



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

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### Abstract

Water is important for living beings on the Earth. Groundwater is excessively used for drinking, irrigation and industrial purposes because of its easy availability. Groundwater is maximum used in irrigation which leads to the declining of groundwater depth and quality deterioration. Groundwater quality for drinking purpose assessed in the study area Pipli block in Kurukshetra district of Haryana state. The geo-coordinates of the study area are latitudes 29.91° N to 30.09° N and longitudes 76.81° E to 76.99° E and covers an area of 184.40 km<sup>2</sup>. Geologically alluvium and geomorphologically alluvial plain are present. In the study area eight groundwater samples were collected in 250 ml double capped plastic bottles from tube wells. 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 drinking water standards (IS 10500:2012) to know the suitability of groundwater for drinking purpose. In the study area pH ranges 6.5 to 7.5, alkalinity 220 mg/l to 350 mg/l, hardness 120 mg/l to 280 mg/l, chloride 20 mg/l to 80 mg/l, total dissolved solids (TDS) 492 mg/l to 828 mg/l, fluoride nil to 1.5 mg/l, iron is nil in all the eight groundwater samples, ammonia nil to 1mg/l, nitrite 0.2 mg/l to 0.5 mg/l, nitrate 45 mg/l to 75 mg/l, phosphate nil in all the eight groundwater samples and residual chlorine nil to 0.2 mg/l. The study is highly useful for planning and monitoring of groundwater quality for drinking purpose in the study area.

### Keywords

Groundwater, quality, drinking, Pipli, Kurukshetra, Haryana

### INTRODUCTION

Present developmental activities have put pressure on water resources. In the states like Haryana where agriculture is dominant and groundwater is used for irrigation purpose in the areas where canal network is less mainly in northern districts of the state. Excessive use of groundwater leads the decline of groundwater depth as well as groundwater quality deterioration. Good quality water is important for drinking to avoid many health problems. Belousova (2006), Samson and Elangovan (2011), Ishaku et al. (2012), Ocheri et al. (2014), Perween and Fatima (2015), Singh et al. (2015), Boskabady et

al. (2016), Khan and Rehman (2017), Bansal and Dwivedi (2018), Al-Hadithi et al. (2019) did work on groundwater quality for drinking purpose in different areas.

### STUDY AREA

Pipli block is located in Kurukshetra district of Haryana (Fig.1). The geo-coordinates of the study area are latitudes 29.91° N to 30.09° N and longitudes 76.81° E to 76.99° E and covers an area of 184.40 sq. km. In the study area geologically alluvium and geomorphologically alluvial plain are present.

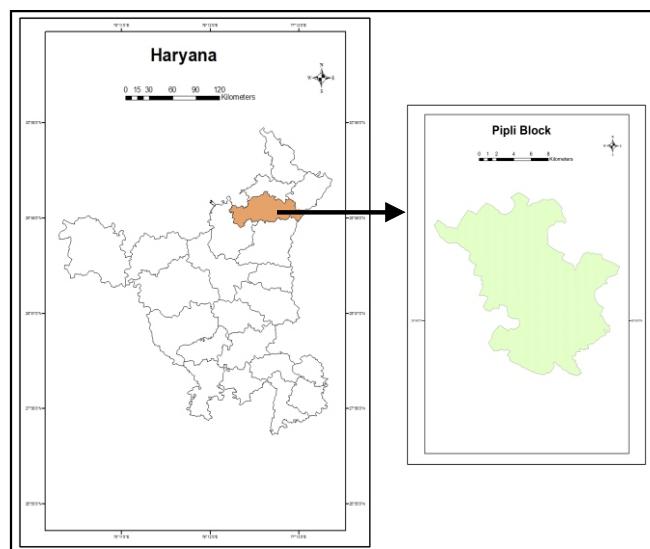


Fig.1: Location map of the study area.

## OBJECTIVE

The main objective 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 from tube wells (TW). 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. Result of chemical analysis of groundwater samples were entered in excel software and prepared bar graph for each chemical parameter. Result of groundwater samples analysis was compared with BIS (IS 10500:2012) drinking water standards (Table 2).

Table 1: Results of chemical analysis of groundwater samples.

