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RESEARCH PAPER

Impact of Industrial Effluents on Water Quality of Behgul River at Bareilly

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ABSTRACT

The effect of mixed effluents of paper and sugar industries in river Bhegul passing through Bareilly district of Uttar Pradesh was studied on Physico-chemical properties of water. The water samples were collected from three sites (Bairam Nagar village, Basai village, Thanpur village) of this river. Site first village Bairam Nagar has non polluted water, while water collected from two other sites i.e. Basai village site second was highly polluted and third site Thanpur village has mixed polluted water. The physico-chemical parameter studied were Temperature, pH, Total solids, Total suspended solids, Total dissolved solids, Dissolve oxygen (D.O.), Biological oxygen demand (BOD), Chemical oxygen demand (COD), Calcium, Hardness, Alkalinity, Chlorides. The results obtained showed fluctuations in these parameter's which gave an idea about the intensity of pollution caused by these industrial effluents. During the month of November 2006 to January 2007, the temperature of water samples was ranged from minimum of 20.0^{0}C to maximum of 29.4^{0}C, T.S. from 195 mg/l to 210 mg/l, T.D.S. from 165 to 190 mg/l, T.S.S. from 18.0 to 28.0mg/l, pH from 6.02 to 7.14, D.O. from 0.9 to 5.0 mg/l, B.O.D. from 0.5 to 8.0 mg/l, C.O.D. from 22.0 to 71.0 mg/l, Alkalinity from 265 to 378mg/l, chlorides from 20.0 to 39.0 mg/l, Calcium from 45.0 to 67.0 mg/l, Hardness from 250 to 296 mg/l. According to the data collected during the months February to April 2007 minimum and maximum temp. ranged from 20.0^{0}C to 24.4^{0}C, T.S. from 185 to 218 mg/l, T.D.S. from 170 to 191mg/l, T.S.S. from 22.0 to 28.0 mg/l, pH from 6.08 to 7.14 mg/l, D.O. from 0.6 to 2.1 mg/l, B.O.D. from 2.1 to 8.5 mg/l, C.O.D. from 32.0 to 70.0 mg/l, Alkalinity from 252 to 368 mg/l, chlorides from 23.0 to 39.0mg/l, Calcium from 42.0 to 70.0 mg/l, Hardness from 240 to 296 mg/l

KEY WORDS:-*Water pollution, Paper and Sugar Industrial effluents, Physico-chemical characteristics of water.*

INTRODUCTION

Pollution in broad sense, refers to any change which causes disbalance in the natural quality of the environment brought about through physical, chemical or biological processes. These industrial pollutants degrade ecosystem many fold; pollute the water bodies or stream, damage aquatic ecosystem, damage the soil fertility and soil subsystem. The effluent contains various inorganic and organic substances in different concentration may affect the growth and germination of crop plants. The agriculture production is heavily affected by the reckless (Polluted) discharge of Paper and Sugar mill effluents to the water bodies. A number of workers as [1, 3, 4, 6, 10] have done a considerable amount of work to study about the change in water quality characteristics of Paper & Sugar mill effluents.

MATERIAL AND METHODS

Three sampling sites of river Behgul, were selected on the basis of the mixing of industrial effluents. The description of the three sampling sites are given below.

Site I: This site is situated at river Behgul near village Bairam nagar (Bareilly). In this site is low amount of industrial effluents are discharged in the water of river Behgul and water at this site in Non-polluted water.

Site II: This site is situated at Kulli Nullha and effluent is drained in Behgul river. This site is highly polluted.

Site III: This site is located at river Behgul near village Thanpur. This site is polluted.

Table 1: Physico-chemical parameters of water of Behgul river November 2006 to January 2007.

