

A General Study on the Evaluation of Physico-Chemical Factors of Ramgarh Lake

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Abstract

Water is the essential part of life and it is assumed that next world war will be based on the scarcity of it. When water is polluted by various ways that means it affects flora and fauna of that area. The people living near the water bodies depend on it for irrigation and pisciculture activities. Water sample collected from Ramgarh Lake located in eastern part of Gorakhpur City of Eastern Uttar Pradesh state. Water is most precious natural resource expected to before from pollution. The physicochemical parameters are atmospheric temperature (AT), water temperature (WT), pH, electrical conductivity (EC), total dissolve solid (TDS), acidity (acid), alkalinity (alk), carbon dioxide (CO₂), dissolve oxygen (DO), were mentioned on monthly basis for period of one time annual cycle that is January 2018 to December 2019. The result revealed that the reservoir water is useful for human use.

Keywords

Irrigation, Ramgarh Lake, Parameters

1. Introduction

In the last two decades, there has been a growing necessity for conservation of our resources, especially water. At the same time, growing populations, progressive industrialization and intensification of agriculture have led to increased pollution of surface waters. This induces ecological imbalances, deleterious for sustained development of fisheries resources, which has necessitated the suspension of the beneficial uses of these water bodies in some places [1]. Nevertheless, an increasing number of specially created environmental agencies are being assigned the task of conserving water quality for all uses within one river or lake basin. In conserving water quality for multipurpose use, a holistic approach was recommended [2-5] in which all-immediate and potential interests in the water basin are considered simultaneously. Experience has shown that only an ecologically healthy fresh water ecosystem fulfils this goal and the ecology of the flora and fauna of the ecosystem best measure this [6]. Water quality monitoring is of immense importance in the conservation of water resources for fisheries, water supply and other activities; it involves the assessment of physico-chemical parameters of water bodies. Impacted changes in the quality of water are reflected in the biotic community structure, with the vulnerable dying, while the most sensitive species act as indicators of water quality [3]. The present study was conducted for one year that is Jan 2018 to Dec 2019 through the monthly sampling of Ramgarh Lake. The density of diversity of zooplanktons is depending on water quality of reservoir. The zooplankton is microscopic free living floating organism, which occupy a central position between the autotrophy and other heterotrophs and from an important link in aquatic food web. Human life is living pattern without the presence of aquatic animals. All over the world, all fresh water habitats, lakes, ponds, reservoir, dams etc. The present paper deals with the result of water analysis of Ramgarh Lake.

2. Materials and Methods

2.1 Area for the Study

District Gorakhpur is situated in the north-east "Tarai" region of U.P. (India) and lies between 26.5°-27.9° N and

83.4°-84.26° E at an altitude of 95 metre above sea level. There are many temporary and residential water bodies of varying size in this region. The Ramgarh Lake is a shallow, perennial eutrophic lake situated at 26° 44' 9" N, and 83° 24' 16" E eastern side of the Gorakhpur town. It covers an area of about 15 km² during summer and 22 km² in the monsoon period. For the determination of heavy metal content in the lake water, five sampling sites (Site-1 Champa Devi, Site-2 Boat Club, Site-3 Sahara Estate, Site-4 RKBK Maruti Showroom Mohaddipur, Site-5 Singhadia Canal Pump) were selected (Figure 1). The water samples were collected monthly. The physiochemical parameters are atmospheric temperature (AT), water temperature (WT), electrical conductivity (EC), total dissolve solid (TDS), acidity (acid), alkalinity (alk), carbon dioxide (CO₂), dissolve oxygen (DO), were carried out on field. Physical chemical characteristics of water were estimated following standard method.

