Original Research Article

Analysis of Groundwater Quality Using Physicochemical Parameters in KahalgaonTown, Bhagalpur District, Bihar.

Abstract

The majority of people living on earth rely on groundwater as their day to day needs of water. However, anthropogenic activities continuously threaten~~ingthis valuable natural resources~~this valuable natural resource.

People on globe are under tremendous threat due to changes in the physical, chemical and biological characteristics of water. With i~~I~~ncreased human populations, industrialization, use of

fertilizer and man-made activities water is becoming highly polluted with different harmful contaminants. It is necessary that the quality of drinking water should be examined thoroughly at regular interval of time, because due to use of contaminated drinking water not only human populations but also other living organism of whole biosphere suffer from various type of water borne diseases. This study was conducted…….Physicochemical parameters analysed are: pH, TDS,

EC, Sulphate, Nitrates, Bacteriological, Total Hardness, Ca, Mg, Fe, As, Cl, F, Turbidity, and Alkalinity were also analysed using standard process and procedures. The present paper is a modest attempt to analyse the Physicochemical Parameters of Groundwater of all 17-wards of Kahalgaon Town, (Bhagalpur District, Bihar) and as well as to suggest suitable measures for the redressal of problems identified.

Key Words: Physicochemical Parameter, Arsenic, Iron, Fluoride, Groundwater, Black Plum Wood, Water Purifier.

Comment [s1]: Introduce your study area here include also your methodology which will include also parameters under study. Thereafter, give a summary of the analytical procedures used and results you got and a very short discussion.

Introduction:

Groundwater is used a lot in our daily life, it is like a precious boon for all of us, but due to excessive interference with nature by humans, our underground water has become polluted. Groundwater source is the major source of drinking water in most of the suburban areas of India[(1)]. This resource is threatened by the potential presence of faecal bacteria coming from a variety of sources and pollution paths, the former including septic tanks, landfills, and crop irrigation with untreated, or insufficiently treated, sewage effluent[(2)]. Accurately assessing the microbiological safety of water resources is essential to reduce diseases caused by waterborne faecal exposure[(2)].Continuous indiscriminate waste dumping and unruly human behaviour towards environmental management and strategies require a holistic approach to guarantee environmental security[(7)].Groundwater being usually of good quality and easy availability is the most viable source of water supply for many communities since decades [(8)]. In the rapidly transforming world, where there are innumerable groundwater issues, the effects of urban environment on groundwater resources have created a worldwide concern[(8)]. Therefore, it has

become necessary to pay ample attention toward this issue[8]. Due to daily use of polluted water, people are falling victim to serious diseases. In this research paper, we tried to find out the real condition of Kahalgaon Town which is located in Bhagalpur district of Bihar state, India by investigating various physicochemical parameters (i.e. pH, TDS, EC, Sulphate, Nitrates, Bacteriological, Total Hardness, Ca, Mg, Fe, As, Cl, F, Turbidity, and Alkalinity) through different methods and we all have tried to provide some safety measures as well. It is also a matter of concern that heavy metals like arsenic have been found in the underground water of some wards of Kahalgaon Town. The underground water of this city contains elements like iron, fluoride, chloride in abundant quantities which are fatal for people and are also the cause of various types of dangerous diseases (citation). The problems can be solved to some extent by putting Black Plum wood in the water tanks of houses. Putting the wood of Black Plum in the water tank does not spoil the water and also saves from stomachache, diabetes, arthritis, dysentery and serious digestive diseases. The problem can be solved to some extent by drinking, the water after cleaning it with the Black Plumwood and then purifying it with a simple water purifier.

~~Methods and Methodology:~~Materials and Methods

The Study Area and Origin of Research:

Kahalgaon is a town and a municipality in Bhagalpur district in Bihar, India and it is situated at elevation 16 meters above the sea level. The Geographical Coordinates of this town is 25°15'37"N and 87°14'10"E. It is located close to Vikramshila that was once a famous Centre of Buddhist learning across the world, along with the Nalanda during the Pala dynasty. The Kahalgaon NTPC located near the ~~the~~ town is very useful to the people. It is also a city of historical importance on the southern banks of the holyriver Ganga.Kahalgaon is my native place. I have personally experienced that there are several water~~born~~borne diseases among the both urbanized and ruralites residing in this micro area. Knowingly or unknowingly they are compel to use contaminated water for there domestic uses. Such circumstances prompted me to do research work on the above mentioned topic, so that somehow they may get rid of such hazardous situation.

