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Assessment of Physico-Chemical Status of Ground Water Taken from Different Sites of Nagpur District and Amravati District, Maharashtra, India

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ABSTRACT

This paper is intended to be a study concerning with surface water quality in Nagpur city Ambazari Dam (India) and Amravati District (India) area dam. While monitoring samples were collected in February 2015 from sampling sites to evaluate relative differences in Physico-chemical properties of Dam Water, Boar Well such as Turbidity, Silica, Hardness, COD, TDS, DO, Phosphate, Alkalinity, Sulphate, Ca^{2+}, Mg^{2+}, Cl^{-}, etc . The results are compared with standards of World Health Organisation **(WHO)**, United States Public Drinking water Standard **(USPH)** and Indian Council of Medical Research **(ICMR)**. A systematic correlation study showed significant linear relationship among different pairs of water quality parameters.

Keywords: Physico-chemical parameters, Ground water, Nagpur District, Amravati District.

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INTRODUCTION

Water plugs a vital role in human life. The consequences of urbanization and industrialization leads to spoil the water for agricultural purposes ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water get polluted drastically because of increased human activities[1-2]. Consequently number of cases of water borne diseases has been seen which a cause of health hazards[3-6]. Better Quality of water described by its Physical, Chemical and Biological Characteristics. But some correlation was possible among these Parameters and the significant one would be useful to indicate quality of water. It is a very difficult and laborious task to regularly monitor all the parameters even if adequate manpower and laboratory facilities are available. Ground water quality in the industrial areas is determined by measuring the concentration of some physico-chemical parameters and comparing them with drinking water standards[7].

Study Area

Study area were selected from vidharbha region of Maharashtra state india. Ambazari dam from Nagpur city, Nagthana Dam, Shekhdari dam, Bore well of Jarud, Bore well of Gavhankund from Amravati District shown by satellite images in Figure 1 to Figure 4 and indicated in Table 1.

Figure 1: Satellite View of Shekhdari

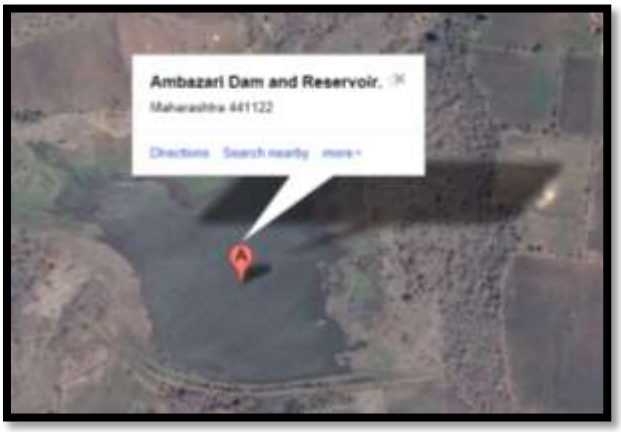

Figure 2: Satellite View of Ambazari Dam

Figure 3: Satellite View of Nagthana Dam

Figure 4: Satellite View of Jarud

Table 1: Sample Point Indicated As

Sr. No	Sample Point	Denoted As	District
1	Ambazari Dam	YDAD	Nagpur
2	Nagthana Dam	YDND	Amravati
3	Bore well from Jarud	YDBWJ	Amravati
4	Bore well from Gavhankund	YDBWG	Amravati
5	Shekhdari Dam	YDSD	Amravati

MATERIALS AND METHODS

The following methodologies was adopted during the present investigation-

- Data collection regarding the physico-chemical analysis.
- During field investigation physical parameter like pH and temperature were measured.
- Proper sampling and preservation techniques for collecting water samples for DO, COD etc.

