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Exploration of Physico-Chemical parameters of underground water from Osmanabad City (Maharashtra State)

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Abstract: Underground water is the most preferred water source in recent days. Once believed to be safe from pollution as it is available many strata below the surface, is now proved to be prone to pollution by many researchers across the world. The contamination of fresh water bodymay be due to improper disposal of domestic and industrial waste water. A study was carried out to assess the underground water quality of Omarabad city, one of the fastest growing city in Maharashtra and an industrial, educational and commercial center. The present work was undertaken to assess the underground water quality of Osmanabad city and discuss the potability of fresh water bodyby collecting data of Physico-Chemical Parameter of Ground Water. The study was carried out by selecting variable spots, situated in different areas of Osmanabad city. The Physico-Chemical Parameter like P^H, temperature, free CO_2, dissolved oxygen, total hardness, total alkalinity, total solids, total dissolved solids, total suspended solids, chloride and salinity. The results reveal that the values of sum of the parameters are found more than the permissible limit whereas some parameters are well within the permissible limit prescribed by WHO and ICMR. The deterioration of the fresh water bodycan be attributed to the lack of fresh water bodydrainage system and maintenance of surrounding of the sources. Results are discussed in length.

Key Words: drinking groundwater, Physico-Chemical Parameters.

Introduction

Potable water is defined as the water, which is suitable for human consumption. Due to the presence of various chemical compounds and human activities water gets polluted. Water is the most vital resource for all kinds of life on this planet. Without clean water neither human nor environment, which sustain them, can survive. To safeguard the long term sustainability of water resources the quality of the water needs to be monitored. Degradation of water quality is measured in terms of the intended use of the water, effect on public health or ecological impact (Dwivedi, 2000). From a public health or

ecological point of view a pollutant is any biological, physical or chemical substance in which an identifiable excess is known to be harmful to other desirable living organism.

There are many different materials that may pollute surface water or fresh water bodyand therefore there is need of assessment of different parameters to monitor the quality of the water bodies (APHA, 1985).The present study was undertaken to assess the exact level of Physico-chemical parameters of the underground water. The study deals with water quality of tube wells, with special references to suitability of water for drinking purpose.

Material and Methods

The underground water samples were collected from various bore wells which are located in the study area (Osmanabad). The samples were collected in pre-sterilized 1000ml. glass bottles with necessary precautions and were brought to the laboratory for the analysis of various Physico-chemical parameters within three hours after collection of water samples by employing the methods described by Trivedi & Goel (1986) and APHA (1985). In present study Temperature, Hydrogen Ion concentration (pH), , Dissolved Oxygen (DO), Free Co_2 , Total Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness (TH), Total Alkalinity (TA), Salinity and Chloride were analyzed in laboratory

Result and Discussion

pH value :- The desirable pH range for drinking water is 6.5 to 8.5. The pH values of all samples were within permissible limits i.e. the water samples were slightly alkaline in nature. Deviation in this range indicates the entry of acidic or basic medium causing lot of health problems. Mustaffa,et.al(1999) stated that the pH value of the drinking water is an important index of acidity and alkalinity. verma and shukla (1970) stated that the pH does not have any adverse effects on health but it alters taste of water. In the present investigation the pH ranges between 7.2 to 8.9. Similar results were observed by Rambhau and someskhararao(1996) worked on vidyasagar colony Nuzvid, Radhika,*et.al*(2004) and Gerge *et.al* (2004).

Dissolved Oxygen:

Dissolved Oxygen values are below the range there by indicating that there is adequate presence of oxygen in the water sample. The saturation level of Do in potable water is 13-15 mg/l. Increase in Do is related to decrease in temperature or decrease in Do is related to increase in temperature as solubility of O_2 decrease with increase in temperature.In the present investigation the DO ranges between 7.2 to 10.5

mg/lit.The prescribed limit of WHO is >4mg/l of DO is permissible for drinking purpose. So the range of water is within the limit. The result co-related with the Sedemkar and Angadi(2003),Jha,*et.al*(2003),and sharma and Gupta(2004).

Free Co_2:

The value obtained is less than the standard value of free Co_2 i.e. 10mg/l of ground water. This may be due to inhibition of Co_2 by presence of appreciable amount of carbonate in water. The water samples never had higher free Co_2 and so are free from any poisonous toxic effect. The amount of free Co_2 from different water samples ranging from 2.0 to 6.0 mg/lit. Similar observation were made by Singh (1992),Rambhau *et.al*(1996) and Manna and Das (2004). Increase amount of dissolved oxygen i.e. less amount of free Co_2.

