

论文

玉米S-腺苷甲硫氨酸合成酶基因家族成员在盐胁迫条件下的差异表达

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摘要:

S-腺苷甲硫氨酸合成酶(SAMS)是植物代谢过程中的一个关键酶,催化甲基供体和化合物前体S-腺苷甲硫氨酸的合成。为研究S-腺苷甲硫氨酸合成酶基因在盐胁迫条件下的响应和功能,以玉米甘油醛-3-磷酸脱氢酶(*GAPDH*)基因为内参基因,通过半定量RT-PCR分析玉米SAMS基因在盐胁迫条件下的表达模式。结果表明,玉米SAMS基因家族4个成员(*SAMS1*、*SAMS2*、*SAMS3*和*SAMS4*)在正常生长(对照)和盐胁迫条件下都表达,对照根茎中的表达量大于叶中。*SAMS1*受盐胁迫后,茎中表达量降低,而叶中表达量略有增加,根中无明显变化。*SAMS2*和*SAMS4*受盐胁迫明显诱导,而*SAMS3*似乎不受盐胁迫诱导,处理植株与对照株相比均无差异。说明玉米SAMS基因家族的4个基因在表达模式上存在差异,推测在功能上存在分工的不同。

关键词: 玉米 S-腺苷甲硫氨酸合成酶(SAMS) 盐胁迫 表达分析 半定量RT-PCR

DIFFERENTIAL EXPRESSION OF MAIZE S-ADENOSYLMETHIONI N SYNTHETASE GENE FAMILY MEMBERS DURING SALT STRESS

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Abstract:

S-adenosylmethionine synthetase SAMS is a key enzyme in plant metabolism, catalyzing the biosynthesis of SAM, which is a donor for methyl groups and the precursor of many compounds. To study the response and functions of SAMS under salt stress in maize, the semi-quantitative RT-PCR was used to investigate the expression patterns of SAMS gene, using maize glyceraldehyde-3-phosphate dehydrogenase gene as a control. The results showed that all of the four maize SAMS genes family members were expressed both under normal and salt conditions, In the control seedlings, the mRNA levels of the four genes were higher in roots and stems than those in leaves. Under the salt stress the expression of SAMS1 was down-regulated in stems, up-regulated in leaves, but no change in roots. The transcript levels of SAMS2 and SAMS4 also increased significantly under salt stress. However, SAMS3 had no response to NaCl in any organs. In maize, the four genes of SAMS family were differentially expressed under salt stress condition, suggesting the possibility of functional differences between their proteins.

Keywords: maize S-adenosyl methionine synthetase salt stress expression analysis semi-quantitative RT-PCR