The samples were collected from three dam, and two boar wells from different region of vidharbha Maharashtra. The samples were collected in cleaned and well-dried brown glass bottles (2.5 L) previously cleaned and washed with deionised water and rinsed with these samples several times with necessary precautions. These bottles were labelled with respect to collecting points, date and time in order to avoid any error between collection and analysis. These samples were collected in the month of February 2015. All the chemicals used were AR grade of pure quality. Double distilled water was used for the preparation of all the reagents and solutions. Glasswares were cleaned with commercial HCl followed by distilled water. The physico-chemical parameters such as pH, Conductivity, Alkalinity, Calcium, Magnesium, Chloride, Total Hardness, Fluoride, Nitrite, Do and COD were determined using standard method[8-9]. Methods used for estimation of various parameters are shown in Table 2.

Table 2: Methods Used For Estimation of Various Parameters

Sr. No	Parameters	Method
1	pH	pH Metrically
2	Electrical Conductance (µS)	Conductometrically
3	Alkalinity (ppm)	Titration Method
4	Calcium	Titration Method
5	Magnesium	EDTA Titration Method
6	Chloride (ppm)	Precipitation Titration
7	Silica (ppm)	Spectrophotometricaly
8	Phosphate (ppm)	Spectrophotometricaly
9	TDS	Gravimetrically
10	COD	Titration Method
11	DO	Winkler Method
12	Hardness	Titration Method
13	Turbidity (NTU)	Turbidity Meter
14	Sulphate	Spectrophotometricaly

RESULTS AND DISCUSSIONS

pH

Observation reveals that, (Table 3) the pH of YDND water reservoir was 6.66. The YDND water pH found to higher than other dam water. The higher pH may due to photosynthetic activity in water body and helps in photosynthesis of phytoplanktons.

Table 3: Statistical Analysis of Ground Water Samples and Comparison with Standards

Sr.No	Parameters	YDAD	YDND	YDBWJ	YDBWG	YDSD	WHO	USPH	ICMR
1	pH	5.8	6.6	5.4	5.5	6.5	6.5-9.2	6.0-8.5	6.5-8.5
2	EC (µS)	1.86×10^{-3}	1.87×10^{-3}	1.90×10^{-3}	1.89×10^{-3}	1.87×10^{-3}	300	300	300
3	Alkalinity (ppm)	75	185	300	275	175	-------	-------	-------
4	Ca^{2+} (ppm)	129.2	118.7	131.7	105.1	109.1	75	100	75
5	Mg^{2+} (ppm)	62.21	54.87	67.22	47.67	52.11	50	30	50
6	Cl^{-} (ppm)	7.086	3.543	8.857	10.63	14.18	200	250	250
7	Silica (ppm)	18.86	40.6	59.56	59.27	44.47	-------	-------	-------
8	PO_4^{3-}(ppm)	Nil	Nil	0.067	0.218	0.263	-------	-------	-------
9	TDS (mg/l)	500	600	400	300	1000	500	500	500-1500
10	COD (ppm)	216	160	200	120	144	-------	-------	-------
11	DO (ppm)	2.3	2.5	2.1	2.6	2.5	----	----	----
12	Hardness (ppm)	19.7	11.82	433.4	39.4	78.8	300	500	300
13	Turbidity (NTU)	0.97	0.73	0.53	0.59	2.41	5	-------	-------
14	SO_4^{2-}	0.27	0.21	0.37	0.20	0.16	------	------	------

Conductivity

Conductivity was somewhat constant to all dam and boar well water.

Alkalinity

Alkalinity is important to aquatic organisms because it protects them against rapid changes in pH. One source of alkalinity is calcium carbonate ($CaCO_3$), which is dissolved in water flowing through geology that has limestone. In the present study alkalinity of YDBWJ water was found to be 300 mg/l. YDBWJ has higher value of alkalinity than other dam and Boar well water.

Calcium

The water above Calcium values 25 mg/l are classified as 'Calcium rich'. The present investigation shows that the concentration of calcium of the YDBWJ water is 131.72 ppm. YDBWJ water contains high concentration of calcium than other dam and Boar well water.

Magnesium

Magnesium is found in seawater (about 1300 p pm) and oceans (after the sodium) in big quantity. Rivers contains approximately 4 p pm of magnesium. Magnesium and other alkali earth metals are responsible for water hardness. The observed value of Magnesium of YDBWJ was found to be 67.22 ppm. It is higher than other dam and Boar well water.

