THE OVER-EXPRESSION OF SYSTEMIN IN TOMATO IMPROVES THE AGRONOMIC PERFORMANCE OF PLANTS GROWN UNDER SALT STRESS CONDITIONS


*) Dipartimento di Ingegneria Agraria e Agronomia del territorio - Università di Napoli Federico II, Via Università 100, 80055 Portici (Italy)
**) Dipartimento di Scienze del Suolo, della Pianta, dell'Ambiente e delle Produzioni Animali, Università di Napoli Federico II, Via Università 100, 80055 Portici (Italy)

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Plants undergo continuous exposure to several different biotic and abiotic stresses in their natural environment. To survive under such conditions, they have evolved intricate mechanisms to perceive external signals and develop optimal responses to environmental conditions. To date, the molecular mechanisms that are involved in plant response to different stresses have been studied independently, while only recently novel studies have revealed the existence of cross-tolerance among the plant responses to different stresses. A relationship between the reaction to salt-stress and to mechanical damage such as wounding has been demonstrated in tomato. Plants exposed to salt stress accumulated proteinase inhibitors and activated other wound-related genes. Similarly, mechanical wounding increases salt-stress tolerance through a mechanism that involves the signalling peptide systemin and calmodulin-like activities.

We investigated the physiological and growth performance of tomato plants over-expressing the systemin peptide grown under salt stress (20 and 40 mM NaCl in the irrigation water). Systemin over-expressing plants (BBS) had a decreased stomatal conductance in absence of stress. Nevertheless, upon salinization, the stomatal conductance was more reduced in the wild type controls (WT) than in BBS plants. It is likely that such effect is a result of a higher hydration state of BBS plants whose leaf water potential was slightly higher than WT plants. Consistently, the leaf concentration of ABA and proline, two molecules that typically accumulate in response to salt stress, were lower in stressed BBS plants compared to WT. The result of such performance may explain the higher biomass production observed in BBS plants grown under salt stress. Exogenous applications of proline (5 mM in the irrigation water) enhanced the salt tolerance of BBS whereas it caused some detrimental effect in WT plants. Comparative gene expression profiling has been performed to highlight possible cross talk between genes involved in wounding and osmotic stress adaptation pathways in tomato.