Ground Water Quality Using Physico-Chemical Analysis In and Around Sendurai Taluk at Ariyalur District -TamilNadu

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Abstract:

The present study is conducted to assess the ground water suitability for drinking and irrigation purpose in and around Ariyalur district, Tamilnadu. Eight Ground water samples are collected from the bore wells in and around sendurai taluk at Ariyalur District during the year April 2017. All the samples are subjected for physico chemical parameters like as pH, EC, TDS, TH, Ca, Mg, Co3,Hco3,Cl, DO,BOD and COD analysis and the results are compared with the WHO standard values. For this study, it is concluded that most of the Ground water samples are above the permissible limit suggested by WHO.

Key words: Sendurai taluk, Ground water and Physico chemical analysis.

Introduction

Ground water is one of the prime natural resource upon which the survival of mankind as well as the social and economic development of the nation is dependent only 2. 5 of the world water is non –saline fresh water .since water is a universal solvent and which provides the ionic balance and nutrients supports all forms of life. The quality of water is vital concern for mankind since it is directly linked with human healthy. Groundwater is highly valued because it constitutes the major drinking and irrigation water source in most of the part of India. In recent decades exploitation of ground water has increased greatly, particularly for agricultural purpose, because large parts of the country have little access to rainfall due to frequent failures of monsoon. There has been a tremendous increase in demand for fresh water due to population growth and intense agricultural activities. Quantity of groundwater is equally important as its quantity owing to the suitability of water for various purposes. Variation of ground water quality in an area is a function of physical and chemical parameters that are greatly influenced by geological formation and anthropogenic activities (subramani et al., 2005).

Materials and Method

The ground water samples were collected from different locations of Senthurai taluk. The physico-chemical parameters are analysed during summer season samples were collected in polyethylene can(2-5lit) which had been thoroughly washed and filled distilled water and then taken to the sample site. The physico-chemical parameters such as pH,

EC,TDS, TH, Ca, Mg, Cl,CO_3, HCO_3, BOD & COD analysed in our laboratory. The results were compared with WHO standard values (2011).

Study Area

Ariyalur is located in the central part of Tamil Nadu. The district headquarters is located at Ariyalur. The district encompasses an area of 1,949.31 km² and had a population of 752,481 as per the 2011 census. Ariyalur is noted for its cement industries and has huge reserves of lignite. There were 1020 women for every 1000 men. The taluk had a literacy rate of 61.6. Child population in the age group below 6 was 6,350 Males and 5,430 Females. This district is also known for its rich prehistoric fossils. They are discharging the waste water, untreated effluent in to the open lands. The people of this area depending only on the ground water as the main source for drinking purpose and other purposes. Hence the present study has been undertaken to analyze the ground water quality in and around Senthurai Taluk. Sendurai is a large village located in Sendurai of Ariyalur district, Tamil Nadu with total 2406 families residing. The Sendurai village has population of 9643 of which 4817 are males while 4826 are females as per Population Census 2011.

Results and Discussion

Physico-Chemical Parameters of Ground Water samples Collected from the Sendurai Taluk in the Month of April-2017.

Parameters	A1	A2	B1	B2	C1	C2	D1	D2	WHO	UNIT
pH	8.6	8.3	8.7	8.6	8.6	8.9	8.2	8.6	6.5-8.5	-
EC	3943	3743	2178	2263	2574	2418	2233	2218	600	dsm^{-1}
TDS	2244	2598	1515	1575	1791	1682	1554	1543	500	ppm
TH	570	505	260	225	305	290	295	280	500	ppm
Calcium	294	360	180	125	210	182	183	178	100	ppm
Magnesium	276	145	80	100	95	108	112	102	150	ppm
Carbonate	40	ND	40	35	50	30	ND	30	600	ppm
Bicarbonate	170	210	360	460	400	190	190	135	500	ppm
Chloride	326	397	169	139	198	155	163	197	250	ppm
DO	3	2	3	4	3	2	2	4	5	ppm
COD	25	23	22	20	21	19	22	21	10	ppm
BOD	12	14	13	13	12	14	15	17	6	ppm

pH

pH is the most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity. The reduced rate of photosynthetic activity the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the

low oxygen values coincided with high temperature during the summer month. Various factors bring about changes the pH of water. The pH values of the water samples varied between 8.2 to 8.7 and were found above the limit prescribed by WHO (6.5-8.5) except the samples A2 and D1.

Electrical Conductivity (EC)

Conductivity shows significant correlation with ten parameters such as temperature, pH value, alkalinity, Total Hardness, Calcium, Total Solids, Total Dissolved Solids, Chemical Oxygen Demand, and Chloride and Iron concentration of water. The EC meter which measures the resistance offered by the water between two platinised electrodes.

EC values were in the range from 2178 to 3943 micro ohms/cm. In the present study the EC values in all the water samples are found above the limit set by WHO (500 micro ohms/cm).

Total Dissolved Solid (TDS)

It indicates the total quantity of dissolved solids in water According to WHO the permissible limit for TDS is 500 ppm. The TDS value varies from 1515 - 2244ppm. In this study indicates that all the samples are higher than the permissible limit of TDS. High TDS concentrations in drinking water it causes cancer, coronary heart disease, arteriosclerotic heart disease, and cardiovascular disease.