Chloride

The suitability of water resource for the irrigational use in agricultural is depends on its salt concentrations, especially Chloride contents. In the present investigation Chloride concentration of YDSD was found to be 14.18 ppm. Chloride value is much higher than other dam and Boar well water.

Total Hardness

Total hardness of water is caused by the presence of Calcium and, Magnesium salts. Hardness has no known adverse effect on health. However, maximum permissible level has been prescribed for drinking water is 300mg/l, by WHO. According some classifications water having Hardness up to 75 mg/l is classified as soft, 76 to 150 mg/l is moderately soft, 151-300 mg/l as hard and more 300 mg/l as very hard. In the present investigation Hardness of YDBWJ was found to be 433.4 ppm. This is higher than other dam and Boar well water.

Dissolved Oxygen

If water is too warm, there may not be enough oxygen in it. When there are too many bacteria or aquatic animal in the area, they may overpopulate, using DO in great amounts. In the present investigation higher value of dissolve oxygen was found in YDBWG water which is 2.6 ppm and higher than other dam and boar well water.

COD

C.O.D. is the major of oxygen consumed during the oxidation of oxydisable organic matter present in the water. The maximum value of COD was found in YDAD which is 216 ppm and higher than other dam and Boar well water.

Turbidity

Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. It is essential to eliminate the turbidity of water in order to effectively disinfect it for drinking purposes. In the present investigation higher value of turbidity was found in the YDSD which is 2.41 NTU. This value is higher than any other dam and boar well water.

Silica

All natural water supplies contain some dissolved “silica” and most will also contain suspended or

colloidal silica. In solution it can exist as silicic acid or silicate ion, depending upon the pH. Silica (SiO2) is an oxide of silicon, and is present in almost all minerals: It is found in surface and well water in the range of 1 - 100 mg/L. In the present investigation higher value of silica was found to be 59.56 in the YDBWJ which is higher than other dam and boar well water.

Phosphate

The typical phosphate levels found in a litre of drinking water are about one hundred times lower than the phosphate levels found in the average American diet. For example, a person would have to drink 10 to 15 litres of water to equal the amount of phosphates in just one can of soda. Phosphate value was found to be 0.263 ppm in the YDSD which is higher than other dam and boar well water. Mining redistributes phosphate, metals, salts, lead, and radiological material formerly bound in the phosphate ore. In higher concentrations and released into the environment, these become poison and degrade water quality.

Sulphate

There have been a number of studies conducted to determine the toxicity of sulphate in humans. Case reports of diarrhoea in three infants exposed to water containing sulphate at concentrations ranging from 630 to 1150 mg/litre have been presented. In the present investigation the value of phosphate was found to be 0.37 in the YDBWJ which is higher than other dam and boar well water. Reported taste threshold concentrations in drinking-water are 250–500 mg/litre (median 350 mg/litre) for sodium sulphate, 250–1000 mg/litre (median 525 mg/litre) for calcium sulphate and 400–600 mg/litre (median 525 mg/litre) for magnesium sulphate.

TDS

Water with extremely low concentrations of TDS may also be unacceptable because of its flat, insipid taste. In the present investigation the maximum value of TDS was found to be 1000 ppm in the YDSD which is higher than other dam and boar well water.

