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Research article

Understanding physiological and molecular adaptations of three diverse halophytic grasses under saline and sodic stresses

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Abstract

Physiological and biochemical analyses of three halophytes were conducted to explore their tolerance and phytoremediation potential. The halophytes *Urochondra setulosa, Sporobolus marginatus* and *Leptochloa fusca* were categorised based on gas exchange attributes, antioxidant system, biomass production under soil salinity (ECe 30-50 dS/m) and sodicity (pH 9.5-10). *L. fusca* and *S. marginatus* produced slightly higher biomass under the sodic condition of pH 9.5, while in *U. setulosa*, it increased under salinity stress. Under sodic conditions, *L. fusca* showed less reduction in potassium content and maintained a higher K^+/Na^+ ratio in their leaf tissues. A maximum decrease in net photosynthesis was observed in *L. fusca* (28.55%) at ECe ~ 50 dS m^{-1} while minimum in *S. marginatus* (13.73%) at pH ~ 10.0. Comparatively, *U. setulosa* showed higher stomatal conductance and transpiration rate than *L. fusca* and *S. marginatus*. At the highest pH and salinity, the antioxidant activities of enzymes APX, SOD, GR and POX increased in all three halophytes. Quantitative expression of *MnSOD*, *NHX1* and *FuSOS1* genes in all three halophytes increased with salt stresses. Based on these indicators, these halophytes were categorised as salt-tolerant or alkaline-stress-tolerant.

Keywords: Antioxidant, Gas exchange, Gene expression, *Leptochloa fusca*, *Sporobolus marginatus*, *Urochondra setulosa*