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A STUDY ON WATER QUALITY ASSESSMENT OF ARIYALUR DISTRICT, TAMILNADU, INDIA

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Abstract

Water covers 70.9 % of the Earth's surface, and is vital for all known forms of life. On Earth, 96.5 % of the planet's water is found mostly in oceans; 1.7 % in groundwater; 1.7 % in glaciers and the ice caps of Antarctica and Greenland; a small fraction in other large water bodies and 0.001 % in the air as vapor, clouds formed of solid and liquid water particles suspended in air, and precipitation. Only 2.5 % of the Earth's water is fresh water, and 98.8 % of that water is in ice and groundwater. Less than 0.3 % of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003 %) was contained within biological bodies and manufactured products. As Ariyalur is a land of limestone, the cement industries flourishes to maximum resulting in air pollution and water pollution. The present study was concerned with the determination of physico-chemical parameters of ground water quality at different locations of Ariyalur.

Key words: Pollution, Water quality, Ariyalur District and Physico-chemical parameters.

1. Introduction

Water is a basic, indeed an absolute requirement for the survival of human race. An adequate supply of good quality safe water is essential for the promotion of public health. Generally in less developed parts of the world and particularly in tropical areas, the health hazards caused by polluted water supplies are more numerous and more serious than those in temperate and more developed areas of the world. Water for the domestic use should be clear, colorless, odorless, pleasant to drink and reasonably cool and free from impurities harmful to health. It is very well known that human health and survival depend on use of uncontaminated and clean water for drinking and other domestic uses. Yet, our society continues to contaminate this precious resource. A poor water supply system has affected the human health at various locations throughout the history. Water is the common name applied to the liquid form state of the hydrogen and oxygen compound H_2O. Pure water is an odorless, tasteless, clear liquid. Water is one of nature's most important gifts to mankind. Essential to life, a person's survival depends on drinking water. Water is one of the most essential elements to good health too.

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It is necessary for the digestion and absorption of food helps maintain proper muscle tone supplies oxygen and nutrients to the cells rids the body of wastes and serves as a natural air conditioning system. Health officials emphasize the importance of drinking at least eight glasses of clean water each and every day to maintain good health. This water molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is a liquid at ambient conditions, but it often co-exists on Earth with its solid state, ice and gaseous state (water vapor or steam). Water also exists in a liquid crystal state near hydrophilic surfaces. Henniker (1949). Under nomenclature used to name chemical compounds, Dihydrogen monoxide is the scientific name for water, though it is almost never used Bramer (2011).

Ariyalur District

Ariyalur District consists of two Revenue Divisions *viz*., Ariyalur and Udayarpalayam, three Taluks *viz*., Ariyalur, Udayarpalayam and Sendurai comprising of 195 Revenue Villages. Ariyalur District is located in central Tamil Nadu and is 265 km away from Chennai. The District has an area of 1949 sq. km. It is an inland district without any coast line. The district has Vellar river in the North and Kollidam river in the South and it has no well-marked natural divisions.

Fig. 1: Sampling stations in Ariyalur district

2. Materials and Methods

Physico-chemical examination of water samples

In the present study, 16 samples (during summer and winter) from the ponds were collected in pre-cleaned 1 L polythene bottles with the necessary precaution (Brown *et al.*, 1974). The physico-chemical parameters *viz*., pH, EC, TDS, Turbidity, TA, CH, MH, TH, DO, BOD, COD, Fe, Nitrate, Sulphate, Phosphate, Na, K, Nitrite, Cl and Fl for the water samples were assessed as per standard procedures (APHA, 1998). List of parameters are given in the Table - 1.

3. Results and Discussion

The drinking water sample from different sites has been characterized in terms of Temperature, EC, pH, Dissolved Oxygen, Total Hardness, Total Alkalinity, Total Acidity, Biological Oxygen Demand, Chemical Oxygen Demand, Calcium Hardness, Magnesium Hardness, Chloride, Total Solids, Total Dissolved Solids, Total Suspended Solids, Silicate, Nitrate, Phosphate, Sulphate and the values have been tabulated in the following tables. The values are the average of triplicate analysis.

