REGISTRATION OF GERMPLASM

Registration of RWR-Tetra-1 Tetraploid Russian Wildrye Germplasm

RWR-Tetra-1 Russian wildrye [*Psathyrostachys juncea* (Fisch.) Nevski] germplasm (Reg. no. GP-75, PI 599302) was developed and released in 1997 by the USDA-ARS Forage and Range Research Laboratory in cooperation with the Utah Agricultural Experiment Station at Utah State University (USU). This 26-line composite was released as source material for genetic studies and for the development of improved cultivars of tetraploid ($2n = 4x = 28$) Russian wildrye. Most Russian wildrye found in natural populations are diploids ($2n = 2x = 14$) (1). RWR-Tetra-1 traces to 10 parental accessions of Russian wildrye that were initially obtained by K.H. Asay, D.A. Johnson, and M.D. Casler during a collection expedition to Kazakhstan in 1988. Four of these accessions, AJC538, AJC539, AJC540, and AJC601, were identified as natural tetraploids, and the remaining lines, AJC595, AJC596, AJC597, AJC598, AJC599, and AJC600, were described as induced tetraploids. The 10 parental tetraploid accessions of RWR were donated by the N.I. Vavilov Institute of Plant Industry (VIR), St. Peterburg, Russia. The accessions have been entered in the National Plant Germplasm System (NPGS) as PI numbers 565063 to 565072.

The 10 parental accessions were initially evaluated from 1989 to 1992 at the USU Evans Experimental Farm, which receives 330 to 558 mm annual precipitation (1). The 10 parental accessions have significantly heavier seeds, greater seedling vigor, taller stature, and longer and wider leaves than standard diploid Russian wildrye cultivars and the tetraploid cultivar Tetracan. The parental accessions also had better water-use efficiency than the diploid cultivars as determined by C isotope discrimination measurement (1). The unselected tetraploid accessions were equivalent to diploid cultivars in forage and seed yield, phenological development, and forage quality (1).

The 10 parental accessions of RWR-Tetra-1 were established in a space-planted breeding nursery (Cycle-0 population) at the USU Blue Creek Experimental Farm (mean annual precipitation of 369 mm) in northwestern Utah in 1990, where they were evaluated for vegetative vigor, seed size, forage yield, and response to biotic and abiotic stresses. Open-pollinated seed from selected clones was screened for seedling emergence from deep (7.6 cm) plantings in the greenhouse.

The Cycle-1 population consisted of 20 half-sib families (total of 2160 plants) that traced to open-pollinated seed of selected accessions, AJC538, AJC539, AJC540, AJC596, AJC597, AJC598, AJC599, AJC600, and AJC601. The Cycle-1 population was established in 1992 as a space-planted nursery at the USU Evans Experimental Farm. Selection for vegetative vigor, seed yield, 100-seed weight, and seedling emergence from deep (7.6 cm) seedings in the greenhouse was practiced among and within half-sib families. Seed was harvested only from selected plants to create the Cycle-2 population. Undesirable plant types were rogued prior to pollination. The Cycle-2 population consisting of 40 half-sib families was established in nurseries on semiarid sites (annual precipitation 340 mm) near Nephi, UT, and on the Curlew Grasslands in northwestern Utah (annual precipitation 150 to 250 mm) to initiate the third cycle of selection.

The 40 half-sib families from the Cycle-2 population were evaluated for in-vitro dry matter digestibility and crude protein in addition to the criteria used in the first two cycles. Dry matter yield of the 40 half-sib family tetraploid breeding population did not differ significantly from the tetraploid cultivar Tetracan and the diploid cultivars Bozoisky-Select, Cabree, and Vinall; however, 100-seed weight and rate of emergence from a 7.6-cm planting depth were significantly greater ($P < 0.05$) than for other diploid lines and cultivars tested. Using a selection index that included forage yield, total seed weight, and individual seed weight (double weighted), equal amounts of open-pollinated seed from 26 selected half-sib families were combined to generate the broad-based RWR-Tetra-1 germplasm.

RWR-Tetra-1 is highly cross-pollinated and behaves meiotically as an autotetraploid ($2n=4x=28$) (genome constitution NsNsNsNs) with a high frequency of multivalents typical of those observed in artificially induced tetraploids of Russian wildrye (4). It is the first release of tetraploid Russian wildrye germplasm that includes naturally occurring tetraploid plants in its parentage. Previous work, including that conducted with the cultivar Tetracan (2,3), has been limited to tetraploids artificially induced from diploids. Morphologically, RWR-Tetra-1 is taller than Vinall, Cabree, and Tetracan and has longer leaves than Vinall. RWR-Tetra-1 has heavier seeds than existing diploid cultivars. Spike characteristics are similar to diploid Russian wildrye.

In environments with 450 to 500 mm of annual precipitation, dry matter production was equal to current cultivars (1). When evaluated on harsh sites (250 to 350 mm of annual precipitation) and under closer row spacings (0.5 vs. 1.0 m), yields were equal to or less than current cultivars.

Seed stocks of RWR-Tetra-I are maintained by the USDA-ARS, Forage and Range Research Laboratory, Utah State University, Logan, UT 84322-6300, and are available in 20-g quantities upon written request. Genetic material of this release will be deposited in the National Plant Germplasm System, where it will also be available for research purposes, including development and commercialization of new cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line or cultivar.

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References and Notes

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