Total Hardness (TH)

TH indicates the concentration of calcium and magnesium only. Both calcium and magnesium are essential minerals and beneficial to human health in several respects. Inadequate intake of either nutrient can result in adverse health consequences. Recommended daily intakes of each element have been set at national and international levels. Individuals vary considerably in their needs for and consumption of these elements. Water passes through or over deposits such as limestone, the levels of Ca^{2+}, Mg^{2+} ions present in the water can greatly increase and cause the water to be classified as hard water. Total Hardness is expressed in terms of calcium carbonate the TH values of water samples varies between 225-570ppm and were found below the limit prescribed by WHO (500ppm) except A1 sample value (570).

Calcium (Ca)

Calcium is the one of the most important element maintaining bone health and dental health, as well as the prevention of colon cancer and the reduction of obesity. Recognizing the deficiency in the body is quite easy. The deficiency of calcium leads to high blood pressure, osteoporosis, loose teeth and gum diseases, insomnia, premenstrual cramps, tetany, hypertension and arthritis. The calcium content in the investigated water samples was varies from 125 to 360 ppm, and were found above the limit prescribed by WHO (100ppm).

Magnesium (Mg)

Magnesium is a cofactor in more than 300 enzyme systems that regulate diverse biochemical reactions in the body, including protein synthesis, muscle and nerve function, blood glucose control, and blood pressure regulation. Magnesium is a cofactor for some 350 cellular enzymes, many of which are involved in energy metabolism. Low magnesium status has been implicated in hypertension, coronary heart disease, type 2 diabetes mellitus and metabolic syndrome. High in taking magnesium leads to muscle weakness, lethargy and confusion.Magnesium content in the investigated water samples was ranging from 80 to 276ppm.The all magnesium values were found above the permissible limit (150ppm).

Carbonate ($CO_{3)}$

Carbonate alkalinity is a measure of the alkalinity of water caused by the presence of carbonate (CO_3^{2-}) and bicarbonate (HCO_3^-) ions. Adverse effect of carbonates is irritation of eyes, respiratory, cough, nausea, dehydration, chronic ingestion, and blood and kidney disorders. In the present analysis the carbonate concentration varies from 30 to 50 ppm and all samples are below the limit prescribed by WHO (600ppm).

Bicarbonate (HCO_3)

Bicarbonate is a major element in body. Secreted by the stomach, it is necessary for digestion. Bicarbonate is present in all body fluids and organs and plays a major role in the acid-base balances in the human body. That is it shows the ranges between 135-460 ppm. When ingested, for example, with mineral water, it helps buffer lactic acid generated during exercise and also reduces the acidity of dietary components. Bicarbonate causes rare illnesses of Bartter syndrome or Gitelman syndrome, bicarbonate may be contraindicated. According to WHO the permissible limit for bicarbonate is 500 ppm. All samples show the values below the permissible limit.

Chloride (Cl)

High concentration of chloride in water gives an undesirable taste to water. Young children may suffer if they consume water with high chloride concentration, as their kidney tissues may be damaged by the higher osmotic pressure brought about by the presence of high concentration of chloride salts.The chloride concentration serves as indicator of pollution by sewage. In the present analysis chloride concentration of various water samples are varies from 139-397 ppm and were found all samples are below the limit prescribed by WHO(250ppm) except Al and A2.

Dissolved Oxygen (DO)

Dissolved oxygen (DO) refers to the volume of oxygen that is contained in water. DO is one of the most important parameter. Its correlation with water body gives direct and indirect information e.g. bacterial activity, photosynthesis, availability of nutrients

etc.According to WHO value the permissible limit for dissolved oxygen in water is 5 mg/l. In the present analysis DO concentration of various water samples are varies from 2.0 - 4.0 ppm. All samples are found to be in the permissible limit.

Chemical Oxygen Demand (COD)

COD is another measure of organic material contamination in water specified in ppm. COD is the amount of dissolved oxygen required to cause chemical oxidation of the organic material in water. Both BOD and COD are key indicators of the environmental health of a surface water supply. They are commonly used in waste water treatment but rarely in general water treatment. All samples show high value of COD that is it shows the values in between 19-25 ppm. According to WHO value the permissible limit for COD is 10 ppm.

Biological Oxygen Demand (BOD)

The greater the amount of organic waste in the water body, the greater is the amount of oxygen required to break it down biologically and therefore higher is the BOD value of water. This value is a good measure in evaluating the degree of pollution in a water body. In the present sample analysis BOD concentration of various water samples are varies from 12 - 17ppm and were found that all samples are above limit prescribed by WHO (6ppm).

