



**PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER SAMPLES IN AND AROUND
ARIYALUR DISTRICT-TAMIL NADU**

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ABSTRACT

Ariyalur is a district of Tamil Nadu. The present study is conducted to assess the groundwater suitability for drinking and irrigation purpose in and around Ariyalur district. Eight ground water samples are collected from the bore wells in and around Ariyalur district. All the samples are subjected for physico-chemical parameter analysis and the results are compared with the WHO standard values. From this study, it is concluded that most of the water samples are above the permissible limit suggested by WHO.

KEYWORDS: Ariyalur district, Ground water, Physico-Chemical analysis.

INTRODUCTION

The Environment consists of four segments atmosphere, hydrosphere, lithosphere, and biosphere. Next to atmosphere, hydrosphere is most vital part of the environment. The hydrosphere includes all types of water resources such as oceans, seas, rivers, lakes, streams, glaciers, polar ice caps and ground water. Water is the fundamental component for existence of living things –human beings Plants and animals. Nature has been magnanimous enough in giving us Innumerable water resources, but man has been incessantly adding a lot of noxious substance into the resources through his activities and destroying the state of water, hence causing pollution. Water pollution means the introduction of unwanted substance or energy, directly or indirectly into the aquatic system. This results in deleterious effects such as harm to living resources, hazards to human health, hindrance to marine activities including fishing impairment of quality for use of sea water and in reduction of amenities.

Water pollution is mainly due to industrial effluents and problem of effluent disposal from different industries has been attracting global attention and liquid wastes coming out of any industry need to be treated before discharging them into the environment. The quality of treated wastes, recognized as treated effluent must be of such quality that their discharges do not alter the use of the resulting environment. Water plays an indispensable role in every species that survive in this world and is required by all living organisms for their existence. Though water is a renewable resource, reckless usage

and improper management water system may cause serious problems in availability and quality of water. Water may be contaminated by various means, chemically and biologically and become unfit for drinking and other uses.

The increasing industrialization, urbanization, agricultural and other human activities have caused enormous deterioration in the quality of various natural water bodies, particularly rivers and ground water in developing countries like India. In spite of considerable purification of river, unabated disposal of sewage and industrial wastes are deteriorating the quality of both ground and river water. Water pollution is the contamination of water bodies. This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. Water pollution affects the entire biosphere of plants and organisms living in these water bodies, as well as organisms and plants that might be exposed to the water. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities.^[1]

MATERIALS AND METHODS

Study Area

The Ariyalur district fairly rich in limestone deposits Lime stone is an important ingredient for cement manufacturing. The People of this area have depending only on the ground water as the main source for drinking purpose and other purposes. Udayarpalayam is a

panchayat town in Ariyalur district in the Indian state of Tamil Nadu. According to the 2011 Indian census, it had a population of 29,698, with an equal number of males & females. Its total literacy rate is 77% but higher for men than women. The main occupation of this town is agricultural, fishing and handlooms. The objective of the present work is to discuss the major physico chemical parameters of ground water in and around Udayarpalayam taluk.

Collection of Sample

The water samples were collected in (2 liter bottle) which were cleaned with acid water, followed by rinsing twice with distilled water. Also the sample bottles were partially filled with the collected water and vigorously shaken to note the odour. The physiochemical parameters such as pH, Electrical Conductivity (EC), Total dissolved solids (TDS), Total Hardness (TH), Calcium (Ca), Magnesium (Mg), carbonate (CO_3), Bicarbonate (HCO_3), Biological oxygen demand (BOD), Chemical oxygen Demand (COD) have been analyzed in our laboratory. The details of sampling locations are illustrated below the table 1.

Table: 1 Water Sampling Locations and Sources.

