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## CRISPR/Cas9 is New Strategies for Short Breeding through Genome Editing of Drought Gene in Rice

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### [Introduction]

Rice is the world's most cultivated crop and the staple food of the world's population. However, recent unpredictable climate change is a direct cause of severe crop yield loss, among which drought stress has the most severe negative effect on yield and grain quality. Therefore, to respond to climate change, the drought gene was editing with CRISPR/Cas9, and a short breeding strategies was constructed in the field and suggest effectively applied to the rice breeding system.

### [Materials and Methods]

*Oryza sativa* Senescence-associated protein (*OsSAP*) was genome-editing with CRISPR/Cas9. *OsSAP* genome-editing (GeD) lines were generated by *agrobacterium*-mediated transformation using Ilmi callus. Agricultural traits, reactive oxygen species (ROS) level, and expression of abiotic stress-related transcription facotrs were analyzed under drought stress. In addition, short breeding strategies were constructed through the investigation of agricultural traits and coefficient of variation (CV) of each line through generation in the field.

### [Results and Discussion]

In the field, agricultural traits of GeD lines were analyzed in each generation, and grain characteristics were also analyzed. In both G<sub>1</sub> plants and G<sub>2</sub> seeds, the CV was lower than 5%. Also, the expression level of *OsSAP* and *Cas9* in each generation was analyzed, there was no expression of *OsSAP* in G<sub>0</sub> plant, but *Cas9* was strongly expressed. However, in G<sub>1</sub> plant and G<sub>2</sub> seed, *OsSAP* did not continue to be expressed, and *Cas9* expression was removed or very weakly expressed. In addition, the target gene was homozygous editing in the G<sub>0</sub> plant, and the results of this research suggest that CRISPR/Cas9 can be applied as new strategies for short breeding.

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