Harnessing the potential of native *Bacillus* species for mineralizing organic sources of phosphorus

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Microorganisms are an integral part of soil's phosphorus (P) biogeochemical cycle, playing a significant role in mediating P availability to plants. Therefore, it is of great importance for the sustainable development of agriculture to understand their influence on plant nutrition and the possibilities of manipulating certain microorganisms to increase the availability of this nutrient in the soil in forms assimilable by the roots (soluble phosphate). The main source of organic P in soil is organic matter, and soil organic P is mainly in the form of inositol phosphate (phytate/phytic acid and its inositol esters), which cannot be directly utilized/absorbed by the roots. For soil phytate to contribute to plant P nutrition, phosphate ester, phosphoanhydride, or phosphonate must be dephosphorylated through phytase-mediated hydrolysis. Phytases catalyze the mineralization, or the conversion of organic P from phytate to inorganic P, which can be easily absorbed by plants. Here, we evaluated *in vitro* different *Bacillus* strains and related genera (*Paenibacillus*, *Peribacillus*, and *Alkalihalobacillus*) for their ability to mineralize insoluble organic P sources. A total of 217 endophytic, epiphytic, and rhizospheric strains isolated from native and cultivated plant species from different Brazilian biomes were obtained from the "Collection of Microorganisms and Microalgae Applied to Agroenergy and Biorefineries (CMMAABio)", located at Embrapa Agroenergia. Three solid culture media from the literature were evaluated (1, 2, and 3): two containing hydrated phytic acid sodium salt (from rice) (media 1 and 2) and one containing soy lecithin (medium 3) as the insoluble organic P source. The bacterial strains were inoculated in *Petri* dishes (90x15 mm in diameter) containing the different culture media and incubated at 28ºC for 15 days. After incubation, the data on colony diameters and enzymatic degradation halos were collected, and the enzymatic index value was calculated as the ratio between the diameter of the degraded zone and the colony. The experimental design was completely randomized with four replications. The results showed that none of the bacteria showed a visible degradation halo in the phytase screening medium 3 (containing lecithin) in the used conditions. In the phytase screening medium 1, 52% of the strains showed values above 1 for the enzymatic index. In the phytase screening medium 2, higher values of enzymatic indexes were observed, and 92% of the strains were able to produce halo in this medium, proving to be a useful method for the selection of phytase-producing bacteria in microbial biodiversity prospecting programs.
Key words: *Bacillus*; Organic Phosphorus Sources; Phytase; Bioprospecting.

Aproveitando o potencial de espécies nativas de *Bacillus* para mineralizar fontes orgânicas de fósforo

Bacillus spp. da biodiversidade brasileira foram avaliadas quanto à capacidade de mineralizar fontes orgânicas insolúveis de fósforo. 217 bactérias endofíticas, epifíticas e da rizosfera de plantas nativas e cultivadas de diferentes biomas foram avaliadas em três meios de cultura, contendo ácido fítico (1 e 2) ou lecitina, em quadruplicata. Nenhuma linhagem formou halo de degradação no meio contendo lecitina. No meio 1 ,52% delas apresentaram índice enzimático acima de 1. No meio 2 observaram-se maiores valores de índice enzimático e o halo de degradação constatado em 92% das linhagens, mostrando-se um método útil na bioprospecção de bactérias produtoras de fitase.
Palavras-chave: *Bacillus;* Fontes Orgânicas de Fósforo; Fitase; Bioprospecção.

Acknowledgements*: This work was developed having support from the research grants FAP-DF number 00193-00000723/2021-95 and EMBRAPA number 10.20.02.009.00.00 to LCLF. IAF and CPS are grateful to CNPq for the fellowships. GEOM is grateful to FAP-DF for the fellowship. We are grateful to Kelly Barreto Rodrigues for their technical support. We are grateful to Kelly Barreto Rodrigues, Letícia Moreschi Alves, Diogo K. Nakai and Tulio Marcos Godoy de Andrade for their technical support.*