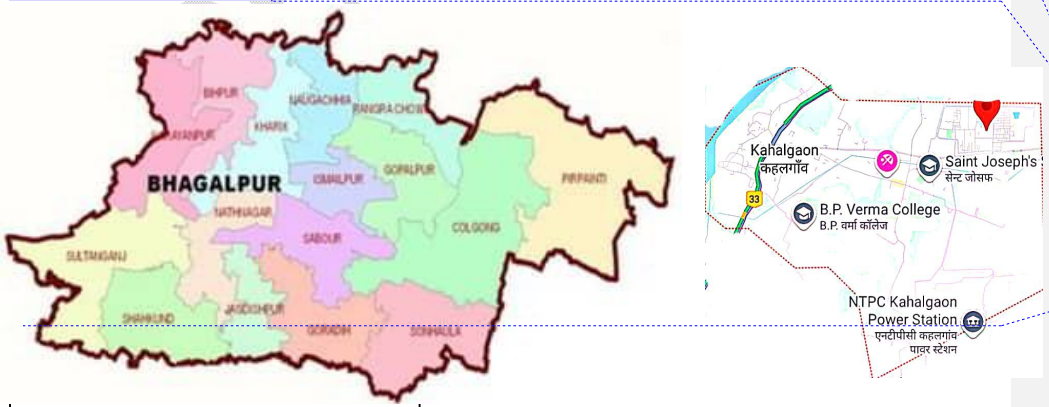

Figure 1: Map of Kahalgaon Town in Bhagalpur District, Bihar

Comment [s2]: Before you go to your study site....Give example worldwide where there exist this problem of urban environment impacting groundwater. You may do this by firstly stating worldwide, then Asia as a continent followed by India as a country and finally talk about your study site.

Comment [s3]: What motivated you to do this. You should have literature backup on why you want to do this in this area. Are there any studies done in this area or not? If there are studies done in the area what is lacking that you want to fill in.

Comment [s4]: Where did you get this. Provide a citation.

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Comment [s5]: This paper is crucial even to layman persons. Try to chip in in the background about this Wood of black plum. What is it, how it works and benefits. Show us that it has served several areas or communities through literature backup.

Comment [s6]: This town is a polygon, write all four coordinates. Two latitudes and two longitudes.

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Comment [s7]: Its very good to use literature rather than your own observation. Go through the reports and literatures to back up the problem.

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Comment [s8]: This should not be in the methodology section. Its supposed to be shown in the background and formulation of the problem.

Comment [s9]: Use QGIS or ArcGIS to draw your study area.

Figure 1: Map of Kahalgaon Town in Bhagalpur District, Bihar

Significance of Research in this Area:

Kahalgaon is a developing town and there is a number of educational institutions and hospitals are situated in and around the town. About 50 villages are entirely depending upon this town. Everyday around thousands of students and people travels through the town. There are number of mango pulp and smallscale industries in and around the city. Therefore, it was very essential to do assessment of environment with respect to water as it is a daily consumption and essential for humans. Now a days, awareness has been increased on environmental issues and trace elements play a vital role, either helpful or harmful to human health. In this regards, the complete study and assessment of water quality around Bhagalpur district was required. It would be helpful to the public as well as administration about the status of the rural areas water quality, public health, environmental conditions and issues of the country.

Objectives:

- To analyse the ward wise concentration of aforesaid physicochemical parameter in groundwater of Kahalgaon Town, Bhagalpur District, Bihar.
- To Suggest the suitable measures for the problem identified.

Hypothesises:

To achieve above objectives following hypotheses have been formulated.

- Due to daily use of polluted groundwater, people in this area are falling victim to serious water born diseases.
- Black Plum or Jawa Plum wood can purify groundwater and can be considered an effective solution for purifying groundwater.

