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Bioprospecting of *Bacillus* spp. and *Paenibacillus* spp. with Nitrogen Fixation Potential

Paula Evangelista Moreira¹, Vitória Palhares Ribeiro², Chainheny Gomes de Carvalho², Daniel Bini², Aline Mendes da Rocha², Ivanildo Evódio Marriel², Sylvia Morais de Sousa Tinoco², Ubiraci Gomes de Paula Lana², Cristiane Alcantara dos Santos¹, Christiane Abreu de Oliveira Paiva²

¹Universidade Federal de São João del rei, UFSJ-CSL, Rodovia MG-424, km 47, Sete Lagoas-MG, Brasil.

²Empresa Brasileira de pesquisa agropecuária - Milho e Sorgo, Rodovia MG-424 km 45, Sete lagoas - MG, Brasil.

*christiane.paiva@embrapa.br

Biological nitrogen fixation (BNF) is an essential process for the sustainability of agricultural systems, especially in soils with low nutrient availability. Rhizosphere bacteria play a key role in nutrient cycling, with some genera, such as *Bacillus* and *Paenibacillus*, being associated with plant growth promotion and, in some cases, atmospheric nitrogen fixation. The search for novel bacterial genera with diazotrophic potential remains limited, constraining the expansion of microbial applications in agricultural systems. This study aimed to bioprospect for bacteria with nitrogen-fixing potential isolated from rhizosphere soil associated with maize grown in low-nitrogen conditions. The samples were subjected to heat shock treatment to select spore-forming bacteria, followed by dilution and cultivation in nitrogen-free solid medium to favor the growth of potentially diazotrophic microorganisms. A total of 26 colonies were isolated based on distinct morphological characteristics. Qualitative *in vitro* assays showed that 58% of the strains grew in nitrogen-free medium, indicating diazotrophic potential. Among these, six were selected for molecular identification by sequencing the 16S rRNA gene and were assigned to the genera *Bacillus* and *Paenibacillus*. These findings indicate that the maize rhizosphere is colonized by bacteria with BNF potential and highlight the potential of the genera *Bacillus* and *Paenibacillus* as promising candidates for bioinoculant development. Further studies, including quantitative assays and field validation, are required to confirm their performance in agricultural systems.

KEYWORDS: Biological nitrogen fixation, rhizosphere soil, heat shock, 16S rRNA.

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