

Limnological Study of Kanavi Karavina Koppa Minor Irrigation Tank of Belagavi District, Karnataka

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ABSTRACT: Wetland water quality degradation have been apparent for decades, especially wetlands situated near the city and habitations. An attempt has been made to know the water quality of Kanavi Karavina Koppa water tank between June 2015 to May 2016. Water samples were collected and brought to the laboratory for analysis of various parameters. Concentrations of investigated parameters were within the permissible limits as prescribed by WHO and BIS throughout the study period. Water tank is constructed for irrigation as well as drinking purposes for villagers. There is lot of anthropogenic activities such as bathing, cleaning, washing cloths and domestic animals etc. Thus, it is advisable that people from this area uses water for domestic purpose must be limited. Awareness about the importance of water should be given to the surrounding villagers. The study revealed that the ranges of physico-chemical parameters of water were within the permissible limit of healthy systems and could support diverse flora and fauna and at present suitable for drinking and agriculture.

KEYWORDS: Water quality, K.K.Koppa, Physical factors, Chemical factors, Irrigation tank

I. INTRODUCTION

Civilization have depended on water bodies such as lakes, and wetlands. Water is not only to sustain human life but also to support the activities that form the basis for thriving economics. Though the water resources are essential to human societies who could pollute the water for their benefits.

India is the bestowed with many large and small water bodies through out the country. These are of immense importance as a source of water for various uses. The water bodies especially pond, man made ponds and puddles are diverse in their water quality which in turn provides diverse environment for the micro fauna. In the present scenario urban lakes/ponds are under direct threat of qualitative and quantitative degradation by means of pollution. Anthropogenic activities such as domestic sewage, run off from agricultural land, laundering increases pollution load and alters physico-chemical properties. Variation in these properties influence the distribution and richness of the aquatic organisms. In the last few decades, there has been a growing necessity for conservation our sources. Assessment of water quality is based on the physico-chemical parameters. The healthy aquatic system supports a varied and rich community of organisms [1].

Most of the rivers of the world are so depleted and polluted that they endanger human health [2]. Providing drinking water is a challenging task, because of various reasons like poverty, illiteracy, lack of awareness [3]. Water quality assessment can be made either by monitoring the physical chemical properties of water or by analyzing inhabiting biota. Physico-chemical factors govern the quality of drinking water. Water bodies are contaminated by various hazardous pollutants. Some times contamination particularly of animal waste rushed to the water body during rainy season. If the catchment area is less and steep, running water brings not only contaminants but also soil particles make the water unsuitable for drinking. Considerable hydrobiological investigation are carried out as the man made lakes in

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India [4,5,3&6]. However no such studies are reported from K.K.Koppa water body of Belagavi. Therefore present work was undertaken. Water of this tank utilized for agriculture and domestic use.

II. MATERIALS AND METHODS

Observation of water quality parameters was made between June 2015 to May 2016. K.K.Koppa water tank was constructed as a minor irrigation tank for agriculture and drinking purpose. Its catchment area is only 90.24 sq Kms and it can able to supply water to about 300 Ha. This water body is located between 15° 45' 46" North latitude and 74° 35' 08" East longitude. The monitoring the water quality was carried out for one year at monthly intervals.

Samples were collected in 2 liter PVC containers and were analyzed for the physico-chemical parameters. For the analysis of physico-chemical factors the surface water was collected from fixed spots of the tank every month between 6 am to 8 am for a period of one year. Physical parameter such as temperature and pH were analyzed at site by thermometer and broad range pH paper. Chemical parameters such as total hardness, chloride, TDS, TH, sulphate, DO, BOD and iron were analyzed in the laboratory by following procedures of standard methods. DO by using Winklers azide modified method, total hardness by EDTA titrimetric method, sodium and potassium by flame photometric method, chloride by using argentometric method. The results were evaluated in accordance with the standards prescribed under Indian standard drinking water specifications [7, 8] standard and Chemical and biological methods for water pollution [9]. The present study was undertaken to investigate the water quality of the K.K.Koppa water tank. The results are discussed in the light if available literature with comments on recorded ecological correlations. Except temperature and pH rest of the parameters are expressed in mg/l. All values are statistically evaluated.

III. RESULTS AND DISCUSSIONS

The importance of physico-chemical parameters in assessing the quality of water has been well documented. The data on physico-chemical analysis has been depicted in Table 1, seasonal variations of physico-chemical parameters and simple correlation coefficient test is presented in table 2 and 3 respectively. The physico-chemical factors may vary substantially at different seasons of the study period, and vary place to place and time to time.

Temperature is basically important parameters and affects on the chemical and biological in the organisms of water [9]. The temperature of tank water ranged from 21.1°C to 30.8°C in different seasons. The water temperature is always lower than air temperature. The reason for higher temperature values can be attributed to low water level, low velocity, clear atmosphere and greater solar radiation while its lower values can be explained due to frequent clouds, high percentage of humidity, high current velocity and high water levels. The water temperature was high due to the low water levels and high air temperatures. Water temperature plays an important role which influences chemical, biological characteristics of water body

pH is a vital characteristic of any aquatic ecosystem since all the biochemical activities and retention of physico-chemical attributes of the water are greatly depend on pH of the surrounding water [10]. Most of the similar study suggested that water samples are slightly alkaline due to presence of carbonates and bicarbonates [11,12,13 &3].

