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Excess of Beneficial Element Intake May Cause Harmful Effect to Mankind

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Abstract: *Ground water is the water located beneath the ground, or surface, in soil pore spaces and in the fractures of rock formation, constitute about 95% of the fresh water on our planet[1]. It is a replenishable but finite resources. It often provides water supply that is more reliable in quantity and more stable in quality than the surface water[3] and thus it has economic and operational advantages due to reduced treatment requirement. But nowadays due to over exploitation of ground water led to decline of these resources, the water table is going down deeper & deeper. More over excessive use of fertilizers and pesticides in agriculture added by improper disposal of urban / industrial waste can cause contamination of ground water resources. Inorganic contaminant including salinity chloride, fluoride, nitrate, iron and some other metals are important in determining the suitability of ground water for drinking purposes. High incidence of the constituents such as fluoride, Manganese, and iron have been reported from some of the areas which have been mostly attributed to geogenic reasons. In the present investigation physicochemical parameter of some of the locality of Bhopal district are measured / detected to know the contamination of ground water and thus impact on health there of.*

Keywords: *Replenishable, Pesticides, Contamination, Geogenic.*

1. INTRODUCTION

Some of the heavy metals are common in our environment, and diet. Interestingly small amounts are actually necessary for good health but large amounts of any of them may cause acute or chronic toxicity[5&6]. Heavy metal toxicity can result in damaged or reduced mental state, central nervous functioning, lower energy level and damage to lungs, kidneys, liver and other vital organs. Long term exposure may result in slow muscular, physical neurological process. Allergies are not uncommon and repeated long term contact with some metal or their compounds may even cause cancer. (International occupational safety. Health information centre 1999). Hence it is important for us to inform ourselves about the heavy metals toxicity and to take protective measures against excessive exposure.

2. MATERIALS & METHODS

All the chemicals used are of A.R. grade. Metals, Manganese and Iron concentration are determined in the sample of ground water (as shown in table I & II). The detection of these ions are based on the formation of some coloured compound with some suitable reagents. Atomic absorption spectrometric method is the most reliable.

Iron may be present in water in ionic form (Fe^{2+} or Fe^{3+}) as dissolved complexes, colloidal and as insoluble suspended matter. Iron after reduction to Fe^{2+} reacts with O- phenanthroline to form a red coloured compound. Total iron could be estimated after digestion and reduction[7]. Iron II reacts with 1-10 phenanthroline to form an orange-red complex. Quantitative formation of the complex is observed in the pH range 6 to 9. Iron must be present in the +2 state and to ensure this a reducing agent is added. Hydroxylammonium chloride or hydroquinone are convenient for the purpose. The orange colour can be measured colorimetrically/ Spectrophotometrically.

Manganese is oxidized to MnO^-_4 which is then estimated colorimetrically. Either potassium persulphate or periodate solution may be oxidizing agent.

The other physicochemical parameters were detected by their respective usual method. Methods

for detection of –

Chloride – Argentometric

Acidity & Alkalinity – Titrimetric

Phosphate–Stanouschloride Method

TDS – Gravimetric method.

3. RESULT & DISCUSSION

The analytical results of water samples from different locality as mentioned are presented in Table I. As per result (Table II) the value of total iron content is high, in some areas. Although iron is an essential element in both plants & animals metabolism but higher value of Iron than permissible limit may cause health hazards. Iron may be present as soluble ferrous or insoluble ferric form[2]. Ground water is contaminated by iron mainly from weathering of ferruginous minerals of igneous rocks such as basalt and sulphide ores of sedimentary and metamorphic rocks. Laterites are soil types rich in Iron formed in hot and wet tropical areas. Nearly all laterites are rusty red because of Iron oxides. It develops by intensive and long lasting weathering of the underlying parent rocks.

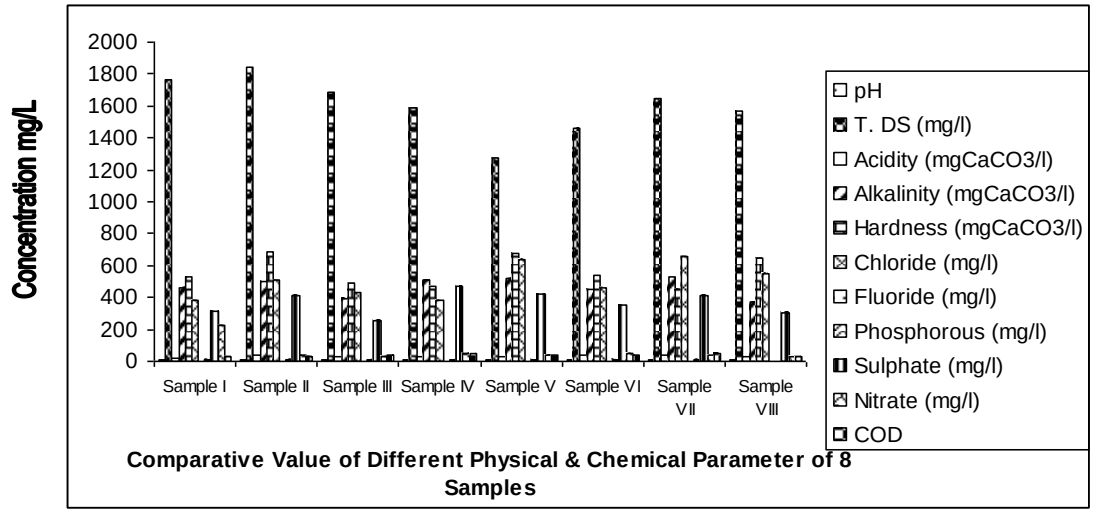
Table I. *Evaluation of Various Physico chemical parameters in Ground Water Sample of Different locality of Bhopal.*

