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SEASONA INFLUENCE ON PHYSICOCHEMICAL PARAMETERS OF YELAHANKA LAKE WATER OF BANGALORE

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ABSTRACT

Water quality is a term used here to express the suitability of water to sustain various Uses or processes. The physical and Chemical characteristics of water at Yelahanka lake in Bangalore during the year May 2007-May 2008 have been studied on the concentrations of Toxic substances for drinking water use, or restrictions on temperature and pH ranges for Water supporting invertebrate communities. The pH value of Yelahanka Lake recorded 7.0-8.2; the pH was found above 7.0 in all the lakes making them alkaline. The alkalinity value of Yelahanka Lake ranges from 8.2 NTU – 10.7 NTU. Conductivity is good and rapid measure of the solids recorded ranges from 838µmhos/cm - 1213 µmhos/cm, the values observed in Yelahanka lake values are very much higher than the prescribed standards limits (1400 µmhos/cm) recommended by W.H.O. Conductivity increases with increasing amount and mobility of ions and also can be used an indicator of water pollution.Dissolve oxygen values ranges from 4.0 mg/l – 7.8 mg/l. Salinity is the saltiness or salt dissolved salt content of water body. The iron rangesfrom 0.5 mg/l – 1.8 mg/l, in water it occurs mainly in the divalent or bivalent state (ferrous and ferric). Iron is the surface water is present in the form of ferric state. The fluoride ranges from 0.23 mg/l-0.63 mg/l, Fluoride in water derives mainly from dissolution of natural minerals in the rocks and soils with which water interacts. The most common fluorine – bearing minerals are lourie, apatite and micas. Fluoride problems therefore tend to occur where the element is most abundant in the host rocks. The changes of the physico-chemical characterstics of lake water due to the runoff water from surrounding agrictural fields and concentration of chemical constituents is partially dried up aquatic environment. The svalues for different parameters evaluated fall for below the acceptable limits in the lake studied necessary to drink water after treatment, boiling and filtrations.

KEY WORDS: Fluoride, water, pH.

INTRODCTION

Water is one of the most precious natural resources needed by all living things for their survival. It maintains an ecological balance between various groups of living organisms and their physical and chemical environments. Aquatic ecosystems provide nurturing shelter to the ancestral life of the living world on the land today. Water bodies cover about 73% of surface and provide the most extensive medium for aquatic life. In the present day, there is a talk on pollution everywhere as clear natural fresh water bodies are being converted in to polluted water due to several causes mainly human activity including discharge of urban and rural sewage , effluent from industries, detergents from washing clothes, organic matter, solid wastes, thermal pollutants and disposal of urban dead bodies etc. Fish production is also hampered since the aquatic organisms constitute a vital link in the food chain in the aquatic ecosystem and its productivity directly depends on physico-chemical features of water.The aquatic ecosystem presents a great contrast to terrestrial ecosystems, and aquatic organisms display such a wide range of adaptations that they continue to attract the attention of biologist even today. [1] studied the nutritional load of Lake Bottom sediments. [2] have studied physico-chemical factors influence on the aquatic biota.[3] investigated detailed aspects of physical, chemical and biological characteristics of coastal Dune lakes of Eastern Australia..The ecology of lakes are under stress condition due to fast pace of development, deforestations, cultural practices and agriculture. These activities trigger the rate of sedimentation of the lakes bed characterized by silt and organic suspended solids, which initiate the process of eutrophication at a very early stage and show a deterioration of habitat quality. It has become necessary proper attention to find out the extent of possibilities of impounded water for raising the fishery wealth. Productivity of the lakes are greatly influenced by its morphometric and hydrological features. In this connection details of limnological investigation in relation to Indian lakes, reservoirs and ponds have been contributed by several researchers: [4] ,[5] and [6].

