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Studies on Limnological parameters of Gangapur tank, Rewa (M.P)

[1] Balbeer Singh, [2] Dr. Dayanand Pandey

[1] Research Scholar, Dept. of Zoology, Govt. S.K.N. P.G. College, Mauganj, A.P.S. University, Rewa, Madhya Pradesh, India
[2] Dept. of Zoology, Govt. S.K.N. P.G. College, Mauganj, Rewa, Madhya Pradesh, India

Abstract
Water is indispensable to life on earth. It is a precious gift of nature which is essential for the survival of plants, animals and human beings. Present investigations were carried out on the limnological aspects of Gangapur tank in district Rewa. Many of the parameters were found below the permissible limits for drinking water as suggested by WHO. A total of 16 parameters were analysed and their seasonal variations in the year 2015 were discussed.

Keywords: Limnological, Parameters, Gangapur tank, Rewa

1. Introduction
Man is dependent for his food supply entirely on the products of land, water, plants and animals of the earth. Ever since the turn of this century progress in limnology has been rapid and for reaching, as a result of which it has become as integrated and coherent branch of science (WHO 2004) [1]. A study of freshwater habitat with special reference to its physico-chemical, geological and biological characteristics is termed as limnology. The study of limnology is of great importance to human race as the biological and physico-chemical date of this branch can be useful for quick development and growth of fishes. The importance of primary productivity is also well realised practically in fish culture programmes. Besides that, elucidation of the physico-chemical conditions in lakes, reservoirs, ponds and rivers are utilized for tiding over difficulties in filtration of drinking water. Thus it is very much essential for a healthy growth. But it may become harmful for life, if one uses water polluted with harmful or with toxic substances and poor sanitation. Mishra, *et al.* 2009 [2], Tewari, *et al.* 2010 [3], Sirajudeen, *et al.* 2014 [4], Kumar and Kumar 2015 [5]) Water quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. For optimum development and management for the beneficial uses, current information is needed which is provided by water quality programmes (Lloyd, 1992) [6]. We depend on water for domestic needs, irrigation, sanitation and disposal of wastes. The quality and quantity of surface water bodies like lakes and tanks depend upon the climate, catchments, geography of the area and the inputs and outputs both natural and manmade (Gray, 1994) [7]. The water quality of lakes can be degraded due to microbiological and chemicals contaminants. In water natural impurities are in very low amounts. Lakes, dams, rivers are important source of fresh water.

2. Materials and Methods
The present project will be visualized to report the diversity, density, role of plankton and fish productivity in Gangapur tank, Rewa. This historic geographical region provides Gangapur tank a unique environment available selblon in other Indian water bodies.
Samples of the water for physicochemical characteristics were analysed according to standard methods of APHA (1998) [8] and Paka and Rao (1997) [9]. Water samples were collected during morning hours in between 8.30 to 10.30 a.m. with one litre containers from the tank in three seasons. To study the water quality and its seasonal variations, the water samples are collected during summer, monsoon and winter seasons. Some of the results were recorded at the sampling sites whereas the others were recorded in the laboratory. The parameters observed were colour, pH, total dissolved solids, carbonates, bicarbonates, non carbonates, hardness, calcium, magnesium, sodium, sulphate, potassium, DO, free CO_2, BOD, COD, nitrate and phosphate. The colour of temple tank water was observed visually. Hydrogen ion concentration was determined with the help of BDH narrow range pH strips. Later on, to confirm the results the pH was also measured in the laboratory by the phillip's digital pH meter. Total dissolved solids was measured by 100 ml of water sample (filtered) dried on a hot plate in a pre-weighed China dish. The China dish was then again weighed to calculate the total dissolved solids (TDS) per litre of sample by applying the formula

$$TDS = \frac{W_2 - W_1}{V} \times 1000$$

Where,
W_2 = Weight of China dish after evaporating the total volume to dryness.
W_1 = Weight of empty China dish and
V = Volume of sample evaporated to dryness.
Total hardness was measured by ammonia buffer and EDTA method.

