Physio-Chemical Characteristics of Borewell Water Samples of Purnea Town

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Abstract- The quality and quantity of drinking water have received considerable attention recently. Moreover in India, almost 70% of surface and underground water reservoirs have been contaminated by biological, inorganic and organic pollutants. Hence, the present study was conducted to characterize the physiochemical parameters (nature) of ground water in municipal areas of Purnea district town by taking water samples from five selected points(station). The assessed parameters in potable water as prescribed by different agencies (viz. – BIS ,ISI ,WHO & etc) .The Study reveals that the domestic sewage discharge and improper location of bore wells with respect to the septic tank and sewer pipes will increase the potential threat to the potable water quality.

Index Terms- Potable water, bore well water, sewage discharge, improper location.

I. INTRODUCTION

Water pollution is a serious cum alarming problem as in India almost 70% of surface and ground water reservoirs have been contaminated by biological, inorganic and organic pollutions. However , the ability and quality of drinking water of fresh water has become a scare commodity due to over exploitation.

Much of the health problems in developing countries are largely due to lack of safe drinking water. According to WHO , about 600 cases of diarrhea and 46,00,000 child deaths are reported annually due to contaminated water and improper sanitation. Ground water is particularly safe drinking rural & sub-urban areas, where population is widely dispersed which completely lacking of infrastructure for treatment of surface water and contaminated water.

The present investigation has been taken to characterize physicochemical parameters of Bore well of five specified points (stations) of municipality area of Purnea town, which once called as “Kalapani”.

The quality of ground water has been compared with the standard desirable limit &quality parameters as prescribed by different agencies is shown in Table -1.

II. EXPERIMENTAL

STUDY AREA

The physiochemical characteristics of ground water of five selected points (station) in Purnea Town viz. Madhubani , Rambagh, Gulabbagh, Line Bazar ,K.hat and nearby areas of Court Station , Purnea , were studied. Bore well water from these stations was collected in the months of October 2007 to February 2008. The depth of the bore wells ranges from 16 feet to 22 feet in all stations or areas. The sampling stations with their corresponding habitats and bore well sampling depths are summarized in Table- 2.

The samples were collected in a clean 2 liter polythene bottles. The bottles were tightly sealed after sampling and lbeled at stations. The colour and temperature of the sample were refrigerated at temperature 4^{o} C – 5 ^{o} C as per standard procedures.

III. ANALYSIS OF WATER SAMPLES

Analysis of water sample was carried out for various physiochemical parameters viz. Temperature, pH, Total Hardness (TH), Alkalinity, COD, Electrical Conductivity(EC), Calcium and Chloride as per standard procedure.

The electrical conductivity and pH was measured with digital conductivity meter and pH meter respectively. Total hardness (TH) and calcium content by EDTA titrimetric method, alkalinity and COD by open reflux method.

IV. RESULTS AND DISCUSSION

Experimental results of various physicochemical parameters of the underground water samples are summarized in Table -3.

TEMPERATURE

The temperature was found to be in the range between 21^{O} C to 23^{O} C during study. High temperature can enhance the activies of micro organism hence it can increase the can increase the pollution level.

pH

The pH of ground water in the study area is varying between 6.8 to 7.8 . It is observed that most of the ground water is alkaline in nature and it is influenced by geology of catchment area.

ELECTRICAL CONDUCTIVITY(EC)

The electrical conductivity of the bore well samples varies from 0.10 to 0.12 ms at 25^{O} C.

TOTAL HARDNESS (TH)

The observed TH values were within the limits and fluctuating trends in it's value were observed in all the five stations. The specified limit for TH as per WHO is 200mg/L.

CHEMICAL OXYGEN DEMAND (COD)

The permissible limit of chemical oxygen demand for drinking water or potable water is 225mg/L (ISI 1983) and the observed values are 111 to 195 mg/L of all selected habitat areas are within the desirable limit .

CHLORIDE

Chlorides were found to be 70 mg/L to 112mg/L and the highest value (112 mg/L) in the Line Bazar (K.hat) water sample. Higher concentration of chlorides in the ground water may be accounted to seepage of septic tanks and somewhere adjacent position of bore well with respect to septic tanks.

