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Rice Cultivars Under Salt Stress Show Differential Expression of Genes Related to the Regulation of Na^+/K^+ Balance

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[Introduction]
Rice is one of the most important staple foods for a least half the world's population and is considered a salinity-sensitive crop. Rice cultivation systems are threatened by the effects of climate change because manyrice-growing areas are located in vulnerable regions.

[Materials and Methods]
Four different rice (*O. sativa*) genotypes Pokkali (Gyehwa-20), IR28, Cheongcheong, and Nagdong were provided by the plant molecular breeding lab of Kyungpook National University. Pokkali (Gyehwa-20) is a unique salt-resistant cultivar that is cultivated in water-logged coastal regions, whereas IR28 is salt-sensitive. The cultivars Cheongcheong and Nagdong were used for comparison.

[Results and Discussion]
We compared two famous rice cultivars namely Nagdong and Cheongcheong, with the salt-tolerant variety Pokkali and salt-sensitive variety IR28. Pokkali and Nagdong cultivars were found to have strong salt tolerance during both seed germination and seedling growth. Under 150-mM NaCl stress, these cultivars showed slight reductions in plant growth, but the plants remained vigorous in comparison to Cheongcheong and IR28. We also found that the salt-tolerant varieties Pokkali and Nagdong enhance their salt tolerance by regulating the Na+/K+ ratio in the roots and shoots. Ion transport-related genes and other micronutrients were also differentially regulated among rice cultivars under salt stress. The findings of this study could help develop new salt-tolerant or salt-sensitive cultivars via CRISPR/Cas9 knockout or overexpression methods in future studies.

[Acknowledgement)
This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2021M3E5E6022715).

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