Assessment of Under Ground Water Quality Near Jagadhri City of Yamunanagar District

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Abstract: Assessment of groundwater parameter studies was carried out from different locations in around Manakpur area of Jagadhari city. Totally, eight samples were collected randomly from hand pumps in the months of July-August and October –November covering both pre and post monsoon seasons of 2014. To assess the quality of ground water each parameter was compared with the standard desirable limits prescribed by Central Pollution Control Board (CPCB) and Bureau of Indian Standard (BIS). From the study it can be concluded that groundwater is safe for drinking purposes from the point of view of levels of pH, Temperature, TDS, Hardness, Alkalinity, Acidity, Turbidity, Cl^{-}, SO_4^{2-}. The study indicates the need for monitoring of underground water for physico-chemical characteristics in study area. The correlation coefficient 'r' along with the different parameters were calculated and the study give an idea about the positive correlation between TDS and acidity, Chloride Content and acidity, Chloride Content and Permanent Hardness and negative correlation of pH and CO_3^{2-} , pH and HCO_3^{-} , pH and acidity, pH and TDS, pH and total hardness, pH and SO_4^{2-} pH and Cl^{-}, total Acidity and temperature, TDS and temperature.

Keywords: *Ground water, physicochemical characteristics, coefficient correlation.*

I. INTRODUCTION

Groundwater is water located beneath the surface in soil pore spaces and in the permeable geological formations. Sources of groundwater include seepage from the land surface, such as rainwater, snowmelt and water also that permeates down from the bottom of some lakes and rivers. The absence or seasonal nature of surface water sources has shifted attention in the exploration and development of groundwater resources. Groundwater forms a major source of drinking water and a crucial part in the maintenance of plant and animal life [1]. The composition of groundwater depends on the natural and anthropogenic processes which can alter these systems by contaminating them or modifying the hydrological cycle [2-4].Industrial discharges whereby chemicals or wastes may be released to the environment, either intentionally or accidentally, have the potential to pollute ground water. Contamination by improper disposal practices of industrial and domestic waste is become a serious concern for human beings. Poor quality of water adversely affects the human health and plant growth (WHO, 2004). As a result, groundwater becomes unhealthy[5-6].Hence a constant monitoring on groundwater becomes compulsory in order to reduce the groundwater pollution and control the pollutants[7]. Since the residents of the industrial area and the workers in the industries are all dependent upon the groundwater for their daily needs, it is very important to have planned disposal of the industrial effluents and solid wastes so as to conserve the existing groundwater aquifers [8].

In this study involve the determination of physicochemical parameter of near Jagadhari city district Yamunanagar. Yamuna Nagar district is the region with maximum rainfall in Haryana due to which ground water level is very high in this region, easily available at 50-60 feet. The present study carried out physicochemical characteristics of different parameters like pH, Temperature, TDS, Hardness, Alkalinity, Acidity, Turbidity, Cl^{-}, SO_4^{2-} for evaluating its suitability for drinking purpose after compare the results with the standard values suggested by ISI and WHO.

II. MATERIAL AND METHODS

A. *About Yamunanagar:* Yamunanagar is an important city on Delhi Ambala Rail Line & Sher Shah Suri Marg (G.T.Road), connected with all important places in the country. It is 123 Kms from Delhi & 130 Kms from Chandigarh. Yamunanagar district lies on the western Bank of river Yamuna which once flow about 11 Kms to the east forming eastern boundary of the district. The river Yamuna separates Haryana from Uttar Pardesh.

