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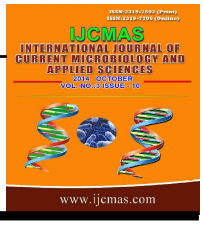

Original Research Article

Analysis of ground water quality of Jagdishpur industrial area of District C.S.M. Nagar (U.P.), India

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A B S T R A C T

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Ground water samples were analysed for the assessment of the physico-chemical parameters with reference to BIS, 1998 standards for drinking water. Research findings revealed that, values of several parameters cross their permissible as well as excessive limits and pointing out to the necessity of proper treatment before disposal of municipal waste, industrial waste and domestic waste of that area.

Introduction

Water is a greatest natural resource, which is essential to all forms of life. In India about 12% of people get clean drinking water, the rest 88% quench their thirst from polluted lakes, rivers and wells due to which more than 03 million people get affected or die of enteric diseases every year. The piped water which is available in cities, is also mixed with a number of impurities causing Jaundice, cholera, Typhoid and gastro enteritis. Sometimes in cities the less dose of bleaching powder invites some diseases due to non-oxidation of the bacterial cell while excess bleaching powder may cause lung diseases and dysentery. Improper dumping of sewage effluent and industrial effluent is very serious pollutant of ground water. Once the ground water resources get polluted the effect map persist for decades or longer.

The reclamation of surface water is easier than ground water. In this paper an effort has been made to know the quality of water whether it is suitable for drinking purpose or not.

Materials and Methods

Collection of Samples

Sampling of Ground water was done during June, 2011. High grade plastic bottles of one litre capacity were used, which were thoroughly cleaned prior to filling, were rinsed with the water being sampled. Ten samples were collected from public hand pumps after running from 15 to 20 minutes, so as to avoid errors due to water contained within the pipes.

Analysis of Samples

The analysis of water done using procedure of standard methods (APHA, 1995) and to analyse the water samples, which are very essential to know the water quality for drinking purpose, carried out water analysis. The findings of the present investigations are summerised in Table 1 and it has been made with BIS, 1998 drinking water standards Table 2 which provides comprehensive picture of physico-chemical characteristics of ground water in the study area.

The parameters like pH, Electrical conductivity, Total dissolved solids were measured in the field at the time of sample collection, using water analysis kit (ELICO). Turbidity of water samples were measured using Nephalometer. Total hardness, Calcium, magnisium and Alkalinity by the titrimetric method, while chloride estimation was done by Argentometric method, sulphate and phosphate by Spectrophotometric method (APHA, 1995).

Results and Discussion

The total of Ten numbers of water-samples were taken from different locations of Jagdishpur industrial area. Three samples were taken from residential area, (S_1, S_2 and S_3), three samples were taken from market area (S_4, S_5 and S_6) and two each from agricultural fields (S_7 and S_8) and solid waste dumping sites (S_9 and S_{10}).

The pH value of the study area are in between 6.8 to 7.4 and is well within the permissible limits prescribed for drinking water standards. However, higher values of pH hasten the scale formation in water heating apparatus and reduce the germicidal potential of chlorine- (Mohapattra and Purohit, 2000).

The values of Electrical Conductivity of the samples were observed and recorded as 462 to 1836 μmhos/cm. It also shows that all the water samples collected for present observation fall well within the desirable limit (750-2000 μmhos/cm). It is indicating high mineralization in that area and also presence of higher concentration of acid, base and salts in water, higher will be the EC (Kataria and Jain, 1995).

The TDS values of the water-samples are 290 to 1265 mg/l and are well within the desirable limits of 1000 mg/l except the sample number S_9 and S_{10}. These two sampling stations are at the solid municipal dumping area. Here the local municipal authority adopted a common method for the disposal of solid municipal wastes by deposition on land. During percolation process, leachates from solid waste dumping sites may reach the ground water table and alters the quality of the water. Foster and Hirata, 1988, also concluded that the amount of dissolved solids increase with depth and with the time and distance of the water has traveled in the ground. Landfills can be any area of land used for the deposition of mainly solid wastes and they constituted important potential sources of ground water pollution (Everett, 1980). Olaniya and Saxena (1977) also reported ground water pollution from refuse leaches in the vicinity of dumping sites detectable through increased TDS of water.

In the present study the values of Turbidity varies from 1.8 to 38.4 NTU. Here all water-samples are well within the desirable limits except for the samples S_9 and S_{10} which are highly turbid indicating leaching down of suspended colloidal particles in the ground water due to the improper dumping of wastes in that site. Generally ground water is less turbid since sand is a good filtering media. If an aquifier receives a leachate

from the domestic solid waste and industrial waste water points which may result in increasing turbidity in ground water (Knight, 1951).

The values of Hardness varies from 290-872 mg/l, only 4 samples (S_1, S_2, S_3 and S_4) were found to be well within the excessive limit and rest all samples cross their excessive limit. The values of Calcium varies from 29.6-140.6 mg/l and it shows the all samples are well within the desirable limit prescribed for drinking water quality standards. The values of Magnesium ranges between 34.5-172.2 mg/l, and are well within the desirable limit of 150 mg/l except the samples S_1 and S_6.

