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Effect of idol immersion on marine and fresh water-bodies

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ABSTRACT

Pollution of water-bodies is a major concern in today's era. Idol immersion activities during certain festive occasions are adding to the pollution load of the water- bodies. Non-biodegradable materials and synthetic paints used for making these idols are posing serious threat to aquatic life and environment. Water quality assessment is an important exercise to evaluate the nature and extent of pollution in order to take appropriate control measures. The present work is concern about the Water quality assessment to evaluate the nature and the extent of pollution in water body. Two major idol-immersion sites Shivaji Park, Mumbai and Masunda lake, Thane were selected for taking marine water sample and fresh water sample respectively in present study. Pre-immersion, immersion and post-immersion samples were collected from three sites stations and analyzed for various water quality parameters such as pH, Total suspended solids (TSS), Total dissolve solids (TDS), Total Solids (TS), turbidity, conductivity, hardness, Dissolved oxygen (OD) and COD. The variations in the values of these parameters were more prominent in fresh water samples than marine samples. It was observed that the values of these parameters significantly increased during the immersion period and then declined in the post-immersion period. However the general trend observed was : immersion > post-immersion > pre-immersion values. pH declined slightly during immersion period whereas DO showed only slight variations in the pre-immersion, immersion and post-immersion samples.

Key words : Water pollution , Idol Immersion, Water quality assessment parameter

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INTRODUCTION

Water is precious. Sea, rivers, lakes are natural resources of water. The issues of water are becoming increasingly important to environment particularly with respect to human health and food security. Festivals are an integral part of rich and diverse cultural heritage of India. In India idol immersion is another anthropogenic activity [1]. Ganesha, the elephant headed God, is widely worshipped as the supreme Lord of wisdom, prosperity and good fortune. Hindus across India celebrate Ganesh festival sometime between August 20 and September 15. Traditionally Ganesha idols were sculpted out of earth and after worshipping returned back to the earth by immersing it in the nearby water body. This symbolized the cycle of creation and dissolution in nature.

In present situations the materials used for making idols has led to use of non- biodegradable materials like Plaster of Paris, Plastic, thermacol, synthetic colours etc. which deteriorate the water quality . Moreover the chemical paints used to paint these idols contain heavy metals which are potentially hazardous and bio-magnify along the food chain. Pollution due to water immersion has many social, religious, scientific and environmental dimensions. Increase in chemical pollutants after idol immersion in the lake waters have been reported [2].

Turbidity is caused by a wide variety of suspended particles that range in size from colloidal to coarse dispersions depending on the degree of turbulence. Idol immersions add large quantities of inorganic (clay, silt etc.) and some

organic materials (straw, jute, flowers, leaves and germinated grains) to the water bodies thus contributing to the turbidity [3]. The water colour is very disturbed completely during the idol immersion causing high turbidity [4]. The total hardness of water in the immersion and post immersion samples is high. Although hardness is not a pollution parameter, it indicates the water quality. Increase in Ca, Mg and total hardness during immersion has also been reported The idols are painted with oil paints of various colours viz. red, yellow, orange, white, black, golden and skin colour. These paints contain heavy metals like Cu, Zn, Cr, Cd, Pb, Fe, As &Hg which are non-biodegradable and bio-accumulate & bio-magnify along the food chain and are neuro and nephrotoxic & some even carcinogenic. Increase in concentration of heavy metals like As, Cr, Cd, Hg, Mn, Ni, Pb due to immersion of idols in the lake waters have been reported [6]. Mumbai alone absorbs immersion of more than 1.5 lakh idols annually. Hence this problem requires an input to find the correct solution.

Shivaji Park or Dadar Chowpatty beach is located in Mumbai, India. The beach is mainly used for walking and jogging purpose but is unfit for bathing as the faecal coliform concentration & BOD values are 6-8 times higher than the permissible levels. On designated days of immersion, devotees assemble to immersion spots at Shivaji Park and have to wait for long hours for immersion of Ganesha idols. Due to heavy immersions in its water, the condition of Dadar beach has further deteriorated.

Masunda lake also called as Talao Pali is one of the prominent lakes in the heart of Thane city. The lake is mainly used for fishing & boating and also serves as a tourist spot. Every year thousands of Ganesha devotees gather on the lake to perform Visarjan ceremony on 2^{nd},5^{th}&11^{th} day of Ganapati festival. Idol immersion activities have deteriorated the water quality and negatively affected the recreational activities in the lake.

In the current study, water samples were collected at three stages-pre-immersion, during immersion and post-immersion and various physico-chemical parameters viz. pH, DO, BOD, COD, Conductivity, Turbidity, TDS, TS were analyzed. This is very essential, as it can help local administration in preparing posters, leaflets, banners etc. for mass awareness programmes.

MATERIALS AND METHODS

Sample Collection

Sampling Sites

Two prominent idol immersing sites in Mumbai: one marine- Sea at Shivaji Park, Dadar and other freshwater- Masunda lake, Thane were selected for the present study.

Pre-immersion samples were collected a week prior to immersion activities. During the immersion period immersion samples were collected whereas post-immersion samples were collected three weeks after the completion of immersion activities. The samples were collected from three stations in triplicate and analyzed for various water quality parameters viz. pH, TSS (Total suspended solids), TDS (Total dissolved solids), TS (Total Solids), turbidity, conductivity, hardness, DO (Dissolved Oxygen) and COD (Chemical Oxygen Demand) as per Standard Methods(APHA, 1995).

pH was analyzed using pH meter.

