

## Study of Physico-chemical properties of water from Bopapur dam of Amravati district of Vidarbha Region.

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**Key-words:**

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**Abstract:** Amravati District is located at North East of Maharashtra state having 76° 37', 27"E latitude and 20° 32', to 21° 46', N longitude. Due North and West Madhya Pradesh state border is present, due South Akola and Yavatmal district, while towards East Nagpur and Wardha district is present. There is Satpuda range towards North of Amravati district. Bopapur dam is in the Amravati district at the base of Satpuda range.

The present paper deals with the physical and chemical properties of water of Bopapur dam of Amravati district.

**Introduction :-**

Amravati District is located at North East of Maharashtra state having 76° 37', 27"E latitude and 20° 32', to 21° 46', N longitude. Due North and West Madhya Pradesh state border is present, due South Akola and Yavatmal district, while towards East Nagpur and Wardha district is present. There is Satpuda range towards North of Amravati district. Bopapur dam is in the Amravati district at the base of Satpuda range.

Water is one of the most essentials to good health. It is necessary for the digestion and absorption of food. It helps to maintain proper muscle tone, supplies oxygen and nutrients to the cells, rids the body of wastes and service as a natural system. Water is known as a natural solvent. Before it reaches the consumer's tap it comes into contact with many different substances, including organic and inorganic matter, chemicals and other contaminants. Many public water systems treat water with chlorine to destroy disease-producing contaminants that may be present in the water.

Although disinfection is an important

step in the treatment of potable water, the taste and odour of chlorine is objectionable. The disinfectants that are used to prevent disease, can create by-product which may pose significant health risks. Today drinking water treatment at the point of use is no longer a luxury, it is a necessity.

Consumers are taking matters into their own hands and are now determining the quality of the water. They and their families drink by installing a drinking water system that gives them clean, refreshing and healthier water.

Water can be divided into four well marked classes. Rain water and water formed by snow are grouped under atmospheric waters. As the rain and snowfall appear, they wash the dusty atmosphere and bring down dust, soot and other suspended particles to the earth. Along with these non-living particles atmospheric water also carries air-borne bacteria to the earth's surface.

As soon as rain drop and snow flakes reach to surface of the earth, they quickly become contaminated with soil-microflora of

the area. Such water facilities the growth of saprophytic species and protozoa. River water shows their highest count during rainy season.

Water which is present in ponds, reservoirs, lakes or ocean for a considerable period is called store water. The microbial population increases greatly in such waters

**Materials and Method:-**

**Location :**

Amravati District is located due North East of Maharashtra state having 76° 37', 27"E

latitude and 200° 32', to 210° 46', N longitude. Due North and West Madhya Pradesh state border is present, due South Akola and Yavatmal district, while towards East Nagpur and Wardha district is present. There is Satpuda range towards North of Amravati district.

**About Resources :**

The water resources for the present studies were selected from Bopapur dam location.. The location include the water resources as Dam .

**Collection of Samples :**

*Map of Maharashtra*



The water samples were collected in the month of February & March-2012 with an interval 15 days. The samples were collected 5 litres, each at different depth from surface. Every time fresh samples were used present studies.

**Method for Parameter Analysis :**

For these parameters either digital or titration were used. The details regarding analysis like reagents, equipments, concentration etc.

**Parameters of the Analytical Studies :**

The analytical studies of these collected water samples were done for the following parameters.

- 1 pH
- 2 Conductivity
- 3 Total Hardness
- 4 Turbidity
- 5 Chloride
- 6 Total Alkalinity
- 7 Total Dissolved Solid
- 8 Temperature
- 9 Silica
- 10 Dissolved Oxygen
- 11 Flame Photometer

**Methods :**

**pH :**

The pH is determined by the taking about 10 mL of water samples in a 100 mL clean beaker by using pH meter as described under water analysis.

**Electrical Conductivity :**

The cell of the conductivity meter is filled with the water samples and the electrical conductivity is measured as described in case of water extract and expressed as dS/m at 25C which is numerically equal to mmhos/cm at 25C.

