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Studies on Hydrological Parameters of Tiptur Lake, Tumkur District. Karnataka State, India

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Abstract: *Natural resources are the important wealth of our country, water is one of them. Water is wonder of the nature. Water is a "cradle of life" on which all organism play. Lentic water system is more accessible to pollution than ground water because of increased industrialiazation, anthropogenic activities and disposal of septic effluents, domestic and municipal sewage. In the present study an attempt has been made to evaluate Hydrological parameters of Tiptur Lake to know pollution load.*

Keywords: *Lentic water, Hydrological parameters, Tiptur Lake, Industrialization, Anthropogenic activities.*

1. INTRODUCTION

Water is aptly being described as the 'mother of life', a precious gift of nature to humankind and millions of other living species. It also performs unique and indispensible activities of ecosystems, biosphere and biogeochemical cycles.

Lentic and lotic habitats are vital to all forms of life. Nearly 97% of water is in ocean which is unfit for human consumption due to high salinity. 2% of water is locked up in polar icecaps. The remaining 1% of freshwater is in rivers, streams, lakes, reservoirs, tanks, ponds and below the earth surface as ground water which is available to all form of living beings. The freshwater resource is becoming day by day at the faster rate of deterioration of the water quality is now a global problem, (Singh Abujam *et al.,* 2011)

The water bodies from time immemorial had an aesthetic look, quenching the thirst of millions of people have today been loaded with toxic materials and chemicals, which have rendered them almost useless (Hina kousar *et al.,* 2007). Without the knowledge of water chemistry it is difficult to understand the biological phenomenon because the property of water reveals about metabolism of the ecosystem and explains the general hydro-biological inter relationship (Kiran 2010). Any change in the physico-chemical characteristics of water not only alters its quality, but also disturbs aquatic environment and affects ecobalance (Pawar and Pandarkar, 2011).

The quality of water usually described according to its physical, chemical and biological characteristics (Rafiullah Khan *et al*., 2012). Rapid industrialization and indiscriminate use of chemical fertilizers, pesticides, insecticides in agriculture are leading to depletion of DO and enrichment of nutrients which leads to increase in BOD which causes pollution and eutrophication which deteriorates water quality and eliminates many sensitive species.

2. STUDY AREA

Tiptur tank commonly known as Tiptur Lake is situated in a central place of Deccan plateau of western side of Tumkur district, between 76º 21′ east longitude to 76 º 43′ east longitude and 13º5′ north latitude to 13º 26′ north latitude and located at 861m(2628 feet)above the sea level. It spread over an area of 785 sq.km. The average temperature ranges from 11ºc in winter and 38ºc during summer. The average rainfall of Tiptur town is 510mm. Tiptur Lake provide infrastructure for pisciculture and it also provide abode for many aquatic birds. Now town municipal has a proposal to supply water to Tiptur town for domestic purpose, hence the present investigation is undertaken.

3. MATERIAL AND METHODS

Water samples from 16 different sampling stations were collected from 7.00 to 9.00 am at 25 cm below the surface by using prewashed polythene cans by grab sampling method.

Physical parameters like Water temperature, p^H, EC, Turbidity, and TDS were analyzed by using Systronics water analyzer 371 micro controller based instrument at the sampling stations. Air temperature is recorded with help of digital pen type thermometer.

Chemical parameters like Salinity is analyzed by using Systronics water analyzer 371 at the sampling stations. While Free CO_2, Total hardness, Total alkalinity, DO, BOD, DOM, Calcium, Magnesium and Chloride were analysed systematically following procedure suggested by R.K. Trivedy and P K Goel 2006 and APHA AWWA WPCF 2005.

4. RESULTS AND DISCUSSION

The results of Hydrological parameters of all the 16 sampling stations were made average every month and tabulated in the Table-1

Results of Hydrological parameters of Tiptur lake from November 2014 to April 2015 Table-1