The physico-chemical characteristics of the analyzed Ground water sample are presented in Table - 2 to 5. From the tables, it was revealed to their chemical composition. A composition of physico-chemical characteristics of the studied Ground water sample has also been made with ISI (1983) standards and WHO (1992) standards for drinking water. The pH values was observed in the range of 7.00 to 8.64 with definite trend of comparatively higher pH value 8.64 of T. Pazhur water was recorded during pre monsoon whereas the lowest pH value 7.00 was recorded during post monsoon in Vikkiramangalam.

The ISI standard for drinking water pH was 6.5 to 8.5 some of the samples under study, are below the ISI standard. To achieve the standard drinking water pH, have been proactive to eliminate the free CO_2 Present in the water by

Table - 1: Parameters and methods employed in the physico-chemical examination of water samples

S. No.	Parameter		Methods	Reference
1	Temp^{o}C	Temperature		
2	p^{H}	p^{H}	Electrometric Methods	APHA (1998)
3	EC mmho/cm	Electrical Conductivity	Electrical Conductivity Method	APHA (1998)
4	TDS mg/L	Total Dissolved Solids	Dessicator method	APHA (1998)
5	TA mg/L	Total Alkalinity	Volumetric method	APHA (1998)
6	Cl^{-} mg/L	Chloride	Argentometric Method	APHA (1998)
7	SO_4^{-2} mg/L	Sulphate	Colorimetric Method	APHA (1998)
8	DO mg/L	Dissolved Oxygen	Winkler's Mayer Method	APHA (1998)
9	BOD mg/L	Biological Oxygen Demand	Closed Reflux Method	APHA (1998)
10	COD mg/L	Chemical Oxygen Demand	Volumetric Method	APHA (1998)
11	TH as $CaCo_3$ mg/L	Total Hardness	Volumetric Method	APHA (1998)
12	CaH as $CaCo_3$ mg/L	Calcium Hardness	Volumetric Method	APHA (1998)
13	MgH as $CaCo_3$ mg/L	Magnesium Hardness	Volumetric Method	APHA (1998)
14	NO_3^{-} mg/L	Nitrate	Colorimetric Method	APHA (1998)
15	NO_2^{-} mg/L	Nitrite	Colorimetric Method	APHA (1998)
16	PO_4^{-3} mg/L	Phosphate	Colorimetric Method	APHA (1998)
17	F^{-} mg/L	Fluoride	Colorimetric Method	APHA (1998)
18	Na mg/L	Sodium	Flame Photometric Method	APHA (1998)
19	Turbidity NTU	Turbidity	Nepleoturbidity meter	APHA (1998)
20	K mg/L	Potassium	Flame Photometric Method	APHA (1998)
21	Fe mg/L	Iron	Colorimetric method	CPCB (2007)

Table – 2: Estimation of Ground water quality analysis of Ariyalur District in Pre monsoon

