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IMPACT OF IDOL IMMERSION ACTIVITY ON THE WATER QUALITY OF MACHNA RIVER, BETUL, MADHYA PRADESH, INDIA

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ABSTRACT

India is a country of festivals. Ganesh and Durga festivals are celebrated each year across the country and immersion of their idols in the water is contaminating the quality of water. Machna river of Betul, which is the only important source of drinking and irrigational water has been polluted by this idol immersion activity on the occasion of religious festivals. As this issue is directly linked with the aesthetism of the people of the city so some steps should be taken very carefully so their emotions are not hearted. Idols are made up of clay but non-biodegradable thermocol and paints containing heavy metals. The idols have grown in numbers and size over the years and urban water bodies are facing an increasing pollution load. This issue is particular for the Betul city as it has totally different situation as no other big source of water is available nearly except this river.

The study area of this study is Machna river of Betul city (M.P.) and principal aim of this work is to analyze different heavy metals and other physico-chemical parameters like BOD, COD, turbidity, dissolved oxygen.

Key words: BOD, COD, DO, Turbidity.

INTRODUCTION

India is a land of rivers. It has a large number of rivers that are lifelines for the millions living along their banks. People use it for the preparation of foods, personal hygiene, and often consume directly 2-3 liters per day, much stemming directly from our tap. Several towns, cities and communities have disappeared due to shortages of water originating from climatic changes. Millions of people all over the world, particularly in the developing countries are loosing their lives every year from water borne-disease[1].

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Betul has population above 13 lakhs as per the census of 2001. Due to rapid urbanization and industrialization, it has done constant development in all sectors but pollution of this river has been increased in the same ratio[2]. This issue is very important for the people of this city. The water of Machna river is used for drinking as well as irrigation purposes. Rivers are considered as purest sources of water but nowadays their pollution has reached to alarming stage. The Machna river has been polluted by different activities but one of the major activity is idol immersion, which generally takes place during festive seasons. Idols are made of clay, but non-biodegradable thermocol and paints containing heavy metals. The immersion practice leads to degradation of water quality and siltation. Parameters like turbidity, biological oxygen demand and chemical oxygen demand became higher on immersion. On account of immersion, materials like clay, bamboo, grass, wooden, metal, jute, colors, paints, cloths, flowers, essence sticks, incense, camphor, ash etc. are released in the water body. The deficiency and excess of essential micro-nutrients (iron, zinc and chromium) may produce undesirable effects[3,4]. The immersion of idol of Lord Ganesh and Goddess Durga during Ganesh Ustav and Navratris festival is a major source of contamination and sedimentation to the river. The Machna river is an important source of potable water for the people of Betul city but during these festivals 2500 Ganesha (120 tonnes) and 500 Durga (50 tonnes) idols are immersed in the water of this river (year 2009). The Ganesh festival is celebrated in Maharashtra with great devotion. Madhya Pradesh, the neighbouring state, has also inculcated the culture of celebrating this festival at public places. Betul city is located nearby the Maharastra border so the people of this city celebrate this festival with great devotion and dedication. In earlier times, the Ganesh Chaturthi celebration was limited to the installation of the statue of the Lord itself which indicated the religious sentiments behind the installation but now thematic jhankis have started. A jhanki is a temporary public place, where the statue is installed with new concepts, new themes and new formations in combination with a short mythological story or social message; each jhanki desires to display its own creativity and superiority over other jhankis. The present study work was done in 2009 and 2010. The following datas were collected

Table 1: Numbers of idol immersed

Year 2009			**Year 2010**		
Small size idols	Medium size idols	Long size idols	Small size idols	Medium size idols	Long size idols
1500	450	550	1370	435	480

The goddess Durga is known for her power and destruction of evil. There are so many places in the city where the godess Durga is worshipped during the festival of

Navratris. This festival is of great importance in the northern, eastern and central parts of India. The jhankies of Durga have grown in numbers, size and combinations. Many creative and thematic jhankies are created during the celebration, increasing the material refuse load which ultimately finds its way into the water bodies. On the last day of these festivals, all idols are brought on the banks of this river at idol immersion point (Badora under bridge and Karbala area) from different corners of the Betul city and villages located nearby the city.