S. No.	Sample Location	Latitude	Longitude	Source	pH	Alkalinity (mg/l)	Hardness (mg/l)	Chloride (mg/l)	TDS (mg/l)	Fluoride (mg/l)	Iron (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)	Phosphate (mg/l)	Residual Chlorine (mg/l)
1	Jirbari	29.93	76.90	TW	7	250	150	80	576	1.5	0	0	0.5	75	0	0.2
2	Mathana	29.98	76.95	TW	6.5	300	120	20	528	1.5	0	0.5	0.5	45	0	0.2
3	Sodhi	29.93	76.93	TW	7.5	230	150	30	492	1	0	1	0.5	45	0	0.2
4	Untsal	30.03	76.92	TW	7.5	350	280	60	828	1	0	0	0.5	75	0	0
5	Ramgarh	30.01	76.89	TW	7	220	150	40	492	1	0	0.5	0.2	45	0	0
6	Partap Garh	29.99	76.88	TW	7	230	210	40	576	0	0	0	0.2	45	0	0
7	Sanwala	30.00	76.88	TW	7	260	240	50	660	0	0	0.5	0.2	45	0	0
8	Kanipla	30.05	76.86	TW	7.5	250	250	70	684	0	0	0	0.5	75	0	0

Table 2: BIS drinking water standards (IS 10500:2012).

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

## RESULTS AND DISCUSSION

### i. pH

In the study area pH ranges 6.5 to 7.5 (Table 1, Fig.2). As per BIS (IS 10500:2012) drinking water standards pH is desirable between 6.5 to 8.5 and non-potable if less than 6.5 and more than 8.5 (Table 2). pH is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).

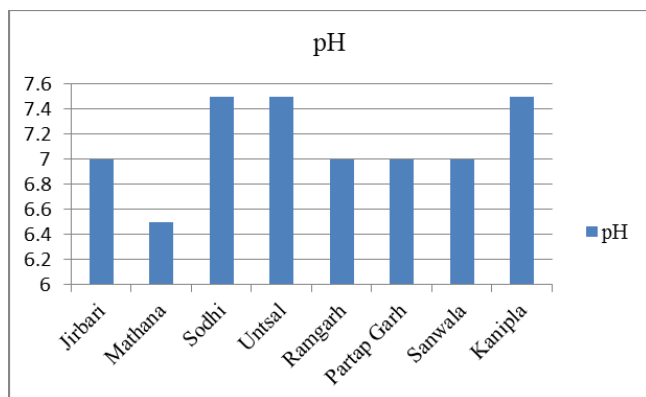


Fig. 2: pH in groundwater samples.

### ii. Alkalinity

Alkalinity ranges 220 mg/l to 350 mg/l in the study area (Table 1, Fig.3). As per BIS (IS 10500:2012) drinking water standards alkalinity is desirable if less than 200 mg/l, permissible between 200 mg/l- 600 mg/l and non-potable if more than 600 mg/l (Table 2). Alkalinity is permissible in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).

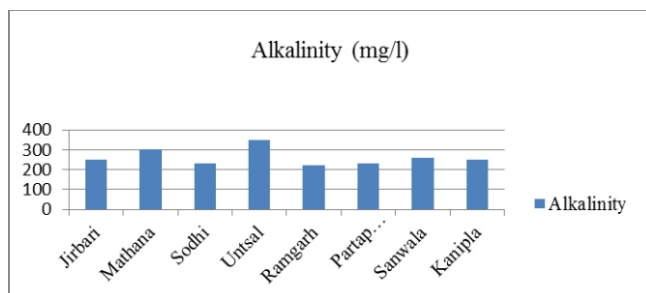


Fig. 3: Alkalinity in groundwater samples.

### iii. Hardness

Hardness ranges 120 mg/l to 280 mg/l in the study area (Table 1, Fig.4). As per BIS (IS 10500:2012) drinking water standards hardness is desirable if less than 200 mg/l, permissible between 200 mg/l - 600 mg/l and non-potable if more than 600 mg/l (Table 2). Hardness is desirable in four

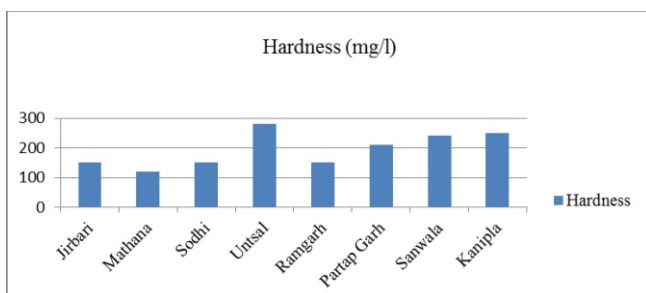


Fig. 4: Hardness in groundwater samples.

groundwater samples (Jirbari, Mathana, Sodhi, Ramgarh) and permissible in four groundwater samples (Untsal, Partap Garh, Sanwala, Kanipla).

