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Physicochemical characteristics of a freshwater pond of Rani Talab Rewa (M.P.) India

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Abstract
In the present study an attempt has been made on physico-chemical characteristics of Rani Talab, located in Rewa district of Madhya Pradesh. This has reflected in reduction in the number of deep diving ducks which prefer to occupy the central deep portion of the pond. They are now outcompeted by dabbling ducks which prefer shallow water. The increasing number of these ducks in the central position is a clear indicator of decrease in the depth of the pond. The total area of Rani Talab is 34.57 acre. the average distance from the bund to centre of the pond is 137 meters, while average distance from bank to the centre of the pond in 130 metres. It has average depth of water in pond is 3.53 metres and the average volume of the pond water is 3518337 cu ft. The surface water quality of Rani Talab is severely degraded due to the pollution from surrounding areas directly entering the water. Three surface sampling points were selected to evaluate the water quality.

Keywords: physicochemical, characteristics, fresh water, rani talab, Rewa

1. Introduction
The surface water quality of the Rani Talab is severely degraded due to the pollution from surrounding areas directly entering the water. Three sampling points were selected to evaluate the water quality. Surface water samples are collected from established sites. Water analysis was done for the parameters like pH, Dissolved oxygen (DO), Biochemical oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total dissolved solids (TDS), Chloride, Calcium and Magnesium and Hardness for testing the suitability for drinking, agricultural purposes.

The pond does not seem to have received care and attention during last few years as a result, the lake as well as its catchment is facing serious threats from encroachment and pollution, in this connection Rewa Municipal corporation is going to undertake the lake improvement project which includes desiltation, beautification and removing of aquatic weeds and its disposal with the help of government.

When selecting a lake/reservoir station, there should be a comprehensive collection of information and an appraisal of the information requirements. There is a need for data on the pond characteristics such as volume, surface area, and mean depth, water renewal time together with such information as is available on the thermal, bathymetric, hydraulic and ecological characteristics. A beautiful landscape and most important visitors affected area of Rewa. This pond make a popularity after reconstruction and most interested government involvement for its beauty and safety. Rani Talab was constructed in 18th century AD by the late maharaja of Rewa state. Its catmint area is about 0.68 sq miles. The source for the pond is water from Bichhiya River and underground water from wells which are situated in pond.

The main source of water is rain water and the inflow point is one. Main water body situated backside of Rani Talab devi ma temple so there a lot of human activity involve to pond and its water sources water used for bathing and washing but now a days it has remarkable for fish culture its fish fauna has so much verity and fish catchment is prohibited in this area.

The topography of the Rani Talab is undulating type with hilly terrain around the pond. Plantation is over the earthen bund and slope of the bund with grass at the inner side of bund which is most important aspect for crossing the limnetic ecosystem.

2. Material and Methods
For the present study, the water samples were collected in sterilized bottles using the standard procedure in accordance with the standard method of American Public Health Association (1995). The samples were collected for a period of 6 months from December 2015 to June 2016, at three sampling stations. The samples were brought to the laboratory with due care and were stored at 20°C for further analysis. Physicochemical properties of drinking water were analysed by using standard method as recommended by APHA (1998) [1]. The physico-chemical parameters such as pH, Biochemical Oxygen Demand, (BOD), Dissolved 340 to 960 m/m) was used for analysis and chemical used were of analytical grade (Bhatia and Singh, 2006) [2].

3. Result and Discussion
The seasonal variation in physicochemical parameters are given in table No. 1 and 3 respectively. In the present study pH range was recorded 7.8 to 8.1 in Dec. 2015 and 8.2 to 8.9 in June 2016. The high pH range was recorded in summer and low range in winter. pH of water is important for the biotic compound because most of the plant and animal species can survive a narrow range of pH. According to literature pH is considered to be the most important factor particularly in the case of the green algae. The lower value of pH during rainy season may be due to the dilution of alkaline substances. A number of published data showed that there are positive relationships among the water quality parameters (Gupta and Mahrotra, 1986) [6].

[6] Gupta, A.K. and Mahrotra, R.S. Studies on seasonal variations in pH and dissolved oxygen content in Sathi Sarovar, Kurushetra. *Geobios.*1986; 13: 276-278.

Table 1: Physicochemical analysis of Rani Talab during December 2015.

