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GROUNDWATER QUALITY ASSESSMENT FOR DRINKING PURPOSE IN BADHRA BLOCK, CHARKHI DADRI DISTRICT, HARYANA, INDIA

Anup Kumar[1]*, Himanshu[2] and V.S. Arya[3]

[1]Front Office-HARSAC, Panchkula, Haryana, India
[2]Deptt. of Geology, Kurukshetra University, Kurukshetra, Haryana, India
[3]Haryana Space Applications Centre (HARSAC), Hisar, Haryana, India

Research Article

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ABSTRACT

Water is important for survival of living beings and non-living developmental activities. In the present developmental scenario requirement of water is increasing very fast. In arid to semi-arid regions groundwater is very important for fulfilling the need of people. Badhra block is falling in Charkhi Dadri district of Haryana state, India. The climate of the block is semi-arid. Groundwater is the main source for drinking and irrigation purpose. In the study area ten groundwater samples were collected in the month of January, 2019. 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. In the groundwater samples pH varies from 7 to 7.5, alkalinity 250-450 mg/l,hardness 70 - 580 mg/l,chloride 60-600 mg/l, total dissolved solids (TDS) 564-1704 mg/l, fluoride 0.5-3 mg/l, iron nil in all groundwater samples, ammonia nil to 1 mg/l, nitrite 0.2- 0.5 mg/l, nitrate 45-75mg/l, phosphate nil to 0.5 mg/l, residual chlorine nil in all ten groundwater samples. Groundwater is potable in one sample taken at Dalawas and non-potable in nine groundwater samples taken at Lad (fluoride 2 mg/l, ammonia 1mg/l, nitrate 75mg/l), Badhara (fluoride 3mg/l), Kari (nitrate 75mg/l), Sisrli (nitrate 75mg/l), Dandma (nitrate 75mg/l), Jeoli (nitrite 75 mg/l), Mandi (nitrate 75 mg/l), Rahrodi (nitrate 75mg/l), Dohka (nitrate 75mg/l). The study is highly useful for monitoring of groundwater quality for drinking purpose.

Keywords: Assessment, groundwater, potable, non-potable, Badhra, Charkhi Dadri, Haryana.

INTRODUCTION

Water is important for survival of living beings on the planet Earth. Besides requirement for living beings, other activities like agriculture and industry are also dependent on water. In arid to semi-arid regions groundwater is very important because of less availability of surface water. Groundwater quality plays vital role in its use for various purposes. Drinking water for human consumption should be as per drinking water standards to avoid health problems. But in the present context of developmental activities availability of good quality groundwater is very less. Many workers have studied groundwater quality in different types of terrain conditions (Hussainand Prasad Rao (2013), Prasad *et al*. (2014), Moghaddam *et al* (2018),VijayaLalithaand Sai Tejaswini (2017), Chaudhary *et al.* (2015), Perween and Fatima (2015), Rani and Chaudhary (2015),Celestino *et al.* (2018)).

*Corresponding author: *anup0106@yahoo.com*

STUDY AREA

Badhra block is located in Charkhi Dadri district of Haryana state, India. Geologically the block has blown sand of recent age. Aeolian plain and sand dunes are geomorphologic features found in the block. The climate of the block is semi-arid type.

OBJECTIVE

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

MATERIALS AND METHODOLOGY

In the study are ten groundwater samples were collected in plastic double capped bottles in the month of January 2019. All the ten 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, phosphate and residual chlorine. Results of chemical analysis were compared with BIS drinking water standards (IS 10500:2012) to know potable and non-potable of groundwater samples. The chemical analysis data were entered in Excel software and prepared bar graphs of each chemical parameter.

RESULTS AND DISCUSSION

Chemical analysis results of groundwater samples are given in table 1, BIS drinking water standards in table 2 and graphical representation of results in fig. 1 to fig.12.

Table1: Results of chemical analysis of groundwater samples.