Study area

The study area for this study has been chosen to be Machna river of Betul city (M.P.), India. It is a important tributary of Tawa river, which joins to Narmada. This river has historical importance as this is flowing from ancient time and Betul city grew along the bank of this river. Its total length is 79.5 kms but particularly in Betul city, its length is approx 4-5 kms. Betul city is very close to cancer line. The main objective of this study is to assess the impact of idol immersion on water quality of Machna river. It means the impact on dissolved oxygen, biological oxygen demand, chemical oxygen demand and other parameters, which adversely affect the water quality of Machna river of Betul. We have taken two main sampling points where this activity has large impact on water quality. These three sampling stations are (i) Entry of Machna river in Betul city (ii) Sampling station under the Badora under bridge and (iii) Sampling station at Karbala. Sampling Stations No. 2 and No. 3 are comparatively more polluted than No. 1. These two sampling stations receive large amount of pollutants due to idol immersion activity. The location of last two sampling station is in the middle of the city.

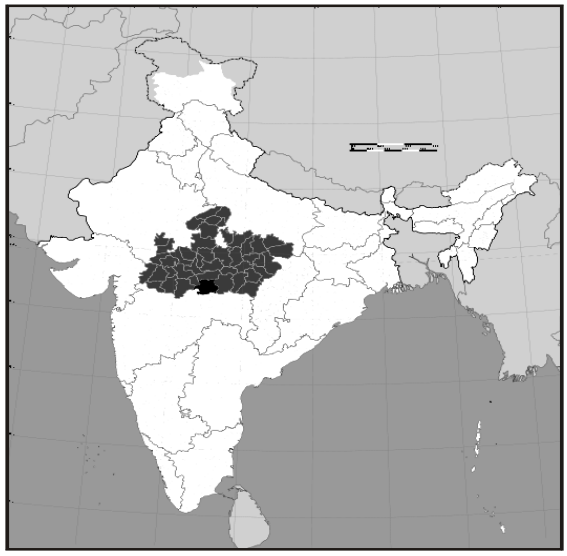

Fig. 1: Study area

Fig. 2: Immersion of Durga idol

EXPERIMENTAL

Materials and methods

This research work was carried out during 2009 and 2010. The samples were collected from (i) Entry of Machna river in Betul city (ii) Sampling station under the Badora under bridge and (iii) Sampling station at Karbala. The water samples were collected at different intervals *i.e.* pre-immersion, during immersion and post-immersion. These samples are collected in plastic can made up of polyethylene. As polyethylene is considered non-reactive compound so these cans are suitable for the collection of samples. The samples are taken 15 days before the immersion activity takes place. Another sample is collected during immersion and last sample is taken after the 15 days of immersion activity took place. This procedure is followed for the each sampling station. After the collection of samples, the analysis of different parameters is done as per the APHA methods[5]. The water samples were collected in one litre bottles at each site. After addition of appropriate preservatives like magnesium sulphate, alkaline iodide and sulphuric acid at the sampling sites, the collected water samples were transferred immediately to water testing laboratory for the analysis.

Dissolved oxygen: It is analyzed immediately at the sampling site using standard equipment (Wrinkler's Azide modification method).

Biochemical oxygen demand: The collected water samples are taken in BOD bottles and incubated for five days at 20^{o}C.

Chemical oxygen demand: Determined by open reflux method.

Turbidity: It was measured by nephelometric method.

Total hardness: It was determined by EDTA titrimetric method using EBT as an indicator.

RESULTS AND DISCUSSION

Water quality factors: Their ICMR/CPHEEO standards and assigned unit weights are given in Table 2.

Table 2: Water quality factors (ICMR[6] / CPHEEO[7])

Standards	Unit weight (Wi)
Hardness < 600**	0.005
Calcium < 75*	0.037
Magnesium < 50*	0.055
Dissolved oxygen > 5*	0.548
*ICMR Standards (1975) ** CPHEEO Standards (1991)	

Dissolved oxygen

It indicates the pollution level in water body. For drinking water limit, the limit is 6.0 mg\L accordingly to WHO[8]. It is required for the survival of aquatic living organism. Dissolved oxygen in water at a given temperature depends on factors like temperature of water. The dissolved oxygen is necessary for almost all plants and animal for respiration. It was found comparatively higher before immersion activity. It ranged from 6.2 mg/L to 4.6 mg/L (Pre-immersion). Maximum and minimum values were noticed at entry of Machna river and Karbala sampling point, respectively. During immersion, DO ranged from 5.36 to 3.2 mg/L. Highest and lowest value were reported at sampling station No. 1 and 2, respectively while in post-immersion samples, maximum reading (5.1 mg/L) was recorded at sampling station No. 1 and minimum value (2.8 mg/L) was reported at sampling station No. 3. Das et al.[9] and Saravanakumar et al.[10] attributed seasonal variation of dissolved oxygen mainly to freshwater influx and ferruginous impact of sediments. Lower DO was reported for a number of polluted river viz. Narmada river at Hosanabad in U. P.[11] and river Rapti at Gorakhpur[12].

