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PARAMETERS REGULATING MICROORGANISM PROPERTIES AND INFLUENCING SOIL REMEDIATION POTENTIAL

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Abstract – Scientists state that in recent years, the level of soil contamination worldwide has significantly increased, mainly due to atmospheric deposits, floods, agricultural and industrial activities, and mining. Soil contamination is a widespread issue that negatively impacts the functions and processes of soil microorganisms. This pollution is associated with disrupting the physiological functions of microorganisms and disrupting processes related to the decomposition and transformation of organic matter. Heavy metals are significant factors of soil pollution, posing a threat to ecosystem functions due to their toxicity, persistence, and ability to bioaccumulate. The soil hosts diverse communities of microorganisms with specific metabolic capacities. Some microorganisms contribute to the decomposition of organic matter by interacting with toxic metals, while others participate in the formation of natural nanoparticles, thereby reducing the toxicity of heavy metals. Microorganisms can be used to immobilize heavy metals, but their effectiveness depends on various parameters such as soil type, chemical composition, pH, temperature, and moisture. The study identified suitable conditions that can stimulate the growth and activity of microorganisms. Optimal temperature is essential for the metabolic processes of microorganisms, such as enzyme activity, pollutant degradation, and biomass growth. Too low pH can inhibit the growth and enzyme activity of microorganisms, while too high pH slows down their activity. The article discusses that although microorganisms can be used in bioremediation, their activity is influenced by soil parameters. Understanding microorganisms' properties and operational parameters is essential for their successful application in soil bioremediation processes. However, this requires delving into not only the complexity of ecosystems, the impact of pollutants, and environmental parameters. The targeted application of microorganisms in bioremediation could become one of the main solutions for combating soil contamination and achieving environmental sustainability.

Keywords – *Bioremediation; heavy metal; microorganisms; soil pollution.*