Sample ID	EC	pH	DO (mg/l)	BOD (mg/l)	HCO_3 (mg/l)	COD (mg/l)	Cl (mg/l)	Ca (mg/l)	Mg (mg/l)	NO_3 (mg/l)	PO_4 (mg/l)	SiO_3 (mg/l)	SO_4 (mg/l)	TDS (mg/l)
Station 1	1150	7.46	7.95	3.15	135	120	150	180	13.36	28.8	0.013	5.75	13.3	500
Station 2	830	7.07	6.5	2.04	97	85	90.15	79	4.37	1.5	0.005	5.7	17.8	500
Station 3	855	7.14	7.25	3.88	88	70	75.5	77	2.67	1.15	0.087	4.38	12.65	550
Station 4	750	7.15	8.1	3.57	92	105	80.1	83	2.19	2.88	0.009	2.25	20.76	300
Station 5	1129	7.61	6.75	3.03	181	120	110.15	89	22.36	10.52	0.078	5.35	8.75	400
Station 6	2005	8.64	7.35	2.15	60	85	25.9	42	4.37	2.45	0.028	6.15	15.75	500
Station 7	350	7.98	6.6	4.07	105	99	99.9	50	3.36	4.35	0.057	5.32	12.65	300
Station 8	650	7.08	8.35	2.15	105	110	105.6	91	3.34	3.78	0.015	3.15	19.5	500
Station 9	1147	7.15	6.08	3.65	110	140	95.47	95	3.64	10.85	0.005	7.54	8.59	1000
Station 10	560	7.05	5.27	2.25	150	118	115.83	85	15.79	21.95	0.059	2.48	7.79	500
Station 11	1120	7.14	5.67	2.08	153	90	105.73	99	13.12	5.64	0.003	6.55	8.35	2300
Station 12	1289	7.15	6.48	4.21	106	102	82.95	88	4.37	8.59	0.065	3.88	7.86	800
Station 13	555	761	6.89	1.28	97	90	92.47	79	4.38	9.58	0.019	6.49	8.1	1500
Station 14	430	7.98	4.86	2.28	100	135	97.89	78	7.78	6.35	0.008	2.89	8.19	2500
Station 15	350	8.64	6.35	3.07	105	100	100.28	99	1.46	12.54	0.075	5.76	8.01	500
Station 16	840	7.98	6.53	3.84	130	123	95.47	84	11.18	9.48	0.003	7.89	7.79	600

Table - 3: Estimation of Ground water quality analysis of Ariyalur District in Post monsoon

Sample ID	EC	pH	DO (mg/l)	BOD (mg/l)	HCO_3 (mg/l)	COD (mg/l)	Cl (mg/l)	Ca (mg/l)	Mg (mg/l)	NO_3 (mg/l)	PO_4 (mg/l)	SiO_3 (mg/l)	SO_4 (mg/l)	TDS (mg/l)
Station 1	565	7.98	6.48	2.25	150	94	40.08	100	12.15	9.65	0.028	5.67	8.43	1000
Station 2	1228	7.04	4.56	1.37	100	120	80.14	84	3.88	5.67	0.025	4.58	9.56	500
Station 3	550	7.24	2.45	1.17	98	82	78.28	80	4.37	7.97	0.005	10.56	5.56	500
Station 4	759	7.04	6.08	4.34	100	110	180.34	74	6.32	15.64	0.032	9.56	10.65	1500
Station 5	370	8.33	5.92	2.25	78	100	30.34	65	3.16	4.58	0.005	9.57	15.86	2000
Station 6	950	7.02	5.25	2.07	99	127	100.4	82	4.13	12.68	0.032	7.68	5.98	1000
Station 7	965	7	6.12	2.47	100	99	98.34	85	3.64	9.78	0.027	5.8	6.95	800
Station 8	1038	8.45	6.38	2.84	97	120	75.46	65	7.78	9.56	0.054	10.56	10.56	1000
Station 9	1370	7.77	7.08	3.85	150	105	105	80	17.01	15.35	0.025	16.89	15.65	1000
Station 10	270	9	6.35	3.04	100	95	95	75	6.07	10.09	0.008	15.45	20.83	2600
Station 11	350	8.22	7.8	6.64	122	120	130	100	5.35	10.3	0.085	18.09	11.58	1900
Station 12	460	7.79	6.7	3.58	235	124	124	90	35.23	10.27	0.015	20.27	15.88	1300
Station 13	1120	7.05	7.8	3.28	110	110	110	80	7.29	14.23	0.057	24.38	22.07	4800
Station 14	1280	7.46	6.48	5.08	100	100	100	60	9.72	12.48	0.028	15.8	9.59	900
Station 15	1180	7.1	8.01	2.52	151	80	80	90	14.82	4.89	0.017	14.39	9.44	1700
Station 16	1780	7.1	7.69	2.65	123	120	120	55	16.52	1.99	0.021	10.83	8.73	1500

Table - 4: Statistical analysis of Ground water quality in Ariyalur District (Pre monsoon)