SL NO	MONTH PARAMETERS	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	AVERAGE	STDEV
1	AT	22.1	21.69	20.21	24.71	28.13	29.7	24.42	3.47
2	WT	25.05	23.72	23.54	27.27	29.46	30.46	26.58	2.70
3	P^H	8.4	8.45	8.12	8.32	8.5	8.7	8.42	0.18
4	TDS	59.95	61.82	66.95	88.47	87.51	90.5	75.87	13.16
5	EC µs/cm	120.5	124.95	134.7	177.62	175.57	181	152.39	26.06
6	Turbidity NTU	3.158	3.7	2.83	2.35	3.94	4.08	3.34	0.62
7	Salinity ppt	0.085	0.091	0.125	0.11	0.13	0.13	0.11	0.02
8	Free co_2	5.638	6.258	6.053	8.8	6.877	8.665	7.05	1.25
9	TH	50.26	51.375	50.075	48.45	41.62	42.125	47.32	3.95
10	TA	48.15	47.2	45.97	53.15	55.01	56.887	51.06	4.15
11	DO	5.337	6.449	8.274	12.81	12.82	13	9.78	3.21
12	BOD	2.196	1.88	2.22	1.86	3.11	3.262	2.42	0.56
13	DOM	4.161	4.55	4.8	2.65	3.375	3.446	3.83	0.74
14	Ca++	10.488	10.82	10.57	8.45	10	10.15	10.08	0.78
15	Mg++	5.67	5.87	5.723	6.578	4.08	4.27	5.37	0.89
16	Cl^-	22.09	21.22	24.26	24.39	24.27	24.63	23.48	1.32

Note: All values are expressed in mg/l, except P^H and otherwise stated

Temperature: The temperature is one of the important factors in aquatic environment since it regulates physico chemical as well as biological activities. The water temperature varies with the atmospheric temperature. In the present study, air and water temperature followed more or less similar trend of oscillations. The air temperature ranged from minimum of 22.1^0 C to maximum of 29.7^0C. The water temperature varied from minimum of 23.54^0 C to maximum of30.46^0C.

P^H: The P^H of a solution is the concentration of hydrogen ions, expressed as negative logarithm. It reflects acidity or alkalinity of water. The P^H plays a role in growth of flora and fauna of aquatic ecosystem. Thus measurement of P^H is important because most of the biological process and biochemical reactions are P^H dependent. The P^H value ranged from minimum of 8.12 to maximum of 8.7 somewhat alkaline in nature. In the present study higher value of P^H was observed in the month of April. The P^H is an important parameter in water body since aquatic organisms are well adapted to specific range and donot withstand abrupt change in it, (George, 1997).

TDS: It is the amount of solids that remain as residue upon evaporation and subsequent drying at defined temperature. It gives the measure of ions dissolved in water. In the present analysis TDS value ranged from minimum of 59.95 mg/Lto maximum of 90.5mg/L.

EC: Electrical conductivity is a numerical expression of the ability of aqueous solution to carry electric current. EC signifies the amount of total dissolved salts. EC values were in the range of minimum of 120.5 µs/cm to maximum of 181µs/cm.

Turbidity: Suspension of particles in water interfering with passage of light is called turbidity.It is caused by wide variety of suspended matter. Turbid water is undersible from aesthetic point of view in drinking water supplies. In the present study turbidity of water ranged from minimum of 2.35 NTU to maximum of 4.08 NTU. The estimated values were well within the permissible limits of BIS standards.

Salinity: The measure of the content of salts in water is called as salinity. It is an important factor in determining many aspects of chemistry of natural water and of biological process with in it. The organisms found in aquatic environment are determined by the salinity of water. In the present study salinity were ranging between minimum of 0.085 ppt to maximum of 0.13 ppt.

Free carbon dioxide: It is an important factor in aquatic environment. The CO_2 is highly soluble in water. CO_2 is a byproduct of respiration and it also provides a carbon source to photosynthesis. The variation of CO_2 in aquatic environment was due to its absorption by plants in photosynthesis and activity of other organsisms. Free CO_2 helps in buffering the aquatic environment against rapid fluctuation in acidity or a CO_2 akalinity and also regulates biological process of aquatic communities (Prasannakumari *et al*., 2003). The free CO_2 values ranged from minimum of 5.63mg/L to maximum of 8.88 mg/L.

Total hardness: The hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium or both. The value of total hardness ranged from minimum of 41.62mg/L to maximum51.37mg/L.

Total alkalinity: It is the capacity to neutralize a strong acid and it is normally due to the presence of bicarbonate, carbonate and hydroxide compounds of calicum, sodium and potassium. The alkaliniy value ranged from minimum of 45.97 mg/L to maximum of 56.86mg/L.

Dissolved Oxygen: DO is one of the important chemical parameter to assess the quality of water. Temeperature play an important role in determination of DO in aquatic ecosystem. DO is an index of physical and biological process occuring in water. The unpolluted water is normally saturate with DO, while presence of oxygen demanding pollutants causes rapid depletion of DO. The DO value ranged from minimum of 5.33mg/L to maximum of 13.0 mg/L. In the present study higher value of DO was observed in the month of April (Summer) due to higher photosynthetic activity.

