

# Evaluation of physico-chemical parameters of groundwater of the villages of Osmanabad district of Maharashtra

■ SAYYED HUSSAIN, H.A. TIRPUDE AND VINOD MANE

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**SUMMARY :** The analysis dealt with the investigation of physico-chemical parameters of ground water of the different villages of dist.Osmanabad (M.S). The physico-chemical parameters like, temperature, pH, electrical conductivity, total dissolved solids, turbidity, total hardness, calcium, magnesium, sodium, potassium, chloride, fluoride, nitrate, sulphate were determined. The results were compared with standards given by WHO and IS10500. In the investigation, it was found that the ground water of some villages like Kangara, Irla got slightly polluted.

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**Key Words :**

Groundwater, Physico-chemical parameter, Water quality, WHO, Standard range

Rural living is the key stone of human ecology. Large villages in the less developed countries typically combine the traditional environmental health problems especially due to polluted water. Physico-chemical analysis is very important to know the quality of water. Water is a good polar solvent and is often referred to as the universal solvent. Substances that dissolve in water, e.g., salts, acids, alkalis, and some gases – especially oxygen, carbon dioxide (carbonation) are known as hydrophilic (water-loving) substances, while those that are immiscible with water (e.g., fats and oils), are known as hydrophobic (water-fearing) substances. Water quality refers to the chemical, physical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water. The ground water

sample collected from two sources like bore well and dub well such as the water sample of Chillwadi, Ruibhar and Rajuri collected from the bore well similarly the samples of Irla and Dhoki collected were from the dub well.

## EXPERIMENTAL METHODOLOGY

The sample was collected from the different villages of Dist. Osmanabad and the sample was collected into the sterilized glass bottle in the morning hours between 09 to 11 AM in the month of November 2012. The collected sample brought to the laboratory immediately for the experiment to study about the various water quality parameters as per the standard procedures (APHA, AWWA and WEF, 1992). pH of the samples was recorded using a pH meter (Toshniwal Instr. Pvt. Ltd., No. 54). Acidity and alkalinity values were determined by titration methods (APHA, 1995), calcium and magnesium by EDTA method (APHA, 1995), chloride by argentometric method (APHA *et al.*, 1995, Manivasakam, 1996) and nitrate by brucine method (Manivasakam, 1996).

**Author for correspondence :**

**SAYYED HUSSAIN**  
Sir Sayyed College,  
AURANGABAD (M.S.)  
INDIA

See end of the article for  
Copted authors'

## EXPERIMENTAL FINDINGS AND DISCUSSION

The physico-chemical parameters of the water sample of various villages of district Osmanabad are shown in Table 1.

### Temperature:

According to the biological importance, temperature plays a very important role. The temperature of the collected water from the villages is shown in Table 1. The odour and colour of the collected sample from the villages were odourless and colourless, respectively.

### pH:

The pH is very important parameter to decide the water quality. The standard range for ground water 7.0 to 8.5 according to the WHO. The pH values recorded during the studies of various villages of Osmanabad dist. The pH is in the range of given by the WHO but the higher pH values obtain from sample of Chillwadi (pH- 8.4), Dhorala (pH-8.3), Kolhgaon (pH-8.2) carbon dioxide and bicarbonates which are responsible for increase in pH.

### Turbidity in NTU:

Turbidity into water is due to the colloidal and extremely small dispersion. But in the study of turbidity in the water sample of these villages it is found that the turbidity in the water sample of some villages in more than standard range given by the ISI (10500-91). In jagji turbidity is 0.6 and Kangara, Wadi and Goriwadi having the turbidity is 0.4 NTU. Similarly in Chilwadi, Dhorala, Takwiki having 0.3 NTU.

### Electrical conductivity in MS/cm:

Electrical conductivity (EC) is a measurement of the dissolved material in an aqueous solution, which relates to the ability of the material to conduct electrical current through it. EC is measured in units called Seimens per unit area (e.g. mS/cm, or miliSeimens per centimeter), and the higher the dissolved material in a water sample, the higher the EC will be in that material.

### Total dissolved solid (TDS) in mg/l:

The TDS are the total amount of mobile charged ions, including minerals, salts or metals dissolved in water. If Water containing more than 500 mg/L. of TDS is not considered desirable for drinking water but in unavoidable cases 1500 mg/L is also allowed. In the study of ground water of these villeges the TDS at high level of Kangara (1318), Irla (1395), Dhoki (1434), Goriwadi (1143).

### Total hardness (TH) in mg/l:

Water becomes hard by being in contact with soluble, divalent, metallic cations. The two main cations that cause