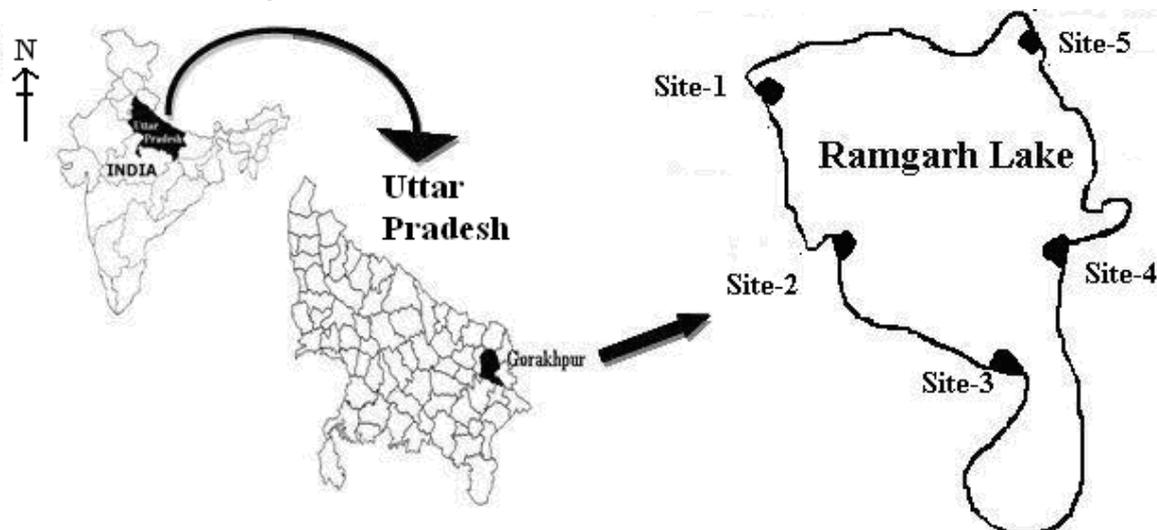


Figure 1. Sampling sites for the collection of water samples of Ramgarh Lake, Gorakhpur.

3. Results and Discussion

The present investigatory study of Ramgarh Lake reveals all parameters are in favorable range for aquatic life, irrigation and domestic use. Present studies showed pH range favorable for aquatic life, irrigation and domestic use. The investigated results are as follows.

Atmospheric temperature of surface water ranges from 24.6°C to 43.5°C during the study period. Minimum (24.6°C) and maximum (43.5°C) atmospheric temperature (AT) were recorded during winter and summer season respectively. The water temperature was maximum during summer (43.5°C) and minimum during winter (24.6°C) (see Table 1 and Table 2). The results show that water temperature varies with the atmospheric temperature. During the summer season, solar radiations are and clear sky condition enhanced the atmospheric temperature. Where the during monsoon season, rainfall and cloudy-skies brought down the atmospheric temperature and subsequently the water temperature to minimum.

Table 1. Monthly reading in four sites of Ramgarh Lake (Jan 2018 to Dec. 2018)

Month	AT ⁰ C	WT ⁰ C	pH	Ec μ s/cm	TDS mg/l	ACID mg/l	Alk mg/l	CO ₂ mg/l	DO mg/l
Jan	24.6	23.5	7.8	181	113	11.1	237	1.8	4.1
Feb	26.9	25.9	8.2	190	125	9.8	261	1.97	4.26
Mar	31.5	28.9	8.6	199	133	8.9	274	1.83	4.37
Apr	38.5	37.6	8.5	205	156	8.6	284	2.15	4.61
May	40.9	40.1	8.1	254	145	9.6	276	2.27	3.56
Jun	42.2	41.2	8.2	265	169	6.5	240	2.3	3.47
Jul	42.1	40.6	8.3	294	140	18.2	243	3.1	3.4
Aug	31.5	29.7	7.6	250	133	19.5	231	3.22	3.95
Sep	30.1	28.4	7.5	236	110	18.9	218	2.11	4.01
Oct	27.6	25.4	7.2	221	112	17.1	215	1.92	4.03
Nov	25.6	23.6	7.6	192	110	18.2	223	1.9	4
Dec	26.9	24.5	7.8	189	105	15.1	234	182	4.05

Table 2. Monthly reading in four sites of Ramgarh lake (Jan 2019 to Dec. 2019)