Parameters	November 2006			December 2006			January 2007		
	Site I	**Site II**	**Site III**	**Site I**	**Site II**	**Site III**	**Site I**	**Site II**	**Site III**
Transparency	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Odour	Light pungent	Pungent	Light Pungent	Less Odour	Pungent	Light Pungent	Odour less	Pungent	Pungent
Colour of water	Colourless	Blakish	Yellowish	Yellowish Muddy	Dark blakish	Blakish	Yellowish	Dark blakish	Dark blakish
Temperature	29.2^0C	29.4^0C	29^0C	20.0^0C	22.0^0C	20.0^0C	20.0^0C	21.0^0C	20.2^0C
Total solids	210 mg/l	208 mg/l	208 mg/l	201mg/l	195mg/l	210mg/l	208 mg/l	198 mg/l	205 mg/l
Total dissolve solids	190 mg/l	190 mg/l	180 mg/l	190mg/l	170mg/l	165mg/l	185 mg/l	170 mg/l	178 mg/l
Total suspended solids	20 mg/l	18 mg/l	28 mg/l	19mg/l	25mg/l	28mg/l	23.0 mg/l	28.0 mg/l	27.0 mg/l
pH	7.09	6.26	6.22	6.02	6.02	6.12	7.14	6.05	6.82
Dissolve oxygen	5.0 mg/l	1.5 mg/l	3.2 mg/l	3.0mg/l	1.0mg/l	1.5mg/l	2.0 mg/l	0.9 mg/l	1.4 mg/l
Biochemical oxygen demand	2.1 mg/l	0.5 mg/l	1.2 mg/l	2.2mg/l	3.6mg/l	4.7mg/l	3.0 mg/l	8.0 mg/l	7.2 mg/l
Chemical oxygen demand	22.0 mg/l	68.0 mg/l	31.0 mg/l	30mg/l	70mg/l	38mg/l	40.0 mg/l	71.0 mg/l	45.0 mg/l
Alkalinity	268 mg/l	378 mg/l	312 mg/l	265mg/l	352mg/l	349mg/l	266 mg/l	355 mg/l	365 mg/l
Chlorides Cl^-	26.0 mg/l	38.0 mg/l	22.0 mg/l	26mg/l	39mg/l	20m/l	27.0 mg/l	32.0 mg/l	22.0 mg/l
Calcium C^{++}	58.0 mg/l	67.0 mg/l	49.0 mg/l	48mg/l	52mg/l	49mg/l	51.0 mg/l	64.0 mg/l	45.0 mg/l
Hardness	296 mg/l	254 mg/l	255 mg/l	296mg/l	250mg/l	270mg/l	294 mg/l	255 mg/l	262 mg/l

Table 2: Physico-chemical parameters of water of Behgul river February 2007 to April 2007

Parameters	February 2007			March 2007			April 2007		
	Site I	**Site II**	**Site III**	**Site I**	**Site II**	**Site III**	**Site I**	**Site II**	**Site III**
Transparency	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Odour	Light Pungent	Pungent	Light Pungent	Odour less	Pungent	Pungent	Light pungent	Pungent	Pungent
Colour of water	Yellowish	Dark blakish	Blakish	Yellowish	Dark blakish	Blakish	Yellowish Black	Dark blakish	Blakish
Temperature	20.0^0C	23.0^0C	20.0^0C	23.0^0C	24.0^0C	23.0^0C	24.0^0C	24.4^0C	24.1^0C
Total solids	209 mg/l	195 mg/l	201mg/l	201 mg/l	185 mg/l	208 mg/l	212 mg/l	195 mg/l	218 mg/l
Total dissolve solids	187 mg/l	170 mg/l	178 mg/l	181 mg/l	175 mg/l	178 mg/l	191 mg/l	178 mg/l	184 mg/l
Total suspended solids	22.0 mg/l	25.0 mg/l	23.0 mg/l	25.0 mg/l	28.0 mg/l	26.0 mg/l	23.0 mg/l	26.0 mg/l	25.0 mg/l
pH	6.42	6.08	6.82	7.12	5.92	6.52	7.14	6.18	6.42
Dissolve oxygen	2.1 mg/l	1.0 mg/l	1.5 mg/l	1.0 mg/l	0.6 mg/l	0.9 mg/l	1.6 mg/l	1.2 mg/l	2.1 mg/l
Biochemical oxygen demand	4.0 mg/l	7.5 mg/l	6.5 mg/l	2.1 mg/l	8.5 mg/l	7.6 mg/l	4.2 mg/l	4.8 mg/l	6.2 mg/l
Chemical oxygen demand	42.0 mg/l	70.0 mg/l	40.0 mg/l	45.0 mg/l	62.0 mg/l	42.0 mg/l	34.0 mg/l	62.0 mg/l	32.0 mg/l
Alkalinity	260 mg/l	325 mg/l	330 mg/l	252 mg/l	342 mg/l	348 mg/l	254 mg/l	368 mg/l	324 mg/l
Chlorides Cl^-	25.0 mg/l	39.0 mg/l	28.0 mg/l	24.0 mg/l	39.0 mg/l	25.0 mg/l	25.0 mg/l	34.0 mg/l	23.0 mg/l
Calcium C^{++}	54.0 mg/l	70.0 mg/l	51.0 mg/l	52.0 mg/l	63.0 mg/l	42.0 mg/l	58.0 mg/l	67.0 mg/l	49.0 mg/l
Hardness	285 mg/l	240 mg/l	254 mg/l	292 mg/l	256 mg/l	268 mg/l	296 mg/l	254 mg/l	255 mg/l

