



PHYSICO-CHEMICAL PARAMETERS OF KAMENAHALLI STREAM WATER IN CHIKMAGALUR, KARNATAKA

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Abstract:

In the present study an attempt has been made to find out the water quality of Kamenahalli stream in Chikmagalur, Karnataka during August and September 2016. The study was conducted to measure various physico-chemical parameters like temperature, pH, electrical conductivity, free carbon dioxide, chloride, total dissolved solids, dissolved oxygen, total alkalinity, total hardness and radon. The investigation revealed that there is a moderately oligotrophic status of the studied stream and hence, preventive measures are required to avoid further deterioration of the water quality. The estimated water quality parameters were compared with the WHO and BIS standards.

Key Words: Physico-Chemical Parameters, Kamenahalli Stream & Chikmagalur

Introduction:

Today, pollution of the water bodies is increasing due to rapid population growth, industrial proliferation, urbanization, increasing living standards wide ranges of human activities. In India too, studies on the problem of water pollution started quite early but water quality studies were given attention only during the last few decades when the situation become alarming (Oinam and Belagali, 2006). Water contamination with pathogens and pollutants create many health problems for the consuming the water. As such water quality in relation to human health is an important fact of limnology, even though ecological interrelationship, species diversity and physico-chemical properties of lakes have received considerable attention (Krishna et al., 2009; Biradar et al., 2014; Basavaraja and Kiran, 2016; Kishore Gujjar and Kiran, 2017). Streams and rivers drain water that falls in upland areas. Moving water dilutes and decomposes pollutants more rapidly than standing water but many rivers and streams are significantly polluted all around the world. A primary reason for this is that of all three major sources of pollution (industry, agriculture and domestic) are concentrated along the rivers. Industries and cities have been located along the rivers because the rivers provide transportation and convenient place to discharge waste (Sunkad, 2013). A perusal of available literature has revealed that there is no scientific study carried out with respect to ecological characteristics of this stream. Hence, the present investigation is carried out in relation to physico-chemical characteristics of water in Kamenahalli stream of Chikmagalur, Karnataka.

Materials and Methods:

Study Area:

The present investigation be carried out to assess the status of the water in Kamenahalli stream of Chikmagalur district. The study area is located at 13°19'N latitude and 75°46'E longitude. The stream waters which was selected for study are used for agriculture and partly for human recreational activities. The climatic condition of the study area during study period was rainy.

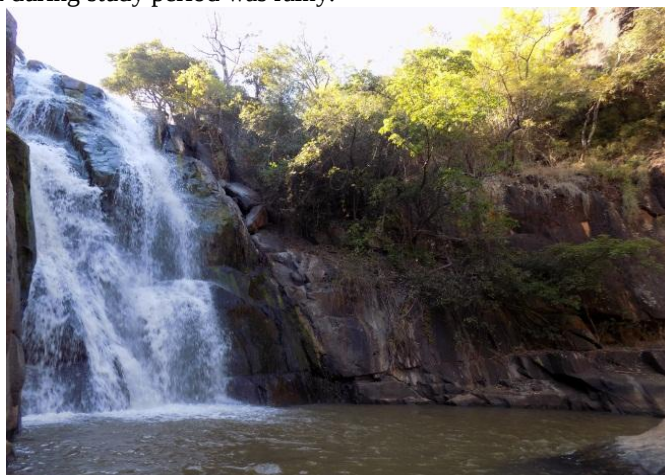


Figure 1: A View of Kamenahalli Stream

Methods:

The present study was conducted during the period from August to September 2016. During the study period, the surface water samples were collected in clean black plastic cans between 9.00 AM to 10.00 AM. Later the data was pooled together and represented as weekly data of the pond. Water temperature was recorded with help of mercury thermometer and pH was analysed by using pH meter and both the parameters were recorded on the sampling site itself. The samples for dissolved oxygen were fixed immediately on the spot itself. The remaining parameters like free CO₂, hardness, alkalinity, chlorides were analyzed as per the methods described in standard procedures (Trivedy and Goel, 1986; APHA, 1998). Radon in water has been analysed by using RAD7 an electronic Radon detector. The WHO and BIS standards for drinking water quality were used for comparison.