Parameters	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8
EC	1020±2.04	900±1.22	1000±2.04	500±1.22	1000±2.04	1100±1.22	800±2.04	900±0.82
pH	7.46	7.07	7.14	7.15	7.61	8.64	7.98	7.08
DO (mg/l)	7.95±0.01	6.5±0.02	7.25±0.02	8.1±0.08	6.75±0.01	7.35±0.01	6.6±0.01	8.35±0.01
Hardness (mg/l)	185±2.04	97±1.22	88±0.82	92±0.81	181±0.41	60±2.04	105±2.04	105±2.04
Alkalinity (mg/l)	60±1.22	35±2.04	70±0.82	50±1.22	90±2.04	50±0.82	80±2.04	50±0.82
BOD (mg/l)	3.15±1.22	2.04±2.04	3.88±0.81	3.57±1.22	3.03±0.81	2.15±0.81	4.07±0.48	2.15±0.81
COD (mg/l)	120±0.08	85±0.004	70±0.08	105±0.02	120±0.02	85±0.01	99±0.08	110±0.08
Chloride (mg/l)	150±2.04	90.15±0.02	75.5±0.02	80.1±0.04	110.15±0.02	25.9±0.02	99.9±0.04	105.6±0.04
Ca (mg/l)	80±0.82	79±0.41	77±0.41	83±0.41	89±0.41	42±0.82	50±1.22	91±0.41
Mg (mg/l)	13.36±0.004	4.37±0.004	2.67±0.004	2.19±0.04	22.36±0.01	4.37±0.08	13.36±0.04	3.4±0.02
Nitrate (mg/l)	28.8±0.08	1.5±0.01	1.15±0.02	2.88±0.01	10.52±0.08	2.45±0.08	4.35±0.02	3.78±0.01
Phosphate (mg/l)	0.013±0.008	0.005±0.001	0.087±0.008	0.009±0.001	0.078±0.001	0.028±0.001	0.057±0.002	0.015±0.002
Silicate (mg/l)	5.75±0.08	5.7±0.01	4.38±0.01	2.25±0.01	5.35±0.02	6.15±0.48	5.32±0.02	3.15±0.01
Sulphate (mg/l)	13.3±0.02	17.8±0.08	12.65±0.08	20.76±0.02	8.75±0.02	15.75±0.01	12.65±0.08	19.5±0.08
TSS (mg/l)	520±0.82	400±1.22	450±0.82	200±0.82	600±1.22	600±0.82	500±2.04	400±0.82
TDS (mg/l)	500±0.82	500±2.04	550±0.82	300±0.82	400±0.82	500±2.04	300±1.22	500±1.22
Parameters	**Station 9**	**Station 10**	**Station 11**	**Station 12**	**Station 13**	**Station 14**	**Station 15**	**Station 16**
EC	2100 ± 1.22	1500 ± 0.4	3000 ± 1.22	1000 ± 0.81	2500 ± 1.22	2800 ± 0.81	1000 ± 1.63	1020 ± 1.22
pH	7.15	7.05	7.14	7.15	7.61	7.98	8.64	7.98
DO (mg/l)	6.08 ± 0.02	5.27 ± 0.01	5.67 ± 0.01	6.48 ± 0.008	6.89 ± 0.008	4.86 ± 0.008	6.35 ± 0.01	6.53 ± 0.01
Hardness (mg/l)	110 ± 2.04	150 ± 0.81	153 ± 1.22	106 ± 1.22	97 ± 0.81	110 ± 0.81	105 ± 0.41	130 ± 0.41
Alkalinity (mg/l)	40 ± 1.22	50 ± 1.63	70 ± 0.81	30 ± 2.04	40 ± 1.22	60 ± 1.22	50 ± 0.81	30 ± 0.81
BOD (mg/l)	3.65 ± 0.01	2.25 ± 0.02	2.08 ± 0.008	4.21 ± 0.01	1.28 ± 0.008	2.28 ± 0.008	3.07 ± 0.01	3.84 ± 0.01
COD (mg/l)	140 ± 1.22	118 ± 0.82	90 ± 1.22	102 ± 0.82	90 ± 1.22	135 ± 2.04	100 ± 0.41	123 ± 0.41
Chloride (mg/l)	95.47 ± 0.08	115.83 ± 0.01	105.73 ± 2.51	82.95 ± 0.008	92.47 ± 0.08	97.89 ± 0.04	100.28 ± .008	95.47 ± 0.008
Ca (mg/l)	95 ± 2.04	85 ± 0.41	99 ± 0.41	88 ± 0.81	79 ± 0.41	78 ± 0.81	99 ± 0.41	84 ± 0.41
Mg (mg/l)	3.64 ± 0.004	15.79 ± 0.0004	13.12 ± 0.004	4.37 ± 0.08	4.38 ± 0.01	7.78 ± 0.01	1.46 ± 0.08	11.18 ± 0.08
Nitrate (mg/l)	10.85 ± 0.01	21.95 ± 0.01	5.64 ± 0.02	8.59 ± 0.01	9.58 ± 0.01	6.35 ± 0.01	12.54 ± 0.008	9.48 ± 0.008
Phosphate (mg/l)	0.005±0.001	0.059 ± 0.008	0.003 ± 0.004	0.065 ± 0.001	0.019 ±0.008	0.008 ±0.008	0.075 ± 0.001	0.003 ± 0.001
Silicate (mg/l)	7.54 ± 0.008	2.48 ± 0.008	6.55 ± 0.02	3.88 ± 0.004	6.49 ± 0.01	2.89 ± 0.01	5.76 ± 0.004	7.89 ± 0.08
Sulphate (mg/l)	8.59 ± 0.004	7.97 ± 0.008	8.35 ± 0.01	7.86 ± 0.004	8.1 ± 0.01	8.19 ± 0.008	8.01 ± 0.01	7.79 ± 0.008
TSS (mg/l)	1100 ±0 .81	1000 ± 1.63	700 ± 0.81	200 ± 0.81	1000 ± 1.63	300 ± 0.81	500 ± 0.81	420 ± 1.22
TDS (mg/l)	1000 ± 1.63	500 ± 0.81	2300 ± 0.81	800 ± 2.04	1500 ± 1.22	2500 ± 0.81	500 ± 0.81	600 ± 1.22

