16. Mapping of Small and Round Seed 3 gene in rice

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To understand the molecular mechanisms forming the seed size of rice, we are carrying out the identification of causal genes in small-round seed mutants. Previously, two genes, D1 and D11, which control the seed size, were isolated (Ashikari et al. 1999, Fujisawa et al. 1999, Tanabe et al. 2005). D1 and D11 genes are located in the position 15.4 Mb of chromosome 5 and 23.4 Mb of chromosome 4, respectively. In this paper, we report the mapping position of the causal gene in a new small-round seed mutant of rice, TCM1173.

TCM1173 was obtained from Taichung 65 (T65) library mutagenized with N-methyl-N-nitrosourea treatment and renamed srs3 in this paper. Gross morphology of srs3 was shown in Fig. 1. The plant height of srs3 was similar to that of the recurrent parent, but the seed size of srs3 was smaller than that of its parent.

To identify the SRS3 gene, srs3 (japonica) was crossed with Kasalath (indica). The F₁ plants were self-pollinated to obtain F₂ seeds. We screened 90 F₂ plants bearing small-round seeds. Genomic DNA from leaf tissues was extracted by the CTAB method. The genetic linkage between the SRS3 locus and molecular markers was determined by PCR using the sequence tagged site (STS) markers reported by the Rice Genome Program and microsatellite markers (McCouch et al. 2002a, b). In addition to these markers, the eight primers for the four STS markers on rice chromosome 5, 5'-2500F (5'-GGATCACGACGAGGTAGAAC-3') and 5'-2500R (5'-CGCTTGGCCTTCTCCGATC-3'), 5'-3000F (5'-TCGGATGGTACCCTACGAAC-3') and 5'-3000R (5'-TCAATGGCAGTTTCAAGTTTC-3'), 5'-3247F (5'-TCCCCACAAGCGCTACCTCAG-3') and 5'-3247R (5'-GCAGTGGTCTCCAAACTGATG-3'), 5'-3599F (5'-TCTTACAGCTGTAAACTAGAG-3') were designated. The SRS3 gene was mapped between 5'-3000 and 5'-3247 markers on the chromosome 5 and co-segregated with the C52717 marker (Fig. 2). Because the SRS3 gene is mapped between the 5'-3000 and 5'-3247 markers, which are located in the position 3 Mb and 3.25 Mb on chromosome...
5, respectively, \textit{srs3} may not be allelic to \textit{dl}, in which mutated gene is mapped on the location 15.4 Mb of chromosome 5. We are constructing a more precise linkage map of the \textit{SRS3} locus using more than 1000 F2 plants bearing small-round seeds and STS markers between 5-3000 and 5-3247 markers.

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![Fig. 1. Pleiotropic abnormalities of srs3 mutant. (A) Gross morphology of T65 (left) and srs3 (right) plants grown in the fields at heading stages. T65 was recurrent parents for srs3. Bar = 20 cm. (B) Grain morphology. See (A) for rice plants. Mutants have shortened grains. Bar = 0.5 cm.](image)

![Fig. 2. The linkage map showing the location of SRS3 on rice chromosome 5. Vertical lines represent the positions of molecular markers, and the numbers of recombinants are indicated below the linkage map.](image)
References


