

## Physicochemical studies of ground water at different areas in Jalgaon city (M.S.) India

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### ABSTRACT

Present work deals with the study of physicochemical parameters of ground water samples in Jalgaon city at different sampling stations during 2008 – 2009 in pre monsoon, monsoon and post monsoon seasons. The observed values of various physicochemical parameters of water samples were compared with standard values recommended by W.H.O. It was found that the concentration of total alkalinity, calcium, magnesium, pH, zinc, total hardness and total dissolved solids are within permissible limits of W.H.O. But the concentration of cadmium and chromium in the present water samples exceeds the maximum permissible limit of W.H.O. However, the sample collected at station no.2, bore well water of Salar Nagar, shows the value of Hardness and TDS more than maximum permissible limits of W.H.O. Therefore this water can be used for household purpose, but is harmful for drinking.

**Key words:** Ground water, physicochemical parameter, total dissolved solids, heavy metals.

### INTRODUCTION

Water is the most vital source for all kinds of life on the earth.<sup>1</sup> In India about 96 % of water resources is used for agriculture, 3% for domestic use and 1 % for industrial activity.<sup>2</sup> In India ponds, rivers and ground waters are used for domestic and agriculture purposes. The quality of water may be described according to their physicochemical and microbiological characteristics.<sup>3</sup> However contamination of ground water used for drinking purpose can affect public health.<sup>4</sup> so the physicochemical study of ground water is necessary. Trace metal ions have important roles in life, involving a wide spectrum of activities. Thus the determinations of heavy metal ions becomes increasingly important.<sup>5</sup>

### EXPERIMENTAL

#### Study area

Jalgaon city lies between 20° to 21° North Latitude and 74° 55' & 76° 28' east longitude and

on the northern border of the state of Maharashtra.

<sup>6</sup> The study was undertaken at three different areas of Jalgaon city considering the surroundings and distance. The sample water was collected from bore well. The sampling stations selected for the present study are

Sample station

1:- Bore well water of Iqra campus, Shirsoli road, Jalgaon. Sample station

2:- Bore well water of Salar Nagar, Jalgaon. Sample station

3:- Bore well water of Apna Ghar colony, Jalgaon.

The analysed data were compared with standard values recommended by W. H. O.

#### Water samples and Chemicals

The water samples were collected in clean polythene bottles which were thoroughly rinsed with samples and tightly sealed and labelled after collection. The method applied by R. Shyamala et. al.<sup>7</sup> has been used. All the chemicals used were of A R grade.

### Methodology

The water samples were collected from sampling stations mentioned above in pre monsoon, monsoon and post monsoon seasons in the year 2008-09. Temperature, pH, Total Dissolved Solid and Electrical Conductance were measured by using calibrated thermometer 1/10, Equiptronics digital pH meter model EQ-610, digital TDS meter model 514 and digital conductivity meter model EQ 664 respectively. Alkalinity, Hardness, Ca and Mg were measured volumetrically by standard procedures. Heavy metals such as chromium, cadmium, zinc and iron were determined by Atomic Absorption Spectrophotometer (Unicom, U.K. model -52). The method for determination of Fe in natural and mineral waters by Flame Emission Atomic Absorption Spectrophotometer was used, as suggested by Stasys and Laura.<sup>8</sup>

### RESULTS AND DISCUSSION

The results of physicochemical analysis of the ground water samples S1 to S3, collected from 3 different places of Jalgaon city are compared with standard values and presented in Table 1. The observed pH value ranges from 8.1 to 8.7 showing that the present water samples are slightly alkaline. These values are within maximum permissible limit prescribed by W. H. O. <sup>9</sup> Generally pH of water is

influenced by geology of catchment area and buffering capacity of the water. The electrical conductance was ranging from 393 to 1532 micro mho/ cm. The observed TDS value of sample 1 & 3 is from 216-408 mg/l. This is under the permissible limit of W. H. O. It was observed that sample no. 3 crosses the maximum permissible limit having TDS more than 500 mg/l. High TDS in ground water may be due to ground water pollution when waste waters from both residential and dyeing units are discharged into pits, ponds and lagoons enabling the waste to migrate down to the water table.<sup>10</sup> Similarly hardness of sample no. 1 & 3 is also in the prescribed limit of W. H. O from 360-435 mg/l. However, the value of hardness of sample no. 2 was 590-605 mg/l., which is well above the maximum permissible limit prescribed by W. H. O (500 mg/l). The maximum permissible level of total alkalinity is 600 mg/l. The value of total alkalinity of all the water samples ranges from 280-335mg/l. This is under the prescribed limit of W. H. O. The value of total alkalinity in water provides an idea of natural salts present in water. The cause of alkalinity is the mineral which dissolves in water from soil. The various ionic species that contribute to alkalinity include bicarbonate, hydroxide, phosphate, borate and organic acids. Calcium concentration was found to vary from 39-62 mg/l. The higher limit of calcium concentration for drinking water is specified as 75

**Table 1: Average values of physicochemical parameters of ground water**

Parameters	Experimental Values ( range ) mg/l			W.H.O. Standards (mg/l)
	S1	S2	S3	
Temperature ° K	296.5-297.0	296.5-297.0	295.5-296.0	-
pH	8.5-8.6	8.1-8.2	8.6-8.7	7.0-8.5
Conductivity (micro mho/ cm)	739-780	1453-1532	393-412	-
Total alkalinity	325-335	360-370	290-280	120-600
TDS	403-408	783-790	216-250	100-500
Calcium	49.0-58.6	52.2-62.8	39.4-42.6	75-200
Magnesium	75.2-86.4	79.5-92.7	62.4-78.6	30-150
Hardness	400-435	590-605	360-370	200-500
Iron	0.32-0.36	0.29-0.35	0.34-0.36	0.30
Cadmium	0.0758-0.0760	0.0745-0.0755	0.0677-0.0675	0.01
Chromium	1.2283-1.2345	1.2724-1.2815	1.1754-1.1767	0.05
Zinc	0.081-0.085	0.694-0.699	0.069 -0.072	5.0

mg/l. The calcium hardness observed in all the 3 stations is within desirable limit. The concentration of magnesium was found to vary from 62-92 mg/l. The limit of magnesium concentration for drinking water is specified as 30-150 mg/l. Thus the magnesium concentrations of water samples are within the prescribed level of W.H.O.

The study of heavy metals, iron and zinc in all the water samples were recorded from 0.29-0.36 mg/l and 0.069 to 0.699 mg/l respectively. These values show that the concentration of iron and zinc are within permissible limit (0.30 mg/l. and 5.0 mg/l respectively). Cadmium ranges from 0.0677 to 0.0760 mg/l were exceeds the prescribed limit of W. H. O. which is 0.01 mg/l for cadmium. Similar values of cadmium, (more than 0.01 mg/l) was recorded by S. R. Gaikwad<sup>11</sup>. While the concentration of chromium ranges from 1.1754 to 1.2835 exceeding the prescribed limit of W. H. O. for chromium which is 0.01 mg/l.

## CONCLUSION

The physicochemical study of water samples from three different stations of Jalgaon city shows that all physicochemical variables are within the highest desirable limit or maximum permissible limit set by W.H.O. except chromium and cadmium. The results of the present study suggest that the ground water of areas under study need treatments to minimize contaminations for domestic and drinking purpose. However, samples at station no.2 also show high values of TDS and hardness compared to prescribed value of W.H.O. Therefore in the light of P. Yadaiah's classification of ground water, it can be concluded that the ground water sample of station no.2 is not suitable for drinking purpose but can be used for other household purpose.<sup>12</sup>

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