3, 30.2, and 30.2 g, respectively, indicating that L092 had lower straw, and L252 had significantly lower tillering than Renville. All four translocation germplasms carried glutenin subunits 1Bx6 and 1By8 conditioned by the Glu-B1d allele. L092, S99B33, and S99B34 have identical low molecular weight (LMW) glutenin subunits and gliadins. Therefore, breeders may find these lines useful as parents in crosses combining durum germplasm carrying Glu-D1d with glutenin or gliadin sources that complement Glu-D1d.

Seed will be available at the USDA-ARS, Cereal Crops Research Unit, Fargo, ND 58105.

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References


