GROUNDWATER QUALITY STUDY FOR DRINKING PURPOSE IN PEHOWA BLOCK, KURUKSHETRA DISTRICT, HARYANA, INDIA

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Research Article

ABSTRACT

Water is prime requirement for living beings to live on the planet earth. In the modern developmental activities, agricultural practices, industrial purposes and need of drinking water for increasing population resources of fresh water are depleting fast and creating crisis of water availability per capita. Haryana is an agricultural dominant state with requirement of water whole year for irrigation purpose. Besides agriculture demand water is also used in industrial purpose as well as increasing drinking water requirement for increasing population in the state. In the present study groundwater quality in Pehowa block which covers 548 sq. km. area in Kurukshetra district of Haryana state, India have been studied for drinking purpose. Nine groundwater samples were collected from different parts of the block in double capped plastic bottles. Groundwater samples were analyzed using field water testing kit prepared by Tamilnadu Water Supply and Drainage Board, Chennai for twelve chemical parameters-pH, alkalinity, hardness, chloride, total dissolved solids, fluoride, iron, nitrite, nitrate, ammonia, phosphate and residual chlorine. Results of chemical analysis of groundwater samples shows that range of pH 7-8, alkalinity 230-420 mg/l, hardness 100-280 mg/l, chloride 30-100 mg/l, total dissolved solids (TDS) 432-924 mg/l, fluoride 0.5 - 1.5 mg/l, iron nil in all groundwater samples, ammonia nil - 2 mg/l, nitrite 0.2- 0.5 mg/l, nitrate 45-75 mg/l, phosphate nil in all groundwater samples, and residual chlorine nil to 0.5 mg/l. The study shows that groundwater is non-potable at Bherian (nitrate 75 mg/l), Gumthala (nitrate 75 mg/l, ammonia 2 mg/l), Thana (nitrate 75 mg/l), Ramgarh (nitrate 75 mg/l), Mohanpur (nitrate 75 mg/l), Sarsa (nitrate 75mg/l), Tikri (ammonia 1 mg/l, residual chlorine 0.5 mg/l). Groundwater is potable in one groundwater sample taken at Bodha with respect of all the twelve chemical parameters of drinking water. The study is highly useful for monitoring groundwater quality for drinking purpose in the study area.

Keywords: Groundwater, quality, drinking, potable, non-potable, Pehowa, Kurukshetra.

INTRODUCTION

Water is important for survival of living beings. Present developmental activities, agriculture practices and domestic uses have put pressure on quality and quantity of water especially on groundwater. Demand of fresh water for drinking purposes is increasing due to increasing population and excessive unwise use of water. Need of the hour is to conserve this precious natural resource for sustainable availability and for future generations. Many workers have studied groundwater quality in various regions (Mahadevaswamy *et al.* (2011), Rameeza *et al.* (2012), Rao, *et al.* (2013), Gupta and Sadashivaiah (2014), Karpagam and Ramesh (2015), Inayathulla and Madhusudhan (2016), Sharma *et al.* (2016)).

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STUDY AREA

Pehowa block is a part of Kurukshetra district of Haryana, India. The block covers 548 sq. km area. Geologically the block has older alluvial formation with sandy loam, and clayey loam soils. Geomorphologically, the block has alluvial plain.

OBJECTIVE

The main objective was to study groundwater quality for drinking purpose in Pehowa block in Kurukshetra district of Haryana state, India.

MATERIALS AND METHODOLOGY

Nine groundwater samples were collected in double capped plastic bottles from different parts of the Pehowa block in the month of January, 2019. Groundwater samples were analyzed using field water testing kits prepared by Tamilnadu Water Supply and Drainage Board, Chennai for twelve chemical parameters-pH, alkalinity, hardness, chloride, total dissolved solids, fluoride, iron, nitrite, nitrate, ammonia, phosphate and residual chlorine. Results of chemical analysis of groundwater samples were compared with BIS drinking water standards (IS 10500:2012).