During the present study water pH values were found to be 7.0 to 8.0. It is indicating that it possesses alkalinity nature throughout the study period. The high values may be due to the sewage discharged from agricultural fields and higher temperatures. PH values were important for plankton growth [14]. Earlier studies reported by [15] recorded that The pH of water effects many chemical and biological process in water. The largest variety of aquatic animals prefer a range of 6.5- 8.0. Seasonally it shows variation in its values.

BOD is the amount of oxygen utilized by microorganisms in stabilizing the organic matter. On the average basis, the demand for oxygen is proportional to the amount of organic waste to be degraded aerobically. BOD is an important parameter to assess the pollution of surface water where the contamination occur due to disposal of domestic effluents.

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	Wt	pH	BOD	DO	TDS	EC	Cl	TH	Ca	mg	So4	Fe
Jun	22	7.1	0.7	7.3	196	320	50	40	9.8	3.8	14	0.3
Jul	22.1	7.4	0.9	7.6	220	300	48	46	10.4	6.1	22	0.3
Aug	21.1	7.4	0.8	7.4	235	248	32	48	10.2	4.2	20	0.3
Sept	22.4	8	0.7	7	180	270	62	56	9.9	3.8	24	0.3
Oct	24	7	0.4	7.8	96	180	72	38	9.1	4.9	18	0.2
Nov	24.6	7.1	0.3	7.7	80	260	102	48	10	3.9	22	0.2
Dec	26	7.4	0.5	8.2	68	230	98	60	12.5	4.8	18	0.25
Jan	27.8	7.6	0.55	8.1	82	180	80	82	13.6	5	16	0.18
Feb	28	7.2	1	7.4	160	360	118	120	20	9.5	48	0.4
Marc	28.8	7.6	1.2	7.2	130	370	110	110	30	8.6	60	0.35
Apr	30	7.8	0.8	7	162	315	130	62	14	4.6	38	0.45
May	30.8	7.4	1.3	6.8	122	362	76	86	18.2	8	30	0.3

Table.1: Monthly variation in physico-chemical parameters of K.K.Koppa water Tank of Belgaum district.

Table shows the variation in the parameters during the study period.

[WT=water temperature, pH= hydrogen ion concentration, EC=Electric, conductance Turb=turbidity, TDS=Totaldissolved solids, TH=Total hardness, DO=dissolved oxygen, BOD=Biochemical oxygen demand] [Except WT, pH, Turb and EC all values are expressed in mg/l]

The main source of organic pollution include untreated domestic sewage. In the present study BOD values ranged between 0.3 mg/l and 1.2 mg/l. The BOD values were higher in summer could be a result of reduced water level, degradation of organic matter and accumulation of waste due to anthropogenic activities, while low BOD during monsoon could be attribute to the dilution of water. Similar observations were recorded by [16] in Tunga river at Shivamogga. Statistically it is significantly negatively correlated with DO ($r=-0.686$), positively correlated with EC ($r=0.823$), TH ($r=0.635$), Ca ($r=0.712$) mg ($r=0.760$).

Dissolved oxygen is a most important aquatic parameter; it is vital to aquatic fauna. It plays an important role in the respiration process. Adequate DO is necessary for good water quality. In the present study, the DO values ranged from 6.8 mg/l to 8.2 mg/l. [17&18] stated that the DO concentration of about 5mg/l throughout the year was found to be productive for Fish culture. Seasonally minimum values observed in summer as temperature increases DO values decreases, in winter recorded maximum DO values because of cold water holds more oxygen. As DO levels in water drop below 5.0 mg/L, many life forms are put under pressure [19]. But in the present study values were almost 7 and above. Statistically, it is negatively correlated with TDS ($r=-0.507$) and EC ($r=-0.736$).

Total dissolved solids denote mainly the various kinds of minerals present in the water. Dissolved solids do not contain any gas and colloidal etc [20]. The concentration of dissolved solids is an important parameter in drinking water and other water quality standards. TDS values ranged from 68 mg/l(Dec) to 235 mg/l (Aug). The values are low as compared with the IS standards. The lower values are indicative of non industrial pollution. Higher values were observed in the month of August which is indicative of erosion that takes place during rain.

Similar observations recorded by [21]. Maximum values recorded in monsoon and minimum values were in winter season. Electrical Conductivity of water is the ability of water to conduct electrical current. Conductivity in water is due to the presence of inorganic dissolved compounds like nitrate, sulphate, chloride, phosphate, sodium, magnesium,

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calcium, iron and aluminum ions. Conductivity of water also depends upon temperature, concentration and mobility of the ions. The Electrical Conductivity were found from 180 μmhos (Oct & Jan)to 362 μmhos (May), which are well within the permissible range and makes the water suitable for drinking. The EC values shows marked seasonal variation being maximum during summer and minimum in monsoon season, similar observations recorded by [22]. Statistically it shows positively significant with total hardness, calcium, magnesium, sulphate and iron.