- *Location and Geographical* ***Area:*** The Yamuna Nagar District lies between 29 09' 50" and 29 50' North Latitude and 76 31' 15" and 77 12' 45" east longitude, its height from sea level is between 235 and 252 meters. The Yamuna Nagar District is surrounded by Kurukshetra Distt on its north-west, Jind & Kaithal Distt. on its West, Yamuna Nagar Distt. on its south and Uttar Pardesh on its East. Fig. 1 shows the location of the study area.
- Jagadhri: Jagadhri is a city and a municipal council in Yamuna Nagar district in the Indian state of Haryana. This town is a part of twin towns, constituting Jagadhri and Yamuna Nagar; Jagadhri is the older one and the latter a relatively new town. There is hardly any demarcation between the two towns and almost impossible, without knowing, where one town ends and where other starts. The town is famous for its metal works & brassware including utensils; though nowadays the production of brass ware has

fallen off, due to high cost. Subsequently, Jagadhri entered into and made its mark in high quality Aluminium and stainless steel products. In addition, Jagadhri has also witnessed the blossoming of a new business, timber trading, in the last decade. There are many shops doing this business these days.

B. Study Area: Industrial area Manakpur , JAGADHRI, HARYANA is located on 30°11'48"N 77°19'48"E on NH-73A (Jagadhri - paunta sahib). Its height is 261 m above sea level. It is famous for metal plating & utensil manufacturing units.

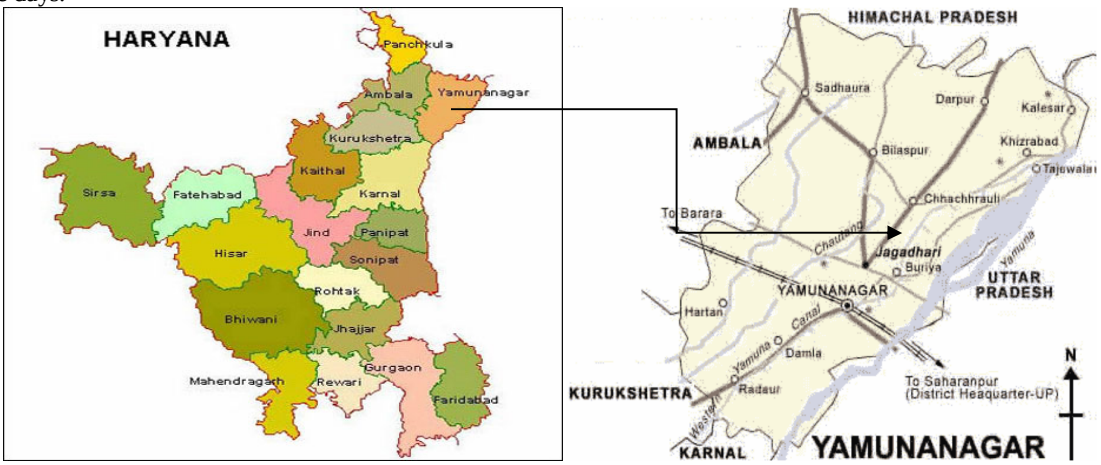

Fig. 1: Location of Study Area

C. Sampling Locations & Procedure

Total eight ground water samples were collected, from hand pumps covering approx 8kms of area around Industrial Area. Samples were taken from 3 villages (Manakpur, Modhuwala, Bhukhri) nearest to the industrial area. Water samples were collected directly from the hand pumps after running the water for 5-7mins.The sampling of groundwater was done in the months of July-August and October –November 2014 covering both pre and post monsoon seasons. Water samples were collected from hand pumps fetching groundwater from aquifers at a depth of approximately 50 to 100 feet. Table No.1 shows location, distance, depth and age of hand pumps.

TABLE 1: Details of Samples Collected from Industrial A

Sample	Location	Distance From Industrial Area	Depth (Feet)	Hand Pump Age (Years)
S-1	Village Temple Bhukhri	5 km	80-85	8-10
S-2	Government Hand Pump Bhukhri Bus Stand	4km	150	1-2
S-3	Village Manakpur	Within 200 mtr	50-60	10
S-4	Village Temple Manakpur	Within 500mtr	70-80	18-22
S-5	Village School	Within 700mtr	70-90	20-25
S-6	Opposite Bus Stand	Within 1km	80-85	7-8
S-7	Village Modhuwala	3 km	80-90	30
S-8	Village Modhuwala	3 km	80-90	20-25

III. METHODOLOGY

Water samples were analyzed in the Environmental Engineering laboratory of Civil Engineering Department, Samples were analyzed for pH, temp, acidity, alkalinity, hardness, solids, sulphate, chloride, turbidity, BOD, COD, DO. Standard methods for the examination of hand pumps water of villages around industrial area were adopted as reference. APHA manual is followed as reference for testing procedures. All the samples were properly preserved after sampling. Table No. 2 shows the permissible limits for various physico-chemical parameters and methods used for their analysis.

