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Can Human Biotechnology Be Used to Increase Rice Yields in the Face of Typhoons?

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[Introduction]

The frequency and intensity of natural disasters are increasing under the influence of climate change, causing severe damage to crop production and threatening food security. Strong winds bend the rice culm and rainstorms flood farmland, causing rice grains and roots to rot after long-term soaking and seriously affecting rice production.

[Materials and Methods]

We detected a new target quantitative trait locus (QTL) for lodging resistance in rice by analyzing lodging resistance to typhoons (Maysak and Haishen) using a scale from 0 (no prostrating) to 1 (little prostrating or prostrating) to record the resistance score in a Cheongcheong/Nagdong double haploid rice population.

[Results and Discussion]

Five quantitative trait loci for lodging resistance to typhoons were detected. Among them, *qTyM6* and *qTyH6* exhibited crucial effects of locus RM3343-RM20318 on chromosome 6, which overlaps with our previous rice lodging studies for the loci *qPSLSA6-2*, *qPSLSB6-5*, and *qLTI6-2*. Within the target locus RM3343-RM20318, 12 related genes belonging to the cytochrome P450 protein family were screened through annotation. *Os06g0599200 (OsTyM/Hq6)* was selected for further analysis. The findings of this study improve an understanding of rice breeding, particularly the culm length, early maturing, and heavy panicle varieties, and the mechanisms by which the plant's architecture can resist natural disasters such as typhoons to ensure food safety. Moreover, rice breeding should focus on maintaining suitable varieties that can withstand the adverse effects of climate change in the future and provide better food security.

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