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SURFACE WATER QUALITY ASSESSMENT DURING IDOL IMMERSION

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ABSTRACT

Rivers in India are regarded as sacred from ancient times. The river Narmada is the third holy and fifth largest west flowing river of India and biggest west flowing river of the Madhya Pradesh. The quality of water is most important as compared to quantity of water, especially for potable purpose purity is of the prime requirement. With this view-point, to check the surface water quality during idol immersion the study has been carried out at six major historical places through which River Narmada is flowing, during Ganesh idol immersion and Durga idol immersion.

The samples were collected 15 days before the festivals, during and 15 days after the festivals. The analytical results reveal that few parameters need treatment before use for drinking purpose. Whereas all the remaining water parameters have been found to be safe from potability consideration.

KEYWORDS: Physico - chemical parameters, river water quality.

INTRODUCTION

The most vital resource for life on the planet is water. There cannot be life without fresh water, which is only 2.7 % of total water on the earth. The issues of water are becoming increasingly important to environment particularly with respect to human health and their food. Festivals are an integral part of rich and diverse cultural heritage of India. In India idol immersion is anthropogenic activity [1,2]. Idol is an image or other material object representing a deity to which religious worship is addressed or any person or thing regarded with admiration, adoration or devotion. A religious Idol is an image of a god which is used as an object of worship and worshipped with all rituals in different time in a year. These idols are immersed into water body and are made by plaster of Paris, clay, cloths, small iron rods, bamboo and decorated with different paints such as varnish, water colors etc. POP idol immersion in natural water leads to pollution [3,4,5]. Plaster of Paris (POP), which is cheaper and lighter, has become the favored material to mould these idols. POP contains chemicals such as phosphorus, gypsum, sulphur, and magnesium. These idols are decorated with plastic and thermocols [6,7,8].

To check the surface water quality during idol immersion the study has been carried out at six major historical places through which River Narmada is flowing, during Ganesh idol immersion and Durga idol immersion. Water samples were collected as before, during and after idol immersion from Omkareshwer, Mortkka, Mandleshwer, Maheshwer, Khalghat and Barwani. Which are situated at the bank of River Narmada in Madhya Pradesh as shown in location map Figure 1. A total stretch of 150 km of River Narmada was considered for the present study. The description of the sampling locations is flowed by the map.

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Figure 1: Sampling points.

Omkareshwar
Omkareshwar (22°14′44.1°N, 76°09′03.8°E) is a sacred place dedicated to God Shiva. It is one of the 12 revered Jyotirlinga shrines of Shiva. It is on an island called Mandhata or Shivapuri in the Narmada river; the shape of the island is said to be like the Hindu Om symbol. It is situated in the Khandwa district of Madhya Pradesh state in India. There are two main temples of Lord Shiva here, one to Omkareshwar located in the island and one to Mamleshwar located on the south bank of Narmada River on the mainland.

Mortakka
Mortakka village is located in (22.2126° N, 76.0479° E) Punasa Tehsil of Khandwa district in Madhya Pradesh, India. It is situated 60km away from sub-district headquarter Punasa and 75km away from district headquarter Khandwa. As per 2009 stats, Mortakka is the gram panchayat of Mortakka village.

Maheshwar
The word Maheshwar in Hindi means *Great God*, an epithet of Lord Shiva. Maheshwar **(**22.1773° N, 75.5830° E**)** is a city in Khargone district of Madhya Pradesh state, in central India. It is located 13 km east of National Highway 3 (Agra-Mumbai highway) and 91 km from Indore, the commercial capital of the state. The City lies on the north bank of the Narmada River. It was the capital of the Malwa during the Maratha Holkar reign till 6 January 1818, when the capital was shifted to Indore by Malhar Rao Holkar III.

Mandleshwar
Mandleshwar is located at 22.18°N 75.67°E, and has an average elevation of 153 metres (501 feet). It is a town and nagar panchayat in the Khargone district of the Indian state of Madhya Pradesh. It is on the Narmada River 8 kilometres (5.0 miles) east of Maheshwar and 99 kilometres (62 miles) south of Indore. Mandleshwar is famous for Ram mandir, and 56 dev mandir.

