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Sucrose transport regulator OsDOF11 mediates cytokinin degradation during rice development

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Abstract

Photosynthetic tissues are dynamic structures whose homeostasis depends on the coordination of two antagonistic processes: self-maintenance and supporting sink tissues. The balance of these processes determines plant development, which might be mediated by cytokinin. However, little is known about the link between sucrose transport signalling and cytokinin. Rice (*Oryza sativa*) *DNA BINDING WITH ONE FINGER 11* (*OsDOF11*) is a transcription factor that mediates sucrose transport by inducing the expression of sucrose transporter genes. Here, we found that *OsDOF11* loss-of-function mutants showed a semi-dwarf phenotype with a smaller cell length due to increased cytokinin content in source tissues. RNA sequencing and reverse transcription quantitative PCR (RT-qPCR) analyses revealed that genes involved in cytokinin signalling and metabolism were affected in *osdof11* mutants. Yeast one hybrid (Y1-H), dual-luciferase reporter and chromatin immunoprecipitation (ChIP) experiments showed that OsDOF11 directly binds to the promoter regions of *Oryza sativa* *CYTOKININ OXIDASE/DEHYDROGENASE 4* (*OsCKX4*). Moreover, mutation of *osckx4* in the *osdof11 osckx4* double mutant rescued the semi-dwarf phenotype of the *osdof11* mutant. Interestingly, exogenous application of kinetin promoted *OsDOF11* expression earlier than *OsCKX4*, and overexpression of *Oryza sativa* *VIN3-LIKE 2* (*OsVIL2*) caused an increase in active cytokinin levels and induced *OsDOF11* transcript levels. Taken together, our results suggest a model in which both a sucrose transport regulator (*OsDOF11*) and cytokinin via *OsCKX4* establish a feedback loop to maintain dynamic tissue homeostasis.

Key words: Transcription factor, Cytokinin, OsDOF11, OsCKX4, Tissue homeostasis, Rice

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