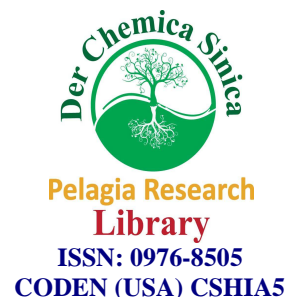




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### Evaluation of physico-chemical parameters of water samples from Maval, Pune

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#### ABSTRACT

Drinking water is one of the basic needs of life and essential for survival. We can hardly live for a few days without water. Water in its pure form is colorless, tasteless, odorless and sparkling in nature. The Physico-chemical parameters of drinking water samples collected from six different locations of Maval taluka in Pune district, Maharashtra, India were evaluated. It includes Temperature (T), Boiling Point (B.P.) pH, Electric Conductivity (EC), Total Dissolved Solids (TDS), Sodium ( $\text{Na}^+$ ), Potassium ( $\text{K}^+$ ), Chlorides ( $\text{Cl}^-$ ), Total Alkalinity (TA), Total Hardness (TH), Dissolved Oxygen (D.O) and Calcium ( $\text{Ca}^{++}$ ) of drinking water samples were carried out. The results were compared with water quality standards prescribed by WHO(1963) and BIS(1991). This indicates good water quality and the water from these sampling points is fit for drinking purpose and domestic use. However these water samples can be used for drinking purpose only after proper treatment like filtering or boiling.

**Key words:** Physico-chemical parameters, Dissolved Oxygen, drinking water samples, sodium ( $\text{Na}^+$ ), WHO.

#### INTRODUCTION

Water has always been a subject of great interest to man since it is essential to human survival [1]. Water is a key determinant of sustainable human health as well as general being [2]. It is a well known fact that adequate supply of fresh and clean drinking water is a basic need for all human beings on earth; though it has been observed that thousands of people are deprived of this, particularly in the developing areas. The, uncontrolled urbanization, industrialization and fast population growth, poor sanitation situation, uncontrolled waste disposal, etc. cause serious quality degradation water [3]. In addition to this various kinds of pollutants and nutrients through the agency sewage, industrial effluents, agricultural runoff etc. in to the water bodies brings about a series of changes in the physicochemical and characteristics of water, which have been the subject of several investigations [4-8]. There is an extensive literature, which stresses deterioration of water quality [9- 12]. Open wells and bore wells are the major source of drinking water in both urban and rural areas.

Maval is towards the west of Pune District, Maharashtra (India). It receives heavy rainfall. This is the hilly area of Pune, with one of the biggest range of mountains in Maharashtra i.e. Sahyadri Mountain. The Hill Stations like Lonavala and Khandala are in Maval where tourists are mostly attracted in the rainy season. Most of the area is

covered with Forest. On global map its location is North Latitude 18° 52' and East Longitude 73.85'. The present study was undertaken to investigate the drinking water samples in six villages of maval taluka in pune district (M.S.) India.

## MATERIALS AND METHODS

### Sample Collection

Water samples were collected in the month of December-2013. Samples were collected in pre-cleaned violet colored Sampling bottle of one liter capacity with necessary precautions and brought to the laboratory for analysis. Water samples collected from open wells and tap water. The sampling locations are given below.

Table-1 Sampling locations in Maval Taluka.

Sr. No	Sampling Locations	Sample No.
1	Lonavla	S <sub>1</sub>
2	Khandala	S <sub>2</sub>
3	Karla	S <sub>3</sub>
4	Malvali	S <sub>4</sub>
5	Takwe	S <sub>5</sub>
6	Kamshet	S <sub>6</sub>

### Analysis of Physico-chemical properties

Analysis were carried out for the determination of Physico-chemical parameters of drinking water samples such as Temperature (T), Boiling Point (B.P.), pH, Electric Conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Total Alkalinity (TA), Total Hardness (TH), Calcium (Ca<sup>++</sup>), Sodium (Na<sup>+</sup>), Potassium (K<sup>+</sup>) And Chloride (Cl<sup>-</sup>) using standard methods [13-15]. All the reagents used for the analysis were AR grade and double distilled water was used for preparation of solutions.

## RESULTS AND DISCUSSION

The Physico-chemical parameters of drinking water samples from six different locations of maval taluka are given in table-2. These result were compared with WHO (1963) and BIS (1991) drinking water standard [16-17].

### 1] Temperature:

Temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the organism. The temperatures were found to be 23<sup>0</sup>C – 26.2<sup>0</sup>C during the study period. The surface water temperature was measured using mercury thermometer. The scale of the thermometer was immersed in the water up to the level of mercury in capillary column.

### 2] Boiling Point:

In the present study Boiling Point ranged as 97.2 - 99.1<sup>0</sup>C. Boiling point of water samples were measured by using mercury thermometer by boiling water in glass beaker on gas burner.

