National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Redefining waste management approaches using marine bacterial consortium for heavy metal bioremediation
Speaker	: Trisnehi Pradhan (523ls6010)
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Venue	: LS Seminar Hall
Date and Time	: 11 Jan 2025 (16:30 hrs)
Abstract	: Marine ecosystems are prone to heavy metal contamination from various anthropogenic sources which necessitate innovative waste management strategies. Biofilm forming marine bacteria have the ability to sequester metal ions in their extracellular polymeric substances (EPS), thereby serving as promising bioremediating agents. The present study investigates the metal remediation potential of consortium formed by biofilm-forming marine bacterial isolates Pseudomonas aeruginosa CSA06P and Kurthia gibsonii PLW09P tolerating high concentration of Pb(II), Cr(VI), and Hg(II). Confocal laser scanning microscopy confirmed interaction of biofilm with metals, showing reduced biofilm thickness. The results of metal sequestration studies indicated that the consortium showed higher removal efficiency of 97.66 % for 100 ppm Pb(II) , 41.8 % for 100 ppm Cr(VI), and 51.92 % for 15 ppm Hg(II). The biofilm mode exhibited enhanced metal removal compared to planktonic mode; hence, the interaction between EPS and metal ions was further studied. Field Emission SEM-Energy Dispersive X-ray Spectroscopy (FESEM-EDX) revealed that globule size increased post-treatment with multimetal which confirmed metal sequestration by EPS. Fourier transformed infrared spectroscopy (FTIR) revealed the interaction between metal ions and EPS associated functional groups (O-H, –C≡C and H–C=O). Proton nuclear magnetic resonance (1H NMR) showed that the intensity of peaks in proton ring region of carbohydrates in EPS has significantly decreased with slight peak shift (from 3.65 ppm to 3.47 ppm). The interactions strongly indicate that EPS of the consortium play a pivotal role in metal sequestration. This bioremediation strategy holds significant potential for mitigating heavy metal contamination, offering a sustainable solution for environmental waste management. Keywords: Bioremediation, heavy metals, consortium, extracellular polymeric substances