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Impact of Textile Effluents on Water in and Around Pali, Western Rajasthan, India

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ABSTRACT

Textile dyeing, printing, bleaching and processing is the most prominent industry of Pali district. Pali is one of the major textile clusters of Rajasthan because of largest number of dyeing and printing units. it has over 800 textile industries that employ about 50 percent of the city's population. The dyeing and printing industry is the major source of livelihood in this region. The major investigation of this study was the impact of textile effluents on Bandi river water. Four sites were selected for collection of samples from different locations. The physicochemical analysis was done for one year and the present reveals that, the pH of river water is more than the standard level and the other parameters of the river water was found to be higher in concentration. Results showed that the textile industrial effluents was adversely affecting on the river water quality, which affects on aquatic environment and human beings of surroundings.

Keywords: Effluents, Textile, Physicochemical Parameters, Environment etc.

INTRODUCTION

Industries are essential for economic development of any country. Textile industries have significant contribution in uplifting economic status. But these industries have negative implications for environment. Normally in production process, textile industry uses huge amount of water and after the production finishes, contaminated waters are released to the sewers or drains without pretreatment. Most of the industries in India are situated along the river banks for easy availability of water and also disposal of the wastes. These wastes often contain a wide range of contaminants such as petroleum hydrocarbons, chlorinated hydrocarbon and heavy metals, various acids, alkalis, dyes and other chemicals which greatly change the physiological properties of water.

Textile effluents contain high BOD due to fiber residues and suspended solids. These can contaminate water with oils, grease and waxes while some may contain heavy metals such as chromium, copper, zinc and mercury.

Rajasthan is well known all over the the world for its hand printed textiles. Luni river is flows in western part of India in the state of Rajasthan. It is the only major river of the area and the source of irrigation. The Jawai, Sukri, Jojri and Bandi are its main tributaries. Pali is the largest erstwhile hand processing clusters situated on the bank of river Bandi, now gradually moving to power processing machines. It is best known for dyeing and printing of cotton and synthetic fabrics. Pollution is the main accuse in the textile processing units. textile effluents discharged from various textile processing units of Pali, flow about 55 kilometer downstream, making the ground water in several riverbank villages unfit for drinking and irrigation and also causes adverse on crops productivity and health of people residing in those areas. The use of toxic chemicals in these units cause threat to the manpower employed in such units in a way directly resulting in occupational health hazards. India's first Common Effluent Treatment Plant [CETP] was set up in Pali in 1982 to treat industrial effluents. Further to be in tune with the government restrictions to be connected to CETP, majority of textile processing houses/ units of Pali district are now adjoined to CETP. In spite of the installation of CETP, Bandi river still has enormous water and soil pollution adversely affecting the fertility of soil and purity of drinking water.

This study aimed to determine the physiochemical parameters of water such as pH, EC (Electrical Conductivity),Temperature, DO, COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand) and TDS (Total Dissolved Solids).

MATERIALS AND METHODS

The Study Area

Pali industrial area is one of the polluted areas identified by The Central Pollution Control Board [CPCB], New Delhi. The Pali district shares a common border with six districts of Rajasthan. The study area forms part of the catchment of Bandi River, a tributary of Luni River, which is the only major river responsible for groundwater recharge during and after monsoons. About 800 industries are in this industrial area, producing chemicals, dyes, textile, paints and some marble based industries. Rainwater is the only source of raw water in the Bandi River and other water bodies. The groundwater is being used for industrial purposes and is the main source for domestic and agriculture purposes.

Sampling and Analysis

A total of 28 samples were collected (4 samples for each parameter) from the study area following standard procedures. Analysis was done in the laboratory. For testing of water parameters, 4 samples for each parameter were collected from the discharge point of these industries. Samples were collected with 2 liters white plastic kegs, which should thoroughly wash with nitric acid and then rinsed several times with distilled water. Analysis was carried out as per the standard methods.

RESULTS AND DISCUSSION

The analytical results of textile effluents are given in Table 1obtained values of the parameters deviated from the permissible limits recommended by DOE for pH, EC, Temperature, DO, COD, BOD and TDS.

The concentration of hydrogen ion is a major sign for measurement of quality of natural and wastewater. The higher value of pH of the textile effluent indicates the alkalinity conditions which have an adverse effect on the soil permeability and soil micro flora. The pH values varied from 7.91 to 9.42 in the study area which was higher from standard value. Maximum value was found in Site 2 and minimum value was found in Site 4.

EC is important for irrigation because it is a measure of the salinity of the water and acts as a surrogate for total dissolved solids. EC values were observed 38781 to 17040 µs/cm which were generally higher than standard given as 250 µs/cm.

