Title: Improving rice milling quality by identifying and deploying loci affecting kernel fissure resistance.

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Breakage of rice during milling reduces income for both rice producers and millers, and reduces food supply and quality. A primary cause of rice breakage upon milling is fissuring, or cracking, of the rice kernels before they enter the mill. Kernel fissuring can result from re-wetting of mature kernels upon exposure to humid field or postharvest conditions. A laboratory method for reliably comparing rice samples from various varieties for their FisR was developed and used to map QTLs for FisR. The FisR first noted in the southern US long-grain cultivar ‘Cypress’ was inherited by its progeny cultivar ‘Cybonnet’, and was attributed to three QTLs presumably inherited from the California long grain parent, ‘L‑202’. These three QTLs were validated and two additional FisR loci discovered among Cybonnet x ‘Saber’ progeny. Grain length, width and thickness were not associated with FisR in these long grain crosses, showing that grain shape was not driving FisR. Association was detected, however, with plant height. The QTL with the largest individual effect on FisR explained from 10 to 30% of the total phenotypic variance in three mapping populations and fine-mapped to a 1.3 Mb region approximately 8 cM (700 Kb) distal to the *sd1* gene on chromosome 1. Use of genome sequence data for local ancestry inference revealed that the fissure resistance allele is in coupling phase linkage with *sd1* on the *indica*-derived *sd1* source introgression, validating the L-202 origin of FisR, and providing additional insight on the chromosomal location and breeder-deployment of genes affecting FisR.