PA-86

Nitric oxide enhances salt tolerance in rice (*Oryza sativa* L.) seedling through gene modulation

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[Introduction]

Rice is of principal importance as a staple food source for more than half of the world population. The world rice production has been projected to be 915 million tons by 2050 which is by far less than the expected yield doubling hypothesis to supply the demand of the would-be 9 billion global population in the mid of the century. The possible reason why it is unable to increase the rice production in a safe pace with the global population growth is associated with biotic and abiotic stress which are aggravated by climate change. Salinity is one of the major abiotic factors that limit rice production in many areas of the world and the level of salt in the river water is being increased from time to time causing shrinkage of the rice lands. As a result, the crop cultivars currently on hand, particularly in small-scale farming systems, are under high threat of salinity. Nitric oxide (NO) plays an important role in a regulation of plants growth, development and as a defense strategy in biotic and abiotic stresses.

[Materials and Methods]

Therefore, the objective was to study the mitigation effect of NO against salinity in different rice genotypes based on the accumulation of transcript levels and phenotypic traits. Two sets of experiments were designed, for gene expression assay and phenotypic data analysis. Two weeks old, rice seedlings were treated with sodium nitroprusside, an NO donor, at a concentration of 0.25 mM for 24 h. After 72 h, No treated and control seedlings were exposed to 150 mM NaCl solutions for gene expression and 100 mM solution for phenotypic study. Nitric oxide enhanced the expression level of OsHIPP38, OsGR1 and OsP5CS2 genes in susceptible genotypes as a response to salinity. Whereas in tolerant genotype the effect of NO was counteracting of the salt induced gene expressions that shunts energy from other biosynthesis activities.

[Results and Discussions]

NO pretreated seedlings also showed high biomass production under salinity stress in comparison with non-treated control seedlings. However, the phenotypic results showed that the effect of nitric oxide in response to salinity was more pronounced in tolerant than susceptible genotypes. Therefore, the use of nitric oxide with the integration of tolerant rice cultivars will help to maintain rice production in salt affected areas.

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