Total Alkalinity:

The total alkalinity of water sample ranges from 65 to 240 mg/l. Out of 10, 9 water samples showed total alkalinity within a desirable limit whereas 1 sample showed total alkalinity beyond desirable limit. The value of alkalinity provides an idea of material salts present in water. Present study indicates presence of basic sodium and potassium salts due to methyl orange alkalinity. Value of phenolphthalein-alkalinity also found up to 5mg/l indicating presence of hydroxyl ion. Similar results were reported by Misra (1991), Yogesh shastri(1999),Purandara, *et. al* (2003) and sharma and sarang (2004) stated that the water in the area was slightly alkaline.

Total Hardness :

It is caused by carbonate and bicarbonate ions. It has no known effect on human health. In present study, total hardness, content of water samples were within permissible limits. The limit of total hardness in drinking water is fixed to be 300mg/l. **Similar observation were by singh (1992), worked on water quality index of major river of pune, purendara *et.al* (2003) and Regina and Nabi (2004).**

Ca & Mg Hardness :

The limit o calcium magnesium in drinking water is fixed to be 75mg/l & 30mg/l. All the water samples shows calcium & magnesium hardness within desirable limits. In the present investigation the concentration of calcium ranges between 18 to 46 mg/lit. and magnesium 6 to20 mg/lit. These results were

within the permissible range. Same results were reported by Dubey (1997), Swarnalathapaka and Narsingrao (1997) and Sedamkar and Angadi (2003)

Chloride :

Excessive chlorides give the water an objectionable salty taste and give laxative effect to human beings concentration of chloride is found in prescribed limit i.e. 250mg/l. Concentration of Chloride of all water samples were found within prescribed limits.

In the present investigation the range of chloride concentration ranges between 24 to 76mg/l. The chloride concentration ranged from 17 to 94 mg/lit in tube well water reported by Abubakaar,*et.al* (2004).He stated that ,the results were found between the range of present study. Similar observations were also made by Sharma and Gupta (2004) and Moti sharma (2004).

Salinity:

The salinity of all the water samples was found within prescribed limits of WHO. In the present investigation amount of salinity ranges between 43.35 to 137.21mg/lit. Salinity themselves don't perform any hazards with respect to water quality but behaves as a very good indicator of pollution. Salinity directly effect on the taste of water .Klein (1975) observed a direct correlation between chloride concentration and pollution load. Similar results were reported by Purandra.*et.al* (2003), Garg.et.al (2004), Manna and Das (2004).) and Radhika.*et.al* (2004)

Total Dissolved Solid :

Above 500mg/l TDS is not suitable for drinking purpose. But present investigation indicates high range in ground water. It is not suitable for drinking purpose at normal course but can be used for drinking purpose is absence of alternate sources as it is below excessive limit of ICMR. In the present investigation the total dissolved solids ranges between 514 to 640mg/lit.Highest concentration of total dissolved solids may reduce the clarity of water which contributes to an increase in the water temperature. Similar reports are reported by Swarnalathapaka and Narsingrao (1997), Suryanarayanan *et.al* (2003) and Khabade and Mule (2003). The values of Physico-chemical characteristic of fresh water bodysamples are represented in Table No. **-1**

TABLE NO.-1: PHYSICO-CHEMICAL PARAMETER OF DIFFERENT SAMPLES OF FRESH WATER BODYOF OSMANABAD DISTRICT

Sr.	Parameter	Limits (WHO)	Spot A	Spot B	Spot C	Spot D	Spot E	Spot F	Spot G	Spot H	Spot I	Spot J
1	Temperature (^{O}C)	-	29.2	33.2	31.2	28.2	29.2	30.2	34.2	36.5	33.2	31.8
2	pH	6.5-9.00	7.9	7.4	7.6	8.1	8.4	7.5	8.2	8.3	7.1	7.2
3	Dissolved Oxygen(mg/lit.)	>4	4.1	4.2	5.1	3.9	4.3	4.1	4.4	4.1	4.2	4.2
4	Total Alkalinity(mg/lit.)	200	90	115	120	170	167	**230**	95	120	90	98
5	Total Hardness(mg/lit.)	300	217	248	184	188	174	120	200	130	111	106
6	Chloride(mg/lit.)	250	58	63	69	76	54	71	24	30	42	45
7	Salinity(mg/lit.)	250	104.72	113.74	124.57	137.21	97.5	128.18	43.35	54.18	75.84	81.25
8	TDS(mg/lit.)	500	540	620	640	568	514	580	550	518	542	615
9	Calcium Hardness(mg/lit.)	100	34	32	31	30	24	28	46	18	24	30
10	Magnesium Hardness(mg/lit.)	30	19	17	16	14	13	18	13	20	6	7
11	Free Co_2(mg/lit.)	10	4	3	6	2	2	4	3	2	3	2

All values are expressed in mg/lit except pH and Temperature

CONCLUSION

The above data one Physico-chemical parameters of fresh water bodyclearly showed that the water samples were not polluted and safe for drinking purpose as the values for different parameters evaluated fall far below the acceptable limit.

However it is always advisable to drink water after proper boiling and filtration.

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