*Available online at*www.scholarsresearchlibrary.com

Scholars Research Library

Archives of Applied Science Research, 2015, 7 (7): 12-18
(*http://scholarsresearchlibrary.com/archive.html*)

ISSN 0975-508X
CODEN (USA) AASRC9

Assessment of ground water quality in Kailasapuram, Tiruchirappalli,Tamil Nadu, India

G. Maheswari Devi and S. Umamaheswari*

P.G and Research Department of Zoology, Periyar EVR College, Tiruchirappalli, Tamil Nadu, India

---

ABSTRACT

Cauvery river is the lifeline of the population residing in Tiruchirappalli district. They are dependent on ground water as their prime source of drinking water. Hence, monitoring the quality of ground water is necessary in order to provide the public with potable water. This paper reports the physiochemical parameters of bore and well water at the site exposed to treated waste water from industries. The mean pH, TS, TDS, TSS, TH, Calcium, Alkalinity, Acidity, Total Nitrogen and Sodium and Mercury of well water exceeded the permissible limits of TNPCB. On the other hand, mean pH, TS, TDS, TSS,TH, Ca, alkalinity, acidity, Total Nitrogen and Sodium were found to be above the permissible limits of TNPCB. These could be attributed to seepage of treated industrial waste water into the ground water.

Key words: Physicochemical parameters, Water quality, groundwater, treated industrial waste water.

INTRODUCTION

The efflux of industrial waste water into the environment may adversely affect the ground water quality. Ground water is used for irrigation, industries and domestic supply. In Tiruchirappalli district, majority of the population depend on the ground water as their prime source of drinking water supply. Rapid growth of urban areas have affected the ground water quality, due to over exploitation of resources and improper waste disposal [1]. The industrial pollutants associated with organic matter, inorganic dissolved solids and other unwanted chemicals cause serious ground water problems [2,3] .Keeping this view ,the present study was initiated to assess the water quality of ground water (bore well and well water) at the industrial treated waste water disposal site in Tiruchirappalli district.

MATERIALS AND METHODS

Bore and well water samples were collected near Kailasapuram Trichy, Tamil Nadu in two litre polythene bottles. The sampling bottles were thoroughly pre-cleaned with 50% HNO_3 (Nitric acid) followed by triple washing with double distilled water. The water samples were immediately brought to the laboratory for estimation of water quality parameters (pH, electrical conductivity, total solids, total dissolved solids, total suspended solids, dissolved oxygen, BOD, COD, total hardness, calcium, magnesiun, chloride, alkalinty, acidity, fluoride, sulphate, nitrate, silicate, total nitrogen, sodium, potassium, phosphorus, mercury and total organic carbon, which were analysed according to the methods mentioned in APHA [4] . The data were subjected to statistical analysis (SPSS version 16.0). Further, the data was compared with national and international standards of water quality WHO (World Health Organisation) ; TNPCB (Tamil Nadu Pollution Control Board) [5,6].

RESULTS AND DISCUSSION

From table 1 and 2, it is evident that the mean pH of the well water and bore well water was 8.13 ± 0.0491 and 8.19 ± 0.0523, respectively. Mean Electrical conductivity of well water was 3.1333 ± 1.2414 dsm^{-1} and that of bore water was 2.2300±0.5400 dsm^{-1}. Mean Total solids of 6566.7 ± 683.9428 mgL^{-1} and 7700.0 ± 351.1884 mgL^{-1} were observed in well water and bore water, respectively. Mean Total dissolved solids of well water was 3866.7 ± 735.6025 mgL^{-1} and that of bore water was 4933.3 ± 240.3700 mgL^{-1} ,which were found to be above the permissible limit (500 mgL^{-1}).

