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ISOLATION OF CHROMIUM(III) SEQUESTRATING BACTERIA FROM TANNERY EFFLUENTS

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Large amounts of chromium salts are used in the tannery industry, and wastewater containing heavy metals is discharged into natural water resources. Heavy metals are toxic and lead to carcinogenic effects on human and aquatic organisms. Consequently, the removal of chromium from contaminated water before discharging is essential. The use of bacteria provides an effective chromium removal method from an aqueous solution as bacteria have the ability for biosorption, intracellular sequestration, extracellular sequestration and reduction of heavy metal ions. This study investigates quantitative aspects of chromium resistance capability and chromium sequestering ability of isolated bacteria species. The isolated bacterium with chromium sequestering capability can be used in many industries to remove chromium species from the wastewater. First, nine samples were collected from two tanneries in the Colombo District and then physical and chemical parameters of the collected samples were determined. Pure bacterial colonies were isolated through culturing and sub-culturing processes. Chromium resistance of isolated bacteria species at different chromium(III) concentrations; 1000 mg L^{-1} to 0 mg L^{-1} was determined using a standard point method. The sequestrated chromium amounts at different chromium(III) concentrations were measured using atomic absorption spectrophotometry. Five bacteria species were isolated from tannery effluents. All the isolated bacteria species grown on nutrient agar plates showed a higher growth rate in the presence of chromium than in the absence of chromium. They showed a poor growth rate when the chromium concentration was higher than 500 mg L^{-1}. The maximum chromium removal percentage shown by a bacterium was 87.1%. Therefore, these isolated bacterial strains can be used to reduce the chromium concentration in chromium-contaminated aqueous solutions. This chromium removal method is more economically feasible when compared to physio-chemical methods. The isolated bacterial strains could be identified and explored for bioremediation purposes.

Keywords: Bacteria isolation, Chromium(III) removal, Metal resistance, Metal sequestration, Tannery effluents