TITLE: CHARACTERIZATION OF PHOSPHATE SOLUBILIZING ABILITY AND PLANT GROWTH PROMOTION TRAITS OF BACTERIAL ISOLATES FROM CANOLA ROOTS

AUTHORS: RIBEIRO, I.D.A; BACH, E.; PASSAGLIA, L.M.P.

INSTITUITION: DEPARTAMENTO DE GENÉTICA, INSTITUTO DE BIOCIÊNCIAS, UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL (AVENIDA BENTO GONÇALVES, 9500; CEP 91501-970, PORTO ALEGRE – RS, BRAZIL)

ABSTRACT:

To ensure high productivity, many agricultural soils demand an elevated addition of fertilizers containing phosphate (P). However, the significant amount of P applied precipitate with ions in the soil, forming hardly-soluble compounds. Several bacteria living on plant roots can solubilize these substances and promote plant growth. In this sense, fourteen bacterial isolates, previously obtained from canola roots, were screened for solubilization of hydroxyapatite, FePO4, AlPO4 and rock phosphate (RP) using NBRIP medium. The production of other factors related to plant growth promotion (PGP) ability, such as IAA synthesis, siderophores production, and nitrogen fixation was also evaluated. These isolates solubilized hydroxyapatite on plate assays and released soluble P in concentrations ranging from 22.17 to 75.2 µg/mL in liquid culture. Interestingly, six isolates were also able to solubilize RP, and no isolate solubilized FePO4 and AlPO4. The three best RP solubilizing isolates were selected for a better description. These isolates were identified as *Paenibacillus graminis* by 16S rRNA gene sequence analysis and genome metrics. *P. graminis* isolates were also capable of fixing nitrogen, produce auxins, but not siderophores. The best solubilization performances were obtained using glucose or sucrose as carbon sources and ammonium as a nitrogen source. The *P. graminis* strains produced exopolysaccharides and formed biofilm under low P conditions, and the addition of exogenous soluble P induced an inhibitory effect on hydroxyapatite solubilization. Several organic acids were identified in the culture supernatants by mass spectrometry, suggesting a role of these compounds in the solubilization mechanism of these isolates. The genomes of *P. graminis* strains were sequenced and various genes related to P uptake and metabolism were identified, including genes involved in organic P mineralization. These results indicate a high potential of these *P. graminis* strains as PGP agents.

Keywords: *Paenibacillus graminis*, phosphate solubilizing mechanism, hydroxyapatite, genome features

Development Agency: Cnpq (Conselho nacional de desenvolvimento científico e tecnológico) and Newton Funding (UK-Brazil).