



## Study of Yearly Variation and Physico-Chemical study of River Water, Underground Water and Surface Water of Rewa City, MP, India

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### Abstract

*This paper present to the yearly variation and physico - chemical study of river water, underground water and surface water of Rewa District, Madhya Pradesh state. The variable data of samples are within prescribed limits as suggested by World Health Organisation and Indian Standard institute and BIS desirable limit for drinking water for drinking purpose. Yearly variation in physical and chemical parameters like colour, odour, taste, total hardness, pH, total dissolved solids, total alkalinity, nitrate, chloride, sulphate, carbonate, bicarbonate, calcium, magnesium, BOD, COD in water. Were analyzed for a period of year 2012 and 2013 (summer). Were river water is indicated by Sample A , underground water is indicated by Sample B and surface water is indicated by Sample C . Some Parameters were found in some limits.*

**Keywords:** Physico chemical study, water hardness, physical and chemical property, yearly parameters of water Rewa Madhya Pradesh India.

### Introduction

Present paper reports results of the study of waters for odour, taste, total hardness, pH, total dissolved solids, total alkalinity, nitrate, sodium, potassium, chloride, sulphate, carbonate, bicarbonate, calcium, magnesium, BOD, COD, of river water, underground water and surface water in a year of 2012 and 2013 (summer) Rewa, M.P. India and river water are indicated by sample A , underground water are indicated by sample B and surface water are indicated by sample C<sup>1</sup>.

### Material and Methods

The water sample were collected during the summer season of year 2012- 2013 of river water, underground water and surface water from Rewa, city. Material requirement for sampling and analysis of water of Itinerary for the trip, personnel and sample transport arrangement, area map, sampling site location map, Icebox, weighted bottle sampler, D.O. Sample, Rope, B.O.D. bottles, sample containers, special sample containers, bacteriological and special sample, heavy metals, D.O. fixing and traction chemical and glassware, thermometer, tissue papers, other field measurement are sample identification forms, labels for sampling containers, field note bottle, pen, pencil, markers, soap and towel, match box, spirit lamp, torch etc. All analysis were carried out as per APHA, Indian standard institute and BIS desirable limit for drinking water. Some material and methods are depicted as follows<sup>2</sup>: i. Colour, odour and taste: Colour, odour and taste in water is determined by physically. ii. Total hardness: Hardness in water is determined by EDTA complexometric titration using EDTA solution, buffer solution,

EBT indicator, distilled water and titration apparatus etc. iii. pH value: pH value in water is determined by pH meter. iv. Total dissolved solid: Total dissolved solids in water is determined by TDS measurement apparatus. v. Total alkalinity: Total alkalinity in water is determined by titration method using sulfuric acid solution, methyl orange and phenolphthalein use as a indicator etc. vi. Nitrate: Nitrate in water is determined by UV spectrophotometric method using spectrophotometer, nitrate free water, stock nitrates solution, standard nitrate solution, hydrochloric acid solution etc. vii. Calcium: Calcium in water is determined by EDTA titration method using NaOH, ammonium purpurate, standard EDTA solution, standard calcium solution etc. viii. Magnesium: Magnesium in water is determined by calculation from total hardness and calcium by EDTA method. ix. Chloride: Chloride in water is determined by argentometric titration method using potassium chromate indicator solution, standard silver nitrate titrant, standard NaCl solution etc. x. Sulphate: Sulphate in water is determined by Nephelometry method using Nephelometric turbidity meter with sample cells, magnetic stirrer, timer with in dicator of second etc. xi. Carbonate: Carbonate in water is determined by obtained measured value of pH and total alkalinity by titration method. xii. Bicarbonate: Bicarbonate in water is determined by obtained measured value of pH and total Alkalinity by titration method. xiii. B.O.D.: B.O.D in water is determined by bottle incubation for 3-days at 27°C method using BOD bottle 300 ML, narrow mouth flare clip with tapered and pointed ground glass stoppers, water bath thermostatically controlled at  $27 \pm 1$ °C, plastic tube, screw – pin and 5-10L water container, phosphate buffer solution, magnesium sulphate solution, calcium chloride solution, ferric chloride solution, acid and alkali solution,

