



Strategic study of adsorption and desorption of chromium on vertisols and its implication in developing an effective remediation technology

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ABSTRACT

Chrome tanning in India leads to severe contamination of soil and water. Due to the indiscriminate disposal of effluent from tanneries, several thousand hectares of agricultural lands have been degraded over several decades in Tamil Nadu. Several researchers were involved in developing remediation technologies for chromium contamination. Adsorption and desorption of Cr on soil determine the mobility of Cr and its environmental impact. There are several studies regarding the adsorption/desorption of Cr. A strategic study regarding the mechanism of adsorption/desorption of Cr to the context of remediation technologies is essential. A better understanding of the adsorption and desorption mechanism of Cr aids in developing a suitable remediation strategy. Therefore, in the present investigation, the adsorption of Cr on soil and some critical factors affecting the adsorption were studied. The Cr adsorption on soil recorded maximum and was best illustrated by the Freundlich isotherm ($R^2 = 0.994$) than the Langmuir isotherm ($R^2 = 0.841$). Amongst the bio-amendments, biochar was found to enhance the adsorption of Cr on the soil. The co-contaminants such as cadmium and lead significantly reduced the adsorption of Cr. Further, a desorption study was carried out with different desorption agents such as NaOH, $\text{CH}_3\text{COONH}_4$ and EDTA. It was found that NaOH exhibited higher desorption efficiency than the other agents. The results reveal that adsorption and desorption mechanisms aids in predicting the toxicity of Cr. This study also shows that the soil pH, bio-amendments, and co-contaminants in the contaminated soil may play a significant role in the remediation process.

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