

Research Article

Ganesh Idol Immersion and Water Quality Deterioration in Ambika River, Navsari (Gujarat)

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Abstract

India is the country of cultural diversity where different religious activities and festivals are celebrated. Ganesh Chaturthi and Durga puja are two major festivals in that idol immersion is performed as ritual and the present study was carried out to assess the impact of Ganesh idol immersion on water quality of Ambika River, Navsari. Water samples were collected during the pre-immersion, immersion and post-immersion periods of the idol at the time of Ganesh festival 2019. These samples were analyzed for important physico-chemical parameters viz. pH, temperature, dissolved oxygen (DO), BOD, COD, total hardness, free CO₂, total calcium. Significant decrease in DO and increase in the total hardness, free CO₂, total calcium, COD and BOD level was observed while pH and temperature showed no major changes during the immersion period. These findings were also verified by the water quality index and water body came in the category IV which indicated very poor water quality and not suitable for drinking purpose.

On the basis of these changes in water quality parameters and water quality index it can be concluded that level of pollution is increased in Ambika River due to Ganesh idol immersion activities. These religious activities cannot be stopped but awareness among the people for idol immersion and implementation of rules for natural resource conservation can help to reduce the pollution level.

Keywords: Ganesh idol, water quality, water quality index, Ambika River, Navsari, Gujarat

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Introduction

Water and water bodies are polluted by indiscriminate disposal of sewage, industrial waste and religious activities. Navaratri, Durga puja, Ganesh chaturthi, Muharam etc. are the important religious festival which play important role to increase the pollution load in natural water bodies [1, 2] and adversely affecting the flora and fauna of the ecosystem [3, 4]. The Ganesh festival takes place on the Ananta chaturdasi day, which falls after 10 days of Ganesh chaturthi which ends with the visarjan or immersion of the idols in nearby water bodies. The dark side of such kind of festivals is that idols used for immersion are made up of plaster of Paris, limes, cement which do not get mixed or disintegrate in the water but affect adversely the flora and fauna. These chemical substances like dyes and colors, which are being used to decorate or paint the idol, contain mercury, zinc oxide, chromium that affect the aquatic life [5].

The water quality deterioration due to idol immersion in Tapi river at different locations were studied by different researchers and reported negative impact of ritual activities on natural water bodies [2, 6-9]. The increment in pollution level due to religious activities causes' adverse effect on ecosystem was reported by Ujjania and Multani [10] from their study. Such studies were carried out by various researchers in different water bodies but Ambika River is still not included for such kind of studies therefore, present study is carried out to observe the impact of idol immersion on water quality of Ambika River, Navsari.

Material and Methods

For the study, water samples were collected during pre-immersion, immersion and post-immersion period and preserved at the site of idol immersion of Ambika River, Navsari (Gujarat) during the Ganesh festival 2019. These water samples were used to analyse the various physio-chemical parameters such as temperature, pH, free CO₂, total Hardness, Biological Oxygen demand (BOD), Chemical oxygen demand (COD) and total calcium. In these parameters, measurement of water temperature and fixation of dissolved oxygen was done in situ while further analysis of dissolved oxygen and remaining parameters were carried out at the Research Laboratory, Department of Aquatic Biology, VNsgu, Surat (Gujarat) following the standards methods [11, 12].

Result and Discussion

The significant changes in physico-chemical properties and impact of Ganesh idol immersion on water quality of Ambika River were observed. The surface water temperature of Amibika river was observed 27.00 – 28.20 °C (27.73 ± 0.37 °C) during pre-immersion, 27.00 – 28.00 °C (27.33 ± 0.33 °C) during immersion and 26.00 – 28.00 °C (27.33 ± 0.66 °C) during post immersion (**Table 1** and **Figure 1**). The increasing trend in temperature was observed which enhance the chemical reaction and biological activity and affect the solubility of gases in water of Ambika River. Similar finding were reported by Ujjania et al., Desai and Tank, Gadhia et al, Ujjania and Mistry and Lokhande [1, 4, 13-15].

