

## THE ASSESSMENT OF PHYSICO-CHEMICAL CHARACTERISTICS OF A FRESH WATER LAKE AND ITS SUITABILITY FOR FISH CULTURE

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### ABSTRACT

An investigation has been carried on the physico-chemical characteristics of Hasanparthy Lake in Warangal district, Telangana State for the period from June 2015 to May 2016. Water samples were collected from the lake and analyzed using standard laboratory methods and procedures. The results of the water analysis showed a variation in some of the parameters at the different sampling stations within the lake. The parameters that were studied included Water Temperature, PH, Turbidity, Electrical Conductivity, Total Alkalinity, Total Hardness, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Chlorides, Sulphates and Phosphates. Water Temperature was maximum ( $29.5\pm 2.05^{\circ}\text{C}$ ) during the summer and minimum ( $24.8\pm 6.37^{\circ}\text{C}$ ) during the winter. Maximum PH ( $8.07\pm 0.19$ ) was recorded during the summer season and minimum ( $7.12\pm 1.66$ ) during winter. Turbidity was observed maximum ( $59.27\pm 36.51\text{NTU}$ ) during the winter and it was minimum ( $17.95\pm 0.22\text{NTU}$ ) during the rainy season. Total Dissolved Solids were maximum ( $85.6\pm 0.30\text{mg/lit}$ ) during the winter and minimum ( $13.43\pm 28.37\text{mg/lit}$ ) during the summer. EC was recorded  $487.5\pm 63.5\mu\text{mhos/cm}$  during the summer and it was  $411\pm 99.13\mu\text{mhos/cm}$  during the winter season. Total Alkalinity was recorded  $139.2\pm 12.8\text{mg/lit}$  during the summer and was  $90.4\pm 23.00\text{mg/lit}$  during the winter season. Total Hardness maximum was recorded  $106.2\pm 20.4\text{mg/lit}$  in summer and was  $83.5\pm 5.40\text{mg/lit}$  during the rainy season. The Dissolved Oxygen was recorded  $8.27\pm 0.72\text{mg/lit}$  during the summer and it was minimum ( $5.2\pm 0.78\text{mg/lit}$ ) during the rainy season. Biological Oxygen Demand was recorded  $3.42\pm 0.25\text{mg/lit}$  during the summer and during the winter season it was  $2.87\pm 0.81\text{mg/lit}$ . Chemical Oxygen Demand was recorded  $8.97\pm 0.14\text{mg/lit}$  during the rainy season and it was  $7.17\pm 0.85\text{mg/lit}$  during the summer. Chlorides were  $77.35\pm 4.38\text{mg/lit}$  during the summer and minimum ( $72.80\pm 1.94\text{mg/lit}$ ) during the winter season. Sulphates were  $5.82\pm 0.43\text{mg/lit}$  during the rainy season and they were  $4.77\pm 0.68\text{mg/lit}$  during summer. Phosphates were  $3.6\pm 0.30\text{mg/lit}$  during the rainy season and they were  $2.27\pm 0.33\text{mg/lit}$  during the summer season. The seasonal variations in various water parameters and the probable reasons for their increase and the decrease were discussed in the light of current literature pertaining to aquatic biology.

**KEYWORDS:** Hasanparthy Lake, Physico-Chemical Parameters & Seasonal Variation

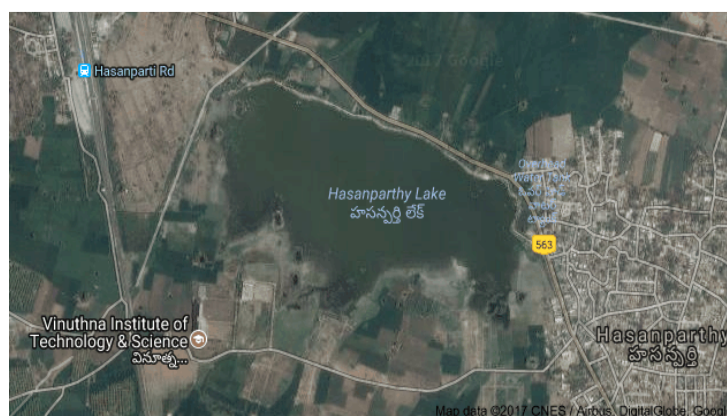
### INTRODUCTION

The water is the universal solvent occupies the first place in the priority list of the life on the planet, the earth. The water is said as the liquid of life and it is the essence of all living processes. A healthy aquatic environment is largely governed by its physico-chemical characteristics and its stability. Biological production in any aquatic body is directly correlated with its physico-chemical status (Sharma et. al., 2013). Water bodies are considerable elements of the world's biological diversity and are important in socio-economic benefit as a result of tourism and recreation. However, the significant increase in population results in a substantial consumption of the water reserves globally (Fafioye et al., 2005). The physical and chemical properties of freshwater bodies

