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Selection of Lead Mobilizing Bacteria from Contaminated Soils and Their Potential in Promoting Plant Growth through Plant Growth Promoting Activity

Authors : Maria Manzoor, Iram Gul, Muhammad Arshad

Abstract : Bacterial strains were isolated from contaminated soil collected from Rawalpindi and Islamabad. The strains were investigated for lead resistance and their effect on Pb solubility and PGPR activity. Incubation experiments were carried for inoculated and unoculated soil containing different levels of Pb. Results revealed that few stains (BTM-4, BTM-11, BTM-14) were able to tolerate Pb up to 600 mg L-1, whereas five strains (BTM-3, BTM-6, BTM-10, BTM-21 and BTM-24) showed significant increase in solubility of Pb when compared to all other strains and control. The CaCl2 extractable Pb was increased by 13.6, 6.8, 4.4 and 2.4 folds compared to un-inoculated control soil at increased soil Pb concentration (500, 1000, 1500 and 200 mg kg-1, respectively). The selected bacterial strains (11) were further investigated for plant growth promotion activity through PGPR assays including. Germination and root elongation assays were also conducted under elevated metal concentration in controlled conditions to elucidate the effects of microbial strains upon plant growth and development. The results showed that all the strains tested in this study, produced significantly varying concentrations of IAA, siderophores and gibberellic acid along with ability to phosphorus solubilization index (PSI). The results of germination and root elongation assay further confirmed the beneficial role of the microbial strains in elevating metal stress through PGPR activity. Among all tested strains, BTM-10 significantly improved plant growth. 1.3 and 2.7 folds increase in root and shoot length was observed when compared to control. Which may be attributed to presence of important plant growth promoting enzymes (IAA 74.6 µg/ml; GA 19.23 µg/ml; Sidrophore units 49% and PSI 1.3 cm). The outcome of this study indicates that these Pb tolerant and solubilizing strains may have the potential for plant growth promotion under metal stress and can be used as mediator when coupled with heavy metal hyperaccumulator plants for phytoremediation of Pb contaminated soil.

Keywords : Pb resistant bacteria, Pb mobilizing bacteria, Phytoextraction of Pb, PGPR activity of bacteria
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