Month	AT ⁰ C	WT ⁰ C	pH	Ec μ S/cm	TDS mg/l	ACID mg/l	Alk mg/l	CO ₂ mg/l	DO mg/l
Jan	23.4	22.4	7.6	180	116	10.9	234	1.6	4.35
Feb	25.5	24.6	8.4	191	121	9.4	265	1.92	4.01
Mar	29.9	28.9	8.7	192	137	8.2	278	1.85	4.40
Apr	39.1	38.4	8.5	201	151	8.7	281	2.20	4.58
May	41.8	39.6	8.3	251	141	9.3	272	2.24	3.59
Jun	42.7	41.2	8.4	262	162	6.1	246	2.33	3.49
Jul	41.4	40.6	8.1	293	146	18.5	241	3.16	3.44
Aug	32.7	29.9	7.7	255	131	19.1	237	3.32	3.98
Sep	30.6	29.4	7.6	231	120	18.2	219	2.16	4.06
Oct	27.5	25.4	7.4	228	119	17.5	216	1.89	4.01
Nov	25.3	23.2	7.8	197	121	18.6	225	1.94	4.01
Dec	26.7	24.8	7.6	182	114	15.4	238	1.79	4.07

pH value of all sample lies in the range of 7.2 to 8.6 are slightly alkaline and suitable to irrigation purpose that is there is no alkalinity hazard (7.2-8.1) during winter and higher value (8.1 to 8.6) during summer (see Table 1 and Table 2). Higher pH is normally associated with a high photosynthetic activity in water [7-9]. The pH of the water appears to be dependent upon the relative's quantities of calcium carbonate and bicarbonates, being alkaline when disposal of wastes also bring about changes in the pH [10, 11] (See Table 1 and Table 2).

Electrical conductivity (EC) is a measure of the salt content of water in the form of ion. EC value ranges from 189 μ S/cm to 294 μ S/cm with an average of 235 μ S/cm (see Table 1 and Table 2). The month wise value shows the minimum during December. The concentration of EC increases during summer and reaches maximum in July. The increase in EC during pre monsoon period may be due to evaporation. This is in agreement with result obtained by Shankar et al. [12-15].

Total Dissolve Solid (TDS) are various kinds of minerals substances present in water. Some dissolve organic matter may also contribute to total dissolve solid. TDSA value ranges from 105 mg/l to 169 mg/l (see Table 1 and Table 2). The season wise value shows the minimum during winter. The concentration of TDS in water gives an idea about suitability of this water for various uses including potable water. All the values of TDS were within the (500 mg/l) highest desirable limit [16, 17].

Acidity is found maximum during winter and minimum during summer. Acidity values of all sample lies in the ranges of 17.1 mg/l to 34.2 mg/l (see Table 1 and Table 2). Acidity of water is its quantitative capacity to react with a strong base to designated pH. Value of the acidity is about 200 mg/l [16] and observed values are far less than this, indicating that acidity of sample water is a safe range.

Total Alkalinity shows seasonal variation in the study. Alkalinity value ranges from 215 mg/l to 284 mg/l. The values were high during the summer and low during winter. The fall in values during monsoon may be due to dilution of water. The high value of alkalinity indicates the presence of weak and strong base such as carbonate and hydroxide in the water body [18-20].

The carbon dioxide level fluctuated between 1.8/l to 2.5mg/l. The seasonal value was 3.82 mg/l in winter, 2.27 mg/l in summer and 3.22 mg/l in rainy season (see Table 1 and Table 2). Low value of free CO₂ as observed during summer are mainly because of CO₂ is utilized in the polysynthetic activities [20].

The dissolve oxygen is most important factor in fresh water life. In present study DO is ranged between 3.4 mg/l to 4.3 mg/l. The average DO value were 3.56 mg/l in summer, 4.05mg/l in winter and 3.95 mg/l during rainy season The value of DO was obtained as following order, winter> rainy> summer season in present study. The phenomenon of re-oxygenation of water during monsoon may be due to the circulation and mixing by in flow water monsoon rains [21-25]. It further progressed in winter may be due to the circulation by cooling and draw down the DO in water [26-27].

4. Conclusion

The present study concluded that the higher values of some parameters of the samples of Ramgarh Lake clearly indicate that it directly affects the floral and faunal population. They minimize the suitability of these samples for drinking purposes without treatment. But, after the filtration and disinfection, naturally present impurities can be removed in water, which provide its suitability for drinking and domestic purposes. People depend on this water are often prone to health hazards due to polluted drinking water. Therefore, some effective measures are urgently required to enhance the drinking water quality by delineating an effective water quality management plan for the region.

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