Decrease in DO value tells us about the pollution due to idol immersion in the river.

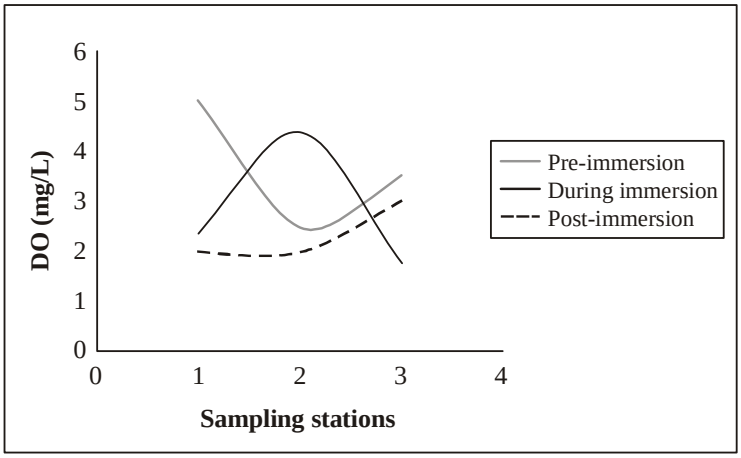

Fig. 3: Dissolved oxygen

Biochemical oxygen demand

BOD is a measure of the amount of oxygen required for the biological oxidation of the organic matter under aerobic conditions at 20^{o}C and for a period of 5 days. Basically BOD is directly related to the extent of pollution of waste water, sewage and industrial effluents. The BOD ranged from 2 mg/L to 3 mg/L in pre-immersion samples at sampling stations 1 and 2, respectively. During immersion, it was found between 5 mg/L to 8 mg/L at stations 1 and 2, respectively, while in post-immersion sample, BOD values were noticed comparatively higher at all the stations. It was recorded between 10 mg/L to 32 mg/L at sampling station No. 1.

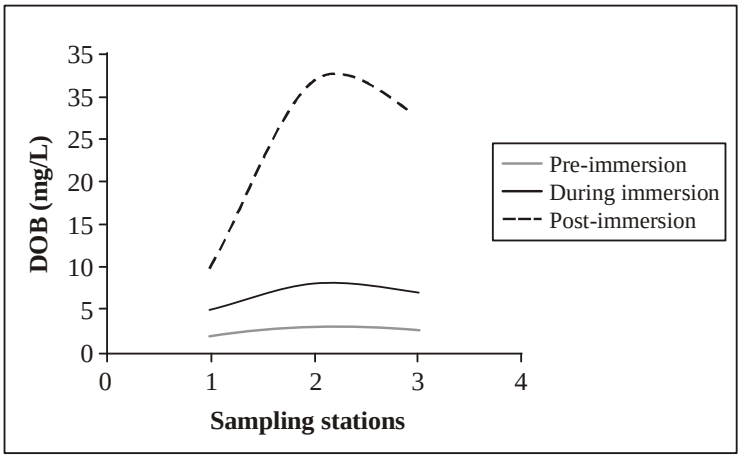

Fig. 4: Biochemical oxygen demand

Chemical oxygen demand

It is also an indicator of pollution level in water body. Organic as well as inorganic components present in water can be measured by this parameter. It ranged from 6 mg/L to 10 mg/L at sampling stations 1 and 2, respectively. During immersion, its values were recorded between 12 mg/L to 42 mg/L and in post post-immersion samples, readings were found in the range from 22 mg/L to 104 mg/L at stations 1 and 2, respectively. COD at Karbala point was comparatively less polluted than station 2.

