http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (6): 960-962, 2000

Monitoring of Pollution Parameters in Waste Water of Tanneries in Kasur

[1]M.H.S. Wattoo, J. Iqbal[2], T.G. Kazi[1] and M.A. Jakhrani[1]
[1]National Center of Excellence in Analytical Chemistry, University of Sindh, Jamshoro-76080, Pakistan
[2]Department of Chemistry, Islamia University, Bahawalpur, Pakistan

Abstract: In Pakistan, the tanning industry is very important for exporting leather as main item. In Kasur tanning industries are within and around residential areas because there is no proper industrial area. The discharge of tanneries effluents pollute air, soil, subsoil, surface water and underground water because of the presence of toxic organic and inorganic compounds especially chromium which is used in tanning processes. By analysis of industrial effluents and drinking water samples collected from different areas of Kasur, it was observed that the level of salts as well other toxic metal present was alarmingly high. The level of chromium in waste water was found to be 147 ppm, also the level of chromium was high in drinking water i.e. above 2.0 ppm. WHO suggested permissible value of chromium in drinking water is 0.05 ppm. The pretreatment of industrial wastes is therefore necessary to control environmental pollution and save our priceless ecosystem and prevent spread of diseases in people residing in vicinity of tanneries.

Key words: Tanneries, water pollution, waste water

Introduction

In Pakistan, the tanning industry is third important industry on the list of principal exports which earn foreign exchange. However, Kasur tanneries are causing extensive environmental pollution. The reason is that there is no proper industrial state for tanneries in Kasur which have multiplied in residential areas. This causes great threat to the inhabitants of Kasur (EPA., 1994). There are 180 tanneries in Kasur which are discharging more than 9000 cubic meter of effluents per day and stagnant pools of waste water have spread over an area of 400 acres (EPA., 1994). In the present study, the quality of untreated effluent from leather industries were monitored. To asses their effects on drinking water, the quality of later was also monitored likewise.

Materials and Method

Out of 180 tanneries 3 are mechanized while the other are poorly mechanized. Tanneries Association Dingarh (TAD) has divided tanneries into 4 zones or sectors. The following table shows sectorwise distribution of tanneries (Table 1).

Crab sample collection was made which involves the collection of liquid wastes coming collectively out of the industrial units (Vermani and Narula, 1989) because our aim was to study the whole polluted area rather to study the effluent of the individual industry. Moreover, the representative combined effluent of industries and some additional water samples from scattered watery polluted area caused by these tanneries were also taken. All the samples deal with the surface water sample collection (Table 2). The samples were collected in 5 liters previously washed with deionised double distilled water polythene bottles (Rasul Jan *et al*., 1998; Sharma and Pande, 1999).

The samples were analyzed for various physico-chemical parameters like pH, Electricity Conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Hardness, Some Anions (Cl^-, SO_4^{2-}) and Some Cations (Li^+, Na^+, K^+, Ca^+ and Mg^+).

All glassware used were of E.mil, Metler PM460 electric balance was used. Conductivity and pH-meters were of Milwaukee-CON-100, Corning-40 Flame Photometer and R and M-Marketing S-200 Spectrophotometer-20 were used. Merck and Fluka Brands reagents were used and internal standards were applied to check the interference problems. The metals concentration was determined in triplicate and the mean value was recorded. All chemicals used in this investigation were of analytical grade.

Table 1: Sectorwise distribution of tanneries

Location or Area	Zone or Sector	No. of tanneries in the area
Dingarh.	A	46
Kot Maulvi Abdul Qadir	B	23
Niaz Nagar	C	89
Younas Nagar	D	22

Table 2: Showing Area wise Collection of Samples

Sample No.	Area or Place of sample collection
S-1	Pure Municipal drinking water used by tanneries as raw
S-2	Niaz Nagar (Left side drain)
S-3	Niaz Nagar (Right side drain) near D R tanneries
S-4	Kot Maulvi Abdul Qadir near ABL
S-5	Younas Nagar near Waseem Tanneries
S-6	Dingarh (Chowk jamia masjad.)
S-7	Dingarh (Chowk No.1)
S-8	Facility Cum training Centre (FCT) back side scattered water
S-9	Tanneries scattered water near Zamindara Cold Storage along DepalPur road
S-10	Drain along DepalPur road to ROHI nala fall which leads to SUTLUG river

