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Enhanced salt tolerance in tomato plants constitutively expressing heat-shock protein in the endoplasmic reticulum

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ABSTRACT. The accumulation of unfolded or misfolded proteins in the endoplasmic reticulum (ER) causes ER stress and activates the unfolded protein response (UPR) signaling pathway. The UPR signaling pathway is associated with plant responses to adverse environmental conditions. Thus, changes in the UPR signaling pathway might affect plant abiotic tolerance. Here, the role of ER small heat-shock protein (ER-sHSP) in improving plant resistance to salt stress was explored. Under salt stress conditions, ER-sHSP transgenic plants were found to have more vigorous roots, maintain a higher relative water content, absorb less Na^+, accumulate more osmolytes and Ca^{2+}, and sustain less damage to the photosystem, compared to wild-type non-transgenic plants. Furthermore, we found that the constitutive expression of ER-sHSP under salt stress depressed the expression of other ER molecular chaperones. These results indicate that the constitutive expression of ER-sHSP enhanced

salinity tolerance of tomato plants significantly, and alleviated the ER stress caused by the salt stress in plant cells.

Key words: Endoplasmic reticulum; Endoplasmic reticulum stress; Endoplasmic reticulum binding protein; Unfolded protein response; Endoplasmic reticulum small heat shock protein; Salt tolerance

