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THE DETECTION AND IDENTIFICATION OF DYEING AND PRINTING WASTE-WATER IMPURITIES PRESENT IN SANGANER (RAJASTHAN)

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ABSTRACT

One major group of contaminants in effluent is dyes from textiles which make it aesthetically unacceptable and toxic depending on the chemicals. The paper describe physico-chemical parameters from dyeing and printing wastewater from Sanganer (Rajasthan). The parameters determined were pH concentration. The quality of water was monitored by measuring different sites. The concentration of cations (Na, K, Ca, Mg and Li) anions (Cl, NO₃, SO₄, PO₄, F) and the heavy metals (Cu, Fe, Cr, Ni, Zn, Pb, Hg, As, Cd, Mn) reveals that effluent discharge from the dyeing and printing textiles having some impact on the quality of water.

Key Words: Water Quality, Physico-chemical parameters, Co-relation Coefficient and Trace Metals

INTRODUCTION

Most of the industrial wastewater is containing organic and inorganic matter and hazardous metals (Dinesh Kumar and *et al.*, 2009). These heavy metals and organic compounds affect quality of soil and ground water of the area (Bhattacharjee *et al.*, 2003). Heavy metals enter in the human body by different pathways and causes harmful effects (Gitimoni *et al.*, 2009). The qualities of water get affected by various man made activities and large amount of organic matter is added every time to the water bodies. These organic matter released in water, result depletion of oxygen (Nanda *et al.*, 2010).

The Sanganer prints of Rajasthan are celebrated all over the country, and have acquired international acclaim as well. Sanganer textile industry which is one of the largest handloom manufacturing zone from western India. Today, there are over 154 block printing units in Sanganer, and these employ around 20,000 people. There are around 3000 families engaged in this Rajasthani art, and Sanganer is one of Rajasthan's most important centers of hand block printing. The main object of the present investigation was to assess the suitability of the waste water and dyes from Sanganer (Rajasthan). The coloured effluent of the textile mill industry have got much attention to their dual toxicity (Talware *et al.*, 2010). The waste generated by the textile dyeing and printing industry contains a variety of organic compounds and poisonous heavy metals. They exhibit high Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD). Also the effluent from these industries were discharge in open land, Agricultural field and river which affect not only the quality of the water and soil but pollute the ground water due to the percolation of some water soluble pollutants (Pande *et al.*, 2009). The weavers of Sanganer uses Vat, Basic, acidic and Azo dyes for the yarns. The water samples are collected for monitoring and analysis in the work. Surface water sample from nearly industrial zone are collected and analyzed. Concentration of cations, anions, and heavy metals like Cr, Ni, Zn, Cd, Hg, Fe, Cu, Mn, Pb, containing in these effluents have been found to be carcinogenic (Tamburlini Ehrenstein *et al.*, 2002).

MATERIALS AND METHODS

The chemicals used in the present investigation were analytical grade supplied by SD Fine chemicals Ltd. The solution were prepared by using double distilled water. The water sample were collected carefully from Sanganer town near different spots where the dyes disposal is carried out. The samples were collected in screw capped polyethylene which was cleaned and washed with deionised water and rinsed with sample two to three times and tightly lid. The Water samples were used for physicochemical analysis as volumetric analysis, BOD, COD, and Flame photometric analysis where Na⁺, Mg⁺, K⁺, Li⁺, was

Research Article

determined by standard methods. For metal detection by ICP-AES the water samples were solvent extracted with HCl –HNO₃.

Physico-Chemical Analysis

The water samples have been analyzed as per standard procedure (APHA, 1998). The Water samples were used for physicochemical parameters like pH, Electrical Conductivity (EC), Alkalinity, carbon dioxide (CO₂), dissolved oxygen (DO), Chemical Oxygen demand (COD), Sulphate (SO₄²⁻), Chlorides (Cl⁻) Hardness, (Ca⁺, Mg⁺) as per standard procedure. Chloride is estimated with the titration by Mohars method while the other anions, sulphate, nitrate, phosphate and fluoride are determined volumetric methods. With volumetric analysis, BOD, COD, calcium and magnesium are determined with the EDTA titration method (Shaikh Asma and *et al.*, 2009). The metals like sodium and potassium and Lithium are measured with the help of flame photometer (Systronic-130). The heavy metals estimated by atomic emission spectrophotometer and Inductive coupled plasma.