RESULTS AND DISCUSSION

Groundwater samples analysis results are given in table 1 and BIS drinking water standards in table 2. Graphical representation of chemical parameters of groundwater samples are shown in figures 1 to 12.

Table 1: Results of chemical analysis of groundwater samples (mg/l except pH)

Location	Latitude	Longitude	pH	Alkalinity	Hard-ness	Chlo-ride	TDS	Fluo-ride	Iron	Ammo nia	Nitrite	Nitrate	Phos phate	Residual Chlorine
Bherian	29.95164	76.57081	7.5	350	280	40	804	1.5	0	0	0.5	75	0	0
Gumthala	29.93782	76.55393	7.5	400	270	100	924	0.5	0	2	0.5	75	0	0
Thana	29.91896	76.49417	7	320	130	50	600	1	0	0	0.5	75	0	0
Ramgarh	29.99475	76.45758	7.5	420	230	40	828	1.5	0	0.5	0.5	75	0	0.2
Mohanpur	30.04249	76.50654	8	370	170	70	732	1.5	0	0.5	0.2	75	0	0.2
Bodha	30.05854	76.57954	7	230	100	30	432	1.5	0	0.5	0.5	45	0	0.2
Tikri	30.02622	76.61608	7.5	250	210	30	588	1.5	0	1	0.2	45	0	0.5
Sarsa	29.93107	76.66759	7.5	330	250	60	768	1	0	0	0.5	75	0	0
Batheri	29.9201	76.60535	7.5	390	200	80	804	0.5	0	0.5	0.5	45	0	0

Table 2: Drinking water standards (IS 10500:2012)

S. No.	Parameter	Parameter		Non-Potable
		Desirable	**Permissible**	
1	pH	6.5 to 8.5	-	<6.5 to >8.5
2	Total Hardness (mg/l)	<200	200-600	>600
3	Iron (mg/l)	<0.3	-	>0.3
4	Chloride (mg/l)	<250	250-1000	>1000
5	Total Dissolved Solids (mg/l)	<500	500-2000	>2000
6	Nitrate (mg/l)	<45	-	>45
7	Nitrite (mg/l)	<1.0	-	> 1.0
8	Fluoride (mg/l)	<1.0	1.0-1.5	>1.5
9	Phosphate (mg/l)	<1.0	-	> 1.0
10	Residual Chlorine (mg/l)	<0.2	0.2-1	>1.0
11	Ammonia (mg/l)	<0.5	-	>0.5
12	Alkalinity (mg/l)	<200	200-600	>600

I. pH: In the study area pH ranges 7-8 and desirable (6.5-8.5) in all groundwater samples in the study area (Table 1, Table 2 and Fig.1).
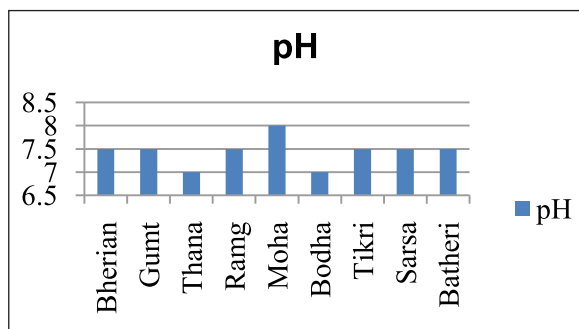

Fig. 1: pH in groundwater samples.

ii. Alkalinity: Alkalinity ranges 230-420 mg/l in groundwater samples in the study area. Alkalinity is permissible (200-600 mg/l) in all groundwater samples (Table 1, Table 2 and Fig.2).
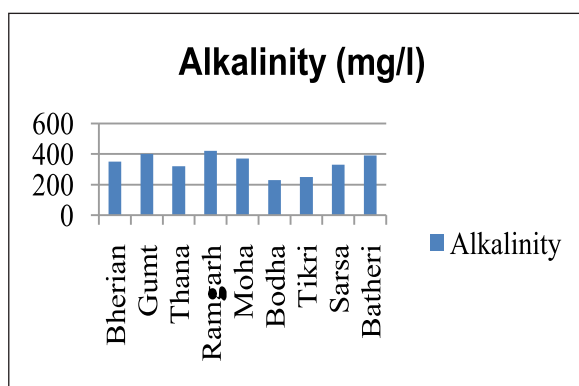

