TITLE: Molecular identification and biochemical characterization of plant growth-promoting rhizobacteria in wheat

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ABSTRACT:

Plants live in association with beneficial microorganisms, which can operate directly through functions such as defense, health, and plant growth promotion. The association between the rhizosphere microbiome and the host plant was shaped by a co-evolution process, however, plant domestication may have affected the recruitment of these microbial communities. Previously, results obtained in the "Back to the Roots" research program had already pointed out differences in the structure of the rhizobacterial communities of ancestral and modern genotypes. Thus, we hypothesized at modern cultivars have lost some traits to recruit specific microorganisms during the domestication process. The aim of this study was access bacterial communities of the wheat rhizosphere from two ancestral genotypes and two modern genotypes through culture-dependent approach and evaluated the biotechnological potential of these microorganisms. A total of 71 isolates were obtained from wheat rhizosphere and identified by 16S rRNA sequencing. The isolates were tested *in vitro* for the presence of beneficial traits related to growth promotion. The results showed that 43% of the bacterial isolates were positive for inorganic phosphate solubilization, 52% produced indole-acetic acid, and 9% showed antagonism against *Fusarium graminearum*. BLASTn software from the NCBI data base was used to identify the 16S rRNA gene sequences. All strains showed high similarity with type strains in the database, ranging from 97 to 100%. The analysis of the rhizosphere-associated bacterial communities of ancestral and modern wheat genotypes was performed through multiple sequence alignment and phylogenetic reconstruction using the Maximum Likelihood algorithm. We identified five phyla (Proteobacteria, Firmicutes, Burkholderia, Actinobacteria, and Rhizobium) and twelve genera in the rhizospheric soil samples. Based on phylogenetic analysis, molecular characterization, inorganic phosphate solubilization, indole-acetic acid production and antagonist against a soil borne pathogen twelve isolates were selected as inoculum candidates to be tested in three commercial wheat cultivars to evaluated their performance, as single isolates or in consortium, in plant growth.

Key words: rhizosphere, 16S rRNA sequencing, beneficial bacteria.

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