

前植物生产层

心莲子草对污泥重金属的响应与吸附效应

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摘要:

植物修复(Phytoremediation)是解决越来越突出的重金属污染问题的一种较好的方法,已成为生态学和环境学研究的重要课题,而植物对重金属的响应和吸附效应是该问题的科学基础。为此,本研究采用盆栽方法,设定污泥与土壤的不同体积配比(无污泥、5%污泥、10%污泥和20%污泥)作为生长基质,测定在含不同重金属的基质中生长不同时间(3-6月)的空心莲子草(*Alternanthera philoxeroides*)叶片的生理指标[叶绿素含量、超氧化物歧化酶(SOD)活性、过氧化物酶(POD)活性]和在含重金属基质中生长6个月后的空心莲子草根、茎、叶中重金属元素(Cd、Cr、Mn、Ni、Pb、Cu、Zn)含量。结果表明,空心莲子草叶片中叶绿素含量总体上随生长基质中污泥体积比例升高而升高;空心莲子草叶片中SOD活性、POD活性总体随生长基质中污泥体积比例升高而升高,但在含重金属的生长基质中生长5个月后,叶绿素含量、SOD活性和POD活性均明显下降;在各处理下,空心莲子草对Mn、Ni、Cr、Pb、Cu和Zn的吸收主要分布在叶片,且空心莲子草的转运系数大于1。研究结果说明,空心莲子草对污泥重金属有较好的耐受性,且转运系数大于1。虽然该植物根、茎、叶的富集系数均小于1,不属于超富集植物,但在受重金属污染的土壤植物修复中仍有一定的参考作用。

关键词: 土壤污染; 植物修复; 生物积累

Response of *Alternanthera philoxeroides* to heavy metals and its sorption effectiveness for heavy metals

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Abstract:

The phytoremediation is an effective way to solve more and more heavy metal problems and becomes an important field in ecological and environmental sciences, in which the response of plant to heavy metals and its sorption effectiveness for heavy metals are the scientific basis. A pot experiment with different ratio of sludge to soil (0, 5%, 10%, 20% sludge) was carried out to determine the response of *Alternanthera philoxeroides* to heavy metals and its sorption effectiveness by measuring the chlorophyll content, peroxidase (POD) activity, and superoxidisedis mutase (SOD) in the leaves of *A. philoxeroides* after three, four, five and six months treatment, and the metals content (Cd, Cr, Mn, Ni, Pb, Cu, and Zn) in the leaves, roots, and stems of *A. philoxeroides* after six months treatment. This study showed that the chlorophyll content, POD and SOD activity in the leaves of *A. philoxeroide* increased as the sludge volume increased; however, they decreased when *A. philoxeroide* grew in the soil containing heavy metals for six months. This study also showed that the Mn, Ni, Cr, Pb, Cu, and Zn content of the leaves and the stems were higher than those of the roots in different treatments. These results indicated that although *A. philoxeroides* was useful for phytoremediation of heavy metals in sludge due to its good growth ability, strong tolerance to the heavy metals, and higher transfer coefficient for Mn, Ni, Cr, Pb, Cu, and Zn.

Keywords: soil pollution; phytoremediation; bioaccumulation

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