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# PHYSICO-CHEMICAL ANALYSIS OF UNDERGROUND WATER OF JALGAON JAMOD REGION OF BULDANA DISTRICT, MAHARASHTRA, INDIA

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## ABSTRACT

*Ground water samples were collected from different villages of Jalgaon-Jamod (India). These water samples from 25 sampling points of Jalgaon-Jamodwere analyzed for their physicochemical characteristics. Laboratory tests were performed for the analysis of samples for pH, Hardness, Chloride, Alkalinity, TDS etc. On comparing the results against drinking water quality standards laid by Indian Council of Medical Research (ICMR) and World Health Organization (WHO), it is found that some of the water samples are non-potable for human being due to high concentration of one or the other parameter. The usefulness of these parameters in predicting ground water quality characteristics were discussed. Thus an attempt has been made to find the quality of ground water in and around Jalgaon-Jamod, suitable for drinking purposes ornot.*

***Key Words:*** *Water quality, physiochemical parameters, pollution study, drinking water. Hariharataluk.*

## INTRODUCTION

Ground water is crucial, most suitable fresh water resource with nearly balanced concentration of the salts for human consumption.Surface water and ground water is the only available source for human being but due to industrializations, urbanization and agriculture practices the surface water resources are greatlypolluted. Relatively groundwater resources are much clean and usable water resources.

Today a large number of rural and urban populationsdepend upon groundwater. It is estimated that approximately one third of world's population depends upon ground water resources for drinking(**Nicksonet al.2005**).The greater part of state in India where more than 90% of population depends upon ground water for drinking(**Ramachandraiah2004**). Over burden of the population pressure, unplanned urbanization, unrestricted exploration policies and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water. Ground water occurs in weathered portion, along the joints and fractures of the rocks. In fact, industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country available water is rendered non-portable because of the presence of heavy metal in excess. The situation gets worsened during the summer season due to water scarcity and rain water discharge. Contamination of water resources available for household and drinking purposes with heavy metals, metal ions and harmful microorganisms is one of the serious major health problems.

In the Jalgaon-Jamod ground water is the main source of fresh water for major population.

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Groundwater is usually extracted through hand dug shallow wells. Selected places of JalgaonJamod been taken for the present study. It lies adjacent to each other in the north of Buldhana district of Maharashtra.

## MATERIALS AND METHODS

**Study Area:** Jalgaon-Jamod situated at the base of Satpura Range, about 20 km from Satpuda and its Coordinates are 21.0486°N 76.5344°E and the total population in Jalgaon-Jamodtahasil is 156,623 as per the survey of census during 2011 by Indian Government. Out of total population 128,347 people are living in the urban area and about 128,347 are living in rural areas. There are 33,861 House Holds in this sub district. There are 80,008 males (51%); There are 76,615 females (49%).It has an average elevation of 291 metres (955 feet).Purna is the largest river in the tehsil which is also largest in the District. There is the satpuda mountain ranges in the northern part of the tehsil.

Sampling location of study area is shown in the Table No:1.1

| Sl. No. | Sample Number | Name of Village | Sl. No. | Sample Number | Name of Village |
|---|---|---|---|---|---|
| 1 | DW1 | Bhon | 14 | BW14 | Ukalgaon |
| 2 | DW2 | Pesoda | 15 | BW15 | Pimpari |
| 3 | DW3 | Khiroda | 16 | BW16 | Rudhana |
| 4 | DW4 | Savali | 17 | BW17 | Bhilkhed |
| 5 | DW5 | Paturda | 18 | BW18 | Kathargaon |
| 6 | DW6 | Awar | 19 | DW19 | Marod |
| 7 | BW7 | Kavathal | 20 | BW20 | Wakana |
| 8 | DW8 | WarvatKhanderao | 21 | DW21 | Wankhed |
| 9 | DW9 | Jastagaon | 22 | DW22 | Bodakha |
| 10 | DW10 | Kalamkhed | 23 | BW23 | Tamgaon |
| 11 | BW11 | Takaleshwar | 24 | BW24 | Nirod |
| 12 | BW12 | Chondi | 25 | DW25 | Ringanwadi |
| 13 | BW13 | Kakoda | | | |

BW:Borewell,DW:Dugwell

### Samplecollection

The water samples were collected in pre-cleaned one liter capacity polyethylene containers of 2 litre capacity. The containers were pre-washed with chromic acid solution and rinse with distilled water several times

