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薹米人工湿地根系分解及其铬元素的释放和化学形态变化

Root decomposition of *Coix aquatica* Roxb in constructed wetlands and release and changes in chemical form of chromium

关键词: [人工湿地](#) [铬总累积量](#) [根系分解](#) [铬化学形态](#)

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摘要: 利用湿生植物薹米构建垂直流人工湿地,研究了不同浓度 Cr^{6+} (0、20、40 $\text{mg}\cdot\text{L}^{-1}$)处理对湿地植物薹米根系分解及铬元素含量和形态分布的影响,以期研究根系中Cr的累积、形态转变及人工湿地高效处理含铬废水技术提供理论支持.结果表明:薹米根系前30 d分解快速,之后分解缓慢;20、40 $\text{mg}\cdot\text{L}^{-1}$ Cr^{6+} 处理与对照相比,根系的分解速率分别降低了40.63%、55.56%.分解前期(0~45 d)根残体对Cr具有较强的吸附能力,分解后期(45~60 d)根残体吸附能力减弱,根残体的Cr含量为先升高后降低,分解60 d后根残体释放出Cr.分解过程中重金属活性较强的乙醇提取态(F1)和去离子水结合态(F2)的含量均显著降低;在分解60 d后, Cr^{6+} 胁迫下根残体内Cr以醋酸提取态(F4)含量最高,其他形态次之;不处理 Cr^{6+} 根残体内Cr以残渣态(F6)为主要优势,百分比高达76.76%.本研究表明,分解过程中根内Cr含量呈先增高后降低的趋势, Cr^{6+} 胁迫下降低了根系分解率,但没有提高Cr的生物活性.

Abstract: In order to characterize chromium accumulation, speciation in root and the treatment of chromium-contained wastewater by artificial wetland, this study constructed vertical-flow wetland and investigated the effect of Cr^{6+} (0, 20, 40 $\text{mg}\cdot\text{L}^{-1}$) on wetland plant *Coix aquatica* Roxb. The results showed that the decomposition rate of roots was fast in the first 30 days and decelerated after that. Compared with the control, the decomposition rate of 20 and 40 $\text{mg}\cdot\text{L}^{-1}$ treatment was reduced by 40.63% and 55.56%, respectively. At the early stage of the deposition (0~45 days), the residue content in root had strong adsorption ability towards Cr, while at the later stage (45~60 days), its adsorption ability was weakened. The residue content of Cr in the roots increased and then decreased. In the process of decomposition, the content of the ethanol extraction state with a strong activity of heavy metals (F1) and deionized water combination pattern (F2) were reduced significantly. After 60-day decomposition, the residue contents of Cr in the roots of Cr^{6+} stress were mainly distributed in FHAC (F4). Cr in Cr^{6+} residue contents in the roots was mainly distributed in residual form, which accounted for 76.76%. The results indicated that, Cr concentration in root during decomposition course exhibited an increasing-decreasing trend which illustrated the reduction of root decomposing rate by Cr^{6+} without increasing biological activity of Cr.

Key words: [constructed wetland](#) [Cr total accumulation](#) [root decomposition](#) [Cr chemical forms](#)

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