Table- 1 Physiochemical analysis of well water at Kilasapuram, Tiruchirappalli District, Tamil Nadu

Parameters	Concentration	Permissible limit (TNPCB)
pH	8.133 ± 0.0491	6.5-8.0
EC (dsm^{-1})	3.1333 ±1.2414	2500
TS (mg/L)	6566.7 ± 683.9428	500
TDS (mg/L)	3866.7 ±735.6025	500
TSS (mg/L)	2700.0 ± 100.0000	100
DO (mg/L)	7.7633 ± 0.3110	13-14
BOD (mg/L)	5.2767 ± 0.1822	30
COD (mg/L)	18.1533 ± 0.6138	40
Total hardness (mg/L)	570.00 ± 98.6576	300
Calcium (mg/L)	115.56 ± 21.0292	75
Magnesium (mg/L)	67.6333 ±12.3590	50-150
Chloride (mg/L)	373.43 ± 56.3434	250-1000
Alkalinity (mg/L)	226.67 ± 131.6983	200
Acidity (mg/L)	171.33 ±114.5095	120
Fluoride (mg/L)	1.0600 ± 0.29143	1.0
Sulphate (mg/L)	2.9967 ± 2.25167	200-400
Nitrate (mg/L)	3.9333 ±1.29915	45
Silicate (mg/L)	1.2533 ± 0.2338	10
Total Nitrogen (mg/L)	82.4933 ± 13.6437	50
Sodium (mg/L)	194.77 ± 32.4538	60
Potassium (mg/L)	39.1667 ± 32.1166	50
Phosphorous (mg/L)	0.0867 ± 0.01333	0.1
Mercury (mg/L)	0.005 ± 0.0000	0.001
Total Organic Carbon (mg/L)	8.7033 ± 3.3056	22

Values are Mean ± Standard Error
TNPCB:Tamil Nadu Pollution Control Board

Mean Total suspended solids (TSS) of well water and bore water also were found to be above the permissible limit of 500 mgL^{-1} (2700.0 ± 100.0000 and 2766.7 ± 145.2966 mgL^{-1}, respectively). Mean Dissolved oxygen content of well water and bore water was 7.7633 ± 0.3110 mgL^{-1} and 7.3233 ± 0.7181 mgL^{-1}, respectively. Mean BOD of well water and bore water was 5.2767±0.1822 mgL^{-1} and 5.2500±0.8234 mgL^{-1}, respectively. Mean COD of well water and bore water was 18.1533±0.6138 mgL^{-1} and 17.2333 ± 2.7302 mgL^{-1} " respectively. Mean Total hardness of well water and bore water was found to be above the permissible limit of 300 mgL^{-1} (570.00 ± 98.6576 mgL^{-1} and 403.33 ± 77.7996 mgL^{-1}, respectively). Mean Calcium content of the well water was 115.56 ± 21.0292 mgL^{-1} and that of bore water was 93.5167 ± 21.5016 mgL^{-1}, which were found to be above the permissible limit (75 mgL^{-1}). Mean magnesium content of well water and bore water was 67.6333 ± 12.3590 mgL^{-1} and 43.7500 ± 8.7918 mgL^{-1}, respectively. Mean chloride content of well water and bore water was 373.43 ± 56.3434 mgL^{-1} and 197.41 ± 40.697 mgL^{-1}, respectively. Alkalinity of well and bore water was 226.67±131.6983 mgL^{-1} and 223.33 ± 113.4803 mgL^{-1}, respectively which were found to be above the permissible limit (200 mgL^{-1}). The acidity of well water was 171.33 ±114.5095 mgL^{-1} and that of bore water was 127.67±67.1821 mgL^{-1}, which were found to be above the permissible limit (120 mgL^{-1}). Mean fluoride content of well water was (1.0600 ± 0.2914 mgL^{-1}) which was found to be slightly higher than the permissible limit (1 mgL^{-1}) and that of bore water was 0.8733 ± 0.2161 mgL^{-1}.

