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DISSERTATION SUMMARY

Salicylic acid improves the acclimation of *Lycopersicon esculentum* Mill. L. to high salinity by approximating its salt stress response to that of the wild species *L. pennellii*

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Salicylic acid (SA), a plant phenolic is now considered as a hormone-like endogenous regulator, and its role in the defence mechanisms against biotic and abiotic stressors has been well documented (Yalpani et al. 1994; Szalai et al. 2000).

In the present work acclimation to salinity stress of tomato plants, which had previously grown for a long time in a relatively low concentration of SA, was investigated. We tried to reveal those biochemical and physiological effects of SA pre-treatment which led to improved fitness of plants exposed to salt stress. In this work we demonstrate that SA pre-treatment induced a halophytic character in *L. esculentum* cv. Rio Fuego, and as a result, accumulation of sodium as inorganic osmolyte in leaf tissues without any serious symptoms of salt stress.

Tomato plants were grown hydroponically. Plants pretreated with 10^{-7}-10^{-4} M SA were exposed to 100 mM NaCl for a week. Ion contents of tissues, relative water content, water potential and osmotic potential of the youngest expanded leaves were determined after SA pretreatment and in plants exposed to salinity. SA treatment decreased the K^+/$^{86}Rb^+$ uptake and contents, and water potential of plants but during the next three-week an osmotic adaptation occurred. Na^+ ions accumulated in the leaf tissues of treated plants exposed to salinity and functioned as inorganic osmolytes. As a result of water potential decrease, the concentration of abscisic acid (ABA), and simultaneously, the activity of abscisic aldehyde oxidase, catalyzing the last step of ABA synthesis, increased in the roots of SA-pretreated plants. This enabled plants to activate the ABA signal transduction pathway and gene expression before salt stress. ABA-regulated genes, such as LEA-s (late embryogenesis abundant proteins), RD29A, DREB2A are clearly involved in the acclimation to salt stress (Ma et al. 2006). In the presence of SA, the leaves accumulated more compatible osmolytes e.g. soluble sugars, glucose and fructose, a sugar alcohol, sorbitol and proline. SA-pretreatment improved the photosynthetic efficiency of plants. By chlorophyll fluorescence measurements, it can be concluded that the quantum efficiency of PS2 open centers was not different from that of the control in the treated leaves in dark adapted state and it increased in light adapted state.

10^{-4} M SA pretreatment induced antioxidative defence mechanisms; first of all it enhanced the activity of ascorbate and guaiacol peroxidase activity in the roots. Pretreated plants maintained high levels of non enzymatic antioxidants, such as carotenoids and a polyamine, putrescine in the shoots under salt stress.

An enhanced acclimation to 100 mM NaCl induced salt stress could be observed at a 10^{-4} M SA pre-treatment. In these plants greater accumulation of putrescine, spermidine and spermine occurred before salt exposure, which decreased the oxidative damage and protected membranes under salinity.

Protoplast cultures were made to detect the effect of SA to the cell viability. By Evans blue staining it was investigated that the effect of SA could be prevented by application of ABA, proline and putrescine. The effectiveness of SA in improving the salt stress response of *L. esculentum* similar to the acclimation mechanisms observed in the Na^+ includer, salt tolerant wild species, *L. pennellii*.

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