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摘要： 设置0、0.5、1.0、2.0和4.0 mmol·L^{-1}铜离子浓度梯度，同时在各浓度梯度中分别添加0.16和0.32 mmol·L^{-1}的谷胱甘肽（GSH），进行大豆种子萌发试验，通过测定萌发率、相对电导率、脯氨酸含量及α-淀粉酶活性等指标研究了GSH对大豆种子铜胁迫的缓解效应。结果表明：1.0 mmol·L^{-1}以上浓度铜显著降低大豆种子的活力指数及幼根长，显著提高电解质渗透率及脯氨酸含量；2.0 mmol·L^{-1}以上浓度铜离子显著降低大豆种子的发芽指数及α-淀粉酶活性；4.0 mmol·L^{-1}铜离子显著抑制萌发率。添加0.16和0.32 mmol·L^{-1}的GSH能显著提高1.0 mmol·L^{-1}以上浓度铜毒害条件下α-淀粉酶活性，降低脯氨酸含量，增加幼根长，并能显著降低2.0 mmol·L^{-1}以上浓度铜毒害下的电解质渗透率；4.0 mmol·L^{-1}浓度铜毒害条件下，添加0.32 mmol·L^{-1}的GSH能显著提高大豆种子的萌发率、发芽指数和活力指数。综合考虑，0.16和0.32 mmol·L^{-1}的GSH能够通过提高α-淀粉酶活性来增强大豆种子的萌发能力，并通过维持细胞膜完整性来缓解一定浓度的铜胁迫。

Abstract: The alleviation effects of exogenous GSH on copper toxicity during soybean seeds germination was studied in this paper. The soybean seeds were soaked in solution with different copper concentrations of 0, 0.5, 1.0, 2.0, 4.0 mmol·L^{-1}, supplied with 0.16 and 0.32 mmol·L^{-1} GSH, and then the seeds germination rate, relative permeability, proline content and activity of α-amylase were investigated. The results showed that the copper concentration of 1.0 mmol·L^{-1} or above evidently decreased the activity index and radicle length, but the relative electrolyte permeability and proline content were enhanced remarkably; 2.0 mmol·L^{-1} or above copper concentration notably reduced the germination index and activity of α-amylase; 4.0 mmol·L^{-1} copper observably restrained the germination rate. Under 1.0 mmol·L^{-1} or above copper stress, 0.16 and 0.32 mmol·L^{-1} GSH markedly improved the activity of α-amylase and radicle length, but reduced proline content. Under 2.0 mmol·L^{-1} or above copper stress, 0.16 and 0.32 mmol·L^{-1} GSH evidently decreased the relative electrolyte permeability. Under 4.0 mmol·L^{-1} copper stress, 0.32 mmol·L^{-1} GSH remarkably enhanced the germination rate, germination and activity index. These results indicated that 0.16 and 0.32 mmol·L^{-1}GSH improved the ability of soybean seeds germination via enhancing the activity of α-amylase, meanwhile, alleviated copper toxicity on soybean seeds in a certain extent to maintain the integrity of cell membrane.

参考文献/References:
[1]Clemens S. Toxic metal accumulation, responses to exposure and mechanisms of tolerance in plants[J]. Biochimie, 2006, 88(11):1707-1719.
[2]苟本富. 铜胁迫对蚕豆种子萌发及幼苗生长的影响[J]. 西南师范大学学报(自然科学版), 2010, 35(5):116-120. (Gou B F. The effects of copper stress on germination and seedling growth of Vicia faba[J]. Journal of Southwest China Normal University (Natural Science Edition), 2010, 35(5):116-120).
[3]葛才林, 阳小勇, 刘向农, 等. 重金属对水稻和小麦DNA 甲基化水平的影响[J]. 植物生理与分子生物学学报, 2002, 28(5):363-368. (Ge C L, Yang X Y, Liu X N, et al. Heavy metal on the DNA methylation level in rice and wheat[J]. Journal of Plant Physiology and Molecular Biology, 2002, 28(5):363-368.)

