Physico-Chemical Analysis of a Fresh Water Lake in Siddipet District, Telangana State, India

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ABSTRACT

Present paper deals with the estimation and analysis of some physical and chemical parameters of a fresh water lake. This lake is located at Thornala village of Siddipet District, Telangana state, India. This fresh water lake is known as Raorukula cheruvu. Presently this lake water is using for domestic and agriculture purposes by local people. Some of the physical and chemical parameters such as Alkalinity, Chloride, Nitrate, Phosphate, Turbidity, Water temperature, pH, Transparency, Total dissolved solids, Total hardness, Dissolved oxygen(DO), Chemical oxygen demand(COD),Biological oxygen demand (BOD), free carbon dioxide were estimated by using standard methods. Present study comprises for a period of one year i.e. from January, 2017 to December, 2017. Water samples were collected from four stations in monthly variation and values of the parameters were recorded. The results were analysed with standard limits prescribed by WHO. Results revealed that some of the parameters were not in the permissible range and indicated poor quality of water. It has been found that the water can be used for other domestic purposes and agriculture work but not for drinking. The direct discharge of sewage, surface run off, agriculture run off and other anthropogenic activities like washing clothes are might be reasons for pollution of the lake water. There is an immediate need to take steps like creating awareness among local people, planning and proper management to protect the lake.

Keywords: Physico-chemical parameters, Water quality, Monthly variation, Fresh water lake.
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INTRODUCTION

Water is an essential natural resource. Earth is recognized as blue planet as it is covered with water. All living things need water to survive. Water is necessary for life existence. Nearly three -fourth of the earth surface covered with water. Inspite of this water scarcity is a common phenomenon in many areas. Fresh water is limited source. Population growth and rapid industrialization are main causes for water pollution in urban areas. Domestic sewage and agricultural runoff are the main causes for water pollution in rural areas [1]. The water quality is directly linked with the human health. Polluted water is the culprit for many diseases. Various parameters show impact on quality of water bodies**.** In Telangana lakes are the major resources for water. Present study is about one fresh water lake. The main objective of the study is to estimate various physical and chemical parameters of this lake. At present many lakes are in ruined stag [2]. Analysis of these parameters helps in assessment of lake water quality [3]. It is necessary to study the parameters and assess the water quality to protect and restore lakes, ultimately which results into protection of environment [4].

MATERIALS AND METHODS

Study area: Raorukula lake is one of the freshwater lakes in Siddipet district. Siddipet town is located in latitude of 18°6 "0"N, longitude of 78°51"0"E. This city is District head quarter and fast developing in all aspects but water scarcity is very common issue. Lakes are main water resources for this city. Raorukula lake is a rain fed one. Lake is situated at Thornala village which is 8 km distance from Siddipet town. Presently lake water is using for both domestic and agriculture purpose by local people.

Water sample preparation: water samples were collected from four stations in monthly intervals for one year from January, 2017 to December, 2017. Samples were collected in clean plastic water bottles of one liter capacity. To estimate DO water samples were collected separately in BOD bottles.

Estimation of Physico-Chemical Parameters: Water samples were used for estimation of physic chemical parameters such as water temperature, pH, Transparency, Turbidity, Total dissolved solids (TDS), Alkalinity. Total hardness, Chlorides, Phosphates, Nitrates, Free carbo dioxide, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD, Chemical Oxygen Demand (COD).

Water temperature, pH, Transparency were recorded in the field at the time of water collection by using digital thermometer, pocket digital pH meter and secchi disc respectively. The other parameters were calculated in the laboratory. Turbidity was recorded by using Nephelo-turbidity meter. Other parameters were estimated by using standard methods [5, 6]

RESULTS AND DISCUSSION

Samples collected from four stations in monthly variation were tested for physico-chemical parameters. Average values of each parameter from four stations were recorded in monthly intervals. These values presented in tables 1 and 2.

Table-1. Physical parameters of lake

Month	Temperature (°C)	Transparency (cm)	TDS gm L^{-1}	Turbidity (NTU)	pH
January 2017	20	12.5	0.3	10	8.2
February	22	10.75	0.3	12.52	8.2
March	23.5	9.5	0.4	12.4	8.4
April	25	7.5	0.3	9.5	8.3
May	26	6.5	0.4	8	8.5
June	21	9.5	1.8	12.6	8.2
July	23	52.5	2.2	2.4	8.2
August	24	68	0.5	1.8	7.4
September	24.5	72	0.3	1.2	7.6
October	23	78.5	0.4	2.2	8
November	22	90	2	1	8.3
December	19	66.25	0.3	1.6	8.2

Water temperature: In the present study water temperature ranges from 26°C to 19°C. The maximum temperature 26°C recorded in the month of May and minimum temperature 19°C recorded in the month of December. Temperature plays a vital role in water quality. Higher temperatures were recorded in summer and lower temperatures in winter. Similar results found by other researchers [7].

Transparency: The Transparency values ranges from 90 cm to 6.5 cm. maximum Transparency recorded in the month of November and minimum recorded in the month of May.

