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Research Article **Zoology**

ANALYSIS OF WATER IN DIFFERENT LOCATION AT ARIYALUR DISTRICT

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ABSTRACT

Physico-chemical analysis two Stations as tap and well water were observed within the ranged as prescribed by WHO and Indian standards. The sulphate level is higher in pond and river water as compared to Indian standards recommended by ICMR and WHO. The nitrate level is higher in pond water as compared to standard recommended by ICMR and WHO. Therefore boiling of water is essential before consumption of water by the people living in this area. From the data of drinking water we should know the properties of bore-well drinking water which is used to enhance our plant growth.

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INTRODUCTION

Water is indispensable and one of the precious natural resource of our planet. Ground water is an important natural source of water supply all over the world. It is used in irrigation, industries and domestic purpose (Sirajudeen *et al*. 2013) Ground water quality depends on the quality of recharged water, atmospheric precipitation, in- land surface water, and on subsurface geochemical processes. Temporal changes in the origin and constitution of the recharged water, hydrologic and human factors, may cause periodic changes in groundwater quality. According to WHO, about 80% of all the diseases in human beings are caused by water? Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from their sources. Groundwater chemistry has been utilized as a tool to outlook water quality for various purposes (Rao, 2006).

According to WHO estimate about 80% of water pollution in developing country, like India is carried by domestic waste. The improper management of water systems may cause serious problems in availability and quality of water (SubbaRao and SubbaRao, 1995). In our country 70% of the water is seriously polluted and 75% of illness and 80% of the child mortality is attributed to water pollution (Zoeteman, 1980). The healthy nature of underground water has also altered (Dasgupta and Purohit, 2001). The industrial pollutants associated with organic matter, inorganic dissolved solids and other unwanted chemicals cause serious ground water problems (Tyagi *et al*.,2000). During the past decade, widespread reports of ground water contamination have increased public concern about drinking water quality (Yanggen and Born, 1990).

Groundwater meets domestic needs of more than 80 % rural and 50 % urban population, besides fulfilling irrigation needs of around 50% irrigated agriculture. Around two-fifth of Indias agriculture output is contributed from area irrigated by groundwater (Mariappan *et al.*,2005). Ground water quality depends on the quality of recharged water, atmospheric precipitation, in- land surface water, and on subsurface geochemical processes.

Polluted water is responsible for spread of water borne disease. So it is necessary to analyze the present environment. Well water are examined to locate the suitable sources of water and to determine the extent of treatment necessary to make it potable. Ground water constitutes 97% of global fresh water and many regions, ground water sources are the single largest supply for serving drinking water to the community. Ground water sources often necessitate examination of water Stations from different points and under varying conditions find out the extent of pollution and purification that takes place in the ground water (Sayyad *et al.*,2011).

Water pollution is the phenomenon that is characterized by the deterioration of the quality of land water (rivers, lakes, marshes and ground water) or seawater as a result of various human activities (Agarwal, 2002). Use of polluted water itself takes about 25000 peoples all over the world every day (Anil Kumar, 2001). Water is the basic need of life. Fresh water immediately available to man for drinking and other purposes is only 0.002% of the total water. Since the demand for water is mostly for fresh water, and everyone have to depend mainly on this tiny fraction of the total water present on this planet. Further the uneven distribution of water on the surface of the earth makes it a scarce resource at several places. A number of diseases are caused by the consumption of poor water quality. It has been reported in the "community health study" that 50% of all reported cases of illness, and 40% of deaths in Pakistan are due to drinking of poor water quality (Chhatwal, 1990).

