Effect of salicylic acid on the interaction between ethylene and polyamines in the short term response of tomato to salinity stress.

Abstract

This study aimed to determine the effects of exogenous application of salicylic acid (SA) on the toxic effects of salt in relation to ethylene and polyamine (PA) synthesis, and to correlate these traits with the expression of genes involved in ethylene and PA metabolism in two tomato species differing in their sensitivity to salt stress: *Solanum lycopersicum* cv Ailsa Craig, the genetic background of functional lines studied in the European project Rootopower (UE Contract #289365), and its wild salt-resistant relative *S. chilense*. In *S. chilense*, treatment with 125 mM NaCl improved plant biomass, increased production of ethylene due to upregulation of genes coding for 1-Aminocyclopropane-1-carboxylic acid (ACC) synthase and ACC oxidase activity, and increased endogenous SA and spermine concentrations. However, salinity decreased plant growth, endogenous SA and did not change the ethylene production and spermine concentration in *S. lycopersicum* cv Ailsa Craig. Exogenous application of salicylic acid at 0.01 mM into the hydroponic solution enhanced salt stress resistance of plants with an increase of dry weight an increase of putrescine content and a slight reduction of ethylene production for *S. lycopersicum* cv Ailsa Craig exposed to salt stress. Nevertheless, an increase of biomass was not observed for *S. chilense* plants treated with salt and salicylic acid compared to salt alone, but this treatment decreased ethylene production and putrescine in *S. chilense*. We conclude that salt affects more negatively S. *lycopersicum* cv Ailsa Craig than *S. chilense*. Exogenous application of SA alleviates salt stress in tomato by interfering with ethylene and polyamine metabolism, thus promoting growth, delaying leaf senescence and contributing to ionic homeostasis, especially in the salt-sensitive glycophytic species.