**Table 1: Result of Physicochemical parameters of different villages of Osmanabad dist**

Str. No.	village	Temp	Colour	Odour	Turb	pH	T.D.S	T.H	Ca	Mg	Cl	Na	K	Fe	F	SO <sub>4</sub>	NO <sub>3</sub>
1.	Chillwadi	29	cl	ol	1.3	8.4	687	252	27	44	176	160	1	0.1	0.15	24	31
2.	Ruibhar	29	cl	ol	3.2	7.9	650	482	117	46	160	24	2	0.1	0.15	50	29
3.	Rajuri	29	cl	ol	2.1	7.4	752	552	118	61	192	56	7	0.2	0.1	28	23
4.	Kangara	29	cl	ol	2.4	7.6	1318	900	200	96	356	129	160	0.5	0.1	102	53
5.	Arni	29	cl	ol	3.2	7.8	360	280	61	31	24	22	2	0.1	0.3	13	11
6.	Jagji	29	cl	ol	2.6	7.8	422	300	77	26	60	33	1	0.1	0.1	22	16
7.	Irla	29	cl	ol	2.1	7.4	1395	1240	248	149	426	130	22	0.2	0.25	149	52
8.	wanewadi	29	cl	ol	3.1	7.7	656	372	83	39	144	119	2	0.1	0.35	24	27
9.	gowardhan wadi	29	cl	ol	2.4	7.9	659	340	72	38	148	118	1	0.1	0.25	25	27
10.	dhoki	29	cl	ol	3.1	7.6	1434	1280	245	160	486	136	22	0.1	0.58	120	52
11.	kavale wadi	29	cl	ol	2.1	7.7	662	384	86	40	144	129	1	0	0.35	34	26
11.	Kolhegaon	29	cl	ol	2.2	8.2	723	368	70	46	170	101	3	0.2	0.46	58	32
12.	Dhorala	29	cl	ol	2.3	8.3	832	276	75	21	168	114	4	0.2	0.64	47	35
13.	Goriwadi	29	cl	ol	1.4	7.3	1143	968	194	116	368	110	2	0.3	0.64	291	14
14.	Takwiki	29	cl	ol	2.3	8	764	528	62	89	156	65	1	0.2	0.4	154	9
15.	Osmanabad	29	cl	ol	2.1	7.3	691	532	144	41	160	52	1	0.1	0.25	24	39

water hardness are calcium ( $\text{Ca}^{2+}$ ) and magnesium ( $\text{Mg}^{2+}$ ). Hardness of water leads to heart diseases and kidney stone. The total hardness range given by WHO up to 500mg/L. The hardness of ground water of villages of Osmanabad dist. In which the Kangara (1318mg/l), Irla (1395 mg/l), Dhoki (1434 mg/l), Goriwadi (1143 mg/l) has higher value.

#### Calcium ( $\text{Ca}^{2+}$ ) in mg/l:

The calcium ion is also responsible for hardness of water. According to the WHO the standard range is 100mg/l. In the study of ground water of Osmanabad dist. Villages it is found that calcium in water sample of Ruibhar (117 mg/l), Rajuri (118 mg/l), Kangara (200 mg/l), Irla (248 mg/l), Dhoki (245 mg/l), Goriwadi (194 mg/l) and Osmanabad (144 mg/l) have more value than standard.

#### Magnesium ( $\text{Mg}^{2+}$ ) in mg/l:

The magnesium in the range is 150mg/l given by the WHO and the sample of water under investigation found that all water sample in the acceptable limit except Dhoki and Irla. Which indicate the more value *i.e.* 160 mg/l and 149 mg/l, respectively.

#### Sodium ( $\text{Na}^+$ ) in mg/l:

The investigated water sample of these villages found below the standard range 200 mg/l. The water of all these villages has limited concentration on sodium ion.

#### Potassium ( $\text{K}^+$ ) in mg/l:

The potassium in the water is due to the weathering of rocks. The percentage of potassium increases due to disposal of waste water. The potassium concentration in the kangara (160 mg/l) has high value as compare to other.

#### Chloride ( $\text{Cl}^-$ ) in mg/l:

The accepted values for the chloride ion is below 250 mg/l. In the present analysis it is found that the villages such as kangara (356 mg/l), Irla (426 mg/l), Dhoki (486 mg/l), Goriwadi (368 mg/l) the chloride concentration was found out of the limit.

#### Fluoride ( $\text{F}^-$ ) in mg/l:

The accepted value for fluoride was 1.5g/l by the WHO and in the analysis of water samples it was found that all the values were accepted and below standard limit.

#### Nitrate ( $\text{NO}_3^-$ ) in mg/l:

The standard limit given by the ISI for Nitrate is 45mg/l. so according to the limit given by ISI the analysis of water sample in which Kangara (53mg/l), Irla (52mg/l) and Dhoki (52mg/l) are above the standard limit.

#### Sulphate ( $\text{SO}_4^{2-}$ ) in mg/l:

Sulphate may be leached from the soil and is commonly found in most water supplies there are several other sources of sulphate in water. Decaying plant and animal matter may release sulphate into water. Sulphate is generally considered to be non-toxic. The consumption of drinking water containing high amounts of magnesium or sodium sulphate may result in intestinal discomfort, diarrhea and consequently dehydration. When someone drinks water that contains greater than 250 milligrams per litre (mg/L) of sulphate. But in the analysis it is found that the concentration of sulphate is under the limit in all samples.

#### Iron (Fe) in mg/l:

Iron concentration in drinking water is typically less than 0.3 mg/L. Iron concentrations of higher than 0.3 mg/L in drinking water are noticeable. In the analysis it is found that the iron concentration is below the given range except kangara (0.5 mg/l).

#### Conclusion:

In the present investigation, it was found that the ground water of some villages like Kangara, Irla was slightly polluted.

#### Coopted Authors' :

**H. A. TIRPUDE**, Shivaji Collage, Udgir, LATUR (M.S.) INDIA

**VINOD MANE**, Mahatma Gandhi Mahavidyala, Ahmedpur, LATUR (M.S.) INDIA

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