**Total Hardness :**

1. Take 5 mL of the water samples in a conical flask , it is diluted to about 25 mL with distilled water.
2. Add 1mL of ammonium chloride-hydroxide buffer and 3 to 4 drops of eriochrome black T indicator.
3. Titrated with the standard EDTA solution. The colour changes is form the

wine red to blue or bluish green.

**Turbidity :**

1. Set turbidity meter at 100 using 40 NTU standard suspension.
2. Shake the samples thoroughly and let the air bubbles subside.
3. Take the sample in turbidity meter samples tube and find out the value on scale.

**Chloride :**

1. Take 5 mL of Sample in a conical flask & dilute to about 25 mL with water.
2. Add 5 to 6 drops K<sub>2</sub>CrO<sub>4</sub>.
3. Titrate with the standard AgNO<sub>3</sub> solution till the brick red tinge appears.

**Total Dissolved Solid :**

1. Filter 250 to 500 mL of sample through Whatman No.4 filter paper in a Pre-weighed evaporating dish.
2. Evaporate the sample on the hot air oven till whole water is evaporated.
3. Note the weight of evaporating dish after cooling it in a desiccators and calculate total dissolved solids.

**Dissolved Oxygen :**

1. Carefully fill a 300-mL glass Biological Oxygen Demand (BOD) stopper bottle brim-full with sample water.
2. Immediately add 2mL of manganese sulfate to the collection bottle by inserting the calibrated pipette just below the surface of the liquid. (If the reagent is added above the sample surface, you will introduce oxygen into the sample.) Squeeze the pipette slowly so no bubbles are introduced via the pipette.
3. Add 2 mL of alkali-iodide-azide reagent in the same manner.
4. Stopper the bottle with care to be sure no air is introduced. Mix the sample by inverting several times. Check for air bubbles; discard the sample and start over if any are seen. If oxygen is present, a brownish-orange cloud of precipitate or floc will appear. When this floc has settle to the

- bottom, mix the sample by turning it upside down several times and let it settle again.
5. Add 2 mL of concentrated sulfuric acid via a pipette held just above the surface of the sample. Carefully stopper and invert several times to dissolve the floc. At this point, the sample is "fixed" and can be stored for up to 8 hours if kept in a cool, dark place. As an added precaution, squirt distilled water along the stopper, and cap the bottle with aluminum foil and a rubber band during the storage period.
  6. In a glass flask, titrate 201 mL of the sample with sodium thiosulfate to a pale straw color. Titrate by slowly dropping titrant solution from a calibrated pipette into the flask and continually stirring or swirling the sample water.
  7. Add 2 mL of starch solution so a blue color forms.
  8. Continue slowly titrating until the sample turns clear. As this experiment reaches the endpoint, it will take only one drop of the titrant to eliminate the blue color. Be especially careful that each drop is fully mixed into the sample before adding the next. It is sometimes helpful to hold the flask up to a white sheet of paper to check for absence of the blue color.
  9. The concentration of dissolved oxygen in the sample is equivalent to the number of milliliters of titrant used. Each mL of sodium thiosulfate added in steps 6 and 8 equals 1 mg/L dissolved oxygen.

**Silica :**

1. Take 25 mL of sample in a conical flask and add 1 mL of HCL & 1 mL of ammonium molybdate solution.
2. Wait for about 10 minutes add 1 mL of oxalic acid solution.
3. Mix thoroughly & record the absorbances on spectrophotometer at 410 nm.
4. Carry out blank with distilled water.

**Temperature:**

It is a simple method, take sample of water in a plastic container and its Temperature is recorded immediately by dipping the thermometer for about one minute.

**Flame photometer :**

1. Read the operation manual of flame photometer. Set the Na, Ca, & K filter. Start the compressor and light the burner of flame photometer. Keep air pressure at 5 lbs & adjust the gas feeder so as to have a blue sharp flame cones.
2. Adjust the zero reading of the meter by feeding distilled water. Now feed standard Na, Ca, & K of the highest value in the standard series and adjust the flame photometer to read full value of emission in the scale i.e., 100 reading.
3. Feed different standard sodium solution one by one and record the emission value for each.
4. Take 10 mL of sample in a 100 mL volumetric flask dilute it upto the mark by adding distilled water.
5. Feed the diluted sample in flame photometer and note the reading.

