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GROUND WATER QUALITY IN POLLACHI TOWN, COIMBATORE DISTRICT, TAMILNADU

Dhanalakshmi V, Remia K.M and Shanmugapriyan R*

Lucine Agro Tech India Pvt. Ltd., Coimbatore, Tamilnadu, India.

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***Correspondence for Author**
Dr.R.Shanmugapriyan,
Lucine Agro Tech India Pvt. Ltd., Coimbatore, Tamilnadu, India.

ABSTRACT

In the present study, the physico chemical parameters of ground water (Bore well) of different highly populated residential area of Pollachi were analysed during May 2013 to April 2014 at monthly interval. The comparative results showed that the electrical conductivity (1350 - 1510 mMhos/cm), pH (6.9-7.2), calcium (69-90 mg/l), magnesium (29-37 mg/l), sodium (189-206 mg/l), potassium (6-9 mg/l), bicarbonate (610-660 mg/l), sulphate (20-23 mg/l), chloride (158-170 mg/l), nitrate (0-1 mg/l), total dissolved solids (820-842 mg/l) and total alkalinity (510-542 mg/l). The parameters pH, sulphate, chloride and nitrate were found within the recommended standards of WHO and ICMR. The analysis revealed that electrical conductivity, calcium, magnesium, total dissolved solids and total alkalinity were exceeded the drinking water standards.

KEYWORDS: Drinking water standards, Ground water, Total dissolved solids.

INTRODUCTION

Pollachi is a town and taluk head quarters in Coimbatore district, Tamilnadu, India and located 40 km to the south of Coimbatore. It is of the important town in the district and located 10.662º N 77.0065º E. Water is essential and precious constituent of living things. The contamination of earth water from the man made source is causing a great threat to the ground water. The boost in urbanization and industrialization are generating huge quantity of waste and waste water. The disposal of waste and waste water without proper treatment on earth is finding its way to ground water through percolation. The excessive use of agricultural chemical as synthetic fertilizers and pesticides has also contaminated the ground water. Venkatesa colony, Mahalingapuram, Sudharsan Nagar, Kandasamy Chettiar Park and Jothi Nagar were the highly populated area in this town. Bore well is chiefly used to combat the

water shortage. Industrial pollution has an influence on the water quality. A study was conducted to monitor the physico chemical properties of bore well water of Venkatesa colony, Mahalingapuram, Sudharsan Nagar, Kandasamy Chettiar Park and Jothi Nagar in Pollachi town from May 2013 to April 2014 at monthly interval.

MATERIAL AND METHODS

Sample collection

The bore well water samples for the present study were collected from Venkatesa colony, Mahalingapuram, Sudharsan Nagar, Kandasamy Chettiar Park and Jothi Nagar at 1 month interval for 12months (May2013 - April 2014) (Figure -1). To protect the sample from contamination the water sample were taken in closed sterilized glass containers (300ml capacity) and the collected sample were stored at 4^0C on ice and transport aseptically for analysis within 24hrs.

Chemical analysis of water

The physicochemical parameters of water samples were carried out as per APHA (1985) method. Various physico-chemical parameters as Electrical Conductivity (E.C), pH, Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Bicarbonate (HCO_3), Carbonate (CO_3), Sulfate (SO_4), Chloride (Cl), Nitrate (NO_3), Total dissolved solids (TDS) and Total Alkalinity ($CaCO_3$) have a significant role in determining the portability of water quality.

