Sociedad Argentina de Microbiología General

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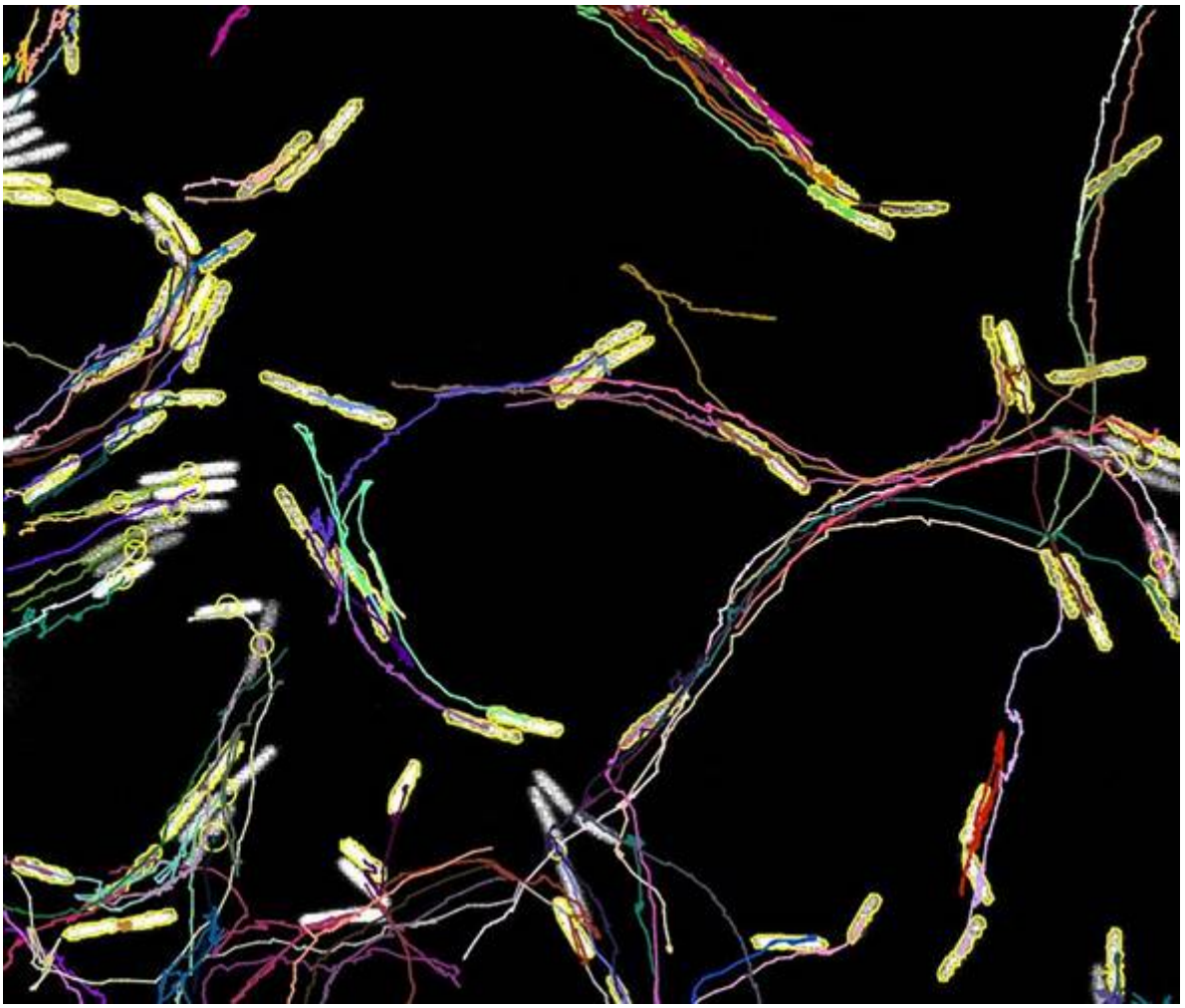

Foto: Se hace camino al andar. Celeste Dea. 1er puesto. Concurso fotográfico SAMIGE 20 años.

245 - invitados

USE OF PHOSPHATE-SOLUBILIZING BACTERIA TO MITIGATE P DEFICIENCY IN AGRICULTURAL SOILS: STUDIES OF THE BACTERIAL RESPONSE TO THIS NUTRITIONAL STRESS AND EFFECT OF THEIR INOCULATION ON THE SOIL MICROBIOME

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Due to the importance of phosphorus (P) in agriculture, crop inoculation with phosphate solubilizing bacteria is a relevant subject of study. These bacteria constitute an important potential for P cycling in soils. The knowledge of the mechanisms involved in this beneficial bacterial phenotype and the effects of the inoculation of these beneficial bacteria on plants growth and their impact on soil microbiome are necessary approaches in the search for sustainable agricultural strategies to supply P to crop lands. The objective of the present study was to analyze the bacterial response to P deficiency by omics strategies and to evaluate the effect of bacterial inoculation on bacterial soil structure in comparison to chemical fertilizers.

Transcriptomic and proteomic approaches were undertaken to determine the response of a model phosphate solubilizing bacterium, *Serratia* sp. S119. This strain was selected due its efficient capacity to solubilize phosphate and promote the growth of agriculturally important plants such as peanut, maize and soybean when exposed to nutritional phosphorus stress. The effect of bacterial inoculation on agricultural important plants was evaluated by metabarcoding approaches analyzing the rhizosphere´s bacterial community structure associated to peanut and maize plants in both microcosm and field assays.

The transcriptomic study indicated that *Serratia* sp. S119 shows a multigenic response in P deficient conditions. Genes of general metabolism, some membrane transporter and cellular signaling genes were overexpressed. On the other hand, within repressed genes, bacterial flagelar mobility and adherence genes were detected. The proteomic analysis detected proteins exclusive to bacterial growth on P deficient condition that would play a relevant role under this stress. Most up-regulated proteins were related to binding properties while within those that were down-regulated, a great percentage were related to chemotaxis and mobility. Presence of several uncharacterized proteins under P deficiency suggests the possibility of novel proteins/pathways involved under this growth condition. The metabarcoding study permitted to detect that rhizobacterial community structure is highly dynamic and influenced by different factors such as type of plant, the fertilizer input and bio-inoculant applied. In particular, chemical fertilizer application exerted a more significative impact on bacterial community associated to peanut and maize plants and thus its replacement with biological inoculants based on PGPB would be a better ecological strategy.

Phosphate solubilizing bacteria presents a multigenic response to P deficiency showing genes and proteins exclusive to this stress. The inoculation of phosphate solubilizing bacteria on agronomical important plants drives the rhizospheric bacterial community to a beneficial microbiota.

Palabras clave: palabras_clave