

Ca²⁺ 对小麦萌发及幼苗抗盐性的效应

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Effects of Ca²⁺ on Wheat Germination and Seedling Development Under Saline Stress

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摘要

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摘要 以冬小麦(*Triticum aestivum*)临远077038为材料,研究了施入外源Ca²⁺对150、200、250及350 mmol·L⁻¹NaCl胁迫下小麦种子萌发及幼苗生长发育的影响。结果表明:20 mmol·L⁻¹CaCl₂浸种能够提高小麦在150-250 mmol·L⁻¹盐胁迫下种子的发芽率,并能增强其生长势;当NaCl浓度为350 mmol·L⁻¹时,小麦种子不能萌发,且在以上浓度的NaCl胁迫下,小麦种子均不能发育成苗。对NaCl胁迫下的小麦幼苗施入外源Ca²⁺后,提高了幼苗膜稳定性,降低了膜脂过氧化程度,从而减轻了盐胁迫对幼苗膜的伤害,表现为电导率降低、MDA含量降低及SOD和POD活性提高,并且提高了幼苗的呼吸强度及叶绿素含量,促进了幼苗生长及生物量的积累;Ca²⁺的缓解效应随着盐胁迫的加剧逐渐减弱,在浓度为350 mmol·L⁻¹的盐胁迫下,幼苗的生物量显著低于对照。以上结果表明,与水处理相比,20 mmol·L⁻¹CaCl₂处理能够更大程度地促进小麦的生长发育。

关键词: Ca²⁺ 萌发 盐胁迫 幼苗生长 冬小麦

Abstract: To explore the external Ca²⁺ alleviating effect of saline stress on winter wheat germination and seedling development, *Triticum aestivum* 'Linyuan 077038' seeds were treated with 150, 200, 250 and 350 mmol·L⁻¹ NaCl after they were soaked in 20 mmol·L⁻¹CaCl₂ or water. Also, wheat seedlings were transplanted to above NaCl solution or supplemented with 20 mmol·L⁻¹CaCl₂. Seeds pretreated with CaCl₂ showed increased seed germination ratio and growth vigor under 150-250 mmol·L⁻¹NaCl stress but could not germinate under 350 mmol·L⁻¹NaCl stress. However, germinating seeds pretreated with CaCl₂ or water could not develop into seedlings under the above NaCl saline stress. Seedlings treated with 150-350 mmol·L⁻¹NaCl supplemented with 20 mmol·L⁻¹CaCl₂ showed increased membrane stability and decreased membrane lipid peroxidation, so alleviated salt injury induced by NaCl, decreased relative conductivity and MDA content, as well as increased SOD and POD activity, aspiration intensity and chlorophyll content. Seedling height and biomass with CaCl₂ treatment were improved accordingly. Alleviation effects were lower with the higher saline stress; seedling biomass was significantly lower than that of the control under 350 mmol·L⁻¹NaCl saline stress. Treatment with 20 mmol·L⁻¹CaCl₂ had more favorable effects than water on wheat development.

Keywords: Ca²⁺ germination saline stress seedling development winter wheat

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