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# Evaluation of Physico-Chemical Parameters in and Around Salem Distick in Tamilnadu

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**ABSTRACT-**The present study was carried out with the aim to assess of water quality using physic-chemical parameters in and around Salem district. People on earth are under tremendous threat due to undesired changes in the physical, chemical and biological characteristics of air, water and soil. Due to increase of human population, advanced agricultural practices, industrialization, man-made activity, use of fertilizers, water is being highly polluted with different contaminants. Water is an important resource for human survival. Natural water contaminates due to weathering of rocks and leaching of soils etc. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water born diseases. The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. This paper is aimed at reviewing the environmental and health impacts of untreated or inadequately treated wastewater effluents. The quality of wastewater effluents is responsible for the degradation of the receiving water bodies. Parameters that may be tested include temperature, pH, turbidity, salinity, nitrates; TDS, sulphate, chloride, alkalinity, phosphates, etc. are of special concern because they produce water or chronic poisoning in aquatic animals. Some water analysis reports with physic-chemical parameters have been given for the exploring parameter study. Guidelines of different physic-chemical parameters also have been given for comparing the value of real water sample. To achieve unpolluted wastewater discharge into receiving water bodies, careful planning, adequate and suitable treatment, regular monitoring and appropriate legislations are necessary.

**KEYWORDS:** Ground water, drinking water, Municipal wastewater, Water quality parameters

### I. INTRODUCTION

Water is an essential compound for survival of life on earth. Which contains minerals, important for human as well as for world and aquatic life. Ground water and surface water reservoirs are the planet's most important freshwater resources and provide innumerable benefits. They are used for domestic and irrigation purposes and provide ecosystems for aquatic life especially fish, thereby functioning as a source of essential protein and for significant elements of the world's biological diversity.

Ground water, surface water (rivers, streams and ponds), atmospheric water (rain-water, snow and hail) and springs are the main source of water available to the people in general. The qualities of these water bodies vary widely depending on the location and environmental factors. The major source of ground water is precipitation that infiltrates the ground and moves through the soil and pore spaces of rocks. Other sources include water infiltrating from lakes and streams, recharge ponds and waste-water treatment system. As ground water moves through soil, sediment and rocks, many impurities such as disease-causing micro-organisms are filtered out. Many water resources in developing countries are unhealthy because they contain harmful physical, chemical and biological agents. To maintain a good health however, water should be safe to drink and meet the local standards and international standards to taste, odor and

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appearance. To monitor the water resource and ensure sustainability, national and international criteria and guidelines established for water quality standards are being used.

Since the chemistry of water directly hints the quality of water for various purposes, its monitoring and assessment gained substantial importance in the present century. A tremendous increase in the population increased the stress on both surface and the groundwater. It is believed at the beginning of the human civilization itself, groundwater was the most trusted form of drinking water because of the filtering effect of the aquifer. However, in the present world drinking the water directly from the source without proper treatment is a tough task. The groundwater analysis for physical and chemical properties is very important for Public health studies. These studies are also main part of pollution studies in the environment. The groundwater contains dissolved solids possesses physical characteristics such as odor, taste and temperature. The natural quality of groundwater depends upon the physical environment, the origin, and the movement of water. As the water moves through the hydrological cycle, various chemical, physical and biological processes change its original quality through reactions with soil, rock and organic matter. Natural processes and human activities cause the changes in groundwater quality, directly or indirectly. According to WHO organization, about 80% of all the diseases in human beings are caused by water.

