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The rice *RADIALIS-LIKE3* (*OsRL3*) connects leaf senescence and salt stress response through ABA pathway

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[Introduction]

Leaf senescence, the final step of leaf development, is genetically programmed deteriorative process that ultimately leads to the death of annual plants. This process can be triggered by external factors including drought, high salinity stress, ultraviolet light, and pathogen attacks. In plant, abscisic acid (ABA) has substantial function in stress response and regulates various plant developments, including seed germination and dormancy, organ abscission, and leaf senescence.

[Materials and Methods]

The parental japonica cultivar 'Dongjin' and *osrl3* mutants were grown in a natural long day conditions. The *osrl3* mutants were obtained from the Crop Biotech Institute at Kyung Hee University, Korea. The wild type and *osrl3* mutants grown in soil were used to determine the salt stress tolerance. For treatment with salt stress, three-week-old plants grown in pots were watered with 200 mM NaCl for 5 days and recovered for another 8 days. To detect the transcription level of *OsRL3* under various abiotic stress and phytohormone treatment, The wild type seeds were sterilized in 75% ethanol for 10 min and in 20% NaClO for 20 min, and washed with sterile water thoroughly for three times. The sterilized seeds were germinated at 30℃ continuous light condition for 10 days in MS solid medium. ten-day-old plants were treated with stress including dehydration stress (the plants were exposed in the air without water supply), high salinity stress using 200 mM NaCl solution, and oxidative stress using 3 mM H_2O_2 and 100 mM mannitol.

[Results and Discussions]

The *OsRL3* transcripts were exclusively found in leaves of WT seedlings that stressed by NaCl, implying that OsRL3 has pivotal roles in response to salt stress. Indeed, null mutation of *OsRL3* exhibited the increased susceptibility to salt stress and led to reduced membrane integrity, resulting in relative higher ion leakage rate and MDA contents compared to WT. Decreased expression of chlorophyll degradation genes and senescence associated genes in *osrl3* mutants stayed the green color in detached leaves under darkness condition, suggesting that OsRL3 is a positive regulator for leaf senescence as transcription factor. functional deficiency of *OsRL3* significantly decreased the expression of ABA signaling genes, resulting in promotion of leaf senescence and increase of susceptible to salt stress.

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