3. Results and Discussion
During the present investigation the values of hydrogen ion concentration of the Gangapur tank during the summer, monsoon and winter seasons were 6.90, 7.1 and 7.13 respectively. The variations of pH values during the study showed no remarkable significance. The highest value was noticed in monsoon season and lowest in summer season. Total dissolved solids of the tank was 116 mg/l in summer, which is the highest value and the lowest values was noticed in winter.

Table 1: Seasonal variation of physicochemical factors in Gangapur tank 2015.

S. No.	Parameters	Summer season	Monsoon season	Winter season	SD
1.	pH	6.90	7.1	7.13	±0.125
2.	TDS (mg/l)	116	93	39	±39.526
3.	Carbonates (mg/l)	0	0	0	±0.000
4.	Bicarbonates (mg/l)	56	31	20	±18.448
5.	Chloride (mg/l)	17	35	8	±13.748
6.	Total Hardness (mg/l)	28	12	14	±8.718
7.	Calcium (mg/l)	6.3	3.3	6.7	±1.858
8.	Magnesium (mg/l)	1.90	0.94	2	±0.585
9.	Sodium (mg/l)	30	26	9	±11.150
10.	Potassium (mg/l)	1.0	1.0	1.0	±0.000
11.	DO (mg/l)	6.5	7.3	8.2	±0.850
12.	Free CO_2 (mg/l)	34.0	6.2	21.5	±13.923
13.	BOD (mg/l)	0.8	3.7	4.3	±1.872
14.	COD (mg/l)	1.8	3.4	8.5	±3.499
15.	Nitrate (mg/l)	0.33	0.29	0.11	±0.117
16.	Phosphate (mg/l)	0.050	0.037	0.030	±0.010

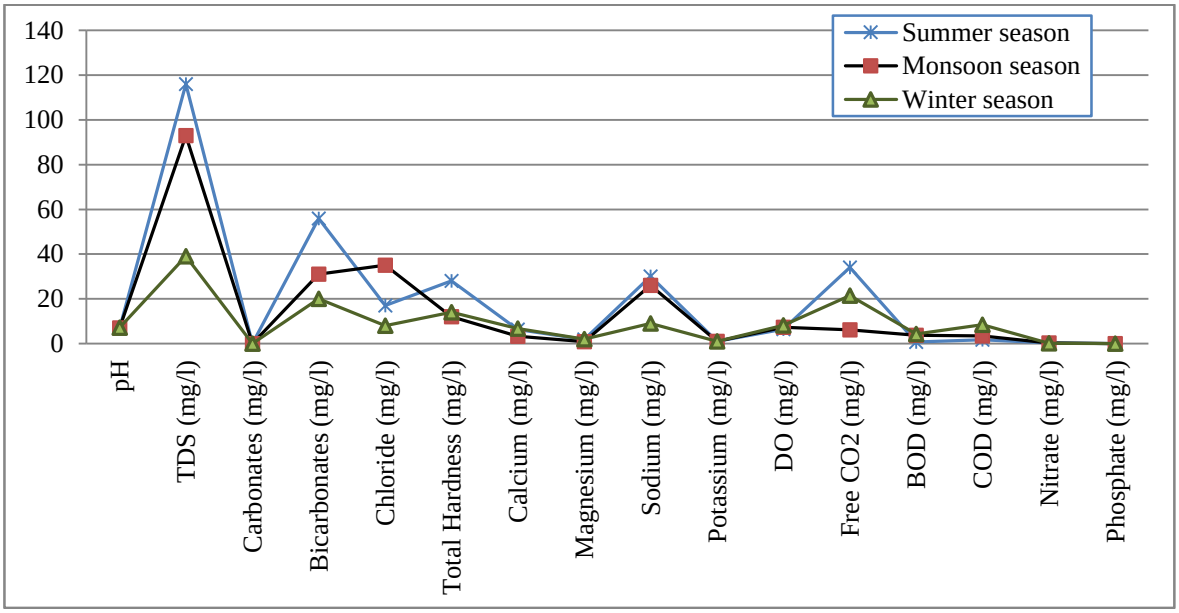

Fig 1: Graphics analysis of Seasonal variation of physicochemical factors in Gangapur tank 2015.

