

## Abstract

One of the limiting nutrient for plants is phosphorus (P), which is an important macronutrient for growth of plants. Since most of the phosphate in the soil is present as insoluble phosphate complexes that plants cannot use it. In this study, we select two very effective rock phosphate solubilizing bacteria S2 and Cw that were isolated from regional soils collected from various areas of Pakistan. Both isolates highly solubilize rock phosphate i.e. 356 to 367  $\mu\text{g/ml}$  in NBRIP medium. It was found that strain S2 and Cw could grow at phosphate concentrations of 0.5 – 2.5%. Optimization of carbon and nitrogen sources was also conducted to increase RP solubilization and maximum soluble phosphate concentration was 347  $\mu\text{g/ml}$  and 326  $\mu\text{g/ml}$  by using glucose (25 g/L and 20 g/L) for S2 and Cw. Maximum solubilization was obtained 356  $\mu\text{g/ml}$  with ammonium sulphate (2 g/L) for S2 and 342  $\mu\text{g/ml}$  with ammonium nitrite (1.5 g/L) for Cw. The RP solubilization effect under different soluble phosphate concentrations showed that the effective RP solubilization ability by strains S2 and Cw was always accompanied by a decrease in pH. Results of FTIR showed that vibrational bands of calcite, quartz and fluorapatite significantly decreased. S2 and Cw were tested for their ability to promote growth of plant because they both feature a number of properties that aid in growth of plant. Increases in shoot and root length, plant dry mass and fresh mass were seen in pepper plants treated with the bacterial isolates. Overall, the results of our research indicate that both of these isolates S2 and Cw can be used as a best biofertilizer candidates for industrial purposes.