**Plant growth-promoting rhizobacteria as a sustainable method to enhance drought tolerance in tomato crop**

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Biostimulants are emerging as sustainable strategies to improve crop tolerance to drought. We investigated the effects of two plant growth-promoting rhizobacteria (PGPR) strains cable of modulating plant stress hormones: *Serratia odorifera*, a producer of 1-Aminocyclopropane-1-Carboxylate (ACC)-deaminase that inhibits stress-induced ethylene formation, and *Pseudomonas sp.*, a producer of Indole-3-acetic acid (IAA). Experiments were conducted using *Solanum lycopersicum* L. grown under well-watered and water-stressed treatments in both pot and field conditions. Plants were inoculated with a mixed PGPR consortium (MIX) prior to the onset of water stress in both experimental settings. We evaluated the interaction between water treatments and PGPR inoculation by measuring plant growth, gas exchange, chlorophyll fluorescence, abscisic acid (ABA) content, biometric traits, and rhizosphere composition. In the pot experiment, MIX-inoculated plants under water stress increased photosynthesis (*A*), *A*/*C*i (intercellular [CO2]) curve parameters (*A*max, *J*max, *V*cmax), and stomatal conductance compared to non-inoculated, water-stressed plants. These results highlight the synergistic potential of ACC-deaminase and IAA-producing PGPR in enhancing drought tolerance under controlled conditions. In contrast, results from the first year of the field experiment, where a one-time inoculation was applied at flowering, showed no significant improvement in gas exchange or yield under water-limited conditions. However, under full irrigation, inoculated plants showed increased *A* and stomatal conductance during advanced fruiting. Additionally, leaf area index and plant height significantly increased in MIX-treated plants in both water treatments. Consequently, water availability remained the primary determinant of physiological and productivity responses, as the low fitness of the inoculated PGPR likely limited their persistence in the field. To address this constraint, a second-year experiment is underway using repeated PGPR applications throughout the crop cycle to assess the effects of inoculation frequency and timing. These findings underscore the complexity of translating PGPB efficacy from controlled to field conditions, where environmental variability and microbial fitness strongly determine outcomes.

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