Table - 5: Statistical analysis of Ground water quality in Ariyalur District (Post monsoon)

Parameters	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8
EC	1200±1.22	1500±0.81	1000±1.01	2500±1.1	3000±1.22	1300±1.22	1200±1.22	1500±1.22
pH	7.98	7.04	7.24	7.04	8.33	7.02	7	8.45
DO (mg/l)	6.48±0.01	4.56±0.01	2.45±0.01	6.08±0.008	5.92±0.08	5.25±1.02	6.12±1.22	6.38±0.01
Hardness (mg/l)	150±0.81	100±0.01	98±0.01	100±1.12	78±0.81	99±0.81	100±0.43	97±2.22
Alkalinity (mg/l)	80±2.04	50±2.04	78±0.41	65±0.41	50±0.41	80±1.13	75±1.63	93±1.63
BOD (mg/l)	2.25±0.008	1.37±0.008	1.17±0.04	4.34±0.02	2.25±0.008	2.07±0.01	2.47±0.01	2.84±0.01
COD (mg/l)	94±0.82	120±0.82	82±0.82	110±0.01	100±0.01	127±0.01	99±0.08	120±2.04
Chloride (mg/l)	40.08±0.01	80.14±0.01	78.28±0.002	180.34±0.002	30.34±0.04	100.14±0.01	98.34±0.08	75.46±0.08
Ca (mg/l)	100±2.04	84±2.22	80±2.53	74±0.75	65±0.81	82±0.81	85±0.64	65±0.64
Mg (mg/l)	12.15±2.03	3.88±0.08	4.37±0.004	6.32±0.02	3.16±0.02	4.13±0.41	3.64±0.41	7.78±0.41
Nitrate (mg/l)	9.65±0.008	5.67±0.01	7.97±0.01	15.64±0.4	4.58±0.23	12..68±0.2	9.78±2.04	9.56±2.22
Phosphate (mg/l)	0.028±0.004	0.025±0.08	0.005±0.001	0.032±0.001	0.027±0.008	0.003±0.001	0.054±0.001	0.005±0.001
Silicate (mg/l)	5.67±1.22	4.58±0.08	10.56±1.24	9.56±0.81	9.57±0.81	7.68±0.004	5.80±0.08	10.56±0.004
Sulphate (mg/l)	8.43±0.01	9.56±0.01	5.56±0.004	10.65±0.008	15.86±1.63	5.98±1.63	6.95±2.04	12.56±2.04
TSS (mg/l)	200±1.63	1000±1.22	500±0.81	1000±0.81	1000±1.63	300±0.81	400±0.83	500±1.22
TDS (mg/l)	1000±1.22	500±0.4	500±0.81	1500±0.81	2000±1.04	1000±1.04	800±1.03	1000±1.22
Parameters	**Station 9**	**Station 10**	**Station 11**	**Station 12**	**Station 13**	**Station 14**	**Station 15**	**Station 16**
EC	2000 ± 1.22	1200 ± 0.4	1000 ± 2.04	1500 ± 1.22	800 ± 2.04	1800 ± 0.4	1000 ±2.04	1600 ± 1.22
pH	7.0	7.7	8.92	8.08	7.45	7.18	7.22	7.08
DO (mg/l)	6.48 ± 0.02	4.87 ± 0.08	4.88 ± 0.01	5.67 ± 0.08	5.25 ± 0.08	6.48 ± 0.08	6.9 ± 0.01	5.69 ± 0.01
Hardness (mg/l)	124 ± 0.4	146 ± 0.4	138 ± 0.81	132 ± 0.81	128 ± 1.22	144 ± 1.63	122 ± 0.81	130 ± 0.4

