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Ectoine: A Compatible Solute in Radio-Halophilic Stenotrophomonas sp. WMA-LM19 Strain to Prevent Ultraviolet-Induced Protein Damage

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Abstract : Aim: This study aims to investigate the possible radiation protective role of a compatible solute in the tolerance of radio-halophilic bacterium against stresses, like desiccation and exposure to ionizing radiation. Methods and Results: Nine different radio-resistant bacteria were isolated from desert soil, where strain WMA-LM19 was chosen for detailed studies on the basis of its high tolerance for ultraviolet radiation among all these isolates. 16S rRNA gene sequencing indicated that the bacterium was closely related to Stenotrophomonas sp. (KT008383). A bacterial milking strategy was applied for extraction of intracellular compatible solutes in 70% (v/v) ethanol, which were purified by high-performance liquid chromatography (HPLC). The compound was characterized as ectoine by 1H and 13C nuclear magnetic resonance (NMR), and mass spectrometry (MS). Ectoine demonstrated more efficient preventive activity (54.80%) to erythrocyte membranes and also inhibited oxidative damage to proteins and lipids in comparison to the standard ascorbic acid. Furthermore, a high level of ectoine-mediated protection of bovine serum albumin against ionizing radiation (1500-2000 Jm-2) was observed, as indicated by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) analysis. Conclusion: The results indicated that ectoine can be used as a potential mitigator and radio-protective agent to overcome radiation- and salinity-mediated oxidative damage in extreme environments. Significance and Impact of the Study: This study shows that ectoine from radio-halophiles can be used as a potential source in topical creams as sunscreen. The investigation of ectoine as UV protectant also changes the prospective that radiation resistance is specific only to molecular adaptation.

Keywords : ectoine, anti-oxidant, stenotrophomonas sp., ultraviolet radiation
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