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Apatite solubilization by phosphate solubilizing bacteria

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In a previous study, phosphate solubilizing microorganisms including 30 bacteria were isolated, screened and characterized from different agro-ecological zones in Sri Lanka. The current study was aimed to evaluate the efficiency of 28 bacterial isolates, in solubilizing apatite to identify an effective phosphate solubilizer. The solubilized phosphate content and the change in pH value were used as parameters of measurement. To determine the inoculum size, the relationship between absorbance and cell density was used. Experimental conditions such as concentrations of the components in the growth medium and inoculum size were optimized in order to obtain detectable amounts of solubilized phosphate.

Ninety five milliliters of modified Pikovaskaya liquid medium with 7.5 grams of High Grade Eppawala Rock Phosphate (HERP) at pH 7 was inoculated with 5 mL of 24 hour old bacterial suspension having an absorbance value of 0.300 corresponding to 2.5×10^9 colony forming units per milliliter. Samples were incubated for 72 hours under 100 rpm constant oscillation at room temperature and filtered. The filtration was centrifuged at 10 000 rpm for 10 minutes and the supernatant was used to measure pH values and solubilized phosphate levels. Spectroscopic method of Murphy and Riley (1958) was used to quantify the solubilized phosphate levels. The data were analyzed statistically using SPSS (16.0 version) and Minitab (15) statistical packages. The solubilized phosphate concentration was significantly higher in all inoculated samples than in the uninoculated control. The highest phosphate solubilization of 54.72 (± 0.33) mg Phosphorus/L was recorded with the bacterial isolate WRB3. There was a significant decrease in pH value in all the inoculated samples with respect to the control. Bacterial isolate WRB1 was the highest organic acid producer with a final pH value of 2.20 (± 0.06). Mean phosphate solubilization and the mean pH among the bacterial isolates were significantly different at 0.05 level in the liquid media. The correlation analysis using SPSS (16.0) statistical software indicated an absence of a correlation between the decrease in pH and the amount of solubilized phosphates ($r=0.293$). The efficient phosphate solubilizing bacterial isolates will be identified and utilized for the production of a phosphate bio fertilizer.