

Feasibility Study and Experimental Analysis of Water Quality Audit

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ABSTRACT: In this project, the water characteristics of physical, chemical and biological tests has been analysed. The following tests like pH value, Total Dissolved solids, Hardness, Dissolved oxygen, Nitrate, MPN Test and Total plate count test has been identify in our Laboratory. However, this study is an important step in the analysis of water sample is to be compared with APHA standards. This study contributes towards a better understanding of pollution dynamics in the LAPC College and draws attention to potential environmental problems that may occur. The estimation of the chemicals and any other apparatus required as per rate of 2021-22. The main objective of this study to determine the Quantitative information on the Physical and chemical characteristics of water, total number of colonies, present in the sample by using Standard Plate count test

Key Words: Characteristics of Water, PH, TDS, MPN test, LAPC etc.

living soul requires water for its survival. It is essential for life, health and sanitation. It is the principal raw material for food production and on the farms. Human can live without food for about 2 months, but cannot survive for two or three days without water. It also plays vital role in the production of essential commodities, generation of electric power, transportation, recreation etc. With our growing population, the demand for water is increasing day by day and hence every country ensures the availability of pollution free water resources. Water quality testing is an important part of environment monitoring, if the water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well Water quality monitoring can help predication and learn about from natural processes in the environment and determine human impacts on Eco system. Most Current environmental laws focus on the designation of particular uses of a water body.

I. INTRODUCTION

The important requirement of any life including human is water. It is nature's gift to lives. It is available in various forms such as rivers, lakes, streams, ponds etc. The development of any city is based on the source of water supply. Universally every

II. STUDY AREA

The samples are taken from different locations like Kovilpatti, Ettayapuram, Illupaiyuranai, Kayathur and Tirunelveli at early morning from 6.00 AM to 7.00 AM.





Figure – 2: Bore water Sample Collection

III. CHARACTERISTICS OF WATER SAMPLE

PHYSICAL TEST	CHEMICAL TEST	BIOLOGICAL TEST
<ul style="list-style-type: none"> • Temperature • Colour • Turbidity • Taste and dour 	<ul style="list-style-type: none"> • Total solids • Hardness • Chlorides • Residual chlorine • Iron & Manganses • pH Value 	<ul style="list-style-type: none"> • Total plate count test • E coli or B. coli test

Figure – 3: Characteristics of Water Sample

3.1 PH

The determination of PH value of sewage is important, because of the fact that efficiency of certain treatment methods depends upon the availability of a suitable PH value. The PH value can be measured

quickly and automatically with the help of a Potentiometer. If the PH value is less than 7, the sample is acidic, and if the PH value is more than 7, the sample is alkalinity in nature based on APHA Standards.



Figure – 4: PH meter

3.2 TOTAL DISSOLVED SOLIDS

Many dissolved substances are undesirable in water. Dissolved minerals, gases and organic constituents may produce aesthetically displeasing colour, taste and odour. Some dissolved organic chemicals may deplete the dissolved oxygen in the

receiving water and some may be inert to biological oxidation, yet others have been identified as carcinogens. High concentration of dissolved solids about 3000 mg/L may also produce distress in livestock. Total dissolved solids can be measured with the help of TDS meter.



Figure – 5: TDS meter

3.3 TOTAL HARDNESS

Hardness of water is important in determining the suitability of a water for domestic and industrial uses. The relative amount of calcium and magnesium hardness, carbonate and non-carbonate hardness

present in a water are the factors while determining the most economical type of softening process. Total hardness can be measured with the help of titration method.



Figure – 6: Hardness Analysis Kit

3.4 CHLORIDE CONTENT

Chlorides associated with sodium exerts salty taste, when its concentration is more than 250 mg/L. In many areas of the world where water supplies are scarce, sources containing as 2000 mg/L are used for domestic purposes without the development of adverse effect, once the human system becomes adapted to the water. The chloride content can be measured by titration method.

3.5 NITRATE CONTENT

A few minerals contribute nitrates to ground water. The most important source of nitrates is biological oxidation of nitrogenous substances which come in sewage, industrial wastes, chemical fertilizers, decayed vegetables, leaches from refuse dumps, septic tank effluent etc. The nitrate content can be measured with the help of Spectrophotometer.