Alkalinity (mg/l)	60 ± 1.22	50 ± 0.81	50 ± 0.81	40 ± 1.22	50 ± 0.81	70 ± 0.81	40 ± 1..22	60 ± 1.22
BOD (mg/l)	2.45 ± 0.81	2.62 ± 0.81	1.08 ± 1.22	3.52 ± 0.81	1.4 ± 1.63	2.15 ± 2.04	3.63 ± 1.63	2.62 ± 2.44
COD (mg/l)	292 ± 0.004	268 ± 0.004	300 ± 0.08	288 ± 0.02	324 ± 0.02	265 ± 0.004	296 ± 0.01	276 ± 0.08
Chloride (mg/l)	77.47 ± 0.08	82.47 ± 0.08	92.45 ± 0.02	85.43 ± 0.01	89.48 ± 0.08	85.3 ± 0.08	95.08 ± 0.01	87.47 ± 0.08
Ca (mg/l)	100 ± 1.22	90 ± 1.63	70 ± 0.4	94 ± 0.4	104 ± 0.4	114 ± 0.4	70 ± 1.22	114 ± 0.81
Mg (mg/l)	5.83 ± 0.08	13.6 ± 0.004	16.52 ± 0.08	9.23 ± 0.01	5.1 ± 0.08	7.78 ± 0.08	12.64 ± 0.01	3.89 ± 0.004
Nitrate (mg/l)	1.08 ± 0.08	20.85 ± 0.01	8.48 ± 0.02	7.24 ± 0.004	15.28 ± 0.02	14.28 ± 0.01	9.58 ± 0.01	6.98 ± 0.08
Phosphate (mg/l)	0.085 ± 0.008	0.005 ± 0.001	0.004 ± 0.008	0.048 ± 0.008	0.032 ± 0.008	0.084 ± 0.008	0.004 ± 0.004	0.029 ± 0.001
Silicate (mg/l)	15.48 ± 0.08	10.85 ± 0.02	14.44 ± 0.01	6.89 ± 0.01	5.35 ± 0.01	11.27 ± 0.01	14.08 ± 0.01	16.54 ± 0.01
Sulphate (mg/l)	32.21 ± 0.08	3.79 ± 0.02	35.22 ± 0.01	4.45 ± 0.08	3.8 ± 0.02	3.34 ± 0.08	3.93 ± 0.02	7.72 ± 0.01
TSS (mg/l)	1000 ± 2.04	200 ± 0.81	200 ± 0.81	1000 ± 1.22	300 ± 0.81	800 ± 0.81	500 ± 1.22	200 ± 1.22
TDS (mg/l)	1000 ± 2.04	1000 ± 2.04	800 ± 2.04	500 ± 0.81	500 ± 0.81	1000 ± 1.22	500 ± 0.81	1400 ± 1.22