Table 1 Water quality parameters of Ambika River Water, Navsari

Parameters	Pre-immersion	Immersion	Post-immersion
Temperature (°C)	27.00–28.20 (27.73 ± 0.37)	27.00–28.00 (27.33 ± 0.33)	26.00–28.00 (27.33 ± 0.66)
pH	7.96–8.05 (8.00 ± 0.02)	7.50–7.80 (7.67 ± 0.09)	6.21–6.92 (6.61 ± 0.21)
Dissolved Oxygen (mg/L)	7.67–8.48 (8.21 ± 0.27)	5.65–7.27 (6.46 ± 0.46)	6.06–7.27 (6.59 ± 0.35)
Free CO ₂ (mg/L)	17.60–26.40 (22.00 ± 2.54)	17.60–35.20 (27.86 ± 5.28)	13.20–22.00 (17.60 ± 2.54)
Total hardness (mg/L)	148.00–162.00 (153.33 ± 4.37)	150.00–174.00 (162.00 ± 6.92)	148.00–162.00 (154.00 ± 4.16)
Biological oxygen demand (mg/L)	6.40–6.80 (6.53 ± 0.13)	7.20–7.60 (7.46 ± 0.13)	6.00–7.60 (6.80 ± 0.46)
Chemical oxygen demand (mg/L)	192.00–216.00 (205.33 ± 7.05)	196.00–220.00 (208.00 ± 6.92)	108.00–204.00 (165.33 ± 29.24)
Total Calcium (mg/L)	120.00–128.00 (123.33 ± 2.40)	132.00–148.00 (140.00 ± 4.61)	82.00–120.00 (95.33 ± 12.34)
WQI	201.14	244.94	155.10

The pH is important parameter of water because it deals with solubility of nutrients and present study showed that water of Ambika river was slightly alkaline 7.50 – 7.80 (7.67 ± 0.09) during the immersion and comparatively more alkaline 7.96 – 8.05 (8.00 ± 0.02) during the pre-immersion period whereas pH values decreased and showed acidic nature 6.21 – 6.92 (6.61 ± 0.21) during the post immersion (Table 1 and Figure 1). Similarly Malik et al. and Nag and Pande reported acidic nature of water due to idol immersion in different rivers of south Gujarat and in Yamuna river respectively [16, 17]. The changes in pH may be due to addition of organic matter and biodegradable materials which were used in the preparation of Ganesh idols [18].

Dissolved oxygen is considered important water quality parameter, which influence the physical and biological process in the water ecosystem and significant parameter for the suitability of aquatic resources for flora and fauna. In present study, it was low 5.65 – 7.27 mg/L (6.46 ± 0.46 mg/L) during the idol immersion, while high during the pre-immersion period 7.67 – 8.46 mg/L (8.21 ± 0.27 mg/L) and post immersion period 6.06 – 7.27 mg/L (6.59 ± 0.35 mg/L) (Table 1 and Figure 1). The similar trend in DO and cumulative effect of idol immersion were reported in different rivers of southern Gujarat [1, 5, 10, 16].

The free CO₂ is generated from the microbial activities and required for the photosynthesis and growth of algal. In the present study, the high value of free CO₂ 17.60 – 35.20 mg/L (27.86 ± 5.28 mg/L) was observed during the immersion period while 17.60 – 26.40 mg/L (22.00 ± 2.54 mg/L) and 13.20 – 22.00 mg/L (17.60 ± 2.54 mg/L) were observed during pre-immersion and post-immersion period respectively (Table 1 and Figure 1). The results of Bhattacharya et al. and Ujjania et al. in Chhatri Lake, Amarawati (Maharashtra) and Tapi river (Gujarat) respectively were very similar to present study [1, 19].

Total hardness is the important water quality parameter which deals with the uses for different purposes. In present investigation it was high 150.00 – 174.00 mg/L (162.00 ± 6.92 mg/L) during immersion period where as comparatively low during pre-immersion 148.00 – 162.00 mg/L (153.33 ± 4.37 mg/L) and post immersion period 148.00 – 162.00 mg/L (154.00 ± 4.16 mg/L) (Table 1 and Figure 1). Idol constructive components are responsible for increasing hardness and high value of total hardness was observed during the idol immersion activity. Bengani et al. also reported similar trend of fluctuation in hardness due to idol immersion in Tapi River [5]. High value (347 ppm) of total hardness during idol immersion was reported in Tapi River (Gujarat) by Malik et al. [16].