Method of Analysis:

In this research paper, we ~~analyzed~~analysed the physicochemical parameters by different suitable methods which are shown in Table 1.

Comment [s10]: Good. The table is well detailed about method of analysis.
But, before the table give a detailed information about data collection methodology (what bottles you used for water collection, did you preclean the bottles...if yes by what), how did you store the samples when transporting to the laboratory. Then were there onsite analysis or they were all done in the laboratory?
Explain what was done either in the field or laboratory for each parameter.

Sl. No.	Name of Physicochemical Parameter	Methods of Analysis
01.	pH	Through pH Meter
02.	Turbidity	Turbidity Meter
03.	Electrical Conductivity	Conductivity Meter
04.	TDS	Gravimetric Filtration Method
05.	Total Hardness	EDTA Titration Method
06.	Calcium	EDTA Titration Method
07.	Magnesium	EDTA Titration Method
08.	Chloride	Titration with $AgNo_3$ Solution Method
09.	Alkalinity	Titration with dil. H_2SO_4 Method
10.	Iron	Phenanthroline Method
11.	Nitrates	UV- Spectrophotometer
12.	Sulphate	Turbidity Meter with Barium Chloride solution

13.	Fluoride	SPANDS Method and Selective Ions Electrode Method
14.	Arsenic	SDDC Method Through UV- Spectrophotometer
15.	Bacteriological	Through H_2S Strip Method

Table 1: Analytical Method used for this Paper.

Result And Discussion:

Comment [s11]: Please present your results while discussing them by looking and citing similar literatures

After checking all the physicochemical parameters we found that the pH value of ground water is correct but the turbidity level is very high, especially in ward number 9, 14, 16 and 17 it has crossed the maximum limit.Electrical conductivity is also higher in some wards.Except ward number 01, 02, 03, 04, 06 and ward number 08, the amount of TDS in all other wards is quite high.Total hardness is fine for almost all the wards.Some wards have high levels of calcium and magnesium. The chloride content is also correct in almost all the wards, and the alkalinity level is also manageable. The amount of iron is also near the maximum limit and nitrate is also correct in all wards.Due to the presence of arsenic in ward number 01, 02, 04, 10 and 16, people living there may face problems in the future.

After analysis of all physicochemical parameters the data are listed in Table 2 and Table 3.

Sl. No.	Place	Source	pH	Turbidity in NTU	EC in µs/cm	TDS in mg/L	TH in mg/L	Ca in mg/L	Mg in mg/L	Cl in mg/L
01.	Ward No. 1	GW	7.50	2.62	212.0	106.0	60.6	14.5	5.8	19.3
02.	Ward No. 2	GW	7.34	2.65	678.0	351.0	177.7	43.6	16.6	109.7
03.	Ward No. 3	GW	7.25	1.63	686.0	343.0	162.0	40.4	14.7	107.7
04.	Ward No. 4	GW	7.41	2.99	845.0	423.0	218.1	59.7	16.6	95.8
05.	Ward No. 5	GW	7.15	4.60	1041.0	506.0	262.6	63.0	25.5	28.9
06.	Ward No. 6	GW	7.29	3.80	204.0	105.0	60.6	12.9	6.8	13.2
07.	Ward No. 7	GW	7.26	3.60	1197.0	590.0	303.0	74.3	28.4	83.8
08.	Ward No. 8	GW	7.67	2.40	371.0	186.0	96.9	25.8	7.8	18.4
09.	Ward No. 9	GW	7.56	23.10	1813.0	898.0	416.1	109.8	34.3	59.8
10.	Ward No. 10	GW	7.48	4.10	1186.0	594.0	290.8	71.1	27.4	43.7

