

PHYSIO-CHEMICAL STUDY OF NARMADA RIVER WATER AT DIFFERENT GHAT OF JABALPUR CITY WITH SOME ASSORTED PARAMETERS

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ABSTRACT

The river Narmada also known as the “Rewa” is the third holy and fifth largest west flowing river of India and biggest west flowing river of the state M.P. Festivals are very important and heartiest to every person of India. Most of the festivals are associated with bathing in rivers, idol immersion, Jaware visarjan, float traditional oil lamps etc. They through some materials like food, waste or leaves in the river for spiritualistic reasons Religious human activities also add to the river pollution. Due to mismanagement of these waste and contaminated water all the areas near the river are polluted. In Jabalpur city one can find number of Narmada river ghats like Jelehri-ghat, Gwari-ghat, Tilwaraghat, Bhedaghat Barmanghat visited by thousands of people every day. In the present study water samples were collected from these ghats of narmada from Jabalpur on four different season from summer and winter. have been considered.

For the assessment of water quality the experiments have been done for physico-chemical parameters are pH, Total Hardness, D.O., B.O.D, Alkalinity as per the standard methods in the shri ram group Jabalpur.

KEYWORDS- physico- chemical, parameters, pH , Total Hardness, D.O., B.O.D, Alkalinity

INTRODUCTION

Water is a transparent fluid which forms the world's streams, lakes, oceans and rain, and is the major constituent of the fluids of living things. As a chemical compound, a water molecule contains one oxygen and two hydrogen atoms that are connected by covalent bonds. Water is a liquid at standard ambient temperature and pressure, but it often co-exists on Earth

with its solid state, ice and gaseous state, steam (water vapor). It also exists as snow, fog, dew and cloud.

Water is a basic need of life and is the foundation for human survival and development. Water is the most common substance on earth, covering seven tenths of the world's surface, and that is why earth is also called the blue planet. Life first started in water and 96% of the composition of all living cells is water. Water is one of the prime needs of life. We can hardly live for few days without water. Since time immemorial fresh water has always been of vital importance to man as his early habitations were within easy reach of rivers, tanks, dams, ponds and lakes. The importance of freshwater resources, their conservation and utilization has attained almost utmost importance during the present time.

The Earth's Surface covers 71% of Water. It is vital for all known forms of life. On Earth, 96.5% of the planet's water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of ice and liquid water suspended in air), and precipitation. Only 2.5% of the Earth's water is freshwater, and 98.8% of that water is in ice (excepting ice in clouds) and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products.

Sources of Pollution on surface water

Pollution of surface and ground water is largely a problem due to rapid urbanization, and industrialization. The large scale urban growth due migration of people from rural areas to urban areas has increased domestic effluents, while industrial development manifested either due to setting up of new industries or expansion

of the existing industrial establishments resulting in generation copious volume of industrial effluents. Once the contaminants enter the water source it is a difficult and expensive to remove them. Water pollution has been seriously affecting the life of humans, plants as well as animals. The eco-system of rivers, streams, lakes, seas and oceans is also getting deteriorated due to the contamination of water, through various sources. Discharges from power stations reduce the availability of oxygen in the water body, in which they are dumped. The flora and fauna of rivers, sea and oceans is adversely affected by water pollution. A number of waterborne diseases are produced by the pathogens present in polluted water, affecting humans and animals. Marine life becomes deteriorated due to water pollution [9]. Unplanned and injudicious disposal of municipal waste causing pollution of water bodies.

Festivals are very important and heartiest to every person of India. Religious human activities also add to the river pollution. Mehta (2014) stated that with growing magnitude of the religious activities pollution load is bound to be increased in manyfolds. The rivers in India have been considered sacred from ancient times. People take holy dip in river with the faith that the water washes away their sin. (#) [] After death of the people dump their asthia in the river, This obviously causes significant impact on the quality of the rivers in

India. "Higher the BOD level worse it is for one's skin," said a CPCB expert. High exposure to dirty water can result in skin rashness and allergie. Exposure factors such as washing clothes, bathing and lack of sewerage, toilets at residence, children defecating outdoors, poor sanitation, low income and low education levels also showed significant associations with enteric disease outcome. Basant Rai (2013) have done a study o water quality of river Gana and found that ontracting dysentery, cholera, hepatitis, as well as severe diarrhea which continue to be one of the leading causes of death of children in India. []

Background of the Study

Narmada river is a holy river and considered lifeline, so number of ghats (river-banks) are found in all the cities from where it passes through and large human population is living near its banks. During different festivals very much spiritual and extensive pujan activities are performed.