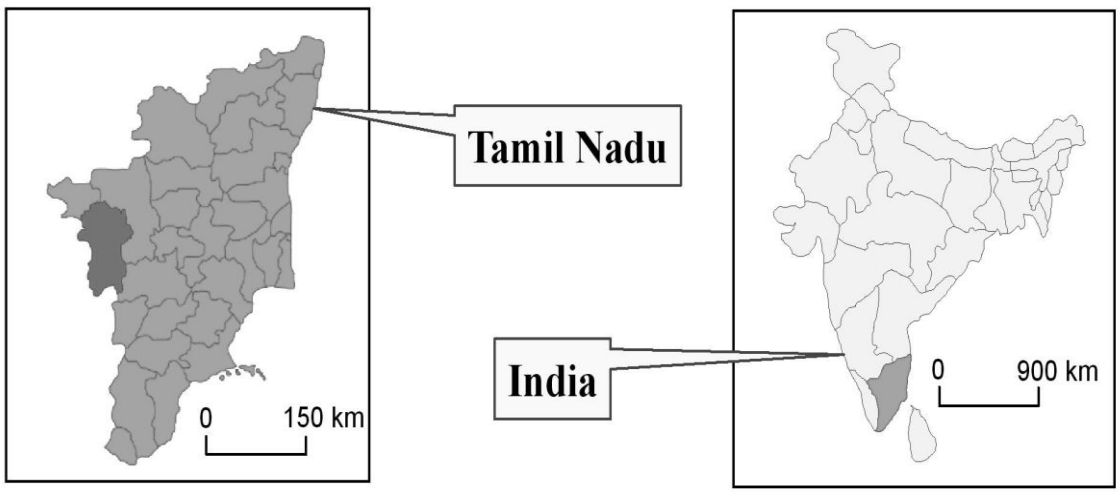
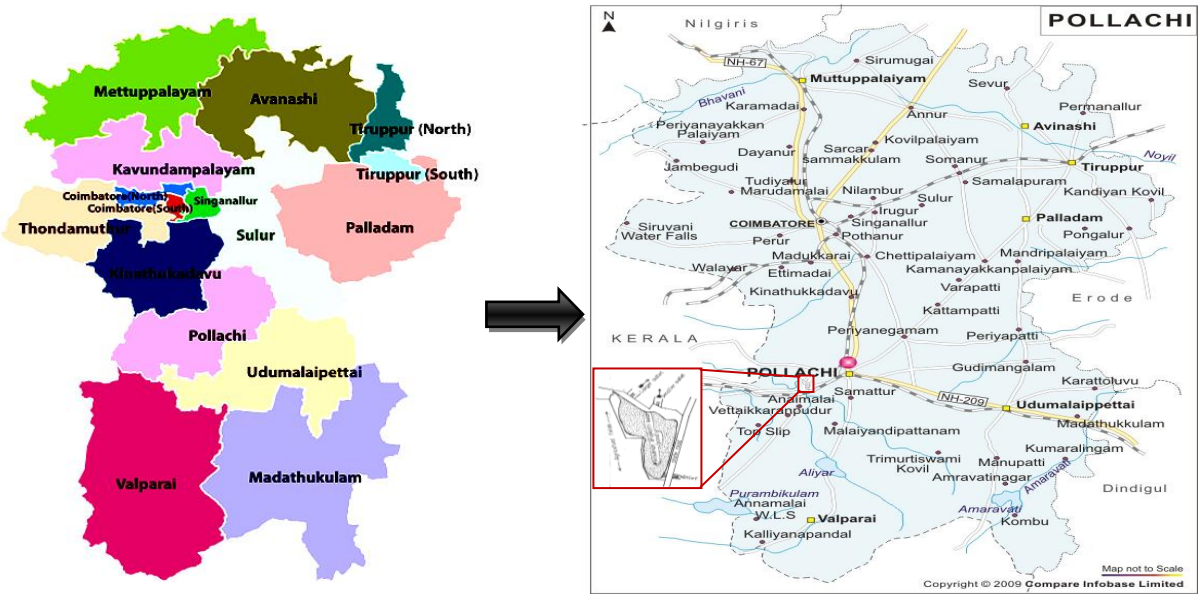


Figure: 1. Study Area

Map Showing Coimbatore District **Pollachi With Study Area**



Electrical Conductivity (EC)

Electrical conductivity was measured by using direct reading conductivity meter 304.

pH

pH of the sample was determined by using Systronics digital pH meter No.335.

