

研究报告

污染土壤重金属的生物有效性和移动性评价：四种方法比较

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摘要 重金属在土壤中的积累可增加土壤对生态环境的危害,而这种危害与土壤中重金属的活性有关.本文以植物体重金属浓度和地表径流重金属浓度为依据,比较研究了总量法、化学形态分级法、有效成分提取法和淋洗法4种方法评价污染土壤中重金属的生物有效性和移动性的可行性.结果表明,不同方法的评价结果有较大的差异.由于不同土壤的重金属组成有很大的差异,总量法难以反映土壤重金属的生物有效性和移动性;化学形态分级法中的交换态重金属可较好地反映土壤重金属的生物有效性和移动性,有机质结合态和碳酸盐结合态的某些重金属与其生物有效性和移动性也有一定的联系,而氧化物结合态、残余态重金属与重金属的生物有效性和移动性无关;用淋洗方法溶出的重金属量可很好地反映地表径流中重金属的浓度,也可较好地反映重金属的生物有效性;5种化学提取剂提取有效态重金属的结果表明,稀盐($0.01 \text{ mol}\cdot\text{L}^{-1} \text{ CaCl}_2$)和 $1 \text{ mol}\cdot\text{L}^{-1} \text{ NH}_4\text{OAc}$ 提取的土壤重金属量与植物中重金属的积累和地表径流中重金属浓度均显著相关,可较好地表征土壤中重金属的生物有效性和移动性,其中稀盐($0.01 \text{ mol}\cdot\text{L}^{-1} \text{ CaCl}_2$)提取的重金属最适于评价重金属的可移动性.

关键词 [重金属](#) [生物有效性](#) [移动性](#) [化学形态](#) [提取方法](#)

分类号

Evaluation of heavy metals bioavailability and mobility in polluted soils: A comparison of four methods

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Abstract

The accumulation of heavy metals in soil could give impact to the environment, and the impact is related to the accumulated heavy metals' bioavailability and mobility. This paper studied the feasibility of four methods, *i.e.*, total analysis, sequential fractionation, chemical extraction, and column leaching, in evaluating the bioavailability and mobility, and the results showed that because of the difference in chemical forms of the metals in different soils, the total concentration of the metals in soil was not suitable to evaluate their bioavailability and mobility. Exchangeable forms of the metals obtained by chemical fractionation could better reflect, while the organic matter-bound forms of some metals had definite correlation with the bioavailability and mobility. There were no significant correlations between the oxides-bound and residual metals and the bioavailability and mobility. Column leaching was also feasible to evaluate the bioavailability and mobility. $0.01 \text{ mol}\cdot\text{L}^{-1} \text{ CaCl}_2$ and $1 \text{ mol}\cdot\text{L}^{-1} \text{ NH}_4\text{OAc}$ extractable metals were significantly correlated with the metals concentrations in surface runoff and plant, and could better predict the potential runoff of heavy metals from soil and the accumulation of the metals in plants.

Key words [Heavy metal](#) [Bioavailability](#) [Mobility](#) [Chemical form](#) [Extraction method](#)

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