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Evaluation of Water Quality: Physico - Chemical Characteristics of Narmada River at Omkareshwar by using Correlation Study, MP, India

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Abstract

The present study is carried out in river Narmada to assess and evaluate the extent of pollution by domestic activities, agricultural wastes and pilgrims' activities at Omkareshwar. Water samples under investigations were collected and analyzed monthly for temperature, transparency, pH, D.O., B.O.D., Chloride, Nitrate, Phosphate during 2011 (January 2011 to December 2011). Correlation coefficient was calculated between different pairs of parameters to identify the high correlated and interrelated water quality parameters.

Key words: Correlation Coefficient, Physio - chemical analysis, Narmada River, Water.

Introduction

India is rich in water resources, being endowed with a network of rivers and blessed with snow cover in the Himalayan range that can meet a variety of water requirements of the country. However, with the rapid increase in the pollution of the country and the need to meet the increasing demand of irrigation, human and industrial consumption, the available water resources in many parts of the country are getting depleted and the water quality has deteriorated. Indian rivers are polluted due to discharge of untreated sewage and industrial effluents. River Narmada is one of the 13 prominent rivers of India which covers 98,797sq km of total water shed area. Narmada is considered to be the lifeline and west flowing river of the states of Madhya Pradesh and Gujarat in terms of its catchment area. Sampling station Omkareshwar is the pilgrim's place situated at the bank of Narmada River. Omkareshwar is famous for Omkareshwar Shiva temple. At this sampling site huge quantity of domestic waste, municipal sewage is dumped daily, agricultural run - off also get mixed with Narmada River. As it is holy place like Haridwar, the entire pilgrim's also contribute

an important role to pollute the Narmada River water at Omkareshwar because of their undesirable activities in the River. Hence it is required to investigate the Physico - Chemical Parameters of river Water.

Material and Methods

The present study was conducted in Narmada River from selected station Omkareshwar which is situated in Khandwa District of Madhya Pradesh, India. Selected stations located in latitude (DMS) 22º15' 1" N and longitude (DMS) 76º8' 48" E. The study was carried out for period of twelve months during year 2011 from January 2011 to December 2011. Water samples were collected from selected station during first week of every month. Five liters water sample were collected from 15 cm below surface water in wide mouthed screw capped, airtight and opaque polythene containers. Separate samples were collected for DO & BOD in 250 ml DO bottles and oxygen was fixed at the time of sampling on field by alkali azide reagent. Water temperature recorded by standard centigrade thermometer, pH recorded by standard pH meter on the spot and rest of all the parameters were analyzed in the laboratory by titrimetric methods. The analysis of Physio - Chemical characteristic is carried out by the standard methodologies for water analysis given by [APHA 2005[1], Welch 1958[2], Golterman *et al.* 1978[3]].

Results and Discussion

The table 1 shows the Physico - Chemical parameters of Omkareshwar. This study concludes that various parameters depending upon the hydrochemistry of the study area and also the domestic, Pilgrims', municipal wastes released in the river. The study was carried out during year 2011 and study shows that throughout the year all the parameters vary. This suggests that water quality of the water can be measured in terms of the Physico - Chemical parameters.

The pH of the River water was found alkaline during the study period and fluctuated between (7.2 to 8.2), it was well with limit (6.5 to 8.5). The maximum pH was observed in the month of July and September, minimum pH was observed in the month of June. This Variation in the pH was due to the domestic waste and Pilgrims' waste. The correlation study shows that pH is -ve correlated with Temp (-0.228), D.O. (-0.528) & chloride (-0.209) & this parameter shows +ve Correlation with B.O.D. (0.342), Phosphate (0.423) & Nitrate (0.480)

Transparency (0.764).

The transparency of the River water during the study period was observed between (14 to 89). Minimum transparency was obtained in the month of August & maximum transparency was observed in the month of January.

Temperature of the River water was observed between (17.3°C to 30.7°C) during the study period. Maximum temperature was observed in the month of May and minimum in the month of December. The correlation study shows that Temperature is -ve correlated with pH (-0.228), D.O. (-0.282), Transparency (-0.306) & this parameter shows +ve Correlation with B.O.D. (0.521), Chloride (0.442), Phosphate (0.429) & Nitrate (0.405). Temperature is important factor as all the degradation and anthropogenic activities varies with the variation of the temperature.

Table 1. Showing monthly fluctuations in Physico-chemical parameters of Narmada River at Sampling station (Omkareshwar) [Jan 11 -Dec. 11]

Sr. No.	PARAMETERS	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	Temperature °C	20.3	22.4	24.6	27.5	30.7	29.5	27.3	26.1	28.3	26.2	21.1	17.3
2	Transparency	89	83	86	81	83	76	19	14	65	82	83	87
3	pH	7.9	7.9	8	7.8	7.7	8.2	7.2	7.3	7.2	8.1	7.9	7.8
4	Dissolved Oxygen (mg. /ltr.)	7.7	7.5	7.4	7.2	7	6.8	7.9	9.4	7.5	7.6	7.8	7.8
5	B. O. D. (mg. /ltr.)	0.7	0.8	0.8	1	1.3	1.2	0.9	0.5	0.6	0.7	0.8	0.7
6	Chloride (mg. /ltr.)	26	28	31	36	34	35	45	22	24	16	20	24
7	Phosphate (mg./ltr.)	0.143	0.156	0.193	0.174	0.163	0.176	0.101	0.099	0.184	0.167	0.116	0.112
8	Nitrate (mg./ltr.)	0.285	0.204	0.270	0.359	0.463	0.425	0.237	0.175	0.228	0.287	0.320	0.275