Temperature plays a vital role in chemical reactions and increases evaporation rate of waste water, thereby suitability of water hampered for beneficial uses such as irrigation. Temperature varied from 52.33 to 33.44 which were above the standard level for surface water. The average temperature during that time period should not be higher than 22.2 degree centigrade.

DO is essential to all forms of aquatic life including microorganism responsible for the self purification system in natural waters. The values of DO ranges from 1.28 to 4.69 mg/L in the study area. There is an inverse linear correlation between TDS value and DO level, therefore, high TDS values always corresponds to low DO level. Lower level of DO was observed near the discharged points and higher amount was found comparatively at the longer distance from the textile discharge points in the study area. The mean value was 2.72 which are very poor for agricultural production compared to standard level.

COD is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solutions. COD values ranges from 840.27 to 1482.75mg/L which indicate a heavy load of organic and inorganic pollution that require more oxygen to oxidize under increased thermal conditions. Higher values of COD indicate the toxicity of the effluents and the existence of huge quantity of biologically resistant organic substance.

Table 1 : Analytical results of selected water samples of textile effluents with standard for industrial effluents.

Parameter	Site 1	Site 2	Site 3	Site 4	Mean	Standard value
pH	8.76	9.42	8.21	7.91	8.57	6.5 - 8
EC µs/cm	17040	19255	28040	38781	25779	250 µs/cm
Temperature	52.33	39.41	45.22	33.44	42.6	40 degree centigrade
DO mg/L	1.28	2.53	2.41	4.69	2.72	4.5-8 mg/L
COD mg/L	1482.75	1238.49	985.59	840.27	1136.77	200 mg/L
BOD mg/L	641.19	512.41	465.78	452.19	517.89	150mg/L
TDS mg/L	37581.56	21597.11	16113.24	10211.11	21375.75	2100mg/L

BOD is the measure of quantity of oxygen required by bacteria and other microorganism under aerobic conditions in order to biochemically degrade and transform organic matter present in the water bodies. The high levels of BOD are the indicators of pollution strength of waters. They also indicate that the less oxygen is available for the living organism in the wastewaters. The BOD values were varied between 452.19 to 641.19 mg/L. values were higher according to the standard value.

TDS (Total dissolved solids) are those solids remain as soluble form in textile effluent. The values of TDS were ranges from 10211.11 to 37581.56. the mean value of TDS was found 21375.75 mg/L which was higher than standard level .it might be due to store of different ions in the effluents from the discharge point. Presence of excess TDS in water would have an adverse impact on aquatic life, render the receiving water unfit for drinking and reduce crop yields if used for irrigation.

CONCLUSION

This research reveals that the measured Physico-chemical parameters such as temperature, pH, DO, EC, BOD, COD, TDS were found higher than the standard guidelines. It is recommended that the effluents of textile industries must be treated well by combined treatment processes before their disposal into the surrounding water bodies to reduce the pollution load and avoid adverse pollution effect.

REFERENCES

ADB (Asian Development Bank) (1994). Training manual for Environmental Monitoring Engineering Science, INC, USA, pp. 2-16.AEPA (Australian Environmental Protection Authority) (1998). Environmental Guidelines for the Textile dyeing and Finishing Industry, State Government of Victoria, Melbourne, Victoria, Australia.

Ahmed T (2007). Characterization of textile effluent from selected industries in DEPZ and their treatment by adsorption- filtration process. M. Sc. Thesis, pp. 1-132, Department of Environmental Sciences, Jahangirnagar University, Saver, Dhaka.

Akan JC, Moses EA, Ogufbuaja VO (2007). Determination of pollution levels in Mario Jose Tannery Effluents from Kano Metropolice, Nigeria. J. Appl. Sci. 7(4): 527-530.

APHA (American Public Health Association) (1989). Standard Methods for the Examination of Water and Wastewater, 17th ed. Washington, DC.

Ayres RM, Mara DD (1996). Analysis of Wastewater for use in Agriculture; A Laboratory Manual of Parasitological and Bacteriological Techniques. Switzerland, Geneva: World Health Organization.

Ayres RS, Westcot DW (1994). Water Quality for Agriculture. FAO Irrigation and Drainage Paper 29 Rev 1. Rome, Italy: Food and Agriculture Organization.

BARC (Bangladesh Agricultural Research Council) (2005). Fertilizer Recommendation Guide for different crops in soil.

Bauder TA, Cardon GE, Waskom RM, Davis JG (2004). Irrigation Water Quality Criteria.http://www.ext.colostate.edu/pubs/crops/00506. html.

