Abstract

Hexavalent Chromium (Cr(VI)) has stringent reactive properties cause it to bind to soil minerals and imbalance soil aggregates structural stability. To execute soil- Cr remediation research, the organic and inorganic treatments co-application with microbiota was considered at lab scale to establish the synergistic effects in heavy metal immobilization in a comparative assessment mode. Iron-enriched and Zinc enriched forms of rice husk biochar manufactured at 550 $_{o}$C and inorganic clay minerals (Bentonite and Attapulgite) were applied at rate of 1.5% and 3% to Cr-spiked sandy loam soil (60 g) in-vitro trial. Furthermore, bacterial sp. such as Azotobacter *nigricans* sp., *Trichococcus* sp., *Pseudomonas alcaligenes* sp., *Pseudomonas fluorescence* sp., *Bacillus subtilis* sp. and *Enterobacter aerogenes* sp. and fungal sp. of Genus *Trichoderma* were added to designed treatment line of 90 pots (three intervals R1=20 days, R2= 30 day, R3=40 days) with three replicates per treatment. Bio-agents with organic and inorganic treatments showed specified performance in setting soil physio-chemical properties that appeared influential to metal sorption, desorption and chelation mechanisms. The Cr-metal immobilization was assessed under the variability of physio-chemical parameters (pH, EC, CE, OM) suggested that soil ecology can be controlled economically to avoid ecological perturbations. Soils DTPA-extractable Cr content reduced up to 99% by FeBC, ZnBC and Bent in particular combination with microbial strains. Attapulgite as co-inoculated treatment showed high desorption behavior over 20 days' incubation period. However, by increasing the time period from 20 to 40 days, the reduction in metal desorption was observed which was still lower than other treatment groups. According to Langmuir adsorption isotherm (R^2>9), treatments showed adsorption potential as ATTA 58< BENT 243< ZnBC 357 < FeBC 263mg/g Q_{max} that depicted feasibly for maintaining native soil ecology based on maximum-optimal interactive behavior with inoculated species. There is need to explore the mechanism by which salt and metal binding balance can be achieved to maintain soil EC and CEC optimal conditions.