Most of the pujan activities and festivals are performed on Ghats situated on the banks of the river Narmada. Many melas or fairs are held on Makara Sankranti the most famous being the Mela, held every years at all

ghats .Narmada Jayanti is a festival celebrated in throughout in the state of Madhya Pradesh. It is celebrated as the Birthday of River Narmada. The Pilgrims float oil lamps on the water of Narmada. A statue of the River Goddess is worshipped on the occasion of Narmada Jayanti by a number Pilgrims coming from far cities, towns & villages. Chaitra Navratri is celebrated in the first month of Hindu lunar calendar and Ram Navami, the birthday of Lord Rama, falls on the ninth day during Navratri.

Most of the festivals are associated with bathing in rivers, idol immersion, Jawarevisarjan, floating oil lamps etc. They through some materials like food, waste or leaves in the river for spiritualistic reasons. Due to mismanagement of human waste and contaminated water all the areas near the river are polluted. This polluted water leads to many harmful effects on human, animals and eco-system. Keeping these aspects in view a through study and water quality monitoring is required during festivals and further there is a need of developing an efficeint water management policy or guidelines to achieve the aim of sustainability of water resources.

METHODS

General

Narmada is the main river of the Jabalpur division in which large human population is living near its banks. Due to mismanagement of human waste and contaminated water all the areas near the river are polluted. To study the pollution of water at different sample points of rivers near human population i.e. Ghats, are considered for testing during different seasons for 4 month. Different analysis will be done for the independent sample observations obtained through different sampling methods and water quality parameters.

Water sampling

Location of sampling points were selected during field visits of the site. The present study was conducted at six important sites namely Jelehri-ghat, Gwari-ghat, Tilwaraghat, Bhedaghat Barmanghat which were renamed as A – 1, A – 2, A – 3, A – 4, and A-5 and respectively for limnological purpose. (Table 4.1) These study areas are situated in a stretch of 20-30 kms of the eastern zone of Narmada river of Jabalpur

Table 1 . Sample station name and number

Sample Name	Station	Sample Station Number
Jelehri-ghat		A-1
GwariGhat		A-2
Tilwaraghat		A-3
Bhedaghat		A-4
Barmanghat		A-5

OBSERVATIONS & CALCULATIONS

Following observations were made after conducting the experiments on physic-chemical parameters like ph, Total Hardness, Alkalinity, Chlorides D.O. and B.O.D.

Table 2. The values of pH at different study sites of Narmada river

Sample Location	pH	
	summer	Winter
Jelehri-ghat	6.2	6.9
GwariGhat	6.8	7
TilwaraGhat	6.7	6.8
Bhedaghat	6.9	7.2
Barmanghat	7.2	7.2

Tables 2. The values of Total Hardness of Narmada river

Sample	Total Hardness (Mg/l as CaCO ₃)	
	summer	Winter
Jelehri-ghat	180.6	178.6
GwariGhat	197	190.5
TilwaraGhat	158.5	165.5
Bhedaghat	170.5	180.8
Barmanghat	190.2	191

TABLE 3: The values of Bicarbonate Alkalinit of Narmada river

Sample Location	Bicarbonate Alkalinity(Mg/l as CaCO ₃)	
	Sumer	winter
Jelehri-ghat	195	182
GwariGhat	190	185
TilwaraGhat	155	160
Bhedaghat	185	190
Barmanghat	192	195

Table 4:The values of Chloride Content in water of Narmada river

Sample Point	Chloride Content (Mg/l)	
	summer	winter
Jelehri-ghat	14.5	15

GwariGhat	15.5	17.2
TilwaraGhat	18	17.5
Bhedaghat	21	20.5
Barmanghat	24	21

Table 5. The values of DO Content in water of Narmada river

Sample Point	DO Content (Mg/l)	
	Summer	Winter
Jelehri-ghat	7	9.4
GwariGhat	7.6	10.4
TilwaraGhat	7.2	9.3
Bhedaghat	6.2	7.1
Barmanghat	6.3	7.4

RESULT AND DISCUSSION

Following observations were made after conducting the experiments on physic-chemical parameters like ph, Total Hardness, Alkalinity, Chlorides D.O. and B.O.D.

