园艺学报 » 2013, Vol. 40 » Issue (6) :1139- DOI:

低温胁迫下北海道黄杨叶肉细胞Ca^{2+}和Ca^{2+}-ATPase的变化

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Changes of Ca^{2+} and Ca^{2+}-ATPase in the Mesophyll Cells of *Euonymus japonicus*‘Cuzhi’Under Cold Stress

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摘要 利用焦锑酸钙沉淀和硝酸铅沉淀的电镜细胞化学方法，以室温生长的北海道黄杨植株为对照，研究了人工4 ℃低温胁迫过程中北海道黄杨（*Euonymus japonicus*‘Cuzhi’）叶肉细胞Ca^{2+}和Ca^{2+}-ATPase的动态变化。在4 ℃低温胁迫的初期（3 ~ 12 h），北海道黄杨叶肉细胞间隙和液泡内的Ca^{2+}沉淀颗粒减少，而细胞质和细胞核内的Ca^{2+}水平升高，但Ca^{2+}-ATPase在细胞的分布几乎没有变化，主要分布在质膜和液泡膜上，有较高的活性；低温胁迫24 h，细胞质和细胞核内增加的Ca^{2+}开始回到细胞间隙和液泡中，Ca^{2+}-ATPase在质膜和液泡膜上活性增强；在低温胁迫48 ~ 96 h，细胞内的Ca^{2+}又回到低温胁迫前的低水平，但Ca^{2+}-ATPase在质膜和液泡膜上仍有很高的活性。叶肉细胞内Ca^{2+}稳态平衡和Ca^{2+}-ATPase的活性变化与植物的抗寒性存在一定的相关性。

关键词： 北海道黄杨 低温胁迫 Ca2+ Ca2+-ATPase 叶肉细胞

Abstract: Changes of Ca^{2+} and Ca^{2+}-ATPase in the mesophyll cell of *Euonymus japonicus*‘Cuzhi’at 4 ℃were investigated with electromicroscopic-cytochemical methods of calcium antimonate and lead nitrate precipitate. It is shown in the evidences that, compared with that of the plant at room temperature, the number of calcium particles in intercellular spaces and vacuoles of the mesophyll cell decreased, but that in the cytoplasm significantly increased at the early stage (at 4 ℃ from 3 hours to 12 hours). However, there was almost no changes of Ca^{2+}-ATPase distribution. The plasma and vacuoles membrane showed high activity of Ca^{2+}-ATPase simultaneously. After 24 hours at 4 ℃, Ca^{2+} in cytoplasm and nucleus which increased before began to go back to the intercellular spaces and the vacuoles, Ca^{2+}-ATPase activity on plasma and vacuoles membrane was enhanced. At 4 ℃ from 48 hours to 96 hours, Ca^{2+} concentration in the cytoplasm restored to the lower resting level, the same as that before the cold stress, yet the plasma and vacuoles membrane still showed high activity of Ca^{2+}-ATPase. Thus it could be concluded that there is certain relativity between Ca^{2+} homeostasis and dynamic changes of Ca^{2+}-ATPase with the plant cold resistance.

Keywords:

收稿日期: 2013-11-23;

引用本文:

.低温胁迫下北海道黄杨叶肉细胞Ca^{2+}和Ca^{2+}-ATPase的变化[J] 园艺学报, 2013,V40(6): 1139-

.Changes of Ca^{2+} and Ca^{2+}-ATPase in the Mesophyll Cells of *Euonymus japonicus*‘Cuzhi’Under Cold Stress[J] ACTA HORTICULTURAE SINICA, 2013,V40(6): 1139-

链接本文:

http://www.ahs.ac.cn//CN/ 或 http://www.ahs.ac.cn//CN/Y2013/V40/I6/1139

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[1] 李 亮, 董春娟, 尚庆茂.内源水杨酸参与黄瓜叶片光合系统对低温胁迫的响应[J]. 园艺学报, 2013,40(3): 487-497

[2] 王 萍, 李彦慧, 张雪梅, 李保国, 姚飞飞.低温对仁用杏雌蕊抗坏血酸—谷胱甘肽循环的影响低温对仁用杏雌蕊抗坏血酸—谷胱甘肽循环的影响[J]. 园艺学报, 2013,40(3): 417-425

[3] 田景花, 王红霞, 张志华, 高仪.低温逆境下两个抗寒性不同的核桃幼叶 Ca^{2+}的亚细胞定位的变化[J]. 园艺学报, 2013,40(3): 441-448
[4] 陈虎, 何新华, 罗聪, 杨丽涛, 黄杏, 胡颖.低温胁迫下龙眼碳酸酐酶基因（*CA*）的克隆与表达分析[J]. 园艺学报, 2012,39(2): 243-252
[5] 薛锡佳, 李佩艳, 宋夏钦, 沈玫, 郑小林.草酸处理减轻杧果采后果实冷害的机理研究[J]. 园艺学报, 2012,39(11): 2251-2257
[6] 柏素花, 祝军, 戴洪义.苹果酰基辅酶A结合蛋白2 编码基因*MdACBP2*的克隆和表达分析[J]. 园艺学报, 2012,39(10): 1893-1902
[7] 徐红霞;陈俊伟;杨 勇;孙骏威;严成其 .枇杷果实*DHN*基因克隆及其在低温胁迫下的表达分析 [J]. 园艺学报, 2011,38(6): 1071-1080
[8] 田丹青;葛亚英;潘刚敏;沈晓岚;何 勇;张 智;刘晓静;朱祝军;.低温胁迫对3个红掌品种叶片形态和生理特性的影响 [J]. 园艺学报, 2011,38(6): 1173-1179
[9] 李超汉;张 琳;史庆华;李青竹;郭晓青;李 霞;于贤昌;.GMPase超表达对番茄植株抗坏血酸含量及耐冷性相关生理指标的影响 [J]. 园艺学报, 2011,38(4): 692-700
[10] 郝 强;张睿鹂;冷平生;关雪莲 .北海道黄杨叶片应答低温胁迫的蛋白质组分析 [J]. 园艺学报, 2011,38(11): 2169-2179
[11] 曹诣斌;石 瑞;陈文荣;郭卫东 .低温胁迫下佛手和枳乙烯应答因子6（*ERF6*）表达变化的比较分析 [J]. 园艺学报, 2011,38(10): 1873-1882
[12] 李光庆;谢祝捷;姚雪琴;陈学好.花椰菜叶绿素荧光参数与耐寒性的关系研究[J]. 园艺学报, 2010,37(12): 2001-2001–2006
[13] 张彦萍;刘海河;申书兴;张成合;张新娥.多胺引发处理对茄子种子活力及幼苗耐冷性的影响[J]. 园艺学报, 2010,37(11): 1783-1788
[14] 孙永平;张治平;徐呈祥;申春苗;高 充;汪良驹.5- 氨基乙酰丙酸处理对低温下西瓜叶片快速叶绿素荧光诱导曲线的影响[J]. 园艺学报, 2009,36(5): 671-678
[15] 高俊杰;秦爱国;于贤昌.低温胁迫对嫁接黄瓜叶片抗坏血酸-谷胱甘肽循环的影响[J]. 园艺学报, 2009,36(2): 215-220