S. No.	Sampling Station	Sample No	Source
1	Udayarpalayam	E1, E2	Bore Well
2	Kacchiperumal	F1, F2	Bore Well
3	Jeyakondam	G1, G2	Bore Well
4	Thathanur	H1, H2	Bore Well

RESULTS AND DISCUSSION

pH

pH is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkaline. The measurement of alkalinity and acidity of pH is required to determine the corrosiveness of the water. The pH values of water samples varied between 8.3 and 9.7 and were found above the limit prescribes by WHO (6.5-8.5). P^{H} values increased slightly for groundwater samples in some of the sampling stations. The mild alkalinity indicates the presence of weak basic salt in the soil.^[2]

Electrical Conductivity

EC of water is the direct function of its Total Dissolved Solids. The salt concentration is generally measured by determining the electrical conductivity of water. Excess of salt increases the osmotic pressure of the soil solutions that can result in physiological drought conditions.^[3] The EC Values was in the range of 1357 micro ohms/ cm to 5812 micro ohms/ cm. In the present study the EC values in all the water samples are found above the permissible limit set by WHO(600 micro ohms/cm).

Total Dissolved Solids

TDS values varied from 944mg/L to 4095mg/L. The high value of TDS influence that the taste, hard ness and corrosive property of the water. Total dissolved solids

indicate the salinity behavior of ground water.^[4] In the present investigation TDS values are showed higher than the permissible limit given by WHO (500 ppm).

Total Hardness

The hardness values shown range from 314ppm to 534ppm. Hardness is the property of water which prevents lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium salt or both. The TH values for all groundwater samples were found below the permissible limit of WHO (500ppm) except F1 sample.^[5]

Calcium

Calcium occurs in water mainly due to the presence of limestone, gypsum and dolomite minerals. Calcium is a essential element for human being, plant cells and soils.^[6] The calcium content in the water samples 110ppm to 163 ppm. The calcium values for all groundwater samples were found above the permissible limit of WHO (100mg/L)

Magnesium

Magnesium is directly related to hardness. This may be due to the gusting in intestinal irrigation of human system.^[7] Magnesium content in the investigated water samples was ranging from 61ppm to 78ppm. Magnesium values for all groundwater samples were found below the permissible limit of WHO (150mg/L)

Carbonate

The carbonate values of water samples varied between 15mg/L to 35mg/L and were found below the permissible limit. Carbonate values for all the ground water samples were found below the permissible limit of WHO (500ppm) The high alkalinity increased due to the action of carbonates on the basic materials in the soil which gives an unpleasant smell to water.^[8]

Bicarbonate

Bicarbonates ion served as the main buffer in aqueous fresh water systems and provides CO_2 for photosynthesis.^[9] The Bicarbonate values of water samples varied between 145 ppm to 335 ppm. Bicarbonate values for all the ground water samples were found above the permissible limit of WHO (500ppm).

BOD

Biological Oxygen Demand (BOD) is a measure of the oxygen used by microorganisms to decompose this waste. If there is a large quantity of organic waste in the water supply, there will also be a lot of bacteria present working to decompose this waste.^[10] The BOD values shown ranged from 10ppm to 20ppm The BOD values of all water samples were found above the prescribed limit WHO (10ppm).

COD

High level of COD indicates the presence of all forms of organic matter, both biodegradable and non-biodegradable and hence the degree of pollution in water. It is the measure of oxygen consumed during the

oxidation of organic matter.^[11] The sampling locations were found to have from 21-24 mg/L. The COD values of all water samples were found above the prescribed limit WHO (10ppm). High COD may cause to affect the aquatic life.

Table 2: Physico-chemical parameters of groundwater samples collected around Udayarpalayam taluk at Ariyalur district in the month of April-2017.

Sampling station	E1	E2	F1	F2	G1	G2	H1	H2
PH	9.4	9.4	8.7	8.7	9.7	9.6	8.3	8.3
EC	4812	3912	1357	2678	2418	3512	4812	5812
TDS	3349	2722	944	1863	1682	2444	3349	4095
TH	324	363	534	394	326	314	348	372
Ca	110	112	163	154	128	122	133	142
Mg	65	63	74	78	69	68	61	68
CO ₃	30	20	25	35	15	30	ND	ND
HCO ₃	145	160	175	260	215	220	335	215
BOD	13	18	14	20	10	19	11	12
COD	23	21	22	24	21	22	23	24

CONCLUSION

The ground water samples were collected from 8 different places at Udayar Palayam taluk at Ariyalur district. The samples were analysed to physico - chemical analysis. The results were showed most of the physic – chemical parameters like pH, EC, TDS, COD and BOD are well above the permissible limit set by WHO (2011). The results reveal that the ground water is most of the area unfit for drinking and domestic purposes. It will help to preserve future sustainability in water quality.

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