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Limnochemical characteristics of Betwa river, Madhya Pradesh, India

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Abstract

The present paper deals with the monthly interval variation of limnochemical characteristics of river Betwa during October 2011 to August 2012. Five major sampling station (10 sites) were selected, station- I Jhirri (1 to 2 sites), station- II Nayapura (3 to 4 sites), station- III Mandideep (5 to 6 sites), station- IV Bhojpur (7 to 8 sites), station- V Vidisha (9 to 10 sites). Various physico-chemical parameters like temperature, pH, hardness, Dissolved oxygen, biological oxygen demand and chemical oxygen demand were measured, and standard methods were apply in the present work. Studies revealed high values of hardness, BOD and COD at station II Nayapura and station III mandideep, and low values of DO and pH at the station, where station I Jhirri, IV Bhojpur, and Vidisha low values of hardness, BOD and COD. High value of hardness, BOD and COD indicate the river water polluted at station II Nayapura and station III Mandideep.

Key-Words: Betwa river, mandideep, Nayapura, Physico-chemical parameters

Introduction

Rivers have always been the most important fresh water resources and most developmental activities are still dependent upon them. Rivers play a major role in assimilating or carrying industrial and municipal waste water, manure discharge and runoff water from agricultural field, road ways and streets which are responsible for river pollution (Ward and Elliot, 1995). The Betwa is a river Northern India, and tributary of the Yamuna originating in the Kumra (Jhirri) village in Raisen dirtrict of Madhya Pradesh, India. The river Betwa plays a significant role in the human life of the villages located in Mandideep, Nayapura and Bhojpur areas. It has become polluted at some places of Mandideep due to industrial activities and the confluence of sewage, domestic wastes and industrial effluents of many big and small enterprises with various types of organic compounds and heavy metals deterioted to human health and aquatic organisms. Urban areas, farms, factories and individual households – all contribute to the contamination of this river.

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The water quality in the stretch of the river Betwa extending from its origin near Mandideep industrial area up to Bhojpur remains poor because of the regular inflow of domestic waste of the Bhopal city through the Kaliyasot river and industrial/domestic waters from Mandideep (Kori *et. al*., 2006). Study of different physico-chemical parameter revealed that the intensity of pollution increased as the river was subjected to sewage and industrial waste. In order to manage the pollution load of river Betwa that pass nearby Mandideep and Nayapura, it is recommended that various methods of sewage industrial waste treatment should be used before disposal of effluents.

Material and Methods

Study area (sampling sites)

On the basis of the survey conducted and literature available, five station and ten (10) monitoring sites were selected to sample water. The sites were selected mostly on the basis of various activities occurring on surrounding area of the river. Samples were taken at the following points during alternate month:

Station I : River Betwa at Jhirri (1 to 2 sites).
Station II : River Betwa at Nayapura village (3 to 4 sites).
Station III : River Betwa at Mandideep where industrial Nallah confluence with river water (5 to 6).

Station IV : River Betwa at Bhojpur (7 to 8).
Station V : River Betwa at Vidisha (9 to 10).
Measurement of physico-chemical parameters: The physico-chemical parameters such as temperature, pH, dissolved oxygen, Biological oxygen demand and Chemical oxygen demand etc. were measured as per (APHA 1976).

Results and Discussion

Temperature influences the life of all biological organisms. During the period of study temperature was recorded ranged from 16 to 31^0C. The variation is mainly related with the temperature of atmospheric and weather condition (Adebowale *et. al.*,2008). pH expresses the intensity of acidity or alkalinity of an aquatic environment. The pH ranged from 5 to 9.2, the water was acidic at station II Nayapura and station III Mandideep. The change in pH values of station II and III. It was observed that pH decreased. The reduction in the pH of river Betwa could have been due to the discharged industrial effluents. This result agrees with the reports by previous scientist (Edema *et.al.*, 2006 ; Rim- Rukeh *et.al.*, 2006). Hardness is often used to assess the quality of water. Hard water contains large concentrations of alkaline earths dissolved from the drainage of calcium deposits (Wetzel, 1975). In the present study the observed values ranged from 14.6 to 58.6 mg/l. The increase in hardness can be attributed to the decrease in water volume and increase in the rate of evaporation at high temperature, high loading organic substances, detergent, chlorides and other pollutants (Rajgopal *et.al.*,2010) (Table No 1).