Physico-chemical parameters	Permissible limit by BIS (mg/l)	Methods used
Ph	6.5 to 8.5	Digital pH meter
Temperature	Below 40° C	Mercury thermometer
Hardness	300 to 600	EDTA Titrimetric method
TDS	500 to 2000	Gravimetric method
Acidity	100 to 250	Titration method
Alkalinity	200 to 600	Titration method
Turbidity	5 to 10	Nephlo-turbiditimeter
Chloride	250 to 1000	Silver nitrate test
Sulphate	200 to 400	Gravimetric method

TABLE 2: Permissible Limits for Various Physico-Chemical Parameters and Methods Used for Analysis

IV. RESULTS AND DISCUSSION

Samples of hand pump water from various locations around Industrial area were taken to analyze the amount of contamination in drinking water. All the samples of groundwater were thoroughly analyzed using standard methods (APHA, 1995). The physico- chemical analysis was done in the Environmental Engineering Lab of Civil Engineering Department in M.M. University. Table (3) shows the results of the experiments. Most of the physicochemical parameters were found within the permissible limits (BIS, 1991). Total Dissolved solids (TDS) in S7 and S8 were found exceeding the desirable limits as prescribed by BIS as shown in above Table No.2. TDS in groundwater originate from sewage, natural sources, urban run-off and industrial wastes [9]. Fig 2-10 show the comparison of physico- chemical parameters with the permissible limits. Table 4 shows the Correlation between different Physico Chemical Parameters

Table 3: Physico- Chemical Analysis for Selected Samples

SR. NO.	Parameters	S1	S2	S3	S4	S5	S6	S7	S8
1.	pH	6.7	7.1	7	7.1	7.1	7.2	7.6	7.4
2	Temperature	31.7	30.2	27	26.5	27	33	33.1	31.8
3	Turbidity	0	0	0.2	0.2	0.7	3.2	0.8	1.4
4	Total Alkalinity	104	100	68	44	40	100	96	92
5	CO2 Acidity	52	24	32	20	28	16	12	16
6	Total Acidity	52	24	198	92	108	16	12	16
7	Total Solids	600	600	600	600	800	800	1200	1200
8	Total dissolved solids	250	400	400	200	200	200	800	800
9	Total suspended solids	600	200	200	400	600	600	400	400
10	Total Hardness	48	32	36	20	36	24	28	28
11	Permanent Hardness	20	12	24	16	12	12	12	12
12	Temporary Hardness	28	20	12	4	24	12	16	16
13	Sulphate Content	0.988	0.494	0.165	0.412	0.659	0.741	0.741	0.741
14	Chloride Content	79.88	0	91.87	7.98	23.96	11.98	0	0

