

BIOCHEMICAL ANALYSIS OF TANNERY EFFLUENT

M.LNIYAS AHAMED*, N. CHANDRASEKARAN AND AMITAVA MUKHERJEE

Centre for Nanobiotechnology, VIT University, Vellore 632014, Tamil Nadu, India

Email: lninyasahamed@vit.ac.in

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ABSTRACT

Objective: The objective of the present investigation is to assess the biochemical analysis in the effluent sample collected from the nearby runoff of common effluent treatment plant (CETP) at Valayampet, Vaniyambadi, Tamilnadu, India.

Methods: Biochemical characteristics of the effluent were determined as per the protocol derived by American public health association (APHA).

Results: The results indicated that effluent sample was found toxic in nature, having high BOD, COD, TDS and Cr (VI) content (3.13 mg/L).

Conclusions: As per the results obtained it was concluded that leather industry should make all attempts to reduce its impact on environment by making every effort to reuse and recycle chemical compounds.

Keywords: Tannery, Vaniyambadi, effluent, CETP, chromium.

INTRODUCTION

Tanneries are such industries which contributes a major part in water usage. Obviously the waste water from this unit contains considerable amounts of hazardous compounds and where heavy metals are very common. Today 70% of available water in India has been polluted and two thirds of illness in India is related to water-borne diseases. Effluents from the tanneries contain high concentrations of inorganic and organic chemicals and are characterized with residual COD and high TDS. Chromium salts (particularly chromium sulphate) are the most widely used tanning substances today. Hides tanned with chromium salts have a good mechanical resistance, an extraordinary dyeing suitability and a better hydrothermic resistance in comparison with hides treated with vegetable substances. Unfortunately only a fraction of the chromium salts used in the tanning process react with the skins. The rest of the salts remain in the tanning exhaust bath and are subsequently sent to a depuration plant where the chromium salts end up in the sludge [1-3]. At high concentration, Cr³⁺ salts used in tanning process exhibit toxic and carcinogenic behavior to the flora and fauna of the aquatic systems [4-5]. One of the major emerging environmental problems in the tanning industry is the disposal of chromium contaminated sludge produced as a by-product of waste water treatment.

At high concentrations chromium is toxic, mutagenic, carcinogenic and teratogenic, chromium exists in oxidation states of +2, +3 and +6. The trivalent oxidation state is the most stable form of chromium and is essential to mammals in trace concentration and relatively immobile in the aquatic system due to its low water solubility. The hexavalent chromium is much more toxic to many plants, animals and bacteria inhabiting aquatic environments [6-7].

There are more than 10 nos of CETP(s) in operation in the Vellore district, Vaniyambadi CETP is tied up with more than 100 tanneries, handling industrial effluents and discharging treated effluents in Palar river basin. There is no water flow in River Palar at present due to construction of many water reservoirs across the tributaries in Andhra Pradesh and Karnataka. Due to high permeability of riverbed, the treated effluents infiltrate into the soil and almost little (or no) discharge is visible in the river. Generally there are three types of wastewater from tanneries i.e. soaking effluent, chromium effluent and other wastewater. Soaking wastewater containing high TDS is commonly allowed for solar evaporation either in the premises or at CETPs. The effluents are generally high TDS, BOD and CETP(s) also receives chromium in significant concentrations.

Only a few CETPs are meeting the standards in terms of BOD and none of the CETPs are meeting the standard in terms of TDS as stipulated by Tamil Nadu pollution control board. None of the CETPs have been issued either consent order or direction by TNPCB [8]. The objective of the present investigation is to assess the biochemical analysis in the effluent sample collected from nearby runoff of common effluent treatment plant (CETP) at Vaniyambadi, Tamilnadu, India.

MATERIALS AND METHODS

Materials

Potassium dichromate (K₂Cr₂O₇) [Analytical grade] used for the preparation of Cr (VI) stock solution and 1, 5-diphenylcarbazide (1, 5 DPC) required for colorimetric estimation of Cr (VI) was purchased from Sigma -Aldrich Chemical Co., USA. All other reagents used were of analytical grade.

Methods

Effluent sample collection

The effluent sample from nearby runoff of common effluent treatment plant (CETP) at Valayampet, Vaniyambadi, Tamilnadu, India, was collected in sterile glass bottles, transported on ice to the laboratory for biochemical analysis.

Biochemical Analysis

Biochemical characteristics of the effluent were determined following standard methods described by American public health association (APHA) [9]. The amount of Cr (VI) in the effluent sample was determined using diphenylcarbazide (DPC) colorimetric methods with a UV-Vis spectrophotometer (Model No. 1240 - Shimadzu Japan) with 1.0 cm quartz cuvettes. Stock solution (1g/ L) of Cr (VI) was prepared by dissolving required quantity of K₂Cr₂O₇ in deionised water. This solution was further diluted to prepare different working concentrations. The pH of the solution was adjusted with 0.1 N HNO₃ and 0.1 N NaOH solutions.

RESULTS

The effluent sample collected from nearby runoff of common effluent treatment plant (CETP) at Valayampet, Vaniyambadi was analyzed for biochemical properties and results showed in Table 1. The effluent was highly acidic (pH 6.3) having high biochemical oxygen demand (983 mg/L), chemical oxygen demand (1873 mg/L), total dissolved solids (9984 mg/L) and Cr content (3.13mg/L).

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