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Arsenic pollution and its detoxification potential of marine bacteria isolated from Alang-Sosiya ship breaking yard, India

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The aim of the present study was to assess the arsenic contents at Alang-Sosiya, world's largest ship-breaking yard, India. Annually, hundreds of ships have been dismantled, which lead to discharge large amounts of detrimental and persistent pollutants at this location. ICP-OES analysis reveals that the average arsenic contents at Alang-Sosiya were 20.01mg/kg and 18.75µg/L respectively in coastal sediment and seawater samples. The pollution index values of arsenic in coastal surface sediment from the sampling station A1–A6 ranged between 2.95 to 4.23, indicating moderate to high level of arsenic pollution. The marine environment affected by ship-scraping activity and contaminated with arsenic is the potential location to get arsenic hyper-tolerant bacterial isolates. Out of 16 isolated bacterial strains, KKDK-1 and KKDK-2 sustained 600mM and 500mM arsenate respectively. The 16S rRNA ribotyping identified strains KKDK-1 and KKDK-2 as *Halomonas* species. The strain KKDK-1 showed the maximum arsenic accumulation of 21.7±3.3 mg g⁻¹ cell dry weight at exponential phase (60h), followed by sudden extrusion of arsenic during stationary phase (84 h) of bacterial growth. Whereas, strain KKDK-2 accumulated 6.8±1.12 mg Arsenic g⁻¹ cell dry weight during exponential phase (72 h), which remains almost invariable during stationary phase (96-144 h) of bacterial growth. TEM analysis revealed that the significant amounts of intracellular electron dense particles accumulated in both KKDK-1 and KKDK-2 treated with arsenic. EDAX analysis confirmed the presence of heavy metal arsenic. These results indicate the hypertolerance of arsenic with higher accumulation capacity, signifying KKDK-1 and 2 as potential candidates for arsenic detoxification of arsenic-contaminated sites.

Biography

Devang Bharatkumar Khambholja has completed his PhD in Biochemistry. After completion of his Masters in 2011, he was appointed as Research Fellow (JRF & SRF) in Ministry of Earth Sciences, Government of India sponsored project. He has published 3 papers in peer reviewed international journals and contributed a book chapter in Handbook of Arsenic Toxicology, Academic Press (Elsevier). Also he has presented and attended various National and International Conferences. Since 2017 He is working as an Assistant Professor at BN Patel Institute of Paramedical and Science (Paramedical Division), Anand, Gujarat, India. Presently, he is working on project entitled "Efficacy of Natural antibacterial agents incorporated onto guided tissue regeneration membrane against periodontal pathogens".

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