Water is a unique, ubiquitous substance that is a major component of all living things. Its nature and properties have intrigued philosophers, naturalists and scientists since antiquity. Water continues to engage the attention of scientists today as it remains incompletely understood in spite of intense study over many years. This is primarily because water is anomalous in many of its physical and chemical properties. Some of water's unique properties are literally essential for life, while others have profound effects on the size and shape of living organisms, how they work, and the physical limits or constraints within which they must operate. The structure and properties of water were explained by spectroscopic and thermodynamic experiments. The more recent discipline of computer simulation has also played a role, having achieved a level of sophistication in the study of water in which it can be used to interpret experiments and simulate properties not directly accessible by experiment. Many of water's basic physical properties can now be explained, at least semi quantitatively, in molecular and structural terms (Eisenberg and Kauzmann, 1969).

MATERIALS AND METHODS

Area of Station collection

The water of different locations was collected in the morning using glass bottles.

Station I - Well water collected from Ariyalur
Station II - Pond water collected from Manakkal
Station III - River water collected from Thirumanur
Station IV - Tap water collected from Manakkal

Collection of Sampling

Stations were collected in 250ml glass bottles. The Stations were collected in plastic bottle for other physiochemical parameters, pre-cleaned by washing with non-ionic detergents, rinsed in tap water. Before sampling, the bottles were rinsed three times with Station water before being filled with the Station. The actual samplings were done midstream by dipping each Station bottle at approximately 20-30 cm below the water surface, projecting the mouth of the container against the flow direction. The Stations were then transported in cooler boxes.

Physic-chemical parameters

The methods used for the analysis of various physic-chemical parameters were the same as given in Standard Methods for the Examination of water (APHA, 1967, 1976, 1980, Gloterman *et al.*,(1978) and National Environmental Engineering Research Institute (NEERI, 1986).

Determination of pH

pH was recorded at the sampling site using digital pH meter maintained at the room temperature.

Determination of Temperature

The water temperature was recorded at the sampling area by using digital thermometer. Surface water temperature was recorded by dipping thermometer directly into water in a container, taking care not to expose it to hear or direct solar radiation.

Determination of Phenolphthalein Alkalinity

To 50 ml Station in Nesslers tube two drops of phenolphthalein indicator were added. If Station turned pink, titration was done with 0`02N sulphuric acid to a colouless end point. When the Station remained colourless on addition of indicator it showed that the carbonates are absent. The Phenolphthalein alkalinity are expressed in mg/l $CaCO_3$.

Determination of Total Alkalinity

Two drops of methyl orange indicator were added to the solution in which phenolphthalein alkalinity has already been determined. This was titrated with sulphuric acid to an end point when colour changed from yellow to orange. The total alkalinities are expressed in mg/l $CaCO_3$.

Determination of Total Dissolved Solids

In a pre-weighted dried dish of suitable size were taken and 100ml of filtered water Station was taken and evaporated on a water bath. The weight of the dish was noted after cooling it in a desiccator. The total dissolved solids are expressed in mg/l.

Determination of Free Carbon dioxide

Free carbon dioxide was estimated using sodium hydroxide titrant and phenolphthalein indicator. 50ml of Station was taken in a conical flask and two drops of phenolphthalein indicator were added. If the colour turned pink, free carbon dioxide was takes as absent. If it remained colourless it was titrated with sodium hydroxide

until pink colour appeared. The free carbon dioxide are expressed in mg/l.

Determination of Calcium hardness as $CaCO_3$

1ml of sodium hydroxide and 0.2gm of murexide indicator were added to 50ml and titrated against EDTA titrant till pink colour changed to purple in order to determine calcium hardness as calcium carbonate. The calcium hardness is expressed in mg/l $CaCO_3$.

Determination of Sulphates

Filtered the water Station through Whatmann filter paper. 50ml of filtered water Station was taken into conical flask containing not more than 10mg/ml sulphate. Added 0.15gm of barium chloride and mixed for 30 minutes using a magnetic stir. Measured the absorbance against distilled water blank at 420nm and compared with the standard curve. The sulphates are expressed in mg/l.

