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Metabolic changes during adaptation to saline condition and stress memory of *Arabidopsis* cells

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Abstract

To understand molecular mechanisms underlying adaptation of plant cells to saline stress and stress memory, we developed *Arabidopsis* callus suspension-cultured cells adapted to high salt. Adapted cells to high salt exhibited enhanced tolerance compared to control cells. Moreover, the salt tolerance of adapted cells was stably maintained even after the stress is relieved, indicating that the acquired salt tolerance of adapted cells was memorized. In order to characterize metabolic responses of plant cells during adaptation to high salt stress as well as stress memory, we compared metabolic profiles of salt-adapted and stress-memorized cells with control cells by using NMR spectroscopy. A principle component analysis showed clear metabolic discrimination among control, salt-adapted and stress-memorized cells. Compared with control cells, metabolites related to shikimate metabolism such as tyrosine, and flavonol glycosides, which are related to protective mechanism of plant against stresses were largely up-regulated in adapted cell lines. Moreover, coniferin, a precursor of lignin, was more abundant in salt-adapted cells than control cells. Cell morphology analysis using transmission electron microscopy indicated that cell wall thickness of salt-adapted cells was significantly induced compared to control cells. Consistently, salt adapted cells contained more lignin in their cell walls compared to control cells. The results provide new insight into mechanisms of plant adaptation to saline stress as well as stress memory in metabolic level.

Keyword: Stress memory, Callus adaptation, Saline stress, Metabolic responses

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