glucose-glutamic acid solution, sample dilute water etc. xiv. C.O.D.: C.O.D. in water is determined by open reflux method using reflux apparatus, volume flask with flat bottle and with ground glass neck, standard potassium dichromate solution, sulphuric acid reagent, ferroin indicator solution standard ferrous ammonium sulphate standard potassium dichromate, mercuric sulphate powder, potassium hydrogen phthalate etc<sup>3</sup>.

### Results and Discussion

Table 1 shows values of river water, underground water and surface water pH ranges 6.2, 8.6, 6.8, value of TDS (mg/L) >220, >321, >380, colour of water colourless, colourless, colourless, odour of water odourless, odourless, Mudysmail, taste of water unpleasent, brackish, soapy, total hardness (ppm) of water >119, >490, >178, total alkalinity (ppm) >104, >281.0, >156, value of BOD (mg/L) >29, >13, >3.5, value of COD (mg/L) > 49, >71, >96 value of Ca<sup>2+</sup> (mg/L) >17, >30, >23, value of Mg<sup>2+</sup> (mg/L) >1.9, >30.05, >2.0, value of Na<sup>2+</sup> (mg/L) >2.1, >32, >3.1,

Table 2 shows values of river water, underground water and surface water PH ranges 8.3, 8.2, 8.2, value of TDS (mg/L) 256, 853, 248 colour of water colourless, colourless, pale yellow, odour of water odourless, odourless, odourless, taste of water Unpleasent, Brackish, soapy, total hardness (mg/L) of water 37, 370, 84, total alkalinity (mg/L) 86 ,334, 96,value of BOD (mg/L) 25, nil, nil,

Table-1

Showing variable and comparative average value of all parameters of different water samples 2012(summer)

Parameters	Sample - A	Sample - B	Sample - C
pH	6.2	8.6	6.8
TDS(mg/l)	>220	>321	>380
Colour	Colourless	Colourless	Colourless
Odour	odourless	odourless	Mudysmail
Taste	unpleasent	Brackish	soapy
Total hardness (ppm)	>119	>490	>178
Total alkalinity (ppm)	>104	>281.00	>156
BOD(mg/l)	>29	>13	>3.5
COD(mg/l)	>49	>71	>96
Ca <sup>2+</sup> (mg/l)	>17	>30	>23
Mg <sup>2+</sup> (mg/l)	>1.9	>30.05	>2.0
Na <sup>+</sup> (mg/l)	>2.1	>32	>3.1
NO <sub>3</sub> <sup>-</sup> (mg/l)	>3.39	>5.2	>12.92
Cl <sup>-</sup> (mg/l)	>17	>79	>21
(SO <sub>4</sub> <sup>2-</sup> (mg/l)	>17	>42	>21
CO <sub>3</sub> <sup>2-</sup> (ppm)	>2.0	>109.00	>53
HCO <sub>3</sub> <sup>2-</sup> (ppm)	>25	>125.00	>61

Value of Nitrate (NO<sub>3</sub><sup>-</sup>) (mg/L) >3.39, >5.2, >12.92, value of Cl<sup>-</sup> (mg/L) >17, >79, >21 value of So<sub>4</sub><sup>2-</sup> (mg/L) >17, >42, >21, value of CO<sub>3</sub><sup>2-</sup> (ppm) >2.0, >109.00, >53, value of HCO<sub>3</sub><sup>-</sup> (ppm) >25, >125.00, >61 etc.