11.	Ward No. 11	GW	7.46	3.60	1514.0	758.0	367.6	105.0	25.5	58.1
12.	Ward No. 12	GW	7.58	3.58	1124.0	564.0	282.8	75.9	22.5	89.8
13.	Ward No. 13	GW	7.62	4.56	1766.0	883.0	420.2	117.9	30.4	90.5
14.	Ward No. 14	GW	7.25	5.65	1504.0	752.0	363.6	96.9	29.4	45
15.	Ward No. 15	GW	7.43	4.68	1252.0	625.0	303.0	79.1	25.5	51.8
16.	Ward No. 16	GW	7.25	8.16	1311.0	657.0	319.1	82.4	27.40	71.8
17.	Ward No. 17	GW	7.34	7.13	1095.0	545.0	262.6	67.8	22.50	39.9
Desirable Limit.			6.5-8.5	1.0	-	500	300	75	30	250
Permissible limit in absence of alternate source.			NR	5.0	-	2000	600	200	100	1000

Table 2: Ward Wise Analytical Result of Physicochemical Parameter.

Sl. No.	Place	Source	Alka. in mg/L	Fe in mg/L	NO_3 in mg/L	SO_4 in mg/L	F in mg/L	As in mg/L	Bacteriological
01.	Ward No. 1	GW	36.3	0.65	1.5	2.0	0.77	0.001	Negative
02.	Ward No. 2	GW	157.5	0.08	2.5	5.0	0.51	0.005	Negative
03.	Ward No. 3	GW	137.3	0.06	2.6	4.0	0.45	0.000	Negative
04.	Ward No. 4	GW	206.0	0.10	3.0	8.0	0.38	0.001	Negative
05.	Ward No. 5	GW	246.4	0.15	3.2	5.0	0.21	0.000	Negative
06.	Ward No. 6	GW	48.4	0.40	1.4	3.0	0.72	0.000	Negative
07.	Ward No. 7	GW	282.8	0.18	4.2	10.0	0.30	0.000	Negative
08.	Ward No. 8	GW	76.7	0.05	1.6	3.0	0.52	0.000	Negative
09.	Ward No. 9	GW	92.9	0.17	6.1	10.0	0.34	0.000	Negative
10.	Ward No. 10	GW	274.7	0.25	3.5	6.0	0.49	0.003	Negative
11.	Ward No. 11	GW	343.4	0.30	5.4	10.0	0.23	0.000	Negative
12.	Ward No. 12	GW	266.6	0.35	3.4	6.0	0.48	0.000	Negative

13.	Ward No. 13	GW	395.9	0.60	5.0	8.0	0.34	0.000	Negative
14.	Ward No. 14	GW	339.3	0.55	4.4	7.0	0.82	0.000	Negative
15.	Ward No. 15	GW	278.7	0.04	4.5	5.0	0.85	0.000	Negative
16.	Ward No. 16	GW	290.8	0.26	4.6	8.0	0.98	0.001	Negative
17.	Ward No. 17	GW	246.4	0.24	4.0	4.0	0.66	0.000	Negative
Desirable Limit.			200	1.0	45	200	1.0	0.01	-
Permissible limit in absence of alternate source.			600	NR	NR	400	1.5	NR	-

Table 3: Ward Wise Analytical Result of Physicochemical Parameter.

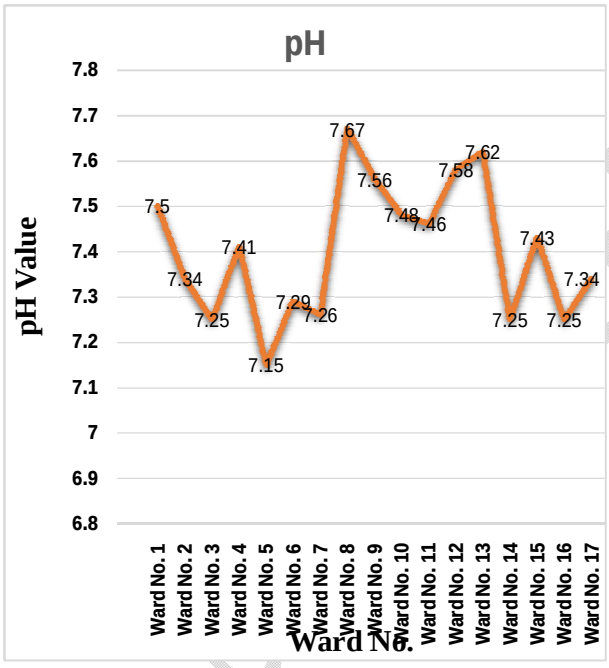

Figure 2: Ward Wise variation of pH (D.L: 6.5-8.5).