Fig.2: Alkalinity in groundwater samples.

iii. Hardness: In the study area hardness ranges 100-280 mg/l in groundwater samples. Hardness is desirable in three groundwater samples (<200mg/l) and permissible (200-600 mg/l) in six groundwater samples(Table 1, Table 2 and Fig.3).

iv. Chloride: Chloride ranges 30-100 mg/l in groundwater samples in the study area. Chloride is desirable (<250 mg/l) in all groundwater samples in the study area (Table 1, Table 2 and Fig.4).
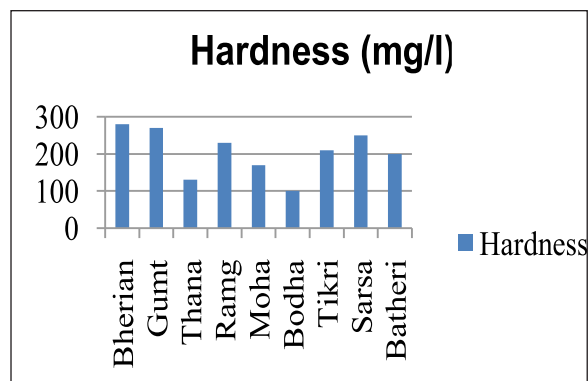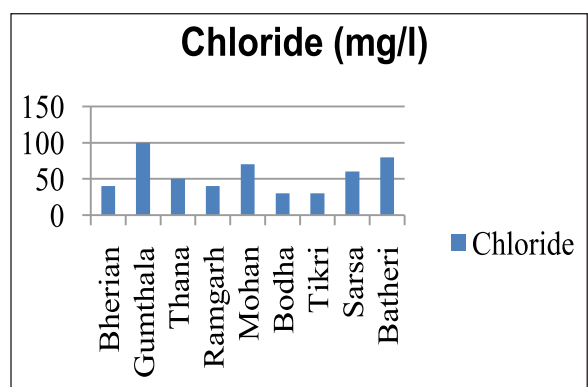

Fig.3: Hardness in groundwater samples.

Fig. 4: Chloride in groundwater samples.

v. Total Dissolved Solids (TDS): Total dissolved solids (TDS) ranges 432-924 mg/l in groundwater samples in the study area. TDS is desirable in one groundwater sample (<500 mg/l) and permissible in eight groundwater samples (500-2000 mg/l) (Table 1, Table 2 and Fig.5).
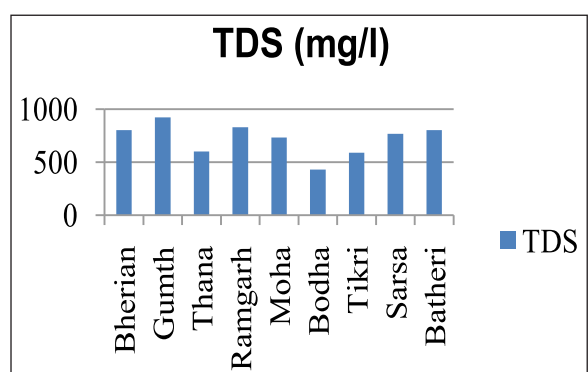

Fig.5: TDS (Total Dissolved Solids)in groundwater samples.