Water samples from these sites were collected to study the physico-chemical parameters of the water body to know the degree of pollution. Water samples were brought in the laboratory in air tight plastic cans from November 2006 to April 2007 in morning between 8 to 9 a.m. Values for physico-chemical parameters namely Temperature, Total solids, Total dissolve solids, Total suspended solids, pH, Dissolve oxygen, Biological oxygen demand, Chemical oxygen demand, Alkalinity, Chloride, Calcium, Hardness were recorded by standard methods of APHA [1].

RESULTS AND DISCUSSION:

Temperature: Temperature is an important parameter, which is directly related with the chemical reaction in the water and biochemical reactions in the living organisms. In present study, the temperature during Nov. 2006 - Jan. 07 ranged from 20.0^0C – 29.4^0C. During the period Feb. –Apr. 07 temp ranged from 20.0^0C - 24.4^0C. Bandela et al. [2], reported 24.6^0C to 33.5^0C temperature of Barul Dam near Nanded.

TDS: Total dissolved solid is particularly useful in the analysis of industrial waste water. The TDS in months of Nov. 06 – Jan. 07 ranged from 165 mg/l to 190 mg/l. Feb. – Apr. 07 TDS ranged from 170mg/l to 191mg/l. Dandge [4] reported T.D.S. value in the range of 273-472mg/l. Tiwari [12], recorded 170.00 mg/l.

T.S.S.: Suspended solids play an important role in water sample causes duplication of oxygen level. In the present study total suspended solids recorded in months Nov. 06 – Jan. 07 from 18.0mg/l to 28.0mg/l. In the months of Feb. – Apr. 07 T.S.S was 22.0mg/l to 28.0mg/l. Shivakumar et al. [9], observed total suspended solids as 56.9-66.0 mg/l in Marlimund lake. Tiwari [12], recorded 80.0 mg/l of total suspended solids.

pH: pH is one of the important tool to compare the sample collected from control and industrial effluents mixed water. When pH is low or high, it can be affect the germination of crop plants and decreased the productivity of crops. In the present investigation pH was slightly decreased due to mixing of effluents from paper and sugar industries. The pH ranges from in month Nov.2006 -Jan. 07, January ranges from minimum and maximum 6.02 mg/l to 7.14mg/l in month Feb.-Apr. 07 from 6.08 mg/l to 7.14 mg/l.

D.O.: The analysis of dissolved oxygen is very important in water pollution control as well as waste water control. It is one of the most important factor, which depends on physical, chemical and biological activities of water body. In the present investigations the D.O. value was recorded in Nov. 06 – Jan. 07 from 0.9mg/l to 5.0mg/l and in months from Feb. – Apr. 07 it ranged from 0.6mg/l to 2.1mg/l. Nair [7], reported maximum D.O. in February and minimum in August in a village pond in Madhya Pradesh.

B.O.D.: Biological oxygen demands is an important parameter, which is widely used to determine the pollution load of waste water. In the present investigation, the B.O.D. value ranged during the Nov. 06 – Jan. 07 from 0.5mg/l to 8.0mg/l, and from Feb. – Apr. 07 it was from 2.1mg/l to 8.5mg/l. Tiwari [12] observed B.O.D. value as 3.0 mg/l.

