



CHARACTERIZATION OF EFFICIENT ROCK PHOSPHATE SOLUBILIZING BACTERIA FOR USE AS BIOINOCULANTS FOR RICE

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Rice (*Oryza sativa*) represents the staple diet of Sri Lankans. Rice growth is strongly limited by key nutrient Phosphorus (P), supplied mainly through phosphate fertilizers which are costly. Rock Phosphate (RP) is regarded as a cheaper alternative, but due to its lack of water solubility, its usage is limited in rice cultivation. However, certain bacteria in rice rhizosphere have shown the capability of solubilizing RP and making P readily available for rice plants. This study was undertaken to investigate the possibility of using RP as a P source in rice cultivation, together with efficient RP solubilizing bacteria.

A total of 165 rice root associated bacteria in rice plants isolated previously were screened for their RP solubilizing capability using solid and liquid PVK (Pikoskaya) selective media. The most efficient RP solubilizing bacteria were identified and their culture filtrates were subjected to High Performance Liquid Chromatography (HPLC) analysis to determine the secreted organic acids by the isolates. To observe their role in plant growth promotion, a pot experiment was carried out. The selected isolates were inoculated to the rhizosphere of traditional variety Suduheenati and modern variety BG-352 rice seedlings, amended with RP (40 kg/ha per pot) and other nutrients. Results of the pot experiment were subjected to statistical analysis by Minitab version 14.0 and significance at 5% level was tested. All experiments were performed in triplicates.

RP solubilization by bacteria strains in PVK media occurred with a concomitant decrease in pH. The results showed that strains 36 and 52, identified as the most efficient RP solubilizing bacteria, released phosphate concentrations of 88.7 ± 0.04 mg L⁻¹ and 80.3 ± 0.02 mg L⁻¹ respectively. According to the HPLC analysis, both strains predominantly produced oxalic and gluconic acid. Strain 36 had produced more oxalic acid (30.28 ppm) and gluconic acid (1689.37 ppm) than strain 52, which were 3.24 ppm and 252.25 ppm respectively. Inoculation of strain 36 increased root and shoot lengths of Suduheenati by 89.7% and 40.9% respectively, and dry weight by 12.34% while in BG-352 it was by 57.4%, 51.25% and 10.23% respectively compared to rice plants with no inoculation. Strain 52 in Suduheenati increased root and shoot lengths by 52.67% and 31.05%, and dry weight by 10.27%, and in BG-352 by 75.24%, 58.71% and 9.45% respectively compared to rice plants with no inoculation. Overall, both strains seemed promising bioinoculants for utilizing RP as a potent P fertilizer for rice cultivation.

Keywords: *Rice, Rock Phosphate, Phosphate solubilizing Bacteria, HPLC, Plant growth promotion*