International Journal of Zoology Studies
ISSN: 2455-7269
Impact Factor: RJIF 5.14
www.zoologyjournals.com
Volume 2; Issue 6; November 2017; Page No. 261-263

Physicochemical nature of son river, Sidhi (M.P.)

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Abstract
The water quality has become a major concern due to over increasing human development activities that over exploits and pollute the water resources. Present investigations were carried out on the Physicochemical nature of Son river, Sidhi (M.P.). Many of the parameters were found below the permissible limits for drinking water as suggested by WHO (1997) [17]. A total of 09 parameters were analyzed and their seasonal variations in the year 2015-2016 were discussed.

Keywords: physicochemical, nature, son river, Sidhi

1. Introduction
Water is abundant in living organisms because of its special properties that have an intimate relationship to the functioning of the living matter, the relationship is so crucial that life is not possible without water. All the interactions of the molecules involved in living take place in a watery solution and water is the most versatile of solvents as more substances dissolve in it than in any other solvent. this is due to the water molecules being polar with a slight positive charge of their oxygen ends. So other molecules with unequal charges are attached to one or the other end of the water molecules. This is hydrogen bond. Water forms the major part of the living matter and its proportion varies from organism to organism and from tissue to tissue in the same organism. In present chapter of the thesis various characteristics of the water has been analyzed.

Water causes ionization molecules, such ionic dissociation is of great importance to many process in life, like the contractions of molecules, transmission of nerve impulses and membrane activities. A certain percent of water molecules themselves dissociate into hydrogen ions and hydroxyl ions. There is also re-association of them into waste molecules, thus maintaining a dynamic equilibrium, substances that increase or decrease the hydrogen ion concentration make the water medium more or less acidic. But the acidity is well regulated in the living system as it is of crucial importance for macromolecules that are highly sensitive to changes in the acidity of the medium.

The nature of water in relation to heat is of great importance to life. It is good conductor of heat and that helps to distribute heat in the body and prevent excessive heating of some part of another, water also helps by preventing any sudden rise in temperature as the latent heat of water is high and also absorbs heat without corresponding rise in temperature. Moreover, water is not only a solvent and medium of reaction but forms part of the structural and working machinery of life.

Limnology is a discipline that concerns the study of inland aquatic ecosystem (whether freshwater are saline, natural or manmade) including the biological, physical, chemical, geological ecological and hydrological aspects of lakes, reservoirs, ponds rivers, wetlands and ground water. At ime and historicaly, limnology is more specificaly defined as the study of lakes and open reservoirs (International year of fresh water 2003, Marcus 1959) [1-2] or as the study of fresh water system European Environment Agency, (2006) [3], or is limited to the study of physical and chemical elements but not the biological elements (Strom 1929) [4]. However, the broader and generaly acepted conception of limnology involves the study of al inland aquatic ecosystems including the biological aspects (Brezonik 1996 and Strom 1929) [5, 4].

2. Material and Methods
Sidhi is the Distt. of old Vindhya Pradesh. Presently it is one of the very important Distt. of Madhya Pradesh. Sidhi is situated on the North-East border of the state. The geographical location is $23^0$15'N - $24^0$15'N latitude and longitude $81^0$45'E- $82^0$45'E. The town is located on a plateau and is situated 65.7 meters above the mean sea level. The Son, Gopad, Son and Mahan rivers surround the town from almost three sites and mark its Northern, Southern and Western boundaries. Hills mark the Eastern boundary.

To study the water quality and its seasonal variations, the water samples are collected from the surface at a depth of 22 cm. from four different points, integrated and a representative sample was taken. Water samples were collected during morning hours in between 8.30 to 10.30 a.m. with one liter containers from the river in three seasons i.e. during summer, monsoon and winter seasons from April 2015 to March 2016. Sampling was done at four sites. Some of the results were recorded at the sampling sites whereas the others were recorded in the laboratory. The parameters observed were water temperature, Temperature of water (°C), Turbidity (NTU), pH, Alkalinity mg/l, Total Hardness mg/l, Chloride mg/l, DO mg/l, BOD mg/l and COD mg/l of the Son river. Samples of the water for physicochemical characteristics were analysed according to standard methods of APHA (1998) [6].

3. Results and discussion

The results of physicochemical analysis of three seasons are summarized in Table-1. The pH of the Son river is 7.20, 6.60 and 6.53 during the summer, monsoon and winter seasons. The highest value was noticed in summer season and lowest in winter season. Decline in pH during monsoon and winter seasons were attributed to the rains as it increase the amount of carbonic acid to the lake water (Khan and Chaudhary 1994, Kaushik *et al*. 1989) [7-8]. Huchinson (1975) [9] stated that if any aquatic system is neither higher alkaline nor highly acidic, the pH of the water is principally governed by the CO_2 - bicarbonate- carbonate system.