The mean sulphate content of well water was 2.9967 ± 0.2516 mgL^{-1} and that of bore water was 2.7067 ± 1.8966 mgL^{-1} . Mean nitrate content of well water and bore water was 3.9333 ± 1.2991mgL^{-1} and 3.1667±1.2679 mgL^{-1} ,respectively. The mean silicate content of well water and bore water was 1.2533 ± 0.2338 mgL^{-1} and 1.0867 ± 0.2204 mgL^{-1}, respectively. Mean total nitrogen was above the permissible limit (50 mgL^{-1}) in well water (82.4933

± 13.6437 mgL^{-1}) and bore water (101.53 ± 12.7346 mgL^{-1}).Mean sodium content of well water was 194.77 ± 32.4538 $mgL^{-1}$and that of bore water was 149.20 ± 33.4501 mgL^{-1} , which were found to be above the permissible limits (50 mgL^{-1}). Mean potassium content of well water was 39.1667±32.1166 mgL^{-1} and that of bore water was 21.6667 ± 16.5166mgL^{-1} , which were within the permissible limits (50 $mgL^{-1)}$. Mean mercury content was above the permissible limit (0.001mgL^{-1}) in well water (0.005 mgL^{-1}) but that of bore water (0.0005 ± 0.000 mgL^{-1}) was found to be within the permissible limit. Mean Total organic carbon content of well water was 8.7033 ± 3.3056 mgL^{-1} and that of bore water was 12.5000 ± 6.2482 mgL^{-1} which were found to be within the permissible limits of TNPCB(22 mg/L).

Table- 2 Physiochemical analysis of bore well water at Kilasapuram, Tiruchirappalli District, Tamil Nadu

Parameters	Concentration	Permissible limits (TNPCB)
pH	8.19 ± 0.0523	6.5-8.0
EC (dsm^{-1})	2.2300 ± 0.5400	2500
TS (mg/L)	7700.0 ± 351.1884	500
TDS (mg/L)	4933.3 ±240.3700	500
TSS (mg/L)	2766.7 ±145.2966	100
DO (mg/L)	7.3233 ±0.7181	13-14
BOD (mg/L)	5.2500 ± 0.8234	30
COD (mg/L)	17.2333 ±2.7302	40
Total hardness (mg/L)	403.33 ± 77.7996	300
Calcium (mg/L)	93.5167 ± 21.5016	75
Magnesium (mg/L)	43.7500 ± 8.7918	50-150
Chloride (mg/L)	197.41 ± 40.6973	250-1000
Alkalinity (mg/L)	223.33 ±113.4803	200
Acidity (mg/L)	127.67 ± 67.1821	120
Fluoride (mg/L)	0.8733 ± 0.2161	1.0
Sulphate (mgL)	2.7067 ±1.8966	200-400
Nitrate (mg/L)	3.1667 ±1.2679	45
Silicate (mg/L)	1.0867 ± 0.2204	10
Total Nitrogen (mg/L)	101.53 ±12.7346	50
Sodium (mg/L)	149.20 ± 33.4501	60
Potassium (mg/L)	21.6667 ± 16.5166	50
Phosphorous (mg/L)	0.1467 ± 0.7219	0.1
Mercury (mg/L)	0.0005 ± 0.0000	0.001
Total Organic Carbon (mg/L)	12.5000±6.2482	22

Values are Mean ±Standard Error
TNPCB:Tamil Nadu Pollution Control Board

Alkaline pH observed in this study in bore water and well water is contradictory to the findings of Vijaya sankar et al., [7] who have registered pH in the range of 6.9 to 7.3 in the ground water of Angarai panchayat of Lalgudi taluk of Tiruchirapalli district, Tamil Nadu .Ramesh et al., have recorded pH in the range of 6.7 to 7.3 in the ground water,which is contradictory to the alkaline pH of well water and borewell water observed in this study [8]. The alkaline pH evinced in the well water and ground water in this study partially agrees with that of Muthukumar et al., who have observed alkaline pH (7.23 to 7.88) in Bemanagar and Kondayampatty, K.Sathanoor ground water and in other sampling stations [1]. Umamaheswari and Anbusaravanan have recorded pH of Cauvery river water in the range of 7.0 to 7.66 [9].

