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Assessment of *Bacillus megaterium* as durum wheat (*Triticum durum*) biofertilizer

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Abstract: According to the UN, the World population is going to achieve 9.700 million people by 2050. Finding a sustainable and efficient way to feed the growing population is one of the major challenges of this generation. Cereal grain crops are the major source of carbohydrates, protein, vitamin B and minerals in human feeding, among them maize, wheat, and rice are the most important cereals. Crop yields can be improved by *plant growth promoting* (PGP) bacteria in substitution of chemical fertilization, which has shown to cause a wide list of environmental harms. Bacterial strains were isolated from the rhizosphere of cereals crop fields nearby Salamanca (Spain) and characterized by both MALDI-TOF and 16S rRNA sequencing. *Bacillus megaterium* strain was identified and characterized phenotypically in order to analyze the PGP potential. Within the assessments performed, positive results were obtained for phosphates solubilization, auxins synthesis, and siderophores, cellulose, and biofilm production. Wheat seedlings *in planta* assays during the early days revealed that *Bacillus megaterium* improved the plant growth, for which colonization test were performed to evaluate the capacity of this strain to associate with the crop. Inoculated seedlings were grown in controlled conditions; after that, root slides were immunolocalized with GFP-labelled uricase antibody and visualized on fluorescence microscopy. Additionally, the genome was sequenced and bioinformatics analyzes showed interesting annotations regarding PGP potential. Finally, the strain was inoculated on wheat seedlings and left to grow on greenhouse conditions until harvesting. Aerial biomass was recollected, measured, and weighted; furthermore, grains were counted and physicochemically analyzed to evaluate the nutrient quality. Promising results were obtained on both, grain yield and nutrient quality parameters.

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