

拟南芥GLP13基因在植物抗氧化胁迫响应中的作用

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Function of GLP13 in Response to Plant Oxidative Stress in Arabidopsis

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摘要

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摘要 类萌发素蛋白(germin-like protein, GLPs)是一类与小麦萌发素序列相似性较高、位于胞外基质的可溶性糖蛋白, 在植物的生长发育阶段以及对生物和非生物胁迫的应答中起着重要的作用。为了研究GLP13基因的生理功能, 我们分离并鉴定了GLP13的敲减突变体*glp13*, 同时构建了其超表达植株35S::*GLP13*。用甲基紫精(methyl viologen, MV)处理2种不同基因型和野生型(WT)植株, 结果发现, 与野生型相比, 突变体*glp13*子叶变绿率较低, 主根生长受抑制较明显; 而超表达植株35S::*GLP13*子叶变绿率较高, 主根生长的受抑制程度较WT轻。用MV处理2周的35S::*GLP13*植株, 其叶绿素荧光参数 F_v/F_m 的下降较野生型对照缓慢。半定量RT-PCR分析结果表明, 与野生型相比, 经MV处理4小时后的35S::*GLP13*中抗氧化酶系基因*FSD1*的表达上调, 而*CAT1*、*CSD1*和*UGT71C1*的表达水平在35S::*GLP13*、*glp13*和野生型植株三者之间没有明显差异。以上结果表明GLP13基因在拟南芥抗氧化胁迫响应中起重要作用。

关键词: 拟南芥 类萌发素蛋白 甲基紫精 氧化胁迫

Abstract: Germin-like proteins (GLPs) comprise a large family of soluble extracellular matrix glycoprotein, which is similar to wheat germin and plays an important role in growth and development and in biotic and abiotic stress responses of plants. To understand the role of *GLP13* in *planta*, we investigated its expression patterns; isolated and characterized a knock-down mutation in the *GLP13* gene (named *glp13*); and constructed overexpression *GLP13* plants (named 35S::*GLP13*). Compared to the wild type, the *glp13* mutant showed a lower cotyledon green ratio and more restrained root growth when 3 different types of plants were treated with methyl viologen (MV); however, the cotyledon green ratio was higher and the root growth less restrained in 35S::*GLP13* plants. The chlorophyll fluorescence parameter F_v/F_m of 35S::*GLP13* plants decreased slower than in the wild type after 2-week MV treatment of seedlings. The expression of oxidative stress response genes (*CSD1*, *FSD1*, *UGT71C1* and *CAT1*) were analyzed by semi-quantitative RT-PCR; the expression of *FSD1* was increased in 35S::*GLP13* plants, with no differences in the expression level of *CAT1*, *CSD1* and *UGT71C1* among 3 different types of plants after 4-hr treatment with MV. Our results indicate that *GLP13* plays an important role in response to oxidative stress in Arabidopsis.

Keywords: Arabidopsis germin-like protein methyl viologen oxidative stress

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