Location	Latitude	Longi-	pH	Alkalinity (mg/l)	Hardness (mg/l)	Chlo (mg/l)	TDS (mg/l)	Fluoride (mg/l)	Iron (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrite (mg/l)	Phosphate (mg/l)	Residual Chlorine (mg/l)
Lad	28°28'52"	75°54'23"	7.5	390	100	90	696	2	0	1	0.5	75	0	0
Badhara	28°31'3"	75°55'33"	7.5	450	70	200	864	3	0	0.5	0.2	45	0	0
Kari	28°31'32"	75°54'51"	7.5	450	100	180	876	1.5	0	0.5	0.5	75	0	0
Sisrli	28°33'41"	75°52'55"	7.5	450	330	400	1416	1	0	0.5	0.5	75	0	0
Dandma	28°34'42"	75°53'47"	7.5	370	580	470	1704	1	0	0.5	0.5	75	0	0
Jeoli	28°31'33"	75°57'31"	7	250	150	130	636	0.5	0	0	0.5	75	0.5	0
Dalawas	28°32'16"	75°59'15"	7	340	190	140	804	1	0	0.5	0.2	45	0	0
Mandi	28°32'41"	76°1'27"	7.5	280	150	100	636	1.5	0	0.5	0.5	75	0	0
Rahrodi	28°33'29"	76°3'2"	7	270	140	60	564	1	0	0.5	0.5	75	0	0
Dohka	28°36'49"	76°4'41"	7.5	310	370	600	1536	0.5	0	0.5	0.5	75	0	0

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

S. No.	Parameter	Potable		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 varies 7-7.5 in all ten groundwater samples. pH is desirable (6.5-8.5) in all ten groundwater samples (Table 1, Table 2 and Fig.1).

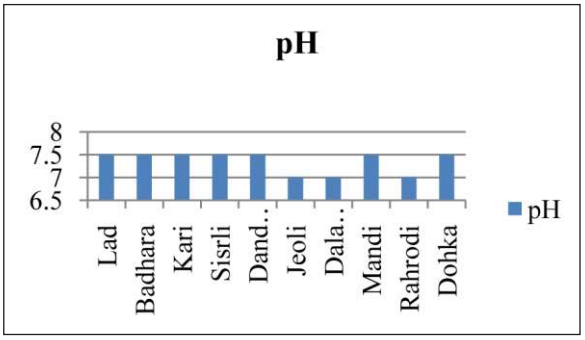

Fig.1: pH in groundwater samples.

ii. Alkalinity: In the study are alkalinity varies 250-450 mg/l in all ten groundwater samples. Alkalinity is permissible (200-600 mg/l) in all ten groundwater samples(Table 1, Table 2 and Fig.2).

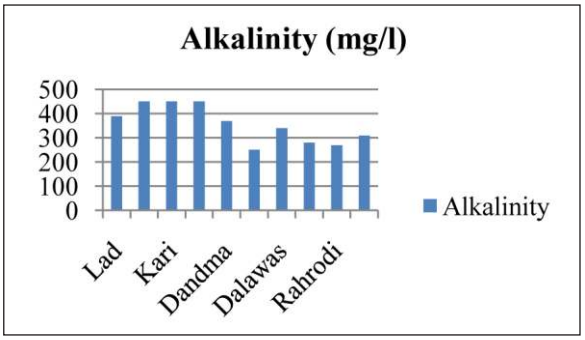

Fig.2: Alkalinity in groundwater samples.

iii. Hardness: In the study area hardness varies 70 - 580 mg/l in all ten groundwater samples. Hardness is desirable (<200 mg/l) in seven groundwater samples and permissible (200-600 mg/l) in three groundwater samples (Table 1, Table 2 and Fig.3).

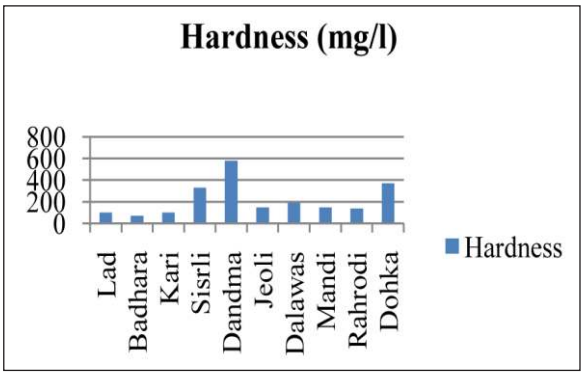

Fig.3: Hardness in groundwater samples.

iv. Chloride: Chloride varies 60-600 mg/l in all ten groundwater samples in the study area. In seven groundwater samples chloride is desirable (<250mg/l) and in three groundwater samples permissible (250-1000 mg/l) (Table 1, Table 2 and Fig.4).

