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Identification of Genes Related to Grain Quality and Yield when Rice Faced with High-temperatures

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[Introduction]

The unpredictable global climate change is seriously damaging rice, a major food crop. In particular, the maximum temperature continues to rise every year. Rice suffers from high-temperature damage at different stages of growth. Most of the major damage negatively affects grain quality and is yield loss. High-temperature alters the structure of the starch and forms a chalkiness grain. In this research, a new gene that is resistant to high-temperature and affects grain quality is mapped.

[Materials and Methods]

To analyze the effect of high-temperature on rice, 120 CNDH (Cheongcheong/Nagdong double haploid) populations were used. Various phenotypic changes were evaluated by high-temperature treatment at 42°C at the grain filling stage. The homology of the detected genes was analyzed through QTL mapping, and the gene function was analyzed by analyzing the relative expression level of the finally selected genes during high-temperature treatment.

[Results and Discussion]

High-temperature stress at the grain filling stage causes chalkiness grains. The chalkiness grain is a phenomenon that occurs when the amylose content decreases due to the occurrence of cracks in the structure of the starch. The chalkiness grain has a low amylose content and a high protein content, which negatively affects grain quality. In addition, the pollen viability is very low, so grain fertility and yield loss are very high. When QTLs mapped, a LOD score of 5.4 was detected in RM15749-RM15689 on chromosome 3. RM15749-RM15689 had ORFs related to various cell functions, and finally *OsSFq3* was detected. *OsSFq3* was analyzed with very high homology with the FLOURY ENDOSPERM protein, and interacts with sugar/energy transfer enzymes. *OsSFq3* has a high relative expression level due to a significant difference in high-temperature resistant lines when treated with high-temperature. *OsSFq3* will be effectively used to develop new rice cultivars that are resistant to high temperatures and have good grain quality.

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