S. No.	Parameters	S1	S2	S3	Mean	SD	p
1.	pH	7.8	8.06	8.1	7.99	0.163	0.018
2.	DO (mg/L)	6.7	7.1	6.5	6.77	0.306	0.062
3.	BOD (mg/L)	126	133	134	131.00	4.359	12.667
4.	COD (mg/L)	132	135	138	135.00	3.000	6.000
5.	Chloride (mg/L)	51.3	47.53	53.57	50.80	3.051	6.205
6.	Calcium (mg/L)	79	81	84	81.33	2.517	4.222
7.	Magnesium (mg/L)	17	19	20	18.67	1.528	1.556
8.	Alkalinity (mg/L)	174	176	188	179.33	7.572	38.222
9.	Hardness (mg/L)	204	207	226	212.33	11.930	94.889
10.	TDS (mg/L)	296	301	312	303.00	8.185	44.667

Table 2: Coefficient of correlation of various parameters of the Rani Talab during December 2015.

	pH	DO	BOD	COD	Chloride	Calcium	Magnesium	Alkalinity	Hardness	TDS
pH	1.00									
DO	0.07	1.00								
BOD	1.00	0.08	1.00							
COD	0.92	-0.33	0.92	1.00						
Chloride	-0.02	-1.00	-0.03	0.37	1.00					
Calcium	0.87	-0.43	0.87	0.99	0.48	1.00				
Magnesium	0.98	-0.14	0.98	0.98	0.19	0.95	1.00			
Alkalinity	0.70	-0.66	0.70	0.92	0.70	0.96	0.84	1.00		
Hardness	0.70	-0.67	0.69	0.92	0.70	0.96	0.83	1.00	1.00	
TDS	0.82	-0.52	0.81	0.98	0.56	1.00	0.92	0.98	0.98	1.00

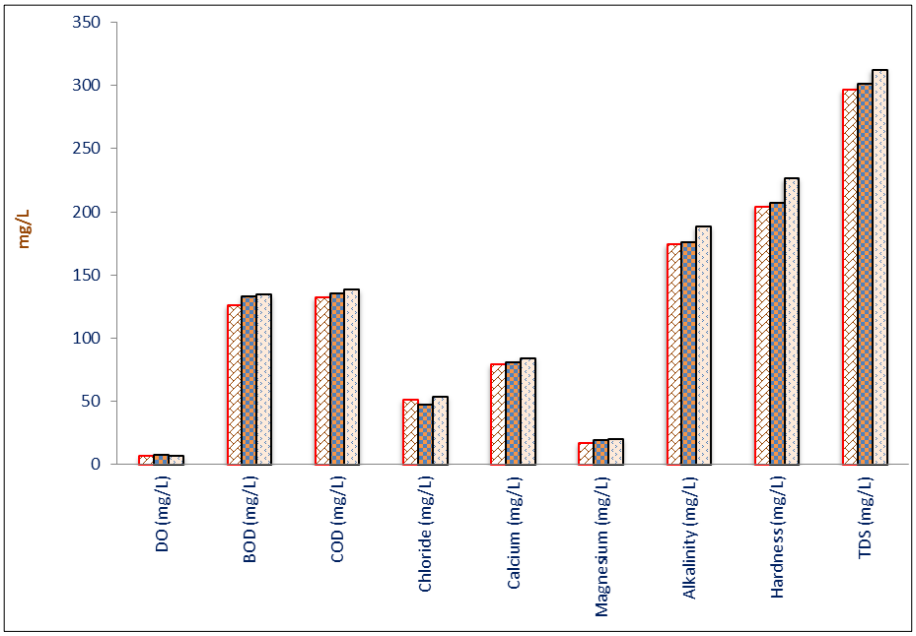

Fig 1: Physicochemical analysis of Rani Talab during December 2015.

Table 3: Physicochemical analysis of Rani Talab during June 2016.

S. No.	Parameters	S1	S2	S3	Mean	SD	p
1.	pH	8.2	8.9	8.4	8.50	0.361	0.087
2.	DO (mg/L)	6.4	5.9	6.1	6.13	0.252	0.042
3.	BOD (mg/L)	117	123	126	122.00	4.583	14.000
4.	COD (mg/L)	122	129	127	126.00	3.606	8.667
5.	Chloride (mg/L)	50.7	56.1	54.4	53.73	2.761	5.082
6.	Calcium (mg/L)	84	88	85	85.67	2.082	2.889
7.	Magnesium (mg/L)	13	22	17	17.33	4.509	13.556
8.	Alkalinity (mg/L)	187	188	183	186.00	2.646	4.667
9.	Hardness (mg/L)	197	186	195	192.67	5.859	22.889
10.	TDS (mg/L)	310	311	307	309.33	2.082	2.889

The dissolved oxygen varied from 6.5 to 7.1 mg/l (Dec. 2015) and 5.9 to 6.4 mg/l in June 2016. Dissolved oxygen in water at a given temperature depends on factors like temperature of water. Almost all plants and animals need Dissolved oxygen for respiration. The biochemical oxygen demand was recorded in the range 126 to 134 mg/l (Dec.2015) and 117 to 126 mg/l (June 2016). The values of Dec.2006 are somewhat higher as compared to June 2007. The Chemical oxygen demand was recorded in the range 132 to 138 mg/l (Dec. 2015) and 122 to 129 mg/l (June 2016). COD is a measure of any kind of oxidisable impurities present in the water. Our observations are well in agreement with earlier workers (Kashyap, 2015 & 2016 [3, 4] Malik Kalyani, 1994 [5]; Mishra, Anjana (2014, 2015, 2016 a & b and 2017 [6-10] Sharma and Mathur, 1994 [11] and Sharma *et al*., 1997 [12]).