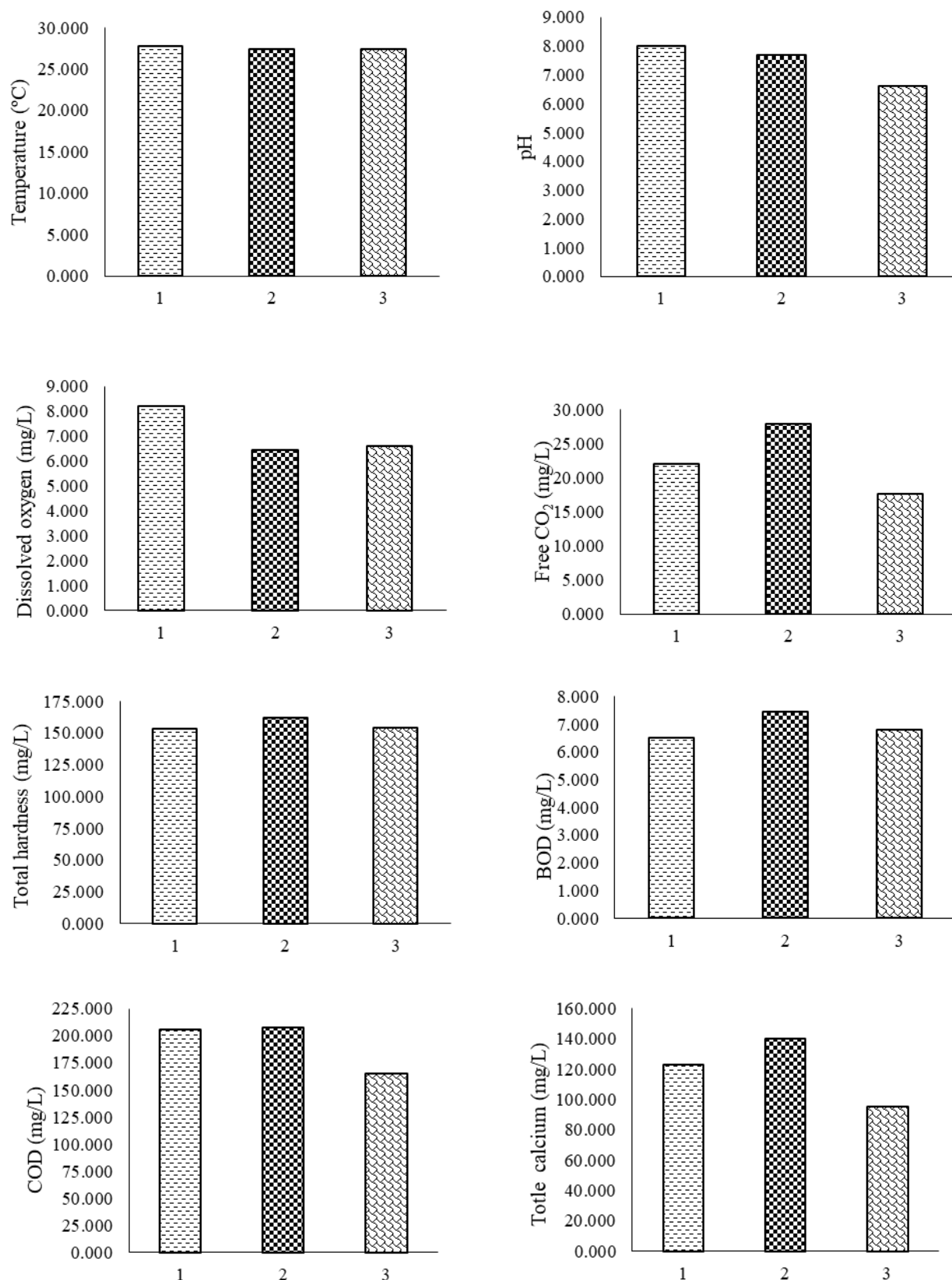


Figure 1 Impact on physico-chemical properties of Ambika River. 1-Pre-immersion, 2-Immersion and 3-post-immersion duration

Biological oxygen demand (BOD) indicates the organic pollution load in the water body and it was observed 7.20 – 7.60 mg/L (7.46 ± 0.13 mg/L) during the idol immersion period which was significantly high compared to 6.40 – 6.80 mg/L (6.53 ± 0.13 mg/L) during pre-immersion and 6.00 – 7.60 mg/L (6.80 ± 0.46 mg/L) during post-immersion

period (Table 1 and Figure 1). The similar results were observed in different studies carried out in Tapi River [1, 4, 5, 10, 13, 14, and 21]