are characterized by the climatic, geochemical, geomorphological and pollution, it is very important to study the physico-chemical factors influencing the biological productivity in the water bodies (Sahni and Yadav, 2012). The quality of aquatic life surviving in the pond is totally dependent on the water quality of the pond. In the recent years, several studies have been made in this field (Yadav et al., 2013). The quality of water affects the species composition, abundance, productivity and physiological conditions especially, the indigenous population of aquatic organisms.(Wetzel,2001). The alteration in physico-chemical parameters leading to eutrophication has become a widely recognized the problem of water quality deterioration. In recent years increase in human population, demand for food, land degradation of many freshwater resources. (Ray et al.,2000 and Carpenter,2005). Eutrophication is a global phenomenon associated with nutrient enrichment of aquatic ecosystem. Several studies have been made so far to understand the physico-chemical properties of lakes, ponds, and reservoirs in India. (Jain et al.,1996, Mohanraj et al.,2000, Thorat and Masarrat 2000).

## MATERIAL AND METHODS

The water samples for physico-chemical analysis were collected from the Lake in every month during the morning hours. Some of the Physical parameters were estimated at the site, Most of the parameters were estimated in the laboratory by standard methods as prescribed by APHA et al.,(2000).



**Figure 1: Shows the Satellite Image of Hasanparthy Lake**



**Figure 2: Shows the Overall View of Hasanparthy Lake**

## RESULTS AND DISCUSSIONS

In the present investigation data of the physico-chemical parameters of Hasanparthy Lake for the period from June 2015 May 2016 has been done and the data thus obtained was given below. These results are shown in table 1 and 2. The temperature of water ranged from 25.0-32.0°C. The highest temperature was recorded in the month of May. While the lowest in the month of December. A similar result has been reported by Jayabhaye, (2013). PH is the measure of

the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. The pH values were ranges from 7.03-8.4. Highest PH value recorded in the month of June, While, the lowest PH value were recorded in the month of August. Turbidity is correlated with the nature of bottom, wave action and anthropogenic activities in the water body. The turbidity value ranges from 12.2-19.3. Highest turbidity value recorded in the month of August while, the lowest turbidity value recorded in the month of December. A similar result has been reported by Alam (2013). Total Dissolved Solids elevates the density of water; influence Osmoregulation of freshwater organisms. The TDS value ranges from 80.5-99.4. The highest TDS value was recorded in the month of March while the lowest value was recorded in the month of June. A similar result has been reported by Rao et al., (2010). Electrical Conductivity value ranges from 403-595. The highest EC value was recorded in the month of May while the lowest value was recorded in the month of September. A similar result has been reported by Kumar et al., (2011). The alkalinity of lake water depends on many factors among them the availability of carbonate and bicarbonate is one of the main factor alkalinity provides an idea of natural salts present in water Gawas et. al (2006). Total Alkalinity value ranges from 87-157. The highest TA value was recorded in the month of May while the lowest TA value was recorded in the month of June. A similar result has been reported by (Vasumathi Reddy et al., 2009). Total Hardness value ranges from 76-138. The highest TH value was recorded in the month of February while the lowest value TH was recorded in the month of August. Oxygen content is important for the direct needs of many organisms and affects the solubility of many nutrients and therefore the periodicity of the aquatic ecosystem (Wetzel, 1983). Total DO value ranges from 4.2-9.2. The highest DO value was recorded in the month of April while the lowest DO value was recorded in the month of August. Biological Oxygen Demand is the amount of oxygen required by microbes to decompose the degradable organic matter under aerobic condition. Biological Oxygen Demand value ranges from 2.0-3.9. The highest BOD value was recorded in the month of July while the lowest BOD value was recorded in the month of September. Chemical Oxygen Demand is being a liable parameter for judging the extent of pollution in water. COD is an rapid test which measures the oxygen required for the oxidation of all the substances present in water, include those are not biologically decomposable. Chemical Oxygen Demand value ranges from 6.0-9.2. The highest COD value was recorded in the month of July while the lowest the lowest COD value was recorded in the month of February. Chlorides value ranges from70.1-86.5. The highest Cl<sup>-</sup> value was recorded in the month of January while, the lowest Cl<sup>-</sup> value were recorded in the month of June. Sulphates value ranges from4.0-6.8. The highest SO<sup>4+</sup> value was recorded in the month of October while the lowest SO<sup>4+</sup> value was recorded in the month of March. An irregular increase of phosphates in water indicates pollution by sewage and agriculture run-off especially phosphate fertilizers. Phosphates value ranges from1.6-4.0. The highest PO<sup>4+</sup> value were recorded in the month of July while the lowest PO<sup>4+</sup> value were recorded in the month of November.

