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BIOREMEDIATION OF LEAD, NICKEL AND COPPER BY METAL RESISTANT *BACILLUS LICHENIFORMIS* ISOLATED FROM MINING SITE: OPTIMIZATION OFOPERATING PARAMETERS UNDER LABORATORY CONDITIONS

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ABSTRACT

Biosorption has been considered as effective process of bioremediation for removal of heavy metals in an ecosystem. In this study, metal resistant bacterial strains were isolated from the soil sample rich in heavy metals like Lead (Pb), Nickel (Ni) and Copper (Cu). Isolates were evaluated for their metal resistant and degradation capacity for applicability in heavy metal removal from the soil. Based on this, one efficient gram positive strain has been characterized by 16S rDNA sequencing and identified as *B. licheniformis.* The effect of metals concentration of biomass and metal sorption efficiency was determined. The optimization study showed that, optimum pH for isolate is 6.0 for Pb, 6.5 for Cu and 7.0 for Ni absorption; optimum media components are 1% glucose, 100 ml of minimal salt solution and 1 g of nitrogen source per liter. The change on surface morphology of cell wall was studied by Transmission Electron Microscopy (TEM). Changes in Chemical functional groups on the surface of bacteria with metal absorption were studied by, Fourier Transform Infrared (FTIR) spectroscopy and crystalline nature by X-ray Diffraction (XRD). The bioreactor was designed and operated at optimized conditions with three different flow rates of medium and result showed the maximum sorption of Pb 86 ± 5% at 192 h, Ni 77 ± 8% at 240 h and Cu 80 ± 6% at 216 h.

KEYWORDS: Bioremediation, *Bacillus Licheniformis*, Metal Resistant, Soil Reactor, Heavy Metal, Biosorption