## II. LITERATURE REVIEW

The various technical research paper on the assessment of water quality for lake, river and different areas have been presented at research level for the study. Various physico-chemical parameters like pH, sodium, potassium, carbonate, bicarbonate, chloride, dissolved oxygen were studied. The calculated values of SAR, RSC and percentage sodium indicate that the water for irrigation uses is excellent to good quality. US Salinity diagram was used for evaluating the water quality for irrigation which suggests that the majority of the groundwater samples were good for irrigation. The parameters analyzed during the study period were pH, Total dissolved solids (TDS), Total Hardness, Nitrate, Most Probable Number (MPN) and heavy metal such as Lead using standard laboratory procedures. The pH ranged from 6.01 to 7.3 indicating acidic in nature in the month of Feb and March, but in the month of April and May all the wells within the levels. The pHs of water in wells within 500-700m are contaminated by the leachate of landfill. Concentrations of Hardness, TDS and Nitrate ranged from 0 to 80 mg/L, 49 to 190 mg/L, and 4 to 79.89 mg/L respectively. The analysis was done for four months from Feb to May. The results showed that within 500 m bore wells were contaminated by E-Coli bacteria, also nitrate concentration is above the permissible level described by WHO and Bureau of Indian Standards for drinking water and pH were acidic in nature. The polluted water requires certain levels of treatment before use. Public enlightenment on waste sorting, adoption of clean technology, using climate change mitigation strategies and the use of sanitary landfill to prevent further contamination of ground water flow are recommended. C.Nagarajan et al [4,5,6] have developed the groundwater is acidic in nature and very hard. It is done by using Arc GIS software. The study reveals that the concentrations of major constituents are well within the permissible limits of IS-10500-1994, except in few cases where total hardness and fluoride concentrations are high. The fluoride conc. exceeded the permissible limit. From the analysis it was observed that the groundwater is polluted in the entire study area. During last few years, the utilization of surface and groundwater for drinking, industrial and agricultural purposes has increased manifolds but consequently it is observed that the water is polluted and affecting the human health, soil nutrients, livestock, biomass and environment in certain areas. The spatial distribution map of pH, Chlorides, Magnesium and Sulphate shows that, these parameters are within range as per standard. TDS and Nitrate concentrations in ground water of the study area exceed the permissible limit at central. People can use the ground water for drinking and domestic purpose in study area. The study is carried out on parameters which are selected for testing is pH, TSS, TDS, COD and Nitrate.

It is used to describe the acid or base properties of wastewater. A pH less than 7 in wastewater influent is an indication of septic conditions while values less than 5 and greater than 10 indicate the presence of industrial wastes and non-compatibility with biological operations. The pH concentration range for the existence of biological life is quite narrow. Another parameter that has significant effect on the characteristics of water is dissolved oxygen. It is required for the respiration of aerobic microorganisms as well as all other aerobic life forms. Oxygen demand, which

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may be in the form of BOD or COD, is the amount of oxygen used by microorganisms as they feed upon the organic solids in wastewater. It involves the measurement of dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The presence of sufficient oxygen promotes the aerobic biological decomposition of an organic waste. Although BOD test is widely used, it has a number of limitations, which include the requirement of a high concentration of active acclimated micro-organisms and the need for treatment when dealing with toxic wastes, thus reducing the effects of nitrifying organisms. The BOD measures only the biodegradable organics and requires a relatively long time to obtain test.

Based on the hydro geochemical facies it has been found that the groundwater regime is severely deteriorated by the anthropogenic activities. It was done water analysis for the parameters like pH, DO, BOD, COD, TDS, Calcium, Magnesium and Hardness for lake water. The analysis of Water quality indicates the temperature in the range of 24°C. The pH was 7.3 to 8.45. It shows slightly alkaline water. The DO varied from 4.8 to 5.7 mg/l. The total hardness ranged from 160 to 298 mg/l which is higher than permissible limit. The turbidity of water was 28 to 42 NTU which is higher as per the APHA limit. To assess the quality of groundwater and to characterize the hydro chemical characteristics of the groundwater in Salem, groundwater samples were collected.

