CORRELATION STUDY ON PHYSICO-CHEMICAL PARAMETERS AND QUALITY ASSESSMENT OF MANDAKINI RIVER WATER, CHITRAKOOT, SATNA, M.P.

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ABSTRACT
The present study was assumed to evaluate the physicochemical parameters of the determine concentrations in water of Mandakini river, Chitrakoot, Satna. The water quality parameters were measured for samples collected from six sampling stations throughout the year -2014. Obtained results were compared with the standard values of World Health Organization (WHO)" value as well as experimental results were analysed statistically with MS-Excel and SPSS software and Pearson Correlation Program. The results were as follows: Tem.26-29 C; pH:7.20-7.80 , TDS: 330-369 ppm, Ca hardness: 170- 194 ppm, Mg hardness 98-110 ppm, chloride:8.1-11 ppm , Nitrate 2.1-3.88 ppm. Significant positive and negative correlations were found among different physicochemical parameters from Pearson Correlation Program. The sources may be attributed to geo-chemical in the transformation weathering of soils and anthropogenic activities.

Key Words- River Mandakini, Water, Physico-chemical ,Correlation coefficient

INTRODUCTION

Water is god's gift to all living creatures from unicellular to multi cellular and from plants to animals on earth. The quality of water is of vital concern for human beings, since it is directly linked with human health. Water plays an important role in various life processes in the human body. In our daily life, water is used for drinking, bathing, cooking and washing purposes. But relentless increase in the demand of water for multipurpose brought about by the two interdependent and parallel lines of forces i.e. industrialization and urbanization, which is one hand usually reflects the all around development and progress but on theother hand posses strong concern about the fate of fresh water habitate. The requirement of water in all lives, from microorganisms to human beings, is increased day-by-day but it is a serious problem to provide a safe drinking water because all water resources have reached to a point of crises due to unplanned urbanization and industrialization. Water is the best solvent also called a universal solvent and the most abundant component on earth's surface comprising about 70% of earth's surface in solid, liquid and gaseous state. The impact of rapid urbanization on the water front is of great concern. Millions of people all over the World, particularly in the developing countries are losing their lives every year from water borne diseases. Numbers of obser vations are reported on the pollution of water resources. The anthropogenic activities and population pressure are the major cause of the degradation of water quality.

Aquatic ecosystems are particularly vulnerable to environmental change and many are, at present, severely degraded. The availability of good quality water is an indispensable feature for preventing disease and improving quality of life. The physico-chemical properties will also help in the identification of sources of pollution, for conducting further investigations on the ecobiological impacts and also for initiating necessary steps for remedial actions in case of polluted water bodies .Therefore, the nature and health of any aquatic community are an expression of quality of the water. In recent years, increase in human population, demand for food, land conversion, and use of fertilizer have led to faster degradation of many freshwater resources. The discharge of urban, industrial, and agricultural wastes has added the quantum of various harmful chemicals to the water body considerably altering their inherent physic chemical characteristics.

MATERIALS AND METHODS

Water samples were collected from six sites of river Mandakini during summer (March 2014). Sati Anusuiya, Sphatic Shila, Janki Kund, Ram Ghat, Karwi Bridge and Surya Kund. In the present study the sampling was done during morning hours and all water sample were collected the above sites from at 10-15 cm depth in pre-conditioned and acid

rinsed clean polypropylene bottles. The physico-chemical parameters were determined following the standard methods for the examination of water and wastewater (APHA).

The statistical analysis has been performed using standard methods. Karl Pearson correlation coefficient (r) was calculated and correlation for significance has also been tested by applying *t*-test**.**

RESULTS AND DISCUSSION

The result of physico-chemical analysis of water samples of river Mandakini for summer season were mentioned in Table 1 and depicted in Figures 1 & 2. The temperature in water samples was found to be 27 to 29^{0}C. The average pH content in water samples was found to vary between 7.2 to 7.8. The values obtained were found to be under the permissible limit (6.5 to 8.5, WHO, 2006). The average total dissolved solids content in water samples was found to vary between 330 to 369 ppm, which was also above the permissible limit (500ppm, WHO, 2006). The concentration of total dissolved solids in water can be approximated in the field by measuring the specific conductance of a sample (**Fermer, 2001**). In the present study, the average concentration of calcium hardness in water samples was found to be 170 to 194 ppm, which was also higher than its permissible limit (75 ppm, WHO, 2006). The average magnesium hardness content in water samples was found to vary between 98 to 110 ppm of the river. The observed values were higher than its permissible limit (30 ppm, WHO, 2006). The average chloride content in water samples was found to vary between 8.1 to 11.0 ppm of the river. The observed values were above the permissible limit of (250ppm, WHO, 2006). The Higher values of chloride are hazardous to human consumption and create health problems (**Kataria and Iqbal, 1995**). The average nitrate content in water samples was found to vary between 2.10 to 3.90 ppm of the river. The observed values were above the permissible limit of (45 ppm, WHO, 2006).