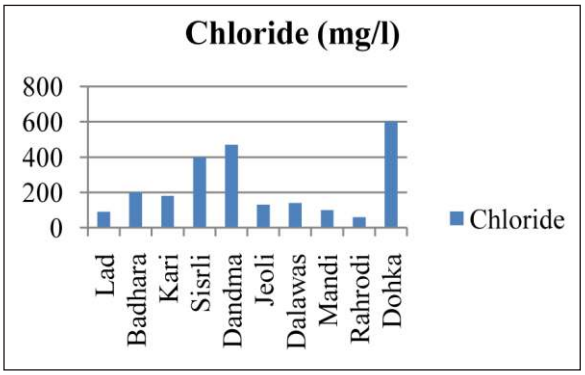

Fig. 4: Chloride in groundwater samples.

v. Total Dissolved Solids: Total dissolved solids (TDS) varies 564 -1704 mg/l in all ten groundwater samples. TDS is permissible (500-2000 mg/l) in all ten groundwater samples in the study area (Table 1, Table 2 and Fig.5).

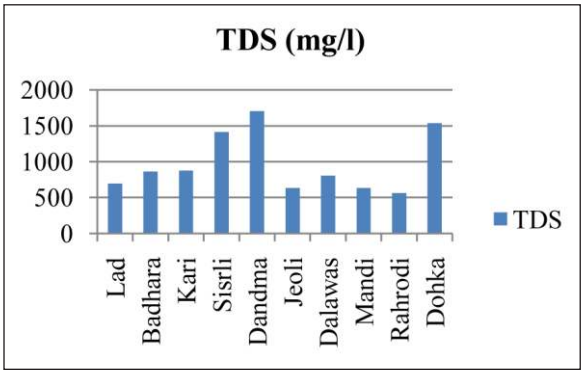

Fig. 5: Total dissolved solids (TDS) in groundwater samples

vi. Fluoride: In the study area fluoride varies 0.5-3 mg/l in all ten groundwater samples. Fluoride is desirable (<1 mg/l) in six groundwater samples, permissible (1-1.5 mg/l) in two groundwater samples and non-potable (>1.5 mg/l) in two groundwater samples (Table 1, Table 2 and Fig.6).

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

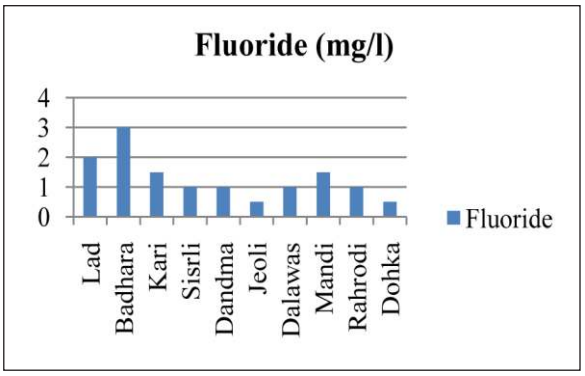

Fig.6: Fluoride in groundwater samples.

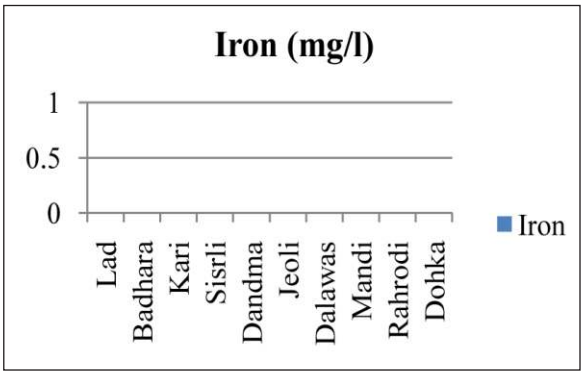

Fig.7: Iron in groundwater samples.

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

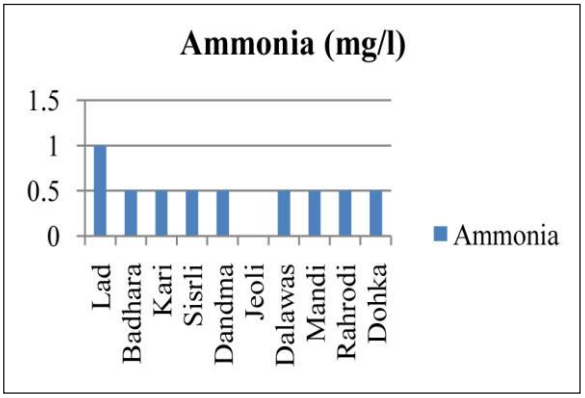

Fig. 8: Ammonia in groundwater samples.

ix. Nitrite: In the study area nitrite varies 0.2- 0.5 mg/l in all ten groundwater samples. Nitrite is desirable (<1mg/l) in all ten groundwater samples (Table 1, Table 2 and Fig.9).

