

Responses of photosynthesis, chlorophyll fluorescence and ROS-scavenging systems to salt stress during seedling and reproductive stages in rice.

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Background and Aims

Salinity is a widespread soil problem limiting productivity of cereal crops worldwide. Rice is particularly sensitive to salt stress during the seedling stage, with consequent poor crop establishment, as well as during reproduction where salinity can severely disrupt grain formation and yield. Tolerance at the seedling stage is weakly associated with tolerance during reproduction. Physiological responses to salinity were evaluated for contrasting genotypes, during the seedling and reproductive stages.

Methods

Three rice genotypes differing in their tolerance of salinity were evaluated in a set of greenhouse experiments under salt stress during both seedling stage and reproduction.

Key Results

Photosynthetic CO₂ fixation, stomatal conductance (g_s) and transpiration decreased substantially because of salt stress, but with greater reduction in the sensitive cultivar IR29. The tolerant lines IR651 and IR632 had more responsive stomata that tended to close faster during the first few hours of stress, followed by partial recovery after a brief period of acclimation. However, in the sensitive line, g_s continued to decrease for longer duration and with no recovery afterward. Chlorophyll fluorescence measurements revealed that non-photochemical quenching increased, whereas the electron transport rate decreased under salt stress. Salt-tolerant cultivars exhibited much lower lipid peroxidation, maintained elevated levels of reduced ascorbic acid and showed increased activities of the enzymes involved in the reactive oxygen scavenging system during both developmental stages.

Conclusions

Upregulation of the anti-oxidant system appears to play a role in salt tolerance of rice, with tolerant genotypes also maintaining relatively higher photosynthetic function; during both the vegetative and reproductive stages.

Keywords: [Chlorophyll fluorescence](#), [photosynthesis](#), [reactive oxygen species](#), [rice](#), [Oryza sativa](#), [salinity](#)

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