In the early 2000, the work on limnological aspects has been studied by several researchers: [7] studied on ecological characteristics of water from Savalanga tank of Shimoga. [8] observed a primary production in fresh water temple tank of Kerala. [9] studied the physico-chemical properties of water from Gondi Anicut Shimoga of Karnataka. [10] studied the limnological aspects in Tulsidas Tal Tarain region of Balarampur in relation to fisheries

Maharashtra.Water resources are of critical importance to both natural ecosystem and human development. It is essential and required for maintaining a healthy state of all the animals. [11]and[12] represent important milestones in the development of the science of ecology.Freshwater has been of great importance to human beings and other organisms of the environment for sustainance of life and maintaining the balance of the nature, hence "*Water is the life blood of the earth".*Lakes are becoming very important Resources through out the world as they meet basic requirements. Man used water resources for various purposes, such as agriculture, hydropower, industries, municipal supplies, fisheries, recreational use and have put severe strain on the lakes resulted in deterioration of its quality. The most important role since ecology determines the habitability and abundance of flora and fauna in different sections [13] though the defilement of water and deterioration of aquatic system is as old civilization, however escalating industrialization, urbanization, developmental and agricultural activities have brought irreversible changes in such systems. The physico-chemical parameters of any lake provide a first hand information about water quality characteristics and pollution in lake.

The aquatic ecosystem presents a great contrast to terrestrial ecosystem and aquatic organisms display wide range of adaptations that they continue to attract the attention of biologists. [3] investigated detailed aspects of physical, chemical and biological characteristics of coastal dune lakes of Eastern Australia. [14] studied basin morphology in relation to chemical and ecological characteristics of lakes. [15] studied the relationship between phytoplankton composition and chemical variables. [16] studied the water chemistry and biology in a shallow lake Pamootis (Greece). [17] studied the species distribution, percentage composition and numerical abundance in north Vembaded lake.[18] studied the interrelationship between physico-chemical parameters and phytoplankton in polluted lake Suleker tank of Mandya, Karnataka. [19] observed monthly variation in physico-chemical characteristics of a wetland of north Bihar. [20] studied comparative limnology of two ponds (Blue and milk pond) of Chandraneswar temple in India. [21] Studied physico-chemical characterization of Kulahalli tank of Davanagere, Karnataka. [22] studied some physico-chemical parameters of Tisgaon lake in Aurangabad, India.The present work focuses on some physico-chemical parameters Yelahanka lake water in Bangalore.

MATERIALS AND METHODS

Water samples from the Yelahanka lake water collected from May 2007 to May 2008. At each collection time, the analysis on water samples were performed twice. All the collections and field observations were made between 07.00 A.M. to 11.00 A.M. hrs throughout the study period. The water samples were collected from the lakes in bottles and brought to the laboratory for analysis of parameters study as per the standard methods described by [23]. The parameters like pH, Alkalinity, Turbidity, conductivity, Chemical oxygen demand (COD),Dissolved oxygen (DO), Biological oxygen demand (BOD), Salinity, Phosphates, Nitrates, Sulphates, Iron and Flouride.

Laboratory Studies: pH values were obtained by using pH scan, W.P. 1.2 (Eutech instruments, Singapore) and pH meter (Elico, Modle, Lil 20).

Temperature was recorded in field using OAKTON Thermometer (made in China) and values were expressed in 0°C.

The TDS of water samples measured by drying temperature at 103°-105°C temperatures and values were expressed in mg/l.

Turbidity of water was estimated by spectrophotometer (P.C. Spectra) and values were expressed in FAU units (Formazin Attenuation units).

The conductivity of water was measured using (Elico-P.E. 132) and values were expressed in µmhos/cm.

The total hardness of water was estimated by titrating the water samples with standard EDTA (O.OIN) using buffer solution and Erichrome black-T indicator and the values were presented in mg/l.

The dissolved oxygen (D.O.) content of water was estimated by modified wrinklers method, the results are expressed in ppt.

The Biological oxygen demand (B.O.D.) was estimated by incubating the water samples at 20°C for five days in the dark under aerobic conditions and the values were expressed in mg/l.

The total alkalinity was detrmined by tirtrimetric method using hydrochloric acid and thus carbonate and bicarbonate alkalinity was calculated. The values are presented in mg/l.

Chemical oxygen demand (COD) was estimated by dichromate oxidation method and the results are expressed in mg/l.

The phosphates of water samples were estimated by spectrophotometer method at 470nm and values were expressed in mg/l.

The sulphates of water samples were also measured by spectrophotometer method at 420nm and values are expressed in mg/l.