pumping the bore well waters to overhead storage tanks. At this stage , the water with free CO_2 get contain with atmosphere air attain equilibrium concentration of dissolved gasses by abortion and description processes, the pH of the water may have the change to get altered to the required standard pH for drinking water purposes.

Dissolved oxygen content ranged from 2.45 to 8.35, in the Thirumanur water dissolved oxygen was recorded maximum 8.35 mg/l and minimum Andimadam 2.45 mg/l. Biochemical oxygen demand ranged from 1.17 to 4.21 in the Keezhapazhur water BOD was recorded maximum 4.21 mg/l and minimum values recorded in Andimadam water 1.17 mg/l. Sulphate ranges from 22.07 to 5.56. The highest value of sulphate was presented in Melapazhur than the Andimadam. The ISI permissible limit for sulphate in drinking water was 150 mg/l. All the samples have sulphate concentration within the permissible limit. Since, all the samples are recommended to drinking water purposes. The highest values of nitrate were recorded Kallankuruchi (28.3 mg/l) than the Udayarpalayam (1.15 mg/l). The calcium content was ranged from ground water were recorded 100 to 42. The maximum total Calcium hardness was recorded in Kallankuruchi (100 mg/l) and minimum was recorded T. Pazhur (42 mg/l).

The total Magnesium hardness ranged from 22.36 to 1.46. The maximum total Calcium hardness was recorded in Sripuranthan 22.36 mg/l and minimum was recorded Sendurai 1.46 mg/l. The ISI standard of Magnesium in drinking water is 30 mg/l and the standard set by WHO for Magnesium in drinking water is 130 – 150 mg/l. When compared with standards, the Magnesium values of all samples are very low and the samples can be recommended to drinking water purposes. The pH also affects various water treatment processes, like water softening, precipitation, coagulation, disinfection etc. Koul Nishtha *et al*. (2012) reported there was no abnormal change of pH in the groundwater samples. If the pH was found beyond the permissible limit, it affects the mucous membrane of cells. The pH which was used in alkalinity and CO_2 measurement and many other acid – base equilibrium (Garg, 2008). Low pH value below 4.0 produces a sour taste and high value above 8.5 gives bitter taste to water (Mahesha *et al*., 2004). Low pH below 6.5 corrodes metal pipes (Suvarnakumari *et al*., 1997; Indirabai *et al.*, 2005).

According to degree of hardness water was classified as soft water (0 – 75 mg/l) moderately hard water (75 – 150 mg/l), hard water (150 – 300 mg/l) and very hard water (above 300 mg/l) (Gupta and Shukla, 2004). Hardness makes water unsuitable for several domestic needs such as washing, cooking etc., because it prevents water from the formation of lather with the soap and also increases the boiling point of water (Mahesha *et al*., 2004; Singh and Kumar, 2008). Mini *et al.* (2003) noted that increased hardness of water causes the maximum use of detergents. It forms scales on water heaters and utensils when used for cooking and consumers more soap during washing of cloth (Singh and Kumar, 2008).

4. Conclusion

Ariyalur is considered as one important place in Tamil Nadu, since it is a major center for cement production. There are many limestone mines and many cement factories located in and around Ariyalur district ground water quality were assessed Calcium and magnesium was the most important alkaline earth metal present in ground water it contributes to the hardness. Both calcium and magnesium are responsible for scale formation in boilers, pipes and utensils. The magnesium level was minimum and maximum ranges from 3.64 mg/l to 70.29 mg/l in Ariyalur district. High amount of magnesium leads to a condition called hyper – magnesemia. It is a well known cause of hypotension, cardiac dysfunction and induces paralytic illus.

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