Khalghat
Khalghat is a town and a municipality in Dhar district in the state of Madhya Pradesh, India. Dhar is located at 21.10°N 75.27°E. It has an average elevation of 150 metres (495 feet). It is located on the banks of Narmada River and National Highway 3 Agra-Indore-Dhule-Mumbai. Khalghat is famous for Nag mandir.

Barwani
Barwani is located at 22.03°N 74.9°E. It has an average elevation of 178 metres (583 feet). The great Narmada River flows through Barwani (5 km from city center). The maximum temperature of Barwani in April and May used to go as high as 48°C, making it one of the hottest place in Central India. However, in recent years, it has cooled a little bit. The name *Barwani* originated from the forests of *BAR* which had surrounded the city in old times. *WANI* is the old word for the Garden. Hence city got its name *BARWANI* which means *Garden of Bars*. Barwani is also famous for Bavan Gaja a Jain tirth.

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MATERIAL AND METHOD

Water samples were collected from artificial ponds prepared specially for idol immersion (Ganesh Visarjan and Durga Visarjan) and the river bank. Samples were collected during September-October 2016 (i) 15 days before Ganesh visarjan, (ii) during Ganesh Visarjan, (iii) during Durga Visarjan and (iv) 15 days after the Durga visarjan. Samples were collected and analyzed based on Standard procedures for water analysis [9,10] Temperature, pH, EC and TDS were analyzed on the site, while other parameters like turbidity, alkalinity, total hardness, chloride, sulphate, COD, sodium and potassium were determined immediately in the laboratory adopting standard procedures. DO was fixed on site and was analyzed within 6 hrs in the laboratory.

Temperature

Temperature is an important parameter because all chemical and biological reaction happens on a optimum temperature. It plays a critical role in life processes like growth, reproduction, migration, succession pattern and metabolism of organisms and communities. It is the important factor for calculating the solubility of oxygen and the carbon-dioxide, bicarbonate and carbonate equilibrium. The temperature of water has an influence on its taste and density, viscosity, solubility of gases and dissolved solids are related. The variations in temperature of a water body have great bearing upon the biological productivity. Distribution of aquatic organisms is greatly influenced by water temperature.

pH

pH of aqueous solution is negative logarithm of hydrogen ion activity. The basic principle of pH measurement is determination of the activity of the hydrogen ions by potentiometer, using a standard hydrogen electrode and a reference electrode. Its value is governed largely by the carbon dioxide/bicarbonate/carbonate equilibrium. The effect of pH on the chemical and biological properties of water makes its determination very important. It is used in several calculations in analytical work and its adjustment is necessary in most of the analytical procedures.

Conductivity

Conductivity is a numerical expression of the ability of an aqueous solution to carry an electric current and varies both with the number and types of ions in the solution, which in turn is related to the concentration of ionized substances in the water. It gives rapid and practical estimate of variation in the dissolved contents of water body.

Solids

The term solids refer to the matters either filterable or in-filterable that remain as residue upon evaporation and subsequent drying at a defined temperature. Further categorization depends upon the temperature employed for drying and ignition. Different forms of solids are defined on the basis of method applied for their determination.

a. Total Solids

Residues after the evaporation and subsequent drying in oven at specific temperature 103-105 ^{0}C of a known volume of sample are total solids.

b. Total Suspended (non filterable) Solids

Non filterable residue left on the filter paper and dried at 103-105^{0}C is a suspended solid. The fraction collected on a pre-weighed 0.45µ membrane filter paper was taken as suspended solids, which includes inorganic particles, plankton and other organic debris.

c. Total Dissolved (filterable) Solids

The principle ions contributing to dissolved solids are carbonate, bicarbonate, chloride, sulphates, nitrate, silicate, sodium, potassium, calcium, and magnesium. Dissolved solids influence other qualities of drinking water such as taste, hardness, corrosion and scaling. The dissolve or filterable solids can be determined either from the difference of the total solids and the total suspended solids or by evaporating the known volume of the filtrate to dryness at 180^{0}C. In the present study dissolved solids were estimated by both gravimetric as well as conductometric methods to counter check the results.