**Table 1: Shows the Monthly Variation in the Physico-Chemical Parameters of Hasanparthy Lake during 2015-2016**

Parameters	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Marc	April	May
Water Tem °C	29.0	29.1	28.4	27	25	23.2	22.0	21.8	26.3	29.7	30.1	32.0
PH	8.4	8.0	7.03	7.50	7.35	7.26	7.40	7.7	7.8	8.0	8.2	8.3
Turbidity(mg/lit)	15.0	17.5	19.3	20.0	18.6	14	12.2	14.4	15.5	17.7	16.5	18.3
TDS (mg/lit)	80.5	85.5	87.1	89.3	90.0	91.8	92.2	95.6	98.4	99.4	98.6	97.6
Total Alkalinity(mg/lit)	87	99	93	100	90	110	94	115	126	128	146	157
Total Hardness(mg/lit)	91	85	76	82	95	100	111	130	138	110	92	85
DO(mg/lit)	6.3	5.5	4.2	4.8	5.4	5.9	6.8	7.5	7.9	8.7	9.2	7.3

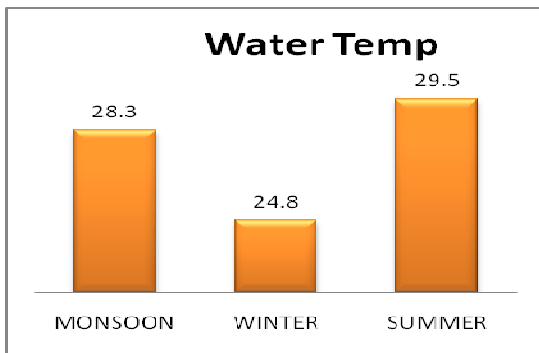
**Table 1: Contd.,**

BOD(mg/lit)	3.6	3.9	3.5	2.0	2.1	2.4	2.7	3.0	3.1	3.3	3.8	3.5
COD(mg/lit)	8.9	9.2	9.0	8.8	8.6	7.5	6.9	6.5	6.0	7.3	7.0	8.4
Cl <sup>-</sup> ( mg/lit)	70.1	73.2	78.1	80.0	83.4	85.2	82.1	86.5	83.3	79.2	75.4	71.5
SO <sup>4+</sup> ( mg/lit)	6.3	5.5	5.3	6.2	6.8	6.3	5.6	4.3	4.2	4.0	5.3	5.6
PO <sup>4+</sup> ( mg/lit)	3.3	4.0	3.3	3.8	3.5	1.6	2.10	2.1	2.8	2.3	2.1	1.9
EC	560	355	405	403	465	432	445	470	433	450	472	595

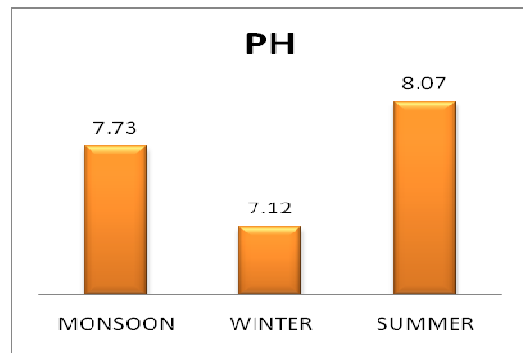
**Table 2: Shows the Seasonal Variations in the Physico-Chemical Parameters of Hasanparthy Lake during 2015-2016**