### iv. Chloride

In the study area chloride ranges 20 mg/l to 80 mg/l (Table 1, Fig.5). As per BIS (IS 10500:2012) drinking water standards chloride is desirable if less than 250 mg/l, permissible between 250 mg/l - 1000 mg/l and non-potable if more than 1000 mg/l (Table 2). Chloride is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).

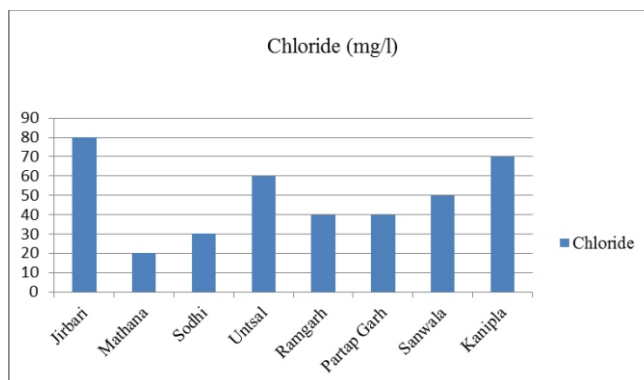


Fig. 5: Chloride in groundwater samples.

### v. Total Dissolved Solids

Total dissolved solids (TDS) ranges 492 mg/l to 828 mg/l in the study area (Table 1, Fig.6). As per BIS (IS 10500:2012) drinking water standards TDS is desirable if less than 500 mg/l, permissible between 500 mg/l-2000 mg/l and non-potable if more than 2000 mg/l (Table 2). TDS is desirable in two groundwater samples (Sodhi, Ramgarh) and permissible in six groundwater samples (Jirbari, Mathana, Untsal, Partapgarh, Sanwala, Kanipla).

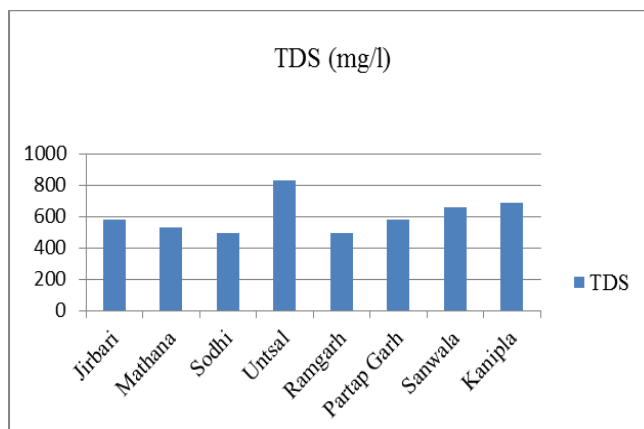
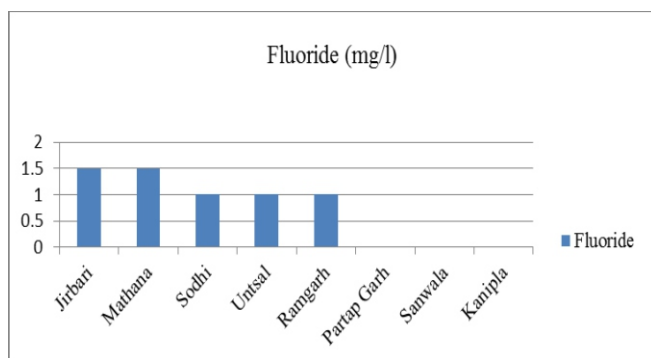


Fig. 6: TDS in groundwater samples.