S.No.	Parameters	Permissible Value	Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI	Sample VII	Sample VIII
1.	pH	7 to 8.5	8.9	7.4	6.8	8.2	6.2	7.5	8.6	7.9
2.	Conductivity (micro mho/ cm.)	-	2694	2852	2245	2498	2372	2565	2715	2642
3.	T. DS (mg/L)	500 to <2000	1764	1842	1687	1592	1274	1458	1648	1564
4.	Acidity ($mgCaCO_3/L$)	6.5 to 9pH	22.8	35.6	32.2	29.2	26.2	38.4	34.6	27.6
5.	Alkalinity ($mgCaCO_3/L$)	200 to <600	456	502	394	514	522	454	532	372
6.	Hardness ($mgCaCO_3/L$)	200 to <600	525	684	495	467	678	538	455	648
7.	Chloride (mg/L)	200 to <1000	379	514	432	382	637	462	659	545
8.	Fluoride (mg/L)	1 to <1.5	2.44	1.83	1.64	3.4	1.96	2.64	1.76	3.25
9.	Phosphorous as phosphate(mg/L)	not toxic	7.5	9.2	5.7	6.8	8.4	7.2	6.4	3.9
10.	Sulphate (mg/L)	200 to <400	316	408	256	472	424	356	416	307
11.	Nitrate (mg/L)	45	222	42	34	48	44	52	36	29
12.	COD	10 to 50 as given by WHO	34	26	42	46	40	38	52	32

Sample – I. Naseerabad, II. Arjun Nagar, III Govindpura, IV. Lalghati,

V. Bilkheria, VI. Padaria, VII. Bastar Railway Colony, VIII. Rachna Nagar.

Graph 1



Comparative Value of Different Physical & Chemical Parameter of 8 Samples

Industrial effluent, acid mine drainage, sewage and land fil leachate may also contribute Fe and Mn to local groundwater. (Table II) Iron is an important chemical to measure, as many processes

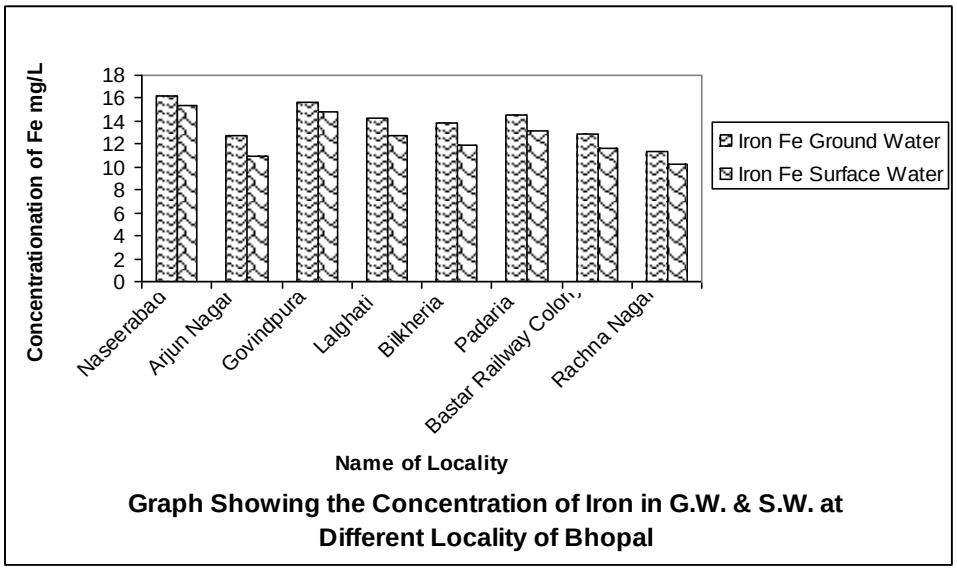
that occur in groundwater are affected by Iron. Iron concentration also provide an indication of chemical condition occurring in ground water. For example trace inorganic chemicals that pose a potential health concern such as arsentic, boron and lead are associated with iron in ground water. Presence of high concentration of Fe^{2+} also reflects reducing condition in Ground Water.

