



STUDIES ON SOME PHYSICO-CHEMICAL PARAMETERS OF BORE WELLS WATER IN GONDPIPRI REGION (MAHARASHTRA)

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ABSTRACT

Physico-chemical studies such as temperature, pH, dissolved oxygen, total dissolved solids, chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate of bore wells water was carried out from twenty villages of Gondpipri town and its some interior adivasi (backward) area during the year 2010, in order to assess water quality index.

Key words: Physico-chemical parameter, Bore well water, Gondpipri, Maharashtra.

INTRODUCTION

Gondpipri is located in Chandrapur district of Maharashtra state in India. Chandrapur city is called as “Black Gold city”. The real coal zone or coal belts are situated in entire Chandrapur district. The agriculture land in these regions is more fertile for the production of different fruits, vegetables and crops. For getting higher yields farmers use different types of insecticides, pesticides and fertilizers. The yield increases but natural composition of land is continuously changing and the harmful ingredients ultimately come into the water and create water pollution as well as soil pollution. Due to geographical isolation and remoteness people residing in the interior adivasi area do not have access to safe drinking water. In the absence of regular fresh water supply, people residing in this area are forced to take borewells water for their domestic and drinking consumption. Hence it was thought to carry out an analysis of the physico-chemical parameters such as temperature, pH, dissolved oxygen, total dissolved solids, chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate of bore wells water.

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EXPERIMENTAL

All the chemicals used were of AR grade. Double distilled water was used for the preparation of reagents and solutions. In the present study, bore well water samples from twenty different areas located around Gondpipri region were collected in brown glass bottles with necessary precautions¹. Before sampling the bottles were treated with dilute mineral acid solution for two days and then they were washed with distilled water. Nearly one litre of each water sample was collected early in the morning. The major water quality parameters considered for the examination in this study are temperature, pH, dissolved oxygen (D.O.), total dissolved solids (T.D.S.), chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate contents². Temperature, pH, D.O., T.D.S., phosphate, nitrate values were measured by water analysis kit and manual methods. Calcium and magnesium hardness of water was estimated by complexometric titration methods³. Chloride contents were determined volumetrically by silver nitrate titrimetric method using potassium chromate indicator and was calculated in terms of mg/L. Sulphate contents were determined by volumetric method³.

RESULTS AND DISCUSSION

The physico-chemical data of the bore well water samples collected in April 2010 and September 2010 are presented in Table 1 and Table 2. The results of the samples vary with different collecting places because of the different nature of soil contamination³. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature. In the present study, temperature ranged from 25.9-32.4⁰C.

The pH values of drinking water is an important index of acidity, alkalinity and resulting values of the acidic-basic interaction of a number of its mineral and organic components. pH below 6.5 starts corrosion in pipes, resulting in release of toxic metals. In the present study pH ranged from 6.6 to 7.0, which lies in the range prescribed by APHA⁴. In the presented study, dissolved oxygen ranged from 4.8 to 9.2 mg/L.

According to WHO and Indian standards, TDS values should be less than 500 mg/L for drinking water. In the present study, TDS ranged from 240 mg/L to 420 mg/L which lies in the range suggested by WHO and Indian standards⁵.

The chloride content in the samples is in between 50 to 150 mg/L. Natural water contains low chloride ions. The findings indicate that all are below the permissible limits of chloride in drinking water, prescribed⁵ by Indian Standard Index.

Table 1: Analysis results of the water samples collected in April-2010

Sample Village	Temp. (°C)	pH	D.O. (mg/L)	T.D.S (mg/L)	Chloride (mg/L)	Total alkalinity (mg/L)	Ca-Hardness (mg/L)	Mg-Hardness (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)	Nitrate (mg/L)
Dhanapur	30.8	6.9	6.8	260	112.4	310.0	72.0	65.2	164.2	0.56	18.0
Pellur	31.2	6.7	5.8	420	89.8	364.0	122.0	48.6	74.8	0.42	32.0
Borgaon	30.0	6.7	7.2	310	96.4	234.0	70.0	74.4	163.8	0.24	41.0
Wadholi	29.7	6.8	6.0	410	103.6	346.0	94.0	44.9	210.8	0.72	47.0
Checkberdi	30.1	6.8	4.6	265	78.8	210.0	88.0	52.1	214.6	0.48	25.0
Aksapur	28.9	6.7	8.4	380	69.7	312.0	109.0	48.2	89.0	0.34	38.0
Ganpur	29.5	6.8	5.6	420	139.8	370.0	62.0	60.6	77.8	0.76	46.0
Jogapur	29.8	6.6	6.4	370	134.4	208.0	89.0	55.8	208.6	0.80	24.0
Karanji	30.2	6.6	7.8	280	70.4	318.0	104.0	70.0	212.8	0.62	35.0
Kemara	30.5	6.7	6.2	430	127.5	290.0	112.0	65.7	188.4	0.34	47.0
Surgaon	31.0	6.8	9.2	350	87.2	370.0	78.0	66.0	152.6	0.38	22.0
Ganeshpipri	31.6	6.9	5.6	330	134.6	344.0	98.0	56.2	202.4	0.54	42.0
Gojoli	30.5	6.7	8.8	390	141.4	214.0	82.0	45.8	112.6	0.62	37.0
Dhamangaon	30.1	6.9	5.8	250	122.7	306.0	66.0	69.7	98.0	0.46	24.0
Chintaldhabha	32.4	7.0	6.2	340	66.4	294.0	118.0	48.0	87.4	0.70	44.0
Dhabha	29.8	6.6	7.8	395	77.8	385.0	77.0	74.2	170.6	0.64	34.0
Chimda	28.5	6.7	7.6	380	69.6	298.0	106.0	56.8	83.4	0.22	45.0
Gondpipri-I	31.1	6.8	7.0	410	110.4	267.0	65.0	73.8	156.4	0.36	32.0
Gondpipri-II	31.7	6.8	6.8	390	90.8	324.0	96.0	64.7	148.2	0.45	28.0
Gondpipri-III	31.6	6.8	6.4	380	95.2	288.0	79.0	67.0	112.8	0.56	34.0

