Harnessing Plant Growth-Promoting Bacteria to Increase Tomato Resilience to Salinity in Soilless Greenhouse Systems

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Salinity is a major constraint to greenhouse horticulture, particularly in intensive soilless cultivation systems. The Sun2Fork project investigates the potential of plant growth-promoting bacteria (PGPB) to enhance tomato resilience under salinity stress. This study aims to identify effective PGPB consortia capable of improving tomato growth and physiological performance in soilless cultivation systems exposed to salinity stress, thereby contributing to more sustainable and resilient greenhouse production strategies.

PGPB consortia were selected based on their tolerance to salinity and their ability to express plant growth-promoting traits, including indole-3-acetic acid production, phosphorus solubilization, siderophore production, and nitrogen fixation, as well as their previously demonstrated capacity to promote plant growth under stressful conditions. The efficiency of the selected consortia was evaluated under greenhouse conditions at different salinity levels (0, 100, and 150 mM NaCl). Microbial consortia were applied by spraying onto the substrate surface in tomato soilless cultivation systems.

At harvest, plant responses were assessed through biometric parameters, including biomass and shoot elongation, and physiological indicators such as SPAD index. Additional stress-related parameters, including leaf relative water content, proline accumulation, and total soluble sugars are currently being evaluated to further characterize tomato responses to inoculation and salinity stress.

Preliminary results indicate that selected PGPB consortia can mitigate the negative effects of salinity on tomato growth in soilless systems. These findings highlight the potential of microbial consortia as sustainable strategy to improve crop tolerance to salinity stress and support more resilient greenhouse horticulture.

Keywords: salt stress; microbial inoculants; soilless cultivation; *Solanum lycopersicum*