

MA-0423

Maize endophytic bacteria and their potential as plant growth promoting

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The colonization of plant roots, stem, leaves or fruits by beneficial microorganisms can protect plants from diseases, promote growth and enhance biomass. These features have made them valuable for improving crop performance. Maize (*Zea mays* L.) represents one of the main economic crops for food and energy in the world, and its associated microbial communities have been intensively prospected focusing on the selection of plant growth promoter microorganisms (PGPM) and their use as biofertilizers. In this work, endophytic bacteria were isolated from roots of Pioneer 30F35 Herculex hybrid corn crops, cultivated with and without phosphorus fertilization for to evaluate the potential as plant growth promoting. After identification by partial sequencing of the 16S rDNA gene, a total of 178 bacteria was evaluated regarding inorganic phosphate (CaPO₄) solubilization, antagonizing bacterial (*Bacillus subtilis* and *Pantoea ananatis*) and phytopathogenic fungal growth (*Fusarium verticillioides* and *Coletotrichum graminicola*), mineralization of phytate, and IAA and siderophores production. There was an equal distribution of the isolates from Actinobacteria, Firmicutes and Proteobacteria clades, and only one isolate (*Flavobacterium acidificum* RT3B- 41) of Bacteroidetes phylum was found. The main genera found were *Microbacterium*, *Bacillus*, *Staphylococcus*, *Pseudomonas*, *Lactococcus*, *Enterobacter* and *Curtobacterium*. In the in vitro assays, 81% of the isolates showed at least one PGP attribute, being that 57% produced auxin (4.5 to 111 µg/ml), 31% were able to solubilize CaPO₄ (10 to 527 mg/l), 42% to mineralize phytate, 15 % of antagonizing phytopathogenic bacteria and fungi, and 43% produced siderophores (0.4 to 7.45mM). An inverse correlation between the CaPO₄ solubilization levels and pH values was observed ($r = -0.56$, $p < 0.05$), suggesting the involvement of the acid production in the phosphate solubilization by bacteria. The spectrum of activity varied among isolates in the study belonging to genera *Bacillus* and *Pseudomonas* (the most frequent), and *Arthrobacter*, *Leucnostonoc*, *Microbacterium*, *Pseudoclavibacter*, *Serratia* and *Staphylococcus*. Of the 15 isolates with antibacterial activity, five were active only against *Bacillus subtilis*, seven antagonizing the both bacteria evaluated (RT2A-12, RT3C-11, RT3C-21 RP3C-01, RT2B-13, RT2C-11 and FP1A -13), and none showed activity only against *P. ananatis*, gram-negative bacteria causing of the disease "white spot" of corn. Regarding the 20 isolates with activity against *C. graminicola* or *F. verticillioides*, causing large impact of disease popularly known as "corn rots," 15 antagonized only *C. graminicola*, four antagonized the two tested fungi (RT2A-12 , RT3C-11, RT3C-21 E 1936 RP3C-01) and ST3-116 antagonized only *F. verticillioides*. This work demonstrates the potential application of these isolates as PGPM, which may be still confirmed by in vivo and field tests. Financial Support: Fapemig, Capes, CNPq.