C.O.D.: Chemical oxygen demands is a test, which is used to measure pollution of domestic and industrial waste. In the present investigation, C.O.D. in months from Nov. 06 – Jan. 07 ranged from 22.0mg/l to 71.0mg/l. Feb. – Apr. 07 it ranged from 32.0 mg/l to 70.0mg/l. Sreenivasa et al. [11] contribution to the C.O.D. evaluation on fresh water.

Alkalinity: Alkalinity due to the presence of carbonate and bicarbonate ions. The alkalinity ranged during Nov. 06 – Jan. 07 was 265.0mg/l to 378.0mg/l and in Feb. – Apr. 07 from 252mg/l to 368mg/l.

Chlorides: Chlorides in natural water may sometimes be due to leaching of rocks. However the greatest source of chlorides in fresh water is sewage& industrial waste. Human body release a very high quantity (6gm per person per day) of chloride. Since much less concentration of chlorides could be added by natural sources, higher concentrations are usually indicative of pollution. In our studies the values ranged during Nov. 06 – Jan. 07 from 20.0mg/l to 39.0mg/l in months Feb. – Apr. 07 from 23.0mg/l to 39.0mg/l. Sharma and Pande [8] recorded the 12 mg/l to 24 mg/l.

Calcium C++ : Calcium and magnesium concentration varied significantly. The calcium ranged during Nov. 06 – Jan. 07 from 45.0mg/l to 67.0mg/l from Feb. – Apr. 07 it ranged from 42.0mg/l to 70.0mg/l.

Hardness: The term hardness indicates the concentration of calcium and magnesium ions only. It is expressed in terms of calcium carbonate. For the estimation of these ions, the E.D.T.A. titrimetric method is used. The total hardness varied from 250.0mg/l to 296.0mg/l during Nov. 06 – Jan 07. During Feb. – Apr. 07 it ranged from 240mg/l to 296mg/l respectively.

REFERENCES:

[1] APHA (1998). Standard Method for the examination of water and waste water 18 Ed. Washington D.C.

[2] Bandela, N.N., Vaidya, D.P., Lomte, V.S., (1998). Seasonal temperature changed and their influence on the level of Co_2 and pH in Barul dam water.
[3] Beg, M.U.; Al-Muzaini, S.; Saeed, T.; Jacob, F.G.; Beg, K.R.; Al-Bahloul, M.; Al-Matrouk K.; Al-obaid-T and Kurain-A (2001). Chemical contamination and toxicity of sediment from a coastal area receiving industrial effluents in Kuwait. *Archives of Environmental contamination and toxicology* **41:** 289-297.
[4] Dandge, P.R. (2001). *Pollution status of Kagzipura lake at Khultabad*. Disseratation reports, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
[5] Gaur, K.K. (1992). Physico-chemical and biological characterstics of keetham lake. *J. Natcon* **4:** 35-39.
[6] Hopetti, B.B.; Natraj, S., Chandra Shekhar, A.S., Kamalakar, S.B. and Patil, S.R. (1995). Ecological studies on River Tunga at Shimaga with special reference to water Pollution and land use. *J. Natcon.* **7:** 111-117.
[7] Nair, M.S.R., 2000. *Physico-chemical factors and its impacts on the ecology of a village pond in India, Vidisha, M.P. Indian, J. Eco. Biol*. 12(1).
[8] Sharma, S.D. and Pande, K.S. (1998). Pollution studies on Ram Ganga river at Moradabad Physico-chemical characteristics and toxic metal. *Poll. Res.* **17(2):** 201-209.
[9] Shiva Kumar, R., Mohanraj, R. and Azzez, P.A. 2000. Physico-chemical analysis of water source of Ooty, South India. *Poll. Res.* **19(1):** 143-146.
[10] Shukla, G.R.; Sharma, R.R. and Manohar, R. (2000). Impact of assessment of industrial pollution of Krishna river. *Aqua cult.* **1:** 69-90.
[11] Sreenivasa Rao, A. Ramamohan Rao, P. and Someswara Rao, N., (1999). Degradation of water quality of kolleru lake. *Indian J. Environ Health*, **41(4):** 300-311.
[12] Tiwari, Yogesh (2001). Water quality assessment of historical lake at Aurangabad. Dissertation report, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
[13] Trivedy, R.K. and Goel, P.K. (1984). Chemical and biological methods for water pollution studies. *Env. Pub. Karool*.