S. No	Parameters	Monsoon	Winter	Summer
		Mean ± S. D	Mean ± S. D	Mean ± S. D
1	Water Tem °C	28.3 ± 0.83	24.8 ± 6.37	29.5 ± 2.05
2	PH	7.73 ± 0.51	7.12 ± 1.66	8.07 ± 0.19
3	Turbidity(mg/lit)	17.5±0.227	59.27±36.51	18.8±1.23
4	TDS (mg/lit)	85.6±0.305	87.68±20.62	13.43±28.37
5	EC	430 ± 77.2	411 ± 99.13	487.5 ± 63.5
6	Total Alkalinity(mg/lit)	94.7 ± 5.21	90.4 ± 23.00	139.2 ± 12.8
7	Total Hardness(mg/lit)	83.5 ± 5.40	85.20 ± 25.95	106.2 ± 20.4
8	DO(mg/lit)	5.2 ± 0.78	5.22 ± 1.48	8.27 ± 0.72
9	BOD(mg/lit)	3.25 ± 0.73	2.87 ± 0.810	3.42 ± 0.25
10	COD(mg/lit)	8.97 ± 0.14	7.88 ± 2.07	7.17 ± 0.85
11	Cl <sup>-</sup> ( mg/lit)	75.35±3.91	72.80±1.94	77.35±4.38
12	SO <sup>4+</sup> ( mg/lit)	5.82 ± 0.43	5.41 ± 1.40	4.77 ± 0.68
13	PO <sup>4+</sup> ( mg/lit)	3.6 ± 0.30	3.00 ± 1.01	2.27 ± 0.33

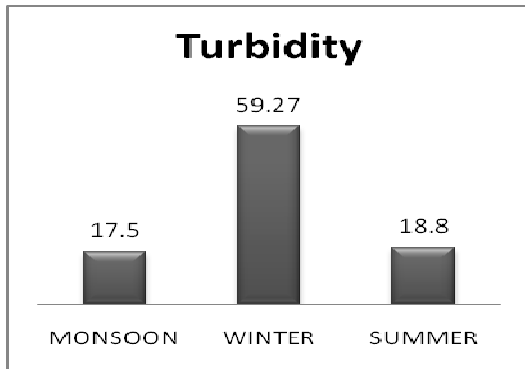
Graphs Show the Seasonal Variations in Water Quality Parameters of Hasanparthy Lake



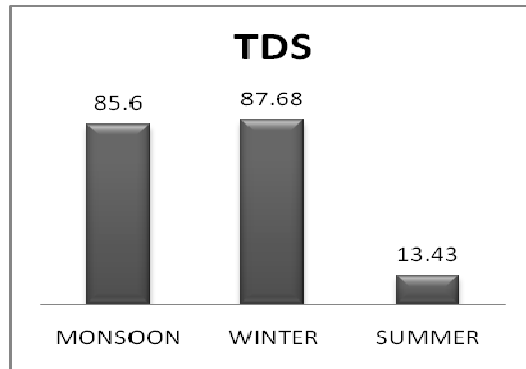
Graph 1



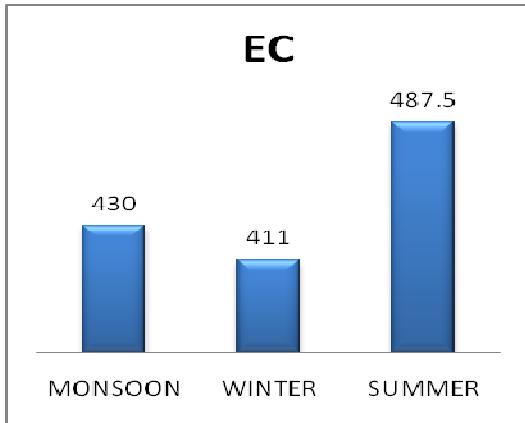
Graph 2



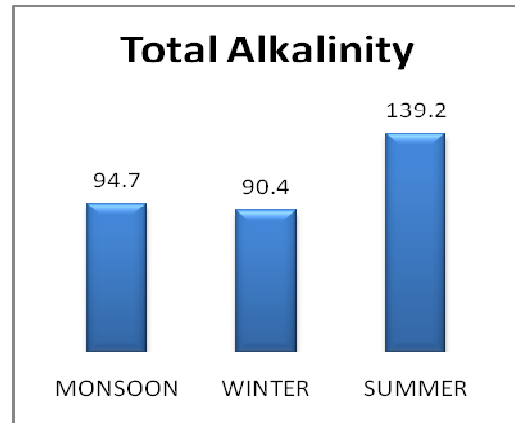
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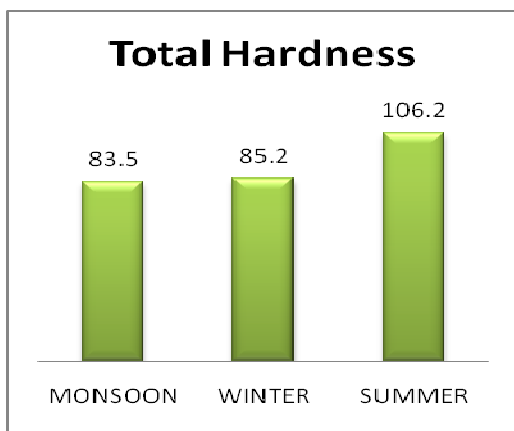
Graph 4



