Overexpression of a tomato annexin gene AnnSp2, enhances drought and salt stress in transgenic tomato through ABA signaling and modulation of ROS production.

Abstract

Drought and high salinity are two major abiotic stresses that affect the agricultural crops worldwide. Annexins belongs to a multigene protein family play an essential role in plant stress responses and various cellular processes. Here, AnnSp2 gene was cloned from wild tomato (*Solanum pennelli*) and functionally characterized in cultivated tomato. AnnSp2 was found to be induced after exposure to drought, salt, H_2O_2 and ABA. Tomato plants overexpressing AnnSp2 remarkably increased plant tolerance to drought and salt stress, as determined through physiological analyses of the germination rate, root growth, survival rate, leaf water loss and Chl content. AnnSp2 transgenic plants were observed to be less sensitive to ABA during seed germination and seedling stages. However, under drought stress the ABA content significantly increased in the AnnSp2- Over expressing plants, reduced water loss, attributed to the enhancement of stress tolerance. Furthermore, we found that AnnSl2 reduced sensitivity of plants to drought by influencing ABA-induced stomatal movement, and expression of ABA-inducible genes, including AREB, DREB, NCED, ERD were clearly up regulated under drought and salt stress conditions. Consistent with the accumulation of reactive oxygen species (ROS), lower lipid peroxidation level, increased peroxidase activities including APX, CAT and SOD all of which contributed to increased tolerance to oxidative stress compared with wild-type plants. These results therefore indicate that AnnSp2 play an important role in the abiotic stress response, and that overexpression of AnnSp2 in transgenic tomato improves salt and drought tolerance through ABA signaling and the regulation of ROS production in plants.

Keywords: ABA Signaling; Tomato (*Solanum penneli*); Drought and salt stress; ROS; AnnSp2 (annexin).