Determination of Nitrates

25ml of water Station was evaporated to dryness on hot water bath and 1ml phenoldisuphonic acid was added after rubbing the residue thoroughly. 10ml of distilled water and 3ml ammonium hydroxide was added one after other. A yellow colour was developed. Absorbance was read at 410nm against a blank and compared with standard curve. The nitrates are expressed in mg/l.

Determination of Chlorides

5 drops of potassium chromate indicator were added to 50ml of Station and titrated with silver nitrate solution till the Station turned brick red. The chlorides are expressed in mg/l.

Determination of Fluoride

Added sequentially to 5 ml volumetric flasks containing 3.5ml of THF solution, 0.1ml of working solution, 1.3ml of Station and 0.1ml of NaH_2PO_4-NaOH Buffer. Mixed the content of the flask thoroughly. After 10min, measure the absorbance at 600nm using THF-water (7:3 v/v) solution as the reference. The fluoride is expressed in mg/l.

Statistical analysis

The results were presented as mean ± SD. Data was statistically analyzed using student "t" test. P. values set as lower than 0.05 was considered as statistically significant.

RESULTS

The present study was carried out to investigate the physicochemical characters of bore well water of different locations (Stations I, II, III and IV). The observations made on different water Stations were compared as follows. Table 1 represent the pH and temperature of Station I and Station II. The pH and temperature is within the normal limit were observed.

Table 1 Shows the pH and temperature Station I to IV

Parameters	Station I	Station II	Station III	Station IV
pH	7.8±0.35	6.63±0.56	7.5±0.34	7.4±0.32
Temperature (^oF)	95.45±0.78	96.63±0.58	94.21±0.38	95.45±0.78

Values were expressed as mean ± SD for triplicate.

Fig.1.Shows the pH of Station (Sample) I to IV

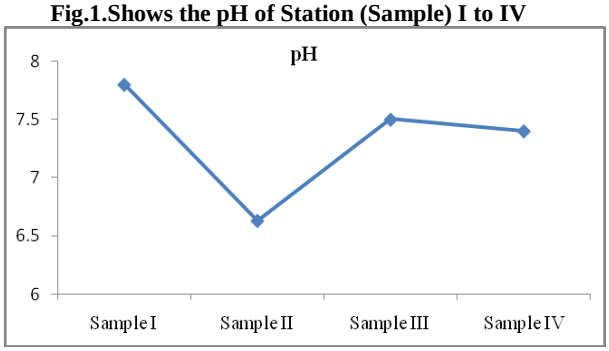


Fig.2.Shows the temperature of Station (Sample) I to IV

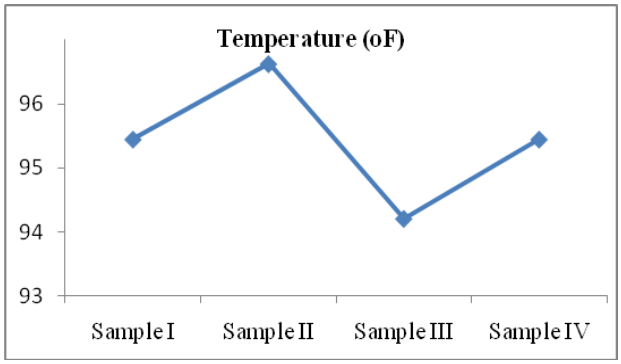


Table 2 represents the concentration of phenolphthalein, total alkalinity and Total Dissolved Substances (TDS) of Station I to Station IV. Station I to III showed significant changes in total alkalinity and decreased phenolphthalein alkalinity when compared to Station IV.