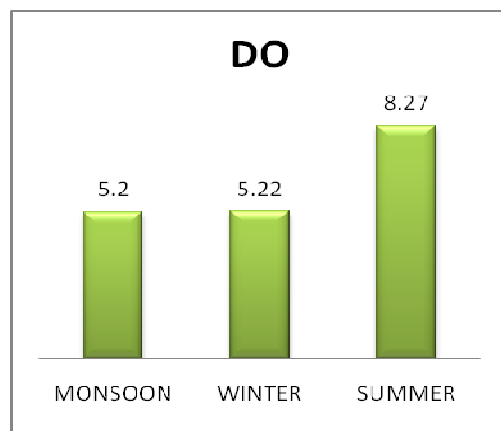
Graph 5



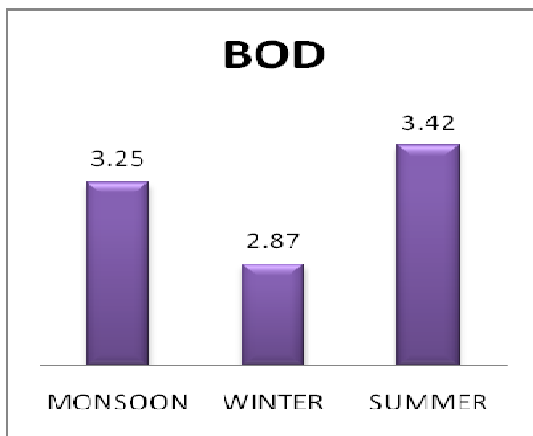
Graph 6



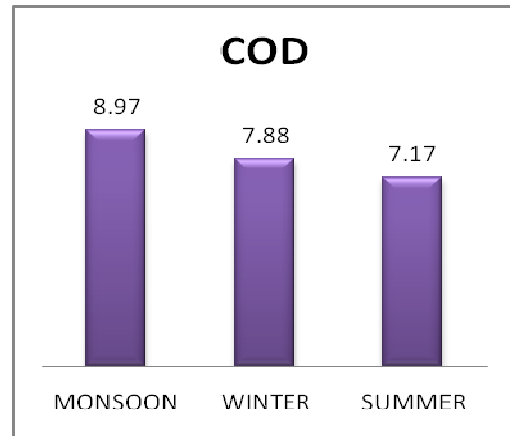
Graph 7



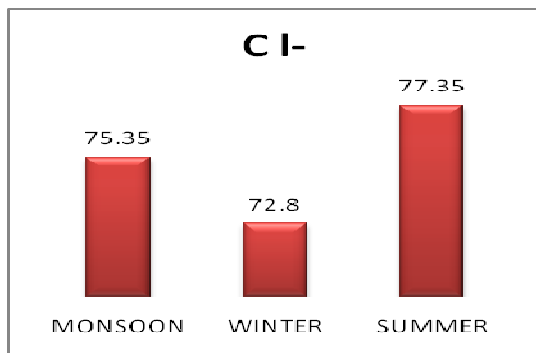
Graph 8



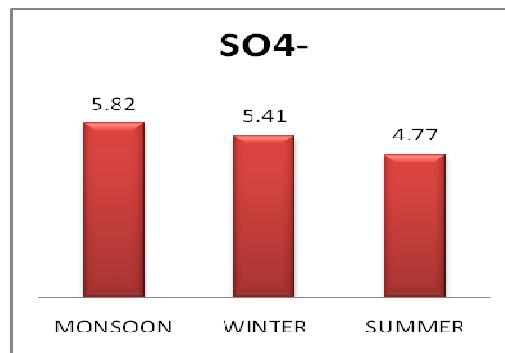
Graph 9



Graph 10



Graph 11



Graph 12

## CONCLUSIONS

In the present study the concentration of all the parameters in all samples were the tolerable limits. It was concluded that this lake will be suitable for fish culture, drinking, and irrigation purpose. In the present study, provides a considerable insight into properties of water in the freshwater lake. The data confines slight changes have been in different season at different sites. The study could also help in an understanding of the structure of a particular water body in relation to its habitats

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