

## Stress-response mechanism by osmoprotectants in plants under saline condition and their application to agricultural production

Sunao Yamazaki, Yuji Takao and Jinghua Zhang  
Faculty of Environmental Studies, Nagasaki University  
1-14 Bunkyo-machi, Nagasaki 852-8521

### Summary

The acclimation of a plant to a constantly changing environment involves the accumulation of certain organic compounds of low molecular mass, known collectively as compatible solutes, in the cytoplasm. The evidence from numerous investigations of plants strongly suggests that glycine betaine (GB), an amphoteric quaternary amine, plays an important role as a compatible solute under various types of environmental stress, such as high levels of salts and low temperature. In this work, sugar beet (*Beta vulgaris*) was grown at NaCl concentrations up to 300 mM and the effects of salt on the growth, contents of water, chlorophyll, soluble protein, soluble saccharide and GB in leaf were measured. GB was very well determined by low pH capillary electrophoresis, the measuring condition of which we developed previously. With increasing NaCl concentration in the medium up to 300 mM the growth was significantly retarded. Contents of water and chlorophyll decreased, whereas soluble protein and saccharide concentrations in the leaf changed little. On the other hand, GB concentration increased 6-fold with increasing salinity of the medium, suggesting that GB is a main osmoprotectant in this plant. In order to make clear the time when GB is induced in the plant cells, the seeds were cultured under various salt stress conditions and the seedlings were analysed by capillary electrophoresis. It was found that beat seeds originally possess micro levels of GB and it was lost during early stage of cultivation, while new GB was synthesized in the stage of germination in a dose-dependent fashion with respect to salt concentration in the medium.