

Are PGPR's traits and the inoculum size relevant for inoculation purposes in mine-affected soils?

H. Moreira, S.I.A. Pereira, A.P.G.C. Marques, A.O.S.S. Rangel, P.M.L. Castro

Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Arquiteto Lobão Vital, 172, 4200-374 Porto, Portugal

*Presenting author – P.M.L. Castro – plcastro@porto.ucp.pt

Abstract - Cadmium and Zn concentrations in soil were largely increased in past decades due to several anthropogenic activities, including mining activities. Phytotechnologies can minimize their hazardous effects through the use of plants coupled with plant growth promoting rhizobacteria (PGPR). Several factors can contribute to the failure of PGPR inoculation, such as bacteria selection and the inoculum size. This work selected five metal resistant PGPR and assessed their *in vitro* growth promoting traits and their ability to induce maize germination and seedlings growth under Zn and Cd increasing concentrations. Additionally, the effect of the inoculum size (10 and 20 mL) of these strains and their efficiency in promoting plants' growth and metal accumulation was evaluated in energy maize sowed in a mine soil. Some bacteria only exhibited or enhanced PGP traits when exposed to metals. Strains ECP37 and EDP28 showed to be the most efficient in improving seedlings' growth with increasing metal concentrations, followed by S3X. Likewise, when inoculated in energy maize grown in mine soil, these same strains outperformed the others by increasing shoot biomass and elongation, metal accumulation, and by decreasing it in roots. The most evident effect of doubling the inoculum size was the increase in Cd accumulation, which was of 17% and 31% in roots and shoots, respectively. Other effects included a slight reduction in shoots' biomass (13%) and a general decrease in P tissue content. The results obtained suggest the selection of PGPR prior to inoculation in target soils should be primarily based in seedling growth promotion under metal exposure. Additionally, the size of the inoculum applied in the soil rhizosphere appears to be important in remediation processes and should be taken into account when planning phytomanagement strategies, especially when the biomass of plants is an important demand.

Keywords – inoculum size, PGPR, heavy metals