



Journal of Applicable Chemistry

2019, 8 (3): 948-953
(International Peer Reviewed Journal)



Determination of Proline Accumulation, an Abiotic Stress Marker in Pearl Millet Inbred Lines under Salt Stress using Spectrophotometry

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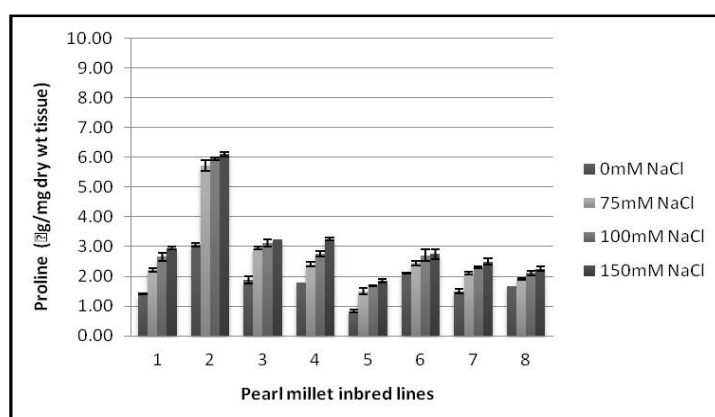
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ABSTRACT

Proline accumulation is a widespread response observed in plants experiencing abiotic stresses like drought and salinity. Apart from acting as an osmolyte for osmotic adjustment, proline contributes to stabilizing sub-cellular structures, scavenging free radicals and buffering cellular redox potential under stress conditions. The determination of this amino acid is therefore very useful to assess the physiological status and to understand the stress tolerance in plants. State of the art spectroscopy and spectrophotometry are being successfully used to decipher the underlying mechanisms of stress tolerance. For a clearer understanding of proline accumulation on plant response to salinity stress, 10-day old pearl millet seedlings were subjected to various levels of salt stress, followed by spectrophotometric determination of the accumulated proline content. Whole plant free proline levels were seen to increase with increasing salinity levels in all the pearl millet lines, specially the tolerant varieties. Accumulation of proline to a higher degree under salinity stress is indicative of the fact that proline acts as cytoplasmic osmoticum and perhaps protects proteins against denaturation. Further use of mass spectrometry (MS)-based analytical platforms to profile stress-responsive metabolites will allow these crop plants to adapt to adverse environmental conditions.

Graphical Abstract



Proline content ($\mu\text{g mg}^{-1}$ dry wt. tissue) under salt stress in eight salt-sensitive lines of pearl millet

Keywords: Spectrophotometry, Salinity stress, Proline accumulation, Osmolyte, pearl millet.