Behra BK, Mishra BN (1969). The effect of a sugar mill effluent on enzyme activities of rice seedlings, Industrial Research. 37: 390-8.

Bhadja P, Vaghela A (2013). Hydrobiological studies on freshwater reservoir of Saurashtra, Gujarat, India. J. Biol. Earth Sci. (2):12-17.

Bharati S, Shinkar NP (2013). Dairy Industry Wastewater Sources, Characteristics & its Effects on Environment. Int. J. of Current Eng. Technol. 3(5): 1611-1615.

Biswas TD, Mukherjee SK (1997).Textbook of Soil Science, Tata McGraw-Hill Publishing Limited.

Chindah AC, Braide AS, Sibeudu OC (2004).Distribution of hydrocarbons and heavy metals in sediment and a crustacean (shrimps-Penaeusnotialis) from the bonny/new Calabar river estuary, Niger Delta. AjeamRagee, 9: 1-14.

DOE(2008). The environment conservation rules. Department of Environment, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh.

EPA(1974). Wastewater-Treatment Systems: Upgrading Textile Operations to Reduce Pollution, United States Environmental Protection Agency, Washington DC, USA, In: EPA Technology

FEPA (Federal Environmental Protection Agency) (1991). Water Quality, Federal Water Standards, Guidelines and Standard for Environmental Pollution Control in Nigeria, National Environmental Standards – Part 2 and 3, Government Press, Lagos pp 238.

Geetha A, Palanisamy PN, Sivakumar P, Ganesh PK, Sujatha M (2008).Assessment of underground water contamination and effect of textile effluents on Noyyal (9 river basin in and around Tiruppur town, Tamil Nadu). 5(4): 696-705.

Haque ME (2002). A Compilation of Environmental Laws of Bangladesh, Administrated by the Department of Environment (DOE).

Islam F, Rumi S, Juhaina J (1994). Industrial pollution in Bangladesh.www.worldbankgroup.org.

Knat R (2012). Textile dyeing industry an environmental hazard Natural Science. 4 (1): 22-26.

Koushik S, Saksena DN (1999). Physico-chemical limnology of certain freshwater bodies of central India.

Maps of Bangladesh. Available at: http://mapofbangladesh.blogspot.com/2011/09/narsing di-district.html.

McMullan G, Poonam NS,Franklin S, Oxspring D (1995). Bioremediation and chemical analysis of textile industry waste water. 17: 760-764.

Metcalf, Eddie (2003). Wastewater Engineering Treatment and Reuse, Forth Edition. New York, USA: McGraw Hill.

Robinson T, Chandranand B, Nigam P (2002). Textile effluent decolorization and dye-adsorbed agricultural residue biodegradation: Biores. Tech. 84, 299 – 301.

Roy R, Fakhruddin ANM, Khatun R, Islam MS, Ahsan MA, NegerA JMT (2010).Characterization of Textile Industrial Effluents and its Effects on Aquatic Macrophytes and Algae.BangladeshJ. Sci. Ind. Res. 45(1): 79-84.

Roy RP, Prasad J, Joshi AP (2007). Effect of sugar factory effluent on some physic-chemical properties of soils – a case study. J. Environ. Sci. 49(4): 277-282.

Sawyer CC, McCarty PL (1978). Chemistry for Environmental Engineers, McGraw Hill, New York. pp. 331–514.

Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals. Federal Register.55 (143): 3

USEPA (United States Environmental Protection Agency) (1986). Quality criteria for water. Office of water Regulation and standards, Washington dc, usepa40015-86-256 pp.

Verma SR, Shukla GR (1969). Pollution in a perennial stream, 'Khala' the sugar factory effluent near lakes. Env. Health. 11: 145-162.

WHO (World Health Organization) (2006). WHO Guidelines for the Safe Use of Wastewater, Excreta and Grey water: Volume II Wastewater use in Agriculture. Geneva, Switzerland: WHO.

World Bank (2010).A detailed analysis on industrial pollution in Bangladesh. Workshop Discussion Paper,World Bank Dhaka Office, Bangladesh. Transfer, EPA-625/3-74-004, pp. 1-12.

Wynne GD, Maharaj, Buckley C (2001). Cleaner Production in the Textile Industry – Lessons from the Danish Experience, School of Chemical Engineering, University of Natal, Durban, South Africa, p. 33.

Yusuff RO, Sonibare JA (2004). Characterization of textile industries. Effluents in Kaduna,Nigeria and Pollution implications. Global Nest: the Int. J 6(3): 212- 221.