Salt tolerance of plants transformed with a gene encoding an Na^+/H^+ antiporter

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Summary

Salinity and water deficit are two major constraints for the worldwide distribution and productivity of plants. Therefore, the development of genetically-engineered plants with enhanced tolerance to salt and drought is an important challenge in modern plant sciences. For the survival and growth, plants have evolved various protective mechanisms by which they manage to overcome unfavorable environments. Two of which that ubiquitously function in plants are the accumulation of compatible osmoprotectant and the active salt sequestration to intra- or extra-cellular compartment. Genes involved in these biochemical and physiological processes are the principle targets of genetic engineering for the improvement of salt tolerance. One of the staple factors in plants that is responsible for the salt sequestration is thought to be an Na^+/H^+ antiporter that is associated with plasma or tonoplast membrane.

In an attempt to test the possibility that engineering Na^+/H^+ antiport activity result in enhanced salt tolerance in plants, *Arabidopsis thaliana* was transformed with a gene (*nhx1*) for vacuole-type Na^+/H^+ antiporter from *Saccharomyces cerevisiae* under the transcriptional regulation of a salt-inducible promoter. In transgenic plants, expression of the *nhx1* gene was activated in response to salt whereas the mRNA was undetectable under normal growth conditions. When examined salt tolerance, however, transgenic plants did not significantly differ from wild-type plants with respect to the frequency of germination and the subsequent growth under salt conditions. Further physiological experiments are under progress for the precise evaluation of salt tolerance in transgenic plants expressing the Na^+/H^+ antiporter.