MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Medicine and Medical Sciences (ISSN: 2354-323X) Vol. 4(11) pp. 476-479, November, 2016
Available online http://www.meritresearchjournals.org/mms/index.htm

Review

A Concise Review on the Effect of Tannery Waste Water on Aquatic Fauna

Ugya A.Y.[1*] and Aziz A.[2]

[1]Biological Sciences Department, Bayero University Kano, Kano State, Nigeria

[2]Lasbela University of Agriculture, Water and Marine Sciences, Uthal, Balochistan, Pakistan

***Corresponding Author's Email: ugya88@yahoo.com**

Abstracts

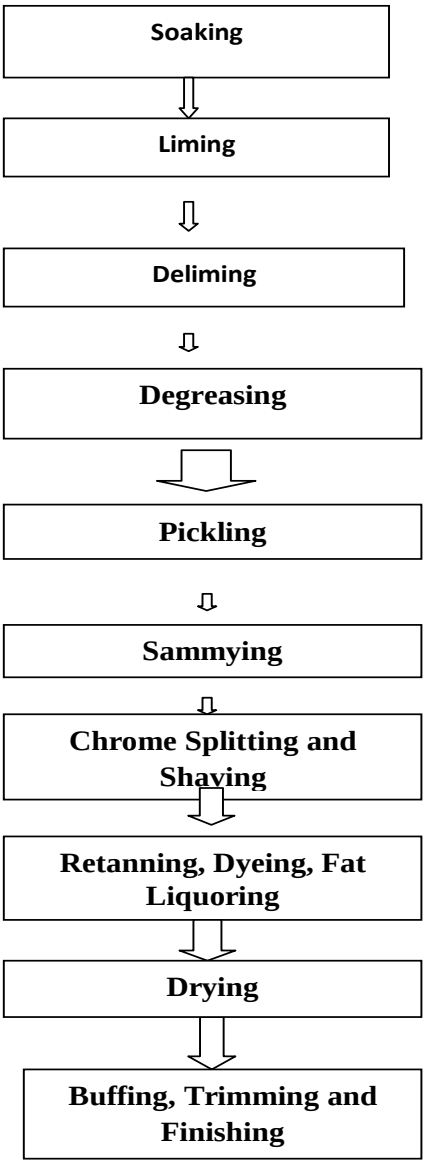
This paper focuses on the effect of tannery waste water on aquatic fauna. The process of tanning, characteristic of tannery waste, effect of tannery waste on aquatic fauna and methods of treatment of tannery waste were concisely discussed. The chapter then concluded by suggesting phytoremediation as an environmentally friendly way to effectively treat tannery waste water.

Keywords: Aquatic Environment, Effluents, Phytoremediation, Tanning, Treatment

INTRODUCTION

Industrial waste is the most common source of water pollution in the present day (Ogedengbe and Akinbile, 2004; Ugya et al., 2015a) and it increases every year because most countries are getting industrialized. Worldwide, it is estimated that the industry is responsible for dumping 300-400 million tons of heavy metals, solvents, toxic sludge, and other wastes into waters each year (UNEP, 2010). Thus, the environment is under increasing pressure from wastes emanating from such industrial activities. As compared to other industries, leather tanning is one of the most polluting activities (Khan et al., 1999) as it consume huge amount of water in several stages, generating an enormous amount of liquid effluents (Farenzena et al., 2005) which are hazardous to the environment to which they are discharged.

The tanning industry is one of the oldest and most traditional industries in World (INETI 2000). The discharge of effluents from this industrial sector is a matter of concern due to its high complexity and the serious pollution it cause (Calheiros et al. 2007; INETI 2000; Karunyal et al. 1994; Mant et al. 2006; Sinha et al. 2002; Tis˘ler et al. 2004). Chromium (Cr), when used in the productive cycle, is one of the most problematic pollutants discharged by the tanning industry (INETI 2000; Mant et al. 2006; Sinha et al. 2002; Zayed and Terry 2003). Studies by Shanker et al. 2005, Sharma et al. 2003; Sinha et al. 2002; Zayed and Terry 2003 have shown high pollution in tannery waste water in terms of biological oxygen demand (BOD), chemical oxygen demand (COD), suspended solids (SS), nitrogen, conductivity, sulphate, sulphide and chromium (Mondal et al., 2005) and in most developing countries tannery effluents are discharged directly into sewers or water bodies without treatment or ineffective treatment (Verheijen et al., 1996; Favazzi, 2002). The high BOD5 content of the effluent will affect the survival of gill breathing animals of the receiving water body and high COD value indicate toxic state of the wastewater along with presence of biologically resistant organic substances. The high level of ammonia-N is toxic to aquatic organism and nitrogen may cause eutrophic condition. The high salinity and TDS of the effluent may result in physiologically stressful conditions for some species of aquatic organisms due to alterations in osmotic conditions. Studies show that increase in salinity causes shifts in biotic communities, limit biodiversity, exclude less tolerant species and cause acute or chronic effects at specific life stages. Changes in the ionic composition of water can also exclude some species while promoting population growth of others (Bhaita, 2011). Tanning industry are scattered un evenly in most country and it exists in large, medium, small and