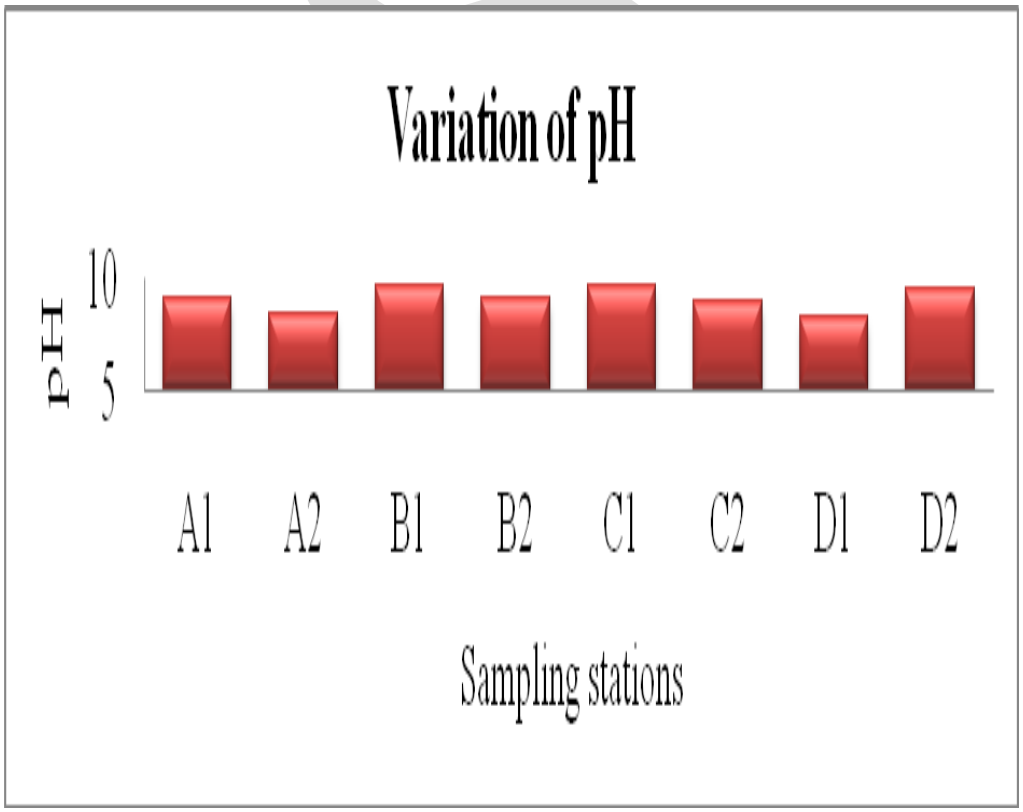

Fig : 2 Sampling Variation in Mean Values of pH

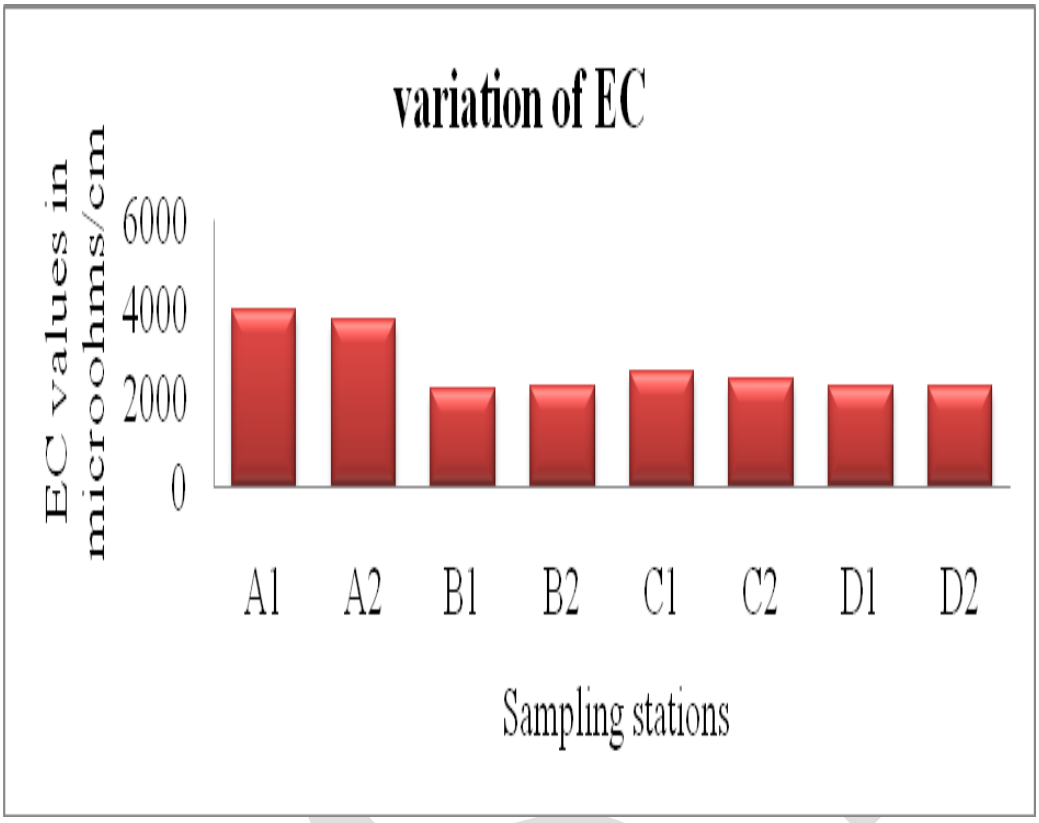

Fig : 3 Sampling Variation in Mean Values of EC

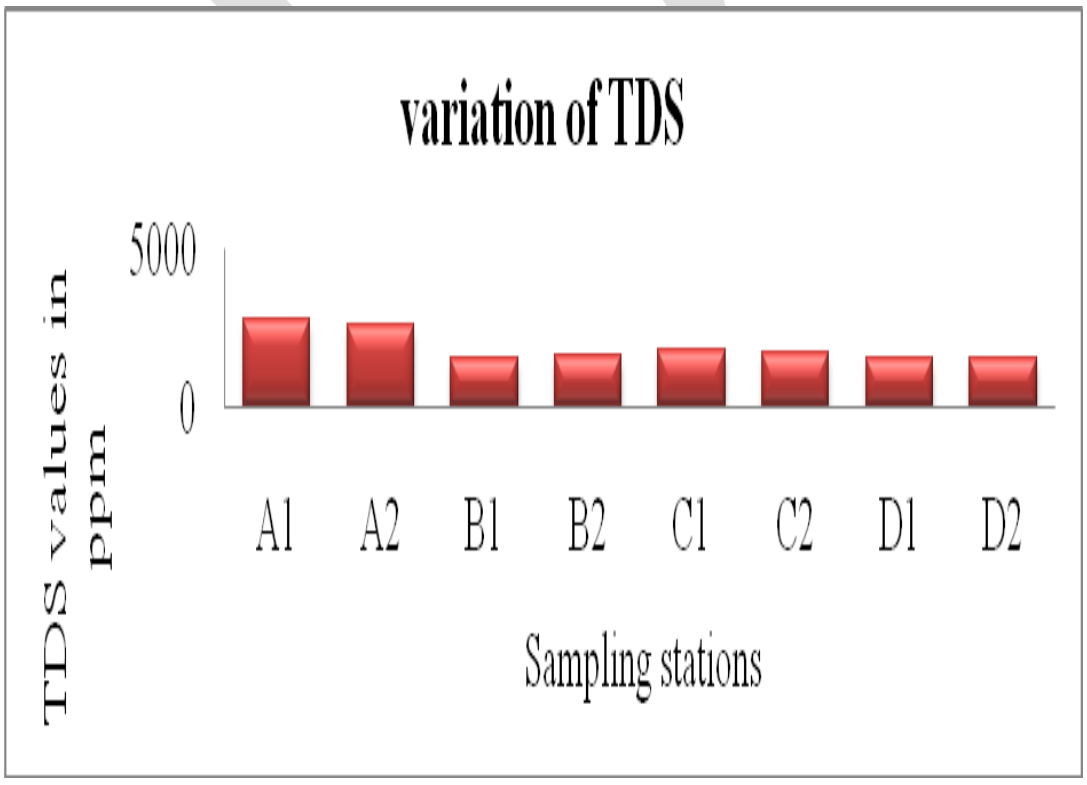

Fig : 4 Sampling Variation in Mean Values of TDS

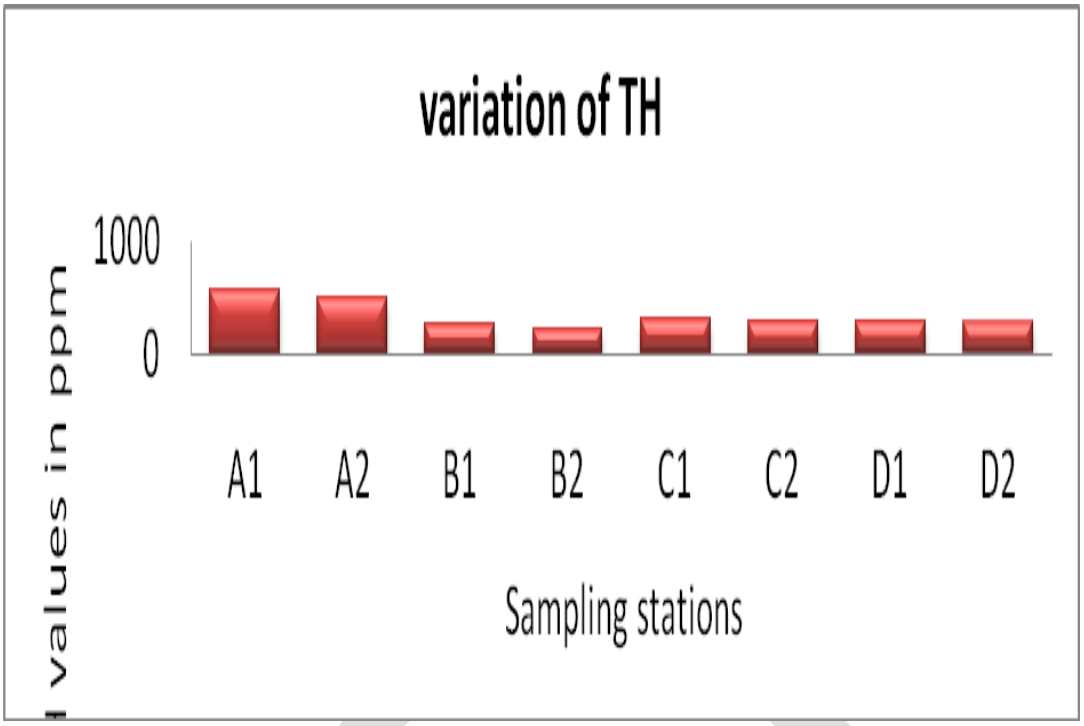

