

## **Physico-Chemical Analysis of Public Well Water Samples of some of the Villages of Dhule Tahsil District Dhule (M.S) India-424005**

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### **Abstract**

The present study was intended to study physico-chemical parameters of public well water samples of some of the villages of Dhule Tahsil District Dhule (M.S) India-424005

The environmental impact influences the quality of ground water. The quality of ground water can be expressed by determining various physico-chemical parameters. In the present work the physico-chemical parameters such as temperature, PH, electronic conductivity, turbidity, total dissolved solids, salinity, sodium, potassium, optical density, dissolved oxygen, total hardness, magnesium hardness calcium hardness and chloride have been determined.

The Physico-chemical analysis of public well water samples of selected ten villages of Dhule Tahsil reveals that the quality of water is not up to the mark.

**Key Words:** public well water, Physico-chemical parameters, Water quality

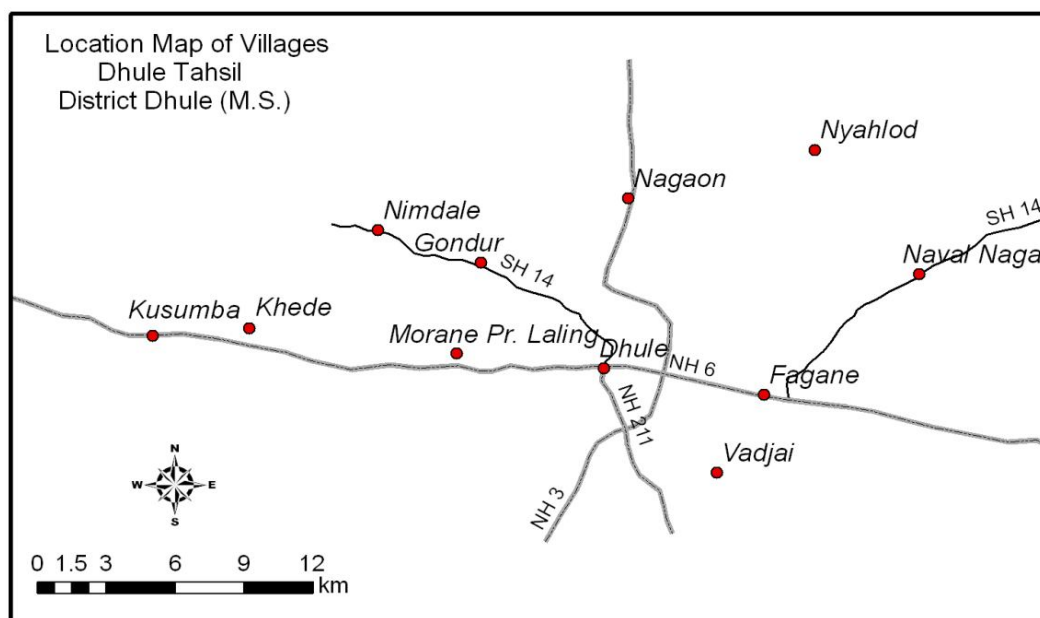
### **Introduction:**

The ground water plays an important role for welfare of mankind. The ground water is the most important source of water for human activities. Now a day ground water sources are under sever environmental tresses and which influences the quality of water.

The objectives of this study is to investigate the physico- chemical parameters such as temperature,  $P^H$ , electronic conductivity , turbidity, total dissolved solids, salinity, sodium, potassium , optical density, dissolved oxygen, total hardness, magnesium hardness ,calcium hardness and chloride.

In the present study public wells of ten villages from the Dhule Tahsil were selected for physico-chemical analysis. The selected villages are Fagane ( $V_1$ ); Gondur ( $V_2$ ); Khede ( $V_3$ ); Kusumba ( $V_4$ ); Morane Pr.Laling ( $V_5$ ); Nagaon ( $V_6$ ); Nimdale ( $V_7$ ); Navalnagar ( $V_8$ ); Nyahlod( $V_9$ ); and Vadjai ( $V_{10}$ ). The water samples were collected at the end of the month of May 2012.

