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Identification and characterization of rock phosphate solubilizing microorganisms isolated from maize rhizosphere

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Many soil microorganisms are able to transform insoluble forms of phosphorus to an accessible soluble form, contributing to plant nutrition as potential inoculants or biofertilizers. The objective of this work was to screen and evaluate the rock phosphate solubilization activity of microorganisms isolated from the rhizosphere of maize cultivated in an oxisol with phosphorus deficiency. The isolates were identified based on nucleotide sequence data from the 16S ribosomal DNA (rDNA) for bacteria, including actinobacteria and the internal transcribed spacer (ITS) rDNA for the fungi. Initially, these microorganisms were selected based on the solubilization efficiency of inorganic and organic phosphate sources in a modified Pikovskaya's liquid medium culture containing sodium phytate (phytic acid), soybean lecithin, aluminum phosphate ($AlPO_4$), and tricalcium phosphate ($Ca_3(PO_4)_2$). The capacity of rock phosphate solubilization was evaluated among 58 isolates, 39 of bacteria, 13 of fungi and 6 of actinobacteria. The greatest solubilization in medium containing phosphate rock was observed among the bacteria. Strains B58 and B31, identified as *Burkholderia* and *Bacillus*, respectively, were the most effective, mobilizing 19.74% (B58) and 19.62% (B5) of the total phosphorus, after 10 days of growth. These values are comparable with the simple superphosphate fertilizer, produced by reaction between the finely ground rock phosphate and sulfuric acid, which the content of soluble P accounts for 20% of total P. Among the fungi, the isolate F14 (*Penicillium*) showed a greater capacity for solubilization of rock phosphate, mobilizing 14.81%, while among the actinobacteria, the solubilization capacity was very low, reaching a maximum of 1.38%. It was observed a high correlation between the percentage of P solubilization and the final pH of culture medium, which may be related to the ability of microorganisms to produce organic acids and/or inorganic, promoting a decrease in pH and phosphate solubilization.
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