



# **PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER QUALITY IN DIFFERENT WARDS OF SOUTH ZONE OF BHUSAWAL, TEHSIL – BHUSAWAL, DIST – JALGAON (MAHARASHTRA)**

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## **ABSTRACT**

Physico-chemical analysis of ground water quality in different wards of south zone of Bhusawal Tehsil, Bhusawal was studied. The samples we collected from seven different wards or sampling points of the south zone of Bhusawal of Jalgaon District of Maharashtra State in December 2009. The parameters of physico-chemical analysis of ground water studied were temperature, pH, total hardness, total alkalinity, chloride, TDS, calcium and magnesium. The ionic concentrations are expressed in terms of mg/L. In case of analysis of ground water quality. It was found that the alkalinity, hardness, calcium and magnesium were high and much above the desirable limits. The effect of long term continuous extensive irrigation by underground water and application of increasing amount of chemical fertilizers & insecticides over years on water and soil quality of this area has been discussed.

**Key words:** Ground water quality, Alkalinity, Hardness, TDS.

## **INTRODUCTION**

Ground water is the most important source of water supply for drinking, irrigation and industrial purpose. Bhusawal is a very big city in District Jalgaon, Maharashtra. Also this city has great history, there is very big Railway station which is situated by British Government. Bhusawal Railway Station is a junction station. It is the largest Railway division is 'Bhusawal Division' which is started from the station Igatpuri (Maharashtra) to Khandawa (Madhya Pradesh). Also there is an ordnance factory named as Bhusawal Ordnance Factory. From the Bhusawal, just 18 km from there is also a very large Ordnance

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factory known as 'Varangaon Ordnance Factory' Due to this quality of water is very essential.

Also Jalgaon District is famous in the world for banana. So the water is also needed for irrigation. Water is used for drinking, industrial and irrigation purpose. It has also vital role in all the development activities. With the advent of development, there is exponential increase in the demand of water. The main source to fulfill this demand is ground water. About 95% of the total available water all over the world is in the form of ground water. Thus, the quality of ground water is of vital concern for mankind, since it is directly linked with human welfare.

## EXPERIMENTAL

Water samples were collected in the clean borosilicate 1 liter bottles. The bottles were first washed with the acetone. The water samples are collected in these bottles in the month of December 2009 from the different sites of south zone of the Bhusawal. The sampling sites are named as S1, S2, S3, S4, S5, S6, and S7, respectively.

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|-------------------------------|------|
| (i) Vikas Colony              | (S1) |
| (ii) Shri Ram Housing Society | (S2) |
| (iii) Near Rockel Depot.      | (S3) |
| (iv) Heera Nagar              | (S4) |
| (v) Shraddha Nagar            | (S5) |
| (vi) Pandarinath Nagar        | (S6) |
| (vii) Amarnath Nagar          | (S7) |

These samples are collected between 9:00 am to 10:00 am and brought to the laboratory of chemistry i.e. Bhusawal Arts, Sci. & P. O. Nahata Comm. College, Bhusawal for the study of properties of ground water.

Chemical and reagents of standard quality were used. Most of these are A. R. grade (E.-Merck) reagents. Glasswares of borosil and pyrex marks were utilized through out the testing. All samples were properly labeled as S1, S2, S3, S4, S5, S6 and S7. The parameters and methods selected for the said examination are given in Table 1 (According to BIS).

**Table 1: Parameter, methods and units employed in physico-chemical examination of sample**

Parameters of water analysis	Method	Unit
Temperature	Thermometric	°C
pH	pH metric	-
Total hardness	Titrimetric	mg/L
Total alkalinity	Titrimetric	mg/L
Chloride	Titrimetric	mg/L
Total dissolve solid	Evaporation	mg/L
Calcium	Titrimetric	mg/L
Magnesium	Titrimetric	mg/L

**Table 2: Standard values in physico-chemical examination of various water samples according to BIS**

Parameters	Standard values as guided by BIS	
	Desirable concentration	Permissible concentration
pH	7.0 – 8.5	No relaxation
Total hardness	300	600
Total alkalinity	200	600
Chloride	250	1000
Total dissolve solid	500	2000
Calcium	50	200
Magnesium	30	150

Temperature of the water was measured by 1/10 thermometer. pH values of water samples are measured using Equip-tonics pH meter type No. 630. The pH meter was standardized by buffer solution of 4.0 pH using K-phthalates.