### 3] pH:

The pH of natural water can provide important information about many chemical and biological processes and provides indirect correlations to a number of different impairments. The pH is the measurement of the acid/base activity in solution; specifically it is the negative common logarithm of the activity/concentration of hydrogen ions;  $\text{pH} = -\log [\text{H}^+]$ . pH values found as 6.7 – 7.54 and it is within the permissible limit of WHO and BIS. However higher value of pH hasten the scale formation in water heater and reduce the germicidal potential of Chlorine [18].

### 4] Electric conductivity:

Electric conductivity (EC) in natural waters is the normalized measure of the water's ability to conduct electric current. Electrical conductance values were ranges as 52 - 117 $\mu\text{s}$ . This is mostly influenced by dissolved salts such as sodium chloride and potassium chloride. It signifies the amount of total dissolved salts [19].

### 5] Total Dissolved Solids:

Total dissolved solids indicate the salinity behavior of groundwater. Water containing more than 500 mg/L of TDS is not considered desirable for drinking purpose [20]. A TDS value found in between 20 and 60 mg/L.

**6] Sodium:**

Sodium concentrations were ranges as 4 - 11 ppm. WHO and BIS shows the concentration of sodium 200 ppm. It found below the limit.

**7] Potassium:**

It was found that the content of potassium in the entire sample is zero. The major source of potassium in natural fresh water is weathering of rocks but the quantities increase in the polluted water due to disposal of waste water.

**8] Chloride:**

Chloride values ranged from 5 - 15 mg/l. High chloride content can cause high blood pressure in people. Chlorides more than 250 mg/l impart a salty taste to water. High Chloride concentration is also an indicator of large amount of organic matter [21].

**9] Total Hardness:**

The maximum allowable limit of total hardness is 500 mg/l and the most desirable limit is 100 mg/l as per the WHO standards. Hardness below 300 mg/l is considered potable but beyond this limits cause gastro-intestinal irritation. High concentration of hardness from 150 to 300 mg/l and above may cause kidney problems [22]. The Total hardness value ranged from 20 to 60 mg/l and it is within the permissible limit of WHO and BIS.

**10] Total Alkalinity:**

Alkalinity of water is its capacity to neutralize a strong acid and it is normally due to the presence of bicarbonate, carbonate and hydroxide compounds of calcium, sodium and potassium. The high alkalinity imparts an unpleasant taste. Total alkalinity values for the investigated samples were ranges from 30 to 70 mg/L.

**11] Dissolved oxygen:**

Dissolved oxygen is an important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. The DO values indicate the degree of pollution in water bodies. DO value found in between 6.5 - 7.6 ppm. There is no standard for dissolved oxygen for water quality assessment. Low D.O. gives bad odour to water due to anaerobic decomposition of organic wastes. Depletion of D.O. is enhanced by high concentration of organic matter of the water bodies [23].

**12] Calcium:**

Calcium is directly related to hardness. Calcium concentration were ranges from 15 to 50 mg/l and it's a within the limit of WHO and BIS.

**Table: Average values of the physico-chemical parameters of different locations in Maval.**

Sr. No	Parameters	Symbol	Unit	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	WHO	BIS
1	Temperature	T	<sup>o</sup> C	23.5	23	25.5	24.9	25.4	26.2	---	---
2	Boiling Point	B.P	<sup>o</sup> C	97.2	99.1	99.0	98.6	97.3	98.8	---	----
3	Potency of Hydrogen	p <sup>H</sup>	--	7.54	6.9	7.2	6.7	7.1	7.0	6.5-8.5	7-8
4	Electric Conductivity	EC	μS	55	98	52	65	82	117	300	----
5	Total Dissolved Solids	TDS	mg/L	50	45	20	42	40	60	1000	500
6	Sodium	Na <sup>+</sup>	ppm	5	8	4	10	5	11	200	200
7	Potassium	K <sup>+</sup>	ppm	0	0	0	0	0	0	----	----
8	Chlorides	Cl <sup>-</sup>	mg/l	11	5	10	15	12	10	250	250
9	Total Hardness	TH	mg/l	30	20	28	34	32	60	500	500
10	Total Alkalinity	TA	mg/l	42	30	30	35	36	70	75	200
11	Dissolved Oxygen	DO	ppm	7.6	6.8	7.0	7.2	6.5	7.2	4-6	4-6
12	Calcium	Ca <sup>++</sup>	mg/l	20	15	20	25	28	50	75	75

**CONCLUSION**

Water quality standards shows good water quality. All the water samples are potable. Physico-chemically fit for drinking purpose on the basis of analyzed parameters only. All parameters were found to be within the permissible limit of WHO and BIS. However these water samples can be used for drinking purpose only after proper treatment like filtering or boiling.

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