

Assessment of water quality status of some water bodies in Kolkata

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Abstract:

The water quality status of some water bodies in Kolkata were assessed during dry season through the analysis of various physico-chemical and biological components. Studies revealed that water of all the ponds were alkaline with pH value ranging from 7.80 to 8.41 at water temperature between 28.0 and 28.5. Total Dissolved solids (TDS) varied from 310 to 710 mg/L with higher in Science city (710 mg/L), followed by Victoria (366 mg/L), B.B.D.Bag (310 mg/L) and Minto park (250 mg/L). Minimum of 56% dissolved oxygen saturation values were observed in the pond of Science city implying presence of higher oxygen demanding waste and maximum (96%) in B.B.D.Bag indicating lowest level of reducing substances. Lower ratios of BOD/COD ranging from 0.18 to 0.29 implied the presence of comparatively higher level of non-biodegradable organic matter in water. According to National Sanitation Foundation Water Quality Index (NSF-WQI) values, water quality of two ponds (Victoria and Minto park) were classified as good to excellent, one (B.B.D.Bag) is medium to good and another (Science city) is bad which corresponded to the class A, B and C respectively as classified by Central Pollution Control Board (CPCB).

Key Words Water Characteristics; Assessment; Ponds; Water Quality Index; Kolkata.

Introduction:

Life is originated from the core of water bodies and this result in strong interaction between the inorganic compound water and the organically combined form of biotic lives. Ponds or water bodies are considered as the most essential ecosystem to human beings because of their immense role imparted to the mankind during the ages (1). Among these, recharging of ground water, recreations, flood control, various economic facilities through the cultivation of aquaculture products, including controlling of local weather and conservation of nature. In addition, water bodies are also useful for fire fighting, water sports, and tourism, fishing, bathing and religious activities (2). But in the recent years, the increasing trends of various anthropogenic activities in and around have contributed for the deterioration of water quality. The inhabitants all around the water bodies are compelled to use the water without having any knowledge on the quality of water and could face great difficulties.

Present dissertation is an endeavor to high light the quality of water of some ponds distributed in various areas in the city, Kolkata.

Materials and Methods:

Some of the important physiographic features have been presented (Table-1) and from visual observations it was found that the ponds in Science City is the larger in size followed by the ponds at Victoria, B B D Bag and Mintu Park. However, in terms of depth, B B D Bag is the higher followed by Victoria, Mintu Park and Science City. In

respect to mode of water replacement, both ponds at B B D Bag and Mintu Park are connected to the river Hooghly through the pipes and water replacement is done when necessary. The pond at Victoria is fed with ground water while Science city is rainwater fed pond.

Table-1. Physiographic Features of the ponds

Ward No.	45	63	63	58
Avg. depth (ft)	16	9	7	6
Uses	Bathing, washing, angling	Recreation,	Recreation	Fish cultivation, bathing, washing
Mode of hydraulic replacement	Untreated piped water of Hooghly river	Ground water	Untreated piped water of Hooghly river	Rain water

Water samples from accessible sides of the ponds were collected by using water samplers during noon of the day from below 10 cm of the surface and kept in plastic containers. The non-conservative components like pH, temperature and conductivity were measured at the spot by using potable instruments. Dissolved Oxygen (DO) also fixed in the field. The other samples were kept in ice-box and brought to the laboratory on the same day and analyzed other parameters by using standard methods as out lined in APHA (3).

