Tannery wastewater treatment pdf files full

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RSC Advances

PAPER

Cite this: RSC Adv., 2023, 3, 29870–29878

Bioreatment of simulated tannery wastewater containing Reactive Black 5, aniline and Cr(VI) using a biochar packed bioreactor

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Acid and wastewater chromium (Cr(VI)) are common pollutants in wastewater generated by the leather processing industry. This study was designed to develop a treatment strategy that can simultaneously remove Cr(VI) and aniline from wastewater. To this end, a biochar was prepared from locally available material and evaluated, after which biochar produced from pyrolysis of corn cobs at 500 °C was selected for further studies. Batch experiments revealed that biochar had a high surface area (1.2 m² g⁻¹), mesoporosity (0.12 cm³ g⁻¹) and ability to support microbial biofilm formation. In the biosorption experiments, biochar exhibited a maximum adsorption capacity of 0.0125 mg g⁻¹ for Cr(VI) and 0.0167 mg g⁻¹ for aniline. Application of corn cob biochar in the presence and absence of Cr(VI) using the bacterium Pseudomonas putida strain P1. The results showed complete biodegradation of Reactive Black 5 (50 mg L⁻¹) and aniline (100 mg L⁻¹) within 24 h and 48 h, respectively, in a bioreactor operated in batch mode at 25 °C ± 2 °C. A continuous packed bed bioreactor. Complete biodegradation of aniline (hydraulic retention time (HRT) = 24 h) and Reactive Black 5 (HRT = 48 h) was observed in the bioreactor. Cr(VI) was also found to fulfill the primary role of Cr(VI) analysis confirmed the biodegradation of Reactive Black 5 and aniline

- *Deliming and Bating*: The unhaired, fleshed and alkaline hides are neutralised with acid ammonium salts and treated with enzymes, similar to those found in the digestive system, to remove hair remnants and to degrade proteins. During this process hair roots and pigments are removed. This results in the major part of the ammonium load in the effluents.

- *Pickling*: Pickling increases the acidity of the hide to a pH value of 3 by addition of acid liquor and salts, enabling chromium tannins to enter the hide. Salts are added to prevent the hide from swelling. For preservation purposes, 0.03-2% by weight of fungicides and bactericides are usually applied.

- *Degreasing*: Normally performed together with soaking, pickling or after tanning, degreasing is performed by organic solvents or surfactants, leading to a higher COD value in the effluent.

b) Tanning (Tanyard operations):

Principally, there are two possible processes:

- *Chrome tanning*: After pickling, when the pH value is low, chromium (III) salts are added. To fixate the chromium, the pH is slowly increased through addition of a base. The process of chromium tanning is based on the cross-linkage of chromium ions with free carboxyl groups in the collagen. It makes the hide resistant to bacteria and high temperature. The chromium-tanned hide contains about 2-3% by dry weight of Cr (III). Wetblue, i.e. the raw hide after the chrome-tanning process, has about 40% of dry matter.

- *Vegetable tanning*: Vegetable tanning is usually accomplished in a series of vats (first the rocker-section vats in which the liquor is agitated and second the lay-away vats without agitation) with increasing concentrations of tanning liquor. Vegetable tannins[1] are polyphenolic compounds of two types: hydrolysable tannins (i.e. chestnut and myrobalan[2]) which are derivatives of pyrogallols[3] and condensed tannins (i.e. hemlock and wattle) which are derivatives from catechol[4]. In some cases as much as 50% by weight of tanniin is incorporated into the hide.

c) Wet Finishing (Post-Tanning):

The wet finishing processes are sometimes performed in one single float. Chromium tanned hides or Wetblue are often retanned - during that process the desirable properties of more than one tanning agent are combined - and treated with dye and fat to obtain the proper filling, smoothness and colour. Before actual drying is allowed to take place, the surplus water is removed to make the hides suitable for splitting and shaving. Splitting and shaving is done to obtain the desired thickness of the hide. The composition of pollutants in the wet finishing effluent is complex due to the presence of dyes, fat liquors and combined tanning agents, but the total amounts generated are smaller than in prior steps and often not considered as significant.