Table 2. Chemical parameters of Lake

Month	Alkalinity	Chloride	Phosphate	Nitrate	Free CO$_2$	Hardness	DO	BOD	COD
Jan	115.5	42.4	1.93	8.03	-	80.5	10.8	48	160
Feb	112.5	33	3.21	10.98	-	80.8	9.8	53	180
March	170	44.38	3.3	11.9	2.2	114	9.5	70	272
April	146	55.61	4.41	14.80	4.2	168	9	62	380
May	220	60.6	4.6	15.84	3.4	160	8.5	82	320
June	186	40.7	12.21	35.5	7.4	156	10.9	78	342
July	165	42,21	11.62	36.8	8.2	76	8.9	76	282
Aug	188	46.57	13.52	21.08	6.2	88	12.34	60	230
Sept	192	36.34	5.2	4.98	18.2	96	13.4	58	320
Oct	160	41,8	0.23	5.6	14.2	80	18.78	62	292
Nov	155	43.66	0.18	4.6	18.2	100	16.2	44	148
Dec	130	49.61	4.86	5.85	24.4	75	11.2	52	182

Value expressed in mg L^{-1}

TDS: The TDS values ranges from 2.2 g L^{-1} to 0.3g L^{-1}. Higher TDS value recorded in the month of July. It is due to heavy rainfall.

Turbidity: The Turbidity values ranges from 1 NTU to 12.6 NTU. Maximum Turbidity value recorded in the month of June and minimum value recorded in the month of November. It might be due to presence of suspended particulate matter and anthropogenic activities.

pH: The pH value ranges from 8.5 to 7.4. The maximum pH value recorded in the month of May and minimum value recorded in the month of August. It might be due to increased temperature and high rate of photosynthesis in summer. According to the WHO report maximum permissible limit of turbidity is 5 NTU and permissible limit for pH is 6.5 to 8.5.pH values of the lake were in permissible limit [8].

Alkaline: The Alkaline values ranges from 220 mg L^{-1} to 112.5 mg L^{-1}. The maximum alkaline value recorded in the month of May and minimum alkaline value recorded in the month of February.

Chloride: The Chloride values ranges from 60.6 mg L^{-1} to 33 mg L^{-1}. The maximum chloride value recorded in the month of May and minimum chloride value recorded in the month of February. Chloride concentration in water is one of the most important parameters to estimate water pollution. Increased chloride value in summer indicates organic pollution [9].

Phosphate: The phosphate values ranges from 13.52 mg L^{-1} to 0.18 mg L^{-1}. The maximum value of phosphate was recorded in the month of August and minimum value of Phosphate was recorded in the month of November. In rainy season higher amount of phosphate was recorded. It might be due to addition of heavy drains in rainy season.

Nitrate: The Nitrate values ranges from 36.8 mg L^{-1} to 4.6 mg L^{-1}. The maximum nitrates recorded in the month of July and minimum Nitrates recorded in the month of November. In rainy season higher amount of nitrates were recorded. It might be due to addition of agricultural effluents into the lake.

Free CO$_2$: The value of free CO$_2$ ranges from 24.2 mg L^{-1} to 2.2 mg L^{-1}. The maximum free CO$_2$ was recorded in the month of December and minimum was recorded in the month of March. It might be due to the high rate of decomposition.

Total hardness: The hardness values ranges from 168 mg L^{-1} to 75 mg L^{-1}. The maximum value of hardness was recorded in the month of April and minimum value was recorded in the month of December.

DO: The DO values ranges from 18.78 mg L^{-1} to 8.5 mg L^{-1}. The maximum DO value recorded in the month of October and minimum DO value recorded in the month of May. In summer lower DO value were recorded. It might be due to high temperature and increased organic matter decomposition.

BOD: The BOD value ranges from 82 mg L^{-1} to 44 mg L^{-1}. The maximum BOD value recorded in the month of May and minimum BOD value recorded in the month of November.

COD: The COD values ranges from 380 mg L^{-1} to 148 mg L^{-1}. The maximum COD value recorded in the month of April and minimum COD value recorded in the month of November. Increased COD value was observed during summer. In summer high COD and BOD values were recorded. It might be due to high temperature and increased organic matter decomposition. Increased COD value during summer indicates the presence of organic pollutants in the water [10].

APPLICATION

At present, Telangana State is depended on lakes for water source. Now a day's lake protection has become major issue. Estimation of parameters is helpful to protect lakes. This study is applicable for all lakes. Protection and restoration of water bodies is essential thing to serve society and to ensure sustainable development. Present study helps the Government authorities and local people in analysis of lake water quality and to take necessary actions.

CONCLUSION

During this study, various physico-chemical parameters of the lake water showed variations in study period. It was found that water quality is not good for drinking purpose. But the lake water can be used for other domestic works and agriculture. The direct discharge of sewage, surface run off, agriculture run off and other anthropogenic activities are culprits for pollution of the lake water. There is an immediate need to take steps like building awareness; planning and proper management to protect the lake.

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