

Physico Chemical Studies of Underground Water of Langat Singh College Campus

Mukesh Kumar Sharma

Resource person,

Department of Industrial Microbiology ,

Langat Singh College, BRABU, Muzaffarpur, Bihar, India.

Abstract— The study of underground water in different sample stations of Langat Singh College Campus have been performed under the heading physico chemical analysis. The study reveals that the groundwater of Langat Singh College Campus is not perfect for drinking purpose with respect to total dissolved solids, total hardness, fluoride and chloride. The ground water of most of the campus is polluted not only for human beings but also for plants. Its total alkalinity total dissolved solids and total hardness is much above than their maximum permissible limit Excess fluoride was not encountered in almost all samples to the prescribed limit set by W.H.O.

Keywords— Langat Singh College. Hardness. Total dissolved solid and Ground water

Introduction

Water supplies essential minerals and is the basis of all drinks. Mineral water contains different types of substance dissolved namely minerals and other biological compounds. Modern science has developed new classification of the different mineral waters by chemicals and physical analysis and the evaluation of metabolic variations by different biochemical parameters.

The biochemical effects and health implications of water were studied particularly in Eastern part of European countries. Mineral waters have been in human nutrition especially in the different stages of life, during physical activity and in presence of some specific conditions.

The water intake favors the digestive solubility of food-stuffs and improves intestinal physiology. It has been suggested by many scholars that thermal waters are valid tools in the treatment of illness such as functional dyspepsia \ irritable bowel syndrome and functional disorder of the biliary tract [14] because carbonated waieix stimulate the secretion of degestive tract and motility of the digestive tract. Moreover suit nth mineral waters enhance the conversion ol cholesterol into bile acids and their subsequent secretion. The oral intake of water containing calcium increase serum calcium and inhibits intact para - throidhormone secretion. However, results vary depending on the type of waler mineralisation. The presence of synthetic organic compounds in ground water is also a matter of serious concern because of their potential health effects in drinking water. A few are known to be carcinogenic and

others can cause problems, such as liver damage neurological disorders or birth defects.

Sample stations

The focus of the present research work includes the study of various physico-chemical analysis with their parameters of ground water. Hence a brief survey was undertaken in the Langat Singh College Campus. Total ten (10) water samples were taken from different stations of Langat Singh College Campus which is under Baba Saheb Bhim Rao Ambedkar. All the water samples were collected from submersible and general hand pumps in a litre plastic bottles.

The abbreviations used for different sites of Langat Singh College Campus are RS₁, RS₂, RS₃, RS₄, RS₅, RS₆, RS₇, RS₈, RS₉ and RS₁₀ given in Table 1

S.No	Sample No.	Sample Station
1	RS ₁	Science Block
2	RS ₂	Art Block
3	RS ₃	Duke Hostel
4	RS ₄	Gandhi Koop
5	RS ₅	Gandhi Udyaan
6	RS ₆	State Bank of India
7	RS ₇	College Sport Council
8	RS ₈	Bachelor of Mass Communication
9	RS ₉	Library and Information Science
10	RS ₁₀	College Main Gate

Table 1. Sample Stations
Experimental Material and Methodology

All the chemicals employed for experiment were of analytical grade and all the aqueous solutions were prepared with double distilled water Freshly prepared solutions were always used. The colour of the sample was observed through naked eyes after taking the sample in a glass test tubes. The odour of the sample was determined directly by smelling. Temperature was recorded at the site by digital thermometer of range 0--50 degree centigrade. The pH of the sample was determined using a digital pH meter (systronics). EC (Electrical conductivity) was measured in the laboratory with the help of digital conductivity meter (NDE-736). Turbidity was measured using nepheloturbidity meter type (systronics). For TDS the water sample was filtered through Whatman filter paper no. 4 and

evaporated the sample on water bath until whole water was evaporated. After cooling the weight of evaporating dish was taken and then calculated total dissolved solids. The total hardness, total alkalinity, calcium, magnesium and chloride were determined by titration method using suitable indicator. Fluoride and iron was determined by visual comparison method making a series of standard solutions and also by means of titration method.

Results and Discussion

The contamination of groundwater may happen in number of ways of direct and indirect human activities, thus there is always a need for the assessment of the groundwater quality with respect to industrialization and urbanization. These studies are very useful in evolving better water management plan. The present study attempted us to evaluate the groundwater quality

The range of turbidity at different sample stations Langat Singh College Campus was found from 5.2 to 8.6 mg/liter. The highest value of turbidity was recorded at sample stations RS₃ i.e. Duke Hostel and lowest at sample station RS₂, i.e. Art Block. The turbidity value at different sample stations were found fairly above the prescribed limit of WHO. It was observed that the electrical conductivity values ranged from 2250 medium to very high salinity in the water of Langat Singh College Campus. All the samples were above the permissible limit of BIS (740-2200). Lowest value was recorded at sample station RS₃ (Duke Hostel) and highest at RS₁ (Science Block). The high electrical conductivity means high ionic total dissolved solids (T.D.S.). If the conductivity and total dissolved solid values exceed the prescribed values, these may lead to scaling in boilers, Tumblers and utensils, corrosion and quality degradation of the product.

