

NO 和ABA 对辣椒幼苗自毒作用缓解的生理生化机制

张国斌, 郁继华, 冯致, 马彦霞, 吕剑

甘肃农业大学农学院, 兰州 730070

Physiological and Biochemical Mechanisms of Nitric Oxide and Abscisic Acid on Alleviation to Autotoxicity in Pepper Seedlings

ZHANG Guo-Bin, YU Ji-Hua, FENG Zhi, MA Yan-Xia, Lü Jian

College of Agronomy, Gansu Agricultural University, Lanzhou 730070, China

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摘要 为探究NO 和ABA 对辣椒幼苗自毒作用缓解的生理生化机制,以蛭石珍珠岩混合基质栽培的辣椒‘陇椒2号’幼苗为材料,用连作3年辣椒的土壤和基质浸提液浇灌幼苗,研究喷施外源SNP(NO 供体,150 μmol·L⁻¹)和ABA(100 μmol·L⁻¹)对自毒作用下辣椒幼苗叶片的抗氧化酶活性、抗氧化剂和渗透调节物质含量、膜脂过氧化损伤的影响。结果表明,土壤和基质浸提液均导致辣椒幼苗叶片超氧化物歧化酶(SOD)、过氧化物酶(POD)和过氧化氢酶(CAT)活性,以及脱氢抗坏血酸(DHA)含量的下降;还原型抗坏血酸(AsA)、脯氨酸(Pro)、可溶性蛋白和丙二醛(MDA)含量,以及相对电导率和AsA/DHA 上升;土壤浸提液胁迫程度显著大于基质浸提液。外源NO 和ABA 处理显著提高辣椒幼苗叶片的SOD、POD 和CAT 活性,以及Pro 和可溶性蛋白含量,降低MDA 含量和相对电导率,显著促进AsA 含量升高和DHA 含量下降,维持较高的AsA/DHA,NO 对自毒作用下辣椒幼苗氧化损伤的缓解效应显著好于ABA。研究结果表明外源NO 和ABA 通过提高自毒作用下辣椒抗氧化酶活性、渗透调节物质含量和AsA/DHA 比值,有效地阻止辣椒体内MDA 积累和电解质渗漏,缓解自毒作用对辣椒幼苗造成的膜脂过氧化,增强辣椒的抗逆性。

关键词: 辣椒 一氧化氮 脱落酸 自毒作用 抗氧化酶 抗氧化剂 渗透调节物质

Abstract: The aim of the experiment was to explore the physiological and biochemical mechanisms of nitric oxide (NO) and abscisic acid (ABA) on alleviation to autotoxicity in pepper seedlings (*Capsicum annuum* L. ‘Longjiao 2’). With soil and substrates extracts of 3 years continuous cropping pepper treated pepper seedlings, then the effects of SNP (150 μmol·L⁻¹) and ABA (100 μmol·L⁻¹) on antioxidant enzymes activity, antioxidant substances content, osmotic adjustment substance content, and membrane lipid peroxidation in pepper seedlings leaves were investigated. The results showed that superoxide dismutase (SOD), peroxidase (POD), catalase (CAT) activities, and dehydroascorbate (DHA) content declined under all of soil and substrates extracts stress, while ascorbic acid (AsA), proline (Pro), soluble protein, malondialdehyde (MDA) contents, relative conductivity and AsA/DHA ratio increased. Autotoxicity on pepper of soil extracts was serious greatly than that of substrates extracts. NO and ABA significantly increased SOD, POD and CAT activities, Pro and soluble protein contents, while reduced MDA content and relative conductivity significantly. At the same time, AsA/DHA ratio was significantly higher through promoting significantly to increase AsA content and decrease DHA content. Alleviate effect to autotoxicity of NO was significantly better than that of ABA in pepper seedlings. The above results suggested that NO and ABA effectively prevented malondialdehyde accumulation and electrolyte leakage, mitigated lipid peroxidation, through increasing antioxidant enzymes activities, osmotic adjustment substance content and AsA/DHA ratio in pepper seedlings under autotoxicity stress.

Keywords: pepper, nitric oxide, abscisic acid, autotoxicity, antioxidant enzymes, antioxidant, substances, osmotic adjustment substance

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