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- [1] 王悦琳,宗晓娟,李德全.转玉米*ZmMPPK7*基因烟草相应高盐胁迫的光合特性和抗氧化酶系统分析
[J].核农学报,2010,24(5):1086-1092
- [2] 李兆君,李万峰,解晓瑜,侯云鹏,梁永超.覆膜对不同施肥条件下玉米苗期生长和光合及生理参数的影响
[J].核农学报,2010,24(2):360-364
- [3] 岳昌武,何博文,何明雄,张义正.甘薯S-腺苷甲硫氨酸合成酶基因克隆与表达
[J].中国农学通报,2007,23(6):121-125
- [4] Belbahri L,Chevalier L,Bensaddek L,Gillet F,Fliniaux M A,Boerjan W,Inzé D,Thomas D,Thomasset B.Different expression of an S-Adenosylmethionine synthetase gene in transgenic tobacco callus modifies alkaloid biosynthesis
[J].Biotechnol Bioeng,2000,69(1):11-20
- [5] Finkelstein J D.Methionine metabolism in mammals
[J].Nutrtr Biochem,1990,1:228-237
- [6] Mato J M,Alvarez L,Ortiz P,Pajares M A.S-adenosylmethionine synthesis:Molecular mechanisms and clinical implications
[J].Journal of Pharmacology and Experimental Therapeutics,1997,73:265-280
- [7] Izhaki A,Shoseyov O,Weiss D.A petunia cDNA-encoding S-adenosylmethionine synthase
[J].Plant Physiology,1995,108:841-842
- [8] Boerjan W,Bauw G,Vanmontagu M,Inze D.Distinct phenotypes generated by overexpression and suppression of S-adenosyl-L-methionine synthetase reveal developmental patterns of gene silencing in tobacco
[J].The Plant Cell,1994,6:1401-1414
- [9] Jennings J C,Apel-Birkhold P C,Mock N M,Jacyn Baker C,Anderson J D,Bailey B A.Induction of defense responses in tobacco by the protein Nep1 from *Fusarium oxysporum*
[J].Plant Science,2001,161:891-899
- [10] Mathur M,Satpthy M,Sachar R C.Phytohormonal regulation of S-adenosylmethionine synthetase by gibberellic acid in wheat aleurones
[J].Acta Biochimica et Biophysica Sinica,1992,1137:338-348
- [11] Mathur M,Sharma N,Sachar R C.Differential regulation of S-adenosylmethionine synthetase isozymes by gibberellic acid in dwarf pea epicotyls
[J].Acta Biochimica et Biophysica Sinica,1993,1162:283-290
- [12] Dekeyser R A,Claes B,Derycke R,Habets M E,Vanmontagu M C,Caplan A B.Transient gene expression in intact and organized rice tissues
[J].The Plant Cell,1990,2:591-602
- [13] Espartero J,Pintortoro J A,Pardo J M.Differential accumulation of S-adenosylmethionine synthetase transcripts in response to salt stress
[J].Plant Molecular Biology,1994,25:217-227
- [14] Breusegem F Van,Dekeyser R,Gielen J,Caplan A.Characterization of a S-adenosylmethionine synthase gene in rice
[J].Plant Physiology,1994,105:1463-1464
- [15] Kodakil T,Tsujil S,Otani N,Yamamoto D,Rao K S,Watanabe S,Tsukatsune M,Makino K.Differential transcriptional regulation of two distinct Sadenosylmethionine synthetase genes (*SAM1* and *SAM2*) of *Saccharomyces cerevisiae*
[J].Nucleic Acids Research Supplement,2003,3:303-304
- [16] John C,Taylorand George D,Markham.Conformational dynamics of the active site loop of S-adenosylmethionine synthetase illuminated by site-directed spin labeling
[J].Archives of Biochemistry and Biophysics,2003,415:164-171
- [17] Schrder G,Eichel J,Breining S,Schrder J.Three differentially expressed S-adenosylmethionine synthetases from *Catharanthus roseus*: molecular and functional characterization

[J]. Plant Mol Biol, 1997, 33: 211-222

[18] Espartero J, Pintor-Toro J A, Pardo J M. Differential accumulation of S-adenosylmethionine synthetase transcripts in response to salt stress
[J]. Plant Mol Biol, 1994, 25: 217-227

[19] 余涛, 支立峰, 彭伦, 李阳生, 朱英国. 烟草中一条新的S-腺苷甲硫氨酸合成酶基因的克隆及表达分析
[J]. 武汉植物学研究, 2004, 22(4): 277-283

[20] Chen X J, Liu G S, Chen Z K, Zhi Y B, Yi M L, Liu H X. A review of the pathway of ethylene biosynthesis and the relevant genetic engineering
[J]. Journal of Tropical and Subtropical Botany, 2002, 10(1): 83-98

[21] Heby O, Persson L. Molecular genetics of polyamine synthesis in eukaryotic cell
[J]. Trends Biochem Sci, 1990, 15: 153-158

[22] Yang S F, Hoffman N E. Ethylene biosynthesis and its regulation in higher plants
[J]. Ann Rev Plant Physiol Plant Mol Biol, 1984, 35: 155-189

[23] Ma X I, Wang Z L, Qi Y C, Zhao Y X, Zhang H. Isolation of S-adenosylmethionine synthetase gene from Suaeda salsa and its differential expression under NaCl stress
[J]. Acta Botanica Sinica, 2003, 45(11): 1359-1365