**Table-2**  
**Showing variable and comparative average value of all parameters of different water samples 2013 (summer)**

Parameters	Sample - A	Sample - B	Sample - C
pH	8.3	8.2	8.2
TDS(mg/l)	256	853	248
Colour	Colourless	Colourless	Pale yellow
Odour	odourless	odourless	odourless
Taste	unpleasant	Brackish	soapy
Total hardness(mg/l)	37	370	84
Total alkalinity(mg/l)	86	334	96
BOD(mg/l)	25	-	-
COD(mg/l)	27	-	-
Ca <sup>2+</sup> (mg/l)	40	107.2	17.6
Mg <sup>2+</sup> (mg/l)	13.1	24.78	9.72
Na <sup>2+</sup> (mg/l)	4.1	55.70	37.9
NO <sub>3</sub> <sup>-</sup> (mg/l)	4.2	12.2	4.6
Cl <sup>-</sup> (mg/l)	75	103.60	63.9
SO <sub>4</sub> <sup>2-</sup> (mg/l)	35	96.30	31.0
CO <sub>3</sub> <sup>2-</sup> (mg/l)	2.2	2.2	0.8
HCO <sub>3</sub> <sup>-</sup> (mg/l)	85.25	332	95

Value of COD (mg/L) 27, nil, nil, value of Ca<sup>2+</sup> (mg/L) 40, 107.2, 17.6, value of Mg<sup>2+</sup> (mg/L) 13.1, 24.78, 9.72, value of Na<sup>2+</sup> (mg/L) 4.1, 55.70, 37.9, value of nitrate (NO<sub>3</sub><sup>-</sup>) (mg/L) 4.2, 12.2, 4.6, value of Cl<sup>-</sup>(mg/L) 75, 103.60, 63.9 value of SO<sub>4</sub><sup>2-</sup> (mg/L) 35, 96.30, 31.0, value of CO<sub>3</sub><sup>2-</sup> (mg/L) 2.2, 2.2, 0.8, value of HCO<sub>3</sub><sup>-</sup> (mg/L) 85.25, 332, 95 etc.

**Table-3**  
**Water Quality parameters and drinking water Standards**

Parameters	Units	Drinking Water WHO and ISI	
		Desirable	Maximum
pH value	-	6.5 to 8.5	Nor relaxation
Dissolved Solids	mg/l	500	2000
Colour	Hazen units	5	25
Odour	-	Unobjectionable	-
Turbidity	NTU	5	10
Taste	-	Agreeable	-
Total hardness (as CaCO <sub>3</sub> )	mg/l	300	600
Alkalinity	mg/l	200	600
Calcium	mg/l	75	200
Manganese	mg/l	0.1	0.3
NO <sub>3</sub> <sup>-</sup>	mg/l	50	No relaxation
Cl <sup>-</sup>	mg/l	250	1000
Sulphate	mg/l	200	400

**Table-4**

**Water Quality parameters and drinking water Standards**

Parameters	BIS Desirable limit for drinking water
pH	6.5-8.5
TDS (mg/l)	500
Total hardness(mg/l)	300
Total alkalinity(mg/l)	200
Ca <sup>2+</sup> (mg/l)	75
Mg <sup>2+</sup> (mg/l)	100
Na <sup>2+</sup> (mg/l)	<60
No <sub>3</sub> <sup>-</sup> (mg/l)	45
Cl <sup>-</sup> (mg/l)	250
SO <sub>4</sub> <sup>2-</sup> (mg/l)	200
CO <sub>3</sub> <sup>2-</sup> (mg/l)	-
HCO <sub>3</sub> <sup>-</sup> (mg/l)	250

**Conclusion**

The result of yearly variation and physico-chemical study of river water, underground water and surface water samples indicate overall alkaline nature. The underground water with pH above maximum desirable limit can affect the mucous membrane. Some samples have TDS less than 1000 mg/l; hence suitable for drinking. Most of the samples have normal chloride, normal carbonate, normal sulphate and moderate to hard, very hard and hard in nature. The comparison of analysed data with WHO (1984), ISI (1991) and BIS desirable limit for drinking water indicate that all water s are more or less suitable for drinking.

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