Characterization of putative rubber-degrading bacterial strains: enzymatic profiling and growth assessment

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Abstract:

Biopolymers, including natural rubber (NR), are a significant component of Earth's organic biomass. Understanding the microbial degradation of NR is essential due to its widespread use and resultant waste production. While some bacterial strains capable of degrading rubber have been identified, detailed insights into their enzymatic activities and growth conditions remain limited. This study aimed to characterize putative rubber-degrading bacterial strains, including *Paenarthrobacter nicotinovorans*, *Paenarthrobacter nitroguajacolicus*, and *Olivibacter soli*, assessing their enzymatic activities and growth behavior under varied environmental conditions.

High-throughput screening techniques were employed to evaluate enzymatic activities using API ZYM tests and *p*-nitrophenyl fatty acid assays. Growth profiling was conducted in basal salts media supplemented with different carbon and nitrogen sources at varying pH levels and temperatures.

The enzymatic assays revealed diverse profiles among strains, with *Olivibacter soli* demonstrating the broadest enzymatic activities, including high phosphatase and glycosidase activities. Growth experiments indicated that glucose was the preferred carbon source, with optimal growth at pH 6.5. Notably, none of the strains grew at pH 4, and variable growth was observed with alternative sugars.

This study provides the first detailed characterization of these strains, highlighting their enzymatic potential and growth preferences. The findings suggest these bacteria may rely on microbial consortia for complex carbohydrate degradation and lay the groundwork for future investigations into their roles in rubber biodegradation and environmental adaptability.