Dissolved Oxygen

Like all the solvents, water has the ability to dissolve atmospheric gases viz. nitrogen, oxygen, carbon dioxide and noble gases. In contrast to noble gases, respiration and microbial oxidation process consume dissolved oxygen. The solubility of atmospheric oxygen in freshwater ranges from 14.6 mg/l at 0^{0}C to about 7.0 mg/l at 25^{0}C under one atmospheric pressure, since it is poorly soluble gas, its solubility directly varies with the atmospheric pressure at any given temperature. In present work, Winkler's method with Azide modification was followed for estimation of dissolved oxygen. Samples collected from the source and were immediately fixed for DO by adding 1ml each of manganeous sulphates and alkali iodide azide solution per 300 ml collected in

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DO/BOD bottles. DO titration were performed in the laboratory within 6-8 hours as per standard methods (APHA, 2012).

Chemical Oxygen Demand

Chemical Oxygen Demand (COD) test determines the oxygen required for chemical oxidation of organic matter with the help of strong chemical oxidant potassium dichromate and against ferrous ammonium sulphate using ferroin indicator.

Alkalinity

The alkalinity of water is the capacity to neutralize the acid thereby indicating the buffering capacity of water. Total alkalinity in water in the present study was measured by titrating the known quantity of sample with standard sulphuric acid (0.02N) to pH 4.5 using pH meter.

Hardness

Hardness of water is the measure of the capacity of water to react with soap. Scaling of hot water pipes, boilers and other household appliances is due to hard water. Total hardness of groundwater samples in the present study was estimated by complexometric titration with EDTA (0.01M) at pH 10.00 using eriochrome black-T indicator and for calcium hardness at pH 12.00 using muroxide indicator.

Sulphate

Sulphate (SO_4^{--}) is widely distributed in nature and may be present in natural waters in concentrations ranging from a few to several thousand milligrams per liter. Sodium and magnesium sulphates exerts cathartic action. Many sulphate compounds are readily soluble in water. Sulphate was measured by turbidimetric measurement of suspension formed by precipitating sulphates as barium sulphates by addition of barium chloride crystals in acidic media.

Chloride

Chloride (Cl^-) is one of the major anion present in water and wastewater and always in combination of alkali and alkaline earths metal. Presence of chlorides usually as metallic salts in natural waters can be attributed to dissolution of salt deposits, discharges of effluents from chemical industries, oil/gas operations, sewage discharges, irrigation drainage, contamination from refuse leachates and sea water intrusion in coastal area. Chloride present in drinking water in combination with sodium ion having concentrations in excess of 250 mg/l gives a salty taste. In the study, chloride in groundwater was estimated by argentometric titration method.

Sodium

Sodium (Na^+) is a major component in drinking water. All water supplies contain some sodium. The amount is dependent on local soil conditions. The higher the sodium content of water, the more corrosive the water becomes. A major source of sodium in natural waters is from the weathering of feldspars, evaporates and clay. The maximum permissible limit of sodium in standard drinking water is 20 mg/l.

Potassium

Potassium (K^+) is an alkaline metal closely related to sodium. It is seldom that one sees it analyzed separately on a water analysis. Potassium is not a major component in public or industrial water supplies.

RESULT AND DISCUSSION

The graphical representation of different parameters for before, during and after Ganesh visarjan and Durga visarjan at all the six sampling locations are shown in Figure 2 to 7.

