LIMNOLOGICAL STUDIES OF MAYA SAROBAR POND AT GAYA DISTRICT, BIHAR (INDIA)

Rajesh Kumar¹, V K Prabhat²

¹P G Department of Botany, Magadh University, Bodh Gaya -824234, India.
²P G Department of Botany, Dr A H Rizvi College, Karari, Kaushambi, U P, India.

Abstract: The present investigation was carried out on certain limnological parameters of Maya Sarober pond at Bodh Gaya in different times intervals. The limnological parameters such as, pH, temperature, alkalinity, calcium, phosphate, total hardness, dissolved oxygen, biochemical oxygen demand, sulphate, iron, chloride and Floride were estimated in the samples to evaluate their quality. The data of limnological parameters are compared with WHO (1992) and IS: 10500 standards for drinking water. Our result revealed that concentration of DO, BOD, Total hardness, Calcium, sulphate, alkalinity, phosphate, iron and chloride are within permissible limits and Iron, phosphate are negligible in comparison to permissible limits whereas the concentration of nitrate is higher at this pond. The proper treatment necessary before the use for drinking purposes and irrigation purposes.

Keywords: Pond, Water quality, Aquatic organism, Physical Parameters.

INTRODUCTION:

Water resources are declining day by day at the faster rate due to rapid urbanization and population load. Deterioration of the water quality is now a global problem (Mahananda et al. 2010). The purity of water varies from place to place in nature (Patil 2013). The quality of water of any aquatic ecosystem arises by the interaction of physical chemical and biological component of the habitat. Aquatic biota presents in any aquatic ecosystem directly influence the Physico-chemical characteristics of that aquatic ecosystem. The physico-chemical parameters have important significance in determining the trophic status of aquatic habitats (Sharma et al. 2009).

Water is one of the most important and basic natural resources and forms about 75% of the matter of the earth crust and present in the form of marine water (Ocean and Sea) and fresh water (River, Lake, ponds, Streams and Ground water etc.). Water is the prime requirement for life and used for drinking, bathing, recreation, irrigation, sheries, navigation and power generation purposes etc. India receives 1800-1900 mm of rainfall annually.

Ecosystem is the basic and fundamental unit of ecology. It gives information about available solar energy in an area and also about the availability of mineral elements their utilization and recycling. The plants, animal and microorganisms present in the ecosystem for the biotic component whereas the physical and chemical components.

Pond ecosystem: In pond shallow standing water characterized by relatively quiet water and abundant vegetation with thousands of micro-organism, large plants and small animals. The important components of pond ecosystem are as follows.

Abiotic components: Abiotic component of any pond ecosystem include all nonliving substance like basic inorganic and organic compounds such as water, CO₂, O₂, Ca, N, P and their compounds, amount of various organic compounds like carbonates, protein and lipid etc are also estimated for biomass determination.

Biotic component: These include all living substance or organism they may be producer, consumers and decomposers. Pond ecosystem is generally divided into following:-

1) Littoral zone- The shallow water region with light penetration to the bottom typically occupied by rooted plants in natural ponds and lakes but not necessarily in managed pond.

2) Limnetic Zone- In general, this level will be at the depth at which light intensity is about 1% of full sunlight intensity. The community in this zone is composed only of planktons, Nectons and some Neuston

OBJECTIVE:

The objective of the present investigation has been made to understand the chemical characteristics of in short period with respect of gaseous exchange.
Study Area:
Selected Maya Sarobar Pond (study area) is situated at Bodh Gaya. The length and width of the pond is 14 and 9 meter and depth is 1.59 meter respectively. The water samples were collected during February 2018 to March 2019.

MATERIALS AND METHODS:
The analysis of pH, Alkalinity, Ammonium, Fluoride, chloride, Calcium Hardness, Phosphate, Iron, Nitrate, Nitrite etc. were carried out by water testing kits which are supplied by Nice Chemicals (P) Ltd. Cochin, Kerala. The temperature of water samples were measured by thermometer (Celsius). The water analysis observed data were compared with the standard data provided by WHO for drinking purposes.

Water samples were collected from these ponds over a depth of about 10 cm below the water surface in the upper layers of the pond water using polythene containers, because maximum photosynthetic activity of primary fish food organisms were observed in these layers and hence this zone should be given more attention for the purpose of dissolved oxygen (DO) estimation. Water samples were collected in 8 spots at equal distance along the diagonal of the pond. Except for DO estimation, samples of water were collected only in the centre of the pond. Each sample collection was carried out 10:00 AM in the morning hours because DO and free CO2 values are likely to remain in critical concentrations. The containers were dipped slowly in water without disturbing the surface and development of any air bubbles were avoided in the near vicinity as well as in the container. Each sample was poured in to poly ethylene bottle (exception DO estimation sample) after rinsing it several times with that water sample and securely sealed. Experiments were carried out within 2 days of collection, and some experiments such as DO, and pH were carried out within a few hours of sample collection.