Table 1: Physico-chemical Parameters of Son river.

S. No.	Parameters	Seasons			
		Summer	Monsoon	Winter	SD
1.	Temperature of water (°C)	36	28	22	±7.024
2.	Turbidity (NTU)	020	288	093	±138.551
3.	pH	7.20	6.53	6.60	±0.368
4.	Alkalinity mg/l	133	122	166	±22.898
5.	Total Hardness mg/l	199	230	200	±17.616
6.	Chloride mg/l	190	86	92	±58.389
7.	DO mg/l	6.3	5.6	5.4	±0.473
8.	BOD mg/l	22.3	8.1	14.1	±7.128
9.	COD mg/l	48	32	166	±73.185

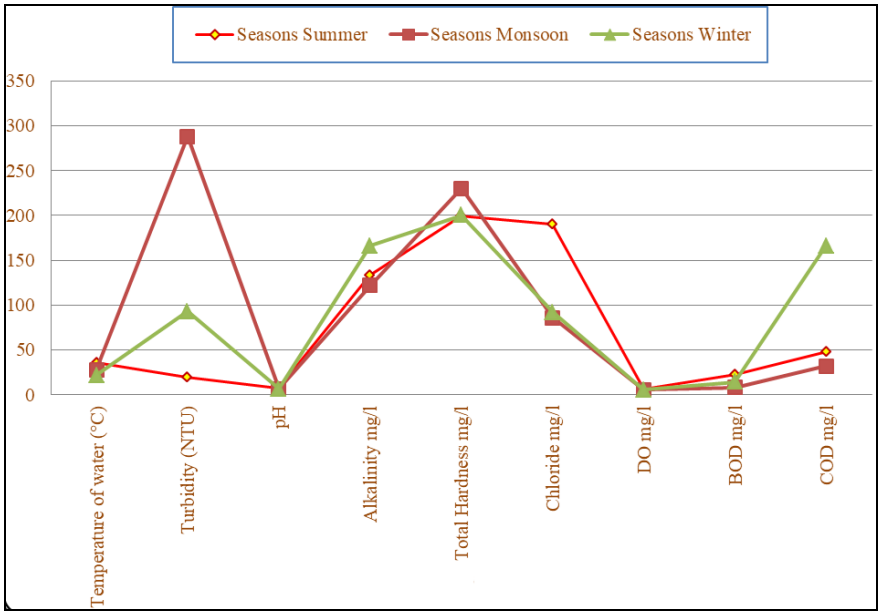

Fig 1: Graphics analysis of Physico-chemical Parameters

The variation was observed in the water temperatures in three seasons whereas a well marked seasonal variation in recorded. The temperature remained comparatively low throughout the study, which may be due to the presence of thick forest around it. Martin (1972) [10] stated that the clarity of water, presence of vegetation etc. are the factors mainly responsible for the daily fluctuations in water temperature. The alkalinity varied from 122 mg/l to 166 mg/l in three seasons, during which minimum value (122 mg/l) was observed in monsoon and the maximum (166 mg/l) in Winter season. The alkalinity of water is usually caused by the presence of carbonates, bicarbonates and hydroxyl ions and less frequently by borates, silicates and phosphates (APHA 1998) [6]. Total dissolved solids of the Son river were 6.3 mg/l in summer, which is the highest value and the lowest values 5.4 mg/l was noticed in winter. Total hardness value of the Son river was 199 mg/l to 230 mg/l of which higher value was in monsoon while the lowest in summer season. The maximum permissible limit for this parameter for drinking water standards is 500 mgl^{-l}. Chloride values were found ranging between 86 mg/l to 190 mg/l of which maximum value was noticed in summer and the lowest value in monsoon may be due to dilution effect in post winter period. Total BOD value of the Son river was 8.1 mg/l to 22.3 mg/l of which higher value was in summer while the lowest in monsoon season. The COD varied from 32 mg/l to 166 mg/l in three seasons, during which minimum value (32 mg/l) was observed in monsoon and the maximum (166 mg/l) in Winter season. Chourasia and Adoni (1985) [11] also found similar behaviour of chlorides in their studies on Sagar lake with summer maxima and winter minima. Cole (1975) [12] noted that free CO_2 supply rarely limits the growth of phytoplankton. It was quite opposite in relation to dissolved oxygen and phytoplankton population. Many earlier workers have also reported similar findings (Marshal and Falconer, 1973; Meckenzie and Gillespie, 1986; Ghavzan *et al*., 2006; Bhadja and Vaghela, 2013) [13-16].

5. Acknowledgement
The author is greatly indebted to Principal of Govt. S.G.S.P.G. College, Sidhi (M.P.) who very kindly permitted to carry out this work at the centre.

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