Calcium and Magnesium

Calcium and magnesium in the water samples were estimated by the method given by Jhingran *et al*. (1969) [EDTA titration method].

Sodium and Potassium

Sodium and Potassium in the water sample were estimated by Flame photometric method.

Sulphate

The sulphate in the water samples were estimated by the method given by Michael (1984).

Chlorides

The Chloride in the water samples were estimated by the method given by Jackson (1973) [Titration method using silver nitrate solution].

Nitrate

The Nitrate in the water samples were estimated by the method given by Strickland and Parson (1965) [Colorimetric method (650 nm), Brucine sulphate acid method (530nm)].

Total Dissolved Solids (TDS)

The filtrate obtained from the above process was evaporated, dried, weighed and recorded as the quantity of dissolved solids in the water samples.

Total Solids (TS)

The amount of total solids was calculated by adding the weight of the suspended solids with that of the dissolved solids.

Total Alkalinity

Total alkalinity (Carbonates and Bicarbonates) of the sample was estimated as per the method given by Piper (1950).

RESULTS AND DISCUSSION

The analytical results of physico chemical parameters of bore well water samples were present in the Table - 2. Electrical conductivity (EC) is a measure of water capacity to conduct electricity. It indicates the amount of total dissolved salts present in water. The electrical conductivity is an index to represent the total concentration of soluble salts in water. In the present study, the EC value of bore water ranged from 1375 to 1513 mMhos/cm. The EC value of bore well water samples declined during the month of June and August. High EC values indicate the presence of high amount of dissolved inorganic substances in ionized form. This corroborates with earlier observations o on the drinking water quality in Perur block, Coimbatore district (Jothivenkatachalam, 2010). They found the EC values for most samples ranged between 1020 and 2910(μ mho/cm). Elevation of EC value affects the crop production (Srinivas *et. al*., 2000). Shanmugasundaram *et. al*., (2014) recorded higher EC value in the analysed well water samples in Coimbatore district.

The pH value of drinking water is an important parameter of acidity or alkalinity. Minerals and organic matter interact within them to give the resultant pH value to the water. In the present study, the pH value ranged between 6.9 and 7.4, which lies in the limit prescribed by WHO.

Calcium and magnesium are the important constituents of drinking water and play important role in the hardness. The calcium content of surveyed water samples ranged from 69 to 90 mg/l. Higher calcium content was recorded during November to march, May and July. The recorded value of magnesium in bore well water sample was ranged from 29 to 34 mg/l. The

magnesium content of water samples exceeded the water standards laid down by ICMR throughout the year except during November. Elevation of calcium and magnesium did not produce health hazards (Kotaiah *et. al*., 1994). Magnesium affects the phytoplankton growth and chlorophyll development (Dagaonkar and Saksena, 1992).

Table - 1 Standard values of drinking water

Particular	Drinking water standard		
	Highest desirable	Maximum permissible	ICMR 1975
Electrical Conductivity (d^3/m^2)			40
pH	7.50-8.5	6.5-9.2	7.6-8.5
Calcium (mg/l)	75	200	75
Magnesium (mg/l)	30	45	30
Sulphate	200	400	-
Chloride	200	600	250
Nitrate	45	45	20
Total Solids	500	1500	-
Total Hardness as $CaCO_3$	-	-	300
Total Alkalinity as $CaCO_3$	-	-	120

