Characterization of a salt-inducible gene in Arabidopsis and its functional analysis using a micro-array with the aim of plant molecular breeding

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Summary

Arabidopsis is a model plant species whose entire genome has now been reported. Numerous bio-resources derived from this tiny plant have been established and used by researchers worldwide. In the field of salt stress biology, it has been reported that several genes from Arabidopsis have been introduced into other plants to confer tolerance to salt stress or dehydration stress. The objective of our present study is to elucidate the function of TLP, a salt stress-inducible gene of Arabidopsis, using a micro-array technique and to utilize the obtained information to breed salt stress-resistant plants. TLP protein contains a LOV domain, which is also seen in blue light receptors such as PHOT, FKF, LKP, and ZTL, whose LOV domains have been shown to be able to bind FMN (Flavin MonoNucleotide). Their LOV domains are also reported to be involved in protein-protein interactions.

RNA gel blot analysis revealed that TLP gene expression was induced within 1 hour by salt stress or dehydration stress. TLP mRNA also accumulated in H_2O_2-treated plants. In non-stressed plants, the mRNA for the TLP gene was detected at high levels in dry seeds, whereas little expression was observed in roots, stems, leaves or flowers. In the TLP promoter:GUS gene present in Arabidopsis plants, strong GUS activities were detected in embryos in dry seeds. GUS activities were also seen in root tips and shoot meristems of the transgenic plants.

We performed micro-array analysis using 35S:TLP plants, which revealed that gene expression for a RING finger protein, cytochrome p450, GST, and zinc finger protein was altered in the 35S:TLP plants compared with wild-type Arabidopsis plants.