Electrical conductivity (EC) of well and bore well water was 3.1333 ± 1.2414 dsm^{-1} and 2.2300 ± 0.5400 dsm^{-1},respectively , which were found to be within the permissible limits. Similarly, Muthukumar et al., have registered electrical conductivity in the range of 369.37 $\mu s/cm^{-2}$ to 4109.10 $\mu s/cm^{-2}$ in the ground water in Trichy region [1]. Similar observations have been reported by Vijaya sankar et al., who have recorded EC in the range between 530-1050 $\mu s/cm^{-2}$ in the ground water of Angarai panchayat of Lalgudi taluk of Tiruchirappalli district, Tamil Nadu [7]. Muthukumar et al., have reported electrical conductivity in the range of 369.37 $\mu s/cm^{-2}$ to 4109.10 $\mu s/cm^{-2}$ in water samples collected from open and borewells in Tiruchirapalli district , Tamil Nadu [1]. They have also noticed that most of the ground water samples had E.C higher than 1000 $\mu s/cm^{-2}$. Ramesh et al., have reported E.C in the range of 1002 to 4122 $\mu s/cm^{-2}$ in the ground water of Mannachanallur block Trichy, Tamil Nadu [8]. They have also stated that electrical conductivity of water is a direct function of its total dissolved salts.

Total solids were found to be within the permissible limits. Total dissolved solids (TDS) of well and bore water were above the permissible limits (500 mgL^{-1}). In contraction to the present result, Umamaheswari and Anbusaravanan have reported that of TDS of cauvery river water were within the permissible limits of CPHEEO (500mg/l) [9]. TSS (Total suspended solids) also was found to be above the permissible limits (100 mgL^{-1}) in the well water and bore well water . Umamaheswari and Anbusaravanan have reported dissolved oxygen of 6 mgL^{-1} in cauvery river water . B.O.D and C.O.D of well water and bore water were found to be within the permissible limits [9]. Umamaheswari and Anbusaravanan reported C.O.D in the range of 6 to 14 mgL^{-1} in the cauvery river water [9].

Total hardness (TH) of both well water and bore water was found to be above the permissible limit of 300 mgL^{-1} This observation is in line with the findings of Ramesh et al., who have recorded Total hardness in the range of 259 mgL^{-1} and 658 mgL^{-1} in bore well water of Mannachanallur block, Trichy, Tamil Nadu [8]. Umamaheswari and Anbusaravanan have registered total hardness in the range of 96 to 246 mgL^{-1} in cauvery river water, which was found to be within the standard limits of ICMR (300mgL^{-1}) [9].

Mean calcium content of well water was found to be above the permissible limit of TNPCB (75 mgL^{-1}) when compared to the present result.These findings are not in good accord with Vijaya sankar et al., who have recorded calcium content in the range of 24 to 44 mg L^{-1} in ground water of Angarai panchayat of Lalgudi Taluk in Tiruchirapalli, which were found to be within the permissible limits [7]. The present observation disagrees with that of Ramesh et al., who have recorded maximum and minimum calcium content of 144 mgL^{-1} and 144 mgL^{-1} , in the ground water of Manachanallur block, Trichy, Tamilnadu [8], respectively and have stated that calcium was found to be within the permissible limits of WHO [5]. Muthukumar et al., have recorded minimum calcium content of 8 mgL^{-1} and maximum of 268 mgL^{-1}in ground water in Trichy city [1]. Umamaheswari and Anbusaravanan have recorded calcium content of 23 to 60 mgL^{-1} in the cauvery river water [9]. Furthermore, they have also reported that mean calcium content was maximum during monsoon period ,which were found to be within the limits of ICMR (75mgL^{-1}) [10].

