Poster

Isolatioin and characterization of thermophilic, sulfur-oxidyzing bacteria from agriculture soils

Romero Núñez, Blanca Eugenia; González Grau, Juan M; Lebron López, Marta; Román Herrera, Laura.

(1) Instituto de Recursos Naturales y Agrobiología de Sevilla, CSIC, Av. Reina Mercedes, 10, Sevilla.

(2) Universidad Pablo de Olavide, Carretera de Utrera, 1, Sevilla .

Tutor académico: Ballesteros Martín, María de la Menta.

Keywords: Thermophiles; sulfur; soil

ABSTRACT

In the soil, sulfur undergoes constant transformation through biochemical reactions resulting from interactions with organisms. This element is essential for all living beings, from prokaryotes to multicellular organisms (Paniagua & Garcia, 2022). Thermophilic bacteria play a crucial role in the mineralization of organic sulfur compounds, actively breaking down organic matter and generating inorganic nutrients of interest to microorganisms and plants, such as inorganic sulfur compounds. Additionally, they are of great importance due to their high persistence and enzymatic activity in warm environments (Gonzalez et al., 2023). Bacterial isolates were obtained from soil samples from different regions of Spain. In this process, two culture media with different characteristics and pH levels were used: one nutrient-rich medium C (nutrient broth/agar) and two sulfur-oxidyzing bacteria selective media. The samples were incubated at 50ºC and 65ºC, resulting in a total collection of 294 thermophilic strains. To assess their sulfur-oxidizing capacity, sulfate determination was performed on all strains (Amala et al., 2020). The ten thermophilic strains that achieved the best results, with a sulfate concentration of approximately 300 mg/L, were selected and their 16S rRNA genes were PCR amplified, purified and sequenced to obtain their taxanomic identification.

In high-temperature agricultural regions, solarization is carried out to maximize soil temperature using solar energy. This is a common practice for pathogen control. This process can influence soil microbial dynamics, particularly thermophilic bacteria with sulfur-oxidizing capabilities. As the next phase of the project, the inhibitory capacity of the thermophilic isolates will be assayed against relevant phytopathogens will be evaluated.

The identification of strains with high sulfur-oxidizing activity opens the possibility of their application in sustainable agricultural practices, improving nutrient availability and potentially contributing to the biological control of phytopathogens. This study highlights the importance of exploring microbial diversity in soils managed with techniques such as solarization to develop integrated strategies that promote soil health and agricultural productivity.

REFERENCES

Paniagua-Vargas, Atzintli, & García-Oliva, Felipe. (2022).Microbial mineralization and immobilization determine sulfur dynamic in soil, 25, e523. Epub 26 de junio de 2023.https://doi.org/10.22201/fesz.23958723e.2022.523

Gonzalez, JM, Santana, MM, Gomez, EJ, & Delgado, JA (2023). Soil Thermophiles and Their Extracellular Enzymes: A Set of Capabilities Able to Provide Significant Services and Risks. Microorganisms , 11 (7), 1650. https://doi.org/10.3390/microorganisms11071650

Amala, P.V., T.G. Sumithra, K.J. Reshman, A. Anju, S. Subramannian, P. Vijayagopal. 2020. Analytical validation of a modified turbidimetric assay to screen sulphur oxidizing bacteria. Journal of Microbiological Methods 176: 105998. doi: 10.1016/j.mimet.2020.105998