COD is a measure of both the biologically oxidisable and biologically inert organic matter present in the water sample. The chloride was recorded in the range 47.53 to 53.57 mg/l (Dec. 2015) and 50.7 to 56.1 mg/l (June 2016). The total hardness ranged from 204 to 226 mg/l (Dec. 2015) and 186 to 197 mg/l (June 2016).

Table 4: Coefficient of correlation of various parameters of the Rani Talab during December 2015.

	pH	DO	BOD	COD	Chloride	Calcium	Magnesium	Alkalinity	Hardness	TDS
pH	1.00									
DO	-0.94	1.00								
BOD	0.45	-0.74	1.00							
COD	0.88	-0.99	0.82	1.00						
Chloride	0.90	-1.00	0.80	1.00	1.00					
Calcium	1.00	-0.92	0.42	0.87	0.88	1.00				
Magnesium	0.98	-0.98	0.60	0.95	0.96	0.98	1.00			
Alkalinity	0.42	-0.08	-0.62	-0.05	-0.02	0.45	0.25	1.00		
Hardness	-0.99	0.89	-0.35	-0.83	-0.85	-1.00	-0.96	-0.52	1.00	
TDS	0.47	-0.13	-0.58	0.00	0.03	0.50	0.30	1.00	-0.56	1.00

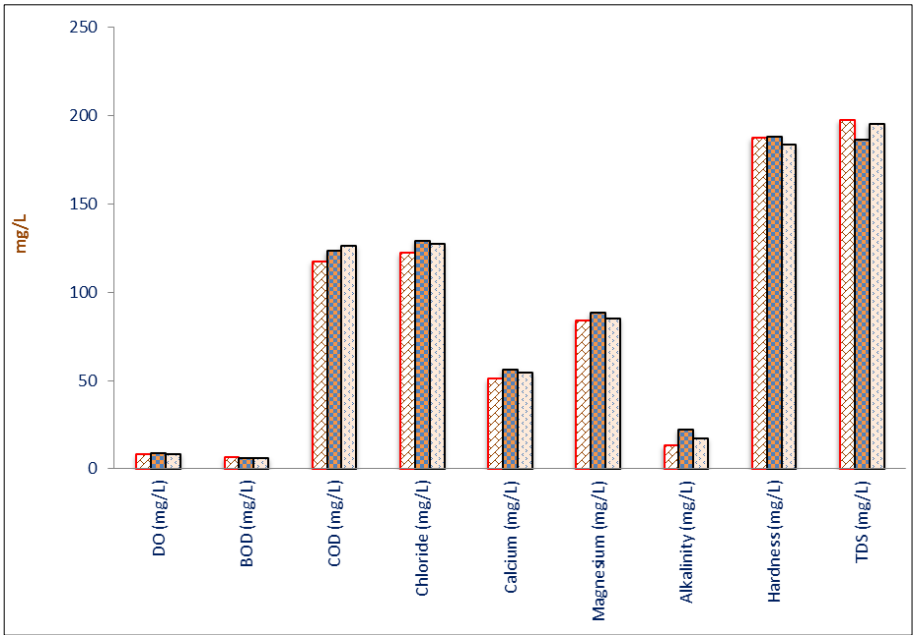

Fig 2: Physicochemical analysis of Rani Talab during December 2016

The calcium levels varied from 79 to 84 mg/l (Dec. 2006) and 84 to 88 mg/l (June 2016). The magnesium levels varied from 17 to 20 mg/l (Dec. 2015) and 13 to 22 mg/l (June 2016). The maximum values were during monsoon while minimum values were during winter. The calcium and magnesium along with other salts are responsible for the hardness of the water. The calcium is not known to indicate or produce any hazardous effect on human health. The magnesium has higher solubility than calcium. The calcium and Magnesium hardness are the two elements which form the most abundant ions in fresh water. The average values of calcium and magnesium hardness never exceed the standard limits of (APHA, 1998) [1]. i.e. 200mg/l and 100mg/l. The total dissolved solids ranged from 296 to 312 mg/l (Dec. 2015) and 307 to 311 mg/l (June 2016). The excessive total dissolved solids generally affects potability of water. Our observations are well in agreement with earlier workers (Kashyap, 2015 & 2016 [3-4] Malik Kalyani, 1994 [5]; Mishra, Anjana (2014, 2015, 2016 a & b and 2017 [6-10] Sharma and Mathur, 1994 [11] and Sharma *et al*., 1997 [12]).

4. Conclusion

The observation of study strongly suggested that hardness and TDS of sample water is very high and needs to be lowered down before use. The calcium and magnesium along with other salts are responsible for the hardness of the water. The calcium is not known to indicate or produce any hazardous effect on human health. The magnesium has higher solubility than calcium. Coordination between the policy makers and the

common public should be given due considerations in planning water resources management. Protection and management of water bodies have been recognized as a priority sector all over the world, since the quality of potable water plays an important role for the welfare of the public health.

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