### Physico-Chemical Analysis

The collected samples were analyzed for different physico-chemical parameters such as pH, Electrical conductivity (EC), Total Dissolved solids (TDS), Total hardness (TH), Total Alkalinity and Chloride as per the standard methods (APHA 1998), and the results were compared with the Indian Standards (ICMR) for potable water. The parameters present in the water sample can be calculated by using various methods. The pH of all the water samples was determined using a pH meter (Model no LI 127, Elico) Electrical conductivity was measured using a conductivity meter. The chloride, and total hardness were estimated by the standard methods of water

## RESULTS AND DISCUSSION

A total of 25 water samples from hand pumps and bore wells of Jalgaon-Jamodwere collected in pre-cleaned one liter capacity polyethylene containers of 2 litre capacity, which were being used mainly for the purpose of drinking and cooking and are brought to the laboratory with proper

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care. The water quality analysis of different ground water samples have been carried out for pH, Electrical conductivity, Total Alkalinity,TDS, Total hardness and Chloride.The samples were analysed using various analytical methods, APHA (1998), AWWA-WPCF (1995).Total hardness and calcium were measured by EDTA titrimetric method using EBT indicator respectively. Chloride was determined by Argentometric method using potassium chromate indicator. The chemical data were complied further to know location wise distribution. The data revealed that there were considerable variations in the examined samples from different sources with respect to their chemical characteristics. The results indicate that the quality of water considerably varies from location to location.

**Hydrogen ion activity (pH):**pH of water is an essential and prime parameters of groundwater Form Table 1.2 reveals that pH values of samples ranged varied 8.15 to 9 in case of post monsoon season and Table 1.3 a revels that pH values of samples ranged between to 7.8 to 8.57 for pre-monsoon season.

**Electrical conductivity (EC):**From Table 1.2 shown that groundwater EC values are founds in ranged 412 to 7120 in post monsoonsession. Table 1.3 shown that groundwater EC values are ranged 312 to 6750 are found in pre-monsoon session.

**Total Alkalinity (TA):**From Table 1.2 shown that Total Alkalinity values are founds in ranged 203 to 821 in post monsoon session. Table 1.3 shown that Total Alkalinity values are ranged 160 to 720 are found in pre-monsoon session.

**Total Dissolve Solid (TDS):**512 to 9556 is the range of TDS inpre-monsoon session and in post monsoon session it varies from 400 to 9984

**Total hardness (TH):**Total hardness value range from 200 to 4412 in pre monsoon session and 112 to 4328 is the range of value for post monsoon session

**Chloride (Cl-):**From Table 1.2 shown that chloride values are founds in ranged 79 to 836 in post monsoon session. Table 1.3 shown that groundwater EC values are ranged 55 to 759 are found in pre-monsoon session.

## CONCLUSION

In general ground water quality of Jalgaon-Jamod is not harmful to human beings, since the ground water which were taken from the various places of Jalgaon-Jamod were analyzed and the analysis reports that the water quality parameters like pH, $Cl^-$ ,Total Alkalinity lies within the maximum permissible limit prescribed by WHO and ICMR. Except certain parameters like Total hardness, TDS, EC etc. As study area comes under the saline belt it is recommend to boil the water before use it minimize the temporary hardness of water.

**Table 1.2: Physicochemical analysis of water from JalgaonJamod and Sangrampur region in Post Monsoon- 2015**

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**Table 1.3: Physicochemical analysis of water from JalgaonJamod and Sangrampur region in Pre Monsoon- 2016**

| S. No. | TA | Cl- | TH | TDS | E.C | pH | S. No. | TA | Cl- | TH | TDS | E.C | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DW1 | 445 | 355 | 252 | 2000 | 420 | 7.74 | BW15 | 205 | 298 | 724 | 400 | 390 | 7.66 |
| DW2 | 212 | 213 | 944 | 9874 | 460 | 8.57 | BW16 | 550 | 355 | 4200 | 9984 | 2030 | 7.73 |
| DW3 | 480 | 76 | 1696 | 5992 | 1240 | 7.9 | BW17 | 160 | 92 | 208 | 400 | 6750 | 7.7 |
| DW4 | 425 | 333 | 176 | 400 | 410 | 7.45 | BW18 | 510 | 73 | 1520 | 5665 | 1460 | 8.45 |
| DW5 | 165 | 146 | 323 | 800 | 6412 | 7.88 | DW19 | 260 | 759 | 270 | 800 | 390 | 7.68 |