### vi. Fluoride

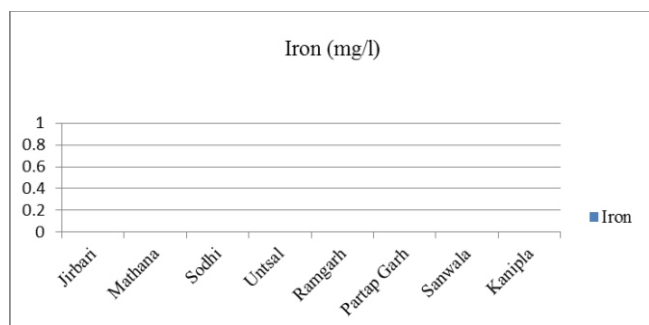
Fluoride ranges nil to 1.5 mg/l in the study area (Table 1, Fig.7). As per BIS (IS 10500:2012) drinking water standards fluoride is desirable if less than 1.0 mg/l, permissible between 1.0 mg/l -1.5 mg/l and non-potable if more than 1.5 mg/l (Table 2). Fluoride is desirable in three groundwater samples (Partapgarh, Sanwala, Kanipla) and permissible in five groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh).



**Fig.7: Fluoride in groundwater samples.**

#### vii. Iron

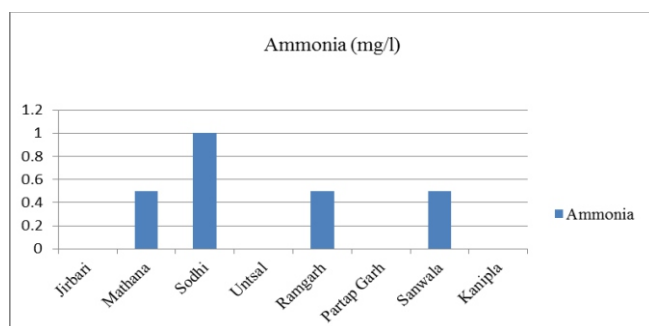
Iron is nil in all the eight groundwater samples (Table 1, Fig.8). As per BIS (IS 10500:2012) drinking water standards iron is desirable if less than 0.3 mg/l and non-potable if more than 0.3 mg/l (Table 2). Iron is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).



**Fig. 8: Iron in groundwater samples.**

#### viii. Ammonia

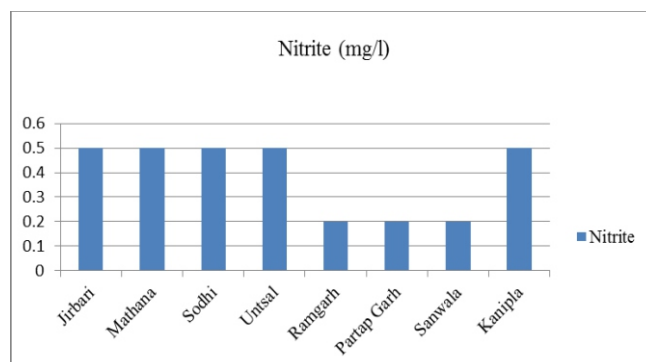
Ammonia ranges nil to 1mg/l in the study area (Table 1, Fig.9). As per BIS (IS 10500:2012) drinking water standards ammonia is desirable if less than 0.5 mg/l and non-potable if more than 0.5 mg/l (Table 2). Ammonia is desirable in seven groundwater samples (Jirbari, Mathana, Untsal, Ramgarh, Partap Garh, Kanipla) and ammonia is non-potable in one groundwater sample (Sodhi (1 mg/l)).



**Fig. 9: Ammonia in groundwater samples.**

#### ix. Nitrite

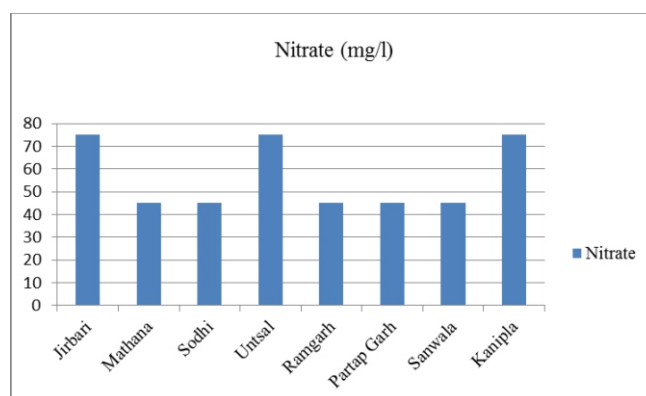
Nitrite ranges 0.2 mg/l to 0.5 mg/l in the study area (Table 1, Fig.10). As per BIS (IS 10500:2012) drinking water standards nitrite is desirable if less than 1.0 mg/l and non-potable if more than 1.0 mg/l (Table 2). Nitrite is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).