Table 3: Analytical results of Physico-Chemical parameters

Sample No.	pH	EC (mS)	TDS (mg/l)	DO (mg/l)	COD (mg/l)	BOD (mg/l)
NEQS*	6-10		3500		150	80.00
FRG**	6.5-10		3500		200	20.00
S-1	9.00	3.09	2168	8.89	24.00	0.90
S-2	8.70	18.46	12494	46.00	696.00	38.60
S-3	8.30	15.78	11904	9.20	904.00	20.00
S-4	8.80	10.00	6654	15.90	100.00	15.00
S-5	8.00	12.14	9530	4.60	380.00	19.00
S-6	8.10	9.48	3546	7.60	420.00	5.00
S-7	6.10	-	31010	21.00	-	8.00
S-8	7.80	19.36	14850	9.20	888.00	1.00
S-9	8.30	16.83	12730	6.80	260.00	0.20
S-10	8.70	17.15	13882	153.30	300.00	249.80

NEQS* = National Environmental Quality Standards
FRG** = Federal Republic of Germany waste water discharge threshold values for Tanneries

Table 4: Analytical results of Cations and Anions

Sample No.	Lithium. Li^+ (ppm)	Sodium. Na^+ (ppm)	Potassium K^+ (ppm)	Chromium. Cr^{+6} (ppm)	Chloride. Cl^- (ppm)	Sulphate. SO_4^{2-} (ppm)
NEQS*					1000	
FRG**						
S-1	-	742.00	134.40	25.00	29.60	147.210
S-2	0.50	2756.00	264.00	57.50	142.10	534.97
S-3	0.50	2385.00	255.875	22.50	107.10	428.25
S-4	0.50	1823.20	150.00	147.50	68.60	415.66
S-5	0.50	2120.00	288.00	47.50	99.10	305.65
S-6	-	7896.00	284.40	37.00	65.10	496.53
S-7	1.50	1823.00	308.75	122.00	420.10	889.93
S-8	0.50	3666.00	310.50	2.00	183.60	386.27
S-9	0.50	2809.00	453.60	50.00	136.10	229.52
S-10	0.50	3229.20	378.40	12.50	122.20	275.03

NEQS* = National Environmental Quality Standards
FRG** = Federal Republic of Germany waste water discharge threshold values for Tanneries

Table 5: Analytical results of hardness

Sample No.	Calcium (ppm)	Magnesium (ppm)	Total hardness Mg/l
NEQS*			
FRG**			
S-1	0.12	0.072	163.793
S-2	0.16	0.160	275.862
S-3	0.62	0.404	939.655
S-4	0.26	0.124	508.620
S-5	0.40	0.240	767.241
S-6	0.18	0.204	362.068
S-7	0.46	0.308	1008.620
S-8	0.18	0.204	413.793
S-9	0.20	-	241.379
S-10	0.08	0.112	215.517

NEQS* = National Environmental Quality Standards
FRG** = Federal Republic of Germany waste water discharge threshold values for Tanneries

Discussion

Tannery waste water poses very serious threat of environmental pollution. Water is the largest raw material used in tanneries (Nasreen and Awan, 1995; Iqbal, 1995). The observation of pH (Table 3) of all, 10 samples shows that they have different pH values (6.1-9.1 i.e. high acidic to high alkalinity) depending upon nature of the process by the industries. No sample has the normal pH value. WHO suggests that the ordinary drinking and irrigation water should have pH 6.5 and 8.5 respectively (Anonymous,1993). But the drinking water supplied by Muncipal Corporation of Kasur has pH 9 indicating that water is not suitable for drinking and irrigation (Zaman and Rahman, 1998) and can cause number of diseases in human stomach. Conductivity observation showed that sample 7 has the infinity conductivity indicating number of impurities are present and drinking water sample has the lowest Conductivity i.e. 3.09. The sample 7 has the TDS 31010 mg/L i.e. highest and sample 1 has TDS 2168 mg/L. The TDS values suggested by WHO for drinking and irrigation are 1000 mg/L and 500 mg/L, respectively (Anonymous, 1993) and above these values problem may occur and water cannot be suitable for drinking.

The other factors like DO, COD, BOD, have the values 7.60-153.3, 24.00-904.00, 0.2-249.8 respectively. High DO value is probably due to presence of highly toxic material in the sample and is not favourable for the growth of bacteria. With the increase in BOD value there is decrease in Oxygen and vice versa. High BOD can kill all natural life in the affected area. COD is the amount of Oxygen used while oxidizing the organic content with a strong chemical oxidant under acidic conditions (Chhatwal *et al.*, 1995; Vermani and Narula,1989; David, 1998). COD values are greater than BOD values. The higher value is probably due to the fact that tanneries in Niaz-Nagar locality are using more acidic chemicals in their process as compared to the other tanneries.