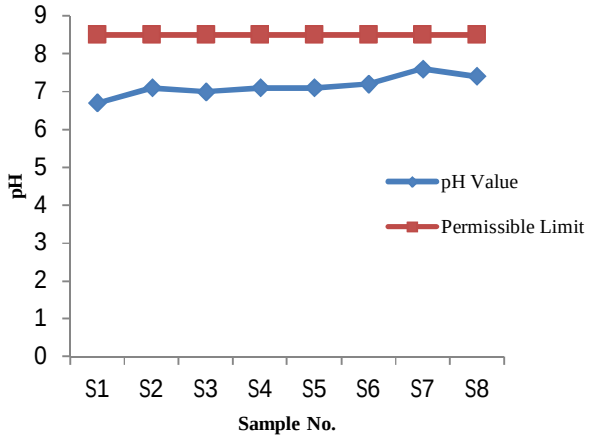

Fig 2 pH Values at Different Location Compared With Permissible Limit

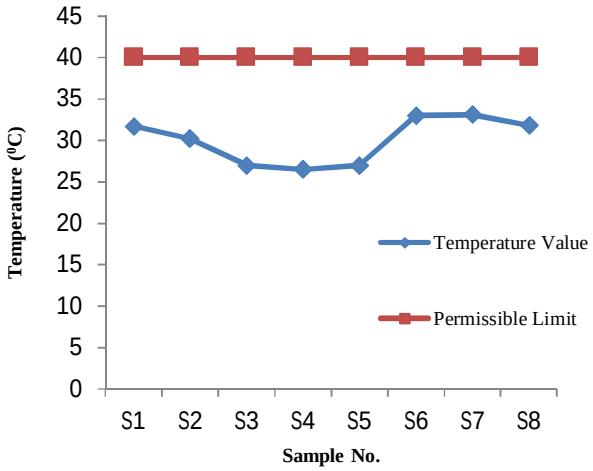

Fig3 Temperature Values at Different Location Compared With Permissible Limit

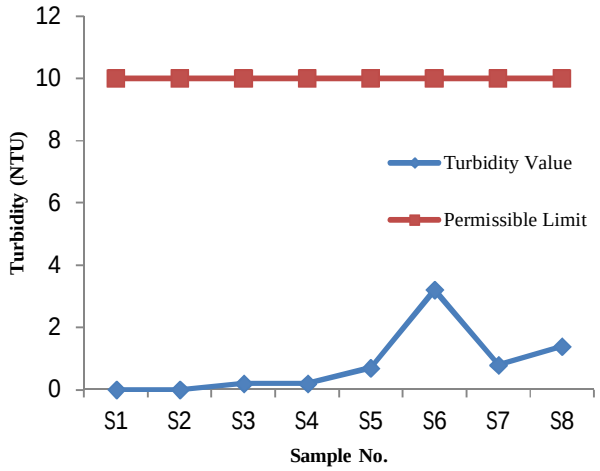

Fig4 Turbidity Values at Different Location Compared With Permissible Limit

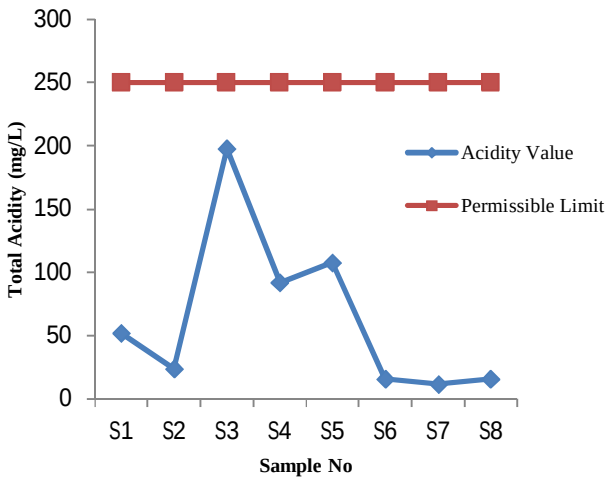

