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WATER QUALITY ASSESSMENT OF TAPI RIVER DURING GANESH VISARJAN

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ABSTRACT

Present study was conducted to assess the water quality of Nanpura Ovara of Tapi River during Ganesh visarjan. Water samples were collected in the morning during pre-immersion, immersion and post-immersion. Water samples were analyzed for physicochemical properties viz., pH, temperature, total alkalinity, total hardness, total calcium, TS, TDS, TSS, DO, BOD, COD, and oil and grease and microbiological study for TVC. It was noted that the values of most of the parameters significantly changed during and after immersion period. Present study indicated that the river water of the study area was affected due to rituals practiced in Ganesh chaturthi festival and caused pollution.

KEYWORDS: Ganesh chaturthi, physico-chemical properties and microbiological study.

INTRODUCTION

India is the country of diversity of culture and rituals. People have deep believe in rituals and follow their cultural activities. Some of the rituals are performed near or bank of water bodies. The Ganesh Chaturathi is one of the important festivals of Hindu and thousands of Ganesh idols of various sizes are immersed every year in different water bodies of the city (Reddy and Kumar, 2001).

Ganesh Chaturthi is the Hindu festival celebrated on the birthday of Lord Ganesh. It is believed that Lord Ganesh bestows his presence on earth for all his devotees during this festival. It is the day when Ganesh was born. Lord Ganesh is widely worshipped as the god of wisdom, prosperity, good fortune and traditionally invoked at the beginning of any new venture.

Surat is situated on the bank of Tapi River that plays important and significant role in its economic growth and development. Tapi River is a river is one of the major rivers of west coast river system of India with a length around 724 km. It originates from the Satpura range of hills, Betul district of Madhya Pradesh. The flow of Tapi River covers Maharashtra,
Madhya Pradesh and Gujarat state and meets in the Arabian Sea near Dumas. Ganesh festival in Surat exhibits enormous energy throughout the festival. Thousands of Ganesh idols are worshipped by Mandals and in households. Everyone knows immersion of idols causes water pollution. Surat has nearly 34,000 Ganesha idols in different parts of the city (Anonymous, 2013) and their immersion causing pollution in Tapi River. So present work was conducted to assess the pollution status of Tapi River at Nanpura Ovara immersion site.

MATERIALS AND METHODS

Surface water samples were collected during morning time from Nanpura Ovara the immersion site of Tapi River, Surat (Figure 1) in 2013 during pre-immersion, immersion and post-immersion.

Figure 1: Nanpura Ovara (the immersion site)

Samples were analyzed for the physico-chemical parameters such as temperature, pH, turbidity, conductivity, salinity, dissolved oxygen, total solid, total dissolved solid, total suspended solid, total hardness, calcium hardness, total alkalinity, biological oxygen demand, chemical oxygen demand and oil and grease to follows the standard methods of Trivedy and Goel (1986) and APHA (2005). The temperature and pH record and fixation of dissolved oxygen were done at the site. Method for microbiological study (Total Viable Count) was adopted as described by APHA (2005).

RESULTS AND DISCUSSION

Results of physico-chemical parameters and microbiological study are depicted in Table 1.
# TABLE 1. PHYSICO-CHEMICAL AND MICROBIOLOGICAL ANALYSES OF WATER

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Parameter</th>
<th>Pre-immersion</th>
<th>Immersion</th>
<th>Post-immersion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PHYSICO-CHEMICAL ANALYSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td>8.7</td>
<td>8.5</td>
<td>8.8</td>
</tr>
<tr>
<td>2</td>
<td>Temperature (°C)</td>
<td>31</td>
<td>28</td>
<td>28.8</td>
</tr>
<tr>
<td>3</td>
<td>Turbidity (NTU)</td>
<td>53</td>
<td>252</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>Conductivity (ms)</td>
<td>0.7</td>
<td>1.9</td>
<td>0.36</td>
</tr>
<tr>
<td>5</td>
<td>Salinity (ppt)</td>
<td>01</td>
<td>02</td>
<td>01</td>
</tr>
<tr>
<td>6</td>
<td>TS (mg/l)</td>
<td>400</td>
<td>1420</td>
<td>140</td>
</tr>
<tr>
<td>7</td>
<td>TDS (mg/l)</td>
<td>180</td>
<td>1070</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>TSS (mg/l)</td>
<td>220</td>
<td>350</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>Total Alkalinity (mg/l)</td>
<td>220</td>
<td>182</td>
<td>156</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness (mg/l)</td>
<td>220</td>
<td>266</td>
<td>126</td>
</tr>
<tr>
<td>11</td>
<td>Calcium Hardness (mg/l)</td>
<td>44.08</td>
<td>42.48</td>
<td>34.46</td>
</tr>
<tr>
<td>12</td>
<td>Dissolve Oxygen (mg/l)</td>
<td>7.29</td>
<td>1.62</td>
<td>10.53</td>
</tr>
<tr>
<td>13</td>
<td>BOD (mg/l)</td>
<td>4.05</td>
<td>12.2</td>
<td>4.1</td>
</tr>
<tr>
<td>14</td>
<td>COD (mg/l)</td>
<td>19.6</td>
<td>68</td>
<td>39.2</td>
</tr>
<tr>
<td>15</td>
<td>Oil &amp; Grease (mg/l)</td>
<td>0.36</td>
<td>0.74</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>MICROBIOLOGICAL ANALYSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Water (TVC) CFU/ml</td>
<td>11.6×10⁵</td>
<td>29.4×10⁵</td>
<td>7.3×10⁵</td>
</tr>
</tbody>
</table>

