BIOPROSPECTING OF PLANT GROWTH-PROMOTING BACTERIA CAPABLE OF MOBILISING MULTIPLE FORMS OF SOIL NUTRIENTS

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ABSTRACT

The expanding global market for biofertilisers is driven by the need for sustainable soil management. Microbial inoculants, typically bacteria and fungi, are touted as alternatives to inorganic fertilisers and potentially pesticides. Optimising the efficacy of these inoculants in field trials requires a comprehensive understanding of their ecology and modes of action, integrating microbiology, plant and soil science, and molecular biology. In this study, we screened native plant growth-promoting bacteria (PGPB) isolated from soils collected at Tangkulap Forest Reserve, Sabah. We isolated 112 tricalcium phosphate-solubilising bacteria that comprised 29 unique strains based on 16S rRNA gene sequences. These potential PGPBs belonged to the genera *Paraburkholderia*, *Caballeronia* (family Burkholderiaceae), and *Pseudomonas* (Pseudomonadaceae). Functional screening showed that these isolates could mobilise multiple nitrogen and phosphorus substrates common in tropical soils. However, cellulose mineralisation was limited to several *Paraburkholderia* strains, and none could degrade lignin. We then conducted a pot (microcosm) experiment to test the ability of three selected PGPB isolates—one from each genus—to improve nutrient uptake in laran (*Neolamarckia cadamba*) plantlets. The single, paired, and tripartite bacterial inoculants generally enhanced the uptake of primary (N, P, K) nutrients, with some also enhancing the availability of secondary (Ca, Mg) plant nutrients. These findings provide insights into the interactions between soil microbial inoculants, with implications for selecting effective strains for field applications. Future work will focus on decoding the genomes of these isolates to identify additional plant growth-promoting genes and assess any potential pathogenicity.