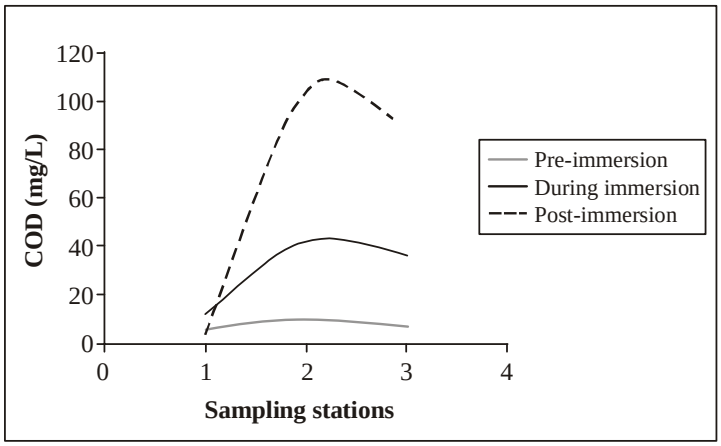

Fig. 5: Chemical oxygen demand

Total hardness

Station 1 is comparatively less contaminated as hardness value at this station during

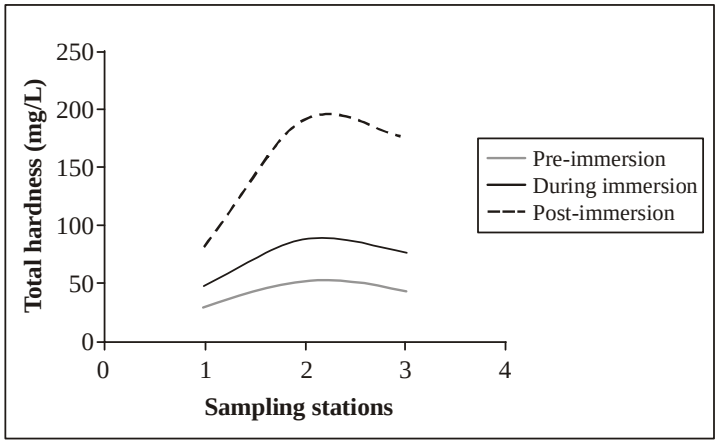

Fig. 6: Total hardness

pre-immersion was 30 mg/L. This parameter ranged from 30 mg/L to 52 mg/L in pre-immersion samples; 48 mg/L to 90 mg/L during immersion in samples at sampling stations 1 and 2, respectively while 83 mg/L to 192 mg/L in post-immersion samples.

Turbidity

The turbidity at station 2 was found comparatively greater than at station 1. The reason is heavy load of idols immersion on this site, Radhika et al.[13] also observed an increase in turbidity during pre-monsoon in Vellayani lake, Kerala, which they attributed to high productivity coupled with excessive planktonic growth. They assumed that the high transparency during monsoon is because of dilution of water. In Periyar lake, the increase in transparency during monsoon is definitely due to excessive inflow, which is not muddy due to undisturbed watershed around. In India, the idols immersion generally takes place during monsoon and after monsoon.

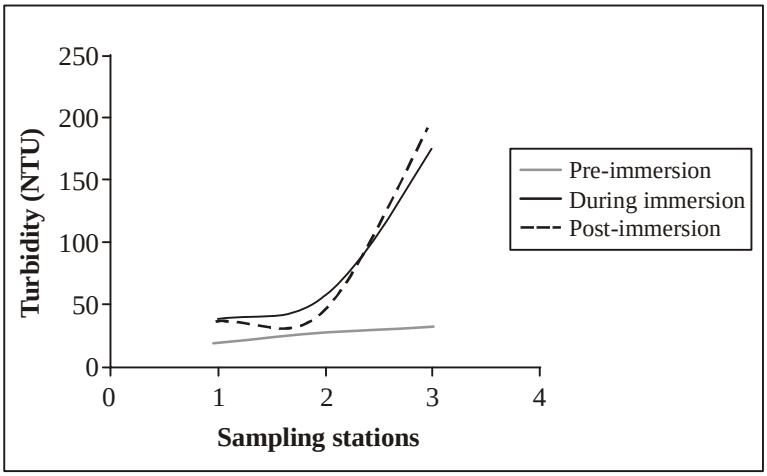

Fig. 7: Turbidity

Pre-immersion samples at all the stations were comparatively less polluted and turbidity was found within limit. Values in pre-immersion samples were 20 NTU, 38 NTU and 35 NTU, respectively at sites 1, 2 and 3. During immersion, values were found quite high due to insolubility of different immersed matter including idols. Sation 1 was comparatively clean and turbidity at this point was found 28 NTU. Sampling stations 2 and 3 were polluted due to high percentage of organic matter. The turbidity reported at these stations was 56 and 45, respectively. In post-immersion samples, turbidity was 32 NTU at station 1 to 196 NTU at station 2. At station 3, the value reported 175 NTU was less than station 2.

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