The pH of the sample was recorded by digital pH meter (Equip-Tronics EQ-160). The conductivity and TDS of water sample were recorded using digital conductivity-TDS meter (Systronics 308) BOD was determined by using five day incubation methods. By using dichromatic reflux method COD was determined. Titrimetric method was used for determination of alkalinity and chloride. A kjehldals's method was applied for determination of nitrogen (Ojha and *et al.*, 2009).

RESULT AND DISCUSSION

The result obtained during the course of present study are given in table 1-4. The pH value range from 7.82 to 9.06 showing that the water is slightly alkaline, Table No.1. These values are out of the maximum permissible limit set by WHO, 9.2 which is safe range for drinking. The conc. of calcium was found in the range of 163.4-332.1 µgms/ml. the values exceed the tolerance limit. A high conc. of calcium makes water hard the soil become soft and allows penetration of water. The concentration of magnesium was

Table 1: Physico-chemical analysis of Textile Dyeing and printing wastewater, drinking and Ground water samples

No. of sample	COD	Hardness	Ca	Mg	Cl ⁻	CO ₂	pH	Cond.	CO ₃ ⁻	HCO ₃ ⁻
Sample 1	246	352	214.2	189.5	255.5	42.4	7.85	2.32	445	332
Sample 2	842	451	264.2	163.4	321.7	58.5	7.52	4.86	422	245
Sample 3	354	234	163.4	187.9	256.4	47.5	8.56	2.41	234	128
Sample 4	457	819	185.4	323.8	165.2	83.3	8.85	3.06	552	354
Sample 5	226	366	187.7	326.5	345.5	68.5	7.83	3.24	745	568
Sample 6	525	342	215.3	421.0	265.3	75.2	8.23	1.08	421	34
Sample 7	314	347	275.2	278.8	287.2	84.5	8.26	1.11	360	425
Sample 8	705	452	332.1	381.4	158.4	62.2	8.52	3.17	370	112
Drinking Water	Nil	221	34.8	87.2	96.5	118.2	7.56	5.24	145	96
Ground 1	242	270	181.5	88.5	278.2	Nil	7.78	5.78	252	142
Ground 2	122	269	169	209.6	185.1	Nil	7.18	2.74	249	289
Ground 3	228	274	195	185.2	231.5	Nil	7.23	4.86	238	320

S1 to S8 : Waste Water Samples, G1 to G3 : Ground Water Samples

Research Article

found in the range of 189-421µgms/ml. The High conc. of magnesium have similar effect on soil and water as calcium . According to ISI maximum acceptable and permissible concentration of magnesium was 2.5 mg/lit. The magnesium deficiency causes breaking down of chlorophyll molecules with botches on the leaves.

The Corelation-coefficient matrix of physico-chemical parameters are tabulated in table No.2

The Concentration of heavy metals in wastewater are being tabulated in table No.3. The concentration of some metals like Hg, As, Cd, were not detected in all wastewater samples. The Conc. of Cu was in the range of 0.017 to 0.44 µ gms/ml.

Table 2: Corelation matrix of physico-chemical parameters

sample	pH	Hardness	Ca	Mg	Cl ⁻	CO ₂	COD	Condu- ctivity	CO ₃ ⁻	HCO ₃ ⁻
pH	1									
Hardness	0.2366	1								
Ca	-	0.0859	0.1205	1						
Mg	-	0.3816	-0.1662	-	0.2828	1				
Cl	0.1459	0.7395	0.3104	0.3599	-	-	1			
CO₂	0.0115	-0.5003	0.6341	0.1458	0.3575	-	-	1		
COD	0.4744	0.2913	0.5295	0.2697	0.0748	0.5789	-	-	1	
Conduct	0.7039	0.5141	0.2395	0.6017	0.2306	0.3942	0.8350	-	-	1
CO₃	0.2232	0.1890	0.1810	0.1263	0.3382	0.1967	0.2954	0.0057	-	1
HCO₃	0.1289	0.2478	0.1468	0.2595	0.3978	0.1577	0.2954	-0.1577	0.9435	-