Chemical oxygen demand (COD) is an important parameter to indicate the pollution and in present study it was 196.00 -220.00 mg/L (208.00 ± 6.92 mg/L) during the idol immersion period while it was 192.00 – 216.00 mg/L (205.33 ± 7.05 mg/L) and 108.00 – 204.00 mg/L (165.33 ± 29.24 mg/L) during pre-immersion and post immersion period respectively (Table 1 and Figure 1). The similar findings of COD in Tapi river was reported by Ujjania et al., Bengani et al, Gadhia et al., Ujjania and Multani during different studies [1, 5, 13, 14, 20, 21].

In water body, calcium is mainly accumulated from naturally dissolution of rock and small quantity of it is added from idol construction components. In present study the total calcium was observed 132.00 – 148.00 mg/L (140.00 ± 4.61 mg/L) during immersion period which was very high and it was low 120.00 – 128.00 mg/L (123.33 ± 2.40 mg/L) during pre-immersion period and 82.00 – 120.00 mg/L (95.33 ± 12.34 mg/L) post immersion period (Table 1 and Figure 1). Similar findings [1, 14] were reported in earlier study in Tapi River during Ganesh festivals.

The impact of idol immersion on water quality was confirmed by water quality index (WQI). In present study, it was high 244.94 during immersion period and low 201.14 and 155.10 during pre-immersion and post immersion period respectively (Table 1 and Figure 2). The order of WQI values were in order immersion period > pre-immersion period > post immersion period (Figure 2). On the basis of WQI values, water body fall under the category IV (**Table 2**) which indicate that water of Ambika River is very poor in quality and not suitable for drinking purpose. Earlier study of WQI based water quality status of Tapi River by Dubey and Ujjania was very close to findings of the present study.

Table 2 WQI value and water quality status of water body

Class	WQI value	Water Quality Status
I	<50	Excellent
II	50-100	Good Water
III	100-200	Poor Water
IV	200-300	Very poor water
V	>300	Water unsuitable for drinking

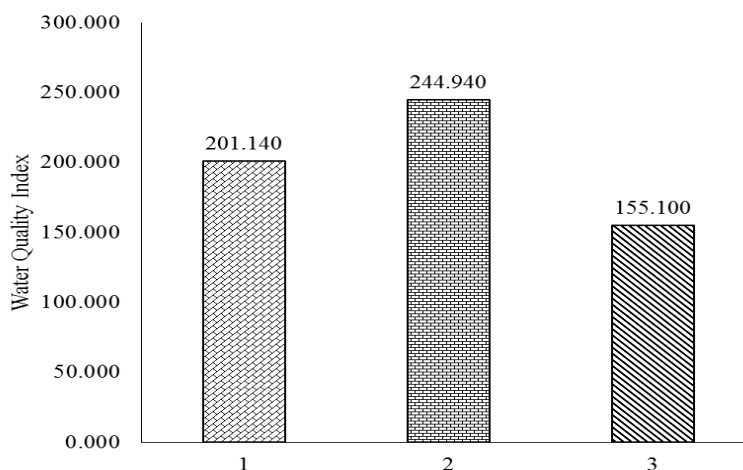


Figure 2. Water quality index of Ambika River water during the 1-Pre-immersion, 2-Immersion and 3-post-immersion duration

Conclusion

After the analysis of different water quality parameters and water quality index during the Ganesh festival, it may be inferred that Ambika River is polluted by religious ceremonies like Ganesh idol visarjan. The important physico – chemical properties were analyzed and it can be concluded that the parameters such as dissolved oxygen, free CO₂, total hardness, COD, total calcium were significantly affected and led to deterioration of water quality of Ambika River by idol immersion activities. Various eco- friendly methods for immersion should be continued and use of them should be increased in order to reduce the adverse impact of ritual activities on natural water bodies.