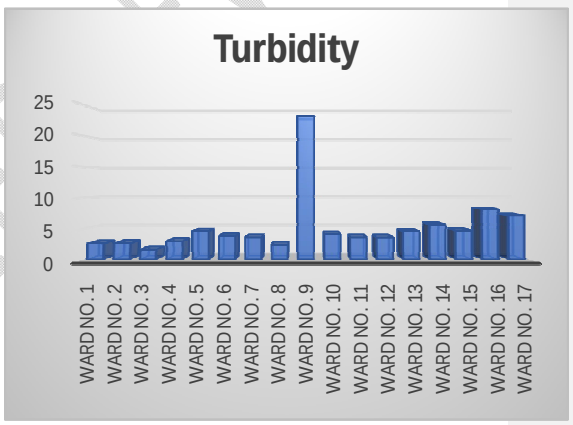

Figure 3: Ward Wise variation of Turbidity (D. L. is 1).

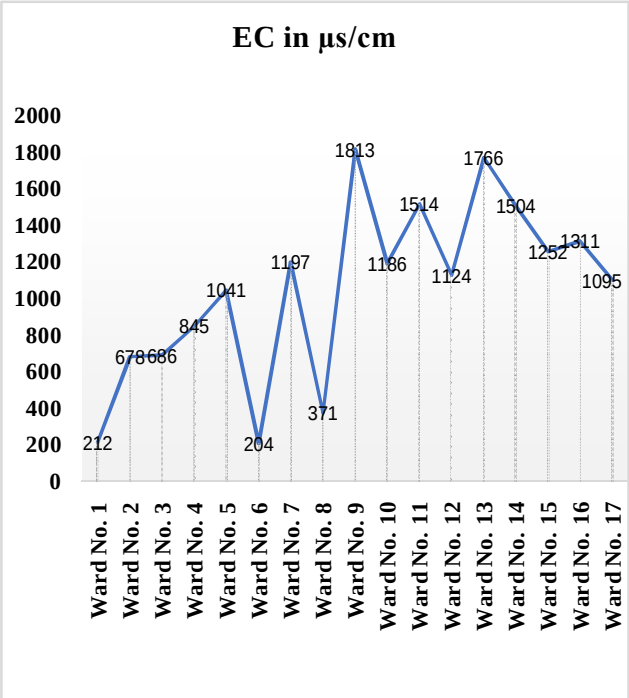

Figure 4: Ward Wise variation of EC.

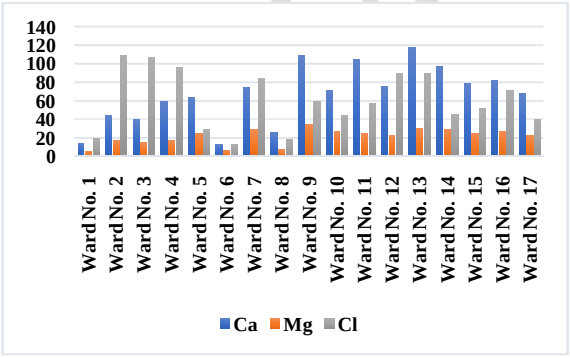

Figure 6: Ward Wise variation of Ca (D.L.-75), Mg (D.L.- 30) and Cl (D.L- 250).

Figure 5: Ward Wise variation of TDS (D.L.-500) and TH (D.L.- 300).