Table 3: Detection of metals by ICP-AES

Sample No.	Concentration of metals (PPM)									
	Cu	Zn	Pb	Cd	Ni	Co	As	Hg	Cr	Fe
1	0.44	2.0	2.96	0.072	0.36	0.82	ND	0.02	0.87	14.26
2	0.23	1.77	1.97	0.014	0.48	0.92	ND	ND	0.82	21.12
3	0.39	0.96	2.83	0.017	0.33	1.0	0.01	0.01	0.21	8.46
4	0.33	2.12	1.92	0.48	0.56	0.82	0.11	ND	0.21	9.59
5	0.38	1.12	0.97	0.56	0.72	0.66	0.13	ND	0.33	16.23
6	0.024	0.16	0.56	ND	ND	ND	ND	ND	1.36	2.97
7	0.33	0.86	0.12	ND	ND	ND	ND	ND	1.91	2.86
8	0.017	0.97	0.012	ND	ND	ND	ND	ND	1.02	3.49

Research Article

The concentration of Zn, Pb and was found to be detected in the ranges 0.16-2.12 ,0.012-2.96,2.86-21.12µgms/ml respectively. The Concnetration of Ni and Cr was 0.33-0.72 and 0.21-1.91µgms/ml.the values exid the tolerance limit. The conc. of Sodium in the range of 0.82-1.91 micro gms/ml. The increase in conc.of Na⁺ in the water causes affects on the cardio-vascular disease and toxemia (Payam and *et al.*, 2009). The concentration. of Potassium in the water sample was 0.16-2.67 µgm/ml High conc. of potassium may causes magnesium deficiency and iron chlorosis. Concnetration of Iron was 0.92-21.46µgms/ml. These heavy metals from the compelx with organic acids, ester and some hetrocyclic compounds.

Table 4: Detection of exchangeable metals by Flame photometer

Sample No	Na ⁺	K ⁺	Ca ⁺	Li ⁺
1	1.75	1.86	12.56	ND
2	1.47	1.57	46.23	ND
3	0.98	1.78	36.25	ND
4	1.89	2.67	45.85	ND
5	0.98	1.49	38.92	ND
6	1.68	1.04	62.52	ND
7	1.87	2.36	67.41	ND
8	0.98	1.08	32.83	ND

The concnetration of some metals like Hg Cd, Cr,Ni, Mn was found bo not detected in all the industrial wsstewater sample.s The concnetration of Cu Found to be in the range of 0.017 to 0.44 µg/ml. The concentration of Zn , Pb, and Cd was found to be detected in the range 0.086-1.78, 0.33-2.73 and µg/ml. The concnetration of all the metals in the ground water sample was not detected. only Cu Zn and Fe are found in trace.

Detection of exchangeable metals as Sodium Potassium Calcium and Lithium were detected by using Flame photometer, Lithium was absent in the water sample Table No.4.

Conclusion

The result achieved in the present investigation on the quality of the water from the Sanganer town shows that all the effluents of the wastewater and printing dye waste physicochemical parameters fall within the permissible limit as per standards. The analytical data from different reagon from Sanganer industiral area, revelas that water is slightly alkaline in nature, rich in total dissolved and suspended solids is in high concentration.The total hardness, alakalinity chloride sulphates and nitrate content were slightly excess. the desirable limit of water concnetrations. It was observed that due to increase in the turbidity the light to be utilized by the plants for photosynthesis decreases, therefore the growth of the phytoplankton decreases.

The corelation coefficient (r) between variables x and y were calculated by usingstandard relation. The value of corelation coefficient for the temp. pH pH,Temp The c-relation matrix of these physico-chemical parameter indicate (Table 3) high corelation between CO₃ and HCO₃(0.9435) , COD and Conductivity (0.8350) and Cl and Hardness (0.7395)

The present study with ICP-AES shows that the wastewater consists of different heavy metals. The concentration of heavy metals does not exceed the permissible limit, the inorganic insoluble salt as calcium and magnesium makes water hard and unsuitable for living organisms. Photocatalysis has a large capability for water treatment. It can be utilized for the decomposition of organic and inorganic compounds and removal of trace metals. Therefore the dyeing and printing wastewater should be treated before pounding to open place or rive

Research Article

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