Table 2: Analysis results of the water samples collected in September-2010

Sample village	Temp. (°C)	pH	D.O. (mg/L)	T.D.S. (mg/L)	Chloride (mg/L)	Total alkalinity (mg/L)	Ca-Hardness (mg/L)	Mg-Hardness (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)	Nitrate (mg/L)
Dhanapur	26.2	6.8	7.0	256	92.8	240.0	65.0	62.4	122.8	0.46	20.0
Pellur	25.9	6.7	6.2	320	81.4	294.0	94.0	37.8	72.4	0.28	28.0
Borgaon	26.7	6.6	7.4	305	92.4	223.0	64.0	73.4	134.2	0.46	36.0
Wadholi	26.8	6.8	6.8	398	71.6	323.0	78.0	56.6	190.6	0.62	53.0
Checkberdi	27.9	6.7	5.4	260	84.6	214.0	84.0	54.2	204.8	0.58	28.0
Aksapur	26.7	6.8	9.2	385	58.8	296.0	96.0	46.8	94.4	0.23	27.0
Ganpur	27.8	6.9	4.8	320	110.0	304.0	64.0	68.5	73.2	0.42	43.0
Jogapur	26.6	6.7	6.2	356	71.8	216.0	77.0	59.6	210.4	0.76	21.0
Karanji	29.0	6.6	8.4	258	94.9	292.0	86.0	64.8	212.8	0.64	38.0
Kemara	26.8	6.7	6.8	360	83.4	264.0	104.0	55.4	112.0	0.32	28.0
Surgaon	28.7	6.8	9.0	316	98.6	308.0	68.0	64.8	132.6	0.34	24.0
Ganeshpipri	29.6	6.8	6.4	320	51.8	228.0	86.0	58.2	206.8	0.58	52.0
Gojoli	27.8	6.9	9.2	280	121.0	230.0	69.0	54.3	96.4	0.56	26.0
Dhamangaon	29.1	6.8	5.6	240	108.3	288.0	68.0	63.8	84.6	0.34	22.0
Chintaldhabha	27.6	7.0	6.8	274	85.6	264.0	94.0	53.7	92.2	0.52	37.0
Dhabha	28.8	6.9	8.8	348	97.4	312.0	74.0	76.8	146.8	0.44	32.0
Chimda	29.4	6.8	8.0	360	82.8	245.0	96.0	54.6	74.8	0.34	48.0
Gondpipri-I	27.9	6.8	7.4	306	94.4	248.0	70.0	66.4	143.4	0.26	36.0
Gondpipri-II	28.5	6.7	7.2	290	89.3	282.0	82.0	64.8	124.6	0.48	38.0

In the present study, total alkalinity ranged from 208-370 mg/L.

The limits of calcium and magnesium have been prescribed in the range 75-200 mg/L and 50-100 mg/L respectively⁶. Calcium and magnesium contents in all samples collected fall within the limits prescribed. Calcium is needed for the body in small quantities, though water provtotal requirements⁶.

The concentration of sulphate in water sample is observed to be within the prescribed⁷ limit for sulphate content and it varies from 65 to 210 mg/L. The high concentrations of sulphate may induce diarrhoea⁷.

In the present study, phosphate ranged from 0.22 mg/L to 0.80 mg/L. The evaluated values of phosphate in the present study are higher than prescribed values⁵. The higher values of phosphate are mainly due to the use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produced in gastro-intestinal tract on reaction with gastric juice. This could even lead to the death of consumer⁵.

Nitrate nitrogen is one of the major constituents of organism along with carbon and hydrogen as amino acids, protein and organic compounds, in the bore well water⁸. In the present study nitrate nitrogen levels show higher values than the prescribed values⁸. This may be attributed to the use of fertilizers and pesticides in this remote adivasi area.

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