1 pH

pH of water is important as it governs the solubility of nutrients in water body. The variation of ph is shown in Figure 4.1 in the summer and winter of the selected Ghats of Narmada river. The determination of pH shows the alkaline and acidic nature of the waters. In the present study the variation of pH values of river water was varied between 6.2 to 8.2. The lowest value is 6.2 at lelehri-ghat in summer season of whereas the maximum value is 7.2 at Baemanghat in same summer and winter season.

2 Total Hardness

The total hardness was found to be high in all water bodies since the river passes through or over deposits such as limestone, the levels of Ca^{2+} , Mg^{2+} and HCO_3^- ions present in the water can greatly increase and cause the

Table 6 : The values BOD Values in Water of Narmada river

Sample Location	BOD Content (Mg/l)	
	Summer	Winter
Jelehri-ghat	6	4
GwariGhat	7	6
TilwaraGhat	4	3.5
Bhedaghat	4.8	4.3
Barmanghat	4.9	4.5

water to be classified as hard water. Figure 5.2 represents the variation of total hardness during the summer and winter season of the the selected ghats of Narmada river Jabalpur It can be seen that total hardness is highest (197.mg/l of $CaCO_3$) in Gwarighat site during summer season and lowest (158.5 mg/l of $CaCO_3$) at tilwaraghat in summer. Water ranged between hard to very hard.

3 ALKALINITY

Alkalinity is total measure of the substances in water that have acid neutralizing ability. Its level showed greater variation at all sites. The amount of alkalinity depends on the nature of materials discharged in water bodies . The variations of alkalinity is shown in Fig 5.3.

The Alkalinity ranged between 155 mg/l of $CaCO_3$ to 195 mg/l as $CaCO_3$. The highest alkalinity was reported from the site of Jelehri-ghat study site during summer and barmanghat in winter whereas the lowest (155 mg/l as $CaCO_3$) was found to be at tilwaraghat at summer.

The reason is obvious that Gwarighat has more religious values than other ghats of the city.

4 Chloride Content

Chlorides may get into surface water from several sources such as rocks agricultural runoff, wastewater from industries, oil well wastes, effluent wastewater from wastewater treatment plants, and road salting etc. The chloride contents indicate domestic as well as industrial pollution. The values of chloride contents ranged between 15 mg/l to 22 mg/l at all sites, respectively (Figure 5.4). The recommended maximum level of chloride in drinking water is 250 mg/L as per the Indian Standards. It can be seen from the Figure 5.4 that Chloride is minimum 14.5 mg/l at TilwaraGhat at summer season and maximum 24 mg/l at barmanghat at summer season.

5 Dissolved Oxygen

Dissolved oxygen (DO) is probably the most crucial and important water quality variable in freshwater body. The variation of D.O. is presented as bar chart in Figure 5.5.

In present study, dissolved oxygen fluctuated in the range of 6.1 mg/l at bhedaghat morning at summer season and gwariGhat in winter at season whereas maximum 10.4 mg/l in Gwarighatin winter at season. The W.H.O suggested the standard D.O. should be more than the 5 mg/l. The D.O. value is maximum at Gwarighat at winter because of more aeration, as depth of the river is lowest at bhedaghat . It is lowest in bhedaghat , since the water depth is very high as compared to other ghats.

6 Biochemical Oxygen Demand

The Biochemical oxygen demand also indicates the amount of organic compounds in water as measured by the volume of oxygen required by the bacteria to metabolise it under aerobic condition. For more organic matter, more oxygen is required by bacteria for its decomposition. This results in release of organic nutrients in water bodies resulting in death of organisms thriving on water . BOD ranged from 3.5 mg/l to 7 mg/l, which is more than the standard value 3 mg/l as specified by Indian standard. Variations in BOD at different ghat at different season are shown in Fig. 5.6 The highest degree of biochemical oxygen demand (7 mg/l) was reported from GwariGhat study site in the summer season whereas while

lowest level (3.5 mg/l) was observed from TilwaraGhat study site in the Tilwaraghat at winter season. This is due to the dumping of lot of organic contents , flowers , oil lamps due to religious activity of Jawarevisarjan in Gwarighat as compared to other ghats

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