[1] The vegetable tanning agents used are typically 15-70% of commercial extraxt, often sulphited, then spray dried or concentrated. [2] myrobalan nut: fruit of *Terminalia chebuka* (Asian tree), used in medicines, for ink/dye production and for tanning leather
[3] pyrogallol = pyrogallic acid; weak acid, also used e.g. as developer in photography
[4] (catechu): astringent extract of Malayan plant *gambir* or similar vegetable extract

International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Quantification of Pollution Discharges from Tannery Wastewater and Pollution Reduction by Pre-Treatment Station

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Abstract: ***Leather tanning generates many complex and highly loaded effluents that require treatment before being discharged into receiving waters. Wastewater from tanneries usually contains high levels of salinity, organic and inorganic matter, dissolved and suspended solids, ammonia, organic nitrogen and specific pollutants (sulphide, chromium and other toxic metal salt residues). Wastewater characterization is an integral part of treatment and management strategies for industrial effluents. This paper outlines the results of detailed characterization of tannery wastewaters in Mohamedia city, Morocco. It evaluates aside from raw wastewater quality in terms of major polluting parameters, the effect of physical settling on wastewater characteristics and on heavy metal removal. The results showed that the COD and chromium were removed mainly through sedimentation: 83% removal of total COD with initial concentration of 27,6 mg/l, and 40-70% removal of total chromium from settled tannery wastewaters, at an initial concentration of 811,4 mg/l and 223,7 mg/l respectively. Other heavy metals were removed by the primary treatment (90% removal of total lead and 98% of total mercury at an initial concentration of 754 µg/l and 716 µg/l respectively).***

Keywords: Tannery Wastewaters, physical settling, Chromiu

1. Introduction

Industrial wastes are usually generated from different industrial processes. As a result the amount and toxicity of waste released from industrial activities varies with the industrial processes. Again, among all the industrial wastes tannery effluents are ranked among the highest pollutants [1]. Tanneries are one of the most prominent sources of chromium pollution to the aquatic environment. If not adequately treated, wastewater from tanneries contaminates surface water and sediments to a toxic level.

Tannery industry in Morocco is the significant contributor to the economy and provides large scale employment opportunity for people of economically weaker part of the society. In the factory of Mohammedia, the tanning operation in which organic or inorganic materials become more chemically bound to the available substance and preserve it from deterioration.

The main chemicals used include sodium sulphine and basic chromium sulphate including non-ionic wetting agents, bactericides, soda ash, CaO, ammonium sulphide, ammonium chloride and enzymes. Others chemicals are sodium bisulphate, sodium chlorite, NaCl, H2SO4, formic acid, sodium formate, sodium bicarbonate, vegetable tannins, syntans, resins, polyurethane, dyes, fat emulsions, pigments, binders, waxes, lacquers and formaldehyde. Various types of processes and finishing solvents and auxiliaries are also used [2]. It has been reported that only about 20% of the large number of chemicals used in the tanning process is absorbed by leather, the rest is released as waste as reported by Blacksmith Institute's [3]. The characteristics of tannery wastewaters vary considerably from tannery to other depending of its size, chemicals used for a specific process, amount of water used and type of final product produced by a tannery. Tannery effluents are characterized by high concentration of pollutants and a great variety of composition. There are considerable dissimilarities in the concentration range of pollutants in tannery wastewaters given by different authors [4]. The main inorganic pollutants are chloride, sulphate, ammonium ions, and sulfide ions... Moreover, the amount of organic pollutants is large-the COD value is usually several thousand mg/l of oxygen. Most of these pollutants are in soluble form, but a lot of them exist in suspension and only few are colloidal [5]. Heavy metal pollution, especially chromium pollution in wastewater sources from tannery has affected the life of many creatures on earth.

