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Establishment of Molecular Breeding Technique for Conferring Salt-Stress Resistance to Plants by Efficient Utilization of Transcription Factors Involved in Osmoregulation

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Summary

Development of salt-tolerant plants as well as improvement of production technology is required for the increased production of crops on salt-rich field. The genetic engineering method for plants can accelerate the development of plants with new characters. Since utilization of transcription factors, which can regulate the function of a lot of genes, is more efficient for this purpose, we focused on the bZIP transcription factors, AtbZIP10 and AtbZIP53, involved in osmoregulation, which is related to salt stress. The utilization of self-activation system by using function of AtbZIP10 and AtbZIP53, and their target gene, *ProDH*, seems to be expected to dramatically increase the expression level of these transcription factors. In this study, we tried to establish the molecular breeding technique for conferring salt-stress tolerance to plants by the efficient utilization of these transcription factors. The experiment of transcriptional activation using transient expression system in *Arabidopsis* protoplasts demonstrated that both AtbZIP10 and AtbZIP53 are enough to fully activate the transcription of *ProDH* gene. Both AtbZIP10 and AtbZIP53 are localized in nucleus, and interact each other through their bZIP domains. Since AtbZIP10 protein is constitutively degraded in the transgenic plants overexpressing *AtbZIP10* driven by CaMV35S promoter (P_{35S}::*AtbZIP10*), utilization of self-activation system with these transcription factors and the promoter region of *ProDH* gene, would be better approach for overexpression of transcription factors than using CaMV35S promoter. P_{35S}::*AtbZIP10* plants demonstrated the enhanced tolerance against osmotic stress in recovery period by re-watering after salt stress treatment. Because the reduction of damages from dramatic changes of osmotic pressure in recovery period after salt or drought stress is expected by strengthening of AtbZIP10 and/or AtbZIP53 function, the approach of making transgenic plants by efficient utilization of both AtbZIP10 and AtbZIP53 could give plants similar effects against the salt stress, too. Therefore we suggest that the establishment of molecular breeding technique for making salt stress tolerant plants would be possible by utilization of function of these transcription factors.