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GROUNDWATER QUALITY IN AND AROUND PALLIPALAYAM IN TAMILNADU, INDIA

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ABSTRACT

Ground water samples have collected from different parts of Pallipalayam, Namakkal District, Tamilnadu, India and analysed for various water quality parameters during monsoon period. Effects of municipal sewage, agricultural runoff, dyeing effluents on the water quality have been investigated. The importance of pallipalayam is slow and steady growing city because of its power loom, dyeing industries, paper industry and textile business. This study involves determination of physical, chemical parameters of ground water. The ground water was found to be hard always due to its topographical nature. The determined values were compared with the standard values to assess the pollution load. The results revealed that most of the water samples were within the limits in a few aspects according to the water quality standards.

KEYWORDS: Ground water, hardness, dye industries, Paper industries, textile business.

1. INTRODUCTION

The quality of ground water in the different parts of Pallipalayam is influenced by various natural processes and anthropogenic activities. The entire array of life is affected due to pollution in water.[1] In many areas, sewage and industrial effluent are disposed into the Cauvery river without treatment in Pallipalayam and river water quality is slowly deteriorated. Consequently, human health and crop yields are being affected or threatened everywhere. Physico–chemical characteristics of river water affect the biological characteristics and it is an indication of the quality of water.[2,3,4,5&6] This study investigates water quality trends and identifies the major sources of pollution in the ground water and also the objectives of the study area is to assess the present water quality through analysis of a few selected water quality parameters like pH, conductivity, TH, TDS, alkalinity etc. In this study an attempt has been made to study the environmental condition along the ground and predict the pollution status.

2. MATERIALS AND METHODS

The water samples have taken from three different parts of Pallipalayam named as Allampalayam, Kadachanallur and Tajnagar. These areas are famous for power loom and industrial based areas in Pallipalayam. The samples have taken during the last week of July month. Allampalayam is at the center place between Thiruchengodu and Erode, both are industrial and agricultural areas. Kadachanallur area which is one of the power loom based area in Pallipalayam and it is nearby paper mill and Tajnagar area is also power loom based area and nearby Cauvery river and it is a Semi-arid area. During summer, the area faces acute shortage of water.

Tajnagar water sample - Sample 1
Allampalayam water sample - Sample 2
Kadachanallur water sample - Sample 3

One litre polythene bottles were used for the collection of water samples for various quality parameter analyses. Prior to sample collection, all the bottles were washed with dilute acid followed by distilled water and before taking water samples the bottles were rinsed two times with the water to be collected at the sampling location. The sample bottles were labelled with date. Samples were collected in the month of July which is south –west monsoon. All the chemicals used were of AR Grade. For the analysis of pH, electrical conductivity, total

dissolved solids, alkalinity, chlorides, total hardness, sulphate and organic matter, standard procedures were followed.

3. RESULTS AND DISCUSSION

The water samples analysis study results were given in the table 1.

Parameter	Sample-1 ppm	Sample-2 ppm	Sample-3 ppm
Temperature	29^0C	29^0C	29^0C
Total hardness	176.47	352.94	303.92
Permanent hardness	102.94	142.15	102.94
Temporary hardness	73.53	210.79	200.98
Hydroxide alkalinity	0	0	0
Carbonate alkalinity	50	70	30
Bicarbonate alkalinity	110	195	220
TDS	261	432	408
Dissolved oxygen	11.84	10.65	9.47
pH	7.73	7.71	7.60
Sodium	26	63	75
Potassium	3	13.6	1.6
Conductance	0.409µ	0.64µ	0.620µ
Sulphate	0.0323	0.164	0.135
Chloride	104.75	122.21	139.67

Temperature

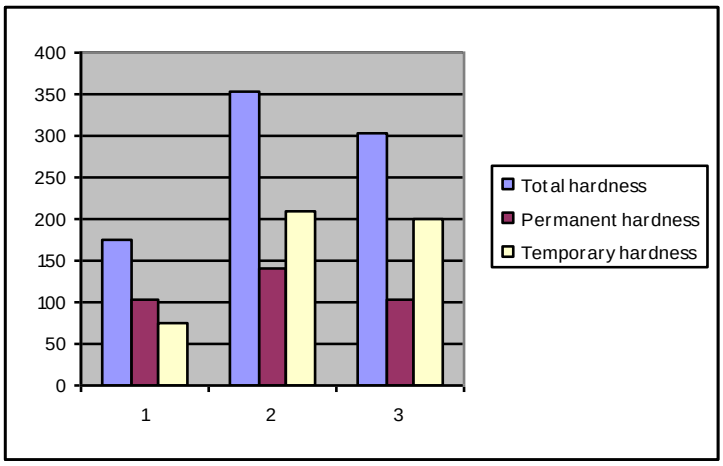
Water temperature has direct and indirect effects on nearly all aspects. For example, the amount of oxygen that can be dissolved in water is partly governed by temperature. If water temperature increase beyond their usual ranges for too long, plants and animals in waterbodies can become stressed and die. One of the factors that affect water temperature is heat exchange on the earth surface under controlled radiation in and out. Increases in annual mean water temperature values of around 1.5oC, and changes in summer mean temperatures of more than 2oC, would have an impact on the thermal habitats of freshwater faunas[7,8] In this study, the temperature values not varied from each other, because they have collected in the monsoon.