| S. No | TA | Cl- | TH | TDS | E.C | pH | S. No | TA | Cl- | TH | TDS | E.C | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DW1 | 521 | 412 | 300 | 2112 | 523 | 8.1 | BW15 | 327 | 325 | 811 | 512 | 458 | 8.2 |
| DW2 | 314 | 300 | 1000 | 9526 | 564 | 9 | BW16 | 572 | 412 | 4284 | 9556 | 2145 | 7.9 |
| DW3 | 523 | 112 | 1721 | 4131 | 1320 | 8.2 | BW17 | 203 | 175 | 312 | 521 | 7120 | 7.9 |
| DW4 | 519 | 412 | 213 | 600 | 521 | 7.8 | BW18 | 571 | 125 | 1614 | 4521 | 1524 | 8.45 |
| DW5 | 245 | 250 | 428 | 956 | 6523 | 8.1 | DW19 | 381 | 836 | 321 | 956 | 451 | 7.9 |
| DW6 | 328 | 200 | 610 | 2152 | 852 | 8.2 | BW20 | 521 | 112 | 1002 | 2714 | 1254 | 8.5 |
| BW7 | 231 | 128 | 231 | 945 | 1452 | 8.2 | DW21 | 523 | 679 | 4412 | 3952 | 4956 | 8.4 |
| DW8 | 301 | 390 | 545 | 2314 | 412 | 7.9 | DW22 | 247 | 789 | 714 | 2541 | 561 | 7.9 |
| DW9 | 412 | 79 | 480 | 2564 | 456 | 8.1 | BW23 | 352 | 378 | 1012 | 925 | 521 | 7.9 |
| DW10 | 421 | 115 | 514 | 1745 | 845 | 7.8 | BW24 | 821 | 215 | 600 | 2714 | 1625 | 8.3 |
| BW11 | 326 | 89 | 319 | 1325 | 654 | 8.2 | DW25 | 512 | 542 | 641 | 2141 | 565 | 7.7 |
| BW12 | 362 | 230 | 200 | 956 | 521 | 8.5 | **Maxi** | **821** | **836** | **4412** | **9556** | **7120** | **9** |
| BW13 | 429 | 724 | 550 | 1754 | 412 | 8.4 | **Mini** | **203** | **79** | **200** | **512** | **412** | **7.7** |
| BW14 | 251 | 156 | 345 | 1721 | 1652 | 8.2 | **Average** | **408.52** | **327.4** | **927.16** | **2554.16** | **1515.48** | **8.15** |
| DW6 | 215 | 163 | 570 | 2000 | 750 | 7.97 | BW20 | 450 | 69 | 928 | 9871 | 1150 | 8.37 |
| BW7 | 185 | 71 | 202 | 800 | 1320 | 7.95 | DW21 | 470 | 597 | 4328 | 9880 | 3850 | 8.02 |
| DW8 | 195 | 322 | 480 | 2000 | 380 | 7.73 | DW22 | 180 | 603 | 662 | 2400 | 420 | 7.72 |



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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DW9 | 300 | 55 | 336 | 2400 | 312 | 7.89 | BW23 | 245 | 303 | 982 | 800 | 450 | 7.34 |
| DW10 | 204 | 97 | 444 | 1600 | 713 | 7.13 | BW24 | 720 | 163 | 534 | 2600 | 1580 | 8.14 |
| BW11 | 250 | 69 | 276 | 1200 | 580 | 7.83 | DW25 | 315 | 445 | 586 | 2000 | 420 | 7.54 |
| BW12 | 204 | 177 | 112 | 800 | 425 | 8.11 | **Maxi** | 720 | 759 | 4328 | 9984 | 6750 | 8.57 |
| BW13 | 325 | 684 | 402 | 1600 | 312 | 7.92 | **Mini** | 160 | 55 | 112 | 400 | 312 | 7.13 |
| BW14 | 175 | 71 | 276 | 1600 | 1578 | 7.82 | **Average** | 313.8 | 263.56 | 857.24 | 3114.64 | 1368.08 | 7.8 |

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