Fig 5 Total Acidity Values at Different Location Compared With Permissible Limit

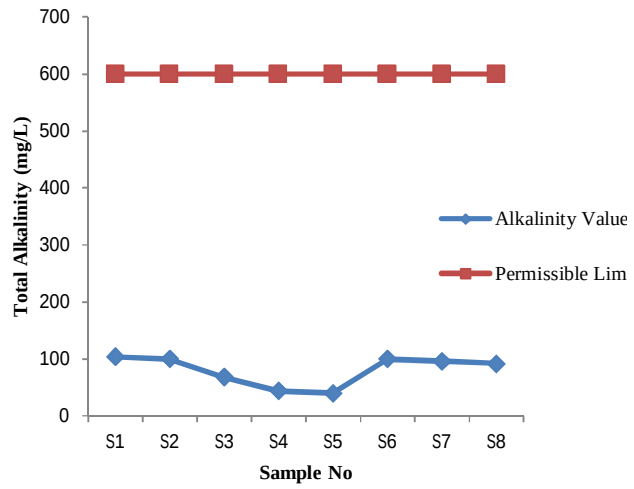

Fig 6 Total Alkalinity Values at Different Location Compared With Permissible Limit

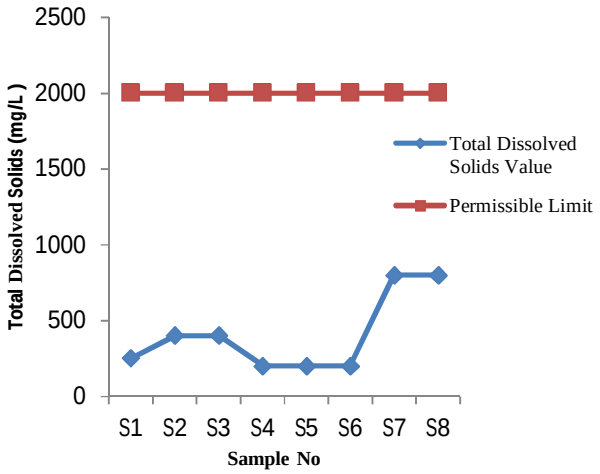

Fig 7 Total Dissolved Solids Values at Different Location Compared With Permissible Limit

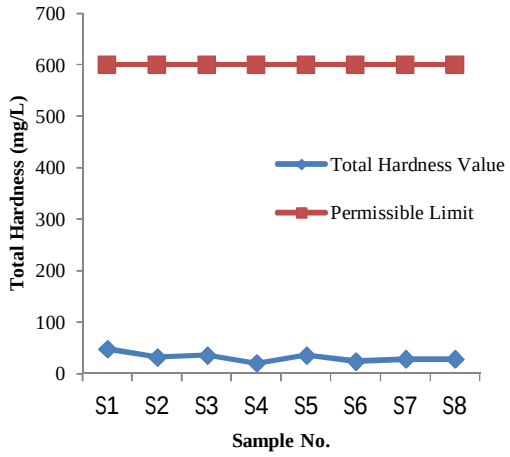

Fig 8 Total Hardness Values at Different Location Compared With Permissible Limit

