

ASSESSMENT OF GROUNDWATER QUALITY FOR DRINKING PURPOSE IN BABAIN BLOCK, KURUSHETRA DISTRICT, HARYANA

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Abstract

Water is important for survival of life on the planet Earth. The present developmental activities and increasing population have put stress on availability of water particularly on groundwater. In agriculture dominant areas groundwater is excessively used which caused declining of groundwater and also its quality deterioration. The present study area Babain block is located in Kurukshetra district of Haryana between the latitudes 30.02[°] N to 30.17[°] N and longitudes 76.92[°]E to 77.09[°]E and covers an area of 150.48 sq. km. The main objective of the study was to assess groundwater quality for drinking purpose in the study area. In the study area eight groundwater samples were collected in 250 ml double capped plastic bottles. Geo-coordinates of sample locations were noted with the help of mobile GPS. Chemical analysis of eight groundwater samples were done using Tamilnadu Water Supply and Drainage (TWAD) Board, Chennai prepared Field Water Testing kit for twelve chemical parameters viz. pH, alkalinity, hardness, chloride, total dissolved solids (TDS), fluoride, iron, nitrite, nitrate, ammonia, phosphate and residual chlorine. Results of groundwater samples analysis were compared with BIS (IS10500:2012) drinking water standards to know the suitability of groundwater for drinking purpose. The study shows that pH ranges 7 to 8, alkalinity 210 mg/l to 350 mg/l, hardness 130 mg/l to 350 mg/l, chloride 30 mg/l to 50 mg/l, TDS 456 mg/l to 900 mg/l, fluoride nil to 1 mg/l, iron nil to 2 mg/l, ammonia nil to 0.5 mg/l, nitrite 0.2 mg/l to 0.5 mg/l, nitrate 45 mg/l to 75 mg/l, phosphate and residual chlorine nil in all the eight groundwater samples. The study is highly useful for planning and monitoring of groundwater quality for drinking purpose in the study area.

INTRODUCTION

Water is important for life on the planet Earth. Increasing demand of water in various uses have reduced its availability per capita. In agriculture dominant areas groundwater is excessively used for irrigation because of easily availability which caused declining of groundwater depth as well as quality deterioration. Many workers have studied groundwater quality in various areas for drinking and other purposes (Shekhar and Sarkar (2013), Shamsuddin et al. (2015), Asadi and Kumar (2017), Nourbakhsh and Yousef

(2017), Zidi et al. (2017), Khelif and Boudoukha (2018), Mohamed et al. (2019), Oualid et al. (2019), Popugaeva et al. (2019).

STUDY AREA

Babain block is located in Kurukshetra district of Haryana (Fig.1). The geo-coordinates of the study area are latitudes 30.02° N to 30.17° N and longitudes 76.92° E to 77.09° E and covers an area of 150.48 sq. km. Geologically alluvium and geomorphologically alluvial plain is present in the study area.

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dominant area in the Kurukshetra district.

OBJECTIVE

The main objective of the study was to assess groundwater quality for drinking purpose in the study area.

MATERIALS AND METHODOLOGY

In the study area eight groundwater samples were collected in 250 ml double capped plastic bottles. Geo-coordinates of sample locations were noted with the help of mobile GPS. Chemical analysis of eight groundwater samples were done using Tamilnadu Water Supply and Drainage (TWAD) Board, Chennai prepared Field Water Testing kit for twelve chemical parameters viz. pH, alkalinity, hardness, chloride, total dissolved solids (TDS), fluoride, iron, nitrite, nitrate, ammonia, phosphate and residual chlorine. Chemical analysis of groundwater samples were entered in excel software and represented in the form of bar graphs to get a easy look of each parameter at different sample locations. Results of groundwater samples analysis were compared with BIS (IS 10500:2012) drinking water standards (Table 2) to know the suitability of groundwater for drinking purpose.



Fig. 1: Location map of the study area.