The present finding lies in parallel with that of Umamaheswari and Anbusaravanan who also have recorded magnesium content in the range of 9 to 23 mgL^{-1} in Cauvery river water which were found to be within permissible limit presented by CPCB (30mgL^{-1}) [9,11]. This findings is also in consistent with that of Vijaya sankar et al., who have recorded magnesium content in the range between 21 mgL^{-1} to 60 mgL^{-1} in the ground water of Lalgudi taluk of Angarai panchayat, which were found to be within the permissible limits of WHO and TNPCB [7,5,6]. Similarly, Ramesh et al., have recorded magnesium in the range between 28 and 80 mgL^{-1}, which were found to be within the permissible limits. Mean chloride content of well water and bore well water were within the permissible limits of TNPCB (250 - 1000mgL^{-1}) [8]. This observation coincides with that of Vijaya sankar et al., who have also registered chloride in the range of 46 to 149 mgL^{-1} in the ground water of Lalgudi Taluk of Angarai panchayat, Tiruchirapalli district , Tamil Nadu [7]. These values were found to be within the limits of WHO [5].This observation gains partial support from the findings of Muthukumar et al., who have recorded minimum chloride content of 35.45 mgL^{-1} and maximum of 1914.30 mgL^{-1} in the open and bore well water samples, in Trichy city [1]. Cholride ions ranged from 98 to 798 mgL^{-1} in the ground water of Manachanallur taluk, Trichy, Tamil Nadu, India. Umamaheswari and Anbusaravanan have recorded mean chloride content of Cauvery river water within the limits of ICMR (250 mgL^{-1}) [9,10].

Remia and Logaswamy (2010) have recorded minimum chloride of 279.7 mgL^{-1} and maximum of 484.2 mgL^{-1} in the bore well water of Koundampalayam panchayat in Coimbatore [12]. These values were found to be beyond the permissble limits of ICMR[10] . They have attributed it to the influx of chloride from septic tank , effluents seepage from channels running at some parts of the city or from garbage and solid waste dumps where the borewells are located in to the ground water [13]. Chlorides are important in detecting the contamination of groundwater by waste water [14]. In general high evapotransipiration tends to increase the chlorides and salinity at the root zone of irrigated plants, making it difficult for crops to take up the water due to osmotic pressure differences between the water outside plants and within the plant cells [15]. For this reason, chlorides and total salinity concentration below drinking water standards are normally specified for waters used to irrigate salt sensitive crops [16]. The prescribed standard limit for chlorides for domestic purpose is 250 mgL^{-1} . All type of natural and raw water contains chlorides. It comes from activities carried out in agricultural area, industrial activities and from chloride stones. Its concentration is because of human activities. As per IS:10500-2012 desirable limit for chloride in 250 and

1000mg/L in permissible limit.

Alkalinity of well water and that of bore water was found to be above the permissible limits of TNPCB (200 mg/L) [6].Umamaheswari and Anbusaravanan have recorded alkalinity in the range of 112 to 221 mg/L in cauvery river water [9]. Further ,they have reported maximum alkalinity during the pre-monsoon and post-monsoon periods. Alkalinity is the sum total of components in the water that tend to elevate the pH to the alkaline side of neutrality. Commonly occuring materials in water are hydroxides. Limestone bedrock and deposits of glacial till are good sources of carbonate buffering [17]. Acidity of well water and bore water were found to be above the limits of TNPCB (120 mgL^{-1}) [6]. Fluoride content of bore well water was found to be within the limits of TNPCB (1.0 mgL^{-1}). On the other hand, fluoride content of well water was 1.0600 ± 0.2914 mg/L, which was found to be above the permissible limits of TNPCB [6] .Fluoride content ranged between 0 and 1.2 mgL^{-1} in the ground water of Manachanallur block, Trichy, Tamil Nadu [8]. Fluoride occurs as fluorspar (fluorile), rock phosphate, triphite, phosphorite crystals etc, in nature. Among the factors which control the concentration of fluoride are the climate of the area and the presence of accessory minerals in the rock minerals assemblage through which the ground water is circulating [17].

