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Advances in Applied Science Research, 2013, 4(4):461-464

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ISSN: 0976-8610
CODEN (USA): AASRFC

Study on groundwater pollution at Sukkaliyur in Karur District, Tamil Nadu

Zahir Hussain and D. Rajadurai

Post Graduate and Research Department of Chemistry, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu, India

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ABSTRACT

The ground water quality of Sukkaliyur at Karur was studied. Twenty ground water samples were taken in and around Sukkaliyur. The samples were subjected to Physico-chemical Analysis. High concentration of Electrical conductivity, Alkalinity, Total Dissolved Solids, Sodium, Nitrate, Chloride and Sulphate were observed in most of the ground water samples.

Keywords: Ground Water, Sukkaliyur, Amaravathi, Karur, Tamil Nadu, India

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INTRODUCTION

Karur is one of the most important industrial cities in Tamil Nadu and which is situated on the bank of river Amaravathi. Sukkaliyur is a one of the village in Karur. Industries of diverse fields such as textiles, dyeing, dairy and small scale industries are located in and around Sukkaliyur.

Ground water is the principle source of drinking water in rural areas of India and indispensable source of life. The problems of ground water quality are more acute in the areas which are densely populated and thickly industrialized. In rural areas the demand has been much lower but the requirements for domestic use are increasing rapidly.

Ground water when once get polluted, its purification is too difficult. In order to maintain equilibrium in bio-chemical reaction taking place in living organisms, certain chemicals needed for maintaining physiology of human being or living organisms, presence of too much of chemical elements is also harmful. A critical perusal of the available literature has revealed that no scientific investigation was carried out with regard to the quality of ground water in and around Sukkaliyur. Therefore, an attempt has been made to assess the quality of ground water in and around Sukkaliyur at Karur District.

MATERIALS AND METHODS

Ground water samples were collected from twenty bore wells in and around Sukkaliyur. The sampling stations are represented as S1 to S20. The water samples were collected in one liter polythene bottles. All samples were refrigerated at 4°C till the completion of analysis. The samples were subjected to physico-chemical analysis. The pH was determined immediately at the place of collection with the help of pH pen. Total dissolved solids and Electrical conductivity of the water analysis kit (Elico). Carbonate, bicarbonate, calcium, magnesium, total hardness and chloride were estimated by titrimetric method. BOD, COD and dissolved oxygen were estimated by reflux method. Nitrate and sulphate were estimated by using spectrophotometric method using standard procedure. (APHA, 1995). Sodium and potassium were measured by using flame photometry.

RESULTS AND DISCUSSION

The values obtained for physico-chemical parameters of ground water samples are tabulated in table 1. The results are discussed and compared with WHO standards. The pH values are found to be in the range of 7.1 - 8.0 in the ground

water samples are within the permissible limit of WHO (8.5). Low pH is not harmful effect. Hence the present study predicts that no harmful effect by pH in the sampling stations. (Zahir Hussain, 2012)

The electrical conductivity values are found to be in the range 1150 – 2950 µmho/cm-^{1}. The electrical conductivity values are exceeded the permissible limit of WHO (600 µmho/cm-^{1}) in all the ground water samples. High electrical conductivity is due to high concentration of inorganic salts, ionic constituents and dissolved minerals in the water samples. (Murugesan et al., 2005)

Most of the ground water samples show higher values of total dissolved solids and are well above the permissible limit of WHO (500 ppm). This may be due to percolation of sewage and industrial effluents (Someswara Rao et al., 1992). The accumulation of organic and inorganic solids also contribute to high total dissolved solids. (Indrajit Sen2011)

The total hardness values are higher than the desirable limit of WHO (300 ppm) in all the sampling stations. This may be due to the presence of bicarbonates, chlorides and sulphates of Ca and Mg present in the water. High concentration of hardness causes heart disease and kidney problem. (Jain et al., 1996).

The carbonate values are not detectable for the ground water samples. Since the observed pH is below 8.6 the carbonate values are not detectable (Zahir Hussain, 2004).

The bicarbonate values of ground water samples are found to be within the permissible limit of WHO (600 ppm) except at stations S9 and S15. This may be due to ground water samples which are collected from nearer to the sewage logging place (Rakh MS 2011).

The chloride values exceed the permissible limit of WHO (600 ppm) in most of the ground water samples. High concentration of chloride is considered to be an indicator of pollution by organic waste of animals and industrial origin (Yadav.S.S2011)

The sodium values are found to be in the range 24 - 416 ppm for the ground water samples. A very few stations show a very high values of sodium. High concentration of sodium may be due to the logging of effluents (Sulochana et al., 1997) and percolation of brine water of irrigational and industrial use (Sharma et al., Elango et al., and Shadhana, C.1994).

The potassium values are in the range of 7- 28 ppm for the ground water samples. High concentration of potassium may be attributed to the contamination by sewage(Abdulafiu2011).