Table 2 shows the phenolphthalein and total alkalinity of Station I to IV

Parameters	Station I	Station II	Station III	Station IV
Phenolphthalein alkalinity (mg/dl $CaCO_3$)	32±0.21*	45±0.28*	18±0.14*	20±0.16
Total alkalinity (mg/dl $CaCO_3$)	38±4.89	36±8.94	15.33±5.73*	27.33±3.77
Total Dissolved Substances (mg/L)	0.98±0.06*	77.69±0.49*	0.32±0.21*	0.01±0.07

Values were expressed as mean ± SD for triplicate.
* Significantly different from Station IV ($P<0.05$)

Fig.3.shows the phenolphthalein and total alkalinity of Station I to IV

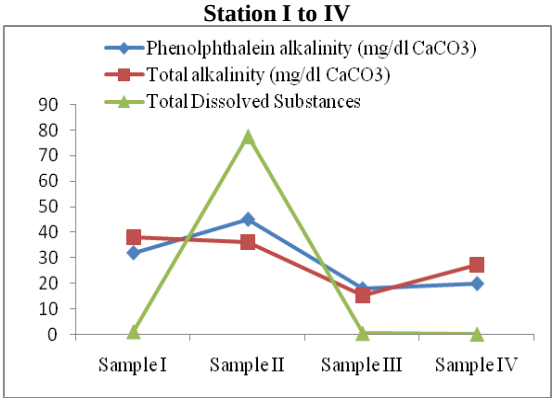


Table 3 represents the concentration of free CO_2 and calcium hardness of Station to Station III. Station I to III showed significant changes in free CO_2 and calcium hardness when compared to Station IV.

Table 3 shows the free CO_2 and calcium hardness of Station I to IV

Parameters	Station I	Station II	Station III	Station IV
Free CO_2 (mg/dl)	16±2.82	28.66±4.21*	13.3±3.79	11.33±3.77
Calcium Hardness (mg/dl)	5.0±4.26	31.5±10.5*	21.6±1.25*	3.2±0.15

Values were expressed as mean ± SD for triplicate.
* Significantly different from Station IV (P<0.05)

Fig.4.shows the free CO_2 and calcium hardness of Station I to IV

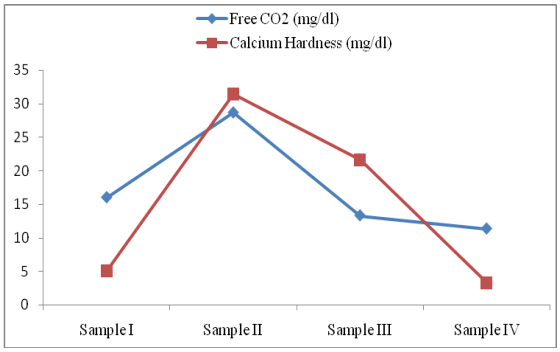


Table 4 represents the concentration of sulphates, nitrate and chloride Station to Station III. Station I to III showed significant changes in sulphates, nitrate and chloride when compared to Station IV.

Table 4 shows the sulphates, nitrate and chloride of Station I to IV

Parameters	Station I	Station II	Station III	Station IV
Sulphates (mg/l)	169.44± 7.45	663.86± 39.04*	273.3±17.69*	174.96± 9.28
Nitrates (mg/l)	112.5±13.46*	314.58± 17.64*	37.5±7.18	31.25±7.18
Chlorides (mg/l)	190.06± 14.90*	51.4±12.89	71.33±11.62*	42.66±6.18

Values were expressed as mean ± SD for triplicate.
* Significantly different from Station IV (P<0.05)