Results and Discussion:

Figure 2 shows average water quality data of the Kamenahalli stream. The average water temperature of the stream was 24°C. pH of the water was slightly alkaline with 7.8 and average EC value of 15.5 µmhos/cm recorded. The total hardness and chloride of the water were 109.95 mg/l and 9.49 mg/l respectively. The Dissolved oxygen (DO) recorded with 6.31 mg/l and Free CO₂ values with 2.66 mg/l. Total alkalinity of Kamenahalli stream showed 86.93 mg/l. Average TDS recorded with 129.75 mg/l and radon concentration of the water was 0.66 Bq/l (Figure 1). Drinking water standards as per WHO and BIS standards are presented in Table 1. Figure 3 and 4 depict the weekly variations in water quality data of Kamenahalli stream at station I and II respectively. The water temperature of Kamenahalli stream varied from 22°C to 26°C. In an established system the water temperature controls the rate of all chemical reactions, and affects organisms' growth, reproduction and immunity. Patil et al. (2012) reported that drastic temperature changes can be fatal to aquatic organisms. Electrical conductivity (EC) is the capacity of an solution to conduct the electric current. EC is an index to represent the total concentration of soluble salts. The conductivity values were found to vary from 8.3 to 24.1 µmhos/cm. Sayeswara et al. (2010) reported that the higher values of conductivity was due to increase in the concentration of minerals and organic matter.

The acidity or alkalinity of water is measured in terms of its pH or hydrogen ion concentration. Neutral water has the pH value of 7.0. If the pH value is less than 7.0, the water is acidic. Similarly, the water is alkaline, if the pH value is more than 7.0. pH values are found slightly acidic to slightly alkaline and found within permissible limit of 6.5 to 8.5 as per the Bureau of Indian Standards (BIS). The pH is important since aquatic organisms are well adapted to specific pH range and do not withstand abrupt changes in it (Khadsan et al., 2003; Sayeswara et al., 2011). During the present study, pH values fluctuated from 7.7 to 7.9. In this study, free CO₂ values fluctuated from 0.50 to 7.1 mg/l respectively. The variation of CO₂ was due to the absorption by plants for photosynthesis and activity of other living organisms. The abundance of carbon dioxide exerts certain specific effects on aquatic biota (Chandanshive et al., 2008). The total alkalinity of Kamenahalli stream ranged from 66 to 101 mg/l. Alkalinity in the water samples is primarily a function of carbonate, bicarbonate and hydroxide content. It is within permissible limit of 200 mg/L (BIS, 1991). Alkalinity around 150 mg/L has been found conducive to higher productivity of water bodies (Ball, 1994). The above results clearly indicate that the water body in the present study was found to be less productive.

Dissolved oxygen is another vital parameter regulating survival of aquatic life. The variations of DO depend on the primary production and respiration of aquatic organisms. From the above data the higher DO values of Kamenahalli stream (4.45 mg/l to 8.12 mg/l) may be due to presence of biotic components (i.e. aquatic plant) releasing oxygen and it may be due to higher interference of atmosphere air with the aquatic bodies. Chloride levels less than 10 mg/l are desirable. Level more than 250 mg/l may cause a salty taste. Chloride content in fish ponds is important to know the quality of water and sources include fertilizers from surrounding areas and animal wastes. In the current study, the chloride of Kamenahalli stream is found to be from 5 mg/l to 14 mg/l. show that chloride content is below than the maximum permissible limit prescribed by the WHO standards (WHO, 1971; Kiran, 2010). Total 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 salts or both (Trivedy and Goel, 1986). The total hardness of Kamenahalli stream water ranged in between 93 mg/l & 135 mg/l indicating the water is moderately hard. Total hardness of water is not a pollution parameter but indicates water quality mainly in terms of Ca²⁺ and Mg²⁺ contents. Total hardness above 200 mg/L is not suitable for domestic use in drinking and cleaning (Sayeswara et al, 2011).

