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Comparison of groundwater quality in and around Salem in Tamilnadu, India

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Abstract - ***Ground water samples have collected from different parts of Salem, 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 Salem is slow and steady growing city because of its Educational institutions, Sago factories, Steel plant, Magnesite 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 water was found slightly alkaline. 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.***

Key Words: Ground water, hardness, sago factories, Salem, textile business.

1.Introduction:

The quality of ground water in the different parts of Salem is influenced by various natural processes and anthropogenic activities. The entire array of life in water is affected due to pollution in water [1]. In many areas, wastewater is disposed into the natural water bodies due to their capacity to assimilate and dilute the harmful constituents of the effluents. The problem of river water quality deterioration is mainly due to human activities such as disposal of dead bodies, discharge of industrial and sewage wastes and agricultural runoff which are major cause of ecological damage and pose serious health hazards [2]. Consequently, human health and crop yields are being affected or threatened in many cases. This study investigates water quality trends and identifies the major sources of pollution in the ground water. Physico–chemical characteristics of river water affect the biological characteristics and it is an indication of the quality of water [3,4,5,6&7]. The objectives of the study area is to assess the present water quality through analysis of some 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 Salem named as Hasthampatti, Kondalampatty and Chinnaseeragapadi. These areas are the oldest and agriculture based areas in Salem city. The samples have taken during the last week of October. Hasthampatti is at the foot of famous Yercaud hill station. Kondalampatty area which is one of the textile based area in Salem city and it is nearby river Thirumanimutharu and now the river turns into sewage canal which carries dyeing unit, soap industry effluent and domestic sewage of Salem city. Chinnaseeragapadi area is power loom based area and heavily populated because of private university. Chinnaseeragapadi is nearby Kanjamalai (hill) and Semi-arid area. During summer, the area faces acute shortage of water.

Hasthampatti water sample - Sample 1

Kondalampatty water sample - Sample 2

Chinnaseeragapadi 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 October. 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 various water analysis study results were given in the table 1.

Table-1: comparision studies

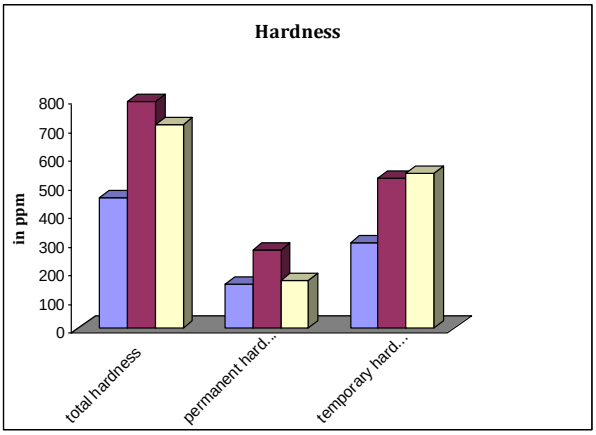
Parameter	Sample-1 ppm	Sample-2 ppm	Sample-3 ppm
Temperature	29^{0}C	29^{0}C	29^{0}C
Total hardness	454.11	792.27	710
Permanent hardness	154.59	270.53	167.48
Temporary hardness	299.52	521.74	542.52
Hydroxide alkalinity	0	0	0
Carbonate alkalinity	50	110	60
Bicarbonate alkalinity	350	487.5	630
TDS	134	148	155
Dissolved oxygen	16.25	11.05	10.07
pH	7.74	7.3	7.84
Sodium	167.5	367.2	382.5
Potassium	10	10	155
Conductance	1.18µ	2.26µ	2.39µ
Sulphate	0.0823	0.164	0.131
Chloride	7.05	18.30	44.02

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 waterways can become stressed and die. Some of the factors that affect water temperature are heat exchange on the earth surface under controlled radiation in and out. Increases in annual mean water temperature values of around 1.5^{o}C, and changes in summer mean temperatures of more than 2^{o}C, would have an impact on the thermal habitats of freshwater faunas (Pockl et al., 2003; Bruce and Franz, 2007)[8,9]. In this study, the temperature values not varied from each other, because they have collected in the monsoon.