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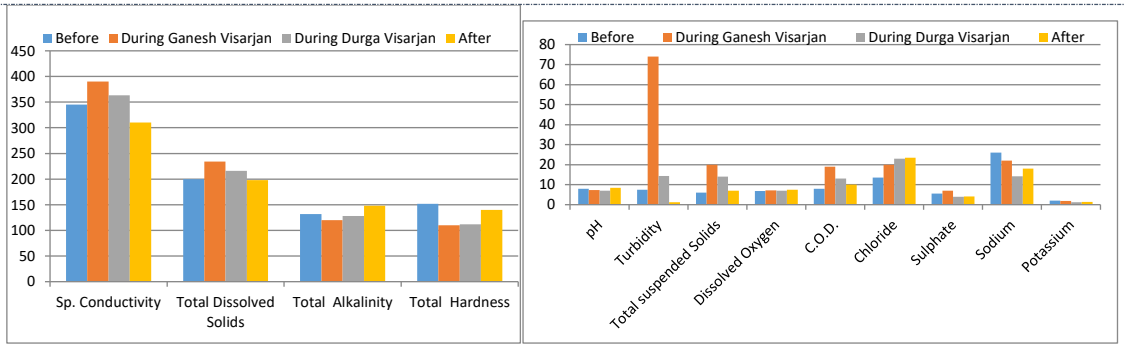

Figure 2 : Graphical representation of different parameters at Omkareshwar.

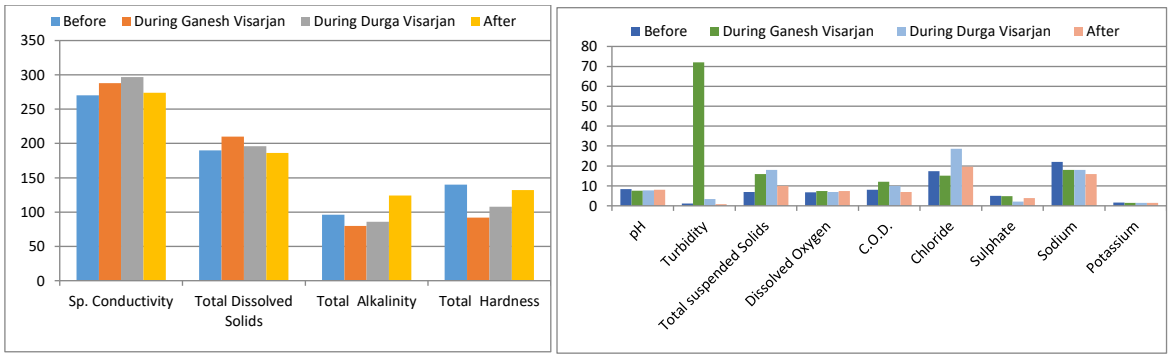

Figure 3 : Graphical representation of different parameters at Mortakka.