SI.	Sample	Latitude	Longitude	Source	pН	Alkalinity	Hardnes	s Chloride	TDS	Fluoride	Iron	Ammonia	Nitrite	Nitrate	Phosp-	Residual Chlorine
110.						(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1	Bargat	30.04	76.97	Tube well	7.5	350	350	50	900	0.5	1	0.5	0.5	75	0	0
2	Marcheri	30.05	76.93	Tube well	7	220	200	50	564	1	0	0	0.5	75	0	0
3	Kalal Majra	30.07	76.93	Tube well	7.5	240	200	40	576	1	0	0	0.5	75	0	0
4	Bir Sujra	30.09	76.95	Tube well	7.5	220	130	30	456	0	0	0	0.5	75	0	0
5	Ramsaran Majra	30.08	77.00	Tube well	8	240	150	40	516	0.5	0	0.5	0.2	45	0	0
6	Sanghor	30.10	77.03	Hand Pump	7	250	200	50	600	0.5	2	0.5	0.2	75	0	0
7	Dhanani	30.12	76.99	Tube well	7.5	210	190	40	528	0.5	0	0.5	0.5	45	0	0
8	Berthala	30.13	76.97	Tube well	7.5	220	140	40	480	0	0	0	0.2	45	0	0

Table 1: Results of chemical analysis of groundwater samples.

Table 2: Drinking water parameters (BIS: 10500:2012).

Sl. No.	Parameters	Potal	Non potable		
		Desirable	Permissible		
1	рН	6.5-8.5	-	<6.5 and >8.5	
2	Alkalinity	200	200-600	>600	
3	Hardness	200	200-600	>600	
4	Chloride	250	250-1000	>1000	
5	TDS	500	500-2000	>2000	
6	Fluoride	<1.0	1.0-1.5	>1.5	
7	Iron	<0.3	-	>0.3	
8	Ammonia	<0.5	-	>0.5	
9	Nitrite	<0.1	-	>1.0	
10	Nitrate	<45	-	>45	
11	Phosphate	<1.0	-	>1.0	
12	Residual Chlorine	0.2	0.2-1.0	>1.0	

RESULTS AND DISCUSSION

i. pH

In the study area pH ranges 7 to 8 (Table 1, Fig.2). As per BIS (IS 10500:2012) drinking water standards pH is desirable 6.5 to 8.5 and non-potable <6.5 and >8.5 (Table 2). pH is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).



Fig. 2: pH in groundwater samples.

ii. Alkalinity

In the study area alkalinity ranges 210 mg/l to 350 mg/l (Table 1, Fig.3). As per BIS (IS 10500:2012) drinking water standards alkalinity is desirable <200 mg/l, permissible 200 mg/l-600 mg/l and non-potable >600 mg/l (Table 2). Alkalinity is permissible in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).



Fig. 3: Alkalinity in groundwater samples.

iii. Hardness

In the study area hardness ranges 130 mg/l to 350 mg/l (Table 1, Fig.4). As per BIS (IS 10500:2012) drinking water standards hardness is desirable <200 mg/l, permissible 200 mg/l - 600 mg/l and non-potable >600 mg/l (Table 2). Hardness is desirable in four groundwater samples (Bir Surja, Ramsaran Majra, Dhanani, Berthala) and permissible in four groundwater samples (Bargat, Marcheri, Kalal Majra, Sanghor).



Fig.4: Hardness in groundwater samples.



Fig.5: Chloride in groundwater samples.

iv. Chloride

In the study area chloride ranges 30 mg/l to 50 mg/l (Table 1, Fig.5). As per BIS (IS 10500:2012) drinking water standards chloride is desirable <250 mg/l, permissible 250 mg/l - 1000 mg/l and non-potable >1000 mg/l (Table 2). Chloride is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).

v. Total Dissolved Solids (TDS)

In the study area TDS ranges 456 mg/l to 900 mg/l (Table 1, Fig.6). As per BIS (IS 10500:2012) drinking water standards TDS is desirable <500 mg/l, permissible 500 mg/l -2000 mg/l and non-potable >2000 mg/l (Table 2). TDS is desirable in two groundwater samples (Bir Surja, Berthala) and permissible in six groundwater samples (Bargat, Marcheri, Kalal Majra, Ramsaran Majra, Sanghor, Dhanani).