pH of water found alkaline 8.5 during the immersion period while it was 8.7 and 8.8 during the pre-immersion and post-immersion period respectively. The value of temperature during the pre-immersion, immersion and post-immersion period it was found 31.0, 28.0 and 28.8 °C respectively. Turbidity of water during immersion period was found very high 252 NTU while it was observed comparatively low during the pre-immersion 53 NTU and post immersion 42 NTU. High value of total solids 1420 mg/l observed during the immersion period that was comparatively low 400 mg/l during pre immersion and 140 mg/l during post immersion period. Similarly total dissolved solid was recorded 1070 mg/l during immersion period while pre-immersion and post-immersion period, it was found low 180 mg/l and 100 mg/l respectively. Total suspended solids was found high 350.0 mg/l during immersion period compare to pre-immersion (220.0 mg/l) and post-immersion period (40.0 mg/l) respectively. In present study total alkalinity was found 220.0 mg/l during pre-immersion period compare to immersion and post-immersion period 182.0 mg/l and 156.0 mg/l respectively. Total hardness was observed as 266.0 mg/l during immersion period while 220 mg/l during pre-immersion and 126 mg/l in post-immersion period. The calcium hardness was observed as 42.48 mg/l during immersion period while 44.08 mg/l during pre-immersion period and 34.46 mg/l during post-immersion period respectively. During immersion period dissolved oxygen was observed very low 1.62 mg/l while it was observed...
comparably high during the pre-immersion 7.29 mg/l and post-immersion 10.53 mg/l. BOD was observed 12.2 mg/l during the immersion period that was significantly high compare to pre-immersion 4.05 mg/l and 4.10 mg/l during post-immersion period. High value of COD 68.0 mg/l was observed in the immersion period that was comparatively low 19.6 mg/l during pre-immersion and 39.2 mg/l during post-immersion period. Oil and grease was observed high 0.74 mg/l during immersion period while pre-immersion and post-immersion period, it was found low 0.36 mg/l and 0.34 mg/l respectively.

The results of total viable count in water sample expressed in colony forming unit per ml (CFU/ml) are shown in Table-1. Results showed maximum bacterial count ($29.4 \times 10^5$ CFU/ml) in water sample from Nanpura Ovara during Ganesh immersion followed by ($11.6 \times 10^5$ CFU/ml) during pre-immersion and ($7.3 \times 10^5$ CFU/ml) in post-immersion. There were no significant difference in pH and temperature during Ganesh visarjan. Changes in various parameters like turbidity, conductivity, TS, TDS, TSS, salinity, total alkalinity, total hardness, calcium hardness, DO and COD etc. during immersion period have been reported in the present study and the results are supported by Dhote et al.(2001), Vyas et al.(2006, 2008) Khapekar & Nandkumar (2009).

The clarity of natural body of water is an important determinant of its condition and productivity. Turbidity in water is caused by suspended and colloidal matter such as clay, silts, finely divided organic and inorganic matter, paint and other microscopic organisms. In the present study turbidity indicated higher values during immersion period and decreased during post immersion period. It could be owing to sedimentation due to immersion of Ganesh idols and decorative (organic & inorganic) materials.

Total solids, total dissolved solids and total suspended solids increased during immersion and then declined during post-immersion. The finding of the present study is supported by Kaur (2012).

Alkalinity of natural waters is due primarily to the salts of weak acids, although weak or strong bases may also contribute. Bicarbonate represents the major form of alkalinity. In the present investigation total alkalinity was found in increasing trend before immersion, at the day of immersion and post-immersion.

Dissolved oxygen was found comparatively low in immersion period than pre-immersion and post-immersion period. Decrease in DO could be due to cumulative effects of various religious activities and present findings are in agreement with the study of Unnisa & Rao (2007). Devi and Belgali (2005) and Jadhav and Dongare (2009) also reported low DO level during the immersion period in water bodies of Karnataka.
BOD is one of the pollution indicating parameter. Concentration of BOD also increased at the immersion period. A higher BOD value indicates the presence of organic material. Decomposition of organic matter utilizes the oxygen resulting in increasing oxygen demand. Chemical Oxygen Demand is an important parameter for knowing the quality of water. The COD values were higher respectively during immersion period and post-immersion period. The study is supported by Kaur (2012). The high value of COD indicates pollution due to oxidizable organic matter.

Increased in the concentration of oil and grease was found during immersion period which declined during post-immersion period. Present study is supported by Vyas et al., (2006) in Lake of Bhopal and Ujjania and Azahar (2011) and Ujjania and Mistry (2012) in Tapi River.

Increased in TVC during Ganesh immersion crossed the permissible limit (Surendran et al., 2009) and indicated that water of Tapi River was polluted during immersion period. The significance of immersion of different types of Ganesh idols is the changes in physio-chemical parameters of the water body. Water quality parameters like turbidity, conductivity TS, TDS, TSS, salinity, BOD and COD have significantly increased during the immersion period similarly TVC was also increased during immersion period. Thus the present study concluded that the river water of the study area was found affected due to rituals practiced in Ganesh festival and immersion of idols. It may be noted here that due to inflow (release) of water from Ukai dam and tidal influence from Dumas, had diluting effects in water quality parameter and reduced the effects whereas as stagnant water causes more cumulative pollutional effects.

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The authors are grateful to SMC staff members of Nanpura immersion site for their kind help and cooperation in collecting the samples.
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