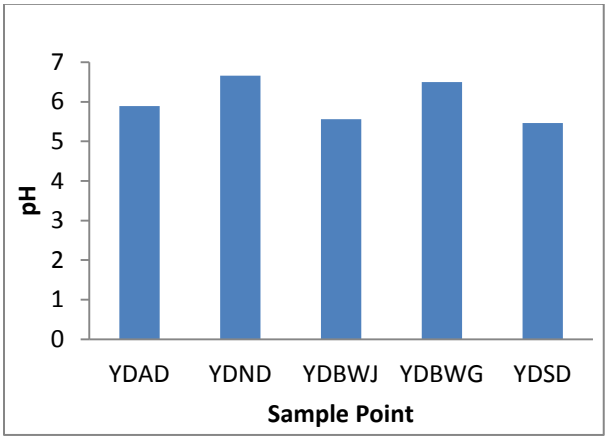

Figure 5: pH

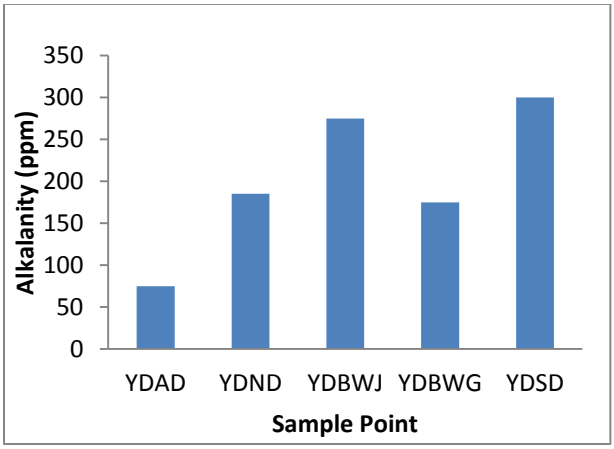

Figure 6: Alkalinity

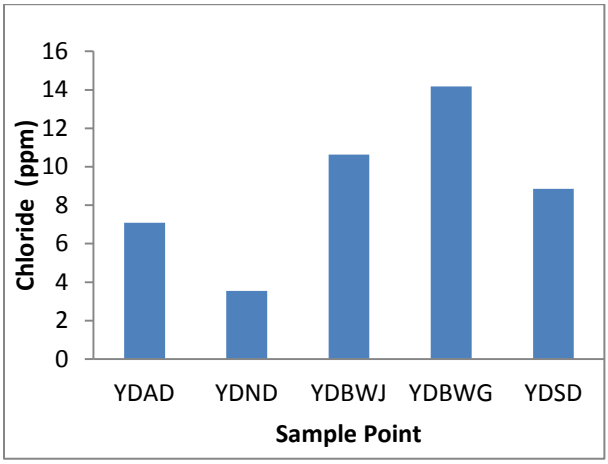

Figure 7: Chloride

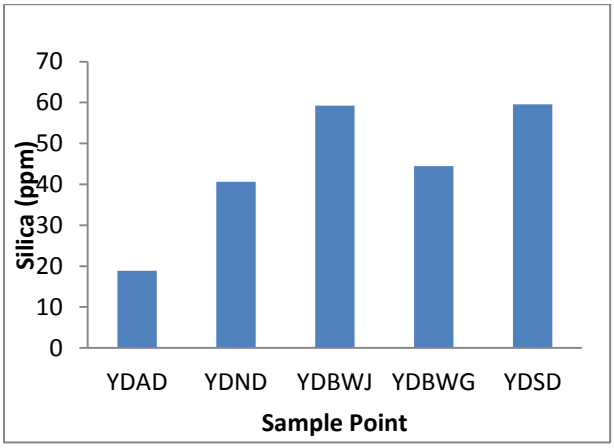

Figure 8: Silica

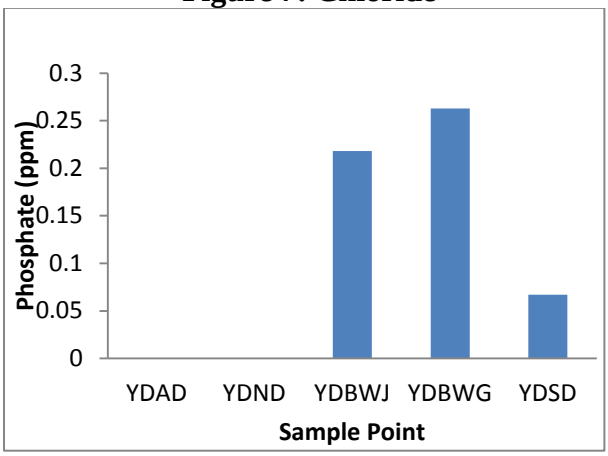

Figure 9: Phosphate

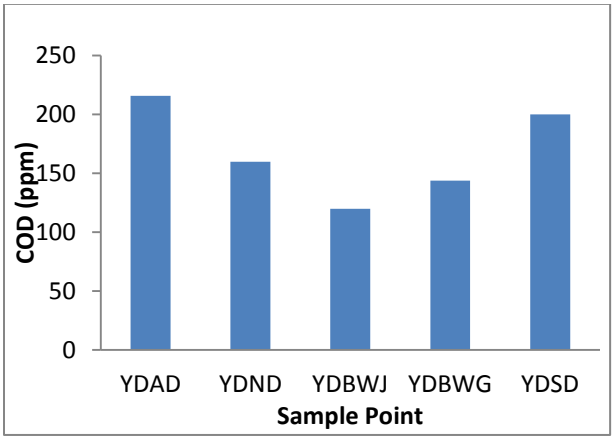

Figure 10: COD

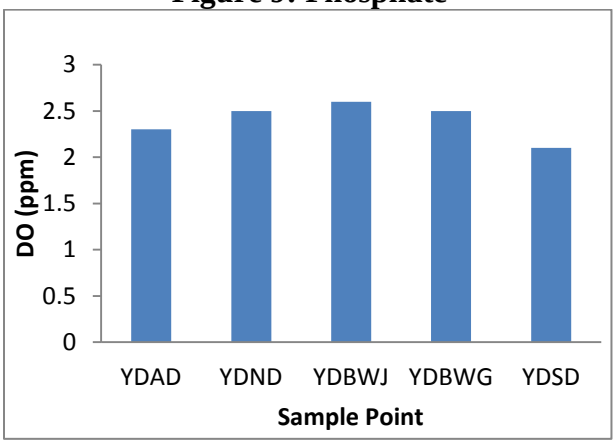

Figure 11: DO

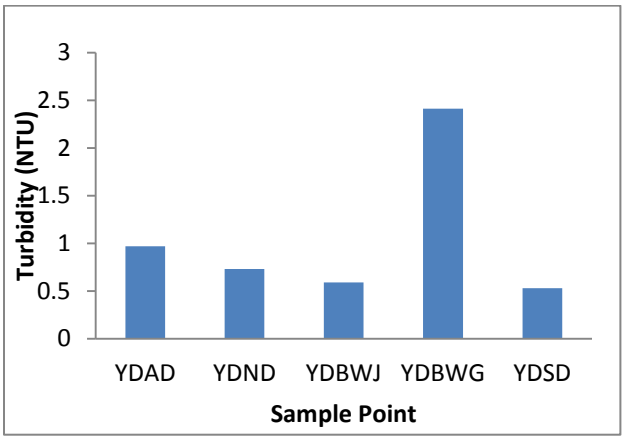

Figure 12: Turbidity

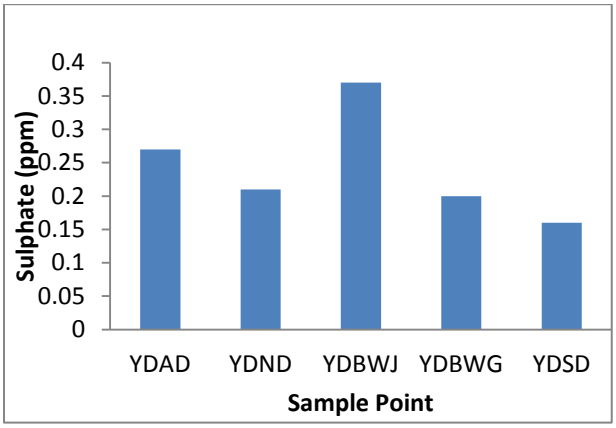

Figure 13: Sulphate

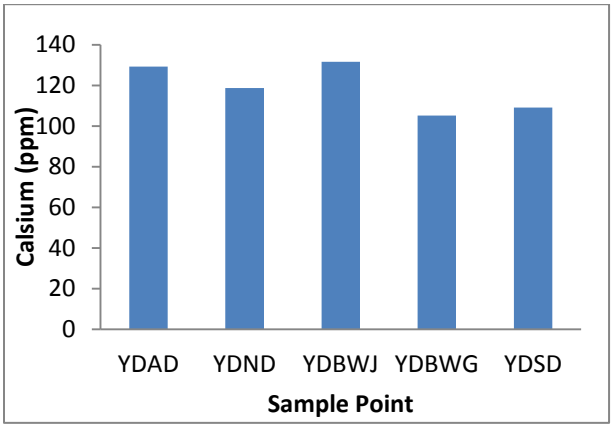

Figure 14: Calcium

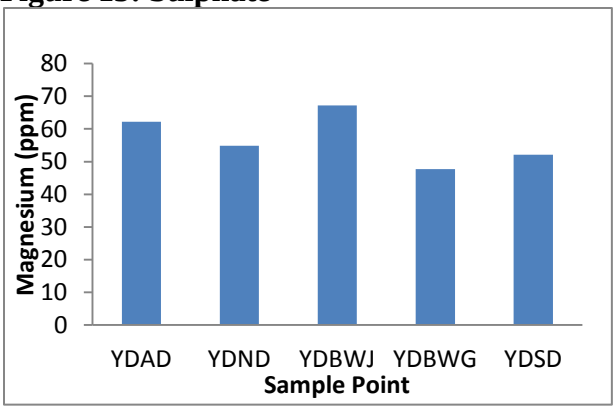