D.O. of the River water was observed between (6.8 mg/Lt. to 9.4 mg/Lt.) during the Study period. D.O. in natural and waste depends on the Physical, Chemical & Biological activities[4-7]. Maximum D.O. was observed in the month of August and minimum in the month of June. The WHO standard suggests that the standard of D.O is > 5.00mg/ml. Our reading was found within limit. The correlation study shows that D.O. is -ve correlated with Temperature (-0.282), pH (-0.528), B.O.D. (-0.736), Chloride (-0.364), Phosphate (-0.718) & Nitrate (-0.721), Transparency (-0.696).

B.O.D. of the River water was observed between (0.5 mg/Lt. to 1.3 mg/Lt.) during the Study period. Maximum B.O.D. was observed in the month of May and minimum in the month of August. The WHO standard suggests that the standard of B. D.O is < 3.00 mg/ml. Our readings was found within limit. The correlation study shows that B.O.D. is -ve correlated with D.O. (-0.736), & this parameter shows +ve Correlation with Temperature (0.521), pH (0.342), Chloride (0.636), Phosphate (0.330) , Nitrate (0.884) & Transparency (0.278). These parameters depends on the temperature extent of biological activities, concentration of organic matter and such other related factors[8-12].

Chloride of the River water was observed between (16 mg/Lt. to 45 mg/Lt.) during the study period. The WHO standard suggests that the standard of Chloride is < 250 mg/ml. Our reading was found within limit. Maximum Chloride was observed in the month of July and minimum in the month of October. The correlation study shows that Chloride is -ve correlated with pH (-0.209) and D.O. (-0.364), Transparency (-0.263) & this parameter shows +ve Correlation with Temperature (0.442), B.O.D. (0.636), Phosphate (0.053) & Nitrate (0.307). Chloride are contributed mainly due to sediments, domestic sewage, bathing, sewage bring with urine which is rich in Urine, which is rich in

Table 2 Represents the Correlation between the Various Physico - Chemical Parameters of Narmada River Water at Omkareshwar Sampling Site.

PARAMETERS	TEMP	pH	D.O.	B.O.D.	Chloride	Phosphate	Nitrate	Transparency
TEMP	1							
pH	-0.228	1						
D.O.	-0.282	-0.528	1					
B.O.D.	0.521	0.342	-0.736	1				
Chloride	0.442	-0.209	-0.364	0.636	1			
Phosphate	0.429	0.423	-0.718	0.330	0.053	1		
Nitrate	0.405	0.480	-0.721	0.884	0.307	0.377	1	
Transparency	-0.306	0.764	-0.696	0.278	-0.263	0.575	0.478	1

urine content

Phosphate of the River water was observed between (0.099 mg./Lt. to 0.193 mg./Lt.) during the Study period. The WHO standard suggests that the standard of Phosphate is < 0.1 mg/ml. Our reading was found beyond the WHO limit. Maximum Phosphate was observed in the month of March and minimum in the month of August. The correlation study shows that Phosphate is -ve correlated with D.O. (-0.718), & this parameter shows +ve correlation with Temperature (0.429), pH (0.423), B.O.D. (0.330), Chloride (0.053), Nitrate (0.377) & Transparency (0.575). The increased applications of the detergents, domestic sewage and Pilgrims' waste generally contribute to the heavy load of the phosphorous in the river water[1-8].

Nitrate of the River water was observed between (0.175mg./Lt. to 0.463mg./Lt.) during the Study period. The WHO standard suggests that the standard of Nitrate is < 0.1 mg/ml. Our readings was found beyond the WHO limit. Maximum Nitrate was observed in the month of May and minimum in the month of August. The correlation study shows that Nitrate is -ve correlated with D.O. (-0.721), & this parameter shows +ve Correlation with Temperature (0.405), pH (0.480), B.O.D. (0.884), Chloride (0.307), Phosphate (0.377) & Transparency (0.478). The presence of Nitrate could be due to the anthropogenic sources like domestic sewage, agricultural wash off and other waste effluents containing nitrogenous compounds[9-12].

Conclusion

This study concludes that Narmada River water at Omkareshwar is getting slightly polluted. Informative data of Physio - chemical Parameters helps us to understand the contamination of waste water in river Narmada. Few parameters are found beyond the desirable limits. The major sources of pollution are local anthropogenic activities, agricultural run-off, pilgrim's waste & Domestic waste. The studies conclude that due to discharge of untreated sewage into the Narmada, the water quality of Narmada River is deterioting. If proper measures are taken for the treatment of sewage before discharge and restrictions are

put on various anthropogenic activities, Narmada river water would remain healthy in the long run.

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