The mean sulphate content of well water and bore well water were found to be within the limits of TNPCB (200-400 mgL^{-1}) [6].This observation is in consistent with that of Vijaya sankar et al., who have recorded sulphate in the range of 10 to 41 mgL^{-1} in the ground water of Angarai panchayat, Lalgudi, Tamil Nadu [7]. Muthukumar et al., have also registered sulphate within the permissible limits (200 - 400 mgL^{-1}) in the ground water of Trichy city Tamil Nadu [1]. This findings partially agrees with that of Ramesh et al., who have recorded minimum and maximum sulphate content of 20 and 970 mgL^{-1} in the ground water of Manachanallur block, Trichy Tamil Nadu, India [8].Umamaheswari and Anbusaravanan have registered seasonal variation in sulphate content of Cauvery river water (Monsoon period :10mgL^{-1}; Premonsoon : 33.5 to 77mgL^{-1}) which were found to be within the permissible limits [9] . As evinced in this study, Remia and Logaswamy have also registered sulphate content of ground water (21.33 mgL^{-1} to 33.3mg L^{-1}) within the permissible limits [12]. Sulphate is a common ion present in water and most of these ions are soluble in water [17]. It can produce bitter taste at higher concentrations. Sulphate originates from sedimentary rocks and igneous rocks [18]. Silicate content of well water and bore well water was 1.2533 ± 0.2338 and 1.0867 ± 0.02204 mgL^{-1}, respectively. Remia and Logaswamy have noticed silicate content in the range of 0.6 mgL^{-1} to 1.5 mgL^{-1} in the ground water in Koundampalayam panchayat ,Ciombatore district, Tamil Nadu, India [12] .They have further stated that the amount of silicate in the waterbody depends on the amount of biological activity occurency.

Nitrate content of well water and bore well water was within the permissible limits (45 mgL^{-1}).This observation coincides with that of Vijaya sankar et al., who have also evinced the nitrate content of ground water (1 to 3 mgL^{-1}) within the permissible limits (45 mgL^{-1} to 100mgL^{-1}) [7] . Nitrate content of ground water of Manachanallur block,Trichy,Tamil Nadu ranged between 11 and 38 mg/L [8] and were found to be within the permissible limits. Umamaheswari and Anbusaravanan have reported that nitrate content of cauvery river water (1 to 2 mgL^{-1}) ,which was found to be within the permissible limit, irrespective of the seasons and stations [9]. Remia and Logaswamy also have registered nitrate content of ground water (10.3 to21.5 mgL^{-1}) Koundampalayam panchayat to be within the permissible limits [12].

Prasad and Ramesh chandra explained that the high nitrates were the indicator of high pollution load [19]. Mason observed increased levels of nitrates due for influx of sewage and industrial effluents into the natural water [20]. Nitrate is present in raw water and mainly it is a form of N_2 compound (of its oxidising state). Nitrate is produced from chemical and fertilizer factories, matters of animals, decline vegetables, domestic and industrial discharge.

Mean total nitrogen content of well water was found to be above the permissible limit of TNPCB (50 mgL^{-1}) [6]. Nitrate contribute dominant form of nitrogen in the natural waters. These are interconvertable and are useful as nutrients. The nutrient nitrogen commonly occurs naturally in ground water, but high nitrate concentration in shallow groundwater might be associated with animal or human waste , septic or sewage releases as well as lawn and garden fertilization [21]. The nitrate contamination has long been considered as a drinking water supply. The principle health risks to consider from the consumption of nitrates in large quantities are methemoglobinemia and the nitrosomines that are carcinogenic where they reach the stomach or liver [22].

Mean sodium level in well water and bore water was found to be above the permissible limit of TNPCB (60 mgL^{-1}) [6]. This observation partially agrees with that of Vijayasankar et al., who have registered sodium content in the range from 30 to 106 mgL^{-1} in the groundwater of Angarai panchayat in Lalgudi , Trichy [7]. They have also observed sodium level of ground water to be slightly higher in New street and have attributed it to contamination due to chemical laboratories. They have also stated that high value of sodium may be injurious to health. The present findings also agrees with that of Ramesh et al., who have also recorded sodium in the range of 98 to 647 mgL^{-1} in the ground water of Manachanallur block except station 6 and station 7 , all the other stations were below the permissible limit [8]. They have stated that sodium plays an important role in human body. Regulatory action is exercised by sodium, potassium, calcium and magnesium. The influx of the ions through cell membranes, other boundary layers level signals that turn metabolic reactions on and off. Elangovan and Dharmendira kumar have observed sodium level in the ground water along Coovum river, channel in the range of 130 - 313 mgL^{-1} and 120 - 313 mgL^{-1} during pre and post monsoon seasons, respectively and have attributed it due to leaching of sodium from domestic discharge [23].