vi. Fluoride: In the study area fluoride ranges 0.5-1.5 mg/l in groundwater samples. Fluoride is desirable in four groundwater samples(<1.0 mg/l) and permissible (1.0-1.5 mg/l) in five groundwater samples in the study area (Table 1, Table 2 and Fig.6).
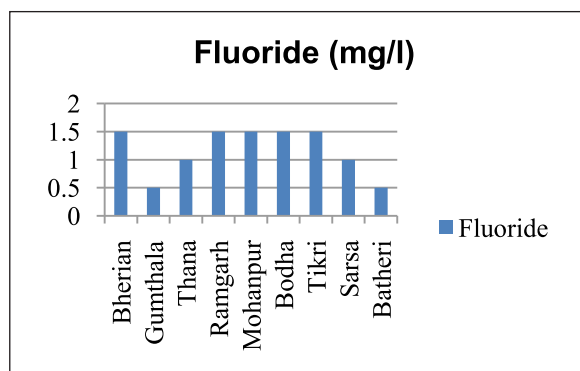

Fig.6: Fluoridein groundwater samples.

vii. Iron: Iron is nil in all groundwater samples in the study area, hence, iron is desirable (<0.3mg/l) in all the groundwater samples (Table 1, Table 2 and Fig.7).
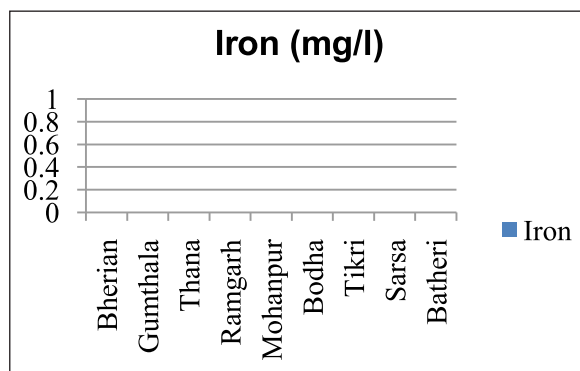

Fig.7: Iron in groundwater samples.

viii. Ammonia: Ammonia ranges nil to 2 mg/l in all the groundwater samples in the study area. Ammonia is desirable (<0.5 mg/l) in seven groundwater samples and non-potable (>0.5 mg/l) in two groundwater samples in the study area (Table 1, Table 2 and Fig.8).

ix. Nitrite: Nitrite ranges 0.2- 0.5 mg/l in groundwater samples in the study area. Nitrite is

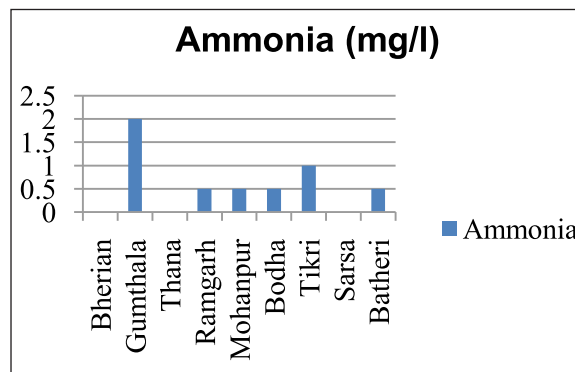desirable (<1 mg/l) in all nine groundwater samples (Table 1, Table 2 and Fig.9).
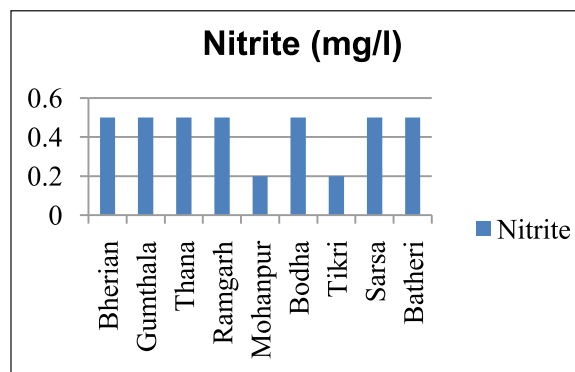