Total Dissolved Solids (TDS) refer to suspended and dissolved matter in water. They are very useful parameter describing the chemical constituents of the water and can be considered as general of edaphically relation that contributes to productivity within the water body (Goher, 2002). In the present study, TDS values ranged from 90 to 200 mg/l. It is observed that the stream water belongs to good class category (160 – 480). Radon in the Kamenahalli stream water of Chikmagalur area was measured. The highest concentration recorded was 1.24 Bq/l while, lowest was found with 0.2 Bq/l. The overall concentration of radon in the surface water of the studied stream is found to be below the permissible limits. The information of physico-chemical parameters under study exhibits that the stream water is not eutrophicated. In the light of standard of water quality

recommended by WHO and Indian standard, the stream water should be used by the human beings especially for drinking and cooking after water treatment. Stream water is fit for aquaculture and irrigation.

Conclusion:

The results of physico-chemical study have revealed that the Kamenahalli stream is not contaminated so much by human activities. In the light of standard water quality recommended by WHO and BIS, the stream water should be used by human beings especially for drinking and cooking after proper treatment. Almost all the physico-chemical parameters in selected water body was within desirable limits. Nevertheless, government authorities should take necessary steps to beautify the stream before reaching eutrophic condition. To improve quality of water, there should be continuous monitoring of water in Kamenahalli stream of Chikmagalur, Karnataka. Further our study suggests that the water body which is present in Chikmagalur have to be well maintained by the respective authorities. The water quality of the stream is free of contaminants and serves as a suitable habitat for aquatic life.

Recommendations:

- ✓ It is necessary to develop biological criteria for assessing the quality of water. Hence, attention must be devoted to the critical analysis of the biological data. Field oriented biology is highly desirable at the moment for the real progress on bio-monitoring studies.
- ✓ Awareness among the public about the importance of water body and their sustainable exploitation should be created.
- ✓ It is obvious that, to maintain the healthy conditions of stream, the catchment area should be protected from the adverse effects of human activities.
- ✓ The concentration of physico-chemical factors in the stream are suitable for aquatic life.

References:

1. American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF). 1998. Standard Methods for the Examination of Water and Wastewater 20th Edition. United Book Press, Inc., Baltimore, Maryland.
2. Ball, R.C.1994. Fertilization of Lake, Good or Bad, Michigan, Conserv, 7-14.
3. Banerjee, S.M.1967. Water quality and soil conditions of Ponds in some states of India in relation to fish production. Indian J. Fish, 14, pp. 115-144.
4. Basavaraja, D and B. R. Kiran. 2016. Seasonal variations in Physico-chemical parameters of Sagara Lake, Yadgir district, Karnataka. International Journal of Applied and Pure Science and Agriculture Volume 02, Issue 09:79-83.
5. Biradar N. V, Ambarish S. Sindagi , Bellad A. S, Jayarama Reddy, Ravi Navalur, Shivaraj Naykar , Mathews P. Raj, Sadashiv S. O and Chandrashekhara Unakal.2014. Assessment of physico-chemical and microbiological parameters of Kotur Lake, Dharwad, Karnataka, India. Int. J. Curr. Microbiol. App. Sci 3(2): 88-96.
6. BIS: 3025. 1993. Methods of sampling and Test (Physical and Chemical) for water and waste water, 1st Revision, 1- 2.
7. Chandanshive, N. E., P. M. Pahade and S. M. Kumble.2008. Physico-Chemical Aspects of Pollution in River Mula-Mutha at Pune, Maharashtra, J. Aqua, Biol, 23(2), 51-55.
8. Goher, M.E.M. 2002. Chemical studies on the precipitation and dissolution of some chemical element in Lake Qarun, Ph.D. Thesis fac. of sci., Al-Azhar University, Egypt.
9. Khadsan, R. E., V. Mangesh and V. Kadu, 2003. Drinking Water Quality Analysis of Some Bore Wells Water Chikhli Town, Maharashtra, J. Indus. Poll. Con., 20, 31-36.
10. Kiran, B.R.2010.Physico-Chemical characteristics of fish ponds of Bhadra Project at Karnataka. Rasayan Journal of chemistry Vol.3, No.4 (2010), 671-676.
11. Kishore N Gujjar & B. R. Kiran, 2017. "Assessment of Physico-Chemical Parameters of Hiremagalur Pond Water in Chikmagalur, Karnataka", International Journal of Multidisciplinary Research and Modern Education, Volume 3, Issue 1, Page Number 350-354.
12. Krishna H.R, Ramachandra M. M and Shivabasavaih, 2009. Microbial quality of total coli forms and fecal coli forms in eutrophicated water bodies of Bangalore Region, Karnataka, Indian, The Bioscan Journal, 4(3), 481-486.
13. Oinam J.D and Belagali S.K., 2006.Physico-chemical and Biological quality of drinking water in Mandya district, Karnataka, South Asian Anthropology, 16(1), 51-55.
14. Patil. P.N, Sawant. D.V and Deshmukh. R.N. 2012. Physico-chemical parameters for testing of water – A review. International Journal of Environmental Sciences Volume 3, No 3, 2012:1194-1207.
15. Sayeswara, H. A., Ravikumar Patil, H.S and Mahesh Anand Goudar.2010. Studies on physico-chemical parameters of Purle pond water of Shivamogga, Karnataka (India). Int. J. Chem. Sci.: 8(1), 2010, 582-588.

