Registation of Sawfly Resistant Hexaploid Spring Wheat Germplasm Lines Derived from Durum

G9608B1-L12J11BF02 (Reg. no. GP- 781, PI 633737) and G9608B1-L12J13AU01 (Reg. no. GP-782, PI 633738) solid-stemmed hexaploid spring wheat lines (*Triticum aestivum* L.), were developed by Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre in Swift Current, SK, and released in July 2003. G9608B1-L12J11BF02 and G9608B1-L12J13AU01 are BC$_2$F$_6$ derived lines from the backcross P89-77-1F4/2*AC Elsa*. P89-77-1F4 is a synthetic hexaploid developed by the late Dr. E.R. Sears at the University of Missouri that expressed pith in the culm lumen and derived from a cross between the tetraploid *Triticum turgidum* var. *durum* ‘Golden Ball’ (2n = 28, ABB) and the diploid *Aegilops squarrosa* L. (2n = 14, DD). Golden Ball is a solid-stemmed durum (Kemp, 1934) introduced to the USA from South Africa in 1918 (Clark et al., 1922). AC Elsa (*T. aestivum*) is a hollow-stemmed hexaploid that is well adapted to the Canadian Prairies (Clarke et al., 1997).

The backcrossed seed from the solider and more fertile plants were increased in a growth cabinet and scored for pith development. Each internode of the primary wheat culm was sliced longitudinally and rated for the degree of pith development in the stem lumen on a scale of 1 to 5 (Clarke et al., 1998). Seed from the solider, more fertile BC$_2$F$_2$ lines were grown in the field in 1998 and scored for solidness. Single BC$_2$F$_2$ selections were made on the basis of criteria of stem solidness, spike fertility, glume color and disarticulation, and time to maturity. These selections were grown as BC$_2$F$_3$ head rows in the 1999 field sawfly (*Cephus cinctus* Nort.) nursery, wherein plots are seeded next to undisturbed stubble containing sawfly pupae from the previous growing season. G9608B1-L12J11BF02 and G9608B1-L12J13AU01 derive from BC$_2$F$_4$ selections made in the 1999 sawfly nursery. The BC$_2$F$_4$ rows had 2% wheat stem sawfly cutting compared to 34% for the hollow check ‘Glenlea’ (Evans et al., 1972), 44% for the wheat stem sawfly resistant hexaploid check ‘AC Abbey’ (DePauw et al., 2000), and 13% for Golden Ball. Both germplasm lines have very solid stems with all stem internodes of G9608B1-L12J11BF02 and G9608B1-L12J13AU01 completely filled with pith (score of 5.0 ± 0). Pith development was similar to Golden Ball (4.6 ± 0.2) and considerably better than the sawfly resistant lines derived from the S-615 source (DePauw et al., 1995) such as AC Abbey (2.7 ± 0.3) and ‘AC Eatonia’ (DePauw et al., 1994) (3.0 ± 0). Stem solidness of the BC$_2$F$_2$ selections were evaluated in the field in 2001. The average pith development over all internodes was 4.8 ± 0.4 for G9608B1-L12J11BF02 and 4.8 ± 0.6 for G9608B1-L12J13AU01.

This first backcross germplasm is not as agronomically unsuitable as the synthetic hexaploid parent. These two lines stood out in the BC$_2$F$_7$ test for their uniformity, fertility, and ease that the seed could be thrashed. However, both lines are still taller and later maturing than AC Elsa (95 cm and ranges in maturity from 104 d in the Brown soil zones to 107 d in the Dark Brown soil zones (Clarke et al., G9608B1-L12J11BF02 and G9608B1-L12J13AU01 are BC$_2$F$_6$ derived lines from the backcross P89-77-1F4/2*AC Elsa*. P89-77-1F4 is a synthetic hexaploid developed by the late Dr. E.R. Sears at the University of Missouri that expressed pith in the culm lumen and derived from a cross between the tetraploid *Triticum turgidum* var. *durum* ‘Golden Ball’ (2n = 28, ABB) and the diploid *Aegilops squarrosa* L. (2n = 14, DD). Golden Ball is a solid-stemmed durum (Kemp, 1934) introduced to the USA from South Africa in 1918 (Clark et al., 1922). AC Elsa (*T. aestivum*) is a hollow-stemmed hexaploid that is well adapted to the Canadian Prairies (Clarke et al., 1997). The vast majority of the culled lines were variable within the rows and produced very few seeds. Cytological instability was observed in some of the initial crosses with the synthetic hexaploid (*data not shown*). We do not know the genetics of solidness in a hexaploid background, so these two lines since they may carry different combinations of genes involved. Investigation of the genetics of solidness is underway.

These lines will be useful for development of new wheat cultivars that have resistance to the wheat stem sawfly and have an ancestry different from S-615. Small quantities of seed are available on request from the corresponding author.

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References


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