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Transient Silencing of Heat Shock Proteins Showed Remarkable Roles For *HSP70* During Adaptation To Stress In Plants.

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Highlights

- The roles of three different classes of *HSP* genes were investigated over control and salt stress conditions.
- Methodologically, the endogenous *HSP* genes of *N. benthamiana* transiently silenced by corresponding heterologous sequences isolated from *Capparis spinosa* L. using a virus system of gene silencing.
- Silencing of *HSP70*, compared to other two *HSP*s, resulted in stronger negative effects on growth and physiological parameters especially under salinity conditions.
- Loss of function of molecular chaperones following gene silencing might be partially compensated with a higher accumulation of proline to protect membranes and proteins from stress-related damages.

Heat shock proteins (HSPs) have vital roles during plant adaptation to biotic and abiotic stresses, as well as stress-free conditions. In the present study, we used a heterologous strategy of virus induced gene silencing to investigate the role of different classes of HSPs in *Nicotiana benthamiana*. Different growth and physiological parameters in silenced plants were evaluated under both control and salt stress conditions. Among the treatments, silencing of HSP70, especially under salinity regime, was found to have stronger impacts on growth, protein concentration, the accumulation of photosynthetic pigments, proline and total soluble carbohydrates content, malondialdehyde, the activity of antioxidant enzymes, performance index, relative water content and the ratio of K^+/Na^+, suggesting a more prominent role for HSP70 in both stressful and stress-free life cycle of the plants. Principal component analysis and hierarchical clustering indicated that HSP70 gene was silenced, the plants might effectively respond to stress by a higher accumulation of compatible solutes, like proline to protect the cell membranes and proteins from damage.

Abbreviations:
HSP, heat shock protein; VIGS, virus induced gene silencing; TRV, Tobacco Rattle Virus; H_2O_2, hydrogen peroxide; MDA, malondialdehyde; ROS, reactive oxygen species; PI, performance index; APX,