16. Sayeswara, H.A., Mahesh Anand Goudar and R Manjunatha.2011. Water quality evaluation and phytoplankton diversity of Hosahalli pond, Shivamogga, Karnataka (India). Int. J. Chem. Sci.: 9(2), 805-815.
17. Sunkad, B.N.2013. Study of water quality of Malaprabha River near Habbanatti, Belgaum, Karnataka. Scholars Journal of Engineering and Technology 1(4):198-203.
18. Trivedy, R. K., and Goel P. K.1986.Chemical and biological methods for water pollution studies, Environmental Publication, Karad, Maharashtra.
19. WHO guidelines for drinking water quality. 2nd edition. Recommendation. World Health organization Geneva, 1, pp 30-113.
20. WHO Geneva. 2008. Guidelines for drinking-water quality (electronic resource), 3rd edition incorporating 1st and 2nd addenda, Volume 1, Recommendations.
21. WHO, 1991. International Standards for Drinking Water, Geneva.
22. WHO, 1971. International standards for drinking water, WHO, Geneva.

Table 1: Drinking water quality standards as given by WHO & BIS standards

Parameter	Permissible limit	
	WHO, 1994	BIS (BIS 10500:1991)
Colour, Hazen unit, max	Nil	5.0
Turbidity, NTU	5.0	5.0
Dissolved solids	500	500
Total hardness	100	300
Calcium hardness	75	75
Magnesium hardness	30	30
Alkalinity	200	200
Dissolved oxygen	4-6	4-6
Chloride	250	250
Nitrate	45	45
Iron	0.3	0.3
pH	6.5-8.5	-
BOD	5	-
Potassium	12	-

Table 2: Physico-chemical characteristics of Kamenahalli stream during the study period

Area	Station I								Station II							
Month	August				Septembr				August				Septembr			
Week	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Temp.(°C)	22	22	25	25	25	24	25	23	24	25	22	23	25	26	25	25
pH	7.8	7.7	7.7	7.8	7.8	7.8	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.7	7.9	7.9
EC µmhos/cm	8.5	8.3	9.6	11.5	10.6	12.8	14.3	17.4	15.2	18.8	24.1	20.5	22.2	19.1	18.8	16.3
TH	93	101	106	108	110	112	116	120	95	102	105	109	112	116	120	135
Chloride	14	6	10	5	9	10	11	13	13	13	9	5	6	9	10	9
DO	4.45	4.9	5.3	6.9	4.8	5.9	7.9	6.9	7.9	6.2	5.9	6.8	4.9	8.12	6.2	7.9
CO ₂	0.5	0.6	7.1	1.97	2.1	0.9	1.2	3.1	0.52	0.7	7.04	3.59	3.2	2.97	2.69	4.5
Total Alk.	98	86	69	81	86	66	101	86	96	76	81	86	92	88	98	101
TDS	130	95	90	98	110	130	150	120	160	105	102	115	200	190	145	136
Radon	0.4	0.2	0.3	0.4	0.9	1.05	0.65	0.81	1.24	0.78	0.89	0.56	0.68	0.62	0.45	0.78