The Nitrate of water was estimated by titrating the water samples with "Phenol-disulphonic acid" using Beer's law, and the values are presented in mg/l.

The potassium of water samples was measured by Flame photometer method at 769nm and the values were expressed in mg/l.

RESULTS

Table 1: Physicochemical characteristics of Yelahanka lake water during 2007-2008.

	May	June	July	August	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May
pH	7.0	7.2	7.0	7.1	7.2	7.0	7.3	7.3	7.4	7.6	8.2	7.9	7.6
ALKALINITY	262	261	272	257	253	242	247	250	237	273	287	273	267
TURBIDITY	7.6	7.8	8.2	7.0	7.8	6.8	7.3	8.2	9.0	8.7	8.3	7.6	7.3
CONDUCTIVITY	897	987	1031	987	1213	1037	993	981	838	847	943	892	947
COD	78.3	79.6	73.2	76.3	81.3	84.4	87.3	67.3	77.3	70.0	73.6	78.3	81.3
DO	5.6	6.3	6.2	7.0	5.3	6.4	6.0	6.5	6.2	6.0	5.3	5.0	5.8
BOD	8.2	7.8	7.3	6.8	7.9	6.2	6.0	6.7	6.8	7.8	8.2	8.9	7.8
SALINITY	437	367	378	381	397	402	414	381	383	384	432	428	438
PHOSPHATE	0.38	0.40	0.47	0.5	0.38	0.48	0.49	0.37	0.38	0.30	0.41	0.40	0.47
NITRATES	0.32	0.30	0.32	0.43	0.47	0.49	0.50	0.40	0.42	0.30	0.32	0.31	0.38
SULPHATES	0.70	0.60	0.72	0.68	0.70	0.72	0.67	0.61	0.57	0.61	0.60	0.52	0.61
IRON (Fe)	0.87	0.80	0.75	1.30	1.38	1.20	0.80	0.80	0.90	1.40	1.80	1.20	1.00
FLURIDE (Fl)	0.37	0.23	0.43	0.45	0.47	0.38	0.40	0.43	0.47	0.45	0.52	0.60	0.72

All the parameters are expressed in mg/l except pH, Turbidity NTU, Conductivity mhos/cm

The pH ranges from 7.0-8.2, high pH was recorded in March, 2007 and lower pH was recorded in July, June and August. The alkalinity ranges from 237 – 287 mg/l, high alkalinity was recorded in March, April and lower alkalinity was recorded in October and November of 2007 and Jan 2008. The turbidity ranges from 8.2 NTU – 9.0 NTU, high turbidity was recorded in January, March of 2008 and lower was recorded in August, October and November of 2007 and May 2008.The conductivity ranges from 838µmhos/cm 1213 µmhos/cm, high conductivity was recorded in September and October 2007and lower was recorded in February and April 2008.The COD ranges from 67.3 mg/l – 87.3 mg/l, high COD was recorded in September, October and November of 2007, and lower COD was recorded in December 2007 and February 2008. It is reliable parameter for judging the extent of pollution in water. As a result the high value of COD higher even then a continuous monitoring is necessary so that the direct disposal of organic matter in to the lake should be strictly prohibited.The DO ranges from 5.0 mg/l – 7.0 mg/l, high DO was recorded in August, October and lower was recorded in March and April of 2008.The BOD ranges from 6.0 mg/l – 8.9 mg/l, high BOD was recorded in April, March and February 2008 and lower was recorded in November and December of 2007.It is the indicator of water pollution and also indicated that amount of organic matter in such water is more. It shows that water samples of Yelahanka Lake are polluted. Therefore, it is required further treatment.The salinity ranges from 367 mg/l – 438 mg/l, high Salinity was recorded in May, March 2008 and lower recorded Juneand July of 2007.Salinity is the saltiness or salt dissolved content of water body. It is a general term used to describes the levels of different salts such as sodium chloride, magnesium and calcium sulfates and bicarbonates. Salinity is an ecological factor of considerable importance, influencing the types of organisms that live in water body. As well, salinity influences the kinds of plants that will grow either in a water body, or on land .The phosphate ranges from 0.30 mg/l – 0.50 mg/l, high phosphate was recorded in November, September and lower recorded in February, March and January of 2007.Phosphate considered as a key nutrients in the productivity. It is necessary for the fertility of fresh water.The nitrate ranges from 0.27 mg/l – 0.50 mg/l, the high nitrates was recorded in November, October and lower recorded in February, March of 2007.It is an important factor for controlling the occurrence and abundance of phytoplankton maximum values during monsoon months revealed that the lake water derived nitrate from allchitinous impact through influx of rain water from catchment area. The higher concentration of nitrate is an indicator of organic pollution and eutrophication. The sulphate ranges from 0.52 mg/l – 0.93 mg/l, the high sulphate was recorded in October, September and August and lower was recorded in