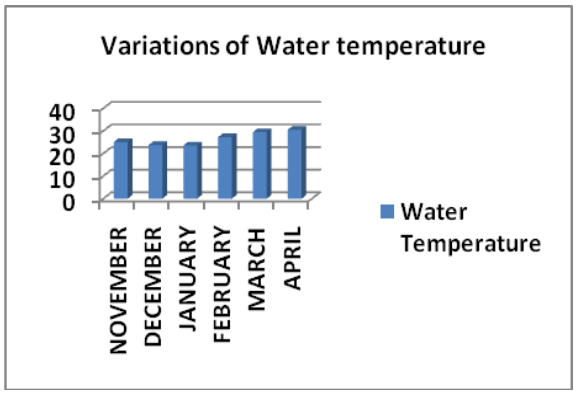
Biochemical oxygen demand: The requirement of oxygen needed for chemical degradation of organic material. BOD determines the strength of sewage effluents and other polluted water (Mahinda, 1981). High BOD indicates higher consumption of oxygen and a higher pollution in water. BOD values ranged from minimum 1.86mg/L to maximum of 3.26 mg/L in the month of April.In the present study the values of BOD were with in the permissible limits of BIS Standards.

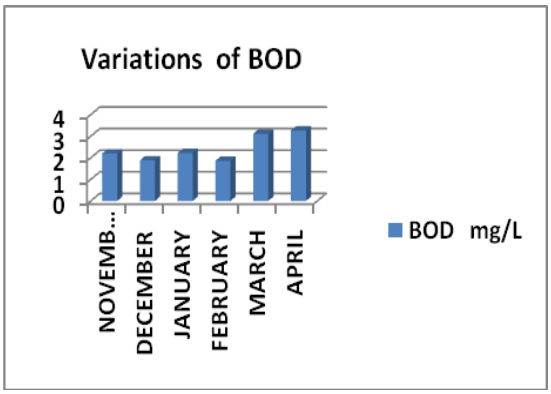
Dissolved organic matter: DOM consists of soluble organic materials derived from the partial decompostion of organic materials including soil, organic matter, plant residues and soluble particles released by living organisms including bacteria, algae and plants. DOM is significant in many respects due to the role it plays in nutrient cycle and supply and it's an available carbon source for micro organism. DOM is mesaure of organic pollution.Water bodies containing less DOM utilize less dissolved oxygen for decomposition. The DOM values ranged from minimum of 2.65 mg/L to maximum 4.8 mg/L.

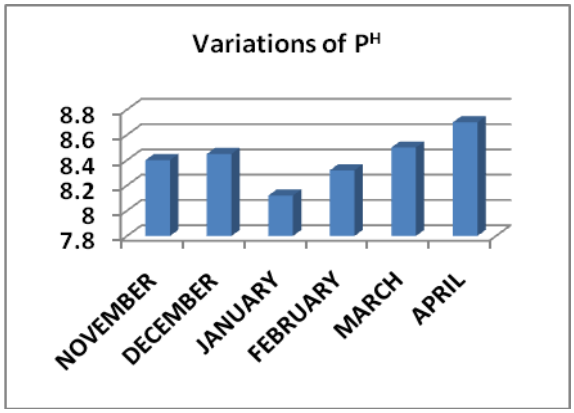
Calcium and Magnesium: They are directly related to hardness. Calcium and magnesium are both essential minerals for living organism. Both the minerals are found in all kinds of natural water with magnesium concentration generally lower than calcium. The Calcium content of water ranged from minimum of 8.45 mg/L to maximum of 10.82 mg/L. Similarly magnesium content ranged from minimum of 4.08 mg/L to maximum of 6.78 mg/L.

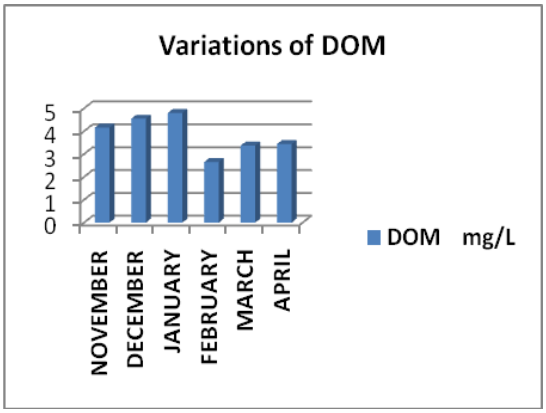
Chloride: It plays an important role in the water quality determination. The chloride concentration serves as an indicator of pollution by sewage. The chloride content ranged from minimum of 21.22 mg/L to maximum of 24.63 mg/L and was well with in BIS standards. Chloride concentration higher than 200 mg/L is considered to be risky for human consumption and causes unpleasant taste of water.