Figure – 7: Spectrophotometer



Figure – 8: Chloride Content Analysis Kit

2.6 MPN TEST

The purpose of this test is to estimate the number of coliforms in water sample as an index of the magnitude of biological contamination. The intestinal tract of human beings contains countless rod-shaped bacteria known as coliform organisms. Each person

discharges 100 to 400 billion coliform organisms per day, in addition to other kinds of bacteria. The presence of coliform organisms is taken as an indication that pathogenic organism may also present and the absence of coliform organism is taken as an indication that the water is free from diseases producing organisms.



Figure – 9: MPN Analysis Kit

2.7 STANDARD PLATE COUNT TEST

The total bacterial count is the number of visible colonies under a magnification of 6-8 X which have developed under defined conditions. It provides a measure of the degree of microbiological

contamination of the water and especially of sudden bacterial invasions. Its values are useful in warning about excessive microbial growth in any water and also judging the efficiency of water and waste water treatment in removing organisms.



Figure – 10: Standard Plate Count Analysis Kit

IV. RESULTS AND DISCUSSION

The Physical and chemical characteristics of the samples like pH, TDS, Total Hardness, Chloride, and Nitrate content was calculated based on APHA

standards. The Biological characteristics of the samples like MPN, Standard Plate count test and Number of Colonies was identified.

Table -1: Characteristics of Sample

CHARACTERISTICS OF SAMPLE						
SAMPLE	PH	TDS	DO	CHLORIDE	NITRATE	HARDNESS
1	7.30	468	4.3	62.5	42	157.5
2	6.70	1132	4	70	80	210
3	7.28	1481	4.6	155	267	550
4	7.34	482	4.4	30	20	62.5
5	7.3	330	5.1	37.5	52	87.5

