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Physiological characterization and evaluation of plant growth-promoting traits of *Paenibacillus* sp. JAB-Hum

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Plant growth-promoting microorganisms play an important role in sustainable agriculture. This study aimed to characterize the physiological profile and evaluate plant growth-promoting traits of *Paenibacillus* sp. JAB-Hum. Salt tolerance was assessed in Luria-Bertani medium containing NaCl concentrations ranging from 0 to 10%, while pH response was evaluated in medium adjusted from pH 3.0 to 10.0. Osmotic stress response was analyzed under reduced water potential conditions, with growth evaluated after 7 days of incubation. Additionally, assays were conducted to evaluate phosphorus, potassium, and zinc solubilization in specific media, as well as growth in minimal medium supplemented with herbicides (atrazine and glyphosate). Lettuce seed germination assays were performed over 7 days. The isolate exhibited growth across a wide range of salinity levels, indicating tolerance to NaCl variation. Growth was observed under both acidic and alkaline conditions, with better performance at slightly acidic pH. Under osmotic stress, higher growth was observed under lower stress conditions, with a gradual reduction as water potential decreased, while maintaining cellular viability. In independent assays, the isolate demonstrated the ability to solubilize phosphorus and potassium, evidenced by halo formation around colonies, as well as activity in zinc-containing medium. Growth in the presence of herbicides indicates tolerance to xenobiotic compounds. In germination assays, inoculated seeds showed improved performance compared to the control, with results expressed as mean germinated seeds ± standard deviation (n = 3 plates, 25 seeds per plate). These findings highlight the physiological versatility of *Paenibacillus* sp. JAB-Hum and reinforce its potential as a plant growth-promoting microorganism.

KEYWORDS: plant growth-promoting bacteria, *Paenibacillus*, abiotic stress, nutrient solubilization, sustainable agriculture.

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