Table - 2 Physicochemical parameters of bore well water

Month	E.C (mMhos/cm)	pH	Calcium (mg/l)	Magnesium (mg/l)	Sulphate (mg/l)	Chloride (mg/l)	Nitrate (mg/l)	Total Dissolved Solids (mg/l)	Alkalinity (mg/l)
May -13	1510	7.1	80	34	22	163	1	841	540
Jun -13	1490	7.2	78	29	20	158	1	837	520
Jul -13	1502	7.1	81	31	21	160	0	835	532
Aug-13	1375	7.2	69	37	20	169	0	838	530
Sept -13	1400	7.4	72	32	21	170	0	830	515
Oct-13	1480	7.4	78	30	23	159	1	840	520
Nov-13	1520	7.1	83	29	22	162	1	833	542
Dec-13	1490	6.9	88	33	20	164	0	820	530
Jan-14	1488	7.1	90	34	21	160	0	840	535
Feb-14	1487	7.2	86	30	23	159	0	838	540
Mar-14	1506	7.1	85	32	22	155	1	842	525
Apr-14	1513	7.1	79	31	21	156	0	840	510

In the present study, the concentration of sulphate ranged between 20 and 23 and lies within the limits of standards. The chloride concentration of analysed water samples was within the limit. The estimated calcium content of water samples were fluctuated between 155 and 170 mg/l throughout the year.

In the study area, the nitrate concentration was within the limit throughout the year. A trace of nitrate was observed in the drinking water samples during May-June, October-November and March. Nil observations made on nitrate content for a period of seven months. The main source of nitrate in water is due to decaying of plant and animal material, natural soil nitrogen, fertilizers and domestic wastes (Adeyeye and Abulude, 2004). Elevated levels of nitrate in drinking water may cause methaemoglobinomia and gastric cancer (Prakash *et. al*., 2001).

Total dissolved solids (TDS) indicate the of salinity of water. Higher TDS value of water is resulted by the addition of huge volume of sewage. In the present study revealed higher concentration of total dissolved solids in bore well water samples. The TDS of water samples ranged from 820 to 842 mg/l. According to WHO and Indian standard, T.D.S. value should be less than 500 mg/L for drinking water. The higher value of total dissolved solids (TDS) can be due to the solid waste deposits near the bore well (Sharma and Kaur ,1998, Mehja *et. al*., 2003). Hagnesh *et al*., (2012) reported that the concentration of total dissolved solids in subsurface water of Coimbatore ranged between 313 mg/l and 1264 mg/l, and 516 mg/l and 1799 mg/l in the year 2009 and 2010 respectively. The analyzed data show that 57% samples had more than the maximum permissible limit in Perur block of Coimbatore (Jothivenkatachalam *et. al*., 2010). High level of TDS may aesthetically be unsatisfactory for bathing and washing (Abdul and Sirajudeen, 2006). Adak and Purohit (2001) reported that Water with high residue is normally less palatable and may induce an unfavourable physiological reaction in the transient consumer and even may cause gastrointestinal irritation. Water containing high solid concentration may cause constipation effects (kumarasamy, 1991).

Total alkalinity is a measure of buffering capacity of the water. The main source for alkalinity is due to weathering of rocks. Higher alkalinity value contributes sour and saline taste to water. The alkalinity of water is a measure of its capacity to neutralize acidity in water. In the present experiment, the concentration of total alkalinity was high and ranged between 510 and 542 mg/l. Elevation of total alkalinity of water is considered to be more productive (Saluja and Jain, 1998). The higher alkalinity value of water is due to the contamination of municipal sewage, domestic sewage and urban wash in to ground water. The alkalinity ranged between 62 mg/l and 481 mg/l in the year 2009, and 68 mg/l and 481.9 mg/l in the year 2010 in subsurface water of Coimbatore (Hagnesh *et. al*., 2012).

CONCLUSION

The physico chemical parameters of ground water samples (Bore well) of different residential areas of Pollachi were analysed during May 2013 to April 2014 at monthly interval. The pH of entire sample is well within the limits. The concentration of sulphate, chloride and nitrate of analysed samples were below the drinking water standards. A marginal elevation observed in the concentration of calcium and magnesium. Alarming level of alkalinity and total dissolved solids were present in the drinking bore well water samples during the period of study. The elevated levels of these parameters in the water samples may be due to high population density, over exploitation of ground water and improper disposal of waste and waste water.

