

Study sheds light on mechanism of OsIRO3 modulating Fe homeostasis in rice

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Iron (Fe) is one of the indispensable micronutrients for plant growth and development. Plants have evolved intricate mechanisms to maintain Fe homeostasis.

Oryza sativa Iron-Related Bhlh Transcription Factor 3 (OsIRO3/OsbHLH63) has been identified as a negative regulator of Fe deficiency response signaling, however, the underlying mechanism remains unclear.

In a study published in *Plant Journal*, researchers from Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences showed that the loss-of-function of OsIRO3 caused the up-regulation of many Fe deficiency inducible genes in the root.

They generated two *iro3* loss-of-function mutants with the CRISPR-Cas9 gene editing system and found that loss-of-function of OsIRO3 leads to the disruption of Fe homeostasis.

Furthermore, the expression of Iron-Related Bhlh Transcription Factor 2 (OsIRO2) and Oryza sativa FER-Like FE Deficiency-Induced Transcription Factor (OsFIT) and their downstream genes were considerably enhanced in the *iro3* root both under Fe sufficient and Fe deficient conditions. Therefore, the expression of Fe deficiency inducible [genes](#) is disrupted in the *iro3* mutants.

They further found that OsIRO3 directly recognizes the OsIRO2 promoter, and represses the [transcription](#) of OsIRO2. In addition to the direct repression, OsIRO3 also indirectly represses the transcription of OsIRO2 since OsIRO3 interacts with Oryza sativa Positive Regulator Of Iron Homeostasis (OsPRI) proteins, OsPRI1/2, to attenuate their transactivation activity towards OsIRO2. OsIRO3 contains an EAR motif recruiting the OsTPL/OsTPRs corepressors, which partially accounts for its repression function.

"This study expands our knowledge of the Fe homeostasis transcription network mediated by the OsIRO3-OsIRO2 module. Based on previous knowledge and our new findings, we propose a putative mechanism in

which OsIRO2 is regulated antagonistically," said Liang Gang of XTBG.

More information: Chenyang Li et al, OsIRO3 negatively regulates Fe homeostasis by repressing the expression of OsIRO2, *The Plant Journal* (2022). [DOI: 10.1111/tpj.15864](https://doi.org/10.1111/tpj.15864)

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