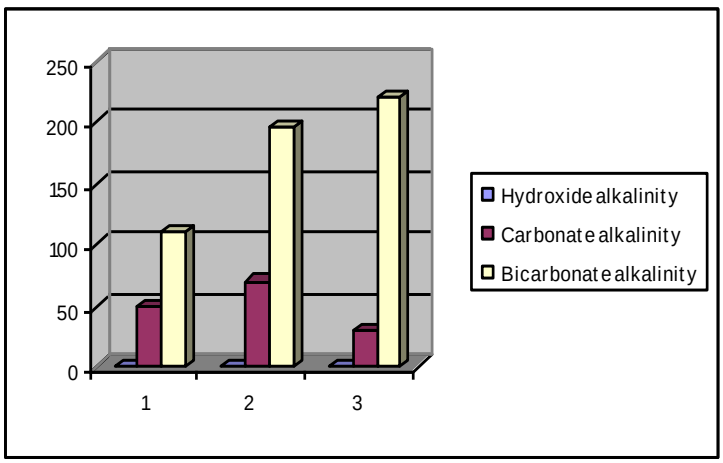
Hardness

WHO specified the total hardness of the water sample to be within 200-600ppm of CaCO3. Hardness values of ground water samples varied from 176.47-303.92ppm. Permanent hardness values differ from 102.94 to 142.15ppm. Temporary hardness values differ from 73.53 to 210.79 ppm. The observed hardness values of all water samples were below the limits prescribed by WHO, which is fit for drinking purpose and irrigation purpose too.

Alkalinity

The standard desirable limit of alkalinity in drinking water is 120ppm (WHO, 1984).[9] The maximum permissible level is 600ppm. In this study, the average value of alkalinity were below the desirable limits in all the water samples. The value of alkalinity in water provides an idea of natural salts present in water. The cause of low alkalinity is the minerals which dissolve in water from soil. The various ionic species that contribute to alkalinity includes bicarbonates, hydroxides phosphates borates and organic acids. These factors are responsible for the alkalinity of water sources. The sewage, drain water, industrial effluents may lead to increase in alkalinity of surface water in future course of time. Hence proper care must be taken to preserve the quality of water.

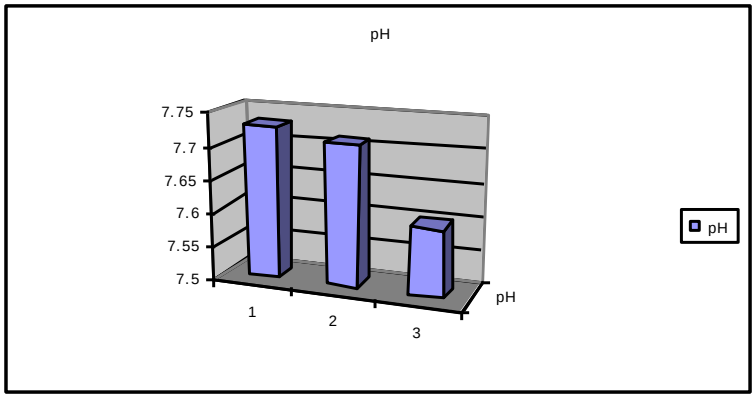




pH

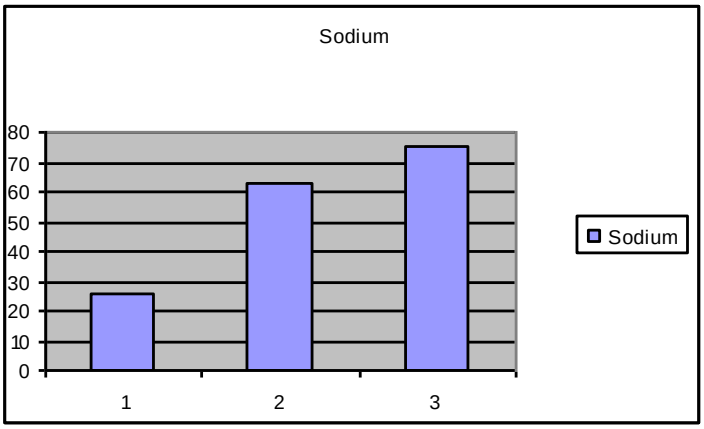
pH is the indicator of acidic or alkaline condition of water quality. It is clear that the pH value is within the potable limits as it ranged from.7.6–8.5 Ground water with a pH of 5.5 and below is particularly at risk. The pH of ground water can also be lowered by organic