## 2.1 Assessment of Water Quality

In now days due to increase in population, industrialization, agricultural activities and urbanization, large quantities of sewage and industrial wastewater are discharged into water bodies has significantly contributed to the pollution of the surface and ground water. The objective of the present study was to assess water quality of various ground water sources in India for drinking and agriculture. For the assessment of water pollution status of the water bodies, the following water quality parameters were analyzed: (1) pH (2) Conductivity (3) Temperature (4) Total dissolved solid (TDS) (5) Total Alkalinity (6) Hardness (7) Cations and Anions (8) Carbonates and Bicarbonates (9) Sulphates. Measurement of pH: The pH is important parameter of water, which determines the suitability of water for various purposes such as drinking, bathing, cooking, washing and agriculture etc. The pH level of water having desirable limit is 6.5 to 8.5 as specified by the BIS pure water is said to be neutral, with a pH of 7. Water with a pH below 7.0 is considered acidic while water with pH greater than 7.0 is considered as basic or alkaline.

## 2.2 Measurement of Conductivity:

The water quality of study area can be checked effectively by controlling conductivity of water and this may also be applied to water quality management of other study areas. It is measured with the help of EC meter which measures the resistance offered by the water between two platinized electrodes.

## 2.3 Measurement of pH:

The pH is most important in determining the corrosive nature of water. It is measured a scale from 0-14. pH of 7 is neutral, pH is less than 7 is acidic and pH is greater than 7 is basic. Aquatic organisms need the pH of their water body to be a certain range optimal growth and survival.

## 2.4 Measurement of Alkalinity:

Standard desirable limit of alkalinity of potable water is 120 mg/l. The maximum Permissible level is 600 mg/l. Excessive alkalinity may cause eye irritation in human and chlorosis in plants. It is measured by titration with standardized acid to a pH value of 4.5 and is expressed commonly as milligrams per liter as calcium carbonate.

## 2.5 Measurement of TDS:

TDS in groundwater can also be due to natural sources such as sewage, urban runoff and industrial waste. According to BIS and ICMR the desirable limit of TDS is 500 mg/l. If TDS value is more than 500 mg/l, it may cause gastro intestinal irritation. High TDS presence in the water decreases the quality and affects the taste of water (Guru Prasad, 2005).

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## 2.6 Measurement of Hardness:

The limit of total hardness value for drinking water is to be within 300 mg/l of CaCO<sub>3</sub>. Higher concentration of hardness was found may be due to natural accumulation of salt, or surface runoff, water enter from direct pollution by human activities. Measurement of Chloride: Chloride is one of the most important parameter in assessing the water quality and higher concentration of chloride indicates higher degree of organic pollution. According to BIS and ICMR the permissible limit of chloride in drinking water is 250mg/l.

High concentration of chloride was observed may be due to natural processes such as the passage of water through natural salt formations in the earth or it may be an indication of pollution from industrial or domestic use. In drinking water, high chloride content may lead to laxative.

## 2.7 Measurement of Turbidity:

Instrument measures the intensity of scattered light by turbid particles at right angle to the incident beam of light in comparison with the intensity of light passing through the sample. Scattering of light is a function of Tyndall effect exhibited by colloidal suspended particles. Turbidity of samples is measured by Nephelometer based on this principle. The maximum Permissible level is 5 NTU.

## 2.8 Measurement of Temperature.

Temperature is measured with help of Digital Thermometer. The thermometer is immersed in sample and temperature is recorded. Total Hardness was observed some evidence indicates its role in heart diseases and hardness of 150-300 mg/l and above may cause kidney problems and kidney stone formation, as it causes unpleasant taste and reduce ability of soap to produce lather. Hard water is unsuitable for domestic use.

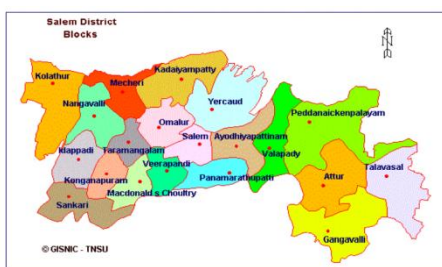


Fig:1 Salem Map

Table: 1 Physical and Chemical parameters of Salem district.