The permissible iron concentration in ground water is 1mg/L prescribed for drinking water but the result shows the concentration of Iron is more than desired level.

Table II. *Iron and Manganese Concentration in Ground Water and Surface Water of Different Locality in Bhopal District*

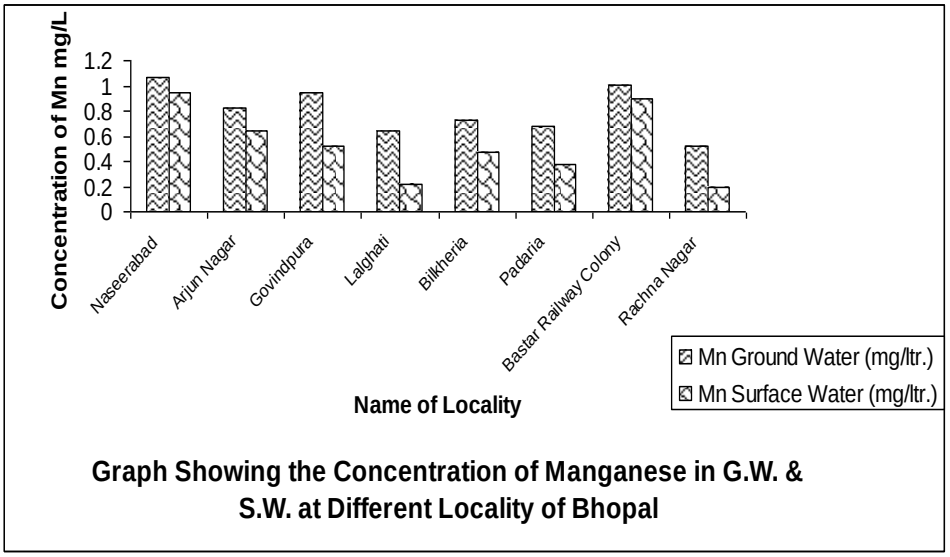
S.No.	Name of Locality	Block	Iron Fe		Mn	
			Ground Water (mg/ltr.)	Surface Water (mg/ltr.)	Ground Water (mg/ltr.)	Surface Water (mg/ltr.)
1.	Naseerabad	Berasia	16.2	15.4	1.07	0.95
2.	Arjun Nagar	Phunda	12.7	10.9	0.82	0.64
3.	Govindpura	Huzur	15.6	14.8	0.95	0.52
4.	Lalghati	Huzur	14.2	12.8	0.64	0.22
5.	Bilkheria	Phunda	13.8	11.9	0.73	0.47
6.	Padaria	Phunda	14.6	13.2	0.68	0.38
7.	Bastar Railway Colony	Huzur	12.9	11.7	1.01	0.90
8.	Rachna Nagar	Huzur	11.4	10.2	0.52	0.19

Graph 2



Graph Showing the Concentration of Iron in G.W. & S.W. at Different Locality of Bhopal

Graph 3



Graph Showing the Concentration of Manganese in G.W. & S.W. at Different Locality of Bhopal

4. CONCLUSION

Iron and manganese both are commonly found in water and are essential element required in small amount by all living organism.[8] Concentration of Iron and manganese in groundwater are often higher than measured in surface water. Water with high concentration of Fe & Mn. may cause the staining of plumbing, fixture of laundry. Manganese solids may form deposit particles that give water an unpleasant appearance and taste. Similarly Fe can collect in block pipes or fixture and produce colour, taste and rust flakes in water. Both substances can increase the growth of unwanted bacteria that form a slimy coating in water pipes.

High concentration of Iron in ground water has been observed by more than 1.1 lakh habitants in the country. Highly contaminated ground water by iron is reported in Assam, West Bengal, Orissa, Chhattishgarh, Andhra Pradesh[2] Karnataka, and localized pockets are observed in U.P., Punjab, Maharashtra and Madhya Pradesh. The use of such contaminated water is highly objectionable as they cause health disorder.

It is possible for one to get too much iron through diet[4] but ingesting too much Iron through drinking water is not associated with adverse health effects[9]. However while chronically consuming large amounts of Iron, can lead to a condition known as Iron overload. This condition is usually the result of a gene mutation that affects about one million people in the United States[5]. Left untreated iron overload can lead to **Hemochromatosis** a severe disease[6] that can damage the body's organs. Early symptoms include fatigue, weight loss, and joint pain but if **hemochromatosis** is not treated it can lead to heart disease liver problem and diabetes. A blood test can identify iron overload.

How Iron and manganese are removed depends on the type and concentration and this self determines the best procedure and treatment system to use. Water treatment methods include

- Oxidation / Filteration.
- Adsorbing on Iron exchange resin.
- Reverse osmosis.

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