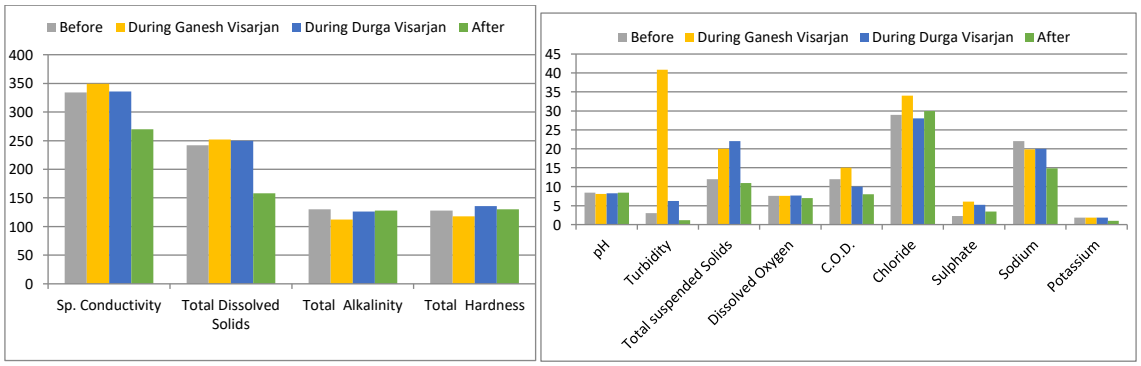

***Figure 4 : Graphical representation of different parameters at Mandleshwar*.**

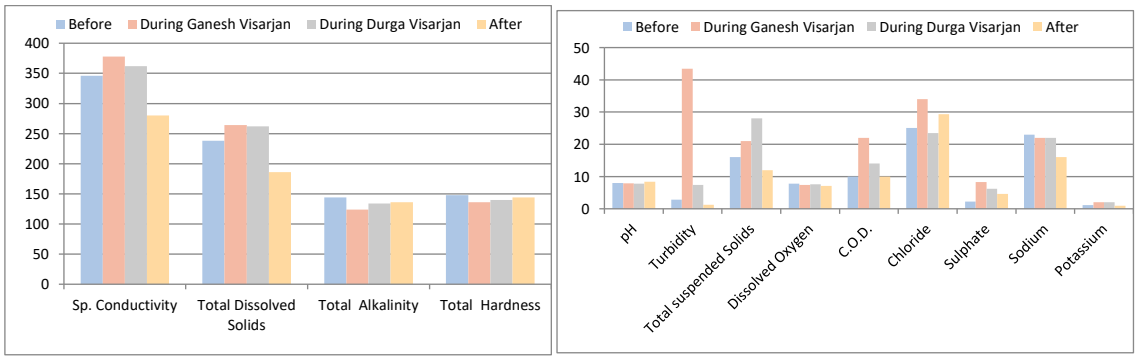

Figure 5 : Graphical representation of different parameters at Maheshwar.

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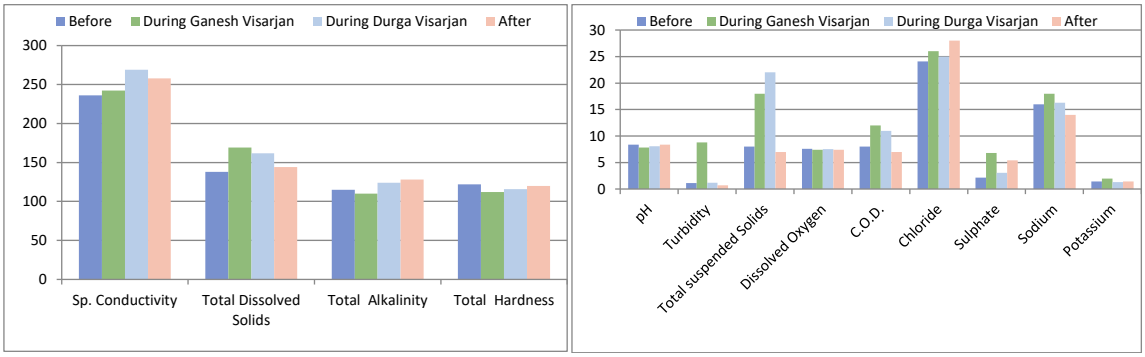

Figure 6 : Graphical representation of different parameters at Khalghat.

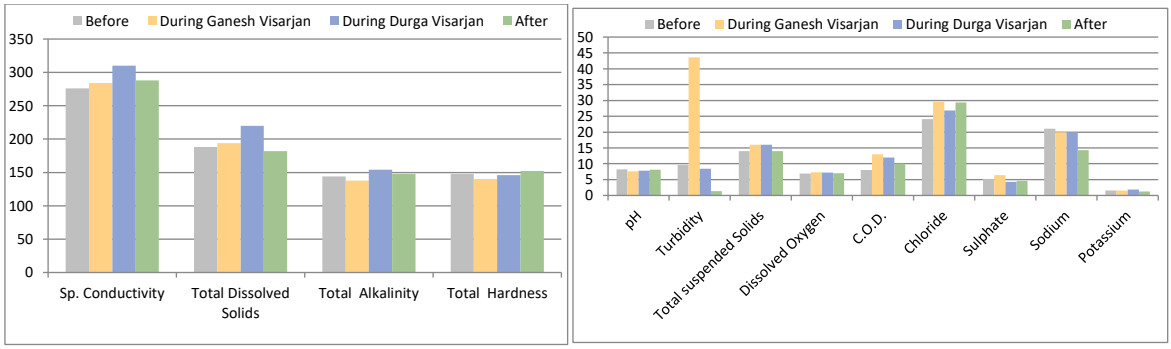

Figure 7 : Graphical representation of different parameters at Barwani.