April, October and December of 2007. The iron ranges from 0.5 mg/l – 1.8 mg/l, the higher concentration of iron was recorded in March, April, February and lower was recorded in July, May and September of 2007. In water it occurs mainly in the divalent or bivalent state (ferrous and ferric). The surface water ironis present in the form of ferric state. The fluoride ranges from 0.23 mg/l - 0.63 mg/l, the higher fluoride was recorded in May, July and October and lower was recorded in June, August of 2007. Fluoride in water derives mainly from dissolution of natural minerals in the rocks and soils in which water interacts. The most common fluorine – bearing minerals are lourie, apatite and micas. Fluoride problems therefore tend to occur where the element is most abundant in the host rocks.

DISCUSSION

Water is the most vital resource for all kind of life on this planet. It is also the resource which has been adversely affected both qualitatively and quantitatively by all kind of human activities on land and water. The increasing industrialization, urbanization and developmental activity and consequent pollution of water resources have brought acute levels of water crisis. Today, most of the lakes receive million liters of sewage, domestic waste, industrial waste, agricultural runoff contains several kinds of harmful substances.The pH value of Yelahanka Lake recorded 7.0-8.2; the pH was found above 7.0 in all the lakes making them alkaline that may be due to the presence of alkine substance, detergents as a component of industrial effluents and household sewage. The pH values were mostly within desirable limits prescribed by (ICMR, WHO). A pH range of 6.7 and 8.4 is considered to be safe for aquatic life and to maintain productivity. However, pH below 4.0 and above 9.6 are hazardous to most life forms. pH gives an idea to the type and intensity of pollution [24] and [25] that pH is considered a very important single factor which influences aquatic production [26]. Alkalinity of water is its acid neutralizing capacity. The alkalinity value of Yelahanka Lake ranges from 8.2 NTU – 10.7 NTU. The variation in total alkalinity may be due to the seasonal effect, planktonic population, bottom deposits. According to [27] high alkalinity values are indicative of the eutrophic nature of the water body. The increase of alkalinity content might be due to fact that the accidental mixing amount of industrial substances in low water quality and high evaporation rates. Similar observation was also reported by [28]. [29] explained that the maximum in summer months induce to the results of evaporation. Turbidity of water is actually the expression of optical property in which the light is scattered by the particles present in the water. Turbidity ranges from 8.2 NTU – 10.7 NTU. Turbidity has been considered as alimiting factor for biological productivity in fresh water [30]. Turbidity in water

is caused by suspended matter such as clay, organic matter, plankton and other microscopic organisms that interfere with the passage of light through the water. Conductivity is good and rapid measure of the solids. Yelahanka lake recorded ranges from 838µmhos/cm - 1213 µmhos/cm, the values observed in Yelahanka lake are very much higher than the prescribed standards limits (1400 µmhos/cm) recommended by W.H.O. Conductivity increases with increasing amount and mobility of ions and also can be used an indicator of water pollution. Higher the values of dissolved solids, greater the amount of ions in water [29]. The conductivity of the common bicarbonate type of Lake Water is closely proportional to concentration of the major ions[31]and [32]. High levels of conductivity reflect on the pollution status as well as tropic levels of the aquatic body [33]. Conductivity is an easily-obtained parameter that is a good indicator of the amount of dissolved solids in water and thus can be used to detect contaminants in water.

