

# Physico-Chemical Studies of Ground Water in Rural and Urban Areas of Shamali District

## Abstract

The quality of ground water in rural areas is more affected than urban areas, due to industrialisation. Keeping in this view this fact a comparative study of water quality parameters are studied include the determination of pH-values, total alkalinity, total dissolved salt, dissolved oxygen and electrical conductivity. In addition to it, the concentration of different metal cations sodium ( $\text{Na}^+$ ), potassium ( $\text{K}^+$ ), calcium ( $\text{Ca}^{++}$ ), Magnesium ( $\text{Mg}^{++}$ ), and anions like bicarbonate ( $\text{HCO}_3^-$ ), carbonate ( $\text{CO}_3^{--}$ ), chloride ( $\text{Cl}^-$ ),  $\text{SO}_4^{--}$  (sulphate) & phosphate ( $\text{PO}_4^{--}$ ) are also studied. Such studies clearly indicate that the quality of ground water in rural areas is better than urban areas.

**Keywords:** Total Dissolved Salts (T.D.S.), Dissolved Oxygen (D.O.), Total Hardness (T.H.), Electrical Conductivity (E.C.), Indian Standard (IS), World Health Organisation (WHO).

## Introduction

The Shamali district was carved out from Muzaffarnagar district on 28 September, 2011, as Prayagraj and renamed Shamali in July 2012. This place is famous for sugar/gud. Shamali is located at northern part of Uttar Pradesh latitude  $29.45^\circ\text{N}$  and longitude  $77.32^\circ\text{E}$ . Shamali having sugar mill-3, paper mill-2, rolling mill-01, and distillery-01. Water demand is increasing day by day for domestic and irrigation purposes. Due to heavy industrialisation ground water of rural as well as urban areas is becoming polluted day by day.

Ground water is the main source of drinking water as well as irrigation, but the waste water released from sugar industries and houses increase toxic material and metals in the ground water and this water is hazardous for health. Natural filtration through soil and sediments makes the ground water free from organic impurities (Karanth K.R. 1989), these toxic pollutants will ultimately reach the ground water and will enter into the food chain. A number of studies regarding pollution aspects of river Hindon & its tributaries have been carried out by different workers. (Verma and Mathur, 1971; Verma and Dalela 1975).

The organic waste discharge from the surrounding industries has affected the ground water quality (Praksh Pam, Srivastava S.K. and Bhartiya K.G. (2013). Sugar mill effluent reduce the water demand for irrigation Saranraj.P. and Stella D. (2014)

Due to above facts ground water may cause health problems in rural as well as in urban areas. In the present work, the quality of ground water samples were collected from rural and urban areas. Their water quality parameters were determined and compared.

## Objective of the Study

The main objective is to study the quality of ground water in urban and rural areas of Shamali district.

## Experimental and Discussion

### Materials and Methods

Fifteen samples were collected from five urban areas and fifteen samples were also collected from five rural areas from 3 July 2017 to 30 August 2017. Samples were collected in glass reagent bottles and stored in glass reagent bottles, at very low temperature to retain their original form. All such samples were analysed and their standardised solutions were prepared in double distilled water, pH values, alkalinity, total dissolved salt, dissolved oxygen, total hardness and electrical conductivity, the concentrations  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  &  $\text{Mg}^{++}$  and anions  $\text{HCO}_3^-$ ,  $\text{CO}_3^{--}$ ,  $\text{Cl}^-$  &  $\text{PO}_4^{--}$  are also determined by usual methods.



