

外源精胺对NO₃⁻胁迫下黄瓜幼苗抗氧化酶活性及光合作用的影响王秀红¹, 王秀峰^{1,2}, 杨凤娟^{1,2}, 魏珉^{1,2}, 史庆华^{1,2}, 焦娟¹, 刘全兴³

1山东农业大学园艺科学与工程学院, 山东泰安 271018; 2山东农业大学作物生物学国家重点实验室, 山东泰安 271018; 3北京中科思壮农业生物技术有限公司, 北京 100080

Effects of exogenous spermine on activities of antioxidant enzymes and photosynthesis in cucumber seedlings under NO₃⁻ stressWANG Xiu-hong¹, WANG Xiu-feng^{1,2}, YANG Feng-juan^{1,2}, WEI Min^{1,2}, SHI Qing-hua^{1,2}, JIAO Juan¹, LIU Quan-xing^{3*}

1College of Horticulture Science and Engineering, Shandong Agricultural University, Taian 271018, China; 2 State Key Laboratory of Crop Biology, Shandong Agricultural University, Taian 271018, China, 3 China Science Strong Ag-biotech Co. Ltd, Beijing 100080, China

摘要

参考文献

相关文章

Download: PDF (852KB) HTML 1KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 采用营养液培养方法,研究了添加不同浓度的精胺(Spm)对NO₃⁻胁迫下黄瓜幼苗生长、叶片抗氧化酶活性及光合作用的影响。结果表明,140 mmol/L NO₃⁻胁迫下,外加1 mmol/L Spm, 10 d后,黄瓜幼苗叶片超氧化物歧化酶(SOD)、过氧化氢酶(CAT)、过氧化物酶(POD)、抗坏血酸过氧化物酶(APX)活性显著增加,电解质渗漏率和丙二醛(MDA)含量显著降低;气孔导度(Gs)、胞间CO₂浓度(Ci)和净光合速率(Pn)显著升高,气孔限制值(Ls)显著降低。说明1 mmol/L Spm处理能增强黄瓜幼苗对活性氧的清除能力,降低膜脂过氧化程度;降低气孔关闭,改善叶片的气体交换,幼苗生长势增加,对高浓度NO₃⁻胁迫的抗性增强。当Spm浓度高达1.5~2 mmol/L时,与1 mmol/L Spm相比,SOD、POD、APX、CAT活性均开始降低,电解质渗漏率和MDA含量增加,Gs、Ci和Pn显著降低,黄瓜幼苗生长受到抑制。可见,外加一定浓度的Spm可通过提高抗氧化酶活性、降低膜脂过氧化程度及改善光合作用来缓解NO₃⁻胁迫对黄瓜幼苗的影响。

关键词: 精胺 NO₃⁻胁迫 黄瓜幼苗 抗氧化酶 光合特性

Abstract: In this study, cucumber seedlings were cultivated in nutrient solution with different concentrations of spermine (Spm) (0.5, 1, 1.5 and 2 mmol/L). The effects of exogenous Spm on growth of cucumber seedlings, activities of antioxidant enzymes and photosynthesis in cucumber leaves under NO₃⁻ stress were investigated. The results show that activities of superoxidase(SOD), peroxidase(POD), catalase(CAT) and ascorbic acid peroxidase(APX) are significantly increased in the treatment of 1 mmol/L Spm for 10 d under 140 mmol/L NO₃⁻ stress, and stomatal conductance(Gs), intercellular CO₂ concentration(Ci) and net photosynthetic rate(Pn) in leaves are significantly enhanced, while electrolytic leakage(EL), the accumulation of malondialdehyde(MDA) and stomatal limitation value(Ls) in cucumber seedlings are significantly decreased. These findings suggest exogenous Spm could enhance the capacity of scavenging active oxygen species and improve photosynthesis, protect cucumber seedlings from the peroxidation of membrane lipids, promote the growth and increase resistance to high concentration of NO₃⁻ stress. After the cucumber seedlings growing in the 1.5-2 mmol/L Spm for 10 d, compared to growing in the 1 mmol/L Spm, activities of SOD, POD, APX and CAT, Gs, Ci and Pn are decreased under the 140 mmol/L NO₃⁻ stress, while MDA level and electrolytic leakage are increased, resulting in injury of cucumber seedlings. These results indicate that the effect of exogenous Spm is dependant on the concentration of Spm. Excessive Spm treatment would decrease the resistance to NO₃⁻ stress.

Keywords: spermine NO₃⁻ stress cucumber seedlings antioxidant enzymes photosynthetic characteristics

Received 2009-07-16;

Fund:

国家自然科学基金(30471187, 30871705); 国家自然科学基金青年基金项目(30900983); 山东农业大学中青年创新基金(23472); 山东农业大学博士后基金(76242)资助。

引用本文:

王秀红, 王秀峰, 杨凤娟, 魏珉, 史庆华, 焦娟, 刘全兴. 外源精胺对NO₃⁻胁迫下黄瓜幼苗抗氧化酶活性及光合作用的影响[J]. 植物营养与肥料学报, 2010, V16(4): 1020-1026

WANG Xiu-Hong, WANG Xiu-Feng, YANG Feng-Juan, WEI Min, SHI Qing-Hua, JIAO Juan, LIU Quan-Xing. Effects of exogenous spermine on activities of antioxidant enzymes and photosynthesis in cucumber seedlings under NO₃⁻ stress[J]. Acta Metallurgica Sinica, 2010, V16(4): 1020-1026

Service

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ Email Alert
- ▶ RSS

作者相关文章

- ▶ 王秀红
- ▶ 王秀峰
- ▶ 杨凤娟
- ▶ 魏珉
- ▶ 史庆华
- ▶ 焦娟
- ▶ 刘全兴