Chromium is an accidently occurring heavy metal that can exist in air, water, soil, and food, and common exposure pathways include ingestion, inhalation, and dermal contact. The primary health impacts from chromium are damage to the gastrointestinal, respiratory, and immunological systems, as well as reproductive and developmental problems. Chromium is a known human carcinogen. Its contribution to the pollution can affect all ecosystems and human health directly or through the food chain. Therefore, the determination of chromium in this study is of great importance since the effluents studied are discharged directly in sewerage without treatment. Example of this harm to the environment was in India, especially, Kanpur tannery industry, where in 2003 the main tanneries effluent disposal unit was dumping 22 tonnes slug of Chromium laden solid waste per day. In tannery industry, effluents are produced up to 64 kilo tonnes of wastewater per year [6]. These problems make the treatment of tannery

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n = 6, CWU1, P. pyramidalis. The reactor zone with 0.59Ã Âm depth (D) was filled with 15¢ÃÂÂ20Ã Âmm VB followed by 0.03Ã Âm depth with 5¢ÃÂÂ10Ã Âmm of VB. A., and Brix, H. ¢ÃÂÂToxic Waste from Leather Industries,¢ÃÂÂ in Energy from Toxic Organic Waste for Heat and Power Generation. pyramidalis plants are relatively short with a maximum length of about 37Ã Âcm, which are thinner, and fibrous structures are with attached root nodules. Denitrification and Environmental Factors Influencing Nitrate Removal in Guaymas Basin Hydrothermally Altered Sediments. Total Environ. doi:10.3389/fmicb.2012.00377PubMed Abstract | CrossRef Full Text | Google ScholarBuljan, J., Kral, I., and Clonfero, G. Hazard. This might be the degradation of the organic waste in the equalization tank before it was fed to the CWUs. Studies on the BOD5/COD of tannery wastewater effluent indicated 0.3 (Durai and Rajasimman, 2011) and 0.2 (Elabed et al., 2019). Colloidal solids might be removed by bacterial growth that could decay and settle it. Ind. The outlet concentration in the pilot HSSF constructed wetland units varied in the range of 0.58¢ÃÂÂ2.22Ã ÂmgÁ ÂL¢ÃÂÂ1. doi:10.1016/b978-0-08-102528-4.00005-5CrossRef Full Text | Google ScholarStottmeister, U., WieÂÂner, A., Kuschk, P., Kappelmeyer, U., KÂ¤Âstner, M., Bederski, O., et al. Editors A. The vesicular nature of the rock increases the surface area of contact with the contaminants and becomes a good harbor for microorganisms to degrade the organic matter in the wastewater.The selection of plants is an important issue in a CWS as they must survive the potentially toxic effects of the wastewater and its variability. doi:10.1186/s40068-018-0112-2CrossRef Full Text | Google ScholarArias, C. This might be due to the plants¢ÃÂÂ integrated effect in the treatment process. domingensis (CWU2) and E. A. 12 (4), 894¢ÃÂÂ901. 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TABLE 1. (2007) that the TSS removal efficiencies vary between 48 and 92% for 3 cm d−1 and 62-77% for 6 cm d−1 HLR for a horizontal system of wet waterways with different plants with a varied influx concentration between 33 and 125 mg L−1 TSS. Temperature effect, HRT, Vegetation and media porous on Pilot-Scale Horizontal Subsurface Flow Removal Effect Built in Wetlands. All pilot treatment units were efficient to remove Cr from concerie waste waters. A 2,000 L plastic tank has been installed to store waste water from the equalization tank and to feed the built wet units (Figure 1A). Pyramidalis) to assess the treatment performance of contaminants from concereal waste water in a pilot scale. Materials and methodsDescription of the study siteThe volcanic basaltic rocks used for building bed units were collected around the river Abbay gorge at about 11°36 ′00″ N latitude and 37°24 x00″ And longitude at an altitude of 1,800 m, where volcanic rocks are abundantly available. purpureum, C. The integrated CWS global performance gives confidence for its definitive application of the treatment of conceria waste water with a high discharge volume. Each unit had a length (L) of 2.8 m, a width (W) of 0,80 m, and a height of 0,62 m (volume of 1.39 m3) as shown in Figure 1B. Skiing. 3, 377. 