Fig.5.shows the sulphates, nitrate and chloride of Station I to IV

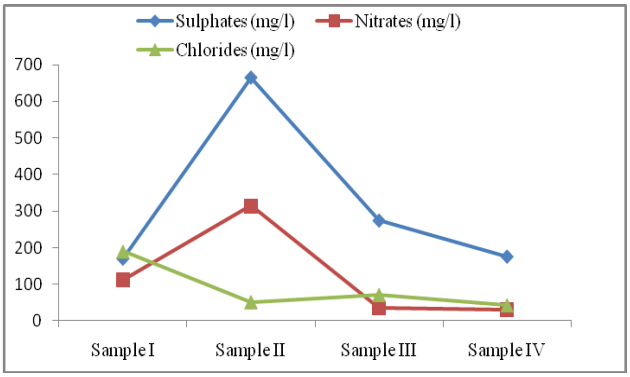


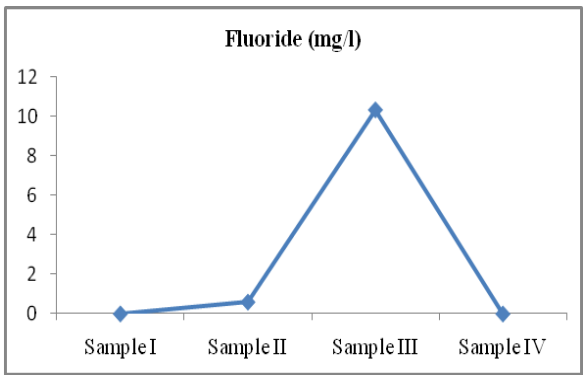
Table 5 represents the concentration of fluoride of Station I to IV. Station I showed a non-significant changes of fluoride when compared to Station IV. Station II to III showed significant changes of fluoride when compared to Station IV.

Table 5 shows the fluoride of Station I to IV

Parameters	Station I	Station II	Station III	Station IV
Fluoride (mg/l)	0.005±0.23*	0.60±0.79*	10.32±1.20*	0.0001± 0.001

Values were expressed as mean ± SD for triplicate.
*Significantly different from Station IV

Fig.6.shows the fluoride of Station I to IV



DISCUSSION

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics (Venkatesharaju *et al.*,2010). The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics. To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load. These characteristics can identify certain condition for the ecology of living organisms and suggest appropriate conservation and management strategies. Many researches are being carried out till present (Prabu *et al.*,2008; Srivastava *et al.*, 2009; Prasanna and Ranjan, 2010). In order to assess the physicochemical property of bore well water of different locations (Station I and Station II). These result were compared with WHO (1963), BIS (1991) and ICMR (1975) drinking water standard (WHO, 1963; ICMR, 1975). Drinking water standard in table 7.

pH

pH is a scale of intensity of acidity or alkalinity and pH measures the concentration of hydrogen ions in water, the variations in temperature affects on pH. All Stations were ranged within the permissible limit of WHO. However higher values of pH hasten the scale formation in water heater and reduce the germicidal potential of Chlorine.

Temperature

In the present study temperature ranged was kept from 94.4 to 96.5 ^{o}F for Stations. This temperature was ranged within the permissible limit of WHO.

Alkalinity

The phenolphthalein alkalinity of water Stations were ranges from 30 to 88 mg/l. The phenolphthalein alkalinity 32 ± 0.21 mg/dl for Station I, 45 ±0.28 mg/dl for Station II, 18 ±0.14mg/dl for Station III and 18 ±0.14 mg/dl for Station IV. The total alkalinity of water Stations were ranges from 75 to 100mg/l. The total alkalinity 38±4.89 mg/dl for Station I, 36±8.94 mg/dl for Station II, 15.33 ±5.73mg/dl for Station III and 27.33±3.77 mg/dl for Station IV. All the Stations were beyond the permissible limit. Alkalinity in itself is not harmful to human being; still the water Stations with less than 100 mg/l are desirable for domestic use (Loganayagi *et al.*,2008). The high alkalinity imparts an unpleasant taste.

Total Dissolved Substances (TDS)

Total dissolved substances value ranged from 0.98 ±0.06 mg/dl for Station I, 77.69 mg/dl for Station II, 0.32 ±0.21 mg/dl for Station III and 0.01 ±0.07 mg/dl for Station IV. Similar findings have been reported by Rao *et al* 2003, Kirubavathy *et al* 2005. TDS analysis has great implications in the control of biological and physical waste water treatment processes. The values of TDS in water Stations ranges from 50 to 500 mg/l .The most important aspect to drinking water quality is its effect on taste. The drinking water containing more than 500 mg/l of TDS is not considered desirable (Sastry *et al.*,1988) and it can also cause excessive scaling in water pipes, water heaters, boilers and household appliances (Tihansky, 1974).