CALCIUM

Calcium concentrations were found vary from 70 to 115mg/L. The Ca hardness observed in four stations are above the desirable limits as specified by ISI i.e. 75mg/L.

ALKALINITY

It is a quantatitive capacity to neutralize a strong acid to a designated pH. The alkalinity determined as phenolphthalein alkalinity and total alkalinity or as methyl orange alkalinity. The reaction which take place can be summed as

(i) $OH^- + H^+ \xrightarrow{H_2O}$ end point phenolphthalein end point with methyl orange

(ii) $CO_3^{-2} + H^+ \longrightarrow HCO_3^-$ (phenolphthalein alkalinity)

(methyl orange alkalinity or total alkalinity)

(iii) $HCO_3 + H^+ \xrightarrow{H_2CO_3}$

The alkalinity of catchment areas varies in between 90 to 102 mg/L.

V. CONCLUSION

Pollution of surface and ground water resources occurs through point and non-point diffusion and degradation of water quality creates water scarcity for human use.

The physiochemical properties of potable water at all sampling stations were analyzed . The results indicate that water quality of bore wells are polluted (having existing concentration of iron) is not best for domestic use. **Water** quality of some sites is poor and somewhat more contaminated. There are many physiological effects show on the human health such as indigestion, rheumatism, urinary infection and etc.

Moreover, improper location of bore wells with respect to septic tanks and sewer pipes will increase the potential for the leaching of waste water / effluents to the ground water table.

VI. SUGGESTION

Awareness among the residents about the adverse effects of sewage contamination rendering the resources not fit use should be brought.

TABLE-1
POTABLE WATER QUALITY STANDARDS (DESIRABLE) OF DIFFERENT AGENCIES.

PARAMETERS	BIS		ISI		ICMR		WHO	
	HDL	MPL	HDL	MPL	HDL	MPL	HDL	MPL
pH	7.0-8.3	8.5-9.0	6.5-8.5		7.0-8.5	6.5-9.2	7.0-8.5	6.5-9.5
TDS mg/L	500	2000	500	2000	500	1500	__	__
TH mg/L	200	600	300	600	300	600	200	600
Alkalinity mg/L	300	600	200	600	300	600	__	120
COD mg/L	150	255	150	245	__	__	__	255
Ca mg/L	__	75	__	75	__	__	__	75
Chloride mg/L	__	250	__	250	__	250	__	250

HDL- Highest Desirable Level,
MPL-Minimum Permissible Level.

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TABLE-2
SAMPLING LOCALITIES WITH THEIR CORRESPONDING HABITATS AND BORE WELL DEPTH.

S.NO.	SAMPLING LOCALITY(STATION)	HABITAT	BOREWELL DEPTH(in feet)	SOURCE
1	Madhubani	Residential Are-	20-22	Bore Well
2	Line Bazar, K. hat	Residential Area	19-21	Bore Well
3	Court station, Purnea	Residential Area	18-20	Bore Well
4	Rambagh	Residential Area	20-22	Bore Well
5	Gulabbagh	Residential Area cum Marketing Yard	18-21	Bore Well

TABLE-3
Physio-chemical analysis of bore well/hand pumps- water

S.NO.	PARAMETER	PARAMETER TOWN MUNICIPALITY AREAS				
		MADHUBANI	RAMBAGH	GULABBAGH	LINE BAZAR (K.HAT)	COURT STATION AREAS
1	Temp(°C)	22	21	20	21.5	23
2	Ph	7.8	7.3	6.9	6.9	7.3
3	EC(ms)	0.12	0.21	0.12	0.12	0.10
4	TH(mg/L)	124	130	201	150	150
5	COD(mg/L)	120	120	124	120	123
6	Chloride(mg/L)	70	82	80.8	113	91
7	Alkalinity(mg/L)	90	102.5	90	110	95
8	Calcium(mg/L)	70	80	80	90	115
9	TDS(mg/L)	800	987	1100	998	1020

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