9 (5), 420-427. pyramid (CWU4) and T. 44 (12), 10057–10066. The total Cr concentration in wastewater was found in the range of 4.27-20.48 mg L−1 with an average value of 11.73 ± 7.00 mg L−1. Dordrecht: Springer, 163–192. Water Res. This could be due to precipitation in the condition ottadA ottadA ²ÂuP :etiurtsoc elosi ellen surohpsohP .T id enoizomir alled icidar eL .)inroig 6(ognul enoizavresnoc id opmet e Should the media be identified? Waste water was fed to the units of the wetlands through an HDPE tube with a control valve. General considerations. B., Kuschk, P., Vainshtein, M. Total average CR concentration (MGâ Gâ˚′1) Dry plant parts (DW) of CWU (n = 3). The removal efficiency of the CWU was determined by the characteristics of waste water collected from the entry and exit of each unit shown in Table 1. DOI: 10.2166/WST.2017.6110.2166/WST.2017.613 Abstract -Abstract | CrossRef Full Text | Google Scholarapha (1998). The studies indicated that the optimal pH for NO3â^âˆâ^âˆâ^âˆâ^âˆâ^âˆâ^â^â€TM-N removal varied between pH 6 and 8 and an increase in temperature with a lower limit of 5 â ° C and a higher limit of 70 ° C (Akpor et al., 2008). N. E., Nguyen, M. Doi: 10.1061/(asce) ee.1943-7870.0000636crossref Complete text | Google Scholarmccarroll, N., Keshava, N., Chen, J., Akerman, G., Kligerman, A. e Rinde, E. (2009). 1, 378 - 381. G., Premrov, A. and Tonderski, K. Manage. doi: 10.1002/em.20525PUBMAD ABSTRACT | CrossRef Complete text | Google Scholarpapaevangelou, V. T. and Seyoum, L. Chemosphere 168, 716â€ “730. Karka. 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Domingensis (CWU2) showed a removal efficiency of 77.4% and 76.78% respectively), the water pact. Cié was made to minimize the shock produced by the wastewater toxic concerts and provide time for adaptation for vegetated plants on the units bed (Davis, 1995). Remediation of the bleaching material effluent from horizontal flow increased bacterial and vertical flow built Wetlands: comparison with pilot scale. Latifolius (CWU3). The control (not verified) removed 78.78% of the COD, which was relatively low compared to the Vegetable Units. This is in agreement with other CR accumulation studies in the parts of the plant (Sultana et al., 2015; Papaevangelou et al., 2017). Table 2. The wavelength selected for the CR analysis was 267,716 nm. The statistical analyzes of the data were performed using the Microsoft Excel and Origin Lab software. 281, 106-113. 73, 684â € “690. M. and Dekkers, D. 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A., and Sun, G. 9 (1), 11¢ÃÂÂ22. doi:10.1016/b978-075067963-3/50009-6CrossRef Full Text | Google ScholarInternational Agency for Research on Cancer (IARC) (1990). Treatment of Leather Industry Wastewater by Aerobic Biological and Fenton Oxidation Process. Google ScholarAkratos, C. Nat. The main nitrogen removing mechanisms in constructed wetlands include microbial interactions with nitrogen, sedimentation, chemical adsorption, and plant uptake (Lee et al., 2009). F., and Harguinteguy, C. The maximum removal efficiency (80.32%) was observed by P. The Nile. Mutagen. doi:10.1016/j.ecoleng.2005.04.013CrossRef Full Text | Google ScholarBeutel, M. A., Shabir, G., Islam, E., Tahseen, R., et al. (2016) also reported 90% COD and 91.4% BOD5 removal efficiencies with an average inflow concentration of 1,134 269 and 523 â ± 219 â Mgâˆ΄1, respectively. W, nigro, l. d. brouillard, e. latifolius vegetated led (cwu3). in this study, a wet area was developed built with a hssf system integrating vb with different plant species available locally (p. bull. the pilot cwu were established in the premise of bahir dar tannery plc, bahir dar, etyopia. technol. pyramidalis; and cwu5, control (not vegetated). removal efficiencies of the pilot unit of wetlands built varied in the range of 78,78 "84,03% during the experimental period. systems of wet zones built vegetated with different plants applied to the treatment of the tanning case. purpureum) with a removal efficiency of 60,48%. adv. k, akratos, c. the porosity of the vb filled in bed was 38%. Yeah. and castro, p. s,. tekerlekopoulou, a. â€ œThe roots and figoritation, in bioprocessing of plant vitro systems. control showed a removal efficiency of 67.75% of tss. this has been increased by 0.57 ãâ âãâãâãâ

