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Functional Analysis of Salt-Tolerance-Related PMP3 Gene in the Salt Transport of Crop Plants

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Summary

To elucidate the mechanism of salt tolerance of rice, one of the most important crop plants, and improve its salt tolerance, we have isolated *PMP3* gene from rice and analyzed their expression and function. We have isolated 7 *OsPMP3* genes from rice, which were homologous to yeast *PMP3* gene. Although the deletion of *PMP3* induced salt hypersensitivity in yeast, 4 of *OsPMP3* genes complemented the phenotype of $\Delta pmp3$ yeast. Northern blot analysis showed that 3 of *OsPMP3* genes were up-regulated under the treatment of NaCl, drought, low temperature and H₂O₂. In addition, the mRNA of stress-inducible *OsPMP3* genes was detected in the mesophyll of leaves and lateral root cap of roots revealed by in situ hybridization. These results indicated that *OsPMP3* genes were expressed mainly in mesophyll and lateral root cap and contribute to salt tolerance via restricting Na⁺ uptake in their tissues.

We have introduced *OsPMP3* gene under the control of CaMV 35S promoter. *OsPMP3* overexpressing rice plants showed decreased growth compared with wild type under a normal condition. However, under saline conditions, *OsPMP3* overexpression alleviated NaCl-induced growth suppression. These results suggest that *PMP3* gene can be used for improving salt tolerance by its genetic modification.