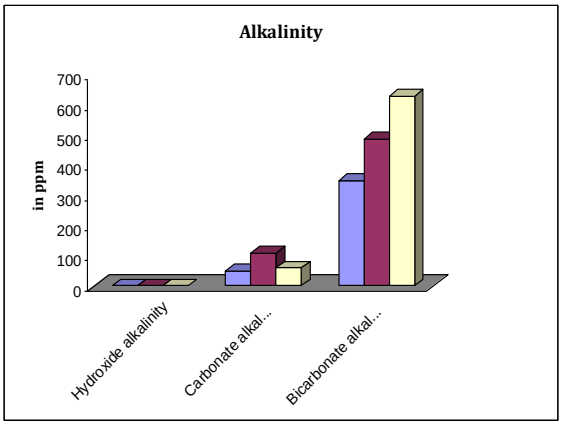
Hardness:

The WHO specified the total hardness to be within 200- 600ppm of $CaCO_3$. Hardness values of ground water samples varied from 454.11-792.27ppm. Permanent hardness values differ from 154.59 to 270.53ppm. Temporary hardness values differ from 299.52 to 542.52ppm.The observed hardness values of water samples 2&3 were above the limits prescribed by WHO, which is not fit for drinking purpose and irrigation purpose too.



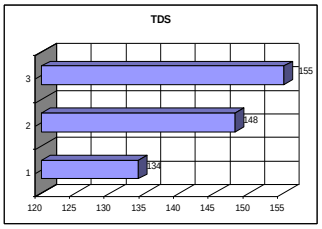
Alkalinity:

The standard desirable limit of alkalinity in drinking water is 120ppm (WHO, 1984)[10]. The maximum permissible level is 600ppm. In this study, the average value of alkalinity were exceeded 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 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.



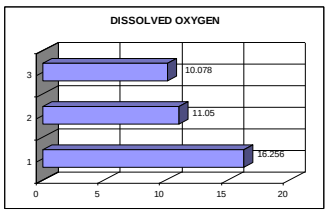
Total Dissolved Solids:

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 (Phyllis and Lawr)[11]. The total dissolved solids (TDS) in the water samples collected in three different places varied from 93-256ppm. Results are within the limit.



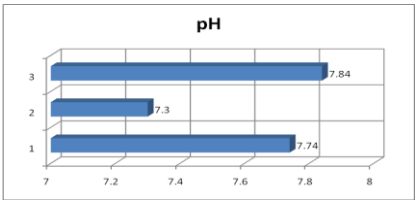
Dissolved oxygen:

The solubility of oxygen in water depends on factors like pressure, temperature, and altitude and chloride concentration. 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 0^0 C to about 7 mgs/L at 35^0C 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



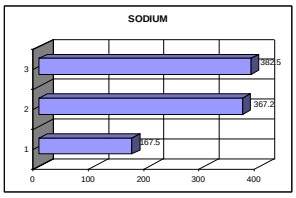
pH:

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 decaying 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 (Hanya, 1949; Bahadur and Chandra, 1996)[12,13]. In this study, the samples are within the limit.



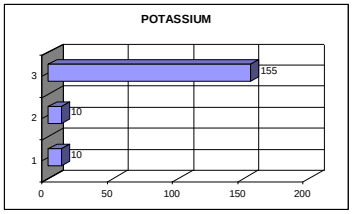
SODIUM:

In the present study the amount of sodium in the water samples was ranged from 167.5 to 382.5 ppm. 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.



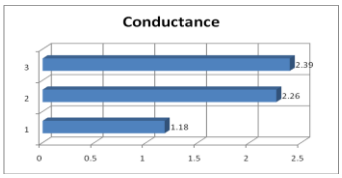
POTASSIUM:

In the present study the amount of potassium in the water samples was ranged from 10 to 155 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.