Fig : 5 Sampling Variation in Mean Values of TH

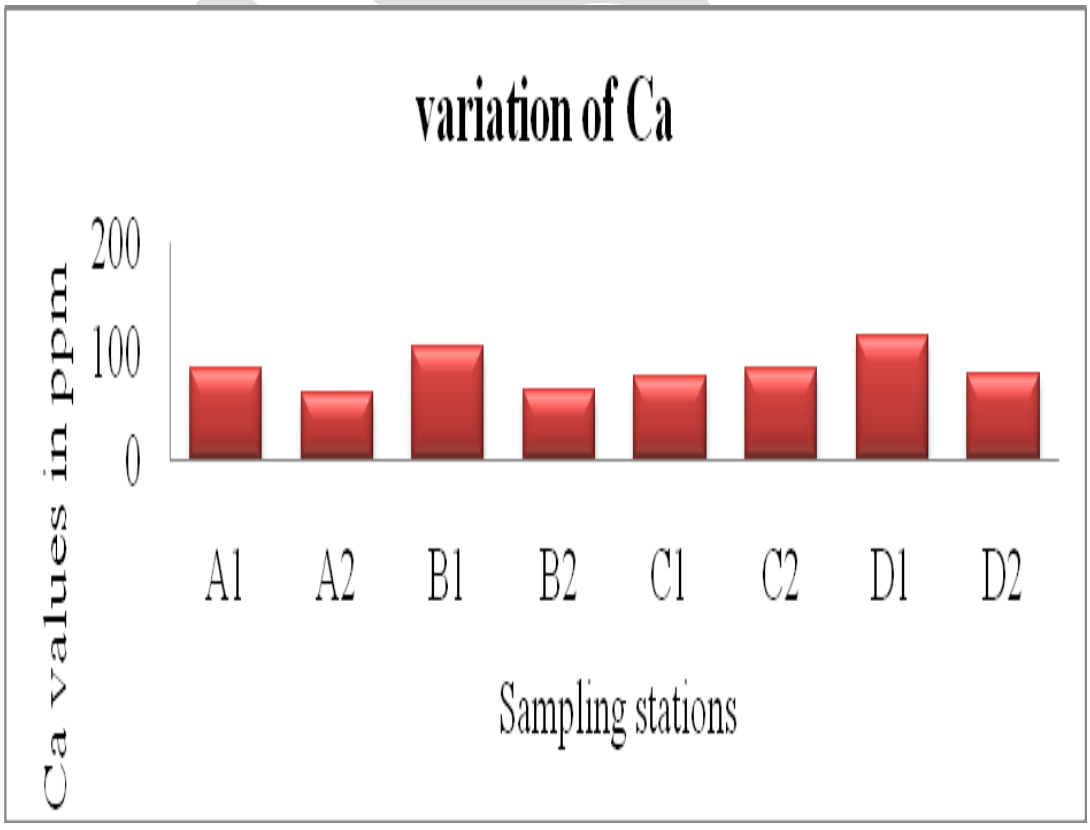

Fig : 6 Sampling Variation in Mean Values of Ca

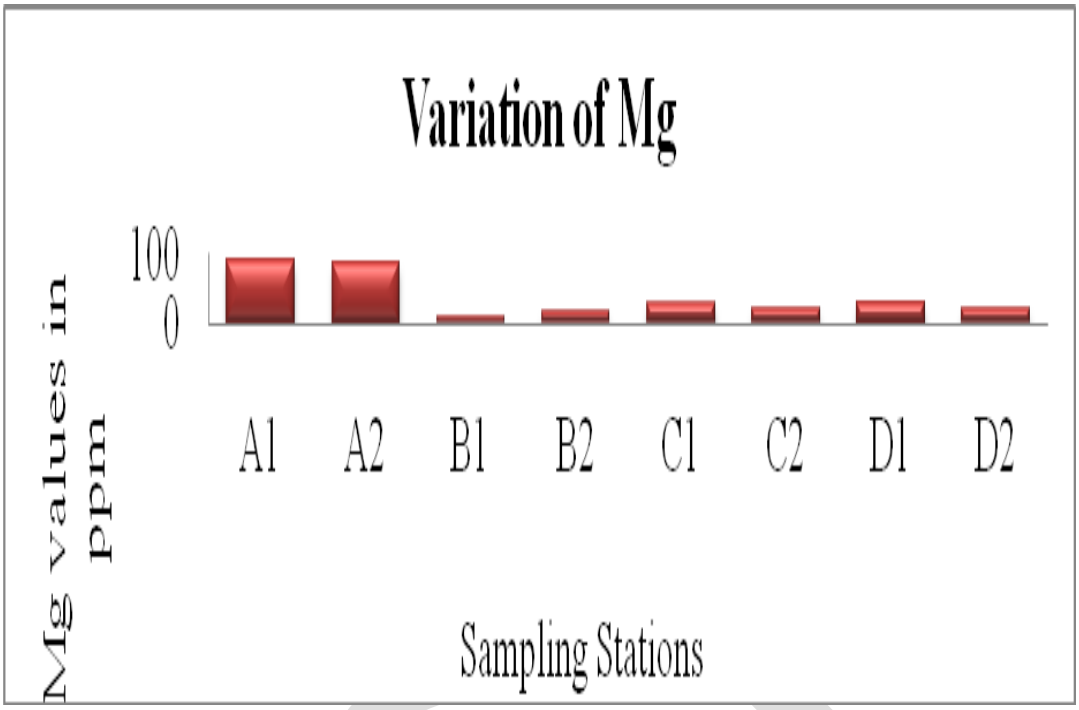

Fig : 7 Sampling Variation in Mean Values of Mg

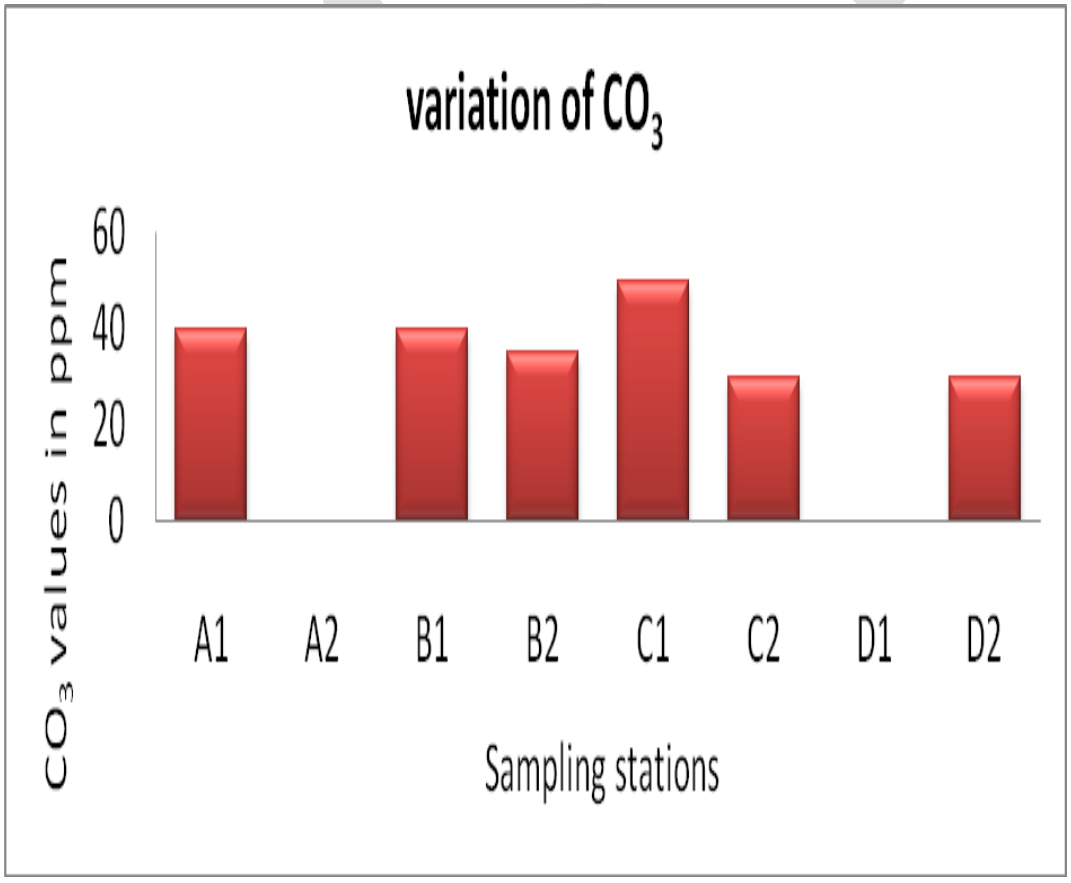

Fig : 8 Sampling Variation in Mean Values of CO_3

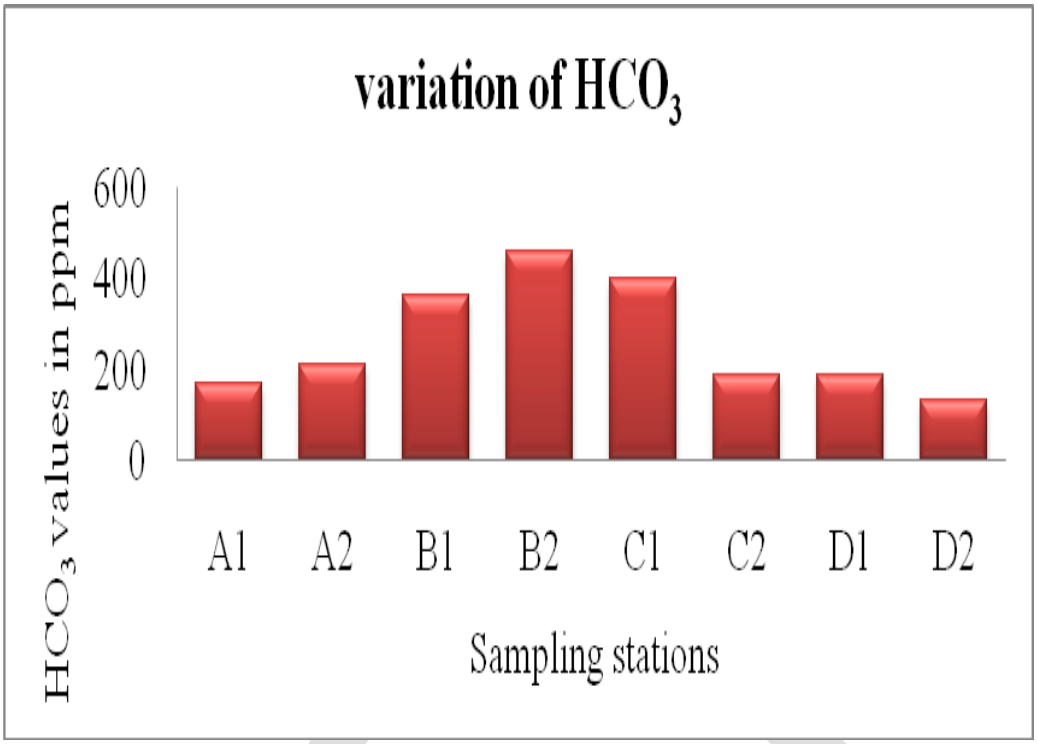

