REGISTRATION OF *PSEUDOROEGNERIA SPICATA* × *ELYMUS LANCEOLATUS* HYBRID GERMPLASM SL-1

THE SL-1 GERMPLASM (Reg. no. GP-4, PI 546061) was developed by the USDA-ARS Forage and Range Research Laboratory in cooperation with the Utah Agricultural Experiment Station at Utah State University and the USDA-SCS and released to breeders November 1990. It was derived from an amphiploid hybrid ($2n = 6x = 42$) between the diploid form of bluebunch wheatgrass [*Pseudoroegneria spicata* (Pursh) Löve] ($2n = 2x = 14$) and thickspike wheatgrass [*Elymus lanceolatus* (Scribn. & Smith) Gould] ($2n = 4x = 28$).

The initial F_1 hybrid was made by Dewey (1) in 1965 between bluebunch wheatgrass PI 232132, originally collected in Utah, and thickspike wheatgrass PI 236663, an accession from Nevada. The F_1 hybrid was triploid ($2n = 3x = 21$) and almost completely sterile. The C_0 amphiploid ($2n = 6x = 42$) was derived from colchicine treatment of several F_1 hybrid plants. The amphiploid population was then subjected to three generations of mass selection primarily to improve fertility. A breeding population, which was initially developed from the most vigorous and fertile plants of the C_1, C_2, and C_3 generations, was advanced through six cycles of mass selection. Spikes of undesirable plants were removed prior to anthesis during each cycle. Selection was based on improved fertility, seed yield, vegetative vigor, reaction to drought stress, leafiness, resistance to insects and disease, seed size, and seedling vigor. Twenty-nine clones, selected from the sixth-cycle breeding population, were isolated in a crossing block to produce seed of this germplasm pool.

Genome constitution of SL-1 has been designated as SSSSHH (2). One S genome was derived from bluebunch wheatgrass (SS) and the other S genome and the H genomes were contributed by the thickspike wheatgrass parent (SSHH). Seed set in the hybrid population approaches that of the parental species. In field trials conducted by Maughan (3), the fourth-cycle breeding population averaged >3 seeds spikelet^{-1} and was more or less typical of a segmental autoallohexaploid. Self fertility in the hybrid varies widely, but averages 34 to 50%, which is higher than expected on the basis of the low levels of self fertility observed in the parental species. Genetic variation for this character in the breeding population suggests that mode of reproduction can be altered through natural or artificial selection (3).

Although the hybrid is morphologically distinct from the parental species, characteristics of both are represented in the breeding population. It has larger culms, more leaves per culm, and longer and wider leaves than either of its parents. Spike characteristics and rhizome development are intermediate to the parental species. Degree of rhizome development of plants grown in field plots near Logan, UT, which receives 468 mm annual precipitation, ranged from a caespitose growth habit to a spread of slightly more than 1 m per season. Genetic variation observed in the breeding population indicates that this trait would be responsive to selection pressure (3).

In seeded and space planted trials on three semiarid range sites in northern Utah, forage yield and forage quality (neutral detergent fiber and crude protein) of the hybrid was equivalent or superior to cultivars of the parental species. The hybrid has responded positively to selection pressure for improved seedling vigor and ample genetic variability remains to make substantial additional progress for this trait.

Seed of this germplasm pool, if increased commercially, should be produced in accordance with the Pre-Variety Germplasm Certification Standards adopted by the Association of Official Seed Certifying Agencies. This germplasm qualifies for the Tested Class according to the Utah Crop Improvement Association, the official seed certifying agency for Utah.

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References and Notes

1. Dewey, D.R. 1965. Morphology, cytology and fertility of synthetic hybrids of *Agropyron spicatum* × *Agropyron dasystachyum-riparium*. Bot. Gaz. 126:269–275.
2. Dewey, D.R. 1984. The genomic system of classification as a guide to intergeneric hybridization with the perennial Triticeae. p. 209–279. *In* J.P. Gustafson (ed.) Gene manipulation in plant improvement. Plenum Publ. Co., New York.
3. Maughan, K.W. 1988. Cytology, fertility and morphology of a *Pseudoroegneria spicata* × *Elymus lanceolatus* (Poaceae: Triticeae) breeding population. M.S. thesis. Utah State Univ., Logan.
4. K.H. Asay, D.R. Dewey (retired), K.B. Jensen, N.J. Chatterton, and W.H. Horton, USDA-ARS, Forage and Range Res. Lab., Utah State Univ., Logan, UT 84322-6300; K.W. Maughan, Pioneer Hi-Bred International, Inc., North Platte, NE 69101; and J.R. Carlson, USDA-SCS, West Natl. Tech. Ctr., Portland, OR 97209-3489. Utah Agric. Exp. Stn. Journal Article no. 4078. Registration by CSSA. Accepted 28 Feb. 1991. *Corresponding author.

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REGISTRATION OF FIVE HOP GERMPLASMS FOR HOP DOWNY MILDEW RESEARCH

FIVE germplasm selections of hop, *Humulus lupulus* L. (Reg. no. GP-28 to GP-32, PI 546950 to PI 546954) were developed at the Washington State University Irrigated Agriculture Research and Extension Center in Prosser, WA, and were released by the Washington Agricultural Research Center in December 1990. The germplasm selections are valuable as a perennial inoculum source of the obligate parasite hop downy mildew [*Pseudoperonospora humuli* (Miyabe & Takah.) G.W. Wilson].

The selections originated from open pollinated seed collected in 1981 from a clone of 'Hersbrucker' grown near Harrah, WA. The seedlings were planted at Prosser in spring 1982, and by 1983 many seedlings were infected with hop downy mildew. The seedlings surviving the infection were observed for 2 additional yr, and those with the most consistent incidence of disease were selected and propagated for further field study.

In the Yakima Valley, hop plants that produce shoots sytemically infected with hop downy mildew either die or do not regularly produce systemically infected shoots. Each year these five selections produce shoots sytemically infected with hop downy mildew as well as uninfected shoots. Table 1 lists the 5-yr (1986–1990) average proportion of systemically infected shoots produced each year. The selections do not show crown die-out induced by hop downy mildew infection. Selection Ph2 can produce systemically infected shoots during the entire Yakima Valley growing season. The other selections typically produce systemically infected shoots until mid-July. These germplasms are valuable because they can produce shoots systemically infected with hop downy mildew until mid-summer every year and they are not killed