ABSTRACT

Heavy metal Cr in +6 oxidation state, introduced in the ecosystem from various kinds of contaminated domestic and industrial wastes. It is extremely toxic, carcinogenic and mutagenic in nature. Its direct discharge can contaminate the soils, ground water, sediments and surface waters and creates serious risk to environment which requires immediate attention of scientists and technologists for getting eco friendly and economical solution for effluent treatment containing Cr(VI).

In this study bioremediation of toxic Cr (VI) was achieved by using chromate reducing bacteria (CRS). CRS isolated from discharge site of effluent, investigated morphologically, biochemically, by 16S rRNA sequencing technique and characterized as Bacillus Megaterium C31171 (CRS-W), Staphylococcus sp. SeLB4 (CRS-Y1), Burkholderia sp (CRS-Y2) and Kocuria turfanensis JKR36 (CRS-R). Minimum inhibitory concentration of Cr (VI) for CRS-W, CRS-Y1, CRS-Y2 and CRS-R was found.

Microbes-cell and extracellular enzyme secreted by microbes were separated. Extracellular enzyme was purified and encapsulation of microbes-cell and extracellular enzyme has been done using sodium alginate. Sodium alginate beads of microbes-cell and extracellular enzyme of all isolated CRS were applied initially on synthetic solution of Cr (VI) and then on effluent of electroplating industry of Nashik district containing Cr (VI).

Optimization of factors affecting on bioremediation like pH, initial concentration of Cr (VI) in effluent and e- donor has been done in order to achieve effective bioremediation.
Results of Cr-VI degradation were analyzed periodically by UV Visible spectrophotometer at λmax=540 nm. Total concentrations of Cr in treated effluent samples were analyzed by atomic absorption spectroscopy.

All four CRS were found effective for bioremediation of toxic Cr (VI). It was observe that degradation of Cr (VI) was increased with time from synthetic solution as well as from effluent by encapsulated microbes-cell, microbes enzyme and decreased with concentration. Bioremediation of Cr-VI was more effective after addition of electron donor like glucose, peptone, molasses, succinate and starch, at pH-5and pH7.

Bioremediation of Cr-VI was found faster in synthetic solution than effluent. It was also found rapid by extracellular enzyme of microbes than microbes cell. Enzymatic transformation of Cr(VI) to Cr(III) during bioremediation was confirmed by the results of bioreduction of Cr(VI) obtained by U.V. visible spectrophotometer and Atomic absorption spectroscopy analysis for treated effluent.

Effective time interval for bioremediation by microbes cells and microbes enzyme were determined by statistical analysis of results obtained. Degradation of Zn present in effluent of electroplating industry was also observed during bioreduction of Cr(VI).