Total hardness was determined by complexometric titration with EDTA using erichrome black-T as indicator. Total alkalinity of the water was measured by titrating with N/50 HCl using phenolphthalein and methyl orange as indicators.

The chloride ions were generally determined by titrating the water sample against a standard solution of  $\text{AgNO}_3$  using potassium dichromate as indicator. Total dissolve solids were determined as the residue left in evaporation of filtered water sample.

Calcium content of the water samples was determined by EDTA by titrimetric method. In this method, sample was titrated with standard EDTA in presence of strong alkali with murexide indicator. For magnesium determination, the calcium and magnesium forms a complex of wine red colour with erichrome black-T indicator at pH 10. The EDTA has stronger affinity for  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ . The former wine red complex was broken down and a new complex of blue colour is formed. The value of  $\text{Mg}^{2+}$  can be obtained by subtracting the value of calcium from the total of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ .

## RESULTS AND DISCUSSION

**Table 3: Properties of ground water**

Properties	S1	S2	S3	S4	S5	S6	S7
Temperature	27.1	26.8	27.4	28.1	26.9	26.5	27.6
pH	7.51	7.63	7.98	7.41	8.71	9.12	8.54
Total hardness	388	286	372	332	314	264	358
Total alkalinity	345	405	265	310	355	380	335
Total chloride	357.84	332.28	309.56	365.00	350.74	368.00	406.12
TDS	872	745	840	565	942	739	665
Calcium	55.20	63.20	59.20	73.80	71.20	78.40	62.20
Magnesium	60.90	31.18	54.46	36.05	33.12	16.65	49.20

### Temperature

The temperature of water is in the range of 26.5 to 28.1°C

### pH

The pH of water indicates the degree of deterioration of ground water quality. The desirable pH range necessary for drinking water is from 7.0 to 8.5. The pH value of the water sample in the study area ranged from 7.41 to 9.12. This shows that pH of water samples were slightly alkaline.

### **Total hardness**

Total hardness was found in the sample water ranges form 264 to 388 mg/L. The desirable limit for total hardness is 300 mg/L. This shows that total hardness of sample water is slightly larger than desirable limit in some samples.

### **Total alkalinity**

Total alkalinity was found in the sample water is from 265 to 380 mg/L. The desirable limit for total alkalinity is 200 mg/L. This shows that the total alkalinity of all the water samples is larger than desirable limit.

### **Chloride**

The concentration of chloride in the water samples was found to be in the range of 309.56 to 406.12 mg/L. The desirable limit for chloride is 200 mg/L. This shows that the concentration of chloride is larger than desirable limit in all the samples.

### **TDS**

TDS found in the water samples is from 565 to 942 mg/L. The desirable limit for TDS is 500 mg/L. This shows that the TDS of water sample is also larger than desirable limit at all the sites.

### **Calcium**

The concentration of calcium found in the sample water is from 55.2 to 78.4 mg/L. The desirable limit for calcium is 50 mg/L. This shows that the concentration of chloride in all the water samples is larger than the desirable limit.

### **Magnesium**

The concentration of magnesium found in the samples of water is from 16.65 to 60.90 mg/L. The desirable limit for magnesium is 30 mg/L. This shows that the concentration of magnesium in water samples is larger than desirable limit.

## **CONCLUSION**

The analysis results obtained in this study show that the ground water quality is rather good, there is no fear of water quality problem and related health in near future to the consumer & students getting education in Bhusawal. This study shows that as water quality problem are arising in big cities but south zone of Bhusawal, District Jalgaon, Maharashtra is still safe as far as ground water quality is concerned.

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