

## Knockout of abscisic acid (ABA)-dependent transcription factor gene OsVP1 using CRISPR/Cas9 system improves germination velocity and pre-harvest sprouting in rice (*Oryza sativa* L.)

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Seed dormancy is a condition that has not germinated during a specific period, even in environmental conditions that are prone to sprouting. These phenomena vary in proportion to the dry storage (after ripening) of the seeds and are genetically controlled by the genotypes of both the mother plant and embryo. The dormancy imposed by the coat is enhanced by the tissue that covers the seed, ie, glue and pale (or crust), pericarp and testis, and optionally endosperm (Bewley et al., 2013). Embryonic dormancy of the endosperm is finely controlled during development (Sugimoto et al., 2010). In cultivated rice, seed dormancy is commonly removed with dry after-ripening to achieve rapid and uniform germination on seed sowing. In this report, Pre-harvest sprouting is a phenomenon that seeds germinate while still attached onto the maternal plants in the condition of cloudy and rainy weather, and is also a restrictive factor of rice production and seed propagation. The phenotype of rice pre-harvest sprouting is very similar to that of maize seed-specific vp1 mutant. VP1 gene is essential for seeds maturation and dormancy, and is also a key transcription factor of ABA signal transduction pathway. Thus, it is of great significance to effectively control the occurrence and hazard of rice pre-harvest sprouting. The aim of the current investigation is to dissect the biological function of homologous gene OsVP1 by using CRISPR/Cas9 system in rice. Germination experiment showed that the percentage of germinated seeds from T1 knockout lines was higher than that of wild-type plants. Under the different concentrations of abscisic acid (ABA) treatment, the inhibition of germination ratio of *osvp1* gene knockout seeds was not significantly different when comparing with wild-type plants. Therefore knockout lines of OsVP1 gene using CRISPR/Cas9 system can increase germination velocity of seeds and also lead to pre-harvest sprouting.

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