

New strategy for iron fortification in rice

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Iron (Fe) deficiency has become one of the factors limiting plant quality and productivity around the world. IMA (IRONMAN), a family of small peptides, has been recently reported to play a positive role in the Fe deficiency response in *Arabidopsis* and rice (*Oryza sativa*). Two OsIMA genes were identified in rice. However, it was still unclear how OsIMA1 and OsIMA2 activate the Fe deficiency response in rice.

In a study published in the *Journal of Experimental Botany*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences showed that IMA positively regulates Fe homeostasis by interacting with OsHRZs (Haemerythrin Motif-Containing Really Interesting New Gene and Zinc-Finger Proteins), and an artificial IMA peptide derived from OsPRI1 is useful for Fe biofortification in rice.

To verify whether OsIMA1 and OsIMA2 interact with OsHRZ1 and OsHRZ2, the researchers carried out yeast-two-hybrid assays. They found that OsIMAs physically interact with OsHRZs in plant cells and the C-terminal regions of OsIMAs contribute to the interactions with OsHRZs, and the last amino acid A is necessary.

To further investigate how OsIMAs regulate the Fe deficiency response, the researchers generated OsIMA1 overexpressing [transgenic plants](#) (OsIMAox) in which the OsIMA1 gene was driven by the maize ubiquitin promoter.

They found that OsIMA1ox plants mimic the hrz1-2 mutant plants and OsHRZ1 and OsHRZ2 promote the degradation of OsIMAs. The C-terminal region of OsPRIs is required for the interactions with OsHRZ1 and OsHRZ2.

They developed an artificial small peptide, aIMA, which possesses the ability to interact with OsHRZs and can be degraded by OsHRZs. Indeed, the increased Fe accumulation and normal fertility were achieved in the transgenic plants overexpressing aIMA peptides. Unlike the strong increase of Fe concentration in the OsIMAox plants, the moderate Fe increase was detected in the aIMAox plants.

"The artificial IMA strategy can apply to other [plant species](#) beyond [rice](#). Our exploration of an artificial IMA peptide provides a new strategy for

Fe fortification in crops," said Liang Gang of XTBG.

More information: Feng Peng et al, IRONMAN interacts with OsHRZ1 and OsHRZ2 to maintain Fe homeostasis, *Journal of Experimental Botany* (2022). [DOI: 10.1093/jxb/erac299](https://doi.org/10.1093/jxb/erac299)

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