

GENOTOXICITY EVALUATION AND BIOREMEDIATION OF CHROMIUM IN TANNERY INDUSTRY WASTEWATER USING MEDICINAL PLANTS

ABSTRACT

Development of rapidly increasing industry and population growth, utilization of water for various purposes increases tremendously, as a result, sources of water are polluted by discharging wastewater from both industry and domestic sectors. When compared to water pollution caused by domestic sector, pollution caused by industry sector contributes more. Today, the heavy metals like Cu, Zn, Ni, Pb, Cd and Cr into various sources of drinking water pose a great threat to public health.

Among these heavy metals, pollution by chromium is of major concern as the metal is used in electroplating, leather tanning, metal finishing, and chromate preparation. Water plays a vital role in various processes had in the above said chrome based industries, particularly leather tanning industry, as a result, large volume of wastewater generated from tanning industry. In leather tanning the wastewater generates from various stages viz. pre-tanning, tanning and post tanning, which generates a huge amount of toxic and physico-chemically different effluent. The tannery industry wastewater is the final composite wastewater discharged from the tannery industry to the Common Effluent Treatment Plant (CETP) for final treatment. The tannery wastewater contains high levels of COD, BOD, SS, TDS, sulphates, chlorides along with Cr(III) & Cr(VI). The pH of tannery industry wastewater ranges from acidic to alkaline depending on the processes carried out in industry.

The usual treatment is based on a precipitation methodology in order to recover and reuse the Cr. Technically, the spent chrome effluent is a high volume effluent with very high concentration of Cr. In Indian scenario where 80% of tanneries are operating under small scale category, the recovery and reuse of chromium does not practiced much as recovery and reuse of Cr increases the operational cost and decreases the quality of leather. This in turn increases the concentration of Cr in the effluent discharged by the industry directly to the water bodies or to the CETPS. The people residing in these contaminated areas are facing health hazards like asthma, chromium ulcers and other types of skin diseases, when consumed the chromium polluted water. Due to this reason, the chromium in contaminated water has to be removed.

The present study focuses to identify chromium degrading fungi and to develop eco-friendly technology for reducing the chromium from tannery industry wastewater.

OBJECTIVES OF PROJECT

1. Evaluate the effluent characteristics of the tannery industry wastewater.
2. To screen and identify the fungi strains in the tannery industry wastewater contaminated soil and water, which demonstrates greater tolerance to chromium.
3. To optimize the growth parameters of identifying fungi strains with respect to various concentrations of chromium in tannery industry wastewater.
4. To investigate the morphological and biochemical characteristics by 16S rRNA sequencing techniques.
5. To identify the Chromium tolerant gene in *Cassia angustifolia* (Senna), *Catharanthus roseus* (Madagascar periwinkle), *Gloriosa superb* (Glory lily), *Chrysopogon zizanioides* (Vetiver), *Mucuna pruriens* (Velvet bean).
6. To investigate antioxidant activity of *Cassia angustifolia* (Senna), *Catharanthus roseus* (Madagascar periwinkle), *Gloriosa superb* (Glory lily), *Chrysopogon zizanioides* (Vetiver), *Mucuna pruriens* (Velvet bean).
7. To investigate the effect of different concentrations of tannery industry wastewater on growth, pigment, protein profile, lipid content, antioxidant enzymes, chlorophyll content of *Cassia angustifolia* (Senna), *Catharanthus roseus* (Madagascar periwinkle), *Gloriosa superb* (Glory lily), *Chrysopogon zizanioides* (Vetiver), *Mucuna pruriens* (Velvet bean) with and without vermicompost (organic matter) and compare the same under field trial.
8. To validate the selected plant species with respect to valuable products derived from them.
9. To develop the bioremediation model for selected medicinal plants.