Fig : 9 Sampling Variation in Mean Values of HCO_3

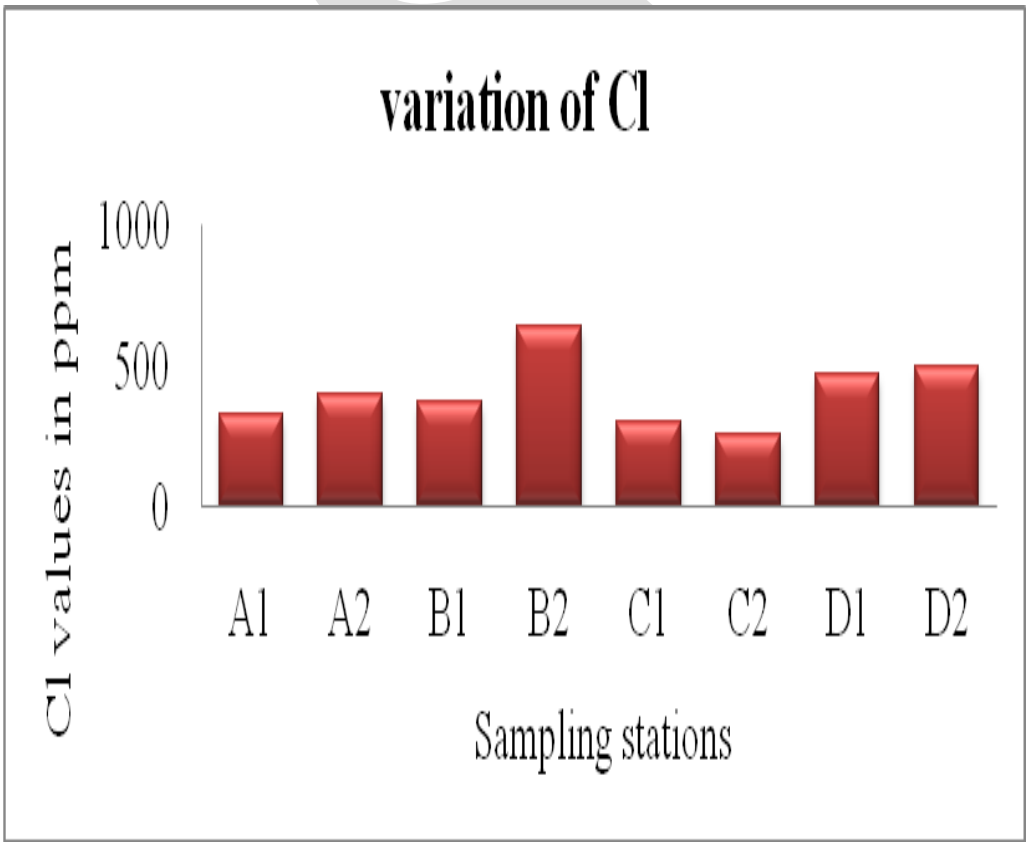

Fig : 10 Sampling Variation in Mean Values of Cl

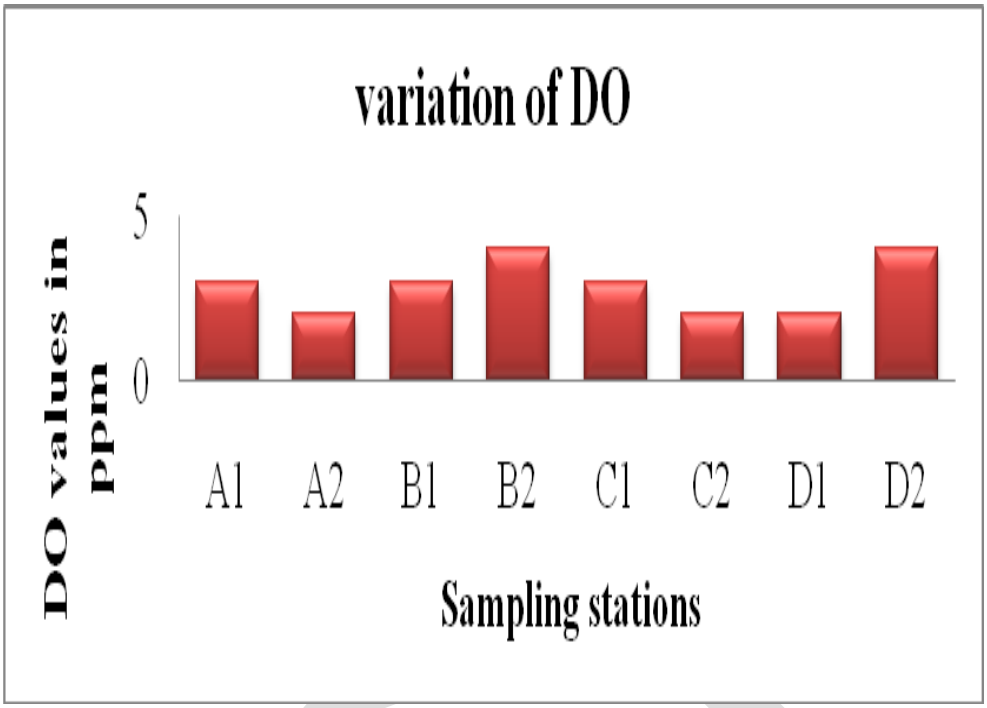

Fig : 11 Sampling Variation in Mean Values of DO

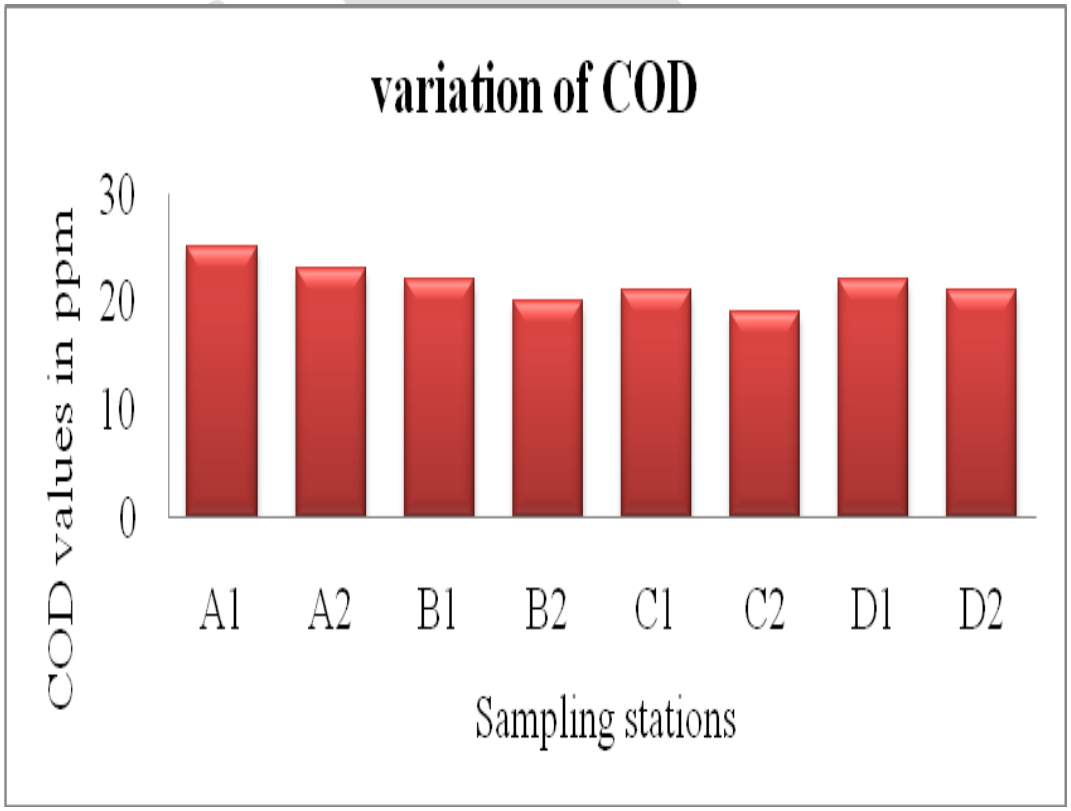

Fig : 12 Sampling Variation in Mean Values of COD