The more amount of total hardness, and magnisum contents are may be due to the ground water of the region presenting the low natutral quality, in other words depth of the wells and the nature of the geological materials with which the ground water comes in contact may influences the quality of water. The ground water chemistry is controlled by the composition of its recharge components as well as by geological and hydrological variations (Narayana and Suresh, 1989).

The hard water causes a toughening of some vegetables, notably beans and peas and in textile finishing. However, excess amount of total hardness, calcium, magnesium accounts on scale formation in boilers, pipelines, utensils and consume more detergents in washing process (Ramaswamy and Rajaguru, 1991).

The values of Alkalinity ranges between 121-571 mg/l. All samples were found to be well within the desirable limit. When alkalinity of water exceeds the excessive limit, it is likely to produce incrustation sediment deposits, difficulties in chlorination, certain physiological effects on human systems etc.

The Chloride levels are found to be 48.7-698 mg/l. Here all samples were well within the desirable limits except the 3 samples S_7, S_9 and S_{10}. These sampling stations are to be located on agricultural field and solid waste dumping sites.

The contamination of chloride in ground water is usually attributed to improper dumping of municipal excreta particularly urine contain chloride in an amount about equal to the chloride consumed with food and water. Chloride in excess imparts the salty taste to water and people are not accustomed to high chloride are subjected to laxative effect (Raviprakash and Krishna Rao, 1989).

The present investigation data reveals for Sulphate values ranging between 27-185 mg/l which were well within the permissible limits for drinking water standards. Sulphate in ground water takes place the break down of organic substances in the soil. However, geological, hydrological and geomorphological characteristics shows remarkable variations and also the human influences. (Alexander, 1961).

The Phosphorus is also an essential elements for sustained primary productivity in the ecosystem. The form of phosphorus discussed here is Ortho-phosphate. The amount of phosphorus in natural water is very low.

Domestic wastes, industrial effluent and agricultural runoff is major sources of phosphorus in water. Hence its high concentration is indicative of pollution. In the present study the value of phosphate varies from 0.08-0.22 mg/l which were well within the permissible limit for drinking water standards.

Table.1 Physico-chemical characteristic data of Ground Water of Jagdishpur Industrial area of district CSM Nagar (U.P.)

S. No.	Physico-chemical Parameters	Samples									
		S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
1.	pH	6.8	7.0	7.2	7.0	7.2	7.0	7.0	7.2	7.3	7.4
2.	EC	1240	830	462	480	1300	1583	1168	1836	1150	1920
3.	TDS	762	520	290	720	790	960	760	715	1130	1265
4.	Turbidity	3.84	1.8	1.56	3.96	2.26	4.21	10.25	12.8	38.3	38.4
5.	Total Hardness	510	452	290	572	748	790	640	872	785	825
6.	Ca^{2+}	68.9	50.4	55.1	29.6	58.4	140.6	88.2	72.4	91.2	122.4
7.	Mg^{2+}	165.2	87.0	34.5	139.4	44.9	172.2	45.6	124.9	108.2	125.6
8.	Alkalinity	351	560	292	121	121	124	132	571	288	484
9.	Cl^-	110	82.2	115	48.7	125	160	698	262	684	635
10.	SO_4^{2-}	49	36	28	112	27	84.2	78.1	129	164	185
11.	PO_4^{3-}	0.10	0.16	0.14	0.15	0.08	0.12	0.11	0.16	0.22	0.18

All the parameters are expressed in mg/l, except pH, Electrical conductivity (μmhos/cm) and Turbidity (NTU).

Table.2 Comparison of Ground water quality data with drinking water standards (BIS, 1998)

S. No.	Physico-chemical Parameters	BIS, 1998		Observed Values	
		P	E	Range	Mean ± SD
1.	pH	6.5-8.5	< 6.5 - > 8.5	6.8 - 7.4	7.11 ± 0.18
2.	EC	750	2000	462-1920	1196.9 ± 503.68
3.	TDS	500	1000	290-1265	791.2 ± 70.15
4.	Turbidity	5	25	1.8 - 38.4	11.74 ± 14.5
5.	Total Hardness	100	600	290 - 872	648.4 ± 189.12
6.	Ca^{2+}	75	200	29.6 - 140.6	77.72 ± 33.82
7.	Mg^{2+}	50	150	34.5-172.2	104.75 ± 50.10
8.	Alkalinity	200	600	121-571	304.4 ± 182.82
9.	Cl^{-}	200	600	48.7 - 698	291.99 ± 268.75
10.	SO_4^{2-}	200	400	27 - 185	89.23 ± 56.85
11.	PO_4^{3-}	0.25	0.40	0.10 - 0.22	0.14 ± 0.04

P = Permissible limit; E- Excessive limit. All parameters are expressed in mg/l except pH, EC (μmhos/cm) and Turbidity (NTU).

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