Preparation of TSS, TDS and TS Samples

Well mixed sample was filtered through a weighed standard glass fibre filter. The residue retained on the filter was dried to constant weight to estimate TSS while the filtrate obtained was evaporated to dryness till constant weight obtained in order to estimate TDS. The sum total of TSS and TDS gives TS value.

Turbidity was estimated using Turbidity meter and Conductivity was estimated by Conductivity meter. Total Hardness was analyzed by titremetric EDTA method. DO- samples were fixed on the spot and analyzed immediately by Winkler's method with azide modification. COD was determined using potassium dichromate open reflux method.

RESULTS

pH - In Fresh water (FW) samples pH varied from 7.5-7.9 in pre immersion, 7.2-7.7 in immersion and 7.3-7.8 in post immersion period whereas in marine water(MW) samples pH ranged from 7.6-8.0, 7.2-7.5 and 7.5-7.9 in the pre immersion, immersion and post immersion period respectively. In the present study, lowering of pH during immersion has been observed.

Table 1 – Variation in pH in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm	Imm	Post-Imm
FW	7.8	7.5	7.6
MW	7.8	7.4	7.7

TSS - Total suspended solids almost doubled during immersion period and then decreased in the post immersion period in the collected water samples. The effect was more pronounced in the fresh water samples than the marine water samples.

Table 2 – Variation in TSS in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm(mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	13	28	20
MW	44	78	65

TDS -The water samples collected from fresh water and marine water sites, TDS increased by 40% and 7.7% respectively during immersion period which then declined to 11.5% and 4% respectively in the post immersion period.

Table 3 – Variation in TDS in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	180	252	207
MW	42420	45710	44110

TS -On an average, Total Solids increased in fresh water and marine water samples by 45% and 7.8% respectively in immersion samples. This then declined to 17.6% and 4% respectively in post immersion samples.

Table 4 – Variation in TS in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	193	280	227
MW	42464	45788	44175

Turbidity -Turbidity ranged from 3.8 – 4.1 NTU, 5.0 – 5.2 NTU and 3.8 – 4.3 NTU in the pre immersion, immersion and post immersion in fresh water samples whereas in marine water samples the values varied from 4.0-4.6 NTU, 5.0 – 6.6 NTU and 4.5 – 4.9 NTU respectively.

Table 5 – Variation in Turbidity in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (NTU)	Imm (NTU)	Post-Imm (NTU)
FW	3.9	5.1	4.2
MW	4.2	5.4	4.8

Conductivity -In the fresh water samples on an average conductivity increased from 260 uS/cm to 275uS during immersion and then decreased to 268uS/cm in the post immersion samples. Similar trend was observed in marine

water samples, the average conductivity values being 55600 uS, 58600 uS and 56700 uS for pre immersion, immersion and post immersion period respectively.

Table 6 – Variation in Conductivity in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (µS)	Imm (µS)	Post-Imm (µS)
FW	200	275	268
MW	55600	58600	56700

HARDNESS -Increase in hardness was observed in the fresh water and marine water samples collected during the immersion period by 40.6% and 14.9% respectively and by 28.3% and 8.9% respectively in the post immersion period.

Table 6 – Variation in Total hardness in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	106	149	136
MW	3680	4230	4010

DO -Dissolved oxygen in fresh water was found to be in the range of 4.1 – 4.9 mg/lit in the pre immersion samples, while 4.0 – 4.6 mg/lit and 4.0- 4.7 mg/lit in immersion and post immersion samples respectively. The range in marine water samples was 3.2 – 4.3 mg/lit (pre- immersion), 3.8 – 4.5 mg/lit (immersion) and 3.8 – 4.3 mg/lit (post immersion).

Table 7 – Variation in DO in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	4.5	4.3	4.4
MW	4.2	4.3	4.1

COD -The COD values were higher by 16.6% and 8.3% respectively for fresh water and marine water samples during immersion period and by 6.3% and 2.5% respectively later in the post immersion period.

Table 8 – Variation in COD in Pre-immersion (Pre-Imm), At immersion (Imm) and Post-immersion (Post-Imm) water samples collected from marine (MW) and fresh water (FW) sites.

Water sample	Pre-Imm (mg/lit)	Imm (mg/lit)	Post-Imm (mg/lit)
FW	24	28	26
MW	**79**	**84**	**81**

DISCUSSION

In fresh water samples the water quality parameters like TSS, TDS, TS, turbidity, conductivity and hardness have significantly increased during the immersion period and then declined in the post immersion period. The post immersion values are lower than the immersion values for all the parameters, more so in the marine samples as the pollutants get dispersed. The present study indicates only slight variations of DO in the pre-immersion, immersion and post immersion samples. On account of disturbance in the water column due to immersion activity, DO increases at the surface layers. COD measures the organic strength of the waste. The values are especially high when biologically resistant organic matter is present. In the present study, COD values were higher in immersion and post-immersion samples as compared to pre-immersion samples.

The current research indicates that the pollution load on water bodies has increased significantly during idol immersion period.

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