**OBSERVATION and RESULTS**

The data related to analytical studies of have been mention as follows

**Resource- : Dam water.**

The analysis of parameter of this resource indicated that 0.0156 & 16.8 mg/L Values of T.D.S, & Dissolved Oxygen respectively. The observation show that all the parameters were within the limits of Indian Standard.

**Comparison of Individual Parameters with Indian Standard Limits for Drinking Water**

**1.pH :**

The pH values is in the range between minimum 6.31 & maximum 8.90. These values lying between the maximum & minimum values certified by Indian Standard (6.5-8.5 ) for drinking water

Conductivity : Average values of conductivity were lying between 680 to 760 ppm. This parameter values were within limits when compared to Indian standard. The

conductivity of all parameter was below 2000 ppm. prescribed by Indian Standard for drinking water.

**Total Hardness :**

The comparison of values of total hardness showed that these values varied between minimum 220 and maximum 380 ppm, thus indicating that this parameters lies within limits prescribed by Indian Standard (600ppm).

**Chloride :**

The chloride values indicated that these values were within limits prescribed by Indian Standard for drinking water. Chloride values of all the resources varied between ppm as against the limit of Indian Standard i.e. 1000 ppm.

**Turbidity :**

The analytical studies about turbidity showed that its values varied between 1 NTU to 03 NTU. It was observed that its values was within limits as compared to Indian Standard specification for drinking water (<10NTU)

**Total Alkalinity :**

The observation about Total Alkalinity indicated that its value varied between 176 to 270 ppm which were below the limits prescribed by Indian Standard for drinking water (up to 600 ppm)

**Silica :**

Analytical data of silica in the present studies showed that its values ranged between 260 to 390 ppm

**Dissolved Oxygen :**

The total number of milliliters of titrant used in steps 6-8 equals the total dissolved oxygen in the sample in mg/L. Oxygen saturation is temperature dependent - gas is more soluble in cold waters, hence cold waters generally have higher dissolved oxygen concentrations. Dissolved oxygen also depends on salinity and elevation, or partial pressure

**Temperature :**

Temperature affects the chemical and biological reaction in water. A rise in temperature of water accelerates chemical reaction, reduce solubility of gases , amplifies taste and odour.

**DISCUSSION**

The present investigation was carried out with an objective of undertaking the “Analysis of physic-chemical properties of water from Bopapur dam of Amravati district”. The data obtained of various parameters like pH, TDS, Total Hardness, Chloride, Turbidity, Alkalinity, flame photometer, DO and Spectrophotometer are given in Table.

**1 pH :**

During the present studies it was found that the pH values of is varied between i.e. within Indian standard limits (6.5-8.5) . Similar studies have been reported by many investigation i.e. [1] from Yavatmal, [2] from Chandrapur and [3] from Nagpur. They had found pH values ranged between 7.65-8.57, 7.91-1.10, 6.70-7.11 and 6.30-7.82, respectively.

**2 Conductivity**

The present investigation of the conductivity values varied between 656-759 ppm i.e. within Indian standard limits (<2000 ppm) . Many workers have investigated conductivity parameters including [1] from Yavatmal (375-663ppm), [2] from Chandrapur (225 ppm-412 ppm) [3] from Nagpur (70-483 ppm)

**3 Total Hardness :**

The total hardness values ranged between (220-380 ppm) i.e. within Indian standard limit (<600 ppm) . Similar studies for photo hardness have been made by many workers i.e. [1] from Yavatmal , [4] from Yavatmal and [3] from Nagpur found 505-557 ppm , 356-444 ppm, and 250-450 ppm, respectively.

#### 4 Chloride:

The present investigator found chloride values between 72-289 ppm, i.e. within Indian standard limits (<1000ppm) many earlier investigator reported about chloride i.e. Bhagat (2008) from Yavatmal [5] from Yavatmal, talkapalliwar (2011) from Chandrapur and Dattatraya Bharti (2011) from Nagpur. They found 223-278 ppm, 87 ppm, 96 ppm, 50-150 ppm and 94-326 ppm, respectively.

