

铜胁迫对紫花苜蓿幼苗叶片抗氧化系统的影响

王松华^{1**}, 张华², 何庆元¹¹安徽科技学院生命科学学院, 安徽蚌埠233100; ²合肥工业大学生物与食品工程学院, 合肥230009Effects of copper stress on *Medicago sativa* seedlings leaf antioxidative system.WANG Song-hua¹, ZHANG Hua², HE Qing-yuan¹¹College of Life Science, Anhui Science and Technology University, Bengbu 233100, Anhui, China; ²College of Biology and Food Engineering, Hefei University of Technology, Hefei 230009, China

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摘要 采用1/4强度Hoagland营养液培养法研究了不同浓度Cu处理(0、10、30、50、100 $\mu\text{mol} \cdot \text{L}^{-1}$ CuSO_4)对紫花苜蓿幼苗叶片生理生化特性的影响。结果表明: 30、50、100 $\mu\text{mol} \cdot \text{L}^{-1}$ Cu处理使叶片中过氧化氢(H_2O_2)、羟基自由基($\text{OH} \cdot$)和丙二醛(MDA)含量升高; 随Cu浓度的增加, 愈创木酚过氧化物酶(POD)、谷胱甘肽还原酶(GR)和抗坏血酸过氧化物酶(APX)的活性逐渐上升, 过氧化氢酶(CAT)和葡萄糖-6-磷酸脱氢酶(G6PDH)的活性先上升后下降; 30、50、100 $\mu\text{mol} \cdot \text{L}^{-1}$ Cu处理增强Fe-SOD和酯酶(EST)的活性, 使叶片中谷胱甘肽(GSH)和抗坏血酸(AsA)含量显著升高。>10 $\mu\text{mol} \cdot \text{L}^{-1}$ 的Cu处理下, 叶片中抗氧化系统清除活性氧的能力上升, 以防止叶片在Cu诱导的氧化胁迫下受到伤害。

关键词: 紫花苜蓿 铜 抗氧化酶 酯酶

Abstract: This paper studied the effects of different concentration (0, 10, 30, 50, and 100 $\mu\text{mol} \cdot \text{L}^{-1}$) CuSO_4 on the leaf physiological and biochemical characteristics of *Medicago sativa* seedlings cultured with 1/4-strength Hoagland nutrient solution. In treatments 30, 50, and 100 $\mu\text{mol} \cdot \text{L}^{-1}$ of CuSO_4 , the leaf H_2O_2 , $\text{OH} \cdot$, and MDA contents and Fe-SOD and EST activities increased, and GSH and AsA contents increased significantly. With increasing concentration Cu, the POD, GR, and APX activities increased gradually, and the CAT and G6PDH activities decreased after an initial increase. In treatments >10 $\mu\text{mol} \cdot \text{L}^{-1}$ of Cu, the capacity of leaf antioxidative system in reactive oxygen species scavenging increased to prevent the injury from copper-induced oxidative stress.

Key words: *Medicago sativa* copper antioxidative enzyme esterase

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