The calcium values are found to be in the range of 80-240 within permissible limit of WHO (200 ppm) except at stations S6, S7 and S9. High calcium concentration values may be due to the logging of the industrial wastes (Patel,S.K, 1991).

The magnesium values are found to be in the range 150-410 ppm. The magnesium values exceed the permissible limit of WHO (150 ppm) in most of the ground water samples. This may be due to the logging of the sewage and dissolution and rock weathering of soil in monsoon seasons (Elinge CM,2011). It indicates that the water is unsuitable for domestic uses.

The nitrate values are found to be in the range 18 - 90 ppm for the ground water samples. Most of the values of ground water samples are within the permissible limit of WHO (45 ppm). The nitrate in water is responsible for the growth of blue green algae (Abdul Jameel, 1998).

The sulphate values are recorded within the range 70 - 430 ppm. The values of sulphates are exceeded the permissible limit of WHO (250 ppm) in most of the ground water samples. High concentrations of sulphate are due to the effluent from industries (Someswara et al., 1992) and the run-off agricultural land (Hari Krishnan et al., 1999).

In the present study the biological oxygen demand values are observed higher than the permissible limit of WHO (5 ppm) in all the ground water samples. This may be due to discharging of domestic sewage and industrial wastewater to soil and water bodies. (Murugesan et al., 2005). Higher biological oxygen demand value indicates the high biological activity in water. (Zahir Hussain,2012)

In the present study the chemical oxygen demand values are observed higher than the permissible limit of WHO (10 ppm) in all the ground water samples. This may be due to discharge of domestic sewage and industrial waste water to soil and water bodies. (Murugesan et al., 2005). Large quantities of domestic sewage, agricultural wastes and other wastes may contribute to the high values of chemical oxygen demand (Mathew Koshy and Vasudevan Nayar, 1999). The dissolved oxygen values are recorded below the permissible limit of WHO (5.0 ppm) in most of the ground water samples. This may be due to the high chemical and biological activity such as photosynthesis, respiration and decomposition in water (Deepak et al., 1999). Accumulation of waste loads from the domestic sewage and effluents also cause high value of dissolved oxygen. (Karim R.M et al., 1999).

Table 1 : Physico-chemical characteristics of of ground water at Sukkaliyur

Stations	pH	EC	TDS	TH	CO_3	HCO_3	CI	Na	K	Ca	Mg	NO_3	$S0_4$	BOD	COD	DO
S1	8.0	2350	1575	465	0	265	510	64	24	117	410	44	88	18	28	5.5
S2	7.1	2770	1856	667	0	306	600	26	24	166	320	18	113	16	25	5.3
S3	7.3	2460	1648	525	0	310	540	46	20	129	148	20	94	24	27	6.0
S4	7.8	1910	610	450	0	470	610	108	19	149	160	56	240	9.0	21	4.7
S5	7.5	2430	1130	910	0	560	850	37	28	95	190	38	400	7.0	29	5.0
S6	7.8	1750	1250	1120	0	530	1610	147	12	215	150	49	380	18	14	4.1
S7	7.6	1150	1350	1100	0	520	1800	416	14	220	170	90	430	23	13	4.3
S8	7.2	1550	1500	1040	0	420	840	24	13	180	160	53	370	16	24	5.1
S9	8.0	1200	1132	950	0	640	510	40	17	230	180	40	350	14	13	6.3
S10	7.2	2160	415	730	0	300	620	38	8	170	210	25	230	19	18	5.1
S11	7.4	2450	550	480	0	410	450	26	14	80	280	60	80	14	28	5.2
S12	7.7	2770	630	920	0	380	360	40	11	160	140	43	200	17	33	5.3
S13	7.8	2450	600	640	0	560	670	32	12	90	270	58	380	23	41	5.8
S14	8.0	2950	625	850	0	660	760	4S	13	160	200	48	290	24	28	5.9
S15	7.6	2300	940	520	0	630	820	37	10	130	300	35	180	14	35	4.7
S16	7.8	2780	630	920	0	550	650	26	20	150	150	55	390	13	20	4.4
S17	7.7	2440	555	750	0	320	940	33	7	140	270	38	70	9.0	23	4.7
S18	7.6	2550	660	830	0	440	720	41	12	150	370	25	360	5.0	31	5.2
S19	7.6	2350	700	650	0	550	610	25	17	90	190	33	410	8.0	18	5.1
S20	7.4	2700	920	880	0	450	850	73	18	180	160	61	380	4.0	14	5.8

EC is expressed in µmho/cm-^{1}. All parameters are expressed in ppm except pH.

CONCLUSION

The results reveal that the ground water in the most of the area does not meet the drinking water standards and is unfit for drinking and domestic purposes. This calls for proper treatment, disposal and management of pollutants. Effective collection, treatment and disposal of industry wastes can help to protect the ecosystem and ensure sustainable development. This problem should be attended and controlled at the earliest for the sake of people health, environmental safety, soil and water quality because once the ground water and soil are polluted, it is difficult to restore it to its initial quality.

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