Exogenous proline significantly affects the plant growth and nitrogen assimilation enzymes activities in rice (Oryza sativa) under salt stress

ABSTRACT

Salinity has been shown to be a major factor contributing to low nitrogen availability in plants. To verify the changes in nitrogen metabolism activity as affected by the exogenous application of proline under salt stress and its relation to salt tolerance, in vitro rice shoot apices were used as a model to study the growth performance and changes in nitrogen assimilation activities in two Malaysian rice cultivars MR 220 and MR 253. Results revealed that salt stress greatly reduced the plant height, shoot nitrate (NO_3^-) content, shoot glutamine synthetase (GS), and root nitrate reductase (NR) activities in both cultivars. Supplementation of proline significantly increased the plant height, number of roots, root NO_3^- content, root NR, and root GS activities under salt stress in both cultivars with greater enhancement in MR 253 than MR 220. The results also indicated that MR 253 possessed higher nitrite reductase (NiR) and glutamate synthase (NADH–GOGAT) activities as compared with MR 220 in all tested treatments. It was suggested that the NO_3^- content, NR, and GS activities played important roles in regulating nitrogen metabolism under salt stress. Taken together, it was concluded that the ability of proline in mitigating salt stress-induced damages was correlated with the changes in nitrogen assimilation activities.

Keyword: Nitrogen metabolism; Proline; Rice shoot apices; Salt stress