acids from decayed vegetation or the dissolution of sulphide minerals. Low pH level causes aquatic species kill by stressing animal systems and causing physical damage, which in turn makes them more vulnerable to disease. It is supposed that the temperature of the atmosphere and the animal and plant activities, caused by it, has much influence.[11,12] In this study, the samples are within the limit.



SODIUM

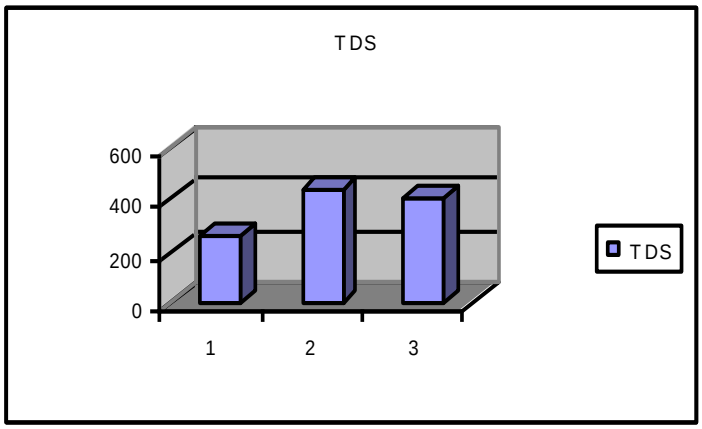
In the present study the amount of sodium in the water samples was ranged from 26 to 75ppm. In the sample 3 the sodium level is more than other samples. There is no particular value for sodium as prescribed by standard norms; however the some data shows the limit as 200ppm.



Total Dissolved Solids

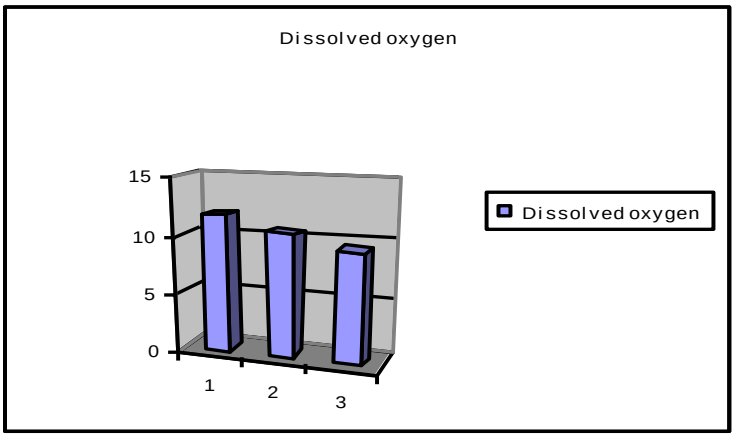
High TDS levels can make water taste like minerals and make it unpleasant to drink and cause water balance problems for organisms. Low TDS levels may limit growth of aquatic life. Phytoplankton and floating aquatic plants, for example, absolutely require the nitrates and phosphates dissolved in the water because they have no roots to take up those

nutrients. Total dissolved solids cause toxicity through increases in salinity, changes in the ionic composition of the water and toxicity of individual ions. Increases in salinity have been shown to cause shifts in biotic communities, limit biodiversity, exclude less- tolerant species and cause acute or chronic effects at specific life stages.[10] The total dissolved solids (TDS) in the water samples collected in three different places varied from 93-256ppm. Results are within the limit.



