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OsYUC11-mediated auxin biosynthesis essential for grain filling of rice

发布日期：2020-12-14 浏览次数：57

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Abstract

Auxin is a phytohormone essential for plant development. However, our understanding of auxin-regulated endosperm development remains limited. Here, we described rice YUCCA (YUC) flavin-containing monooxygenase encoding gene OsYUC11 as a key contributor to auxin biosynthesis in rice (Oryza sativa) endosperm. Grain filling or storage product accumulation was halted by mutation of OsYUC11, but the deficiencies could be recovered by exogenous application of auxin. A rice transcription factor (TF) yeast library was screened, and 41 TFs that potentially bind to the OsYUC11 promoter were identified, of which OsNF-YB1, a member of the nuclear factor Y family, is predominantly expressed in the endosperm. Both osyuc11 and osnf-yb1 mutants exhibited reduced seed size and increased chalkiness, accompanied by a reduction in indole-3-acetic acid biosynthesis. OsNF-YB1 can bind the OsYUC11 promoter to induce gene expression in vivo. We also found that OsYUC11 was a dynamically imprinted gene that predominantly expressed the paternal allele in the endosperm up to 10 days after fertilization (DAF) but then became a non-imprinted gene at 15 DAF. A functional maternal allele of OsYUC11 was able to recover the paternal defects of this gene. Overall, the findings indicate that OsYUC11-mediated auxin biosynthesis is essential for endosperm development in rice.

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https://academic.oup.com/plphys/advance-article/doi/10.1093/plphys/kiaa057/6030968?searchresult=1