From the graphs it can be seen that the Specific Conductivity increases during the idol immersion/visarjan while it decreases gradually. Same pattern is also seen for other parameters like Total Dissolved Solids, Turbidity, Total Suspended Solids, COD, Chloride and sulphate. The Alkalinity and Total Hardness decreases as the water becomes acidic during the idol immersion and increases afterwards, this can be confirmed by the decrease in pH during the idol immersion.

The dissolved oxygen of the River increases during the idol immersion as there is continuous immersion of idols. Due to increase in chlorides and sulphate, there is slight increase in the concentrations of sodium and potassium.

CONCLUSION

It can be concluded that the POP idols after immersion in the River water remains as it is and acts as a slow pollutant whereas clay idols dissolve easily increasing the dissolved solids. The study provides informative data to understand the pollution level at various Ghats of river Narmada during Ganesh and Durga visarjan. It was found that the turbidity crosses the maximum permissible limit during the festivals.

Careless immersion of idols in natural water bodies blocks its flow which results in stagnation and breeding of mosquitoes and other harmful pest. Even though the C.P.C.B. has given guidelines for making idols and way of immersion it is observe that they are not followed strictly. Assistance of police and the Municipal Corporation should be taken to insure that the idol immersion is done in the constructed ponds and not into river or natural resources.

RECOMMENDATIONS

1. The idols should be made of traditional clay instead of backed clay.
2. The paints of idols should be water soluble and biodegradable.
3. The offerings like flowers, leaves, etc. should be collected separately so that it can be used for composting.
4. Awareness activities should be carried out to educate people in this regard.
5. The pond water should be disposed properly.

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6. The artificial ponds for idol immersion should be prepared according to CPCB guidelines.

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REFERENCES

[1] Gadhia Mohini, Ansari Ekhalak and Surana Ranjana, 2014. Pollution load assessment of Tapi River during Ganesh festival, India. Octa Journal of Environmental Research. 2(4), 310-313.
[2] N.P.Shukla, P.S. Bundela, S.K. Khare and S. Sarsaiya, 2014. Study of the Impact of Plaster Of Paris (Pop) and Clay Idols Immersion in Water. International Journal of Scientific Engineering and Technology. 3(7), 861-864.
[3] Kaur, R., 2012. Effect of idol immersion on marine and fresh water-bodies. Advances in Applied Science Research. 3(4),1905-1909.
[4] Yuvraj, 2013. Ganesh Idol Immersion and Water Pollution in the State of Maharashtra: an Action Plan. http//www.legalservicesindia.com/article/.
[5] Madhusudan Raj, 2014. Explorer: the monthly newsletter of the Department of Human Resource Development Veer Narmad South Gujarat University, Surat. 4(11), 1-7.
[6] Chandrashekhar Patel, Shailza Verma and Rakesh Kumar Grover, 2015. Water Quality Assessment in Different Festivals at Narmada River, Jabalpur India. South Asian Journal of Multidiciplinary Studies. 1(5), 62-69.
[7] Watkar A.M. and Barbate M.P., 2014. Impact of Idol Immersion on Water Quality of Kolar River in Saoner, District Nagpur, India. International Research Journal of Environment Sciences, 3(3), 39-42.
[8] Malik G.M., Raval V.H., Zadafiya S.K. and Patel A.V., 2012. Idol immersion and physico-chemical properties of South Gujrat Rivers, India. Research Journal of Chemical Sciences, 2(3), 21-25.
[9] APHA (2012), Standard Methods for the Examination of Water and Waste Waters, 22nd Edition, American Public Health Association, Washington, DC.
[10] BIS (2012), Specifications for Drinking Water, IS:10500:2012, Bureau of Indian Standards, New Delhi.