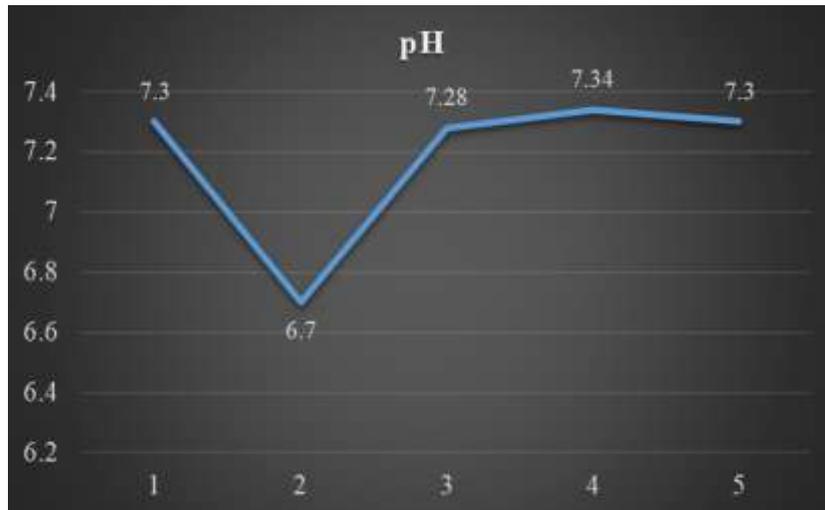


Chart -1: pH Value



Chart -2: TDS Value

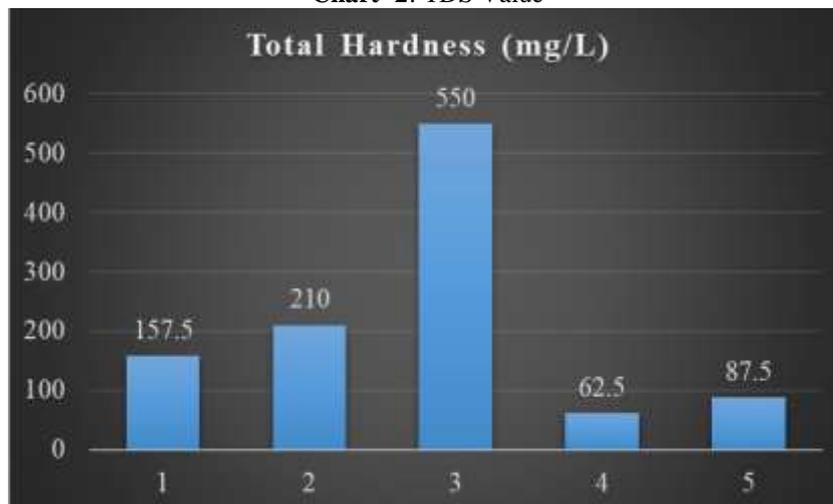


Chart -3: Hardness Value

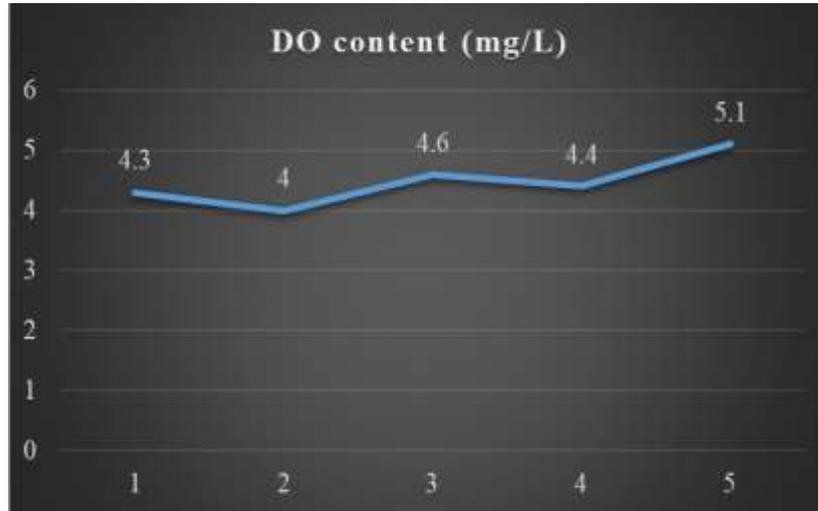


Chart -4: DO Content

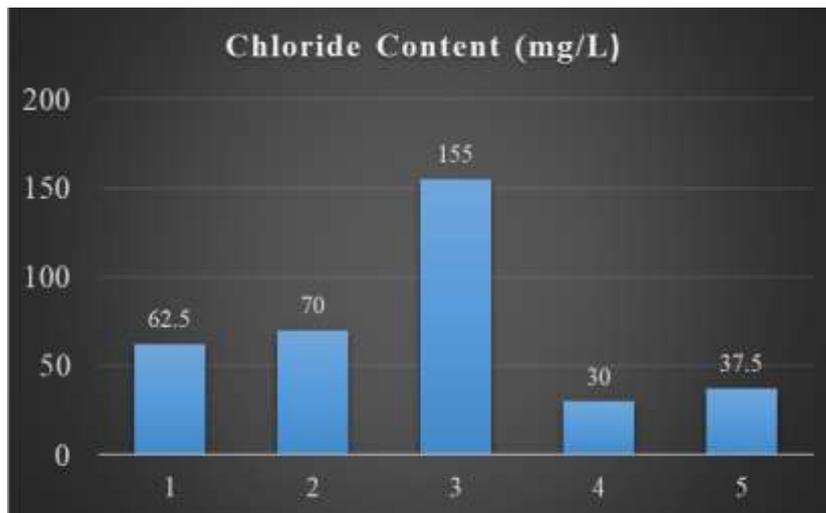


Chart -5: Chloride content

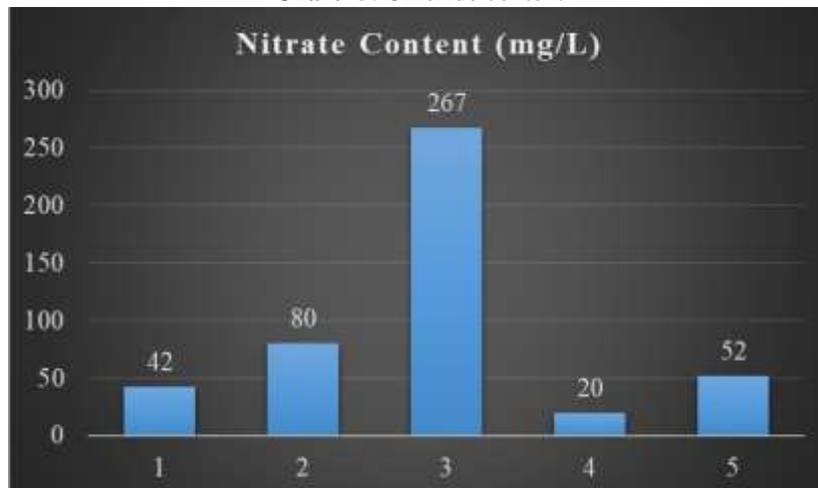


Chart -6: Nitrate content

Sample – 1- Krishna Nagar, Kovilpatti
Sample – 2 -Thachanallur, Tirunelveli
Sample – 3 - Pasumpon Nagar, Illupaiyuranai
Sample – 4 - Ettayapuram
Sample – 5 - Kayathur