REFERENCE

1. Abdul Jameel A, Sirajudeen. J. India. Enviro. Monitoring and assessment, 2006; 123: 299.
2. Adak M G and K.M. Purohit K M. Chemical Properties of Drinking Water of Some Villages in Sangamner Tahasil, Dist- Ahmednagar, Maharashtra, India and its Impact on Human Health. Poll. Res., 2001; (20): 575.
3. Adeyeye E I and Abulude F O. Analytical assessments of some surface and ground water resources in Ile-Ife, Nigeria, J. Chem. Soc.Nig., 2004; (29): 98-103.
4. APHA. Standard methods for the examination of water and waste water, American Public Health Association, Washington D.C. 16th ed: 1985. pp: 245 - 246.
5. APHA. Standard methods for the examination of water and waste water. 20th Edition. American Public Health Association, Washington D.C.1998.
6. Dagaonkar A and Saksena D N. Physico-chemical and Biological characterization of a temple tank, Kaila Sagar, Gwalior, Madhya Pradesh, J. Hydrobiol., 1992; 8(1):11-19.
7. Haganesh B, Mohan Sakthivel P, Meenambal T and Balasubramanian N. Study on subsurface water quality in selected places in Coimbatore. IRACST – Engineering Science and Technology. 2012; 2 (4): 699-703.
8. Jackson M L. Soil chemical analysis, Prentice Hall India. Pvt. Ltd. New Delhi.1973; 498.
9. Jhingran V G, Natarajan A V, Banerjee S M and David A. Methodology on reservoir fisheries investigation in India. CIFRI Bulletin. 1969; 12.
10. Jothivenkatachalam K, Nithya, A and Chandra Mohan, S. Correlation analysis of drinking water quality in and around Perur block of Coimbatore district, Tamilnadu, India. Rasayan J. Chem. 2010; 3 (4): 649-654.

11. K. Shanmugasundaram K**,** R. Nikhila R and Janarthanan B. Physico-Chemical Analysis of Drinking Water from Different Sources in Coimbatore District, Tamilnadu and India. Inter. J. Res. Sci. & Adv. Tech. 2014; 3 (1):005-012.
12. Kotaiah B and Kumarasamy N. Environmental Engineering laboratory manua. Charotar Publishing House, Anand-388 001 (India).1994.
13. Kumarasamy N, Poll. Res., 1991; 10 (1): 13.
14. Michael P. Aquatic environment In: Ecological methods for field and laboratory investigations. Tata Mc Graw Hill. Publishing Company, Ltd. New Delhi.1984.
15. Piper C S. Soil and Plant analysis. Intr. science publications. New York.1950; 368.
16. Prakash T R, Murth D S and Reddy M C. Quality of Ground Water in Karnataka with special reference to nitrate abstract vol., International workshop on integrated water management, Bangalore university, 2001; 29.
17. Reddy R. Poll. Res., 2000; 19 (2): 285.
18. Saluja D S and Jain P. Preliminary physico-chemical studies of water flow of Machna Annicut Dam, Betul District (MP). *Asian J. Chem*. 1998; 10: 980 - 982.
19. Sharma B K and Kaur. Environmental chemistry, Goel Pub. House, Meerut.1998; 40.
20. Srinivas C H, Ravi Shankar Piska, Venkatesan C, Sathya Narayana Rao M S and Ravinder
21. Strickland, J. D. and K and Parson, T. R. 1965. A manual of sea water analysis Fish Re Board Can Bull. No. 128.
22. WHO, 1996. Guidelines for Drinking-Water Quality, Second Edition Volume 2, Health Criteria and Other Supporting Information international programme on chemical safety, Geneva: 1996, pp. 13-17.
23. WHO, 1998. Guidelines for drinking water quality., 3 edn. World Health Organisation, Geneva.