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内源ABA信号水平动态调控的分子机制

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摘要 从逆境信号感知、ABA合成的触发到ABA水平的动态调控, 是细胞内重要的逆境信号传导途径, 相对于应答ABA的下游信号事件, 该领域研究滞后。研究显示, 根系中ZEP、限速酶NCED、AtRGS1等合成酶基因及ABA2基因响应胁迫反应上调ABA信号水平。而7′-, 8′-, 9′-hydroxylase和糖基转移酶基因受逆境诱导激活, 负调节ABA的积累。同时, 提高的内源ABA信号水平能激活合成酶基因和代谢酶基因的表达。此外, 基因表达和源库动力学分析显示, 叶片ABA动态库的维持依赖根源ABA的持续供应。值得一提的是, miRNA与ABA信号起源及动态水平维持有关。进一步的代谢动力学分析揭示, ABA信号水平受合成酶基因和代谢酶基因表达的协同控制, 多因素共同参与内源ABA信号水平的动态调控。

关键词: ABA信号水平 合成调节 代谢调节 反馈调节 转运调节 miRNA途径 协同控制

Abstract: The process from stress signal perception and the trigger of ABA biosynthesis to dynamic regulation of ABA level is an important stress signaling pathway in cells. Compared to the downstream events in ABA signal transduction, the researches in this field are relatively lagged. Expression of synthase genes, such as *ZEP* in roots and rate-limiting enzyme genes *NCED, AtRGS1* and *ABA2*, can be activated in response to stresses. However, the expression of genes encoding degradative enzymes, including 7′-, 8′-, 9′-hydroxylase and glucosyltransferase, negatively regulates ABA accumulation. Meanwhile, the expressions of the synthases, such as ZEP and NCED3, are induced by increasing en-dogenous ABA contents. Additionally, the analyses of gene expression and source-sink dynamics indicates that sustained supply from root-sourced ABA is required for the maintenance of leaf ABA dynamic pool. It is notable that miRNAs should be involved in ABA signal origin and ABA level dynamic adjustment. Further dynamic analysis of ABA metabolism re-vealed that endogenous ABA signal levels are synergistically controlled by the expressions of synthases and degradative enzymes.

Keywords: ABA signal levels, biosynthetic regulation, degradative regulation, feedback regulation, transportation regulation, miRNA pathway, synergistic control

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