Results and Discussions

Studies on physic-chemical characteristics of pond water highlighted that water remained alkaline ranges of pH (7.8 to 8.41) ascribing well buffering capacity in these pondecosystems (Table-1). Lower levels of total dissolved salts (TDS) were observed in the pond at Mintu Park (250 mg/L), probably due to proper maintenance of inflow and outflow of the water coming from the Hooghly River through the pipes and absence of anthropogenic activities like bathing, washing etc. An intermediate value of TDS in the ponds at Victoria (366mg/L) and B B D Bag (310mg/L) could be due to irregularity in water replacements together with fish cultivations. The water body at the Science City could be distinctly distinguished by higher levels of TDS (710 mg/L), solely due to lack of any facility of water replacement and gradual accumulation of salts originating from oad washing and catchment run-off from all around of the pond. The pond water at Minto Park and B B D Bag areas recorded the occurrence of dissolved oxygen (DO) in near saturation level (87 and 96% respectively). Although oxygen saturation values of Victoria (65%) and Science City (56%) registered lower values, yet these were not below 40% or less than the critical levels as prescribed (4) for fish culture.

BOD and COD were lower in Victoria (3.67 mg/L) and Minto Park (3.31 mg/L) and the ratio of BOD/COD almost remained almost same ascribing less amount of biodegradable anthropogenic activities like bathing, washing etc. An intermediate value of TDS in the ponds at Victoria (366mg/L) and B B D Bag (310mg/L) could be due to irregularity in

water replacements together with fish cultivations. The water body at the Science City could be distinctly distinguished by higher levels of TDS (710 mg/L), solely due to lack of any facility of water replacement and gradual accumulation of salts originating from oad washing and catchment run-off from all around of the pond. The pond water at Minto Park and B B D Bag areas recorded the occurrence of dissolved oxygen (DO) in near saturation level (87 and 96% respectively). Although oxygen saturation values of Victoria (65%) and Science City (56%) registered lower values, yet these were not below 40% or less than the critical levels as prescribed (4) for fish culture.

BOD and COD were lower in Victoria (3.67 mg/L) and Minto Park (3.31 mg/L) and the ratio of BOD/COD almost remained almost same ascribing less amount of biodegradable organic matter than the amount of non-biodegradable organic compounds in all these ponds. This might be due to higher residence time of water. Higher values of microbial density⁵, measured by maximum population numbers (MPN) per 100 ml of water was found in the pond water of Science City (35.5×10^3) and lower in Mino Park (4.4×10^3) and showed positive relationship with the content of BOD in water, which might serve as food source for the microbial community.

Table-2. Physico-chemical and biological characteristics of the pond water.

Components	BBD Bag	Victoria	Minto Park	Science City
Temperature (°C)	28.0	28.5	28.2	28.0
pH	8.34	8.0	7.8	8.41
Conductivity (microsimen)	540	666	370	1210
DO (mg/L)	8.1	7.0	7.7	4.85
BOD (mg/L)	5.2	3.67	3.31	10.6
COD (mg/L)	28.0	12.5	16.0	40.5
TDS (mg/L)	310	366	250	710
Chloride (mg/L)	12.5	20.0	10.0	37.0
%O ₂ saturation values	96	65	87	56
MPN $\times 10^3$ /100 ml of water	16.5	15.5	4.4	35.5

Table-3. Water Quality Index values of the pond

Ponds	NSF-WQI values	NSF grade	CPCB classification
BBD Bag	60	Medium to good	B
Victoria	69	Good to excellent	A
Minto Park	68	Good to excellent	A
Science City	47	Bad	C

Table 4. Classification on the basis of WQI values

WQI values	According to NSF	According to CPCB
63-100	Good to Excellent	A
50-63	Medium to Good	B
38-50	Bad	C
< 38	Bad to very Bad	D,E

The water quality status was assessed by NSF-WQI, based on ratings and weightings (6,7) of the studied parameters like pH, DO, BOD and MPN values as described by CPCB (ADSORBS/3/78-79). Index values ranged from 47 to 69 ascribing with grades

between bad and good to excellent (Table-3). This is exactly similar to CPCB classification (8) (Table-4). Higher values of BOD and MPN could be the most prominent reason to lower WQI values in case of pond at Science City. On the other hand, on contrasting to these, lower values of these components in water recorded higher values of WQI as observed in the ponds at Victoria and Minto Park.

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