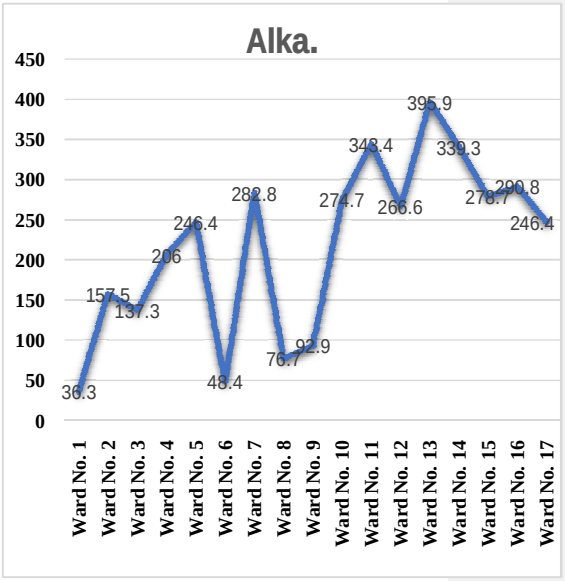

Figure 7: Ward Wise variation of Alka. (D. L.- 200).

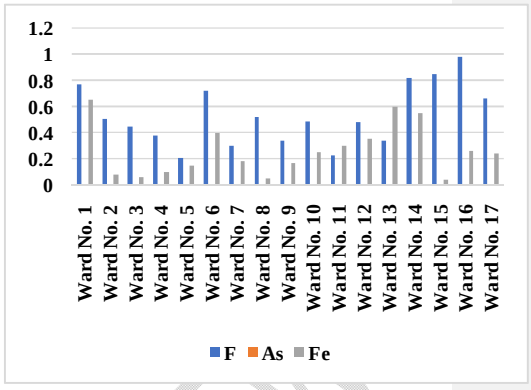

Figure 9: Ward Wise variation of F (D.L.-1), Fe (D.L.- 1) and As (D.L- 0.01).

Figure 8: Ward Wise variation of Nitrate (D.L.-45) and Sulphate (D.L.- 200).

Method of Redressal: support this with literature

This paper is working on the process of purifying water and discuss some of these through which water can be cleaned to some extent,but this work is still ongoing, this process cannot provide a complete solution, better solutions are needed.Although there are many equipment and processes like reverse osmosis for water purification, these are quite expensive and it is difficult for all families to install them in their homes,and also there is lot of wastage of water in this. Most of the people in Kahalgaon city live below the poverty line and cannot afford such a costly solution, hence by using an old and less costly solution they can clean the water to some extent and use it.The problem can be solved to some extent by drinking, the water after cleaning it with the Black Plum wood and then purifying it with a simple water purifier.Putting the wood of Black Plum in the water tank does not spoil the water and also saves from stomachache, diabetes, arthritis, dysentery and serious digestive diseases.In earlier times, when wells were dug in villages, large pieces of Black Plum wood were placed at its bottom so that the water of the well always remained pure.discuss this

There are many benefits of adding Black Plum wood to water, such as:

- Black Plum wood has anti-bacterial and anti-fungal properties. Therefore, adding Black Plum to a water tank kills harmful bacteria and fungi present in the water.
- By adding Black Plum wood, algae and green moss do not accumulate in water.
- By adding Black Plum wood the water remains clean and the tank does not get contaminated.
- Black Plum wood provides extra minerals to the water and keeps its TDS balanced.
- By adding Black Plum wood, the water remains clean and balanced and a healthy water flow is also obtained.

Figure10: Black Plum wood inside the water tank.

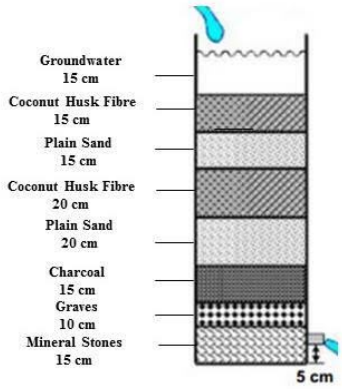

Figure 11: Diagram of the principle of a simple water

Finding and Conclusion:

After testing the water of all the wards, we have come to the conclusion that the actual condition of water in Kahalgaon Town is not good, people there need to be made aware to improve it. There is a lack of awareness among the people, and due to which they are still forced to use such water in daily lives.The people use their underground water in daily lives, due to which a lot of water born diseases are arising in that area and they do not have any other solution.With the help of the solution mentioned in our research paper, they can adopt this process and use clean water in daily life to some extent.

References:

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