National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Feasibility studies on integrated treatment of chromium contaminated water using microbial consortium and hairy roots of Nicotiana tabacum
Speaker	: Leonard J (Rollno : 516ch6005)
Supervisor	: Prof. Susmita Mishra
Venue	: New Seminar Hall (https://meet.google.com/abb-fwxn-mnq)
Date and Time	: 19 Dec 2024 (9.30 am)

Abstract : Hexavalent chromium Cr(VI) contamination is one of the most vital environmental problem in Odisha since it is being a rich belt of chromite mines. Discharged water from the mines to the surface water bodies consists Cr(VI) above permissible limit. Bioremediation can be a possible eco-friendly remedy for this problem. Chromium reducing organisms were isolated from the soil of chromite mines. Five highly potent bacterial isolates were screened after acclimatization and identified using 16S rRNA sequencing. Three bacterial consortia namely CRC589, CRC580 and CRC489 were developed from the different combinations of screened bacterial isolates. The process parameters such as pH, temperature, inoculum size, inoculum age and carbon source were optimized for maximum Cr(VI) reduction by conventional single variable method. Box- Behnken design (BBD) of Response surface methodology was implemented to evaluate the effect of three independent variables including pH, temperature and carbon source concentration on the Cr(VI) reduction by microbial consortia. Optimization results revealed that the optimum temperature for all the three consortia was 35°C and optimum pH for consortia CRC589, 489 was 7 whereas pH 8.5 was found to be optimum for CRC580. Batch and continuous studies for Cr(VI) reduction were conducted with consortiumCRC489. Cr(VI) reduction in the CSTR revealed that at the dilution arte of 0.01 h-1, the maximum reduction of 91 % and 80% was achieved at the initial Cr(VI) concentration of 10 mg/L and 25 mg/L respectively. Hairy roots were induced from *Nicotiana tabacum* through the infection of *Agrobacterium rhizogenes* MTCC 2364. Effect of various influencing factors on the hairy root induction such as co-cultivation period, infection time, Acetosyringone concentration and ultrasonication treatment was evaluated. Hairy roots were used to evaluate their potential to remove Chromium from aqueous solution at varying chromium concentration. The effluent of CSTR study was treated with hairy roots and resulted in a Cr(VI) level below the permissible limit in the water with 99.12 % reduction. In addition to that the production of secondary metabolite from the hairy root under the influence of various Cr(VI) concentration was evaluated by HPLC.

Keywords: *Hexavalent chromium, consortium, RSM, 16s rRNA sequencing, CSTR, Hairy root, secondary metabolite*