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Poster Communication Abstract – 2.42

MOLECULAR AND PHYSIOLOGICAL MECHANISMS OF TOLERANCE INDUCED BY THE RHIZOBACTERIUM SICCIBACTER SP. STRAIN C2 IN TOMATO PLANTS UNDER SINGLE AND COMBINED ABIOTIC AND BIOTIC STRESSES

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Solanum lycopersicum, abiotic stress, biotic stress, plant growth-promoting rhizobacteria, plant-microbe interactions

Plant growth promoting rhizobacteria (PGPR) have been proposed as beneficial microorganisms that can induce positive effects on plant health and increase tolerance to both biotic and abiotic stresses. A novel halotolerant PGPR strain (*Siccibacter* sp. strain C2, or S-C2), recently identified by a rhizospheric bacterial screening in southeast Tunisia S-C2, was demonstrated to enhance salt stress tolerance in barley (*Hordeum vulgare*) (Sayahi et al., 2022). We tested the growth-promoting properties of S-C2 under controlled environmental conditions in tomato (*Solanum lycopersicum*) cv. Rio Grande. Additionally, S-C2 beneficial properties were tested on tomato plants subjected to: i) saline abiotic stress; ii) virus (Potato virus Y, PVY) disease biotic stress ; and iii) both the above stresses in combination. Physiological parameters (e.g., chlorophyll content, sugar and proline accumulation, NDVI) and morphometric growth parameters, measured on both shoots and roots, consistently indicated that S-C2 treatments had beneficial effects on healthy plants. Furthermore, S-C2 treatments increased tomato plants' tolerance to saline stress and positively correlated with a decreased level of PVY RNA compared to non-treated tomato plants. The PGPR strain conferred increased levels of tolerance not only to individually-induced saline and PVY infection stresses, but also in the presence of the two stresses in combination.

To gain insight into the molecular bases of the beneficial effects of the S-C2 treatments in tomato plants, a gene expression analysis (RT-qPCR) was performed, including genes involved in proline metabolism (*Slp5CS*), stress-inducible transcription factors (e.g. *SlAREB, SlDREB2A*), genes related to salicylic acid-mediated (*SlPR1b1*) or jasmonic acid (JA)-mediated (*SlCOI1, SlLoxD*) defense responses, and genes involved in RNA silencing-mediated antiviral immunity (*SlDCL2, SlAGO1, SlRDR1*). Our data suggest that the inhibitory effects of S-C2 treatments on hormone-mediated defense responses may induce enhanced stress tolerance.

In summary, although previous studies provided evidence of the ameliorative effects of PGPRs on crop plants under environmental stresses, this work supports the notion of complex defense mechanisms activated by rhizobacteria, able to induce significant tolerance upon different combined stresses. Our results futher encourage the developments of sustainable practices for horticultural crop production in the Mediterranean environment.

Sayahi, N., et al. Characterization of Siccibacter sp. Strain C2 a Novel Rhizobacterium that Enhances Tolerance of Barley to Salt Stress. Curr Microbiol 79, 239 (2022). https://doi.org/10.1007/s00284-022-02930-5