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The influence of abiotic factors on phosphate solubilizing bacteria

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Abstract

Phosphorus is one of the most important macronutrients needed for optimal plant growth and development. Although P compounds are relatively abundant in agricultural soils, the concentration of soluble phosphorus accessible to plants is very low. The use of phosphate solubilizing bacteria as biofertilizers is a sustainable alternative for improving agricultural productivity globally, but the efficiency of these bacteria can be affected by some abiotic factors, such as: pH, temperature and salinity. In this context, the purpose of this study was to identify bacterial strains that have the ability to solubilize tricalcium phosphate ($Ca_3(PO_4)_2$) under abiotic stress. Bacterial strains were isolated from the rhizosphere of maize using the serial dilution method. The bacterial isolates were further analyzed for their ability to solubilize tricalcium phosphate in Pikovskaya liquid medium. Ten out of fifteen isolated bacterial strains solubilize $Ca_3(PO_4)_2$ in quantitative assay and the amount of phosphorus varied between 9.82 and 17.06 µg P/ml. The strain that solubilized the highest amount of $Ca_3(PO_4)_2$ was further subjected to abiotic stress (pH and temperature). When the bacterial strain P2.1S grew in medium with an acidic pH (4.9) it solubilized a lower amount of $Ca_3(PO_4)_2$ compared to that solubilized at pH 7.2, respectively pH 9. The highest amount of phosphorus solubilized by the P2.1S strain was recorded at 28°C. In conclusion, the bacterial strain P2.1S solubilizes $Ca_3(PO_4)_2$ regardless of pH and temperature values tested, but more studies are needed before this bacterial strain can be used in agriculture.

Keywords: bacteria, pH, temperature, tricalcium phosphate.

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