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Identifying heavy metal multi-resistant bacteria isolated from the rhizosphere of potential metallophytes

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Abstract

Soil heavy metal pollution has attracted considerable attention due to the negative effects on human health and on ecosystems. Decontamination of heavy metal polluted soils by engineering-based remediation technologies is -expensive and invasive as they affect the topsoil and thus the micro- and macrobiota on the site. Bioremediation technologies based on using microbiota able to survive the metal toxicity has been proposed.

The aim of the study was to identify and describe the multi-resistant bacteria present in the rhizosphere of some potential metallophytes from a heavy metal polluted site in Romania. Concentration of heavy metal in soil samples was determined via Vanta pXRF analyzer - (Olympus, - USA). Culturable soil bacteria were isolated by the plate culture method using metal supplemented media. Isolates displaying metal resistance were further identified based on 16S rDNA sequence and assessed for the presence of metal resistance molecular determinants such as merA, merB, czcA, nccA, copA. Cell morphology and heavy metal accumulation was investigated by SEM-EDX.

In this study, 309 bacterial isolates were obtained based on their resistance to different metals. More than 75% of the isolates displayed multi metal resistance. The majority (93%) of the isolates were resistant to Hg^{2+} that was found in very high concentrations in soil. Most of the isolates were identified as part of the genus *Pseudomonas.* These data support the idea that the natural rhizobiota of some plants is already developed to withstand toxic concentrations of heavy metals, making them suitable candidates for new bioremediation technologies.

Keywords: Bioremediation, heavy metals, rhizosphere.

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