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Comparative study of the mechanisms of salt tolerance in cultivated rice and their wild relatives

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Salinity tolerance among rice varieties vary and most cultivated varieties are sensitive to moderate salinity at 3 ds/m. Given the ubiquitous prevalence, it is presumed that wild rice varieties are capable of tolerating high salinity more than their cultivated counterparts. The objective of this study was to examine the salt tolerant mechanisms in the seedling stage of wild rice relatives; *Oryza nivara* L. and *Oryza rufipogon* L. in comparison to the cultivated rice varieties of *Oryza sativa* L. (salt tolerant – Pokkali and salt sensitive – IR29) with contrasting tolerance to salt stress. A comparative study was carried out on relative growth rate, chlorophyll content, relative water content, membrane stability index, rate of transpiration, monovalent cation content and root anatomy of the seedlings 10 days after sowing (DAS) in response to 100mM NaCl treatment in hydroponic culture system for 12 days.

This study showed that in most physiological and growth parameters, the wild variety; *Oryza rufipogon* showed trends similar to that observed in the salt tolerant variety; Pokkali. *Oryza rufipogon* maintained comparatively higher relative growth rate in roots, culms and leaves, plant height, relative water content and membrane stability index under salt treatment than the salt sensitive IR29 and its wild counterpart *O. nivara*. *O. rufipogon* maintained a physiologically conducive *inplanta* Na^+ and K^+ ion content in response to 100 mM NaCl. A unique pattern of short term salt uptake and transport was also observed in *O. rufipogon*. Although *Oryza nivara* showed a higher membrane stability index, rate of transpiration and relative water content were higher than the salt sensitive IR29 in response to the salt treatment. Further, it showed poor tolerance in terms of retarded growth and higher accumulation of *inplanta* Na^+ content. There was no significant difference observed in the root anatomy of the four rice varieties studied except the slight elongation of endodermal cells in response to salt stress in all cultivars. The outcome of this study identified novel salt tolerance mechanisms based on the analysis of growth, physiological, biochemical and anatomical parameters in wild rice relatives in comparison to the cultivated varieties. Thus the identified phenotypic mechanisms may lead to the discovery of the underlying genes involved in improving salt tolerance in cultivated rice.

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