Investigating OsSxr Nutrient Transporters to Increase Rice Submergence and Drought Resilience via CRISPR-Cas9 Technology

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Rice is a crop of global importance that provides approximately 20% of the calories humanity consumes. Abiotic stress events such as flooding and droughts present a clear danger to global food security by severely depressing crop yield. One possible way to increase rice resilience to these events is to alter how the plant uses its sugar reserves during long periods of strain. As a new approach to this issue, CRISPR-Cas9 technology knocks out parts of the understudied sugar transporters of the SXR family. Afterward, how they play a role in sugar mobilization during submergence and water-deficit stress in rice is investigated and observed. Following seven days of growth on ½ MS Gel with 0.5% Agarose and 0.5% Sucrose, wild type coleoptile and root development prove to have a statistically significant difference compared to the knockout lines. The significance is verified by consistent two-sample equal variance t-tests, all with numbers less than the expected p-value, rejecting the null hypothesis. Additionally, drought and recovery at the four-leaves stage and continued growth in the original environment demonstrate more significant root development in the wild type. In regards to submergence, a staining test verifying root death presented a more prominent blue in the knockout lines as opposed to wild type. With these results, the hypothesis that the knockout lines would be much weaker in events of stress is verified and, moving forward, experiments with overexpressed transporters will help to accept the theory further. Additionally, this research brings us steps closer to solving 79% of the loss of agriculture and crops to hazardous events.

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