Chemical oxygen demand (COD) is the amount of oxygen required by the organic substances in the waste to oxidize them by strong chemical oxidant, but it does not suggest whether the waste is degradable basically or it indicates the rateat with biological oxidation would proceed and hence, the rate at which oxygen would be required in a biological system. However it gives us a reliable parameter for judging the extent of pollution in water.Dissolved oxygen (DO) is one of the important parameter in water quality assessment. Its presence is essential to maintain variety of forms of biological life in the water and the effects of waste discharges in a water body are largely determined by the oxygen balance of the system. Dissolve oxygen values ranges from 4.0 mg/l – 7.8 mg/l.The highest D.O. recorded during monsoon and post monsoon months, it may be due to the impact of rain water resulting in aeration[34], [35] and[36]. The lowest DO values exhibited at summer months as a result of the accumulation of oxygen demanding effluents. The biological oxygen demand is the indicator of water pollution. It represents the amount of oxygen required for microbial degradation of organic matter. The standard value of BOD for drinking water is less than 5mg/l. The values range from 5.0 mg/l – 10.2 mg/l, compared to standard limits of W.H.O therefore, it is required further treatment. BOD, a relative oxygen demand is the amount of oxygen required for the biochemical degradation of organic material and the oxygen used to oxidize in organic material such as sulphides and ferrous ions [37].The salinity ranges from 292 mg/l – 447.5 mg/l. Salinity is the saltiness or salt dissolved salt content of water body. It is a general term used to describe the levels of different salts such as sodium chloride, magnesium, calcium sulfates, and bicarbonates, salt influencing the types of

organisms that live in water body. Phosphates generally considered as a key nutrient in the productivity. It is necessary for the fertility of fresh water. The phosphate values ranges from 0.26 mg/l – 0.53 mg/l, Phosphate emphasized that weathering of phosphorus bearing rocks, leaching of the soils are the main sources of phosphorus to natural waters [38] and [39] established at the importance of phosphate as a nutrient element in the growth of microscopic algae and is responsible for the maintains the lakes productivity. Nitrate is the most highly oxidized form of nitrogen compounds commonly present in natural waters. Nitrate is an important factor for controlling the occurrence and abundance of phytoplankton. The nitrate values range from 0.27 mg/l – 0.50 mg/l. Maximum values during monsoon months revealed that the lake water derived nitrate form allochitionous input through influx of rain water from catchment areas. All the values within the desirable level of (45 mg/l.) prescribed by ISI and 20mg/l(ICMR.). The higher concentration of nitrate is an indicator of organic pollution and eutrophication. [40] stated that nitrate was generated by heterotrophic microbes as a primary end product of decomposition of oxygenic matter either directly from protein or organic compound.[41]stated that presence of excessive nitrate in water is due to manmade domestic activities, fertilizers farm f ields. Sulphate usually occurs in natural waters. They contribute to the permanent hardness sources like sulphate rocks such as calcium Sulphate and Sulphur minerals such as pyrites and also due to air and water pollution sulphate contribute to the total solids content and reduce anaerobic condition due to production of hydrogen sulphide, which gives a rotten egg odour to the water. Sulphates value ranges from 0.52 mg/l – 0.93 mg/l. The high concentrations of sulphates have been reported and high concentration of sulphates stimulus the action of sulphur reducing bacteria which produced hydrogen sulphide gas highly toxic to fish life. Higher concentration of sulphates were observed and could be attributed due to run off from the agriculture land during flood in the monsoon period and sulphate enters into the lake water body from the catchment area through surface runoff and domestic waste water.The iron ranges from 0.5 mg/l – 1.8 mg/l, in water it occurs mainly in the divalent or bivalent state (ferrous and ferric). The fluoride ranges from 0.23 mg/l 0.63 mg/l, Fluoride in water derives mainly from dissolution of natural minerals in the rocks and soils in which water interacts. The most common fluorine – bearing minerals are lourie, apatite and micas. Fluoride problems therefore tend to occur where the element is most abundant in the host rocks. On the basis of the physico-chemical characterstics of Yelahanka lake water polluted and not safe for drinking purposes. The values of different parameters evaluated fall for below the acceptable limits in the lake studied necessary to drink water after treatment, boiling and filtrations.

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