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研究论文

钙对拟南芥耐盐性的调节

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摘要 已有报道钙作为植物生长的大量元素和胞内重要的第二信使缓解植物的盐害，但在不同Na^+/Ca^{2+}条件下对它们之间的相互作用及生理机制的研究报道很少。为了进一步探讨Ca^{2+}对植物耐盐性的调节作用，本研究用外加不同浓度CaCl2-NaCl的固态和液态培养基对拟南芥的形态和生理生化的多项指标进行了测定。结果表明，0 mmol • L^{-1}下拟南芥的根长随外加钙浓度的增加而增长，当200、250 mmol • L-1NaCl胁迫时抑制了拟南芥根的生长，但在同一NaCl浓度下随钙离子浓度增加，侧根增加且真叶逐渐展开并由紫变绿。在高盐胁迫下，拟南芥的生物量、存活率、K^+含量、K^+ / Na^+都降低；但在同一NaCl浓度下，外加钙增加了盐胁迫下拟南芥的生物量、存活率、K^+含量、K^+ / Na^+。在高盐胁迫下，拟南芥体内的脯氨酸和丙二醛(MDA)的含量增加，但在同一NaCl浓度下，外加钙增加了脯氨酸含量并抑制了膜脂过氧化的产物丙二醛(MDA)的积累。说明外加Ca^{2+}能通过提高植物对盐胁迫的适应而增加K^+含量、脯氨酸含量并降低丙二醛的含量以增强植物抗离子、渗透和氧化等胁迫的能力从而缓解盐对拟南芥幼苗的伤害，提高拟南芥的耐盐性。

关键词 氯化钙 拟南芥 氯化钠胁迫 耐盐性

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Regulations of Calcium on the Salt Tolerance in *Arabidopsis*

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Abstract It has been known that calcium is one of the macro-elements and an important intracellular second messenger, which can release the salt damage. However there is poor knowledge about the mechanism of interaction between Na^+ and Ca^{2+} under different Na^+/Ca^{2+} ratio condition damage. In order to explore the mechanism of regulation of salt tolerance by Calcium in plants, the experiments of different concentrations of CaCl2-NaCl in solid and liquid culture media were conducted to find the morphological differences and physiological-biochemical characteristics were measured in *Arabidopsis*. The results showed that the root length increased with the increase of calcium under 0 mmol • L^{-1} NaCl, the root growth was suppressed under 200, 250 mmol • L^{-1}NaCl, but the number of lateral roots increased and the leaves turned to green with the calcium increase under the same NaCl concentration. The biomass, survival rate, the K^+ content and K^+ / Na+ ratio reduced under high salt stress but increased with the calcium increase under the same salt stress. The contents of proline and malondialdelehyde(MDA) increased under high salt stress, but under the same salt stress the contents of proline increased and MDA decreased with the calcium increase. These results implied that supplied Ca^{2+} may increase the adaptation and tolerance to salt stress by increasing contents of K^+ and proline, decreasing MDA, content, and increasing the resistances to ionic, osmotic and oxidative stress, and further to salt stress in the *Arabidopsis* seedlings.

Key words CaCl2 Arabidopsis thalinan NaCl stress Salt tolerance

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