Identification of Saline Tolerant Clones of *Casuarina equisetifolia* using Biochemical Markers

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Abstract

Soil salinity has become a major factor limiting crop productivity worldwide, especially in arid and semi arid regions. *Casuarina equisetifolia*, being a multipurpose species with farmer-friendly attributes and industrial demand farmers prefer to grow it in all types of soil. In this context identification clones suitable for different soil conditions, especially saline soils is essential to expand casuarina cultivation. A study was undertaken to identify biochemical parameters as markers for screening clones of *C. equisetifolia* for saline tolerance at nursery stage. Salinity induction experiments were carried out with 25 clones using Hoagland solution as growth medium. Clones were classified into 4 groups based on survival after 3 months namely, Tolerant (withstands up o 250mM), Moderately tolerant (up to 200 mM), Low tolerant (up to 150 mM) and Sensitive (up to 100 mM). Biochemical analysis for soluble proteins, phenols, proline, peroxidase, ascorbic acid, chlorophyll A, chlorophyll B, total chlorophyll, anthocyanin, anthocyanin: chlorophyll, root and shoot sodium and root and shoot potassium ions were conducted before and after saline induction. In addition physiological parameters such as membrane injury index, relative water content, chlorophyll stability index and morphometric parameters were studied. ANOVA showed that except root sodium, collar diameter, membrane injury index and relative water content, all other parameters were significantly differed among clones. Canonical Discrimination Analysis to identify the highly discriminating parameters for grouping the clones showed proline, protein and chlorophyll A, phenol and anthocyanin and chlorophyll B as discriminating parameters, however, Chlorophyll A and B were found to be non-consistent. An increasing trend for proline and decreasing trends for protein and phenol with increasing saline concentration were observed. Anthocyanin showed an initial increase on saline stress followed by a decline. Threshold levels for the biochemical parameters were identified to classify the saline tolerant and sensitive clones. On validation of the results on a new set of clones, proline successfully grouped the clones to the extent of 50%, protein to the level of 60% and both Phenol and Phenol + Protein to the scale of 80%. This study shows that biochemical markers could be used for screening *C. equisetifolia* clones at nursery stage for saline tolerance for further field testing and breeding experiments.