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1285-1 Harnessing Haloarchaea from Atriplex nummularia Rhizosphere to Enhance Salt Tolerance in Maize Seedlings: Insights into Plant-Microbe Interactions

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Resumo:

Soil salinization poses a significant threat to global crop productivity, resulting in the degradation of arable lands and desertification. Plant growth-promoting microorganisms (PGPM) have emerged as potential allies in mitigating the adverse effects of salinity stress on plants. However, the role of halophilic archaea, a group of microorganisms commonly found in saline environments, in enhancing salt tolerance remains elusive due to cultivation limitations. In this study, we investigated the potential of haloarchaea isolated from the rhizosphere of Atriplex nummularia, a halophytic plant, to alleviate salt stress in maize plants. By employing 16s rDNA gene sequencing of the V4 region (515Fb and 806Rb), we characterized the microbial communities associated with Atriplex plants cultivated under varying salinity levels. We successfully isolated six strains belonging to the Haldaptatus genus from the rhizosphere of Atriplex nummularia, grown under saline irrigation (5.98 mS/cm-1) in the Brazilian semi-arid region. These halophilic archaea strains were inoculated on maize seeds (CFU 6×108) to evaluate their potential in mitigating the adverse effects of salt stress on maize seedlings. The experiment involved irrigation with NaCl at concentrations of 50 mM and 250 mM. Notably, the inoculated plants exhibited a remarkable increase in salt tolerance index (STI), reaching up to 80%, along with enhanced dry biomass compared to the control group. Moreover, the archaeon-inoculated plants demonstrated improved potassium and sodium balance, attributed to increased potassium uptake within the cells. These findings represent the first evidence of the exceptional potential of haloarchaea strains in mitigating saline stress on maize seedlings under controlled greenhouse conditions. Furthermore, our genome analysis revealed potential genes associated with plant hormone biosynthesis, osmotic stress response (e.g., indole-3-acetic acid [IAA]), and osmolytes such as proline/glycine betaine, as well as K+ uptake. These discoveries corroborate the functional capacity of archaea in alleviating the negative impacts of salinity stress on plants.

Palavras-chave:

halophilic archaea, soil salinization, plant-microbe interactions, salt tolerance

Agência de fomento:

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