The most important source of chloride in natural waters is the discharge of sewage. In very high concentration it gives salty taste and it is variable and dependent on chemical composition of water. In this study, chloride was found in range of 32 mg/l (Aug)to 118 mg/l(Feb). similar observation reported by [23]. Potable water has been shown to contain negligible amount of chloride. [24] opined that water bodies of urban areas are found to contain more chloride than rural water bodies because of high input of city wastes. Maximum values recorded in summer. High concentration of chloride may indicate high concentration of pollutant. High chloride content indicates deterioration of water quality linked with sewage. High values of chloride may be associated with high temperature which enhances the evaporation reducing the volume of water, thus resulting in high concentration of salts. Statistically significantly correlated with TH ($r=0.576$), Ca ($r=0.540$) and SO₄ ($r=0.641$). The values observed in present study were in the range of permissible limit.

In the present study, total hardness ranged from 38 mg/l to 120 mg/l in different seasons. Hardness often employed as indicator of water quality depends on the concentration of carbonates and bicarbonate salts of calcium and magnesium or sulphate, chloride or other anions of mineral acids. Hardness is inversely proportional to water volume and directly proportional to rate of evaporation. Statistically significantly correlated with Ca($r= 0.878$), magnesium($r= 0.867$) and sulphate($r= 0.804$). The total hardness was below the desirable limits of 300 mg/ L.

Calcium is considered to be more important because it is an integral part of plant tissue as well as it increases the availability of other ions. It is considered as a basic inorganic element of algae and regarded as a nutrient for various metabolic processes. Calcium is essential for maintenance of the structural and functional integrity of cell membrane in ion absorption. (Yelvigi 2016) Calcium is found in great abundance in all natural waters as its main source is weathering of rocks from which it leaches out. Values of calcium are varied between 9.1 mg/l to 18.3 mg/l. The present findings reveal that calcium content was higher in summer and lower in monsoon months. Similar findings recorded in Almatti reservoir [22]. Magnesium values are very less compared with the calcium. Calcium and magnesium play an important role in antagonizing the toxic effects of various ions.

Table 2: Average seasonal variations in the physico-chemical parameters in K.K.Koppa water Tank during the study period.

	Monsoon	Winter	Summer
Water temp	21.9	25.6	29.4
pH	7.48	7.28	7.5
BOD	0.77	0.43	1.07
DO	7.52	7.95	7.1
TDS	207.8	81.5	143.5
EC	284.5	212.5	351.75
Cl	48	88	108.5
TH	47.5	57	94.5
Ca	10	11.3	20.55
Mg	4.47	4.65	7.67
SO ₄	20	18.5	44
Fe	0.3	0.2	0.37

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Magnesium is found in various salt and minerals, frequently in association with iron compound. Magnesium is vital micronutrient for both plant and animal. Magnesium is often associated with calcium in all kind of water, but its concentration remains generally lower than the calcium [25]. In the present study values were recorded from 3.8 mg/l to 9.5 mg/l. Magnesium is essential for chlorophyll growth and acts as a limiting factor for the growth of phytoplankton [26].

Table shows the seasonal variations of the parameters during the study period.

Sulphate itself has never been a limiting factor in aquatic ecosystems. Sulphate ion is one of the important anions present in natural water and produces a cathartic effect on human beings when present in excess amount [27]. In the present study sulphate values ranged between 14 mg/l (Feb) to 60 mg/l (May). Seasonally they were maximum in summer and minimum in winter.

Table 3: Simple correlation test between water parameters of Kanavi Karavina Koppa water Tank.

	Wt	pH	BOD	DO	TDS	EC	Cl	TH	Ca	mg	SO4	Fe
Wt	1	.221	.454	-.225	-.494	.388	.770**	.717**	.680**	.603*	.598*	.345
pH		1	.277	-.370	.178	.108	.129	.201	.193	-.069	.251	.368
BOD			1	-.686**	.394	.823**	.065	.635*	.712**	.760**	.666**	.637*
DO				1	-.507*	-.736**	-.021	-.206	-.305	-.258	-.463	-.669**
TDS					1	.369	-.537*	-.187	-.151	-.046	.036	.518*
EC						1	.289	.547*	.642*	.650*	.719**	.756**
Cl							1	.576*	.540*	.402	.641*	.392
TH								1	.878**	.867**	.802**	.414
Ca									1	.827**	.898**	.443
mg										1	.774**	.418
SO4											1	.684**
Fe												1

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).

Iron: Iron was found ranging from 0.18 mg/l to 0.45 mg/l in water samples from study area. Fe content for most of the samples was within the limit which indicates that water is fit for drinking.

IV. CONCLUSION

The results revealed that majority of the sampling stations had permissible range of concentrations of salts while some of them are highly polluted. The parameters in most of the water samples are in normal range and indicated better quality of water. It is advisable that people from this area who use water for domestic purposes must be limited. Awareness about the importance of water should be given to the surrounding villagers. The study revealed that the ranges of physico-chemical parameters of water were within the permissible limit of healthy systems and could support diverse flora and fauna.

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