Genetic Engineering of Salt Tolerance in Rice Plant

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Summary

Improvement of salt tolerance is an important challenge in genetic engineering of agronomically valuable crops. Glycinebetaine (hereafter betaine), a quaternary nitrogen compound found in a number of halotolerant plants and bacteria, not only serves as an osmoregulatory substance, but also prevents proteins from salt-induced inactivation and denaturation. Therefore, this compound is considered one of the most critical factors for providing tolerance to salt stress with halotolerant organisms.

Rice (*Oryza sativa*) plants do not produce betaine and cannot grow in high salt environment. Aiming at the enhancement of salt tolerance in rice, the *codA* gene of *Arthrobacter globiformis* encoding choline oxidase, which converts choline into betaine through a single-step reaction, was introduced into rice plants by the microprojectile bombardment. Expression of the *codA* gene, which is driven under the control of the cauliflower mosaic virus 35S promoter in combination to the first intron of the rice *SodCc2* gene, was confirmed at levels of the mRNA, the protein and the enzyme activity in transgenic plants. Betaine was detected in these transformants, demonstrating the first successful production of transgenic rice that accumulates the compound through genetic engineering. Photosynthetic activities measured by chlorophyll fluorescence suggested that the betaine-accumulating transgenics are more tolerant than the wild-type plants to NaCl stress.