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Functional Analysis of an Auxin-Inducible Transcription Factor to Salinity Responses in Plants

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Summary

Salt stress is one of the major extrinsic factors that affect plant growth and crop productivity. Because of their sessile nature, plants have developed various adaptive responses to salt stress. Elucidation of a complex network of the stress responses is expected to engender reduction of crop yield loss caused by salt stress. To identify genes that confer improved tolerance to salt stress, we have constructed more than 20,000 transgenic Arabidopsis overexpressing about 13,000 kinds of rice full-length cDNAs, and isolated 208 lines as candidates for salinity tolerant lines by screening the library under salinity stress. In this study, the salinity-tolerant line R02819 was characterized in detail. An Aux/IAA gene *OsIAA9* was identified as the gene responsible for the salinity tolerance of R02819. *OsIAA9*-overexpressing Arabidopsis showed enhanced tolerance to osmotic stress as well as salt stress. *OsIAA9* was highly induced by salt stress and auxin. Gene expression profile of *OsIAA9* -overexpressing Arabidopsis was examined by microarray analysis. Interestingly, many of the up-regulated genes were induced by both salinity and osmotic stresses. On the other hand, many of the down-regulated genes were repressed by these stresses, showing that *OsIAA9* induces molecular responses to the stresses. Overexpression of *OsIAA9* also affected the expression of auxin-inactivation enzyme, IAA-amido synthase (GH3). *OsIAA9* -overexpressing Arabidopsis represented morphological defects that are often observed in auxin mutants. These results indicate that *OsIAA9* has dual functions - auxin-signal transduction and salt-stress tolerance. *OsIAA9* might function at the intersection between auxin and abiotic stress signaling.