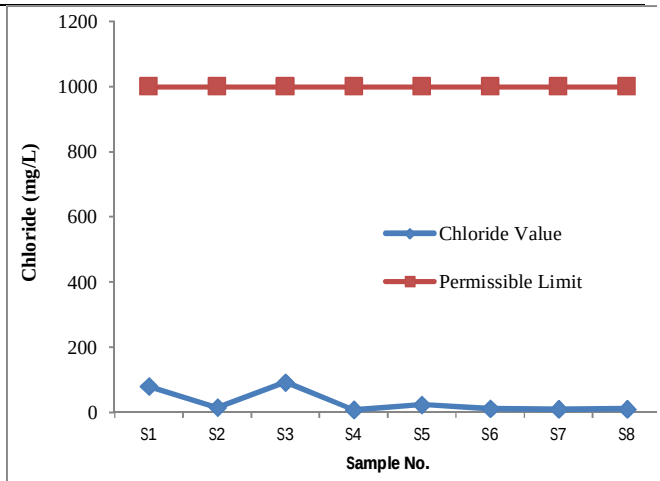

Fig 9 Chloride Values at Different Location Compared With Permissible Limit

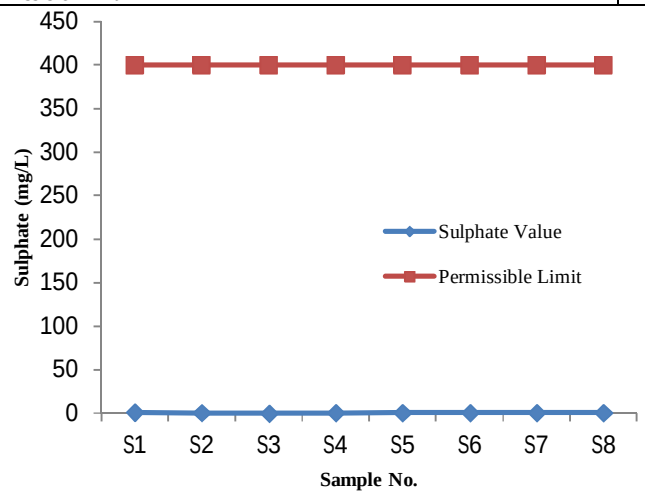

Fig 10 Sulphate Values at Different Location Compared with Permissible Limit

Table 4: Correlation Between Different Physico Chemical Parameters

	pH	*Temperature*	*Turbidity*	*Carbonate Alkalnity*	*Bicarbonate Alkalnity*	*Total Acidity*	*Total dissolved solids*	*Total suspended solids*	*Total Hardness*	*Permanent Hardness*	*Sulphate Content*	*Chloride Content*
Ph	1.000											
Temperature	0.347	1.000										
Turbidity	-0.675	0.103	1.000									
Carbonate Alkalinity	-0.698	0.249	0.617	1.000								
Bicarbonate Alkalinity	-0.616	0.469	0.590	0.825	1.000							
Total Acidity	-0.957	-0.519	0.617	0.646	0.431	1.000						
Total dissolved solids	-0.933	-0.243	0.710	0.836	0.611	0.924	1.000					
Total suspended solids	0.033	0.302	0.287	-0.194	0.002	-0.157	-0.162	1.000				
Total Hardness	-0.117	0.052	-0.300	0.067	0.213	0.064	-0.068	0.160	1.000			
Permanent Hardness	-0.769	-0.457	0.303	0.524	0.387	0.829	0.652	-0.244	0.338	1.000		
Sulphate Content	-0.914	-0.022	0.743	0.767	0.729	0.800	0.888	0.240	0.135	0.551	1.000	
Chloride Content	-0.888	-0.370	0.489	0.634	0.524	0.906	0.775	-0.069	0.401	0.947	0.746	1.000

Correlation matrix - A matrix giving the correlations between all pairs of data sets. The correlation coefficient, r, ranges from -1 to +1.There is some interdependence between the physicochemical parameters. The correlation coefficients (r) were calculated and correlation matrix was obtained [10-11].The degree of fitness of the equation is determined by the factor, correlation coefficient (r). Hence, it is a helpful tool for the promotion of research activities [11-12]. Correlation between physcio chemical parameters is positive between many and negative in few. The values of correlation coefficients are listed in Table 2.

The negative correlations were found in between pH and turbidity, pH and CO_3^{2-} , pH and HCO_3^- , pH and acidity, pH and TDS, pH and total hardness, pH and SO_4^{2-} pH and Cl^-, total Acidity and temperature, TDS and temperature, Maximum positive correlation was found between TDS and acidity, Chloride Content and acidity, Chloride Content and Permanent Hardness. Very negligible positive correlation was observed between Total suspended solids and pH, Total suspended solids and Bicarbonate Alkalinity, total hardness and temperature.

V. CONCLUSION

Underground water is very essential component for the survival of living beings and also for their development. In this study thirteen different physicochemical parameters showed values for eight sample locations. Studies have revealed that most of the physicochemical parameters for which the samples were tested, were found within the permissible limits. This can be attributed to the fact that due to open disposal most of the contaminants are removed due to natural filtration by soil. However it cannot be stated that the quality is good since many other contaminants can directly reach the groundwater surpassing the soil layers making it unfit for usage.

VI. REFERENCES

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