Fig. 5: Chloride in groundwater samples.

vi. Fluoride

In the study area fluoride ranges nil to 1 mg/l (Table 1, Fig.7). As per BIS (IS 10500:2012) drinking water standards fluoride is desirable < 1.0 mg/l, permissible 1.0 mg/l -1.5 mg/l and nonpotable >1.5 mg/l (Table 2). Fluoride is desirable in six groundwater samples (Bargat, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala) and permissible in two groundwater samples (Marcheri, Kalal Majra),



Fig. 7: Fluoride in groundwater samples.

vii. Iron

In the study area iron ranges nil to 2 mg/l (Table 1, Fig.8). As per BIS (IS 10500:2012) drinking water standards iron is desirable <0.3mg/l and non-potable >0.3 mg/l (Table 2). Iron is desirable in six groundwater samples (Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Dhanani, Berthala) and non-potable in two groundwater samples (Bargat, Sanghor).



Fig. 8: Iron in groundwater samples.

viii. Ammonia

In the study area ammonia ranges nil to 0.5 mg/l (Table 1, Fig.9). As per BIS (IS 10500:2012) drinking water standards ammonia is desirable <0.5 mg/l and non-potable > 0.5 mg/l (Table 2). Ammonia is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).

ix. Nitrite

In the study area nitrite ranges 0.2mg/l to 0.5 mg/l (Table 1, Fig.10). As per BIS (IS 10500:2012) drinking water standards nitrite is desirable <1.0 mg/l and non-potable >1.0 mg/l (Table 2). Nitrite is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).



Fig. 9: Ammonia in groundwater samples.



Fig. 10: Nitrite in groundwater samples .

x. Nitrate

In the study area nitrate ranges 45 mg/l to 75 mg/l (Table 1, Fig.11). As per BIS (IS 10500:2012) drinking water standards nitrate is desirable <45 mg/l and non-potable >45mg/l (Table 2). Nitrate is desirable in three groundwater samples (Ramsaran Majra, Dhanani, Berthala) and non-potable in five groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Sanghor).

xi. Phosphate

In the study area phosphate is nil in all the eight groundwater samples (Table 1, Fig.12). As per BIS (IS 10500:2012) drinking standards phosphate is desirable <1.0 mg/l and nonpotable >1.0 mg/l (Table 2). Phosphate is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).

xii. Residual Chlorine

In the study area residual chlorine is nil in all the eight groundwater samples (Table 1, Fig.13). As per BIS (IS 10500:2012) drinking water standards residual chlorine is desirable <0.2 mg/l, permissible 0.2 mg/l-1 mg/l and non-potable >1.0 mg/l (Table 2). Residual Chlorine is desirable in all the eight groundwater samples (Bargat, Marcheri, Kalal Majra, Bir Surja, Ramsaran Majra, Sanghor, Dhanani, Berthala).

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CONCLUSIONS

In the study area pH, chloride, ammonia, nitrite, phosphate and residual chlorine is desirable in all the eight groundwater samples while alkalinity permissible in all the eight groundwater samples. Hardness is desirable in four groundwater samples as well as permissible in four groundwater samples. TDS is desirable in two groundwater samples and permissible in six groundwater samples. Fluoride is desirable in six groundwater samples and permissible in two groundwater samples, Iron is desirable in six groundwater samples. Nitrate is desirable in two groundwater samples. Nitrate is desirable in three groundwater samples and non-potable in three groundwater samples. The study can be used for monitoring of groundwater quality for drinking purpose in the study area.

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