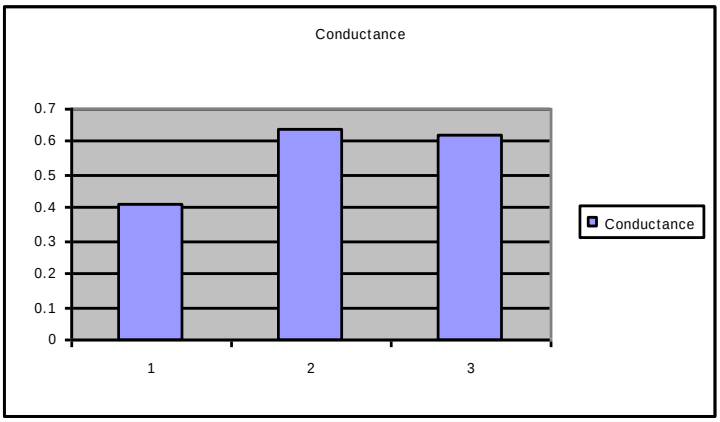
Dissolved oxygen

The solubility of oxygen in water depends on factors like pressure, temperature, and altitude and chloride concentration.[15] It plays a key role in various metabolic activities. Low oxygen content in water is usually associated with organic pollution. The solubility of atmospheric oxygen in fresh water ranges from 14.6mgs/L at 00 C to about 7 mgs/L at 350C at 1 atm pressure. This clearly indicates that the solubility of atmospheric oxygen decrease with increase of temperature. DO is ranged from 10.07 to 16.256 mg/l in the study area. In this study the sample 3, dissolved oxygen is found to be low when comparing with the other water sample. The pollutants from fast growing population, topography, textile business etc., may be the reason.



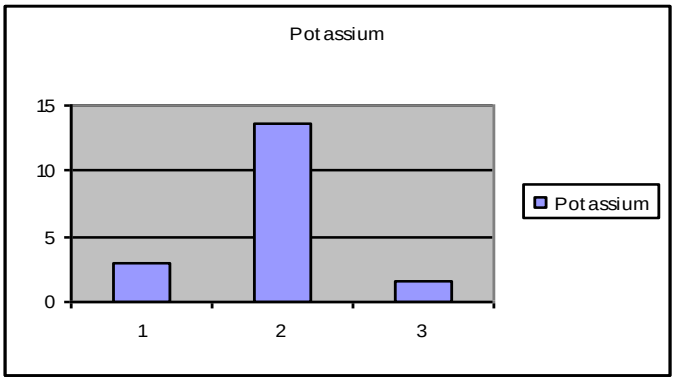
Conductivity

The conductivity (EC) mean values ranged from 138-380µs cm^{-1}.[13] The highest and the lowest values obtained were 139 µs cm^{-1} and 380µs cm^{-1}different quality in different places. The higher EC Values indicate the presence of higher concentration of dissolved salts in the sample 2 and EC values are a good measure of the relative difference in water quality between different aquifers.



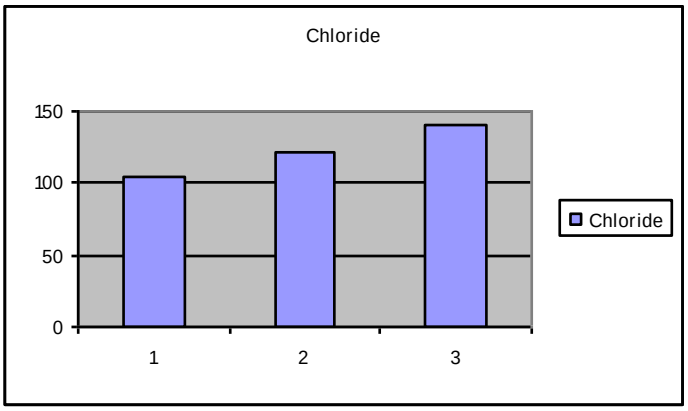
Pottasium

In the present study the amount of potassium in the water samples was ranged from 3 to 13.6 ppm. In the sample 3 the potassium level is more when compare with the other sample. There is no particular value for potassium in the standard norms.



Chloride

The permissible limit of chloride in drinking water must be 250ppm (WHO, 1984).[10] Because the chloride salts in excess of 100 ppm give salty taste to water. When combined with calcium and magnesium, may increase the corrosive activity of water. In this study Chloride concentrations were varying from 7 - 44.02ppm. The values of chloride observed in the ground water were very low.



Organicmatter

Concentrations of these determinants are normally raised as a result of organic pollution, caused by discharges from waste water treatment plants, industrial effluents and agricultural runoff. The organic matters are not present in the water samples. It may be due to closed borewell and the pollutants have not penetrated the underground level.

Sulphate

The sulphate in the water samples collected in three different places varied from 0.0323, 0.164, and 0.135 mg, but the values are still within the limits. High sulphate levels can make water taste like minerals and make it unpleasant to drink. High sulphate can cause

water balance problems for organisms.

CONCLUSION

This study shows the samples can be used for domestic purpose. The industrial effluent like dyeing effluent, agricultural run off, urbanization, domestic sewage etc., have not been affected much. The topography may be the one of the factor for hardness and alkaline nature. Usually the contaminations are taking place through soil easily. Since the sample 1 is collected in the rocky area, the pollution was not much. Among the three the sample 1 was better than the other two. The samples can be used after purifying them for drinking purpose.

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