National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Resilience of marine bacteria towards climatic stress and heavy metal induced cellular and DNA damage
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Venue	: LS Seminar Hall
Date and Time	: 02 Jul 2024 (10:00 AM)
Abstract	: Bacteria play a pivotal role in regulating various elemental cycles in the mangrove ecosystem. The delicate balance of this ecosystem is under threat from climate change and environmental stressors, which impact the performance of these microorganisms and disrupt the biogeochemical cycle. Amidst the challenges posed by climatic and heavy metal stressors, the present study delves into the genotoxic effects on mangrove bacteria and their adaptive mechanisms. Comparative analysis between two bacterial strains, Bacillus stercoris GST-03 and Pseudomonas balearica DST-02, isolated from the Bhitarkanika mangrove ecosystem in Odisha, India, showed cellular injuries in response to various stressors as evident by declined growth, elevated levels of reactive oxygen species (ROS), and resultant DNA damage. B. stercoris GST-03 showed enhanced tolerance towards acidic pH, whereas P. balearica DST-02 exhibited greater resilience to UV exposure and heavy metals (Lead and Cadmium). The adaptation strategies of these bacterial strains unveiled the role of GST and SOD in ROS scavenging activity, along with the involvement of Nucleotide Excision Repair or SOS response pathways. The significant production of GST enzyme under oxidative stress indicated its key role in the primary antioxidant defense of mangrove bacteria. Despite these adaptive mechanisms, irreversible DNA damage was observed at pH 9 and 200 ppm Cd in B. stercoris GST-03, and at pH 4, 1000 ppm of Pb and 200 ppm of Cd in P. balearica DST-02. The current study broadens our understanding of bacterial responses and adaptability in the face of imminent climate and environmental changes. Understanding the effects of various stressors on bacteria as a proxy will help to predict the instantaneous response by haploid organisms toward future climate change scenarios. Keywords: Mangrove bacteria, oxidative stress, ROS, DNA damage, antioxidants, DNA repair