Dhule Tahsil is a District head quarter (M.S) situated between  $20^{\circ}.38'$  and  $21^{\circ}.61'$  North latitude and between  $73^{\circ}.50'$  and  $75^{\circ}.11'$  East longitude. Location map of public wells of respective villages from Dhule Tahsil is presented in the following figure:



### Material and Methods:

Samples were collected in good quality screw capped polyethylene containers of two liter capacity. The containers were immediately covered tightly after collection of respective samples and brought to the laboratories for analysis. The water temperature and air temperatures were recorded on the respective sampling station with timings.

The experiments were carried out in the laboratory of the department of chemistry, S.S.V.P.S's L.K.Dr.P.R. Ghogrey Science College Dhule. The instruments such as turbidi meter, spectrophotometer, colorimeter, flame photometer,  $P^H$  meter, water analysis kit and various standard methods<sup>1</sup> were employed.

The chemicals such as calcium carbonate, disodium salt of E.D.T.A, Erichrome Black T indicator, silver nitrate, ammonium oxalate, ammonium chloride, Liq. Ammonia, potassium chloride, sodium sulphite, sodium chloride, potassium chromate, were used of A.R. Grade. Double distilled water was used for dilutions and preparation of reagents.

**Results and Discussion:**

In the water quality values at various public wells of different villages of Dhule Tahsil are given in the Table 1.

Table 1 The water quality values at various public wells of different villages of Dhule Tahsil

Parameters	Name of village with code									
	Fagane V <sub>1</sub>	Gondur V <sub>2</sub>	Khede V <sub>3</sub>	Kusumba V <sub>4</sub>	Morane pr.L V <sub>5</sub>	Nagaon V <sub>6</sub>	Nimdale V <sub>7</sub>	Nawal N V <sub>8</sub>	Nyahlod V <sub>9</sub>	Vadjai V <sub>10</sub>
Sample Collection Date	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12	26/5/12
Sample collection Time	5.00pm	12.15pm	9.20am	10.00am	1 0.50am	2.00pm	11.45am	4.30pm	3.30pm	5.30pm
Air Temp. <sup>0</sup> C	41.0	43.0	41.0	38.0	39.5	41.0	42.0	42.0	41.0	39.0
Water Temp. <sup>0</sup> C	30.0	28.5	29.5	29.0	31.5	31.0	29.5	31.5	29.5	29.0
p <sup>H</sup> at 41.2 <sup>0</sup> C	7.66	7.98	7.18	7.82	7.39	8.10	7.92	7.84	7.62	7.38
EC inµ S/cm at 41.7 <sup>0</sup> C	1020	569	1639	702	1368	924	437	1174	1013	2460
Turbidity at 36 <sup>0</sup> C 25 NTU Scale	0.7	0.8	0.7	0.5	0.4	0.6	0.9	0.1	0.5	0.3
TDS in ppm at 41.7 <sup>0</sup> C	680	381	1076	468	906	605	288	770	671	1652
Salinity ppm	588	348	863	471	792	551	269	692	598	1161
Sodium ppm	06	02	14	06	12	05	00	09	08	11
Potassium ppm	01	00	00	01	00	00	00	00	00	02

O.D at 530 nm	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
D.O at 35.5 <sup>0</sup> C	4.1	4.0	1.6	3.1	2.5	3.4	4.6	0.2	0.5	4.1
Total Hardness ppm	285	179	448	195	463	344	156	377	319	1102
Mg ++ ions ppm	252	143	379	141	379	238	104	357	215	684
Ca++ ions ppm	32	35	68	53	83	106	52	20	104	418
Cl <sup>-</sup> ppm	72	17	272	64	203	40	12	75	122	417

As shown in the in Table 1 the public well water samples from the ten villages were collected on 26<sup>th</sup> May 20012. The timing, air temperature and water temperature of the respective sample was recorded immediately. The first water sample was collected from Khede (V<sub>3</sub>) and last sample was collected from Vadjai (V<sub>10</sub>). The minimum air temperature 38<sup>0</sup>C was recorded at Kusumba (V<sub>4</sub>) while maximum temperature 43<sup>0</sup>C recorded at Gondur (V<sub>2</sub>). The minimum water sample temperature 28<sup>0</sup>C was recorded at Fagane (V<sub>1</sub>) while maximum temperature 31.5<sup>0</sup>C recorded at Morane Pr.Laling (V<sub>5</sub>) and Nawalnagar (V<sub>8</sub>).