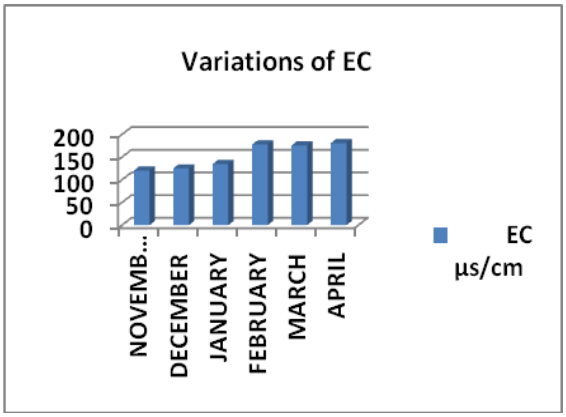
Graphs showing variations of Hydrological parameters of Tiptur lake from Nov 2014 to April 2015

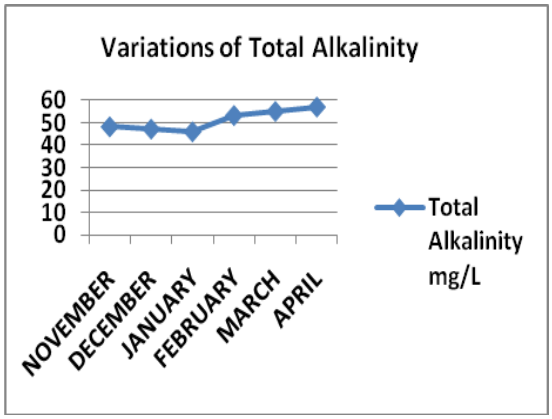


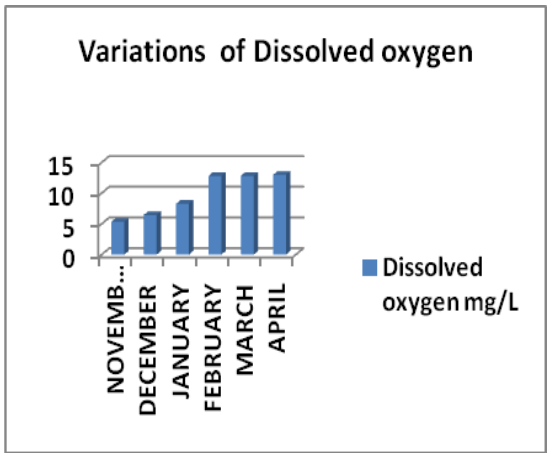


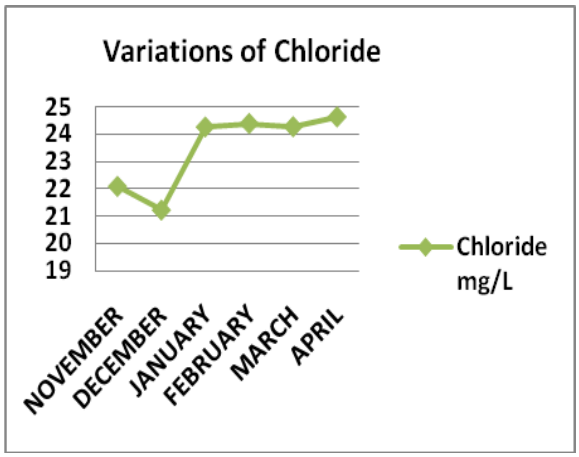












5. CONCLUSION

- The water quality analysis of Tiptur Lake revealed that most of the Hydrological parameters found with in permissible limits of BIS standards except $P^{H.}$
- Lake water is slightly alkaline.
- BOD is less hence water is less polluted with less pressure of eutrophication.
- The lake water is suitable for pisciculutre and for domestic purpose.
- Bathing, wahing and defecation, immersion of idols, domestic and septic tank effulent discharge must be strictly probihited, since these activites alter water quality and affect adversly aquatic organism.
- Unplaned growth of human habitation in the vicinity of the lake has to be checked.

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