Discovery of transcription factor protein that regulates cold tolerance in rice

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Cold stress at the booting stage leads to lower seed setting rate and seriously threatens the production and quality of rice.

Recently, a research group led by Prof. Bu Qingyun from the Northeast Institute of Geography and Agroecology (IGA) of the Chinese Academy

of Sciences (CAS) has revealed that OsWRKY53 negatively regulates rice cold tolerance at the booting stage, which provides a target for improving rice cold tolerance.

The study was published in *The Plant Cell* on August 16.

The researchers characterized the function of the transcription factor OsWRKY53 in rice cold tolerance at the booting stage. OsWRKY53 expression is induced by cold stress.

The OsWRKY53 mutant displays higher cold tolerance at the booting stage with higher seed setting, stronger pollen fertility and normal tapetum degenerates. But OsWRKY53 overexpressing plants show lower seed setting rate, weaker pollen fertility and abnormally tapetum degenerates under normal or low temperature conditions. "These results suggest that OsWRKY53 negatively regulates rice cold tolerance at booting stage and tapetum development," said Prof. Bu.

What's more, OsWRKY53 negatively regulates gibberellin (GA) content in anthers. GA can improve rice cold tolerance at booting stage, and the GA content in anthers of oswrky53 is higher than wild type under cold stress. OsWRKY53 directly binds to the promoters of GA biosynthesis genes (GA20ox1, GA20ox2, GA3ox1) and represses their expression in anthers.

More information: Jiaqi Tang et al, WRKY53 negatively regulates rice cold tolerance at the booting stage by fine-tuning anther gibberellin levels, *The Plant Cell* (2022). DOI: 10.1093/plcell/koac253

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