It is well known fact that if T.D.S. value exceeds 2000 mg/liter definite laxative effects are observed in those people who are also not accustomed to such salinity. The total dissolved solids were found to vary from 1475-4225 mg/liter. which is well above the permissible limit of BIS (500 ppm). The highest value was recorded at sample station RS₉ (Library and

Parameters	WHO Standards	ICMR Standards	BIS standard	Sample Station										Avg.	
				RS ₁	RS ₂	RS ₃	RS ₄	RS ₅	RS ₆	RS ₇	RS ₈	RS ₉	RS ₁₀		
Color				Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	
Odor				Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	
Temperature				35° C	35° C	35° C	35° C	35° C	35° C	35° C	35° C	35° C	35° C	35° C	
pH	6.8-8.5	7-8.5	6.5-8.5	7.21	7.25	7.40	7.20	7.35	7.45	7.26	7.26	7.46	7.45	7.33	
Turbidity	5	5	10	6.1	5.2	8.6	6.6	6.8	7.8	8.5	7.8	5.5	6.3	6.92	
TDS	-	-	470-2200	6450	3.40	2250	5415	4548	2570	3100	4248	4138	4046	2679.5	
EC	1000	500	500	3575	2635	2685	3110	1450	1560	1490	3030	4250	3010	4160.5	
Alkalinity(P)	-	-	-	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	
Total Alkalinity	-	-	200	1020	466	885	1025	400	545	550	545	470	560	646	
Chloride	250	250	250	1000	415	500	1015	500	775	420	1020	630	110	737.5	
Fluoride	1.5	1.0	1.0	1.5	1.8	1.2	1.5	1.2	2.0	1.5	1.5	1.8	1.8	1.58	
Iron (Fe ³⁺)	0.3	0.2	0.3	1.15	1.16	1.18	1.16	1.28	1.25	1.2	1.28	1.17	1.10	1.19	
Calcium (Ca ²⁺)	-	75	75	115	145	124	158	175	115	119	122	125	115	131.3	
Magnesium(Mg ²⁺)	-	50	50	240	150	120	80	275	104	105	125	120	115	143.4	
Total Hardness	300	300	300	1355	710	744	1253	950	954	644	1267	875	1330	1012.2	

Table 2.

of different stations of Langat Singh College Campus. The value of physico-chemical characteristics of underground water in different sample stations of Langat Singh College Campus are presented in Table-2 with standard deviation and described as here under[13].

pH is a numerical expression which is used to indicate the degree to which water is acidic or alkaline. pH (W.H.O. limit 6.5 - 8.5) alone does not provide a full picture of the characteristics or limitations with the water supply. In all the sampling stations, pH values were within the guidelines value for safe drinking water. The pH values were found to be from 7.20 to 7.45 showing basic nature of ground water in Langat Singh College Campus. The pH values of different sample stations followed the order RS₉> RS₆, RS₁₀>RS₃>RS₅>RS₇,RS₈>RS₂>RS₁>RS₄. It was found maximum at RS₉ and minimum at RS₄. pH does not have any direct detrimental effect on human health, however a lower value below 4 produces sour taste and higher value above 8.5 produces alkaline taste.

Information Science) and-lowest and sample station RS₅, (Gandhi Udyan). This may be due to contamination of inorganic salts like carbonates sulphates. nitrates etc. generally found in polluted water.

The presence of calcium and magnesium in ground water is mainly due to its passage through or over deposits of limestone gypsum and other gypsiferous materials results, it has been observed that calcium and magnesium were ranging from 115-175gm/litre and 80-245 mg/litre respectively. All the samples were above the permissible limits of ICMR (Ca -75mg/litre, Mg-50mg/litre).

Total hardness of all water samples (644- 1355 mg/litre) was found high and above the permissible limit of ICMR (300 mg/litre). In most of the study areas, very high total hardness values are recorded. The hard water causes health effect on digestive system and more over the possibilities of forming calcium oxalate crystals in urinary tracts.

Total alkalinity was observed in the range of 400 to 1025 mg/litre. The lowest value of total alkalinity was recorded at sample station RS₅ (Gandhi Udyan) and highest at sample station RS₄, (Gandhi Koop). The BIS acceptable limit for

alkalinity in drinking water is 200 mg/litre. This shows that the variation in the observed alkalinity concentration is very high chloride is the common anion found in the groundwater. It gives brackish taste to the water but salty is variable and dependent on the chemical composition of the water. Chloride ion found to range between 415-1100ppm which is above the ICMR recommended value (250ppm). The highest value of chloride concentration was recorded at sample station RS₁₀, (College Main Gate) and lowest at sample station RS₂ (Art Block). Chloride is not a potential hazard to human health, if present in concentration below 250mg/litre. However, it is the best indicator and detrimental of pollution caused by sewage discharge in ground water system.

The distribution of fluoride in the study area ranged from 1.2 - 2.0 mg/ litre. The permissible limit for fluoride content in water for drinking is 1.0 mg/litre. "The highest value of fluoride concentration was recorded at sample station RS₆ and lowest value at sample station RS₃, and RS₅. Fluoride becomes toxic to animals and human beings, when present at concentration in drinking water and injurious to crops when present at concentration > 0.3mg/litre in drinking water' and injurious to health causes indigestion. It is also harmful to crops when present at concentration >10mg/litre in soil solution.

On the basis of above discussions, I may be concluded that the underground water for drinking of Langat Singh College Campus is not fit for direct human consumption with respect to total dissolved solids, total hardness, fluoride and chloride concentration. The ground water of most of the campus is polluted and not safe for public health as well as plants. Its pH total dissolved solids and total hardness are much more than their maximum permissible limit. Excess fluoride was also encountered in almost all samples to the prescribed limit set by WHO. Therefore, the use of ordinary hand pumps should be discouraged people dependent on this water are often prone to health hazards due to polluted drinking water. Therefore, indigenous technologies should be adopted to make the water fit for drinking after desalination treatment. The safe drinking water in the affected areas could also be provided by sanctioning schemes based on surface water source. One should must remember the fact that water and especially drinking water is an important essential component to stay alive for the human beings and animals and especially for any living organism8-12.

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