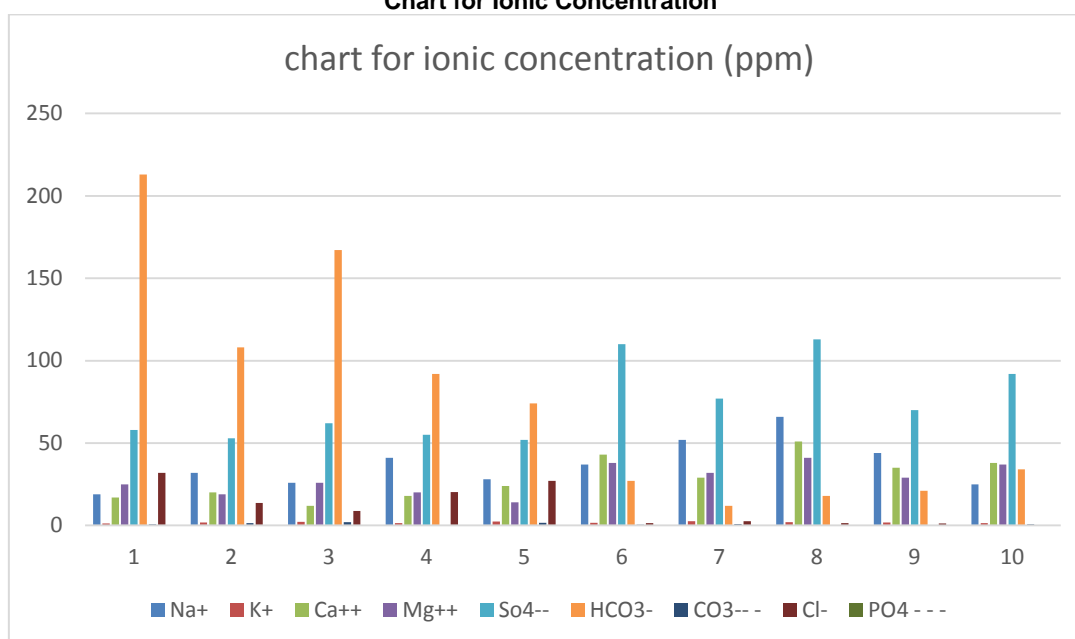
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**Table -1**  
**(Ionic Concentration Parameters)**

area	No. of sample	Na <sup>+</sup> (ppm)	K <sup>+</sup> (ppm)	Ca <sup>++</sup> (ppm)	Mg <sup>++</sup> (ppm)	So <sub>4</sub> <sup>--</sup> (ppm)	HCO <sub>3</sub> <sup>-</sup> (ppm)	CO <sub>3</sub> <sup>---</sup> (ppm)	Cl <sup>-</sup> (ppm)	PO <sub>4</sub> (ppm)
urban	1.	19	1.3	17	25	58	213	0.6	32.0	0.21
	2.	32	1.8	20	19	53	108	1.4	13.6	0.19
	3.	26	2.3	12	26	62	167	2.0	8.9	0.23
	4.	41	1.4	18	20	55	92	0.	20.3	0.18
	5.	28	2.4	24	14	52	74	1.7	27.0	0.15
rural	1.	37	1.6	43	38	110	27	0.4	1.4	0.04
	2.	52	2.7	29	32	77	12	0.8	2.6	0.01
	3.	66	2.0	51	41	113	18	0.0	1.4	0.07
	4.	44	1.9	35	29	70	21	0.3	0.02	0.08
	5.	25	1.5	38	37	92	34	0.7	0.7	0.10

**Chart for Ionic Concentration**



**Table-2**  
**(Physico-Chemical Parameter)**

area	No. of sample	pH	E.C. mmhos/cm	T.D.S. ppm	D.O. mg/l	T.H. ppm	T.A. ppm
urban	1.	8.1	0.26	187	4.26	376	32
	2.	7.6	0.27	218	3.95	304	42
	3.	7.9	0.28	192	5.21	293	39
	4.	8.0	0.25	216	4.05	277	35
	5.	7.8	0.20	194	3.72	361	42
rural	1.	7.3	0.24	137	9.81	107	53
	2.	7.7	0.22	142	7.53	142	42
	3.	7.5	0.23	155	8.14	129	45
	4.	7.4	0.21	163	9.25	163	51
	5.	7.6	0.24	124	7.98	118	48

Chart for (Physico-Chemical Parameter)

