Registration of Induced Semidwarf Rice Mutant DR1

USDA-ARS released an induced semidwarf mutant of rice (*Oryza sativa* L.), DR1 (Reg. no. GP-105, PI 642749) in February 2005. The mutant was induced in the tall Arkansas rice cultivar, Drew (Moldenhauer et al., 1998), to quickly obtain semidwarfism in adapted germplasm. This mutant, which is 22% shorter than its parent, provides a breeding source of semidwarfism, nonallelic to the worldwide semidwarfing gene *sd1*, in tropical japonica germplasm adapted to the southern USA and similar climatic areas. Such a mutant provides an alternative semidwarfing source should genetic vulnerability problems arise from widespread use of *sd1*.

Approximately 15,000 seeds of the parent cultivar were treated with 270 Gy of gamma rays in 1999. In the M1 generation grown in the 1999–2000 winter nursery, 840 random panicles were harvested to establish a panicle-to-row M2 generation. In the M2 generation grown at Stuttgart in 2000, semidwarf selection was made in a row segregating for tall and semidwarf plants. The mutant was advanced in subsequent summer and winter nurseries and evaluated for yield in the M8 semidwarf plants. The mutant was advanced in subsequent F2 plant segregation, determined by F3 progeny tests, was found to be 27 cm shorter than its parent, at 93 cm was 27 cm shorter in both years was 112 kg ha⁻¹ of N, applied preflood.

Drilled 2 d later than its parent, at 93 cm was 27 cm shorter than its parent and yielded 7330 compared to 8060 kg ha⁻¹. The parent cultivar of the M8 generation grown at Stuttgart in 2000, semidwarf selection was made in a row segregating for tall and semidwarf plants. In measurements on the 2005 crop, apparent amylose content, brown rice grain length, width, and 100 grain content, brown rice grain length, width, and 100 grain weight of DR1 was 228 g kg⁻¹, 7.3 mm, 2.0 mm, and 1.60 g, compared to 242 g kg⁻¹, 7.3 mm, 2.1 mm, and 1.78 g for Drew.

An allelism test to *sd1*, the worldwide semidwarf source, was conducted by crossing the M₄ semidwarf generation mutant to ‘Calmochi-101’ (Carnahan et al., 1986) which is known to carry *sd1* from ‘Calrose 76’ (Rutger et al., 1977). The mutant was also crossed to the tall Arkansas cultivar ‘Francis’ (Moldenhauer et al., 2002). The F₁’s and F₂’s were grown in the greenhouse but height data were inconclusive under these conditions. The F₃ generation was grown in the field in the winter nursery in late 2004. In the cross DR1/Calmochi-101, F₂ plant segregation, determined by F₃ progeny tests, was deduced to be 95 tall:54 single dwarf:9 double dwarf, a satisfactory fit (0.50 < P < 0.75) to a 9:6:1 ratio for nonallelism. In the cross DR1/‘Francis’, F₂ plant segregation, again determined by F₃ progeny tests, was deduced to be 149 tall:52 semidwarf, a satisfactory fit (0.75 < P < 0.90) to a 3:1 ratio for recessive semidwarfism.

DR1 is the 12th semidwarf mutant induced in tall Arkansas cultivars by the senior author and colleagues previously reported (Rutger et al., 2004a, 2004b). In each of these 12 semidwarfs has proven to be *sd1*. The parent cultivar of this 12th semidwarf was covered by PVP 9700138; permission to release germplasm was received from the cultivar owner, the University of Arkansas, Division of Agriculture, Agricultural Experiment Station.

Small amounts of seed (≤5 g) of DR1 may be obtained from the corresponding author for research purposes, including the corresponding author for research purposes, including new cultivars it is requested that appropriate credit be given to the source.

J.N. Rutger,* R.J. Bryant, and K.A.K. Moldenhauer

References


J.N. Rutger and R.J. Bryant, USDA-ARS, P.O. Box 1252, Stuttgart, AR 72160; K.A.K. Moldenhauer, Univ. of Arkansas, Division of Agriculture, Rice Research and Extension Center, 2900 Hwy 130 East, Stuttgart, AR 72160. Registration by CSSA. Reprints available from J.N. Rutger, USDA-ARS, P.O. Box 1252, Stuttgart, AR 72160; *Corresponding author (jnrutger@spa.ars.usda.gov).

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