[4]于敏，王文国，王胜华，等．外源柠檬酸对水稻铜毒害的缓解效应[J]．应用与环境生物学报，2010,16(5):617-621.(Yu M,Wang W G,Wang S H,et al.Alleviative effect of exogenous citric acid on rice under copper toxicity[J].Chinese Journal of Applied and Environmental Biology,2010,16(5):617-621.)
[5]Cnubben N H,Rietjens I M,Wortelboer H,et al.The interplay of glutathione-related processes in antioxidant defense[J].Environmental Toxicology and Pharmacology,2001,10(4):141-152.
[6]Didier H,Emmanuel B,Pierre F,et al.Reactive oxygen species,nitric oxide and glutathione:a key role in the establishment of the legume-Rhizobium?symbiosis[J].Plant Physiology and Biochemistry,2002,40(6-8):619-624.
[7]Jos&M M,Cristina P G,Ignacio N D C,et al.Glutathione and its relationship with intracellular redox status,oxidative stress and cell proliferation/death[J].The International Journal of Biochemistry & Cell Biology,2002,34(5):439-458.
[8]Pastori G M,Foyer C H.Common components,networks,and pathways of cross-tolerance to stress.The central role of "redox" and abscisic acid-mediated controls[J].Plant Physiology,2002,129(2):460-468.
[9]Sen C K.Glutathione homeostasis in response to exercise training and nutritional supplements[J].Molecular and Cellular Biochemistry,1999,196(1-2):31-42.
[10]Mike J M,Teva V,Chris L,et al.Glutathione homeostasis in plants:implications for environmental sensing and plant development[J].Journal of Experimental Botany,1998,49(321):649-667.
[11]钱猛，朱昌华．外源GSH对海州香薷铜毒害的缓解作用[J]．植物生理学通讯，2010,46(12):1243-1246.(Qian M,Zhu C H.Alleviation of glutathione on copper toxicity of Elsholtzia haichowensis?Sun[J].Plant Physiology Communications,2010,46(12):1243-1246.)
[12]陈玉胜．外源谷胱甘肽对水稻种子萌发过程中铜毒害的缓解效应[J]．南京晓庄学院学报，2007(6):66-69.(Chen Y S.Effects of copper toxicity on germination of rice seeds and alleviation role of exogenous glutathione[J].Journal of Nanjing Xiaozhuang University,2007(6):66-69.)
[13]陈玉胜，陈全战．硫对铜胁迫下大豆种子的解毒作用[J]．大豆科学，2010,29(4):630-633.(Chen Y S,Chen Q Z.Detoxification of sulfur on soybean seeds under copper stress[J].Soybean Science,2010,29(4):630-633.)
[14]张志良．植物生理学实验指导[M]．北京：高等教育出版社，1993.(Zhan Z L.The experimental guide for plant physiology[M].Beijing:Higher Education Press,1993.)
[15]李合生．植物生理生化实验原理和技术[M]．北京：高等教育出版社，2000:258-260.(Li H S.Principle and technology of plant physiology and biochemistry experiment[M].Beijing:Higher Education Press,2000:258-260.)
[16]Sommer A L.Copper as an essential for plant growth[J].Plant Physiology,1931,6(2):339-345.
[17]何俊瑜，任艳芳，王阳阳，等．不同品种小麦种子萌发和幼苗生长对镉胁迫的响应[J]．麦类作物学报，2009,29(6):1048-1054.(He J Y,Ren Y F,Wang Y Y,et al.Response to cadmium stress at seed germination and seedling growth of different wheat varieties[J].Journal of Triticeae Crops,2009,29(6):1048-1054.)
[18]支立峰，余涛，朱英国，等．过量表达脯氨酸的转基因烟草细胞对毒性重金属的抗性增强[J]．湖北师范学院学报(自然科学版)，2006(2):14-19.(Zhi L F,Yu T,Zhu Y G,et al.Overexpression of △1-pyrroline-5-carboxylate synthetase enhanced tolerance to toxic heavy metals in transgenic tobacco cells[J].Journal of Hubei Normal University(Natural Science),2006(2):14-19.)

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