

Seasonal variation of some physico - chemical analysis of ground water quality during monsoon and post monsoon season in Bind Toli village along main stream of river Ganga near Digha, Patna (Bihar)

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Abstract: The seasonal variation in physico - chemical properties of the ground water during monsoon and post monsoon season in Bind Toli village near Digha, Patna (Bihar) was investigated. A total of seventeen water samples from different hand pumps was taken. The experiment analysis its various physico - chemical parameters such as pH, Turbidity, Total Dissolved Solids, Chloride, Total Alkalinity, Total Hardness, Total Iron, Arsenic content in water and the result were compared with water quality standard prescribed by Bureau of Indian Standard (IS-10500;1991). The different physico-chemical parameters were determined by APHA, 21ST Edition. The small variation in all physico- chemical value were observed during monsoon and post monsoon season.

(Keywords: Ground Water Quality, Seasonal Variation, Physico - chemical Parameters, Hand Pump)

Introduction

Ground water is an important natural source of water supply all over the world. Its use in irrigation, industries and domestic usage continues to increase where perennial surface water source are absent ¹. The modern civilization, over exploitation, rapid industrialization and increased population has lead to fast degradation of our environment ². To meet the rising demand it is imperative to recognize the fresh water resources and also to find out remedial methods for improvement of water quality ³. The quality of water may depend on geology of particular area

and also vary with depth of water table and seasonal changes and is governed by the extent and composition of the dissolved salts depending upon source of the salt and soil, subsurface environment. Good drinking water quality is essential for the well-being of all people which has affected the health and economic status of the populations. Groundwater is the major source of water for drinking, agricultural and industrial desires. The present study aim to assess ground water quality and its suitability for drinking and its seasonal variation.

Experimental

Material and methods: The water sample were collected with utmost care to ensure that no contamination occurs at the time of collection or prior to examination. The ground water samples were collected from different seventeen hand pump of Bind Toli village near Digha, Patna (Bihar) during monsoon (June – September) and post monsoon season (October – February)2009 -2010. Samples were collected in good quantity polyethene bottle of one litre capacity and analysed by APHA (2005)⁴. The seventeen collected water sample were analysed under various physico – chemical analysis and method of testing parameters for pH, Turbidity, Total Dissolved Solids, Chloride, Total Alkalinity, Total Hardness, Total Iron, Arsenic under minimum and maximum permissible limit ⁵ given in table 1 and 2.

Table - 1
Seasonal variation in physico – chemical parameter of Bind Toli village (Digha), Patna studied during monsoon (June – September) and post monsoon (October – February) 2009-10

Sample code	pH Min.- Max. Per. limit 6.5 - 8.5		TDS Min.- Max. Per. limit 500 - 2000 (mg/l)		Chloride Min.- Max. Per. limit 250 - 1000 (mg/l)		Turbidity Min.- Max. Per. limit 5 - 10 (NTU)	
	Monsoon	Post Monsoon	Monsoon	Post Monsoon	Monsoon	Post Monsoon	Monsoon	Post Monsoon
B1	6.9	6.9	335	338	9	10	0.61	0.61
B2	6.7	6.9	526	530	12	13	44.4	43.9
B3	6.8	6.9	625	622	21	23	56.3	56.7
B4	7.1	7.3	530	535	18	20	70.1	70.6
B5	6.7	6.9	625	636	30	30	100.2	101.3
B6	7.0	7.1	485	488	77	75	185.4	186.2
B7	6.8	7.2	390	400	56	57	105.2	104.8
B8	6.7	7.1	560	572	28	30	75.5	74.8
B9	7.1	7.3	420	435	22	20	20.1	20.6
B10	6.9	7.2	432	452	17	18	25.1	25.3
B11	7.2	7.5	542	552	27	27	100.0	100.4
B12	6.7	6.9	612	618	28	30	90.1	89.5
B13	6.8	7.2	512	510	20	22	98.0	98.4
B14	6.6	7.1	425	430	12	12	62.1	62.3
B15	6.5	6.8	510	530	56	58	108.3	108.5
B16	6.5	6.9	516	520	30	34	105.2	105.8
B17	6.7	7.1	485	490	22	21	98.0	92.3

Results and Discussion

The small variation in all physico – chemical parameter values were observed during monsoon and post monsoon season. The results can be summarised as follows.

1. pH: The pH of ground water in the study area ranged from 6.5(B15,B16) to 7.2 (B11) during monsoon season. In post monsoon season, the pH value of water samples were ranged from 6.8 (B15) to 7.5 (B11). According to the drinking water standards prescribed by BIS (IS-10500:1991) the water sample was found to be well with in permissible limit during monsoon and post monsoon season.

2. Total Dissolved Solids: The simplest classification of water is based on the concentration of dissolved Solids ⁶. Total Dissolved Solids in the study area ranged from 335(B1) to 625 (B3, B5) during monsoon season. In post monsoon season its values ranged from 338(B1) to 636(B5). The TDS value of all the water sample during monsoon and post monsoon season were well with in maximum permissible limit.

