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ABSTRACT
BOOK

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ID682 | Innovative PGPB-based fertilizers as a sustainable solution to promote crop resilience in degraded soils

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Background: Biofertilizers, made of non-pathogenic and living microorganisms, such as plant growth-promoting bacteria (PGPB), support crop growth in degraded soils as eco-friendly alternatives to chemical fertilizers. They enhance nutrient availability, reduce pollution, and boost stress resilience. However, field performance and effectiveness remain inconsistent due to short shelf life, low bacterial viability, and unstable trait expression. This study aims to perform a comprehensive laboratory study by testing a novel biofertilizer carrier to ensure long-term efficiency, along with a proper selection of bacterial strains based on a greenhouse pot assay.

Methods: Fifty-three representative bacteria were isolated from soil samples collected in Alentejo for assessment of traits such as P solubilization, N₂ fixation, osmotic stress tolerance, and production of lytic enzymes, siderophores, and extracellular polymeric substances (EPS). A greenhouse pot experiment using wheat is ongoing to test the real ability of each isolate to influence plant growth under water stress conditions. A PGPB-based formulation using a new carrier, EPS, a gel-like polymer that confers protection to microbial cells, is being developed, making use of the most promising isolates.

Results: Among the isolates, 30% showed the ability to solubilize P, 54.4% to fix N₂, and 62.3%, 37.7%, and 18.9% to produce proteases, pectinases, and cellulases, respectively. 16S rRNA isolates sequencing revealed the presence of genera such as *Bacillus*, *Pedobacter*, and *Streptomyces*. Dried EPS was mixed with a concentrated bacterial suspension, and granules were produced. Granule's physical resistance and bacterial viability tests are being carried out.

Conclusions: This approach will support the development of a robust formulation with strong potential for success.

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A scenic landscape featuring a blue ocean, green hills, and a clear sky. The foreground shows a dark, rocky cliffside with a dense forest of green trees. Above the cliff, a bright green field stretches across the middle ground. In the distance, a large, flat-topped island or headland is visible in the blue sea under a vast, clear blue sky with a few wispy clouds near the horizon.

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