Microbial interactions in legumes: perspectives for improvement of biofertilizers

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Legumes establish beneficial interactions with several soil microorganisms which improve plant growth and increase tolerance to unfavorable environmental conditions. Associated organisms include the symbiotic nitrogen-fixing bacteria rhizobia, and arbuscular mycorrhizal fungi (AMF). Biological nitrogen fixation (BNF) provides a valuable contribution to agricultural production, with legumes representing 25-35% of the world's protein. Increase of BNF is recognized as one of the most important mitigation actions to reduce greenhouse gases emission in agriculture and this is an important reason to increase the use of legumes in rotations or intercropping.

Several studies reported inconsistent results of inoculation in some legume crops due to the indigenous rhizobia and the low competitive ability of the inoculated strains. Therefore, the knowledge of the diversity and effectiveness of indigenous rhizobial populations is fundamental for selecting competitive and efficient N2-fixers for preparing highly effective inoculants, adapted to particular environmental stresses. These inoculants could also include arbuscular mycorrhizhal fungi (AMF) and plant growth promoting rhizobacteria (PGPR) which are either nitrogen-fixing or not and present several beneficial activities that stimulate the plant growth and protects against phytopathogens. PGPR belong to different

genera such as *Azospirillum*, *Bacillus*, *Burkholderia*, *Enterobacter*, *Paenibacillus*, *Pseudomonas*, among others.

The selection of appropriate rhizobia, AMF and PGPR can optimize the efficiency of BNF, reduce the use of synthetic agrochemicals and increase the performance of legumes in a scenario of global climatic changes.