Absence of carbonates was noticed and the bicarbonate alkalinity varied from 20 to 56 mg/l in three seasons, during which minimum value was observed in winter season and the maximum in summer season. Larger quantities of bicarbonates during summer may be due to the liberat ion of CO_2 in the process of decomposition of bottom sediments with resultant conversion of carbonates to bicarbonates.

Chloride values were found ranging between 8 to 35 mg/l of which maximum value was noticed in monsoon and the lowest value in winter may be due to dilution effect in post monsoon period. Pandey and Tiwari (2016) [10] also found similar behavior of chlorides in their studies on Gangapur tank with summer maxima and P mansoon.

Total hardness value of the tank was 12 to 28 mg/l of which higher value was in summer while the lowest in monsoon season. The maximum premissible limit for this parameter for drinking water standards is 500 mg/l. Same result are also founded by Pandey and Tiwari (2016) [21].

Calcium is found in greater abundance in all natural water as its main source is weathering of rocks from which it leaches out. Calcium was found in the same quantity and comparatively higher both in summer and winter seasons while lower in monsoon seasons. Magnesium values are poor. Same result are also founded by Rao *et al.* (2010) [11] and Jena *et al.* (2013) [12].

Sodium quantities varied between 9 to 30 mg/l with its summer maxima and winter minima. High sodium content in the form of chloride and sulphate makes the salty taste of water, making it unfit for human consumption but these three parameters were found in lower quantities indicating portability of the tank water. Potassium content (1.0 mg/l) was also low in all the three seasons. Throughout the investigation period, high dissolved oxygen contents was noticed during winter season.

Carbon dioxide is one of the essential constituents of an aquatic ecosystem. The abundance of carbon dioxide exerts certain specific effects on aquatic bioata. The tank exhibited maximum carbon dioxide as 36.0 mg/l during summer whereas the lowest concentration of carbon dioxide (6.2 mg/l) was recorded during monsoon season. Cole (1975) [13] noted that free CO_2 supply rarely limits the growth of phytoplankton. Alternately, the bicarbonates are utilized as a source of carbon by the

photosynthetic activity of phytoplankton.

BOD is found to be more sensitive test for organic pollution. BOD value of tank water ranged between 0.8-4.3 mg/ l. Highest BOD value was observed in winter season. Increased temperature and sedimentation load reduce BOD (Pyatkin and Krivoshein, 1980) [14]. The estimation of COD is of great importance for waters having unfavourable conditions for the growth of microorganism, such as presence of toxic chemicals (Saxena, 1994) [15]. COD value of tank water ranged between 1.8-8.5 mg/l. Highest COD value was observed in winter season. The most important source of nitrates is biological oxidation of nitrogenous substances present in sewage, industrial wastes, chemical fertilizers, decayed vegetables, animal feed lots, leachates from refuse dumps, septic tank effluent, etc. High amounts of nitrates in tank water are indicative of pollution. The nitrates concentration of water lies in the range of 0.11-0.33 mg/l. Although all the samples have nitrate concentration with in the permissible limits prescribed by Bureau of Indian Standards, the presence of nitrates in the water samples is suggestive of some bacterial action and bacterial growth. These findings support to the observations of several workers (Hussainy, 1967 [16]; Singh, 1991 [17]; Majumder *et al.*, 2006 [18]). It is evident from the present study that the phosphate concentration was higher during summer and lower in winter season. It was quite opposite in relation to dissolved oxygen and phytoplankton population. Many earlier workers have also reported similar findings (Marshal and Falconer, 1973 [19]; Ghavzan *et al.*, 2006 [20] and Pandey and Tiwari, 2016 [10]).

4. Conclusion

In the present investigation results of physicochemical parameters of Gangapur tank water were within desirable limits. The results obtained from the present investigation shall be useful in future management of the tank. The physico-chemical characteristics of tank water suggested that there was no harmful to pisiculture, irrigation and drinking water. So there is a need of proper treatment and restoration for humans and environment.

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