Physical Characteristics:
Temperature was recorded with the help of a mercury thermometer, avoiding direct exposure of the mercury bulb to sunlight and water. pH was measured the pH meter (multi parameter kit).

Chemical Characteristics:
The chemical characteristics were analysed as follows:
Total Dissolved solids, Chloride, Total alkalinity, Dissolved oxygen, Biological oxygen demand (B.O.D), Calcium-S, Dissolved Organic, total hardness, Phosphate and Biological characteristics (Quantitative analysis of Plankton’s).

RESULTS AND DISCUSSION:
The limnological parameters given in Table-1. and data are comparing with WHO (2011) and IS: 10500 standards for drinking water.

Temperature: Temperature of water plays important role for living beings. Quality of water is also maintained by temperature. The temperature of different sampling station ranges from 27°C to 28°C

pH: The pH of ground water ranges from 6 to 7 which is within the range of drinking water proposed by ISI 1991 is 6.5 to 7.0

Alkalinity: Generally ground water associated with dissolved carbon dioxide, bicarbonates and hydroxides which occurs due to dissolution of minerals in the soil. The values of alkalinity ranges from 200 to 300 mg/l. Iron: The concentration of iron varies from 0.2 mg/L to 3.0 mg/L whereas permissible limit for iron is 0.3 to 1.0 mg/L. Only the sample S3 have higher value of iron (3 mg/l).

Calcium Hardness: The value of calcium hardness varies from 100 mg/l to 400 mg/l.

Nitrate: The biochemical oxidations of nitrogenous substances coming from domestic wastes are main source of nitrate in Ground Water. The concentration of nitrate in present study varies from 10 mg/l to 15 mg/l which is higher the permissible limit of WHO health based guide line values. The concentrations of nitrate above 40 mg/L cause Blue diseases in infants (Sharma, 1997).

Nitrite: It varies from 0.0 to 3.0 mg/l in the samples.

Ammonium: It varies from 0.3 to 1.0 mg/l

Chloride: The chloride values ranges from 150 mg/L to 500 mg/L in the present sample. The permissible limit of chloride in drinking water is 250 mg/L as suggested by WHO and ISI. The higher concentration of chloride may affect heart and kidney disease affected person (Patil et al., 2002)

Total Hardness: The temporary hardness of water is only due to dissolved of Calcium and Magnesium bicarbonate in water, where as permanent hardness is due to presence of chlorides of Calcium and Magnesium in water. The value of total hardness ranges 150 to 1500 mg/L.
Table 1: Showing different Parameters of ground water of Maya sarobar pond at Bodh Gaya.

<table>
<thead>
<tr>
<th>SI No</th>
<th>Parameters</th>
<th>Date of sampling and analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10-3-18</td>
</tr>
<tr>
<td>1</td>
<td>Temperature(ºC)</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>PH</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Alkalinity (mg/l)</td>
<td>230</td>
</tr>
<tr>
<td>4</td>
<td>Phosphate (mg/l)</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>Iron (mg/l)</td>
<td>0.3</td>
</tr>
<tr>
<td>6</td>
<td>Calcium Hardness (mg/l)</td>
<td>225</td>
</tr>
<tr>
<td>7</td>
<td>Nitrate (mg/l)</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Nitrite (mg/l)</td>
<td>2.0</td>
</tr>
<tr>
<td>9</td>
<td>Ammonium (mg/l)</td>
<td>0.5</td>
</tr>
<tr>
<td>10</td>
<td>Fluoride (mg/l)</td>
<td>0.0</td>
</tr>
<tr>
<td>11</td>
<td>Chloride (mg/l)</td>
<td>300</td>
</tr>
<tr>
<td>12</td>
<td>Total Hardness (mg/l)</td>
<td>350</td>
</tr>
<tr>
<td>13</td>
<td>DO(mg/l)</td>
<td>3.2</td>
</tr>
<tr>
<td>14</td>
<td>BOD(mg/l)</td>
<td>2.0</td>
</tr>
</tbody>
</table>

CONCLUSION:

1. It was observed that the concentration of all parameter of ground water were the permissible limit of WHO health based guide line values.

2. The higher concentration of nitrate needs proper treatment before the use for drinking purposes.

3. The observed values of sulphate, sodium, potassium, DO, Nitrate, BOD are within the permissible limits as per WHO guide lines for drinking water. The values of phosphate, uoride, residual chlorine and arsenic are observed negligible.

SUGGESTION:

The detail investigation may be carried out on other living organisms to avoid the hazardous/ injurious impact of the nitrate contamination.

REFERENCES:


VI. Dyaneshwari P and Meena D. Seasonal variation ion DO and BOD of some lentic water bodies of Kolhapur city.


XIV. Senthilkumar RD; Narayansamy, R and Ramkrishan K. Pollution studies on sugar mill effluent physio-chemicals