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AtEF1a, a translational elongation factor 1a from *Arabidopsis*, functions as molecular chaperone and confers resistance to salt stress in yeast and plant

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Objectives

We have isolated and characterized an *Arabidopsis* gene that confers NaCl tolerance to yeast

Materials and Methods

1. Material

   Yeast-*Saccharomyces cerevisiae*

   Plant-*Arabidopsis thaliana* plants

2. Methods

   Arabidopsis genes that can functionally complement salt-sensitive phenotype of a calcineurin (CaN)-deficient yeast mutant (*cnb*, regulatory subunit null mutant) was isolated and characterized.

Results and Discussion

An *Arabidopsis* cDNA clone that encodes putative translational elongation factor 1a (EF1a) was isolated by functional complementation of yeast *cnb* mutant. The amino acid identities of AtEF1a with the known proteins from human, yeast were 82.6%, and 81.2% respectively. The transformants harboring full length cDNA or truncated form of *EF1a* (deleted 24 amino acids) complemented the NaCl sensitive phenotype of *cnbD* cells. Because EF1a is known to regulate protein fidelity in protein elongation step, we made two point mutants related to protein fidelity and examined this activity is related to salt stress. However, the activity of EF1a was not important to salt tolerance in yeast. Interestingly, AtEF1a showed chaperone activity in a dose-dependant manner *in vitro*. Deletion analysis indicated that the chaperone activity of central domain of EF1a (DS3) was significantly higher than that of full length EF1a. Consistent with this observation, DS3 domain was required for NaCl tolerance of *cnbD* cells, but N- or C-term of EF1a was not. When compared with wild-type, knock-out plant of AtEF1a from ABRC stock center was more sensitive to NaCl stress. Furthermore, transgenic plant overexpressing EF1a was more tolerance to NaCl than wild-type. Taken together, we suggest that AtEF1a functions as molecular chaperone in the cell, and this activity is required for NaCl tolerance in yeast and plants. [Supported by EB-NCRC and Biogreen 21 program]

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