ANALYSIS OF PHYSICO-CHEMICAL CHARACTERISTICS OF GOMTI RIVER WATER AT DISTRICT SULTANPUR (U.P.)

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MATERIALS AND METHODS
Water samples were collected once in a month from three selected stations viz. Golaghat (S-I), Dhobighat (S-II) and Shanshanghat (S-III) from river Gomti at district Sultanpur (U.P.) for physico-chemical analysis during April 2009 to March 2010. In the present study the maximum value of temperature, turbidity, total dissolved solids and free CO₂ at site-I; colour, total hardness, sulphate and BOD at site-II and pH, alkalinity, chlorides, DO and COD at site-III, and the minimum value of turbidity, pH, total hardness, total dissolved solids, sulphate, BOD and COD at site-I; alkalinity, chlorides, DO, and free CO₂ at site-II; and temperature and colour at site-III. Some parameters are highly changed due to bathing, washing and direct disposal of domestic and municipal wastes in the river Gomti at Sultanpur District.

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The mean and standard deviation of physico-chemical parameters like Temperature, Colour, Turbidity, pH, Total hardness, TDS, Alkalinity, Sulphate, Chlorides, DO, BOD, COD and free CO₂ of selected sampling stations (S-I, S-II and S-III) are presented in Table-1. The maximum water temperature was recorded as 31ºC at site-I during summer season in the month of June, 2009 and minimum was recorded as 18.5ºC at site-III during winter season in the month of January, 2010. The maximum mean value of water temperature was recorded 26.07 + 2.76 at site-I and minimum mean value was recorded 24.9 + 3.93 at site-III.
In the summer season water temperature was generally higher as compared to winter season. The present study is in agreement with the above observations. Since temperature has no direct impact on aquatic life, solubility of oxygen in the water increased when water temperature decreases. The maximum value of Colour of Gomti river water was recorded on (pt-co-scale) as 8.6 at site-II in the month of October, 2009 and minimum value was recorded as 4.3 at site-III in the month of April, 2009. The maximum mean value of colour of river water was recorded 7.28 + 1.07 at site-II and minimum mean value was recorded 6.25 + 1.10 at site-III.

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The maximum value of Turbidity was recorded as 66.2 at site-I in the month of February, 2010 and minimum value was recorded as 31.6 at site-I in the month of July, 2009. The maximum mean value of turbidity of Gomti river water was recorded 42.0 + 3.63 at site-II and the minimum mean value was recorded 39.03 + 3.05 at site-III.