Dissolved oxygen very crucial for the survival of aquatic organism, Yakub and Ugwvmba,(2009). The DO ranged from 2 to 12.3 mg/l. minimum DO was recorded station II and III Nayapura and Mandideep. Minimum dissolved oxygen due to effluents discharge, Emongor *et. al.*, 2005, suggested that the industries were releasing some organic substances that were high oxygen demanding wastes. Biological oxygen demand (BOD) is an important parameter which is widely used to determine the pollution load of waste water. The aim of BOD test is determine the amount of bio-chemically oxidisable carbonaceous matter (Gupta *et. al.*, 2003). BOD value of river water ranged 2 to 15mg/l. high value of BOD recorded at station II and III. These were due to higher rate of decomposition of organic matter at higher temperature, turbidity and less water current (Sanap *et.al.*, 2006). Chemical oxygen demand is a test which is used to measure pollution of domestic and industrial waste. This gives valuable information about the pollution potential of industrial effluents and domestic sewage (Gupta *et. al.*, 2003). In the present study the value of COD varies from 8 to 81.5mg/l. highest value of COD indicates that most of pollution in study zone in Betwa river in caused by industrial effluents discharged by industrial units. Similar results were also reported by Pande and Sharma (1998) (Table No 1).

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References

1. Adebowale, K.O., F.O. Agunbiade and B.I. (2008) Olu-Owolabi,.Impacts of natural and anthropogenic multiple sources of pollution on the environmental conditions of Ondo State Costal Water Nigeria. EJEAFChe, 7 (4): 2797-2811.
2. APHA, (1976). American public Health association.
3. Edema MO, Omenu AM, Fapeta OM. (2006)Microbiology and physiological analysis of different sources of drinking water in Abeokuta. Nig.J. Microb., 13(1): 57-61.
4. Gupta,S., M. Bhatnagar and R. Jain,. (2003) Physico-chemical characteristics and analysis of Fe and Zn in tubewell water and sewage water of Bikaner City. Asian J. Chem., 15: 727.
5. Kori,R., Shrivastava, P.K., Upadhyay,N., Singh,R. (2006). Studies on presence of heavy metals and halogenated hydrocarbons in river Betwa (M.P), India.No2/3: 147-153.
6. Pande, K.S. and S.D. Sharma, (1998).Studies of toxic pollutants in Ramganga river at Moradabad India. Envtal Geo., 1(2): 93-96.
7. Rim-Rukeh A, Ikhifa GO, Okokoyo PA. (2006) Effects of agricultural activities on the water quality of Orogodo River, Agbor, Nig. J. Appl. Sci. Res., 2(5): 256-259.
8. Rajagopal T., Thangamani A., Sevarkodiyone S. P., Sekar M. and Archunan G., (2010), Zooplankton diversity and physicochemical conditions in three perennial ponds of Virudhunagar district, Tamilnadu. Journal of Environmental Biology 31:265- 272.
9. Sanap, R.R. Mohite, A.K. Pingle, S.D. and Gunale, V.R, (2006) evaluation of water qualities of Godawari river with reference to

physicochemical parameters, dist. Nasik (M.S.), India. Poll. Res., 25(4), pp 775-778.
10. Yakub, A.S. and Ugwumba, A.A.A.(2009). Study on the macroinvertebrates fauna of cower Ogun river at ishasi, Ogun state south west Nigeria. The Zoologist Vol.7: 65-74.
11. Wetzel, R.G. (1975). *Limnology*. W B. Saundrs Co., Philadelphia, p. 980.
12. Ward A.D., Elliot W.J. (1995). Enviornmental Hydrology. Lewis publishers, Boca Radittaton, Florida.

Table 1: Studies of different parameters of River Betwa, Bhopal, (M.P.)