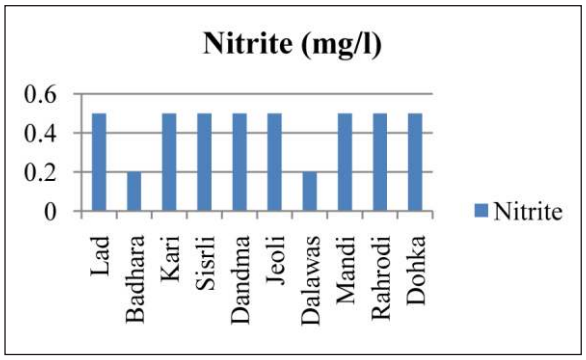

Fig. 9: Nitrite in groundwater samples.

x. Nitrate: In the study area nitrate varies 45-75 mg/l in all ten groundwater samples. Nitrate is desirable (<45mg/l) in two groundwater samples and non-potable (>45mg/l) in eight groundwater samples (Table 1, Table 2 and Fig.10).

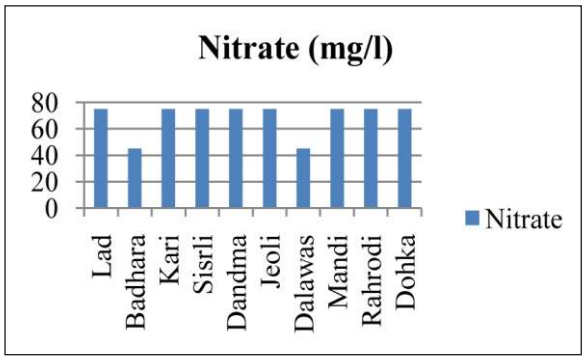

Fig.10: Nitrate in groundwater samples.

xi. Phosphate: In the study area phosphate varies nil to 0.5 mg/l in all ten groundwater samples. Phosphate is desirable (<1 mg/l) in all ten groundwater samples in the study area (Table 1, Table 2 and Fig.11).

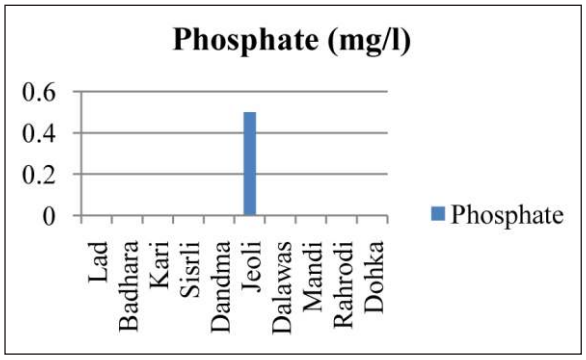

Fig.11: Phosphate in groundwater samples

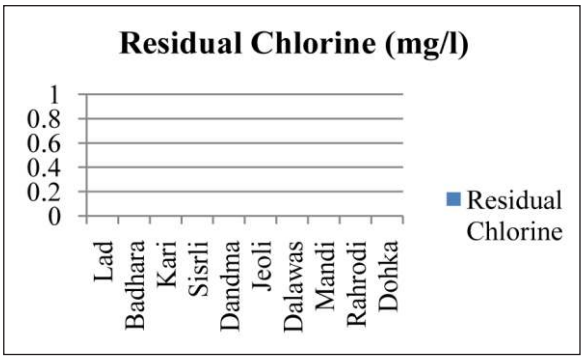

Fig.12: Residual Chlorine in groundwater samples.

xii. Residual Chlorine: Residual chlorine is nil in all ten groundwater samples in the study area, hence, residual chlorine is desirable (<0.2 mg/l) in all ten groundwater samples (Table 1, Table 2 and Fig.12).

CONCLUSIONS

Groundwater is potable in one groundwater sample taken at Dalawas and non-potable in nine groundwater samples taken at Lad (fluoride 2 mg/l, ammonia 1 mg/l, nitrate 75 mg/l), Badhara (fluoride 3 mg/l), Kari (nitrate 75 mg/l), Sisrli (nitrate 75 mg/l), Dandma (nitrate 75 mg/l), Jeoli (nitrite 75 mg/l), Mandi (nitrate 75 mg/l), Rahrodi (nitrate 75 mg/l), Dohka (nitrate 75 mg/l). The study is highly useful for planning and monitoring of groundwater quality for drinking purpose in the study area.

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