Mean potassium content of well water and bore well water was found to be within the permissible limits of TNPCB (50 mgL^{-1})[6].This observation is in consistent with Vijaya sankar et al., who have also noticed potassium in the ground water sample of Angarai panchayat, Tiruchirapalli in the range of 1 to 37 mgL^{-1}[7].Our results partially lies in line with Muthukumar et al., who have registered mean potassium content of ground water of Trichy city in range of 7.70 mgL^{-1} to 136.8 mgL^{-1}[1]. Ramesh et al., have recorded potassium level in the range of 19 to 158 mgL^{-1} in the ground water of Manachanallur block,Trichy,Tamil Nadu, India[8]. Mean phophorous content of well water was found to be within the permissible limit of TNPCB [6], where as that of bore well water was above the permissible limit of TNPCB (0.1 mgL^{-1}) [6]. This observation is in good accord with Ramesh et al., who have registered phosphate level in the ground water of Manachanallur block, Trichy, Tamil Nadu in the range between 0.02 to 0.62 mgL^{-1} [8]. Phosphorous is an essential nutrient for living organisms , which occurs in water as both dissolved and particulate matter. Remia and Logaswamy have recorded phosphrous level in the ground water in range of 4.6 mgL^{-1} to 5.2 mgL^{-1} in Koundampalayam panchayat ,Coimbatore ,Tamil Nadu [12]. Normally ground water contains only a minimum phosphorous level because of the low solubility of native phosphate minerals and the ability of ions to retain phosphate [17] . Mean mercury content of well water was 0.005 mgL^{-1} , which was found to be above the permissible limits (0.001 mgL^{-1}). On the other hand, mean mercury content of bore well water which was found to be within the permissible limits of TNPCB (22 mgL^{-1}) [6].

According to many studies, freshwater without any obvious source of anthropogenic nature mercury is estimated to contain 5 mgL^{-1} of mercury (ATSDR).Generally drinking water is assumed to contain less than 0.025 µg/L [24]. Karunasagar et al., have registered total mercury (Hg^{r}) of 356 - 465 ngL^{-1} and 50ng L^{-1} mercury in methyl mercury form in Kodai waters while, Berijam and Kukkal water showed lower values. Mean total organic carbon content of well water was 8.7033 ± 3.3056 $mgL^{-1}$and that of bore well water was 12.5000 ± 6.2482 mgL^{-1} which was found to be within the permissible limit (22 mg L^{-1}) [25]. All these studies correlate with our results. Our results also show similarity with the data of Bhagyashri and Bhavana who have reported that 50 % of the well water samples from Rise, Pune, Maharashtra, India were unsuitable for drinking due to higher concentration of hardness, nitrate and iron [26] . While, similar results were also observed by LaxmanKumar et al ., who have evinced that 92 % (TDS),76 % (Total Hardness), 62 % (Ca), 3 % (Carbonate), 24 % (Chloride), 22 % (Magnesium), 3 % (Potassium), 24 % (Nitrate) and 32 % (Fluoride) of ground water samples collected from Maheshwaram area, Ranga Reddy district, Telangana State, India, which exceeded the permissible limits of WHO for drinking propose [27]. The present study is in agreement to the work down by Sirsat et al., who have examined the quality of ground water samples collected from bore wells and hand pumps from Balepir, Swarajya nagar, Rajurives and Bus station in Beed city, Maharashtra, India and have observed that the water quality was good in some cases but some of the parameters were above the permissible limits indicating sources of contaminated water and sanitary disposal near the study area may raise the risk of health conditions [28].

CONCLUSION

The physiochemical analysis of well water and bore well water indicate that some of the parameters were found to be exceed the permissible limits, which were could be ascribed to seepage of treated waste water into ground water.