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were recorded as 8.5 at site-III in the month of August, 2009 and March 2010, and minimum value was recorded as 7.0 at site-I in the month of February, 2010. The maximum mean value of pH of Gomti river water was recorded as 8.08 + 0.30 at site-III and the minimum mean value was recorded as 7.79 + 0.38 at site-I. In natural water, pH also changes due to variation in photosynthetic activities which increases the pH due to consumption of CO$_2$ in the process. The microbiological integrity of water also depends upon its pH value. Total hardness of water is caused by bicarbonates, carbonates, sulphate, chlorides and nitrates of calcium and magnesium. In the present study, the maximum value of Total Hardness was recorded as 272.6 at site-II in the month of July 2009 and minimum value was recorded as 185.3 at site-I in the month of December, 2009. The maximum mean value of Total hardness was recorded 245.23 + 18.41 at site-II and minimum mean value was recorded 218.55 + 19.46 at site-I. Total dissolved solids in water comprise organic salts and small amount of organic matter. In the present study, the maximum value of Total dissolved solids was recorded as 613 at site-I in the month of February, 2010 and minimum value was recorded as 446 at site-I in the month of September, 2009. The maximum mean value of Total dissolved solids was recorded 521.92 + 46.79 at site-II and the minimum mean value was recorded 501.08 + 30.47 at site-II. The high amount of suspended, dissolved and total solids adversely affects the quality of water and unsuitable for any purpose including irrigation. Dissolved solid substances also influence the taste, hardness and corrosive property of water. Total alkalinity of water is due to presence of mineral salts present in it. It primarily caused by the carbonate and bicarbonate ions. In the present study, maximum Alkalinity was recorded as 210 at site-III in the month of June, 2010 and minimum value was recorded as 145 at site-II in the month of November, 2009. In the present study the total Alkalinity was high during summer season followed by steep fall in monsoon periods. The low alkalinity was recorded in the months of November (after monsoon) due to dilution. The maximum concentration of Sulphate was recorded as 215.0 at site-II in the month of November 2009 and the minimum concentration was recorded as 145.6 at site-I in the month of March, 2010. The maximum mean value of sulphate was recorded 195.01 + 7.78 at site-II and the minimum mean value was recorded 153.58 + 5.10 at site-I. Chloride occurs naturally in all types of water. Man and other animals excrete very high quantities of chloride together with nitrogenous compounds. In the present study, the maximum concentration of Chlorides was recorded as 80.8 at site-III in the month of February, 2010 and the minimum concentration was recorded 28.5 at site-II in the month of November, 2009. The maximum mean value of chlorides was recorded 71.53 + 6.10 at site-III and the minimum mean value was recorded 37.73 + 5.54 at site-II. Dissolved Oxygen is one of the most important parameters in water quality assessment and reflects the physical and biological processes prevailing in the water. In the present study the maximum value of Dissolved oxygen in the Gomti river water was recorded 7.5 at site-III in the month of January, 2010 and the minimum value was recorded 4.0 at site-II in the month of June, 2009. The maximum mean value of dissolved oxygen was recorded 6.45 + 0.47 at site-I and the minimum mean value was recorded 5.04 + 0.67 at site-II. Its deficiency directly affects the ecosystem of river due to bioaccumulation and biomagnifications. Maintenance and distribution of biota in aquatic ecosystems depends upon the concentration of DO to a great extent. High DO content is an indication of a healthy system. Dissolved Oxygen is one of the most important parameters in water quality assessment and reflects the physical and biological processes prevailing in the water. In the present study the maximum value of Dissolved oxygen in the Gomti river water was recorded 7.5 at site-III in the month of January, 2010 and the minimum value was recorded 4.0 at site-II in the month of June, 2009. The maximum mean value of dissolved oxygen was recorded 6.45 + 0.47 at site-I and the minimum mean value was recorded 5.04 + 0.67 at site-II. Its deficiency directly affects the ecosystem of river due to bioaccumulation and biomagnifications. Maintenance and distribution of biota in aquatic ecosystems depends upon the concentration of DO to a great extent. High DO content is an indication of a healthy system. BOD is the oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. The BOD test is useful in evaluating the self-purification capacities of streams which serves as a measure to assess the quality of wastes which can be safely assimilated by the stream. In the present study, the maximum value of B.O.D. was recorded 11.5 at Site-II in the month of June, 2009 and the minimum value was recorded as 5.5 at site-I in the month of January, 2010. The maximum mean value of B.O.D. was recorded 10.03 + 0.75 at site-II and the minimum mean value was recorded 7.03 + 1.04 at site-I. The maximum value of C.O.D. was recorded as 21.5 at site-III in the month of June, 2009 and the minimum value was recorded 13.0 at site-I in the month of January, 2010. The maximum mean value of C.O.D. was recorded 18.39 + 1.63 at
Table-1. Values of mean and standard deviation of physico-chemical parameters recorded at three selected sampling stations during April 2009 - March 2010 from Gomti River within district Sultanpur (U.P.).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Physico-chemical Parameters</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S-I</td>
<td>S-II</td>
<td>S-III</td>
</tr>
<tr>
<td>1.</td>
<td>Temperature</td>
<td>26.07</td>
<td>25.02</td>
</tr>
<tr>
<td>2.</td>
<td>Colour (on pt-co scale)/m</td>
<td>6.68</td>
<td>7.28</td>
</tr>
<tr>
<td>3.</td>
<td>Turbidity (JTU)</td>
<td>41.68</td>
<td>42.0</td>
</tr>
<tr>
<td>4.</td>
<td>pH</td>
<td>7.79</td>
<td>7.83</td>
</tr>
<tr>
<td>5.</td>
<td>Total Hardness (ml/l)</td>
<td>521.92</td>
<td>501.08</td>
</tr>
<tr>
<td>6.</td>
<td>Total dissolved solids(ml/l)</td>
<td>160.92</td>
<td>174.0</td>
</tr>
<tr>
<td>7.</td>
<td>Alkalinity (ml/l)</td>
<td>153.58</td>
<td>195.01</td>
</tr>
<tr>
<td>8.</td>
<td>Sulphate (ml/l)</td>
<td>41.26</td>
<td>37.73</td>
</tr>
<tr>
<td>9.</td>
<td>Chlorides (ml/l)</td>
<td>7.03</td>
<td>10.03</td>
</tr>
<tr>
<td>10.</td>
<td>Dissolved oxygen (ml/l)</td>
<td>16.25</td>
<td>17.85</td>
</tr>
<tr>
<td>11.</td>
<td>B.O.D. (ml/l)</td>
<td>7.91</td>
<td>6.96</td>
</tr>
</tbody>
</table>

site-III and the minimum mean value was record 16.25 + 1.48 at site-I.

The B.O.D. and C.O.D. was recorded significant increase in the polluted zone which contains varieties of pollutants present in the domestic sewage and detergents. The maximum value of free CO$_2$ was recorded as 9.6 at site-I in the month of June, 2009 and the minimum value was recorded as 5.6 at site-II in the month of February, 2010. The maximum mean value of free CO$_2$ was recorded 7.91 + 1.08 at site-I and the minimum mean values was recorded 6.96 + 0.99 at site-II. In the present study the maximum free carbon dioxide level was recorded during summer season and minimum level was recorded in winter which is antagonistic to dissolved oxygen level.

REFERENCES