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多种盐分离子作用下苋菜对重金属的吸收累积特征

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Absorption adn Accumulation of Heavy Metals in Amaranth Under Stress of Multiple Salt Ions

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摘要 模拟不同淋洗脱盐阶段滩涂土壤孔隙水中盐分和重金属含量，通过苋菜水培试验，研究多种盐分离子（SO_4^{2-}、Cl^-、NO_3^-、CO_3^{2-}、Na^+、Ca^{2+}、K^+和Mg^{2+}等）的共同作用下，苋菜对Zn、Cu、Ni、Cr、Pb和Cd 6种重金属的吸收、累积和转运的变化。结果表明，与对照相比，在不同盐分浓度影响下，苋菜茎叶中Cd的累积增幅为69.2%～146.2%，而茎叶中其他重金属的含量无显著变化，苋菜根系中Cd、Pb、Cr、Ni和Cu含量的最大增幅分别为187.8%、197.7%、305.7%、228.1%和58.2%，但根系中Zn含量未受到显著影响。在相对较高的盐分离子浓度（>1312.4 mg · L^{-1}）范围内，不同盐分离子浓度处理间苋菜茎叶和根系中6种重金属含量差异均不显著。盐分处理显著降低了苋菜对Pb、Cr、Ni和Cu的转移系数，但未显著影响苋菜对Cd和Zn的转移系数。

关键词： 多种盐分离子 共同作用 苋菜 重金属 吸收 转运

Abstract： Reference to the salt and heavy metals content in the pore water of tidal flat soil which was in different leaching and desalinization stages, a hydroponic experiment of amaranth was carried out to investigate absorption,accumulation and transportation of six heavy metals (Zn, Cu, Ni, Cr, Pb and Cd)by the plant under the combined effect of a variety of salts(SO_4^{2-}、Cl^-、NO_3^-、CO_3^{2-}、Na^+、Ca^{2+}、$K^+$and Mg^{2+},etc.). Results show that compared with what was observed in the control, under the effects of salt ions different in concentration,the content of Cd in stems and leaves of the plant increased by 69.2% -146.2%, while the contents of other heavy metals did not change much;the content of Cd,Pb,Cr,Ni and Cu in roots of the plant increased by 187.8%, 197.7%, 305.7%, 228.1% and 58.2%, respectively,but that of Zn was not significantly affected. In the culture with salt ion concentration being more than 1312.4 mg · L^{-1}, the contents of the six heavy metals in roots and shoots did not vary much between treatments different in salt concentrations,separately.Salt treatment apparently reduced the translocation coefficients of Pb, Cr, Ni and Cu in amaranth from the roots to the shoots, but it did not affect much that of Cd and Zn.

Keywords： multiple salt ions combined effect amaranth heavy metal absorption transportation

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