3. Chloride: The chloride value of water samples ranged from 9.0(B1) to 77.0(B6) in monsoon season and its values ranged from 10.0(B1) to 75.0 (B6) in post monsoon season. The chloride value of all the water sample were found to be well with in minimum permissible limit.

Table - 2

Seasonal variation in physico – chemical parameter of Bind Toli village (Digha), Patna studied during monsoon (June – September) and post monsoon (October – February) 2009-10

Sample code	Total Alkalinity Min.- Max. Per.Limit 200 - 600 mg/l		Total Hardness Min.-Max. Per. limit 300 - 600(mg/l)		Total Iron Min.- Max.Per.Limit 0.3 – 1.0(mg/l)		Arsenic Min.- Max.Per.Limit 50 (ppb)	
	Monsoon	Post Monsoon	Monsoon	Post Monsoon	Monsoon	Post Monsoon	Monsson	Post Monsoon
B1	160	158	140	146	0.23	0.27	8.00	8.50
B2	358	360	320	322	3.51	3.56	505.10	520.80
B3	334	332	322	328	3.40	3.58	311.00	318.00
B4	518	515	338	342	3.00	3.20	113.00	124.00
B5	362	363	320	324	3.05	3.14	120.90	125.50
B6	392	397	266	268	3.02	3.24	332.00	320.00
B7	174	173	246	250	3.06	3.00	39.80	42.60
B8	308	309	344	340	3.20	3.26	130.40	136.20
B9	406	407	332	336	3.00	3.10	336.00	335.50
B10	402	408	318	322	3.07	3.16	203.20	230.20
B11	346	487	318	222	4.46	4.48	236.90	238.00
B12	392	395	396	408	4.20	4.26	264.10	260.80
B13	384	385	336	342	3.01	3.15	183.10	186.00
B14	402	405	292	310	3.50	3.50	136.50	138.60
B15	364	366	328	326	3.80	3.84	210.80	215.20
B16	286	289	282	272	2.90	3.00	316.20	310.20
B17	330	333	304	308	2.60	2.66	85.10	85.20

4. Turbidity: Turbidity of water samples ranged from the highest value of 185.4 NTU (B6) to lowest value of 0.61 NTU (B1) during monsoon season and its values ranged from 0.61 NTU (B1) to 186.2 NTU (B6) during post monsoon season. However except for sample B1, all other water samples had turbidity value between 20.1 and 186.2 NTU (B6) which are all above the minimum permissible limit of 5 NTU.

5. Total Alkalinity: Total alkalinity is the measure of the capacity of water to neutralize a strong acid. The alkalinity of water is generally

imparted by the salt of carbonate, bicarbonate, phosphates, nitrate, borates, silicates etc, tighter with the hydroxyl ion in free state.

Total Alkalinity in the study area ranged from 160 (B1) to 518 (B4) during monsoon season and its values ranged from 158(B1) to 515 in post monsoon season.

6. Total Hardness : Total Hardness in the study area ranged from 140 (B1) to 344 (B8) in monsoon. In post monsoon season its values ranged from 146 (B1) to 342 (B4, B13). Total

Hardness value of sample (B1) was found to be below the minimum permissible limit and all other sample were well with in maximum permissible limit during monsoon and post monsoon season.

7. Total Iron: Iron is one of the most abundant of the rocks and soil. All kinds of water including ground water have appreciable quantities of iron. Iron has more solubility at acidic pH, therefore, large quantities of iron are leached out from the soil and rocks by acidic water. In monsoon season, total iron in the study area ranged from 0.23 (B1) to 4.46 (B11) and in post monsoon season its values varied from 0.27 (B1) to 4.48 (B11). The iron value of sample B1 was found to be well with in minimum permissible limit and in all other water sample, the iron concentration was beyond the maximum permissible limit which are not suitable for drinking purpose.

8. Arsenic: Arsenic a metalloid element occurring in hydrological environment. Arsenic is introduced in water through the dissolution of mineral and ores, atmospheric depletion and erosion from natural sources. Arsenic is a general plasmatic poison and its affect all system of the body. The chronic ingestion of inorganic arsenic

causes peripheral arteriosclerosis commonly known as black foot disease ^{7,8}.

During monsoon season its values varied from maximum value of 505.10ppb (B2) to minimum value of 8.00ppb (B1). In post monsoon season its values varied from maximum value of 520.80ppb (B2) to a minimum value of 8.50ppb (B1). Arsenic concentration in water sample (B1) was within permissible limits. But water samples from all other location analysed during monsoon and post monsoon season the presence of arsenic concentration higher than the maximum permissible limit of 50ppb. People of the village Bind Toli where arsenic concentration in drinking water sources was more than the maximum permissible limit of 50ppb complained of some skin disease such as pigmentation change and thickening (hyperkeratosis).

Conclusion : The basic data behind the present investigation was to evaluate the extent of seasonal variation during monsoon and post monsoon season. A small variation in all the physico –chemical parameters in all the water samples were observed during monsoon and post monsoon season. Turbidity, arsenic and iron concentration of only one water sample was well with in permissible limit and safe for drinking purposes.

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