National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Mitigation of lead-induced soil toxicity and plant growth promotion by phosphate-solubilizing bacterium Enterobacter hormaechei KR2215
Speaker	: Sharmily Chakraborty (521ls6013)
Supervisor	: Santosh Kumar #2787
Venue	: LS Seminar Hall
Date and Time	: 11 Jan 2025 (16:00 hrs)
Abstract	: Lead (Pb) contamination in soil, primarily caused by mining and agricultural practices, poses significant environmental challenges due to its toxicity and persistence. Phosphate-solubilizing bacteria (PSB) adsorb Pb through anionic groups present on their cell walls, thereby improving soil health, and enhancing nutrient availability to plants. This study explored the role of PSB in Pb remediation and chickpea (Cicer arietinum) growth under lead stress. The bacterium Enterobacter hormaechei KR2215, isolated from the Bhitarkanika mangrove ecosystem, demonstrated exceptional Pb-removal efficiency with a tolerance of 1900 ppm while promoting plant growth. ICP-OES analysis revealed that the bacterial activity significantly reduced Pb concentration in biofilm mode compared to the planktonic mode. ATR-FTIR and 1H NMR spectroscopy analyses revealed shifts in functional groups in the biofilm-EPS treated with Pb. FESEM-EDX spectra confirmed Pb adsorption peaks on the treated EPS, with approximately 39.73 atomic wt.%. The phosphate solubilization activity peaked upto 931.96 mg/ml on the 4th day, accompanied by a decrease in pH. An upregulation of the phosphate solubilizing genes (phoR and pqqE) was observed till the 4th day, while gene responsible for lead uptake (zntA) showed increased expression up to 5th day. The chickpea plants exhibited an increased height and vigor index under Pb stress when inoculated with E. hormaechei KR2215. Additionally, antioxidant activity increased significantly, with a 49.23% rise in superoxide dismutase and 61.85% in catalase, aiding plant survival under Pb stress. Therefore, this bacterium offers a promising biological solution for improving soil health and crop productivity in lead-polluted environments. Keywords: Phosphate-solubilizig bacteria; Biofilm; Lead; Antioxidant activity