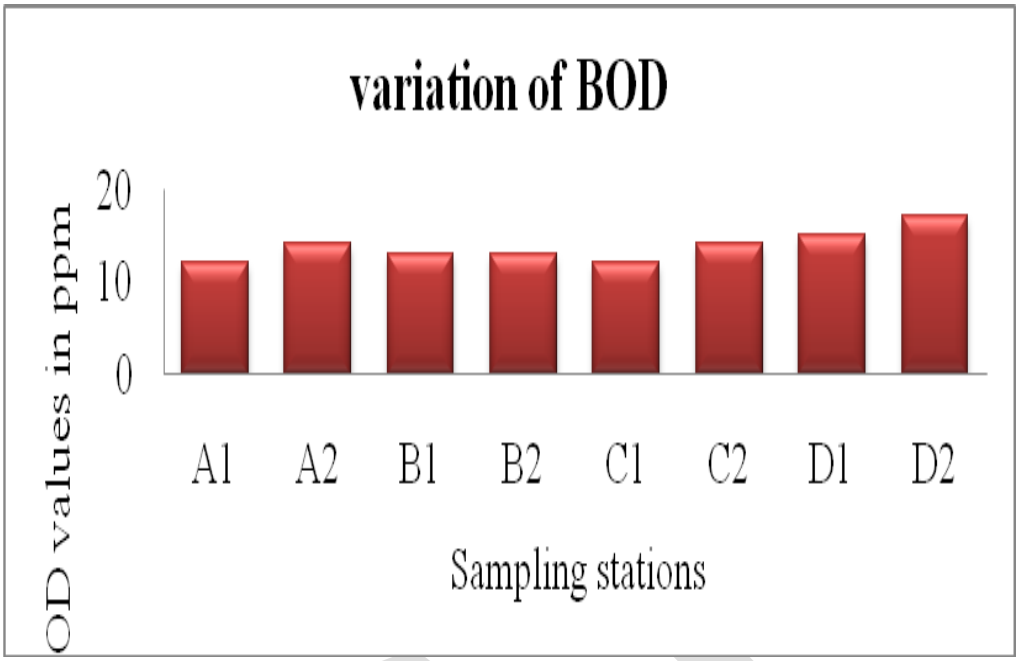

Fig : 13 Sampling Variation in Mean Values of BOD

CONCLUSION

The ground water samples are collected from 8 different stations in and around Senthurai Taluk at Ariyalur district. The physico chemical parameters analysis like pH, Electrical Conductivity, Calcium, Magnesium, Total Hardness, TDS, Chloride, Dissolved Oxygen, Biological Oxygen demand chemical Oxygen demand were analysed using standard procedures. Some parameters like pH, EC, TH, TDS, Cl, Ca, COD and BOD, shows the values more than the permissible limit.

According to this project work we found that the station Mathur in Senthurai Taluk is little bit more polluted than the other stations (A1 and A2) So it is the time to preserve water around this vulnerable resource from pollution. By adopting proper drainage system around this area, we can minimize these problems. All stations is unfit for domestic purpose and drinking purpose.

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