Table 1: Concentration of physico-chemical parameters of river Mandakini water summer period, 2014

Parameters / Sites	Temp. (°C)	pH	TDS (ppm)	Ca hardness (ppm)	Mg hardness (ppm)	Chloride (ppm)	Nitrate (ppm)
Sati Anusuiya	29	7.20	353.00	194.00	110	9.0	2.44
Sphatik Shila	26	7.30	345.00	190.00	98	8.1	2.10
Janki Kund	28	7.30	346.00	180.00	105	9.8	3.10
RamGhat	29	7.50	369.00	170.00	100	8.1	3.90
Karwi Bridge	28	7.40	330.00	182.00	108	9.5	2.95
Surya Kund	29	7.80	340.00	190.00	105	11.0	3.88

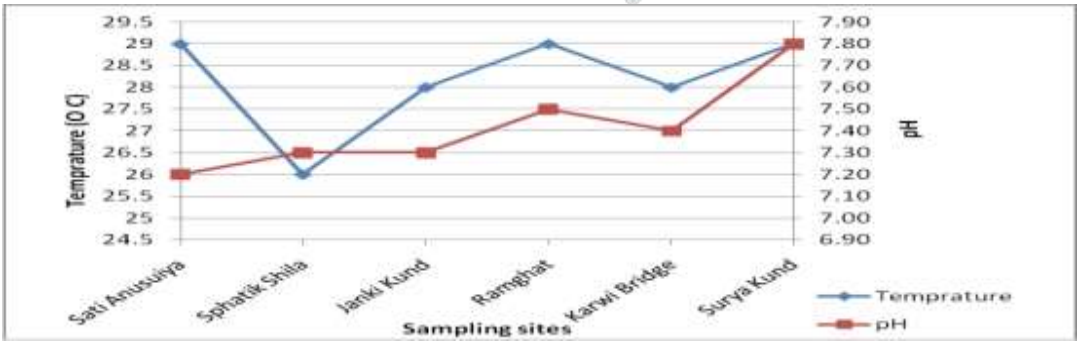

Figure 1: Concentration of physico-chemical parameters-Temp./pH of river Mandakini water summer period, 2014

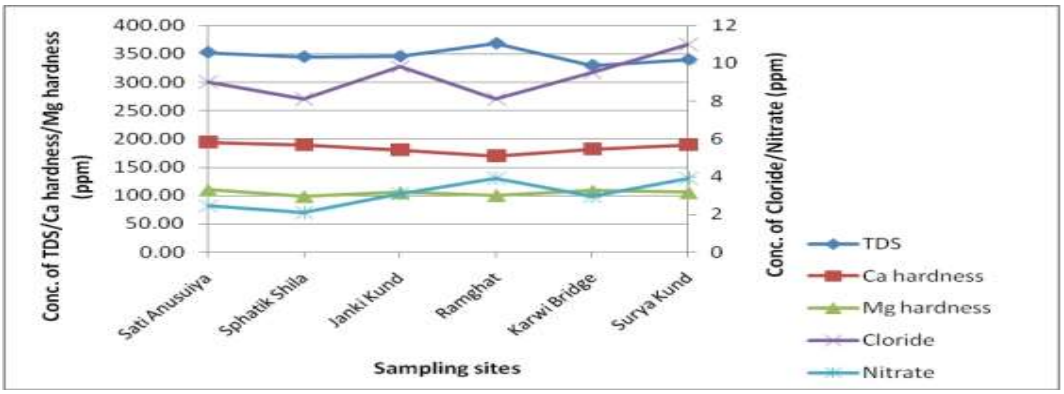

Figure 2: Concentration of physico-chemical parameters-TDS/Ca-Mg hardness/Cl^-/NO_3^- of river Mandakini water summer period, 2014