(Bhaita, 2011)

cottage section. Leather is among the foreign exchange earners for most country. Considerable investment has been made on sophisticated equipment, thereby replacing the manual operations by mechanization in the production of finished leather products. The pollutants from large numbers of tanneries in the world have cause damage to water courses, affecting drinking water supply and irrigation. This study thereby focuses on the effects of tannery waste water on aquatic organisms and a possible remediating method.

Tanning Process

Leather production involves tanning which is a chemical process converting the derma, epidermis and flesh into a stable non-putrescible material knoen as leather. The process involves clearing and washing the dirt, blood, flesh e.t.c from raw hides and skin after flaying before preserving with salt till they are transported to tannery. In the tannery, hide and skin are first brushed smoothly manually or in some cases mechanically to remove much salt as possible. This hides and skin will then be subjected to various processes as summarized above.

The above tanning process is accompanied by pollutants such as decomposing organic matter, hair, lime, sulphide and organic nitrogen with high BOD and COD.

Characteristic of Tannery Wastewater

The table below represent the detail of tanning process, chemical use and general constitutes of wastewater

Table 1. Tanning Process and General Constitutes of wastewater

Operations	Chemical Use	Constituents of Waste water
Soaking	Wetting emulsifying agents and bactericidal agent	Olive green, obnoxious smell, soluble protein, suspended matter and high amount of chlorides
Liming	Lime and sodium chloride	Highly alkaline, sulphides, ammoniacal nitrogen, suspended solids, hair, pulp and dissolved solids
Delimning	Ammonium salts, enzymatic bates.	Alkaline, organic matter and ammoniacal nitrogen
Vegetable Tanning	Vegetable Tanning Material	Coloured, acidic and offensive odour
Pickling and Chrome Tanning	Common, acid, basic and chrome salt	Coloured, acidic, chromium, TDS and chlorides
Buffing, Trimming and Finishing	Dye and fatty oil	Coloured, soluble protein, Chromium, TDS, sulphides, suspended solid

(Bhaita, 2011)

Effect of Tannery Waste water on Aquatic Fauna

Tannery waste water contains vegetable tannins and non vegetable tannis which exert oxygen demand. The increase in the demand for oxygen leads to decrease in the amount of oxygen in the aquatic body which lead to an unsustainablity of the aquatic ecosystem (Kwaza et al., 2001; Koukal et al., 2004).

They also contain high amount of protein, especially when a hair pulping unhairing system is used. These proteins are biologically degradable and exert high BOD. About 80% of suspended solids are composed of organic matter in the form of protein, high BOD5 and COD were reported by researchers such as Akan et al (2009), Seyoum et al., (2003), Haydar et al., (2007), Assefa and Ayalew (2014). This high BOD5 content of the waste water will affect the survival of gill breathing animals of the recievig body since the increase in BOD is responsible for the decrease in DO which in turn have negative effect on aquatic Faunas (Akan et al., 2009).

High pH, excessive alkalinity, suspended matter and sulphides are injurious to fish and other aqautic life. Sulphide present in waste water can react with iron and other metals causing black precipitate thereby making water unsafe for fishes and other aquatic life nitrogen and phosphorus in tannery waste water encourage algae blooms which in turn pose high treat to fishes and other aquatic organisms. Chlorides and other suspended solids may settle at the buttom of the water body thereby posing treat to the bottom fauna (Seyoum et al., 2003; Akan et al., 2009; Bosnic et al., 2000; Birnesh et al., 2007; Lefebvre and Moletta, 2006; Modal et al., 2006; Ogendengbe and Akaribe, 2004)

Treatment of Tannery Waste Water

Conventional and non conventional method have been employed to treat tannery waste water before discharging into water bodies

Convectional method include: biological system, combine system and chemical system

Non conventional system include: use of Fungi, water hyacinth, sand filter, agricultural utilization and disposal by spraying irrigation (Bhaita, 2011).

CONCLUSION

Tannery waste water do not only affect aquatic organisms but also terrestrial organisms when they drink from polluted receiving body. This water also seep into aquifers and pollute underground water thereby posing treat to man also.

Since civilization has made it in evitable to desist from tannery activities, these chapter thereby recommend that more attention should be focused on phytoremediation as an environmentally friendly way to treat tannery waste as done by Padhi *et al*., (2012), Ugya and Imam., (2015), Ugya *et al., (*2015) among others using *Eicchornia crassipe.*

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