Free Carbon Dioxide:

In water body the presence of carbon dioxide is due to respiratory activity of aquatic life and the process of decomposition, the CO_2 is useful for the photosynthetic activities of plants; the high range of carbon dioxide is present in polluted water. In present study the values of carbon dioxide were observed in 16±2.82mg/dl for Station I, 28.66±4.21 mg/dl for Station II, 28.66±4.21 mg/dl for Station III and 11.33±3.77mg/dl for Station IV. All the Stations were within the limit.

Table 6 Drinking Water Standards of WHO (1963) and ICMR (1975)

Parameters (mg/L)	WHO	ICMR
Temperature (^{o}F)	95-98	96-98
pH	6.5-8.5	7-8.5
Free carbon dioxide as $CaCO_3$	20	20
Total Dissolved Substances	500	500
Calcium Harness	75-200	75-200
Phenolphthalein alkalinity	30 to 88	50 to 100
Total alkalinity	75	100
Chloride	200-1000	250-1000
Sulphates	200	200
Nitrates	45	20-100
Fluroide	Nil	Nil

Calcium Hardness:

The calcium hardness range is from 5.0±4.26 mg/dl for Station I, 31.5±10.5 mg/dl for Station II, 21.6 ±1.25 mg/dl for Station III and 3.2±0.15 mg/dl for Station IV. Calcium contents in all Stations collected fall within the limit prescribed. Calcium is needed for the body in small quantities, though water provides only a part of total requirements.

Sulphate

Sulphate ranged from 169.44±7.45mg/dl for Station I, 663.86±39.04mg/dl for Station II, 273.3±17.69mg/dl for Station III and 174.96±9.28mg/dl for Station IV. The tolerance range for sulphate is 200 to 400 mg/l. The high concentration of sulphate may induce diarrhea.

Chloride

Chloride found low during the study ranged 190.06±14.90 mg/dl for Station I, 51.4±12.89 mg/dl for Station II, 71.33±11.62 mg/dl for Station III and 42.66±6.18 mg/dl for Station IV. Similar results were reported by Swarnalatha and Nasing Rao (1998) and Umavathi *et al.,* (2007) showed that low concentration of chloride is association with decreased level of pollution. Chloride values ranged from 200 to 1000 mg/l. High chloride content can cause high blood pressure in people. Chloride in excess (1000 mg/l) imparts a salty taste to water and people who are not accustomed to high chloride may be subjected to laxative effect. High Chloride concentration is also an indicator of large amount of organic matter (Yadav, 2002).

Nitrate

During the study Nitrate 112.5±13.46 mg/dl for Station I, 314.58±17.64mg/dl for Station II, 37.5±7.18 mg/dl for Station III and 31.25±7.18 mg/dl for Station IV. Station I value is within the permeable limit but Station II is beyond the limit. High concentration of nitrate drinking water is toxic (Umavathi *et al.,* 2007).

Fluroide

Fluroide ranged from 0.005±0.23 mg/dl for Station I and 0.60±0.79 mg/dl for Station II, 10.32±1.20 mg/dl for Station III and 0.0001±0.001mg/dl for Station IV.. The tolerance range for fluride is Nil. The high concentration of fluoride may induce teeth decay.

The following conclusion obtained from the study Physico-chemical analysis two Stations as tap and well water were observed within the ranged as prescribed by WHO and Indian standards. The sulphate level is higher in pond and river water as compared to Indian standards recommended by ICMR and WHO. The nitrate level is higher in pond water as compared to standard recommended by ICMR and WHO. Therefore boiling of water is essential before consumption of water by the people living in this area. From the data of drinking water we should know the properties of bore-well drinking water which is used to enhance our plant growth.

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