[24] Peleman J, Boerjan W, Engler G, Seurinck J, Botterman J, Alliotte T, Montagu Van M, Inze D. Strong cellular preference in the expression of a housekeeping gene of Arabidopsis thaliana encoding S-adenosylmethionine synthetase
[J]. Plant Cell, 1989, 1: 81-93

[25] Sánchez-Aguayo I, Rodríguez-Galán J M, García R, Torreblanca J, Pardo J M. Salt stress enhances xylem development and expression of S-adenosyl-L-methionine synthase in lignifying tissues of tomato plants
[J]. Planta, 2004, 220: 278-285

[26] Azaizeh H, Steudle E. Effects of salinity on water transport of excised maize (*Zea mays* L.) roots
[J]. Plant Physiol, 97: 1136-1145

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1. 张志勇, 陈梅, 李晚忱, 付凤玲. 以玉米幼胚为受体转化海藻糖合成酶基因[J]. 核农学报, 2009, 23(5): 743-746
2. 周柱华, 徐立华, 王丽丽, 许方佐, 邢燕菊, 张凤云, 邱登林, 阴卫军, 韩金龙, 徐相波, 丁一. 玉米自交系鲁原92的选育及应用[J]. 核农学报, 2009, 23(6): 986-989
3. 曹墨菊, 黄文超, 潘光堂, 荣廷昭, 朱英国. 首例航天诱变玉米细胞核雄性不育株与可育株的株高生长分析[J]. 核农学报, 2004, 18(04): 261-264
4. 王殿轩, 李淑荣, 温贤芳, 原锴. 电子束辐照谷物中玉米象不同虫态的生物效应[J]. 核农学报, 2004, 18(02): 131-133
5. 齐延芳, 许方佐, 周柱华, 邢燕菊, 徐立华, 邱登林. 种植密度对玉米鲁原单22光合作用的影响[J]. 核农学报, 2004, 18(01): 14-17
6. 左元梅, 陈清, 张福锁. 利用¹⁴C示踪研究玉米/花生间作玉米根系分泌物对花生铁营养影响的机制[J]. 核农学报, 2004, 18(01): 43-46
7. 齐延芳, 杨景成, 周柱华, 邢燕菊, 徐立华, 许方佐, 邱登林. 玉米自交系及F₂分离群体花药培养中的过氧化物同工酶分析[J]. 核农学报, 2003, 17(03): 191-195
8. 杨起简, 周禾, С. И. Погосян. 不同钠盐胁迫对豌豆幼苗超弱发光的影响[J]. 核农学报, 2003, 17(02): 111-114
9. 袁佐清, 张怀渝, 王化新, 李晚忱, 陈志渝. 不同玉米自交系的抗旱力与超弱发光关系的研究[J]. 核农学报, 2003, 17(01): 35-40
10. 周柱华, 齐延芳, 许方佐, 邢燕菊, 徐立华, 邱登林. 辐照花粉对玉米F₁M₁结实及后代植株的影响[J]. 核农学报, 2002, 16(06): 347-350
11. 刘应红, 秦嘉岳, 黄小珍, 胡育峰, 黄玉碧. 外源激素和糖类对玉米zSs1表达的影响[J]. 核农学报, 2011, 25(3): 432-435, 505
12. 傅俊杰, 冯凤琴, 包志毅, 夏晓峰. 甜玉米辐照保鲜研究[J]. 核农学报, 2002, 16(03): 144-147
13. 唐秀芝, 张维强, 任继明, 刘志芳. 粮饲兼用玉米中原单32号的育成与推广[J]. 核农学报, 2001, 15(06): 360-364
14. 潘家荣, 巨晓棠, 刘学军, 张福锁, 毛达如. 高肥力土壤冬小麦/夏玉米轮作体系中化肥氮去向研究[J]. 核农学报, 2001, 15(04): 207-212
15. 周柱华, 单成钢, 朱斗北, 许方佐, 祝清俊, 邢燕菊, 齐延芳, 徐立华. 玉米自交系辐照效应的研究[J]. 核农学报,

