Molecular Cloning and Characterization of Novel Salt-Inducible Gene *GmTDF-5* Involved in Soybean Salt Tolerance towards Improvements in Crops

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Summary

Soybean (*Glycine max* (L.) Merr.), which contains abundant proteins, lipids and valuable chemical metabolites and is a major source of protein and vegetable oil for human nutrition, has a higher salt tolerance in comparison with other crops. To understand salt responsive/adaptable mechanism in soybean, we have screened salt-inducible genes, differentially transcribed in soybean treated with 100 mM NaCl for 3 days, by cDNA-AFLP method. As a result, 106 of partial cDNAs from salt-inducible genes were cloned and designed as *Glycine max* Transcript-Derived Fragment (GmTDF). Of them, 3 GmTDFs were unidentified nucleotide sequences as compared to known ones in DNA databases. This suggests that soybean genes from these clones encode novel proteins involved in plant salt tolerance.

Final objective of our study is identification of salt responsive mechanisms and its tolerant abilities unique to soybean via molecular characterization of the unidentified salt-inducible genes. In this report, we characterized the gene/protein structure, subcellular localization and transcriptional response to salt stress of an unidentified clone, *GmTDF-5*. A 1,422-bp of full-length cDNA for *GmTDF-5* gene encodes a putative protein of 367 amino acid residues and has a calculated molecular mass and an isoelectronic value of 40.7-kDa and 5.44, respectively. GmTDF-5 protein is characterized based on its sequence profiles as an unidentified protein with helix-turn-helix motif and leucine-zipper motif and, interestingly, localized on and/or around nucleus as detected by transient analysis using the GFP-fused GmTDF-5 protein. Temporal transcription of *GmTDF-5* gene in response to 100 mM NaCl stress was induced at 2- to 3-hour after stress treatment and was increased by 24-hour. In addition, *GmTDF-5* transcription was also regulated by other environmental factors, such as osmotic pressure, drought and a plant hormone abscisic acid (ABA).

These results suggest that the *GmTDF-5* gene might function as one of DNA-binding factors in soybean salt tolerance.