The correlateon coefficient of physico-chemical parameters and 't' test significance value of Summer 2014 presented in Table 2, results revealed that temperature positively associated with, pH (0.387),total dissolved solid (0.323), calcium hardness (0.104), magnesium hardness (0.547), chloride (0.409) and magnesium hardness (0.689), correlation. The pH parameters shows correlation with temperature (0.387), chloride (0.587), and nitrate (0.800) rest of parameters showed total dissolved solid (-0.108),calcium hardness- (-0.242) and magnesium hardness (-0.419) shows negatively association. total dissolved solid parameters showed positively correlation with temperature (0.323),calcium hardness - (0.398) and nitrate(0.265) . rest of parameters, pH (-0.108) magnesium hardness (-0.386),and chloride (-0.571) shows negatively correction with the total dissolved solid parameters. Calcium hardness physico-chemical parameters showed positively associated with temperature (0.104),total dissolved solid, (0.398), chloride (0.027), and nitrate (0.164) rest of the parameters, pH (-0.242) and magnesium hardness (-0.099) showed negatively correlation. Magnesium hardness parameter showed positively association with temperature (0.547), and chloride (0.523) rest of the parameters pH (-0.150), total dissolved solid (-0.386), calcium hardness (-0.099) and nitrate (-0.054) showed negatively correlation. Chloride parameter showed positively associated with temperature (0.409), pH (0.587), calcium hardness (0.027), magnesium hardness (0.523) and nitrate(0.423), rest of the parameters total dissolved solid (-0.571), shows negatively correlation. nitrate parameter of Mandakani river showed positively associated with temperature (0.843) total dissolved solid (0.230), and chloride (0.434) rest of the parameters temperature (0.689), pH (0.800), total dissolved solid (0.265), calcium hardness (0.164), and , chloride (423) only magnesium hardness (-0.054) showed negatively correlation. It can be concluded that only pH physico-chemical parameter found significant positively associated with nitrate (0.800) at 0.05 level (2-tailed), rests of the parameters *i.e.* Temperature, total dissolved solid ,calcium hardness , magnesium hardness and chloride was not significantly associated with each others. Similar results recorded between these two parameters by **Kamal *et.al* (2007) and Pradhan *et.al* (2009**).

Table 2: Correlation coefficient (r) and test of significance (t) of physico-chemical parameters in summer period, 2014

Parameters		R	I t I	Results
Temperature	**pH**	0.387	0.94	Non Significant
	TDS	0.323	0.76	Non Significant
	Ca hardness	0.104	0.23	Non Significant
	Mg hardness	0.547	1.46	Non Significant
	Cl^-	0.409	1.00	Non Significant
	NO_3^-	0.689*	2.13	Significant
Ph	**Temperature**	0.387	0.94	Non Significant
	TDS	-0.108	0.24	Non Significant
	Ca hardness	-0.242	0.56	Non Significant
	Mg hardness	-0.150	0.34	Non Significant
	Cl^-	0.587	1.62	Non Significant
	NO_3^-	0.800*	2.98	Significant
TDS	**Temperature**	0.323	0.76	Non Significant
	pH	-0.108	0.24	Non Significant
	Ca hardness	0.398	0.97	Non Significant
	Mg hardness	-0.386	0.94	Non Significant

	Cl^-	-0.571	1.56	Non Significant
	NO_3^-	0.265	0.61	Non Significant
Ca hardness	**Temperature**	0.104	0.23	Non Significant
	pH	-0.242	0.56	Non Significant
	TDS	0.398	0.97	Non Significant
	Mg hardness	-0.099	0.22	Non Significant
	Cl^-	0.027	0.06	Non Significant
	NO_3^-	0.164	0.37	Non Significant
Mg hardness	**Temperature**	0.547	1.46	Non Significant
	pH	-0.150	0.34	Non Significant
	TDS	-0.386	0.94	Non Significant
	Ca hardness	-0.099	0.22	Non Significant
	Cl^-	0.523	1.37	Non Significant
	NO_3^-	-0.054	0.12	Non Significant
Cl^-	**Temperature**	0.409	1.00	Non Significant
	pH	0.587	1.62	Non Significant
	TDS	-0.571	1.56	Non Significant
	Ca hardness	0.027	0.06	Non Significant
	Mg hardness	0.523	1.37	Non Significant
	NO_3^-	0.423	1.05	Non Significant
NO_3^-	**Temperature**	0.689*	2.13	Significant
	pH	0.800*	2.98	Significant
	TDS	0.265	0.61	Non Significant
	Ca hardness	0.164	0.37	Non Significant
	Mg hardness	-0.054	0.12	Non Significant
	Cl^-	0.423	1.05	Non Significant

Note: **Significance at 1 % level of significance *Significance at 5 % level of significance
Value of t-table 1 % =3.74, 5 % =2.132

CONCLUSION

The increasing trend of concentrations of all physico-chemical parameters recorded increasing trend pH <Nitrate <Chloride< Magnesium Hardness< Calcium Hardness <Total dissolved solids. The Temperature, pH, Nitrate, Chloride, Were found more than the permissible limit prescribed by WHO. The high concentrations of calcium and magnesium hardness in the river water were due to presence of lime stone, calcite, dolomite, rocks in plenty in the study area. Correlation coefficients indicated the strength of relationship between physic-chemical parameters. It can be concluded that in summer season pH a physic-chemical parameter was significant negatively associated with nitrate. It is concluded that the water of river is not highly polluted but there is an indicating of increasing pollutant due to anthropogenic activities. Proper monitoring is needed to avoid anthropogenic contamination.

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