Months	Sites										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**M**
	Temperature										
Oct.	21	20	20.5	21	21.4	22	20	21.1	22	22.4	21
Dec.	19	18	19.4	19	17.3	18.3	19.2	20	20.5	17.7	18.6
Feb.	16.3	17.5	17.2	18	16.5	18.5	19.2	17	19	18.5	17.5
Apri.	23	23.5	24.3	22	23	24	21	23	23.2	23.5	23
Jun.	30	30.2	31.3	29.5	32	31	31.6	30.2	32.2	31.2	31
Aug.	24	24.3	23	22	24	23	21	23.2	23	24.3	23.1
	pH										
Oct.	7.3	7.1	6.2	6.4	5.4	5.8	7.5	6.7	8.9	7	6.8
Dec.	7.4	7.8	5.5	6	5.8	6.3	7.4	8.3	6.8	7.5	6.8
Feb.	7.2	7	6.3	6.5	5.7	5.3	8.2	8	7.8	7.1	7
Apri.	8.1	8.4	6.2	6.1	6	5.5	7.6	6.7	7.3	8.2	7.2
Jun.	7	7.2	6.4	6.3	6.1	6	7.7	7.4	8.2	8.5	7
Aug.	8.8	8.4	5.6	5	5.3	5.5	8.1	7.4	6.8	7.2	6.7
	Hardness										
Oct.	16	16.2	40	40.4	52.4	50.5	20.2	20.5	22	22.6	30.8
Dec.	15	15.8	42.4	42.8	50.5	52.2	18.4	18.9	20.2	20.8	34
Feb.	14.2	14.8	38.2	36.8	48.4	48.6	20.4	20.6	24.5	24.4	29
Apri.	15.6	15.9	35.6	35.8	50.5	50.8	22.4	22.8	21.4	21.6	29.2
Jun.	18.4	18.8	36.2	36.5	58.4	58.6	24.4	24.6	24.8	24.9	32.5
Aug.	16	16.8	35.4	35.6	54.8	54.2	22	22.4	21.5	21.8	30
	Dissolved oxygen										
Oct.	8.4	8.2	2.1	2.2	2	1.8	7.6	8	8.2	7.5	5.6
Dec.	10.2	12.3	2.4	2	2.1	2.5	10	10.7	9.8	9.7	7
Feb.	8.8	9.9	2.2	2.	3	3.1	7.2	8.2	8	8.4	5.7
Apri.	7.1	7.2	2.4	2.3	2.4	2.1	7.8	8.3	7.5	7.1	5.4
Jun.	5.8	6.2	1.5	1.3	1.6	1.3	6.2	6.9	6.5	6.1	4.3
Aug.	6.8	6.5	2.2	2.4	3.2	3.4	7.6	7.8	6	6.5	5.2

	Biological oxygen demand										
Oct.	2.4	2.5	7.4	7.5	12.3	14.6	2.5	2.4	4.2	3.4	6
Dec.	3.4	2.2	8	8.5	10.2	12.3	4.7	4.4	2.8	2.5	6
Feb.	2.5	2.9	8.5	8	9	11.5	2.1	2.3	2.4	2.5	5.1
Apri.	3.2	4.4	10.5	10.2	9.8	10.4	3.5	4.8	2.5	2.8	6.2
Jun.	4.4	4.2	11	10.5	10.6	11.8	2.1	3.8	2.5	3.5	6.4
Aug.	3.5	3.8	9.4	9.2	12.1	14.6	2.5	2.6	4.4	4.2	6.6
	Chemical oxygen demand										
Oct.	10.1	11.4	42.3	42.2	70.5	71.2	12.5	12.2	11.6	11.5	29.5
Dec.	8.4	8.5	38.6	38.2	78.9	72.5	11.3	13.5	12.2	13.8	29.5
Feb.	9.5	9.8	39.2	40	60.6	64.2	10.6	10.5	10.8	10.4	26.5
Apri.	10.5	10.6	42.5	40.3	64.2	68.5	11.4	10.3	11.5	12.2	28.2
Jun.	12.5	12.2	43.3	41.4	82.5	82.2	10	10.4	11.5	12.4	28.8
Aug.	11.5	10.3	42.8	40.6	80.8	81.8	12.5	12.4	13.2	13.6	31.9