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Halotolerant Phosphates Solubilizing Bacteria Isolated from Phosphate Solid Sludge and Their Efficiency in Potassium, Zinc Solubilization, and Promoting Wheat (Triticum Durum 'karim') Germination

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Abstract : Climate change is becoming a crucial factor that can significantly impact all ecosystems. It has a negative impact on the environment in many parts of the planet. Agriculture is the main sector affected by climate change. Particularly, the salinity of agricultural soils is among the problems caused by climate change. The use of phosphate solubilizing bacteria (PSB) as a biofertilizer requires previous research on their tolerance to abiotic stress, specifically saline stress tolerance, before the formation of biofertilizers. In this context, the main goal of this research was to assess the salinity tolerance of four strains: Serratia rubidaea strain JCM1240, Enterobacter bugandensis strain 247BMC, Pantoea agglomerans strain ATCC 27155, Pseudomonas brassicacearum subsp. Neoaurantiaca strain CIP109457, which was isolated from solid phosphate sludge. Additionally, their capacity to solubilize potassium and zinc, as well as their effect on Wheat (Triticum Durum 'Karim') germination. The four PSB strains were tested for their ability to solubilize phosphate in NBRIP medium with tricalcium phosphate (TCP) as the sole source of phosphorus under salt stress. Five concentrations of NaCl were used (0%, 0.5%, 1%, 2.5%, 5%). Their phosphate solubilizing activity was estimated by the vanadate-molybdate method. The potassium and zinc solubilization has been tested qualitatively and separately on solid media with mica and zinc oxide as the only sources of potassium and zinc, respectively. The result showed that the solubilization decreases with the increase in the concentration of NaCl; all the strains solubilize the TCP even with 5% NaCl, with a significant difference among the four strains. The Serratia rubidaea strain was the most tolerant strain. In addition, the four strains solubilize the potassium and the zinc. The Serratia rubidaea strain was the most efficient. Therefore, biofertilization with PSB salt-tolerant strains could be a climate-change-preparedness strategy for agriculture in salt soil.

Keywords : bioavailability of mineral nutrients, phosphate solid sludge; phosphate solubilization, potassium solubilization, salt stress, zinc solubilization.
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