Parameters	Sample's	Yercaud	Omalur	Attaiyampatti	Panamarathupatti
pH	S 1	8.55	8.15	8.7	8.35
	S 2	8.4	8.1	8.3	8.3
	S 3	7.8	8.15	8.3	8.15
	S 4	8.2	8.5	8.2	8.3
	S 5	8.05	8.6	8.4	8.05
Electrical conductivity	S 1	2900	1750	1590	2485
	S 2	205	1240	750	2200
	S 3	270	1455	1800	1735
	S 4	230	1055	1315	2150

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	S 5	280	1250	1650	2005
Hardness	S 1	127.5	240	350	605
	S 2	470	305	185	390
	S 3	67.5	240	605	502.5
	S 4	80	187.5	437.5	302.5
	S 5	95	155	500	430
Chloride	S 1	42.5	213	156	468
	S 2	482	248.5	96	478.5
	S 3	23	92	258.5	36.5
	S 4	39	124	136.5	390
	S 5	28.5	142	191	323
Calcium	S 1	28	36	32	36
	S 2	10	25	4	24
	S 3	12	29	28	21
	S 4	15.8	8	50	15.2
	S 5	21	26	40	18

### ELECTRICAL CONDUCTIVITY

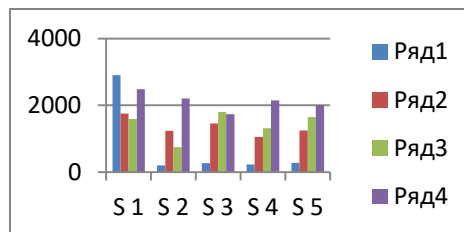


Fig: 2Electrical conductivity of the drinking water in Salem district.

### HARDNESS

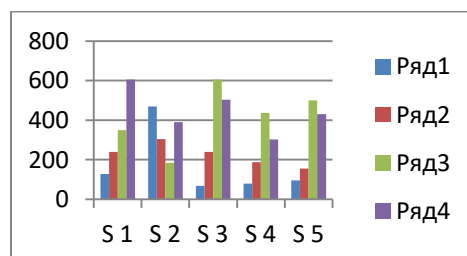


Fig: 3 Hardness value of the drinking water in Salem district.

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## CHLORIDE

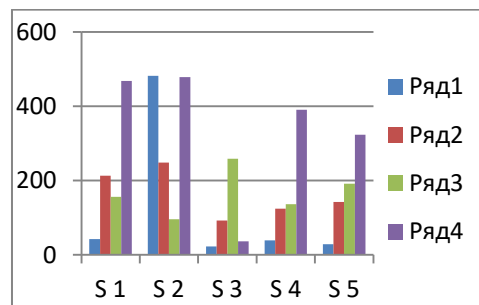


Fig: 4 Chloride content of the drinking water in Salem district.

## CALCIUM

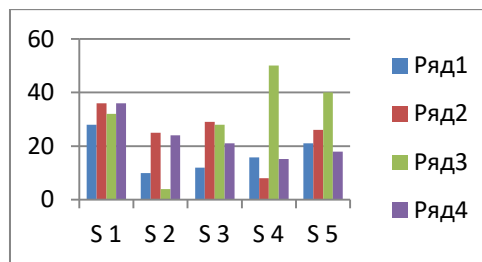


Fig:5 Calcium of the drinking water in Salem district.

## III. CONCLUSION

From present investigations we concluded that the quality of most of the water samples under study was suitable for drinking purpose except in rainy season. In rainy season WQI increases due to increased concentration of sodium and dissolved solids. Some of the samples have total dissolved solids, pH, alkalinity, total hardness, magnesium, calcium, and dissolved oxygen values exceeding the permissible limits as prescribed by Indian standards. We noticed parameters such as electrical conductivity, chloride, nitrate and BOD values are within permissible limits. This can be achieved through the application of appropriate treatment processes, which will help to minimize the risks to public health and the environment. The effects of water pollution are not only devastating to people, but also to animals and birds also reduces its reproductive ability. Polluted water is unstable for drinking, recreation, agriculture and industry. It diminishes the aesthetic quality of lakes and rivers. Eventually, it is a hazard to human health. The present review paper undertaken to account to bring an acute awareness among the people about the quality of water.

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