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Studies on Vacuolar Membrane Proton Pumps and Metal-Cation Sensing Proteins Involving in Salt Tolerance in Plants

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Summary

We investigated relationship between salt and plants through proton pumps, cation transporters, and metal-cation-binding proteins. We could carry out several projects with support by SSRF; (1) possible positive effect of salt on plant growth, (2) effect of the lack of a metal transporter on the balance of metal elements in plants, (3) possibility of novel sodium transport system, and (4) additional role of vacuolar membrane Na^+/H^+ exchanger. Here we describe briefly on the project (1).

During the study on metal-cation-binding proteins, we found that NaCl at high concentration conferred the resistance to copper toxicity in *Arabidopsis thaliana*. Copper is toxic for plants at excess concentrations, although copper is an essential microelement. Many proteins and organic acids bind Cu^{2+} and excess Cu^{2+} is incorporated into vacuoles in plants. We tested the effect of NaCl on the copper tolerance of *A. thaliana*. $CuSO_4$ at 0.1 mM notably suppressed the growth of plants. When NaCl was added at a concentration of 100 mM to Cu^{2+}-containing medium, plants grew well compared with that without NaCl (unpublished data). At preset we cannot explain biochemical mechanism of this phenomenon. However, there are some possible explanations: namely, suppression of Cu^{2+}-uptake system, induction of several genes involving stress responses, such as CuZn-superoxide dismutase, and activation of the vacuolar Cu^{2+}-uptake system by NaCl. Now we carry out DNA microarray analysis to determine genes induced by NaCl.