REFERENCES

[1]. S Muthukumar; C Lakshmanan; G Sathiya; P Krishna Kumar; S Viveganandan; *International journal of environmental sciences*, **2011**,1, 7.
[2]. Poonam Tyagi; Dharam Buddhi; Rubina Choudhary;Sawhney;*Journal of pollution rasearch*,**2000**,19,443-445.
[3]. A C Murugen;A Ramu;N Kannan;*Journal of Environmental science*,**2007**,49(2),121-126.
[4]. APHA: Standard methods for the examination of water and wastewater. American Public Health Association, 20th Edn. DC, New York **1998**.
[5]. WHO; Guidelines for drinking water quality, World Health Organisation, **1984**,1,130.
[6]. TNPCB; Tamil Nadu Pollution Control Board.**2010**.
[7]. M Vijaya sankar; S Abideen; M Babu selvam; T Gunansekaran; M I Hussain syed Bava; International Journal of Science, environment and technology, **2014**, 3,1,348-356.
[8]. M Ramesh; E Dharmaraj; B Jose Ravindra Raj; *Pelagia research library*, **2012**, 3(3), 1709-1713.
[9]. S Umamaheswari; N Anbusaravanan, *International Journal of Lakes and Rivers*, **2009**, 2, 1,1-20.
[10]. ICMR Indian Council for Medical Research. Manual of Standard of quality of drinking water supplies 2nd .,Special report series 44 New Delhi. (**1975**)
[11]. CPCB; Central Pollution Control Board,**1974**.
[12]. K M Remia; S Logaswamy; *Recent Research in Science and Technology* , **2010**, 2(3): 14-18.
[13]. M Shivakumar; M V Ramamoorthy; *Journal of Environment Health*,**1973**,19(3),199-209.
[14]. B Lalitha kumari; M.Rojarani; P Sudhakar; M Hanumasri; K P N V Sathya sree; *International journal of recent scientific research*, **2013**,4,3, 198-201.
[15]. A V L N S H Hariharan. *J curr Sci*, **2007**, 10,9-99.
[16]. G Alagamuthu;M Rajan;*Rasayan journal of chemistry*, **2008**,1(4),757-765.
[17]. Devendra Dohare; Shriram Deshpande; Atul Kotiya; *Research journal of Engineering sciences*, **2014**,3(5),26-31.
[18]. Mor Suman,M S Bishnoi; N R Bishnoi. *Indian J Env Prot* **2003,** 23(6) 673-679.
[19]. B V Prasad; Ramesh Chandra, *Poll Res*,**1997**,16 (2),105-107.
[20]. C F Mason; Biology Fresh water pollution ,2nd edn, John Wiley and Sons, New York, **1991** 48-121.
[21]. M T Zohn; W D Grimm;*Water ,Air and Soil pollutin*,**1993**,68(1),469-483.
[22]. S Annouara ; M Mountadar ; A Soufiane; A M A Elmidaoui ; S Menkouchi ; M Kahlaoui. Denitrification of underground water by chemical adsorption and by electro dialysis .Paper presented at the conference on Desalination strategies in South mediterranean countries, Marrakech Morocco. **2004** .
[23]. N S Elangovan; M Dharmendira Kumar; Hindawi publishing corporation *Journal of chemistry*, **2013**, Article ID 672372,10 .
[24]. ATSDR . Toxicological Profile for mercury .Draft for Public Conmment (update) Prepared by Research Triangle Institute under contact No.205-93-0606. Prepared for; US Department of Health and Human Services, Health Service, Service Agency for Toxic Substance and Disease Registry August, **1997**.
[25]. D Karunasagar; M V Balarama krishna; Y Anjaneyulu; J Arunachalam; *Environmental Pollution*, **2006**,143,153-158.
[26]. M C Bhagyashri ; U N Bhavana. *J.Environ Res Develop* , **2015**, 9,(3),541-546
[27]. D Laxman kumar; K Sateesh; K Praveen Raj Saxena ; E Satyanarayana ; A Edukonda . *J.Environ Res Develop* , **2015**, 9,(3), 523-529.
[28]. P B Sirsat ; G D Suryawanshi ; S V Lamture, *J.Environ Res Develop* , **2015**, 9,(3),613-616.