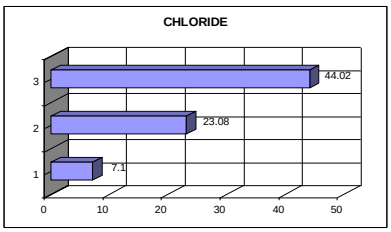
Conductivity:

The conductivity (EC) mean values ranged from 138-380µs cm^{-1} (Shiddiky, 2002)[14]. The highest and the lowest values obtained were 139 µs cm^{-1} and 380µs cm^{-1} respectively. This indicates that the ground water had different quality in different places. The higher EC Values indicate the presence of higher concentration of dissolved salts in the sample 3 and EC values are a good measure of the relative difference in water quality between different aquifers.



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.

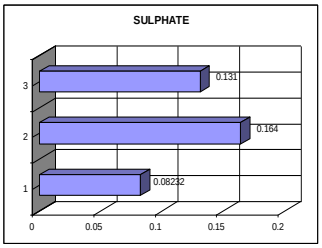


Organic matter:

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 0.08232, 0.164, 0.131mg, 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 and 3 were 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.

References

[1] Thitame, S. N. and Pondhe, G. M. Assessment of seasonal variation in physico- chemical characteristics and quality of Pravara River water for irrigation use in Sangamner, Dist Ahmednagar, Maharashtra. *J. Chem. Pharm. Res.* 2(2): 316-320, 2010.

[2] Padmanabha and Belagali, Water quality Index of Kabini River in the Kallahally Village of Nanjangud Taluk, Mysore District, Karnataka (India), *J. Envi. Sci. & Engg.*, 49(1),48, 2007.

[3]APHA – American Public Health Association 1998. Standard method for the examination of water and Waste Water 20th edition, APHA, AWWA, WEF, Washington DC, 1998.

[4] Bhargava, D. S. Water quality in three typical rivers in UP. Ganga, Yamuna and Kali. Ph.D. Thesis, IIT, Kanpur, 1977.

[5] Tripathi, C. K. M. Investigation of Ganga River to determine biological indicators of water quality, Ph.D. Thesis, B.H.U. Varanasi, 1982.

[6] Tripathi, G. 1983. Environmental problems of Indian rivers and their ill effects, River pollution and human health. R.S. Ambashat and B.D. Tripathi (Eds.), NECA, Varanasi: 23-33, 1983.

[7] EPA Publication, "Methods for Chemical Analysis of Water and Wastes", mEPA #600/4-79-02, 1979.

[8] Pöckl, M., Webb, B. W. and Sutcliffe, D. W. Life history and reproductive capacity of Gammarus fossarum and G. roeseli (Crustacea: Amphipoda) under naturally fluctuating water temperatures: a simulation study. *Freshwater Biol.* 48: 53–66, 2003.

[9] Bruce Webb, W. and Franz, N, Long-term changes in river temperature and the influence of climatic and hydrological factors, Hydrological Sciences J. 52(1): pp 74-85, 2007.
[10] World Health Organization (WHO), Guidelines for Drinking water Quality. Health criteria and other supporting information, WHO, Geneva, 1, 1984.
[11] Phyllis, K., Weber, S. and Lawrence, K. D. Effects of Total Dissolved Solids on Aquatic Organisms: A Review of Literature and Recommendation for Salmonid Species. *Ameri. J.Environ. Sci*., 3(1): 1-6, 2007.
[12] Hanya, T. Geochemical Studies of Sugashima Island, VII. Regional Distribution of Dissolved Substances in Streamlet waters and the Relation between the Chemical Society of Japan. 27(7), 1949:
[13] Ph- Chandra, R., Y. Bahadur and B. K. Sharma Monitoring the quality of river Ramganga waters of Bareilly. *Poll. Res..,* 15(1): 31-33, 1996.
[14] Shiddiky, M. J. A. A study on the water quality parameters of the Surma River, M. Sc. Thesis, Chemistry Department, Shahjalal University, Bangladesh, 2002.

BIOGRAPHIES

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