P<sup>H</sup> stands for potential hydrogen referring to the amount of hydrogen mixed with water. The PH of the samples was in the range 7.18 to 8.10, so that slightly alkaline but within ISI limit (6.5 to 8.6). Drinking water with P<sup>H</sup> level above 8.5 could indicate water is hard<sup>2</sup>. Out of ten villages water sample from Nagaon (V<sub>6</sub>) has higher P<sup>H</sup> value 8.10 and it is reaching towards hard water category. High P<sup>H</sup> does not pose a health risk but cause aesthetic problems.

The electronic conductivity is a measure of dissolved salts in water sample. The changes in EC denote change in composition. In the present investigation EC values ranged from 437 $\mu$  S/Cm to 2460  $\mu$  S/Cm at 41.7<sup>0</sup>C

Turbidity is a measure of cloudiness in water. The higher the turbidity the cloudier the water appears. This can be caused by waste discharge and presence of micro organisms. The turbidity is measured in Nephelometry turbidity units (NTU's). In the present study the turbidity level was found in between 0.1 to 0.9 NTU units. The turbidity level-i) Excellent for turbidity < 10 NTU's ii) Fair for turbidity between 15-30 NTU's and iii) poor for turbidity >30 NTU's .Over all turbidity values of all water samples were found in the desirable limit.

The TDS levels of water samples were found in the range between 288 to 1652 ppm. As per the guide lines for drinking water quality prescribed by WHO the TDS concentration below 1000 ppm is acceptable. The TDS level –

i) excellent for TDS<300 ppm ii) Good for TDS between 300 and 600 ppm  
 iii)Fair for TDS between 600 and 900ppm iv) Poor for TDS between 900 and 1200ppm V) Unacceptable for TDS >1200 ppm.

Salinity is the saltiness contents of body water. In the present study Salinity values ranged from 269ppm to 1161 ppm.

In the present study sodium and potassium contents in all the samples ranged from 5 to 14 ppm and 0.0 to 1 ppm respectively.

Optical density is one of the parameter that judges the coloration in the water samples. The O.D of all samples was found in the range of 0.0 to 0.01 indicating the absence of coloring matter in all the samples.

Dissolved oxygen is one of the most important parameter in assessing water quality and understanding the physical and biological processes prevailing in the water. Good water should have the solubility of oxygen 7 ppm at 30<sup>0</sup>C. In the present study dissolved oxygen ranged from 0.2 to 4.6 ppm. The minimum tolerance range is 4 ppm<sup>4</sup> for drinking water.

Total hardness of water samples were determined by complex metric titration with EDTA using Erichrome Black T indicator. Indian standard institute specified the total hardness to be within 300 ppm<sup>5</sup> of CaCO<sub>3</sub> In the present study total hardness (TH) ranged from 156 to 1102 ppm. As per the Bureau of Indian standards (BIS) the permissible limit for TH is 200 ppm. On the basis of equivalence of concentration of calcium carbonate present in the water samples, the hardness can be categorized as-

Equivalence conc. of CaCO <sub>3</sub>	Hardness Category
< 60 ppm	Soft
60 to < 120 ppm	Medium
120 to < 180 ppm	Hard
180 ppm or greater	Very Hard

Out of ten villages two villages namely Gondur (V<sub>2</sub>) and Nimdale (V<sub>7</sub>) come under permissible limit of hardness.

The magnesium ion concentrations were found in the range of 104 to 684 ppm.

The calcium ion concentrations were found in the range of 20 to 418 ppm. The WHO upper limit for concentration is 100 ppm<sup>3</sup>.

Chloride concentration was determined by titrating against standard silver nitrate solution using potassium chromate solution as indicator. In this study chloride concentration was found to vary from 12ppm to 417 ppm. In sample V<sub>10</sub> chloride concentration was found to be very high. High concentration of chloride gives a salty test to water.

## **Conclusion**

The present study, the physico chemical parameters of public well water

samples of some of the villages in Dhule Tahsil District Dhule (M.S) shows conclusively that except samples V2, V4 and V7 are not within desirable limit hence are not suitable for drinking purpose. The effective maintenance of water quality of public wells is necessary

**Acknowledgements:**

The author is thankful to the Principal, S S.S.V.P.S's L.K.Dr.P.R. Ghogrey Science College Dhule, Administrators and Management of S.S.V.P Santa's Dhule for providing facilities for investigation and U.G.C. for financial support.

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