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Exploring the Potential of *Bacillus subtilis* Is1 and *B. Amyloliquificiens* Is6 to Manage Salinity Stress and Fusarium Wilt Disease in Tomato Plants by Induced Physiological Responses

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Abstract

The intensified concerns related to agrochemicals' ecological and health risks have encouraged the exploration of microbial agents as eco-friendly alternatives. Some members of *Bacillus* spp. are potential plant-growth-promoting agents and benefit numerous crop plants globally. This study aimed to explore the beneficial effects of two *Bacillus strains* (*B. subtilis* strain IS1 and *B. amyloliquificiens* strain IS6) capable of alleviating the growth of tomato plants against salinity stress and Fusarium wilt disease. These strains were able to significantly promote the growth of tomato plants and biomass accumulation in pot trials in the absence of any stress. Under salinity stress conditions (150 mM NaCl), *B. subtilis* strain IS1 demonstrated superior performance and significantly increased shoot length (45.74%), root length (101.39%), fresh biomass (62.17%), and dry biomass (49.69%) contents compared to control plants. Similarly, *B. subtilis* strain IS1 (63.7%) and *B. amyloliquificiens* strain IS6 (32.1%) effectively suppressed Fusarium wilt disease and significantly increased plant growth indices compared to the pathogen control. Furthermore, these strains increased the production of chlorophyll, carotenoid, and total phenolic contents. They significantly affected the activities of enzymes involved in antioxidant machinery and the phenylpropanoid pathway. Hence, this study effectively demonstrates that these Bacillus strains can effectively alleviate the growth of tomato plants under multiple stress conditions and can be used to develop bio-based formulations for use in the fields.

Keywords: *Salinity Stress, Fusarium Wilt, Induced Resistance, Bacillus, PGPR*