Spaced plants of clone 22R were transplanted into plots in fall 1989 alongside Regal control plots (1). An adjacent 3-yr-old Regal white clover test, with more than 90% PSV-infected plants, provided a natural reservoir of PSV. In addition, single clone 22R plants were infected by AMV, but remained free of PSV, in spite of heavy PSV disease pressure, and in spite of heavy aphid vector activity as suggested by the AMV infections. Open-pollinated (OP1) seed was collected in August 1990 from these 22R plants which presumably outcrossed with Regal. Approximately 50% of OP1 seedlings exhibited hypersensitivity, consistent with the hypothesis that hypersensitivity is inherited as a single dominant gene (P) and that clone 22R is heterozygous (Pp) for this trait (1).

OP1 seedlings were grown in the greenhouse and cloned by stolon cuttings in 1991. Response to PSV was determined by inoculation of ramets of each clone and each clone was identified as susceptible or hypersensitive-resistant. Noninoculated ramets of 10 clones of either PSV-resistant (hypersensitive) or PSV-susceptible (nonhypersensitive) clones were established in adjacent field plots in fall 1991. Open-pollinated (OP1a) seed, from noninoculated with other hypersensitive plants within each plot and with nonhypersensitive plants in adjacent plots, was collected from the hypersensitive clone plots in 1992. Approximately two-thirds of plants grown from OP1a seed were hypersensitive (PSV-resistant).

To identify homozygous (PP) hypersensitive (PSV-resistant) plants for seed production and release, OP1a plants were cloned, grown in the greenhouse in fall and winter of 1992-1993, and hand-crossed in 1993 with at least one of eight nonhypersensitive (PSV-susceptible) OP1 clones. Ten plants grown from seed of each cross were evaluated for PSV reactions in greenhouse tests in winter 1993-94. Systemic PSV infection in any of the 10 test plants identified the parent as heterozygous (Pp) and eliminated it from further crosses. Nineteen hypersensitive resistant (PP) clones were thus identified and subsequently polycrossed to produce seed of a first-generation synthetic variety (Psyn). Syn, seed was harvested from each parent and stored separately. Fifteen seedlings of each Syn, seed parent were grown in the greenhouse in fall 1994, then moved to an isolation cage and polycrossed with honey bees (Apis mellifera L.) in 1995, to produce PSV-resistant seed of second generation synthetic PSVR1.

PSVR1 is similar to Regal in appearance and growth, but unlike Regal, which has about 3% PSV-hypersensitive plants, PSVR1 should be 100% hypersensitive. Although plots grown from cloned hypersensitive 22R plants yielded more dry matter than Regal in 1990-1991 tests (1), PSVR1 yields less dry matter than Regal, probably due to inbreeding depression within the relatively small population used to produce OP1a seed. In a variety trial seeded in fall 1995 at Mississippi State, PSVR1 produced less total dry matter than Regal in spring harvests in the first and second growing seasons; however, yields in summer harvests of both years were not significantly different from Regal. Field tests demonstrated improved drought tolerance in hypersensitive clones, compared with Regal (1, 3); thus, it is believed that PSVR1 may be more drought tolerant than Regal, especially in the presence of PSV.

White clover plants with and without this hypersensitive resistance have been useful in field experiments at Mississippi State, MS, as a means of controlling the natural spread of aphid-transmissible PSV among white clover cultivars. Eliminating the confounding of treatment effects from natural spread of PSV in the field allowed definitive measurement of the effects of PSV alone and in combination with root-knot nematode (*Meloidogyne incognita* (Kofoid & White) Chitwood) and drought (3). The hypersensitive resistance of PSVR1 may also be useful in producing PSV-resistant cultivars. However, in field tests at Blacksburg, VA, and Lexington, KY in 1997, hypersensitivity failed to protect white clover against infection by the predominant local strains of PSV, suggesting that PSVR1 hypersensitivity may be PSV strain specific. Strain specificity, however, may make PSVR1 an even more useful laboratory model for studying hypersensitive resistance.

Small quantities of seed are available for distribution to qualified researchers upon written request to the corresponding author, while supplies last. Recipients of seed are asked to make appropriate recognition of the germplasm source if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

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References and Notes


4. USDA-ARS, Crop Science Res. Lab., Waste Management and Forage Res. Unit, P.O. Box 5367, Mississippi State, MS 39762-5367. Joint contribution of the USDA-ARS and the Mississippi Agric. and Forestry Exp. Stn. Registration by CSSA. Accepted 31 May 1999. "Corresponding author (mmclaugh@ra.msstate.edu).

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Registration of Reduced Seed Shattering *Cuphea Germlasm PSR23*

The *Cuphea* germplasm PSR23 (*C. viscosissima* Jacq. × *C. lanceolata* f. *silenoideus* W.T. Aiton) (Reg. no. GP-28, PI 606544) was developed by the Department of Crop and Soil Science at Oregon State University and officially released by the Oregon Agricultural Experimental Station in 1998. PSR23 is a reduced seed shattering population with low seed dormancy. This germplasm was developed as part of a project to domesticate *cuphea* (1). *Cuphea* is a summer annual that produces short- and medium-chain seed oils (2, 3) and thrives in subtropical and temperate climates. This germplasm was released as a resource for developing germplasm and cultivars with reduced seed shattering.

PSR23 was developed by one cycle of mass selection and two generations of inbreeding and selection for reduced seed shattering in the VL50 C6 population resulting from a *C. lanceolata* f. *silenoideus* C. *viscosissima* cross (4). Seed shattering is severe and ubiquitous in *C. viscosissima* and *C. lanceolata* and in the genus as a whole. Despite the lack of nonshattering phenotypes in the parent germplasm, several reduced seed shattering phenotypes (transgressive segregates) arose in the VL50 C6 population (1). The development of the dorsal dehiscence zone (DDZ) is delayed and the placenta does not separate from the capsule in reduced shattering phenotypes. The development of the DDZ and the separation of the placenta from the capsule ensures complete seed shattering in wildtype lines. The morphological, physiological, and genetic bases for differences between PSR23 and wildtype lines are not known. The DDZ forms 1 to 3 wk later in PSR23 than