Registration of STARS 0601W Wheat Germplasm

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STARS 0601W (Reg. No. GP-836, PI 643399) is a hard red winter wheat (Triticum aestivum L.) germplasm developed cooperatively by the Wheat, Peanut and Other Field Crops Research Unit, USDA-Agricultural Research Service, Stillwater, OK, and the Oklahoma Agricultural Experiment Station (OAES). STARS 0601W is resistant to biotypes 1 and 2 of the Russian wheat aphid (RWA), Diuraphis noxia (Mordvilko).

STARS 0601W was experimentally tested as 02 Altus 034 and OK03825, and originated from the cross ‘Custer’/94M81. Custer is a hard red winter wheat cultivar developed by the OAES and the USDA-ARS and released in 1994. It is best adapted to western Oklahoma and the High Plains and has the pedigree, F29-76/TAM 105/Citr 17826/’Chisholm’ (PI 486219).

STARS 0601W is resistant to RWA biotypes 1 and 2 when seedling plants are tested with greenhouse-reared colonies of biotype-verified aphids. Seedling reactions to RWA biotypes 1 and 2 feeding are characterized as resistant (scores of 1 and 2, respectively) on a damage rating scale of 1 (no damage) to 9 (dead plant) using standard RWA culture and resistance evaluation protocols (Porter et al., 1993). The South African wheat selection, 94M81, is the source of RWA resistance in STARS 0601W. 94M81 was derived from the line 93M45-14, which contains a 1BL.1RS wheat-rye translocation developed through an intergeneric transfer from ‘Turkey 77’ rye (Secale cereale L.) to ‘Veery’ wheat (Marais et al., 1994). Resistance to RWA biotype 2 in 94M81 is conferred by a single dominant gene, designated Dn7, located on the 1BL.1RS wheat-rye translocation (Marais et al., 1998).

In 1995, seedlings of 94M81 were tested for resistance to RWA biotype 1; resistant plants were identified, rescued from RWA infestation, and crossed with Custer. RWA biotype 1 resistant progeny were selected and backcrossed twice to Custer in subsequent years. BC, populations were evaluated in the greenhouse over several years for RWA resistance and agronomic traits (e.g., height, spike type, maturity, uniformity, etc.) and evaluated in field plots in 2002 (as 02 Altus 034) and in 2003 and 2004 (as OK03825). Greenhouse tests conducted in 2004 revealed 02 Altus 034 (OK03825) was also resistant to RWA biotype 2 (Porter et al. 2005). In subsequent 2004 tests, single plants of OK03825 were infested with a combination of RWA biotypes 1 and 2, and plants with damage ratings of 1 to 2 were selected and increased in the greenhouse in 2005. Three single-plant progenies were increased at Yuma, AZ in 2006. STARS 0601W was selected from one of those progenies and is a BC$_{3}$F$_{2}$-derived line currently in the F$_{4}$ generation. Homogeneity of RWA biotype 2 resistance in STARS 0601W was verified in greenhouse tests conducted in 2006.

STARS 0601W is an awned, white-chaffed, medium height, semidwarf wheat with medium-early maturity, heading about 2 d before ‘Ok101’ (PI 631493). STARS 0601W plant height, at 82 cm, is similar to Ok101 (81 cm), and slightly shorter than ‘TAM 111’ (PI 631352) (86 cm). STARS 0601W is susceptible to leaf rust (Puccinia triticina Eriks.) in the seedling stage and to wheat soil-borne mosaic virus. Based on replicated trials in western Oklahoma in 2003 (six locations, three replications each), grain yield of STARS 0601W (5220 kg ha$^{-1}$) was similar to ‘TAM 110’ (PI 595757) (5260 kg ha$^{-1}$). In 2004 trials (six locations, three replications each), grain yield of STARS 0601W (3440 kg ha$^{-1}$) was similar to ‘Ragale’ (3420 kg ha$^{-1}$) in central and western Oklahoma tests. STARS 0601W has a grain volume weight similar to ‘Ok102’ (3623635 g kg$^{-1}$) and intermediate to Ok101 and TAM 111. Across three test locations in 2004, grain volume weights were 77.8 (STARS 0601W, 77.9 (Ok102), 76.7 (Ok101), and 78.6 kg hL$^{-1}$ (TAM 111).

End use quality of STARS 0601W was assessed by OSU’s Wheat Quality Laboratory in 2003 (two sites) and 2004 (three sites). Protein levels varied from 122 to 134 g kg$^{-1}$, 9 g kg$^{-1}$ higher than TAM 110 (2003) and 15 g kg$^{-1}$ higher than Ok101 (2004). Based on single-kernel characterization system analysis from three sites in 2004, STARS 0601W averaged 38.5 mg for kernel weight, 2.7 mm for kernel diameter, and 55 for kernel hardness index. The check cultivar, Ok101, averaged 34.1 mg for kernel weight, 2.6 mm for kernel diameter, and 44 for kernel hardness index. STARS 0601W had a mixing time of 2.7 min, and a mixing tolerance score of 3.7 on a 1-to-10 (low-to-high) scale. Ok101 had a mixing time of 4.0 min, and a mixing tolerance score of 5.3. Mixing tolerance parameters were derived from a computer-assisted National Manu-