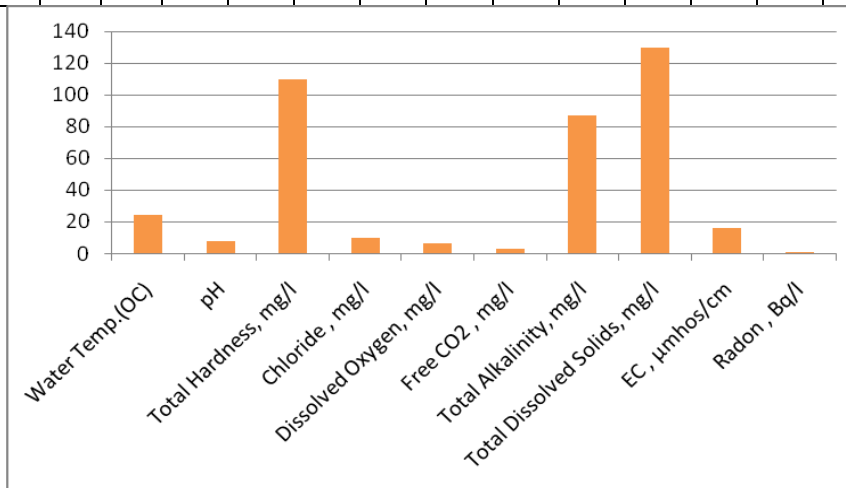


Figure 1: Average physico-chemical parameters of Kamenahalli stream

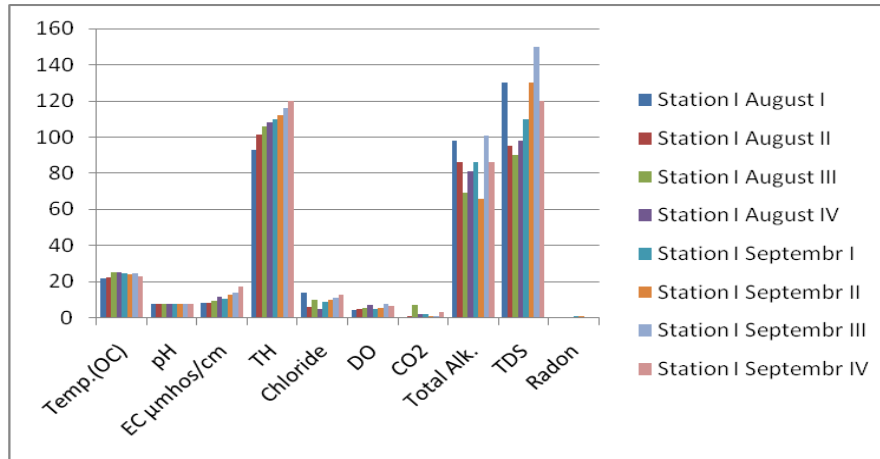


Figure 2: Water quality of Kamenahalli stream at station I

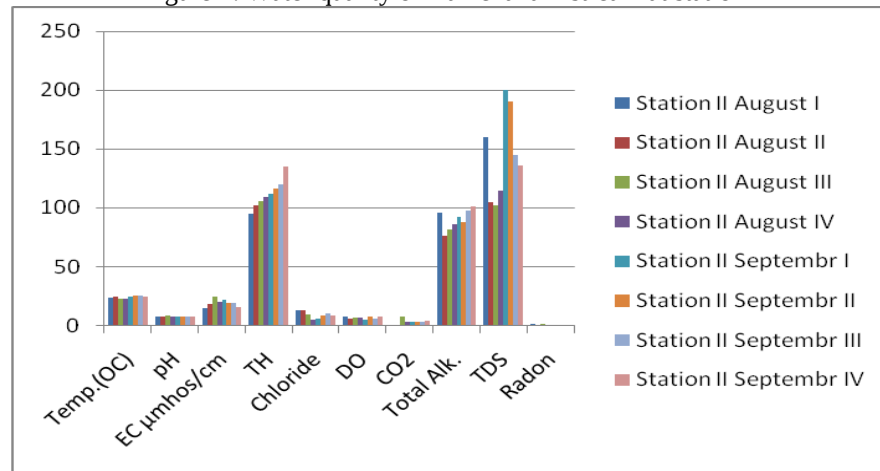


Figure 3: Water quality of Kamenahalli stream at station II