Table -2: Colonies Name

SAMPLE	EMB	XLD	TCBS	SS
1	+ 5 colonies	+ 1 colony	-	+ 2 colonies
2	+ 4 colonies	+ 1 colony	+ 5 colonies	+ More colonies
3	+ 4 colonies	+ 4 colonies	+ 4 colonies	-
4	+ 1 colony	+ 1 colony	-	+ 1 colony
5	+ More colonies	+ More colonies	+ 20 colonies	+ More colonies

EMB – Eosin Methylene Blue Agar
XLD – Xylose Lysine Deoxycholate Agar
TCBS – Thiosulphate Citrate Bile Salt Sucrose Agar
SS – Salmonella Shigella Agar

Table -3: Colonies Count

SAMPLE	DILUTION & NO OF COLONIES			
1	10^{-3}	10^{-4}	10^{-5}	10^{-6}
2	85	43	12 (TLTC)	5 (TLTC)
3	36	26 (TLTC)	19 (TLTC)	4 (TLTC)
4	482	4.4	30	20
5	330	5.1	37.5	52

Table -4: MPN Test

S. No	10 ml	10 ml	10 ml	1 ml	1 ml	1 ml	0.1 ml	0.1 ml	0.1 ml	Result			Coloni es count
										10 ml	1 ml	0.1 ml	
1	-	-	+	-	-	+	-	-	-	1	1	0	7
2	-	-	+	+	-	-	-	-	-	1	1	0	7
3	+	+	+	+	-	-	-	-	-	3	1	1	43
4	+	+	+	+	+	+	+	+	+	3	3	3	2400
5	+	+	+	+	+	+	+	+	+	3	3	3	2400

V. CONCLUSIONS

The importance of access to good quality water cannot be overemphasized. Increase in population coupled with the rise in human activity pose a great pressure on provision of safe drinking water. Effective water quality monitoring could assist in

checking how our daily activities affect the quality of our water and impact of the introduction of pollutants on water quality. In general ground water quality of selection of different locations like Kovilpatti, Ettayapuram, Illupaiyuranai, Tirunelveli and Kayathur, since the ground water which were taken from the

various places were analysed and the analysis showed that the water quality parameters like pH, Total dissolved solids (TDS), Chloride content (Cl), Total Hardness, Dissolved oxygen and Nitrates lies within the maximum permissible limit prescribed by WHO. Also, the biological parameters like MPN test and Standard plate count test were determined. Based on the sample analysis, Ettayapuram and Kayathur samples have more of colonies is not fit drinking as per standard WHO. Hence this report explains that the ground water in different locations is suitable for drinking and agricultural purposes.

REFERENCES

- [1]. C.H. Ikeme, “Physico-Chemical Analysis of Selected Borehole Water in Umuihi, Town Imo State, Nigeria”, vol 5, Pg no – 680 - 689. 2014.
- [2]. Giorgio Mannina, “Water quality modelling for ephemeral rivers: Model development and parameter assessment”, vol 393, Pg no – 186 - 196, 2010.
- [3]. Noutsopoulos C, “A Simple Water Quality Model as A Tool for the Evaluation of Alternative River Basin Management Plans”, vol 16, Pg no – 1 - 8, 2014.
- [4]. Dagim Abera Shigut, “Assessment of physico-chemical quality of borehole and spring water sources supplied to Robe Town, Oromia region, Ethiopia”, vol 7, Pg no – 155 – 164, 2016.
- [5]. Hessamaddin Sohrabi et al., (2021), “Recent advances on portable sensing and biosensing assays applied for detection of main chemical and biological pollutant agents in water samples: A critical review”, vol 143, 2021
- [6]. Charles Missia, “Physical, chemical and isotopic characteristics of groundwater and surface water in the Lake Chilwa Basin, Malawi”, vol 162, 2019.
- [7]. S.K. Garg, “Water Supply Engineering, Environmental Engineering – Vol - I & II”.
- [8]. APHA Standards & CPCB Manual