ABILITY OF INDIGENOUS MODERATE HALOPHILIC BACTERIA IN REMOVING ZINC AND TITANIUM OXIDE NANOPARTICLES IN WASTEWATER

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ABSTRACT

Microorganisms with detoxifying mechanisms can be used to the treatment of wastewater containing high metallic nanoparticles. These organisms can be controlled for bioremediation of high industrial effluent wastewater system. This study aimed at comparing the maximum removal ability of moderate halophiles species *Morganella morganii* for H12, *Serratia ureilytica* for H5, *Bacillus sp.* for H8, *Citrobacter freundii* for H15 and *Lysinibacillus sp.* for H28 found in Brine water from Emalhaleni water reclamation plant. The nanoparticles (ZnO and TiO2) were characterized using scanning electron microscope (SEM) and Transmission electron microscope (TEM). The isolates were exposed to various concentrations of ZnO and TiO2 in order to determine their ability to remove the nanoparticles separately as well as in consortium in the wastewater mixed liquor. The physicochemical parameters such as chemical oxygen demand (COD), pH, Nitrate, Phosphate and dissolved oxygen (DO) of the media and the growth rates of the isolates were measured using standard methods. ICP (Inductively Coupled Plasma) was used after each experiments for the detection of trace metals and metallic nanoparticles (ZnO and TiO2) from the samples. The outcome of the study revealed that the isolates could remove nZnO at concentrations ranging between 0.001-55 ppm and nTiO2 at concentrations ranging between 0.001-35 ppm during a five day experiment where they were incubated at 30°C. *Bacillus sp.* for H8 was the isolate with the highest removal (55ppm) for ZnO while for TiO2, *Lysini bacillus sp.* for H28 was the highest with 35ppm with a growth from the 2nd day of a five day experiment. All isolates could remove the nitrate and phosphate up to 98% expect for *Lysini bacillus sp.* for H28 which could remove up to 85% for Nitrate and 95% for Phosphate. *Serratia ureilytica* for H5 was the least responsive when it came to both ZnO and TiO2, the isolates demonstrated a steady phase from day 2 of the five day experiment. The maximum removal limit of all the isolates was significantly dependent on the concentration of the nanoparticles. The study suggests that these isolates can be further used for the bioremediation of high salt effluent from wastewater systems.

**Keywords:** Adsorption, Bioremediation, Halophiles, Nanoparticles, Zinc-Oxide, Titanium-Oxide.

**Topic:** Water Pollution