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Isolation and Characterization of *DREB* Gene Homolog towards the Improvement of Salt Tolerance in Lettuce

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Summary

Lettuce (*Lactuca sativa* L.) is one of the most consumed leafy vegetables in the world and its productivity is dramatically decreased by environmental stresses, such as heat, drought, and high salinity. Improvement of the stress tolerance of lettuce is desirable for the breeding of new cultivars. Isolation and characterization of genes involved in stress from this plant would help us understand the molecular mechanisms of stress response and generate tolerant lettuce by transgenic technology. *DREBs* (dehydration responsive element binding factors) encoding DRE/CRT-binding proteins play important roles in plant response of abiotic stress. In this study, a *DREB2*-homolog, named *LsDREB2A* was isolated from lettuce (*Lactuca sativa* L.) and analyzed its expression and function. *LsDREB2A* encoded proteins with the conserved AP2 (apetala 2) domain, and it was classified into A-2 subgroup of DREB subfamily. It was shown that there might be more than ten *DREB* homologs in the lettuce genome by southern blot analysis. Quantitative real-time PCR experiments revealed that the expression of *LsDREB2A* was significantly increased by drought and high salinity treatment, but not cold, heat and ABA (Abscisic Acid) treatment. This result suggested that *LsDREB2A* play an important role during drought and high salinity stress in ABA-independent pathway. Gel shift assay indicated that LsDREB2A could specifically recognize DRE (dehydration responsive element) sequence *in vitro*. In yeast one-hybrid assay, LsDREB2A was specifically bound to DRE sequence and activated the expression of both reporter genes of *His3* and *LacZ*. These results suggest that LsDREB2A might function as a transcription factor. Since LsDREB2A has no PEST sequence that relates with protein degradation, overexpression of *LsDREB2A* increased the tolerance of salt stress in transgenic Arabidopsis plants. These results indicate that *LsDREB2A* gene might have ability for producing transgenic lettuce that is tolerant to salt stress.