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ROLE OF MICROBES IN ENVIRONMENTAL BIOREMEDIATION & SUSTAINABLE CHEMO-WASTE MANAGEMENT.

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ABSTRACT

Environmental contamination has become a big issue in recent decades as a result of fast industrialization and dangerous farming practices. Toxic contaminants such as nuclear waste, heavy metals, pesticides, and hydrocarbons have been wreaking havoc on the environment and human health. Bioremediation with microbial populations is developing as an excellent, environmentally friendly, and cost-effective method of mitigating the negative impacts of hazardous contaminants. Microbes have amazing metabolic capacity to change most types of organic material and can survive in harsh environments, making them an appealing alternative for bioremediation. Microbes are treasure troves for environmental cleansing and soil recovery, and they have been recorded from a wide range of environmental situations, including hot, cold, drought, and salinity. Bacteria, fungi (including yeast), and algae have all been documented to be bioremediating microorganisms. Microbes from the genera Alcaligenes, Aspergillus, Bacillus, Flavobacterium, Ganoderma, Methosinus, Nocardia, Phormidium, Pseudomonas, Rhizopus, Rhodococcus, and Sternum have been identified as potential and efficient bioremediators for the degradation of various environmental pollutants such as xenobiotics, heavy metals, hydrocarbons, and paper and pulp effluent. The current study focuses on microbial diversity in bioremediation, methodologies used in bioremediation, bioremediation of various environmental toxins, and how bioremediation processes might be evaluated. The objective of this research is to form a consortium based on microorganisms isolated from technogenic locations for future development in the field of agricultural soil restoration. Pantoea sp., Achromobacter denitrificans, Klebsiella oxytoca, Rhizobium radiobacter, and Pseudomonas fluorescens were chosen as promising organisms to remove heavy metals from experimental medium. On their foundation, consortiums were formed and tested for their capacity to remove heavy metals from nutritional medium as well as create phytohormones. Consortium D, which includes Achromobacter denitrificans, Klebsiella oxytoca, and Rhizobium radiobacter in a 1:1:2 ratio, was the most successful. This consortium's ability to generate indole-3-acetic acid and indole-3-butyric acid was 18.03 g/L and 2.02 g/L, respectively; the experimental media's absorption capacity for heavy metals was Cd (56.39 mg/L), Hg (58.03 mg/L), As (61.17 mg/L), Pb (91.13 mg/L), and Ni (98.22 mg/L).

Consortium D has also been shown to be effective in mixed heavy metal pollution. Because the consortium's future application will be centred on agricultural land soil cleanup, its capacity to accelerate the phytoremediation process has been investigated. Trifolium pratense L. and the formed consortium removed around 32% Pb, 15% As, 13% Hg, 31% Ni, and 25% Cd from the soil.