Fig.8: Ammoniain groundwater samples

Fig.9: Nitrite in groundwater samples.

x. Nitrate: In the study area nitrate ranges 45-75 mg/l in groundwater samples. Nitrate is desirable (<45mg/l) in three groundwater samples and non-potable (>45mg/l) in six groundwater samples in the study area (Table 1, Table 2 and Fig.10). High concentration of nitrate in drinking water may cause blue baby disease in infants.
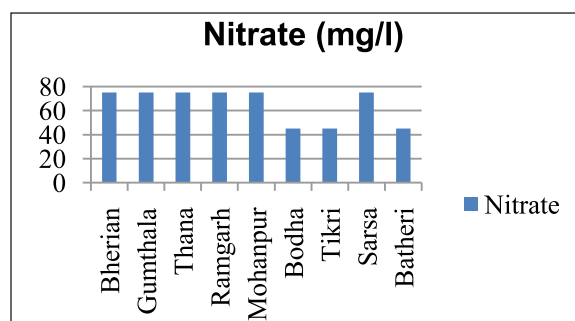

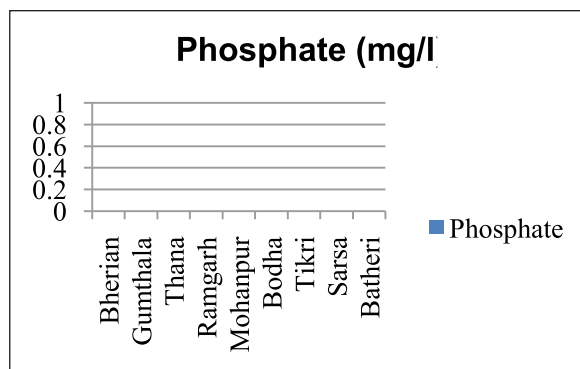**Fig.10: Nitratein groundwater samples.**

Phosphate (mg/l

Fig.11: Phosphate in groundwater samples.

xi. Phosphate: Phosphate is nil in all nine groundwater samples in the study area, hence, phosphate is desirable (<1 mg/l) in groundwater samples (Table 1, Table 2 and Fig.11).
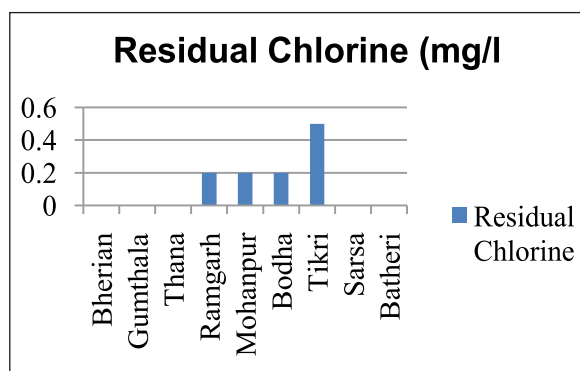
Residual Chlorine (mg/l

Fig.12: Residual Chlorine in groundwater samples.

xii. Residual Chlorine: Residual chlorine ranges nil to 0.5 mg/l in groundwater samples in the study area. Residual chlorine is desirable (< 0.2mg/l) in eight groundwater samplesand permissible (<1mg/l) in one groundwater sample (Table 1, Table 2 and Fig.12).

CONCLUSIONS

Groundwater is non-potable of groundwater samples taken at Bherian (nitrate 75 mg/l), Gumthala (nitrate 75 mg/l, ammonia 2 mg/l), Thana (nitrate 75 mg/l), Ramgarh (nitrate 75 mg/l), Mohanpur (nitrate 75 mg/l), Sarsa (nitrate 75mg/l). Tikri (ammonia 1 mg/l, residual chlorine

0.5 mg/l). Groundwater is potable only in one groundwater sample taken at Bodha with respect of all the twelve chemical parameters of drinking water. The study is highly useful for monitoring groundwater quality for drinking purpose in the study area.

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