Physico-chemical analysis of sewage discharged into Varuna river at Varanasi

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ABSTRACT

The present work deals with the analysis of physicochemical characteristics of municipal waste water of city Varanasi. Most of such water of city flow directly by means of a system of independent drains in river Varuna. Four major nalas in different areas were selected for analysis of waste water quality of city Varanasi during 2008-2009. The result revealed that physico-chemical parameters of city sewage discharged showed quite high values of pH, temperature, alkalinity, BOD, COD, Chloride, nitrate, phosphate, potassium, calcium and low level of dissolved oxygen which make the degradation of water quality of river Varuna.

Key words: Varuna, Physico-chemical, Sewage discharge.
identified and analysis of sewage was done. To study
the impact of chemical pollutants on the chemistry
of Varuna river water, four study sites were selected
along the Varuna river corridor. The first site was
control site, the second and third sites were
the mixing point of sewage and effluents of minor
industries, and the fourth one was at the confluence
point of river Varuna with river Ganga at Rajghat.

The waste water samples were collected
in precleaned plastic containers of two litres capacity
in triplicate in first week of each month during 2008-
2009 between 10am to 12.00 noon. Sample storage
analysis were done by selecting standard and
suitable methods described in APHA (1985).

RESULTS AND DISCUSSION

The average values and range of measurements of one year for each parameters
are given in table-1. The colour of wastewater in
each nala was almost blackish. The results revealed
that the maximum (29.2°C) temperature was
recorded at site III where as minimum (26°C) at
control site. Over all pH value was alkaline range
and was maximum (8.6) at site IV and minimum
(7.7) at site I. It may be due to direct addition of
municipal & small industrial wastes in it. The
alkalinity was maximum (515) at site III followed by
site II and site IV (Table 1) Biological oxygen
demand also showed the similar trend, however,
dissolved oxygen showed reverse trend, because
dissolved oxygen showed reverse trend, because
eutrophication (Table 1). The variation in DO value
at various points, was in the accordance with the
variation in the quantity and quality of municipal/
domestic wastes discharged at those points.
Increased organic wastes enhance the bacterial
population which put a heavy bio-chemical oxygen
demand and reduce the dissolved oxygen.

The quantity of nutrients in sewage varies
at different region as also supported by Singh &
have reported that BOD values also depend
on amount of sewage and effluents. The river
drainage and the temperature also affect BOD
(Tiwari 1983). Peterson et al. (1973) have related
the depletion of dissolved oxygen with high
phosphorus inputs from agricultural and natural drainage.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Site I</th>
<th>Site II</th>
<th>Site III</th>
<th>Site IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>16.5-35.5</td>
<td>6.9-8.5</td>
<td>205-395</td>
<td>32-85</td>
</tr>
<tr>
<td>PH</td>
<td>3.7</td>
<td>2.7</td>
<td>1.75</td>
<td>1.0-2.5</td>
</tr>
<tr>
<td>Alkalinity (mg/l)</td>
<td>635</td>
<td>635</td>
<td>635</td>
<td>635</td>
</tr>
<tr>
<td>DO (mg/l)</td>
<td>35-45</td>
<td>112.5</td>
<td>7.7-50</td>
<td>16.23</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>209</td>
<td>209</td>
<td>209</td>
<td>209</td>
</tr>
<tr>
<td>COD (mg/l)</td>
<td>232</td>
<td>232</td>
<td>232</td>
<td>232</td>
</tr>
<tr>
<td>Chloride (mg/l)</td>
<td>233</td>
<td>233</td>
<td>233</td>
<td>233</td>
</tr>
<tr>
<td>Nitrate (mg/l)</td>
<td>445</td>
<td>445</td>
<td>445</td>
<td>445</td>
</tr>
<tr>
<td>Phosphate (mg/l)</td>
<td>435.988</td>
<td>435.988</td>
<td>435.988</td>
<td>435.988</td>
</tr>
<tr>
<td>Potassium (mg/l)</td>
<td>690-198</td>
<td>690-198</td>
<td>690-198</td>
<td>690-198</td>
</tr>
<tr>
<td>Calcium (mg/l)</td>
<td>1.335</td>
<td>1.335</td>
<td>1.335</td>
<td>1.335</td>
</tr>
</tbody>
</table>
The calcium content was recorded maximum (1.335) at site III followed by site II (.711) and minimum at control site (.445) (Table 1). It was also observed that calcium content was maximum in winter followed by rains and minimum in summer month. The lower value of calcium recorded in summer month may be attributed to the comparatively higher water temperatures which facilitate the decomposing activity and its utilization by decomposing bacteria (Shashikant 1990). The amount of phosphate in drains also had higher value in site III followed to site II due to their loading of much amount of organic matter as well as detergents from house holder. Chloride contents of all drains were increased with increased pollution load. It was maximum (74) at site IV and minimum (19.5) at control site. Nitrate concentration was increased with increase in sewage and agrochemical waste and was maximum (1.209) at site III (Table- 1).

From the physico-chemical characteristics reported in present study, it is evident that major nulas of Varanasi city flowing in river Varuna carry highly degraded water. This is responsible for decline of water quality of Varuna river. To check degradation of water quality of river Varuna immediate steps are necessary to prevent discharge of raw municipal and industrial waste water without any effective treatment.

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REFERENCES