mÂ Ã2.0 fo toohs gniworg a htiw lairetam emozihr/toor laudividni na htiw stnalp ehT .ytivarg fo ecrof eht yb Local plant species. This was a good range of pH for plants to grow well and microorganisms to degrade the entrance drain water to it. The maximum concentrations of CR after the treatment were below the permitted driving limit (2 mg lâace1) for the concerts (EEPA, 2003). The accumulation of CR in the plant parts is indicated in Table 2. This study was supported by Calheiros et al. Chrome in the environment: an assessment of the exposure of the general population of the United Kingdom and possible adverse effects of health. The removal of pollutants in a CWS is a complex process, where the substrate, vegetation and pollutants in the waste water interact with each other and in the surrounding environment (STOTTMEister et al., 2003). Elimination of nitrate in wetlands built with surface flow that deal with the dilute agricultural escapement in the lower Basin of Yakima, Washington. DOI: 10.1007/978-319-32004-5_22-1cross ref full text | Google Scholarmandal, T., Dasgupta, D., Mandal, S. and Datta, S.S., and Shuker, L. Doi: 10.1007/S001280262PubMed Abstract | Cross ref full text | Google Scholarhussain, Z., Arslan, M., Shabir, G., Malik, M. Doi: 10.1016/J.Ecoleng.2005.07.010 Crossref full text | Google Scholarvymazal, J. and Kräast Pfelovãcing, L. Boca Raton: Lewis Publishers. B., Asfaw, S. Health B 3 (3), 145-178. Microbial processes of removing heavy metals from carbon-compliance effluents in the built forests. Temperature (Tâ °) and pH were analyzed in sampling sites. The waste water generated by the industry were collected in a large tin of equalization with a volume of 486 m3. F. This study was agreed with the research reports of Tadese and Seyoum (2015), which refers to the removal of CR by some selected wet plants, a CW that uses drinking water. Purpureum> T. Furthermore, colloidal particles that do not come from pretreatment are removed by settlement and filtration in the first meters away from the entrance area (Vymazal 2005; Kadlec and Wallace, 2008). 2008). planted planted wetland unit (CWU3) with an average COD removal efficiency of 82.86%. doi:10.1016/j.biotechadv.2003.08.010PubMed Abstract | CrossRef Full Text | Google ScholarStowell, R., Ludwig, R., Colt, J., and Tchobanoglous, G. pyramidalis (CWU4) showed 81.02 and 80.99% COD removal efficiencies, respectively. The HRT in the bed was 6Ã days. Above the bed, 0.05Ã m depth was left as a space to control overflowing of the wastewater. Dordrecht, Netherlands: Springer. (2004). (2015). O. The ANOVA analysis illustrated that there were no statistically significant differences ($p > 0.05$) between the constructed wetland units in the removal efficiency of COD.The average removal efficiencies of BOD5 in the outlet of constructed wetland units varied in the range of 74.20¢ÃÂÂ80.32% during treatment operations. 7 (13). Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.AcknowledgmentsWe are grateful to Bahir Dar Tannery, for their kind cooperation to provide land for the construction of the pilot-scale constructed wetland units in the premise of industry and to produce the desired size of vesicular basalt rock by their milling machine. doi:10.1080/10937400050045255CrossRef Full Text | Google ScholarSaeed, T., Afrin, R., Muyeed, A. A study on the fate of 15N-nitrate in the riparian of wetland soil microcosms indicated 24¢ÃÂÂ26% immobilized in the soil, 11¢ÃÂÂ15% assimilated in the plant, and 61¢ÃÂÂ63% was lost through denitrification (Matheson et al., 2002). B., Silva, G., Crispim, L. The author(s) read and approved the final manuscript.FundingThe authors are grateful to Biotechnology Research Institute, Bihar Dar University, for financial support. P. 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