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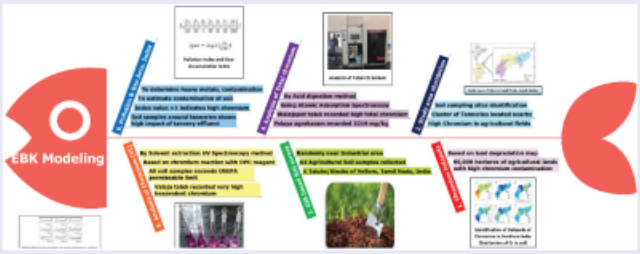
Evaluation and speciation of heavy metals in the soil of the Sub Urban Region of Southern India

M. Sinduja[a], V. Sathya[b], M. Maheswari[a], P. Dhevagi[a], P. Kalpana[b], G. K. Dinesh[c], and Shiv Prasad[c]

[a]Department of Environmental Sciences, Tamil Nadu Agricultural University, Coimbatore, India; [b]National Agro Foundation, Research & Development Centre, Anna University Taramani Campus, Chennai, India; [c]Division of Environment Science, ICAR – Indian Agricultural Research Institute, New Delhi, India

ABSTRACT

This study examines the pollution of soil by chromium using statistical analysis and Empirical Bayesian Kriging (EBK) modeling around the leather tanning industries of Southern India. Sixty-four soil samples were collected from agricultural lands and analyzed for their major ions and trace elements using Atomic Absorption Spectrophotometer. It is observed that the concentration of trace elements, decreases in the following order: Cr > Fe > Ni > Pb > Mn > Cu > Zn. Also, the chromium present in the soil samples ranged between 0.1 and 2459 mg/kg. The higher concentration of Cr, Pb, Ni, and Zn observed in this study exceeds the permissible limit around tannery regions, indicating tannery effluents' impact. The positive correlation of Cr with Ca, Mg, Pb, and Mn specifies the discharge of tannery wastewater into the open land, thus contaminating the soil in the study area. The root mean square error (RMSE) values derived from the EBK model for Cr, Pb, Fe, and Ni are close to 1, indicating the model's validity. Moreover, the soil pollution index and Geo-accumulation index results around the tannery region show a profound impact of tannery effluent. The obtained results clearly emphasize the presence of toxic heavy metals in the study area that may cause extensive degradation of productive agricultural land. Hence, it is essential to make an appropriate strategy and implement a suitable remediation technique to solve the heavy metals pollution problem.



KEYWORDS

trace elements; chromium (III) and (VI); Pollution Index (PI); EBK modeling; Chromium speciation; Vellore District contamination