**Fig. 10: Nitrite in groundwater samples.**

#### x. Nitrate

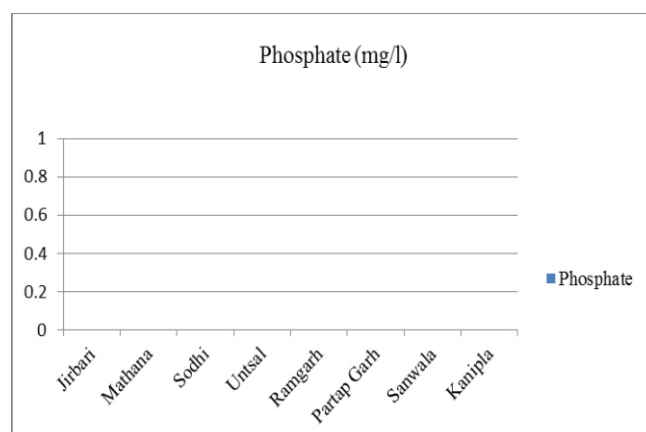
Nitrate ranges 45 mg/l to 75 mg/l in the study area (Table 1, Fig.11). As per BIS (IS 10500:2012) drinking water standards nitrate is desirable if less than 45 mg/l and non-potable if more than 45mg/l (Table 2). Nitrate is desirable in five groundwater samples (Mathana, Sodhi, Ramgarh, Partapgarh, Sanwala) and non-potable in three groundwater samples (Jirbari (75 mg/l), Untsal (75 mg/l), Kanipla (75 mg/l)).



**Fig. 11: Nitrate in groundwater samples.**

#### xi. Phosphate

Phosphate is nil in all the eight groundwater samples in the study area (Table 1, Fig.12). As per BIS (IS 10500:2012) drinking standards phosphate is desirable if less than 1.0 mg/l and non-potable if more than 1.0 mg/l (Table 2). Phosphate is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).



**Fig. 12: Phosphate in groundwater samples.**

## xii. Residual Chlorine

Residual Chlorine ranges nil to 0.2 mg/l in the study area (Table 1, Fig.13). As per BIS (IS 10500:2012) drinking water standards residual chlorine is desirable if less than 0.2 mg/l, permissible 0.2 mg/l-1 mg/l and non-potable if more than 1.0 mg/l (Table 2). Residual Chlorine is desirable in all the eight groundwater samples (Jirbari, Mathana, Sodhi, Untsal, Ramgarh, Partapgarh, Sanwala, Kanipla).

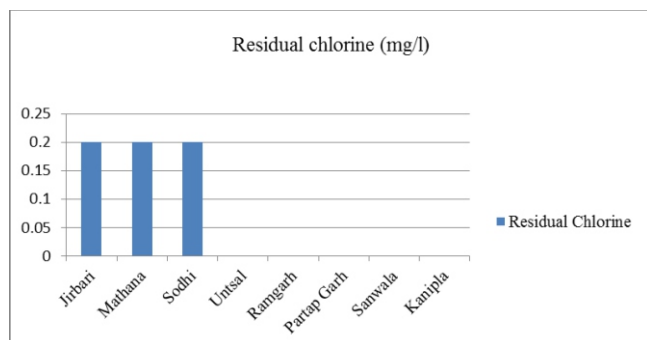


Fig. 13: Residual Chlorine in groundwater samples.

## CONCLUSIONS

In the study area pH, chloride, iron, nitrite, phosphate and residual chlorine are desirable in all the eight groundwater samples. Alkalinity is permissible in all the eight groundwater samples. Hardness is desirable in four groundwater samples and permissible in four groundwater samples. Total dissolved solids (TDS) is desirable in two groundwater samples and permissible in six groundwater samples. Fluoride is desirable in three groundwater samples and permissible in five groundwater samples. Ammonia is desirable in seven groundwater samples and non-potable in one groundwater sample. Nitrate is desirable in five groundwater samples and non-potable in three groundwater samples. The study is highly useful for planning and monitoring of groundwater quality for drinking purpose in the study area.

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