Figure 15: Magnesium

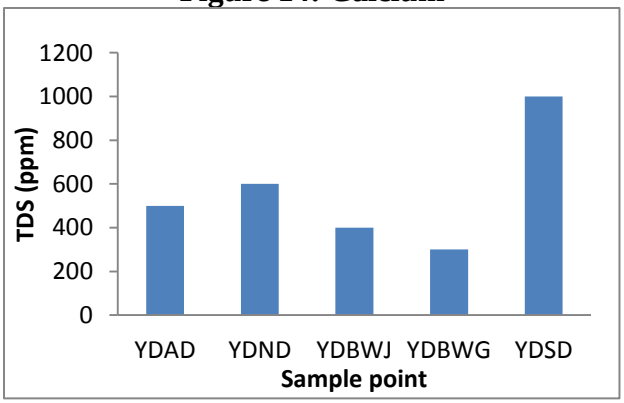

Figure 16: TDS

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REFERENCES

1. Jamal AA. Physico–chemical studies in Uyyakondan channel water of river Cavery. Poll. Res 1998; vol.17 (2):111.
2. Desai PV. Water Quality of Dudhsagar river at Dudhasagar, Goa, India. Poll. Res 1995; vol.4: 377-382.
3. Elizabeth KM. Naik PL. Effect of polluted water on human health. Poll. Res 2005; Vol. 24(2):337.
4. Muller EE. Ethlers MM. The occurrence of E. coli. in South Africa water sources intended for direct and indirect human consumption. Water Res 2001; vol. 35: 3085-3088.
5. Antony AS. Balakrishnan M. Gunasekaran S. Natarajan RK. A correlation study of the ground water quality in the Manali Petroleum Industrial Region in Tamil Nadu India. Indian Journal of Science and Technology 2008; 1(6): 1-11.

6. Kripanidhi KVJR. Mechanism of Ground Water Pollution in Village Wells. Geological Society of India 1984; 25:301-302.
7. Trivedi RK. Goel PK. Chemical and Biological methods for water pollution studies. Environment publication Karad 1984; 2: 211-215.
8. Sinha MR. Dev A. Prasad A. Ghosh M. Tagore RN. J. Chem. Pharm. Res. 2011,; 3(3):701-705.
9. Venkatachalam KJ. Drinking Water Quality In Coimbatore District. Rasayan Journal of Chemistry 2010; 3(4): 649-654.