References

- [1] Ujjania N.C., Azhar A. Multani, Mistry C.A. and Patel M.S. Festivals and deterioration of aquatic environment: A case study of Idol immersion in Tapi River, India. *Journal of Geoscience, Engineering, Environment and Technology*, 2018, 3 (4): 208-213.
- [2] Sangani K. and Manoj K. Ganesh Idol immersion: impact on water quality of Tapi River, Surat, Gujarat, India, *Research Journal of Recent Sciences*, 2017, 6 (2): 54-56.
- [3] Bajpai A., Vyas A. and Mishra D. A case study of Idol Immersion in the Upper Lake of Bhopal. *Asian Journal of Experimental Science*, 2007, 20, (2):289-296.
- [4] Desai J. and Tank S.K. Deterioration of Water Quality due to Immersion of Ganesh Idols in the River Tapti at Surat (India). *Journal of Environmental Research and development*, 2010.4 (4): 999-1007
- [5] Bengani. R, Ujjania, N.C., Sangani. K. and Roy L. Idol Immersion and its consequences on water quality of Tapi River, Surat (Gujarat). *International Journal of Advanced Research in Biological Sciences*. 2020, 7(10): 137-144.
- [6] Variya R. Work in effect on water and soil quality of Umra Ovara, Surat with reference to Ganesh Visarjan. M.Sc. dissertation Veer Narmad South Gujarat University, Surat.2010
- [7] Varsani A. Work in effects on water and soil quality of Ashwini Kumar Ovara, Surat with reference to Ganesh Visharjan. M.sc. dissertation Veer Narmad South Gujarat University, Surat, 2009
- [8] Malik, G.M., Raval, V.H., Zadafiya, S.K. and Patel, A.V. Idol immersion and physico-chemical properties of South Gujarat Rivers. *Current World Environment*, 2010, 5 (1): 173-176.
- [9] Ansari E., Gadhia M., Surana R. and Talsania N. Water quality assessment of Tapi River during Ganesh visharjan, *Journal of International academic for multidisiplinary*, 2014.1 (12):85-90.
- [10] Ujjania N.C. and Azhar A. Multani. Impact of Ganesh Idol Immersion Activities on the Water Quality of Tapi River, Surat (Gujarat) India, *Research Journal of Biology*, 2011, 01 (01): 11-15.
- [11] Trivedy R.K. and Goel P.K. *Chemical and Biological methods water pollution studies* - R. K. Trivedy, P. K. Goel – Google Books. (Environmental Publication), Karad, India, 1984
- [12] American Public Health Association. *Standard methods for the examination of water and waste water*, sixteenth edition Washington D.C., 2005
- [13] Gadhia M., Surana R. and Ansari E. Pollution load assessment of Tapi River during Ganesh festival, India. *Octa Journal of Environmental Research*, 2014, 2 (4): 310-313.
- [14] Ujjania N.C. and Patel M.S. Ganesh idol immersion and its impact on water quality of Tapi river, *Indian Journal of Environmental Science and Water Resources*, 2012,.1 (9): 231-235.
- [15] Lokhande Pradnya A. The effect of Ganesh Idol Immersion on the Water Quality of Gorai Jetty, Mumbai. *The Environmental Health Perspective*, *International Journal of Trend in Scientific Research and Development*, 2019, 3: 398-402.
- [16] Malik, G.M., Raval, V.H., Zadafiya, S.K. and Patel, A.V. Idol immersion and Physico-Chemical properties of South Gujarat Rivers, *Indian Research Journal of Chemical Science*, 2012, 2(3): 21-25.
- [17] Nag Sarbari and Pande P. K. Effect of idol immersion on water quality of Yamuna River in Delhi and its potential influence on ground water quality. *Indian Journal of Geo-Marine Science*, 2015, 44(10): 1545-1553
- [18] Dubey. M and Ujjania, N.C. Assessment of water quality and sources of pollution in downstream of Ukai, Tapi River (Gujarat). *Current World Environment*, 2015, 10 (1): 350-354
- [19] Bhattacharya .S, Arpita. B, Dutta.A and Uday C. G., Effects of idol immersion on the water quality parameters of Indian water bodies: Environmental health perspectives. *International Letter of Chemistry, Physics and Astronomy*, 2014, 20(2): 234-263
- [20] Gadhia M., Sanghani P.J and Ujjania N.C. Ganesh idol immersion and its impact on soil of Tapi River India. *International conference on sustainable water resources development and management 20 to 21 December*, 2012
- [21] Gadhia M., Surana R., Talsania N. and Ansari E. Hydrological changes in water due to idol immersion in artificial pond. *Journal of Materials and Environment Science*. 2015, 6 (1): 220-223.

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