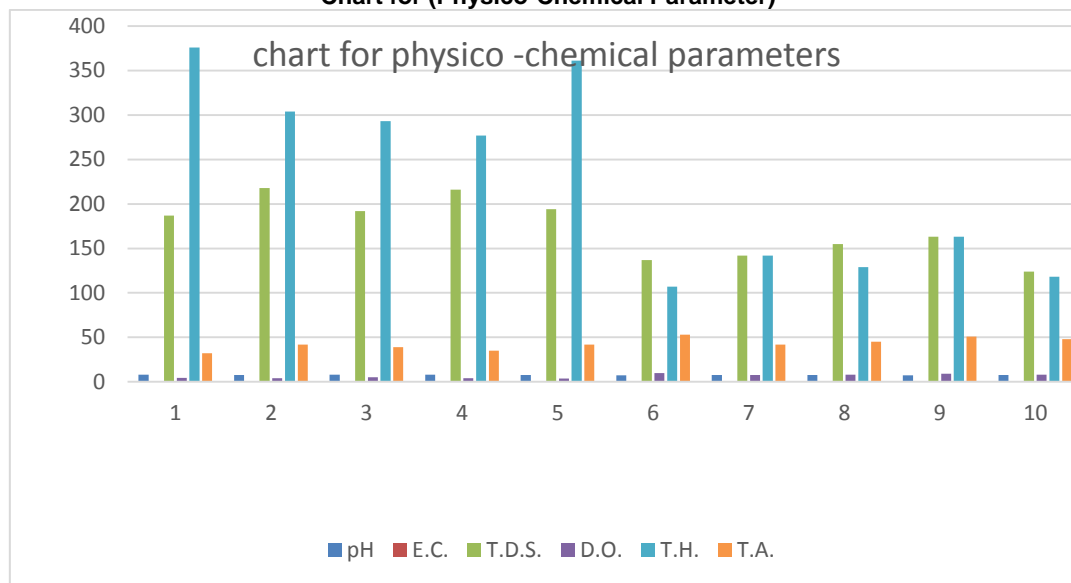


Table for Acceptable Limit (IS), Permissible Limit (IS) and Permissible Limit (WHO)

S.No.	parameter	Acceptable limit(IS)	Permissible limit(IS)	Permissible limit(WHO)
1	pH	6.5-8.5	6.5-8.5	6.5-8.0
2	T.D.S.	500mg/l	2000mg/l	1000mg/l
3	Ca	75mg/l	200mg/l	75mg/l
4	Cl	250mg/l	1000mg/l	250mg/l
5	Mg	30mg/l	100mg/l	50mg/l
6	So <sub>4</sub> <sup>-</sup>	200mg/l	400mg/l	150mg/l
7	T.H.	200mg/l	600mg/l	500mg/l
8	T.A.	200mg/l	600mg/l	-
9.	HCO <sub>3</sub> <sup>-</sup>	300mg/l	-	-
10.	Na	200mg/l(BIS)	-	200mg/l
11.	D.O.	4-6mg/l(USPH)	-	-

**Result and Discussion**

The value pH is lie between the acceptable limit in rural and urban , the value of T.D.S. ,T.A.and T.H. are below the acceptable limit, the value of D.O.is more than acceptable limit in rural and urban.The value of Na<sup>+</sup>,Ca<sup>++</sup>, So<sub>4</sub><sup>-</sup> and HCO<sub>3</sub><sup>-</sup> concentration are below the acceptable limit in urban and rural areas ,Mg<sup>++</sup> ion concentration is more than the acceptable limit in rural areas.

The above said ground water quality parameters were determined for urban and rural areas (5 samples for each area).

Such result clearly indicates that the ground water of urban as well as of rural areas has become less polluted, due to industrialisation and waste water release from houses.

**Suggestion**

Waste water release from industries and houses is collected in the tank and adsorbent is used, which adsorb hamfull metals and then this water is used for irrigation and other purposes.

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