Isolation of nitrogen fixing and phosphate solubilizing bacteria from diverse soil ecosystems

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The plant growth promoting microorganisms stimulate the plant growth by enhancing nutrient uptake, nitrogen fixation and phosphate solubilization. However, the identification and application of indigenous soil bacteria with these potentials is at an emerging stage. The objective of the study was to isolate and identify high nitrogen fixing and phosphate solubilizing bacteria from different regions in Sri Lanka, to determine their potential in formulation of a biofertilizer. In this study, nitrogen-fixing and phosphate-solubilizing bacteria were isolated from soil samples collected from 11 geologically different locations, including paddy fields, coconut estates and agricultural lands. A total of 32 morphologically different bacteria were isolated after serially diluting soil samples and screening them on selective media (Burk's nitrogen-free medium and NBRIP agar medium) yielding 16 nitrogen-fixing and 18 phosphate-solubilizing isolates. Among them, two isolates—Isolate I-30 and Isolate I-25 showed the highest activities of nitrogen fixation and phosphate solubilization. Quantitative assays confirmed that Isolate I-30 released 70.03 mg/L of ammonia and solubilized 213.20 mg/L of phosphate, while Isolate I-25 released 54.92 mg/L of ammonia and solubilized 174.50 mg/L of phosphate. Using 16S rRNA gene sequencing, Isolate I-30 was identified as *Bacillus aryabhattai* and Isolate I-25 as *Priestia megaterium*. Both isolates are non-pathogens, and a bacterial antagonism assay indicated their compatibility by showing their non-antagonistic interaction. These results suggest that the combination of both isolates hold promise for biofertilizer formulation, to increase soil fertility and advance sustainable agricultural practices. The formulation is currently in progress.

Keywords*: Plant growth-promoting bacteria***,** *Nitrogen fixation, Phosphate solubilization***,** *Biofertilizer formulation*