#### 5 Turbidity:

The turbidity values observed in present investigation between 01-03 NTU i.e. within Indian standard limits(<10 NTU) Earlier investigator also like Rajankar(2010) from Amravati& Dattatraya Bharti (2011) from Nagpur have found 03-04 NTU & 4.2-6.2 NTU, respectively.

#### 6 Total Alkalinity :

The observed values of total alkalinity in present studies were minimum 176ppm & maximum values 270ppm i.e. within Indian Standard limits . About total alkalinity also the earlier investigators including [6] from Yavatmal reported as (210ppm), Rajankar (2010) from Yavatmal mentioned as (238-285ppm).

#### 7 Silica :

The present studies indicated the values of silica ranging between 260-370ppm the silica limits in drinking water was not specified by either W.H.O. or Indian Standard by [7] as silica value is not an issue if its concentration is little high.

#### 8 Dissolved Oxygen :

The total number of milliliters of titrant used in steps 6-8 equals the total dissolved oxygen is ranges between 16.2 to 17.4 mg/L. Oxygen saturation is temperature dependent - gas is more soluble in cold waters, hence cold waters generally have higher dissolved oxygen concentrations

#### 9 Temperature :

Temperature (C)	Examples of Life
Greater than 20C (warm water)	Much plant life, many fish diseases Most bass, crappie, bluegill, carp, catfish , caddis fly
Middle range (12-20C)	Some plant life, some fish diseases Salmon, trout, stone fly, mayfly, caddis fly, water beetles
Low range (cold-less than 12C)	Trout, caddis fly, stone fly, mayfly

#### 10 Flame photometer:

It was found that the Calcium having minimum value 50ppm whereas maximum values is 100ppm, & the sodium of various resources having minimum value 50ppm whereas maximum values is 130ppm. The Potassium of various resources having minimum value 80ppm whereas maximum values is 200ppm.

From the discussion of above mentioned parameters it seems that our finding were on the Same lines as that of earlier investigations.

In the present studies it was observed that the parameters as T.D.S, Total Hardness, Chloride, Turbidity, Total Alkalinity were within limits of Indian standard values is Studied. However, the values of pH is beyond the limits of Indian Standard.

#### Conclusion :-

The potential and quality of ground water, and economic resource and essential component of our life, is getting deteriorated in major cities and urban centre. Due to pollution cause by pollution exploitation, urbanization and industrialization, which result adverse effect on health. Hence it is necessary to test the water resources of various places in order to observe the safety of drinking water. Therefore, the present investigator has undertaken the present research work on the topic "Analysis of physico-chemical properties of water from Bopapur dam of

Amravati district”.

The specific objective of the present studies were:

- 1) To analysis the physico-chemical properties of water from dam.
- 2) To suggest the measure to be undertaken for parameters crossing limits beyond Indian standard so as to make the water useable for drinking.

In the present investigation, the various physico-chemical parameters of drinking water resources were analysed i.e pH, TDS DO, Total hardness chloride Turbidity ,alkalinity spectrophotometer ,flame photometer. either digital or titration methods were used for analytical studies. It was observe that dam water had calcium hardness beyond limits.

The standard limits about silica have not been reported in review of literature but mention in one report [8] that higher concentration of silica do not cause any adverse effect to health. Thus on the basis of analytical data , obtained from dam water of , the present investigators has concluded that the water studied is potable and safer only after applying required treatments for removing calcium hardness.

1. Estimation of sodium (Na), Potassium (k) & Calcium (Ca):

Observation :

Sr.No	Standard Concentration	Emission Value of (K)	Emission Value of (Na)	Emission Value of (Ca)
1	1 mL	46	37	48
2	2 mL	46	51	48
3	3 mL	102	65	53
4	4 mL	123	79	64
5	5 mL	137	88	74

**For Potassium :**

Sr. No.	Total value in mL	Emission value of (K)	Concentration in PPM
1	1+99mL D.W.	42	100

**For Sodium :**

Sr.No.	Total value in mL	Emission value of (Na)	Concentration in PPM
1	1+99mL D.W.	42	130

**For Calcium :**

Sr. No.	Total volume in mL	Emission value of (Ca)	Concentration in PPM
1	1+99mLD.W.	38	80

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