Four elements like Lithium, Sodium, Potassium and Chromium were determined in drinking water as well as in waste water effluents. It was observed that level of all elements was higher in industrial effluents and water is not suitable for irrigation purposes (Zaman and Rahman, 1998; Iqbal, 1995). The high level of Chromium in drinking water is very alarming and very toxic to human beings and human internal system will be destroyed completely.

In the determination of Anions the amount of Chloride and Sulphate was studied (Table 4) All the industries are using high amount of salts and acids of cheaper brands, so amount of SO_4^{2-} and Cl^- also observed high in all samples and in the drinking water. High chloride content makes the soil salty and make it unfit for agriculture purposes (Zaman and Rahman, 1998). Chloride content above the permissible limit inhibits the fish growth and even the death of fish or microbes (Zaman and Rahman, 1998; Ipinmoroti *et al.*, 1997).

Hardness due to Calcium, Hardness due to Magnesium, and Total hardness (Table 5) shows that for drinking water is within the safe limits i.e. 300 mg/L. This is because the amount of Calcium/Magnesium and the some high Carbonate/Bicarbonate are present and are being used in the tanneries for producing of leather. It has been concluded that, The concentration of above said parameters were found to be high then the permissible limits which would not only effect the aquatic life of river Sutluj but also render water unsuitable for drinking purposes by human beings and cattles. The adverse effects of these effluents also affect the quality of underground muncipal drinking water.

To secure 400 acres irrigation land from the stagnant pool of waste water and to manage the 900 cubic meter effluents per day by the tanneries the waste water management engineering projects should be started as early as possible.

Tanneries owners should be courged to migrate their tanneries from the residential areas to outside the city. The ministry of industries should plane the industrial state outside the city.

It is also recommended that in each tannery, a primary treatment system must be installed which will be helpful to eliminate most of the Chromium from tanneries waste water.

Acknowledgment

The author is thankful to Dr.Javid Iqbal (Research Suppervisor) and Dr. Amin-ud-din, Professors, Department of Chemistry-Islamia University Bahawalpur for their nice cooperation and

suppervision during the whole research project. For sample collection facilities Mr. Shafique, President Tanneries Association Dingrah (TAD) and for nice cooperation of Mr. Qayyum Asghar in collection of the litrature from EPA library Lahore is also acknowledged.

References

Anonymous, 1993. Guidelines for Drinking Water Quality. 2nd Edn., Vol. 1, World Health Organization, Geneva, Switzerland, pp: 48-57.

Chhatwal, G.R., M.C. Mehra and M. Katyal, 1995. Encyclopedia of Environmental Pollution and its Control. Anmaol Publications (Pvt.) Ltd., Delhi, India.

David, B.M., 1998. Exporting hazards to developing countries. World Health Forum, 19: 412-416.

EPA., 1994. Report on Kasur Tanneries waste water. EPA-Library Main Office, Lahore.

Ipinmoroti, K.O., A.A. Oshodi and R.A. Owolabi, 1997. Comparative studies of metals in fish organs, sediment and water from Nigerian fresh water fish ponds. Pak. J. Sci. Ind. Res., 40: 70-74.

Iqbal, M., 1995. Chromium in sediment of the moving stream of tannery waste-water, from Sector 7-A of Korangi Industrial Area to Arabian sea. Pak. J. Scient. Ind. Res., 38: 1-4.

Nasreen, S. and I.A. Awan, 1995. Pollution due to effluents from tanneries/leather industries in NWFP. Pak. J. Scient. Ind. Res., 38: 215-219.

Rasul Jan, M., Shah, H., S. Khan and J. Shamroz, 1998. Chemical investigation of the effluents of selected industries of NWFP, Pakistan. J. Chem. Soc. Pak., 20: 41-45.

Sharma, S.D. and K.S. Pande, 1999. Pollution studies of River Ramganga at Moradabad: Determination of toxic substances. Chem. Environ. Res., 8: 117-129.

Vermani, O.P. and A.K Narula, 1989. Applied Chemistry Theory and Practice. Wiley Eastern Limited, New Delhi, ISBN: 9788122401707, pp: 35-62.

Zaman, M.W. and M.M. Rahman, 1998. Impact of groundwater irrigation on the chemical characteristics of soil at Shahzadpur in Bangladesh. Pak. J. Scient. Ind. Res., 41: 11-16.